

TENDER FOR CIVIL ELECTRICAL DATA & FURNISHING WORKS FOR ESTABLISHMENT OF REGIONAL OFFICE AND MLP AT MUZAFFARNAGAR

PREQUALIFICATION CUM TECHNICAL BID

**PLACE OF COLLECTING, SUBMISSION OF TENDER AND PRE-BID
MEETING**

Regional office - Muzaffarnagar
175, 2nd Floor, Dwarikapuri, Muzaffarnagar, U.P.-251001

NOTICE INVITING TENDER

Sealed, Item Rate, tenders are invited in the prescribed format from eligible contractors for execution of “Civil; Electrical Data & Furnishing works for establishment of Regional Office and MLP Muzaffarnagar” as per following

Name of the work	Tender for Civil; Electrical; Data & Furnishing works for establishment of Regional office and MLP at Muzaffarnagar
Eligibility Criteria	<ul style="list-style-type: none">• Should have executed one similar work of Rs. 80.00 lacs OR Should have executed two similar work of Rs. 60 lacs OR Should have executed three similar works of Rs. 50.00 lacs during last 3 years. “The similar work shall mean “Establishment of entire Administrative office having minimum area of 5000 SQFT consisting of Civil, Electrical, Data, finishing and furnishing works, of Public sector Banks / Public sector undertakings only.”• Experience with Public Sector Banks• Average turnover for the last three years shall be minimum 30 lacs and above form government projects• solvency certificate of Rs. 30 lacs (not older than 3 months)
Tender Fees	Rs.1500/- (non-refundable) by way of DD in favour of Union Bank of India payable at Muzaffarnagar
Earnest Money Deposit	Rs. 3,00,000/- (Rupees Three Lakh only) by way of DD and drawn in favour of Union Bank of India, payable at Muzaffarnagar
Period of Completion	1.5 months / 45 days
Validity of Tender	180 days
Date of Issue of Tender	From 09.02.2024 up to 29.02.2024 from 11:00 AM to 2:00 PM during working days. The tender can also be downloaded from the Bank’s website www.unionbankofindia.co.in and government tender portal www.eprocure.gov.in .
Pre-bid Meeting with Contractor	11.30 AM onwards on 21.02.2024
Last date of submission of Tender	Up to 2.00 PM on 29.02.2024
Date & Time of opening the Tender (Technical bid)	3.30 PM on 29.02.2024; Presence of bidder is desired during opening of Bid.
Date & Time of opening the Tender (Price bid)	Price Bid of only eligible bidders would be opened. The date of opening of price bid shall be announced to qualifying bidders through email only. Presence of bidder is mandatory during opening of Bid.
Performance Guarantee	The amount of performance guarantee shall be 5% of the accepted value of the tender excluding EMD. The performance guarantee shall be payable in form of DD / Bank Guarantee issued by Nationalized government Banks. Performances guarantee to be submitted within

Signature & Stamp of bidder

	07 days of issue of work order.
Date of commencement	10 days from the date of acceptance of work order OR date of site possession, whichever is later.
Retention money to be deducted from the bills.	10% of the certified gross value of each running bill, till accumulating total security deposit.
Total Security Deposit	10% of Contract amount / value of final bill whichever is maximum.
Defect Liability Period	Twelve months from the virtual completion. However, if all the works or more than one works awarded to one contractor the defects liability period will be reckoned from the date of virtual completion of last work.
Period of Final Measurement	15 days.
Liquidated damages	Shall be 0.5% of contact amount per week of delay subject to ceiling of 7.5% of the accepted contract amount.
Value of works for Interim Certificates	Value not less than Rs.10.00 lacs (Rs. Ten Lakhs only) or as decided by the Bank.
Period for honouring interim certificate.	Payable within 30 days after checking by the Bank.
Recovery towards taxes.	As per rules applicable from time to time.

- 1) The Pre-bid meeting and purchase / submission of tender will be at 175, 2nd Floor, Dwarikapuri, Muzaffarnagar, U.P.-251001, the tender can be purchased from above address **during working days from 11.00 A.M. up to 1.00 P.M.** on payment of Tender fees of Rs.1500/- (non-refundable) by way of DD in favour of Union Bank of India payable at Muzaffarnagar. The tender can also be downloaded from the Bank's website www.unionbankofindia.co.in and government tender portal www.eprocure.gov.in.
- 2) The Item Rates under the contract include for full, final & entire completion of all works in all respects as described in documents forming part of the contract. Tenders will be opened in the presence of contracting agencies or their authorized representatives.
- 3) It is mandatory for bidders to attend pre-bid meeting along with site inspection at mentioned date.
- 4) The tenders shall be submitted in two envelopes. **The envelope No. 1** shall be marked as **Technical Bid**, shall contain Technical Bid of the tender, containing (but not limited to) EMD in the form of Demand Draft / Pay Order, Prequalification application & supporting documents etc.

The envelope No. 2 shall be marked as **Price Bid** and shall include the price bid only. Unsealed price bids would be rejected.
- 5) **Envelope No. 1.** Will be opened on the due date of opening. **Envelope No. 2 / Price bid** of only qualified bidders will be opened at later date (to be intimated subsequently) and the sealed price bid of disqualified bidders shall be returned unopened.
- 6) Tenders are to be submitted in one sealed Envelope Cover Enclosing therein the Envelope No. 1 and Envelope No.2 duly Superscripted " Tender for Civil; Electrical; Data & Furnishing works for establishment of Regional office and MLP at Muzaffarnagar"

- 7) The tenderer must use only the tender forms issued for the purpose to fill in the rates. Intimation of tender quoted by letter, telegram / telex will not be acceptable. The tender must be dropped in a tender box. Delivery of the tender through courier / post shall be avoided and will not be entertained.
- 8) Tenderers are advised not to make any alteration/modification in the tender documents, Item of work or in any respect whatsoever. Violation of this requirement will make the tender Liable for rejection.
- 9) In case of postal delivery, the tenderer has to ensure that tender is reached before the due date and time and dropped in the tender box. The bank will not be responsible for damage in the transit and delay of receipt of tender, if any or sent by a special messenger. Tender received late shall be rejected.
- 10) Every page of the tender documents should be signed by the person or persons submitting the tender in token of his/their having acquainted himself/themselves with the General and Special Conditions of Contract, Specifications etc., as laid down. Any tender with any of the documents not so signed will be subjected to rejection.
- 11) No consideration will be given to a tender received after the time stipulated above and no extension will be allowed for submission of the tender.
- 12) The Union Bank of India shall not be bound to accept the lowest tender and reserves the right to accept or reject any or all the tenders without assigning any reason whatsoever.
- 13) This notice inviting tenders, the conditions of tender and the duly completed form of tender etc. will form part of the Agreement to be executed by the successful tenderer with the bank.
- 14) Tender submitted without EMD will be treated as incomplete and the same will be rejected out rightly. The EMD shall be strictly in the form of Pay Order / Demand Draft. No Cheques will be accepted on account of EMD. Tenders submitted with the cheque as EMD will be treated as incomplete and will be rejected. The EMD of successful bidder shall be retained by the Bank and the EMD of unsuccessful bidders shall be returned. The bidder seeking relaxation in EMD as per statutory guideline in vogue shall submit all relevant documents, failing which their tender is likely to be rejected.

NOTE: - it is mandatory to fill all required field properly in legible handwriting with black / blue pen in the given format only, extra sheet may be used as per need. Merely mentioning "refer attachment" in the tables shall make tender liable for rejection

BIO - DATA OF CONTRACTING AGENCY

1. Name of the firm :
Address :
Telephone No. :
Office :
Residence :
Mobile :
Fax :
E-Mail :

2.a) Whether proprietary/partnership/
Pvt. Ltd. / Public Ltd. (certificate
of registration / partnership deed
to be enclosed as Annexure-I).

b) Name of the Proprietor, :
Partners, Directors

I)

II)

c) Year of establishment :

3. Registration with Tax Authorities :

i) Income-tax (PAN) No. :

ii) GST no. :

iii) EPF Regn. No. :

iv) ESI Regn. No. :

v) TIN / VAT No. :

(copies of certificates of registration with relevant authorities to be enclosed as Annexure-II-A, II-B, II-C, II-D & II-E)

4. Names of the Bankers with address & telephone numbers:

I)

II)

5. Enclose solvency certificate of : Enclosed / Not enclosed
Minimum Rs. 30 Lacs

Signature & Stamp of bidder

Note: The solvency certificate should be addressed to Union Bank of India and not older than three months from the date of advertisement.

6. Furnish copies of audited balance-Sheet and Profit & Loss A/C. for the last 3 years as Annexure-IV-A, IV-B & IV-C. : Enclosed / Not enclosed
7. Registration with Govt. / Public Sector / Banks (certificates of Registration to be enclosed as Annexure-V.

Name of the Organization	Year since empanelled

8. Give details if at present involved in litigation in similar type of contracts:

Sr. No.	Name of Project	Name of Employer	Nature of work	Work order dated	Date of completion of work	Value Rs.

9. Details of civil suit, if any, that arose during execution of contract in the past 10 years. :
10. Specify maximum value of single value project executed during the last three years. :
11. Name & relation, if any, with the staff member of Union Bank of India. :
12. Details of work executed during the last 3 years:

Type of work	Work executed for (name of the Institution / Body)	Nature of work (in brief)	Location	Value Rs.	Duration of work with dt Commence completion		If work left incomplete or terminated (give reasons)

Note: Copies of work orders along with xerox copies of relevant TDS certificate, satisfactory completion certificate obtained from the client shall be enclosed as Annexure VI. Please note without the copies of certificates, your application is liable to be rejected.

13. Details of work on hand (photocopies of performance certificate, work orders issued by valued clients, preferably Banks, Govt., and Semi-Govt. Bodies should be enclosed as Annexure VII).

Type of work	Work executed for (name of the Institution / Body)	Nature of work (in brief)	Location	Value Rs.	Duration of work, stipulated time	Present stage of work

14. Details of Pre-Qualifying work (Filling of columns is mandatory and to be supported by copies of work order and completion letters as per the criteria. Non filling of columns or not enclosing credentials, the application form submitted will be rejected without assigning any reason)

Name of the work	Name of the client	Work order reference /date	Completion letter reference/ date	Value of work completed

Signature & Stamp of bidder

15. LIST OF NAME/S OF PROPRIETOR / PARTNERS & EMPLOYEES

Name	Qualifications	Experience	Particulars of work done	Employed in your firm since	Value of work done

16. Turnover in last 5 years: Enclose certified copy issued by registered CA with UDIN

Sr. No.	Year	Turnover (Rs.in lacs)	Income-tax paid	VAT paid	GST / Service Tax paid
1	2022-23				
2	2021-22				
3	2020-21				
4	2019-20				
5	2018-19				

Copies of income-tax returns / assessment orders for each year to be enclosed as Annexure VIII-A,B,C,D & E

17. List of equipments / machinery owned:

Sr. No.	Name of equipment	Year of manufacture	Nos. available

18. PRE-QUALIFICATION CRITERIA:

Sr. No.	Criteria	Weightages	Self rating marks
1	Should have executed one similar work of Rs. 65.00 lacs OR Should have executed two similar work of Rs. 40.00 lacs OR Should have executed three similar works of Rs. 35.00 lacs during last 3 years.	50 40 30	
2	Experience with Public Sector Banks	20	
	Average turnover for the last three years shall be minimum 30 lacs and above from government projects. Certificate issued from registered CA in favor of Union Bank is mandatory	10	
3	Should have submitted solvency certificate of Rs. 30 lacs (not older than 3 months) and have made profit at least in two years during last three years. Certificate issued from registered CA in favor of Union bank would only be acceptable. Mandatory Criteria, without which tender shall be rejected	10	
4	Empanelment with Union Bank of India	10	

NOTE: Criteria mentioned above are just minimum requirement. The Bank at its discretion may upgrade the criteria. No complaint on this account will be entertained. Contractors scoring minimum 80 marks will only be considered for pre-qualification. Contractors themselves have to fill in self-rating marks column in the above table.

“The similar work shall mean “Establishment of entire Administrative office having minimum area of 5000 SQFT consisting of Civil, Electrical, Data, finishing and furnishing works, of Public sector Banks / Public sector undertakings Only.”

19. LIST OF ENCLOSURES:

ANNEXURE NO.	PARTICULARS	TICK IF ENCLOSED
I	Certificate of registration of Company / partnership deed.	
IIA, IIB, IIC, IID, IIE	Certificates of registration with Income Tax, GST, EPF, ESI and VAT / TIN authorities.	
III	Solvency Certificate.	
IVA, IVB, IVC	Audited Balance Sheet & Profit & Loss A/c. Statement	
V	Certificates of Registration with Govt. / Public Sector / Banks.	
VI	Copies of work orders along with xerox copies of relevant TDS certificate, satisfactory completion certificate mentioning value of work.	
VII	Copies of performance certificate, work orders issued by valued clients, preferably Banks, Govt., Semi-Govt. Bodies.	
VIIIA, VIIIB, VIIIC, VIIID, VIIIE	Copies of income-tax returns / assessment orders	

Note: In absence of any of the above enclosures, your application is likely to be rejected.

Signature & Stamp of bidder

DETAILS OF PREQUALIFYING WORKS - I

(Filling all details are mandatory without which application will be summarily rejected)

1.	NAME OF FIRM & ADDRESS FOR WHOM THE WORK IS EXECUTED	
2.	DETAILS OF WORK DONE BY THE FIRM	
3.	PHOTOGRAPHS OF WORK COMPLETED (PLEASE ENCLOSE COPY)	
4.	VALUE OF CONTRACT EXECUTED	
5.	BRIEF DISCRPTION OF THE WORK	
6.	PERIOD DURING WHICH THE CONTRACT IS EXECUTED	
7.	WORK ORDER REFERENCE (PLEASE ENCLOSE COPY OF THE WORK ORDER)	
8.	COMPLETION CERTIFICATE REFERENCE (PLEASE ENCLOSE COPY OF THE COMPLETION OF WORK)	
9.	DELAY IN EXECUTION OF WORK	
10.	WHETHER TIME SCHEDULE IS ADHERED TO	
11.	ANY OTHER INFORMATION WHICH YOU CONSIDER WILL HELP US IN TAKING OUR DECISION.	

PLACE:

SIGNATURE WITH OFFICE SEAL

DATE:

DETAILS OF PREQUALIFYING WORKS - II
(Filling all details are mandatory without which application will be summarily rejected)

12.	NAME OF FIRM & ADDRESS FOR WHOM THE WORK IS EXECUTED	
13.	DETAILS OF WORK DONE BY THE FIRM	
14.	PHOTOGRAPHS OF WORK COMPLETED (PLEASE ENCLOSE COPY)	
15.	VALUE OF CONTRACT EXECUTED	
16.	BRIEF DISCRIPTION OF THE WORK	
17.	PERIOD DURING WHICH THE CONTRACT IS EXECUTED	
18.	WORK ORDER REFERENCE (PLEASE ENCLOSE COPY OF THE WORK ORDER)	
19.	COMPLETION CERTIFICATE REFERENCE (PLEASE ENCLOSE COPY OF THE COMPLETION OF WORK)	
20.	DELAY IN EXECUTION OF WORK	
21.	WHETHER TIME SCHEDULE IS ADHERED TO	
22.	ANY OTHER INFORMATION WHICH YOU CONSIDER WILL HELP US IN TAKING OUR DECISION.	

PLACE:

SIGNATURE WITH OFFICE SEAL

DATE:

Signature & Stamp of bidder

DETAILS OF PREQUALIFYING WORKS - III
(Filling all details are mandatory without which application will be summarily rejected)

23.	NAME OF FIRM & ADDRESS FOR WHOM THE WORK IS EXECUTED	
24.	DETAILS OF WORK DONE BY THE FIRM	
25.	PHOTOGRAPHS OF WORK COMPLETED (PLEASE ENCLOSE COPY)	
26.	VALUE OF CONTRACT EXECUTED	
27.	BRIEF DISCRIPTION OF THE WORK	
28.	PERIOD DURING WHICH THE CONTRACT IS EXECUTED	
29.	WORK ORDER REFERENCE (PLEASE ENCLOSE COPY OF THE WORK ORDER)	
30.	COMPLETION CERTIFICATE REFERENCE (PLEASE ENCLOSE COPY OF THE COMPLETION OF WORK)	
31.	DELAY IN EXECUTION OF WORK	
32.	WHETHER TIME SCHEDULE IS ADHERED TO	
33.	ANY OTHER INFORMATION WHICH YOU CONSIDER WILL HELP US IN TAKING OUR DECISION.	

PLACE:

SIGNATURE WITH OFFICE SEAL

DATE:

Signature & Stamp of bidder

DECLARATION

I / We have read the instructions appended to the proforma and I / We understand that if any false information is detected at a later date, any future contract made between ourselves and Union Bank of India, on the basis of the information given by me / us can be treated as invalid by the Bank and I / We will be solely responsible for the consequences.

I / We agree that the decision of Union Bank of India in selection of contractors will be final and binding to me / us.

All the information furnished by me hereunder is correct to the best of my knowledge and belief.

I / We agree that I / we have no objection if enquiries are made about the work listed by me / us in the accompanying sheets.

Place :
Date :

SIGNATURE
NAME & DESIGNATION
SEAL OF ORGANISATION

INSTRUCTION WITH REGARD TO SUBMISSION OF TENDER

- 1) Rates should be quoted both in figures and words in columns specified. All erasures and alterations made while initials of the tenderer must attest filling the tender. Overwriting of figures is not permitted. Failure to comply with either of these conditions will render the tender invalid and it will be the option of Union Bank of India to accept or reject the tender. No request of any change in rate or conditions after opening of the tender will be entertained.
- 2) In the case of figures, the word `Rs.' should be written before the figures of rupees and the word `P' written after the decimal figures e.g. Rs. 3.25 P. In the case of words, the word Rupee should similarly precede and the words "Paise only" should be written at the end, closely following each the percentage rate. The word "only" should not be written in the next line unless the rate quoted is in whole Rupees closely followed by the word "only": The amount should invariably be upto two decimal places.
- 3) The different Schedules should be filled as follows:
 - (a) The "Rate" Column wherever applicable to be legibly filled in ink in both figures and words.
 - (b) The "Amount" Column also to be legibly filled in ink in both figures and words.
 - (c) All corrections to be initialed.
 - (d) No over writing is allowed.
 - (e) The figure of percentage of rate shall be legibly filled in ink in both figure and words.
- 4) Errors in the bill of quantities shall be dealt with in the following manner.
 - a. In the event of any discrepancy between the rates quoted in words and the rates in figures the former shall prevail.
 - b. In the event of an error occurring in the amount column of the bills of quantities as a result of the wrong extension of the unit rate and the quantity, the unit rate shall be regarded, as firm and extension shall be amended on the basis of the rates.
 - c. All the errors in totaling in the amount column and in carrying forward the totals shall be corrected.
- 5) The tender shall be signed and dated at all places provided therein. Also all pages, drawings and corrections / alterations shall be initialed. The tender submitted on behalf of a firm shall be signed by all the partners of the firm or by a partner who has the necessary authority on behalf of the firm to enter into the proposed contract. Otherwise the tender may be rejected by Union Bank of India.
- 6) The time allowed for completion of works is 1.5 months / 45 days from the date of commencement of the work is reckoned from the tenth day from the date of Letter of Intent. Time shall be considered the essence of contract.
- 7) It shall be the responsibility of the contractor to arrange for water and electricity required for completing construction. If water is available with the bank, the same shall be supplied to the contractor. However, contractor will have to make

arrangement of pipeline for distributing water. Contractor to make own arrangement of electricity and pay tariff to the electricity board.

- 8) Every tender shall be accompanied by earnest money of Rs.3,00,000/- (Rupees Three Lacs only) by way of Demand Draft/Pay Order favouring UNION BANK OF INDIA, payable at Muzaffarnagar. Tender submitted without earnest money shall be summarily rejected. The bidder seeking relaxation in EMD as per statutory guideline in vogue shall submit all relevant documents, failing which their tender is likely to be rejected. The contractor whose tender is accepted will have to deposit Performance guarantee a further sum of 5 % of the value of the accepted tender. The performance guarantee will have to be made within 07 days from the date of acceptance of tender, failing which the Bank at his discretion may revoke the letter of acceptance and forfeit the earnest money deposit furnished along with the tender.
- 9) The Earnest Money will be retained in the case of the successful tenderer as part of the security for due fulfillment of the Contract. No interest shall be paid on this deposit. Failure to enter into the Contract agreement within the stipulated time of 7 days from the date of acceptance of work order shall entail the forfeiture of the Earnest money Deposit. The Earnest money of unsuccessful tenderers will be released after issue of work order, without any interest.
- 10) The tenderer shall submit his tender after carefully examining the whole of the tender document and the terms and conditions of contract, specifications, the schedule of quantities etc., and also after examining the site and conditions prevailing in and around site.
- 11) The Bank does not bind himself to accept the lowest or any tender and reserve to them the right of accepting the whole or any part of the tender and tenderer is bound to perform the same at the rates quoted. The Bank will not be bound to accept the lowest tender and reserves the right to accept or reject any or all the tender without assigning any reasons whatsoever. The work may also be divided among the contracting agencies depending on the exigencies of the bank.
- 12) Tenders shall remain valid for a period of 180 days from the date of opening of the tender which period may be extended by mutual agreement and the tenderer shall not cancel or withdraw the tender during the initial validity period of 180 days.
- 13) The successful tenderer shall be bound to implement the Contract and mobilise within 07 days and sign specified agreements within 10 days from the date of acceptance of work order.
- 14) Tenderers must include in their rates, sales tax (State & Central Govt.), service-tax, education cess, Labour cess, excise duty, octroi, sales tax on works contract, VAT and any other tax & duty or other levy by the central and state government applicable on the date of submitting tender. Due to change in taxes structure by orders from Central Govt. / State Govt. after opening of tenders shall be reimbursed to the contractor as per actual and upon verifying the proof of having made the payment.
- 15) This contract shall be a item rate contract. The Contractor shall be paid for actual quantity of work done, as measured at site including any deviation plus or minus. The

rate of any non-schedule items of work shall be decided as mentioned in the conditions of contract.

- 16) No correspondence will be entertained in respect of this tender other than any clarifications strictly pertaining to this tender.
- 17) The tender price quoted by a tenderer shall be kept strictly confidential and shall not be divulged to any other party even approximately before the time limit for delivery of tender. The only exception be for obtaining an insurance quotation, you may give your insurance company or agent any essential information they ask for, so long as it is done in strict confidence. No information about other's tender price should be obtained and no arrangement with any one else should be made whether or not he submit the tender.
- 18) For electrical, sanitary, water supply and drainage works, tenderers must possess respective valid licenses from the competent authority of the area where the site is located.
- 19) Contractor should sign at the end of every page prior to submitting the tender.
- 20) Conditional tenders will be summarily rejected.
- 22) COMPLETION PERIOD OF THE PROJECT WILL BE 1.5 MONTHS / 45 DAYS.

To be filled by bidder wherever required in legible handwriting in blue and black pen

TENDER FORM

To,
Regional Head,
Union Bank of India,
RO, Muzaffarnagar

TENDER FOR: Tender for Civil; Electrical; Data & Furnishing works for establishment of Regional office and MLP at Muzaffarnagar

Sir,

1. We have read and examined the following documents as received by us:

- a) Notice Inviting Tender
- b) Instructions to Tenderers
- c) Conditions of Contract.
- d) Supplementary Conditions.
- e) Specifications / Drawings
- g) Schedule of Quantities.
- h) Addition condition of contract

1. We are well aware and familiar with CPWD, Schedule of Rates and their specifications, CPWD Specification, BIS publication and National Building code which shall apply to this contract to supplement any missing details in this contract in order of preference.

Further to the above, we have visited and examined the site of the proposed works and have acquired the requisite information relating thereto as affecting the tender invited by Bank.

2. We agree that any other terms or conditions of contract or any general reservation which may be printed on any correspondence emanating from us in connection with this tender or with any contract resulting from this tender shall not be applicable to this tender or to the contract.

3. We have obeyed the rules about confidentiality of tenders and will continue to do so as long as they apply.

4. We are enclosing along with our tender an earnest money of Rs. _____ (Rupees _____ only) favouring Union Bank of India, payable at Muzaffarnagar (Pay Order No. ----- dated ----- drawn on -----). We hereby agree that this sum shall be forfeited by Union Bank of India in the event of our tender being accepted and if we fail to execute the contract when called upon to do so.

Signature & Stamp of bidder

5. Subject to and in accordance to the terms and conditions contained or referred to in the tender documents, we agree and offer to execute all the Works referred to in the said documents upon the terms and conditions contained or referred to therein and to carry out such deviations as may be ordered to be valued as per the conditions of contract.
6. We undertake to complete and deliver the whole of the works within a period i.e. 2 months / 60 days as specified in the contract and further confirm that the time allowed for completion is adequate. Time allowed for completion of entire job or part job assigned shall be reckoned from the tenth day of the date of acceptance of work order. We shall be under the obligation to pay the sum as stated in the contract for every day that the works shall remain incomplete, damages as compensation subject to the conditions of contract relating to extension of time.
7. We hereby agree that unless & until a formal agreement is prepared & executed in accordance with the Articles of agreement, this tender together with your acceptance thereof, shall constitute a binding contract between us.
8. We agree to pay Performance Guarantee of 5% of the contract amount by way of DD/BG in favour of UNION BANK OF INDIA, payable at Muzaffarnagar. This amount shall be released after virtual completion of work. We further agree for a deduction of 10% from the running bill as retention money till accumulating total security deposit.
9. Validity of the tender is 180 days from the date of opening of tender or it may be beyond 180 days if mutually accepted.
10. The bank is at liberty to accept or reject any tender, without assigning any reasons whatsoever.
11. The work may be split up in the first instance as per exigencies of the bank. But it may be split up in more parts or parts combined if so desired by the Bank without assigning any reasons whatsoever. We will not have any claim either for loss of profit or revision in rates.
12. Adherence to the pert chart will be ensured by us as the project is to be executed in a very strict time frame.
13. We are aware that the quantities of work indicated in the bill of quantities are approximate, may vary to any extent, even it may be omitted, we will not have any claim of any kind against the bank.

Signed in the capacity of duly authorised
to sign tenders for and on behalf of

Address Telephone No

.....

Date:

Signature & Stamp of bidder

SUPPLEMENTARY CONDITION

INDEMNITY BOND

On the acceptance of his tender, the contractor will be required to execute an Indemnity Bond with-in 10 days of issue of work order in favor of the bank against third party claims, civil or criminal complaints, site mishaps and other accidents or disputes, against any damages, loss or expenses due to or resulting from any negligence or breach of duty on the part of the contractor, his subcontractors or his employees and agents etc., as per the appropriate Indemnity Bond attached.

It will also be covered by labour laws of the Govt. of India.

Any other conditions suggested by the Bank may be added subsequently.

INDEMNITY BOND

(On Non-Judicial Stamp Paper of Rs. 10/-)

KNOW all men by these presents that I/We _____ do hereby execute Indemnity Bond in favour of the Union Bank of India on this _____ day of _____ 20__.

WHEREAS Union Bank of India, (address of the office) _____, have appointed _____ as the Contractors for their Proposed Union Bank of India Project at _____.

THIS DEED WITNESS AS FOLLOWS:

I/We _____ hereby do Indemnify and save harmless Union Bank of India, _____ against

1. Any third party claims, civil or criminal complaints/liabilities, site mishaps and other accidents or disputes and/or damages occurring or arising out of any mishaps at the site due to faulty work, negligence, faulty construction and/or for violating any law, rules and regulations in force, for the time being while executing/executed works by me/us.
2. Any damages, loss or expenses due to or resulting from any negligence or breach of duty on the part of me/us or my sub contractor's if any, servants or agents.
3. Any claim by an employee of mine/ours or of sub contractors if any, under the Workmen's Compensation Act and Owners Liability Act, 1939 or any other law, rules and regulations in force for the time being and any Acts replacing and/or amending the same or any of the same as may be in force at the time and under any law in respect of injuries to persons or property arising out of and in the course of the execution of the contract work and/or arising out of and in the course of employment of any workman/employee.

Any act or omission of mine/ours of sub-contractor's if any, our/their servants or agents which may involve any loss, damage, liability, civil or criminal action.

IN WITNESS WHEREOF THE _____ has set his/their hand on this day of _____ 20__.

SIGNED AND DELIVERED BY THE	NAME AND ADDRESS
AFORESAID _____	(Contractor)

IN THE PRESENCE OF WITNESSES:

- 1.
- 2.

ARTICLES OF AGREEMENT

(Draft will be modified by Bank's Law Officer as per requirement)

ARTICLES OF AGREEMENT made at _____ this _____ day of _____ Two Thousand and _____.

BETWEEN

UNION BANK OF INDIA, a body corporate constituted under the Banking Companies (Transfer of Undertakings) Act, 1970 and having its Office at 239, Vidhan Bhavan Marg, Nariman Point, Mumbai 400 021, hereinafter called "the Bank" (which expression shall, unless it be repugnant to the context or meaning thereof, include its successors and assigns) of the **ONE PART**

AND

MESSRS _____, having its registered office at _____, hereinafter called the "Contractor" (which expression shall unless repugnant to the context or meaning thereof, include its successors and permitted assigns) of the **OTHER PART**.

WHEREAS

- i. The Bank is desirous of _____ (Works) on its _____ at _____.
- ii. The Bank has already appointed and retained M/s _____, having its Office at _____ and Registered Office at _____ to supervise the Works.
- iii. The Bank has caused the bills of quantities showing and describing the works to be done to be prepared by or under the direction of the Bank;
- iv. The Bank had invited tenders for _____ work in accordance with the general conditions of contract, special conditions of contract, technical specifications, bills of quantities and furnished to the Contractor.
- v. Having examined the general conditions of contract, special conditions of contract, technical specifications, bills of quantities, the Contractor offered to execute, complete and maintain the whole of the Works relating to the Project in conformity with the said general conditions of contract, special conditions of contract, technical specifications, bills of quantities and in accordance with instructions issued by the Bank and the Contractor submitted its tender for the contract sum of Rs. _____ towards the said work.
- vi. The tender submitted by the Contractor was, after negotiations, modified/alterd upon the Contractor agreeing to revise the rates of certain items and further offering a rebate for execution and completion of the Project thereby reducing the tender amount to Rs. _____ as confirmed by its letters dated _____.

- vii. Towards the implementation of the Project, the Contractor has supplied the Bank with a fully priced copy of the said bills of quantities (which copy is hereinafter referred to as “the Contract Bills”). The Contract Bills have been signed by or on behalf of the parties hereto:
- viii. The Contractor has already agreed with the Bank to implement and execute the Project in full on the basis of the contract documents as hereinafter defined on the terms and conditions therein contained;
- ix. The parties are now executing this Agreement setting out the basic terms of the agreement between them for smooth implementation and execution of the Project without any unnecessary difference or dispute.

NOW IT IS HEREBY AGREED as follows:

1. The Contract Document is comprising of

- i. Tender document including technical bid (Vol.-I) and pre-bid (Vol.-II).
- ii. Notice Inviting Tender issued vide letter _____
- iii. Subsequent letters issued by the Bank vide _____
- iv. Clarifications submitted by the contractor vide letter dt. _____.
- v. Minutes of Meeting held on _____
- vi. Rebate / Discount offered by the contractor vide letter _____
- vii. Work Order issued by the Bank vide letter _____
- viii. Acceptance letter _____ from the contractor

1.a Unless the context otherwise requires the contract documents above mentioned shall be harmoniously construed and in the chronological order.

1.b Unless otherwise expressly provided under these presents, contract documents (iii) to (ix) above shall be construed as modifying only those general and special terms and conditions in tender document in so far and to the extent referable to the clauses in the said tender document.

1.c Unless otherwise stated expressly hereunder, all the general and special terms and conditions shall apply and binding on the contractor.

2. The Contract Document is complimentary. What is called for in any one shall be as binding as called for by all. The aforesaid shall form integral part of contract and in the event of any inconsistency between any provisions herein the provisions of the Contract Documents shall prevail. When any of the General and Special Conditions are at variance, the condition stipulated in the Special Conditions of Contract shall supercede relevant provisions in General Conditions. For all matters not specifically provided for herein the provisions of General and Special Conditions in the Tender Documents shall apply and the rights and liabilities of the parties shall be decided accordingly. The decision of the Bank in this regard shall be final and binding.

3. All time limits stated in the Contract Document are of the essence of the contract where the work has to be completed within 1.5 months / 45 days failing which

liquidated damages will be recovered @ 0.5% of contract amount for per week of delay subject to maximum recovery of 7.5% of the contract amount.

4. For the consideration hereinafter mentioned, the Contractor shall carry out and complete the Works in conformity with the contract documents and in accordance with the instructions issued by the consultant from time to time including all modifications extra and additional works and obligations to be carried out either on the Site or at any factory or work shop or any other place for subsequent incorporation as required for the due performance of the contract.
5. The general character and the scope of the Works is illustrated and defined by the specifications and the bills of quantities herewith attached and by the signed drawings. The scope includes furnishing all materials, labour, tools, equipment and management necessary for and incidental to the construction and completion of the Works. If the Contractor shall find any discrepancy in or divergence between the contract drawings and/or the contract bills he shall immediately give to the Consultant a written notice specifying the discrepancy or divergence and the Consultant shall issue instructions in regard thereto which shall be complied with by the Contractor.

6. INTENT

The intention of arrangement is to secure the performance of the Contractor's obligations to the satisfaction of the Bank / Bank / Consultant. All labour, material, equipment, constructional plant and transportation necessary for the proper execution of the Project is to be provided by the Contractor and should only be of the approved manufacturer/agencies respective kinds as described in the Contract Documents which is to be subjected from time to time to such tests as the Engineer/ Consultant's representative may direct. In case the required material/services of approved manufacturers/agencies are not available or are not upto the mark the Contractor shall procure material/ services from such other manufacturer/agencies as may be approved by the Consultant / Bank and the Contractor shall submit rate analysis for such material.

7. EXTENT

The Contractor shall carry out and complete the Works in every respect in accordance with this contract and with the directions of and to the reasonable satisfaction of the Consultant. The Consultant may in their absolute discretion and from time to time issue further drawings, details and/or written instructions and written explanations whole of which are collectively referred to as Consultants' instructions. All such drawings and instructions shall be consistent with the Contract Document true developments thereof as reasonably inferable therefrom.

8. TYPE OF CONTRACT

The Contract is an Item Rate contract. The Contractor shall be paid for the actual quantity of Work done, as measured at Site, at the rates quoted by him in the Contract Bills. The contractors have

- i. Been informed that the schedule of approximate quantities is liable to alteration by omission, deduction, substitution or additions at the discretion of the Bank without affecting the terms of the contract and no compensation to Contractor.
- ii. Fully and correctly understood the meaning of all the tender documents, the General Conditions of Contract, Special Condition of Contract, Technical Specifications, Bill of Quantities or part thereof.

9. CONTRACTORS COVENANTS

- i. The Tender form conditions, priced schedule of quantities, and General and Special Conditions of Contract, specifications, priced Bill of Quantities, Schedule of Rates and Prices, if any, Tender, pre-contract correspondence, Letter of Intent/Acceptance, Work order, shall be read and construed as forming part of this agreement and the Contractor shall abide by and submit themselves to all the conditions and stipulations contained therein; which are not specifically incorporated herein;
- ii. The Contractor shall obtain necessary permissions/ certificates/ order from the Competent Authority in respect of workmen employed by them for the Project and shall keep the Bank safe, harmless and reimburse all amounts/expenses incurred or suffered by the Bank in connection with any such claim;
- iii. The Contractors shall not make any claim as regards want of information of any particular point or any change in the rate or conditions save and except as provided herein;
- iv. The Contractors shall have a duly authorized agent at the place of Work to accept services of notice and to agree to extras, omissions, additions and substituted items of Works and rates from the commencement of the Work until it is virtually completed.
- v. In the event of any discrepancy between the details and/or description given in the Bill of Quantities, the Drawings and the Technical Specifications, such item shall be deemed to have been priced in accordance with the details and/or description confirming to the most superior provisions contained in any of the following :-
 - a) Bill of Quantities
 - b) Drawings
 - c) Technical Specifications
- vi. It shall be understood that the details and/or description not specifically mentioned in the Bill of Quantities shall be the same as those mentioned in the Technical Specification. Any further interpretation of above Clause shall be at the discretion of the Bank, whose decision shall be final and binding on the parties to the contract.
- vii. The Contractors shall not make any claim for increase in the contract consideration on the basis of incorrectness and insufficiency of the information available at the time of submitting the Tender and/ or incorrectness and insufficiency of the rates and prices stated in the price bill of quantity and schedule of rates and prices or otherwise alleging insufficiency of the tender amount to cover their obligation under the contract or matters concerning the execution of the Project.

- viii. It shall be responsibility of intending bidder to visit site and make self assessment of work and bid accordingly, nothing extra can be claimed in this regard at any stage of work.
 - ix. The Contractor shall be fully responsible for the adequacy, stability and safety of all site operations and methods of construction.
 - x. The Contractor shall promptly inform the Bank of any error, omission, fault and other defects in specifications for the Works, which are discovered while reviewing the Contract Documents or in the process of execution of the Works.
 - xi. The Contractor shall arrange for the permits and licenses for release of materials, which are under Government control subject to the Bank giving all the necessary assistance and signing any forms or applications that may be necessary.
 - xii. The Contractor shall comply with the provisions of all statutory legislation prevailing during the currency of contract.
10. The Contractor shall keep the Bank saved harmless and indemnified against claims if any of the workmen and all costs and expenses as may be incurred by the Bank in connection with any claim that may be made by any workmen.

11. GENERAL CONDITIONS

- i. The schedule of Quantities given in the Contract Bill are provisional and are meant to indicate the intent of the Work and to provide a uniform basis for tendering. The Bank reserves the right to increase or decrease any of the quantities or to totally omit any item of Work and the Contractor shall not claim any extras or damages on these grounds.
 - ii. Any error in description or in quantity or omission of items from the Contract Bill shall not vitiate this Contract but shall be treated as a variation.
 - iii. The rates quoted by the Contractor in the priced bill of quantities (Contract Bills) shall be treated as firm and the contract sum shall be deemed to have been calculated with reference to the cost of execution of Works as set out in Contract Documents and shall not be adjusted or altered for any reason other than any adjustments on account of statutory rise or fall in the cost of labour and/or material or any other matters affecting the cost of execution of Works, or price variation adjustment formula if provided.
12. Notwithstanding anything contained elsewhere in any of the clauses of the tender, the prices/rates quoted for each item/Work in the Bills of Quantities shall be deemed to be inclusive of all direct and indirect costs, duties, taxes, sales tax, consignment tax, octroi/local tax, Works contract tax, etc. on any of inputs, royalty on quarried items etc. that may be involved in completing the item/Work as required in the fulfillment of all obligations under the contract and to the satisfaction of the Bank. Additional Taxes / Levies by Central / State Government legislations after opening of tender shall be reimbursed to the contractors as per actuals.
13. All the interim payments shall be regarded as payments by way of advance against the

final payment only and not as payments for Work actually done and completed, and shall not preclude the repairing of bad, unsound, and imperfect or unskilled Work to be removed and taken away and reconstructed, or re-erected or be considered as an admission of the due performance of the contract, or any part thereof in any respect or the accruing of any claim, nor shall, it conclude, determine or affect in anyway the power of the Bank under these conditions or any of them as to the final settlement and adjustment of the accounts or otherwise or in any other way vary or affect the contract. The final bill shall be submitted by the Contractor within one month of the date fixed for completion of the Work and payment shall be made within eight (8) weeks from the date of receipt of final Bill and joint measurement.

14. INSURANCE

- i. Without limiting the obligations and responsibilities under Contract Clause for Care of Work the Contractor shall effect third party insurance with an insurer and in terms approved by the Bank in the joint names of the Bank and the Contractor-
- ii. against all loss or damage from whatever cause arising, other than the excepted risks stated in contract clause of the General Conditions for which the Contractor is to be held responsible under the terms of the Contract so as to cover the Bank and the Contractor during the period beginning with commencement of the Works until the date stated in the Certificate of Completion for the whole of the Works.
- iii. Against any loss or damage occasioned by the Contractor in the course of any operations carried out by him for the purposes of completing the outstanding Work during the Defects Liability period pursuant to the Undertaking given at the time of applying for the issue of Certificate of Completion.
- iv. Against any loss or damage occasioned by the Contractor in the course of any operations carried out by him for rectifying any defect in perfection or fault appearing during the progress of the Work or during the Defects Liability Period.
- v. Against any loss or damage occasioned by the Contractor in the course of any operations carried out by him for searching the cause of any defect, imperfection or fault appearing during the progress of the Works or during the Defects Liability Period.
- vi. Against any liability for or in respect of any damages or compensation payable at law in respect of or in consequence of any accident or injury to any workmen or other person in the employment of the sub-Contractor provided the sub-contractors shall not have insured against such contingency. (Insurance against accident etc. to workman)
- vii. Unless otherwise instructed the Contractor shall insure the Works and keep them insured until the virtual completion of the contract against loss or damage by fire and/or earthquake, flood etc.
- viii. The Contractor shall maintain Contractors' all risks insurance policy covering loss, damage, theft, burglary etc. of all materials and equipments, temporary Works and the Work shall be insured for a total sum equal to the value of all such items plus 10% of such value.

Provided always that all the insurance under the contract documents shall be arranged by the Contractor from a first class insurance company having a branch near the site who can deal with all matters pertaining to the subject, the insurance must be placed with a company approved by the Bank, in the joint names of the Bank and the Contractor for such amount and for any further sum if called to do so by the Bank, the premium of such further sum being allowed to the Contractor as an authorised extra.

15. The Contractor shall deposit the policy and receipt for premiums paid with the Bank within 21 (twenty-one) days from the date of issue of Work order unless otherwise instructed. In default of the Contractor insuring as provided above, the Bank on his behalf may so insure and may deduct the premiums paid from any money due, or which may become due to the Contractor. The Contractor shall as soon as the claim under the policy is settled or the Work reinstated by the Insurance Company should they elect to do so, proceed with due diligence with the completion of the Works in the same manner as though the insured risk/contingency has not occurred and in all respects under the conditions of the contract. The Contractor in case of rebinding or reinstatement after the occurrence of the insured risk/contingency shall be entitled to such extension of time for completion as the Bank may deem fit.
 - A. Such insurance shall continue during the whole of the time of continuance of Work and/or during such time that any persons are employed by him on the Works and shall when required produce before the Bank or the consultant, such policy of insurance and the receipt for payment of the earlier premium and the current premium.
 - B. The insurance shall be effective in such manner that the Bank is indemnified under the policy. In the event of the sub-contractor having effected an insurance against accident etc. to the workmen the Contractor shall require such sub-contractor to produce to the Bank / consultant when required, such policy of insurance and the receipt for the payment of the current premium, then in that event insurance under clause (vii) hereof by the Contractor shall not be necessary.
- 16 The Contractor shall provide for adequate cover to the Bank as per the provisions of Workmen Compensation Act.
- 17 The Contractor shall make available the insurance cover note before the commencement of the Work and shall notify any change in the nature or extent of the Work and also make available additional insurance of Works if required in special circumstances.

18 DEFECTS LIABILITY

- A. Any defects, shrinkages or other faults which shall appear within the Defects Liability Period of 12 months from the date of handing over the works and which are due to materials or workmanship not in accordance with this contract or on account of failure on the part of the Contractor to comply with any of his obligations expressed or implied shall be specified by the consultant in a schedule of defects which he shall deliver to the Contractor not later than 14 days after the expiration of the Defects Liability Period, and within a reasonable time after receipt of such schedule the defects, shrinkages and other faults therein specified shall be made good by the

Contractor and (unless the consultant shall otherwise instruct, in which case the contract sum shall be adjusted accordingly) entirely at his own cost.

- B. The Contractor shall make good at his own costs and to the satisfaction of the consultant, all defects, shrinkages or small faults arising in the opinion of the Bank from Work or materials not being in accordance with the drawings or specifications or schedule of quantities or the instructions of the Bank, which may appear within the **"Defects Liability Period of 12 months from the date of handing over completed site"** referred to in the Appendix to General Conditions. All defects, shrinkages or small faults arising from any other cause not attributable to the Contractor shall be rectified by the Contractor as an additional work.
- C. In the event of failure of the Contractor to carry out any such work to the satisfaction of the Bank, the Bank shall be entitled to carry out the same at the Contractor's costs and all expenses consequential and incidental thereto shall be deducted by the Bank from any payment due or to become due to the Contractor.
- D. When in the opinion of the Bank any defects, shrinkages or other faults which he may have required to be made good under sub-clause (1) and (2) of this condition shall have been made good he shall issue a certificate to that effect, and completion of making good defects shall be deemed for all the purposes of this contract to have taken place on the day named in such certificate.

19 **SPECIAL RISK**

The Contractor shall not be liable for or in respect of any consequences arising out of any special risks as enumerated in relevant clause of the General Conditions. The responsibilities, rights and liabilities of the parties in such case shall be determined with respect to Clause 65 of the General Conditions.

20 **STATUTORY OBLIGATIONS, NOTICES, FEES AND CHARGES**

The Contractor shall comply with and give all notices required by any Act of Parliament, any instrument rule or order made under any Act of Parliament, or any regulation or byelaw of any local authority or of any statutory undertaker which has any jurisdiction with regard to the Works or with whose systems the same are or will be connected. The Contractor before making any variation from the contract drawings or the contract bills necessitated by such compliance shall give to the Bank a written notice specifying and giving the reason for such variation and the bank may issue instructions in regard thereto. If within 7 days of having given the said written notice the Contractor does not receive any instructions in regard to the matters therein specified, he shall proceed with the Work confirming to the Act of Parliament, instrument, rule, order, regulation or byelaw in question and any variation thereby necessitated shall be deemed to be a variation required by the Bank.

21 **MATERIALS, WORKMANSHIP, SAMPLES, TESTING OF MATERIALS**

- A. All the Works specified and provided for in the specifications or which may be required to be done in order to perform and complete any part thereof shall be executed in the best and most workmanlike manner with materials of the best and approved

quality of the respective kinds in accordance with the particulars contained in and implied by the specifications and as represented by the drawings or according to such other additional particulars, and instructions as may from time to time be given by the Bank during the execution of the Work, and to his entire satisfaction.

- B. If required by the Bank the Contractor shall have to carry out tests on materials and workmanship in approved materials testing laboratories or as prescribed by the Bank at his own cost to prove that the materials etc., under test conform to the relevant I.S. Standards or as specified in the specifications. The necessary charges for preparation of mould (in case of concrete cube) transporting, testing etc., shall have to be borne by the Contractor. No extra payment on this account should in any case be entertained.
- C. In case contractor is delaying or refusing or avoiding testing of material, the Bank shall arrange for carrying out testing of material and the necessary expenditure in carrying out the testing, transportation and incidental expenses shall be recovered from the contractor.
- 22 All the materials (except where otherwise described) stores and equipment required for the full performance of the Work under the contract must be provided through normal channels and must include charge for import duties, sales tax, octroi and other charges and must be the best of their kind available and the Contractor/s must be entirely responsible for the proper and efficient carrying out of the Work. The Work must be done in the best workmanship. Samples of all materials to be used must be submitted to the Bank when so directed by the Bank and written approval from Bank must be obtained prior to placement of order.
- 23 During the inclement weather the Contractor shall suspend concreting and plastering for such time as the Bank may direct and shall protect from injury all Work when in course of execution. Any damage (during constructions) to any part of the Work for any reason due to rain, storm or neglect of Contractor shall be rectified by the Contractor in an approved manner at no extra cost.
- 24 If the Work be suspended by reason of rain, strike, lock-outs or any other cause, the Contractor shall take all precautions necessary for the protection of Work and at his own expenses shall make good any damage arising from any of these causes.
- 25 The Contractor shall cover up and protect from damage from any cause, all new Work and supply all temporary doors, protection to windows, and any other requisite protection for the execution of the Work whether by himself or special tradesmen or sub-contractor and any damage caused must be made good by the Contractor at his own expenses.

26 SUBSTITUTION

Should the Contractor desire to substitute any materials and workmanship, he/they must obtain the approval of the Bank in writing for any such substitution well in advance. Materials designated in this specification indefinitely by such term as "Equal" or "Other approved" etc. specific approval of the Bank has to be obtained in writing. The term equivalent means, if material specified is not available, then after

satisfying to the fact, the Bank may give other material to be used which will be subject to adjustment in purchase prices.

27 INSPECTION OF WORKS

- A. All materials and workmanship shall be subject to inspection, examination and test at any and all times during manufacture and/or construction. The Bank may issue instructions requiring the Contractor to open up for inspection any Work covered up or to arrange for or carry out any test at any and all times.
- B. The Bank shall have the right to reject the defective material and workmanship or require its correction.
- C. The test of any materials or goods (whether or not already incorporated in the Works) or of any executed Work, and the cost of such opening up or testing (together with the cost of making good in consequence thereof) shall be added to the contract sum unless provided for in the contract bills or unless the inspection or test shows that the Work, materials or goods are not in accordance with this contract.
- D. The Bank may issue instructions in regard to the removal from the site of any Work, materials or goods, which are not in accordance with this contract.
- E. The Bank may (but not unreasonably) issue instructions requiring the dismissal from the Works of any person employed thereon.
- F. On the failure of the Contractor to comply with any of the Bank's instructions the Bank may proceed to replace or correct such material/workmanship entirely at the cost of the Contractor.

28 REMOVAL OF IMPROPER WORK

The Bank 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 Bank are not in accordance with specification or instructions, the substitution or proper re-execution of any Work executed with materials or workmanships not in accordance with the drawings and specifications or instructions. In case the Contractor refuses to comply with the order the Bank 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 Bank 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 Bank shall relieve the Contractor from his liability in respect of unsound Work or bad materials.

29. PROTECTIVE MEASURES

- A. 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.
- B. Contractor shall indemnify the Bank against any possible damage to the building, roads,

or members of the public in course of execution of the work.

29 C The contractor shall provide necessary temporary enclosures 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 works and making good all works disturbed.

30 **NOTICE AND PATENTS OF APPROPRIATE AUTHORITY AND OWNERS.**

A. The Contractor shall conform to the provisions of any Acts of the Legislature relating to the Work, and to the Regulations and Bye-laws of authorities, and/or any water, lighting and other companies, and/or authorities with whose systems the structures were proposed to have connection and shall before making any variations from the drawings or specification that maybe associated to so conform, give the Bank written notices, specifying the variations proposed to be made and the reasons for have making them and apply for instruction thereon. The Bank on receipt of such intimation, shall give a decision within a reasonable time.

B. The Contractor/s shall arrange to give all notices required for by the said Acts, Regulations or Bye-laws to be given to any authority, and to pay to such authority or to any public officer all fees that may be properly chargeable in respect of the Work and lodge the receipts due with the Bank.

31 **ASSIGNMENT AND SUB-LETTING**

A. The whole of the Works 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 Bank 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.

B. The Contractor shall not assign the Contract or any benefit or interest therein or thereunder, otherwise than by a charge in favour of the Contractor's bankers of any money due or to become due under this Contract, without the prior written consent of the Bank.

C. The Contractor shall not sub-let the whole of the Works except where otherwise provided by the contract, the Contractor shall not sublet any part of the Works without the prior written consent of the Bank, which shall not be unreasonably withheld, and such consent, if given shall not relive the Contractor from any liability or obligation under the contract and he shall be responsible for the acts, defaults and neglects of any sub-contractor, his agents, servants or workmen as fully as if they were the acts, defaults or neglects of the Contractor, his agents, servants or workmen. Provided always that the provision of labour on a piecework basis shall not be deemed to be a subletting under this clause. The Contractor shall co-ordinate and shall be responsible for all aspects of his sub-contractor(s) without being relieved of any of his obligation under the contract.

D. If, the contracting agencies are violating the tender terms and sub-let the work without bank's consent and the same is brought to the notice of the Bank, the Bank will be

entitled to recover 10% of such work as penalty besides initiating measures as provided in contract.

32. If, at any time during the execution of the Works, the Bank shall require the Contractor to make boreholes or to carry out exploratory excavation, such requirement shall be ordered in writing and shall be deemed to be an addition ordered under the provisions of the General Conditions unless a provisional sum in respect of such anticipated Work shall have been included in the Bill of Quantities.
33. The Contractor shall in connection with the Works provide and maintain at his own costs all lights, guards, fencing and watching when and where necessary or required by the Consultant / Engineer or the Bank, or by any duly constituted authority, for the execution and for the protection of the Works, and/or for the safety and convenience of the public / others.
34. The Contractor shall, in accordance with the requirements of the Bank, afford all responsible opportunities for carrying out their Work to any other Contractors employed by the Bank and their workmen and to the workmen of the Bank and of any other duly constituted authorities who may be employed in the execution on or near the Site of any Work not included in the contract or of any contract with the Bank may enter into in connection with or ancillary to the Works. The Contractor will not be paid any compensation on this account.
35. Shall keep the Site reasonably free from unnecessary store of constructional plant and machinery, wreckage and rubbish during progress of Works and on completion leave the whole site clean and in a workmanlike condition to the satisfaction of the Bank.

36. Default of Contractor

If the Contractor

- i. being a company presents a petition for winding up and/or goes into liquidation (other than a voluntary liquidation for the purposes of amalgamation or reconstruction) or
- ii. shall make an assignment or a composition for the benefit of the greater part, in number of amount of his creditors or shall enter into a Deed or arrangement with his creditors, or
- iii. if a Receiver of the Contractor's firm appointed by the court shall be unable, within fourteen days after notice to him requiring him to do so, to show to the reasonable satisfaction of the Bank that he is able to carry out and fulfill the contract, and if so required by the Bank to give reasonable security therefor, or
- iv. if the Contractor shall suffer execution to be issued, or
- v. shall suffer any payment under this contract to be attached by or on behalf of and of the creditors of the Contractor, or
- vi. shall assign, charge or encumber this contract or any payments due or which may become due to the Contractor without the consent in writing of the Bank first obtained, thereunder, or

- vii. shall agree to carry out the contract under a committee of inspections of his creditors, or
- viii. shall have an execution levied on his goods, or
- ix. shall use improper materials or workmanship in carrying on the Works, or
- x. shall in the opinion of the Bank not exercise such due diligence and make such due progress as would enable the Work to be completed within due time agreed upon, and
- xi. the Bank certifies in writing that the Contractor has failed to commence the Works or failed to proceed with the Works after the suspension order when so called upon by the Bank, or
- xii. shall abandon the contract,
- xiii. without reasonable excuse has failed to commence the Works or have suspended the progress of Works for 28 days after receiving from the Bank written notice to proceed on
- xiv. has failed to remove materials from the site or to pull down or replace for 28 days after receiving from the Bank written notice that the said materials or Work has been condemned and rejected by the Bank under these conditions or
- xv. despite previous writings by the bank in writing has failed to execute Works in accordance with the contract, or is persistently or flagrantly neglecting to carry out his obligations under the contract or as to the detriment of good workmanship or in defiance of the Bank instructions to the contrary, sublet any part of the contract then and in any of the said cases the Bank may notwithstanding previous waiver
 - a) determine the contract by after giving 14 days notice in writing to the effect as hereinafter mentioned, but without thereby affecting the powers of the Bank or the obligations and liabilities of the Contractor the whole of which shall continue in force as fully as if the contract, had not been so determined and as if the Works subsequently executed had been executed by or on behalf of the Contractor (without thereby creating any trust in favour of the Contractor)
 - b) further the Bank or his agent, or its officials, may enter upon the Site and take possession of the Work and all Constructional Plant, amenities, unused materials, tools, scaffolding, sheds, machinery, steam and other power, utensils and materials lying upon premises or the adjoining lands or roads reserved for the execution of the Works and
 - I. sell the same as his own property or
 - II. may employ the same by means of his own officials and workmen in carrying on and completing the Works or
 - III. by employing any other Contractors or other persons or person to complete the Works, and the Contractor shall not in any way interrupt or do any act, matter of thing to

prevent or hinder such other Contractors or other persons or person employed from completing and finishing or using the materials and plants for the Works when the Works shall be completed, or as soon thereafter as conveniently may be, the Bank shall give notice in writing to the Contractor to remove his surplus materials and plants and should the Contractor fail to do so within a period of 14 days after receipt by him the Bank may sell the same by Public Auction and shall give credit to the Contractor for the amount so realized.

- 36.1 Any expenses or losses incurred by the Bank in getting the Works carried out by other Contractors shall be adjusted against the amount payable to the Contractor by way of selling his tools and plants or due on account of Work carried out by the Contractor prior to engaging other Contractors or against the Security Deposit.
- 36.2 Upon such entry and expulsion by the Bank, Bank may adopt an appropriate mode at his discretion and certify the amounts, if any, that had at the time of such entry and expulsion reasonably been earned in respect of the work actually done by him and the value of any unused or partially used materials, any Constructional Plant and any amenities brought into existence exclusively for execution of the Works.
- 36.3 If the Bank shall enter and expel [the Contractor] under this Clause, he shall not be liable to pay to the Contractor any money on account of the Contract, until the expiration of the Defects Liability Period and thereafter until the costs of execution, damages for delay in completion, if any, and all other expenses incurred by the Bank have been ascertained and the amount thereof certified by the Bank. The Contractor shall then be entitled to receive only such sum or sums, if any, as the Bank may certify would have been payable to him upon due completion by him after deducting the said amount. If such amount shall exceed the sum which would have been payable to the Contractor on due completion by him, then the Contractor shall, upon demand, pay to the Bank the amount of such excess and it shall be deemed a "debt due" by the contractor to the Bank and shall be recoverable accordingly.

37 DEFAULT OF THE BANK

The Contractor may, if -

- a. The Bank does not pay to the Contractor the amount due on any certificate within six weeks from the receipt of Certificate named in the appendix to these conditions and continues such default for 7 days after receipt by registered post or recorded delivery of a notice from the Contractor stating that notice of determination under this condition will be served if payment is not made within 7 days from receipt thereof; or
- b. The Bank interferes with or obstructs the issue of any certificate due under this contract; or
- c. The carrying out of the whole or substantially the whole of the uncompleted Works is suspended by the Bank for a continuous period of 90 days;
- d. The Bank becomes bankrupt or makes a composition or arrangement with his creditors or has a winding up order or (except for the purposes of reconstruction) a resolution for voluntary winding up passed or a receiver or manager of his business or undertaking is duly appointed, or possession is taken by or on behalf of the holders of

any debentures secured by a floating charge, of any property comprised in or subject to the floating charge,

- e. if the Bank gives a formal notice of his inability to meet his contractual obligations after giving 14 days prior written notice by registered post or recorded delivery to the Bank terminate the employment of the Contractor PROVIDED that such notice shall not be given unreasonably or vexatiously.

37.1 Upon the expiry of 14 days notice referred to herein, the Contractor shall with all reasonable dispatch remove from the site all constructional plant brought by him thereon.

37.2 Upon such determination, without prejudice to the accrued rights or remedies of either party or to any liability which may accrue either before the Contractor or any sub-contractors shall have removed his temporary buildings, plant, tools, equipment, goods or materials or by reason of his or their so removing the same, the respective rights and liabilities of the Contractor and the Bank shall be as follows, that is to say:

- a. The Contractor shall with all reasonable dispatch and in such manner and with such precautions as will prevent injury, death or damage of the classes in respect of which before the date of determination he was liable to indemnify the Bank remove from the site all his temporary buildings, plant, tools, equipment, goods and materials and shall give facilities for his sub-contractors to do the same;
- b. After taking into account amounts previously paid under this contract the Contractor shall be paid by the Bank for;
- The total value of Work completed at the date of determination;
 - The total value of Work begun and executed but not completed at the date of determination, the value being ascertained if such Work were a variation required by the Bank
 - The cost of materials or goods properly ordered for the Works for which the Contractor shall have paid or for which the Contractor is legally bound to pay, and on such payment by the Bank any materials or goods so paid for shall become property of the Bank;
 - The reasonable cost of removal under paragraph (a) of this sub-clause.
 - And in addition the amounts payable in respect of any preliminary item, so far as the work or service comprised therein has been carried out or performed and a proper proportion as certified by the Consultant / Engineer of any such item, work or service comprised in which has been partially carried out or performed.
 - A sum certified by the Bank being the amount of any expenditure reasonably incurred by the Contractor in the expectation of completing the whole of the Works in so far as such expenditure shall not have been covered by the payments made under this clause.

- The reasonable costs of repatriation of all the Contractor's staff and workmen, employed on or in connection with the Works at the time of such termination.

Provided always that against any payment due from the Bank under this sub-clause, the Bank shall be entitled to be credited with any outstanding balances due from the Contractor for advances in respect of constructional plant and materials and any other sums which at the date of termination were recoverable by the Bank from the Contractor under the terms of the Contract. The Bank shall also return all Bank Guarantees and Retention after proper accounts have been settled between the Contractor and the Bank.

Provided that in addition to all other remedies the Contractor upon such determination take possession of and shall have a lien upon all unfixed goods and materials, which may have become the property of the Bank until payment of all monies due to the Contractor from the Bank.

- 37.3 If a war or other circumstances outside the control of both the parties, arises after the Contract is made, so that either party is prevented from fulfilling his contractual obligations, or under the law governing the Contract, the parties are released from further performance, then the sum payable by the Bank to the Contractor in respect of the Work executed shall be the same as that which would have been payable under Clause 32 hereof as if the Contract had been terminated under the provisions of Clause 32 hereof. Performance of obligations becoming more onerous shall not be consider as a cause for "Frustration".

38 NOTICES

- 38.1 All certificates, notices or written orders to be given by the Bank to the Contractor under the terms of the Contract shall be served by sending by registered post or by Courier or delivering the same to the Contractor's principal place of business, or such other address as the Contractor shall nominate for this purpose or email.
- 38.2 All notices to be given to the Bank under the terms of the Contract shall be served by sending by registered post or by Courier or delivering the same to the respective addresses nominated for that purpose in Part II of these conditions.
- 38.3 Either party may change a nominated address to another address in the country where the Works are being executed by prior written notice to the other party and the Consultant / Engineer may do so by prior written notice to both parties.

39 ARBITRATION

- 39.1 Wherever, in any of the documents forming part of the Contract, the Bank's General Manager, RO Muzaffarnagar has been vested with the final powers, his decision, opinion, certificate or any other discretion shall be final conclusive and binding on the parties and shall be without appeal. All other matters shall be subject to the right of arbitration.
- 39.2 All disputes or differences of any kind whatsoever save and except matters referred to in clause 1) arising out of or in connection with the Contract, whether during the progress of Work or after Completion and shall after written notice by either party to

the contract to the other of them and to the Bank hereinafter mentioned be referred for adjudication to two Arbitrator, one each to be nominated by the Contractor and the Bank, who shall thereafter appoint an Umpire. The provisions of Indian Arbitration and Conciliation Act 1996 shall apply for the purposes.

- 39.3 The Work under the Contract shall, however, continue during the arbitration proceedings and no payment due or payable to the Contractor shall be withheld on account of such proceedings.
- 39.4 The Arbitrator shall be deemed to have entered on the reference on the date he issued notice to both the parties fixing the date of the first hearing.
- 39.5 The Arbitrator may from time to time, with the consent of the parties, enlarge the time for making and publishing the award.
- 39.6 The Arbitrator shall give a separate award in respect of each dispute or difference referred to him. The Arbitrator shall decide each dispute in accordance with the terms of the contract and give a reasoned award. The venue of arbitration shall be such place as may be fixed by the Arbitrator in his sole discretion.
- 39.7 The fees, if any, of the Arbitrator shall, if required to be paid before the award is made and published, be paid half and half by each of the parties. The cost of the reference and of the award including the fees, if any, of the Arbitrator who may direct to and by whom and in what manner, such costs or any part thereof shall be paid and may fix or settle and amount of costs to be so paid.
- 39.8 The award of the Arbitrator shall be final and binding on both the parties.
- 39.9 Subject to aforesaid the provisions of the Arbitration & Conciliation Act 1996 or any statutory modification or re-enactment thereof and the rules made thereunder, and for the time being in force, shall apply to the arbitration proceeding under this clause.
- 39.10 The Bank and the Contractor hereby also agree that arbitration under clause shall be a condition precedent to any right to action under the contract with regard to the matters hereby expressly agreed to be so referred to arbitration.

AS WITNESS the hands of the said Parties.

