Pollution Control Board, Assam

Bamunimaidam, Guwahati-21

www.pcbassam.org

Fax No. – 0361-2550259; Phone No. – 0361-2550258

Email: membersecretary@pcbassam.org

TECHNO COMMERCIAL BID DOCUMENT

FOR CONSTRUCTION OF:

1. **Office Building (G+3) for Regional Laboratory cum Office, Sivasagar, Pollution Control Board, Assam at Sivasagar.**
2. **Office Building (G+2) for Regional Office, Golaghat, Pollution Control Board, Assam at Golaghat.**
3. **Office Building (G+2) for Regional Office, Nagaon, Pollution Control Board, Assam at Nagaon.**

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NOTICE INVITING TENDER

NIT No. WB/G-1115/14-15/06 Dated Guwahati the, 06th Jan., 2015

Sealed tenders in two-bid system are invited from experienced & competent contractors for following works of Pollution Control Board, Assam at Sivasagarh, Golaghat and Nagaon respectively:

Name of works	**Construction of Office Building (G+3) for RLO, Sivasagar, PCBA at Sivasagar**	**Construction of Office Building (G+2) for RO, Golaghat, PCBA at Golaghat**	**Construction of Office Building (G+2) for RO, Nagaon, PCBA at Nagaon**
Earnest Money	Rs. 5,05,000.00	Rs. 4,90,000.00	Rs. 3,90,000.00
Date of issue of tender paper	09.01.2015 to 28.01.2015	09.01.2015 to 28.01.2015	09.01.2015 to 28.01.2015
Last Date & time of submission of tender	31.01.2015 (1.30 PM)	31.01.2015 (1.30 PM)	31.01.2015 (1.30 PM)
Technical Bid Opening Date & Time	31.01.2015 (2.00 PM)	31.01.2015 (2.00 PM)	31.01.2015 (2.00 PM)
Qualifying criteria for issue of Tender Document: **(1)** Registered with Govt. / Semi Govt. Dept. / Autonomous Body, **(2)** Should have completed satisfactorily multistoried building works of value not less than that shown in table below against single work order during last 5 yrs. under Govt./ Semi Govt. Dept. / Autonomous Body.			
Name of works	**Construction of Office Building (G+3) for RLO, Sivasagar, PCBA at Sivasagar**	**Construction of Office Building (G+2) for RO, Golaghat, PCBA at Golaghat**	**Construction of Office Building (G+2) for RO, Nagaon, PCBA at Nagaon**
One work of	Rs. 2,00,00,000.00	Rs. 1,95,00,000.00	Rs. 1,55,00,000.00
OR Two works of	Rs. 1,50,00,000.00	Rs. 1,45,00,000.00	Rs. 1,20,00,000.00
OR Three works of	Rs. 1,00,00,000.00	Rs. 95,00,000.00	Rs. 80,00,000.00
3. Annual Turn Over:			
Minimum Annual Turn Over during last 3 consecutive years	Rs. 1,25,00,000.00	Rs. 1,20,00,000.00	Rs. 1,00,00,000.00
Tenderers bidding for more than one work shall satisfy the above qualifying criteria taken together and price bids will be opened up to the extent of their qualifying criteria.			

Date & Time of Pre-Bid meeting : 22.01.2015 at 2.30 PM

Note **:** Financial turn over and values of completed works of previous years shall be given weightage of 10% per year and part thereof to bring them to the present price level. The statement showing the value of existing commitments and ongoing works as well as stipulated period of completion for each of the work listed should be countersigned by the Engineer-in-Charge not below the rank of Executive Engineer of the concerned Departments.

Tender document will be issued on payment of Rs. 5000.00 (non refundable) for each work in the form of demand draft / banker's cheque in favour of 'Member Secretary, Pollution Control Board, Assam' payable at 'Guwahati' and submission of proof of all qualifying documents as stated above. Tender papers can also be downloaded from the website www.pcbassam.org in which case the cost of tender paper should be submitted along with the tender.

1. Application for Tender Document must be accompanied by the attested copies of the qualifying documents as stated above. Tender documents will be issued on any working day during office hour within the last date of issue of Tender on payment of (non-refundable) demand draft/ banker's cheque of Rs. 5000.00 in favour of Member Secretary, Pollution Control Board, Assam payable at Guwahati towards the cost of tender document for each work.
2. The bidders within 7 (seven) days of receipt/downloading of Bidding Document, shall acknowledge the receipt/downloading of the same and confirm his intention to bid for the tendered work as per proforma, **Acknowledgement-Cum-Consent Letter** enclosed in Bidding Document. Bidder also must intimate their intention of not quoting if they are not submitting their Bid within 7 days of receipt/downloading of the Bidding Document positively. The Acknowledgement-cum-consent letter may be sent by Fax or e-mail to: Member Secretary, Pollution Control Board, Assam, Guwahati-21; Fax: 0361-2550259, E-mail- **membersecretary@pcbassam.org**
3. The earnest money up to Rs. 20.00 lacs shall be deposited along with the tender in the form of **Demand draft/ Banker's cheque** in favour of 'Member Secretary, Pollution Control Board, Assam' payable at 'Guwahati'. The amount in excess of Rs.20.00 lakhs may be deposited along with the tender in the form of Bank Guarantee issued by a scheduled bank in the proforma enclosed in the bid document.
4. Pollution Control Board, Assam reserves the right to not issuing tender papers to any contractor, if in the opinion of the Board, the progress of the ongoing works of the contractor has not been found satisfactory and they will not be able to handle a new work till the completion of their ongoing work(s). PCBA also reserves the right to accept or reject any or all applications for issue of the tender document without assigning any reason thereof.
5. The issue of tender paper to a contractor does not automatically mean that the tenderer is considered qualified for the price part of the bid.
6. The acceptance of tender will rest with the authority of Pollution Control Board, Assam who does not bind itself to accept the lowest tender and reserves itself the right to reject any or all the tenders received without assigning any reason thereof. The work may be allotted in part or whole at the discretion of competent authority of the Board.
7. For all clarifications regarding site conditions, items of works or any other related matters to the tender, Sr. Env. Engineer, Zone-IV, Head Office, PCBA may be contacted during office hours on any working day.
8. In case, the day of submission of the tender happens to be a holiday on account of Govt. notification and tender cannot be received or opened; the tender shall be received and opened on the next working day at the same times.

9. Pre-bid queries should reach the undersigned at least two days ahead of the schedule date of meeting. Any query may be sent through fax/e-mail at the number and e-mail id mentioned hereinabove.

10. The tender document shall be submitted in two properly sealed packet/envelop as follows:

    PART-A : This packet shall contain the Techno-Commercial Bids comprising of NIT, General Conditions of Contract, Special Conditions of Contract, Technical specifications, drawings alongwith EMD and documents/particulars of the tenderer and any other matter the tenderer wish to submit duly signed on every page with official seal etc. This packet/envelop should be marked as "**TECHNO-COMMERCIAL BID"** and Name of the Work and Name of Tenderer should be written in Capital letters.

    PART-B : This packet shall contain the Price Bids comprising of only the **BILL OF QUANTITIES (BOQ)** duly filled in and signed on every page with office seals. No other paper other than the BOQ contained in this package shall be accepted. This packet shall be marked as, **"PRICE BID"** and Name of the Work and Tenderer Name should be written in Capital letters.

11. Part-A tenders shall be opened on the date and time as mentioned above. But price bids of only of those tenderers whose techno-commercial bids (Part-A) are found acceptable shall be opened on a later date. Prior notification shall be given to all tenderers who qualify for opening of the PRICE BIDS to enable them to attend the opening of the Price bids. Part-B of the tender of those tenderers who do not qualify for opening of the Part-B shall be returned without opening the same.

Yours faithfully,

Member Secretary
Pollution Control Board, Assam
Bamunimaidam, Guwahati-21

Pollution Control Board, Assam, Bamunimaidam, Guwahati-21

Submission of Tender

From :.....

To
The Member Secretary,
Pollution Control Board, Assam
Bamunimaidam, Guwahati-21

1. I/We hereby tender for execution of the work **"**…… …… …… ……**"** as per tender document within the time schedule mentioned therein and accepted by me/us, at the schedule of rates quoted by me/us for the whole work in accordance with terms and conditions, specifications, drawings, as detailed in the tender document.
2. It has been explained to me/ us that the time stipulated for job and completion of works in all respects and in different stages mentioned in the "Time schedule" of completion of work and signed and accepted by me/us is the essence of the Contract. I/We agree that in the case of failure on my/ our part to strictly observe the time of completion mentioned for work or any of them and to the final completion of works in all respects according to the schedule set out in the said "Time Schedule of Completion of work", I/We shall pay compensation to the Owners as per provision and stipulations contained in clause-23 of General conditions of Contract and I/We agree to the recovery being made as specified therein. In exceptional circumstances extension of time which shall always be in writing may, however, be granted by the Engineer-in-Charge at his entire discretion for some items of work, and I/We agree that such extension of time will not be counted for the extension of completion dates stipulated for work and for the final completion of works as stipulated in the said "Time Schedule" of Completion of work.
3. I/We agree to pay the earnest money and security deposit and accept the terms and conditions laid down in the memorandum below in this respect.

MEMORANDUM

(a)	General description of work	:
(b)	Earnest Money	:..... (Rupees)……..... ……..... (only). The Earnest money is payable in the manner set out in Para 5, below. The Earnest money, if the tender is accepted, will be retained against the security deposit.
(c)	Security Deposit	: 10% of the contract amount which will be paid in the manner set out in clause (19) in section IV of the General Conditions of Contract
(d)	Time allowed for starting of work	: Fifteen days from the date of issue of letter of acceptance of the tender

4. Should this tender be accepted I /We hereby agree to abide by and fulfill all terms and conditions referred to above and in default thereof, to forfeit and pay to the Owner or its successors or its authorized nominees such sums of money as are stipulated in conditions contained in Notice Inviting Tender and other tender documents.

5. I/We hereby pay the earnest money of ₹ ..... (Rupees..... .....)in the form of Banker's cheque /Demand Draft/..... (Name and Office of the State Bank of India or any Schedule 'A' Bank) in favour of "Member Secretary, Pollution Control Board, Assam" payable at 'Guwahati'.

6. If I/We fail to commence the work specified in the memorandum in Para (3) above, or I/We fail to deposit the amount of security deposit specified in the Memorandum in Para (3) above, I/We agree that the said Owner and its successors without prejudice to any other right or remedy be at liberty to forfeit the said earnest money in full otherwise the said earnest money shall be retained by Owner, towards the security deposit specified in Para (3) above. The said Owner shall also be at liberty to cancel the notice of acceptance of tender if I/We fail to deposit the security amount as aforesaid or to execute an agreement or to start work as stipulated in the tender documents.

   I/We enclose herewith evidence of my/our experience of execution of work of similar nature and magnitude carried out by me/us in the prescribed proforma and also the Income Tax and Sales Tax Clearance Certificate.

Date.....day of.....2015

Witness:

Name in Block Letters:

Address:

Signature of Tenderer(s), with the seal of Firm

PROFORMA FOR ACKNOWLEDGEMENT LETTER OF BIDDING DOCUMENT
(TO BE SUBMITTED IN BIDDER'S OWN LETTER HEAD)

Ref no. **Date:**

To
The Member Secretary,
Pollution Control Board, Assam
Bamunimaidam, Guwahati-21

Sub:

Ref: NIT No.

Dear Sir,

We hereby acknowledge receipt of a complete set of bidding document along with all enclosures for the subject work for preparation and submission of the Bid.

We undertake that the contents of the above Bidding document shall be kept confidential, further that specifications and documents shall not be transferred, and that the said documents are to be used only for the purpose for which they are intended.

(A) We intend to bid as requested for the subject works and furnish following details with respect to our quoting office:

(i)	POSTAL ADDRESS	:
(ii)	TELEPHONE NUMBER	:
(iii)	MOBILE NO.	:
(iv)	TELEFAX NUMBER	:
(v)	CONTACT PERSON	:
(vi)	DESIGNATION	:
(vii)	EMAIL ADDRESS	:
(viii)	REGISTERED OFFICE	:

BIDDER'S NAME : ……

SIGNATURE: ……..

NAME : ……

DESIGNATION : ……..

DATE : ……

LIST OF TENDER DRAWINGS

For Construction of

Sl. No.	Drawing Titles	No. of Copies
1.	Plan for all floors	
2.	Elevations (front & sides)	
3.	Sectional Elevation	
4.	Site Plan	

GENERAL CONDITIONS OF CONTRACT (GCC)

SECTION - 1

1. Definition of Terms

In the contract document as herein defined where the context so admits, the following words and expressions will have the following meanings:

1.1 "The Owner" means the Pollution Control Board, Assam having its registered office at Bamunimaidam, Guwahati-21.

1.2 "The Contractor" means the person or the persons, firm or company whose tender has been accepted by the Owner and includes the Contractor's legal representative, his successor and permitted assignees.

1.3 The "Engineer-in-Charge" shall mean the person designated as such by the Owner and shall include those who are expressly authorized by the Owner to act for and on his behalf for operation of this contract.

1.4 The "Work" shall mean works to be executed in accordance with the contract or part thereof as the case may be and shall include all extra, additional altered or substituted works as required for the purpose of the contract.

1.5 The "Permanent work" means works as handed over to the Owner by the Contractor on completion of the contract.

1.6 "Construction Equipment" means all applications and equipment of whatsoever nature for the use in or for the execution, completion, operation or maintenance of the work unless intended to form part of the Permanent work.

1.7 "Site" means the areas on which the permanent Works are to be executed or carried out and any other places provided by the Owner for purpose of the contract.

1.8 "Contract Document" means collectively the Tender Document, Designs, Drawings, Specifications, agreed variations, if any, and such other documents constituting the tender and acceptance thereof.

1.9 "The Sub-Contractor" means any person or firm or Company (other than the Contractor) to whom any part of the work has been entrusted by the Contractor, with the written consent of the Engineer-in-Charge, and the legal personal representatives, successors and permitted assigns of such person, firm or company.

1.10 The "Contract" shall mean the Agreement between the Owner and the Contractor for the execution of the works including therein all contract documents.

1.11 The "Specification" shall mean the various technical specifications attached and referred in the tender documents. It shall also include the latest edition including all addenda/corrigenda of relevant Indian Standard Specifications published before entering into Contract.

1.12 "The Drawings" shall include maps, plans and tracings or prints thereof with any modifications approved in writing by the Engineers-in-Charge and such other drawings as may required , from time to time, or furnished or approved in writing by the Engineer-in-Charge.

1.13 The "Tender" means the tender submitted by the Contractor for acceptance by the Owner.

1.14 The “Alteration Order” means an order given in writing by Engineer-in-Charge to effect additions to or deletion from and alteration in the work.

1.15 The “Completion Certificate” shall mean the certificate to be issued by the Owner when the works have been completed to his satisfaction.

1.16 The “Final Certificate’ in relation to a work means the certificate issued by the Owner after the period of liability is over.

1.17 The “Period of Liability” in relation to a work means the specified period from the date of issue of completion certificate up to the date of issue of final certificate during which the Contractor stands responsible for rectifying all defects that may appear in the works.

a. The “Appointing Authority” for the purpose of arbitration shall be the Director, Pollution Control Board, Assam or any other person so designated by the Owner.

b. ‘Tendering period’ means the period from the date of invitation of tender to date of submission of tender.

c. ‘Consultant’ means the consultant engaged by the ‘Owner’ for the work which shall be reported to the contractor.

SECTION - 2

2. GENERAL INFORMATION

2.1 Location and Accessibility of Site

2.2 Scope of Work

The scope of work is defined in the special conditions of Contract and specifications. The Contractor shall provide all necessary materials, equipment, labour etc. for the execution and maintenance of the work till completion unless otherwise mentioned in this tender document. All materials required for the work shall be approved by Engineer-in-Charge prior to procurement and use.

2.3 Water Supply

The Contractor will have to make his arrangements for supply of water to his labour camps and for works. All pumping installations, pipe network and distribution system will have to be carried out by the Contractor at his own cost.

2.4 Power Supply

The Contractor will make his own arrangement for his requirement of power to carry out the work. Owner will not be supplying power for this work. All the works by the Contractor in this regard will be done as per the Indian Electricity Act and rules framed there under and as approved by the Engineer-in-Charge.

2.5 Land for Contractor's Field Office, Go-down and Workshop

The Owner will at his own discretion and convenience and for the duration of the execution of the work make available near the site, the land for construction of Contractor's field office, go-downs, workshops and assembly yard required for the execution of the contract. The Contractor shall at his own cost construct all these temporary buildings and provide suitable water supply and sanitary arrangement approved by the Engineer-in-Charge.

2.6 Land for Residential Accommodation

No land for residential accommodation for staff and labour of the Contractor will be made available within the campus.

2.7 Site clearance

On completion of the works undertaken by the Contractor, he shall remove all temporary works erected by him and have the site cleaned as directed by the Engineer-in-Charge. If the Contractor shall fail to comply with these requirements, the Engineer-in-Charge may at the expense of the Contractor remove such surplus and rubbish materials and dispose of the same as he deems fit and get the site cleared as aforesaid; and the Contractor shall forthwith pay the amount of all expenses so incurred and shall have no claim in respect of any such surplus materials disposed off as aforesaid. But the Owner reserves the right to ask the Contractor any time during the pendency of the contract to vacate the land by giving seven days notice on security reasons or on material interest or otherwise.

SECTION - 3

GENERAL INSTRUCTIONS TO TENDERER

3. Submission of Tender

3.1 Tender must be submitted in original and without making any additions, alterations and as per details given in other clauses in tender document. The requisite details shall be filled in by the Contractor in page 1 and 2 of Tender document. The rate shall be filled in the Schedule given in this tender document. Reservations, if any, regarding the tender conditions and schedule rates should be clearly brought out in a separate letter.

3.2 Addenda/Corrigenda to this tender document, if issued, must be signed and submitted along with the tender document. The tenderer should write clearly the revised quantities in schedule of rates of Tender Document and should price the work based on revised quantities when amendments for quantities are issued in addenda.

3.3 The Original tender copy marked duly completed and signed on each page should be submitted along with the offer.

3.4 The tender should be placed in doubled sealed covers super-scribing the full name of the work, due date of opening .The full name, postal address of the tenderer shall be written on the bottom left corner of the sealed cover.

4. Documents

4.1 The tenders, as submitted, shall consist of the following :

(i) Complete set of the “Original Copy” of the tender document as sold duly filled in and signed by the tenderer as prescribed in different clauses of the tender document with all addenda/corrigenda issued duly signed.

(ii) Earnest money in the manner specified in clause no. 6 hereof of GCC.

(iii) Power of Attorney or a true copy thereof duly attested by Gazetted Officer/ Notary in case an authorized representative has signed the tender, as required under clause 4.5 of GCC.

(iv) Income tax clearance and sales tax clearance certificates in original or their true copies duly attested by Government Gazetted Officer.

(v) Information regarding tenderers in the Performa enclosed under the head “Information about Tenderer “.

(vi) Details of work of similar type and magnitude carried out by Tenderer in the Performa enclosed.

(vii) Organization chart giving details of field management at site proposed by the tenderer for this work.

(viii) Details of construction plant and equipment available with the Tenderer for use in this work in Performa enclosed under the head “Information Regarding Equipment which the Tenderer proposes to use for this work.”

(ix) Solvency Certificate from a Scheduled bank to prove the financial ability to carry out the work tendered for.

(x) The tenderer shall submit copies of PAN, VAT, registration under EPF and MP Act1952, ESIC, Service tax whatever is applicable to this contract.

4.2 All pages to be initialed

All the pages of tender document shall be initialed at the lower right hand corner and signed wherever required in the tender by the tenderer or by a person holding power of attorney authorizing him to sign on behalf of the tenderer before submission of tender.

4.3 Rates should be in Figures and Words

The tenderer should quote in English both in figures and words, the rates and amounts tendered by him in the schedule of rates for each item and in such a way that insertion is not possible. However, should there be any discrepancy between the rates in figures and in words the rates in words shall be considered as correct. The amount for each item should be worked out and entered and requisite total given of all items both in figures and words. The tendered amount for the work shall be entered in the tender and duly signed by the tenderer.

4.4 Corrections and Erasures

All corrections and alterations in the entries of tender document will be signed in full by the tenderer with date. No erasures or over-writings are permissible.

4.5 Signature of Tenderer

4.5.1 The tender shall contain the name, residence and place of business of person or persons making the tender and shall be signed by the tenderer with his usual signature. Partnership firms shall furnish the full name of all partners in the tender. It should be signed in the partnerships name by all the partners or by duly authorized representative followed by the name and designation of the person signing. Tender by a corporation shall be signed by an authorized representative and a power of attorney in that behalf shall accompany the tender. A copy of the constitution of the firm with names of all partners shall be furnished.

4.6 Witness

Witness and sureties shall be persons of status and property and their names, occupation and address shall be stated below their signature.

4.7 Details of Experience

The tenderer should enclose documents to show that he has previous experience in having successfully completed in the recent past works of the same nature, together with the names of Owners, location of sites and values of contract.

5. Transfer of Tender Documents

Transfer of tender documents purchased by one tenderer to another tenderer is not permissible.

6. Earnest Money deposit (EMD)

The tenderer shall pay Earnest money as given in the detailed Notice Inviting Tender. Tenders without EMD are liable to be rejected. The Earnest Money up to Rs. 20.00 lacs shall be paid in Demand Draft/ Banker's cheque only and amount exceeding Rs. 20.00 lacs may be paid in the form of Bank Guarantee from any Nationalized / Schedule Bank in favour of "Member Secretary, Pollution Control Board, Assam" payable at 'Guwahati'.

Note : No interest shall be paid by the Owner on the Earnest Money deposited by the tenderer. The earnest money of the unsuccessful tenderers will be refunded within a period of 120 days from the date of award of the contract.

The earnest money deposited by successful tenderer will remain towards the security deposit for the fulfillment of the contract but shall be forfeited if the tenderer fails to deposit the requisite initial security deposit as per clause no. 10 herein under and or fails to execute the agreement within 25 days from the date of issue of the Letter of Intent.

7. Validity

Tenders submitted shall remain valid for acceptance for a period of **120 days** from the date of opening of the tender. The tenderer shall not be entitled during the said period of 120 days, without the consent in writing of the Owner, to revoke; or cancel his tender or to vary the tender given or any term thereof. In case of tenderer revoking or cancelling his tender or varying any term in regard thereof without the consent of Owner in writing, the Owner shall forfeit earnest money paid by him along with tender.

8. Addenda/Corrigenda :

8.1 Addenda/Corrigenda to the tender document may be issued prior to the date of opening of the tenders to clarify documents or to reflect modification in the design or contract terms

8.2 Each addenda/Corrigenda issued by the Owner will be distributed in duplicate to each person or organization to whom a set of tender documents has been issued. Each tenderer will retain one copy of each addenda/Corrigenda for submission along with his tender and return one signed copy to the Engineer-in-Charge as acknowledgement of receipt of the same. All addenda/Corrigenda issued by the Owner shall become part of tender Documents.

9. Right of Owner to Accept or Reject Tender:

The right to accept the tender will rest on the Owner. The Owner, however, does not bind itself to accept the lowest tender, and reserves to itself authority to reject any or all the tenders received without assigning any reason whatsoever.

Tenders in which any of the particulars and prescribed information are missing or are incomplete in any respect and/or the prescribed conditions are not fulfilled are liable to be rejected.

Canvassing in connection with tenders is strictly prohibited and tender submitted by the Tenderer who resort to canvassing will be liable to rejection.

10. Security Deposit

The person/persons whose tender may be accepted (hereafter called the Contractor) shall within 15 days from the date of issue of the Letter of Intent, remit the initial security deposit of 2 % of the accepted value of the tender to the Pollution Control Board, Assam in the manner stipulated in clause 19 of General Conditions of Contract.

11. Time Schedule

The time allowed for carrying out the job is as shown in this document. This shall be signed and submitted along with the tender. Requests for revision for construction time after tenders are opened will not be received for consideration.

12. Collection of Data Tenderer's Responsibility

The tenderer shall visit the site and acquaint himself fully of the site and no claims whatsoever will be entertained on the plea of ignorance or difficulties involved in execution of work or carriage of materials.

13. Retired Government and Board Officer

No Engineer of Gazetted rank or other Gazetted Officer, employed in Engineering or Administrative duties in an Engineering Department of the State/Central Government or of the Owner is allowed to work as Contractor for a period of two years after his retirement from Government Service, or from the employment of the Owner without the previous permission of the Owner. The contract, if awarded, 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 State/Central Government or the Owner as aforesaid before submission of tender or engagement in the Contractor's service as the case may be.

14. Signing of the Contract

The successful tenderer shall be required to execute an agreement in the Performa attached with tender document within 25 days from the date of issue of the Letter of Intent. In the event of failure on the part of the successful tenderer to sign the agreement within the above-stipulated period, the earnest money or his initial security deposit shall be forfeited and the acceptance of the tender shall be considered as cancelled.

15. Field Management

15.1 The field management will be the responsibility of the Engineer-in-Charge who will be nominated by the Owner. The Engineer-in-Charge may also authorize his representatives to perform his duties and functions.

15.2 Clause 63 of the General Conditions of Contract shall be referred to in this connection.

15.3 Co-ordination of Work

The Engineer-in-Charge shall co-ordinate the works of various agencies engaged at site to ensure minimum disruption of work carried out by different agencies. It shall be the responsibility of the Contractor to plan and execute the works strictly in accordance with site instructions to avoid hindrance to the work being executed by other agencies.

SECTION - 4

GENERAL OBLIGATIONS

16. Interpretation of Contract Documents

16.1 Except if and to the extent otherwise provided by the Contract, the provisions of the General Conditions of Contract and special conditions shall prevail over those of any other documents forming part of the contract. Several documents forming the contract are to be taken as mutually explanatory. If there be any discrepancy, inconsistency, error or omission in the contract or any of them the matter may be referred to the Engineer-in-Charge who shall give his decisions and issue to the Contractor instructions directing in what manner the work is to be carried out. The decision of the Engineer-in-Charge shall be final and conclusive and the Contractor shall carry out work in accordance with this decision.

16.2 Works shown upon the drawing but not mentioned in the specifications or described in the specifications without being shown on the drawing shall nevertheless be held to be included in the same manner as if they had been specifically shown upon the drawing and described in the specifications.

16.3 **Headings and Marginal Notes**

All headings and marginal notes to the clause of these General Conditions of Contract or to the specifications or to any other tender document are solely for the purpose of giving a concise indication and not a summary of the contents thereof, and they shall never be deemed to be part thereof or be used in the interpretation or construction thereof of the contract.

16.4 **Singular and Plural**

In these contract documents unless otherwise stated specifically, the singular shall include the plural and vice-versa wherever the context so requires. Words imputing persons shall include relevant corporate companies/registered associations/body of individuals/firm of partnership.

17. Special Conditions of Contract

17.1 Special Conditions of Contract shall be read in conjunction with the General Conditions of Contract, specifications of work, Drawings any other documents forming part of this contract wherever the context so requires.

17.2 Notwithstanding the subdivision of the documents into these separate sections and volumes every part of each shall be deemed to be supplementary to and complementary of every other part and shall be read with and into the contract so far as it may be practicable to do so.

17.3 Where any portion of the General Conditions of Contract is repugnant to or at variance with any provisions of the Special Conditions of Contract then, unless a different intention appears the provisions of the Special Conditions of Contract shall be deemed to over-ride the provisions of the General Conditions of Contract and shall to the extent of such repugnancy, or variations prevail.

17.4 Wherever it is mentioned in the specifications that the Contractor shall perform certain work or provide certain facilities, it is understood that the Contractor shall do so at his cost.

17.5 The materials, design and workmanship shall satisfy the relevant Indian Standards, the job specifications contained herein and codes referred to. Where the job specifications stipulate requirements in addition to those contained in the standard codes and specifications stipulate requirements in addition to those contained in the standard codes and specifications, these additional requirements shall also be satisfied.

18 Contractor to Obtain His Own Information

The Contractor in fixing his rate shall for all purposes whatsoever be deemed to have himself independently obtained all necessary information for the purpose of preparing his tender. The correctness of the details, given in the Tender Document to help the Contractor to make up the tender is not guaranteed.

The Contractor shall be deemed to have examined the Contract Documents to have generally obtained his own information in all matters whatsoever that might affect the carrying out the works at the scheduled rates and to have satisfied himself to the sufficiency of his tender. Any error in description of item and quantity or omission there from shall not vitiate the contract or release the Contractor from executing the work comprised in the contract according to drawings and specifications at the scheduled rates. He is deemed to have known the scope, nature and magnitude of the works and the requirements of materials and labour involved etc., and as to what all works he has to complete in accordance with the contract documents whatever be the defects, omission or errors that may be found in the Contract documents. The Contractor shall be deemed to have visited surroundings to have satisfied himself to the nature of all existing structures, if any, and also as to the nature and the conditions of the Railways, roads, bridges and culverts, means of transports and communications, whether by land, water or air, and as to possible interruptions thereto and the access to and egress from the site, to have made enquiries, examined and satisfied himself as to the sites for obtaining sand stones, bricks and other materials, the site for disposal of surplus materials, the available accommodation as to whatever required, depots and such other buildings as may be necessary for executing and completing the works, to have made local independent enquiries as to the sub-soil, subsoil water and variations thereof, storms, prevailing winds, climatic conditions and all other similar matters affecting these works. He is deemed to have acquainted himself as to his liability for payment of Government taxes, customs duty and other charges.

Any neglect or failure on the part of the Contractor in obtaining necessary and reliable information upon the foregoing or any other matters affecting the contract shall not relieve him from any risks or liabilities or the entire responsibility from completion of the works at the schedule rates and time in strict accordance with the contract documents.

No verbal agreement or inference from conversation with any officer or employees of the Owner either before or after the execution of the contract agreement shall in any way affect or modify any of the terms of obligations herein contained.

19 Security Deposit

19.1 A sum of 10% of the accepted value of the tender shall be deposited by the person/persons (hereafter called the Contractor) as security deposit with the Owner. This may be deposited initially at 2% of the value of the contract

(referred as initial Security Deposit) within 15 days from the date of issue of Letter of Intent and the balance 8% will be recovered in installments through deductions @ 10% of the value of each running account bill till the total security deposit amount is collected, after which no further deductions from bills will be made on this account, subject to Cl. 19.3 below.

The earnest money deposited with the tender shall be adjusted towards security deposit, provided it is furnished in demand draft only.

Alternatively, the Contractor may, at his option, deposit the full amount of 10% of the accepted value of the tender towards the security deposit within 15 days from the date of issue of the Letter of Intent.

19.2 The Contractor shall furnish the initial security deposit amount equivalent to 2% of the accepted value of work in the form of Demand draft / Banker's Cheque in favour of "Pollution Control Board, Assam" payable at Guwahati. Security deposit recovered in cash in excess of 50% of the security deposit including the initial security deposit of 2% may be later on converted at the request of the contractor to either interest bearing Govt. securities or FDR of a scheduled "A" bank duly endorsed in favour of "Pollution Control Board, Assam" and hypothecated with the Owner or may be replaced by a bank guarantee of a scheduled "A" bank.

19.3 If the Contractor/Subcontractor or their employees shall break, deface or destroy any property belonging to the Owner or others during the execution of the contract, the same shall be made good by the Contractor at his own expenses and in default thereof, the Engineer-in Charge may cause the same to be made good by other agencies and recover expenses from the Contractor (for which the certificate of the Engineer-in-Charge shall be final).

19.4 All compensation or other sums of money payable by the Contractor to the Owner under terms of this contract may be deducted from or paid by the sale of a sufficient part of his security deposit or from any sums which may be due or may become due to the Contractor by the Owner on any account whatsoever and in the event of his security deposit being reduced by reasons of any such deductions or sale of aforesaid, the Contractor shall within ten days thereafter make good in cash, bank drafts or Government securities endorsed as aforesaid any sum or sums which may have been deducted from or realized by sale of his Security Deposit, or any part thereof. No interest shall be payable by the Owner from sums deposited as security deposit.

19.5 Half of the security deposit for the job concerned may however be refunded after the expiry of half the period of liability for that particular Job, at the discretion of the Engineer-in-charge and the balance half on the full period of liability.

20. Time of performance

20.1 The work covered by this contract shall be commenced from the 25th day from the date of issue of the Letter of Intent and be completed in stages on or before the dates as mentioned in the time schedule of completion of work. The Contractor should bear in mind that time is the essence of this agreement, unless such time is extended pursuant to the provision of clause No. 22. Request for revision of construction time after tenders are opened will not receive any consideration.

20.2 **Time Schedule of Construction**

The general time schedule of construction is given in the tender document. The Contractor should prepare a detailed monthly or weekly construction programme jointly with the Engineer-in-Charge within one month from the date of issue of Letter of Intent or acceptance of tender. The work shall be executed strictly as per the time schedule given in this document. The period of construction given includes the time required for testing, rectifications, if any, retesting and completion in all respects to the entire satisfaction of the Engineer-in-Charge.

21. Force Majeure

Any delays in or failure of the performance of either party hereto shall not constitute default hereunder or give rise to any claims for damages, if any, to the extent such delays or failure of performance is caused by occurrences such as Acts of God or the public enemy, expropriation or confiscation of facilities by Government authorities, compliance with any order or request of any Governmental authorities, acts of war, rebellion or sabotage or fires, floods, explosions' riots or illegal strikes.

22. Extension of Time

If the Contractor shall desire an extension of the time for completion of the work on the grounds of his having been unavoidably hindered in its execution or on any other grounds, he shall apply in writing to the Engineer-in-Charge within ten days of the date of the hindrance on account of which he desires such extension as aforesaid, and the Engineer-in-Charge shall, if in his opinion (which shall be final) reasonable grounds have been shown thereof, authorize such extension of time as may, in his opinion be necessary or proper without any extra cost / liability to the Owner.

No compensation for any resources, labourer etc. brought to site' in idle period will be paid to contractor.

23. Compensation for Delay

23.1 The time allowed for carrying out the works as entered in the Contract shall be strictly observed by the Contractor. The work shall throughout the stipulated period of the contract be proceeded with all the diligence (time being deemed to be the essence of the contract), and the Contractor shall pay to the Owner as compensation, an amount equal to 1% or such smaller amount as the Engineer-in-charge (whose decision in writing shall be final), may decide on the amount of the contract value for every week that the work may remain incomplete as per the time schedule, subject to a maximum compensation of 10% of the contract value after which prior action will be taken by the Engineer-in-Charge under the provisions of the Contract.