Signed by the said In the presence of	Bank
Witness Name: Address	
Signed by the said In the presence of	Contractor
Witness Name: Address	

**GENERAL INSTRUCTIONS TO CONTRACTORS
AND SPECIAL CONDITIONS**

- 1) Canvassing in connection with tenders is strictly prohibited and the tenders submitted by the contractors who resort to canvassing will be liable to rejection.
- 2) The Tender Form must be filled in English and all entries must be made by the hand and written in ink, if any of the documents is missing, or unsigned, the Tender may be considered invalid by the Bank in its discretion.
- 3) The contractor shall not assign the contract. He shall not sub-let any portion of the contract except with the written consent of the Bank. In case of breach of these conditions, the Bank may serve a notice in writing on the contractor rescinding the contract whereupon the Security Deposit shall stand forfeited to the Bank, without prejudice to his other remedies against the contractor. Central Govt. / State Govt. organization will not be allowed to sublet the work on back to back basis.
- 4) The contractor shall carry out of all the work strictly in accordance with Drawings, details and instructions of the Bank. If in the opinion of the Bank, changes have to be made in the design and with the prior approval in writing of the Employer, they desire the contractor to carry out the same, the contractors shall carry out the same without any extra charge. The Bank's decision in such cases shall be final and shall not be open to arbitration.
- 5) A Schedule of probable quantities in respect of each work and specifications accompany these special conditions. The Schedule of probable quantities is liable to alteration by omission, deductions or additions at the discretion of the Bank/ Bank. No claim will be entertained from the contractor on account of loss of profit over revising the tender rates.
- 6) The Tenderer must obtain for himself on his own responsibility and at his own expenses all the information which may be necessary for the purpose of filling of Tender and for entering into a contract and must examine the drawings and must inspect the site of the work and acquaint himself with all local conditions, means of access to the work, nature of the work and all matters pertaining thereto. No compensation will be paid on account of not getting proper information.
- 7) The rates quoted in the Tender shall be inclusive of all charges for clearing of site before commencement as well as after completion, water, electrical consumption, meters, double-scaffolding, centering, boxing, staging, planking, timbering and pumping out water, including bailing, fencing, planking, timbering and pumping out water, including bailing, fencing, hoarding, plant and equipment, storage sheds, watching and lighting by night as well as day, including Sundays and Holidays, temporary plumbing and electric supply, protection of the public and safety of adjacent roads, streets, cellars, vaults, open pavements, walls, houses, buildings and all other erections, matters or things and the contractor shall take down and remove any or all such centering, scaffolding, staging, planking, timbering, strutting, shoring, etc. as occasion shall require or when ordered so to do, and fully reinstate and make good all matters and things disturbed during the execution of the work and to the satisfaction of the Bank / Consultant.

- 8) Time allowed for carrying out the work as mentioned in the Memorandum shall be strictly observed by the contractor and its shall be reckoned from the 10 days after acceptance of order to commence the work or the date of handing over the site to the contractor whichever is later. The work shall throughout the stipulated period of the contract be proceeded with all due diligence and if the contractor fails to complete the work within the specified period i.e.90 days /3 months, he shall be liable to pay compensation as defined in the conditions of contract.
- 9) The contractor shall not be entitled to any compensation for any loss suffered by him on account of delays in commencing or executing the work, whatever the case of delays may be, including delays arising out of modifications to the work entrusted to him or in any sub-contract connected therewith or delays in awarding contracts for other trades if the project or in commencement or completion of such works or in procuring government controlled or other building materials or in obtaining water and power connections for construction purposes or for the other reasons whatsoever and the Employer shall not be liable for any claim in respect thereof. The Employer does not accept liability for any sum besides the Tender amount, subject to such variations as are provided for herein.
- 10) The successful Tenderer is bound to carry out any items of work necessary for the completion of the job even though such items are not included in the quantities and rates. Schedule of instructions in respect of such additional items and their quantities will be issued in writing by the Bank / consultant with the prior consent in writing of the Bank.
- 11) The successful Tenderer must co-operate with the other contractors appointed by the Employer so that the work shall proceed smoothly with the least possible delay and to the satisfaction of the Banks / Consultant.
- 12) The contractor must bear in mind that all the work shall be carried out strictly in accordance with the specifications made by the Bank / Consultant and also in compliance of the requirements of the Authorities concerned and no deviation on any account will be permitted.
- 13) (i) The rates quoted in the Schedule rates also include the expenditure for providing all the water required for the work and the contractor shall make his own arrangements for the supply of good quality water including obtaining Municipal connection for his labour as well as for construction purpose and all charges shall be borne by him. If Municipal water connection is not available and should it become necessary for the contractor to drill a bore well for obtaining water for construction purposes or to bring water from outside by Tankers, The Bank shall not be liable to pay any charges in connection therewith.

(ii) The rates quoted in the Tender shall also include Electric consumption charges for Power. If no power is available at site, the contractor shall have to make his own arrangement to obtain electric power connection and maintain at his own cost an efficient service of electric light and power and shall pay for the electricity consumed.

(iii) For water and power, the contractor to whom the work is allotted shall maintain the same in good working conditions.

(iv) Contractor for other trades appointed by the Bank shall also be allowed to use water and power available by fixing reasonable charges mutually agreed.

(v) Any dispute regarding payment for water and power charges by the other contractor and or by subsidiary agencies appointed by the Bank to the contractor, who has obtained the temporary connections and allowed sub-connections, will be settled by the Bank / Consultant and the decision taken by the Bank / Consultant shall be final and shall be that of the contractor.

(vi) The Bank as well as the Consultant shall give all possible assistance to the Contractor to obtain the requisite permission from the various authorities, but the responsibility for obtaining the same shall be that of the contractor.

(vii) If no such facility is available at the site of work and if available found inadequate, it shall be the responsibility of the contractor to make his own arrangement for obtaining water and power at his cost.

- 14) The contractor will have to obtain completion / clearance certificate in respect of services such as water supply, sewerage, etc. The contractor will also obtain permanent water connection for the entire project. The Bank will pay necessary fee to be made to Govt. authorities.
- 15) The Contractor shall strictly comply with provision of safety code annexed hereto.
- 16) The contractor shall indemnify Union Bank of India, against any claim or legal action arising out of the said Act due to the failure of non-compliance of the provisions of the said Act and the penalty or any other amount levied by the authorities, shall be recoverable from the payments due to the contractors.
- 17) The Contractor shall comply with the provision of the Apprentices Act,1961, and the Rules and Orders issued there under from time to time. Failure to do so will be in a breach of the contract and the Bank / consultant and the Bank may in their discretion cancel the contract. The contractor shall also be liable for any pecuniary or other liabilities arising on account of any violation by him of the provisions of the Act.
- 18) The Security Deposit of the successful Tender will be forfeited if he fails to comply with any of the conditions of the contract.
- 19) The contractor shall be responsible for the observance of all Central Rules and Regulation framed by the Central Government under the Contract Labour (Regulation and Abolition) Act,1970. The Bank shall be entitled to deduct all damages, which it might suffer on account of non-observance of these rules by the Contractor, from the amount payable to the Contractor.
- 20) Contractors are not allowed to remove materials brought at Site against which advances have been paid.

- 21) The Contractor is to provide at all times during the progress of the works and the maintenance period / defect liability period proper means of access, with ladders, gangways, etc., and the necessary attendance to move and adopt as directed for the inspection or measurement of the works by the Consultant or their representatives.
- 22) Materials shall be of approved quality and the best of their kind available and shall generally conform to I.S. Specifications. The Contractor shall order all the materials required for the execution of work as early as necessary and ensure that such materials are on site well ahead of requirement for use in the work. The work involved calls for approved standard of workmanship combined with speed and to the entire satisfaction of the Bank/ consultant. All the material shall be approved by the Consultant / Bank before use. Contractor to arrange samples well in time.
- 23) The Contractors shall after completion of the work clear the Site of all debris and left over materials at his own expenses to the entire satisfaction of the Bank / Consultant and Municipal or other public authorities.
- 24) The contractor herewith agrees that in respect of inspection of works by the Chief Technical Examiner of the works, a wing of Central Vigilance Commission and the bills of the contractor including all supporting vouchers, abstract etc. to be made after payment of the bills and if as a result of such audit and technical examination any sum is found to have been over paid in respect of any work done by the contractor under the contract of any work claimed by him to have been done by him under the contract and found not to have been executed or any work is found not to have been executed in accordance with the contract, the contractor shall be liable to refund the amount of over payment made already and it shall be lawful for the bank to recover the same from him in any manner the bank deems fit either from any payments due and / or becoming due to the contractor or from the security deposit or retention money or through any further bills and / or final bill or in any other manner whatsoever not excluding through recourse to legal action. The certification of bills / measurements by consultant / Bank and Engineer will be scrutinized by the Bank's Central Office / Audit / Vigilance and any deficiency will be corrected accordingly. Contractor cannot insist for payment just because it is signed by consultant / Bank / engineer. The contractor herewith agrees to co-operate with the Bank / Consultant while such examinations of works and redo the things without any extra cost to the Bank. It is essential and agreed condition of the contract that any such action taken by the bank shall be deemed to be the fully legal and valid and binding on the contractor.
- 25) Contractors are requested to note that no extra item or deviated item of work to be executed without taking prior permission, the Bank shall not be held responsible for the payment of such works executed. Contractors will have to submit all the particulars including purchase bills/price list for the materials along with the rate analysis for verification of Percentage Rates.
- 26) If it is observed the existing compound wall, gates railings are damaged then the contractors will have to make good the same at their own cost.
- 27) If contractors fail to pay the taxes/royalties to the Authorities concerned, the bank reserve their rights to recover the said amount from the amount payable to the contractor and pay the same to the Authorities concerned.

- 28) Work is to be executed & measurements are to be paid as per the detail specification & description of item given in the Standard Specification Book except for the items which are specifically mentioned in the tender for which the details of item and mode of measurements to be followed as indicated separately in the conditions of contractors.
- 29) If there are any contracting clauses mentioned in the tender, the interpretation of the same will be done by the Bank / consultant. However, the decision of the Bank will be final and binding.
- 30) After awarding the work, contractor shall get registered with the office of the Labour commissioner and inform Bank accordingly. Contractors shall follow all rules and regulations stipulated by the Labour Commissioner strictly.
- 31) Contractors shall quote consistent rates for the items of similar nature or analogous in specifications for the sections in schedule of quantities. If it is observed that the rates quoted for similar nature of items or analogous in specification under different sections, are inconsistent, then the Bank reserves his right to consider the lowest of rates for all such items and work out the final amount for payment, unless the competent authority finds that there is justifications for such inconsistent rates.
- 32) The contractor shall give a list of his relatives working with the bank along with their designations and addresses.
- 33) No employee of the bank is allowed to work as a contractor for a period of two years of his retirement from bank service, without the previous permission of the bank. The contract is liable to be cancelled if either the contractor or any of his employees is found at any time to be such a person who had not obtained the permission of the bank as aforesaid before submission of the tender or engagement in the contractor's service.

THE CONDITIONS HEREINBEFORE REFERRED TO

1. Definition of terms / interpretation:

In construction these conditions, the specification schedule of quantities and contract agreement, the following words shall have the meanings herein assigned to them expect where the subject or context otherwise requires.

- (a) “Employer/ / owner / Bank” shall mean ”Union Bank of India, Government of India undertaking” having Central Office at 239, Vidhan Bhawan Marg, Nariman Point, Mumbai - 400 0021 and any of its employees representatives authorized on their behalf.
- (b) “Contractors” (in case of partnership) shall mean.....andtrading as partners in the name and style ofand shall include partners for the time being of the said firm and the legal representatives of a deceased partner.
- “Contractors” (in case of individuals) shall mean.....andtrading in the name and style ofand shall include his / their heirs, legal representative assigns or successors.
- “Contractors” (in case of company) shall mean.....a company incorporated underand having its registered office atand shall include its successors and assigns.
- (c) “Site” shall mean “Work Place located at _____ include any building and erections thereon and any other land (inclusively), as aforesaid, allotted by the Bank for the contractor’s use.
- (e) Bank / Engineer: Bank’s Architect / Engineer for the management of the project.
- (g) “The works” shall mean the work or works to be executed or done under this contract.
- (h) “This Contract” shall mean Articles of Agreement, the special conditions, the general conditions of contract, the appendix, the schedule of quantities and specifications, attached hereto and duly signed.
- (i) “Notice in writing” or written notice shall mean a notice in written, typed or printed characters sent (unless delivered personally or otherwise proved to have been received), by registered post to the last known private or business address or registered office of the addressee and shall be deemed to have been received when in the ordinary course of post, it would have been delivered.
- (j) “Act of Insolvency” shall mean any Act of Insolvency as defined by the Presidency Towns Insolvency Act, or the Provincial Insolvency Act or any amending such original.
- (k) “The Schedule of Quantities” shall mean the schedule of quantities as specified and forming part of this contract.

- (l) “Priced Scheduled of Quantities” shall mean the schedule of quantities duly priced with the accepted quoted rates of the contractor.
- (m) “Net Prices” If in arriving at the contract amount, the contractor shall have added to or deducted from the total of the items in the Tender any sum either as a percentage or otherwise, then the net price of any item in the Tender shall be the sum arrived at by adding to or deducting from the actual figure appearing in the Tender as the price of that item a similar percentage or proportion of the sum so added or deducted of the sum so added or deducted by the contractor the amount of any Prime Cost items and provisional sums of money shall be deducted from the total amount of the Tender. The expression “net rates” or “net prices” when used with reference to the contract or accounts shall be held to mean rates or prices so arrived at.

2. SCOPE OF WORK:

The work consists of construction of Civil Electrical Installation/ Data / Furnishing and all other related works in accordance with drawings, schedule of quantities. The civil, sanitary, plumbing, electrical Installation, external sewerage / drainage, water supply works and construction of internal road and pathways etc., are within the scope of this tender. It includes furnishing all materials, labour, tools and equipment and management necessary for and incidental to the construction and completion of the work. All work, during its progress and upon completion shall conform to the lines, elevations and grades as shown on the drawings furnished by the employer / Banks. Should any detail essential for efficient completion of the work be omitted from the drawings and specifications it shall be the responsibility of the contractor to inform the Bank / Consultant and to furnish and install such detail with Bank / Consultant’s concurrence, so that upon completion of the proposed work the same will be acceptable and ready for use.

3. CONTRACTOR’S RESPONSIBILITY

The Contractor shall carry out and complete the said work in every respect in accordance with this contract and with the directions of and to the satisfaction of Bank. The Consultant may in his absolute discretion and in consultation with the Bank (with prior approval from the Bank) and from time to time issue drawings and/or written instruction, details directions and explanations which are hereafter collectively referred to as “Consultant /Bank’s Instruction”.

In regard to :-

- a. The variations or modifications of the design, quality or quantity of works or the additions or omission or substitution of any work.
- b. Any discrepancy in the drawings or between the schedule of quantities and/or drawings and or drawings and or specification.
- c. The removal from the site of any defective materials brought thereon by the contractor and the substitution of any other materials thereof.
- d. The removal and/or re-execution of any works executed by the contractor.
- e. The dismissal from the works of any person employed thereupon.
- f. The opening up for inspections of any work covered up.
- g. The amending and making good of any defects under clauses 19 hereof and those arising during the maintenance / defect liability period.

The contractor shall forthwith comply with and duly execute any work comprised in such Consultant /Bank instructions, provided always that the verbal instructions, directions, and explanations given to the contractor or his representative upon the works by the Consultant /Bank shall, if involving a variation, be confirmed in writing by the contractor within seven days, and if not dissented from in writing within a further seven days by the Consultant, such shall be deemed to be Consultant /Bank instructions within the scope of the Contract.

4. VISIT TO SITE

The contractor shall visit the site and make himself thoroughly acquainted with the local site condition, nature and requirements of the works, facilities of transport condition, effective labour and materials, access and storage for materials and removal of rubbish. The tenderer shall provide in their tender for cost of carriage, freight and other charges as also for any special difficulties and including police restriction for transport, etc. for proper execution of work as indicated in the drawings. The successful tenderer will not be entitled to any claim of compensation for difficulties faced or losses incurred on account of any site condition which existed before the commencement of the work or which in the opinion of the Bank or Consultant might be deemed to have reasonably been inferred to be so existing before commencement of work.

5. AGREEMENT

The successful contractor is required to sign agreement as may be drawn up to suit local conditions and shall pay for all stamps and legal expenses, incidental thereto.

6. PERMITS AND LICENSES

Permits and licenses for release of materials which are under Government control will be arranged by the contractor. The Bank will render necessary assistance, sign any forms or applications that may be necessary.

The contractor shall at his own cost arrange for storage shed adequate for taking delivery and storing of the quantity of controlled materials released by the authorities or supplied by the Bank. The costs of storing, transporting, etc. of all materials including those under Government control are to be included by the tenderer in his quoted rates.

The Bank / Consultant shall be indemnified against all Government or legal actions for theft or misuse of any controlled materials in the custody of the contractor.

7. GOVERNMENT AND LOCAL RULES

The contractor shall conform to the provisions of all local Bye-laws 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 said Act, Rules, Regulations and Bye-laws, 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 license, fees for footpath encroachment and restorations etc. and shall indemnify the Bank against such liabilities and shall defend all actions arising from such claims or liabilities.

8. QUANTITY OF WORK TO BE EXECUTED

The quantities shown in the schedule of quantities are intended to cover the entire structure but the Bank reserves the right to execute only a part or the whole or any excess thereof without assigning any reason therefore. The quantity may vary to any extent and even the same will be omitted. No separate payment / compensation / revision in the rates will be entertained.

9. VARIATIONS TO BE APPROVED BY THE BANK / CONSULTANT

Notwithstanding anything herein contained, the contractor shall submit to the Bank, a statement of variations giving rise quantity and rates duly supported by analysis of rates, vouchers, etc. The rates on scrutiny and final acceptance by the Bank shall form a supplementary tender. The Bank shall not be liable for payment of such variations until these statements are sanctioned by the bank.

10. CONTRACTOR TO PROVIDE EVERYTHING NECESSARY:

The contractor shall provide everything necessary for the proper execution of the works according to the intent, Schedule of quantities and Specification taken together whether the same may or may not be particularly shown or described therein provided that the same can be reasonably be inferred there from, and if the contractor finds any discrepancies therein, he shall immediately and in writings, refer the same to the Bank whose decision shall be final and binding. The contractor shall provide himself for ground and fresh water for carrying out of the works at his own cost. The Bank shall on account be responsible for the expenses incurred by the contractor for hired ground or fresh water obtained from elsewhere.

- (i) The rates quoted against individual items will be inclusive of everything necessary to complete the said items 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 documents.
- (ii) 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 by 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, houses, buildings, all other erections, matters and things and the contractor shall take down and remove any or all such centering, scaffolding, plumbing, 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 or when ordered so to do, and shall fully reinstate and make good all matters and things disturbed during the execution of works to the satisfaction of the Bank.

- (iii) The Contractor shall also provide such temporary road on the site as may be necessary for the proper performance of the contract and for his own convenience but not otherwise. Upon completion, such roads shall be broken up and leveled where so required by the Bank.
- (iv) The contractor shall at all times give access to workers employed by the Bank 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 Bank as any be required to enable such workman to lay or fix pipes, electrical wiring, special fittings etc. The quoted rates of the tenderers shall accordingly include all these above-mentioned contingent works.

11. AUTHORITIES NOTICES AND PATENTS

The contractor shall confirm to the provisions of any Act of the legislature relating to the works, and to regulations and bye-laws of any authority, and or any water electric supply and other companies and /or authorities with and whose the systems the structures is proposed to be connected, and shall, before making any variations from the drawing or specifications that may be associated to so confirming, give to the Bank written notice, specifying the variations proposed to be made and the reason for making it and apply for instructions thereon. In case the contractor shall not within ten days receive such instructions he shall proceed with the work confirming to the provisions, regulations, or byelaws in questions, and variations so necessitated shall be dealt with under clause 13 hereof.

The contractor shall bring to the attention of the bank all notices required by the said Acts, regulations or bye-law to be given to any authority and pay to such authority, or to any public office, all fees that may be properly chargeable in respect of the said work, and lodge the receipt with the Bank.

The contractor shall indemnify the Bank against all claims in respect of patent rights, royalties, damages to buildings, roads or members of public in course of execution of work and shall defend all actions arising from such claims and shall keep the Bank saved harmless and indemnified in all respects from such actions, costs and expenses.

12. CLEARING SITE AND SETTING OUT WORKS

The site shall be cleared of all obstructions, loose stone, and material rubbish of all kind. All holes or hollows either originally existing or produced by removal of loose stone or material shall be carefully filled up with earth, well rammed and leveled of as directed at his own cost. The contractor shall set out the works and shall be responsible for the true and perfect setting out of the work and for the correctness of the positions, dimensions, levels and the alignment of all the parts thereof. If at any time any error in this respect shall appear during the progress of any part of work or within the period of one year from the completion of the works, the contractor shall at his own expenses rectify such error to the satisfaction of the Bank.

13. DATUM

The average ground level will be considered as the crown of the nearest road, which should be taken as "Datum" which is however, subject to final confirmation by the Bank.

14. BENCHES

The contractor is to construct and maintain proper benches of all the main walls, in order that the lines and levels may be accurately checked at all times.

These benches will consist of salwood post of adequate length and minimum diameter 75mm to be driven in the ground at suitable distance as directed encased with brickwork. The wire nails will be driven on the top of salwood post on the center lines of columns, walls, inside and outside faces of foundation trenches, in order that lines may be stretched between the benches and accurate intersection of excavation. Centre line of walls, columns, etc. may be clearly indicated and checked at any time if it is so required.

15. CONTRACTOR IMMEDIATELY TO REMOVE ALL OFFENSIVE MATTERS

All soil, filth or other matters of any offensive nature taken out of any trench, sewer, drain, cesspool or other place shall not be deposited on the surface but shall be at once carted away by the contractor to place provided by him.

The contractor shall keep the foundations and works free from water and shall provide and maintain at his own expenses electrically or other power driven pumps and other plant to the satisfaction of the Bank for the purpose, until the building is handed over to the Bank. The contractor shall arrange for the disposal of the water so accumulated to the satisfaction of the Bank and local authority and no claims will be entertained afterwards if he does not include in his rates for the purpose.

16. MATERIALS, WORKMANSHIP, SAMPLES, TESTING OF MATERIALS:

All the works specified and provided for in the specifications or which may be required to be done in order to perform and complete any part thereof shall be executed in the best and most workman like manner with materials of the best and approved quality of the respective kinds in accordance with the particulars contained in and implied by the specifications and represented by the drawings or according to such other additional particulars and instructions as may from time to time be given by the Bank during the execution of the work, and to his entire satisfaction.

The contractor shall have to carry out test on materials and workmanship in approved materials testing laboratories or as prescribed by the Bank at own cost to prove the materials quality and test sample, confirm to the relevant I.S. Standard or as specified in the specifications. The necessary charges for preparation of mould (in case of concrete cube) transporting testing etc. shall have to borne by the contractors. No extra payment on this account should in any case be entertained.

All the materials (except where otherwise described) store and equipment required for the full performance of the work under the contract must be provided through normal channels and must include charges for import duties, sales tax, octroi and other charges and must be the best of their kind available and the contractors/must

be entirely responsible for the proper and efficient carrying out the work. The work must be done in the best workmanship. Samples of all materials to be used must be submitted to the Bank when so directed by the Bank must be obtained prior to placement of order.

The Contractor shall set up a field laboratory with necessary equipment for day to day testing of material like sand, brick, aggregate etc.

17. INCLEMENT WEATHER

During the inclement weather the contractor shall suspend concreting and plastering for such time as the Bank may direct and shall protect from injury all work when in course of execution. Any damage (during construction) to any part of the work for reasons due to rain, storm, or neglect of contractor shall be rectified by the contractor in an approved manner at no extra cost.

Should the work be suspended by reason of rain, strike, lockouts or any other cause, the contractor shall take all precautions necessary for the protection of work and at his own expenses shall make good any damage arising from any of these causes. The contractor shall cover up and protect from damage, from any cause, all new work and supply all temporary doors, protection to window, and any other requisite protection for the execution of the work whether by himself or special tradesmen or sub-contractor and any damage caused must be made good by the contractor at his own expenses.

18. MATERIALS AND WORKMANSHIP TO CONFORM TO DESCRIPTIONS:

All materials and workmanship shall so far as procurable be of the respective kinds described in the schedule of quantities and / or specifications and in accordance with the Bank's instructions, and the contractor shall upon the request of the Bank furnish him with all invoices, accounts, receipts and other vouchers to prove that the materials comply therewith. The contractor shall at his own cost arrange for and / or carry out any test of any materials which the Bank may require.

19. CONTRACTOR'S SUPERINTENDENCE & REPRESENTATIVE ON THE WORKS.

The contractor shall give all the necessary personal superintendence during the execution of the works, and as long thereafter as the Bank may consider necessary until the expiration of the defects liability period stated in the Appendix hereto.

20. DEPLOYMENT OF LABOURS

No labourer below the age of eighteen years shall be employed on the work.

Any labourer supplied by the contractor to be engaged on the work on day-work basis either wholly or partly under the direct order or control of the Bank or his representative shall be deemed to be a person employed by the contractor.

21. FACILITIES TO BE PROVIDED TO WORKERS

The contractor shall comply at his own cost with the order of requirement of any Health Officer of the State or any local authority or of the Bank regarding the maintenance of proper environmental sanitation of the area where the contractor's labourers are housed or accommodated, for the prevention of small pox, cholera, plague, typhoid, malaria and other contagious diseases. The contractor shall provide, maintain and keep in good sanitary condition adequate sanitary accommodation and provide facilities for pure drinking water at all times for the use of men engaged on the works and shall remove and clear away the same on completion of the works. Adequate precautions shall be taken by the contractor to prevent nuisance of any kind on the works or the lands adjoining the same.

The contractor shall arrange to provide first-aid treatment to the labourers engaged on the works. He shall within 24 hours of the occurrence of any accident at or about the site or in connection with execution of the works, report such accident to the Bank and also the competent authority where such report is required by law.

22. DISMISSAL OF WORKMEN

The contractor shall at the request of the Bank immediately dismiss from the works, any person employed thereon by him who may in the opinion of the Bank incompetent or misconduct himself and such person shall not be engaged again. Such discharges shall not be the basis of any claim for compensation or damages against the Bank or any of their officer or employee.

23. ACCESS TO WORK

The Bank and their responsible representative shall at all reasonable times have free access to the works 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 are lying or from where they are being obtained the contractor shall give every facility to the Bank. No. persons not authorised by the Bank except the representatives of Public Authorities shall be allowed on the works at any time.

24. ASSIGNMENT / SUB-LETTING

The whole of the works included in the contract shall be executed by the contractor and the contractor shall not directly or indirectly transfer, assign, or under-let the contract or any part share there of or any interest therein without the prior written consent of the Bank and no undertaking shall relieve the contractor of the full and entire responsibility of the contract or from active superintendence of works during their progress. Central Govt. / State Govt. companies shall not be allowed to sublet the work on back to back basis / labour basis without approval from the Bank. In case, contractor sub-let the work, the bank will be entitled to deduct 10% of cost of work executed besides initiating other measures provided in the contract.

25. VARIATIONS

No alterations, omissions or variations shall vitiate this contract, but in case the Bank thinks proper at any time during, the progress of the works to make any alterations in, or additions to or omissions from, the work or any alteration in the kind or quality of materials to be use therein and shall give notice thereof in writing under his hand to

the contractor, the contractor shall alter, add to, or omit from, as the case may be, in accordance with such notice, but the contractor shall not do any work extra to or make any alterations or additions to or omissions from the works or any deviations from any of the provisions of the contract, stipulation specifications without the previous consent in writing of the bank and the values of such extras, alternations, additions or omissions shall in all cases be determine by the Consultant with the prior approval in writing of the Bank in accordance with the provision of the Clause hereof, and the same shall be added to, or deducted form the contract amount, as the case may be accordingly.

26. SCHEDULE OF QUANTITIES

The Schedule of quantities, unless otherwise stated shall be deemed to have been prepared in accordance with the standard method of quantity measurement.

Any error in description or in quantity or in omission of items from the Schedule of quantities shall not vitiate this contract but shall rectified and the value thereof shall be added to or deducted, from the contract amount (as the case may be), provided that no rectification of errors, if any, shall be allowed in the contractor's Schedule of rates.

The contractor shall be deemed to have satisfied himself before tendering as to the correctness and sufficiency of this tender for the works and the prices stated in the Schedule or quantities and or the schedule of rates and prices which rates and prices shall cover all his obligations under the contract and all matters and things necessary for the proper completion of works.

The quantities of work may vary to any extent or may be omitted, the contractor cannot claim loss of profit / overhead on this account.

27. MEASUREMENT OF WORKS

- (i) The Bank may from time to time intimate to the contractor that he requires works to be measured, and the contractor shall forth with attend or send a qualified agent to assist the Bank in taking such measurements and calculations and to furnish all the particulars or to give all assistance required by any of them.
- (ii) The Bank will take measurement of the work jointly with the contractor and enter the same in measurement books. Based on these measurements the contractor will raise the bill as per the prescribed format.
- (iii) Should the contractor not attend or neglect or omit to send such agent then the measurement taken by the Bank shall be final and binding on the contractors.
- (iv) The contractor or his also supply without charge the requisite number of persons with means and materials necessary for the purpose of measurements or examinations at any time and from time to time of the work or counting weighting of the materials, etc.

- (v) All authorized extra works, omissions and all variations made without the Consultant's knowledge, if subsequently sanctioned by him in writing (with the prior approval in writing of the Bank) shall be included in such measurement.
- (vi) Measurements shall be recorded as per IS 1200 mode measurement and in metric system. Measurement shall be recorded in 100 pages bounded measurement book. Such measurement shall be recorded by the Bank's officer and not by contractor. M.B. shall be kept in the custody of the consultant / Bank.

28. PROCEDURE FOR MEASUREMENT AND BILLING OF WORK IN PROGRESS:

a. Advance against materials brought at Site:

Contractor may be allowed Secured advance on security for materials brought to site for execution on contracted item of work to the extent of 75% of the value of the materials provided that the materials of the imperishable nature is safeguarded against losses due to the contractor postponing execution of the work or to the storage or misuse the materials and against the expenses entitled for their proper watch and safe custody. Recoveries of advances so made would be from running bills. The secured advance may be given against the following materials brought to the site and stored properly.

- i) Cement
- ii) Steel
- (iii) Wood
- (iv) Flooring / Wall tiles
- (v) Aluminum steel / wooden window and door frame
- (vi) Plumbing / Sanitary / Pipes and fittings.
- (vii) Electrical items (one time only)
- (viii) Any other item of non-perishable nature and as decided by the Bank

The Contractors will have to submit the bills for the materials purchased, in triplicate, to verify the cost of the materials purchased and brought at Site.

No advances against perishable materials purchased and brought at Site will be made.

The Contractors will have to keep the materials at Site under their safe custody and at their risk and cost.

The Bank is not responsible for damages and losses of such materials brought at site.

The contractor to submit undertaking marking lien on the material brought at site against which bank has granted advance payment.

b. Running Account Payments to be regarded as Advances:

All running account payments shall be regarded as payments by way of advance against the final payment only and not as payments for work actually done and completed and accepted and shall not preclude the requiring of bad, unsound and imperfect or unskilled work to be removed and taken away and reconstructed or re-erected or be considered as an admission of the due performance of the contract, or

any part thereof, in this respect, or the accruing of any claim, nor shall it conclude, determine or effect in any way the powers of the bank under these conditions or any of them as to the powers of the bank under these conditions or any of them as to the final settlement and adjustment of the accounts or otherwise, or in any other way vary/affect the contract. The final bill shall be submitted by the contractor within two months of the date fixed for completion of the work, other wise the Bank's Bank certificate of the measurement and of the total amount payable for the work accordingly shall be final and binding on all parties.

29. COMPLETION CERTIFICATE

(i) APPLICATION FOR COMPLETION CERTIFICATE

The Bank authorised official shall normally issue to the contractor the completion certificate within one month after receiving, an application thereof from the contractor and after verifying from the completion documents and satisfying himself that the work has been completed in accordance with and as set out in the construction and erection drawing and contract documents.

The contractor, after obtaining the completion certificate, is eligible to present the final bill for the work executed by him under the terms of contract.

(ii) Completion Certificate

Within one month of the completion of the work in all respects, the Contractor shall be furnished with a certificate by the authorised official of the Bank of such completion but no certificate shall be given nor shall the work be deemed to have been completed until all scaffolding, surplus materials and rubbish is cleared of the site completely. The work will not be considered as complete and taken over by the Bank, until all the temporary works, labour and staff colonies etc., constructed, are removed and the works site cleared to the satisfaction of the Bank.

If the Contractor shall fail to comply with the requirements of this clause on or before the date fixed for the completion of the work, the Bank may at the expenses of the contractor remove such scaffolding, surplus materials and rubbish and dispose off the same as he thinks fit and clean up the site and the contractor shall forthwith pay the employer for all expenses so incurred and shall have no claim in respect of any such scaffolding or surplus materials as aforesaid except of any sum actually realized by the sale thereof.

(iii) CERTIFICATE (to be issued by the Bank's Architect)

It is certified that various items of works claimed in the RA Bill by Contractor has been completed to the extent claimed and at appropriate rates and that the items are in accordance with and fully confirming to the standard and/or prescribed specifications and drawings. Quality and rates verified. The material supplied and work done conform tender specifications. We further certify that we have checked the measurement to the extent of 100 per cent of each item claimed in this bill. As net amount of Rs..... (Rupees) is recommended to be paid to the contractor making the total upto date payment of Rs.....

(Rs.)

Quality and rates verified. The material supplied and work done confirm with the tender specifications.

DATE :

Bank Architect

The above certification shall be endorsed in the relevant Measurement Books also by the Consultant.

iv. FORMAT FOR RUNNING BILL

ON LETTER HEAD OF CONTRACTOR

Running Bill No.		
Tender Amount		Rs.
Value of work done		Rs.
Less rebate	(-)	Rs.

Net Value of work done		Rs.
Extra variation items after settlement @100%		Rs.
Extra variation items without settlement @75%		Rs.

Total		
Add : Cost of material on site @ 75%		Rs.

	Total payable	Rs.
Deductions		
1. Retention money		Rs.
2. Recovery of advance if any		Rs.
3. Income-tax		Rs.
4. Any other		Rs.
5. Total bill paid till last bill		Rs.

Total deductions	Rs.	Rs.

	Net payable	Rs.

	Amount certified for payment	Rs.

Note : This page shall be signed and stamped by the Bank's Bank.

Signature & Stamp of bidder

v. **FORMAT FOR SECURED ADVANCE**

**ACCOUNT OF SECURED ADVANCE IF ADMISSIBLE ON
MATERIALS HELD AT SITE BY THE CONTRACTOR**

Sno.	Name of the supplier	Quantity	Unit	Amount	Remarks
1	2	3	4	5	6
Face value of Materials at site					
Secured Advance % of above value.					

Date

.....
Signature of Bank
Preparing the bill.

Date

Signature of Bank's
Bank

Date

Signature of the Contractor

vi. **FORMAT FOR RUNNING BILL (To be submitted b the contractor)**

I	Name of the Contractor / Agency	:	
II	Name of the Work	:	
III	Sr.No. of the Bill	:	
IV	Sr.No. of the Previous Bill	:	
V	Reference to Agreement No.	:	
VI	Date of written order to commence	:	
VII	Date of Completion as per Agreement	:	
VIII	Date of Measurements	:	
XI	Present status of work	:	

Sno.	Items Description	Unit	Rate	Qty. as per measurement	Tender Amount Rs.
1	2	3	4	5	6

Up to previous RA Bill		Up to date gross		Present bill		remark
qty	Amt.	Qty.	Amt.	Qty.	Amt.	
7	8	9	10	11	12	13

Note :

1. If part rate is allowed for any item, it should be indicated with reasons for the allowing such a rate.
2. If adhoc payment is made, it should be mentioned specially.
3. Consumption of Cement/Steel statement to be submitted along with each R.A. Bills.

vii. CEMENT CONSUMPTION STATEMENT

Code	Description of item of work	Unit	Quantity of cement to be used per unit quantity of work (Bags)
1	2	3	4
Cement Concrete (Cast-in-Situ)			
1.	1:1.5:3 (1 Cement : 1.5 sand : 3 graded aggregate)	Cu.M.	8.00
2.	1:2:4 (1 Cement : 2 sand : 4 graded aggregate)	Cu.M.	6.40
3.	1:3:6 (1 Cement : 3 sand : 6 graded aggregate)	Cu.M.	4.40
4.	1:4:8 (1 Cement : 4 sand : 8 graded aggregate)	Cu.M.	3.40
Burnt Brick Masonry			
5.	In CM 1:3 (1 Cement : 3 mortar)	Cu.M.	2.56
6.	In CM 1:4 (1 Cement : 4 mortar)	Cu.M.	1.90
7.	In CM 1:6 (1 Cement : 6 mortar)	Cu.M.	1.06
Half Brick Masonry			
8.	In CM 1:3 (1 Cement : 3 mortar)	100Sq.M.	28.56
9.	In CM 1:4 (1 Cement : 4 mortar)	100Sq.M.	21.28
Random Rubble Masonry			
10.	In CM 1:6 (1 Cement : 6 mortar)	Cu.M.	1.70
Course Rubble Masonry			
11.	In CM 1:6 (1 Cement : 6 mortar)	Cu.M.	1.50
Flooring			
12.	40 mm thick in PCC (1:2:4)	Sq.M.	0.34
13.	18 mm thick in Skirting	Sq.M.	0.32
Cement Plaster			
14.	12 mm thick in CM (1:3)	100Sq.M.	14.68
15.	12 mm thick in CM (1:4)	100Sq.M.	10.94
16.	15 mm thick in CM (1:4)	100Sq.M.	13.08

17.	15 mm thick in CM (1:6)	100Sq.M.	8.60
18.	20 mm thick in CM (1:4)	100Sq.M.	17.02
19.	20 mm thick in CM (1:6)	100Sq.M.	11.20
20.	6 mm thick in CM (1:3)	100Sq.M.	7.34
21.	6 mm thick in CM (1:4)	100Sq.M.	5.48

30. Bank

The Bank's Bank, or the Bank shall have power to give notice to the contractor or to his representative, 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 Bank is obtained. The work will be from time to time be examined by the / the Bank's Bank, but such examination shall not in any way exonerate the contractor from the obligations to remedy any defects which may be found to exist at any stage of the works or after the same is complete. Subject to the limitations of this clause, the contractor shall take instructions only from the Bank.

31. PRICES FOR EXTRAS ETC. ASCERTAINMENT OF NON-TENDER ITEMS

The contractor may, when authorized, and shall, when directed with the approval of the Bank, add to, omit from, or vary the works shown upon the drawings, or described in the specification or included in the schedule of quantities, but contractor shall make no addition, omission or variation without such authorization or direction. Any such extra is herein referred to as authorized extra and shall be made in accordance with the following provisions.

- (a) (i) The net rates or prices in the original tender shall determine the valuations of the extra tender shall determine the valuation of the extra work where such extra work is of similar character and executed under similar conditions as the work priced therein.
- (ii) Rates for all items, wherever possible, should be derived out of the rates given in the priced schedule of quantities.
- (b) The net prices of the original tender shall determine the value of the items omitted, provided if omissions vary the conditions under which any remaining items of works are carried out, the prices for the same shall be valued under sub-clause C hereof.
- (b) Where the extra works are not of similar character and /or executed under similar conditions as aforesaid or where the omissions vary the conditions under which any remaining items of works are carried out or if the amount of the whole of the contract works or to any part thereof shall be such that in the opinion of the Bank the net rate or price contained in the priced schedule of quantities or tender or for any item of the works involves loss or expense beyond that reasonably contemplated by the contractor or is by reason unreasonable or inapplicable, the Bank shall fix such other rate or price as in the circumstances seems reasonable and proper.

- (c) Where extra work cannot be properly measured or valued the contractor shall be allowed days work prices as the priced schedule of quantities or, if not so stated, then in accordance with the local day work rates and wages for the district; provided that in either case vouchers specifying the daily time (and if required by the Bank, the workman's name) and materials employed to be delivered for verification to the Bank at or before the end of the week following that in which the work has been executed.

Actual cost of materials Rs.
Add for Labour charges Rs.
Add for Taxes, Transportation, If any. Rs.
Add for Wastage of Materials (Upper Limit 5% wherever applicable).....	Rs.
Add for water and electricity Charges if any required, upper limit 2% of basic cost of materials.Rs.
Add for 10% towards contractor's overheads and profit.Rs.
Final rate arrived.	Rs

32. UNFIXED MATERIALS WHEN TAKEN INTO ACCOUNT TO BE THE PROPERTY OF THE BANK

Where in any certificate (of which the contractor has received payment), the Bank has included the value of any unfixed materials intended for and /or placed on adjacent to the works, such materials shall become the property of the Bank and they shall not be removed except for use upon the works, without the written authority of the Bank. The contractor shall be liable for any loss of or damages to such materials.

33. REMOVAL OF IMPROPER WORKS

The Bank shall, during the progress of the works, 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 order, of any materials which in the opinion of the Bank are not in accordance with the specifications or the instructions, the substitution of proper materials, the removal and proper re-execution of any work executed with materials or workmanship not in accordance with the drawings and specification instruction and the contractor shall forthwith carry out such order at his own cost. In case of default on the part of the contractor to carry such order, the Bank shall have the power to employ and pay other persons to carry out the same and all expenses consequent thereon, or incidental thereto, shall be deducted by the Bank from any money due or that may become due, to the contractor.

No certificate, which may have been issued by the Bank, shall relive the contractor from his liability in respect of unsound work of bad materials.

34. DEFECTS AFTER COMPLETION

The contractor shall make good at his own cost and to the satisfactions of the Bank all defects, shrinkage, settlements or other faults, which may appear within 12 months after completion of the work. In default the Bank may employ and pay other persons to amend and make good such damages, losses and expenses consequent thereon or

incidental there to shall be made good and borne by the contractor and such damages, loss and expenses shall be recoverable from him by the Bank or may be deducted by the Bank, in lieu of such amending and making good by the contractor, deduct from any amount 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 from the contractor from the amount retained as retention money together with any expenses the Bank may have incurred in connection therewith.

35. CONCEALED WORK:

The contractor shall give due notice to the Bank whenever any work is to be buried in the earth, concrete or in the bodies of walls or otherwise becoming inaccessible later on, in order that the work may be inspected and correct dimensions taken before such burial, in default whereof the same shall, at the opinion of the Bank be either opened up for measurement at the contractor's expense or no payment may be made for such materials. Should any dispute or differences arise after the execution of any work as to measurements etc., or other matters which cannot be conveniently tested or checked, the notes of the Bank shall be accepted as correct and binding on the contractor.

36. CERTIFICATE OF VIRTUAL COMPLETION & DEFECTS LIABILITY PERIOD

The work shall not be considered as completed until the Bank authorized officer has certified in writing that they have been virtually completed. The defects Liability Period shall commence from the date indicated in the virtual completion certificate issued.

37. NOMINATED SUB-CONTRACTORS

All specialist, Merchants, Tradesmen and others executing any work of supplying and fixing any goods for which prime cost prices or provisional sums are included in the Schedule of Quantities and/or Specifications who may be nominated or selected by the Bank are hereby declared to be Sub-Contractors employed by the Contractors and are herein referred to as nominated Sub-Contractors.

No nominated Sub-Contractor shall be employed on or in connection with the works against whom the Contractor shall make reasonable objection or (save where the Bank and Contractor shall otherwise agree) who will not enter into a Contract providing:-

- a. That the nominated Sub-Contractor shall indemnify the Contractor against the same obligations in respect of the Sub-Contract as the Contractor is under in respect of this contract.
- b. That the nominated Sub-Contractor shall indemnify the Contractor against claims in respect of any negligence by the Sub-Contractor, his servants or agents or any misuse by him or them of any scaffolding or other plant, the property of the Contractor or under any workmen's Compensation Act in force.

38. OTHER PERSONS ENGAGED BY THE BANK

The Bank reserves the right to execute any part of the work included in this contract by other agency or persons and contractor shall allow all reasonable facilities and use of his scaffolding for the execution of such work. The main contractor shall extend all co-operations in this regard.

39. INSURANCE

a. IN RESPECT OF DAMAGE TO PERSONS AND PROPERTY

- (i) The contractor shall be responsible for all injury to the work or to persons, animals or things, and for all damages to the structural and / or decorative part of the property which may arise from the operation or neglect of himself or of any nominated sub-contractor or any of his / sub-contractor's employee, whether such damage/ injury arises from carelessness, accident or any other cause whatsoever in any way connected in the carrying out of this contract. This clause shall be held to include inter alias, any damage to buildings, whether immediately adjacent or otherwise, and any damage to the roads, streets, foot-paths, bridge or ways as well as damage caused to the building and work forming the subject of this contract by rain, wind or other inclement of the weather. The contractor shall indemnify the Bank and hold it harmless in respect of all and any expense arising from such injury or damage to persons or property as aforesaid and also in respect of any claim made in respect of injury and damage under any Act of any Legislature or otherwise and also in respect of any award of compensation or damage consequent upon such claims.
- (ii) The contractor shall reinstate all damage of every sort mentioned in this clause, so as to deliver up the whole of the contract works complete and perfect in every respect and so as to make good or otherwise satisfy all claims for damage to the property or third parties.
- (iii) The contractor shall indemnify the Bank against all claims which may be made against the Bank by any member of the Public or third party in respect of any thing which may arise in respect of the works or in consequence thereof and shall at his own expense arrange to effect and maintain, until the virtual completion of the contract, with an approved office, a Policy of Insurance in the name of the Bank and the contractor against such risks and deposit such policies with the Bank from time to time during the currency of this contract. The contractor will also similarly indemnify the Bank of all claims which may be made upon the Bank whether under the Workmen's Compensation Act or any other statute in force during the currency of this contract or at common law in respect of any employee of the contractor or any sub-contractor and shall at his own expense effect and maintain, until the virtual completion of the contract, with an approved office, a Policy of Insurance in the joint name of the Bank and the Contractor against such risks and deposit such policy or policies with the Bank from time to time during the currency of the contract.
- (iv) The contractor shall be responsible for any liability which may be excluded from the Insurance Policies above referred to and also for all other damages to any person animal or property arising out of incidental or defective carry in out of this contract. He shall also indemnify the Bank in respect of any cost, charges or expenses arising out of claims or proceeding and also in respect of any award of composition and damages arising therefrom.

- (v) The Bank shall be entitled to deduct the amount of any damage, compensation, cost, charges and expenses arising from or accruing from, or in respect of, any such claims or damage from any or all sums due or to become due to the contractor without prejudice to the Bank's other rights in respect thereof.

b. FIRE INSURANCE

- (i) The Contractor shall, within fourteen days from the date of commencement of works, insure the works at his cost and keep them insured until the virtual completion of the contract, against loss or damage by fire and / or earthquake, flood with an office to be approved by the Bank in the joint name of the Bank and the Contractor (the name of the former being placed first in the policy), for the contract amount only. The Contractor shall deposit the policy and receipts for the premium with the owner within 21 days from the date of issue of work order, unless otherwise instructed by commencement of the works. In default of the Contractor insuring as provided above, the Bank, may so insure the works and may deduct the premium paid from any money due or which may become due to the Contractor without prejudice to the other rights of the Bank in respect of such default. In case it becomes necessary to suspend the works, the Contractor shall as soon as the claim under the policy is settled, or work reinstated by the Insurance office should they elect to do so, proceed with all due diligence with the completion of the works in the same manner as though the incident had not occurred and in all respects under the same conditions of the Contract. The contractor in case of rebuilding or reinstatement after fire, shall be entitled to such extension of time for completion as the Bank deemed fit.
- (ii) The amount so due as aforesaid shall be the total value of the works duly executed and of the contract materials and goods delivered upon the site for use in works upto and including a date not more than seven days prior to the date of the said Certificate less the amount to be retained by the Employer (as hereinafter provided) and less any installments previously paid under this clause. Provided that such Certificate shall only include the value of the said materials and goods as and from time to time as they are reasonably, properly and not prematurely brought upon the site and then only if properly stored and/or protected against weather.

c) The Contractors will have to take out following Insurance Policies:

- 1) Contractors All Risks Insurance Policy to cover-
Earthquake- Fire & Shock
Landslide/Rockslide/Subsidence.
Flood/Inundations.
Storm/Tempest/Hurricanes/Typhoon /Cyclone Collapse.
Theft/Burglary.
Damage to material brought at Site and to be subsequently used in the work.
- 2) Third party Insurance Policy
 - a. For accidental loss or damage caused to the property of other persons.
 - b. For fatal or non-fatal injury to any person other than insured own employees or work men of employees of the owner of the works any other construction work thereon, or

member of the Insured's family or of any of the aforesaid; directly consequent upon of solely due to the construction of any property described in the Schedule.

3) Workmen's Compensation Insurance.

40. ACCOUNTS RECEIPTS & VOUCHERS:

The contractor shall, upon the request of the employer furnish them with all the invoices, accounts, receipts and other vouchers that they may require in connection with the works under this contract. If the contractor shall use materials less than what he is required under the contract, the value of the difference in the quantity of the material he was required to use and that he actually used shall be deducted from his dues. The decision of the Bank shall be final and binding on the contractor as to the amount of materials the contractor is required to use for any work under this contract.

41. LIQUIDATED DAMAGES / DAMAGES FOR NON-COMPLETION

If the Contractor fails to complete the works by the date stated in the Appendix or within any approved extended time, the Contractor shall pay the Bank liquidated damages @ 0.5% of the contract amount per week of delay subject to maximum deduction of 7.5% of the contract amount.

42. TOOLS, STORAGE OF MATERIALS, PROTECTIVE WORKS AND SITE OFFICE REQUIREMENTS

- i) The contractor shall provide, fix up and maintain in an 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 works and make good all work disturbed.
- ii) All documents 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 from ravages of termites, ants and other insects.
- lii) The contractor shall provide at his own cost all artificial light required for the work and to enable other contractors and sub-contractors to complete the work within the specified time.
- iv) The contractor shall provide a suitable temporary hut for the watchmen and clear away the same when no longer required and to provide all necessary attendance, lights, etc. required.
- v) The contractor shall arrange for temporary latrines 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 works disturbed by these conveniences,.

- vi) Every precaution shall be taken by the contractor to prevent the breeding of mosquitoes on the works during the construction and all receptacles, cisterns, water tans, etc., used for the storage of water must be suitably protected against breeding of mosquitoes. The contractor shall indemnify the Employer against any breach of rules in respect of anti-malarial measures.
- vii) The contractor shall not fix or place any placards or advertisement of any description or permit the same to be fixed or placed in or upon any boarding, gantry, building structure other than those approved by the Bank.

43. 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.

Contractor shall indemnify the Bank against any possible damage to the building, roads or members 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 adoption the same as may be required and removing on completion of the works and making good all works disturbed.

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 sub-contractors and remove same on completion.

Cement godown shall be constructed for storing about six weeks' requirement of cement and stored as per norms with a stack of 10 bags each and 2 feet opening all around with 2 feet passage of each stack. Structure shall be water-proof from all the sides and top. Cement should be stored one feet 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: Theodolite levels, prismatic compass, chain, steel and metallic taps and all other surveying instruments found necessary on the works shall be provided by the contractor for the due performance of this contract as instructed by the Bank.

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

The masons and the supervisors on the works shall carry with them always a one meter or two meter steel tape, a measuring tape of 30 meters, a spirit level, a plum bob and a square and shall check the work to see that the work is being done according to the drawing and specifications. The Banks official will use any or all

measuring instruments or tools belonging to the contractors as he chooses for checking the works executed or being executed on the contract.

The contractor should cover in his rates for making provisions for all reasonable facilities for the use of his scaffolding, tools and plant etc. by sub-contractors for their work.

44. DATE OF COMMENCEMENT & COMPLETION

The Contractor shall be allowed admittance to the Site on the “Date of Commencement” stated in the Appendix hereto, or such later date as may be specified by the Bank and he shall there upon and forthwith begin the works and shall regularly proceed with and complete the same on or before the “Date of Completion” stated in the Appendix subject nevertheless to the provision for extension of time hereinafter contained.

45. TIME OF COMPLETION, EXTENSION OF TIME & PROGRESS CHART

- (i) Time of completion: The entire work is to be completed in all respects within the stipulated period i.e. 02 months. The work shall deemed to be commenced within 10 days from the date of acceptance of work order or date of handing over of site, whichever is later. Time is the essence of the contract and shall be strictly observed by the contractor. The work shall not be considered as complete until the Bank / Banks have certified in writing that this has been completed and the Defects Liability Period shall commence from the date of such certificate.
- (ii) Extension of time: If in the opinion of the Bank the work has been delayed
 - (a) By force majeure; or
 - (b) By reason of any exceptionally inclement weather or
 - (c) By reason of proceedings taken or threatened by or dispute with adjoining or neighboring owners or public authorities arising otherwise than through the Contractors own default or
 - (d) By the works or delay or the other Contractors or tradesmen engaged or nominated by the Bank and not referred to in the Schedule of Quantities and/or specification or
 - (e) By reasons of the Bank’s instructions as per clause 2 hereof or
 - (f) By reason of any combination of workmen or strike or lock-out affecting any of the building trades or
 - (g) in consequence of the Contractor not having received in due time necessary instructions from the Bank for which he shall specifically applied in writing or
 - (h) From other cause which the Bank may consider as beyond the control of the Contractor or
 - (i) In the event, the value of work exceed the value of the Priced Schedule of Quantities owing to variation, the Bank may with the previous approval in writing of the Bank make a fair and reasonable extension of time for the completion of the Contract works.

In case of such strike or lockout, the Contractor shall as soon as give written notice thereof to the Bank, but the Contractor nevertheless constantly use his endeavor to prevent delay and shall do all that may be reasonably required to the satisfaction of

the Bank to proceed with the work and on his doing so that it will be ground of consideration by the Bank for an extension of time as above provided. The decision of the Bank 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 Bank shall then, in the event of an extension being granted, determine and declare the final completion date. The provision in clause with respect to payment of liquidated damages shall, in such case, be read and construed as if the extended date fixed by the Bank were substituted for and the damage shall be deducted accordingly.

- (iii) **PROGRESS OF WORK:** During the period of construction the contractor shall maintain proportionate progress on the basis of a Programme Chart submitted by the contractor immediately before commencement of work and agreed to by the Bank. Contractor should also include planning for procurement of scarce material well in advance and reflect the same in the Programme Chart so that there is no delay in completion of the project.

46. FAILURE BY CONTRACTOR TO COMPLY WITH BANK / CONSULTANT'S INSTRUCTION

If the Contractor after receipt of written notice from the Bank requiring compliance within ten days fails to comply with such instructions, the Bank may employ and pay other persons to execute any such work whatsoever the may be necessary to give effect thereto, and all costs incurred in connection therewith shall be recoverable from the Contractor by the Bank as a debt or may be deducted by him from any moneys due to the Contractor.

47. 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.

48. Suspension:

If the contractor except on account of any legal restraint upon the Bank preventing the continuance of the work or in the opinion of the employer shall neglect or fail to proceed with due diligence in the performance of his part of the contract or if he shall more than once make default, the Bank shall have the power to give notice in writing to the contractor requiring the work to be proceeded within a reasonable manner and with reasonable dispatch, such notice purport to be a notice under this clause.

After such notice shall have been given the contractor shall not be at liberty to remove from the site of the works or from any ground contiguous thereto any plant or materials to subsist from the date of such notice being given until the notice shall have been complied with. If the contractor fails to start the work within seven days after such notice has been given to proceed with the works as therein prescribed, the employer may proceed as provided in clause Termination of Contract by employer.

49. TERMINATION OF CONTRACT BY THE BANK

If the Contractor being a individual or a Firm, commits any “act of insolvency” or shall be adjudged an Insolvent or being an Incorporate company, shall have an order for supervision of the court and the official Assignee or the Liquidator in such acts of insolvency and winding up, as the case may be, shall be unable within seven days after notice to him requiring him to do so, to show the reasonable satisfaction of the Bank that he is able to carry out and fulfill the Contract and to give security therefore, if so required by the Bank.

OR if the Contractor (whether an individual, Firm or Incorporated Company) shall suffer execution or other process of court attaching property to be issued to the Contractor.

OR shall suffer any payment under this Contract to be attached by or on behalf of any of the creditors of the Contractors.

OR shall assign or sublet this Contract without the consent in writing of the Bank first obtained.

OR shall charge or encumber this Contract or any payment due or which may become due to the Contractor hereunder.

OR that the contractor:

- i. Has abandoned the Contract, or
- ii. Has failed to commence the works, or has without any lawful excuse under these conditions suspended the progress of the works for fourteen days after receiving from the Bank notice to proceed, or
- iii. Has failed to proceed with the works with such due diligence and failed to make such due progress as would enable the works to be completed within the time agreed upon, or
- iv. Has failed to remove materials from the Site or to pull down and replace work within seven days after receiving from the Bank written notice that the said materials or work were condemned and rejected by the bank under these conditions or,
- v. Has neglected or failed persistently to observe and perform all or any of the acts, matters or things by this Contract to be observed and performed by the contractor to observe or perform the same.

Then and in any of the said cases the Bank may, notwithstanding any previous waiver, after giving seven days notice in writing to the Contractor, determine the Contract but without thereby affecting the powers of the Bank or obligations and liabilities of the Contractor, the whole of which shall continue in force as fully as if the contract has not been so determined, and as if the work subsequently executed had been executed by or on behalf of the Contractor, And further, the Bank by his agent or servants may enter upon and take possession of the work and all plant, tools,

scaffoldings, shed, machinery, steam and other power utensils and materials lying upon the premises or on the adjoining land or roads and use the same as his own property or may employ the same by means of his own servants and workmen in carrying on and completing the works or by the employing any other contractor or person or persons to complete the works and the contractor shall not in any way interrupt or do any act, matter or thing to prevent or hinder such other contractor or other person or persons employed for completing or finishing or using the materials and plant for the work. When the work shall be completed or as soon as thereafter as convenient the bank shall give a notice to the Contractor to remove his surplus materials and plant, and should the Contractor fail to do so within the period of fourteen days after receipt thereof by him, the Bank may sell the same by public auction, and give credit to the Contractor for the net amount realised. The Bank shall thereafter ascertain and certify in writing under his hand what (if anything) shall be due or payable to, or by the employer, for the value of the said plant and materials so taken possession of by the Bank and the expense or loss which the bank shall have been put to in procuring the works to be completed and the amount, if any, owing to the Contractor and the amount, which shall thereupon be paid by the Bank to the Contractor or by the Contractor to the Bank, as the case may be and the certificate of the Bank shall be final and conclusive between the parties.

50. Certificates & payments:

The Contractor shall be paid by the Bank from time to time by installments under Interim certificates on account of the works executed, work to the approximate value named in the appendix as value of work for Interim Certificates (or less at the reasonable level), subject, however, to a retention of the percentage of such value named in the appendix hereto as “retention percentage from Interim Certificate”, until the total amount retained shall reach the named in the Appendix as “Total Retention Money”, after which time the installments shall be upto the full value of the work subsequently so executed and fixed in the building. The Bank may in his discretion include the Interim Certificate, such amount, as he may consider proper on accounts of material delivered upon the site by the contractor for use in the works. And when the works have been virtually completed the contractor shall be paid by the Bank the sum of money named in the Appendix “Installment after virtual completion” being a part of the said Total Retention Money. And the contractor shall be entitled to the payment of the Final Balance in accordance with the Final Certificate at the expiration of the period referred to as “The Defects Liability Period” in the appendix hereto from the date of virtual completion, or as soon after the expiration of such period as the works shall be finally completed and all defects made good according to the true intent and meaning and hereof whichever shall last happen, provided always that the issue of the Bank of any certificate during the progress of the works or at or after the completion shall not relieve the contractor from his liability under clause 2 and 20 nor relieve the Contractor from his liability in case of fraud, dishonesty or fraudulent concealment relating to the works or materials or to any matter dealt with in the certificate, and in case of all the defects and insufficiencies in the works or materials which is a reasonable examination would not have disclosed. No certificate shall of itself be conclusive evidence that any works or materials to which it relates are in accordance with the contract, neither will the contractors have a claim for any amounts which the might have certified in any interim bill and paid by the Bank and

which might subsequently be discovered as not payable and in this respect the Bank's decision shall be final and binding.

The Bank shall have power to withhold any Certificate if the works or any parts thereof are not being carried out to his satisfaction.

The Bank may by any certificate make any correction in any previous certificate, which shall have been issued.

No certificate of payment shall be if the contractor fails to insure the works and keep them insured till the issue of Virtual completion certificate.

All the interim payments shall be regarded as payments by way of advance against the final payment only and not as payments for work actually done and completed and shall not preclude the requiring of bad, unsound and imperfect or unskilled work to be removed and taken away and reconstructed or re-erected or be considered as an admission of the due performance of the contract, or any part thereof in any respect or the accruing of any claim nor shall it conclude determine or affect in any way the power of the Bank under these conditions or any of terms as to the final settlement and adjustment of the accounts or otherwise or in any other way vary or affect the contract.

51. EXCEPTED MATTERS / MATTERS TO BE FINALLY DECIDED BY THE BANK:

The decisions, opinion, direction, certificate with respect to all or any of the matters under this tender shall be final and conclusive and binding on the contractor and shall be without appeal.

52. SETTLEMENT OF DISPUTES BY ARBITRATION

Wherever, in any of the documents forming part of the Contract, the Bank has been vested with the final powers, his decision, opinion, certificate or any other discretion shall be final conclusive and binding on the contractor and shall be without appeal. All other matters shall be subject to the right of arbitration.

All disputes or differences of any kind whatsoever save and except matters referred to in clause 1) arising out of or in connection with the Contract, whether during the progress of Work or after Completion and shall after written notice by either party to the contract to the other of them and to the Bank hereinafter mentioned be referred for adjudication to two Arbitrator, one each to be nominated by the Contractor and the Bank, who shall thereafter appoint an Umpire. The provisions of Indian Arbitration and Conciliation Act 1996 shall apply for the purposes.

The Work under the Contract shall, however, continue during the arbitration proceedings and no payment due or payable to the Contractor shall be withheld on account of such proceedings.

The Arbitrator shall be deemed to have entered on the reference on the date he issued notice to both the parties fixing the date of the first hearing.

The Arbitrator may from time to time, with the consent of the parties, enlarge the time for making and publishing the award.

The Arbitrator shall give a separate award in respect of each dispute or difference referred to him. The Arbitrator shall decide each dispute in accordance with the terms of the contract and give a reasoned award. The venue of arbitration shall be such place as may be fixed by the Arbitrator in his sole discretion.

The fees, if any, of the Arbitrator shall, if required to be paid before the award is made and published, be paid half and half by each of the parties. The cost of the reference and of the award including the fees, if any, of the Arbitrator who may direct to and by whom and in what manner, such costs or any part thereof shall be paid and may fix or settle and amount of costs to be so paid.

The award of the Arbitrator shall be final and binding on both the parties.

Subject to aforesaid the provisions of the Arbitration & Conciliation Act 1996 or any statutory modification or re-enactment thereof and the rules made thereunder, and for the time being in force, shall apply to the arbitration proceeding under this clause.

The Bank and the Contractor hereby also agree that arbitration under clause shall be a condition precedent to any right to action under the contract with regard to the matters hereby expressly agreed to be so referred to arbitration.

The Bank and the contractor hereby also agree that arbitration under clause shall be a condition precedent to any right to action under the contract with regard to the matters hereby expressly agreed to be so referred to arbitration.

Jurisdiction: All matters arising out of or in any way connected with this contract shall be deemed to have arisen in _____ and only the courts in _____ shall have jurisdiction to determine the same.

53. RIGHT OF TECHNICAL SCRUTINY OF FINAL BILL

The Bank shall have right to cause a technical examination of the works and the final bill of the works and the final bill of the contractor including all supporting vouchers, abstracts, etc., to be made at the time of payment of the final bill. If as a result of this examination or otherwise any sum is found to have been overpaid or over certified, it shall be lawful for the Bank to recover the sum.

The subject work will be scrutinized by the Chief Technical Examiner's Office, a technical wing of Central Vigilance Commission and other Vigilance and Audit Authorities of the Bank. Decision of this Authority shall be binding on the contractor. Any discrepancy noted defected shall be rectified by the contractor free of cost or appropriate amount will be recovered from the contractor's payment.

54. BANK ENTITLED TO RECOVER COMPENSATION PAID TO WORKMEN:

The Bank is obliged, by the virtue of the provisions of the workmen's compensation Act, 1923, or any statutory modification or re-enactment thereof to pay compensation to a workman employed by the contractor in execution of the works, the Bank shall be

entitled to recover from the contractor the amount of compensation so paid, and without prejudice to the rights of the bank under said Act. The Bank shall be at liberty to recover such amount or any part thereof by deducting it from the security deposit or from any sum due to the contractor under this contract or otherwise. The bank shall not be bound to contest any claim made against it under the said Act, except on written request of the contractor and upon his giving to the bank full security to the satisfaction of the Bank for all costs for which the Bank might become liable in consequence of contesting such claim.

55. ABANDONMENT OF WORKS:

If at any time after the acceptance of the Tender, the Employer shall for any reasons whatsoever not require the whole or any part of the works to be carried out, the Bank shall give notice in writing to the contractor who shall have no claim to any payment of compensation or otherwise whatsoever on account of any profit or advantage which he might have derived from the execution of the whole works but which did not derive in consequence of the foreclosure of the whole or part of the work.