23.2 To ensure good progress during the execution of the work, the Contractor shall be bound, in all cases in which the time allowed for any work exceeds one month, to complete one/fifth of the work before one-fourth of the time allowed under the contract has elapsed, three-eighth of the work before one-half of such time has elapsed and three-fourth of the work before three-fourth of such time has elapsed. In the event of the Contractor failing to comply with this condition, he shall be liable to pay as compensation an amount as stipulated above. The compensation so paid shall not relieve the Contractor from his obligations to complete the work or from any other obligations and liabilities under the contract.

24. Sum Payable by Way of Compensation to be considered as Reasonable Compensation without Reference to Actual Loss

All sums payable by way of compensation under any of the conditions shall be considered as reasonable compensation without reference to the actual loss or damage, which shall have been sustained.

25. Rights of the Owner to Forfeit Security Deposit

Wherever any claim against the Contractor for the payment of a sum of money arises out of or under the contract, the Owner shall be entitled to recover such by appropriating in part or whole, the security deposit of the Contractor, and to sell any Government Securities etc. forming whole or part of such security. In the event of the security being insufficient or if no security has been taken from the Contractor, then the balance or the total sum recoverable, as the case may be, shall be deducted from any sum then due or which at any time thereafter may become due to the Contractor. The Contractor shall pay to the Owner on demand any balance remaining due.

26. Failure by the Contractor to Comply with the Provisions of the Contract:

26.1. If the contractor refuses or fails to execute the WORK or any part thereof with such diligence as will ensure its completion within the time specified in the contract or extension thereof or fails to perform any of this obligation under the Contract or in any manner commits a breach of any of the provisions of the Contract, it shall be open to the Owner at its option by written notice to the contractor, by registered post or recorded delivery specifying the default.

a) to determine the Contract in which event the Contract shall stand terminated and shall cease to be in force and effect on and from the date appointed by the Owner on that behalf, whereupon the Contractor shall stop forth with any of the Contractor's work then in progress, except such WORK as the Owner may, in writing, require to be done to safeguard any property or WORK, or installations from damage, and the OWNER, for its, part, may take over the work remaining unfinished by the Contractor and complete the same through a fresh Contractor or by other means at the risk and cost of the Contractor, and the contractor or any of his sureties if any, shall be liable to the Owner for any excess cost occasioned by such work having to be so taken over and completed by the Owner over and above the cost, at rates specified in the Schedule of Quantities and rate/ prices.

In the event of incompleted work being completed by other agency, the excess cost incurred shall be recovered from the contractor and in this regard decision of the 'Owner' shall be final and binding.

Or

b) Without determining the Contract to take over the work of the Contractor or any part thereof and complete the same through a fresh Contractor or by other means at the risk and cost of the Contractor. The contractor and any of his sureties are liable to the Owner for any excess cost over and above the cost as worked out in terms of the Contract, occasioned by such works having been taken over and completed by Owner.

26.2 **In such events as above:**

a) The whole or part of the security deposit furnished by the Contractor is liable to be forfeited without prejudice to the right of the Owner to recover from the Contractor the excess cost referred to in the sub-clause aforesaid, the Owner shall also have the right of taking possession and utilizing in completing the works or any part thereof, such materials, equipment and plants available at work site belonging to the Contractor as may be necessary and the Contractor shall not be entitled for any compensation for use or damage to such materials, equipment and plant.

b) The amount that may have become due to the Contractor on account to work already executed by him shall not be payable to him until after the expiry of six (6) calendar months reckoned from the date of termination of Contract or from the taking over the WORK or part thereof by he Owner as the case may be, during which period the responsibility for faulty materials or workmanship in respect of such work shall under the Contract, rest exclusively with the contractor. This amount shall be subject to deduction of any amounts due from the Contractor to the Owner under the terms of the Contract authorised or required to be reserved or retained by the owner.

26.3 Before determining the Contract, provided in the judgment of the Owner, the default or defaults committed by the Contractor is/ are curable and can be cured by the contractor if an opportunity is given to him, then the Owner may issue notice in writing calling the Contractor to cure the default within such time specified in the notice.

26.4 The Owner shall also have the right to proceed or take action as per above, in the event that the Contractor becomes bankrupt, insolvent, compounds with his creditors assigns the Contract in favour of his creditors or any other person or persons or being a company or a corporation goes into voluntary liquidation, provided that in the said events it shall not be necessary for the Owner to give any prior notice to the Contractor.

26.5 Termination of the Contract as provided for in sub-clause 26.1 (a) above shall not prejudice or affect the rights of the Owner which may have accrued upto the date of such termination.

27. Contractor Remains Liable to Pay Compensation if Action not Taken under Clause 26.

In any case in which any of the powers conferred upon the Owner by clause 26 thereof shall have become exercisable and the same had not been exercised, the non exercise thereof shall not constitute a waiver of any of the conditions hereof and such powers shall notwithstanding be exercisable in the event of any further case of default by the Contractor for which by any clauses hereof he is declared liable to pay compensation amounting to the whole of his security deposit and the liability of the Contractor for past and future compensation shall remain unaffected. In the event of the Owner putting in force the powers under sub-clause (a), (b) or (c) vested in him under the preceding clause he may, if he so desires, take possession of all or any tools & plants, materials and stores in or upon the works or the site thereof belonging to the Contractor or procured by him and intended to be used for the execution of the work or any part thereof paying or allowing for the same in account at the contract rates or in case of these not being applicable at

current market rates to be certified by the Engineer-in-Charge whose certificate thereof shall be final, otherwise the Engineer-in-Charge may give notice in writing to the Contractor or his clerk of the works, foreman or other authorized agent, requiring him to remove such tools, plant, materials or stores from the premises (within a time to be specified in such notice), and in the event of the Contractor failing to comply with any such requisition, the Engineer-in-Charge may remove them at the Contractor's expense or sell them by auction or private sale on account of the Contractor and at his risk in all respects without any further notice as to the date, time or place of sale and the certificate of the Engineer-in-Charge as to the expense of any such removal and the amount of the proceeds and expense of any such sale shall be final and conclusive against the Contractor.

28. No Compensation for Alteration in or Restriction of Work

If at any time from the commencement of the work the Owner shall for any reason whatsoever not require the whole or part thereof as specified in the tender to be carried out the Engineer-in-Charge shall give notice in writing of the fact to the Contractor, who shall have no claim to any payment or compensation whatsoever on account of any profit or advantage which he might have derived form the execution of the work in full, but which he did not derive in consequence of full amount of the work not having been carried out neither shall he have any claim for compensation by reason of any alterations having been made in the original specifications, drawings, designs and instructions which shall involve any curtailment of the work as originally contemplated.

29. Change in Constitution

Where the Contractor is a partnership firm the prior approval, in writing, of the Owner shall be obtained before any change is made in the constitution of the firm. Where the Contractor is an individual or a Hindu undivided family business concern, such approval as aforesaid shall, likewise be obtained before such a Contractor enters into any agreement with other parties, where under the reconstituted firm would have right to carry out the work hereby undertaken by the Contractor. In either case if prior approval as aforesaid is not obtained, the contract shall be deemed to have been allotted in contravention of clause 35 hereof and the same action may be taken and the same consequence shall ensue as provided in the said clause.

30. If the Contractor Dies

Without prejudice to any of the rights or remedies under this contract, if the Contractor dies, the Owner shall have the option of terminating the contract without compensation to the contract.

31. Members of the Owner not individually Liable

No employee of the Owner shall in any way be personally bound or liable for the acts or obligations of the Owner under the contract or answerable for any default or omission in the observance or performance of any of the matters or things which are herein contained.

32. Owner not Bound by Personal Representations

The Contractor shall not be entitled to any increase on the schedule rates or any other right or claim whatsoever by reason of representation, explanation

or statement or alleged representation, promise or guarantees given or alleged to have been given to him by any person.

33. Contractor's Office at Site

The Contractor shall provide and maintain an Office at the site for the accommodation of his agent and staff and such office shall be open at all reasonable hours to receive instructions notices or other communications.

34. Contractor's Subordinate Staff and their Conduct

34.1 The Contractor, on or after award of the work shall name and depute qualified Engineers having sufficient experience in carrying out work of similar nature, to whom the equipments, materials, if any, shall be issued and instructions for works given. The Contractor shall also provide to the satisfaction of the Engineer-in-charge sufficient and qualified staff to superintend the execution of the works, competent sub-agents, foremen and leading hands including those specially qualified by previous experience to supervise the types of works comprised in the contract in such manner as will ensure work of the best quality, expeditious working. Whenever in the opinion of the Engineer-in-charge additional properly qualified supervisory staff is considered necessary, they shall be employed by the Contractor without additional charge on account thereof. The Contractor shall ensure to the satisfaction of the Engineer-in-charge that sub-contractors, if any, shall provide competent and efficient supervision over the work entrusted to them.

34.2 If and whenever any of the Contractor's or sub-Contractor's agents, sub-agents, assistants, foremen or other employees shall in the opinion of Engineer-in-Charge be guilty of any misconduct or be incompetent or insufficiently qualified or negligent in the performance of their duties or that in the opinion of the Owner or the Engineer-in-Charge, it is undesirable for administrative or any other reason for such person or persons to be employed in the works, the Contractor, if so directed by the Engineer-in-charge, shall at once remove such person or persons from employment thereon. Any person or persons so removed from the works shall not again be employed in connection with the works without the written permission of the Engineer-in-Charge. Any person so removed from the works shall be immediately replaced at the expense of the Contractor by a qualified and competent substitute. Should the Contractor be requested to repatriate any person removed from the works he shall do so and shall bear all costs in connection herewith.

34.3 The Contractor shall be responsible for the proper behavior of all the staff, foremen, workmen and others and shall exercise a proper degree of control over them and in particular and without prejudice to the said generality, the Contractor shall be bound to prohibit and prevent any employees from trespassing or acting in any way detrimental or prejudicial to the interest of the community or of the properties or occupies of land and properties in the neighborhood and in the event of such employee so tress - passing, the Contractor shall be responsible therefore and relieve the Owner of all consequent claims or actions for damages or injury or any other grounds whatsoever. The decision of the Engineer-in-Charge upon any matter arising under this clause shall be final.

34.4 If and when required by the Owner all the Contractor's personnel entering upon the Owner's premises shall be properly identified by badges of a type

acceptable to the Owner which must be worn at all times on the Owner's premises.

35. Sub-letting of Work

(i) No part of the contract nor any share or interest therein shall in any manner or degree be transferred, assigned or sublet by the Contractor directly or indirectly to any person, firm or corporation whosoever except as provided for in the succeeding sub-clause, without the consent in writing of the Owner.

(ii) **Sub-Contracts for Temporary Works etc.**

The Owner may give written consent to sub-contract for the execution of any part of the works at the site, being entered into by the Contractor provided each individual sub-contract is submitted to the Engineer-in-charge before entered into and is approved by him.

(iii) **List of Sub-Contractors to be Supplied**

At the commencement of every month the Contractor shall furnish to the Engineer-in-Charge list of all sub-Contractors or other persons or firms charged by the Contractor and working at the site during the previous month with particulars of the general nature of the sub-contract of works.

(iv) **Contractor's Liability not Limited by Sub-Contractors**

Notwithstanding any sub-letting with such approval as aforesaid and notwithstanding that the Engineer-in-Charge shall have received copies of any sub-contracts, the Contractor shall be and shall remain solely responsible for the quality and proper and expeditious execution of works and the performance of all the conditions of the contract in all respects as if such sub-letting or sub-contracting had not taken place and as if such work had been done directly by the Contractor.

(v) **Owner may Terminate Sub-Contracts**

If any sub-Contractor engaged upon the works at the site executes any work which in the opinion of the Engineer-in-charge is not in accordance with the contract documents, the Owner may by written notice to the Contractor request him to terminate such sub-contract and the Contractor upon the receipt of such notice shall terminate such sub-contract and the latter forthwith leave the works, failing which the Owner shall have the right to remove such sub-Contractors from the site.

(vi) **No Remedy for Action Taken under this Clause**

No action taken by the Owner under the clause shall relieve the Contractor of any of his liabilities under the contract or give rise to any right to compensation, extension of time or otherwise, failing which the Owner shall have the right to remove such sub-Contractors from the site.

36. Power of Entry

If the Contractor shall not commence the work in the manner previously described in the contract documents or if he shall at any time in the opinion of the Engineer-in-Charge

(i) fail to carry out the works in conformity with the contract documents, or

(ii) fail to carry out the works in accordance with the time schedule, or

(iii) Substantially suspend work or the works for a period of fourteen days without authority from the Engineer-in-charge, or

(iv) Fail to carry out and execute the works to the satisfaction of the Engineer-in-Charge, or

(v) Fail to supply sufficient or suitable constructional plant, temporary works, labour, materials or things, or

(vi) commit or suffer or permit any other breach of any of the provisions of the contract on his part to be performed or observed or persist in any of the above mentioned breaches of the contract for the fourteen days, after notice in writing shall have been given to the Contractor by the Engineer-in-Charge requiring such breach to be remedied, or

(vii) if the Contractor shall abandon the works, or

(viii) if the Contractor during the continuance of the contract shall become bankrupt, make any arrangement or composition with his creditors, or permit any execution to be levied or go into liquidation whether compulsory or voluntary not being merely a voluntary liquidation for the purpose of amalgamation or reconstruction then in any such case, the Owner shall have the power to enter upon the works and take possession thereof and of the materials, temporary works, constructional plant, and stock thereon, and to revoke the Contractor's license to use the same, and to complete the work by his agents, other Contractors or workmen, or to relate the same upon any terms and to such other person firm or corporation as the Owner in his absolute discretion may think proper to employ and for the purpose aforesaid to use or authorize the use of any materials, temporary works constructional plant, and stock as aforesaid, without making payment or allowance to the Contractor for the said materials other than such as may be certified in writing by the Engineer-in-charge to be reasonable, and without making any payment or allowance to the Contractor for the use of temporary said works, constructional plant and stock or being liable for any loss or damage thereto, and if the Owner shall by reason of his taking possession of the works or of the works being completed by other Contractor (due account being taken of any such extra work or works which may be omitted) then the amount of such excess as certified by the Engineer-in-charge shall be deducted from any money which may be due for work done by the Contractor under the contract and not paid for. Any deficiency shall forth with be made good and paid to the Owner by the Contractor and the Owner shall have power to sell in such manner and for such price as he may think fit all or any of the constructional plant, materials etc. constructed by or belonging to and to recoup and retain the said deficiency or any part thereof out of the proceeds of the sale.

37. Contractor's responsibility with the Mechanical, Electrical Intercommunication System, Air Conditioning Contractors and other Agencies

Without repugnance to any other conditions, it shall be the responsibility of the Contractor executing the work of Civil construction to work in close corporation and coordinate the works with the mechanical, electrical, air conditioning and intercommunication Contractor's and other agencies or their authorize representatives in providing the necessary grooves, recesses, cuts and openings etc., in wall, slaves, beams and columns etc. and making good the same to the desired finish as per specifications, for the placement of electrical, intercommunication cables, conduits, air conditioning inlets and outlets grills and

other equipments etc. where required. For the above said requirements in the false ceiling and other partition, the Contractor before starting up the work shall in consultation with the electrical, mechanical, intercommunication, air conditioning Contractors and other agencies prepare and put up a joint scheme, showing the necessary openings, grooves recesses, cuts the methods of fixing required for the works of the aforesaid, and the finishes therein, to the Engineer-in Charge and get the approval. The Contractor before finally submitting the scheme to the Engineer-in-Charge, shall have the retain agreement of the other agencies. The Engineer-in-charge before communicating his approval of the scheme, with any required modifications, shall get the final agreement of all the agencies, which shall be binding. No claim shall be entertained on account of the above. The Contractor shall conform in all respects with the provisions of any statutory regulations, ordinances or by laws of any local or duly constituted authorities of public bodies which may be applicable from time to time to the workers or any temporary works. The Contractors shall give the Owner indemnified against all penalties and liabilities of every kind, arising out of non-adherence to such statutes, ordinances, laws, rules, regulations etc.

38. Other Agencies at Site

The Contractor shall have to execute the work in such place and condition where other agencies will also be engaged for other works such as site grading, filling and leveling, electrical and mechanical engineering works, etc. No claim shall be entertain due to work being executed in the above circumstances.

39. Notices

Any notice here under may be served on the Contractor or his duly authorized representative at the job site or may be served by registered mail direct to the address furnished by the Contractor. Proof of issue of any such notice could be conclusive of the Contractor having been duly informed of all contents therein.

40. Rights of Various Interests

(i) The Owner reserves the right to distribute the work between more than one Contractors. The Contractor shall corporate and afford other Contractors reasonable opportunity for access to the works for the carriage and storage of materials and execution of their works.

(ii) Wherever the work being done by any department of the Owner or by other Contractors employed by the Owner is contingent upon work covered by this contract, the respective rights of the various interests involved shall be determined by the Engineer-in-charge to secure the completion of the various portion to the work in general harmony.

41. Right of Owner to Determine/Terminate contract

(i) Owner shall, at any time, be entitled to determine and terminate the contract, if in the opinion of the Owner the cessation of the work becomes necessary owing to paucity of funds or for any other cause whatsoever, in which case the cost of approved materials at the site at current market rates as verified and approved by Engineer-in-Charge and of the value of the work done to date by the Contractor shall be paid for in full at the rates specified in the contract. A notice in writing from the Owner to the Contractor of such determination and termination and the reason, therefore shall be the conclusive proof of the fact that the contract has been so determined and/terminated by the Owner.