56. RETURN OF SURPLUS MATERIALS:

Notwithstanding anything to the contrary contained in any or all the clauses of this contract, where any material for the execution of the contract is procured with the assistance of the Bank by purchase made under orders or permits or licenses issued by the Government, the contractor shall hold the said materials economically and solely for the purpose of the contract and not dispose of them without the prior written permission of the bank, if required by the Bank, at the price having due regard to the condition of the materials, the price to be determined not to exceed the purchase price thereof inclusive of Sales Tax, Octroi Duty and other such levies paid by the contractor in respect thereof. In event of the breach of the aforesaid condition, the contractor shall, in addition to being liable to action for contravention of the terms of license or permit and /or criminal breach of trust, be liable to Bank for all such moneys, advantage or profits resulting or which in the usual course would have resulted to him by reason of such breach.

57. RIGHT OF BANK TO TERMINATE CONTRACT IN THE EVENT OF DEATH OF CONTRACTOR IF INDIVIDUAL.

Without prejudice to any of the rights or remedies under this contract, if the contractor, being an individual dies, the Bank shall have the option of terminating the contract without incurring any liability for such termination.

58. Materials Having Basic Price

For materials for which a basic price has been stipulated in the tender, the variation in the actual cost of purchase from the basic price will be considered for adjustment (payment / recovery) in the tender cost due to incorporation of required quantity of such material in the works over different periods of time as per construction schedule. Rates should be however fair and competitive and verified by market enquiry and the quantity purchased in every period should be reasonable and advantageous, if any due to bulk purchase may be also taken into account.

Reinforcement Steel (TOR)	As mentioned in the Bill of Quantity
Reinforcement Steel (MS)	As mentioned in the Bill of Quantity
Cement	As mentioned in the Bill of Quantity
Granite slab	As mentioned in the Bill of Quantity
Granite Tile	As mentioned in the Bill of Quantity
Marble	As mentioned in the Bill of Quantity
Ceramic tiles	As mentioned in the Bill of Quantity
Interlocking / paver blocks	As mentioned in the Bill of Quantity
Vitrified tiles	As mentioned in the Bill of Quantity

The amount of difference in actual price and basic cost will be paid by the bank if the increase is on higher side or the amount will be recovered if there is decrease in the prices. The clause will be operated irrespective of any ceiling in terms of time frame as stipulated for price variation adjustment wherein the contractor is supposed to complete specific value of work during first six months within which they are not entitled for PVA relief.

59. Security arrangement at Site

Upon taking possession of the site, the contractor shall make arrangement of security by posting required number of security guards and flood light arrangement.

SAFETY CODE

1. Scaffolds

- i. Suitable scaffolds shall be provided for workmen for all works that cannot safely be done from the ground, or from solid construction except in the case of short duration work which can be done safely from ladders. When a ladder is used, it shall be of rigid construction made either of good quality wood or steel. The steps shall have a minimum width of 450 mm and a maximum rise of 300 mm. Suitable hand holds of good quality wood or steel shall be provided and the ladder shall be given an inclination not steeper than $\frac{1}{4}$ to 1 ($\frac{1}{4}$ horizontal and 1 vertical).
- ii. Scaffolding or staging more than 4 m. above the ground floor, swung or suspended from an overhead support or erected with stationary support shall have a guard rail property bolted, braced or otherwise secured, at least 1 m. above the floor or platform of such scaffolding or staging and extending along the entire length of the outside and ends thereof with only such openings as may be necessary for the delivery of materials. Such scaffolding or staging shall be so fastened as to prevent it from swaying from the building or structure.
- iii. Working platforms, gangways and stairways shall be so constructed that they do not sag unduly or unequally and if the height of the platform, gangway or stairway is more than 4 m. above ground level or floor level, they shall be closely boarded and shall have adequate width and be suitably fenced as described in (ii) above.

- iv. Every opening in the floor of a building or in a working platform shall be provided with suitable means to prevent the fall of persons or materials by providing suitable fencing or railing whose minimum height shall be 1 m.

Wherever there are open excavations in ground, they shall be fenced off by suitable railing and danger signals installed at night so as to prevent persons slipping into the excavations.

- v. Safe means of access shall be provided to all working places. Every ladder shall be securely fixed. No portable single ladder shall be over 9 m. in length while the width between side rails in rung ladder shall in no case, be less than 290 mm. for ladder up to and including 3 m. in length. for longer ladders this width shall be increased at least 20 mm. for each additional meter of length.
- vi. A sketch of the ladders and scaffolds proposed to be used shall be prepared and approval of the Engineer obtained prior to construction.

2. Other Safety Measure

- vii. All personnel of the contractor working within the plant site shall be provided with safety helmets. All welders shall wear welding goggles while doing welding work and all metal workers shall be provided with safety gloves. Persons employed on metal cutting and grinding shall wear safety glasses.
- viii. Adequate precautions shall be taken to prevent danger from electrical equipment. No materials on any of the sites of work shall be so stacked or placed as to cause danger or inconvenience to any person or the public.

3. Excavation & Trenching

- ix. All trenches, 1.25 m. or more in depth shall at all times be supplied with at least one ladder for each 30 m. in length or fraction thereof. The ladder shall be extended from bottoms of the trench to at least 1 m. above the surface of the ground. Sides of trenches which are 1.5 m. or more in depth shall be stepped back to give suitable slopes or securely held by timber bracing so as to avoid the danger of sides of collapsing. The excavated materials shall not be placed within 1.5 m. of the edges of the trench or half of the depth of the trench whichever is more. Cutting shall be done from top to bottom. Under no circumstances undermining or undercutting shall be done.
- x. The contractor shall take all measure on the site of the work to protect the public from accidents and shall be bound to bear the expenses of defence of every suit, action or other proceedings at law that may be brought by any persons for injury sustained owing to neglect of the above precautions and to pay any such persons or which may with the consent of the contractor, be paid to compromise any claim by any such person.

4. Demolition

- xi. Before any demolition work is commenced and also during the process of the work:

- a. All roads and open areas adjacent to the work site shall either be closed or suitably protected.
- b. No electric cable or apparatus which is liable to be a source of danger over a cable or apparatus used by the operator shall remain electrically charged.
- c. All practical steps shall be taken to prevent danger to persons employed from the risk of fire or explosion or flooding. No floor, roof or other part of the building shall be so overloaded with debris or materials as to render it unsafe.

5. Personal Safety Equipments

- xii. All necessary personal safety equipment as considered adequate by the Engineer should be kept available for the use of the person employed on the site and maintained in a condition suitable for immediate use, the contractor should take adequate steps to ensure proper use of equipment by those concerned.
 - a. Workers employed on mixing asphaltic materials, cement and lime mortars shall be provided with protective footwear and protective goggles.
 - b. Those engaged in white washing and mixing or stacking of cement bags or any material which is injurious to the eyes shall be provided with protective goggles.
 - c. Those engaged in welding works shall be provided with welder's protective eyesight lids.
 - d. Stone breaks shall be provided with protective goggles and protective clothing and seated at sufficiently safe intervals.
 - e. When workers are employed in sewers and manholes, which are in use, the contractor shall ensure that the manhole covers are opened and are ventilated at least for an hour before the workers are allowed to get into manholes and the manholes so opened shall be cordoned off with suitable railing and provided with warning signals or boards to prevent accident to the public.
 - f. The contractor shall not employ men below the age of 18 years and women on the work of painting with products containing lead or any toxic material in any form. Wherever men above the age 18 are employed on the work of such painting the following precautions should be taken:
 - i. No paint containing lead or lead products shall be used except in the form paste or ready made paint. Paints like vinyle and epoxies having toxic fumes should be applied after following all precautions laid down by manufactures.
 - ii. Suitable face masks should be supplied for use by the workers when paint is applied in the form of spray or a surface having lead paint dry rubbed and scrapped.
 - iii. Overalls shall be supplied by the contractor to the workmen and adequate facilities shall be provided to enable the working painters to wash during the cessation of work.

- xiii. When the work done near any public place where there is risk of drawings all necessary equipments should be provided and kept ready for use and all necessary steps taken for prompt rescue of any person in danger and adequate provision should be made for prompt first aid treatment of all injuries likely to be sustained during the course of the work.

6. Hoisting Machines

- xiv. Use of hoisting machines and tackle including their attachments anchorage and supports shall conform to the following standards or conditions:
 - i.a. These shall be of good mechanical constructions sound material and adequate strength and free from patent defect and shall be kept in good repair and in good working order.
 - i.b. Every rope used in hoisting or lowering materials or as means of suspension shall be of durable quality and adequate strength and free from patent defects.
 - ii. Every crane driver or hoisting appliance operator shall be properly qualified and no person under the age of 21 years shall be incharge of any hoisting including any scaffolding winch or give signals to operator.
 - iii. In case of every hoisting machine and of every chain ring hook, shackle shovel and pulley block used in hoisting or as means of suspension the safe working load shall be ascertained by adequate means. Every hoisting machine and all gear referred to above shall be plainly marked with the safe working load. In case of a hoisting machine having a variable safe working load, each safe working load and the conditions under which it is applicable shall be clearly indicated. No part of any machine or any gear referred to above in this paragraph shall be loaded beyond the safe working load except for the purpose of testing.
 - iv. In case of departmental machines, the safe working load shall be notified by the Engineer. As regards contractor's machines, the contractor shall notify the safe working load of the machine to the Engineer whenever he brings any machinery to site of work and get verified by the Engineer concerned.
- xv. Motors, gearing, transmission, electrical wiring and other dangerous parts of hoisting appliances should be provided with efficient safeguards. Hoisting appliances should be provided with such means as will reduce to the minimum of the risk of any part of a suspended load becoming accidentally displaced. When workers are employed on electrical installations which are already energized, insulating mats, wearing apparel, such as gloves, sleeves and boots as may be necessary, should be provided. The workers should not wear any rings, watches and carry keys or other materials which are good conductors of electricity.
- xvi. All scaffolds, ladders and other safety devices mentioned or described herein shall be maintained in safe condition and no scaffold, ladder or equipment shall be altered or removed while it is in use.

Adequate washing facilities should be provided at or near places of work.

- xvii. These safety provisions should be brought to the notice of all concerned by display on a notice board at a prominent place at work spot. The person responsible for compliance of the safety code shall be named therein by the contractor.
- xviii. To ensure effective enforcement of the rules and regulations relating to safety precautions the arrangements made by the contractor shall be open to inspection by the Labour Officer, Engineer of the Department or their representatives.
- xix. Notwithstanding the above clause from (i) to (xviii), there is nothing in these to exempt the contractor from the operation of any other Act or Rule in force in India.

ADDITIONAL CONDITIONS

1. **Tenderer to inspect Site:** The tenderer shall visit and examine the construction site and satisfy himself as to the nature of the existing roads or other means of communications, the character of the soil and the excavation, the extent of magnitude of the work and facilities for obtaining material and shall obtain generally his own information on all matters affecting the execution of the work. No extra changes made in consequence of any misunderstanding or incorrect information on any of these points or on grounds of insufficient description will be allowed. All expenses incurred by the contractor in connection with obtaining information for submitting this tender including his visits to the site or efforts in compiling the tender shall be borne by the Tenderer and no claim for reimbursement thereof shall be entertained.
2. **Access to Site:** The tenderer is to include in his rates for forming access to the Site with all temporary roads gangways required for the works.
3. **Setting out:** The tenderer shall set out the building in accordance with the plans. All grid/centre lines shall be pegged out to satisfaction of the Banks. The tenderer shall be responsible for the correctness of the lining out and any inaccuracies are to be rectified at his own expenses. He will be responsible for taking ground levels of the Site before setting out and recording them without any extra charge.

The tenderer shall construct and maintain proper benches at the intersection of all main walls, columns, etc., in order that the lines and levels may be accurately checked at all times.

4. **Treasure Trove :** Should any treasure, fossils, minerals, or works of art of antiquarial interest be found during excavation or while carrying out the works, the tenderer shall give immediate notice to the Banks of any such discovery and shall make over such finds to the Employer.
5. **Attendance upon all Trades :** The general tenderer shall be required to attend on all the Tradesman or Sub-contractor/ contractors appointed by the bank for Water-Supply & Sanitary, Electrical installation, Air-conditioning, Security Equipment, Hardware, Telephone and other special contactors. The rates quoted shall be inclusive of attendance and also allow the contractors and retain until such times the relevant Sub-contract works are completed.
6. **Gate-Keeper and Watchmen:** The tenderer from the times of being placed in possession of the Site must make arrangements for watching, lighting and protecting the work, all materials, workmen and the public by day and night on all days including Sundays and holidays at his own cost.
7. **Sheds for materials :** The contractor shall provide all necessary sheds of adequate dimensions for shortage and protection of materials like cement, lime, timber, and such other materials including tools and equipments which are likely to deteriorate by the action of sun, wind, rain or other natural causes due to exposure in the open. Cement godown shall be constructed for storing about six weeks' requirement of cement and stored as per norms with a stack of 10 bags each and 2 feet opening all around with 2 feet passage of each stack. Structure shall be waterproof from all the

sides and top. Cement should be stored one feet 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.

All such sheds shall be cleared away and the whole area left in good order on completion of the contract to the satisfaction of the Banks.

All materials which are stored on the site such as bricks, aggregate, etc. shall be stacked in such a manner as to facilitate rapid and easy checking of quantum of such materials.

8. **Cost of transporting** : The tenderer shall allow in his cost for all transporting, unloading stacking and storing or supplies of goods and materials for this work on the site and in the places approved from time to time by the Banks. The tenderer shall allow in his price for transport of all materials controlled or otherwise to the site.
9. **W.C and Sanitary accommodation and office Assessors and accommodation:** The tenderer shall provide at his own cost and expense adequate closet and sanitary accommodation complying in every respect to the rules and regulations in force of the local authorities and other public bodies, for his workmen of nominated sub-contractors and other contractors working in the building, the assistant engineer and other employer's agent connected with this building project and maintain the same in good working order.

The tenderer shall also provide at his own expense adequate office and shall maintain the same in a satisfactory condition and shall provide light, fan and attendant, etc... for the same and shall remove them after completion of works. He shall arrange to supply at his own expense, office furniture with drawing assessors for the official use of the assistance engineer and at all times maintain in good working order a dumpy level and a Theodolite at Site, to enable the Bank to check the lines and levels of work.

10. **Materials, Workmanship & Samples** : Materials shall be of approved quality and the best of their kind available and shall generally conform to I.S. Specifications, The Contractor shall order all the materials required for the execution of work as early as necessary and ensure that such materials are on site well ahead of requirement for use in the work. The work-involved calls for high standard of workmanship combined with speed and to the entire satisfaction of the Banks.
11. **Rates for Non-Tender Items** : Rates of items not included in Schedule of Quantities shall be settled by the Banks as mentioned in the variation clause of the Contract Conditions.
12. **Rate to include:** The rates quoted shall be for all heights and depths and for finished work.

The contractor shall ascertain from other contractors as directed by the Banks all particulars relating to their work with regard to the order of its execution and the position in which cases, holes and similar items will be required, before the work is

taken in hand as no claims for extras will be allowed for cutting away work already executed in consequence of any neglect by the contractors to ascertain these particulars beforehand.

Before ordering materials, the contractors shall get the samples approved from the Banks well in time.

13. **Testing of work and material:** The contractors will have to carryout testing of the material at regular interval to proof quality, soundness and efficiency of the material. Expenditure required for testing and transportations shall be borne by the tenderer.

All the test should be as under :

LIST OF MANDATORY TESTS

MATERIALS	TEST	TEST ROCEDURE	MINMUM QUANTITY	FREQUENCY
1	2	3	4	5
Lime	Chemical and Physical Properties of lime	IS-6932	15 Mt.	10 mt or part thereof
Sand	a) Silt Content	Field	40 Cu.M.	40 Cu.M. or part thereof
	b) Bulking	Field	40 Cu.M.	50 Cu.M. or part thereof
	c) Particle size distribution	Field	80 Cu.M.	Every Cu.M. required in R.C.C. Work
Stone Aggregate	Particle size distribution		135 Cu.M.	Every 135 Cu.M. or part thereof for R.C.C. work. For rest of work as desired.
Cement	- Setting time - Strength - Soundness	IS-269 and other applicable I.S.		Every batch of Consignment and as directed wherever there is a change of source.

Cement Concrete or R.C.C.	1. Slump			Once a day or as desired.
	2. Cube strength		20 Cu.M. in slab beams & connected columns 5 Cu.m. in column.	Every 20 Cu.M. of a days concrete. Every 5 Cum. In column concrete.
Bricks	1. Water absorption &		Designation-35	One test for each source of

	Efflorescence			manufacture.
	2. Compressive strength		Designation-35	1,00,000 or part thereof. Two test for 1 st lot of 1,00,000 & One test later for every 2,00,000 & part thereof.
Timber	Moisture		1 Cu.M.	Every three Cu.M. & part thereof.
Aluminum doors or Windows fitting	Thickness of anodic coating	IS-5523	Rs.5000.00	Rs. 10000 or part thereof.
Mortice Locks	Testing of springs		50 os.	100 or part thereof.
Steel	a)TensilesStrength	IS-1529	20 ton	Every 20 Tonne or part thereof.
	b) Bend strength		-----do-----	-----do-----
Marble/Mosaic/Terrazo Tiles	1) Transverse strength	IS-1237	10000 tiles	10000 tiles or part thereof
	2) Water absorption	-----do-----	-----do-----	-----do-----
	3) Abrasion test	-----do-----	-----do-----	-----do-----
White glazed tiles	1) Water absorption	IS_777	10000 tiles	10000 tiles or part thereof
	2) Craxing		-----do-----	-----do-----
	3) Impact		-----do-----	-----do-----
Flush door	1) End Immersion		IS-2202	Destructive tests no.
	2) Knife			No. of shutters
	3) Adhesion		22-65	1
			66-100	2
			101-180	2
			181-300	3
			301-500	4
			501-above	5

- Cost of testing and transport will be borne by contractors.
- Any other materials will be tested by contractors at his own cost as per the instruction of Bank and Bank from time to time.
- Frequency stated above is minimum and the Contractor may have to test materials with any frequency or as instructed by Bank/Banks without any cost.

If after any such test the work or portion of works is found in the opinion of the Bank to be defective or unsound, the contractor shall pull down and re-do the same at his own cost. Defective materials shall immediately be removed from the site.

14. **Mechanical Plant:** The contractor will be required to provide and maintain in working order the following power-driven equipments during the constructions work: -

- Concrete Mixers of more than 200 Liters capacity (7 C.ft.).

- ii. Devices to lift up materials to the highest level of the building of the capacity in R.C.C. beams, columns and partition wall and surface type vibrators shall be maintained on the site of work.
 - iii. Pumps for bailing out water.
 - iv. Any other machinery ordered by the Banks.
15. **Foremen and Tradesmen :** All tradesmen shall be experienced men properly equipped with suitable tools for carrying out the work of carpentry and joinery and other specialist trades in a first class manner and where the Banks deemed necessary , the contractor shall provide any such tools, special or ordinary which are considered necessary for carrying out the work in a proper manner.

All such tradesmen shall work under an experienced and properly trained foremen, who shall be capable of reading and understanding all drawings, pertaining to this work and the contractor shall also comply with other conditions set out in Clause 9 of the conditions of the contract.

18. Work Programme / weekly progress report:

The contractor shall prepare and submit to Banks for approval, a bar chart showing the programme of construction of various items, fitted within the period stipulated for completion, within 15 days of the communication of the acceptance of the tender. The contractor shall also furnish necessary particulars to the Bank for compiling weekly progress reports in the form furnished by the Banks.

18. **Photographs:** The contractor shall at his own expense supply to the Banks with triplicate copies of large photographs not less than 25cm x 20cm (10"x8") of the works taken from two approved portions of each building, at intervals of not more than three months during the progress of the work, or at every important stage of construction.

19. Preparation of building for occupation and use on completion:

The whole of the work shall be thoroughly inspected by the contractor and all deficiencies and defects put right. On completion of such inspection, the contractor shall inform the Banks in writing, that he has finished the work and it is ready for the Bank's inspection.

On completion, the contractor shall clean all windows and doors and all glass panes, including cleaning of all floors, staircases and every part of the building including oiling of all hardware. He will leave the entire building neat and clean and ready for immediate occupation and to the satisfaction of the Banks.

20. **Clearing of Site:** The contractor shall after completion of the work clear the site of all the debris and left over materials at his own expense to the entire satisfaction of the Banks and Municipal or other public authorities.

The whole of the work shall be thoroughly inspected by the contractor and all deficiencies and defects put right. On completion of such inspection, the contractor shall inform the Banks in writing, that he has finished the work and it is ready for the Banks inspection.

21. **Contractor to provide etc :** The contractor shall provide a notice board on proper supports 2 m. x 1.5m (6' x 4'-6") in a position approved by the Banks. He shall allow for painting and lettering stating name of work, name of Banks, Structural consultants, general contractor and Sub-contractor. All letters except that of the name of the work shall be in letters not exceeding 5 cm. in height and all to the approval of the Banks.
22. **Vouchers :** The contractor shall furnish the Banks with vouchers on request , to prove that the materials are as specified and to indicate the rates at which the materials are purchased in orders to work out the rate analysis of the non-tender items which he may be called upon to carry thereafter.

PROFORMA FOR APPLICATION FOR EXTENSION OF TIME PERIOD

1.	Name of Contractor	:	
2.	Name of the work as given in the Agreement	:	
3.	Agreement No.	:	
4.	Estimated tender amount	:	
5.	Date of Commencement of work as per Agreement	:	
6.	Period allowed for completion of work as per Agreement.	:	
7.	Date of Completion stipulated in Agreement.	:	
8.	Period for which extension of time has been give previously	:	
a)	1st extension vide Bank's /Bank's letter	:	
	No.	Dated	Month Days
b)	2 nd extension vide Bank's /Bank's letter	:	
	No.	Dated	Month Days
c)	3 rd extension vide Bank's /Bank's letter	:	
	No.	Dated	Month Days
d)	4 th extension vide Bank's /Bank's letter	:	
	No.	Dated	Month Days
	Total extension previously given	:	
9.	Reason's for which extensions have been previously given (Copies of the previous applications should be attached)	:	
10.	Period for which extension is applied for	:	
11.	Hindrances on account of which extension is applied for with dates on which hindrances occurred and the period for which these are likely to last.	:	

a)	Serial No.		
b)	Nature of Hindrance		
c)	Date of occurrence		
d)	Period for which it is likely to last.		
e)	Period for which extension required for this particular hindrance		
f)	Over lapping period if any, with reference to item (e) above		
g)	Net extension applied for		
h)	Remarks, if any		
12.	Extension of time required for extra work	:	
13.	Details of extra work and the amount involved	:	
a)	Total value of extra work		
b)	Proportionate period of extension of time on estimated amount put to tender.		
14.	Total extension of time required for 11 & 12	:	

Date:

Signature of Contractor

**PARTICULAR SPECIFICATIONS
PART-I**

Section I - Excavation Earth Work and Anti termite Treatment

1. **General:** The work shall be carried out strictly in accordance with particular specifications and drawings. The drawings, specifications and BOQ shall be taken complementary and also supplementary to each other and shall form part this contract. Any work or material shown on drawings and not specifically included in BOQ/specification or vice versa shall be executed and deemed to be included in the scope of work for item rate.
2. Incase there are no specifications for items shown on the drawings or where items are not exhaustively described, the general specifications of CPWD shall be followed for which nothing extra shall be paid.
3. **Scope of works** The scope of work for buildings under this contract includes for full & final and entire completion of all works including all internal services in all respects described in particular specification Part-I and as shown on drawings forming part of the contract.
4. Although all the details of construction have been by a large covered in these documents, any item or details of construction not specifically covered but obviously implied and essential to consider. Civil works and all internal services complete and functional, shall be deemed to have been covered in the Percentage Rate. The cost of external development works pertaining to a particular contract shall also be carried out on a final price based on the rates quoted for each item. The tenderer may however, consider a minimum level of specifications conforming to IS code or National Building Code to over these missing details.
5. **Sample of Materials:** The Contractor shall produce samples of all materials and shall obtain approval of these in writing from Bank/ Bank before he places bulk order for the materials for incorporation in the works. The samples must be produced atleast six week before they are to be incorporated in sample units. Materials to be incorporated in the work shall conform to latest relevant ISI. The items should be ISI marked where manufactured.
6. **Slopes :** Adequate slope shall be provided in areas where there is likelihood of ingress of water such as toilets, balconies, verandah, kitchens, terraces, top of chajjas, window sills, plinth protections etc. though these may not be expressly shown in drawings.
7. **CURING:** Exposed surfaces of all cement works viz. cement concrete, brick work, flooring, plastering, pointing and the like shall be cured by keeping the surface adequately and continuously wet as directed by Bank and Bank for atleast seven days where ordinary portland cement has been used and minimum 10 days where pozzolana portland cement has been used. Approved curing compound may be used in lieu of moist curing with the permission of Bank and Bank. Such compound shall be applied to all exposed surface of cement works as soon as possible after the initial setting of cement. This shall be without extra cost.

8. The work to be done under this section comprises of supply of all labour, plant, materials and other performance of all work necessary for excavation with necessary close timbering, strutting, shoring & bailing/pumping out water including disposing of all surplus excavated material from the side as directed by Bank/ Bank.
9. **Site Clearance**: Before the start of work, the area of the plot shall be cleared of all shrubs, vegetation, grass, bush wood, shrubs etc. All the building shall be laid out to ensure that the layout plan fits at site. After completion of the work, the entire area of the plot shall be cleared from all debris, unwanted materials and level/slope of ground as required at site upto peripheral roads. The debris and unwanted material shall be disposed off away from the land without extra cost.
10. **Site Levels**: After site clearance and before commencement of excavation or filling, the contractor shall take levels at 3.0 Mtr. intervals in either directions or at lesser intervals as considered necessary at site for the entire plot. A record of these levels shall be signed jointly by tenderer and Bank/Bank. These records shall be, kept by the Bank.
11. **Setting out of works**: The tenderer shall set out the works and shall provide and fix all setting out apparatus required and solely be responsible for the true and perfect setting out the same and for the correctness of the position, levels, dimensions and alignment of all buildings as per the drawings. The tenderer shall take in writing the approval of the Bank for setting out and levels before starting the works. These approvals shall be recorded in the stage passing register and signed by the Bank and contractor and countersigned by the Bank.
12. **Surface Excavation**: The surface area to be occupied by the building shall be cleared of all debris, shrubs and plants, grass and thereafter excavated, if required to an average depth in 150mm including 3.0mtr.all round the building including ramps if any. All roots and organic material shall be cleared from the filling area inside the building.
13. **Excavation in Trenches**
- (a) Earth work in excavation in any type of soil as existing at site for foundations of columns and walls shall be carried out as indicated on drawings.
- (b) The finished floor level of stilt area and ground floor units of each block/other buildings shall be fixed at site by the Bank and Bank The work shall be executed at site as per levels shown on drawings/approved by the Bank/Bank.
- (c) Immediately after the execution of the foundation work and before covering the same the record of the following levels as actually executed at site separately for each unit block/other buildings shall be recorded in the measurement books and jointly signed & dated by the Bank, contractor/ Bank.
- i. Existing ground level
- ii. Level of bottom of lean concrete, under footings of columns and walls.
- iii. Finished floor level of stilt area and ground floor units.

- (d) If trenches or foundations are excavated beyond the specified dimensions due to bad workmanship of contractor, the extra excavation shall be filled with lean concrete 1:5:10 (1 cement: 5 coarse sand: 10 graded stone aggregate of 40 mm nominal size) without any extra cost to Employer.
14. **Excavation over Areas:** Excavation over areas shall be carried out to the required depths and profiles. Suitable arrangements shall be made by the contractor. The sides of the trench shall be kept vertical upto a depth of 2 mtr. from the bottom. For a greater depth, the excavation profiles shall be widened by allowing steps of 50 cm on either side after every 2 mtr. from the bottom. Alternately the excavation can be done so as to give slopes of 1:4. Where the soil is soft, loose or slushy, the width of steps shall be suitably increased or side sloped or the soil shored up as directed by Bank/Bank. It shall be the responsibility of the contractor to take complete instructions in writing from Bank/Bank regarding the stepping, sloping or shoring to be done for excavation deeper than 2 mtr.
15. **Slips :**The contractor shall take all necessary precautions to prevent slips in excavation and shall at his own expense make good any damage or defect and remove top soil dumps and any surplus material caused by slips.
16. **Plinth Filling**
- Earth obtained from excavation (or approved earth brought from outside for which no extra payment shall be made) shall be filled in layers not more than 20cm. in depth at a time, spread, leveled, watered and well consolidated around foundations, under floors and other locations. The earth used for filling shall be free from all grass, roots debris etc. In case extra earth filling is required for under floors, verandah and court yards/open to sky area within the perimeter of the unit block/ other building the contractor will do so at their own cost. The quoted rate shall be deemed to include the earth filling required under floors for the locations indicated herein before.
 - Testing of filling layers : After the compaction of each layer, samples shall be taken from the compacted layer and tested for dry density as per IS practice. The next layer of filling shall not be permitted to be deposited until the Bank is satisfied that the previous layer has achieved required compaction. The contractor shall inform the Bank in writing for inspection after filling and compaction of each layer. If any particular layer fails to meet the required compaction, it shall be re-compacted as directed by the Bank/Project Engineer and fresh samples shall be taken to ascertain the compaction density. Such re-compaction shall be continued till the desired compaction is achieved.
16. **Sand Filling:** Sand shall be free from dust and organic and foreign matters and corresponding to approved grading meeting the approval of the Bank/Bank. Fine sand filling under floors of stilt and ground floor units and other buildings shall be provided with specified thickness as shown on drawing. This shall be dry River fine sand watered and consolidated including dressing and leveling.
17. **Disposal of Surplus Soil/Material:** Surplus soil/earth if any, shall be disposed off within the site of UNION BANK OF INDIA as directed by the Bank/Project Engineer. The

same shall be spread out evenly. All excavated material not so used shall only be disposed off in areas approved by the Bank/Bank.

18. Antitermite Treatment

- (a) This shall be provided to bottom of trenches sides, including treating the back fill, under floors and other locations as specified in IS-6313 Part II for pre construction soil treatment with any of the following:-

<u>Chemical</u>	<u>Concentration by weight/Percent</u>
(i) Chlorpyriphos emulsifiable concentrates to IS 8944-1978	1.00
(ii) Heptachlor emulsifiable concentrates conforming to IS 6436 - 1978	0.50
(iii) Chlordane emulsifiable concentrates conforming to IS 2682 - 1966	1.00

- (b) The work of anti termite treatment shall be got executed by a specialist firm which must be member of IPCA and approved by the Bank and shall be carried out as per IS 6313 Part II of 1981 for pre construction soil treatment. The firm shall render a ten year guarantee to the employer through the contractor who will be the principal guarantor. The period of ten year shall be reckoned from the date of completion of the contract.
- (c) Such guarantee shall be given by directly given by the specialist agency to the bank in all form approved by the bank. In the event of reinfestation at any time during guarantee period, the specialist agency shall undertake to the bank to carry out such treatment as may be necessary to render the structure free from termite infestation including breaking and reinstalling any other work that may necessary for the treatment at no extra cost.

FORMAT OF GUARANTEE TO BE EXECUTED
BY THE FIRM / CONTRACTOR IN RESPECT
OF THE WORK OF PRE-CONSTRUCTION
ANTI-TERMITE TREATMENT

This agreement made this _____ day of _____ Two thousand five hundred between Union Bank of India, a body corporate constituted under the (Name of the Act) Act, 19____, having its Head Office at Union Bank Bhavan, 239, Vidhan Bhavan Marg, Nariman Point, Mumbai 400 021 (hereinafter called “the employer”) of the one part and ____ (name of firm / contractor (hereinafter called “the Guarantor” of the other part.

WHEREAS THIS AGREEMENT is supplementary to a contract (hereinafter called the contract dated _____ and made between the Employer of the one part and the Guarantor of the other part) where by the firm / contractor inter alia undertook to render the building / structure completely free from any infestation of termite. And whereas the guarantors agreed to give guarantee to the effect that the said building / structure shall remain free from any infestation of termites for a minimum period of ten years from the date of completion of pre-construction anti-termite treatment carried out as per the relevant I.S. Code.

Now the guarantor hereby agrees to make good all defects and render the building / structure free from any infestation of termites, during this period of guarantee and to the satisfaction of the employer. The guarantor also agrees to take up such rectification work at his own cost, and within one week from the date of issue of notice from the employer, calling upon him to rectify the defects. The decision of the employer as to the cost payable by the guarantor will be final and binding, in case the guarantor fails to commence the work as per above notice and the work is got done through some other contractor. That if the guarantor fails to execute the pre-construction anti-termite or commits breach thereunder then the guarantor will indemnify the principal and his successors against all loss, damage caused, expense or otherwise which may be incurred by him by any reason of any default on the part of the guarantor in performance and observance of this agreement. As to the amount of loss and/or damage and/or cost incurred by the employer the decision of the employer will be final and binding.

In witness where of these presents have been executed by the obligator _____ and by _____ and for on behalf of the employer on the day, month and year first above written.

Signed, and delivered by Union Bank of India by the hands of Shri _____ in the presence of _____

Signed and delivered by the hand of _____ (contractor) _____ in the presence of _____.

SECTION II - CONCRETE (PLAIN AND REINFORCED)

1. **General:** This section covers the requirements for furnishing of cement concrete including materials proportioning batching, mixing, testing, placing, compacting, finishing, jointing, curing and all other work as required for cast-in-place/plane cement concrete.

2. **Submittals**

a) **Materials Reports:** Prior to start of delivery of materials required for cement concrete the following shall be submitted by the contractor to the Bank for approval.

- (i) Recommended suppliers and/or sources of all ingredients for making concrete including cement fine and coarse aggregates. Water and additives.
- (ii) Quality Inspection Plan to ensure continuing quality control of ingredients by periodic sampling, testing and reporting to the Bank on the quality of materials being supplied.

b) **Plant & Equipment**

- (i) The contractor shall submit the following to the Bank well in advance.
- (ii) The proposed Programme, methods and details of plant and equipment to be used for batching and mixing of concrete.

c) **Reports for Inspection and Testing :** During concreting operations, the contractor shall conduct inspection and testing as described above and all reports thereon shall be submitted in summary form to the Bank/Bank.

d) **Schedules :** The contractor shall prepare working schedule for dates and rate of placing of concrete for each item of work and submit the same to the Bank / Site Engineer when requested.

3. **Materials:** Before bringing to the site, all materials for cement concrete shall be approved by the Bank all approved samples shall be deposited in the office of the Bank/Bank. The Bank shall have the option to have any of the materials tested to find whether they are in accordance with specifications at the contractor's expenses.

a. **Cement** : shall be ordinary Portland or Portland pozzolana cement and shall be stored in a dry waterproof godown.

b. **Fine Aggregate** : For all concrete work, it shall be coarse sand/coarse stone dust conforming to the grading given below :-(Zone I or II only applicable to concrete). Silt content not to exceed 8% by weight. The grading of fine aggregate shall be within the limits given in the following table and shall be described as fine aggregate grading Zone I and II:-

IS Sieve Designation	Percentage Passing for
Grading Zone I	Grading Zone II

10mm	100	100
4.75mm	90-100	90-100
2.36mm	60-95	75-100
1.18mm	30-70	55-90
600micron	15-34	35-59
300micron	5-20	8-30
150micron	0-10	0-10

c. Coarse aggregate :For concrete it shall be crushed stone graded coarse aggregate.Grading shall be within the limits as given in the following table:-

d. Coarse aggregate of all grades shall be from the crushers of approved source).

IS Sieve Designation	Percentage Passing for graded aggregate of				Nominal size
	40mm	20mm	16mm	12.5mm	
80mm	100	-	-	-	
63mm	-	100	-	-	
40mm	95-100	100	-	-	
20mm	30-70	95-100	100	100	
12.5mm	-	-	-	-	90-100
10mm	10-35	25-55	30-70	40-85	
4.75mm	0-5	0-10	0-10	0-10	0-10
2.36mm	-	-	-	-	-

e. Broken Brick aggregate :- Broken brick aggregate shall be prepared from well burnt bricks. These shall be free from under burnt particles and adherent coating of soil or silt.

Note: If directed by Bank/Bank, the aggregate(fine as well as coarse) shall be washed at contractor's expense.

f. Water Used in concrete, brick work, plasters shall be clean fresh and non saline according to relevant IS.Water samples should be got tested before use if required by Bank/ Bank.

g. Admixture & Additives: Chemically admixtures are not to be used until permitted by the Bankin case their use is permitted, the type amount and method of use of any admixture proposed by the contractor shall be submitted to the Bank/Bank.

4. Mixing: All cement concrete (plain or reinforced) shall be mixed in mechanical mixers.

5. Consolidation: Concrete for all reinforced concrete works in column footings, columns, beams, slabs and the like shall be deposited and well consolidated by vibrating, using portable mechanical vibrators. The rest of the concrete such as chajjas and shelving etc. shall be deposited and well consolidated by pouring and tamping. Care shall be taken to ensure that concrete is not over vibrated so as to cause segregation.

Form Work

6. **General:** The steel/plywood form work shall be designed and constructed to the shapes, lines and dimensions shown on the drawings. All forms shall be sufficiently watertight to prevent leakage of mortar. Forms shall be so constructed as to be removable in sections. One side of the column forms shall be left open and the open side filled in board by board successively as the concrete is placed and compacted except when vibrators are used. Maximum height of column for which concrete can be placed at a time shall not be more than 1.5 mtr.
7. Props may be hard wood/steel. Timber used in centering and props should be suitable & strong. Pre moulded cement cubes or plastic blocks will be placed between formwork and reinforcement to achieve uniform cover of concrete.
8. **Cleaning and Treatment of Forms:** - All rubbish, particularly chippings, shavings and saw dust, shall be removed from the interior of the forms (steel/ply) before the concrete is placed. The form work in contact with the concrete shall be cleaned and thoroughly wetted or treated with an approved composition to prevent adhesion between form work and concrete. Care shall be taken that such approved composition is kept out of contact with the reinforcement.
9. **Verticality of frame structure:** All the outer columns of the frame will be checked for plumb by plumb-bob as well as by the Theodolite as the work proceeds to upper floors. Internal columns will be checked by taking measurements from outer row of columns for their exact position.
10. **Stripping time:** Forms shall not be struck until the concrete has attained a strength at least twice the stress to which the concrete may be subjected at the time of removal of form work. The strength referred to shall be that of concrete using the same cement and aggregates with the same proportions and cured under conditions of temperature and moisture similar to those existing on the work. Where so required form work shall be left longer in normal circumstances and where ordinary Portland cement is used, forms may generally be removed after the expiry of the following periods:-
 - (a) Walls, Columns and Vertical faces of all structural members 2 days
 - (b) Removal of props under slabs:
 - (i) Spanning upto 4.5 mtr. 7 days
 - (ii) Spanning over 4.5 mtr. 14 days
 - (c) Removal of props under beams:-
 - (i) Spanning upto 6.0 mtr. 14 days
 - (ii) Spanning over 6.0 mtr. 21 days
 - (d) In case of cold weather these periods may be increased at the discretion of the Bank/Bank. For other cements (like pozzolana etc.) Stripping time recommended for ordinary Portland cement may be suitably modified. The number of props left under, their size and disposition shall be such as to be able to safely carry full dead load of the slab, beam or arch, as the case may be together with any live load likely to occur during placing of concrete, curing or further construction.

11. **Removal of Form Work:-** Form work shall be removed in such a manner as would not cause any shock or vibration that would damage the concrete. Before removal of soffits and props, concrete surface shall be exposed to ascertain that the concrete has sufficiently hardened.
12. Where the shape of element is such that form work has re-entrant angles, the form work shall be removed as soon as possible after the concrete has set, to avoid shrinkage cracking occurring due to the restraint imposed.
13. **Finish to concrete work:**
 - a.** All concrete while being poured against form work shall be worked with vibrators rods & trowels as required so that good quality concrete is obtained.
 - b.** All exposed surface of RCC lintels, beams, columns etc. shall be plastered to match with adjoining plastered face of walls after suitably hacking the concrete surface.
 - c.** All soffits of RCC slabs, loft slab, cup board slab, shelves and working platform in kitchen etc. and other exposed surfaces of RCC work not continuous to brick work shall be plastered (6mm thick) with cement mortar 1:3 (1 cement:3 fine sand) to give an even and smooth surface.
 - d.** The top of loft slabs and shelves shall be smooth finished while the concrete is green with a floating coat of neat cement to give a smooth and even surface. The exposed front face shall be finished in cement plaster 1:3(1 cement:3 coarse sand) to bring it in line and level and finished in neat cement. Such thin slabs shall be carefully cast so that they can be finished within 12mm of their specified thickness. Additional thickness of plaster which makes these elements look unnecessarily heavy will not be allowed.
 - e.** Chicken wire mesh 24 gauge and 20mm mesh will be provided all along RCC surface adjoining brick work giving 150mm lapping on either side using nails etc for fixing mesh while plastering.
 - f.** The rate shall be deemed to include for small and incidental labour such as chamfer splays, rounded or curved angles, grooves, rebate and drip moulds/courses.
14. **Sampling and testing of concrete:** Samples from fresh concrete shall be taken as per IS-1199-1959(method of sampling of concrete) and cubes shall be made, cured and tested at 28 days in accordance with IS 516- 1959 (method of test for strength of concrete). For testing cement concrete the contractor shall arrange for all the tools/moulds for making necessary cubes and shall bear all the charges for making the cubes, curing and testing through an approved laboratory. Further the contractor shall make available laboratory equipment. A temporary room of adequate size have these facilities, shall also be constructed by the contractor at his expense. After completion of work the contractor shall remove the equipment, dismantle the room and clear the site:-

15. Compressive strength test at 7 days may be carried out in addition to 28 days compressive strength test for a quicker idea of the quality of concrete. In all cases the 28 days, compressive strength alone shall be the criteria for acceptance or rejection of the concrete.
16. **Test Specimen:** Three test specimens shall be made from each sample for testing at 28 days. Additional cubes may be required for such purposes as to determine the strength of concrete at 7 days or to check the testing error.
17. **Test strength of samples:** The test strength of the sample shall be the average of the strength of three specimen. The individual variation shall not be more than + - 15 percent of the average.
18. **Cement boiling test:** Accelerated compressive test as per IS-9013/78 shall be carried out to determine the quality of cement received at site in each consignment. This shall be done as per details below. The test result shall be recorded, signed and kept in a register with the Bank /Bank.
- (a) Prepare 9 cubes with cement concrete mix proposed to be used for the job. Keep the same water cement ratio that will be actually used. Slump could be a good indication.
- (b) After the cubes are cast, 3 moulds containing the cubes to be tested by accelerated curing method must be covered on the top with a machine plate. The plate should be of the same size as cube mould plates.
- (c) After 24 hours of casting, the three cubes shall be boiled with the top plates on. In the field these could be boiled in a drum with at least 75mm water standing over the cube moulds. The boiling must be uniform and constant for exactly 3½ hours. Thereafter, the cubes must be taken out of the boiling water, remolded and cooled for 1 hour and tested., Exact timings are extremely important and must be followed. The anticipated 28 days compressive strength can be calculated from the regression equation given below:-
- $$Y = 8.2 + 1.609A$$
- Where Y = the predicted 28 days cube result in N/mm²
A = accelerated cube result in N/mm²
- (e) Contractor shall arrange all tools, moulds and cubes etc. and bear all expenses for carrying out the cement boiling test as per above.
19. Mix of cement concrete/reinforced cement concrete required to be used in various locations /situations shall be as shown on drawing. Wherever not mentioned shall be as under:-
- (a) Cement concrete in floors (self finished) and concrete as under layer for terrazzo floor cast in situ shall be PCC 1:2:4(1 cement:2 coarse aggregate:4 graded stone aggregate 12.5 nominal size).
- (b) Cement concrete for RCC work in raft, wall, columns footings, columns, beams/ Roof/ floor slabs, landing, fins, lintels, chajjas, shelves, staircases, balconies, Loft

slabs and in any other situation shall be of mix cement concrete 1:2:4 (1 cement: 2 coarse sand: 4 stone agg. 20mm nominal size).

- (c) Cement concrete in PCC filling for pressed steel frames, hold fast blocks and rain water pipes etc. shall be 1:3:6 (1 of cement:3 of coarse sand:6 stone aggregate 20mm nominal size).
 - (d) The mix 1:2:4 shall conform to M 15(nominal) and mix (1:1.5:3) shall conform to M 20 (nominal) as per IS 456-1978 for the purpose of testing and acceptance based on 28 days strength.
 - (e) Lean cement concrete below raft columns/walls footings and in sub flooring of stilt floor shall be of mix 1:5:10 (1 cement: 5coarse sand:10 stone aggregate 40mm nominal size).
20. **Construction Joints** : Construction joints shall be made only where shown in the drawings. Vertical constructed joints shall be formed against a stop board and horizontal construction joints shall be level.
21. **Contraction Joints**: Contraction joints required will be as shown on the drawings. Contraction joints shall not be hacked, wetted or mortared before concrete is placed against them.
22. **Expansion Joints** : Expansion joints shall be provided where shown on the drawings. They shall be constructed with an initial gap between the adjoining parts of the works of the width specified in the drawings. The contractor shall ensure that no debris is allowed to enter expansion joints. Expansion joints shall be provided with joints filler, a joint sealing compound and in water proof concrete a water bed.
23. **Open Joint Fillers** : Where shown on the drawings, open joints in the structure shall be filled with one of the following of expansion joint fillers:
- (a) In internal areas a material conforming to IS:1838 containing bitumen emulsion fibers of cork granules bound together with natural resin.
 - (b) In external areas a material comprising closed cell rubber or containing cork granules bound together with natural resin.

The Joints filler shall be easily and uniformly compressible to its original thickness, tamable, easily cut of sawn, robust, durable, resistant to decay due to termite or weathering, unaffected by water and free of any constituent work) will be into or stain the concrete. The joints filler shall be of same thickness of the joint width, it shall extend through the full thickness of the concrete unless otherwise specified and shall be sufficiently rigid during handling and placing to permit the formation straight joints.

24. **Joint Sealing Compounds** : Joints sealing compounds shall seal joints in concrete against the passage of water prevent the ingress of grit or other foreign material and protect the joint filler. The compound shall have good extensibility and adhesion to concrete surfaces and shall be resistant to flow and weathering.

Poly sulfide joints where specified on the drawings shall be sealed with poly sulfide liquid polymer, stored, mixed, handled applied and cured strictly in accordance with the manufacturer's written instructions. Such joints shall be formed to the correct dimensions, thoroughly cleaned and treated with recommended primer strictly in accordance with the manufacturer's written instructions prior to sealing. The contractor shall use only competent personnel experienced in the application of poly sulfide for such work.

25. **P.V.C. Water Bars/Water stop:**-Where water bars are shown on the drawings, the joints shall incorporate an approved PVC external type, water bar complete with all necessary moulded or prefabricated intersection pieces assembled in accordance with the drawings with bends and butt joints in running lengths made by heat welding in an electrically heated jig. Joining and fixing of water bars shall be carried out strictly in accordance with manufacturer's written instruction.
26. **Inserts:** The contractor shall fix all necessary inserts such as steel plates, pipe sleeves, bolts etc. and make holes, pockets, dowels etc., in the form work to enable efficient fixing of supports in the form work to enable efficient fixing of supports, brackets, ceilings, precast members etc. as indicated on the drawings, called for in the schedule of quantities or as required by the Bank/Bank. In-situ concrete inserts shall be as per IS: 1946 and of a type approved by the Bank/ Site Engineer.
27. **Bearing Plaster:** This shall consist of cement plaster 1:3 (1 cement:3 fine sand) 20mm thick finished with a coat of neat cement laid on top of walls as bearing for RCC lintels, beams and slabs, when dry, a thick coat of lime wash shall be given before starting, shuttering. The shuttering shall be started after minimum one day of bearing plaster so that it is set.
28. **Concrete filling for sunken and lowered portions of slab:** This shall be cement concrete 1:5:10 (1 cement:5 coarse sand:10 brick ballast 40mm nominal size) in the entire sunken portions irrespective of what is shown on the drawings over this sub base, flooring as per specifications shall be provided.
29. **Damp Proof Course:**
 - a) This shall consist of 40mm thick PCC 1:2:4 (1 cement: 2 coarse sand:4 graded stone aggregate :12.5mm nominal size)with water proof compound conforming to IS-2645) as per manufacturer's specifications)
 - b) DPC as specified above shall be provided 40mm thick at level with finish floor to the full width of walls (Ground floor only)
 - c) No DPC shall be provided over dwarf walls but floors shall be carried over to the width over the dwarf wall finished 10mm projecting over from the wall.
 - d) The dried up surface of DPC shall be cleared with brushes and finally with a piece of cloth soaked in kerosene oil and then applied with hot bitumen using 1.7 kg per sqm. of DPC area.

- e) Vertical Damp proof course shall be provided at ground floor on common walls between floors at different levels and shall consist of 20mm thick plaster of mix 1:4 (1 cement:4 coarse sand) with water proofing compound at the rate as unused in as in (d) above before filling earth /sand is carried out.
30. **Plinth Protection** : PCC 1:3:6 (1 cement:3 coarse sand:6 graded stone aggregate 20mm nominal size) 50mm thick of width as shown on drawing shall be provided and laid in alternate bays in slope over 75mm hard core of rammed dry brick aggregates of 40mm nominal size over well rammed and consolidated earth base with brick edging all around the buildings except in portions covered by steps, ramps and platforms. A joint of 10mm shall be left through depth of concrete all along with junction between wall and plinth protection at all turnings and across at every 2.5m. These joints shall be filled with a mixture of blown grade Bitumen 85/25 and sand. The surface shall be finished smooth without using extra cement. Brick edging shall be laid on header with cement mortar 1:4 (1cement : 4 Coarse sand) as per detail as shown on drawing.

SECTION III - BRICK WORK

MATERIAL

1. **Sand for Masonry Mortars:-** Unless otherwise indicated, sand for masonry mortars shall consist of natural sand (generally termed as coarse sand) crushed stone sand or crushed sand or a combination of any of these conforming to IS 2116-1965 specifications for sand for masonry mortars. Sand shall be hard, durable, clean and free from adherent coatings and impurities such as iron particles, alkalies, salts, coal, mica, shale or similar laminated or other materials exceeding the specified limit. Grading of sand shall be as under:-

IS Sieve	Percentage Passing by weight	
	Unreinforced masonry	Reinforced masonry
4.75 mm	100	100
2.36 mm	90-100	90-100
1.18 mm	70-100	70-100
600 micron	40-100	40-100
300 micron	5-70	5-70
150 micron	0-75	0-10

2. The maximum quantities of clay, fine silt and fine dust in sand shall not be more than 4 percent by weight, Organic impurities shall be below that obtained by comparison the standard solution on specified in 6-2-2 of IS-2386 (Part II 1983). The coarse/fine sand shall be from river Gaggar.
3. **Common Burnt clay building brick:-** Common burnt clay building bricks (herein-after termed as bricks shall conform to the requirements laid down in IS-1077-1976 for common burnt clay building bricks. Bricks shall be class designation 75, sub Class 'A' as per parameters given in the IS regarding edges, dimensions etc. The overall dimensions shall however be as per local practice of moulds. Water absorption after immersion in cold water for 24 hours shall not exceed 20% and grading for efflorescence shall be less than moderate. Bricks shall be free from cracks, flaws and nodules of free lime. Dimension shall be all within tolerance. Under/over burnt bricks and warped bricks shall be totally rejected.
4. Test check on random samples from each lot of bricks brought at site shall be carried out for compressive strength and water absorption test. Results of these tests duly signed and dated by Contractor; Bank and Bank shall be recorded in a separate register, which shall be kept with the Bank.

WORKMANSHIP - MASONRY MORTARS

5. **Preparation of Cement Mortars:-** Mortar shall be of mix as indicated. The mixing specified is by volume. Mixing shall be done in a mechanical mixer. The mortar shall be mixed for atleast three minutes after adding of water. Cement mortar shall be freshly mixed for immediate use. Any mortar which has commenced to set shall be discarded and removed from the site.

6. **Bond:-** All brick works shall be built in English bond., unless otherwise indicated. Half brick walls shall be built in stretcher bond. Header bond shall be used for walls curve on plan for better alignment, header bond shall also be used in foundation, stretchers may be used when the thickness of wall renders use of header impracticable. Where the thickness of footings is uniform or a number of courses, the top course of the footings shall be of headers. Brick courses at DPC level and at all slab levels below the bearings of slab shall be as bricks on edges.
7. Half or cut brick shall not be used except where it is necessary to complete the bond.
8. Overlap in stretcher bond is usually half brick and is obtained by commencing each alternate course with a half brick. The Overlap in header bond which is equally half the width of the brick is obtained by introducing a three-quarter brick in each alternate course at quoins. In general, the cross joints in any course of brick work shall not be nearer than a quarter of brick length from those in the course below or above it.
9. **Curing:** The bricks shall be adequately wet before use and brickwork shall be constantly kept wet for atleast seven days.
10. **Half Brick Walls:** - The bricks shall be laid in stretcher bond in cement and sand mortar 1:4 (1 cement : 4 coarse sand) or as indicated. The reinforcement shall be 2 Nos. MS round bars or as indicated and as described in section VII steel and Ironwork. The diameter of bars shall be 6mm. The first layer of reinforcement shall be used at second course and then at every fourth course of brick work. The bars shall be properly anchored (min. 150mm) at their ends where the portions and or where these walls join with other walls columns. The inland steel reinforcement shall be completely embedded in mortar. Overlap in reinforcement if any, shall not be less than 30cm. The cover i.e. the mortar interposed between the reinforcement bars and brick shall not be less than 6mm. The mortar covering in the direction of joints shall be not less than 15mm.
11. **Brick work in foundation upto plinth:** Brickwork in foundation shall be with brick of class designation 75 upto plinth level in cement mortar 1:6(1 cement: 6 coarse sand).
12. **Brick work in Super structure:** Brickwork in superstructure including parapets etc. shall be bricks of class designation 75 in cement mortar 1:6 (1 cement: 6 coarse sand).
13. **Brick work in steps of staircase:** Brick work in steps of staircase shall be in bricks of class designation 75 and in cement mortar 1:6 (1 cement :6 coarse sand).
14. **Parapets and Railings:** Parapets and railing shall be provided to balconies, Terraces, roof tops and stair landing etc. of upper floors as per details shown on drawings.
15. **70mm Thick Brick Work:** 70mm thick brick work shall be provided with bricks of class designation 75 in cement mortar 1:3 (1 Cement: 3 coarse sand) wherever shown in the drawings.

SECTION IV - PRESSED/COLD ROLLED FORMED STEEL FRAMES FOR DOOR, WINDOWS AND VENTILATORS

Pressed/Cold Rolled Formed steel frames for doors including combined door cum window frame sand Ventilators.

1. Frames shall be conforming to IS-4351 and shall be manufactured from mild steel sheet of 1.25mm thickness conforming to IS 513-1973 (second revision). The overall size and types of doorframes (four/double/single rebated) shall be made in the following profiles as shown on drawings:
 - a) 50 x 100 - Single rebated
 - b) 50 x 120 - Double rebated
 - c) 125 x 60 - Mullion four rebated
2. Each doorframe shall consist of hinge jamb, lock jamb and head mullions where shown on drawings. The whole shall be welded. Two base tie of MS angle 25x25x3 mm shall be welded to the feet of frame in order to form a rigid unit. The tie shall not be removed after fixing the frame in position. This shall get embedded in the floor concrete. There shall be three MS holdfasts 30cm long out of MS Flat 40x3 mm with one end split into fish tail for each jamb. One end of the hold fast shall be bent and welded to frame and the other end (split fish end) shall be embedded in wall in cement concrete block 1:3:6 mix of size 230x230x150 .MS flat 35mm x 6mm shall be welded on inner face of the frame at the position of the lock plate. Three number 125mm long heavy-duty hinges shall be provided for each shutter leaf. These shall be welded to the pressed steel frame. For fixing the hinges a slit shall be cut at the corner edge of the rebate and the hinge shall be welded to the back side of the jamb of the frame as per sample. Necessary provision/slots shall be made for fixing locks, tower bolts, sliding bolts etc. The work shall conform to the sample available for inspection. Suitable sizes of flat 6mm in thickness and mortar guards are to be welded at the rear of frame where slots, holes etc. are to be provided.
3. Vertical members of door frames shall be 40mm more than the specified height and shall be embedded in floor at all floor levels. All members of the frame shall be sand papered to remove all scale and rust. A coat of red oxide zinc chromate primer shall be applied as primer coat all round as per manufacture's specifications. Thereafter, the frame shall be filled with cement concrete 1:3:6(1 cement:3 coarse sand:6 stone aggregate 12mm down gauge). The concrete shall be compacted very carefully to ensure that no area is left loose and cured for at least 5 days. The cement concrete shall not have a slump more than 1 cm.
4. In case of doors cum window the size of profile of the complete frame shall be as para-1 above other details for door portion shall be as per para-2&3 above and for window portion other detail shall be as per para-7 below.
5. Each window frame shall consist of jambs (sides), heads(tops) cills (bottom) and mullions (central members etc.) The whole shall be welded as described in para 2 and 3 above.

6. There shall be two MS hold fasts 20cm long out of MS flat 40mmx3mm with one end split into fish tail to each jamb upto1650mm length and three holdfasts for jamb above 1650mm in length. One end of the hold fast shall be bent and welded to the frame and other embedded in wall in cement concrete block 1:3:6 of size 230 x230x 150mm. Before erection, the frame shall be sand papered and provided a coat of primer and filled with concrete (1:3:6) as in the case of door frames. 100mm long MS flats 35mm x 6mm shall be welded on inner face of the frame at the position of the hinges. Two number 75mm long heavy duty Butt hinges shall be provided to each leaf of window shutter at a distance of 150mm from top and bottom welded to the pressed steel frame. Necessary provision/slots shall be made for fixing tower bolts, etc.
7. Frames shall be fixed in position true to line and levels. Necessary opening shall be left in the walls to receive frames. During construction of masonry lay dry bricks in mud mortar in position that they can be removed subsequently for providing cast in situ concrete blocks for holdfasts.
8. Whenever frames are required to be fixed adjacent to RCC columns the frame shall be fixed with MS size of straps and Anchor (dash)fastener in lieu of holdfasts. The strap shall be concealed in plaster after covering with chicken wire mesh 150mm wide.
9. Overall dimensions of the doors/windows and ventilator frames shown in the drawing shall be maintained.
10. Door/Window/ventilators frames shall be from one of the following manufacturers listed on page :-
11. If Excise duty is applicable then Excise duty gate passes shall be submitted by the contractor for each consignment of Door/Window frames dispatched by the factories and brought at site for incorporation in the work.
12. The contractor shall submit the fabrication (shop)drawings from the manufacturers for the approval of Bank/ Bank before starting the fabrication. On getting approval of the shop drawing the contractor shall produce the sample piece of each profile with required fittings for final approval of Bank and Bank before mass production by the manufacturer.
13. **GLAZING FOR WINDOW & DOOR FAN LIGHT** All window and Door fan light where fixed glass is to be provided to the pressed steel frames, M.S. beading 12x12mm (made out of 1.25mm thick. M.S. sheet) shall be provided with the pressed steel frames. The beading shall be fixed to the frames with machine screws (steel). Thickness and quality of glass shall be as specified in para 10 of Section V.

SECTION - V - JOINERY

1. **General:** The type of shutters for doors, windows, ventilators etc. viz. paneled glazed wire gauzed and flush shall be as indicated and detailed in the drawing.
2. **Flush Door shutters:** Door shutters shall be 35 mm thick flush door shutters/solid core type non decorative factory made confirming to IS- 2202 and ISI marked with block board core (confirming to the requirements as per IS-1659 1969) with internal hard wood clippings and both faces commercial ply veneered. Adhesive used shall be phenyl form aldehyde synthetic resin conforming to BWP types specified in IS-848-1974.
3. Contractor shall obtain the approval for the name of the manufacturer of the flush door shutters from the Bank/Bank before placing the supply order. While asking for the approval, copy of the "Bureau of Indian Standard" letter under which manufacturer has been authorised to mark the product with ISI marking should be attached. Bank and Bank before giving the approval shall ensure that the validity date of license has not expired.
4. **Testing of Flush Door Shutters:** On receipt of the shutters at site the Bank or the Bank shall be entitled to get the samples of door shutters tested in any approved laboratory. From each lot of approximately 100 shutters, one shutter shall be selected at random by the Bank/Bank. The cost of replacement of the door shutters selected as samples, their transportation to the laboratory and cost of testing by the laboratory shall be borne by the contractor.
5. **Glazed & Gauzed Door Shutters:** Shutters shall be 35mm thick. These shall consist of first class i.e. champ, haldu, hillock, jamun, mango wood styles, top, bottom and lock rails as per details shown on drawings. Timber to be used for these shutters shall be of good quality, seasoned of material growth and conforming to IS-4021-1963. Seasoning and ASCU treatment shall be done as per IS-402-1962. Styles and rails of shutters shall be in one piece only. Styles and rails shall be jointed to each other by tonen or mortice at right angles. Mountings and glazing bars shall have joints and shall be shrub tanned to the maximum depth, which the size of member would permit.
6. **Wire gauge shutters:** Provisioning and fixing of wire 35mm thick gauge shutters to all external doors including main entrance door and all openable windows is in the scope of work of this contract. Wire cloth shall be securely housed in rebates by giving a right angled bend and fixing by means of suitable staples at intervals of 75mm. Over this wooden bead of specified size shall be fixed with nails, or screws, where indicated to cover the rebate fully. The space between the beading and the rebate shall be filled with putty to give it a neat finish. Exposed edges of the beads shall be rounded.
7. Door and windows shutters shall be provided as per details shown on the drawings.
8. The bottom of door shutters shall be 5mm above the finished floor level.

9. The glass panes shall be free from flaws, specks or bubbles and shall have square corners and straight edges. The glass panes shall be so cut that it fits slightly loose in the frames. The glass pane shall be fixed to the shutter with first class hardwood beading of size as indicated properly screwed to the shutter with steel nails and necessary adhesive as per details as shown on drawings.
10. Glazing to windows/doors shutters shall be as follows of quality as approved by Project Engineer & Bank.
- | | | | |
|-----|---|---|--------------------------------|
| (a) | Fan light of Doors shutters | : | 4 mm thick plain sheet glass. |
| (b) | Door Shutters fully glazed | : | 5.5mm thick plain sheet glass. |
| (c) | Windows (openable & fixed) except for toilets.: | : | 4 mm thick plain sheet glass. |
| (d) | Windows openable and fixed of toilets | : | 4 mm thick pin head glass. |

NOTE : On all toilet door shutters, aluminum sheet 18 gauge bent to U shape shall be provided at the bottom of the flush shutters. This sheet shall be upto 30cm height on the inner face of the shutters and upto 20cm height on the outer face of the shutters. This shall be fixed with 12mm steel Nails.

Section - VI - Aluminium Doors, Windows & Ventilators.

1. The Aluminium extruded sections shall conform to Designation 63400 given in IS 737-1986 and shall be of manufacturers such as JINDAL or Hindalco or INDAL or equivalent manufacturers to be approved by the Bank/ Bank.
2. The Aluminium Doors, Windows, Ventilators and Glazing sections shall be anodised (anodic coating shall conform to IS 1868) as per colour approved by the Bank and Bank.
3. The fabrication shall be carried out having mechanical joints, accurately machined and fitted to form hair-line joints, with the vertical and horizontal sections at the corners to meet in 45 degrees mitered. The jointing shall be either with accessories such as cleats and cleating screws or by crimping with Hydraulics Press on to heavy duty extruded Aluminium cleats. The relevant arrangement shall be got approved by the Banks. The Glazing shall be fabricated and anchored to withstand wind pressures as per the Indian Standards.
4. Before proceeding with any manufacture, Shop Drawings for each typical elevation shall be submitted for the approval of the Bank and no work shall be performed until the approval of the shop Drawings is obtained.
5. All Glazing shall be airtight and watertight, using appropriate extruded EPDM gaskets/as manufactured by Anand Lescuyer Pvt.Ltd., or equivalent; and sealant which shall be of high quality and performance requirements.
6. Each Glazing shall be tailor-made as per openings at Site. No cutting and making good of exposed grit wash plaster surfaces shall be permitted.
7. All the Aluminium sections shall be wrapped with self-adhesive non-staining thick layer of PVC tapes as Manufactured by M/s Bhor Industries or equivalent as approved by the Banks, and shall be duly packed for avoiding scratches or blemishes to the powder coated surface of the sections till the installation is completed.
8. The frames shall be fixed to concrete/masonry /brick work with dash fasteners and the method of fixing shall be got approved by the Banks before installation. The drilling of holes for inserting the dash fasteners shall be carried out with drilling machines and the frame shall be fixed in plumb, line and level at jambs, sills and heads.
9. The perimeter gap between the outer frame and the masonry shall be sealed with poly sulphide sealant as per the make approved by the Bank.
10. **Glazing:** The glass panes shall be free from flaws, specks or bubbles and shall have square corners and straight edges. The glass panes shall be so cut that it fits slightly loose in the frames. The glass pane shall be fixed to the shutter with Aluminium beading and E. P.D.M gasket properly shaped as per the drawing. The glass panes shall be of make as specified.

SECTION VII - BUILDERS HARDWARE

Manger shall be provided to all doors/windows/ventilator/shutters with necessary matching screws of suitable size

Fittings and fixtures to all doors window and ventilators etc. shall be Aluminium anodised Matt finish ISI marked of make as specified. These shall be ISI marked where manufacturer contractor shall obtain the approval of the name of the manufacturer and brand of fittings from page of Director/Bank before placing the supply order. While asking for the approved copy of bureau of Indian Standard letter under which the manufacturer has been issued the license and authorised to make the items of builder hardware with ISI marking should be attached and one sample of each fillings of the particular brand duly ISI marked shall be given by contractor.

Butt hinges for doors shall be ISI marked cold rolled mild steel heavy quality of size as specified with mild steel pin and shall be oxidised finish. These shall be welded to pressed steel frames as specified.

Handles for window shutters shall be 75mm long & door shutters shall be 125 mm D-Type Aluminium anodised.

Link chain and sliding channel shall be sturdy of CP brass and shall be provided to main entrance door of all units as specified.

Magic eye for entrance door shall be wide-angle best quality. This shall be fixed at 1400mm height from finished floor level.

One sample piece of each fitting shall be produced for approval of Bank /Bank. The bulk supply order shall be placed by the contractor only after approval is accorded by Bank/Bank.

Schedule of Builder's Hardware : Schedule of Hardwares/fittings to door, window and ventilator shutters shall be as per drawing.

9. **Mortice Latch (Vertical Type):** Mortice latch (Vertical type) shall conform to IS 5930-1970. Specification for mortice latch (Vertical type). These latches shall be capable of being operated inside and outside and shall be provided with a pair of Aluminium anodised lever handle fitted on the handle plate in order to close the door. The latches shall be of brass alloy. Faceplate shall be provided in front of the ease plate, size of latch shall be 65mm.

10. **Mortice Locks:** These shall conform to IS 2209-1976. Specification for Mortice locks (Vertical Type). These shall have body, body covers, cast plate, faceplate, skirting plate lever, follower of cast brass and locking bolt and latch bolt extruded brass. Lever spring and latch spring shall be of phosphor bronze. The locks shall be supplied with 2 Nos. stainless steel keys. Locks shall be 6 lever. The lock shall be easy working with lever and shall be capable of being opened with from both inside and outside and shall be provided with a paid of Aluminium anodised lever handles on the handle plate in order to close the door from both side.

11. **Hydraulic Door Closer (Floor Type)** : The Contractor shall provide double acting Hydraulic Door Closer model No.F-32, Cat No.1204 with SS Plate, Capacity to carry door weight upto 380Kg of EVERITE brand or Cat No.OFS 9621 of OPEL brand. These shall be of approved brand and manufacturer as above (Confirming to IS-6315) for Aluminium door including cost of cutting floor as required, embedding in floors and cover plate etc.

NOTE:

- i) It shall insure that all builder's hardware are from one manufacturers only for the entire work, However, if due to any reason contractor progress to provide part quantity from other manufacturer approved in Para 2 above, then he may be permitted but he will have to obtain specific approval of Project Engineer/Bank for this change in brand. This will be subject to that all items and fixtures in any particular blocks shall be always of one manufacturer only. In no circumstances items of two manufacturers shall be used in all of the particular blocks.
- ii) Project Engineer before giving the approval of the name of the manufacturer and brand shall ensure that the validity date of license for making the fittings, as ISI marked has not expired.
- iii) Those fittings which are not manufactured, as ISI marked shall also be of the one brand of which the ISI marked fittings are approved by Project Manager.

**SECTION - VIII - STEEL AND IRON WORK INCLUDING STEEL DOOR AND ROLLING SHUTTERS
(OTHER THAN PRESSED/COLD ROLLED FORMED STEEL DOORS AND WINDOWS
FRAMES)**

1. Steel and ironwork shall be executed as indicated in drawing and as per standard practice.
2. Quality of steel shall conform to the following specifications:-
 - (a) Mild steel (Misc.) IS 432-1966 Part I
 - (b) MS reinforcement bars IS 432 Part II 1962
 - (c) Structural steel works IS 226-1962
 - (d) Steel Deformed Bars IS-1786/1979
3. **Reinforcement:**
 - (a) Reinforcement bars 6mm dia shall be MS bars.
 - (b) All reinforcement bars 8mm and above shall be deformed twisted steel bars.
 - (c) Laps and crossing shall be tied with mild steel binding wire of size not less than 0.9mm dia.
 - (d) The contractor shall be responsible for accurate fixing and placing of reinforcement shown in drawing and shall not place the concrete until the reinforcement has been checked, passed and recorded by the Bank and Project Engineer.
 - (e) Reinforcement shall be bent and fixed as per IS-2502-1963.
 - (f) Laps in reinforcement for columns, beams and slabs etc. will be as stipulated in IS.
4. **Bar Bending Schedule of Reinforcement:** On receipt of structural drawing contractor shall prepare bar bending schedule of reinforcement and shall be got approved from the Bank / Bank / Bank in advance before starting the work.
5. **Cutting of Reinforcement:** Before steel reinforcement bars are cut, the Contractor shall study the lengths of bars required as per drawing and shall carry out cutting only to suit the sizes required as per drawings so that the wastage is minimum.
6. **Net Measurement:** Reinforcement shall be placed as shown in the structural drawings and payment will be made on the net measurements from drawings. Only such laps, dowels, in reinforcement shown on drawings shall be paid for. The contractor shall allow in his quoted rates for all wastage and rolling margin which will not be paid separately. The measured length of all the bars shall be converted into weight as per latest IS schedule.
7. **Stock Piling of Steel:** Steel required shall be stock piled well in advance of need in the work. Bars should be stacked off the ground so that they do not get covered with mud.
8. **Rates quoted for reinforcement, addition to any factors mentioned elsewhere, shall also include for**

- All cutting to length, labour in bending and cranking, forming hooked ends, handling, hoisting and everything necessary to fix reinforcement in work as per drawings.
 - De-coiling, straightening (coiled bars, bars to facilitate transporting)
 - Cost of binding wire required as described.
 - Cost of pre-cast concrete cover blocks of proper size or nylon spacers to maintain cover and holding reinforcement in position.
 - For fabricating and fitting reinforcement in any structural member irrespective of its location, dimensions and level.
 - Removal of rust and every other undesirable substances, using wire brush, etc. as described.
 - Work at all levels.
 - Stock piling of reinforcement as described.
9. **Holdfasts:** Holdfasts shall be made from MS flats of size as specified with split fish tail ends coated with anti corrosive paint/tar. Holdfast shall be welded to door/windows frame as specified.
10. **Steel Door frame and shutters:** Size of door and locations shown on drawing and shall comprising of frame and shutter fabricated and welded out of MS angle, plate & sheet and 10mm square tie bar. The door shall be painted with two or more coats of synthetic enamel paint of approved quality & shade over one coat of steel primer. Each MS gate shall have hold fast - 6 Nos, Butt hinges 125mm - 3 Nos, MS handles 100mm - 2 Nos and MS sliding bolts 300 x 16 mm - 2 Nos (1 inside and 1 outside). Hold fasts shall be embedded in PCC block (1:3:6) of size 23 x 23 x 15cm.
11. **Grills:** MS grills manufactured out of flat iron, MS square tubes and round bars and of pattern as shown on drawing shall be provided to all windows openable/fixed, glazed portion of doors and fanlight of doors. All Grills shall be fabricated and welded to the pressed steel frames in the factory where the pressed steel frames are manufactured and shall be brought to site as welded. Grills to fully glazed door shutters shall be fixed with steel screws.
12. **Railing to staircases, landings, passages, balconies & parapets:-**
- (a) Railing to staircase, landing etc. shall be fabricated with square M.S. tubes and square MS bars etc. with vertical supports & top handrail made of M.S. pipe (medium grade) welded at joints fixed into floor/steps as shown in drawing.
- (b) Verandah/Balcony Railing shall be fabricated with MS flat, M.S. tubes MS bars with vertical supports & top handrail made of M.S. pipe (medium grade) welded at joints fixed into floor/steps as shown in drawing.
- (c) The fixing details and dimensions for 7 (a), 7(b) above shall be as shown in drawings. All welded joints shall be grounded properly before painting. The finished railing shall

be true to plumb, line and levels as called for. The mild steel blusters and other exposed mild steel members shall be painted with approved shade and brand synthetic enamel paint.

8. **Exhaust Fan opening:** In kitchen, toilets, WC, bath etc. provision for fixing of exhaust fan shall be made by fixing 19mm thick BWP grade commercial board with a circular hole 300mm dia in window as shown on drawings. This opening shall be covered by bird guard fabricated out of galvanised iron sheet 18 gauge as shown on drawing.
9. **Welding:** This shall be done by electric process with precautions for health and safety. The places to be welded be cut angularity so that the welding material does not protrude and the members to be welded join properly. The welds shall be ground clean to give a one-piece appearance. The welds shall run around the contact surfaces of two meeting sections. Throat thickness not less than 4mm.
- 10 **Steel Rolling Shutters:-** Shall be of approved make and shall confirm to the requirement of IS 6248 - 1979 specification for metal rolling shutters and rolling grills. The size of rolling shutters shall be as indicated in drawing. It shall be self coiling type shutters (push pull type manual type with ball bearings, It shall be built-up of interlocking lath section formed from cold rolled steel strips of size 80 x 1.25mm. or rolling grills. Rolling grill shutter and rolling shutters-cum-grill shall be fabricated with 8mm dia meter mild steel round bars. It shall be complete with locking arrangement with lock plates hoods cover, springs Guide channels, and bracket plate, rollers and other associates. Complete in all respect including applying a coat of steel primer of approved quality and two or more coats of synthetic enamel paint of approved quality.

SECTION - IX - ROOF COVERING, WATER PROOFING & RAIN WATER PIPES

1. **Exposed roof at terrace floor level:-** Roof slabs shall be cleaned thoroughly and following treatment/covering shall be provided:-
 - (a) Clean the RCC slab surfaces including sides upto 30cm high by wire brush. Chisel out any mortar sticking to the surface and then rendering rough/ uneven surface with cement mortar 1:4 (1 cement:4 coarse sand)
 - (b) Providing and laying 100mm thick (average consolidated thickness) mud phaska terracing shall be prepared as per CPWD specification.
 - (c) Providing and laying 40mm thick brick tiles of class designation 100 grouted and pointed with cement mortar 1:3 (1cement:3 fine sand). The joints shall be finished flush with the brick surface neatly. Brick tiles shall be of uniform colour, free of cracks and flaws with uniform and straight edges and surfaces. Entire roof surface to be kept wet for seven days after this operation.
 - (d) Providing & laying FPS brick tiles of class designation 100 over mumty roof grouted with cement mortar 1:3 (1 cement : 3 fine sand) mixed with 2% of integral water proofing compound by weight of cement over 12mm layer of cement mortar 1:3 (1 cement : 3 fine sand) & finished neat.
2. **Gola:** Providing Gola 75x75 in cement concrete 1:2:4 (1 cement :2 coarse sand:4 stone aggregate 10mm and down gauge) at the junction of RCC slab and wall and junction of tiles and parapet/wall including finishing exposed surfaces with cement mortar 1:4 (1 cement :4 fine sand) as per drawing. Gola shall be done before the plaster of parapet.
3. **Khurras:** Making khurras 450 x 450mm with average minimum thickness of 50mm cement concrete 1:2:4 (1 cement :2 coarse sand:4 stone aggregate 10mm nominal size)finished with 12mm cement plaster 1:3 (1 cement : 3coarse sand) mixed with water proofing compound and coat of neat cement including rounding of edges and making and finishing the outlets complete as per standard design.
4. **Balconies:** Finishing of balconies shall be terrazzo cast in situ with matching skirting.
5. **Chajjas:** Slab shall be cleaned thoroughly and following treatment/covering shall be provided:-
 - a) Apply treatment as per para 1.(a) above.
 - b) Finishing with 12mm plaster in cement mortar 1:4(1 cement: 4 coarse sand) mixed with water proofing compounds per manufacturer's specifications OR @ 5% of amount by weight. This shall be applied after treatment as 7 (a) above
6. **Sunken/Lowered slabs:** Water proofing treatment shall be provided to all sunken/lowered portion of slabs. This shall consist of the following:-
 - (a) Clear the sunken/lowered portion of RCC slab surface (including vertical total depth) by wire brush. Chisel out any mortar sticking to the surface including rendering 6mm thick over rough uneven surfaces with cement mortar 1:4 (1cement:4 coarse sand).
 - (b) Wash it with water and dust it clear and clean.
 - (c) Apply one coat of water-soluble Epoxy-TECHOXY and two coats of coal tar epoxy to bottom and vertical sides upto skirting height of the sunken portion as per manufacturers specifications.

- (d) Plastering the bottom and sides with 12mm thick cement mortar 1:4 over and above with water proofing compound as per manufacturer's specifications including rounding of corners and junctions.
- (e) When the treatment set dry fill with water for seven days and ensure that the treated area is fully waterproofed.
- (f) All CI/GI pipes laid in sunken portion shall be covered by 50mm thick PCC 1:3:6 around after painting with anticorrosive paint (Japan black) G.I.pipes in sunken portion shall also be protected against corrosion by providing and applying two coats of bitumen paint covered with polythene tape and finished with a final coat of bitumen paint.
- (g) Filling with PCC 1:5:10 as specified.
- (h) One 50mm dia GI pipe spouts with wire gauge on inside mouth shall be provided to each sunken portion irrespective of what is shown on drawings.

NOTE: All CI/GI pipes and fittings passing through the wall of the sunken portion shall be laid/fixed before the treatment as specified in para 8 above is carried out.

7. Water proofing treatment to raft/floor,walls and roofs of overhead water storage tanks & pump room etc. shall be as per drawing & BOQ.

8. **Rain Water pipes:-**

- a) The rainwater pipes and fittings shall be provided sand cast iron. All pipes and fittings shall conform to IS 1729 - 1979 and ISI marked. These shall have uniform wall thickness for the entire length, free from surface and other defects. The pipes shall be coated externally and internally with coating material Tar or any other suitable materials. The coating material should set quickly with good adherence and should not scale off.
- b) Cast iron rainwater pipes and accessories shall be provided as shown on the drawings. The joints in cast iron rain water pipes shall be with cement mortar 1:3. The CI pipe will start from 150mm above plinth protection with bend and a tee junction shall be provided at all terraces levels to collect water from khurras and vertical pipe shall be extended upto 150mm above top of parapet wall. At top cast iron COWL shall also be provided.
- c) Cast iron chamber and grating at the top and outlet of every rainwater pipe shall be provided and shall fit in snugly on the socket end of the pipe. The perforations in the gratings shall be atleast 60% of the total area of gratings.
- d) Where the rain water pipes are to be provided concealed within masonry the pipes shall be embedded in the walls with PCC 1:3:6 (1 Cement:3 coarse sand:6 stone aggregate 20 mm down gauge) encasing all round.
- e) Rainwater pipes running down along the walls/columns shall be firmly fixed with MS holder bat clamps at all joints.

ON STAMP PAPER OF ADEQUATE VALUE
FORM OF GUARANTEE FOR WATERPROOFING

Name of the project:

Free Maintenance Guarantee - Waterproofing work:

By _____

We, Hereby guarantee that the surfaces treated by us for waterproofing in the above work, for M/s the general building contractor for the above work, shall remain entirely watertight. Should, however, due to any unforeseen defect left out in the work carried out by us at the time of execution of the work, there be any leakage from any surface treated by us during the period of ten years from the date of virtual completion of the work i.e. from to the same shall be rectified by us without any extra cost to the Union Bank of India.

However, we shall not be responsible in any way work is tampered with or if the body of the structure is damaged due to sinking, cracking and/or by any other act of God beyond our control.

Signature of the

.....

Waterproofing contractor

Signature of the general

.....

Building contractor

SECTION - X - FLOOR FINISHING, SKIRTING & DADO

1. General

a) This section shall cover all flooring and wall tiling work as shown in the drawing. No work under this section shall be started until specifically allowed by the Bank/Site Engineer and until all other major works such as plastering, embedding of conduits and pipes, channels, windows fixing etc. have been completed. Samples of adequate size representing the nature of variation including quality, size, texture after polishing of the tiles to be used in the flooring work fully shall be prepared for all work and got approved by the Bank before proceeding. The approved samples shall be retained up to the end.

b) Floor shall be laid to level and or to slope as shown on drawings and as required and directed by Bank/Bank. Floor shall be carried through all the doors and other openings and over dwarf walls. Exposed edge of floors shall be finished in the same manner as for top surfaces. Skirting shall match with the floor finish.

2. Sub Flooring

a) For Ground floor:

Sub floors (base concrete under floor finish) 100mm thick lean concrete in 1:5:10 (1 cement: 5 coarse sand & 10 brick aggregate 40mm nominal size) for all locations except stilt area. In stilt area instead of brick aggregate it shall be stone aggregate) shall be laid over a layer of fine sand 150mm thick at ground floor only.

b) For Upper Floors:

- Sunken/lower portion of slabs: Sub base shall be in lean concrete in 1:5:10 (1 cement :5 coarse sand and 10 brick ballast 40mm nominal size).
- Other floors: Wherever required/directed lean concrete 1:5:10 (1 cement: 5 coarse sand: 10 brick aggregate 40mm nominal size) of required thickness laid over RCC slab.
- Floors under cupboards/bookshelves/kitchen counters etc. in 1:5:10 lean concrete (1 cement: 5 coarse sand & 10 brick aggregate 40mm nominal size).

3. Plain cement concrete flooring: Cement concrete 1:2:4 (1 cement: 2 coarse sand: 4 graded stone aggregate 12.5 mm nominal size) flooring of specified thickness. The thickness of flooring finished shall be 40mm/50mm as specified in schedule of quantities with grooves of 10mm wide shall be left through depth of the flooring (finishes) to form bays as specified in para 5 (b) hereinafter OR The top surface shall be finished with floating coat of neat cement using steel float while the concrete is green. With 3mm thick 38mm wide glass strips, as specified in Schedule of quantities.

4. Skirting: To match PCC floors 18mm thick plaster in cement mortar of mix 1:3 (1 cement: 3 coarse sand) finished with a floating of neat cement shall be applied to skirting. The skirting shall be 100 high and it shall be projecting uniformly from the plastered surfaces of walls and columns and separated with a horizontal groove of 10mmx10mm

5. Terrazzo Cast in situ flooring:

- (a) Terrazzo cast in situ shall consist of 10mm thick (top layer) over 40mm (Avg.) thick PCC (under layer) with 4mm thick 38mm wide PVC strips and shall be provided conforming to the specifications given hereafter.
- (b) 3mm thick and 38mm wide glass dividing strips shall be placed in position to form bays. Generally, these shall be at 750mm centers for internal floors. Extra strips shall be provided on both sides of door. The strips shall be kept in position with cement concrete fillets 1:1:2 (1 cement: 1 coarse sand: 2 stone aggregate 6mm gauge) and as few fillets as possible shall be used. The top of the strips shall be so kept that it will flush with floor finish it should neither project above the floor finish nor be depressed.
- (c) Base concrete shall be cleaned, moistened and brushed with cement slurry at 2.5kg/sq.mts A layer of 30/40 mm thick PCC 1:2:4 (1cement: 2 coarse sand: 4 stone aggregate 12.5mm nominal size) as specified shall then be laid between the strips. This layer shall be thoroughly worked and leveled with screening board to leave slightly rough surface.
- (d) Terrazzo cast in situ topping 10mm thick shall be of following description and mix proportions. This topping layer shall be laid between 24-28 hours after laying the under layers:-

A mixture of ordinary grey cements and approved white marble dust/powder mixed in proportion of 4 parts of cement and 1 part of marble dust/powder by volume.

Marble Chips: Size of marble chips shall be 4mm to 8mm and of size 1 B for skirting and dados.

Proportion of white marble chips shall be 75% out of white, coloured and black as per approval of Bank.

Mix one part by volume of mixture vide (d) (i) above with 1.25 parts by volume of (iii) above.

- (e) The terrazzo mixture shall be thoroughly mixed dry. First apply cement slurry to under layer, make the terrazzo mix wet to make a stiff mixture and lay in position over PCC under layer (in bays between the PVC strips). The terrazzo layer shall be tamped to bring maximum amount of marble chips to the surface. After allowing for air curing for 24 hours the surface shall be cured well for 3 to 4 days. The surface of terrazzo shall then be cut with machine at least four times with different coarse and fine graded carborundum stone as per details given below:-
 - (i) The first grinding should be done with No.60 grit stone after 3-4 days. During grinding, keep the floor wet all the time.
 - (ii) Clean the floor with water. The floor should then be grouted with neat cement to fill up all holes and imperfections.

- (iii) Air dry the grouted floor for day and then cure for 3-4 days for hardening.
- (iv) The second grinding should be done after 7 days of laying with grit No.80 and repeat grouting as above.
- (v) Third grinding is done after 14-15 days of laying with carborundum stone of grit blocks No.120.
- (vi) The final grinding and polishing should be done with carborundum stone of grit block No.320

After final grinding is over, scrub the floor thoroughly with soft soap solution made in water to clean the floor, when the surface is adequately dry slightly moisturized with oxalic acid powder at the rate of 5 gm per square meter of floor surface and finally polished with wax polish of approved brand (mansion) to the entire satisfaction of Bank/Bank.

- (vii) After the floor is polished fully saw dust shall be spread over the floor for protection after which no moisture will be allowed to avoid stains on the floor.
- (f) The mixing shall be done in tubs and the whole operation shall be carried out in absolutely clean conditions so that there is no staining due to dirt and other materials.
- (g) The terrazzo flooring of treads of steps and landings of staircase shall be projected 10mm in front and sides to form nosing and shall be finished as directed by Bank and Bank.

6. Terrazzo cast in situ in skirting, risers to treads and landings of staircases and where indicated.

- (a) 6mm thick terrazzo in skirting matching the terrazzo flooring shall be provided of the same composition as specified above as in the case of terrazzo floors except that the size of chips shall be 3mm to 4mm and base shall be 12mm thick with cement mortar 1:3 (1 cement: 3 coarse sand). The colour and mix of marble chips to match main floor. Glass strips shall be provided in line with strips in the floor in vertical direction only. The skirting shall be 100mm high and shall be projecting uniformly from the plastered surface of walls. The height of riser shall be as shown on drawings.
- (b) The terrazzo mix shall be applied firmly and finished to the required thickness.
- (c) Cutting and polishing shall be done by hand till a smooth polished surface is obtained. After final grinding is over scrubbing, polishing and finishing to be done as per above.
- (d) At front nosing of treads of all staircases M.S. Angle 35x35x5mm shall be provided as edging. Each nosing angle shall have 3 No. hold fast and shall be fixed as per details shown on drawing.

NOTE: Before starting the terrazzo work, the contractor shall submit the terrazzo finish samples for Bank's approval.

7. Glazed tiles

- (a) The tiles/ceramic shall be of first quality and shall generally conform to IS: 777. These shall be flat, and true to shape and free from cracks, crazing, spots, chipped edges and corners. The glazing shall be of uniform shade and shall be provided in Dado of kitchen and toilets. The tiles shall be set over screed/ plaster 12mm thick with cement mortar 1:3 (1 cement :3 coarse sand) to all surface, set and jointed with neat white cement slurry. The joints shall be neat and fine. Tiles face shall be kept flush with the skirting below.
- (b) Size of glazed tiles both for toilets, Baths, WC and kitchen shall be as shown on drawings.
- (c) The colour of tiles shall be white/coloured.
- (d) Height of glazed tiles dado above skirting in toilets and in kitchen, above kitchen platform shall be as shown on the drawings.

8. The glazed tiles shall be first quality vitreous china and of the following makes:-

- (a) Somany Pilkington.
- (b) Johnson
- (c) Orient

9. **Finish of working platforms in kitchens:** Finish of the working platform in kitchen shall be with 20mm thick Marble (Udaipur Green) stone slabs diamond cut and polished laid over RCC slab with 20mm cement mortar 1:4 (1cement :4 coarse sand). Marble slabs shall not be in more than two pieces for each side straight length of working plate form. Marble shall be jointed with white cement slurry including grinding smooth and polishing complete. The marble stone slabs shall be removable to facilitate the cooking range wherever required.

10. **Polished Kota stone flooring:** The Kota stone slabs shall be machine cut and machine polished and of selected quality, hard, sound, dense and homogeneous texture, free from cracks decay watering and flaws. They shall be machine cut to the requisite thickness. The edges shall truly vertical. The colour of the slabs will be approved by the Bank/Project Engineer, before starting of work. The slabs shall have the top (exposed) face polished before being brought to site. The slabs shall conform to the size conform to the size required. The thickness of the slabs shall be 25mm.

- (i) **Dressing: Every** slab shall be cut to the required size and shape and fine chisel dressed in the edges to the full depth. The edges shall be table rubbed with coarse sand or machine rubbed before paving. All angles and edges shall be true and square and the surface shall be true and plane.
- (ii) **Preparation of surface and laying** : The sub grade concrete or RCC slab on which the kota stone slabs are to be laid shall be cleaned, wetted and mopped. The bedding shall be with cement mortar of an average thickness of 20mm and mix 1:5(1 cement :5 coarse sand), over this bedding, neat grey cement slurry of honey lie consistency shall be spread. The edges shall be pasted with cement slurry @ 4.4 kgs of cement per

sqm mixed with pigment to match the shade of the slabs. The joints shall be kept as thin as possible.

- (iii) **Polishing and finishing:** The floor shall then be kept wet for a minimum period of seven days. The surface thereafter shall be grounded with machine fitted with grit block No.60, then No.120 and finally with No.320. Between every two successive grindings the surface shall be washed, cleaned and covered with a thin coat of grey cement in order to fill any pin hole that appear. After the final polish oxalic acid shall be dusted over the surface at the rate of 33 gm per square metre sprinkled with water and rubbed hard with mamdah block (pad 7% woolen rags) the following day the floor shall be wiped with a moist rag and dried with a soft cloth and finished clean.

11. **Polished Kota Stone in Risers of Steps, Skirting and Dado:** The Kota stone slabs for skirting shall be as specified in clause 10 above and of thickness 12mm. The height of skirting shall be 100mm and for risers to steps it shall be up to full height. The height of dados shall be as shown on drawings.

- (i) **Preparation of surface and laying:** The surface shall be chipped off the projections/productions if any cleaned and wetted 12mm thick plaster of cement mortar 1:3 (1cement:3coarse sand) shall be applied and allowed to harden. The plaster shall be roughened with wire brushes or by scratching diagonal lines 2mm deep at approximately 7.5 cms centre both ways. The back and edges of the stone slabs shall be buttered with a coat of grey cement slurry and set in the bedding mortar.
- (ii) **Cutting, Polishing and finishing:** Cutting, grinding and polishing of skirting shall be done in the same manner as of flooring but by hand.

12. (a) **Marble flooring:** 20mm thick marble (Makrana Chak Doongri marble) having black streds stone slabs laid over sub floor with 20mm thick base cement mortar 1:4 (1 cement : 4 coarse sand) Marble shall be jointed with white cement slurry including grinding smooth & polishing complete.

(b) **Marble Skirting:** The marble stone slabs for skirting shall be as specified in clause 12 (a) above and of thickness 20mm. The height shall be laid over 12mm thick cement mortar plaster 1:3 (1cement:3 coarse sand), jointed with white cement slurry including grinding smooth and polishing.

(c) **Marble Skirting:** The marble stone slabs for skirting shall be as specified in clause 12 (a) above and of thickness 20mm. The height shall be laid over 12mm thick cement mortar plaster 1:3 (1cement:3 coarse sand), jointed with white cement slurry including grinding smooth and polishing.

13.(a) **Red or White Fine Dressed Sand Stone Filling :**The stone slabs shall be hard, sound, durable and tough, free from crack decay and weathering. Incase of red sand stone, white patches or streaks shall not be allowed. However, scattered spots upto 10mm diameter will be permitted. Before starting the work the contractor shall get samples of slabs approved by the Bank/Project Engineer. The slabs shall be hand or machine cut to the requisite thickness along planes parallel to the natural bed of stone and should be of uniform size as required.

(b) **Dressing:** Stone slab shall be cut to the required size and shape and chisel dressed on all sides to a minimum depth of 20mm. The top and the joints shall be fine tooled so that

straight edge laid along the face is fully in contact with it incase machine cut stone are used chisel dressing and fine tooling of machine cut surface need not be done provided a straight edge laid any where along the machine cut surfaces is in contract with every point on it. The thickness of the slabs after dressing shall be as specified in the description of items.

(c) **Preparation of surface and laying** : The sub base concrete or RCC slab on which the stone slabs are to be laid shall be cleaned, wetted and mopped. The bedding shall be with cement mortar of an average thickness of 20mm and mix 1:5(1 cement: 5 coarse sand), over this bedding, neat grey cement slurry of honey like consistency shall be spread over the same @ 4.4 Kg/Sqm. The edges buttered with white cement admixed be with pigment to match the shade of the slabs. The joints shall be kept as thin as possible. The points shall be done with cement mortar as specified in the items. The joints shall be raked out uniformly to a depth not less than 12mm thickness when the mortar is green. The pointing shall be cured for a period 7 days (minimum).

14. **NON - SKID CERAMIC TILES:** Where indicated in Schedule of finishes shall be laid as under:

(i) It shall be 6 mm to 8 mm thick of size 300x300mm, conforming to IS 13755 hydraulically pressed, high temperature fires (around 1200°C) in single operation having breaking strength 350 to 400 Kg per Sqm. & weighing 17 Kg per Sq.M of approved make and shall be laid & jointed in white cement paste pigmented to tile shade over 20 mm thick cement & sand screed (1:4) over sub base.

(ii) **NON-SKID CERAMIC TILES SKIRTING:** where shown/indicated in the drawing / schedule of finishes shall be provided 100mm height over 10mm thick cement mortar (1:3 (1Cement: 3 coarse sand) and Jointed with white cement paste pigmented to the tile shade.

15. **CHEQUERED TERRAZO TILE FLOORING**

a) Tiles shall generally conform to IS:1237 the tile shall be supplied with initial grinding and grouting of wearing layer. The size of tile shall be 250 x 250 x 22mm thick or as shown in the drawings or as required by the Bank/Project Engineer. The tile shall be manufactured in a factory under presser process subjected to hydraulic pressure of not less than 140 kg per square cm. The finished thickness of the upper layer shall not be less than 6mm for size of marble chips varying from the smallest upto 20mm.

b) **PRECAST CEMENT CONCRETE TILES:-** The cement concrete tiles shall be of nominal size of 30x30 Cum with equal sides. The overall thickness of tiles shall not be less then 22mm. The tiles shall confirm to the method of manufacture, the mix of backing and wearing layers.

Where full tile can not be fixed, tile shall be cut (Sawn) from full time to the required size and their edges rubbed smooth to ensure straight and true joint to be approved by the Project Engineer/Bank before installing at site.

c) **LAYING** : Base concrete or RCC slab on which the tiles are to be laid shall be cleaned wetted and mopped. The bedding for the tiles shall be 20mm thick cement mortar 1:4

(1cement: 4 coarse sand). Over the bedding neat grey cement slurry shall be spread @ 4.4 Kg of cement per square meter.

d) **CURING, POLISHING & FINISHING**

i) The day after the tiles are laid all joints shall be cleaned of the grey cement grout with a wire brush or trowel to a depth of 5mm and all dust and loose mortar removed and cleaned. Joints shall then be grouted with grey or white cement mixed with or without pigment to match the shape of the topping of the wearing layer of the tiles. The same cement slurry shall be applied to the entire surface of the tiles.

ii) The grinding, curing, polishing & finishing shall be done as specified above for terrazzo flooring

SECTION - XI - WALL FINISHES

1. **General**

a) **Scope:** This section shall cover internal and external plastering/rendering works as shown in the drawings.

b) **Mortar:** The mortar of specified mix shall be used.

c) **Scaffolding:** Stage scaffolding shall be provided for plastering work as per standard practice and as directed by Bank/Bank. This shall be independent of the walls.

d) **Preparation of Surfaces :** Joints of brickwork walls shall be raked-out properly. Dust and loose mortar shall be brushed out. Efflorescence if any shall be removed by brushing and scraping, shuttering imperfections of all concrete shall be roughened by hacking with chisel and all resulting dust and loose particles cleansed and the surface shall be thoroughly hacked or bush hammered to the satisfaction of Bank/Project Engineer. The surface shall be thoroughly washed with water, cleaned and kept wet before plastering is commenced.

e) **Approval of Bank/Project Engineer to be taken :** No plastering work shall be started before all conduits, pipes fittings and fixtures clamps, hooks etc. are embedded, grouted and cured and all defects removed to the satisfaction of Bank/Project Engineer. Special approval shall be taken from Bank/Project Engineer before starting each plastering work. No cutting of finished plaster shall be allowed. No portion shall be left out initially to be patched up later on.

f) **Mixing :** The ingredients shall be mixed in specified proportions by volume. The mixing shall be done in a mechanical mixer on water-tight platform. The cement and sand shall first be mixed thoroughly dry in the mixer. Water shall then be added gradually and wet mixing continued for at least a minute until mortar attains the consistency of a stiff paste and uniform colour. Mortar shall be used within 30 minutes of addition of water. Mortar which has partially set shall not be used and removed from the site immediately.

2. **Internal Surfaces**

- i) Plastering shall be started after the completion of ceiling plaster from top and gradually worked down towards floor. It shall not, at any place be thinner than as specified. To ensure even thickness and a true surface plaster of about 15cm x 15 cm shall be first applied horizontally and vertically at not more than 2m interval over the entire surface to serve as gauges. The mortar shall then be applied to the wall/surface between the gauges and finished even. All corner junctions and rounding shall be truly vertical or horizontal and finished carefully. Inspecting the work at the end of the day plaster shall be cut clean to line, where recommencing the plastering, edge of old work shall be crapped, cleaned and wetted with cement putty before restarting plastering
- ii) Cement plastering internally on all internal surfaces including soffits of RCC slabs, chajjas, lintels, around shelves, inner side of parapets and around of parabolas etc. shall be as shown on drawing. Wherever not shown it shall be as under:-
 - (a) 12mm thick plaster in cement mortar 1:6 (1 cement:6 parts 75%:fine sand & 25% coarse sand) mixed with 10% of lime water over brick and concrete surfaces. Dubbing out wherever required (i.e. bringing up the undulation on the rough face of brick work in level with proudest points) shall also be executed in the same mix along with rendering coat.
 - (b) 6 thick plaster in cement mortar 1:3 (1 cement: 3 fine sand) on soffits of RCC slabs, chajjas, lintels and kitchen platforms and around of shelves and para golas.
 - (c) 10mm x 6mm grooves shall be provided in ceiling plaster at junction of wall and ceiling.
 - (d) 12mm thick plaster in cement mortar 1:4 (1cement: 4 parts 75% fine sand & 25% coarse sand) mixed with water proofing compound CICO-1 (liquid) as per manufacturer's instruction to be done on the inside face of the book shelves and cupboards.
 - (e) 15mm thick plaster in cement mortar 1:4 (1 Cement: 4coarse sand) mixed with water proofing compound CICO-1(liquid) as per manufacturer's instruction to be done on the internal surfaces of parapet walls including dubbing wherever required.
 - (f) Before plastering it should be ensured that brick masonry joints are raked out (atleast on even surfaces) to a depth of 12mm and all concrete surfaces are rough enough for proper adhesion of plaster. If not they shall be made rough by hacking or bush hammering at intervals of 2". Efflorescence if any and dust/dirt shall be removed. The surfaces shall be wetted adequately before plastering.
 - (g) G.I. Chicken wire mesh of 24 guage and 20mm mesh shall be fixed all along RCC Surface adjoining brick work given 150mm lapping on either side of the junction in double fold or as called for using nails etc and cement slurry before plastering. Ensuring equal thickness of plaster on both sides of the mesh.
 - (h) Sand used in plaster shall be within the grading zones as stipulated in the IS silt contents shall not exceed 4% by weight. Brick surface shall be raked out at the end of day brick work to afford key to plaster. Plaster surface shall be hard and even without patchy appearance. If they flake or show scratch marks if rubbed by appointed nail the plaster shall be rejected, dislodged and redone.

3. **Drip course:** Drip course shall be provided to all projections as per details shown in drawings.

4. **EXTERNAL SURFACES:**

A. **Washed Grit Finish:**

Surfaces as shown on the drawings shall be finished with washed grit plaster with necessary grooves and pattern as shown on the drawings.

- (a) Washed grit plaster shall be provided in two layers.
- (b) Apply under layer of 12mm thick plaster of cement mortar 1:4 under layer (1 cement : 4 badarpur sand/Jamuna sand 50:50) after thoroughly wetting the surface. The surface shall be kept wet till top layer is applied.
- (c) Make the surface broom finish by steel brush or scratching tool.
- (d) Grooves of size 15mm wide and 15mm deep (slightly tapered for easy removal) to be formed of uniform size in top layer of plaster using hard wood battens nailed to under layer, to desire patterns of panels truly vertical and horizontal as shown on drawings or as directed by the Bank/Bank.
- (e) All stone chippings to be washed in a clean tub by clean water before use.
- (f) Top layer shall be 15mm thick comprising cement marble powder and marble chips in proportion of 1:0.5:2 (1 cement: 0.5 coarse sand:2 marble chippings 10 mm nominal size) mixed with suitable quantity of approved shade of pigment for 2 shades (dark green or light green) from approved manufacturers as approved by the Bank and Bank for shade pattern as shown on drawings and approve by the Bank and Bank. Before application of top coat the surface of the under coat shall be cleaned and a coat of cement slurry @ 2 Kg. of cement per Sqm. shall be applied. The top layer shall be applied in uniform thickness and sufficiently pressed with wooden float for proper bonding with the under coat and finished to a true and plumb surface. Finished surface of topcoat after the mix has taken the initial set shall be scrubbed.
- (g) Scrub and wash the top layer by clean water with brushes to expose the stone chippings to its natural colour.
- (h) Marble chippings of size 10mm of approved colours, coarse sand of approved quality and pigment of approved colour shall be used.
- (i) The wooden battens to be removed very carefully by a special tool so that the edges of grit wash are not damaged.
- (j) Suitable scaffolding to be used shall have sound and strong supporters tied together with horizontal pieces over which scaffolding planks shall rest to ensure that for horizontal support no holes are made in the walls.

(k) Before application of under coat of plaster the surfaces shall be prepared by racking out joints properly and brushing out the dust and loose mortar and washed thoroughly with water and kept wet.

(l) Contractor to get a sample approved prior to start the work by the Bank/Bank.

B. 18mm thick plastering with terrazo finish

(a) 18mm thick plastering with terrazo finish shall be provided as shown on drawings. It shall be provided in two layers. Under layer

(b) Under layer shall be 12mm thick plaster of cement mortar 1:3 (1cement:3 coarse sand) and shall be brought to truly level and plumbs by using wooden float. The surface shall be further roughened by furrowing with a scratching tool. The surface shall be kept wet till top layer is applied.

(c) Top layer shall be 6mm thick terrazo topping consist of cement marble powder and hand marble chips shall be white or pink, black, yellow, green or any approved colour. Size of marble chips shall be 1B

i) A mixture of ordinary grey cement and approved white marble dust/powder mixed in proportion of 4 parts of cement and 1 part of marble dust/powder by volume.

ii) Marble Chips: Size of marble chips shall be 3mm to 4mm.

iii) Proportion of white marble chips shall be 75% out of white, coloured and black as per approval of the Bank and Bank.

iv) Mix one part by volume of mixture vide (i) above with 1.25 parts by volume of (iii) above.

v) Cutting & polishing shall be done by hand or by machine till a smooth polish surface is obtained after final grinding is over scrubbing, polishing & finishing to be done as per para 5 (e).

1) Glass Mosaic Tiles

(i) 5mm thick glass Mosaic tiles fixed with cement slurry shall be provided as shown on drawings.

SECTION - XII - WHITE WASH, DISTEMPER AND PAINTING

1. White wash shall be provided to all ceiling, and internal surfaces of lofts, staircase, stair lobby and stilt area of all unit blocks/other building as shown on drawings.

2. Dry distemper of approved shade shall be provided to all internal surfaces of walls as shown on drawings.

3. Before application of white wash and distemper the surfaces shall be prepared to a clean and even surface.

4. White wash (lime wash) shall be carried out in three coats.
5. White wash shall be prepared from lime slacked on site, mixed and stirred with sufficient water to make a thin cream. This shall be allowed to stand for 24 hours and shall be screened through clean cloth. Four kg. of gum dissolved in hot water shall be added to each cubic meter of the cream (115gm/cft). Blue shall be added to give required whiteness. The approximate quantity of water to be added in making cream shall be five liters per kg. of lime. 10% Zinc Oxide shall also be added to obtain a desired shining in the white wash.
6. Dry distemper shall be carried out in two or more coats over one coat of suitable cement primer as per manufacturer instructions to give even shade.
7. White wash and dry distemper shall be applied in specified coats by using flat brushers or spray pumps. Each coat shall be allowed to dry before next coat is applied, if additional coats than what have been specified are necessary to obtain uniform and smooth finish it shall be given at no extra cost.
8. The finished dry surface shall not show any signs of cracking and peeling nor shall it come off readily on the hand when rubbed.

PAINTING

9. **Cement Base Paint:** Two or more coats of cement base paint shall be applied to give even shade on all external cement plaster surfaces, internal cement plaster surfaces of parapets, soffits of chajjas, lintels, beams, and cills as shown on drawings. The shade of the paint shall be used as approved by the Bank /Bank. Each coat shall be cured well by wetting surfaces for at least three days. This shall apply to all buildings i.e. unit blocks/other buildings.
10. **Painting to wooden surfaces:** All exposed wooden surfaces shall be prepared and given a primer coat of approved quality as approved by the Bank. The surface shall then be bodied in with liquid wood filler of approved make, allowed to dry and rubbed with sand paper after moistening the surface with water, the surface cleaned then two or more coats of synthetic Enamel paint applied to give an even shade of approved quality. Tint/shade of synthetic enamel paint shall be as approved by the Bank/Bank.
11. **Painting to Steel Surfaces:** All exposed steel surfaces shall be prepared, cleaned with sand paper to completely remove scales and rusts and shall be painted with two or more coats of synthetic enamel paint to give an even shade over one coat of steel primer. The shade of synthetic enamel paint shall be as approved by Project Engineer/Bank.
12. **Painting to CI and GI Pipes:** All exposed CI and GI pipes shall be painted by applying two or more coats of oil paint. The shade and quality shall be as approved by the Bank/Bank.
13. Synthetic enamel paints and primer manufactured by the following:-

- (a) Asian Paints (Apcolite))
- (b) Jenson & Nicholson)
- (c) Berger Paints)
- (d) Garware Paints) Only first quality brand of the manufacturer's paints and
- (e) Japee Gold (Gold Toucg)) primer shall be incorporated in the work.
- (f) Killick Nixon Ltd. (Pololite Syn super white))
- (g) United Paints India)
- (h) M/S. Bombay Paints)

14. The following cement base shall be used:-

- (a) Robbiacem (Jenson and Nicholson)
- (b) Durocem (Berger Paints)

15. Dry distemper manufacture by the following firms shall be used:-

- (a) Asian Paint
- (b) Johnson and Nicholson

Mode of Measurements:

The method of measurement for various items in the tender shall be generally in accordance with IS:1200 subject to the following:

1. Excavation:

- (a) Footings: Area of excavation for footing shall be measured equal to the area of the lowest concrete course as shown on the drawing. Depth shall be measured vertically from ground level to bottom of concrete course or dry rubble packing as the case may be.
- (b) Plinth beams: Depth of excavation for plinth beam shall be measured from ground level upto bottom of beam and width equal to width of beam. If a leveling course is ordered, it shall be measured upto the bottom of the leveling course.
- (c) Where excavation is made in trenches, measurements for cutting shall be taken by means of tape and staff and the width of concrete or rubble packing as shown on the drawing shall be considered as width of excavation.

- (d) Where excavation is made for leveling the site, levels shall be taken before start and after completion of work and total quantity of excavation computed from these levels in manner approved by the Bank.
- (e) Where soil including soft rock and hard rock are mixed, hard rock after excavation shall be stacked separately. Measurement of the entire excavation shall be measured from stocks of excavated hard rock and reduced by 50% for bulkage and voids. The quantity so arrived at shall be paid for under hard rock. The difference between the quantity of entire excavation and quantity payable under hard rock shall be paid as soil including soft rock.

2. Earth filling:

In open space: filling shall be measured from cross sections of embankments, levels of which are recorded by means of levels before start of work and after completion of work. When it is not possible to measure filling from cross sections, it may be measured from loose stacks or lorry measurements with previous written permission from the Bank and 20% deduction shall be made from the measured quantity to arrive at the net quantity payable.

3. Cement concrete (plain & reinforced):

Cement concrete in P.C.C. and R.C.C. items shall be measured exclusive of reinforcement and plaster thickness but shall include necessary coats of shuttering, centering, hire charges of all equipment, curing, hacking and fair finish. Reinforcement and plaster shall be measured and paid separately.

Item like R.C.C. precast jalli, RCC pipes and other such items which are normally manufactured in factories as well as those items which have been specifically mentioned in schedule of quantities shall be measured inclusive of reinforcement.

No deduction will be made for openings upto 0.1 sq.m. and no extra labour for forming such openings or voids shall be paid.

Columns shall be measured from the top of the footing and shall be measured through, including flare of the column in case of flat slab construction.

Beams shall be measured from face to face of columns/beams and shall include haunches, if any. The depth of the beam shall be measured from the top of the slab to bottom of the beam.

In case of combined footings with connecting beams or strap beam the exposed portion of beam rib shall be measured as beam and the remaining portion measured in footing.

Slabs shall be measured in bays (clear of beams) with deductions for column portion.

Chajja: Only projected portion shall be measured in sq.mts.

Staircase: Measurements shall be in cu.m. Staircase comprising of step, soffit slab, landing slab shall be measured and paid under this item. Side parapet walls, failings,

finishing of risers and trades M.S. reinforcement and plastering etc. shall be paid separately under respective items.

4. Reinforcement:

Shall be measured in lengths of bars as actually placed in position on standard weight basis; no allowance being made in the weight for rolling margin. Wastage and binding wire shall not be measured. Authorised overlaps and spacers shall only be measured.

5. Brick work:

Except walls of half-brick thickness or less, all brick work shall be measured in cubic meters.

Walls of half-brick thickness or less shall each be measured separately and given in sq.mts. stating the thickness.

Thickness of wall:

Brick walls upto and including three bricks in thickness shall be measured in multiples of half-brick which shall be deemed to be inclusive of the mortar joints. Where fractions of half-brick occur due to Bankural or other reasons, the measurement shall be taken as full half-brick.

For walling, which is more than three bricks in thickness, the actual thickness of will shall be measured to the nearest centimeters.

Honeycombed brick walling shall be given in square meters stating the thickness of wall and the pattern of honeycombing. Honeycomb opening shall not be deducted.

Deductions:

No deductions or additions shall be made on any amount for.

- (i) ends of dissimilar materials (i.e. joists, beams, lintels, lofts, girders, rafters, purlins, trusses, corbels, steps, etc.) upto 500 sq. centimeter in section.
- (ii) Openings upto 0.1 sq.mt. in section.
- (iii) Wall plates, bed plates and bearing of slabs, chajjas and the like where the thickness does not exceed 10 cm. And the bearing does not extend over the full width of the wall.

6. Stone masonry:

Except where otherwise described, stonework and stone walling generally shall be given in cubic meter and facia work in sq.mts.

When measuring walls, the thickness shall be measured to the nearest one centimeter.

Deductions shall be made as described under brick work.

7. Woodwork:

All work shall be measured not as fixed. No extra measurement will be given for shape, joints, splayed, meeting stiles of doors and windows and shall be measured in sq.meters.

Area over one face inclusive of exposed frame thickness (excluding width of cover mould) shall be measured in case of doors, windows and ventilators when frames are included in the item. Portions embedded in masonry or flooring shall not be measured. Where frames are measured separately mode of measurements shall be as per CPWD practice.

8. Steel doors, windows, ventilators, louvers:

Clear area over one face inclusive of exposed frame shall be measured. Holdfasts or portions embedded in masonry or flooring shall not be measured.

Steel rolling shutters and rolling grilles:

Clear width between side jambs and clear height between floor and bottom of lintel / beam shall be measured. Hood shall not be measured separately. The rate should be inclusive of the cost of hood.

10. Flooring, skirting, dado:

Flooring shall be measured from skirting to skirting and where the wall surfaces are plastered or provided with dado it shall be measured from plaster to plaster or dado to dado.

The skirting and dado shall be measured clear from the floor to the top of tile, and the length shall be between finished tile faces measured along the floor.

11. Plastering & pointing:

All plastering and pointing work shall be measured in sq.mts. unless otherwise described.

Net area of surface plastered shall be measured. No deductions will be made for ends of joists, beams, posts, etc. and openings not exceeding 0.5 sq.mt. each and no addition shall be made for revalue, jambs, soffits, sills, etc. of these openings nor for finishing the plaster around openings, ends of joints, beams and posts, etc.

12. Painting, white washing colour washing and distempering:

All painting work shall be measured in sq.mts.

Net area of the surface painted shall be measured. No deductions will be made for unpainted surfaces of ends of joists, beams, posts, etc. and openings not exceeding

0.5 sq.mt. each and no addition shall be made for reveals, jambs, soffits, sills, etc. of these openings.

The following multiplying factors for obtaining equivalent areas shall be adopted:

Sr.	Description of work	How measured	Multiplying factor
i.	Paneled, framed, ledged, braced and battened.	Measured flat (not girthed) including frame, edges, chocks, cleats, etc., shall be deemed included in the item.	1.12 (for each side)
ii.	Flush, part paneled and part glazed or gauzed.	- do -	1.00 (for each side)
iii.	Fully glazed or gauzed or glazed louvered ventilators	- do -	0.5 (for each side)
iv.	Fully ventioned or louvered (not with glazing)	- do -	1.5 (for each side)
v.	Weather boarding	Measured flat (not girthed) supporting frame work shall not be measured separately.	1.13 (for each side)
vi.	Trellis (or Jaffri work one way or two way.	Measured flat overall; shall be made for opening (supporting members shall not be measured separately)	1 (for each side)
vii.	Guard bars, balustrades, gratings, grille, railings, grille doors, grille partitions, etc.	Measured flat overall; no deduction shall be made for opening. (Supporting members shall not be measured separately).	1 (for painting all over)
viii	Gates and open palisade fencing including standards, braces, rails, stays, etc.	See note below	1 (for painting all over)
ix	Carved or enriched work	Measured flat	2 (for each side)
x	Steel rolling / alligator type shutters.	Measured flat over jamb, guides, bottom rails and locking arrangement, etc. shall be deemed to be included in the item.	1.25 (for each side)
xi	Fully glazed or gauzed steel windows or partitions.	Measured flat.	1.25 (for each side)

Note: The height shall be taken from the bottom of the lowest rail, if the palisades do not go below it (or from the lower end of palisades, if they project below the lowest rail upto the top of palisades, but not upto the top of standards, if they are higher than

the palisades. Similarly for gates, depth of roller shall not be considered while measuring the height.

SECTION - XIII - INTERNAL PLUMBING WORK (INTERNAL WATER SUPPLY PLUMBING, INTERNAL DRAINAGE)

GENERAL

- 1.1. The form of Contract shall be according to the “Conditions of Contract”. The following clauses shall be considered as an extension and not in limitation of the obligation of the Contractor
- 1.2. Work under this contract shall consist of furnishing all labour, materials, equipment and appliances necessary and required. The Contractor is required to completely furnish all the plumbing and other specialised services as described hereinafter and as specified in the schedule of quantities and /or shown on the plumbing drawings.
2. Scope of internal water supply, plumbing, internal sewerage and drainage shall consist of providing and fixing of the following for each units of each unit blocks/other buildings as shown on drawings.
3. The entire work shall be carried out by licensed plumbers
 - (a) GI pipe with fittings and valves for cold and hot water supply.
 - (b) Sanitary fixtures, CP fittings and accessories.
 - (c) Soil, waste, vent, rain water pipes and fittings
 - (d) Overhead water tank at Terrace with supports.
 - (e) Internal Drainage including gully traps.
4. **Water supply.**
 - (a) All GI pipes and fittings from over head tank to all taps, wall mixers, wash basins, cisterns, sinks, geyser points, washing machine and showers as shown on drawings.
 - (b) Provision of hot and cold water supply lines in all toilets and kitchen .

5. MATERIALS

6. All GI pipes shall be galvanised steel tubes medium grade conforming to IS-1239 and ISI marked of makes Jindal Hissar/Prakash.
7. All GI fittings shall be conforming to IS-1879 and ISI marked.
8. Valve shall be heavy Gun metal full way confirming to IS-778-1971 class I and ISI marked.

LAYING, FIXING AND FITTINGS OF GI PIPES

9. All GI pipes below ground shall be laid in trenches and shall have minimum cover of 600mm.

10. The runs of the pipes shall be straight and pipes shall not run diagonally. Proper bends, elbows, tees at turnings/corners shall be used.
11. All GI pipes with necessary fittings wherever they are laid on internal faces of the walls shall be concealed in chase. On external faces they will be laid on walls fixed with G.I. clamps or on M.S. angle iron brackets as shown in drawings.
12. In the concealed portion of plumbing no joints shall be provided in the pipe lines except in the fittings i.e., bends, elbows, tees and nipples where required.
13. All GI pipes for water supply (Hot or cold) within toilets and kitchen shall be laid on walls only. No GI pipe shall be laid in sunken portion of toilets/kitchen.
14. For each unit the size of down comers, branch pipes from the ring (at terrace) from over head tank and branch pipes from down comers shall be of sizes as shown on drawing.
15. Pipes and fittings shall be jointed with screwed fittings, care shall be taken to remove burrs from the end of the pipe after cutting by a round file. Genuine white/red lead and a few strands of cotton thread shall be applied. All pipes shall be fixed in accordance with layout shown on the drawings. Care shall be taken to avoid air pockets. GI pipes inside toilets shall be fixed in wall chases at least 30cm above the floor.
16. GI pipes in shafts and other locations shall be supported by GI clamps of design as indicated in the Typical detail. Pipes in wall chases shall be anchored by iron hooks.
17. **Unions:** Contractor shall provide adequate number of unions on all pipes to enable dismantling later. Unions shall be provided near each gun metal valve, stop cock, or check valve and on straight runs as necessary at appropriate locations.
18. **Puddle Flanges:** Puddle flanges shall be provided to all connection i.e. inlet overflow, and scour of the over head tank wherever required.
19. **Pipe Protection:** All pipes in chase or under floors or below ground shall be protected against corrosion by applying two coats of bitumen paint, covered with polythene tape and finished with a final coat of bitumen paint.
20. **Painting:** All exposed pipes shall be painted with two coats of oil paint over one coat of primer. Pipes shall be painted to standard colour code as approved by Project Engineer/Bank.
21. **Over Head Tanks**
 - a. The tanks shall be of moulded HDPE and shall be one of the following make.
 - i) Unitank, ii) Polycon iii) Sintex
 - b. These tanks shall be located on the roof terrace as shown on drawing. Placed on supports as per details shown on drawings.
 - c. Each over head water tank shall be complete with the following.

- (i) Lid and cover with locking arrangement.
 - (ii) Inlet, outlet, over flow(25mm), scour pipe(20mm) and Air vent pipe with all fittings.
 - (iii) Mosquito proof coupling shall be provided to overflow and air vent pipes.
 - (iv) The inlet pipe to the over head tank shall be provided with ISI marked 25mm brass body ball valve with polythene ball.
 - (v) The inlet pipe to the over head tank shall be provided with 25mm ISI marked full way gunmetal brass valve and each outlet pipe shall be provided with ISI marked full way gunmetal valve of size of out let pipe.
 - (vi) The over flow pipes shall be brought down up to the finished terrace level and laid up to nearest khurra on terrace.
- d. The water tank will rest over 100 mm thick RCC 1:2:4 (1 cement:2 coarse sand:4 graded stone aggregate 20mm nominal size) platform with nominal reinforcement of 8mm dia 6”c/c both ways, supported over ISMBs resting on brick wall supports over terrace and finished with cement plaster 1:6 all around as shown in drawings.

22. **Vent pipes** : Each down take pipe shall be provided with a vent pipe. The height of the vent pipe shall be 150mm above the top of the water tank.

23. **Testing of GI pipes** :

- a) All pipe lines shall be tested hydraulically to pressure of 7 kg/Sq.cm for a minimum period of 24 hours for check for leakage.
- b) The pipe line in chase or under floors/ground shall be covered up only after the testing is carried out satisfactorily and passed by Bank/Bank.
- c) The instrument, equipment and water for testing shall be arranged by the contractor without extra charges. (i.e. Hydraulic testing machine with pressure gauge)
- d) A test register shall be maintained by the Bank and all entries shall be signed and dated by contractor, Bank and Bank.

24. **Insulation**: 24 Hot water line in chases shall be provided with 20 mm thick insulation by wrapping 6 mm dia asbestos rope and finishing with a coat of 85% magnesia.

25. **Approval of layout of GI pipes and position of fixtures at site** : The contractor shall mark the location of all fixtures and fittings and layout of GI pipes on the terrace walls/ ground at site and take approval of Bank/Bank before commencement of cutting chases for GI pipes within the building and digging trenches outside the building.

25. Sanitary Fixture and CP Fittings and Accessories

All sanitary ware shall be first quality white-vitreous china and shall be inclusive of all fixing devices nuts, bolts and hangers/Brackets.

These shall be from one of the following manufactures:-

- (a) Hindustan Sanitary Ware
- (b) Parry Ware
- (c) CERA (Madhu Sudan Ceramics)
- (d) NEYCER Ceramic

26. It will be ensured that all sanitary fixtures are from one manufacturer only for the entire work i.e. for all the units. However, if due to any reason contractor proposes to provide part quantity from other manufacturer as approved above, then he may be permitted, but he will have to obtain specific approval of Bank/Bank for this change in brand. This will be subject to that all items and fixtures in any particular block/other buildings shall be always of one manufacturer only. In no circumstances items of two manufacturers shall be used in all of the toilets of particular block/other buildings.

27. **Kitchen sink and draining Board:** Kitchen sink and draining boards shall be of stainless steel (Salem stainless steel ISI-304) 1.0mm thick. The sink and draining board shall be in one piece of following sizes with rectangular compartment/bowl. Each sink shall be provided with one CP brass waste and PVC waste pipe.

Overall size (LxW)	=	1060x510mm
Bowl size (LxWxD)	=	500x400x200mm

28. The Stainless steel sink and draining board shall be of one of the following makes:-

- (a) NEELKANTH (Sekhri Brothers)
- (b) AMC (Ashoka Manufacturing Co., 12, Scindia House, New Muzaffarnagar)
- (c) COBRA(Prakash Sanitary appliances (P) Ltd.,A-49/3 Mayapuri Industrial area-I, New Muzaffarnagar)
- (d) JAYNA (M/s.M.L. Sharma & Co., M-48, Shopping Centre, Greater Kailash - II, New Muzaffarnagar - 110 048).

29. Kitchen Sink shall be supported on RCC platform having suitable cut for the bowl of the sink as per the details shown on the drawings.

30. All bib cocks, stop cocks, angle-valves, pillar taps, mixtures, showers rose & arm, bottle traps, CP waster and inlet connections and other minor fittings shall be brass chromium plated. These shall be ISI marked where manufactured. Contractor shall obtain the approval of the name of the manufacturer and brand of CP brass fittings from Bank/Bank before placing the supply order. While asking for the approval, copy of the Bureau of Indian Standard letter under which the manufacturer has been issued the license and authorised to mark the five items of CP brass fittings as listed in hereinafter below with ISI marking should be attached and one sample of each fittings of the particular brand duly ISI marked shall be given by contractor.

31. Project Engineer before giving the approval of the name of the manufacturer and brand shall ensure that the validity date of license for marking the fittings as ISI marked has not expired.
32. Those CP brass fittings which are not manufactured as ISI marked shall also be of the same brand of which the ISI marked CP brass fittings are approved by Bank as per para above.
33. It will be ensured that all CP fittings are from one manufacturer only for the entire work i.e. for all units in D'unit blocks/other buildings. However, if due to any reason contractor proposes to provide part of quantity from other manufacturer approved in para hereinafter then he may be permitted, but he will have to obtain specific approval of Bank/Bank for this change in the brand. This will be subject to that all items and fittings in any particular block/other buildings shall be always of one manufacturer only. In no circumstances items of two manufacturers shall be used in any of the toilets of particular block/other buildings.
34. All chromium plated brass fittings and accessories shall be provided with CP cast brass wall flanges.
35. For fixing of CP brass fittings wherever required CP brass extension pieces shall be provided.
36. Fixing screws shall be half round head chromium plated brass screws with CP washers.
37. All exposed pipes, if any, within the toilets and near the fixtures shall be chromium plated brass except otherwise specified.

Schedule of Sanitary and CP Brass fittings in all buildings shall be as under:-

(a) Kitchen

- (i) Stainless steel Sink with drain board
- (ii) CP Brass waste
- (iii) Sink Mixer
- (iv) GI Waste pipe 40mm dia from CP Waste to floor drain grating

(b) Toilets :- All vitreous china sanitary wares shall be "white". The fittings and fixtures in toilets of each units shall be as under:-

(A) Wash Hand Basin

- (i) Vitreous china first quality wash basin 550 x 400mm wall mounting type on MS Angle brackets.
- (ii) Same as above but Oval Shape undercounter WB.
- (iii) CP Brass waste 32mm dia with over flow
- (iv) CP Brass bottle trap with CP brass pipe to wall with CP cast brass wall flange
- (v) Brass pillar taps 15mm
- (vi) CP Brass Basin Mixer
- (vii) CP Brass angle valves with CP copper

- (vii) Connecting pipes with nuts and washers.
- (viii) GI waste pipe 32 mm dia

Note: Outlet of CP brass bottle trap shall be connected to nearest floor trap by GI waste pipe (concealed) as per details shown on drawings

(B) Water Closets and Cisterns

- (1.) European type white vitreous china ware and cistern with S-trap with out vent horn
- (2.) White 10.00 Litre capacity low level HIP flushing cistern water bird "COMMANDER MODEL" ISI marked complete with Delrin valve and float, fittings and specials of standard make & 40mm white flush bend, over flow with mosquito proof coupling, all washers and rubber bed etc. complete including fixing accessories
- (3.) CP brass angle valve with CP copper connecting pipe with nut and washer
- (4.) Bakelite solid type seat and cover ISI marked Type 1A (IS-2548-1983) with CP brass Hinges commander brand (black colour)

(C) Urinals

- (i) Range of one and three urinals
- (ii) Chinaware cistern
- (iii) Bottle trap
- (iv) CP brass angle valve with CP copper connecting pipe with nut and washer.

(D) Shower and Taps

- i. CP brass wall mixer with bend for over head shower with central control knob for three positions, for supply to spout, second to stop and third for supply to shower.
- ii. 125mm dia CP brass shower rose 15mm with ball joint and 230mm long CP brass extension pipe.

(E) Towel Rail : CP brass towel rail 20mm dia 16 gauge 600mm long including brackets.

(F) Towel Ring : CP brass towel ring 200 mm dia with CP brass brackets fixed to wall with Flanges & CP brass screws.

(G) Mirror of size as specified in the items and 5mm thickness over every wash hand basin. The mirrors shall be of make Modifloat or Atul Brand made from Tata Ashi float glass. The mirror shall have marine ply backing 6mm thick mounted on kail wood frame 3/4" x 1 1/2" with Aluminium angle 30 x 15 x 2mm around & hung on to wall with key hole hooks.

(F) Peg Sets: Aluminium Anodised with 3 hooks

(J) Gratings:

- (i) All floor traps (FT) and floor drains (FD) shall be provided with 125mm and 100mm round stainless steel gratings respectively of approved design and shape. The weights

of 125mm dia and 100mm dia gratings shall not be less than 130gms and 100 gms respectively.

- (ii) Gratings for floor drain (FD) below sink in kitchen shall have suitable hole for passing GI waste pipe from sink.

38. Geysers: Scope for arrangement of fixing of Geysers included in this contract is as under:

- (a) Arrangement for fixing electric geyser vertical type one each in toilets and kitchen.
- (b) In all the units from the provision of common hot water supply shall be made.
- (c) Hot water supply of all units shall be from the respective Geysers/Solar heater installed therein.
- (d) At the inlet pipe of all Geysers one number CP brass angle valve shall be provided.
- (c) The ends of inlet and outlet pipes shall be connected with one PVC connecting pipe with CP brass nuts & washers. This is to pass the water from inlet to outlet till Geyser is installed at a later date.
- (d) Provisioning and fixing of Geysers is beyond the scope of this contract.