(ii) Should the contract be determined under sub-clause (i) of this clause and the Contractor claims payments to compensate expenditure incurred by him in the expectation of completing the whole of the work, the Owner shall consider and admit such claim as are deemed fair and reasonable and are supported by vouchers to the satisfaction of the Engineer-in-Charge. The Owner's decision on the necessity and propriety of any such expenditure shall be final and conclusive and binding on the Contractor.

42. Patents and Royalties

The Contractor, if licensed under any patent covering equipment, machinery, materials or compositions of matter to be used or supplied or methods and process to be practiced or employed in the performance of this contract , agrees to pay all royalties and license fees which may be due with respect thereto. If any equipment, machinery, materials or composition of matters to be used on, supplied or methods and processes to be practiced or employed in the performance of this contract, is covered by the patent under which the Contractor is not licensed than the Contractor before supplying or using the equipment, machinery, materials, composition method or processes shall obtain such licenses and pay such loyalties and license fees as may be necessary for performances of this contract. In the event the Contractor fails to pay any such loyalty or obtain any such license, any suit for infringement of such patents which is brought against the Contractor or the Owner as a result of such failure will be defended by the Contractor at this own expense and the Contractor will pay any damages and costs awarded ion such suit. The Contractor shall promptly notify the Owner if the Contractor has acquired knowledge of any plant under which a suit for infringement would be reasonably brought because of the use by the Owner of any equipment, machinery, materials, process, methods to be supplied hereunder. The Contractor agrees to and does hereby grant to Owner , together with the right to extent the same to any of the subsidiaries of the Owner as irrevocable loyalty-free license to use in any country, any invention made by the Contractor or his employee in or as a result of the performance of the work under the contract.

The Owner shall indemnify and save harmless the Contractor from any loss on account of claims against Contractor for the contributory infringement of patent rights arising out and based upon the claim that the use by the Owner of the process included in the design prepared by the Owner and used in the operation of the plant infringes on any patent right with respect to any sub-contract entered into by Contractor pursuant to the provision of the relevant clause thereof, the Contractor shall obtain from the sub-Contractor and undertaking to provide the Owner with the same patent protection that Contractor is required to provide under the provisions of the clause.

43. Liens

If, at any time, there should evidence any lien of claim for which the Owner might have become liable and which is chargeable to the Contractor, the Owner shall have the right to retain out of any payment any due or thereafter to become due an amount sufficient to completely indemnify the Owner against such lien or claim and if such lien or claim be valid the Owner may pay and discharge the same and deduct the amount so paid from any money which may be or may become due and payable to the Contractor. If any lien or claim remain un-settled after all payments are made, the Contractor shall/ refund or pay to the Owner all moneys that the latter may be compelled to pay in discharging such lien or claim including all costs and reasonable expenses.

SECTION – 5

PERFORMANCE OF WORK

44. Execution of works

All the works shall be executed in strict conformity with the provisions of the contract documents and with such explanatory detail drawings, specifications and instructions as may be furnished from time to time to the Contractor by the Engineer-in-Charge whether mentioned in the contract or not. The Contractor shall be responsible for ensuring that works throughout are executed in the most substantial proper and workman light manner with the quality of material and workmanship in strict accordance with specifications and to the entire satisfaction of the Engineer-in-Charge.

45. Coordination and inspection of works

The coordination and inspection of the day-today work under the contract shall be responsibility of the Engineer-in-Charge. The written instructions regarding any particular job will normally be passed by the Engineer-in-Charge or his authorized representative. A work order book will be maintained by the Contractor for each sector in which the aforesaid written instruction will be entered. This will be signed by the Contractor or his authorized representative by way of acknowledgement within 12 hours.

46. Work in monsoon and dewatering

46.1. The completion of the work may entail working in monsoon also. The Contractor must maintain minimum labour force as may be required for the job and plan and execute the construction and erection according to the prescribed schedule. No extra rate will be considered such work in monsoon.

46.2. During monsoon and other period, it shall be the responsibility of the Contractor to keep the construction work site free from water at his own cost.

47. Work Sundays and holidays

For caring our work on Sundays and holidays, the Contractor will approached the Engineer-in-Charge or his representative at least two days in advance and obtain permission in writing.

48. General conditions for construction and erection mark

48.1. The working time at the time of work is 48 hours per week. Over timework is permitted in cases of need and the Owner will not compensate the same. Shift working at 2 or 3 shifts per day will become necessary and the Contractor should take this aspect in to consideration for formulating his rates for quotation. No extra claims will be entertained by the Owner on this account.

48.2. The Contractor must arrange for the placement of workers in such a way that delayed completion of the work or any part thereof for any reason whatsoever will not effect their proper employment. The Owner will not entertain any claim for idle time payment whatsoever.

48.3. The Contractor shall submit to the Owner reports at regular intervals regarding the state and progress of work. The details and proforma of the report will be mutually agreed after the award of the contract.

49. Drawings to be supplied by the Owner.

49.1. Where drawings are attached with a tender, this shall be for the general guidance of the Contractor to enable him to visualize the type of work contemplated and scope of work involved. The Contractor will be deemed to have studied the drawings and formed an idea about the work involved.

49.2 Detailed working drawing on the basis of which actual execution of the work is to proceed will be furnished from time to time during the progress of work. The Contractor shall be deemed to have gone through the drawings supplied to him thoroughly and carefully and in conjunction with all other connected drawings and bring to the notice of the Engineer-in-Charge discrepancies, if any, therein before actually caring out the work.

49.3. Copies of all detailed working drawings relating to the works shall kept at the Contractor's office on the site and shall be made available to the Engineer-in-Charge at any time during the contract. The drawings and other documents issued by the Owner shall be returned to the Owner on the completion of the work.

50. Drawings to be supplied by the Contractor.

50.1 Where drawings/ data are to be furnished by the Contractor, they shall be as enumerated in the special conditions of contract, and shall be furnished within the specified time.

50.2. Where approval of drawings before manufacture/ construction/ fabrication has been specified, it shall be the Contractors responsibility to have these drawings prepared as per the direction of the Engineer-in-Charge and got approved before proceeding with the manufacture/ construction/ fabrication as the case may be. Any change that may have become necessary in these drawings during the execution of the work shall have to be carried out by the Contractor to the satisfaction of the Engineer-in-Charge at no extra cost. All final drawings shall bear the certification stamp as indicated below, duly signed by both the Contractor and the Engineer-in-Charge.

"Certified true for

..... Project

Agreement No.....

Signed..... .....

(Contractor) (Engineer-in-Charge)

50.3. A period of three weeks from the date of receipt shall be required for approval of drawings by the Engineer-in-Charge.

51. Setting out works

51.1. The Engineer-in-Charge shall furnished the Contractor with only the four corners of the work site and a level bench mark and the Contractor shall set out the works and shall provide and efficient staff for the purpose and shall be solely responsible for the accuracy of such setting out.

51.2 The Contractor shall/provide, fix and be responsible for the maintenance of all stakes, templates, level marks, profiles and other similar things and shall take necessary precautions to prevent their removal or disturbance and shall be responsible for the consequence of such removal or disturbance should the same take place and for their efficient and timely reinstatement. The Contractor shall also be responsible for the maintenance of all existing survey marks, boundary marks, distance marks and centre line marks, either existing or supplied and fixed by the Contractor. The work shall be set out to the satisfaction of the Engineer-in-Charge. The approval thereof or joining with the Contractor by the Engineer-in-Charge in setting out the work, shall not relieve the Contractor or any of his responsibilities.

51.3 Before beginning the works, the Contractor shall at his own cost, provide all necessary reference and level posts, pegs, bamboo, flags, ranging rods, strings and other materials for proper layout of the work in accordance with the scheme for bearing marks acceptable to the Engineer-in-Charge. The Centre, longitudinal or face lines and cross lines shall be marked by means of small masonry pillars. Each pillar shall have distinct marks at the centre to enable a theodolite to be set over it. No work shall be started until all these points are checked and approved by the Engineer-in-Charge in writing but such approval shall not relieve the Contractor of any of his responsibility. The Contractor shall also provide all labour, material and other facilities, as necessary, for the proper checking of layout and inspection of the points during construction.

51.4 Pillars bearing geodetic marks located at the sites of units of works under construction should be protected and fenced by the Contractor.

51.5 On completion of works, the Contractor must submit the geodetic documents according to which the work was carried out.

52. Responsibility for level and alignment

The Contractor shall be entirely and exclusively responsible for the horizontal and vertical alignment, the levels and correctness of every part of the work and shall rectify effectually any errors or imperfections therein. Such rectifications shall be carried out by the Contractor, at his own cost, when instructions are issued to that effect by the Engineer-in-Charge.

53. Materials to be supplied by Contractor

The Contractor shall procure and provide the whole of the materials required for the construction including M.S. rods, cement and other building materials, tools, tackles, construction plant and equipment for the completion and maintenance of the works except the materials which will be issued by Owner and shall make his own arrangement for procuring such materials and for the transports thereof. The Owner may give necessary recommendation to the respective authority if so desired by the Contractor but assumes no further responsibility of any nature. The Owner will insist on the procurement of materials which bear ISI stamp and/or which are supplied by reputed suppliers borne on DGS & D list.

54. Stores supplied by Owner

54.1 If the specification of the work provides for the use of any material of special description to be supplied from the Owner's stores or it is required that the Contractor shall use certain stores to be provided by the Engineer-in-Charge, such materials and stores, and price to be charged therefore as hereinafter mentioned being so far

as practicable for the convenience of the Contractor, but not so as in any way to control the meaning or effect of the contract, the Contractor shall be bound to purchase and shall be supplied such materials and stores as are from time to time required to be used by him for the purpose of the contract only. The sums due from the Contractor for the actual value of materials supplied by the Owner will be recovered from the running account bill on the basis of the actual consumption of materials in the works covered and for which the running account bill has been prepared. After the completion of the works, however, the Contractor has to account for the full quantity of materials supplied to him as per relevant clauses in this document.

54.2 The value of the stores/materials as may be supplied to the Contractor by the Owner will be debited to the Contractor's account at the rates shown in the schedule of materials and if they are not entered in the schedule, they will be debited at cost price, which for the purpose of the contract shall include the cost of carriage and all other expenses whatsoever such as normal storage supervision charges which shall have been incurred in obtaining the same at the Owner's stores. All materials so supplied to the Contractor shall remain the absolute property of the Owner and shall not be removed on any account from the site of the work, and shall be at all times open for inspection to the Engineer-in-Charge. Any such materials remaining unused at the time of the completion or termination of the contract shall be returned to the Owner's stores or at a place as directed by the Engineer-in-Charge in perfectly good condition at the Contractor's cost.

55. Conditions for Issue of Materials

(I) Materials specified as to be issued by the Owner will be supplied to the Contractor by the Owner from his stores. It shall be the responsibility of the Contractor to take delivery of the materials and arrange for its loading, transports and unloading at the site of work at his own cost. The materials shall be issued between the working hours and as per the rules of the Owners as framed from time to time.

(ii) The Contractor shall bear all incidental charges for the storage and safe custody of materials at site after these have been issued to him.

(iii) Materials specified as to be issued by the Owner shall be issued in standard sizes as obtained from the manufacturers.

(iv) The Contractor shall construct suitable godowns at the site of work for storing the materials safe against damage by rain, dampness, fire, theft etc. He shall also employ necessary watch and ward establishment for the purpose.

(v) It shall be duty of the Contractor to inspect the materials supplied to him at the time of taking delivery and to satisfy himself that they are in good condition. After the materials have been delivered by the Owner, it shall be the responsibility of the Contractor to keep them in good condition and if the materials are damaged or lost, at any time, they shall be repaired and/or replaced by him at his own cost according to the directions of the Engineer-in-Charge.

vi) The Owner shall not be liable for delay in supply or non-supply of any materials which the Owner has undertaken to supply where such failure or delay is due to natural calamities, act of enemies, transports and procurement difficulties and any circumstances beyond the control of the Owner. In no case, the Contractor shall entitled to claim any compensation or loss suffered by him on this account.

(vii) It shall be the responsibility of the Contractor to arrange in time all materials required for the works other than those to be supplied by the Owner. If, however, in the opinion of the Engineer-in-Charge the execution of the work is likely to be delayed due to the Contractor's inability to make arrangement for supply of materials which normally he has to arrange for, the Engineer-in-Charge shall have the right at his own discretion to issue such materials if available with the Owner or procure the materials

from the market or elsewhere and the Contractor will be bound to take such materials at the rates decided by the Engineer-in-Charge. This however, does not in any way absolve the Contractor from the responsibility of making arrangements for the supply of such materials in part or in full, should such a situation occur, nor shall this constitute a reason for the delay in the execution of the work.

(viii) None of the materials supplied to the Contractor will be utilised by the Contractor for manufacturing item which can be obtained as supplied from standard manufacturer in finished form.

(ix) The Contractor shall, if desired by the Engineer-in-Charge, be required to execute an indemnity bond in the prescribed form, for safe custody and accounting of all materials issued by the Owner.

(x) The Contractor shall furnish to the Engineer-in-Charge sufficiently in advance a statement showing his requirement of the quantities of the materials to be supplied by the Owner and the time when the same will be required by him for the work so as to enable the Engineer-in-Charge to make necessary arrangements for procurement and supply of the material.

(xi) A day account of the materials issued by the Owner shall be maintained by the Contractor indicating the daily receipt consumption and balance in hand. This account shall be contained in a manner prescribed by the Engineer-in-Charge along with all connected papers viz, requisitions, issues etc. and shall be always available for inspection in the Contractor's office at site.

(xii) The Contractor should see that only the required quantities of materials are not issued. The Contractors shall not be entitled to cartage and incidental charges for returning the surplus materials, if any, to the stores where from they were issued or to the place as directed by the Engineer-in-Charge.

(xiii) Material/Equipment supplied by Owner shall not be utilized for any other purpose (s) than issued for.

56. Material Procured with Assistance of Owner.

Notwithstanding anything contained to the contract in any or all the clauses of this contract where any materials for the execution of the contract are procured with the assistance of the Owner either by issue from Owner's stock or purchases made under orders or permits or licences issued by Government, the contractor shall hold the said materials as trustee for the Owner and use such materials economically and solely for the purpose of the contract and not dispose them off without the permission of the Owner and return, if required by the Engineer-in-Charge shall determine having due regard to the condition of the materials. The price allowed to the Contractor, however, shall not exceed the amount charged to him excluding the storage charges, if any. The decision of the Engineer-in-Charge shall be final and conclusive in such matters. In the event of breach of the aforesaid condition, the Contractor shall in terms of the licences or permits and/or for criminal breach of trust, be liable to compensate the Owner at double rate or any higher rate, in the event of those materials at the time having higher rate or not being available in the market, then any other rate to be determined by the Engineer-in-Charge and his decision shall be final and conclusive.

57. Materials Obtained from Dismantling

If the Contractor in the course of execution of the work is called upon to dismantle any part for reasons other than those stipulated in clauses 63 and 67 hereunder, the materials obtained in the work of dismantling etc., will be considered as the Owner's property will be disposed off to the best advantage of the Owner.

58. Articles of Value Found

All gold, silver and other minerals of any description and all precious stones, coins, treasure, relics antiquities and other similar things which shall be found in, under or

upon the site, shall be the property of the Owner and the Contractor shall dully preserve the same to the satisfaction of the Engineer-in-Charge and shall from time to time deliver the same to such person or persons indicated by the Owner.

59. Discrepancies between Instructions

Should any discrepancy occur between the various instructions furnished to the Contractor, his agents or staff or any doubt arise as to the meaning of any such instructions or should there be any misunderstanding between the Contractor's staff and the Engineer-in-Charge's staff, the Contractor shall refer the matter immediately in writing to the Engineer-in-Charge whose decision thereon shall be final and conclusive and no claim for losses alleged to have been caused by such discrepancies between instructions, doubts or misunderstanding shall in any event be admissible.

60. Alterations in Specifications & Designs, Drawings, Extra Works, Deviation of quantities.

A. The Engineer-in-Charge shall have power to make any alterations in, omission from, addition to or substitutions for, the schedule of items, the original specifications, drawings designs and instructions that may appear to him to be necessary or advisable during the progress of the work and the Contractor shall be bound to carry out such altered extra new items of work in accordance with any instructions which may be given to him in writing signed by the engineer-in-charge and such alterations, omissions, additions or substitutions shall not invalidate the contract and any altered, additional or substituted work which the Contractor may be directed to do in the manner above specified as part of the work shall be carried out by the Contractor on the same conditions in all respects on which he agreed to do the main work. The time for completion of work may be extended additions or substitutions of the work, as he may consider as just and reasonable. The rates for such additional, altered or substituted work under this clause shall be worked out in accordance with the following provisions.

(a) If the rates for the additions, altered or substituted work are specified in the contract for the work, the Contractor is bound to carry out the additional, altered or substituted work at the same rates as are specified in the contract.

(b) If the rates for the additional, altered or substituted work are not specifically provided in the contract for the work, the rates will be derived from the rates for similar class of work as are specified in the contract for the work. The opinion of the Engineer-in-Charge, as to whether or not the rates can be reasonably so derived from the items in this contract, will be final and binding on the Contractor.

NOTE : Individual trade means the trade sections into which the schedule of rates in the agreement is divided such as excavation and earthwork, concrete, woodwork and joinery, piping etc.

(c) If the rates for the altered, additional or substituted work cannot be determined in the manner specified in sub-clause (a) & (b) above, then the Contractor shall, within 7 days of the date of receipt of order to carry out the work, inform the Engineer-in-Charge of the rate which it is his intention to charge for such class of work, supported by analysis of the rate or rates claimed, and the Engineer-in-Charge shall determine the rate or rates on the basis of the prevailing market rates, labour cost at schedule of labour plus 10% to cover Contractor's supervision, overheads and profit and pay the Contractor accordingly. The opinion of the Engineer-in-Charge as to current market rates of materials and the quantum of labour involved per unit of measurement will be final and binding on the Contractor.

(d) Provisions contained in sub-clause (a) to (c) above shall not however apply in the following cases :

(i) Where the alterations, additions or substitutions in respect of items individually exceed by or are less than plus/minus 30% of the value for that particular items specified in contract.

(ii) Where the alterations, additions or substitutions in respect of items of any individual trade included in the contract exceed by or are less than plus/minus 50% of the value of that trade as a whole in the contract or 30% of the total value of the contract whichever is less.

(B) In case of the items which individually exceed the value stipulated in the contract by more than the limits given in clause (d) above, the Contractor shall within 15 days from the receipt of order, claim revision of the rates supported by proper analysis in respect of such items for quantities in excess/ reduction of the above limits, notwithstanding the fact that the rates for such items exist in the tender for the main work or can be derived in accordance with the provisions of sub-clause (b) of clause (60) and the Engineer-in-Charge may revise their rates, having regard to the prevailing market rates and the Contractor shall be paid in accordance with the rates so fixed. But under no circumstances the Contractor shall suspend the work on the plea of non-settlement of rates of items falling under this clause.

All the provisions of the preceding paragraph shall equally apply to the decrease in the rate of items for quantities in excess of the limits specified in clause (d) notwithstanding the fact that the rates for such items exist in the tender with the provisions of sub-clause (b) of Clause 60, and the Engineer-in-Charge may revise such rates having regard to the prevailing market rates. Notwithstanding anything contained in paras 28 & 72 (vii) the parties to this agreement mutually agree that paragraphs 60 A & B shall be applicable to work done under unit rate basis only.

61. Action where no Specification is Issued

In case of any class of work for which there is no such specification supplied by the Owner as mentioned in the tender documents such work shall be carried out in accordance with Indian Standard specifications and if the Indian Standard Specifications do not cover the same, the work should be carried out as per standard Engineering Practice subject to the approval of the Engineer-in-Charge.

62. Abnormal Rates

The Contractor is expected to quote rate for each item after careful analysis of cost involved for the performance of the completed item considering all specifications and conditions of contract. This will avoid loss of profit or gain in case of curtailment or change of specification for any item. In case it is noticed that the rates quoted by the tender for any item are unusually high or unusually low it will be sufficient cause for the rejection of the tender unless the Owner is convinced about the reasonableness of the rates on scrutiny of the analysis for such rate to be furnished by the tenderer on demand.

63. Inspection of Works

63.1 The Engineer-in-Charge will have full power and authority to inspect the works at any time wherever in progress either on the site or at the Contractor's premises/workshops wherever situated, premises workshops of any person, firm or corporation where work in connection with the contract may be in hand or where materials are being or are to be supplied, and the Contractor shall afford or procure for the Engineer-in-Charge every facility and assistance to carry out such inspection. The Contractor shall, at all time during the usual working hours and at all other times at which reasonable notice of the intention of the Engineer-in-Charge or his representative to visit the work shall have been given to the Contractor, either himself be present to receive orders and instructions, or have responsible agent duly accredited in writing present for the purpose. Orders given to the Contractor's agent shall be considered to have the same force as if they had been given to the Contractor himself. The Contractor shall give not less than seven days notice in

writing to the Engineer-in-Charge before covering up or otherwise placing beyond reach of inspection and measurement any work in order that the same may be inspected and measured. In the event of breach of above the same shall be uncovered at Contractor's expense for carrying out such measurement or inspection.

63.2 No material shall be dispatched from the Contractor's godown before obtaining the approval in writing of the Engineer-in-charge.

The Contractor is to provide at all times during the progress of the work and the maintenance period proper means of access with ladders, gangways etc. and the necessary attendance to move and adopt as directed for inspection or measurement of the works by the Engineer-in-Charge.

63.3 **Access of Architect to the works**

The Architect and his representatives, upon duly authorized in writing by the Owner for the purpose, shall at all reasonable times have access to the works and to the workshops or other places of the contractors or sub-contractors, if any, where work is being prepared for the contract and the contractors shall do all things reasonably necessary for the Architect to carry out the inspection. All modifications/ rectifications as may be pointed out by the Architect shall be conveyed by the engineer-in-Charge to the contractor and the same shall be carried out accordingly.

64. Assistance to the Engineers

The Contractor shall make available to the Engineer-in-Charge free of cost all necessary instruments and assistance in checking of setting out of works and in the checking of any work made by the Contractor for the purpose of setting out and taking measurement of work.

65. Tests for quality of Works

65.1 All workmanship shall be of the respective kind described in the contract documents and in accordance with the instructions of the Engineer-in-Charge and shall be subjected from time to time to such test at Contractor's cost as the Engineer-in-Charge may direct at the place of manufacture or fabrication or on the site or at all or any such places. The Contractor shall provide assistance, instruments labour and materials as are normally required for examining, measuring and testing any workmanship as may be selected and required by the Engineer-in-Charge.

65.2 All the tests that will be necessary in connection with the execution of the work as decided by the Engineer-in-Charge shall be carried out at the field testing laboratory of the Owner/approved Agency by paying the charges as decided by the Owner from time to time. In case of non-availability of testing facility with the Owner, the required test shall be carried out at the cost of Contractor at government or any other testing laboratory as directed by Engineer-in-Charge.

65.3 If any tests are required to be carried out in connection with the work or materials or workmanship not supplied by the Contractor, such tests shall be carried out by the Contractor as per the instructions of Engineer-in-Charge and cost of such tests shall be reimbursed by the Owner.

66. Samples

The Contractor shall furnish to the Engineer-in-Charge for approval when requested or if required by the specifications adequate samples of all materials and finishes to be used in the work. Such samples shall be submitted before the work is commenced and in ample time to permit tests and examinations thereof. All materials furnished and finished and finishes applied in actual work shall be full equal to the approved samples.

67. Action and compensation in case of Bad Work

If it shall appear to the Engineer-in-Charge that any work has been executed with unsound, imperfect or unskilled workmanship, or with materials of any inferior

description, or that any materials or articles provided by the Contractor for the execution of the work are unsound, or of a quality inferior to that contracted for, or otherwise not in accordance within the contract, the Contractor shall on demand in writing from the Engineer-in-Charge or his authorized representative specifying the work, materials or articles complained of, notwithstanding that the same may have been inadvertently passed, certified and paid for, forthwith rectify or remove and reconstruct the work so specified and provide other proper and suitable materials or articles at his own charge and cost, and in the event of failure to do so within a period to be specified by the Engineer-in-Charge in his demand aforesaid, the Contractor shall be liable to pay compensation at the rate of one percent of the estimated cost of the whole work, for every week limited to a maximum of 10 percent of the value of the whole work, while his failure to do so shall continue and in the case of any such failure the Engineer-in-Charge may on expiry of notice period rectify or remove and re-execute the work or remove and replace with others, the materials or articles complained of as the case may be at the risk and expense in all respects of the Contractor. The decision of the Engineer-in-Charge as to any question arising under this clause shall be final and conclusive.

68. Suspension of Works

(i) Subject to the provisions of sub-para (ii) of this clause the Contractor shall if ordered in writing by the Engineer-in-Charge or his representative, temporarily suspend the works or any part thereof for such period and such item as so ordered and shall not, after receiving such written order, proceed with the work therein ordered to be suspended until he shall have received a written order to proceed therewith. The Contractor shall not be entitled to claim compensation for any loss or damage sustained by him by reason of temporary suspension of the works aforesaid. An extension of time for completion, corresponding with the delay caused by any such suspension of the works as aforesaid will be granted to the Contractor should he apply for the same provided that suspension was not consequent to any default or failure on the part of the Contractor.

(ii) In case of suspension of entire work, ordered in writing by Engineer-in-Charge, for a period of more than two months, the Contractor shall have the option to terminate the contract.

69. Owner may do Part of Work

Upon failure of the Contractor to comply with any instructions given in accordance with the provisions of this contract the Owner has the alternative right, instead of assuming charge of entire work, to place additional labour force, tools, equipments and materials on such parts of the work, as the Owner may designate or also engage another Contractor to carry out the work. In such cases, the Owner shall deduct from the amount which otherwise might become due to the Contractor, the cost of such work and materials with ten percent added to cover all departmental charges and should the total amount thereof exceed the amount due to the Contractor shall pay the difference to the Owner.

70. Possession Prior to completion

The Engineer-in-Charge shall have the right to take possession of or use any completed or partially completed work or part of the work. Such possession or use shall not be deemed to be an acceptance of any work completed in accordance with the contract agreement. If such prior possession or use by the Engineer-in-Charge delays the progress of work, suitable adjustment in the time of completion will be made and the contract agreement shall be deemed to be modified accordingly.

71. Twelve Month's Period of Liability from the Date of Issue of Completion Certificate

71.1 The Contractor shall guarantee the installation/work for a period of 12 months from the date of issue of completion certificate. Any damage or defect that may arise or lie

undiscovered at the time of issue of completion certificate, connected in any way with the equipment or materials supplied by him or in the workmanship, shall be rectified or replaced by the Contractor at his own expense as deemed necessary by the Engineer-in-Charge or in default, the Engineer-in-Charge may cause the same to be made good by other workmen and deduct expenses (of which the certificate of Engineer-in-Charge shall be final) from any sums that may be then or at any time thereafter, become due to the Contractor or from his security deposit, or the proceeds of sale thereof, or of a sufficient portion thereof.

71.2 If the Contractor feels that any variation in work or in quality of materials or proportions would be beneficial or necessary to fulfill the guarantees called for, he shall bring this to the notice of the Engineer-in-Charge in writing.

71.3 **Care of Works**

From the commencement to completion of the works, the Contractor shall take full responsibility for the care for all works including all temporary works land in case any damages or loss shall happen to the works or to any part thereof or to any temporary works from any cause whatsoever, shall at his own cost repair and make good the same so that at completion the work shall be in good order and in conformity in every respect with the requirements of the contract and the Engineer-in-Charge's instructions.

71.4 **Defects prior to take over**

If at any time, before the work is taken over, the Engineer in Charge shall decide that any work done or materials used by the Contractor or any sub-Contractor is defective or not in accordance with the contract or that the works or any portion thereof are defective or do not fulfill the requirements of contract (all such matters being herein called 'Defects' in this clause) as soon as reasonably practicable, he shall give to the Contractor notice in writing of the said decision, specifying particulars of the defects alleged to exist or to have occurred and the Contractor shall at this own expense and with all speed make good the defects so specified.

In the case Contractor shall fail to do so, the Owner may take, at the cost of the Contractor, such steps as may in all circumstances, be reasonable to make good such defect. The expenditure so incurred by the Owner will be recovered from the amount due to the Contractor. The decision of the Engineer-in-Charge with regard to the amount to be recovered from the Contractor will be final and binding on the Contractor. As soon as the works have been completed in accordance with the contract (except in minor respects that do not affect their use for the purpose for which they are intended and except for maintenance thereof provided in clause 71.1 of General Conditions of the Contract) and have passed the tests on completion. The Engineer-in-Charge shall issue a certificate (hereinafter called completion certificate) in which he shall certify the date on which the works have been so completed and have passed the said tests and the Owner shall be deemed to have taken over the works on the date so certified. If the works have been divided into various groups in the contract, the Owner shall be entitled to take over any group or groups before the other or others and there upon the Engineer-in-Charge shall issue a completion certificate which will, however, be for such group or groups so taken over only.

71.5 **Defects after Taking Over**

In order that the Contractor could obtain a completion certificate he shall make good with all possible speed any defect arising from the defective materials supplied by the Contractor or workmanship or any act or omission of the contract or that may have been noticed or developed, after the works or group of the works has been taken over, the period allowed for caring out such work will be normally one month. If any defect be not remedied within a reasonable time, the Owner may proceed to do the work at Contractor's risk and expense and deduct from the final bill such amount as may be decided by the Owner.

If by reason of any default on the part of the Contractor a completion certificate has not been issued in respect of every portion of the works within one month after the date fixed by the contract for the completion of the works, the Owner shall be at liberty to use the works or any portion thereof in respect of which a completion certificate has not been issued, provided that the works or the portion thereof so used as aforesaid shall be afforded reasonable opportunity for completing these works for the issue of completion certificate.

SECTION – 6

CERTIFICATES AND PAYMENTS

72. SCHEDULE of RATES and PAYMENTS

(i) Contractor's Remuneration

The price to be paid by the Owner to Contractor for the whole of the work to be done and the performance of all the obligations undertaken by the Contractor under the contract documents shall be ascertained by the application of the respective schedule of rates (the inclusive nature of which is more particularly defined by way of application but not of limitation, with the succeeding sub-clause of this clause) and payment to be made accordingly for the work actually executed and approved by the Engineer-in-Charge. the sum so ascertained shall (excepting only as and to the extent expressly provided herein) constitute the sole and inclusive remuneration of the Contractor under the contract and no further other payment whatsoever shall be or become due or payable to the Contractor under the contract.

(ii) Schedule of Rates to be Inclusive

The price/ rates quoted by the Contractor shall remain firm till the issue of final certificate and shall not be subject to escalation. Schedule of rates shall be deemed to include and cover all costs, expenses and liabilities of every description and all risk of every kind to be taken in executing, completing and handing over the work to the Owner by the Contractor. The Contractor shall be deemed to have known the nature, scope, magnitude and the extent of the works and materials required though the contract document may not fully and precisely furnish them. He shall make such provision in the schedule of rates as he may consider necessary to cover the cost of such items of work and materials as may be reasonable and necessary to complete the works. The opinion of the Engineer-in-Charge as to the items of work which are necessary and reasonable for completion of work shall be final and binding on the Contractor, although the same may not be shown on or described specifically in contract documents.

Generally of this present provision shall not be deemed to cut down or limited in any way because in certain cases it may and in other cases it may not be expressly stated that the Contractor shall do or perform a work or supply articles or perform services at his own cost or without addition of payment or without extra charge or words to the same effect or that it may be stated or not stated that the same are included in and covered by the schedule of rates.

(iii) Schedule of Rates to cover constructional Plant, Materials, Labour etc.

Without in any way limiting the provisions of the proceeding sub-clause the schedule of rates shall be deemed to include and cover the cost of all constructional plant, temporary work (except as provided for herein), pumps, materials, labour, insurance, fuel, stores, and appliances to be supplied by the Contractor and all other matters in connection with each item in the schedule of rates and the execution of the works or any portion thereof finished, complete in every respect and maintained as shown or described in the contract documents or may be ordered in writing during the continuance of the contract.

(iv) Schedule of Rate to Cover Royalties, Rents and Claims

The schedule of rates shall be deemed to include and cover the cost of all royalties and fees for the articles and processes, protected by letters, patent or otherwise incorporated in or used in connection with the works, also all royalties, rents and other payments in connection with obtaining materials of whatsoever kind for the works and shall include and indemnity to the Owner which the Contractor here-by gives against all actions, proceedings, claims damages, costs and expenses arising from the

incorporation in or use on the works of any such articles, processes or materials. Octroi or other municipal or local board charges if levied on materials, equipment or machineries to be brought to site for use on work shall be borne by the Contractor.

(v) Schedule of Rates to cover Taxes and Duties

No exemption or reduction of customs duties, excise duties, sales tax, contract quay or any port dues, transports charges, stamp duties or Central or State government or local body or Municipal Taxes or duties, taxes or charges (from or of any body), whatsoever, will be granted or obtained, all of which expenses shall be deemed to be included in and covered by the schedule of rates. The Contractor shall also obtain and pay for all permits or other privileges necessary to complete the work.

(vi) Schedule of rates to cover Forest Royalties.

All the responsibilities for obtaining all forest permits and payment of forest royalties etc. for use of all forest produces shall lie with the contractor. The contractor shall deposit royalty and obtain necessary permit for supply of all forest produces from local authorities. If pursuant to or under any law, notification or order, any royalty, cess or the like becomes payable by the Board and does not any time become payable by the contractor to the State Government/Local authorities, in respect of any material used by the contractor in the works, then in such a case, it shall be lawful to the Board and it will have the right and be entitled to recover the amount paid in the circumstances as aforesaid from dues of the contractor. The schedule of rates shall be inclusive of all forest royalties, monopolies and all admissible taxes from time to time as per rules of Government of Assam.

(vii) Schedule of Rates to cover Risks of Delay

The schedule of rates shall be deemed to include and cover the risk of all possibilities of delay and interference with the Contractor's conduct for work which occur from and cause including orders of the Owner in the exercise of his powers and on account of extension of time granted due to various reasons and for all other possible or probable causes of delay.

(viii) Schedule of Rates cannot be altered

For work under unit rate basis, no alteration will be allowed in the schedule of rates by reason of works or any part of them being modified altered, extended, diminished or omitted. The schedule of rates are fully inclusive rates which have been fixed by the Contractor and agreed to by the Owner and cannot be altered.