39. Installation of Sanitary Fittings:

- (a) European Type water closets shall be fixed with brass screws of suitable length with PVC plugs or phill plugs embedded in the floor after drilling hole in floor. It should be coupled with low level flushing cistern complete with rubber cone adapters etc, all as per manufacturer instructions.
- (b) Wash hand basins shall be fixed firmly to wall with MS angle iron brackets. The brackets shall be given two coats of white enamel paint over a coat of primer. In addition the wash basin shall be securely fixed to walls with a pair of 25x3mm MS clips screwed with rawl plugs to walls (placing of basin over the brackets without secure fixing on wall shall not be accepted).
- (c) Indian type Water Closets shall be embedded firmly in the floor and its surrounding packed with cement concrete 1:3:6 (1 cement : 3 coars sand : graded aggregate 40mm graded aggregate) below the level of top of the Closet to receive the top layer of floor finish. WC shall be set in the CI trap in cement concrete 1:3:6 (1cement:3 coarse sand:6 graded stone aggregate 20mm nominal size), joint between WC and Flush pipe will be made in the pre-moulded rubber joint.
- (d) Urinals: Urinals shall be lipped type half stall (small) white glazed vitreous china of first quality and size 610x 400 x 380 mm size.
- (i) Half stall urinal shall be provided 15 mm dia spreader, 32 mm dia CP domical waste and C.P. cast brass bottle trap with pipe and wall flange, and shall be fixed to wall by one CI bracket and two CI wall clips complete as recommended by manufacturer's directives/Bank.

- (ii) Half stall urinals shall be fixed with C.P.brass screws.
- (iii) Flushing cistern for urinals shall be automatic type vitreous china as given in the schedule of quantities. Each flushing cistern shall have a copper siphon and inlet nozzle cock to control the flow. Flushing cistern shall be fixed to wall with R.S. or C.I. brackets painted with two coats of white enamel paint.
- (iv) Flush pipes shall be G.I. pipes concealed in wall chase but with chromium plated bends at inlets and outlets.
- (v) Urinals may be flushed with flush valves as described in the item.
- (vi) Waste pipes for urinals shall be any of the following.

a. G.I. pipes. b. Rigid PVC

Waste pipes may be exposed on wall or concealed chase as directed by the engineer-in-charge. Specifications for waste pipes shall be same as given in Section II.

- (e) **Urinal Partitions:** Urinal partitions shall be white glazed vitreous chinaware marble or stone of size specified in the schedule of quantities. Porcelain partitions shall be fixed at proper heights with C.P. brass screws with anchor fastners and MS clips as recommended by the manufacturer and directed by engineer-in-charge.
- (e) All fixtures shall be fixed at proper heights, as shown in drawings and workmanship which shall be of acceptable standards.

40. **Internal Drainage:** Scope of internal sewage disposal and drainage system for all buildings/blocks included in Schedule A part I under this contract will include the following and shall be provided as per the layout/locations shown on drawings:

- (a) GI floor drains in toilets and kitchen
- (b) HCI waste pipes and their connections upto Gully traps.
- (c) HCI soil pipes and their connections upto nearest manholes.
- (d) Vent pipes with vertical stacks
- (e) All floor traps and gully traps.

Note: SWG sewerage lines from Gully Trap and nearest manholes onwards shall be measured and paid separately under schedule A part III (External sewerage)

41. **Soil, Waste, Vent and Rain Water Pipes:** All pipes shall be sand cast iron and shall comply to IS-1729 of 1979 and shall be ISI marked. Where shown on drawings the floor drains (FD) shall be of GI pipe medium grade ISI marked.

42. All cast iron pipes fittings like bends, branches, floor traps, tees 'Y' junctions, in waste, soil and vent pipes shall be sand cast iron comply with IS 1729 of 1979 and shall be ISI marked. These shall be spigot and socket "Access door shall be made up with 3mm thick insertion rubber washer and white lead. The bolts shall be lubricated

with grease or white lead for easy removal later. The fixing shall be air and water tight".

43. **Cast Iron Traps :** Floor trap shall be cast iron, deep seal with an effective seal of 50mm. The trap and waste pipes shall be set in cement concrete blocks firmly supported on the structural floor. The blocks shall be in cement concrete 1:2:4 (1 cement :2 coarse sand:4 graded stone aggregate 20mm nominal size) and extended to 40mm below finished floor level. The concrete portion at top of the floor trap inlet shall be finished smooth and water proofed by applying neat cement slurry mixed with water proofing compound. Size of the blocks shall be 30x30cms of the required depth. The trap shall be 100mm inlet and 100mm outlet for kitchen and for toilets. Traps shall have extension pieces to receive waste lines as indicated in typical details.

Urinal Traps : Urinal traps shall be cast iron P&S trap with or without vent and set in cement concrete block specified in para above without extra charge.

Cleanout Plugs : Contractor shall provide cast brass clean out plugs as required. Cleanout plugs shall be thread and provided with key holes for openings. Cleanout plugs shall be fixed to the pipe by a G.I. socket lead caulked.

Laying and Joining of CI (Cast Iron)Pipes:

- (a) Pipes and fittings shall be fixed truly vertical horizontal or in slope as required in a neat workmanship. Pipes shall be fixed in a manner as to provide easy accessibility for repairs and maintenance and shall not cause obstruction in shafts etc.
- (b) All vertical pipes shall be fixed by MS clamps truly vertical Branch pipes shall be connected to the stack at the same angle as that of fittings. No collar shall be used in HCI pipes laid in sunken portion of slabs and vertical stacks.Each stack shall be terminated at top with a cast iron COWL and to the height as specified hereinafter.
- (c) MS clamps shall be standard design and fabricated from MS flat 40x3mm thick anchored directly to walls, concrete slabs, beams or column or as indicated in detailed drawings or and as directed by the Bank/ Bank.
- (d) Joints in cast iron soil, waste, vent and rain water pipes shall be lead caulked joints. Quantity of lead to be used for each joint shall be 1.2kg for 100 dia pipes, 1.00kg for 75mm dia pipe and 0.80 kg.for 50mm dia pipe.
- (e) The water closet in ground, first and second floor shall be connected to the common soil pipe coming vertically downwards along the external face of walls with single branch connections with necessary bends/Y junction containing access doors. A vent pipe shall be provided from the single branch connection at the last floor level (as a continuation of the soil pipe) taken vertically upwards upto 800mm above the top of parapet wall and shall be provided at top with cast iron cowl.
- (f) CI/GI waste pipes and HCI soil pipes laid under floors shall rest in cement concrete 1:2:4 (1cement :2coarse sand:4 parts stone aggregate 20mm) 70mm thick minimum 300mm wide. All pipes and fittings shall also be encased all-round with concrete 1:2:4 (1cement :2coarse sand:4 parts stone aggregate 20mm) 70mm thick.

- (g) Floor traps shall have extension pieces to receive waste pipes. Waste pipes from floor traps shall be connected to common waste pipe coming downward along the external face of walls with single branch connections with necessary bends/Y junctions containing access doors. The common waste pipe shall run vertically downwards upto gully trap. A vent pipe shall be provided from the single branch connection at top of parapet wall and shall be taken vertically upward upto 800mm above the top of parapet wall and shall be provided at top with a cowl and fixed with iron clamps.
- (h) Cast iron drain pipes passing under the building shall be laid before commencement of works in foundations and where passing through concrete work inserts /sleeves should be left before casting the concrete.
- (i) Drain pipe shall be laid to levels/slopes indicated in drawings.
- (ii) Soil, waste, vent and rain water pipes in exposed location in shafts and pipe space shall be painted with two or more coats of oil paint to give an even shade. G.I. pipes in chases shall be painted with two coats of bitumen paint.

Gully Traps :

- (a) Gully traps shall be of the same quality as described for stoneware pipes.
- (b) After excavation gully traps shall be fixed on 100mm thick cement concrete 1:5:10 mix (1 cement:5 coarse sand:10 stone aggregate 40mm nominal size). After fixing the gully trap and pipe a brick masonry chamber 1' x 1' inside in 4¹/₂" thick brick work around the gully trap in cement mortar 1:5 (1 cement:5 coarse sand) shall be constructed up to the ground level. The space between chamber wall and the trap shall be filled in with cement concrete 1:5:10 (1 cement:5 coarse sand:10 stone aggregate 40mm nominal size). The upper portion of the chamber shall be plastered inside with cement mortar 1:3 (1 cement :3 coarse sand) finished with a floating coat of neat cement with all corners rounded off sloping towards the grating. A square CI grating shall be fixed on trap inlet.

Testing::

- (a) HCl soil and waste and vent pipes. These shall be tested to hydraulic test of 8 mtr. head.
- (b) The joints of CI pipes coming under floors/walls shall be covered up only after testing is carried out satisfactorily and passed by Project Engineer/Bank.
- (c) For SWG pipes test as indicated in particular specification part III shall be carried out.
- (d) A test register shall be maintained which shall be signed and dated by Contractor, Bank and the Bank.

Approval of layout of waste/soil/GI/CI/SWG pipes, Floor traps, gully traps and manholes. The contractor shall mark the location of these pipes, floor traps, gully trap and MH on floors/walls/ ground at site and take approval of Project Engineer/ Bank before commencement and cutting of holes in walls, digging of trenches and

laying of pipe lines. Record of these approvals should be recorded in a register and kept in Project Engineer's office.

CI MH covers for UGT : Manhole covers and frame for UGT shall be of CI. These shall be embedded in cement concrete slabs/brick works as shown on drawings. These shall be of medium duty, the weight of the same is mentioned in schedule of quantities.

PVC Foot rests for UGT: Providing and fixing safety foot rest of required shape of minimum 6 mm thick plastic encapsulated as per IS 10910 on 12 mm dia steel bar as per IS 1786 having minimum cross section as 23 mm x 25 mm overall minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projection on tail length of 138 mm and suitable to withstand and bend test and chemical resistance test as per manufacturer specification. (preferably) footrest shall be fixed while laying concrete of walls for UG tank or fixed cement concrete 1:2:4 mix with proper anchoring.

PVC pipes & fittings : PVC pipes for drainage system shall be rigid upvc pipes conforming to I.S. 13592 Type B.

- i. Fittings for the pipes shall be injection moulded with approved type of sockets and 'O' rings joints.
- ii. Jointing shall be done as per the manufacturers recommendation. The pipes and fittings must have matching dimensions for a perfect joint. Loose or excessively tight joints in the system shall not be accepted. Fittings must have sufficient gap (approx. 10 mm) for permissible thermal expansion of pipes.

Fittings

- i. Fittings shall conform to the same Indian Standard as for pipes. Contractor shall use pipes and fittings of matching specifications.
- ii. Fittings shall be of the required degree of curvature with or without access door of rear, LH or RH .

PARTICULAR SPECIFICATIONS

PART II

(EXTERNAL WATER SUPPLY & GARDEN HYDRANT SYSTEM)

1. **SCOPE OF WORK :** Work of external water supply shall consist of furnishing all labour, material, equipment and appliances necessary and required to install complete external water supply from water supply main of Local Authority upto UG tank and from UGT to OH tanks at terraces. Providing and installation of garden hydrant system including provisioning and installation of pumping sets and pipe connections within the pump house including all control valves, masonry chambers, etc.
2. **SAMPLES OF MATERIALS:** The contractor shall produce samples of all materials and shall obtain approval to these in writing from Bankbefore he places bulk order for the materials for incorporation in the works. Materials to be incorporated in the work shall conform to latest relevant ISI marked goods where manufactured.
3. **APPROVAL OF LAYOUT:** The layout of all external water supply lines including valves and chambers shall be marked out on the site and get approved from the Bankbefore execution and also before laying of pipe lines.

4. **G.I. PIPES**

Material

- (a) All pipes, fittings, accessories etc. to be incorporated in the work shall be of standard quality strictly (complying with the current appropriate Indian Standard Specifications) conforming to IS 1239(Part I of 1979) and IS 1239 (Part II of 1969) and ISI marked
- (b) Water supply tubing, fittings and accessories shall be of galvanised steel. The galvanised steel pipes shall be screwed and socketed of medium grade and manufactured by Jindal Hissar, Prakash and ISI marked.
- (c) Fittings shall be of Malleable iron galvanised, ISI marked and of approved make.
- (d) Ferrule shall be brass 20mm or of required dia of Leader make with shut off arrangements.
- (f) Cast iron bell mouth cover for protection of ferrule shall be provided. M.S. addles of suitable size shall also be provided.

5. **WORKMANSHIP**

1. **Trenches:** The width and depth of trenches for different diameter of GI/CI pipes shall be as under:-

Dia of pipe	Width of trench	Depth of trench
-------------	-----------------	-----------------

For G.I. pipes

- | | | | |
|-----|--|-------|--------|
| (a) | 15 to 50mm pipes | 30cms | 60 cms |
| (b) | Exceeding 50mm but not exceeding 100mm pipes | 45cms | 75 cms |

For C.I. pipes:

- | | | | |
|-----|------------------------|--------|------|
| (a) | 80mm to 150mm width of | 55 cms | 1 m. |
|-----|------------------------|--------|------|

At joints the width of trench shall be widened where necessary.

6. **Cutting and Threading:** Where pipes have been cut or re threaded the ends shall be carefully filed out so that no obstruction to flow is offered. The ends of pipes shall then be carefully threaded, in such a manner as will not result in slackness of joints.
7. **Jointing :** G.I. pipes shall be jointed with screw and socketed joints using screwed fittings. All screwed joints, both internal and external shall be examined before jointing to ensure that the threads are perfect for the full depth of the joints. The jointing work shall be so arranged in case of every joint that the two ends of the pipe or special jointed thereby shall be equidistant from the middle of the socket and shall have a space of not more than 3mm between them in center of socket. Teflon tapes instead of conventional white lead and yarn is more effective and nearer. A paste of white lead shall be lightly smeared over the threads to act as lubricant and to make up for imperfections in the threads when the pipes are screwed up. A few strands of fine yarn of thread wrapped round the screwed end. The pipes shall be screwed up tightly with pipe fitters tongs or pipe wrenches to ensure that each and every joint shall be perfectly water tight.
8. **Protection:** GI pipes below ground shall be protected against corrosion by the application of two coats of bitumen paint covered with polythene tape and a final coat of bitumen paint.
9. **Trench filling of GI pipes:** The pipes shall be laid on layer of 10 cm sand and filled upto 15 cm above the pipes. The remaining portion of the trench shall then be filled with excavated earth & the surplus earth shall be disposed off as directed with in the UNION BANK OF INDIA plot.
10. **Ferrule connection:** Ferrule connection shall be inclusive of necessary excavation, boring a hole in cast iron/mains, tapping it, providing necessary saddles, and bailing out of water.

11. **Testing of GI pipe line:** On completion, the GI pipe line shall be tested to a hydraulic pressure of 7 kg/sqm(70 meter). Pressure shall be maintained for a period of two hours without drop. Any joint found leaking shall be redone and all leaking pipes removed and replaced. Testing shall be done before the trenches are refilled. The contractor shall arrange all the equipments required for testing and rate quoted shall be deemed to be inclusive of this cost.
12. A test register shall be maintained by Bank and tests shall be recorded in it. The entries shall be signed and dated by Bank, Bank and Contractor. This register shall be handed over to the Bank on completion of work.
13. GI pipes shall be measured per linear meter (to the nearest centimeter) and shall be inclusive of all fittings, earth work, pipe protection and other items as specified.
14. **C.I. PIPES : Material**
15. **Cast iron pipes:** The cast iron spun pipes shall be spigot and socket conforming to IS-1536-1976. These shall be Centrifugally cast of class LA suitable for Tyton joints.
16. **Cast iron specials :** The Cast iron specials shall be spigot and socket or flanged as required and conforming to IS-1538-1976.
17. **Caulking Lead:** Pig lead and lead/wood shall comply with IS-782-1978.
18. **Rubber Gasket:** Rubber gasket for tyton joints shall be of approved quality and of Orient make for flanged joints shall comply with IS-5382-1969 and shall be of thickness between 1.5mm to 3mm.

Workmanship:

19. **Trenches**
 - (a) Width of the trenches at bottom shall be as per para herein before above the nominal dia of the pipe plus 40cm, but it shall not be less than 55 cm. Additional width shall be provided at position of sockets and flanges for jointing to be made properly. The required depth to be excavated at any point of the trench shall be regarded as directed by the Project Engineer/Bank. The depth of the trench shall not be less than 1.0m measured from the top of the pipe to the ground under roads and not less than 0.75m elsewhere. Contractor shall not be entitled for any extra payment if he makes the trench width more than specified above for any reason.
 - (b) The bottom of trench excavations shall be carefully prepared so that the barrels of the pipes when laid are well bedded for their whole length on firm ground and are true to line and gradient. Joint holes shall be made to such dimensions as will allow the joints to be conveniently made and thoroughly caulked.
 - (c) Detection of cracks in pipes : All pipes and fittings shall be inspected carefully before being laid. Broken or defective pipes shall not be used and removed from the site of

work. Pipes shall be rung with a light hammer preferably while suspended to detect cracks. If doubt persists, confirmation may be obtained by pouring a little paraffin of the inside of the pipe at the suspected spot; if a crack is present, the paraffin seeps through and shows on the outer surface.

- (d) Preparing Pipes: The pipe shall be carefully cleared of all foreign matter before laid. They shall be thoroughly brushed out internally with a well fitting hard brush and after laying, the open end shall be temporarily plugged to preventing ingress of water, soil etc. Precautions shall be taken to prevent flotation of the plugged pipes, should the trench become flooded.

20. Laying of pipes:

- (a) Every precaution shall be taken to prevent foreign material from entering the pipe while it is being placed in the line. If the pipe cannot be laid without earth entering it, a heavy, tightly woven canvas bag of suitable size shall be placed over each end and left there until the connection is to be made to the adjacent pipe. During laying operation no tools, clothing or other materials shall be placed in the pipe.
- (b) Laying of pipes shall always proceed up grade of a slope if the pipes have spigot and socket joints, the socket ends shall face upstream. In the case of pipes with joints to be made with loose collars, the collar shall be slipped before the next pipe is laid.
- (c) While laying pipes, the trenches shall be kept free from water until the material in the joints hardens. Walking or working on the completed pipe line shall not be permitted until the trench has been backfilled to a height of at least 30cm over the pipes.
- (d) After placing a length of pipe in the trench, the spigot end shall be centered in the socket and the pipe forced home and aligned to gradient. The pipe shall be secured in place with approved backfill material tamped under it except at the socket.
- (e) When pipe laying is not in progress the open ends of pipe shall be closed by a water tight plug.

21. Cutting of pipes: The cutting of pipes for inserting valves fittings shall be done in a neat and workman like manner without damage to the pipe so as to leave a smooth end at right angles to the axis to the pipe. Pipes shall be cut with a ring cutter and not with chisels.

22. Jointing of pipes:

- a. Spigot and socket joints of CI pipe shall be with tyton joints, but the joint of these CI pipes with specials shall be lead caulked joints.
- b. Run lead joints: The spigot shall be centered in the adjoining socket by tightly caulking in sufficient turns of tarred gasket or hemp yarn to leave unfilled half the depth of socket for lead. When gasket or hemp yarn has been caulked tightly home, a jointing ring shall be placed round the barrel and against the faces of the socket. Molten pig lead shall then be poured into fill the remainder of the socket. The lead shall then be solidly caulked with suitable tools and hammers of not less than 3 kg. weight, right round the joints to make up for the shrinkage of the molten metal on

cooling and shall be preferable dry before run lead joints are made, otherwise blow holes may occur in the lead.

- c. The lead shall be heated to proper temperature so that when stirred it will show a rapid change of colour. Before pouring, all scum shall be removed. Each joint shall be made in one continuous pouring. Care shall be taken that no dross enters the joints. Spongy or imperfectly filled joints shall be burnt out and repoured.
- d. The joint runner shall fit snugly against the face of the socket and the outside of the pipe shall be dammed with clay to form a pouring lip to provide for filling the joint flush with the face and to the top of the socket.
- e. Any deviation either in plan or elevation less than 11 1/4 deg. shall be effected by laying the straight pipes round a flat curve such each radius that the minimum thickness of lead at the face of socket shall not be reduced below 6mm or the opening between the spigot and socket increased beyond 12mm at any point. A deviation of about 2-1/4 deg. can be effected at each joint this way.
- f. The quantity of lead and spun required for different size of pipes shall be as under:

Nominal size of pipe	Lead per Joint	Depth of lead per joint	Spun Yarn per joint
80mm	1.8 kg.	45mm	0.1 kg.
100mm	2.2 kg.	45mm	0.18 kg.
150mm	3.4 kg.	50mm	0.20 kg.
250mm	6.1 kg.	50mm	0.25 kg.

22. Inspection and Testing

- (a) Inspection of pipes and fittings: The pipes and fittings shall be inspected on site before laying and shall be sounded to disclose cracks. Any defective items shall be clearly marked as rejected and forthwith removed from the site.
- (b) Testing of pipe lines: After laying and jointing, the pipe line shall be tested in sections as the work of laying proceeds, before testing the trench shall be partly backfilled. The joints shall be kept fully exposed for inspection during testing. The pipe line shall be slowly and carefully charged with water so that all air is expelled from pipe line by providing a 25mm inlet with a stop cock and then allow to stand full of water for two days and then tested under pressure. The test pressure shall be 6 kg/cm. The pressure shall be applied by means of a manually operated test pumps. Pressure gauge shall be accurate and shall preferably be calibrated before test. The test pump having been stopped the test pressure shall maintain itself without measurable loss for atleast half an hour. If any leakages are observed then the joint shall be redone and cracked pipe if any shall be replaced and the complete test shall be repeated till satisfactory results are obtained. The record of the test shall be maintained in a register jointly signed by contractor, Bank and Bank indicating the section of the

pipe line tested test pressure maintained, date and time of the test. The instruments, equipments, equipment and water for testing shall be arranged by the contractor. The rates quoted against the respective items of CI pipes and specials shall be deemed to be inclusive of the cost of testing.

23. Disinfection of CI/GI pipe lines: All CI/GI pipe lines shall be disinfected by flushing with water containing bleaching powder at 0.5gm per litre of water and cleaning the same with fresh water, operation to be repeated three times including getting the samples of water from the disinfected main tested in the municipal laboratory. Cost of disinfecting the CI/GI pipes shall be deemed to be included in the rates quoted against the respective items of pipes in Schedule 'A' Part II.
24. Measurement: All CI pipe lines shall be measured (without any allowance of cutting and waste) as laid including fittings and specials such as bends junctions and tail pieces near sluice valves etc. Length shall be measured along the centre line of the pipes and fittings. Pipe fittings and specials like bends junctions, tail pieces and joints shall not be measured separately. The cost of these shall be deemed to be included in the quoted rates, against the respective item of pipes in Schedule 'A' part II.
25. Full way valve: The full way valve shall be of heavy gun metal with cast iron wheel conforming to IS-778-1971 class I of leader make ISI marked and of sizes as specified.
26. Sluice valve: Sluice Valves 80mm and above dia shall be cast iron double flanged with non rising spindle. Sluice valves below ground shall be provided with caps suitable for operations by a key, Sluice valves shall conform to IS-780 class -I and tested to 10kg/sq.cm (100 meter head). The fixing of the valve shall be done by means of bolts and nuts and 3mm thick rubber insertions with the flanges of spigot and the socketed tail piece drilled to the same specifications. In case of S&S pipes tail pieces jointed to line by means of lead caulked joints and with flanges in case of flanged pipes.
27. Butterfly Valves: Valves 50mm dia and above shall be cast iron butterfly valve to be used for isolation and/or flow regulation. The valves shall be bubble tight, resilient seated suitable for flow in either direction and seal in both direction. Butterfly valve shall be of best quality conforming to IS: 13095.
28. Non Return Valve : Where specified non return valve (swing check type) shall be provided through which flow can occur in one direction only. It shall be single door swing check type of best quality conforming to IS: 5312.
29. Testing: All pipes, fittings and valves, after fixing at site, shall be tested by hydrostatic pressure of 1.5 times the working pressure or 14 kg/sqcm whichever is more. Pressure shall be maintained for a period of at least thirty minutes without any drop. A test register shall be maintained and all entries shall be signed and dated by Contractor(s), Bank and Bank.
30. Ferrules: The ferrules for connection with CI main shall generally confirm to IS:2692-1969 and ISI marked. It shall be of non ferrous material with a CI bell mouth cover and MS saddles and shall be of nominal bore as specified. The ferrule shall be fitted with a screw and plug or valve capable of completely shutting off the water supply to the communication pipe if and when required. (Leader make)

31. Masonry Chambers and Covers: For material and workmanship masonry chambers and covers respective items of particular specification part I-A shall be followed.

PVC Pipes & Fittings

32. Garden hydrant mains shall be rigid uPVC pipes conforming to IS : 4985 of class specified. If class is not mentioned in the schedule of quantities the same shall be class IV (10 kg./ Sq.cm).
33. Fittings for uPVC pipes shall be injection moulded fitting with spigot & sockets suitable for solvent weld joints. Fittings must have suitable provision for expansion.
34. Solvent shall be of make and type approved by pipe and fittings manufacturer. Joint shall be made in an approved manner as recommended by the manufacturer.
35. Provide uPVC flanges at intervals of 20-25 m. for all pipes 65 mm dia and above.
36. Provide suitable uPVC to thread adaptor for connection between pipes & valves.
37. Provide cement concrete supports and anchor blocks at all bends, tees and other locations as directed by Bank. Connections at garden hydrant outlet, near valves must also be anchored.

G.I. Pipes & Fittings

38. Vertical connection for garden hydrant points shall be galvanized steel tubes to IS : 1239 (medium class) with matching malleable iron fittings of approved make.

Garden Hydrants

39. Garden hydrants shall be 25 mm dia gunmetal valves installed on G.I. pipes as per details.

Valves

40. Valves 65 mm dia and below shall be heavy gunmetal globe valves conforming to I.S. 778 class I. Valves shall be tested at manufacturer's works and the same stamped on it.
41. Valves 80 mm dia and above shall be C.I. Double flanged sluice valves with non rising spindle to IS: 780. Each sluice valve shall be provided with wheel in exposed positions and cap top for underground valves. Contractor shall provide suitable operating keys for sluice valves with cap tops.

Trenches

- 42 All pipes below ground shall be laid in trenches with a minimum cover of 100 cms. The width and depth of the trenches shall be as follows:-

<u>Dia of pipe</u>	<u>width of trench</u>	<u>Depth of trench</u>
15 mm to 50 mm	30 cms	100 cms
65 mm to 100 mm	45 cms	100 cms

This will not apply to drip irrigation pipes which may be laid just below the surface or on surface.

Testing

- 43 All pipes, fittings and valves, after fixing at site, shall be tested by hydrostatic pressure of 7 kg/sq.cm or 1.5 times the working pressure, whichever is higher. Pressure shall be maintained for a period of at least thirty minutes without any drop. A test register shall be maintained and all entries shall be jointly signed and dated by Contractor(s), Bank and Bank.
44. In addition to the sectional testing carried out during the construction, Contractor shall test the entire installation after connections to the pumping system. He shall rectify all leakages and shall replace all defective materials in the system. Any damage done due to carelessness, open or burst pipes or failure of fittings, to the building, furniture and fixtures shall be made good by the Contractor during the defects liability period without any cost.
45. After commissioning of the water supply system, Contractor shall conduct performance test to ensure that the system operates as specified. The test shall be conducted over a period of 15 days.

Measurement

Pipes

46. Pipes shall be measured per linear meter (to the nearest cm) and shall be inclusive of fittings, e.g. couplings, tees, bends, elbows, unions, deductions for valves shall be made. Rates quoted shall be inclusive of all fittings. Excavation, back filling & disposal of surplus earth shall be paid by volume per cubic meter. Gunmetal, cast iron valves and masonry chambers shall be paid by numbers.

PUMPS & ALLIED PIPING

47. Scope of work:

- a) The work shall consist of furnishing all labour, materials, equipment and appliance necessary and required to completely install electrically operated and Diesel operated pumps as specified hereinafter or given in the Schedule of Quantities.
- b) Without restricting to the generality of the foregoing, the pumps and ancillary equipment all include the following:

(i) Electrically operated pumping set

- (a) Electrically operated pumps with motors, base plates and accessories.
 - (b) All accessories wiring and connections, with panel board including provisioning & fixing of panel boards.
 - (c) Pressure gauges with isolation valves and piping bleed and block valves.
 - (d) M.S. and G.I. pipes, valves, suction strainers, suction and delivery headers and accessories.
 - (e) Foundations, Vibration eliminator pads and foundation bolts.
- (ii) Diesel Engine operated pumping set: This shall be complete all as per (i) above, but with diesel engine of suitable Horsepower.

48. General Requirements:

- a) Pumps shall be installed true to level on suitable concrete foundations, baseplate shall be firmly fixed by foundation bolts properly grouted in the concrete foundations.
- b) Pumps and motors shall be truly aligned by suitable instruments.
- c) All pump connections shall be standard flanged type with appropriate number of bolts. In case of nonstandard flanges, companion flanges shall be provided with the pumps.
- d) Manufacturer's instructions regarding installation connections and commissioning shall be followed with respect to all pumps and accessories.
- e) Contractor shall provide necessary Test Certificates and performance Charts with NPSH requirement of the pumps from the manufacturer. The Contractor shall provide facilities to the Engineer or his authorised representative for inspection of equipment during manufacturing and also to witness various tests at the manufacturer's Work without any cost to the Owner.
- f) Each pump shall be provided with a 150mm dia. pressure gauge, isolation cock and connecting piping, bleed and block valve.
- g) Provide vibration eliminating pad and connectors for each pump.
- h) The contractor shall submit with this Tender a List of recommended spare parts for two years of normal operation and quote the price for the same.

Water Supply Pumps

49. Pumps for Hydro pneumatic system shall be of variable speed and of vertical multistage centrifugal type with stainless steel SS 304 stage casing and SS 304 impellers with stainless steel SS 316L shaft as per IEC standards and GJL 250 cast iron suction and discharge casing connected to TEFC ventilated induction bottom of motor

of pole, 2900 Rpm, suitable for 400 volts 3 phase, 50 Hz AC supply. The system shall also include FRP composite construction lined pressure vessels of required capacity, control panel with details as specified in bill of quantities, pressure switches, non-return valve, etc.

Sump Pumps:

50. a) Sump pumps shall be vertical drainage wet pit type for muddy water. Pump shall be grease lubricated and shall have ample supporting arrangement for suspension from sump top slab. The suspension shall be as given in the Schedule. The impeller shall be cast iron with open vane suitable for handling solids upto 38mm dia.
- b) The pump shall have capacity of delivering 150 L.P.M. to delivery head of 7 meters including suction left of 10 meter.

Vibration Eliminators:

51. Provide on all suction and delivery lines double flanged reinforced neoprene pipe connectors. Connectors should be suitable for a working pressure of each pump and tested to the test pressure given in the relevant head. Length of the connector shall be as per Manufacturer's details. Flexible connectors shall be as manufactured by Reley Corporation, New Muzaffarnagar.

Piping:

52. a) Pipes for water supply services shall be galvanized steel tubes to IS:1239 (Class mentioned in Schedule of Quantities). The fittings and flanges shall be mild galvanized iron.
- b) Fullway valves and check valves above 65mm dia. shall be CI double flanged conforming to IS :780 (Class -I) manufactured by Leader or Zoloto.
- c) Fullway and check valves 65mm dia and below shall be gunmetal. Seat tested to 20 kg/ sq.cm. pressure (Leader or CG make certified and conforming to IS:778 (Class I)).
- d) Suction strainer or foot valves shall be gunmetal.
- e) Joints:
- i) M.S.pipes shall be double welded with electric arc welding.
- ii) All GI pipes and fittings shall be provided with screwed joints.

Testing

- 53 All GI piping work in pump house shall be tested hydrostatically for a period of two hours to a pressure or 1.5 times the working pressure without drop in pressure.

PARTICULAR SPECIFICATIONS

PART-III

EXTERNAL SEWERAGE & STORM WATER DRAINAGE

SCOPE OF WORK

1. Work under this section shall consist of furnishing all labour, materials, equipment and appliances necessary and required to completely install the sewerage system as specified hereinafter shown in the drawings and given in the schedule of quantities.
2. Work of external sewerage shall start from the first manholes of size as shown in Drawings

GENERAL REQUIREMENTS

3. All materials shall be of the best quality conforming to specifications and subject to the approval of the Bank/Bank.
4. All sewerage work shall be done in accordance with the local bye laws.
5. The layout of all pipelines, manholes, Catch Basins/Road Gully Chambers and their locations as shown in the drawings shall be marked out on site with relative levels and got approved from the Bank / Bank before excavation and also before laying of the pipe -lines.
6. Excavation for manholes, Catch Basins/Road Gully Chambers shall not be measured separately and shall deem to be included in the rates quoted for the construction of manholes including extra depths where required. This shall also be inclusive of disposal of surplus soil within UNION BANK OF INDIA plot as directed by Site Engineer/Bank.
7. All excavation for laying of pipelines marked external shall be measured and paid separately as provided in schedule of quantities. The rate for excavation shall be deemed to include filling back where necessary and disposal of surplus soil within UNION BANK OF INDIA plot as directed by Bank/ Bank.
8. Width of the trench for 100/150mm dia SWG pipe at the bottom of the trench and width of bed concrete shall be 55cms and for 250mm dia SWG pipe it shall be 70cms. No extra payment shall be admissible for width excavated greater than the specified.

SALT GLAZED STONE WARE PIPES

9. Stone ware pipes shall be of first quality salt glazed and free from rough texture inside and outside and straight. All pipes shall have the manufacturers name marked on it and shall comply to IS-651-1980. Approved makes are PERFECT/ANAND makes. Pipes are liable to be damaged in transit and notwithstanding tests they may have been damaged before dispatch, each pipe shall be examined carefully on arrival at site.

Each pipe shall be rung with a wooden hammer or mallet and those do not ring and clear shall be rejected.

LAYING AND JOINTING OF SWG PIPES

10. The pipes shall be laid with sockets leading uphill and should rest on 15cm thick 1:5:10 (1 cement :5 coarse sand:10 stone aggregate 40 mm graded) cement concrete bed foundation for the full length of the barrel. Socket holes shall be formed in the foundation sufficiently deep to allow the pipe as short as practicable to admit the socket and allow the joint to be made.
11. Tarred gasket shall first be wrapped round the spigot of each pipe and the spigot shall then be placed into the socket of the pipe previously laid. The pipe shall then be adjusted and fixed in its correct position and the gasket caulked tightly so as to fill not more than one quarter of the total length of the socket. The remainder of the socket shall be filled with a stiff mixture of cement mortar 1:1 (1cement: 1 clear sharp wash sand). When the socket is filled fillet should be formed round the joint with a trowel forming an angle of 45 degree with the barrel of pipe. The mortar shall be mixed as needed for immediate use.
12. After the joint has been made by any extraneous spout shall be removed from inside the joint with a suitable scrapper or badger. The newly made joint shall be protected until set, from the sun, drying winds, rains or dust. The joint shall be left exposed and space left round the pipes for inspection by the Bank/ Bank. The inside of sewer must be left absolutely clear in bore and free from cement mortar or other obstructions through out its entire length and should efficiently drain and discharge.

TESTING:

13. a) All length of the sewer shall be fully tested for water tightness by means of water pressure maintained for not less than 30 minutes. Testing shall be carried out from manholes. All pipes shall be subjected to a test pressure of atleast. 1.5 meters head of water at the highest point of the section under test. In long lengths the test pressure shall not exceed 6 meters head at any point. The pipe shall be plugged preferably with standard drain plugs with rubber plugs on both ends. The upper end shall, however, be connected to a pipe for filling with water and getting the required head.
- b) Sewer line shall be tested for straightness by :-
 - i) Inserting a smooth ball 12mm less than the diameter of the pipe. In the absence of obstructions such as yarn or mortar projecting at the joints the ball should roll down the invert of the pipe and emerge at the lower end.
 - ii) Means of a mirror at one end and at the other end, if the pipe line is straight the full circle of light will be seen otherwise obstruction of deviation will be present.
 - c) The contractor shall give a smoke test to the drains and sewer at his own expense and carry out changes if directed by the Bank/ Bank.

- d) A test register shall be maintained which shall be signed and dated by the contractor and Bank/ Bank and shall be handed over to Bank on completion of work.
 - e) No payment for testing the sewer lines for water tightness and straightness as stated above shall be admissible. The rates quoted for the items of “Providing and laying stoneware pipes” shall be deemed to include the cost of testing the pipelines.
14. PCC in Encasing and Haunchings: The bed concrete and the concrete for haunches and encasing of SWG Pipes shall be of mix 1:5:10 (1 cement :5 coarse sand :10 graded stone aggregate 40mm nominal size) and shall be laid to the dimensions as shown on drawings. The pipes with their crown level at 1.20 m depth and less from ground shall be covered with 15 cm thick concrete above the crown of the pipe and sloped off to meet the outer edges of the concrete to give a minimum thickness of 15 cm all around the pipe. Pipe laid at a depth greater than 1.2 m at crown shall be concreted at the sides upto the level of the centre of the pipe and sloped off from the edges to meet the pipe tangentially.
15. Measurement: For providing, laying and jointing of SWG pipes measurements shall be recorded for the finished length of the pipe line i.e. lengths between manholes shall be recorded from inside of one manhole to the inside of other manhole.

REFILLING:

16. After the sewer or other work has been laid and tested and passed by Bank/Bank as per para 13 above, the trench or other excavation shall be refilled. Utmost care shall be taken in doing this, so that no damage shall be caused to the sewer and other permanent work. The filling in the haunches and upto 75 cms above the crown of the sewer shall consist of the finest selected materials placed carefully in 15 cms layers and flooded and consolidated. After this has been laid, the trench and other excavation shall be refilled carefully in 15 cms layers with materials taken from the excavation, each layer being watered to assist in the consolidation unless the Bank/Bank otherwise direct.

MANHOLES:

17. Manholes shall be constructed as per the details indicated in the drawings. Foundation concrete shall be PCC 1:4:8 (1 Cement:4 coarse sand :8 graded stone aggregate 40mm nominal size). Side walls shall be with brick of class designation 75 in cement and coarse sand mortar 1:4. Inside of the manholes shall be plastered, 12mm thick with cement mortar 1:3 (1 cement :3 coarse sand) with a floating coat of neat cement and external plaster 12mm thick with cement mortar 1:6 (1 cement :6 fine sand) PVC rungs heavy duty shall be embedded in PCC blocks of mix 1:3:6 (1 cement: 3 coarse : 6 graded stone aggregate of 20mm nominal size) in manholes exceeding 700mm depth concrete in benching and channels shall be PCC 1:2:4 mix (1 cement :2 coarse sand :4 graded stone aggregate 20mm nominal size) trowelled smooth using extra cement. All junctions and changes in directions in PCC channels shall be formed by smooth curve. The benching shall have slopes of 10 cm towards the channel. The depth of the channel shall be the full diameter of the pipe. The manholes frames and covers shall be of steel fiber reinforced concrete (medium duty with clear opening 560mm dia) Thickness of frame should be 130mm and thickness of cover 80mm and confirming to IS-12592.

MEASUREMENT

18. All manholes shall be measured by numbers and shall include cost of all items specified above and necessary excavation, refilling and disposal of surplus earth.
19. Manholes with depths greater than specified under the main item shall be paid for under "Extra Depth" and shall include all items as given for manholes. Measurement shall be done to the nearest cm Depth of the manhole shall be measured from top of the manholes cover to bottom of channel.
20. **Storm Water drainage:** Excavation and back filling

Trenches: The width and depth of trenches for different diameter of SWG and RCC pipes shall be as under:
 - a. Width of trenches at bottom upto 150mm diameter shall be 550 mm and for the above diameter from 150 mm dia width of trench shall be nominal dia of pipe plus 400 mm. Additional width shall be provided at the position of sockets.
 - b. The depth of the trench shall not be less than 1.00 measured from the top of the pipe to the surface of the ground under road and not less than 0.60 m elsewhere. The required depth to be excavated at any point of the trenches shall be regarded as directed by the Bank/Bank. Contractor shall not be entitled for any extra payment if he makes the trenches width more than specified.
 - c. **Refilling:** Same as per para 16 above.
 - d. The bottom of trench excavations shall be carefully prepared so that the barrels of the pipes when laid are well bedded for their whole length on firm ground and are true to line and gradient. Joint holes shall be made to such dimensions as will allow the joints to be conveniently made and thoroughly caulked.
21. **Reinforced cement concrete pipes:** All underground storm water drainage lines where specified shall be centrifugally spun RCC pipes class NP₂ confirming to IS 458-1971 shall be true to shape and straight with uniform bore throughout. Cracked, wrapped pipes shall not be used on the work. All pipes shall be tested by manufacturer and the contractor shall produce, when directed a certificate to this effect from the manufacturer.
 - (i) **Laying:** RCC spun pipes shall be laid on cement concrete bed or cradles as specified and shown on the detailed drawings. The cradles may be precast and sufficiently cured to prevent cracks and breakage in handling. The invert of the cradles shall be left 12mm below the invert level of the pipes properly placed on the soil to prevent any disturbance. The pipe shall then be placed on the bed concrete or cradles and set for the line and gradient by means of sight rails and bonding rods etc. Cradles or concrete bed may be omitted, if directed by the Bank.
 - (ii) **Jointing:** After setting out the pipes the collar shall be centered over the joint and filled in with tarred gasket, so that sufficient space is left on either side of the collar to receive the mortar. The space shall then be filled with cement mortar 1:2

(1cement:2 fine sand) and caulked by means of proper tools. All joints shall be finished at an angle of 45 deg. to the longitudinal axis of the pipe on both sides of collar neatly.

- (iii) Testing: All pipes shall be tested to a hydraulic test of 1.5 m held for at least 30 minutes at the highest point in the section under test. Test shall be carried out similar to those for stoneware pipes given above. The smoke test shall be carried out by the Contractor, if directed by the Bank.
- (iv) Measurement: Same as provided for in para (15) above

22. Road Gully Chambers:

The chamber shall be of brick masonry with Bricks of class designation 75 in cement mortar 1:5 (1cement:5 coarse sand and shall have a SFRC gully grating with frame fixed in 150mm thick cement concrete 1:2:4 (1cement :2 coarse sand:4 hard stone ballast 20mm nominal size) on top the size of the chamber shall be taken as the clear internal dimensions as specified in the schedule of quantities. The brick walls, the top of the bed concrete 1:5:10 (1cement:5 coarse sand:10 hard stone ballast 40 mm and down gauge) of the chamber shall be plastered with 12mm thick cement plaster 1:3 (1 cement :3 coarse sand) finished with a floating coat of neat cement. The excavation shall be done true to dimensions and level shown in the drawings.

All Road gully chambers wherever required shall have SFRC gratings with frame of approved design and manholes with SFRC covers and frame of heavy quality.

23. Masonry Drains

Brick masonry drains shall be of a minimum width of 30cms for depth upto 45cm and a maximum width of drains shall be 45cms for depths beyond 45cms. Brick masonry drains shall be constructed in brick masonry in cement mortar 1:5 in cement concrete foundations as specified in the schedule of quantities. Wherever specified, masonry drains shall be plastered with cement mortar inside. The outer surface shall be flush pointed without additional charge.

Wherever specified, all brick masonry covered drains shall be provided with cast in situ or precast R.C.C slabs. All drains shall be plastered with cement mortar 1:4, 12mm thick with a coat of neat cement. All finished works shall afford specified gradient to ensure free and efficient discharge.

Payment for masonry drains shall be made under individual items of masonry, cement concrete and plaster by volume of area as given in the drawings and schedule of quantities.

24. Making Connections

Item for making connection to municipal sewer shall be paid for by number and shall include all items given in the Schedule of Quantities and Specifications.

PARTICULAR SPECIFICATION

PART -IV

(ROADS, PATHWAYS, RAMPS, KERBS AND EARTH FILLING OVER AREAS)

1. **Scope of Work:** The road work in this contract comprises of provision of roads with sub base course 150mm thick consolidated, base courses 100mm thick consolidated 40mm thick Premix Carpet, Kerb stones, and earth filling as described in schedule items and as specified in succeeding paragraphs.

MATERIALS

1. **Sub Base & Base Course :** This shall be water bound macadam with stone aggregates. Stone aggregate shall be quartzite. This shall be crushed/broken stone as per grading requirement given in the table shown below:-
- a) Grading requirements of stone aggregate.

Grading	Size Range	Sieve designation	Percent by weight passing the sieve	Test requirement
1.	90mm to 40mm	100mm	100	One test per 100 cum
		80mm	65-85	
		63mm	25-60	
		40mm	0-15	
2.	63mm to 40mm	80mm	100	- do-
		63mm	90-100	
		50mm	35-70	
		40mm	0-15	
		20mm	0-5	

- b) The stone shall be hard, durable and free from excess of flat elongated soft and disintegrated particles, dirt and other objectionable matter.

3. a) **Stone Screenings for Sub base and Base Courses:**

Screening to fill voids in the stone aggregate shall consist of the same material as the stone aggregate.

i) The screenings shall have grading shown in the following table:-

Grading Classification reqd. for	Size of Sieve screenings	Percent by designation the sieve	Quantity weight passing 10 sqm.
Sub base course	12.5mm	100	0.63cum
	12.5mm	100	
	10.0mm	90-100	
	4.75mm	10-30	
Base course	150micron	0-8	0.40cum
	10.00mm	100	
	4.75mm	85-100	
	150micron	10-30	

ii) The screening shall be clean, durable, and free from disintegrated pieces and other objectionable material.

b) Stone chippings for Premix carpet: Stone chippings shall consist of fairly cubical fragment of clean, hard, tough and durable rock of uniform quality throughout. This shall be crushed stone and shall be free of elongated or flaky pieces, soft or disintegrated stone, salt, alkali, vegetable matter and dust. These shall confirm to the quality requirements given in para 4 below:-

4. Physical requirements of Stone aggregate and stone chippings

S.No.	Type of Constn.	Test	Test method	Requirements of test	Frequency
i)	Sub Base course	Loss Angeles value or Agg. impact value	Abrasioin	IS:2386(Part IV) 60% max. IS:2386(Part IV) *50% max. IS:5640 ***	One test per 200cum of aggregate
ii)	Base course	a) Loss Angles value or Agg. impact value	Abrasion	IS:2386(Part IV) 50% max. IS:2386(Part IV) *40% IS:5640***	-do-
					b) Flakiness Index
* Aggregate may satisfy requirements of either of the two tests.					
** The requirements of flakiness index shall be enforced only in case of crushed broken stone and crushed slag.					
iii)	Screening /Stone chipping	a) Loss Angeles A brasion value of Agg. Impact value.		IS: 2386(Part IV)	One test per 50-100cum of aggregate
					b) Flakiness Index

c) Stripping value

IS: 6241

of aggregate.
-do-

5. **Binding Material:** The binding material shall consist of fine grained material possessing plasticity index value 4-6 which shall be determined in accordance with IS 2720(Part V). The quantity of binding material required shall be as under:-

Per 10 sqm.

- | | | |
|----|-------------|----------|
| a) | Sub base | 0.15 cum |
| b) | Base course | 0.12 cum |

6. **Bitumen:**

- a) Paving bitumen shall conform to IS:73-1961 and shall be of grade 80-100, solvent like kerosene oil shall be mixed, i.e. 70g/kg. of the bitumen.
- b) The bitumen shall be obtained from approved manufacturers and delivered to site in sealed containers bearing ISI marking. This shall be stacked as directed by the Bank and Bank on one side of the roadway.

WORKMANSHIP

7. a) **Preparing formation** : The ground shall be formed to proper gradient, camber, super elevation, etc. corresponding to the required surface, by trimming the surface. Surplus soil (if any) shall be thrown clear of the road formation. The formation shall be watered and rolled.
- b) **Preservation of property:** Road side trees, shrubs, poles, fences, monuments buildings pipelines, sewers etc .within or adjacent to the road which are not to be disturbed shall be protected from injury or damage.
8. **Preparation of sub-grade:** The surface of the formation for a width equal to that of base course shall first be cut to the depth below the proposed finished level, equal to the combined depth of base course and wearing courses (due allowance being made of consolidation). It shall then be cleared off all foreign substances and sub-grade dressed off parallel to the finished profile.
9. **Consolidation of sub-grade:** The subgrade shall then be sprinkled with water and rolled with minimum of 5 numbers of passes of 8-10 tonne smooth wheeled roller, till the soil is evenly and densely consolidated.
10. All undulations in the surface that might develop due to rolling shall be made good with earth or quarry soils as the case may be and subgrade re-rolled.

SUB-BASE:

11. The sub-base shall be water bound macadam with stone aggregate of size 90mm to 40mm. This shall be laid on prepared sub-grade in conformity with line, grades and thickness. The consolidated thickness of the sub-base shall be 150mm. Loose quantity of the aggregate shall be 2.02 cum per 10sqm. The stone aggregate shall be

mechanically inter locked by rolling and voids thereof filled with screening and binding material with the assistance of water,laid on a prepared sub-grade. The coarse aggregate shall be spread uniformly and evenly upon the prepared subgrade in required quantities with a twisting motion to avoid segregation. In no case shall these be dumped in heaps directly on the area where these are to be laid. This shall be laid on proper profile, grades, by using templates. The surface of the aggregate spread shall be carefully trued up and all high or low spots corrected by removing adding aggregate as required.

12. **Rolling:**

Immediately after spreading of the coarse aggregate it shall be compacted to the full width by rolling with a power roller of 8-10 ton capacity. Initially light rolling is to be done which shall be discontinued when the aggregate is partially compacted with sufficient voids to permit application of screening. The rolling shall begin from the edges with roller runner forward and backward and adding the screenings simultaneously until the edges have been firmly compacted. The roller shall then progress gradually from the edges to the centre, parallel to central line of thread and over lapping uniformly each preceding rear wheel track by 1/2 width and shall continue until the entire area of the sub base has been rolled by the rear wheel. Slight sprinkling of water may be done during rolling. On super-elevated curves the rolling shall proceed from the lower edge and progress gradually continuing towards the upper edge of the road.

14. **Application of Screening:**

After the coarse aggregate has been lightly rolled to the required surface, screening shall be applied gradually over the surface to completely fill the inter sticks. Dry rolling shall be continue while screenings are being spread so that the jarring effect of the roller causes them to settle in the voids of the aggregate. The screening shall be spread uniformly in successively thin layers, which shall be applied at a slow rate. To ensure filling of all voids, rolling and brooming shall continue with the spreading of screening. Damp and wet screening shall not be used under any circumstances.

15. **Sprinkling and Grouting:**

After spreading the screening and rolling, the surface shall be copiously sprinkled, swept in brooms and rolled, to distribute the screenings evenly, additional screenings be applied wherever necessary, until the stone aggregate is well bonded and firmly set for the entire depth and until a grout has been formed of screening and water and form a wave of grout ahead of the wheels of the roller.

16. **Application of binding material:**

After the application of screening and rolling, the binding material shall be applied at a uniform and slow rate into two or more successive thin layers. After each application, the surface shall be copiously sprinkled with water and the resulting slurry swept in with hand broom to fill the voids. The surface shall then be rolled by an 8-10 tone roller, water being applied to the wheels. This process shall be continued till the slurry forms a wave ahead of the wheels of the roller.

17. **Setting and drying:**

After final compaction of the sub base course, the road shall be allowed to cure over night. Next morning, the defective spots shall be filled with screening or binding

material lightly sprinkled with water if necessary and rolled. No traffic shall be allowed till the macadam sets.

18. **Surface Evenness:**

The surface evenness of the completed W.B.M. sub base course in the longitudinal and transverse direction shall be as under:-

Longitudinal profile undulation when measured with a 3 meter, straight edge shall not be more than 15mm
Cross profile - undulation when measured with a camber template shall not be more than 12mm.

19. **Rectification of Defects:**

When the surface irregularity of the WBM sub base course exceeds the tolerance specified above, or where the base course is otherwise defective due to sub-grade soil mixing with the aggregate, the layer of its full thickness shall be scarified over the affected area, re-shaped with added material and recompact. The depressions shall not be filled with screenings and binding material.

20. **Base course** : Base course of water bound macadam shall be with stone aggregate of size 63 to 40mm in 100mm consolidated thickness. The base course shall be laid over the prepared sub base course with operations as described in the succeeding paragraphs. The quantities of the loose aggregates required for base course should not be less than 1.33 cum per 10 Sq.M. of road surface.

21. **Spreading of stone aggregate:** This shall be as specified above for sub base course Para 11 except that the base course shall be constructed with a consolidated thickness of 100mm thick.

b) **Rolling:** This shall be as per para 12 of the sub base course.

c) **Application of Screening:** This shall be as per para 13 of the sub base course.

d) **Sprinkling and Grouting:** This shall be as per para 14 of the sub base course.

e) **Application of binding material:** This shall be as per para 15 of the sub base course.

f) **Setting and drying:** This shall be as per para 16 of the sub base course.

g) **Surface Evenness:** This surface evenness of the completed base course in the longitudinal and transverse direction shall be as under:-

i) **Longitudinal profile:** Maximum permissible undulation when measured with a 3.0m straightedge-12mm.

- ii) Cross profile: Maximum permissible undulation when measured with a camber template-6mm.
- h) The longitudinal profile shall be checked with 3.0m long straight edge at the middle of each traffics line.
- j) The transverse profile shall be checked with a series of 3 camber boards at intervals of 10m.
- k) Rectification of defective construction same as for subbase course (para 1 above)

PREMIX CARPET (40mm CONSOLIDATED THICKNESS)

- 22. **Preparation of base**: Before the carpet is applied on the existing base, the surface shall be ensured free from dust or caked mud or other foreign matters. Pothole or ruts if any in the existing surface shall be filled with premixed chippings and well rammed about a week before the carpets laid.
- 23. **Priming coat**: The bituminous primer shall be heated to the temperature as recommended by the manufacturer and applied uniformly to the base by means of sprayer just before spreading of the premix.
- 24. **Preparation of Premix**: Mechanical mixers shall be employed for mixing. For small quantities of work, the aggregates and the bitumen are heated separately upto the required temperature.
- 25. **Rolling and finishing**: After the premix obtained is a thorough and homogeneous mix, the same is carried out at site for spreading and rolling. Suitable rakes are used for spreading. At one operation 15m of premix is laid and rolled with a power roller of (8-10 tones). The roller/wheels shall be kept damp with water to avoid adhesion of the mix. The rolling is continued in a process as explained above till there is no sign of creep or formation of ruts etc. and a smooth uniform surface is obtained.
- 26. **Foot path/Pathways and Ramps**
 - a) **Under layer**: Earth shall be properly rammed and consolidated in required slope over which PCC of mix 1:5:10 (1 cement :5 coarse sand:10 graded stone aggregate of 40mm nominal size) shall be laid and thoroughly rammed by heavy iron rammers of 4.5 to 5.5 kg. Ramming shall be continued till a skin of mortar cover the surface completely. The cost of ramming of earth is also deem to be included in the item of PCC. Thickness of under layer PCC shall be as shown on drawings or as approved by Bank and Bank.
 - b) **Topping** : 75mm thick concrete of mix 1:2:4 shall be laid in pattern as shown on the drawing. Excessing trowelling shall be avoided. Use of dry cement or cement and sand mixture sprinkled on the surface to stiffen the concrete or absorb excessive moisture, shall not be permitted. The surface shall be finished rough and grooves be provided as per the required pattern.

27. **PCC kerb stone etc.:** These shall be in precast/cement concrete as per drawings and as approved by Bank and Bank finished even and concrete cured well.
28. **Earth filling over areas:** Earth filling over areas shall be by bringing earth from outside UNION BANK OF INDIA land by the contractor. The entire plot levels shall be taken in a grid of 3.0 x 3.0m and jointly signed before fillings. Earth shall be spread in layers of 20cm in the entire width of the road. Each layer shall be rolled with a roller of minimum 1/2 tonne weight by providing 5 passes. Every 3rd layer and topmost layer shall be consolidated with a power roller of minimum 8 tonne weight by giving 5 passes. Light watering shall also be done for each layer while consolidating. Final levels shall be attained as indicated by Bank/ Bank.
29. Computing the gross filling volume shall be by prismatic formula Simpson's Rule or Trapezoidal formula as the case may be. Area covered by buildings shall be deleted. Any excess excavation in foundation after plinth filling etc. shall also be deducted. The net payable volume shall be arrived after deducting 10% from the gross volume arrived after above procedure. Rate quoted shall be deemed to include all operations and above provisions including for net volume only.

SEAL COAT

Seal Coat: A premix seal coat shall be applied immediately after laying the carpet. The binder shall be heated in boilers of suitable design in the temperature appropriate to the grade of bitumen. The fine aggregate shall be dry and suitably heated to a temperature as directed by Project Engineer before the same are placed in the mixer of suitable design. Mixing of binder with aggregate to the specified proportions shall be continued till the later are thoroughly coated with binder. The mix shall be immediately transported from the mixing plant to the point of use and spread uniformly on the bituminous surface to be sealed. As soon as sufficient length has been covered with the premixed material, the surface shall be rolled with 8 to 10 tones roller. Rolling shall be continued till hot premixed material completely seals the void in the bituminous course and a smooth uniform surface is obtained.

Rough Chisel Dressed Stone (CUL - DE - SAC)

Cul-de-sac shall be provided with rough chisel dressed stone of approx. size 20x15x 10cm laid over subbase course (WBM) including filling the earth in joints as per the drawing.

**List of Material
Of
Approved Maker/Brands: Civil Works**

The contractor shall quote for the best of the materials specified below with ISI mark wherever applicable. The contractor shall obtain prior approval from the Bank / Bank before placing order for the specific materials agencies. In case of non availability of any of the approved/specified materials/agency. During the execution of the work, the Bank /Bank may approve suitable equivalent brand/agency and his decision shall be final and binding on the contractor and the price variations. If any shall be adjusted accordingly.

S.No	Materials	Manufacturers
1.	Grey Cement (43 or 53 Grade) White Cement Putty	A.C.C , L&T, AMBUJA, Jaypee Birla White, J.K. Birla White Putty
2.	Steel (Thermo Mechanically Treated Steel) High strength deformed bars or mild steel reinforcement	TATA, SAIL, JINDAL equivalent
3	Clay Bricks	Good quality locally available material approved by Bank
4	Pressed Steel frames for Doors	Fabricated P.S. frames approved by Bank.
4a.	Pressed Steel frames for Aluminum-Windows, Ventilators.	Indal / Jindal of 25 microns approved by Bank.
5	Flush Door Shutters	Century/ Anchor / Archid / Green / Samrat / Kenwood or equivalent
6	Particle Boards/Block Boards (Ward robe Shutters and Kitchen Cabinets on with Laminates)	Century / Anchor / Archid / Green /Marino / Multiply or equivalent
7	Glass (Plain / Pin Headed) and Glass Tinted	Modi Float / Triveni / Hindustan Pallington / Asahi / Saint Gobain or equivalent
8	Aluminum Hardware/fittings	Argent / Classic / Shalimar or equivalent
9	Brass Mortice Locks & Latches	Godrej or equivalent
10	Latches with Internal locks	Godrej / Ultra or equivalent

11	Floor Type Hydraulic door closer (Floor spring)	Everite / Hypper / Hemco or equivalent
12	Aluminum door, window and ventilator sections.	Jindal / Indal / Hindalco or equivalent
13	Water proofing material / compound.	CICO - I / Roff or equivalent
14	Glazed Tiles	Johnson & Johnson / Naveen / Nitco / Regency / Spartek or equivalent
15	Ceramic Tiles (Non-Skid)	Johnson & Johnson /Kajaria / Nitco / Bell / Spartek / Navin or equivalent
16	Cement Concrete (Chequered) Tiles	Nitco / Bharat or equivalent
17	Vitrified Tiles	Marbonite, / Navin / Bell / Spartek or equivalent
18	Glass Mosaic Tiles	Italia or equivalent
19	Synthetic Enamel Paint	Jenson & Nicholsan / Asian / Nerolac / Berger or equivalent
20	Oil Bound Distemper	Jenson & Nicholsan / Asian / Burger / Nerolac or equivalent
21	Plastic Paint	Jenson & Nicholsan / Burger / Nerolac or equivalent
22	Panelled Doors	National / Century / Swastik / Kitply or equivalent
23	P.V.C. Doors	Sintex / Mihir / Fixopan or equivalent
24	Rolling Shutter & Grills	Good quality locally available material.
25	Hardeners	“Ironite” or equivalent.
26	Red Oxide	“Asian” or equivalent.
27	Waterproof cement paint / acrylic paint	Snocem India, Nerolac, Nitcocem or equivalent.
28	Glazing	“Hindustan Pilkington” Tiveni, Modi
29	Water seal (Epoxy-sterarate) compound.	As approved by Bank / Engineer
30	Medium density fibre-board in lieu of partitions panelled doors and flush doors.	Nuwood, mangalam or equivalent

31	Screws	GKM/mettle fold or equivalent
32	Brass Hinges	Reliance/Punit heavy duty or equivalent
33	Ironmongeries and brass fittings	Jiranna / CIEF/ Shalimar / Everite.
34	Drawer sliding fitting	Earl bihari or equivalent
35	Hardware	Shalimar, Everite/ Reliance Brass powder coated
36	Drawer Shutter Lock	Vijayan/Godrej (3 set of keys or equivalent)
37	Ball Catch	Magnetic (M-2) / Brass or equivalent
38	Veneer	Achor / Kitply / Uro / Durian / Century or equivalent
39	Adhesive	Fevicol (SH) for furniture, laminates, Araldite of Hindustan Ciba Geigy Ltd. for Steel/Mirror
40	Polish	French/Zinc Oxide / Melamine (Asian) or equivalent
41	Wood Preservative	Asian paint / British paint or equivalent
42	Sun control film	Garware or equivalent
43	Polyure than foam	'U' foam or equivalent

PLUMBING WORK

S.No	Materials	Manufacturers
44	Vitreous china sanitary ware (ISI mark)	Hindustan sanitary ware/parry ware / Cera or equivalent
45	Seats & Covers solid (W.C.)	Commander / Admiral / Supreme or equivalent
46	PVC Low level flushing cisterns	Commander / Parryware / Hindustan or equivalent
47	C P Fittings / Toilet Accessories ISI Marked	Jaquar / Aquel / ESS ESS / Marc or equivalent
48	UPVC Pipes (S/W/R Pipes)	Diplast / Supreme / Finolex / Prince or equivalent

49	Centrifugal cast CI Pipes & Fittings	RIF / Neco or equivalent
50	G.I. Pipes (B-Class)	ITC / Tata / Zenith or equivalent.
51	G..I. Fittings (ISI Brand)	Unik / AMCO or equivalent.
52	Gunmetal valves (Full way, check and globe valves)	Leader / Zoloto (with ISI mark) / Sant or equivalent.
53	S.W. Pipes / Fittings & Gully traps	Perfect / Tirmurti / Bharat or equivalent.
54	Ball valves	Voltec / Zoloto or equivalent.
55	Stainless steel sinks	Nirali / Neelkanth or equivalent.
56	HDPE Tanks	Sintex / Polycon / Unitank or equivalent.
57	Mirrors	Modiguard or equivalent.
58	C.I. Manhole Cover	RIF / BIC / Neco or equivalent.
59	Concrete Manholes SFRC	CICO
60	Hydropneumatic Systems	Grund Fos / Crompton or equivalent.
61	Water lifting Pump	Grund Fos / Crompton or equivalent.
62	Submersible Pump	Grund Fos / Crompton or equivalent.
63	Chemical Doser	Asia Lmi / Prominent / Ion Exchange or equivalent.
64	Pressure Gauge	H. Guru or equivalent.
65	Level Indicator	RM or Equivalent Approved Make
66	Air Relief Valves	RB / Zolto or equivalent.
67	Water Meter	Dasmesh / Capstain / Kaycee or equivalent.
68	PVC Encapsulated footrest.	KGM or equivalent approved make
69	C.I. Sluice valves	Kirloskar, Leader or equivalent with ISI mark on the body.
70	A.C. Pipes	Everest Ramco or equivalent
71	R.C.C. Pipes	Indian Hume pipe or equivalent
72	Brass & Gun metal globe, gare valves, feet valves	Leader NETA or equivalent with ISI marking on the body.
73	Sanitary Fixture	Hindware / Parryware / Cera or equivalent.

74	Storage Heaters	Recold, Spherehot or equivalent.
75	Fire Hydrant	Approved by local fire Bridges Authority
76	Sand cast soil pipes and fittings	NECO sand cast / B.I.C. or equivalent.
77	Bracket supports	Hi-tech/MS brackets as per drawings
78	Towel rail / ring	Jaquar / ESS ESS or equivalent.
79	Connection pipe-PVC	Kohinoor/Viking or equivalent.
80	Butterfly valve	Intervalve
81	PVC Fittings (Moulded)	Clarion / Finolex / Prince or equivalent.
82	Non-return valve	Intervalve or equivalent
83	UV filter	Alfa-level or equivalent
84	Stainless Steel	Salem Steel or equivalent
85	Marble Mosaic Tiles	Nitco / Bharat / Himalayan or equivalent
86	Fire Door	RDG / Shakti / Metdor or equivalent
87	RCC pipe	Indian Hume Pipe Co. / Spun Pipe Co. or equivalent
88	Stoneware Pipe and fittings	Trimuirti / Perfect Potters / Bharat

SPECIFICATIONS FOR ELECTRICAL WORKS

SPECIAL CONDITIONS OF CONTRACT

1. COMPLETENESS OF TENDER :-

All sundry fittings, assemblies, accessories, hardware items, foundation bolts, termination lugs for electrical connections as required, and all other sundry items which are useful and necessary for proper assembly and efficient working of the various components of the work shall be deemed to have been included in the tender, whether such items are specifically mentioned in the tender documents or not.

2. RATES: -

The rates tendered shall be for complete items of work inclusive of Cost of material, erection, connection, testing, labour, supervision, tool & plants, storage, contingencies, breakage, wastage, execution at any level & height, all taxes (including works contract tax, if any), duties, and levies etc. and all charges for items contingent to the work, such as, packing, forwarding, insurance, freight and delivery at site for the materials to be supplied by the contractor.

3. WORKS TO BE DONE BY THE CONTRACTOR :-

The scope of internal and external electrification under this contract shall include the design, engineering, manufacture, assembly, testing, delivery, erection and commissioning of electrical system including supply of all material, labour, T&P etc for followings -

- Main Switches, Main L T Panels, meter board and external cable connection.
- 11 KV HT Panel.
- 11 KV / 0.433 KV Transformers.
- D. G. Sets with fuel tank, piping, fuel pump, exhaust piping with lagging and supports, cooling system complete.
- Sub and branch distribution boards, MCB's and RCCB's etc.
- Mains and Sub mains between various panels, meter boards and distribution boards.
- Point wiring with Conduits for all type of wiring including circuits, sub mains, light, fans, power and AC etc.
- Switches and socket outlets for light, fans, plug, power, Tel, TV, computer network etc with suitable MS/GI boxes with accessories complete.
- Earthing and Lightning Protection with earth leads/strips.
- Conduits and wiring for Telephone, EPABX, TV system, PA system, Music system and Computer networking, fire alarm, broad band etc.
- Cables and other allied works.

- Provision of emergency electrical supply and distribution for complete light, fans and other specified points are also included in the scope of work. For the purpose of emergency distribution separate DB's shall be installed for Light/fans and fax machines & staircase lighting at every place, so that these can be separated.
- Lighting Fixtures fans and exhaust fans. (If these are supplied by the client, then the contractor will erect the fixture as required without any extra payment beyond the contract)
- External lighting including underground cables and connection with the external cables and earthing.
- Feeder pillars with circuit breakers.
- Underground cables.

All the above work shall be complete in all respects up to the satisfaction of Bank, consultant, Client and Engineer in charge as per the details mentioned in BOQ and drawings supplied time to time.

Unless and otherwise mentioned in the tender documents the following scope of works shall be done by the contractor, and therefore their cost shall be deemed to be included in their tendered cost:

- a) Furnishing of all labour, skilled and unskilled, supervisory and administrative personnel, erection tools and tackles, testing equipment, implements, supplies, consumables like welding rods and gas, oil and grease, cleaning fluids, insulating tape, anti corrosive paints, jute cotton waste etc., and hardware for timely and efficient execution of the erection work.
- b) Transport vehicles necessary for efficient transportation of equipment from Owner's stores to site of erection and excess materials back to owner's stores.
- c) Complete assembly, erection and connection, testing and commissioning, putting into successful and satisfactory commercial operations of above equipment.
- d) The items of work to be performed on all equipment and materials shall include but not limited to the following:
 - (i) Receiving, unloading and transportation at site. (To Owner or Contractor's stores and from their upto actual place of erection).
 - (ii) Opening, inspecting and reporting all damages and short supply items.
 - (iii) Arranging to repair and/or re-order all damaged and short supply items.
 - (iv) Storing at site with suitable all weather protection.
 - (v) Assemblies, erection and complete Installation.
 - (vi) Necessary coordination between work done by other Contractors.
 - (vii) Final check-up, testing and commissioning in presence of Owner's representative.
 - (viii) Obtaining Owner's written acceptance of satisfactory performance.

4. INFORMATIONS REQUIRED FROM CONTRACTOR

- i. Typical GA drawing of all equipment to be supplied and disposition of various fittings and loading.
- ii. All Annexures of this specification duly filled in and signed by the contractor.
- iii. Catalogue of all equipment and components explaining construction features.
- iv. Transportation/shipping dimensions and weights, space required for handling parts for maintenance.
- v. Type test certificates for all equipment on similar type of equipment.
- vi. Final Single line diagram complete with cable sizes etc.
- vii. Bill of Materials, Control & schematic line diagram for meter & relay panel, terminal connection/Master Terminal box diagram, wiring diagram with physical location of components for all equipment.
- viii. Detailed cabling layout showing cable trench / tray layout, earthing layout.
- ix. Detailed lighting layout showing position of fixtures / type of fixtures, circuiting and route of wires / cables / fixing details, DB details.
- x. Protection relay settings.
- xi. Cable schedule & interconnection chart.
- xii. Foundation details and plan, loading details for all equipment.
- xiii. Test certificates.
- xiv. Instruction manuals of all major equipment.
- xv. Test Procedures at sites.
- xvi. Test reports of all tests carried out at site.
- xvii. 'AS BUILT' drawings (2 sets of soft copies on CD and six sets of hard copies duly wound).
- xviii. All layout drawings shall be made in scale of 1:50 or 1:100 unless until agreed by the Owner / Consultant.

5. PRICES

- a) The price quoted for supply items shall include all packing, crating, excise duty, sale tax / Works Contract tax, insurance, freight, loading/ unloading, handling & all other charges.
- b) The price quoted for erection & commissioning shall include cost of all consumables, taxes & duties. (if any). No additional taxes/duties shall be payable by Owner.
- c) Prices quoted shall be firm and no variation shall be allowed during contract period.

- d) Contractor shall furnish prices separately for spare parts for two (2) year's trouble free operation of the equipment and shall furnish the list of the same.

6. ELECTRIC POWER SUPPLY AND WATER SUPPLY :-

Unless and otherwise specified, power supply and water supply as may be required shall be arranged by the contractor for installation and testing of the equipment's at the site of work.

7. PROVISIONS AGAINST ACCIDENTS AND SAFETY MEASURES

- a) All safety rules and codes as applicable to work including rules applicable as per factory inspector shall be followed during execution of above work.
- b) All safety appliances and protective devices including hand gloves, aprons, helmets, shields, goggles, **safety** belts etc. shall be provided by Contractor for his personnel.
- c) The Contractor shall arrange to provide guards and prominent display caution notices if access to any equipment / area is considered unsafe and hazardous.

8. SPECIFICATIONS

In the absence of specifications for any work or materials, relevant Indian Standard Specifications shall be applicable. If such codes for a particular subject have not been framed, the decision of the Employer / Consultant will be final and binding.

9. VARIATION IN QUANTITY

- a) The Owner shall have right to delete or increase / decrease quantity specified in this specification as specified in preamble to Bill Of Materials.
- b) Quantities indicated in Bill of Materials are based on engineering status of the project as on date. It is necessary that proper engineering is carried out by the contractor before procurement of material.
- c) For procurement of any material & sequential delivery at site from point of view of erection etc. Contractor shall take prior approval from the employer.
- d) All left over material for which payment has been made by the employer, has to be taken back by the contractor. The employer shall make necessary deduction from the bills of contractor.

10. SITE VISIT

It is recommended that contractor shall visit site before submission of his offer. Time and date shall be fixed with employer.

11. TOOLS FOR HANDLING AND ERECTION :-

All tools and tackles required for handling of equipment and materials at site of work as well as for their assembly and erection and also necessary test instruments shall be the responsibility of the contractor.

12. CO-ORDINATION WITH OTHER AGENCY: -

The contractor shall co-ordinate with all other agencies involved in the building work so that the building work is not hampered due to delay in his work. Recessed conduit and other works, which directly affect the progress of building work, should be given priority.

13. CARE OF BUILDINGS :-

Care shall be taken by the contractor to avoid damage to the building during execution of his part of the work. He shall be responsible for repairing all damages and restoring the same to their original finish at his cost. He shall also remove at his cost all unwanted and waste materials arising out of his work from the site, from time to time as designed by the Engineer-in-charge.

14. STRUCTURAL ALTERATIONS TO BUILDINGS :-

- i. No structural member in the building shall be damaged/ altered, without prior approval from the competent authority through the Engineer-in-charge.
- ii. Structural provisions like openings, cutouts if any, provided by the department for the work, shall be used. Where these require modifications, or where fresh provisions are required to be made, such contingent works shall be carried out by the contractor at his cost.
- iii. All such openings in floors provided by the department shall be closed by the contractor after installing the cables/conduits/rising mains etc. as the case may be, by any suitable means as approved by the Engineer-in-charge without any extra payment.
- iv. All chase required in connection with the electrical works shall be provided and filled by the contractor at his own cost to the original Bankural finish of the buildings.

15. WORK IN OCCUPIED BUILDINGS: -

- i. When work is executed in occupied buildings, there should be minimum of inconvenience to the occupants. The work shall be programmed in consultation with the Engineer-in-charge and the occupying department. If so required, the work may have to be done even before and after working hours.
- ii. The contractor shall be responsible to abide by the regulations or restrictions set in regard to entry into, and movement within the premises.
- iii. The contractor shall not tamper with any of the existing installations including their switching operations or connections there to without specific approval from the Engineer-in-charge.

16. STATUTORY REGULATION AND APPROVALS :-

All electrical works shall be carried out only by those Contractors who are licensed by the concerned local authorities to execute this type of work. Only "A" Class government approved electrical contractor shall execute the job.

It shall be the responsibility of the Contractor to comply with the regulations laid down by the Indian Electricity Rules and local authorities. The Contractor shall also be responsible for obtaining all the statutory approvals/certificates for the work from the concerned Departments and these certificates shall be handed over to the Banks/Clients at the completion. All coordination with the local electric supply authorities, submitted of application, getting the desired load sanctioned shall be in the scope of contractor. The fees required to obtain the desired load sanctioned and other legal and miscellaneous charges by local electric supply authority / undertaking shall be given by the client but all follow-ups etc. shall be the contractor's responsibility.

On completion of the work, the contractor shall obtain the certificates of final inspection and approval by the local electric supply authority and deliver these certificates to the Owner/Banks in original. The contractor shall bear all expenses and fees required to obtain these certificates without which the work shall not be taken over and shall not be considered complete..

17. STANDARDS AND CODE OF PRACTICE :-

The work shall be carried out as per the enclosed Specifications of work and the construction drawings to be issued from time to time. These specifications shall be read in conjunction with National Building Code, National Electrical Code 1985, Relevant Codes of Practices and Standards as issued by ISI and Indian Electricity Rules, CPWD specifications for electrical works (all with the latest amendments). The installation shall conform in all respects to Indian Standard code of Practices. Following BIS codes shall be referred -

- a) National Electrical Code
- b) IS: 694 - 1977: PVC insulated cables for working voltage up to and including 1100 volts
- c) IS: 732 -1989: Electrical wiring installation
- d) IS: 1225 -1938: Installation and Maintenance of power Cables up to and including 33 KV Rating
- e) IS: 1554: PVC insulated heavy-duty electrical cables.
- f) IS: 1860: Installation operation and maintenance of passenger and goods elevator.
- g) IS: 2309 -1989: Protection of building and allied structures against lightning.
- h) IS: 3043 -1987: Earthing
- i) IS: 3646 (Part-1) -1992: Interior Illumination
- j) IS: 3661 (Part-2) -1967: Current rating for cable
- k) IS: 3661 (Part-5) -1968: Current rating for cable
- l) IS: 5216 (Part-1) -1982: Recommendations on safety procedures and practices in electrical work.
- m) IS: 7098 (1 & 2): XLPE insulated cables
- n) IS: 10028 (Part-1) -1985: selection, Installation and Maintenance of Transformers
- o) IS: 10118 (Part-1) -1982: Selection, Installation and Maintenance of switchgear and Control gear

18. MATERIAL SAMPLES AND SHOP DRAWINGS :-

It shall also be the responsibility of the Contractor to submit without any extra charge the samples of the materials/equipment as and when asked by the Bank/Consultant. If the Contractor wishes to use an alternative make due to non-availability of the approved one, he should take the prior approval of the Bank/Consultant. Under such situations the Contractor shall show such promptness as not to hamper the progress of the work.

The Contractor shall submit for Bank/Consultant's approval the shop drawings at approved scale indicating the custom built equipment, L.T. Panels, run of cables and conduits he proposes to install.

19. ELECTRICAL DRAWINGS: -

i) The electrical drawings issued from time to time to the contractor are diagrammatic but shall be following as closely as actual construction and work will permit. The Contractor at his own expenses shall make any deviation from the drawings required to conform to the building construction. The Bankural drawings shall take precedence over the electrical drawings as for as the civil and other trades works are concerned.

ii) If there is any discrepancy due to in-complete description, ambiguity or omission in the drawings and other documents relating to this Contract found by the Contractor either before starting the work or during execution or after completion, the same shall be immediately brought to the attention of the Bank/Consultant and his decision would be final and binding on the Contractor.

20. TESTING AND COMMISSIONING: -

The Contractor shall be responsible for testing and commissioning the entire electrical installation described in these specifications and relevant IS specifications and will demonstrate the operation of the systems to the entire satisfaction of the Bank/Consultant and to the Client approval.

21. GUARANTEE

At the close of work and before issue of final certificate of virtual completion by Owner / Consultant, the contractor shall furnish a written guarantee indemnifying the owner against defective materials and workmanship for a period of one year after commissioning. The contractor shall hold himself fully responsible for reinstallation or replacement of defective material free of cost to the owner.

22. COMPLETION DRAWINGS

The contractor shall submit, after the completion of the work, one set of originals and two sets of prints of the As-Fitted drawings/Completion drawings, giving the following information:

a. Run and size of conduits, inspection, junction and pull boxes.

- b. Size of conductor in each circuit.
- c. Location and ratings of sockets and switches controlling the light/fan and power outlets.
- d. Location and details of distribution boards, mains, switches, switchgears and other particulars.
- e. A complete wiring diagram as installed and schematic drawings showing all connections in the complete electrical system.
- f. Location of telephone outlets, junction boxes and sizes of various conduits.
- g. Location of all earthing stations, route and size of all earthing conductors etc.
- h. Layout and particulars of all cables.
- i. Location of all equipments with dimensions and connections.

23. INSPECTION

All equipment / material covered under this specification is liable for inspection by the Owner/ his representative. The vendor shall inform two weeks in advance for inspection to be carried out at the manufacturer's works.

The contractor shall furnish data Sheets & other details. Additional information, if desired by the bidder can also be furnished separately.

SYSTEM DESCRIPTION

1.0 GENERAL INFORMATION

- 1.1 Ambient air temperature shall be taken as 50 deg. C for the purpose of designing of electrical equipment.
- 1.2 This specification shall be read and constructed in conjunction with the drawings and annexure to determine the scope of work.
- 1.3 All equipment shall be capable of continuous operation satisfactorily under the following conditions:
- a) voltage variation : $\pm 10\%$
 - b) frequency variation : $\pm 5\%$
 - c) combined voltage & frequency variation : $\pm 10\%$
- 1.4 Nominal system supply available shall be as follows:
- a) Incoming : 11 kV, 3 Ph., 50 Hz,
 - b) Utilization : 415V, 3 Ph., 4 wire, 50 Hz

2.0 CODES AND STANDARDS

- 2.1 All equipment and materials specified herein or not, shall be designed, manufactured and tested with the latest applicable standards & bureau of Indian standards.
- 2.2 All electrical equipment shall also conform to the latest electricity rules as regards safety and other essential provisions.
- 2.3 All electrical installation work shall comply with the requirements of the following Act / rules / codes as amended upto date:
- a) Indian electricity act.
 - b) Indian electricity rules.
 - c) National electric code published by 818.
 - d) All relevant IS codes of practice.
 - e) Regulations published by tariff advisory committee.

3.0 SYSTEM DESCRIPTION

3.1 GENERAL

- a) One independent radial feeder is envisaged from State Electricity Board for

receiving incoming supply on 11 kV.

- b) Two poles structure consisting of LAs, Isolator, drop out fuses etc. or 11 KV incoming supply shall be connected to Metering Panel through 11 kV XLPE cable. On two Pole structure 11 kV XLPE cable shall be terminated through outdoor termination.
- c) 11 kV XLPE cable from two pole structure to metering Panel to shall be buried in ground
- d) 11 KV Panel shall have one incomer cum outgoing (unit panel), which will feed power to the Transformer.
- e) 415V L T panel shall receive power from Transformer / DG sets and shall feed power to various Blocks & Common Services as per enclosed single line diagram. The panel will be PLC controlled for automatic operation in case of power failure for DG synchronization and auto load sharing arrangements.
- f) Further routing of cables and Power Distribution shall be as per Single Line Diagram.

4.0 DESIGN CRITERIA

4.1 GENERAL

- a) The equipment shall be used in high voltage system having characteristics as listed in this specification.
- b) The equipment shall be installed in a hot, dusty, humid and tropical atmosphere.
- c) There shall be no radio interference when the equipment are operated at maximum service voltage.
- d) The max. temp. in any part of the equipment at specified rating shall not exceed the permissible limits as stipulated in the relevant standards.
- e) The equipment shall be capable of withstanding the dynamic and thermal stresses of listed short circuit current without any damage or deterioration.
- f) All equipment, accessories and wiring shall have tropical protection, involving special treatment of metal and insulation against fungus, insects and corrosion.
- g) The safety clearances of all live parts of the equipment shall be as per relevant standards.
- h) All equipment/components of identical rating shall be physically and electrically interchangeable.
- i) All outdoor equipment shall be suitable to mount on steel structure. Connectors shall be bimetallic conductor.

- j) Wherever single core cables are terminated in any equipment, gland plate shall be of Aluminium (3-4 mm thick).
- k) There shall be no straight through joints in power & control cables.
- l) All cable terminations shall be with Double compression cable gland with armour holding system.
- m) The lighting fixture shall have loop in & loop out facility.

4.2 D G SET

- a) DG Sets are intended to provide emergency load of 415V, 3 Ph. 4 wire, 50 Hz to various loads of campus.
- b) DG Sets shall be provided with Electronics governor and shall be suitable for parallel operation.
- c) DG sets shall be silent type and should be provided in a suitable acoustic enclosure.
- d) All controls shall be of 24V DC.
- e) DG Sets shall be suitable for continuous operation.
- f) DG Sets shall be started / stopped from Engine / DG Panel / Remote.
- g) The height of exhaust pipes shall be in line with requirements of pollution control rules.
- h) DG set shall **be radiator cooled** and shall be silent type (In acoustic enclosure).
- i) Main features of DG sets shall be as follows:
 - i. Rating : As per B.O.Q. at 0.8 PF, 415V, 3 Ph, 50 Hz.
 - ii. Duty : Continuous
 - iii. Diesel Engine : 4 stroke, multi Cylinders, turbo charged after cooled.
 - iv. Speed : 1500 rpm
 - v. Type of cooling : Radiator cooled

- vi. Type of alternator : Brushless, separately excited (PMG), self-regulated
- vii. Starting : Electrical Self-Starting
- viii. Batteries : Lead Acid type

GENERAL & TECHNICAL

1 POINT WIRING :-

1.1. DEFINITION :-

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

- i. Ceiling rose or connector (in the case of points for ceiling/exhaust fan points, pre wired light fittings and call bells).
- ii. Ceiling rose (in the case of pendants except stiff pendants)
- iii. Back plate (in the case of stiff pendants).
- iv. Lamp holder (in the case of goose neck type wall brackets, batten holders and fittings which are not pre wired).

1.2. SCOPE :-

Following shall be deemed to included in point wiring.

- i. Conduit/casing and capping as the case may be, accessories for the same and wiring cables between the switch box and the point outlet.
- ii. All fixing accessories such as clips, nails, screws, Phil plug, rawl plug etc as required.
- iii. Metal switch boxes for control switches, regulators, sockets etc, recessed or surface type, and phenolic laminated sheet covers over the same.
- iv. Outlet boxes, junction boxes, pull-through boxes etc, but excluding metal boxes if any, provided with switchboards for loose wires/conduit terminations.
- v. Any special block required for neatly housing the connector.
- vi. Control switch or MCB, as specified.

- vii. 3 pin or 6-pin socket, ceiling rose or connector as required.
- viii. Connections to ceiling rose, connector, socket outlet, lamp holder, switch etc.
- ix. Interconnecting wiring between points on the same circuit, in the same switch box or from another.
- x. Protective (loop earthing) conductor from one metallic switch box to another in the distribution circuits, and for socket outlets. (The length of protective conductor run along with the circuits/sub mains is excluded from scope of points)
- xi. Bushes conduit or porcelain tubing where wiring cables pass through wall etc.

1.3 **MATERIAL :-**

The system of wiring shall consist of ISI marked single core PVC insulated flexible copper conductor wires as per IS: 694 amended up to date.

2. **MEASUREMENT :-**

- i. Contractor shall measure the work jointly with the Bank and prepare measurement sheets in triplicate. Three copies of measurement sheets shall be submitted along with running account bills. Bills received without proper measurements of work shall not be considered submitted.
- ii. Should the contractor neglect to measure the work, then the measurement taken by Engineer/Bank or a person approved by the Bank shall be final and binding to him. Such measurements shall be taken in accordance with the mode of measurements wherever specified or as per actual executed quantities.
- iii. All authorised extra works, omissions and all variations made without the Engineer/Bank/Bank's knowledge, or subsequently sanctioned by him in writing (with the prior approval of the contractor in writing) shall be included in such measurement.
- iv. All bills for the work shall be submitted in the tender price bid format.

2.1. **POINT WIRING (OTHER THAN SOCKET OUTLET POINTS) :-**

- i. Unless and otherwise specified, there shall be no linear measurement for point wiring for light points, fan points, exhaust fan points and call bell points. These shall be measured on unit basis by counting.
- ii. No separate measurement will be made for interconnections between points in the same distribution circuit and for the circuit protective (loop earthing) conductors between metallic switch boxes.

2.2 POINT WIRING FOR SOCKET OUTLET POINTS :-

- i. The light plug (5A/6A) point and power (15A/16A) point wiring shall be measured on linear basis, from the respective tapping point of live cable, namely switch box, another socket outlet point, or the sub distribution board as the case may be, up to the socket outlet.
- ii. The metal box with cover, switch/MCB socket outlet and other accessories shall be measured and paid as a separate item.
- iii. The power point outlet will be 15A/5A or 16A/6A six-pin socket outlet.

2.3 GROUP CONTROL POINTS WIRING :-

- i. In the case of points with more than one point controlled by the same switch, such point shall be measured in parts i.e.(a) from the switch to the first point outlet as one point, and (b) for the subsequent points each shall be treated as separate point.
- ii. No recovery shall be made for non-provision of more than one switch in such cases.

2.4 TWIN CONTROL LIGHT POINT WIRING: -

- i. A light point controlled by two numbers of two way switches shall be measured as two points from the fitting to the switches on either side.
- ii. No recovery shall be made for non-provision of more than one ceiling rose or connector in such cases.

2.5 MULTIPLE CONTROLLED CALL BELL POINTS WIRING :-

- i. In the case of call bell points with a single call bell outlet, controlled from more than one place, the point shall be measured in parts i.e. (a) from the call bell outlet to one of the nearest ceiling roses meant for connection to bell push, treated as one point and (b) from that ceiling rose to the next one and so on, shall be treated as separate point(s).
- ii. No recovery shall be made for non-provision of more than one ceiling rose or connector for connection to call bell in such cases.

3. CIRCUIT AND SUBMAIN WIRING :-

3.1. CIRCUIT WIRING :-

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

3.2. SUB MAIN WIRING :-

Sub main wiring shall mean the wiring from one main/distribution switchboard to another and from Distribution Board to Power Outlet / AC Outlet.

4. MEASUREMENT OF CIRCUIT AND SUBMAIN WIRING :-

- i. Circuit and sub main wiring shall be measured on linear basis along the run of the wiring. The measurement shall include all length from end to end of conduit or casing and capping as the case may be, exclusive of interconnections inside the switchboard etc. The increase on account of diversion or slackness shall not be included in the measurement.
- ii. 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 switch box or not.
- iii. When wires of different circuits are grouped in a single conduit/casing and capping, the same shall be measured on linear basis depending on the actual number and sizes of wires run.
- iv. When circuit wires and wires of point wiring are run in the same conduit/casing and capping, circuit wiring shall be measured on linear basis depending on the actual number and sizes of wires run in the existing conduit/casing capping.
- v. Protective (loop earthing) conductors, which are run along the circuit wiring and the sub main wiring, shall be measured on linear basis and paid for separately, if not included in item.
- vi. Except as specified above for point wiring, circuit wiring and sub main wiring, other types of wiring shall be measured separately on linear basis along the run of wiring depending on the actual number and sizes of wires run.

5. SYSTEM OF DISTRIBUTION AND WIRINGS :-

- i. Main distribution board shall be controlled by the circuit breaker. Each outgoing circuit shall be controlled by a circuit breaker on the phase or live conductor.
- ii. The branch distribution board shall be controlled by a circuit breaker. Each outgoing circuit shall be provided with a MCB of specified rating on the phase or live conductor.

- iii. The load of the circuits shall be divided, as far as possible, evenly between the number of ways of the distribution boards, leaving at least one spare circuit for future extension.
- iv. The neutral conductors (incoming and outgoing) shall be connected to a common link (multi way connector) in the distribution board and be capable of being disconnected individually for testing purposes.
- v. Wiring shall be separate for essential loads (i.e those fed through stand by supply) and non-essential loads throughout.

6. BALANCING OF CIRCUITS :-

The balancing of circuits in three wire or poly phase installations shall be arranged up to the satisfaction of the Engineer-in-charge.

7. WIRING SYSTEM :-

- j. Unless and otherwise specified the 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.
- ii. 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 also be wired in the “Lighting” circuit both in residential as well as non-residential buildings.
- iii. The wiring throughout the installation shall be such that there is no break in the neutral wire except in the form of linked switchgear.
- iv. Surface wiring shall run, as far as possible, along the walls and ceiling so as to be easily accessible for inspection.
- v. In no case, the open wiring shall be run above the false ceiling without the approval of Engineer-in-charge.
- vi. In all types of wiring, due consideration shall be given for neatness, good appearance and safety.

8. PASSING THROUGH WALLS OR FLOORS :-

- i. When wiring cables are to pass through a wall, these shall be taken through a protection (steel/PVC) pipe or porcelain tube of suitable size such that they pass through in a straight line without twist or cross in them on either end of such holes. The ends of metallic pipe shall be neatly bushed with porcelain, PVC or other approved material.

- ii. Where a wall pipe passes outside a building so as to be exposed to weather, the outer end shall be bell mouthed and turned downwards and properly bushed on the open end.

9. JOINTS IN WIRING :-

- i. No bare conductor in phase and/or neutral or twisted joints in phase, neutral, and/or protective conductors in wiring shall be permitted.
- ii. 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 necessitating a through joint, such joints shall be made by means of approved mechanical connectors in suitable junction boxes.
- iii. Termination of multi-stranded conductors shall be done using suitable crimping type thimbles.

10. CONFORMITY TO I.E. ACT, I.E. RULES AND STANDARDS :-

- i. All electrical works shall be carried out in accordance with the provisions of the Indian Electricity Act, 1910 and Indian Electricity Rules 1956 amended up to date.
- ii. The work shall also conform to relevant Indian Standard codes of practice for the type of work involved.
- iii. In all electrical installation works, relevant safety codes of practice shall be followed.
- iv. The complete wiring installation shall conform to IS: 732 amended up to date.

11. GENERAL REQUIREMENTS OF COMPONENTS :-

11.1 QUALITY OF MATERIALS :-

All materials and equipment supplied by the contractor shall be new. They shall be of such design, size and material as to satisfactorily function under the rated conditions of operation and to withstand the environmental conditions at site.

11.2 RATING OF COMPONENTS :-

- i. All components in a wiring installation shall be of appropriate ratings of voltage, current and frequency, as required at the respective sections of the electrical installation in which they are used.
- ii. All conductors, switches and accessories shall be of such size as to be capable of carrying the maximum current, which will normally flow through them, without their respective ratings being exceeded.

11.3 CONFORMITY OF STANDARDS :-

All components shall conform to relevant Indian Standard specification, wherever existing. Materials with ISI certification mark shall be preferred. However for conduits, wiring cables, piano/tumbler switches and socket outlets, ISI marked materials shall only be permitted.

11.4 INTERCHANGEABILITY: -

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

SWITCHES & RECEPTACLES (Piano Type)

1. CONTROL SWITCHES FOR POINTS :-

- i. 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 3 mm and in case of welded mild steel sheet boxes, the wall thickness shall not be less than 1.2 mm (18 gauge) for boxes up to a size of 20 cm x 30 cm, and above this size 1.6 mm (16 gauge) thick MS boxes shall be used. The metallic boxes shall be duly painted with anticorrosive paint before erection.
- ii. 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.
- iii. An earth terminal with stud & 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.
- iv. Clear depth of the box shall not be less than 50 mm, and this shall be increased suitably to accommodate mounting of fan regulators in flush pattern.
- v. The fan regulators can also be mounted on the switch box covers, if so directed by the Engineer-in-charge.

- vi. Control switches (single pole switches) carrying not more than 16 A shall be of piano type, as specified, and the switch shall be "ON" when the nob is down.
- vii. Only MCB' s shall be used for controlling industrial type socket outlets.
- viii. Control switch shall be placed only in the live conductor of the circuit. No single pole switch or fuse shall be inserted in the protective (earth) conductor, or earthed neutral conductor of the circuit.
- ix. All switches, regulators, outlets & other accessories shall be white colour with matching white cover plate. In no case ivory or off-white switches shall be accepted.

2. SOCKET OUTLETS: -

- i. Socket outlet shall be of the same type, white piano 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 shall be provided in 'power' circuits.
- ii. In an earthed system of supply, socket outlets and plugs shall only be of 3 pin type, the third pin shall be connected to earth through protective (loop earthing) conductor. 2 pin or 5 pin sockets shall not be permitted to be used.
- iii. Every socket outlets shall be controlled by a switch or MCB, as specified. The control switch/MCB shall be connected on the 'live' side of the line.
- iv. Outlet boxes for socket outlets (both 15A/16A and 5A/6A) points shall be of size 175 mm x 100mm.
- v. Unless and other wise specified, the control switches for the 5A/6A and 15A/16A socket outlets shall be kept along with the socket outlets.

3. SWITCH BOX COVERS :-

Phenolic laminated sheets of approved white shade shall be used for switch box covers. These shall be of white 3 mm thick synthetic phenolic resin bonded laminated sheet as base material and conforming to grade P-I of IS:2036-1974, Secured to the

box with counter sunk C.P. Brass Screws. The corners of cover plates shall be at right angle.

SWITCHES & BOXES (Modular Type)

- i. The switch box or regulator box shall be made of metal on all sides, except on the front. Since Modular type switches are to be used in the project, hence the boxes shall also be used of the same make and model. The size of box shall be governed by the number of switches/outlets/regulators on the respective board. The boxes shall be with zinc plating and yellow passivation to comply with the rust test as per IS 3854. The boxes should have slotted holes for level adjustments. The boxes shall be fitted with riveted brass earth terminals for earth connections.
- ii. Clear depth of the box shall not be in a range of 50 mm to 65 mm depending upon the size of board and manufacturer.
- iii. Control switch shall be placed only in the live conductor of the circuit. No single pole switch or fuse shall be inserted in the protective (earth) conductor, or earthed neutral conductor of the circuit. The switches shall be provided with silver contacts. The neutral should make first and break last.
- iv. Socket outlet shall be rated either for 5A/6A or 15A/16A. 5/6 Amp sockets shall be of 5 pin type with shutters. Combined 5A/15A or 6A/16A six pin shuttered socket outlet shall be provided in 'power' circuits. The earth pin shall be connected to earth through protective (loop earthing) conductor. All sockets shall be provided with safety shutters to allow easy entry of two pin plugs without the need to force the earth terminal by unsafe means. All sockets shall conform to IS: 1293.
- v. Every socket outlet shall be controlled by a switch, as specified. The control switch shall be connected on the 'live' side of the line.
- vi. The switches and sockets shall be manufactured using engineering plastic to make it fire retardant and highly resistant to impact.
- vii. The fan speed regulators shall be of electronic and stepped type
- viii. The RJ-45 data socket shall be suitable for cat5/cat 6 data cables.
- ix. Gold plated contacts shall be provided in all communication jacks to enhance data and voice transmission.

SWITCHGEAR AND CONTROLGEAR

1. GENERAL ASPECTS :-

- i. All items of switchgear and distribution boards (DB' s) shall be metal clad type.
- ii. The types, rating and/or categories of switchgear and protective gear shall be as specified in the tender schedule of work.
- iii. RCCB's, ELCB's and RCBO's where specified, shall conform to the requirements of current rating, fault rating, single phase or three phase configuration and sensitivity laid down in the tender documents.
- iv. While each outgoing way of distribution board (D.B.) shall be of miniature circuit breaker (MCB) as specified, and of suitable rating on the phase conductor, the corresponding earthed neutral conductor shall be connected to a common neutral terminal block and shall be capable of being disconnected individually for testing purpose.
- v. **Independent earth terminal block.**

Every distribution board (single phase as well as three phase) shall have an earth terminal block identical to, but independent from neutral terminal block, to enable termination of protective (loop earthing) conductors (incoming as well as out goings) individually by screwed connection and without twisting.
- vi. Earthing terminal (1 for single phase and 2 for three phase) shall be provided on the metal cladding of switches and D.B.' s for body earthing. These shall be suitably marked.
- vii. Knock out holes, with or without end plates as per standard design of manufacturers, shall be provided in the metal cladding of switches and D.B.' s for termination of conduits/cables.
- viii. Each distribution board shall be provided with a circuit list giving details of each circuit, which it controls, and the current rating of the circuit, and the size of the fuse element.

2. MCB TYPE DISTRIBUTION BOARDS (MCB DB) :-

- i. MCB DB' s may be of single phase, three phase (horizontal type) suitable for feeding single phase loads or 3 phase (vertical type) suitable for feeding single phase as well as three phase loads, each phase isolation type three phase DB in which each phase can be isolated by a separate circuit breaker or RCCB, as specified. These shall be complete with accessories, but without MCB' s, which shall be specified as a separate item in the tender documents.

- ii. 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 a separate item in the Schedule of work.
- iii. MCB DB' s shall be of surface/flush mounting pattern according to the requirement of their location, and shall be suitable to accommodate MCB' s and MCB type isolators and RCCB (ELCB) at incoming in single pole or multi pole configuration, as required.
- iv. MCB DB's shall be double door type; dust and vermin proof conforming to IP 42, and shall be fabricated out of CRCA sheet steel, 1.6 mm thick, with stove enameled paint finish.
- v. In case of Concealed / Recessed D.B.'s, cutting of brick work, providing suitable lintel, making good the wall including plastering etc. with necessary civil work including all Civil material shall be included in contractor's scope for proper completion of work.
- vi. MCB DB' s shall have removal type end plates with knockouts at the bottom and top, and shall have hinged covers with locking arrangement.
- vii. Only the knobs of the MCB' s shall protrude out of the front covers through openings neatly machine made for the purpose.
- viii. The bus bars used shall be solid electrolytic copper of appropriate sections.
- ix. Din bar(s) shall be provided for mounting the MCB' s.
- x. The complete board shall be factory fabricated and shall be duly pre-wired in the works, ready for installation at site.
- xi. The board shall be fully pre wired with single core PVC insulated copper conductors/insulated solid copper links, and terminated on to extended type terminal connectors, suitable for connections to the sizes of the respective conductors.
- xii. All incoming and outgoing wiring to the pre wired MCBDB' s shall be terminated only in the extended terminal connectors to be provided within the DB. The terminal connectors shall therefore be so provided as to facilitate easy cable connections and subsequent maintenance.

3. MCCB TYPE DISTRIBUTION BOARDS (MCCB DB) :-

- i. All MCCB DB' s shall be of three phase suitable for feeding single phase loads or 3 phase loads through SP/TP MCB's, IP 42 enclosure, sheet steel, double door with tinned copper bus bar, neutral bar, earth bar, knock outs etc. The DB's shall be original factory fabricated of approved make.

- ii. The current ratings of Incomer MCCB shall be upto 250 amp and the number of ways shall be as specified. Blanking plates shall be provided to close unused ways.
- iii. MCCB DB shall be of surface/flush mounting pattern according to the requirement of their location, and shall be suitable to accommodate Four pole MCCB at incomer and SP/TP MCB's at outgoings, as required.
- v. MCCB DB's shall be dust and vermin proof conforming to IP 42, and shall be fabricated out of CRCA sheet steel, 1.6 mm thick, with stove enameled paint finish.
- v. In case of Concealed / Recessed D.B.'s, cutting of brick work, providing suitable lintel, making good the wall including plastering etc. with necessary civil work including all Civil material shall be included in contractor's scope for proper completion of work.
- vi. MCCB DB' s shall have removal type end plates with knock-outs at the bottom and top, and shall have hinged covers with locking arrangement.
- viii. The bus bars used shall be solid electrolytic copper of appropriate sections.
- ix. Din bar(s) shall be provided for mounting the MCB' s.

4. WORKMANSHIP :-

- i. Good workmanship is an essential requirement to be complied with. The entire work of manufacture/fabrication, assembly and installation shall conform to sound engineering practice.
- ii. The work shall be carried out under the direct supervision of a first class licensed foreman, or of a person holding a certificate of competency issued by the state Government for the type of work involved, employed by the contractor, who shall rectify then and there the defects pointed out by the Engineer-in-charge during the progress of work.

5. COMMISSIONING ON COMPLETION: -

Before the workman leaves the work finally, he must make sure that the installation is in commission, after due testing.

6. COMPLETION PLAN AND COMPLETION CERTIFICATE :-

- i. For all works completion certificate after completion of work shall be submitted to the Engineer-in-charge.
- ii. Completion plan drawn to a suitable scale in tracing cloth with ink indicating the following, along with three blue print copies of the same shall also be submitted.
 - a) General layout of the building.
 - b) Locations of main switch board and distribution boards, indicating the circuit numbers controlled by them.
 - c) Position of all points and their controls.
 - d) Types of fittings, viz. fluorescent, pendants, brackets, bulkhead, fans and exhaust fans etc.
 - e) Name of work, job number, accepted tender reference, actual date of completion, names of Division/Sub-Division and name of the firm who executed the work with their signature.

7. ADDITION TO AN INSTALLATION :-

An addition, temporary or permanent, shall not be made to the authorised load of an existing installation until it has been definitely ascertained that the current carrying capacity and the condition of the existing accessories, conductors, switches etc affected, including those of the supply Authorities, are adequate for the increased load.

CIRCUIT BREAKERS

A. MINIATURE CIRCUIT BREAKERS (MCB) :-

Miniature Circuit Breaker shall comply with IS-8828-1996/ IEC898-1995 amended upto date.

Miniature circuit breakers shall be quick make and break type for 240/415 V AC, 50 Hz application with magnetic thermal release for over current and short circuit protection.

The breaking capacity shall not be less than 10kA at 415V AC.

MCBs shall be DIN mounted.

MCBs shall be current limiting type (class-3).

MCBs shall be C-curve.

MCBs shall have minimum power loss (watts) per pole defined as per the IS/IEC and the manufacturer shall publish the values.

MCBs shall be of self-extinguishing ULV0 grade thermoset plastic material. The housing shall be heat resistant and having high impact strength. The terminals shall be protected against finger contact to IP20 Degree of protection.

All DP, TP, TPN and 4pole MCBs shall have a common trip bar independent to external operating handle.

Mechanical Life shall be 20000 operations and Service life at rated load for In below 32A shall be 20000 and for In above 32A shall be 10000 operations.

B. Earth Leakage Circuit Breaker / Residual Current Circuit Breaker - Current Operated Type (ELCB / RCCB / RCBO)

• **System of operation**

ELCB/ RCCB/RCBO shall work on the principle of core balance transformer. The incoming shall pass through toroidal core transformer. As long as the currents in the phase and neutral shall be the same, no electro motive force shall be generated in the secondary winding of the transformer. In the event of a leakage to earth, an unbalance shall be created which shall cause a current to be generated in the secondary winding, this current shall be fed to a highly sensitive miniature relay, which shall trip the circuit if the earth leakage current exceeds a pre-determined critical value. ELCB/RCCB/RCBO shall be current operated independent of line voltage. Current sensitivity shall be of 30mA at 240/415V AC or as specified in BOQ / drawings and shall have a minimum of 10000 electrical operations. The RCBO shall also provide over load and short circuit protection in addition to the earth leakage protection.

• **Mechanical Operation**

The moving contacts of the phases shall be mounted on a common bridge, actuated by a rugged toggle mechanism. Hence, the closing/opening of all three phases shall occur simultaneously. This also shall ensure simultaneous opening of all the contacts under tripping conditions.

• **Neutral Advance Feature**

The neutral moving contact shall be so mounted on the common bridge that, at the time of closing, the neutral shall make contact. First before the phases; and at the time of opening, the neutral shall break last after allowing the phases to open first. This is an important safety feature which is also required by regulations.

- **Testing Provision**

A test device shall be incorporated to check the integrity of earth leakage detection system and the tripping mechanism. When the unit is connected to service, pressing the test knob shall trip the ELCB/RCCB/RCBO and the operating handle shall move to the "OFF" position.

C. MOULDED CASE CIRCUIT BREAKER (MCCB's)

The rated normal current should be specified at 40° C

1. General

Moulded case circuit breakers shall be incorporated in the switchboard wherever specified. MCCB shall conform to IS:13947 (Part-2): 1993 or IEC-60947-2 in all respects. MCCB shall be suitable either for single phase AC 230 Volts or three phase 415 volts \pm 10%. The rated insulation voltage shall be 600 volts. Suitable discrimination shall be provided between upstream and down stream breakers in the range of 10-20 milli seconds. The MCCBs will have earth fault module (if specifically asked) and front operated.

MCCB shall indicate its suitability for isolation and this should appear clearly on the MCCB with the symbol as specified in standard IS: 13947/IEC 60947

2. Construction

The MCCB cover and case shall be made of high strength heat-resistant and flame retardant thermosetting insulating material; operating handle shall be quick make/quick break. The operating handle shall have suitable 'ON' 'OFF' and 'TRIPPED' mechanical indicators notable from outside. Three phase MCCBS shall have a common operating handle for simultaneous operation and tripping of all the three phases.

Suitable arc extinguishing device shall be provided for each contact. **Tripping unit shall be thermal-magnetic type upto 250A and Microprocessor based above 250A (or as specified specifically in Bill of Quantities and drawings)** provided on each pole and connected by a common trip bar such that tripping of any one pole operates all three poles to open simultaneously. Tripping device shall have IDMT characteristics for sustained over load and short circuits.

3. Contact tips shall be made of suitable arc resistant, sintered alloy for long electrical life. Terminals shall be of liberal design with adequate clearances.

4. Accessories

All the accessories shall be mounted from the front and shall be adjustment free. MCCBs shall have the electrical accessories fitted even without removing the circuit breaker from the switchboard so that site changes, if any, can be carried out easily. MCCB shall be provided with the following accessories, if specified in schedule of quantities, such as Under voltage trip, Shunt trip, Alarm switch, auxiliary switches, Rotary and motorized operating mechanism, Plug in and with drawable mechanism etc.

5. Interlocking

Moulded case circuit breakers shall be provided with the following interlocking devices for interlocking the door of a switchboard.

- a) Handle interlock to prevent unnecessary manipulations of the breaker.
- b) Door interlock to prevent the door being opened when the breaker is in ON position.
- c) Defeat-interlocking device to open the door even if the breaker is in ON position.

6. Rupturing capacity

The moulded case circuit breaker shall have a rupturing capacity as mentioned against each in Schedule of Quantity at 415 volts. Wherever required, higher rupturing capacity breakers to meet the system short circuit fault shall be used. In absence of any capacity specifically mentioned in the bill of quantities and drawings, following rupturing capacities shall be used -

100 / 125 Amp : 25 KA

160/200/250 Amp : 35 KA

300/400/630/800 Amp : 50 KA

7. The MCCB shall be **current limiting type** and comprise of quick make - break switching mechanism. MCCBs shall be capable of defined variable overload adjustment. For thermal magnetic protection the O/L adjustment should be 75%-100% and for microprocessor-based release the adjustment should be 40%- 100% and S/c for 2 to 12 times .All MCCBs rated 200 Amps and above shall have adjustable magnetic short circuit pick-up.

8. Electrical Features

All MCCB's & shall be selected on the basis of rated current. Four poles MCCBs shall be always supplied with neutral protection. The MCCBs having 400A & should have category B as per the IEC standards to ensure the selectivity . Minimum Electrical & Mechanical Endurance of MCCB Shall be as follows

Rating of MCCB	Electrical Endurance	Mechanical Endurance
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Upto 160 A
Above 160 A

7000 Opns
4000 Opns

25000 Opns
15000 Opns

9. The trip command shall override all other commands. The manufacturer shall provide both the discrimination tables (with test certificates) and let-through energy curves. Line and Load connections shall be interchangeable.

10. Installation

It should be possible to terminate Aluminium cable of required size for the defined current carrying capacity. The requisite size should be made available by means of extended terminals (as a standard offer) in case the direct terminals are not of adequate size. Adequate phase to phase clearance has to be ensured in case of extended terminations.

The circuit breaker should provide the flexibility of terminating line and load from any direction. Manufacturers should test the circuit breaker for this condition and requisite test certificate should be available.

Phase barrier should be provided as a standard feature.

11. Testing

- a) Original test certificate of the MCCB as per BS 3871 or JS-C-8370 shall be furnished.
- b) Pre-commissioning tests on the switchboard panel incorporating the MCCB shall be done as per standard specifications.

D. AIR CIRCUIT BREAKER

1. General

Air circuit breakers shall be incorporated in power control center and motor control centers wherever specified. ACB shall conform to **IEC60947 / IS: 13947 Part-2 1993** in all respects. ACBS shall be suitable for operation on 660 volts, 3 phase, 50/60 Hz, AC supply. The rated insulation voltage shall be equal to or greater than 1000V. The rated impulse withstand voltage shall be equal to 12kV, so that the device can be used for every installation category, in compliance with the international standards CEI IEC 664-1.

2/2

2. Type and construction

Air circuit breakers shall be of enclosed pattern, dead front type with trip free operating mechanism. Air Circuit breakers shall be **withdrawable type with horizontal drawout carriage**. The mechanism shall be mechanical if not specifically mentioned for electrical. The ACBs shall be strong and robust in construction with

suitable arrangement for anchoring when in fully engaged or fully drawn out positions. The carriage or cradle on which the breaker is mounted shall be of robust design made of fabricated steel, supported on rollers. Cradle shall also comprise of main and secondary separable contacts and all draw out mechanisms in a completely fig welded assembly short circuit on top. There shall be no dependence upon the panel board frame for any critical alignment. The withdrawal arrangement shall be such as to allow smooth and easy movement.

The draw out operation shall be possible through a closed door. Three positions of the moving part shall be possible:

- 1 - connected / service position - all auxiliary and main circuits engaged
- 2 - test position - all auxiliary circuits engaged all main circuits disconnected
- 3 - isolated position - all circuits disconnected.

All three positions should be indicated discreetly on the cradle. Safety shutter to be provided as standard

All the current carrying parts of the circuit breakers shall be silver-plated. Suitable arcing contacts shall be provided to protect the main contacts. The contacts shall be of spring-loaded design. The sequence of operation of the contacts shall be such that arcing contacts 'make' before and 'break' after the main contacts. Arcing contacts shall be provided with efficient arc chutes on each pole. The arc chutes shall be suitable for ready replacement. Self-aligning isolating contacts with automatic shutters to screen the live parts shall be provided. The design of the breaker shall be such that all the components are easily accessible to inspection, maintenance and replacement. The ACB at its rated current shall be suitable for operation in extremely tropical humid climate at 50°C ambient temp. The manufacturer shall declare ideal de-rating charts.

There should be total segregation between the power circuit and control circuit, thus making double insulation and ensuring fitting of accessories while the circuit breaker is in the ON position. It shall be possible to inspect the arcing chamber and main contacts. The ACB shall have metal load bearing structures. The main contacts shall be separate from the arc-breaking contacts. It shall be possible to check the wear of the main contacts with the ACB in its racked-out position, removing the arcing chambers. No mechanical junctions in the main contact shall be there so that losses are minimal.

3. Operating Mechanism

Air circuit breaker shall be provided with a **quick-make, trip-free** operating mechanism. The operating mechanism shall be strain-free spring operated. The operating shall be "handle front of the panel" type. The design shall be such that the circuit breaker compartment door need not be opened while moving the breaker from completely connected, through test, in to the disconnected position. The spring shall

be charged automatically during the closing operation. Mechanical Indication of the position of the spring charge shall be provided.

4. Interlocking and safety arrangement

Air circuit breakers shall be provided with the following safety and interlocking arrangements:

- i) It shall not be possible for breaker to be withdrawn when in `ON" position.
- ii) It shall not be possible for the breaker to be switched on until it is either in fully inserted position or for testing purposes it is in fully isolated position.
- iii) The breaker shall be capable of being raked in to `testing' isolated and maintenance positions and kept locked in any of these positions.
- iv) A safety latch to ensure that the movement of the breaker, as it is withdrawn is checked before it is completely out of the cubicle.
- v) If under voltage release is provided then circuit breaker will close only if it is energized. Under voltage release should have time delay to avoid nuisance tripping for transient voltage failure
- vi) The operating mechanism shall provide for raking the breaker in to connect, test and disconnected positions without opening the compartment door.
- vii) Mechanical interlocks shall be provided between the operation of different breakers (if specified in Bill of Quantities).

The circuit breaker shall provide as a standard feature, the following mechanical indicator in the front Panel

1. Contact portion indicator (on/off)
2. Stored energy status indicator
3. Trip indicator on fault

5. Rating

The CTs range from 250A to 6300A: all the CTs shall have a structure made of self-extinguishing thermoplastic material. The breaking capacity of the ACB shall be greater than or equivalent to 50kA. The Breaking Capacity of the circuit breaker shall be as indicated in the BOQ with minimum of 50kA for upto 1250A, 65kA for 1600 to 2000A and 80kA for 2500 to 3200A. **Icu=Ics for all ACBs.** Icw rating at 1 sec/3sec should be declared. The minimum Electrical & Mechanical Life of ACB at 415/440V shall be as follows:

Rating of ACB	Electrical Endurance	Mechanical Endurance
Upto 1600 A	10000 Opns	20000Opns
2000-4000 A	5000 Opns	15000 Opns

Above 4000 A

1500 Opns

10000 Opns

6. Accessories

All the accessories like U/V, shunt opening, shunt closing shall be accessible from the front.

Circuit breakers shall be provided with the following Accessories: -

- i) Under-voltage relay for the incoming ACB.
- ii) Microprocessor based Overload releases with IDMT characteristics.
- iii) Microprocessor based Instantaneous earth fault release.
- iv) Alarm switches (if specifically asked for)
- v) Auxiliary switches
- viii) NO and NC auxiliary contacts rated for 10 Amps at 415 V AC and 6 Amp at 48V DC, in addition to ones already in use for the operation of the breaker and will be used in subsequent interlocks to be incorporated in future.

8. Mechanical indicators

Mechanical indication on the front of the air circuit breaker shall be provided to indicate the following :

- main contacts closed "ON"
- main contacts open "OFF"
- springs charged
- springs discharged
- circuit breaker in "service" position (drawout only)
- circuit breaker in "test" position (drawout only)
- circuit breaker in "isolated" position (drawout only)

9. Mounting

Circuit breakers shall be mounted as per the standard specification of power control centers.

10. Testing

Testing of each circuit breaker shall be carried out at the works as per IEC:60947 and the original test certificate shall be furnished in triplicate. The tests shall incorporate atleast the following:

- i) Impulse withstand test
- ii) Insulation test
- iii) Di-electric rigidity /Insulation test
- iv) Mechanical operation checking

- v) Thermal protection with a current of 3ith starting from cold conditions.

11. Protection

The ACB shall be with an integral self-powered **microprocessor based current release** for Overload, Short-Circuit and Earth Fault protection which works on true rms values for ensuring accurate protection, if specifically asked for. The protection unit should meet the EMI/EMC requirement as per latest standard. Online Test Fault shall be provided to test healthiness of release and ACB.

12. Setting range of protection release

- a) Overload protection shall have adjustable setting from 40% to 100% of the ACBs rated current in steps of 10% and adjustable time setting from 3-18m sec.
- b) Short circuit protection shall have adjustable current setting from 100% to 1000% of the overload setting and adjustable time delay setting for fault discrimination from 50-500 m sec.
- c) E/F protection if specified will have adjustable current setting from 40% to 100% of ACB rated current and adjustable time setting from 100-800m sec. It shall be possible to charge the release setting on load.

METALLIC CONDUIT WIRING SYSTEM

1. SCOPE :-

This chapter covers the detailed requirements for wiring work in metallic conduits. This chapter covers both surface and recessed types of works.

2. APPLICATION :-

- i. Recessed conduit is suitable generally for all applications. Surface conduit work may be adopted in places like workshops, plant rooms, pump rooms, 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.
- ii. Flexible conduits may only be permitted for interconnections between switch gear, DB' s and conduit terminations in wall.

3. MATERIALS :-

3.1 CONDUITS :-

- i. All rigid conduit pipes shall be of steel and be ISI marked. The wall thickness shall be not less than 1.6 mm (16 SWG) for conduit up to 32 mm dia. and not less than 2 mm (14 SWG) for conduits above 32 mm. These shall be solid drawn or reamed by welding, and finished with galvanized or stove enameled surface.
- ii. The maximum number of PVC insulated cables conforming to IS : 694-1990 that can be drawn in one conduit is given size wise in table 1, and the number of cables per conduit shall not be exceeded. Conduit sizes shall be selected accordingly in each run.
- iii. No steel conduit less than 20 mm in diameter shall be used.

3.2 CONDUIT ACCESSORIES :-

- i. The conduit wiring system shall be complete in all respects, including their accessories.
- ii. All conduit accessories shall be of threaded type, and under no circumstances pin grip type or clamp grip type accessories shall be used.

- iii. Bends, couplers etc. shall be solid type in recessed type of works and may be solid or inspection type as required, in surface type of works.
- iv. a) Saddles for surface conduit work on wall shall not be less than 0.55 mm (24 gauge) for conduits up to 25 mm dia. and not less than 0.9 mm (20 gauge) for larger diameter. The corresponding widths shall be 19mm & 25mm.
- b) The minimum width and the thickness of girder clips used for fixing conduits to steel joists, and clamps shall be as per **table 2.**

TABLE - 1

MAXIMUM NUMBER OF PVC INSULATED 650/ 1100 VOLT GRADE COPPER CONDUCTOR CABLE THAT CAN BE DRAWN INTO RIGID STEEL CONDUIT.

Nominal cross sectional area of conductor in Sq. mm.	20 mm	25 mm	32 mm	40 mm
1.50	5	10	14	-
2.50	5	8	12	-
4.00	3	8	10	-
6.00	2	5	8	-
10.00	-	3	5	6
16.00	-	-	3	6
25.00	-	-	2	4

Note :-

The above table shows the maximum capacity of conduits for a simultaneous drawing of cables.

TABLE - 2

GIRDER CLIPS OR CLAMPS

S.No.	Size of conduit	Width	Thickness
i.	20 mm	19 mm	0.9 mm (20 SWG)
ii.	25 mm	19 mm	0.9 mm (20 SWG)
iii.	32 mm & above	25 mm	1.2 mm (18 SWG)

4. INSTALLATION :-

4.1 COMMON ASPECTS FOR RECESSED AND SURFACE CONDUIT WORKS :-

i. CONDUIT JOINTS :-

- a) The conduit works of each circuit or section shall be completed before the cables are drawn in.
- b) Conduit pipes shall be jointed by means of screwed couplers and screwed accessories only. Threads on conduit pipes in all cases shall be between 13 mm to 19 mm long, sufficient to accommodate pipes to full threaded portion of couplers or accessories.
- c) Cut ends of conduit pipes shall have no sharp edges, nor any burrs left to avoid damage to the insulation of the conductors while pulling them through such pipes.
- d) The Engineer-in-charge, with a view to ensuring that the above provision has been carried out, may require that the separate lengths of conduit etc., after they have been prepared, shall be submitted for inspection before being fixed.
- e) No bare threaded portion of conduit pipe shall be allowed, unless such bare threaded portion is treated with anticorrosive preservative or covered with approved plastic compound.

ii. BENDS IN CONDUITS :-

- a) All necessary bends in the system, shall be done either by neatly bending the pipes without cracking with a bending radius of not less than 7.5 cm, or alternatively, by inserting suitable solid or inspection type normal bends, elbows or similar fittings, or by fixing cast iron inspection boxes, whichever is most suitable.
- b) Conduit fittings shall be avoided as far as possible on conduit system exposed to weather. Where necessary, solid type fittings shall be used.

iii. OUTLETS :-

- a) All outlets such as switches, wall sockets etc. may be either flush mounting type, or of surface mounting type, as specified and as required on site.
- b) All switches and accessories shall be fixed in flush pattern.

iv. **PAINING AFTER ERECTION :-**

After installation, all accessible surface of conduit pipes, fittings, switch and regulator boxes etc shall be painted.

5. **ADDITIONAL REQUIREMENTS FOR SURFACE CONDUIT WORKS :-**

i. **PAINING BEFORE ERECTION :-**

The outer surface of conduit including all bends, unions, tees, junction boxes, etc. forming part of the conduit system , shall be adequately protected against rust when such system is exposed to weather by being painted with 2 coats of red oxide paint applied before they are fixed.

ii. **FIXING CONDUIT ON SURFACE :-**

- a) Conduit pipes shall be fixed by saddles, screwed to suitable approved plugs with screws in an approved manner at an interval of not more than one meter, on either side of the couplers or bends or similar fittings.
- b) Where conduit pipes are to be laid along the trusses, steel joists etc. the same shall be secured by means of saddles or girder clips or clamps as required by the Engineer-in-charge.
- c) In long distance straight run of conduit, inspection type couplers at reasonable intervals shall be provided, or running threads with couplers and jam nuts shall be provided.

iii. **FIXING OUTLET BOXES :-**

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

6. **ADDITIONAL REQUIREMENTS FOR RECESSED CONDUIT WORK :-**

i. **MAKING CHASE :-**

- a) chase in the wall shall be neatly made, and of ample dimensions to permit the conduit to be fixed in the manner desired.
- b) In the case of buildings under construction, the conduits shall be buried in the wall before plastering, and shall be finished neatly after erection of conduit.
- c) In case of exposed brick/rubble masonry work, special care shall be taken to fix the conduit and accessories in position along with the building work.

ii. **FIXING CONDUIT IN CHASE :-**

- a) The conduit pipe shall be fixed by means of staples, J-hooks, or by means of saddles, not more than 40 cm apart or by any other approved means of fixing.
- b) All threaded joints of conduit pipes shall be treated with some approved preservative compound to secure protection against rust.

iii. **FIXING CONDUIT IN R.C.C. WORK :-**

- a) 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.
- b) 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 of conductors.
- c) Location of inspection/junction boxes in RCC work should be identified by suitable means to avoid unnecessary chipping of the RCC slab subsequently to locate these boxes.

iv. **FIXING INSPECTION BOXES :-**

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

- b) These shall be mounted flush with the wall or ceiling concrete. Minimum 65 mm depth junction boxes shall be used in roof slabs.
- c) Suitable ventilating holes shall be provided in the inspection box covers.

v. **FIXING SWITCH BOXES AND ACCESSORIES :-**

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

vi. **FISH WIRE :-**

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

7. **BUNCHING OF CABLES :-**

- a) Cable carrying alternating current, installed in metal conduit, shall always be bunched so that the outgoing and return cables are drawn into the same conduit.
- b) Where the distribution is for single phase loads only, conductors for these phases shall be drawn in one conduit.
- c) In case of three phase loads, separate conduits shall be run from the distribution boards to the load points, or outlets as the case may be.

8. **EARTHING REQUIREMENTS :**

- i. The entire system of metallic conduit work, including the outlet boxes and other metallic accessories, shall be mechanically and electrically continuous by proper screwed joints, or by double chuck nuts at terminations. The conduit shall be continuous when passing through walls or floors.
- ii. Protective (loop earthing) conductor(s) shall be laid along the runs of the conduit between the metallic switch boxes and the distribution boards/switch boards, terminated thereto. These conductors shall be of such size and material, the protective earth conductors shall be either drawn inside the conduits along with the cables, or shall be laid external to the conduits. When laid external to the conduits, this shall be properly clamped with the conduit at regular intervals.
- iii. The protective conductors shall be terminated properly using earth studs, earth terminal block etc. as the case may be.
- iv. Gas or water pipe shall not be used as protective conductor (earth medium).

PVC CONDUIT WIRING SYSTEM

1. SCOPE :-

This chapter covers the detailed requirements for wiring work in non-metallic conduits. This chapter covers both surface and recessed types of wiring work.

2. APPLICATION :-

1. Recessed conduit work is generally suitable for all applications. Surface conduit work may be adopted in places like workshops etc. and where recessed work may not be possible to be done. The type of work shall be as specified in individual works.

2. Flexible non-metallic conduits shall be used only at terminations, wherever specified.

3. Special precautions :-

i. If the pipes are liable to mechanical damages, they should be adequately protected.

ii. Non-metallic conduit shall not be used for the following applications :-

a) In concealed/ inaccessible places of combustible construction where ambient temperature exceeds 60°C.

b) In places where ambient temperature is less than 5°C.

c) For suspension of fluorescent fittings and other fixtures.

d) In areas exposed to sunlight.

3. MATERIAL :-

3.1 CONDUITS :-

i. All non-metallic conduit pipes and accessories shall be of suitable material complying with IS : 2509-1973 and IS : 3419-1988. for rigid conduits and IS : 9537(V)-2000 for flexible conduits. The interior of the conduits shall be free from obstructions. The rigid conduit pipes shall be ISI marked.

- ii. The conduit shall be circular in cross-section. The conduit shall be designated by their nominal outside diameter. The dimensional details of rigid non-metallic conduits are given in **Table-3**.
- iii. No non-metallic conduit less than 20 mm in diameter shall be used.

iv. **WIRING CAPACITY :-**

The maximum number of PVC insulated aluminium/copper conductor cables of 650/1100 V grade conforming to IS : 694-1990 that can be drawn in one conduit of various sizes is given in **table-4**. Conduit sizes shall be selected accordingly.

3.2 CONDUIT ACCESSORIES :-

- i. The conduit wiring system shall be complete in all respect including accessories.
- ii. Rigid conduit accessories shall be normally of grip type.
- iii. Flexible conduit accessories shall be of threaded type.
- iv. Bends, couplers etc. shall be solid type in recessed type of works, and may be solid or inspection type as required, in surface type of works.
- v. Saddles for fixing conduits shall be heavy gauge non-metallic type with base.
- vi. The minimum width and the thickness of the ordinary clips or girder clips shall be as per **Table-5**.
- vii. For all sizes of conduit, the size of clamping rod shall be 4.5mm (7 SWG) diameter.

4. INSTALLATION :-

1. COMMON ASPECTS FOR BOTH RECESSED AND SURFACE CONDUIT WORKS.

- i. The erection of conduits of each circuit shall be completed before the cables are drawn in.

ii. CONDUIT JOINTS :-

- a) All joints shall be sealed/cemented with an approved cement. Damaged conduit pipes / fittings shall not be used in the work. Cut ends of conduit pipes shall have no sharp edges nor any burrs left to avoid damage to the insulation of conductors while pulling them through such pipes.

- b) The Engineer-in-charge, with a view to ensuring that the above provision has been carried out, may require that the separate lengths of conduit etc. after they have been prepared, shall be submitted for inspection before being fixed.

iii. **BENDS IN CONDUITS :-**

- a) All bends in the system may be formed either by bending the pipes by an approved method of heating, or by inserting suitable accessories such as bends, elbows or similar fittings, or by fixing non-metallic inspection boxes, whichever is most suitable. Where necessary, solid type fittings shall be used.
- b) Radius of bends in conduit pipes shall not be less than 7.5 cm.
- c) Care shall be taken while bending the pipes to ensure that the conduit pipe is not injured, and that the internal diameter is not effectively reduced.

iv. **PAINTING :-**

After installation, all accessible surface of metallic accessories shall be painted.