For lump sum contracts, the payment will be made according to the work actually carried out, for which purpose an item-wise, or work-wise, schedule of rates shall be furnished, suitable for evaluating the value of work done and preparing running account bills. Lump sum contracts shall also allow for any increase or decrease in the total quantity of work upto approximately 10% for the quoted price and the contract value shall be adjusted accordingly.

73. Procedure for Measurement/Billing of Work in Progress

(I) Measurements

All measurements shall be in metric system. All the works in progress will be jointly measured by the representative of the Engineer-in-Charge and the Contractor's authorized agent progressively. Such measurement will be got recorded in the measurement book by the Engineer-in-Charge or his authorized representative and signed in token of acceptance by the Contractor or his authorized representative.

For the purpose of taking joint measurement the Contractor's representative shall be bound to be present whenever required by the Engineer-in-Charge. If, however he is absent for any reason whatsoever the measurements will be taken by the Engineer-in-Charge or his representative and this will be deemed to be correct and binding on the Contractor.

(ii) Billing

The Contractor will submit a bill in approved Performa in quadruplicate to the Engineer-in-Charge of the work giving abstract and detailed measurements for the various items executed during a month, before the expiry of the 1st week of the succeeding month. The Engineer-in-Charge shall take or cause to be taken the requisite measurements for the purpose of having the same verified and the claim, as far as admissible, adjusted, if possible, before the expiry of 10 days from presentation of the bill.

(iii) Secured Advance on Materials

In case of tenders for completed item of work, Contractor may be allowed 'Secured Advance' on the security of materials brought to site for execution of the contracted item of work to the extent of 75% of the value of materials as assessed by the Engineer-in-Charge provided that the materials are of an imperishable nature and that a formal agreement is drawn up with the Contractor under which the Owner secures a lien on the materials and is safeguarded against losses due to the Contractor postponing the execution of the work or to the storage or misuse of the materials and against the expense entitled for their proper watch and safe custody. Recoveries of advances so made would not be postponed until the whole of the work entrusted to the Contractor is completed. They should be adjusted from his bills for work done as the materials are used, the necessary deductions being made whenever the items of work in which they are used are billed for.

(iv) Dispute in Mode of Measurement

In case of any dispute as to the mode of measurement not covered by the contract to be adopted for any item of work, mode of measurement as per latest Indian Standard Specifications shall be followed.

74. Lump-sums in Tender

For the item in tender where it includes lump-sum in respect of parts of work, the Contractor shall be entitled to payment in respect of the items at the same rates as are payable under this contract for such items, or if the part of the work in question is not, in the opinion of the Engineer-in-Charge capable of measurement or determination, the Owner may at his discretion pay the lump-sum amount entered in the tender or a percentage thereof and the certificate in writing of the Engineer-in-Charge shall be final and conclusive against the Contractor with regards to any sum or sums payable to him under the provisions of this clause.

75. Running Account Payments to be Regarded as Advances

All running account payments shall be regarded as payment 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 this respect, or of the accruing of any claim by the Contractor, nor shall it conclude, determine or affect in any way the powers of the Owner 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 of physical completion of the work, otherwise, the Engineer-in-Charge's certificate of the measurement and of total amount payable for the work accordingly shall be final and binding on all parties.

76. Notice of Claims for Additional Payment

Should the Contractor consider that he is entitled to any extra payment or compensation or to make any claims whatsoever in respect of the works he shall forthwith give notice in writing to the Engineer-in-Charge that he claims extra payment

and/or compensation. Such notice shall be given to the Engineer-in-charge within ten days from the ordering of any work or happening of any event upon which the contractor bases such claims and such notice shall contain full particulars of the nature of such claim with full details and amount claimed. Failure on the part of the Contractor to put forward any claim with the necessary particulars as above within the time above specified shall be an absolute waiver thereof. No omission by the Owner to reject any such claim and no delay in dealing therewith shall be waiver by the Owner of any rights in respect thereof.

77. Payment of Contractor's Bill

No payment shall be made for works estimated to cost less than Rs. 10,000/- till the whole of the work shall have been completed and a certificate of completion given. But in case of works estimated to cost more than Rs. 20,000/- the Contractor on submitting the bill thereof be entitled to receive a monthly payment proportionate to the part thereof approved and passed by the Engineer-in-Charge, whose certificate of such approval and passing of the sum so payable shall be final and conclusive against the Contractor. This payment will be made after making necessary deductions as stipulated elsewhere in the contract document for materials, security deposit etc.

Payment due to the Contractor shall be made by the Owner if so directed by the Owner by Crossed Account Payee cheque forwarding the same to registered office or the notified office of the Contractor. In no case will Owner be responsible if the cheque is mislaid or misappropriated by unauthorized person/persons. In all cases, the Contractor shall present his bill duly pre-receipted on proper revenue stamp.

All payments shall be made in Indian currency.

78. Receipt of Payment

Receipt for payment made on account of work when executed by a firm, must be signed by a person holding due power of attorney in this respect on behalf of the Contractor, except when the Contractors are described in their tender as a limited company in which case the receipts must be signed in the name of the company by one of its principal officers or by some other person having authority to give effectual receipt for the company.

79. Completion Certificate

79.1 **Application for Completion Certificate**

When the Contractor fulfils his obligation under clause 71.4 shall be eligible to apply for completion certificate. the Contractor may apply for separate completion certificate in respect of each such portion of the work by submitting the completion documents along with such application for completion certificate.

The Engineer-in-charge shall normally issue to the Contractor the completion certificate within one month after receiving and application therefore from the Contractor 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 drawings and the 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.

79.2 **Completion Certificate**

Within one month of the completion of the work in all respects, the Contractor shall be furnished with a certificate by the engineer-in-Charge of such completion, but no certificate shall be given nor shall the work be deemed to have been executed until all scaffolding, surplus materials and rubbish is cleaned of the site completely nor until the work shall have been measured by the Engineer-in-Charge whose measurements shall be binding and conclusive. The work will not be considered as complete and taken over by the Owner, until all the temporary works, labour and staff colonies etc.;

constructed, are removed and the worksite cleaned to the satisfaction of the Engineer-in-Charge.

If the Contractor shall fail to comply with the requirements of this clause on or before the date fixed for the completion of work, the Engineer-in-Charge 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 of such dirt as aforesaid, and the Contractor shall forthwith pay the amount of all expenses so incurred and shall have no claim in respect of any such scaffolding or surplus materials as aforesaid except for any sum actually realised by the sale thereof.

79.3 **Completion Certificate Documents**

For the purpose of clause 79 the following documents will be deemed to form the completion documents.

(i) The technical documents according to which the work was carried out.

(ii) Three sets of construction drawings showing therein the modification and corrections made during the course of execution signed by the Engineer-in-Charge.

(iii) Completion certificate for 'embedded' and 'covered' up works.

(iv) Certificates of final levels as set out for various works.

(v) Certificates of tests performed for various works.

(vi) Materials appropriation Statement for the materials issued by the Owner for the works and list of surplus materials returned to the Owner's store duly supported by necessary documents.

80. Final Decision and Final Certificate

Upon expiry of the period of liability and subject to the Engineer-in-Charge being satisfied that the works have been duly maintained by the Contractor during monsoon or such period as herein before provided in clause 71.1 and that the Contractor has in all respect duly made up any subsidence and performed all his obligations under the contract, the Engineer-in-Charge shall (without prejudice to the rights of the Owner to retain the provisions of relevant clause hereof) otherwise give a certificate herein referred to as the final certificate to that effect and the Contractor shall not be considered to have fulfilled the whole of his obligations under the contract until Final Certificate shall have been given by the Engineer-in-Charge notwithstanding any previous entry upon the work and taking possession, working or using of the same or any part thereof by the Owner.

81. Certificate and Payments no Evidence of completion

Except the final certificate, no other certificates or payments against a certificate or on general account shall be taken to be an admission by the Owner of the due performance of the contract or any part thereof or of occupancy or validity for any claim by the Contractor.

SECTION - 7

TAXES AND INSURANCE

82. Taxes, Duties, Octroi etc.

The Contractor agrees to and does hereby accept full and exclusive liability for the payment of any and all taxes, duties, octrois etc. now or hereafter imposed, increased, or modified from time to time in respect of works and materials and all contributions and taxes for unemployment compensation, insurance and old age pensions or annuities now or hereafter imposed by any Central or State governmental authorities which are imposed with respect to or covered by the wages, salaries, or other compensations paid to the persons employed by the Contractor and the Contractor shall be responsible for the compliance with all obligations and restrictions imposed by the Labour Law or any other law affecting employer-employee relationship and the Contractor further agrees to comply and to secure the compliance of all sub-Contractors, with all applicable Central State, Municipal and local laws and regulations and requirements of any Central, State or Local, Government agency or authority. Contractor further agrees to defend, indemnify and hold harmless from any liability or penalty which may be imposed by the Central, State or Local authorities by reason of any violations by Contractor or sub-Contractor of such laws, regulations or requirements and also from all claims, suits or proceedings that may be brought against the Owner arising under growing out of, or by reason of the work provided for by this contract, by third parties, or by Central or State government authority or any administrative sub-division thereof.

82.1 All taxes income tax, Sales Tax, Duties, Levies, VAT, Building and other Construction Workers Welfare Cess or any other tax or Cess in respect of this contract applicable at the time of submission of this tender shall be payable by the Contractor and the Board shall not entertain any claim whatsoever in this respect. Taxes, VAT, Cess etc. shall be deducted as per applicable rules from the bills of the contractor at the rates prevailing on the day of submission of the tender.

Any increase in the rates of any existing taxes/duties/levies/royalties etc shall be borne by the Board. If there are any decreases the amounts payable will be reduced accordingly.

82.2. Other taxes:

Any fresh imposition of taxes, duties, levies etc, imposed after receipt of tender shall be reimbursed by the Board on actual on production of proof of imposition of the tax.

83. Insurance

Contractor shall at his own expense carry and maintain insurance with reputable insurance companies to the satisfaction of the Owner as follows:

(i) Employees State Insurance Act

The Contractor agrees to and does hereby accept full and exclusive liability for compliance with all obligations imposed by the Employees State Insurance Act, 1984, and the Contractor further agrees to defend, indemnify and hold Owner harmless from any liability or penalty which may be imposed by the Central, State or Local authority by reason of any asserted, violation by Contractor or sub-Contractor of the Employees State Insurance Act, 1948, and also from all claims, suits or proceeding that may be brought against the Owner arising under, growing out of or by reasons of the work provided for by this contract whether brought by employees of the Contractor, by third parties or by Central or State Government authority or any political sub-division thereof.

The Contractor agrees to fill in with the Employee's State Insurance Corporation, the Declaration Forms, and all forms which may be required in respect of the Contractors

or sub-Contractors employees, whose aggregate remuneration is Rs. 15000.00 per month or such amount as prescribed under the Employees State Insurance Act, 1948 from time to time and who are employed in the work provided for or those covered by ESI from time to time under the Agreement. The Contractor shall deduct and secure the agreement of the sub-Contractor to deduct the employee's contribution as per the first schedule of the Employee's State Insurance Act form wages and affix the Employee's contribution Cards at wages payment intervals. The Contractor shall remit and secure the agreement of the sub-Contractor to remit to the State Bank of India, Employees' State Insurance Corporation. Account, the Employees contribution as required by the Act. the Contractor agrees to maintain all cards and records as required under the Act in respect of employees and payments and the Contractor shall secure the agreement of the sub-Contractor to maintain such records. Any expenses incurred for the contributions, making contributions or maintaining records shall be to the Contractor's or sub-Contractor's account.

The Owner shall retain such sum as may be necessary from the total contract value until the Contractor shall furnish satisfactory proof that all contributions as required by the Employees State Insurance Act, 1948, have been paid.

(ii) Workman's compensation and employer's Liability Insurance

Insurance shall be affected for all the Contractor's employees engaged in the performance of this contract. If any of the work is sublet, the Contractor shall require the sub-Contractor to provide Workman's Compensation and employer's liability insurance for the latter's employees if such employees are not covered under the Contractor's Insurance.

(iii) Any other Insurance Required Under Law or Regulations or by Owner

Contractor shall also carry and maintain any and all other insurance which may be required under any law or regulation from time to time. He shall also carry and maintain any other insurance, which may be required by the Owner.

84. Damage to Property

(i) Contractor shall be responsible for making good to the satisfaction for the Owner any loss or and any damage to all structures and properties belonging to the Owner or being executed or procured or being procured by the Owner or of other agencies within the premises of all the work of the Owner, if such loss or damage is due to fault and/or the negligence or willful acts or omission of the Contractor, his employees, agents, representative or sub-Contractors.

(ii) The Contractor shall indemnify and keep the Owner harmless of all claims or damage to property other than Owner's property arising under or by reason of this agreement if such claims result from the fault and/or negligence or willful acts or omissions of the Contractor, his employees, agents representative or sub-Contractors.

SECTION – 8

LABOUR LAWS AND SAFETY REGULATIONS

85. Labour Laws

(i) All matters regarding the labour shall be in accordance to Contract labour (Regulation and Abolition) Act, 1970, minimum wage Act 1948 and other applicable acts under law.

(ii) No labour below the age of fifteen years shall be employed on the work.

(iii) The Contractor shall not pay less than what is provided under law to labourers engaged by him on the work.

(iv) The Contractor shall at his expense comply with all labour laws and keep the Owner indemnified in respect thereof.,

86. Implementation of apprentices Act 1961

The Contractor shall comply with the provisions of the Apprentices Act 1961 and the Rule and orders issued thereunder from time to time. If he fails to do so, his failure will be a breach of the contract and the Engineer-in-Charge may, at his discretion, cancel the contract. The Contractor shall also be liable for any pecuniary liability arising on account of any violation by him of the provision of the Act.

87. Contractor to Indemnify the Owner

(i) The Contractor shall indemnify the Owner and every member, officer and employee of the Owner, also the Engineer-in-Charge and his staff against all actions, proceedings, claims, demands, costs and expenses whatsoever arising out of or in connection with the matters referred to in clause 84 and elsewhere and all actions, proceedings, claims, demands, costs and expenses which may be made against the Owner for or in respect of or arising out of any failure by the Contractor in the performance of his obligations under the contract documents. The Owner shall not be liable for or in respect of any demand or compensation payable by law in respect or in consequence of any accident or injury to any workmen or other person in the employment of the Contractor or his sub-Contractor and Contractor shall indemnify and keep indemnified the Owner against all such damages and compensations and against all such damages and compensations and against all claims, damages, proceedings, costs, charges and expenses whatsoever in respect thereof or in relation thereto.

(ii) **Payment of Claims and Damages**

Should the Owner have to pay any money in respect of such claims or demands as aforesaid the amount so paid and the costs incurred by the Owner shall be charged to and paid by the Contractor and the Contractor shall not be at liberty to dispute or question the right of the Owner to make such payments notwithstanding the same may have been made without his consent or authority or in law or otherwise to the contrary.

(iii) In every case in which by virtue of the provisions of section 12, sub-section (I) of workmen's compensation act, 1923 or other applicable provisions of Workmen's Compensation Act or any other Act, the Owner is obliged to pay compensation to a workman employed by the Contractor in execution of the works, the Owner will recover form the Contractor the amount of the compensation so paid, and without prejudice to the rights of Owner under section 12, sub-section (2) of the said Act,

Owner shall be at liberty to recover such amount or any part thereof by deducting if from the security deposit or from any sum due to the Contractor whether under this contract or otherwise. The Owner shall not be bound to contest any claim made under section 12 dub-section (1) of the said act, except on the written request of the Contractor and upon his giving to the Owner full security for all costs for which the Owner might become liable in consequence of contesting such claim.

88. Health and Sanitary Arrangements for Workers

In respect of all labour directly or indirectly employed in the work for the performance of the Contractor's part of this agreement, the Contractor shall comply with or cause to be complied with all the rules and regulations of the local sanitary and other authorities or as framed by the Owner from time to time for the protection of health and sanitary arrangements for all workers.

89. Safety Regulations

(i) In respect of all labour, directly or indirectly employed in work for the performance of Contractor's part of this agreement, the Contractor shall at his own expense arrange for all the safety provisions as per safety codes of C.P.W.D., Indian Standards Institution, The Electricity Act, Mines Act and such other acts as applicable.

(ii) The Contractor shall observe and abide by all fire and safety regulations of the Owner. Before starting construction work Contractor shall consult with Owner's safety Engineer or Engineer-in-Charge and must make good to the satisfaction of the Owner any loss or damage due to fire to any portion of the work done or to be done or to be done under this agreement or to any other Owner's existing property.

90. Arbitration

All disputes of difference whatsoever which shall at any time arise between the parties hereto touching or concerning the works or the execution or maintenance thereof of this Contract or the rights touching or concerning the works or the execution or maintenance thereof this Contract of the construction meaning operation or effect thereof or to the rights or liabilities of the parties or arising out of or in relation thereto whether during or after completion of the contract or whether before or after determination, foreclosure or breach of the contract (other than those in respect of which the decision of any person is by the Contract expressed to be final and binding) shall after written notice by either party to the Contract to the other of them and to the Owner hereinafter mentioned be referred for adjudication to a sole Arbitrator to be appointed as herein after provided.

For the purpose of appointing the sole arbitrator referred to above, the appointing Authority will send within thirty days of receipt of the notice to the Contractor a panel of three names of persons who shall all be presently unconnected with the organization for which the work is executed.