5. **ADDITIONAL REQUIREMENTS FOR SURFACE CONDUIT WORK :-**

- i. Conduit pipe shall be fixed by heavy gauge non-metallic saddles with base, secured to suitable approved plugs with screws in an approved manner, at an interval of not more than 60 cm, on either side of couplers or bends or similar fittings, saddles shall be fixed at a closer distance from the center of such fittings. Slotted PVC saddles may also be used where the PVC pipe can be pushed in through the slots.
- ii. Where the conduit pipes are to be laid along the trusses, steel joists etc. the same shall be secured by means of saddles or girder clips as required by the Engineer-in-charge. Where it is not possible to use these for fixing, suitable clamps with bolts and nuts shall be used.

6. **ADDITIONAL REQUIREMENTS FOR RECESSED CONDUIT WORK :-**

i. **MAKING CHASE :-**

- a) chase in the wall shall be neatly made, and of ample dimensions to permit the conduit to be fixed in the manner desired.

- b) In the case of buildings under construction, the conduits shall be buried in the wall
Before plastering, and shall be finished neatly after erection of conduit.
- c) In case of exposed brick/rubble masonry work, special care shall be taken to fix the conduit and accessories in position along with the building work.

ii. **FIXING CONDUITS IN CHASE :-**

- a) The conduit pipe shall be fixed by means of staples, or by means of non-metallic saddles, placed at not more than 40 cm apart, or shall be fixed by any other approved means of fixing.
- b) At either side of the bends, saddles/staples shall be fixed at a distance of 15 cm from the center of the bends.

iii. **ERECTION IN RCC WORK :-**

- a) 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.
- b) 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 of conductors.
- c) Location of inspection/junction boxes in RCC work should be identified by suitable means to avoid unnecessary chipping of the RCC slab subsequently to locate these boxes.

iv. **FIXING INSPECTION BOXES :-**

- a) Suitable inspection boxes to the minimum requirement shall be provided to permit inspection, and to facilitate replacement of wires, if necessary.
- b) These shall be mounted flush with the wall or ceiling concrete. Minimum 65 mm Depth junction boxes shall be used in roof slabs.
- c) Suitable ventilating holes shall be provided in the inspection box covers.

v. **FIXING SWITCH BOXES AND ACCESSORIES :-**

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

vi. **FISH WIRE :-**

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

7. BUNCHING OF CABLES :-

- a) Cable carrying alternating current, installed in metal conduit, shall always be bunched so that the outgoing and return cables are drawn into the same conduit.
- b) Where the distribution is for single phase loads only, conductors for these phases shall be drawn in one conduit.
- c) In case of three phase loads, separate conduits shall be run from the distribution boards to the load points, or outlets as the case may be.

8. EARTHING REQUIREMENTS :-

- i. A protective (earth) conductor shall be drawn inside the conduit in all distribution circuits to provide for earthing of non-current carrying metallic parts of the installation. These shall be terminated on the earth terminal in the switch boxes, and/or earth terminal blocks at the DB's.
- ii. Protective conductors of large size which may not be possible to be carried inside the conduits (as in the case of some sub mains etc.) may be laid external to the conduits and clamped thereto suitably.
- iii. Gas or water pipes shall not be used as protective conductors (Earth medium).

TABLE - 3.

DIMENSIONAL DETAILS OF RIGID NON-METALLIC CONDUITS.

(All dimensions in mm)

S.No.	Nominal outside diameter (In mm)	Maximum outside diameter (In mm)	Minimum inside diameter (In mm)	Maximum permissible eccentricity (In mm)	Maximum permissible ovality (In mm)
1.	20	20 ^{+0.3}	17.2	0.2	0.5
2.	25	25 ^{+0.3}	21.6	0.2	0.5
3.	32	32 ^{+0.3}	28.2	0.2	0.5
4.	40	40 ^{+0.3}	35.8	0.2	0.5
5.	50	50 ^{+0.3}	45.0	0.4	0.6

TABLE - 4

MAXIMUM NUMBER OF PVC INSULATED 650/ 1100 VOLT GRADE COPPER CONDUCTOR CABLE THAT CAN BE DRAWN INTO RIGID PVC CONDUIT.

Nominal cross sectional area of conductor in Sqmm.	20 mm	25 mm	32 mm	40 mm
1.50	5	10	14	-
2.50	5	8	12	-
4.00	3	8	10	-
6.00	2	5	8	-
10.00	-	3	5	6
16.00	-	-	3	6
25.00	-	-	2	4

Note :-

The above table shows the maximum capacity of conduits for a simultaneous drawing of cables.

TABLE - 5.

ORDINARY CLIPS OR GIRDER CLIPS.

S.No.	Size of conduit	Width	Thickness
1.	20 mm & 25 mm	19 mm	20 SWG (0.9144 mm)
2.	32 mm & above	25 mm	18 SWG (1.219 mm)

EARTHING

1. SCOPE :-

This chapter covers the essential requirements of earthing system components and their installation. For details not covered in these specifications. IS code of Practice on Earthing (IS:3043-1987) shall be referred to.

2. INSTALLATION :-

1. ELECTRODES :-

- i. Plate electrode shall be buried in ground with its faces vertical, and its top not less than 3 m below the ground level. The installation shall be carried out as per standard drawing.
- ii. When more than one electrode is to be installed, a separation of not less than 2 m shall be maintained between two adjacent electrodes.
- iii. a) The strip or conductor electrode shall be buried in trench not less than 0.5 m deep.

b) If condition 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.
- iv. Earth Electrodes shall be kept clear of the building foundation & in no case shall it be nearer than 2 meters from the outer surface of the wall.

3. WATERING ARRANGEMENT :-

- i. In the case of plate earth electrodes, a watering pipe 20mm dia. medium class pipe shall be provided and attached to the electrodes. A funnel with mesh shall be provided on the top of this pipe for watering the earth.
- ii. The \watering funnel attachment shall be housed in a masonry enclosure of size not less than 30cm*30cm*30cm.

- iii. A cost iron/MS frame with MS cover, 6 mm thick, and having locking arrangement shall be suitably embedded in the masonry enclosure.

4. EARTHING CONDUCTOR (Main earthing lead) :-

- i. The earthing conductor shall be securely terminated on to the plate with two bolts, nuts, check nuts and washers.
- ii. A double C-clamp arrangement shall be provided for terminating tape type earthing conductor with GI watering pipe coupled to the pipe earth electrode. Galvanised "C" shaped strips, bolts, washers, nuts and check nuts of adequate size shall be used for the purpose.
- iii. The earthing conductor from the electrode up to the building shall be protected from mechanical injury by a medium class 15 mm dia GI pipe in the case of wire, and by 40 mm 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 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.
- iv. The earthing conductor shall be securely connected at the other end to the earth stud/earth bar provided on the switchboard 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.
 - c) Earthing Terminal / neutral point / earth bus in case of equipments / sub stations.

5. PROTECTIVE (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 switchboard by protective conductor(s).
- ii. Two protective conductors shall be provided for a switchboard carrying a 3 phase switch gear thereon.
- iii. All the mountings of industrial type switchboards shall be bonded to the earth stud/earth bar using a protective conductor looping from one to another. Loop earthing of individual units will not be however necessary in the case of cubical type switchboards.

- iv. The earth connector in every distribution board (DB) shall be securely connected to the earth stud/earth bar of the corresponding switchboard by a protective conductor.
- v. All metallic switch boxes and regulator boxes in a circuit shall be connected to the earth connector in the DB by protective conductor (also called circuit protective or loop earthing conductor), looping from one box to another up to the DB.
- 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 non-metallic type, these shall be looped at the socket earth terminals, switch or at an independent screwed connector inside the switch box. Twisted earth connections shall not be accepted in any case.
- vii. Double earthing strips in rising mains, bus trunking etc. shall be securely connected to the earth bar/earth stud at the sending end switchboard. In the case of overhead bus bar systems, protective conductors shall be provided in addition to feeder cable armouring connection.

6. 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.
- iii. If the earth resistance is too high and the multiple electrode earthing does not give adequate low resistance to earth, then the soil resistivity immediately surrounding the earth electrodes shall be reduced by adding sodium chloride, calcium chloride, sodium carbonate, copper sulphate, salt and soft coke or charcoal in suitable proportions.

7. MARKING: -

- i. Earth bars/terminals at all switchboards shall be marked permanently either as "E".
- ii. Main earthing terminal shall be marked "SAFETY EARTH - DO NOT DISCONNECT".

LIGHTNING PROTECTION SYSTEM

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, which suitable precautions to avoid corrosion.
- iii. The lightning conductors shall be secured not more than 1.2 m apart for horizontal run, and 1.0 m for vertical run.

2. AIR TERMINATION :-

All air terminals shall be effectively secured against overturning either by attachment to the object to be protected, or by means of substantial bracing 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.

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.
- ii.
 - a) Practical reasons may not be some times allow the most direct route to be followed. While sharp bends, such as arise at the end of a 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 can not 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 flushing :-**

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.

4. **JOINTS AND BONDS :-**

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, 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.

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 metal involved, i.e. the metal from 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 environmental.
- 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.

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.

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 station should have a resistance not exceeding the product given by 10 ohms multiplied by the number of earth electrodes to be provided their in. The whole of the lightning protective system, including any ring earth, should have a combined resistance to earth not exceeding 10 ohms without taking account of any bonding.
- iii. If the value obtained for 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 installed below ground, some time 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 electrode 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.

CABLES

1. GENERAL

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

The recommendations of the cable manufacturer with regard to jointing and sealing shall be strictly followed.

The laying of cable shall be done as per IS 1255 amended up to date.

Cable Identification

- (i) Cable identification shall be provided by embossing on the outer sheath the following:
- (ii) Manufacturer's name or trade mark
- (iii) Voltage grade
- (iv) Year of manufacture
- (v) Type of insulation
- (vi) Printing of cable length on each meter

Core Identification

Respective cores of power/control cables shall be identified with the following pattern :

- 2 core : red (R), black (BK)
- 3 core : 5 core red (R), yellow (Y),blue (BL)
- 4 core : red (R),yellow (Y),blue (BL), black (BK)
- 5 core : red (R), yellow (Y),blue (BL), black (BK) & grey (GY)
- 7&14 cores : cores shall be numbered.

Tests

- (i) Shop Tests
The cables shall be subject to shop tests in accordance with relevant standards to prove the design and general qualities of the cables as below:
- (ii) Routine tests on each drum of cables.

- (iii) Acceptance tests on drums chosen at random for acceptance of the lot.
- (iv) Type tests on each type of cable, inclusive of measurement of armour D.C. resistance of power cables.

2. MATERIAL

11 kV HT Cables

The 11 KV cable shall be cross linked polyethylene insulated, GI strip armoured, PVC inner and outer sheath (to be extruded type) earthed grade cable. The outer sheath shall be resistant to water, fungus, termite & rodent attacks. Colour of outer sheath shall be black. The cable shall be confirming to IS : 7098 (Part - II) with aluminium conductor as per I.S. 8130.

L T Power Cables

The 1.1 KV cables shall be XLPE insulated PVC sheathed aluminium conductor armoured conforming to IS : 7098 (part - 1) amended up to date or PVC insulated, extruded PVC inner sheath, steel strip armored and extruded PVC overall sheath conforming to 15:1554 (PI).as mentioned in the Bill of Quantities and drawings, laid in trenches, ducts and underground as shown on drawing or as per instruction given by engineer-in-charge.

Control Cables

Control cables shall be of stranded annealed copper conductors with cross section area of 1.5/ 2.5 sq.mm, PVC insulated, colour coded or with core identification, extruded inner sheathed, steel wire armoured and over all PVC extruded outer sheath etc. The cable shall conform to 15: 1554 (P-I).

Cable Termination

a) HT Cable Terminations

Cable termination shall be heat shrinkable type/cold shrink type suitable for sizes as specified in BOQ, XLPE insulated 11 kV (E) grade, and aluminum conductor armoured cables. Termination shall confirm to IS 3573 with latest amendment.

b) L T power, control cable termination

- (i) L T cable termination shall be provided with compression cable glands of brass suitable for holding the armour of the cable.
- (ii) Lugs shall be crimping type and shall be of copper suitable for copper conductor cable and of aluminum for aluminum conductor cable.
- (iii) Termination shall be carried out as per details furnished in this specification.

Compression Glands

Cable glands shall be made of brass casting, machined accurately to the required size with protective coating of nickel.

Cable glands shall be of heavy duty type and shall consist of: gland nipple, neoprene seal for inner sheath, armour clamping cone, gland body, neoprene seal for outer sheath, skid washer, gland body nut.

The Aluminium conductor shall be stranded, grade H4 class 2 as per IS 8130 and copper conductor shall be annealed copper class 2 as per IS 8130.

Technical data sheets for above cables, including all electrical & mechanical parameters shall be furnished with offer.

11 KV TWO POLE STRUCTURE SYSTEM

- a) Two pole structure is intended to receive 11 kV 3 Ph. 50 Hz power supply through 11 kV XLPE cable from overhead line of State Electricity Board.
- b) Two pole structure shall be fabricated from steel member and shall comprise of 11 kV Lightning Arrestors, Isolator, Drop out fuses (DO), Supporting channel, ACSR, Disk & pin insulators for cable support, Conductor, Outdoor end termination disc and pin insulators for XLPE 11 kV cable, 150 dia. GI pipe for cable protection, nut, bolts etc.
- c) All structural work shall conform to relevant Indian Standards, specifications & codes etc.
- d) Necessary guy wires shall be provided for supporting the structure (wherever required).
- e) The structure shall be painted with two coats of red oxide.
- f) Lightning arrestors shall be in single pole assembly heavy duty, station type suitable for outdoor installation & suitable to mount on steel structure.
- g) Lightning arrestors shall be adequately rated to discharge the energy of voltage surges and shall be provided complete with mounting brackets as well as line and earth connections.
- h) Lightning Arrestors shall be suitable for termination to ACSR conductor.
- i) Isolator shall be suitable to mount vertically on two pole structure
- j) Isolator shall have operating handle with locking arrangement
- k) Isolator shall have operating handle with necessary arrangement to operate the isolator from ground
- l) Isolator shall also be suitable for ACSR conductor termination
- m) Drop out fuses shall be provided of suitable rating.

11 KV HT SWITCHGEAR

1. Design Criteria

- a) 11 KV HT Panel shall be used to receive the power from SEB and to feed supply to the plant through the step down transformer.
- b) Switchgear shall be located in a clean but hot, humid and tropical atmosphere.
- c) For continuous operation at specified ratings. temperature rise of the various switchgears components shall be limited to the permissible values stipulated in the relevant standards.
- d) The switch gears and components thereof shall be capable of withstanding the mechanical forces and thermal stresses of the short circuit current listed in the annexure without any damage or deterioration material.
- e) Circuit breakers, instrument transformers, bus-bars cable compartment etc. shall be housed in separate compartment within the cubicle. The design shall be such that failure of one equipment shall not affect the adjacent units.
- f) Circuit breakers of identical rating shall be physically and electrically interchangeable.

2. Specific Requirements

a) Construction Features

- (i) The Switchgear shall be indoor, metal-clad, floor mounted, drawout type.
- (ii) The Switchgear shall be such as to allow extension at either end.
- (iii) The Switchgear enclosure shall conform to the degree of protection IP4X.
- (iv) The minimum thickness of sheet steel used shall be 2 mm.
- (v) The switchgear shall be dead-front, free standing type vertical cubicle.
- (vi) Switchgear shall have a front hinged door with latches and a removable back cover.
- (vii) All covers and doors shall be provided with neoprene gaskets.
- (viii) All relays, meters, switches and lamps shall be flush mounted on the respective cubicle door or on control cabinet built on the front of the cubicle.
- (ix) The complete structure shall be free, rigid, self supporting, free from twist and bends etc.

b) Bus and Bus Taps

- (i) The main buses and connections shall be of high conductivity aluminium / aluminium alloy, sized for specified current ratings with maximum temperature limited to 85 degree C (i.e. 35 degree Crise over 50 degree C ambient)
- (ii) Busbars and connection shall be fully insulated for working voltage with adequate phase! ground clearances. Insulating sleeves for busbars and cast-resin shrouds for joints shall be provided.
- (iii) All buses and connections shall be supported and braced to withstand stresses due to maximum short circuit current and also to take care of any thermal expansion.
- (iv) Busbars shall be colour coded for easy identification and so located that the sequence R-Y-B shall be from left to right, top to bottom or front to rear, when viewed from front of the switchgear assembly.

c) Circuit Breakers

- (i) Circuit breakers shall be triple pole, single throw and shall be Vacuum type / SF6 type.
- (ii) Circuit breakers shall be drawout type, having SERVICE, TEST and DISCONNECTED position with positive indication for each position.
- (iii) The operating time (break time) of the breaker shall be maximum of 3 cycles.
- (iv) Circuit breaker shall have motor wound spring charged trip free mechanism with anti-pumping feature and shunt trip. In addition, facility for manual charging of spring shall be provided.
- (v) For motor wound mechanism, spring charging shall take place automatically after each breaker closing operation. One open-close open operation of the circuit breaker shall be possible after failure of power supply to the motor.
- (vi) Mechanical safety interlock shall be provided to prevent:
 - The circuit breaker from being racked in or out of the service position when the breaker is closed.
 - Racking in the circuit breaker unless the control plug is fully engaged.
- (vii) Automatic safety shutters shall be provided to fully cover the female primary disconnects when the breaker is withdrawn.
- (viii) Each breaker shall be provided with an emergency manual trip, mechanical ON-OFF indication, an operation counter and mechanism charge! discharge indicator.

(ix) Each breaker shall be provided with following:

- Auxiliary switch, with 6 NO + 6 NC contacts, mounted on the drawout portion of the switchgear.
- Position/cell switch with 3NO + 1 NC contacts, on each for TEST and SERVICE position.

(x) Control & Indication:

Breaker cubicle shall be equipped with following:

- One (1) No. spring return type TNC switch for closing and tripping of the breaker.
- One (1) No. Push button operated mechanical mechanism for tripping.
- Three (5) Nos. indicating lamps on front of compartment

GREEN	Breaker Open	
RED	Breaker Closed	
AMBER	Breaker Trip	
	BLUE	Spring Charged
	WHITE	Trip circuit healthy

- Lamps shall be of LED type. Lamps and lens shall be replaceable from the front.
- Each circuit breaker shall be provided with a anti-pumping relay. Trip coil supervision relay and fast trip relay in addition to those shown in the drawing.
- Metering device and protective relays for switchgear shall be provided as shown in the attached drawings.

d) Current Transformers

- (i) Current transformer shall be cast resin type. All secondary connections shall be brought out to terminal blocks where wye or delta connections will be made.
- (ii) Accuracy class of Current Transformers shall be :
 - Class 5P20 for relaying
 - Class 1.0/0.5 as specified and ISF<5 for metering.

e) Voltage Transformers

- (i) Voltage Transformers shall be of cast-resin type having accuracy class of

1.0/ 0.5 and shall be mounted on drawout trolley.

- (ii) High voltage winding of voltage transformer shall be protected by current limiting fuse. The voltage transformer and fuse shall be completely disconnected and visibly grounded in fully draw-out position.
- (iii) Low voltage fuses, sized to prevent overload, shall be installed in all ungrounded secondary leads. Fuse shall be suitably located to permit easy replacement while the switchgear is energised.

f) Relays

- (i) Relay shall be of drawout design with built - in testing facilities. Small auxiliary relays may be in non-drawout execution and mounted with in the cubicle.
- (ii) Relays shall be rated for operation on secondary voltage and secondary currents as shown on drawings. Number and rating of relay contacts shall suit the job requirements.

g) Meters

Indicating instruments (96 x 96 mm) shall be digital meter, switch board type and accuracy class of + (1% full scale + 1 count).

h) Secondary Wiring

- (i) The switchgear shall be fully wired at the factory to ensure proper functioning of control, protection, transfer and interlocking schemes.
- (ii) Fuse and links shall be provided to permit individual circuit isolation from bus wires without disturbing other circuits. All spare contacts of relays, switches and other devices shall be wired upto terminal blocks.
- (iii) Wiring shall be done with flexible, 650V grade, PVC insulated switchboard wires with stranded copper conductors of 2.5 sq. mm for control and current circuits and 1.5 sq. mm for voltage circuits.
- (iv) Each wire shall be identified, at both ends, with permanent markers bearing wire numbers as per contractor's Wiring Diagram.
- (v) Wire terminations shall be made with crimping type connectors with insulating sleeves. Wires shall not be spliced between terminals.

i) Terminal Blocks

- (i) Terminal blocks shall be 660 V grade box-clamp type with marking strips similar to ELMEX 6 Sq. mm or equal. Terminals for CT secondary leads shall

have provision for shorting.

- (ii) Not more than two wires shall be connected to any terminal. Spare terminals equal in number to 20% active terminals shall be furnished.

j) Cable Termination

- (i) Switchgear shall be designed for cable entry from the bottom. Sufficient space shall be provided for ease of termination and connection.
- (ii) Power cables shall be XLPE insulated, armoured, overall PVC sheathed with stranded Aluminium conductor.
- (iii) Control cables shall be PVC insulated, armoured, overall PVC sheathed with 2.5 Sq. mm stranded copper conductor.
- (iv) The gland plates shall be minimum 4 mm thick. The gland plate and supporting arrangement for *IIC* power cables shall be such as to minimise flow of eddy current. In such case, gland plate shall be non ferrous metal.
- (v) Sufficient space shall be provided between the power cable termination (end-boxes) and gland plate. Core accommodated within this space.

k) Ground Bus

- (i) A ground bus, rated to carry maximum fault current, shall extend to full length of the switchgear.
- (ii) The ground bus shall be provided with two- bolt drilling with G.I. bolts and nuts at each end to receive 50 x 6 mm G.I flat.
- (iii) Each stationary unit shall be connected directly to the ground bus. The frame of each circuit breaker and drawout V.T. unit shall be grounded , through heavy multiple contacts at all times.
- (iv) Wherever the schematic diagrams indicate a definite ground at the switchgear, a single wire for each circuit thus grounded shall be run independently to the ground bus and connected thereto.
- (v) C.T. and P.T. secondary neutrals shall be earthed through removable links so that earth of one circuit may be removed without disturbing other.

l) Nameplates

- (i) Nameplates of anodised aluminum shall be furnished at each cubicle and at each instrument, device mounted on or inside the cubicle.
- (ii) Caution notice on suitable metal plate shall be affixed at the back of each vertical panel.

m) Space Heaters

Cubicle shall be provided with thermostat-controlled space heaters.

n) A.C/ D.C Power Supply

(i) The following power supplies shall be made available at each switchgear by the, contractor:

AC. Supply : Single Feeder

D.C supply : Double Feeder

(ii) Isolating switch fuse units shall be provided at each switchgear for the incoming supplies, 4- pole, single throw for A.C. and 2-pole, double throw for D.C.

(iii) Bus-wires of adequate capacity shall be provided to distribute the incoming supplies to different cubicles. Isolating switchfuse units shall be provided at each cubicle for AC & D.C. supplies.

(iv) AC. load shall be so distributed as to present a balance loading on three-phase supply system.

o) Tropical Protection

(i) All equipment, accessories and wiring shall have fungus protection, involving special treatment of insulation and metal against fungus, insects & corrosion.

(ii) Screen of corrosion resistant material shall be furnished on all ventilating louvers to prevent the entrance of insects.

p) Painting

(i) All surfaces shall be sand blasted, pickled and grounded as required to produce a smooth, clean surface free of scale, grease and rust.

(ii) After cleaning, the surfaces shall be given a phosphate coating followed by 2 coats of high quality primer and stoved after each coat.

(iii) The panels shall be finished in Siemens Grey, RAL7032 with polyester enamel paint.

3. TESTS

The switchgear shall be completely assembled, wired, adjusted and tested at the factory as per the relevant standards.

Routine Test

The tests shall include but not necessarily limited to the following:

- a) Operation under simulated service condition to ensure accuracy of wiring, correctness of control scheme & proper functioning of the equipment.
- b) All wiring and current carrying part shall be given appropriate High Voltage test.
- c) Primary current and voltage shall be applied to all instrument transformers.
- d) Routine test shall be carried out on all equipment such as circuit breakers, instrument transformers, relays, meters etc.

Type Test

Type test reports of similar switchgear shall be furnished.

Test Witness

All tests shall be performed in presence of *Owner's* representatives, if so desired by the *Owner's*. The Contractor shall given at least fifteen (15) days advance notice of the date when tests are to be carried out.

4. SYSTEM DESCRIPTION & REQUIREMENTS

System Description

a) System Details

- | | | |
|---------------------|---|-------------------------|
| (i) Voltage | : | 011/12 KV (Nom. / Max.) |
| (ii) Nos. of Phase | : | 3 |
| (iii) Frequency | : | 50 Hz. \pm 5% |
| (iv) System Neutral | : | Non effectively earthed |

b) Insulation Level

- | | | |
|------------------------------|---|------------|
| (i) 1 minute 50 Hz withstand | : | 28 KV rms. |
| (ii) Impulse withstand | : | 75 KV peak |

c) Short Circuit Rating

- | | | |
|---------------------|---|----------|
| (i) Interrupting | : | 350 MV A |
| (ii) Withstand time | : | 1 Sec. |

d) Circuit Breaker

- | | | |
|---------------------|---|---------|
| i) Breaking Current | : | 18.3 kA |
|---------------------|---|---------|

- e) Auxiliary Power supply available : 24V DC
- f) Heater/Lamp/Socket : 415V/240V±10%
50 Hz± 5% 3Ph./1 Ph.
- g) Spring wound motor for circuit breaker : 220V-240V 1 Ph. 50 Hz
- h) Shunt trip coil & Closing coil : 24V DC

TRANSFORMER

1. DESIGN CRITERIA

- a) Transformer is intended to step down incoming 11 KV power supply to 433 V for feeding power supply to 415V Main L T PCC for further distribution.
- b) Transformer shall be installed indoor in hot, humid and tropical atmosphere. All equipment, accessories and wiring shall be provided with tropical finish to prevent fungus growth.
- c) The transformer shall be capable of withstanding the short circuit stresses due to a terminal fault on one winding with full voltage maintained on the other winding for minimum period of three (3) seconds.
- d) The transformer shall be free from annoying hum or vibrations. The design shall be such as not to cause any undesirable interference with radio or communication circuits.
- e) Transformer shall be provided with **OFF LOAD TAP CHANGER** on HV side.
- f) The safety clearances of all live parts of equipment shall be as per relevant standard.

2. SPECIFIC REQUIREMENTS

a Tank

- a) Tank shall be of all welded construction and fabricated from good commercial grade low carbon steel of adequate thickness. All seams shall be properly welded. All welding shall preferably be stress relieved.
- b) The tank wall shall be reinforced by stiffener to ensure rigidity so that it can withstand without any deformation, mechanical shock during transportation and during oil filling by vacuum.
- c) Transformer tank shall be provided with one set of bi-directional flanged wheels for rolling the transformer parallel to either center line.
- d) All heavy removable parts shall be provided with eye bolt for ease of handling.
- e) Hand holes of sufficient size shall be provided for access to leads, windings, bottom terminals of bushings and taps.

b Core & Coils

- a) The transformer may be of core type. The core shall be built up with high grade, non-aging, low loss, high permeability, grain oriented, cold-rolled silicon steel laminations specially suitable for core material.
- b) The coils shall be manufactured from electrolytic copper conductor and fully

insulated for rated voltage.

- c) Insulating material shall be of proven design. Coils shall be so insulated that impulse and power frequency voltage stresses are minimum.
- d) Coil assembly shall be suitably supported between adjacent sections by insulating spacers and barriers. Bracing and other insulation used in assembly of the winding shall be arranged to ensure a free circulation of the oil and to reduce the hot spot of the winding.
- e) All leads from the windings to the terminal board and bushings shall be rigidly supported to prevent injury from vibration or short circuit stresses. Guide tube shall be used where practicable.

c Radiators

- a) Radiators shall be made from pressed steel and shall be detachable type.
- b) Radiators shall be interchangeable type. Top and bottom shut off valve shall be provided for each radiator.
- c) Each radiator shall be provided with air release plug, drain valve and lifting lugs.

d Tapings

- a) Off load taps shall be provided on the high voltage winding.

3. Insulating Oil

- a) The transformer shall be filled with mineral insulating oil suitably inhibited to prevent slugging.
- b) First filling of oil along with 10% excess shall be furnished for each transformer. Oil shall be supplied in non-returnable containers suitable for outdoor storage.

4. Terminal Arrangements

- a) Terminals on HV shall be through HT cable where as the LV side shall be through bus duct.
- b) Cable-end box shall be weatherproof, air filled type with sufficient space inside for termination and connection of cables.
- c) Cable-end box shall be furnished complete with removable gland plate.
- d) A separate LV. neutral bushing shall be provided for connection to station earthing. Necessary insulators shall be provided on transformer body for bringing down the conductor.

5. Marshalling Box

- a) A sheet steel, weatherproof, IP55 marshalling box shall be provided for each transformer. The box shall contain all auxiliary devices except those, which must be located directly on the transformer.
- b) All terminal blocks for cable connection shall be located in this box. The terminal blocks shall be Phoenix 10 sq.mm.

6. Wiring

- a) All control, alarm and indication devices provided with the transformer shall be wired upto the terminal blocks.
- b) Wiring shall be done with PVC wires in conduit or PVC armoured cable. Minimum wire size shall be 2.5 sq. mm copper. Not more than two wires shall be Connected to a terminal. 10% spare terminals shall be provided.
- c) All devices and terminal blocks within the marshalling box shall be identified by symbols corresponding to those used in applicable schematic or wiring diagram.

7. Grounding

- a) Two grounding pads, located on the opposite sides of the tank, shall be provided for connection to station ground mal
- b) Grounding pad shall have dean buffed surface with two tapped holes, M10 GJ. bolts and spring washers for connection 50 x 6 mm G.I. flat.
- c) Ground terminals shall be also provided on marshalling box to ensure its effective Earthing.
- d) Bonding shall be provided between various non-current carrying parts of transformer wherever the same are connected thru' gaskets.

8. Fittings And Accessories

Each transformer shall be equipped with fittings and accessories as listed below:

- a) Oil conservator with filter cap, drain plug and plain oil level gauge (with coloured prismatic front).
- b) Silica gel breather with connecting pipe and oil seal.
- c) Air release plugs.
- d) Pressure release device. Explosion vent, should be double diaphragm type.
- e) 150mm dial magnetic oil level gauge with low level alarm contact.
- f) 150 mm dial oil temperature indicator with maximum reading pointer and electrically separate contacts for trip and alarm.

- g) 150 mm dial winding temperature indicator with maximum reading pointer and electrically separate sets of contacts for trip and alarm.
- h) Thermometer pockets.
- i) Double float Buchholz relay with gas release cock, shut-off valve on either side and separate sets of contacts for trip and alarm.
- j) Sampling valve/ Filter valve with threaded adopted (top and bottom).
- k) Drain valve with threaded adopted.
- l) Jacking pads, handling and lifting lugs.
- m) Cover lifting eyes.
- n) Bi-directional rollers and skids.
- o) Radiators (Detachable type).
- p) Clamping devices.
- q) Two grounding pads.
- r) Remote tap changer control panel.
- s) Weatherproof marshalling box for housing control equipment and terminal connections.
- t) Rating and terminal marking plates.
- u) Neutral bushing with earthing conductor bringing down duly supported on insulators.
- v) HT cable box! L T suitable for Bus Duct connection.
- w) CTs in neutral as specified.

9. Painting

- a) All steel surfaces shall be thoroughly cleaned by sand blasting or chemical agents, as required, to produce a smooth surface free of scales, grease and rust.
- b) The internal surfaces in contact with insulating oil shall be painted with heat resistant insulating varnish, which shall not react with and be soluble in the insulating liquid used.
- c) The external surfaces, after cleaning, shall be given a coat of high quality red oxide or yellow chromate primer followed by filler coats.
- d) The transformer shall be finished with two coats of Siemens Grey (RAL 7032)

polyster enamel paint.

10. TESTS

a ROUTINE TESTS

During manufacture and on completion, all transformer shall be subjected to the IS routine tests.

b TEST WITNESS

Tests shall be performed in presence of Owner's representative if so desired by the Owner. The Contractor shall give at least fifteen (15) days' advance notice of the date when the tests are to be carried out.

c SYSTEM DESCRIPTION & REQUIREMENT

- | | | |
|--|---|-------------------------------------|
| a) Application | : | LT. Transformer. |
| b) Service | : | Outdoor/indoor, step-down. |
| c) Type | : | Oil immersed |
| d) Rated output | : | as per bill of quantities |
| e) Cooling | : | ONAN |
| f) Rated voltage (line to line) | : | 11 KV / 0.433 KV. |
| g) Number of phases | : | 3 |
| h) Rated frequency | : | 50Hz. |
| i) System fault level at 11 KV | : | 350 MV A |
| j) Temperature rise above 50 Deg. C | | |
| i) In oil by thermometer | : | 45 deg. C. |
| ii) In winding by resistance | : | 50 deg. C. |
| k) Insulation level on HV side | : | 75/28 KV (peak rms) |
| l) Vector group | : | Dyn 11 |
| m) Type of Radiator | : | Detachable type |
| n) Type of taps provided | : | Off Load |
| o) Taps provided on | : | HV. Winding. |
| p) Range of taps | : | + 10% and -15% in total of 15 steps |
| q) Percentage impedance at 75deg.C on full load. | : | 6% |
| r) Method of tap changer control | : | a) Manual Mode |

- b) Electrical Local
- c) Electrical Remote

s) Terminal Connection

HV Cable end box suitable : XLPE cable

for LV Terminal box suitable for : XLPE Cable

t) Additional Neutral Bushing for Earthing. : 1 No.

v) Full load Losses : 12.0 KW *(Maximum)

w) No Load Losses : 1.75 KW * (Maximum)

* Transformers having losses more than specified above are not acceptable.

DESIGN CRITERIA OF 415V L T PANEL

- a) One nos. transformers of 1000 KVA each and two DG sets of 200 KVA each have been envisaged to cater the campus loads.
- b) Generally in normal condition, Transformer shall feed power to Main L T Panel with bus coupler in open condition.
- c) As long as SEB power supply shall be available, the whole plant load shall be fed through Transformers.
- d) There shall be two positions selector switch (Auto/ Manual) on each breaker of L T panel
 - (i) In Auto Mode: Closing/ switching off of breaker shall be automatic.
 - (ii) In Manual Mode: Closing/switching off of breaker shall be manual through TNC switch, located on breaker panel.
 - (iii) In no condition, two different supplies shall get paralleled.
- e) There shall be three positions selector switch (Auto/test/Manual) on each DG set breaker panel
 - (i) In Auto Mode of breaker panels:
All operation i.e. starting of required DG set, their parallel operations, load sharing (Active/Reactive), outgoing breakers closing, switching off breakers on power resumption, switching off DG sets etc. shall be totally automatic.
 - (ii) In Manual Mode of breaker panels
All operation defined above shall be manual.
 - (iii) In test mode of DG power Panel
It shall be possible to check the system without energizing its breaker.
- f) In case of failure of power, following shall happen:
(If selector switches of breakers of L T panel & breakers of DG power panel are kept on Auto Mode).
 - (i) DG sets shall be started automatically (Based on load requirement) one by one.
 - (ii) DG set shall get paralleled automatically. Their breakers of DG synchronization panel (whatever is required) shall get closed on parallel operation.
 - (iii) Outgoing breakers of DG Synchronization panel shall get closed automatically
 - (iv) At Main L T panel side, respective breaker from transformer supply shall open out and breakers from D G supply shall get closed automatically.
 - (v) DG Sets shall share active / reactive load automatically.

- g) On resumption of power, following shall happen: (if selector switch of breakers of LT panel & breakers of DG Power Panel are kept on Auto mode)
- (i) An Alarm shall be sounded for resumption of power for a fixed duration.
 - (ii) First one outgoing of DG Panel shall be switched off and through reducing the load of DG Sets.
 - (iii) After some time, second outgoing breakers shall be switched off.
 - (iv) Breakers from D G supply on Main Panel shall get switched off automatically.
 - (v) Subsequently breakers from Transformer supply shall be switched ON automatically.
 - (vi) DG sets shall run on NO Load for the prescribed time before they are switched off.
- i) Main L T Panel shall receive power supply from transformer through cables & DG synchronization panel through cables and shall feed power supply various feeders / services
- j) Further power distribution shall be as indicated in the enclosed single line diagram.
- k) Operating height of boards shall be limited within 350 mm to 1900mm from floor level.
- l) The type and rating of the Panels covered herein shall be as follows:
- | | | |
|---------------------|---|---------------------------|
| System voltage | : | 415V |
| System Frequency | : | 50 Hz |
| No. of phases | : | 3 Phase (4 wires) |
| Busbar rating | : | As specified in drawings. |
| High voltage Test | : | 2.5KV for 1 minute. |
| Degree of Enclosure | : | IP52 (as per IS 2147) |
- m) All switchgear and its components provided in the panel shall have same fault withstand capacity as indicated for bus bar in single line diagram.

L. T. PANEL

1. CONSTRUCTION FEATURES

- a) Panels shall be indoor, metal clad, modular construction, fix type (except circuit breaker cubicles) air insulated and floor mounted type.
- b) Unless otherwise mentioned, panels shall be of single front construction and shall be of dead front type.
- c) All panels shall be extensible on both sides.
- d) All panels shall be dust proof and vermin proof.
- e) The panels shall have horizontal Busbar Chamber at top of the panel even for top cable entry.
- f) All panels shall have provision for cable entry from top or from bottom or both as required. The same shall be confirmed to the Vendor during detailed engineering ! approval of shop drawing of panel manufacturer.
- g) All panels including capacitor panels shall be fully compartmentalized with metal! insulating partitions between individual compartments.
- h) The Horizontal busbar chamber shall be separate & totally enclosed.
- i) Minimum thickness of CRCA MS sheet member shall be 1.6 mm for non load bearing members and 2.0 mm for load bearing members.
- j) All panels shall comprise a continuous line up of dead front, free standing vertical sections. The installation of circuit breakers shall be limited to the bottom two tiers only. In two tiers formation two nos. of upto 1000 Amp. breakers can be provided.
- k) All doors and cutouts shall be provided with neoprene gaskets.
- l) The back doors of the panels shall be double door leaf type where the panels have more than 400 mm width.
- m) Strong concealed type hinges shall support all doors.
- n) All relays, meters, and switches etc. shall be flush mounted type.
- o) All incoming terminals shall be provided with shrouds. Support shrouds shall be transparent and shall be made of SMC/DMC material. However Bakelite/Hylam material is not acceptable and shall not be used any where in panels.
- p) The complete structure shall be rigid, self-supporting free from vibration, twists and bends etc.
- q) The panels housing circuit breaker feeders shall be in single front draw out

execution. The incoming & bus coupler circuit breaker feeders shall be in single tier formation while the outgoing circuit breaker feeders may be in double tier formation, unless otherwise specified.

- r) A suitable barrier shall be provided between the circuit breaker and the associated control.
- s) The number of modules shall be so decided that the cable alleys are not over crowded. However the number of module in any panel shall not exceed six. The minimum size of module shall be 300mm and 225mm for starter and switch fuse / MCCBs feeders respectively. The minimum clear width of cable alley shall be 300mm.
- t) In cable alley, outgoing terminals shall be identified with feeder number.

2 BUS AND BUS TAPS

- a) The main buses and connection shall be of high grade of aluminium bus bars conductivity aluminium 1 aluminium alloy (Grade EC-91 E), sized for specified current ratings with max, temp. limited to 85 deg.C (35 deg. above 50 deg. ambient temp.).
- b) Vertical bus bars shall be designed depending upon the actual feeder requirement. Bimetallic connector shall be provided for connection between dissimilar metals.
- c) Busbars and connections shall be fully insulated for working voltage with adequate phase to ground clearances. Insulating sleeves for Bus bars and shrouds for joint shall be provided. Minimum clearance of 25 mm is required between phases and between phase & earth.
- d) Shrouds for busbars joints tapping points shall be of fiber glass only. Bus insulators shall be flame retardant, track resistant type with high creepage surface and of non-hygroscopic material such as epoxy SMC DMC.
- e) Busbars shall be supported and braced to withstand the stresses due to max. short circuit current and also to take care of any thermal expansion. .
- f) The busbar size shall be of similar size as of busduct.

3 CHANGEOVER SWITCHES

- a) Changeover switches shall be 4 pole, heavy duty, group operated load break fault make type with AC 23A duty.
- b) The switches shall be capable of successfully withstanding the thermal stress for one sec. caused by the short circuit corresponding to the fault level specified.
- c) The switches shall be able to withstand mechanical stresses caused by the peak

short circuit currents corresponding fault level specified.

- d) The switches shall be provided with operating handle compartment door and shall be so interlocked that on the hinged compartment door and shall be so interlocked that :
 - i) The door can be opened only when the switch is in OFF position.
 - ii) It shall not be possible to close the switch when the door is open.
- e) The switch shall be provided with pad-locking arrangement for 250A and above rating.
- f) The switch shall be provided with defeat interlock facilities.

4 FUSES

- a) All fuses shall be HRC cartridge link type.
- b) The fuses shall be provided with visible indication when they have operated.
- c) Rating of the fuses shall be so chosen so as to have co-ordination with switch. Fuses shall preferably mounted directly on plug in type fuse bases & sufficient number of insulated fuse pullers shall be supplied.
- d) Fuses and links functionally associated with the same circuit shall be mounted side by side.

Earthing and neutral links in main supply circuits shall be of silver plated copper & of bolted pattern.

5 CONTACTORS

- a) Contactors shall be of double break, single throw and electromagnetic and non-gravity type.
- b) Contactors shall be suitable for interrupted duty and shall be rated for class AC-3 duty.
- c) Main contacts of contactors shall be silver faced.
- d) Operating coils of contactors shall be suitable for operation on 220/240V AC, 1 phase, 50 Hz supply.
- e) Contactors shall be provided with at least two pairs of 'NO' and 'NC' auxiliary contacts.
- f) Contactors shall not drop out at voltages down to 70% of coil rated voltages and min. pick up voltage shall be 85%.

6 OVERLOAD RELAYS

- a) Overload protection for each motor feeder (wherever required) shall be provided by thermal overload relay on each of the three phases.
- b) The relay shall be duly compensated against fluctuations on ambient temp. and frequency and shall have single phasing preventer feature.
- c) Relay shall be hand reset type from the front of the cubicle door.

Overload relay for fan applications shall be of heavy duty type with provision of bypassing the same during starting of the fan.

7 CAPACITORS

- a) The capacitor shall be of mixed dielectric type rated for 440Volts. Capacitors shall be provided with discharge resistors. The value of discharge resistors should be such that the residual voltage be less than 50V in one minute.
- b) Capacitors shall be suitable for prolonged operation at an rms. voltage between terminals not exceeding 1.10 times the rated voltage, excluding transients.
- c) Capacitors shall be suitable for continuous operation at an rms. line current not exceeding 1.30 times the current which occurs at rated sinusoidal voltage and rated frequency excluding transients.
- d) The maximum continuous reactive output of a capacitor (including any due to flow of harmonic currents) shall not exceed 30% over rated reactive output of a capacitor.
- e) Loss in the capacitors shall be kept as low as possible. (Max. 0.5W/KV AR).
- f) Wherever capacitor consists of several elements inside the units, each element shall be provided with individual fuses, so that the unit need not be discharged or disconnected (although with moderate reduction in output), if one of short circuit to any of the elements.

8 AUTOMATIC POWER FACTOR CONTROL RELAY

- a) Automatic Power factor control relay (APFCR) shall operate its auxiliary relay by sensing the power factor of the plant thru' current and voltage signals.
- b) APFCR shall have no. of steps specified in drawings.
- c) APFCR shall be provided with Built in PF meter (0.5 lag to 0.5 lead), calibrated setting dial.
- d) APFCR shall be suitable for 5A secondary current.
- e) APFCR shall be suitable for flush mounting in capacitor panel/MCCs.

- f) Current rating of its auxiliary relay shall be compatible with switching and continuous energization of main contactor of capacitors. Otherwise, additional relay shall be provided.

9 COOLING

- a) All the Capacitor Panels shall be properly ventilated. If required a small exhaust fan of suitable rating shall be provided on the rear door of the panel, with the opening properly covered with fine wire mesh. The fan shall start/stop automatically along with normal start/stop provision.
- b) Louvers shall be provided on the door on rear side with a fine wire mesh.

10 CURRENT TRANSFORMERS

- a) Current Transformers shall be cast - resin type .All secondary connections shall be brought out to terminal blocks where connection will be made.
- b) Accuracy class of the current transformers shall be:
 - (i) Class 5P20 for protection.
 - (ii) Class 1.0 for metering.
 - (iii) Class PS for differential Protection & REF.
- c) Current transformer shall be provided with test links and shorting on both secondary leads for setting purpose.
- d) All current transformers shall be earthed by a separate earth link on terminal blocks.
- e) Additional nameplate of CTs/ PTs shall be provided (if required) at such a place that it shall be possible to find out details of CTs/ PTs after mounting in the panel.

11 VOLTAGE TRANSFORMERS

- a) Voltage transformers shall be cast-resin, fixed type and shall have an accuracy class of 1.0.
- b) Low voltage fuses, sized to prevent overload, shall be installed in all ungrounded secondary leads. Fuses shall be suitably located to permit easy replacement while the board is energized.

12 RELAYS

Relays wherever provided shall be of draw-out design with built-in testing facilities. Small auxiliary relays may be in non-drawout execution-.

13 CONTROL AND SELECTOR SWITCHES

- a) Control and selector switches shall be of rotary type having enclosed contacts, which are accessible by the removal of cover.
- b) Control and selector switches shall be of flush mounted type and on front of panels. .
- c) Selector switches shall be of stay-put maintained contact type.
- d) Control switches shall be provided with escutcheon plate clearly marked to show the position.

14 INDICATING METERS AND INSTRUMENTS

Indicating instrument (96 x 96 mm) shall be digital meter, switch board type and accuracy class of 1 (1 % full scale \pm 1 count).

15 INDICATING LAMPS

- a) Indicating lamps shall be of LED type, low watt consumption and provided with appropriate value of resistors. The LEDs shall also have an in-built surge suppressor.
- b) Bulbs and lenses shall be interchangeable and easily replaceable from the front of the panel.

16 PUSH BUTTONS

- a) All push buttons shall be of the push to actuate the contact type.
- b) All push buttons shall be oil tight and shall be provided with adequate no. of contacts.

17 POWER AND CONTROL CABLE TERMINATION

- a) Suitable supporting arrangement shall be provided for all power and control cables entering the panel.
- b) Removable undrilled gland plate of 3 mm thick of MS for multicore cables and 4mm thick of Aluminium for single core cables sufficient in size to accommodate all compression type, heavy duty brass glands shall be provided.
- c) Adequate termination arrangement shall be provided for all power cables which shall be aluminium / copper conductor, PVC insulated, sheathed, armoured PVC sleeved overall, heavy-duty cables, 1.1 KV grade. Power cables termination shall be by means of crimping type lugs on conductor cables.
- d) The terminal blocks shall be bolted lug type for cables. These shall be protected type and rated for 1100 Volts service. The minimum current rating of terminal block shall be 16 Amp. The construction shall be such that after the connection

of cable by means of lugs, necessary clearance and creepage distance are available.

- e) Wherever there is more than one equipment connected on the same feeder, separate terminals shall be provided.

18 INTERNAL WIRING

- a) All internal wiring shall be carried out with stranded copper conductors, PVC insulated, 1100/650 V grade.
- b) Min. size of conductor for power wiring shall be 2.5 sq.mm, 1.5 sq.mm for AC control wiring and 4.0 sq.mm. for DC control wiring. Current transformer secondary wiring shall be with 2.5 sq.mm conductor.
- c) All wiring shall be run on the sides of the panels and shall be neatly bunched and shall not affect access to equipment mounted in the panels.
- d) Wiring shall be terminated on terminal blocks using crimping type lugs and without joints or tees on their runs.
- e) Power wiring shall be done either by phase identifying coloured wires or suitably coloured PVC sleeves shall be provided at each end of wire.

The following wiring codes shall be used.

Instrument Transformer : Red, yellow or blue depending upon phase with which wire is associated.

A-C phase wire : White

A-C Neutral wire : Black

Earth connection : Green

- f) PVC identification ferrules, yellow colour with black engraved letter shall be provided at each end of all control wires marked to correspond with equipment designation & termination numbers.
- g) Ferrules provided shall be oil tight and numbered from left to right.

19 TERMINAL BLOCKS

- a) Terminal blocks for control wiring shall be 650V grade 10 sq.mm size.
- b) Terminal blocks shall be grouped depending on circuit voltage. Different voltage groups of terminals blocks shall be segregated.
- c) Terminal blocks shall be numbered for identification and provision shall be provided for terminal labels.
- d) Terminal blocks requiring duplication shall be provided with solid bonding links.
- e) Terminal blocks for current transformer secondary lead wires shall be provided

with shorting, disconnecting / earthing facilities.

- f) Terminal blocks and control wiring shall be so arranged that only one conductor of external wiring required to be terminated in at each terminal.

20 GROUND BUS

- a) A ground bus, rated to carry maximum fault current, shall extend to full length of the panel.
- b) The ground bus shall be provided with two-bolt drilling with GJ. bolts and nuts at each end to receive 75X 10 mm G.I. flat. .
- c) Each stationary unit shall be connected directly to the ground bus. The frame of each circuit breaker and shall be grounded through heavy multiple contacts at all times.
- d) Wherever the schematic diagrams indicate a definite ground at the switchgear, a single wire for each circuit thus grounded shall be run independent to the ground bus and connected thereto.
- e) C.T. shall be earthed through removable links so that earth of one circuit may be removed without disturbing other.
- f) Frames and non current carrying metal parts of all equipment mounted shall be effectively to earth bus.
- g) All hinged doors shall be connected to earth bus by flexible tinned bare copper wire.
- h) Instrument and relay cabinets shall be connected to earth by 2.5 sq.mm stranded copper insulated wire 1100 V grade.

21 SPACE HEATERS

Each cubicle shall be provided with thermostat controlled space heaters.

22 AC/DC POWER SUPPLY

- a) The panels shall be suitable to receive following power supplies.
AC Supply : Single Feeder
DC Supply : Double Feeder
- b) Isolating switch fuse units shall be provided at each switchgear for the incoming supplies, 4-pole, single throw for AC.
- c) Bus-wires of adequate capacity shall be provided to distribute the incoming supplies to different cubicles. Isolating switch-fuse units shall be provided at each cubicle for AC supplies.
- d) AC load shall be so distributed as to present a balance loading on three phase

supply system.

23 NAME PLATES

- a) Name plates of anodized aluminium shall be furnished at cubicle and at each instrument, device mounted on and inside the cubicle.
- b) Caution notice on suitable metal plate shall be affixed at the back of each vertical panel.
- c) Name plates for feeders shall be provided on front and back of the panel.

24 TROPICAL PROTECTION

- a) All equipment, accessories and wiring shall have fungus protection, involving special treatment of insulation and metal against fungus, insects and corrosion.
- b) Screens of corrosion resistant material shall be furnished on all ventilating louvers to prevent the entrance of insects.

25 PAINTING

- a) All surfaces shall be sand blasted, pickled and grounded as required to produce a smooth, clean surface free of scale, grease and rust.
- b) After clearing, the surfaces shall be given a phosphate coating followed by 2 coats of high quality primer and stoved after each coat.
- c) The panels shall be finished with two coats of Siemens Grey (Shade RAL 7032) powder coated / Polyester enameled.

26 TESTS & INSPECTION

- a) The following routine and acceptance tests shall be carried out during final acceptance list.
 - i) Mechanical operation test.
 - ii) Electrical operation test.
 - iii) High voltage test on power circuits.
 - iv) High voltage test on control circuits.
 - v) Millivolt test on the circuit breakers.
 - vi) Millivolt Drop test on Busbar joints
- b) All tests shall be performed in the presence of Owner's representative, if so desired by the owner. The contractor shall give at least 15 days advance notice of the date when tests are to be carried out.
- c) Contractor shall furnish test certificate indicating that equipment has been tested by their quality control department for compliance of technical specification and

approved drawings. The same shall be forwarded to owner! consultants along with inspection call.

- d) These inspections shall however, not absolve the vendor from the responsibility for making good any defect with may be noticed subsequently.
- 27. The bank at its discretion may purchase light fixtures and supply it to the contractor for installation. Contractor cannot claim any compensation for supply of fixtures by the bank.

BATTERY & BATTERY CHARGER

1. BATTERY

General

- a) The battery shall be maintenance free type
- b) The plates shall be designed for maximum durability during all service conditions including high rate of discharge and rapid fluctuation of load.

2. BATTERY CHARGER

General

- a) The charger shall be natural air cooled, solid state type with full wave, fully controlled, bridge configurations.
- b) The charger shall be provided with automatic voltage regulation, current limiting circuitry smoothing filter circuit and soft start feature.
- c) Voltage control shall be step-less, smooth and continuous.
- d) The charger shall be self-protecting against all A-C and D-C transients and steady state abnormal currents and voltages.
- e) Voltage setters shall be provided for setting the output of float boost charge. Setting shall be independent of each other so that setting of one voltage shall not require resetting other.
- f) There shall be separate transformers for float and boost charger.
- g) Charger A-C input and D-C output shall be electrically isolated from each other and also from panel ground.
- h) Isolation shall also be provided between power and control circuits.
- i) Batteries shall also be housed into the Battery Charger cubical.

Construction

- a) The charger shall be freestanding, floor mounted with sheet steel enclosure with all access from the front.
- b) The panel shall conform to the degree of protection IP 42. Minimum thickness of sheet metal used shall be 2 mm.
- c) Access door shall be with concealed hinges and neoprene gaskets. Ventilating louvers shall be covered with fine wire mesh.
- d) All equipment within the panels shall be arranged in modular units and laid out

with sufficient space for easy maintenance.

- e) Switches, meters, relays etc. shall be flush mounted on the front of the panels. Nameplates of approved size and type shall be provided for all circuits and devices.

Charger Equipment

- a) All power diodes and control rectifiers shall be silicon type. Rectifier Transformer shall be dry type, double wound, with copper conductor and class B insulation.
- b) Blocking diodes shall be fully rated and redundant so that failure of a single diode shall not incapacitate the system in any way.
- c) Isolating switches shall be heavy duty, load break type, operated by an external handle with provision for padlocking in ON and OFF position.
- d) Changeover switch shall be 3 position, 4 pole, load break type with 2 NO + 2 NC auxiliary contacts.
- e) Contactor shall be air-break type with thermal overload relays having in built single phase preventor.
- f) Fuses shall be HRC type and arranged for easy replacement. Semi conducting device fuses shall be fast-acting.
- g) Indicating lights shall be low-watt filament type with series resistor. Both lamp and lens shall be replaceable from front.
- h) Meters shall be 96 x 96mm switchboard type, 250 deg. scale, antiglare glass, :!: 2% accuracy with zero adjuster on the front.

Alarms

- a) One (1) ten-points alarm facia shall be provided on charger panel, complete with proper actuating devices, circuitry and legends.
- b) The arrangement shall be such that on occurrence of a fault the corresponding window will light up and stays lighted until the fault is cleared and reset button is pressed.
- c) Each time a window lights up, a master relay will get energized to provide group alarm signals for Owner's remote panel.
- d) Following minimum annunciation shall be provided:
 - i) A. C. Supply failure *
 - ii) D. C. Voltage low *
 - iii) D. C. Voltage high *
 - iv) D. C. System ground *

- v) Charger overload *
 - vi) SCR fuse blown
 - vii) Filter fuse blown
 - viii) D. C. Output fuse blown
- e) Alarm points marked with an asterisk (*) shall have electrically separate spare set of contacts wire_ up to the terminal block for Owner's use.
- f) Alarm contacts shall be rated 2A at 24V D. C. And 5A at 240V A.C.

Outgoing Feeders

- a) Each Outgoing feeder shall be provided with double pole switch and with HRC fuses.
- b) Outgoing feeders shall be located in separate module forming part of charger panel with separate cable alley for terminated outgoing cable.

Lamp / Space Heaters / Receptacles

- a) The charger panels shall be provided with :
 - Internal illumination lamp with door switch.
 - Space heater with thermostat control.
- b) Lamp, heater circuits shall have individual switch fuse units.

Wiring / Cabling

- a) The panels shall be completely wired-up. All wiring shall be routed through wiring troughs. Wires shall be ferruled at both ends for identification.
- b) Panels shall have removable gland plates at the bottom for cable entry. All incoming / outgoing cables shall be terminated in suitable terminal blocks.
- c) Control terminal blocks shall be box-clamp type ELMEX 10 Sq. mm or approved equal.

Grounding

- a) The charger panels shall be fully rated ground bus with two ground terminals, one at each end.
- b) Each terminal shall comprise two-bolt drilling with M10 G.I. bolts and nuts to receive Owner's ground connection of 50 x 6 mm G.I. flat.

Tropical Protection

- a) All equipment accessories and wiring shall have fungus protection, involving

special treatment of insulation and metal against fungus, insects and corrosion.

- b) Screens of corrosion resistant material shall be furnished on all ventilating louvers to prevent the entrance of insects.

Painting

- a) All surfaces shall be sand blasted, pickled as required to produce a smooth, clean surface free of scale, grease and rust.
- b) After cleaning, the surfaces shall be given a phosphate coating followed by 2 coats of high quality primer and stoved after each coat.
- c) The panels shall be finished in powder coated Siemens Grey, RAL7032 ..

Tests

- a) All equipment and components there of shall be subject to shop tests as per relevant IS standards. The tests shall included but not limited to:
- b) Tests on battery charger.
- Dielectric tests.
 - Voltage regulation check from 0 to 100% load with $\pm 10\%$ input voltage variation.
 - Ripple content measurement.
 - Heat run test on current limiting value.

Test Witness

All tests shall be performed in presence of Owner's representatives, if so desired by the Owner. The contractor shall give at least fifteen (15) days advance notice of the date when tests are to be carried out.

3. REQUIREMENT

Battery

- i) Type : Lead Acid
- ii) Nos. of Cells per Battery : 12
- iii) Battery nominal voltage : 24 V
- iv) Ten hour rating to : 300 AH
1.85 Volt/Cell at 27 deg. C.

Battery Charger

- i) Charger : Float & Boost
- ii) Type : Solid state, rectifier
- iii) Rating : 40A
- iv) A.C. Input Supply : 415V, 3ph,4 w/230V, 1Ph.,

50Hz.,

- v) Ripple content in charger DC output
- vi) Outgoing feeders - 12 Nos :

2 wire.

: $\pm 1\%$

Each consisting of double pole
MCB of 32A.

DIESEL GENERATING SET
(Radiator Cooled)

1.0 ENGINE

1.1 GENERAL

- a) Engine shall be internal combustion type, multistroke, multi-cylinder, V type, turbo charged after cooled, suitable for High Speed Diesel Fuel
- b) The engine shall be capable to run on 10% overload for 1-hour duration in every 12 hours of service as per ISO regulations.
- c) The engine shall be directly coupled with the generator set.
- d) The engine shall be designed to have provision for easy maintenance, overhaul, cleaning, inspection & replacement of parts.
- e) The engine shall be of similar design and shall permit interchangeability of parts among various units.
- f) All parts subjected to substantial temperature variations shall be designed & supported to permit free expansion and contraction without resulting in leakage, excess of clearance, harmful distortion or misalignment.
- g) Vibration, noise, mechanical, thermal stresses & exhaust gas conditions shall be not exceed the permissible or acceptable limits of the guiding standards / codes.
- h) DG Sets and its governor / A VR shall be suitable for auto parallel operation. However **Governor** shall be electronics type

1.2 COOLING

- a) The engine cooling shall be done through a closed loop forced circulation system. Engine driven pumps shall be used to circulate the primary cooling water through the cylinder jackets, charge air cooler, lube oil cooler, valves, cylinder block and other water cooled moving parts.
- b) Thermostat, temperature gauge, with high temperature alarm trip shall be provided in the control circuit.

- c) Secondary cooling shall be through radiator.

1.3 LUBRICATION

- a) The engine lubricating oil system shall comprise an engine driven pump complete with oil coolers, duplex oil filters, strainers etc. Priming pump if required shall also be provided.
- b) Lubricating system shall also consist of pressure gauge, temperature and oil level indicators, pressure switch for "oil pressure low" alarm for interlock and alarm along with necessary piping, fittings, valves etc.

1.4 FUEL SYSTEM

- a) Engine shall be suitable to run on High-Speed Diesel fuel.
- b) The fuel oil system of the engine shall be direct injection type provided with fuel piping, governor injectors, shutdown valve with fuel strainer and filters.
- c) Fuel day tank of suitable capacity for each DG set shall be provided with stand, level gauge, valve and complete piping up to engine.

1.5 ASPIRATION AND EXHAUST

- a) Engine shall be turbo-charged radiator cooled. Air intake shall be provided either with dry type replaceable filters or oil bath type filters. Air cleaner assembly shall also have service indicator.
- b) Exhaust manifold and exhaust pipe shall be suitably legged with asbestos rope. Exhaust system shall be insulated and shall be fitted with bellows type coupling and supported suitably with anti vibration spring mountings.
- c) Silencer shall be of the residential type.
- d) The height and size of the exhaust hooks shall be fixed considering the emission of gases and the environmental law of Government of India and the local authorities.
- e) The noise level and gas emission temperature and volume shall be as per relevant standards.

1.6 STARTING SYSTEM

- a) Engines shall be started with 24 volts starter motors.
Charging of battery shall be through panel-mounted static Battery charger. AH rating of Battery shall be suitable for three successive starts of DG Set, and control supply of DG panel completes with battery leads etc.

1.7 ENCLOSURE

- a) The complete DG Set shall be housed in a sheet steel enclosure with suitable acoustic system to reduce the noise level.
- b) The enclosure shall also be provided with Air Cooling System to maintain the temperature of the Engine.
- c) Enclosure shall have necessary doors for maintenance of Engine / Alternator.
- d) Enclosure shall also be provided with Fuel Tank.
- e) Side walls of enclosure shall be fabricated from 1.6 mm CRCA sheet and shall be filled with 100mm thick acoustic material having 96 Kg/m³ density which should be then be covered with fibre cloth/ tissue paper and finally with perforated MS Sheets.
- f) The D.G. chamber shall be fitted with internal lighting system for ease of maintenance.
- g) Residential type silencer shall be provided and shall be isolated from main D.G. chamber to avoid excess heat in genset operational area.
- h) Air inlet and outlet space should be provided with sound dampers.
- i) Enclosure shall level the Noise Level to 68-72 dBA or as per DPCC norms (what ever is lower).

2.0 ALTERNATOR

2.1 General features of the alternators shall be as follows:

- Capacity : As per BOQ at 0.8 PF, 415V, 3 Ph. 50 Hz.
- Voltage : 415V, 3 Phase, 4 wire, 50 Hz.

Speed : 1500 rpm
Enclosure : IP23
Insulation : "H"
Temp. Rise : "H"
Excitation : Separately-excited (PMG), self regulated with brushless system and static voltage control unit suitable to maintain terminal voltage constant at all loads. The voltage control unit to be provided with facility for adjusting the output voltage ($\pm 5\%$ of rated voltage).

- 2.2 Alternator winding shall have 2/3 Pole pitch winding to take care of heating due to "Harmonics" in the system.
- 2.3 Damper winding shall be provided to assist parallel operation of Alternators. The damper bars of copper brazed to heavy copper and connector shall be located in semi-closed circular slots situated in the pole faces.
- 2.4 The generator shall be capable of delivering rated output at rated p. f. with:
- a) The terminal voltage shall not differ by more than $\pm 0.5\%$ of set value of terminal voltage.
 - b) The frequency shall not differ by more than $\pm 4\%$ of rated value.
- 2.5 The Generator shall withstand 10% overload for 1 hour at every six hours.
- 2.6 Transient Voltage Dip shall not be more than 14% on application of full load at rated power factor.
- 2.7 The Generator shall be capable of withstand minimum 25% unbalance load of its rated load without exceeding the current in any of the phases beyond full load current.
- 2.8 Alternator winding shall be suitable to take minimum 70% Thyristor load of rated capacity.
- 2.9 Anti Condensation heater of 240V, 1 Ph, 50Hz shall be provided with thermostat control switch.
- 2.10 All alternators shall be suitable for paralling operation

3.0 LIST OF FITTINGS & ACCESSORIES

Following Accessories shall be provided with DG Set.

3.1 WITH ENGINE

- a) Tachometer with hour meter
- b) Flywheel
- c) Flexible coupling with guard
- d) Electronics Governor
- e) Electronic control panel (ECP)
- f) Radiator for cooling
- g) Corrosion resistor
- h) Heat Exchanger
- i) Air cleaner
- j) Turbo charger
- k) Fuel pump
- l) Fuel Tank for 990 lts. with low level alarm switch
- m) Fuel/lube oil filter
- n) Air intake manifold
- o) Residential type silencer
- p) Exhaust pipe with asbestos, vibration isolators (if required), rain water hood
- q) Exhaust manifold
- r) Anti vibration pads
- s) Engine mounted instrument panel with control key switch and gauges for
 - i) Lube oil pressure
 - ii) Cooling water temperature
- t) Starter Motor
- u) Speed switch
- v) Lube oil pressure switch for low pressure

3.2 WITH ALTERNATOR

- a) Terminal box suitable for cable connection.
- b) Space Heater
- c) Energy meter to record DG power consumption (as per requirement of PWD).

3.3 24V LEAD ACID BATTERIES

Suitable for 3 starts of engine and for control of DG Set.

- 3.3.1 Master Engine control switch.
- 3.3.2 Engine Running Hour Meter & Engine operation counter.

ERECTION & COMMISSIONING

1.0 GENERAL

1.1 EQUIPMENT ERECTION

- a) The equipment in disassembled condition shall be received at site by the contractor.
- b) The contractor shall unpack, assemble all parts, mount and wire up loose equipment, fitting and accessories and complete all connections.
- c) The contractor shall mount the equipment on respective foundation/ supports, level & align the same & arrange for necessary grouting/anchoring.
- d) The erection work shall be carried out in compliance with manufacturer's instruction and shall include all adjustments, checks and measurements.
- e) The contractor shall record results of all erection tests and measurements and furnish copies of the same to the owner for his reference and record.
- f) Any internal wiring of the equipment, which has been left incomplete because of shipping, split or which requires minor modifications shall be carried out by the contractor. This includes mounting of items like relays, meters etc. and connecting the same as per wiring scheme diagram furnished by the original manufacturers.

1.2 CONSUMABLES AND HARDWARE

The contractor shall furnish all erection materials, hardware and consumables required for the completion of the installation. The materials shall include but not limited to the following:

- a) Consumables : welding rods & gas, oil & grease, cleaning fluids, paints, electrical tape, soldering materials etc.
- b) Hardware : bolts, nuts, washers, screws, brackets, supports, clamps, hangers, saddles, cleats, sills, shims etc.
- c) Materials : junction boxes, terminal blocks, connectors, ferrules, lugs, brass glands, rigid/flexible conduits, cables, ground wires etc.

Supply of cement, sand, stone etc. required for the execution of the contract shall be responsibility of the contractor.

1.3 ERECTION TOOLS & TACKLES

- a) The contractor shall provide all tools, tackle, implements, module equipment such as chain pulley block, trailers etc. which are required for transportation, handling and erection of equipment.

- b) Special erection tools, if any, furnished by the Manufacturer along with the equipment may be used by the contractor. such tools and equipment, however, shall be returned in good working conditions to the owner on completion of the job.
- c) The contractor shall also arrange for major testing equipment as list below:
- Insulation Tester : Motor operated Megger 1000V & 10KV grade.
Hand operated Megger 1000V.
 - Hand driven earth resistance megger, range 0-1/3/30 ohms.
 - Tong testers of suitable ranges.
 - Contact resistance measuring set for micro-ohms.
 - Torque wrench.
 - Primary / secondary injection set and relay testing kit.
 - Multimeters, test lamp, field telephone with buzzer sets, different gauges etc.
 - Streamline filter.
 - Chain pulley block, cable jacks & spindle, cable, collars, electricians tool kit, jointer's tool kit, fitters tool kit, welding transformer, phase sequence meter, HV testing kit, primary & secondary injection kit.
- other test equipment as required for testing and commissioning of the equipment shall have to be arranged by the contractor.

1.4 METHODS AND WORKMANSHIP

- a) All work shall be installed in a first class, neat workman like manner by mechanics / electricians skilled in the trade involved.
- b) The erection work shall be supervised by competent supervisors holding relevant supervisory license from the Government.
- c) All details on installation shall be electrically and mechanically correct.
- d) The installation shall be carried out in such a manner as to preserve access to other equipment installed.
- e) If in the opinion of the contractor any work is insufficiently specified or require modification, the contractor shall refer the same in writing to the owner and obtain his instruction / approval before proceeding with the work.
- f) If the contractor fails to refer such instances, any excuse for the faulty erection, poor workmanship or delay in completion shall not be entertained.
- g) Equipment and material, which are wrongly installed shall be removed and re-installed to comply with the design requirement at the contractor's expense, to the satisfaction of the owner/consultant.

- h) All scaffolding pipes and frames shall be of tubular steel. Bamboo's/ *ballies* timer frames are not permitted under any circumstances. All vertical & horizontal scaffolds shall be of MS pipes of adequate size to withstand the loads & pressures. The working platforms shall be either of conduit pipes or MS bars.

1.5 ALLOWABLE WASTAGE

- a) The erection contractor shall make every effort to minimize wastage during erection work. In any case, the wastage shall not exceed 1 %
- b) Measurement shall be taken at site jointly by contractor and owner's representative.
- c) If the actual wastage be more than the quoted figure then equivalent price of the balance amount will be deducted from contractor's bills.
- d) The contractor shall submit a detailed account of materials issued to him after completion of work. The excess materials after completion of job shall be returned back to the owner's store.

1.6 FOUNDATION AND CIVIL WORK

- a) The contractor shall check the foundations provided by owner before commencement of erection to ensure their suitability.
- b) All final adjustments of foundation levels, chipping and dressing of foundation surfaces, drilling holes on foundation channels to suit the equipment setting and grouting of anchor bolts, sills, inserts and fastening devices shall be carried out by the contractor including minor modification of civil work as may be required for erection.
- c) Any cutting of masonry work which is necessary shall be done by the Contractor at his own cost and shall be made good to match the original work. The contractor shall obtain approval of owner/ consultant before proceeding with any cutting of masonry / concrete work.

1.7 EXCAVATION AND BACK FILLING

- a) The contractor shall perform all excavation and back filling as required for the scope of work pecified.
- b) The contractor shall make his own arrangement for pumping out any water that may accumulate in the excavation.
- c) All excavation shall be back filled to the original level with good consolidation.

1.8 REPAIR OF DAMAGE SUBSTAINED DURING TRANSIT

The contractor shall repair minor damages sustained during transit or subsequent storage in purchaser's store. The repair charges shall be paid to the contractor on the basis of extra work.

1.9 INSPECTION

- a) After completion of erection / installation, each piece of equipment shall be thoroughly tested as per approved procedure and inspected in presence of the owner/consultant for correctness and completeness of erection and acceptability for start up.
- b) A check list in triplicate will be furnished by the owner/consultant wherein all details to be checked and necessary instruction shall be listed. the inspection and checking shall strictly follow the checklist.
- c) on completion of the inspection (2) copies of the check list duly filled-in shall be handed over to the owner/consultant.
- d) This check list shall be jointly signed by the contractor and the owner/consultant. Such endorsement, however, shall not relieve the contractor of his obligations under the contract.

2.0 11 KV SWITCHGEARS

- 2.1 11 KV HT Switchgears shall be installed in accordance with IS:3072 and manufacturer's instructions. The contractor shall be required to install and align any channel sills which form part of the foundation. The HT Switchgears shall be made absolutely vermin proof.
- 2.2 Control wiring (if any) between 11 KV HT switchgears & other electrical equipment shall be carried out as per the instructions of the manufacturers & site-in-charge.

3.0 TRANSFORMER

- 3.1 Installation of the transformer shall be in accordance with the IS : 1886, manufacturer's instructions and as per the enclosed drawings.
- 3.2 Care shall be taken during handling of insulating oil to preventing ingress of moisture or foreign material. Testing and sampling of oil shall be in accordance with manufacturer's instructions and related IS. If oil filtration is required the same shall be carried out at site by the Contractor.
- 3.3 Control wiring between Transformer & other electrical panels shall be carried out as per the manufacturer's drawings and as per the instructions of site - in - charge.

4.0 415 V BUS DUCT

- 4.1 Bus duct will be received in transportable pieces. The Contractor shall erect the bus duct including bends, wall seating copper flexible at both ends and complete all connections in accordance with Manufacturer's drawings. The work also includes erection of steel hangers / supports for these bus ducts wherever necessary.
- 4.2 All steel structure / support / hardware for supporting bus duct shall be calculated by the contractor.

5.0 MAIN PCC / CAPACITOR PANELS

- 5.1 All above panels & DBs will be available in split - up - sections for ease of transportation and handling. However in some cases, breakers, busbars relays, meters and control switches may be supplied loose to be mounted and connected at site as per the relevant drawings.
- 5.2 All alignments leveling, grouting, anchoring and adjustments shall be carried out in accordance with manufacturer's instructions and/or as directed by the Engineer. All boards shall be cleaned by using blower before installation.
- 5.3 All connections in the panels shall be completed, checked and adjusted to ensure safety and satisfactory operation of the equipment. This includes the following activities:
- a) Functional test on circuit breakers.
 - b) Setting of protective relays and thermal over load relays.
 - c) Adjustment of zero error of various indicating instruments.
 - d) Testing of thermal overload relays by primary injection and protective relays by secondary injection.
- 5.4 In some cases, minor modifications may have to be carried out at site in the wiring of an equipment to meet the requirements of the desired control scheme and the Contractor shall have to do the same at no extra cost.

6.0 MISC. ITEMS AND LOCAL PANEL INSTALLATION

- 6.1 The contractor shall install miscellaneous items such as local control station, start-stop push button stations, and local starter units. control panels, misc. panel etc.
- 6.2 These equipment will be generally wall or column mounted excepting a few which are floor mounted. The exact locations will be as decided by the Engineer at site.

6.3 All supports or brackets need for installation shall be fabricated by the Contractor.

6.4 All welding, cutting, chipping and grinding as and when necessary shall be carried out by the Contractor at no extra cost.

7.0 CABLING SYSTEM

7.1 CABLE TRAYS AND RACKS

- a) The contractor shall install the cable racks, trays, risers, shafts and supports.
- b) Cable trays and risers shall be aligned and leveled correctly. All runs shall be installed parallel to the trench/building walls and floors except otherwise noted on the drawings.
- c) The contractor shall provide embedded steel inserts/supports on wall, ceiling or floor by suitable anchoring & shall secure racks and supports by welding these to inserts.
- d) The trays in general shall be supported at a distance of 1.5 to 2 meters on horizontal and vertical run.
- e) Cable trays shall be installed as per drawings furnished to the Contractor. Any deviation in routes shall have the prior approval of the Engineer In charge.
- f) Prefabricated cable trays and accessories shall be assembled and erected at site as per instructions of Manufacturer. Alternately, the Contractor shall fabricate and install all cable trays, risers, shafts and supports as agreed upon during finalization of the award.
- g) Sufficient spacing not less than 250 mm shall be provided between trays and maintained to permit adequate access for installing and maintaining the cables.
- h) Contractor shall co-ordinate with other contractors (such as for piping etc.) where there is a common support for cable trays and for other services.
- i) All necessary steel & all consumables as specified elsewhere shall be provided by the contractor.

7.2 STORAGE AND HANDLING

- a) Cable drums shall be stored on hard and well drained surface so that they may not sink. In no case the drum shall be stored on the flat Le. with flange horizontal.
- b) Rolling of drum shall be avoided as far as practicable. For short distance, the drums may be rolled provided they are rolled slowly and in proper direction as marked on the drum.

- c) In absence of any indication the drums may be rolled in the same direction as it was rolled during taking up the cable.
- d) For unreeling the cable, the drum shall be mounted on jacks or on cable wheel. The spindle shall be strong enough to carry the weight without bending.
- e) The drum shall be rolled on the spindle slowly so that cable should come out over the drum and not below the drum.
- f) While laying cable, cable rollers shall be used at an interval of 2000 mm. The cable shall be pushed over the roller by a gang of people positioned in between rollers.
- g) Cable shall not be pulled from the end without having intermediate pushing arrangement. Bending radius of the cable shall not be less than that is specified by the manufacturer.
- h) All possible care shall be taken during unreeling and laying to avoid damage due to twist, kink or sharp bends.

7.3 CABLE LAYING

- a) Cable shall generally be installed in ladder type / perforated trays in trenches or buried in ground except for some short runs in conduit for protection or crossings the roads etc.
- b) Each length of run shall be physically measured at site before cutting the cable. Contractor shall furnish cable cutting the schedule to engineer in charge with respect to cable drum length available at site and runs of cables & sizes of cables.
- c) Cable may also be laid through hume pipes in road crossings etc. The hume pipes shall be supplied and placed in position by the Contractor.
- d) Cable laid on trays and risers shall be neatly dressed and clamped at an interval of 3000 mm and 900 mm for horizontal and vertical cable run respectively and at each bend of cable.
- e) All power cables shall be clamped individually and control cables shall be clamped in groups of three or four cables.
- f) Clamps for multicore cables shall be fabricated of 25 x 3 mm G.I. flats. Single core power cables shall be laid in trefoil formation and clamped with trefoil clamps made of Fiber glass/PVC.
- g) Cable openings etc. in walls/floor made by the Contractor or by others shall be sealed by the Contractor suitably by Hessian tape and bitumen compound or by any other proven method to prevent ingress of water.
- h) Directly buried cables shall be laid as per detail shown in drawing. These cables shall be laid on and covered with sand/raddle earth and protected by brick

barriers as sides and precast concrete slab brick on top. Job also involve digging/excavation of earth and refilling the same after laying of cables. For cables laid underground a loop of diameter of 3 meters shall be provided near each terminating ends.

- i) After completion of installation and prior to connection, all High Voltage Power cables shall be given a high potential test. The contractor shall provided this Hipot Test set having provision of leakage current measurement.
- j) Laying cost shall include all above activities including supply and fixing of clamps etc.
- k) Cables for machines in clean area shall be laid in suitable size of stainless steel conduit.

7.4 CABLE TAGS AND MARKERS

- a) Each cables and conduit run shall be tagged with numbers that appear in the cable schedules. Cables and conduits shall be tagged at every thirty (30) meters. Cables and conduits shall also be tagged on either side of a floor/wall passage.
- b) The tags shall be of PVC or Aluminium with the number engraved on it and securely attached to the cable by not less than two turns of G.! wire.
- c) Location of cables laid directly underground shall be indicated clearly by cable marker made of cast iron.
- d) The location of cable joints, if any, shall be clearly indicated with cable marked with an additional inscription "Cable Joint".
- e) The marker shall project 100 mm above ground and shall be spaced at an interval of 30 meters at every change of direction.
- f) Where cables are cut from the drums the ends of the cables at the drums shall be properly sealed.
- g) The power and control cable shall be laid with a provision of extra length at one of the end terminations. This length shall be confirmed by the Engineer in charge before laying.
- h) Cost of laying shall also include supply and fixing of tags, cable markers etc.

7.5 TERMINATIONS JOINTS AND CONNECTION

- a) The termination, Joints and connections of cables shall be done by qualified jointers strictly in accordance with manufacturer's instruction drawings and/or as directed by the Engineer.
- b) The work shall include all clamping, fittings, fixing, plumbing, soldering, taping, compound filling, epoxy cable jointing, crimping, connecting, shorting and

earthing as required for all such operations should be available with concerned contractor. For all size of L T termination, crimping tool (Hydraulic type) shall be used. Further, inhibiting compound shall be provided before termination.

- c) The equipment will be generally provided with blank plates for cable/conduit entry and cable end box for power cables.
- d) The Contractor shall perform all drilling, cutting on the blank plates and any minor modification work required to complete the job.
- e) If the cable-end box or terminal enclosure provided on the equipment is found unsuitable and requires major modification, the same shall be carried out by the Contractor as extra work item.
- f) Control cable cores entering control panel/switch gear / MCC etc. shall be neatly bunched and served with nylon cord or PVC perforated tape to keep in position at the terminal block.
- g) The contractor shall provide oil resistance ferrules for all control cable cores at all terminations including at all junction boxes. and at all terminations. The ferrules shall carry terminal numbers as per drawing. The ferrules shall be of interlocked plastic type or approved equal.
- h) Spare cores shall be similarly tagged, crimped with lug and taped on the ends. Spare cores shall be tagged with individual cable number.
- i) Terminations and connections shall be carried out in such a manner as to avoid strain on the terminals.
- j) All cable entry points shall be sealed and made vermin and dust proof. Unused opening, if any shall be effectively closed.
- k) Termination kits for HT cables, Straight through joint kits for HT & L T cables, cable of all glands lugs shall be arranged by the Contractor, which includes furnishing consumable materials such as plumbing and soldering material, electrical tape including bitumen compound/resin if not a part of kit shall be included in the erection rates.

8.0 IMPORTANT NOTES FOR ERECTION ACTIVITIES

8.1 CABLES AND CONDUITS

- a) Approximate lengths of cables and conduits runs will be given in the cable schedule. Before commencement of work the Contractor shall take actual measurements and prepare his own cable cutting schedules to reduce wastage to a minimum.
- b) During the erection period the Contractor shall furnish weekly / fortnightly

report on cable position in an approved proforma so as to keep the Engineer In Charge apprised of the position and to enable him to intimate any procurement action in time.

- c) The Contractor shall also maintain and submit when requested, a record of cable insulation value when drawn from store, after laying, before and after termination/jointing.

8.2 EXCAVATION AND BACK FILLING

- a) The Contractor shall perform all excavation and back filling as required for the scope of work specified.
- b) The Contractor shall make his own arrangement for pumping out any water that may accumulate in the excavation.
- c) All excavation shall be back filled to the original level with good consolidation.

8.3 FOUNDATION AND CIVIL WORK

- a) The contractor shall provide foundations wherever required & in case same has been provided by the employer earlier, same shall be checked for correctness before commencement of erection to ensure their suitability.
- b) All final adjustments of foundation levels, chipping and dressing of foundation surfaces, drilling holes on foundation channels to suit the equipment setting and grouting of anchor bolts, sills, inserts and fastening devices shall be carried out by the Contractor including minor modification of civil work as may be required for erection.
- c) Any cutting of masonry work which is necessary shall be done by the Contractor at his own cost & shall be made good to match the original work.

The Contractor shall obtain approval of Engineer before proceeding with any cutting ,of masonry /concrete work.

8.4 STRUCTURAL FABRICATION WORKS

- a) All chequered plate covers, cable racks, trays, supports, hangers and brackets wherever necessary shall be supplied/fabricated by the Contactor. Steel for fabrication shall be straightened and cleaned of rust and grease. All fabrication shall be free of sharp edge.
- b) Every effort shall be made to minimize the wastage of steel as far as practicable during fabrication. The wastage in no case shall exceed as specified else where in this specification.

8.5 TESTING AND COMMISSIONING

- a) On completion of erection work, the Contractor shall request the Engineer, for inspection and tests with minimum of fourteen (14) days' advance notice.
- b) The Engineer shall arrange for joint inspection of the installation for completeness and correctness of the work. Any defect pointed out during such inspection shall be promptly rectified by the Contractor.
- c) The installation shall be then tested and commissioned in presence of the Engineer.
- d) The Contractor shall provide all men, material and equipment required to carry out the tests.

All rectification, repairs or adjustment work found necessary during inspection, testing and commissioning shall be carried out by the Contractor, without any extra cost. The handing over of the installation shall be effected only after the receipt of written instruction from the Purchaser/his authorized representative.

9.0 SCHEDULE OF PRE-COMMISSIONING TESTS

9.1 CIRCUIT BREAKER

- a) Insulation resistance test on each pole by Meggar.
- b) Insulation resistance test on control circuit.
- c) Checking of all joints for leakage in breaker.
- d) Measurement of contact resistance for all the Three Phases.
- e) Checking the auxiliary circuits associated with circuit breaker.
- f) Functional check of breaker operation electrically at 70% and 110% of rated D.C. supply voltage.
- g) Checking of interlock provided in Control Circuits and tripping through simulated protective relay contacts.
- h) Auto-reclosing duty cycle check wherever auto-reclosing is required.
- i) Measurement of resistance of closing and tripping coils.

9.2 CURRENT TRANSFORMER

- a) Insulation Resistance test on each winding by Meggar to earth and between windings.
- b) Checking of all ratios on all cores by Primary injection set.
- c) Polarity check on each winding.
- d) Continuity test.

- e) Check for connection to correct taps.
- f) Oil level check.

9.3 EARTHING

- a) Continuity of earthing connection.
- b) Testing of Earth Resistance of Individual Electrode.
- c) Testing of Earth Resistance of the combined earthing system.

9.4 SWITCHBOARDS / MCC / DISTRIBUTION BOARD / PANELS

- a) Measurement of insulation Resistance of Bus-bar System.
- b) Measurement of I. R. of Control Circuit.
- c) Functional check of circuit components
- d) Continuity check of different circuits.
- e) Calibration test of Relays and Meters.
- f) Space heater operation.
- g) Annunciations.

9.5 RELAYS & METERS

- a) Calibration test.
- b) Operation / performance test.

NOTE

Tests required for some of the major items are indicated for Bidder's reference. Apart from the tests listed herein and also as mentioned elsewhere in this specification, any other test as necessary per relevant standards, recommendations, Code of Practice, Manufacturer's recommendations etc., shall have to be carried out by the Contractor without any implication within the quoted price and time schedules.

DATA SHEET (to be filled by the Bidder)

PROPOSAL PARTICULARS

(to be filled by the Bidder)

1.0 GENERAL

1.1 Bidder's Complete company :

Signature & Stamp of bidder

Name and Address

1.2 Proposal Ref. & Date :

1.3 Validity of Proposal :

1.4 Name and designation of the Officer of Contractor to whom all references shall be made for expeditious technical co-ordination :

1.5 i) Bidder's license No. :

ii) License issued by :

iii) Validity date of License :

1.6 Performance guarantee period for :

a) The equipment offered :

i) From the date of commissioning at site. :

ii) From the date of dispatch :

b) Installation work from date of commissioning. :

2.0 SPECIFIC

2.1 . Details of facilities for Design / Engg. Available : with the Contractor.

2.2 Details of documents enclosed with this offer :

2.3 Prices quoted are

• inclusive of :

• exclusive of :

APPROVED LIST OF ELECTRICAL MATERIAL

Description	Brand
11 KV CIRCUIT BREAKER PANEL	ABB / SEIMENS / AREVA
11 KV / 0.4 KV TRANSFORMERS	CROMPTON / KIRLOSKER / AREVA / SEIMENS
BATTERY CHARGING PANEL	KELTRON / NELCO
BATTERIES	EXIDE / AMCO / STANDARD
L T PANEL	NEPTUNE (INDIA) LTD. / ZETA SWITCH GEARS / KRYPTON POWER CONTROL INDIA PVT LTD. / ADLEC SYSTEM / N E C
11 KV Isolator and D O Fuses	AMEI / ELLPRO / STERLING
Capacitor	L & T / DUCATI / EPCOS

Signature & Stamp of bidder

APFC relay	L & T KHATAU / DUCATI / SYNTRON
M.C.B. / RCCB / RCBO	LEXIC / HAGER / ABB
Distribution Boards	LEXIC / HAGER / ABB
Switch Fuse Units With HRC fuses	GE / L&T / ABB
Moulded Case Circuit Breaker (MCCB)	ABB (T max) / L & T (D sine)
Air Circuit Breakers	ABB (EMEX/L&T(C POWER)
Current Transformer / Meters / Voltage Transformers / Relays / Starters / Contactors / Selector Switch / Indicating Lamps	L & T / SIEMENS / AUTOMATIC ELECTRIC / CONTROL & SWITCH GEARS / ABB
Change Over Switches	GE / L&T / HH ELCON
Cable Glands and Sockets	SIEMENS
PVC insulated Copper conductor wires	FINOLEX / RR / POLYCAB
Telephone Wires and cables	FINOLEX / (RPG/BIRLA ERICSSON POLYCAB
Television Coaxial cable	FINOLEX / RR /RPG / L&T
PVC / XLPE Insulated 11 KV / 1.1 KV Cables	UNIVERSAL /FORT CLOSTER / NICCO / FINOLEX/POLYCAB
Switches and Sockets outlets (Conventional piano type)	ANCHOR
Switches and Sockets outlets (Modular type)	LK Fuga / MK / MDS-MOSAIC
Industrial outlet	LEXIC / HAGER / ABB
MIS Conduits and Accessories	B.E.C./AKG/MK
PVC Conduits and accessories	AKG/BEC/CAP/SEIKO / [POLYCAB
Fluorescent Tube Fitting	PHILIPS /WIPRO
Incandescent Light Fitting	DECON/PHILIPS / BAJAJ / WIPRO
Hpmv/hpsv/ halogen Lamp	PHILIPS / WIPRO
Ceiling Fans / Exhaust Fans	CROMPTON / BAJAJ
Floor / Wall Raceways to date	MK/ LK/ MDS
Computer networking - outlet	AMP/SYSTEMAX / LUCENT
Electronic Energy Meters	SECURE / L&T
UPS	EMERSON / POWERWARE / TATA LIBERT
Ceiling Rose holders	ANCHOR
Buzzers/Bell Push bell	ANCHOR
MCB Distribution Board	MOS/LEGRAND/SIEMENS /HAGER
HRC Switch Fuse nits	SIEMENS ABB/GE/L&T
Cable Glands/Lugs	SIEMENS/DOWELLS
Electronic Regulator	MK/ANCHOR/ROMA/DEGRAND/MDS
Contractors	SIEMENS/L&T/ABB/SCHNIEDER
Geysers/water/heater	Havels /RACOLD/USHA

NOTE :

Sr. No.	Description
1.	The choice of the final makes shall be made by the owner
2.	The samples or Cat.No. of all type of switches & light fittings should be approved before execution.

TECHNICAL SPECIFICATIONS FOR COMPACTOR

KNOCK DOWN CONDITION

High Density Compactor Storage System suitable for storing records/files, etc.

1. **System capability:**

The Compactor system should have the following capabilities.

- a) It should be able to store box files, flat files, documents, etc.
- b) It should facilitate dust free and pilfer proof storage.
- c) It should maximize cubic feet utilization of space.
- d) It should be compact and modular in design i.e. there should be provision in the system to add moving units at further point of time
- e) It should be aesthetically appealing, sturdy in construction, easy to operate and require minimum maintenance.

2. **General Design of the System**

a) The Compactor system should be essentially collapsible or Knock down type mounted on mobile trolleys which would move on a set of rails.

b) Each carriage should be provided with 4 Nos. of traveling wheels which moves on the main rail along with 4 nos. guide wheels which move in the guide rail, for preventing of derailment or overturning.

c) The movement of storage units and trolleys should be achieved by Mechanical movement of a hand wheel. The hand wheel should be attached to gear and chain arrangement/ the gear & chain shall be strong enough to a carry the load of multi-units movement simultaneously.

d) The rails should be installed above the floor by means of expansion type foundation bolts if required else self-load should keep it in place.

e) The system should be provided with centralized locking arrangement on the last Unit, so that when all the units are brought together, a central lock gets the system locked with the floor and does not allow access to the units. Individual locking of each unit is also an option if asked for by putting sliding/leaf doors.

f) End stopper should be provided at the end of the rails to prevent the derailment of the carriage while in operation

g) Temporary locking arrangement consisting of Push and Pull knob to be provided on every unit so that the balance units do not move when the operator enters the aisle.

3. **System Configuration, Dimensions & CONSTRUCTION:**

The Compactor storage system comprises of broadly two parts,

- 1) Base Frame.
- 2) Superstructure.

BASE FRAME

Base frame should be fabricated in Channel type from 10/ 14 SWG HR IS 1079 Sheet to form a channel of Size: 30mm x 65mm x 30mm.

GUIDE RAILS:

The guide rails are roll formed into an integrated 25mm square & J section profile in 2mm thick HRCA.

DRIVE MECHANISM:

Drive Mechanism should be provided externally supported on special grade antifriction bearing to have smooth and effortless movement. Entire mechanism or gear and sprockets should be incorporate within the front panel provided in the front of the Unit.

1) Each compactor should have 4 nos. of Cast Iron Wheels of Size: 72 x 22 mm. Each wheel should be provided with a pair of self-aligned heavy duty pedestal Type bearings.

2) The drive Mechanism should comprise of sprocket chain type arrangement.

3) The chain used should be ½” traction chain of ‘Diamond’ or ‘Roller’ make.

4) The drive mechanism should only be provided on the external front side of the compactor systems i.e. effective storage area inside the compactor should not be disturbed. The entire drive mechanism should be concealed from all sides from the safety point of view.

DRIVING WHEEL

Driving wheel should comprise of a central hub resting on a pair of roller bearings with 3 insertable arms engaging into the hub. The entire component should be chrome plated for better finish & longer life. Alongside the central hub there should be the unit locking arrangement for preventing the unit from moving when in use.

DRIVE COVER PANEL

Made out of 1 mm thick C.R.C.A. prime quality steel conforming to IS:513 GrD and of Box type to cover the entire drive mechanism completely. The drive cover panel should be of full height i.e. it should be of unit Height.

SUPER STRUCTURE

Super structure of the Compactor storage system should be essentially collapsible or Knock down type. However, if you need individually lockable units then the super structure shall be a welded structure. Each component of the compactor such as shelves, front panel, end panel, vertical read panel, center partition etc., should act as an integral member of the unit as a whole.

SHELVES:

Boltless type shelves should made of 1 mm thick C.R.C.A. prime quality steel conforming to IS:513Grd. Having 8 folds each designed to carry a U.D. L. of 60 Kgs.

VERTICAL PANEL:

Vertical panel consists of the front, center & rear panel should be made out of 1 mm thick C.R.C.A. Prime quality steel and designed to take the load of shelves on clip arrangement (for boltless shelving)

CENTRE PARTITION:

The Centre partition should comprise of a full C.R.C.A. prime quality 1 mm Sheet.

SHUTTERS/DOORS (Hinged):

Shutters, if required, shall be mounted on the unit. They should be made from 20 G CRCA Sheet. The same should be powder coated/painted in required finish and provided with a Lock

CENTRAL LOCKING :

System should be provided with centralized locking arrangement on the last Unit when all the Units are brought together; central lock when operated gets locked with the floor and does not allow access to the Units.

INDEXING ARRANGEMENT :

One or two Numbers of MS/Acrylic indexes (250 x 150 x 2.5mm/2.0mm thick as per the model chosen) should be provided on each Front panel of the compactor unit for easy identification and retrieval.

FINAL FINISH :

Each Component of the system shall be treated with rust preventing treatment and all the components should be powder coated/painted in required shade.

S A F E T Y F E A T U R E S**INDIVIDUAL UNIT LOCK**

Each Compactor unit should be provided with individual unit locking arrangement in built into the hand wheel of the system.

The unit should not move from its position when the lock is engaged during operation for total safety of the user.

CENTRAL LOCKING

Each system should be provided with central lock to enable locking of the entire system with one key.

STOPPERS

Each system should be provided with stoppers on either ends of the rails to prevent the Compactor unit from moving away from the rail.

**TENDER FOR CIVIL ELECTRICAL DATA & FURNISHING WORKS
FOR ESTABLISHMENT OF REGIONAL OFFICE AND MLP AT
MUZAFFARNAGAR**

PRICE BID

TO BE PACKED IN A SAPERATE SEALED ENVELOPE

All item shall confirm to relevant IS code wherever detail is not specifically motioned

BILL OF QUANTITIES							
S.No.	Particular	Unit	QTY	RATE		Amount	
				Num	Word	Num	Word
1	P/F SOLID / PARTIALLY GLAZED Full Height Partitions in tubular aluminium frame 2'x2' clear size with 16 gauge, placed at distance of 2'-0" c/c both ways fixed rigidly at floor lvl. with fasteners, another end fixed to top roof. Partition to have 12 mm thick commercial ply BWR grade both sides and both side 1.5 mm thick laminated (approved shade) Door in partition shall be measured as partition, Including door frame for shutter (2 3/4" x1 - 1/4") with steam beech with single leaf shutter 3'-0"x7'-0", made with wooden laminated flush door with glass slit 9"x4' or , handle on both side of shutter (neki make - kich-PHS 1908 S) or equivalent approved, lock and door closer , toughen glass door with all required hardware and accessories , complete in all respect , as per design . Rates to include 1/2" toughen glass, conduit provision inside partition, and Switch boxes fixing etc. height will be measured finish floor to bottom of false ceiling i.e. finished area of partition	SFT	3000				

2	<p>P/F SOLID / PARTIALLY GLAZED Half Height Partitions in tubular aluminium frame 2'x2' clear size with 16 gauge, placed at distance of 2'-0" c/c both ways fixed rigidly at floor lvl. with fasteners, another end fixed to top roof. Partition to have 12 mm thick commercial ply BWR grade both sides and both side 1.5 mm thick laminated (approved shade) Door in partition shall be measured as partition, Including door frame for shutter (2 3/4" x1 - 1/4") with steam beech with single leaf shutter 3'-0"x7'-0", made with wooden laminated flush door with glass slit 9"x4' or , handle on both side of shutter (Neki make - kich-PHS 1908 S) or equivalent approved, lock and door closer , toughen glass door with all required hardware and accessories , complete in all respect , as per design . Rates to include 1/2" toughen glass, conduit provision inside partition, and Switch boxes fixing etc. height will be measured finished area of partition</p>	SFT	650				
3	<p>Providing & Fixing 2'X2' GRID & Gyp board false ceiling in combination and as per design & patterns, including vaulted /curved ceiling etc., which includes providing and fixing G.I. perimeter channels of size 27mm, 1.5 mm th. having one of flange of 20 mm and another flange of 30mm along with edge board is screw fixed but the joints are staggered. Then tapered and square edges of the board are filled and finished with jointing compound, paper-tape, suitable for Gypsum plaster boards (as per recommendations of M/s India Gypsum Ltd.). P.O.P smooth seamless finish. The cost to include Provision of Trap Door as per requirement complete. Note: For light fittings, AC, etc. cut-outs have to be made with the frame of perimeter channels of size</p>	SFT	5100				

	20x27x30x0.5mm thick supported suitably extra.						
4	Providing and fixing panelling over walls/ in AL. frame, 1"x2"@ 2'-0' c/c with 12mm th. ply BWR grade over + 4 mm th. MDF finished with 1.5 mm laminate in approved shade, patterns, SBW moulding /beading as per design, finished in natural shade with melamine, complete in all respect.	SFT	2465				
5	Providing & laying PCC in ratio 1:2:4 under floor admixed with waterproof admixture as per CPWD Norms. Item to be executed as per need and directions of Bank	SFT	2400				
6	Core Cutting of RCC Slab as per CPWD Specification for 4.5" Dia & thereafter plugging the hole and lead sealing after laying of pipeline and chemical Water proofing. Item to be executed as per need and directions of Bank	Each	06				
7	Providing & laying water proofing treatment on RCC slabs, side walls / beams as per following:- Cleaning, washing and saturation of surface with water Applying the mortar above and around the pipes. Providing and laying of coving at the junction with cement sand mortar in the ratio 1:5 admixed with 200ml/50kg bag of Cement Dr.Pidicrete LW and 5% of Dr.Pidicrete URP by the weight of cement. Applying the mortar above and around the pipes. Applying two coats of Dr. Fixit Pidifin 2K @ 1kg per 13 sq.ft. per coat (two similar coats to be applied) to achieve minimum thickness of 1mm and sprinkling of sand on the second coat. All complete as per manufacturer's specifications, design intent and instructions of the Architect. Item to be executed as per need and directions of Bank	SFT	1350				

8	<p>Providing and laying tiles (thickness to be as specified by the manufacturer) conforming to IS-15622 of approved make in floor and in dado and in pattern as approved by Bank. Tile to be embedded in 12mm thk cement sand mortar of mix ratio of 1:3 (1 cement: 3 coarse sand) including cleaning and preparing the surface for bedding by spreading neat cement slurry by using minimum cement about 3.3 kg / sq. m. over cleaned surface. Joints to be cleaned and grouted with polymer grouts of approved shade, curing, cleaning etc. in plumb & level for all heights & leads etc. Complete cleaning prior to handing over. All as per drawing, approval and instructions of the Architect. Ceramic tile of homogeneous composition of size 300mm x 600mm in dado (Approx.) and of size 600 mm X 600 mm in floors of approved shade and pattern (Basic rate of tile only Rs.650/- per SQMT)</p>	SFT	4800				
9	<p>Providing and fixing (7'X3' approx.) 12 MM Thk Toughen glass Door with holes cut-outs as per requirement complete with all accessories and hardware of Dorma / Ozone make mounted over floor springs complete as per instructions with Garware translucent films as per approved shade and pattern</p>	Each	9				
10	<p>Providing and fixing (7'X2.5' approx) 12 MM Thk Toughen glass Door with holes cut outs as per requirement complete with all accessories and hardware of Dorma / Ozone make mounted over floor springs complete as per instructions with Garware translucent films as per approved shade and pattern</p>	Each	2				

11	Providing and fixing in position filing cabinet Full Height up to minimum 1'-6" deep, made of 19MM ISI marked BWR Ply , complete in all respect, including all required hardware and accessories of Hettich make with SS handles and locks etc. as per instructions complete all side and inside to be laminated with 1.5 mm thick laminate of approved shade pattern and brand	SFT	480				
12	Providing and fixing in position filing cabinet Half Height minimum up to 1'-6" deep, made of 19MM BWR Ply, complete in all respect, including all required hardware and accessories of Hettich make with SS handles and locks etc. as per instructions complete all side to be laminated with 1.5 mm thick laminate of approved shade pattern and brand	SFT	55				
	Providing, assembling and placing in position machine made factory assembled Modular Partition System of following sizes and specifications.						
	Frame work:- shall consist of main spine and return spine of aluminium extruded section of thickness not less than 1.20mm. The size of main spine to be 45mm and that of return spine shall also be 45mm. The height of framework shall be 1200 mm. The complete framework shall be of powder coated aluminium having powder coating of thickness not less than 40 micron.						

<p>Partition: The partitions panel above work top along the length of workstation shall be cladded/ fixed with prelaminated board/trackable fabric/superior quality particle board /white board/ magnetic tile/ 5.5 mm thick glass of approved colour design as per shade requirement of the users and the total height of the partition will be 1200 mm to 1250mm. The cross partition shall be cladded fixed with superior quality particle board tile/ trackable fabric/polycarbonat sheets/prelaminated board/ white board/ magnetic tile/ 5.5 mm thick glass. The bottom partition of workstation below worktop shall be of prelaminated particle board conforming to IS:12823, of approved colour and design.</p>						
<p>Cable Management: There shall be complete cable management arrangement. There shall be one openable raceway of 100mm to 150mm wide for cables, made up of minimum 0.8mm thick aluminium having powder coating 40 micron (minimum) with sufficient space to accommodate cables.</p>						

	<p>Supplying and placing top shall be made of superior quality particleboard of 25mm thickness of approved shade duly post formed on machine with 0.6 mm cladding of decorative laminate and balancing in white colour laminate. All exposed edges of top shall have 2 mm thick PVC lipping duly machine pressed of make Rehau or dolkin. The workstation shall have one metal Key board tray of size 500x230mm made of plastic cold Polyster PH 88 or 1.2mm thick CRCA sheet duly powder coated not less than 50 micron fixed in to table top with arrangement to slide in / out adjustment having attachment of LHS/RHS mouse pad and one CPU Trolley of size 230mm (Length) x 150-230mm (Width) (adjustable)x 140mm (Minimum) (Height) made of MS sheet of thickness 2mm / CRCA sheet of thickness 1.6mm duly powder coated. Complete approved by Architect.</p>						
13	<p>Modular workstation in Size 1500 X 600 X 750/1200 mm Rates to include all the details Above</p>	Each	32				
14	<p>PA Workstation in size 1350 X 600 x 800 with Side storage 900 X 450 MM X800 made of laminated with 1.5 MM Laminate over 19MM Ply Board of BWR grade of approved make and shade, all side and inside to be laminated complete as per design intent with all required hardware of Hettich / Ebco make</p>	Each	1				
15	<p>CM Table 1650 X 600 x 800 with Side 900 X 450 MM X 800 and Back Credenza 2550 X 450 MM X 800 made of laminated with 1.5 MM Laminate over 19MM Ply Board of BWR grade of approved make and shade, all side to be laminated complete as per design intent with all required hardware of Hettich / Ebco make</p>	Each	6				

16	AGM Table 1800 X 600 x 800 with Side 900 X 450 MM X 800 and Back Credenza 3150 X 450 MM X 800 made of laminated with 1.5 MM Laminate over 19MM Ply Board of BWR grade of approved make and shade, all side to be laminated complete as per design intent with all required hardware of Hettich / Ebco make	Each	3				
17	DGM Table 2100 X 600 x 800 with Side 1200 X 450 MM X 800 and Back Credenza 3150 X 450 MM X 800 made of laminated with 1.5 MM Laminate over 19MM Ply Board of BWR grade of approved make and shade, all side to be laminated complete as per design intent with all required hardware of Hettich / Ebco make	Each	1				
18	Mobile Pedestal Unit made of laminated with 1.5 MM Laminate over 19MM Ply Board of BWR grade of approved make and shade, all side to be laminated complete as per design intent with all required hardware of Hettich / Ebco make	Each	40				
19	Conference Table 26' X 6' made of laminated with 1.5 MM Laminate over 19MM Ply Board of BWR grade of approved make and shade, all side to be laminated. The exposed surface to contain Veneer 4 MM of Green and PU polished complete as per design intent with all required hardware of Hettich make	Each	1				
20	Reception Table 6'X 3' made of laminated with 1.5 MM Laminate over 19MM Ply Board of BWR grade of approved make and shade, all side to be laminated. The exposed surface to contain Veneer 4 MM of Green and PU polished complete complete as per design intent with all required hardware of hettich / Ebco make	Each	1				
21	Pantry Granite Top with double edge moulding of 19MM prepolished granite fixed with mortar including cutting all complete in approved	SFT	25				

	shade						
22	Double bowl SS Sink of Nirali make with integrated drain board with all required accessories complete as per approved design complete	Each	1				
23	Mechanical Ventilation at toilets made of GI boxing and suspended from ceiling with all required hardware. Gauge and design as per Bank's approval	SFT	100				
24	Providing and fixing Flush Door 35 MM of Green make with all required Hardware in SS of approved design and make and laminated with 1 MM door Skin on both sides. The edges to be polished complete.	Each	15				
25	Meeting Room Credenza width as per site / minimum 1'-6" with granite top made of laminated with 1.5 MM Laminate over 19MM Ply Board of BWR grade of approved make and shade, all side to be laminated complete as per design intent with all required hardware of hettich / Ebco make	SFT	160				
26	3D Acrylic Logo Back Lit with 3d Lettering of Bank's and office name of size 8' - 0" X 10'-0" or as per site as per approved shade and design	Each	3				
27	Wall Unit DGM Cabin made of laminated with 1.5 MM Laminate over 19MM Ply Board of BWR grade of approved make and shade, all side to be laminated complete as per design intent with all required hardware of hettich / Ebco make including polishing and designer lights.	SFT	90				
28	Trophy Unit made of laminated with 1.5 MM Laminate over 19MM Ply Board of BWR grade of approved make and shade, all side to be laminated complete as per design intent with all required hardware of hettich / Ebco make including polishing and designer lights with required glazing complete.	SFT	180				

29	Entrance Bubble Fountain Unit made of laminated with 1.5 MM Laminate over 19MM Ply Board of BWR grade of approved make and shade, all side to be laminated complete as per design intent with all required hardware of hettich / Ebco make including polishing and designer lights required glazing complete	SFT	60				
30	Providing & applying wall paper over 6MM thk MDF mounted of 2'-0" X 2'-0" tubular AL frame work with all required hardware and accessories , ref. Warack Design cat./ approved equivalent on existing surface with suitable adhesive	SFT	90				
31	Lacquer Glass Panelling over 6MM thk MDF mounted of 2'-0" X 2'-0" tubular AL frame work with all required hardware and accessories	SFT	325				
32	Providing and fixing big Ceramic Planters of approved design with Plants as per approved design	Each	40				
33	Fabricating and Sprinklers positioning as per site requirement / Design intent including supply of required material, pipes etc, fabricating complete as per design intent	JoB	1				
34	Supply installation testing and commissioning of Access Control system complete as per Bank's Approval	JoB	2				
35	Supply installation testing and commissioning of 100 Lit Water Cooler and commercial RO of suitable capacity of approved make and model complete	JoB	1				
36	Texture Painting of approved shade pattern design and brand as per manufacturer specification complete	SFT	25				

37	Preparing the masonry surface with 03 or more coat of PoP and timber and metal surface with suitable putty punning & thereafter applying high gloss emulsion / acrylic Paint in 03 or more coats of approved shade, pattern and brand. Complete as per instructions	SFT	13				
38	POP beading as per design intent in series on wall for area of 250 SFT including providing around 10-12 elevation lights as indicated of Philips make, sample to be approved by Bank.	JoB	1				
39	Providing and fixing Roller Blinds of vista Make in the windows / fixed glazing with manual operation complete as per instructions	SFT	110				
40	Glass Flim of garware make in approved pattern	SFT	55				
41	Floor Mat PVC of approved make and shade complete as per instructions	SFT	90				
READY MADE FURNITURE							
1	Providing and fixing Side Table 2' X 2'with glass top as per design intent of approved make shape and design	Each	5				
2	Providing and fixing Centre Table 5' wide with glass top as per design intent of approved make shape and design	Each	2				
3	Lunch Table 12' X 2.5' with granite top made of laminated with 1.5 MM Laminate over 19MM Ply Board of BWR grade of approved make and shade, all side to be laminated complete as per design intent with all required hardware of hettich / Ebco make	Each	1				
4	Providing and fixing Sofa 3-Seater with leather tapestry mounted over SS frame of food grade steel as per design intent of approved make shape and design	Each	5				
5	Providing and fixing Sofa 2-Seater with leather tapestry mounted over SS frame of food grade steel as per design intent of approved make shape and design	Each	5				

6	Providing and fixing Ergonomic Mid Back Chairs in nylon Mesh mounted over Metal frame chrome finished as per design intent of approved make shape and design. Sample to be approved by Bank before installation.	Each	30				
7	Providing and fixing Ergonomic High Back Chairs in nylon Mesh mounted over Metal frame chrome finished as per design intent of approved make shape and design. Sample to be approved by Bank before installation.	Each	42				
8	Providing and fixing Ergonomic Executive Chairs in nylon Mesh mounted over Metal frame chrome finished as per design intent of approved make shape and design. Sample to be approved by Bank before installation.	Each	3				
9	Providing and fixing RH Chair in nylon Mesh mounted over Metal frame chrome finished as per design intent of approved make shape and design. Sample to be approved by Bank before installation.	Each	1				
ELECTRICAL WORKS							
I.	LIGHT AND SOCKET OUTLET POINT WIRING	Qty	Unit				
	The rates for point wiring for all the items shall include the following: The Point Wiring shall include the wiring of light/outlets of any length from the distribution board via switch to the point. All the light fixtures, third pin of outlets, switch and outlet boxes shall be earthed with 1.5 sq. mm. PVC insulated copper conductor wire. All the outlets on the workstations and 16 amp 6-pin outlets shall be earthed with 2.5 Sq. mm. PVC insulated copper conductor wire. All the switch boxes, outlet and junction boxes shall be covered with White Polycarbonate modular cover plate Painting of junction boxes. Embedding conduits and allied						

	fittings in walls/floors/slabs etc. during construction and/or in chases including cutting chases and making good as necessary in the case of concealed conduit work. All accessories necessary to complete the wiring as specified. Internal wiring between accessories. Wherever flexible conduits are required GI flexible conduit of suitable size shall be used with checknut.						
1)	Wiring including termination for the following light points with 2 X 2.5 sq. mm PVC insulated copper conductor FRLS wires of 650/1100 Volts grade in concealed/exposed medium duty FRLS PVC conduits as called for including providing 6 amp flush type switches, anodized MS box for housing switches, approved White Polycarbonate modular cover plate for switch boxes and earthing. (Both for Raw & UPS)						
a.	First point controlled by one no. 6 amp switch.	45	Nos				
2)	Same as item No. 1 above but LOOP POINT i.e. wiring including termination of point looped from first point with 2 X 1.5 sq. mm PVC insulated copper conductor FRLS wire of 650/1100 volt grade in concealed/exposed medium duty FRLS PVC conduit and earthing (controlling switch in item no. 1).	65	Nos				
3)	Wiring for the following light points with 2 X 2.5 sq. mm PVC insulated copper conductor FRLS wires of 650/1100 Volts grade in concealed/exposed medium duty FRLS PVC conduits as called for including providing 16 amp flush type switches, anodized MS box for housing switches, approved White Polycarbonate modular cover plate for switch boxes and earthing.						
a.	First point controlled by one no. 16 amp switch.	35	Nos				

4)	Same as item No. 3 above but LOOP POINT i.e. wiring of point looped from first point with 2 X 2.5 sq. mm PVC insulated copper conductor FRLS wire of 650/1100 volt grade in concealed/exposed medium duty FRLS PVC conduit and earthing with controlling switch. (Both for Raw & UPS)	55	Nos				
5)	Wiring including termination for 6 amp socket outlet point with 2 X 1.5 sq. mm PVC insulated copper conductor FRLS wires in concealed/exposed medium duty FRLS PVC conduits including providing 6 amp switch, 5 pin 6A shuttered socket, anodised MS box for housing switches sockets, approved White Polycarbonate modular cover plate and earthing. (Looped to lighting circuit) (Both for Raw & UPS)	65	Nos				
6)	Wiring including termination for the following configuration of outlets for workstations with 3 core x 2.5 sq.mm. Copper conductor, PVC insulated PVC sheathed wires of 650/1100V grade in existing conduit/raceway including supplying and fixing following numbers socket and switch housed in anodised MS box with approved White polycarbonate modular cover plate as required.						
a)	3 Nos. 6A, 3-pin outlet with round pin controlled by 1 no.16A switch, 16A (UPS at W/S) (Maximum of three/four workstations shall be looped in one circuit)	70	Nos				
7)	Wiring for 20 Amp power outlet with 6.0 Sqmm 660/1100V FRLS PVC insulated multi stranded copper conductor wires in recessed/surface PVC conduit including cost of cutting and filling chases Supplying and fixing of 20 amp 3-pin for 1-phase industrial socket outlet including supplying boxes of suitable size,20 amp DP MCB, and a plug top, complete as required and as per specifications.	20	Nos				

8)	Wiring for 16 Amp power outlet with 4.0 Sqmm 660/1100V FRLS PVC insulated multi stranded copper conductor wires in recessed/surface PVC conduit including cost of cutting and filling chases supply and fixing of 6 pin 16 Amps shuttered modular switch socket, switch plate with internal wiring in G.I. box, earthing of 3rd pin with PVC insulated, green colour 2.5 Sqmm copper wire, complete with all accessories as required. (Power Socket).					
a)	Two 16A outlets in one circuit with switch sockets of approved make (Both for Raw & UPS)	30	Nos.			
b)	One 16A outlet in one circuit with switch socket of approved make (Both for Raw & UPS)	42	Nos.			
9)	Wiring for wall fan points with 1.5 sq. mm FRLS PVC insulated stranded copper conductor 1100 volt grade wires in 25 mm dia heavy duty PVC surface/concealed conduit including the cost of providing circuit wiring with 2.5 sq mm FRLS PVC insulated stranded copper conductor 1100 volt grade wires and including cost of providing saddles etc for surface conduiting and/or cost of cutting and filling chases for recessed conduiting and including the cost of providing and fixing a 6 amp 240 volt single pole grid plate mounted switch with moulded cover plate in a recessed galvanized box with including cost of providing stepped electronic fan regulator as required and including running 1.5 sq mm FRLS PVC insulated copper conductor wire for loop earthing etc. complete as per specification and as required. (Both for Raw & UPS)	25	Nos			

10)	Wiring including termination for 6 amp socket outlet point with 2 X 12.5 sq. mm PVC insulated copper conductor FRLS wires in concealed/exposed medium duty FRLS PVC conduits including providing 6 amp switch, 5 pin 6A shuttered socket, anodised MS box for housing switches sockets, approved White Polycarbonate modular cover plate and earthing. (raw power light plugs on alternate table max 4 outlet per circuit)	70	Nos				
II.	VOICE, DATA NETWORK, OUTLET BOXES, MS CHANNEL AND CONDUITS						
1)	Supplying and fixing in position MS anodised box for data/voice outlet suitable for fixing of RJ 45 jack complete as required.	80	Nos				
2)	Supplying and laying, fixing in position following sizes of medium duty PVC conduits including providing all accessories concealed/exposed as required.						
a)	25 mm dia medium duty FRLS PVC conduit	2500	RM				
3)	Supplying and laying of CAT 6 Data cable in conduit	3500	RM				
4)	Supplying and laying of CAT 6 Patch Cord 2 MTR	150	Nos				
5)	Supplying and drawing the following sizes of annealed tinned electrolytic copper conductor PVC insulated unshielded twisted telephone wires in existing conduit and making connection on both the ends.						
a)	2 pair (0.61 mm)	2500	RM				
b)	10 Pair Cable	200	RM				
6)	supply fixing of RJ11 telephone socket outlet with modular switch on existing ms box as required	75	Nos				
III	SUPPLY & INSTALLATION OF PANEL , DB AND EARTHING						

1)	Supplying, erection, connecting, testing and commissioning of cubicle type Panel fabricated out of 14 SWG CRCA sheet steel floor mounted totally enclosed extensible on both sides switchboard of uniform width suitable for use on 433 V 3 phase 4 wire 50 c/s complete and housed with Aluminum bus bars equipments and their accessories including supply and fixing of base channels of 100x50x6mm as required and with following incoming and outgoing switchgear as per specification and schematic diagram submitted by the vendor and approved by Bank						
	A. INCOMING:						
	b) 160A TPN MCCB (25KA) 1 NO						
	160 A FP CHANGE OVER SWITCH						
	B. INSTRUMENTS						
	I) 1 No. Voltmeter (0-500V) with selector switch and control fuses						
	II) 3 Nos. CT's 1560/5 A accuracy Class-I 15 VA						
	iii) 1 No. Ammeter with ASS						
	iv) 3 Nos. Phase indication lights						
	C. OUTGOING :						
	i) 4 Nos. 63A TPN MCB (10 KA)						
	ii) 5 Nos. 40A DP MCB (10 KA)						
	ii) 5 Nos. 40A TPN MCB (10 KA)	1	Set				
2)	Supplying, erection, connecting, testing and commissioning of cubicle type Panel for AC as per above specs, the drawing submitted by vendor to be approved by the bank	1	Set				

3)	Supplying, installing in position, testing and commissioning of the following Distribution Boards made of 16 gauge powder coated MS sheet steel , wall mounted/fully recessed in wall, indoor industrial type, with dust proof, hinged and lockable doors, double door design, complete with inter connecting wires from incomer MCB to each ELCB along with earthing terminal. The DB shall be suitable for taking cable/conduit as incoming/outgoing. For all UPS DB the MCB shall be motor duty.						
a)	Sheet metal enclosed 12 way SPN DB with 10 Nos. 10/20 Amp SP MCB and controlled by 1 no. 40 Amp DP MCB complete as required.	10	Nos				
b)	12 way TPN DB with 36 Nos of 10/20 amps SP MCB's i.e. 12 Nos. of 10/20 amp SP MCB's arranged in 3 rows arranged in 3 tier one above other and controlled by 1 No. 63 amp TPN MCB and neutral link. Each row of MCB's shall be provided with 40 amp DP ELCB of 100 mA sensitivity.	5	Nos				
4)	Supplying and fixing of the following MCBs in Sheet Steel Enclosure as required. The Steel Sheet Enclosures to be powder coated						
a.	40 amps TPN MCB	40	Nos.				
b.	40 amps SPN MCB	45	Nos.				
5)	Supply ,installation, testing and commissioning of earth pits comprising 600 x 600 x 6.3 mm. thick GI electrode, 25 mm. dia medium class GI pipe, GI funnel with 20 gauge GI wire mesh, masonry chamber with concrete base, CI manhole cover with frame (300 mm. x 300 mm.) painted with bitumastic paint, test link joint and packing the mixture of Charcoal and salt around plate electrode complete as required ,as per specifications and as per IS: 3043	5	Nos.				

6)	Supply, Laying, testing and commissioning of following sizes of XLPE insulated (Heavy duty) armoured cables suitable for working voltage upto and including 1100 Volts , laid and tied on existing overhead cable trays; or laid and tied over MS supports in masonry trenches including providing MS supports and clamps for fixing to supports ; or buried in ground including excavation, brick protection and back filling in an approved manner complete as required and as per specifications.						
a	4 x 10 sq.mm. Cu. Cable	100	RM				
b	2 x 16 sq.mm. Cu. Cable	200	RM				
c	2 x 6 sq.mm. Cu. Cable	900	RM				
d.	3 X 2.5 SQMM CU Cable for circuit wiring	800	RM				
e	4 X 120SQMM Armoured Al Cable for main supply and AC supply of Havel / Ploycab Make	120	RM				
7)	Termination of the following sizes of XLPE insulated Aluminium conductor cable including providing terminal lugs, single compression gland , crimping the joints ,providing insulation tape, effecting terminal connections to the equipment complete as required.						
a	3.5 x 70 sq.mm. AL. Cable	4	Nos.				
8)	Supplying and laying, fixing in position of the following sizes of exposed/concealed medium duty PVC conduit including all accessories complete as required and as per specifications.						
a	25 mm dia medium duty PVC conduit	200	RM				
9)	Supply, installation, testing and commissioning of Earth box made of 2mm thick MS painted, with a glass cover and having 25 x 3 mm Cu strip with insulators complete as required.	5	Set				

10)	Supply and laying in position the following GI tape/wires including providing all fixing accessories and effecting proper connections.						
a.	25 x 3 mm GI tape	123	RM				
b.	25 x 3 mm Cu tape with PVC insulated heat shrinkable sleeve.	125	RM				
c.	8 swg Copper Wire	150	RM				
d.	8 swg G.I Wire	140	RM				
11	Supply and installation of following sizes of perforated GI cable tray made cut of 2 mm thick GI sheet, suspended from the ceiling or fixed on wall/column etc complete with suspenders, runners and fixing hardware etc. as required.						
a)	50 mm x 150 mm x 50 mm	220	Mtrs				
IV	RACEWAY						
1)	Supplying & fixing of following sizes of G.I. under floor raceways with 1.6mm thick cover in recessed including cutting the wall / floor and making good the same in case of recessed system (For 300 mm x 38 mm x 1.6mm thick (3 Partitions)	200	Meter				
2)	Supplying & fixing of following sizes of GI Junction Boxes 60 mm deep, for above trunking made of 1.6mm galvanized sheet and 1.6 mm cover made from GI steel sheet, with cover on all four sides.	75	Each				
3)	Supplying & fixing of following sizes of GI Crossover Boxes 75 mm deep, for above trunking made of 1.6 mm galvanized sheet and 1.6 mm cover made from GI steel sheet, with cover on all four sides.	15	Each				
4)	Supply, Fabrication and installation of supports in structural steel. The supports shall be constructed preferably out of M.S. hollow sections / ISMC / other structural steel & all support structure shall be of bolted / welded construction. The cost of plated hardware is also included in the item. The supports & hardware shall be painted with one coat of matching primer and two coats of final enamel paint the	100	KG				

	shade of paint shall be matching with building steel structure.						
V.	SUPPLY & FIXING OF LIGHTING FIXTURES - Sample to be approved by Bank before installation						
	The fixtures shall be suitable for single phase, 50 cycles, 230 Volts, A.C. supply system. Fluorescent light fixtures shall be provided with Electronic Ballast. All fixtures shall be factory wired with copper conductor wires. All fixtures shall be supplied with lamps/bulbs, as specified. All the samples shall be submitted within one month of the issue of work order, for approval from the Architect. The rate should be quoted based on the condition that quantity may vary within same type of fixture. The rate should be quoted based on the condition that quantity may vary within same type of fixture.						
1	600X600 LED Ceiling Panel 36W, PHILIPS / Equivalent As per approved Design	86	Nos				
2	LED Down Lighter 15 W, PHILIPS / Equivalent As per approved Design	150	Nos				
3	1x36W LED Patti For Cove Light TMC-19/140, PHILIPS / Equivalent As per approved Design	33	Nos				
4	LED STRIP of Philips / Equivalent As per approved Design	50	RMT				
5	Providing and fixing Designer Light as per approved make and shade	1	Each				
6	Providing and fixing LED tube light set complete of approved make	30	Each				
7	Providing LED 3"-4" profile light of approved make and shade	35	RMT				
8	Supply Installation Testing and commissioning 1500 RPM heavy duty metallic fresh Air fan of 1'X1' face in ventilation shaft	9	Each				
	Total						
	Air-Conditioning						

1	Supply Installation Testing and Commissioning of 100% Inverter variable refrigerant flow, Compressor Inverter Type air conditioning system, suitable for 380 to 420 V for outdoor , 100% Capacity at 43 deg C ambient temperature and Nonstop working at 56 deg C ,. Heat sink for PCB, Fire Alarm System Compatibility, Remote Monitoring System compatibility, Tenant Billing System compatibility, Remote Monitoring Service, BMS Compatibility, Data Concentrator including fully charge refrigerant R410A.						
	The Fins of the ODU units to be coated with hydrophillic Coating and PCB to be coated with conformal coating						
	VRF machines should have QCO complaint compressors as per ISI Standards and machines should have NABL Certified testing.						
	TDS and Certificates to be provided along with the Bid						
1.1	28 HP (Heating and Cooling)	Nos	2				
2	4 Way Cassette Unit - Supply Installation Testing and Commissioning of following minimum capacity VRF Ceiling Suspended type 4 Way Cassette type Indoor unit equipped with washable synthetic media pre-filter, fan section with low noise fan/dynamically balanced blower, multispeed motor, coil section with DX copper coil, electronic expansion valve, outer cabinet, vibration isolators, Inbuilt drain pump, other necessary supports etc., suitable for operation on single phase AC supply 230 V ± 10%, 50 Hz complete as required. The cooling capacity of indoor unit will be at air inlet conditions of 27 Degree C DB and 19 Degree C WB temperature.						
2.1	1.3 TR	Nos	3				

2.2	1.7 TR	Nos	2				
2.3	2 TR	Nos	1				
2.4	3.2 TR	Nos	11				
3	Supply Installation testing and Commissioning of Cordless Remotes for Cassette Units	Nos	17				
4	Supply Installation testing and Commissioning of Refrnet Joints for Indoor Units and Outdoor Units	Nos	17				
5	Supply Installation testing and Commissioning of Wifi Based central controller with 10-inch Touch screen	Nos	1				
6	Supply Installation Testing and Commissioning of 5 Star Inverter Split AC of following capacity having eco-friendly refrigerant.						
6.1	1.5 TR	Nos	2				
7	Supply Installation Testing and Commissioning of Copper pipes as per Bluestar standards with nitrile rubber Insulation with 13mm thick on liquid line and 19 mm Suction line						
7.01	6.35 mm with 13 mm thick insulation.	m	15				
7.02	9.51 mm with 13 mm thick insulation.	m	120				
7.03	12.7 mm with 13 mm thick insulation.	m	30				
7.04	15.86 mm with 19 mm thick insulation.	m	120				
7.05	19 mm with 19 mm thick insulation.	m	65				
7.06	22.2 mm with 19 mm thick insulation.	m	10				
7.07	25.1 mm with 19 mm thick insulation.	m	15				
7.08	28.58 mm with 19 mm thick insulation.	m	10				
7.09	34.9 mm with 19 mm thick insulation.	m	10				
7.10	41.3 mm with 19 mm thick insulation.	m	35				
8	Supply and Charging of refrigerant R-410a	HP	56				
9	Supply and installation of copper communication cable of 2Cx0.75 Sqmm in PVC conduit	M	300				

10	Supply and Installation of MS Stand fabricated out of C channel of 75mm X 35mm X 5mm						
10.1	VRF outdoor Units	Nos	2				
10.2	Split Units	Nos	2				
11	Supply and Installation of PVC Drainpipe with 6 mm nitrile rubber insulation						
11.1	25 mm	M	90				
11.2	40 mm	M	50				
11.3	Supply Installation Testing and Commissioning of Weatherproof Electrical panel fabricated out of 1.6 mm Powder coated MS Sheet, double Door with Canopy having Voltmeter, ammeter, phase light indicators at the incomer side. The Panel should have MS Stand of minimum 18" height inbuilt to the panel as per requirement	Nos	1				
11.4	Electrical works like cable Tray, wire and accessories required for AC system	Nos	1				
A	TOTAL						
B	ADD GST						
C	GRAND TOTAL						

PROPOSED LAYOUT PLAN - RO MUJZAFARNAGAR & MLP

REGIONAL OFFICE SEATING
 1 - DGM CABIN
 2 - AGM CABIN
 5 - CM CUBICLE
 32-WORK STATION

MLP
 1 - IN-CHARGE CABIN
 1- DY IN-CHARGE
 4 -WORK STATION

LEGEND
 ■ MASONRY WALL
 ■ CORRIDOR WITH ALLIED FEATURES
 ■ RCC COLUMN
 ■ SOLID / GLAZED PARTITION