The Contractor shall on receipt of the names as aforesaid, select any one of the persons named to be appointed as a sole Arbitrator and communication his name to the Appointing Authority within thirty days of receipt of the names. The Appointing Authority shall thereupon without any delay appoint the said person as the sole Arbitrator. If the Contractor fails to communicate such selection as provided above within the period specified, the Appointing Authority shall make the selection and appoint the selected person as the sole Arbitrator.

If the Appointing Authority fails to send to the Contractor the panel of three name as aforesaid within the period specified, the Contractor shall send to the Appointing Authority a panel of three names of persons who shall all be unconnected with either party. the Appointing Authority shall on receipt of the names as aforesaid select any one of the persons named and appoint him as the sole Arbitrator. If the Appointing Authority fails to select the person and appoint him as the sole Arbitrator shall be entitled to appoint one of the persons from the panel as the sole Arbitrator and communicate his name to the Appointing Authority.

If the Arbitrator so appointed is unable or unwilling to act or resigns his appointment or vacates his office due to any reasons whatsoever another sole Arbitrator shall be appointed as aforesaid.

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 issues 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 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 costs of the reference and of the award including the fees, if any of the Arbitrator shall be in the discretion of the Arbitrator who may direct to any by whom and in what manner, such costs or any part thereof shall be paid and may fix or settle the 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 and 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.

91. Jurisdiction

The contract shall be governed by and construed according to the laws in force in INDIA. The Contractor hereby submits to the jurisdiction of the Courts situated at Guwahati for the purposes of actions and proceedings arising out of the contract and the courts at Guwahati only will have the jurisdiction to hear and decide such actions and proceedings.

SECTION - 9

SAFETY CODE

A. General

Contractor shall adhere of safe construction practice and guard against hazardous and unsafe working conditions and shall comply with Owner's safety rules as set forth herein. Prior to start of construction, Contractor will be furnished of Owner's "Safety Code" for information and guidance, if it has been prepared.

B. First Aid and Industrial Injuries

(1) Contractor shall maintain first aid facilities for his employee and those of his sub-Contractors.

(2) Contractor shall make out side agreements for ambulance service and for the treatment of industrial injuries. Names of those providing these services shall be furnished to the Owner prior to start of construction and their telephone numbers shall be prominently posted in Contractor's field office.

(3) All critical industrial injuries shall be reported promptly to the Owner, and a copy of Contractor's report covering each personal injury requiring the attention of a physician shall be furnished to the Owner.

C. General Rules

Smoking within the battery area, tank farm or dock limits is strictly prohibited. Violators of the no smoking rules shall be discharged immediately.

D. Contractor's Barricades

(1) Contractor shall erect and maintain barricades required in connection with his operation to guard or protect.

(a) Excavations.
(b) Hoisting areas.
(c) Areas adjudged hazardous Contractor's or Owner's inspectors.
(d) Owner's existing property subject to damage by Contractor's operations.
(e) Rail road unloading spots.

(2) Contractor's employees and these of his sub-Contractors shall become acquainted with Owner's barricading practice and shall respect the provisions thereof.

(3) Barricades and hazardous areas adjacent to but not located in normal routes of travel shall be marked by red flasher lanterns at nights.

E. Scaffolding

(I) Suitable scaffolding should be provide for workmen for all works that safely be done from the ground or from solid construction except such short period work as can be done safely from ladders. When a ladder is used an extra Mazdoor shall be engaged for holding the ladder and if the ladder is used for carrying materials as well, suitable footholds and handholds shall be provided on the ladder shall be given an inclination not steeper than 1 in 4 (1horizontal and 4 vertical).

(ii) Scaffolding or staging more than 4 meters above the ground or floor, swing suspended from an overhead support or erected with stationary support shall have a guard rail properly attached, bolted, braced and otherwise rewarded at least 3 ft. high 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) Every opening of 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 metre.

(iv) Working platform, gangways and stairways should be so constructed that they should not sag unduly or unequally and if the height of the platform of the gangway or the stairway is more than 4 metres above ground level or floor level, they should be closely boarded, should have adequate width and should be suitably fastened as described in (ii) above.

(v) Safe- means of access shall be provided to all working platforms and other working places, Every ladder should be securely fixed. No portable single ladder shall be over 9 metres in length while the width between side rails in rung ladder shall in no case be less than 30cms for ladder up to and including 3metres in length. For longer ladder this width should be increased at least 5 mm for each additional foot of length. Uniform steps spacing shall not exceed 30 cms. Adequate precautions shall be taken to prevent danger from electrical equipment. No materials on any of the site of work shall be so stacked or placed to cause danger or inconvenience to any person or public. The Contractor shall also provide all necessary fencing and light to protect the workers and staff from accidents, and shall be bound to bear the expenses of defence of every suit, action or other proceedings of law that may be brought by any person for injury sustained owing to neglect of the above precautions and pay any damages and costs which may be awarded in any such suit or action or proceedings to any such person or which may with the consent of the Contractor be paid to compromise any claim by any such person.

F. Excavation and Trenching

All trenches 1.2 metres or more in depth, shall at all times be supplied with at least one ladder for each 50 metres length or fraction thereof.
Ladder shall be extended from bottom of the trench to at least 1 metre above the surface of the ground. The sides of the trenches which are 1.5 metres in depth shall be stepped back to give suitable slope or securely held by timber bracing, so as to avoid the danger of sides to collapse. The excavated materials shall not be placed within 1.5 metres of the edge of the trench or half of the trench width whichever is more. Cutting shall be done from top to bottom. Under no circumstances undermining or undercutting shall be done .

G. Demolition

(i) Before any demolition work is commenced and also during the progress of the work.

(a) All road 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 shall remain electrically charged.

(c) All practical shall be taken to prevent danger to persons employed from risk

of fire or explosion or flooding. No floor, roof or other part of the building shall be so over-loaded with debris or materials as to render it unsafe.

(ii) All necessary personal safety equipment as considered adequate by the

Engineer-in-charge, should be kept available for the use of the persons employed on the site and maintained in condition suitable for immediate use, and the Contractor shall 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 gloves.

(b) Those engaged in white washing and mixing or stacking of cement bags or any materials which are injurious to the eyes shall be provided with protective goggles.

(c) Those engaged in welding and cutting works shall be provided with protective face and eye shields, hand gloves etc.

(d) Stone breakers shall be provided with protective goggles and protective clothing, and seated 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 gate in to the manholes, and the manholes so opened shall be cordoned off with suitable railing and provided with warning signals or board 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 in any form. Wherever men above the age of 18 years are employed on the work of lead painting, the following precautions should be taken,

(1) No paint containing lead or lead product shall be used except in the form of paste or ready-made paint.

(2) Suitable face masks should be supplied for use by the workers when

Paints is applied in the form of spray or a surface having lead paint dry rubbed and scrapped.

(3) Overalls shall be supplied by the Contractor to the workmen and adequate

Facilities shall be provided to enable the working painters to wash them during and on cessation of.

(iii) When the work is done near any place where there is a risk of drowning, all

Necessary safety equipment 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.

(iv) Use of hoisting machines and tackles including their attachments, anchorage and supports shall conform to the following standards or conditions:-

(a) These shall be of good mechanical construction, sound materials and adequate strength and free from patent defect and shall be kept in good working order.

(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.

(c) Every crane driver or hoisting appliance operator shall be properly qualified and no person under the age of 12 years should be in charge of any hoisting machine including any scaffolding, which or give signals to the operator.

(d) In case of every hoisting machine and of every chain ring hook , shackle, swivel, and pulley block used in hoisting or lowering or as means of suspension, the safe working load shall be ascertained by adequate means. every hoisting machine and all gears referred to above shall be plainly marked with the safe working load of the conditions under which it is applicable which 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.

(e) In case of departmental machine, the safe working load shall be notified by the Engineer-in-charge. As regards Contractor's machines, the Contractor shall notify the safe working load of the machine to the Engineer-in-charge whenever he brings any machinery to site of work and get it verified by the Engineers concerned.

(v) Motors, gearing transmission, electric wiring and other dangerous part of hoisting appliances should be provided with such means as to reduce to the minimum the accidental descent of the load, adequate precautions should be taken to reduce to the minimum the risk of any part or 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 shall not wear any rings, watches and carry keys or other materials which are good conductors of electricity.

(vi) All scaffolds, ladders and other safety devices mentioned or described herein shall be maintained in safe conditions 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.

(vii) These safety provisions should be brought to the notice of all concerned by the displaying on a notice board at a prominent place at the work-spot. The person responsible for compliance of the safety code shall be named therein by the Contractor.

(viii) 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 Welfare Officer, Engineer-in-Charge or safety Engineer of the administration or their representatives.

(ix) Notwithstanding the above clauses there is nothing in these to exempt the contractor from the operations of any other Act or rules in force in the Republic of India.

The works throughout including any temporary works shall be carried out in such a manner as not to interfere in any way whatsoever with the traffic on any roads or footpaths at the site or in the vicinity thereto or any exiting works whether the property of the Administration or of a third party.

In addition to the above, the Contractor shall abide by the safety code provision as per C.P.W.D. Safety Code and Indian standard Safety Code framed from time to time.

PROFORMA OF AGREEMENT

CONTRACT AGREEMENT FOR THE WORK OF.....

DATED...……..2015 (……..Two Thousand Twelve) Between M/s .....……..... in the town of .....…….hereinafter called the **"CONTRACTOR"** which term shall unless excluded by or repugnant to the subject or context include its successors and permitted assignees of the one part and the Pollution Control Board, Assam hereinafter called the **"OWNER"** (Which term shall, unless excluded by or repugnant to the subject or context include its successors and permitted assignees) of the other part.

Whereas :

A. The Owner being desirous of having provided and executed certain works mentioned, enumerated or referred to in the tender documents including short Tender notice , General Tender Notice, General Conditions of Contract, Special conditions of Contract, Specifications, Drawings, Plans. Time Schedule of Completion of Jobs, Agreed Variations, other documents has called for Tender.

B. The Contractor has inspected the site and surroundings of the works specified in the tender documents and has satisfied himself by careful examination before submitting his tender as to the nature of the surface strata, soil, sub-soil and ground, the form and nature of site and local conditions , the qualities, nature and magnitude of the work, the availability of labour and materials necessary for the execution of work, the means of access to site, the supply of power and water thereto and accommodation he may require and has made local and independent enquiries and obtained complete information as to the matters and things referred to, or implied in the tender documents or having any connection therewith, and has considered the nature and extent of all probable and possible situations, delays, hindrances or interferences to or with the execution and completion of the work to be carried out under the contract, and has examined and considered all other matters, conditions and things and probable and possible contingencies, and generally all matters incidental thereto and ancillary thereof affecting the execution and completion of the work and which might have influenced him in making his tender.

C. The Notice Inviting Tender, General Conditions of Contract, Special Conditions of Contract Specifications, Drawings, Plans, Time Schedule of Completion of Jobs, and other documents, copies of all which are hereto annexed and marked "A", The letter of submission of Tender and Acceptance of tender and any statement of agreed variation with its enclosures, copies of which are also hereto annexed and marked "B" form part of this contract though separately set out herein and are included in the expression "CONTRACT" wherever herein used .

And Where as

The Owner accepted the Tender of the Contractor for the provision and the execution of the said work at the rates stated in the schedule of quantities of works and finally approved by Owner (herein after called the "Schedule of Rates") upon the terms and subject to the conditions of contract.

Now This Agreement Witnesseth And it is hereby agreed and declared as follows :-

1. Inconsideration of the payment to be made to the Contractor for the work to be executed by him, the Contractor hereby covenants with the Owner that the Contractor shall and will duly provide, execute and complete the said works and shall do and perform all other acts and things in the contract mentioned or described or which are to be implied there from or may be reasonably necessary for the completion of the said works and at the said times and in the manner and subject to the terms and conditions or stipulations mentioned in the contract.

2. In consideration of the due provision execution and completion of the said works, Owner does hereby agree with the Contractor that the Owner will pay to the Contractor the respective amount for the work actually done by him and approved by the Owner at the Schedule of Rates and such other sum payable to the Contractor under provision of Contract, such payment to be made at such time in such manner as provided for in the Contract.

AND

3. In consideration of the due provision, execution and completion of the said works the Contractor does hereby agree to pay such sums as may be due to the Owner for the services rendered by the Owner to the Contractor, such as power supply, water supply and others as set for in the said contract and such other sums as may become payable to the Owner towards the controlled items of consumable materials or towards loss, damage to the Owner's equipment, materials construction plant and machinery, such payments to be made at such time and in such manner as is provided in the Contract.

It is specifically and distinctly understood and agreed between the Owner and the Contractor that the Contractor shall have no right, title or interest in the site made available by the Owner for execution of the work executed or in the buildings, structures or works executed on the said site by the Contractor or in the good articles, materials etc. brought on the said site unless the same specifically belongs to the Contractor and the Contractor shall not have or deemed to have any lien whatsoever change for unpaid bills nor will be entitled to assume or retain possession or control of the site or structures and the Owner shall have an absolute and unfettered right to take full possession of site and to remove the Contractor, their servants, agents and materials belonging to the Contractor and laying on the site.

The Contractor shall be allowed to enter upon the site for execution of the works only as a licensee simpliciter and shall not have any claim, right, title or interest in the site or the structures erected thereon and the Owner shall be entitled to terminate such license at any time without assigning any reason.

The material including sand, gravel, stone, loose earth, rock etc., dug up or excavated from the said site shall, unless otherwise expressly agreed under the contract exclusively belong to the Owner and the Contractor shall have no right to claim over the same and such excavations and materials should be disposed of on account of the Owner according to the Instructions in writing issued from time to time by the Engineer-in-charge.

In witness whereof the parties have executed these presents in the day and the year first above written.

Signed and Delivered for and on behalf of Owner Indian Board of Technology Guwahati	Signed and Delivered for and on behalf of Contractor
Date :	Date :
Place :	Place :

In presence of the Witnesses

1.....	1.....
.....	.....
.....	.....
2.....	2.....

PROFORMA OF BANK GUARANTEE

(On non-judicial paper of appropriate value)

To
The Member Secretary,
Pollution Control Board, Assam
Guwahati, Assam

Dear Sirs,

M/s.....
have taken tender for the work of.....

for Pollution Control Board, Assam.

The tender Conditions of Contract provide that the Contractor shall pay a sum of ₹ ……..... (Rupees.....as earnest money/ initial full Security deposit in the form therein mentioned. The form of payment of earnest money/ security deposit includes guarantee executed by Schedule 'A' Bank, undertaking full responsibility to indemnity Pollution Control Board, Assam in case of default.

The said.....has approached us and at their request and in consideration of the promises we.....

having our office at ..... have agreed to give such guarantee as hereinafter mentioned.

1. We.....

   hereby undertake and agree with you that if default shall be made by M/s.....
   .....

   in performing any of the terms and conditions of the tender or in payment of any money payable to Pollution Control Board, Assam we shall on demand pay to you in such manner as you may direct the said amount of Rupees..... only or such portion thereof not exceeding the said sum as you may from time to time require.

2. You will have the full liberty without reference to us and without affecting this guarantee, postpone for any time or from time to time the exercise of any of the powers and rights conferred on you under the contract with the said .... and to enforce or to forbear from endorsing any powers or rights or by reason of time being given to the said .....
   which under law relating to the sureties would but for provision have the effect of releasing us.

3. Your right to recover the said sum of ₹ ..... (Rupees.....)
   from us in manner aforesaid will not be affected or suspended by reason of the fact that any dispute or disputes have been raised by the said M/s.....

.....and/or that any dispute or disputes are pending before any officer, tribunal or court.

4. The guarantee herein contain shall not be determined or effected by the liquidation or winding up, dissolution or change of constitution or insolvency of the said.....but shall in all respects and for all purposes be binding and operative until payment of all money due to you in all respect of such liabilities is paid.

5. Our liability under this guarantee is restricted to Rupees.....Our guarantee shall remain in force until.....unless a suit or action to enforce a claim under Guarantee is filed against us within six months from .....(which is date of expiry of guarantee) all your right under the said guarantee shall be forfeited and we shall be relieved and discharged from all liabilities thereunder.

6. We have power to issue this guarantee in your favour under Memorandum and Articles of Association and the undersigned has full power to do under the power of Attorney dated.....granted to him by the bank.

Yours faithfully,

…….....

Bank

By it's Constituted Attorney

Signature of a person duly authorised to sign on behalf of the bank.

GUARANTEE AGAINST ADVANCE PAYMENT

This deed of Guarantee made this .....…….....

day of.....…….....between ....and wherever the context so requires includes its successors and assigns hereinafter called "They Surety" and.....a Company registered under the Companies Act of 1956 and having its Registered Office at..... and wherever the context so requires includes its successors and assigns, hereinafter called "the Owner".

WHEREAS M/s.....(a company registered under the Companies Act of 1956 having its registered office at .....(Wherever applicable) and wherever the context so requires includes its successors and assigns, hereinafter called the " Contractor" has undertaken to the terms and conditions mentioned in the :

(a) Letter of Intent No.....dated.....

OR

(b) Agreement No.....dated.....

referred to as "the said Contract"

AND WHEREAS the Owner has agreed to make an advance of ₹ ….....(Rupees..... being) % value of the contract on ..... as provided in the contract as the said advance to the Contractor carrying no interest.

AND WHEREAS the Contractor has agreed with the Owner authorising him to deduct under the terms of the said contract from the amount that becomes due the payable to the Contractor as per the terms and conditions described under the clause "Terms and Conditions of Payments" of the Contract on proper execution of the Contract.

Now this deed witnesseth that in consideration of the said advance or any balance thereof made by the Owner to the Contractor, the surety hereby GUARANTEES the payment of the said advance by the Contractor, undertakes to pay the Owner on demand the said sum of ₹ ..... subject to the following conditions.

(a) "Surety hereby gives an irrevocable guarantee and declares that its liability under this bond shall extend to the payment of the whole of the amount viz. ₹ .....paid as advanced as provided for in the contract "as the said advance"

(b) this guarantee shall remain in force and effect so long as the said advance of any part thereof remains outstanding and shall expire and become ineffectual only after the recovery of the entire sum of ₹ ..... covered by the Guarantee and upon intimation thereof being given by the Owner to the Surety, in which event, the Surety shall be discharged by the Owner.

(c) the Surety shall not be discharged or released from the Guarantee by any arrangement made between the Owner and the Contractor with or without the Consent of the surety or by any alteration in the obligations of the parties or by any indulgence, forbearance, whether as to payment , time performance or otherwise.

(d) The Guarantee shall come in to force from the date Contractor receives from the Owner the said advance.

(e) Notwithstanding anything stated above, the liability of the Surety under the guarantee is given is not completed or filly performed, the surety (bank) hereby agrees to further extend the Guarantee till such time as is required to fulfill the contract.

INDENTURE FOR SECURED ADVANCED

THIS INDENTURE made.....……..... day.....…….....2012 between…….....…….....
.....…….. (hereinafter called the Contractor which expression shall where the context so admits or implies be deemed to include his executors, administrator and the assigns) of one part and Indian Board of Technology Guwahati (hereinafter called the IIT G which expression shall where the context so admits or implies be deemed to include its successors in office and assigns) of the other part.

WHEREAS by an agreement No.....dated..... (hereinafter called the said agreement the Contractor has agreed..... and WHEREAS the Contractor has applied to the PCBA that he may be allowed advance on the security of materials absolutely belonging to him and brought by him to site of the works, the subject of the said agreement for use in the construction of such of the works a he has undertaken to execute at rates fixed for the finished work (inclusive of the cost of materials and labour and other charges) and where as the PCBA has agreed to advance to the Contractor an amount upto ₹.....(Rupees.....
.....only) on the security of the quantities and other particulars of the materials on the security of which the advance or advances are made as detailed in the secured advance account forming part of the running account bill preferred from time to time and signed by the Contractor for the said works.

NOW THIS INDENTURE WITNESSETH that in pursuance of the said agreement and in consideration of amounts aggregating to the sum of ₹ .....(Rupees.....
.....only) on or after the execution of these presents paid to the Contractor by the PCBA (the receipt where of the Contractor hereby acknowledge) Contractor doth hereby covenant and agree with the PCBA declare as follows :

1. That the said sum aggregating to ₹.....….....(Rupees.....……..…
……... ....only) so advanced by the PCBA to Contractor as aforesaid shall be employed by the Contractor in or towards expending the execution of the said works and for no other purpose whatsoever.

2. That the materials detailed in the said Running Account Bills which have been offered to and accepted by the PCBA as Security are absolutely the Contractor's own property, and free from encumbrances of any kinds and Contractor will not make any application for or receive a further advance on the security of materials which are not absolutely his own property and free from encumbrances of any kind and the Contractor hereby agrees to indemnify the PCBA against all claims to any materials in respect of which an advance has been made to him as aforesaid.

3. That the materials detailed in the said Running Account Bills (hereinafter called the said materials) shall be used by the Contractor solely for the execution of

the said works in accordance with the directions of the Engineer-in-Charge and in terms of the said agreement.

4. That the Contractor shall make at his own cost all necessary and adequate arrangement for the proper watch, safe custody and protection against all risk of the said materials and that until used in construction as aforesaid the said materials shall remain at the site of the said works in the Contractor's custody and on his own responsibility and shall at all times be open to inspection, by the event of the said materials or any part thereof being stolen, destroyed or damaged the Contractor will forthwith replace the same with other materials of like quality or repair and make good same as required by the Engineer-in-Charge.

5. That the said materials shall not on any account be removed from the site of the said works except with the written permission of the Engineer-in-Charge or an officer authorised by him on that behalf.

6. That the advance shall be repayable in full when or before the Contractor receives payment from the PCBA of the price payable of him or the said works under the terms and provisions of the said agreement provided that if any intermediate payments are made to the Contractor on account of the work done then on the occasion of each such payment the PCBA will be at liberty to make recovery from the Contractor's bill for such payment by deducting there from the value of the said materials then actually used in the construction and in respect of which recovery has not been made previously the value for this purpose being determined in respect of each description of materials at the rates at which the amounts of the advances made under these presents were calculated.

7. That if the Contractor shall at any time make any default in the performance or observance in any of the terms and provisions of the said agreement the total amount of the advances that may still be owing in the PCBA together with the interest thereon at twelve percent per annum from the date or respective dates of such advance to the dates of payment will with all costs, charges, damages and expenses incurred by the PCBA in the recovery thereof or the enforcement of the security or otherwise by reason of the default of the Contractor shall become payable by the Contractor hereby covenants and agrees with the PCBA to repay and pay the same respectively to him accordingly.

8. That the Contractor hereby gives charge all the said materials for the repayment to the PCBA of the said sum aggregating to ₹ .....(Rupees..... .....only) and all costs, charges, damages and expenses payable under these presents PROVIDED ALWAYS AND it is hereby agreed and declared that notwithstanding anything in the said agreement and without prejudice to the powers contained therein if and whenever the money owing shall not be paid in accordance herewith the PCBA may at any time thereafter adopt all or any of the following courses as he may deem best :-

a) Seize and utilise the said materials or any part thereof in the completion of the said works on behalf of the Contractor in accordance with the provisions in that behalf contained in the said agreement debiting the Contractor with the actual cost of effecting such completion and the amount due in respect of advance under these presents and crediting the Contractor with the value of work done as if he had carried it out in accordance with the said agreement and the rates thereby provided. If the balance is against the Contractor he is to pay same to PCBA on demand.

b) Remove and sell by the public auction the seized materials or only part thereof and out of the moneys arising from the sales retain all the sums aforesaid repayable to the PCBA under these presents and pay over the surplus (if any) to the Contractor.

c) Deduct all or any, part of the money owing out of the security deposits or any sum due to the Contractor under the said agreement.

9. That in event of any conflict between the provisions of these presents and the said agreement the provisions of the said agreement shall prevail and in the event of any dispute or difference arising over the construction or effect of these presents the settlement of which has not been herein before expressly provided for, the same shall be referred to arbitration as provided in the said agreement.

IN WITNESS WHEREOF.....…….....and…… PCBA by the order and under the directions of PCBA have herein to set their respective hands the day and year first above written.

Signed, sealed and delivered by the said Contractor in the Presence of Witness

Signature :

Name :

Address :

Address :

Witness :

SPECIAL CONDITIONS OF CONTRACT

SECTION - 1

1.1. Scope of Work

The present scope of work under this contract shall include installation and testing of driven cast in situ piles of required length, pile caps, substructure and superstructure, water supply and sanitary works, site development works, all electrical works and other related works as per specifications and drawings issued from time to time subject to the conditions of the contract. The Contractor shall provide all necessary materials, equipment, labour etc. for the execution and maintenance of the work till completion unless otherwise mentioned in this tender document. All materials required for the work shall be as per technical specifications and approved by Engineer-in-Charge prior to procurement and use.

1.2. Time Schedule

1.2.1. The work shall be completed strictly within 18 months as per the following milestones:

a. Sub Structure including piles – 4 months from date of start

b. Super structure upto roof level - 5 months from the date of completion of sub structure

c. Other Civil work including tiles work, plastering work – 4 months from the date of completion of super structure

d. Water supply & Sanitary work and Electrification - 3 months from the date of completion of civil works.

e. Painting & handover – Last 2 months

1.2.2. The detailed construction program submitted along with the tender for completion of the work shall show starting and completion of the major items. On award of the work this master program will be reviewed and updated every month or at more frequent intervals as directed by the Engineer-in-charge.

1.2.3 The tenderer shall also submit in details the methodology supported by deployment of sufficient machineries, manpower and materials matching with the nature, volume of work and the schedule time of completion.

1.2.4 The tenderer shall also submit the following along with their offer:

a) Methods/ machinery to be adopted for mixing, transportation and pouring of concrete with reference to the volume given in the BOQ.

b) Source of earth for filling in land development.

1.2.5 List of Mandatory machineries: The contractor shall ensure employing the following machineries without fail within two months of awarding the work.

i) At least 4 Pile driving rigs.

ii. At least 4 concrete mixer of full bag capacity with hopper.

iv. Steel shuttering plates with beams and props with adjustable jacks on top for 1500 sqm.

v. Facility for site testing.

vi. Needle vibrators as per requirement.

vii. Contractor shall submit complete plan for engagement of curing pumps for the proposed work to the satisfaction of the Engineer-in-Charge.

viii. Any other plants and machineries considered essential to complete the work in time and with acceptable quality.

1.2.6. Monthly / weekly work program will be drawn up with the contractor based on availability of work fronts. The contractor shall scrupulously adhere to this schedule by deploying adequate personnel and construction tools and tackles and equipment. In all matters concerning the extent of target set out in the weekly and monthly program and the degree of achievement, the decision of the Engineer-in-Charge will be final and binding.

1.2.7. Incentive for early completion

In case, the contractor completes the work ahead of the scheduled completion time, a bonus @ 1% (one percent) of the tendered value per month computed on per day basis, shall be payable to the contractor, subject to a maximum of 5% (five percent) of the tendered value. The amount of bonus, if payable, shall be paid along with the final bill after completion of the work. In order to enable to claim BONUS under this clause, each delivery schedule as specified in the tender has to be fulfilled on time.

1.3. Scope of supply

1.3.1 Owner's scope of supply:

a) No store materials, tools and plants shall be issued by the owner.

1.3.2 Contractor's scope of supply :

a) All materials, equipment, consumable, testing appliances, tools and tackles necessary for completing the work shall be procured and engaged by the contractor at his own cost.

b) Land for borrow areas for procuring earth shall be arranged by the Contractor. All payments towards cost of forest royalties for land, taxes, cess, octroi, right of way etc. shall be paid by the contractor.

c) The contractor may arrange for Ready Mix Concrete for which no extra payment will be made. However the contractor should take prior approval from Engineer-in-charge in writing before commencing with concreting with RMC.

1.4. Quality assurance & quality control

1.4.1 The tenderer is required to carry out various tests for quality assurance as given in this tender document and technical document that will be furnished during the performance of the work as per IS codes.

Tenderer shall furnish in his offer the quality assurance programme containing the overall quality management and procedures which is required to be adhered to during the execution of the contract including the details of the field laboratory to be maintained at site.

1.4.2 The contractor shall engage specialized construction agencies having experience and expertise in concerned field for the execution of the following items of works:

(i) Structural Glazing

(ii) Aluminium composite panel

(iii) Wooden Flooring

(iv) Acoustic Wall paneling and Ceiling

(v) Air Conditioning

(vi) Fire Fighting

(vi) False Ceiling

Prior approval from the Board shall be obtained before taking up the above works. (Agencies for all the above specialized items shall be finalized within 6^{th} months from the date of issue of work order).

1.5. Test and inspection of work

All tools, tackles and equipments for the tests and inspection of works shall be provided by the contractor. If any test(s) is required to be done through other agencies the test(s) shall be done at the cost of the contractor. These are in addition to clause no. 63, 64 & 65 of General Conditions of Contract.

1.6. Site clearing

The contractor should clean the site free from all obstructions. No payment shall be made against this. And no extra time on this account shall be considered.

1.7 Approach Road

There are black top approach roads to the surroundings of the work site. Maintenance of roads within the construction site and also those to the contractor's office, staff quarters and labour camps in motor able condition shall be responsibility of the contractor at his own expenses.

1.8. Schedule of Labour Rates

Tenderer should quote labour rates for only those categories of labour that are likely to be used in this work in the prescribed form enclosed.

1.9. Validity of Bank Guarantee against Earnest Money Deposit

The Bank Guarantee submitted towards Earnest Money Deposit as per detailed NIT of General Conditions of Contract shall be kept valid for a period of six months from the date of opening of the tender.

1.10. Variation in Drawings and Quantities

Drawings accompanying the Tender Document are indicative and issued for tendering purpose only. Detailed drawings on the basis of which actual execution of the work is to be executed shall be furnished to the contractor progressively based on the programme involved after the award of the work. The Contractor will not be entitled for any price variation for quantities as per execution from the quantities given in the tender upto the limit specified in the clause no. 60.A(d) under General Condition of Contract

1.11 Billing

The Contractor will submit a bill in approved proforma in duplicate to the Engineer-in-Charge of the work giving abstract and detailed measurements

recorded as per clause no. 73(i) of GCC for various items executed during a month, before the expiry of the 1st week of the succeeding month. The Engineer-in-Charge shall take further action to effect payment of the bill before the expiry of 15 days from the date of presentation of the bill along with joint measurements. This clause shall supercede clause no. 73 (ii) of General Conditions of Contract.

In the event of the necessity of a check measurement the contractor or his representative shall remain present and quantity after check Measurement shall be final.

1.12. Income Tax Clearance Certificate (I.T.C.C)

Attested copy of the latest I.T.C.C. in the proforma prescribed by the Govt. of India should accompany the Tender Document. The I.T.C.C should be in the name of the firm/individual, quoting for this work.

1.13. Water and Power

1.13.1 Water :

The contractor shall arrange water fit for the purpose of drinking and construction at their own cost.

1.13.2 Power :

The contractor has to arrange themselves the electrical power supply at the work site as required by the Board, from where the contractor will make his/their own arrangement for distribution. All the works of the contractor shall be done as per Indian Electricity Act and Rules framed there under and approved by the Engineer-in-Charge. The temporary lines will be removed forthwith after the completion of the work or if there is any hindrance caused to the other work due to the alignment of these lines, the contractor will re-route or remove the temporary lines at his own cost.

The contractor at his own cost will also provide suitable electric meters, fuses, switches etc. These shall be in the custody and control of the Owner. The cost of power supply shall be payable to the Owner every month at the prevailing rates from time to time or will be deducted from the running account bills.

1.13.3. Owner, however, does not guarantee uninterrupted power supply and this does not relieve the contractor of his responsibility for the timely completion of various works as stipulated, nor any compensation shall be paid to the contractor for any failure or short supplies of Power. The contractor shall therefore make their own arrangement for stand by power supply at his own cost.

1.14 Mobilization Advance:

1.14.1 Contractor shall be paid on request recoverable Mobilization advance up to a maximum of 10% of the awarded contract value at the discretion of the Engineering-in-charge. The mobilization advance will carry a fixed simple interest @ Prevailing Base rate of SBI + 0.5% OR prevailing rate of Interest of SBI on Domestic Deposits for 80% of the stipulated contract period, at the time of release of the payment whichever is higher.

1.14.2 Mobilization advance as mentioned above shall be paid as follows:

a) 50% on completion of the following:

i. Submission of initial security deposit/security deposit as mentioned at clause 19 of General Conditions of Contract and signing of agreement.

ii. Submission of Bank Guarantee Equivalent to mobilization advance plus estimated interest charges for the contract period, in proforma approved by OWNER, from a Nationalised Bank/Scheduled Bank.

b) 50% after initial mobilization of plants & equipments and completion of labour camps etc., to the full satisfaction of the Engineer-in-Charge.

The Mobilization Advance together with the interest accrued shall be recovered from each running account bill @12% of gross amount of the RA bill in such a manner that the total advance and interest accrued is recovered approximately within 80% of the stipulated contract period. Balance amount, if any, remaining unrecovered shall be deducted in full from the RA bill succeeding 80% of the contract period. The same method of recovery will hold good for interest free mobilization also.

c) The contractor has to submit the utilization statement supported by authentic document of 1st installment of mobilization advance paid and 2nd installment of mobilization advance will be paid only after submission of utilization statement.

1.14.3. In case, any bidder requests for interest free mobilization advance, the offers of such bidders shall be loaded as follows for the purpose of comparison of prices :

Loading = Interest charges calculated @ prevailing base rate in percent+ 2% per annum for half the time period of the contract.

$$= \frac{\text{MA x (Prevailing base rate+2) x Time Schedule in Months}}{100 \times 12 \times 2}$$

MA = Mobilisation Advance.

1.14.4 The bidder shall indicate in the BOQ whether the above requirement of advance shall be interest free or interest bearing. In the absence of the said information, it will be presumed that no mobilization advance is required by the Contractor.

1.15. Price Escalation.

The contract value shall be adjusted for material, labour and P.O.L. escalation based upon the following. The base date for working out such escalation shall be the last date of receipt of tender. No escalation on extra items shall be paid.

1.15.1 **Price Escalation for Civil Works –**

The compensation for escalations for Cement, Steel, other building materials, labour and P.O.L. shall be worked out as per the following formulae:

(a) Cement :

$$V_C = 0.85 \times W \times 0.15 \times \frac{CI - CI_0}{CI_0}$$

V_C = Variation in cement cost i.e. increase or decrease in the amount in rupees to be paid or recovered

W = Value of work done during period under consideration (Civil Works).

CI = All India wholesale price index for cement as published by the Economic

Adviser to Govt. of India, Ministry of Industry & Commerce, for the period under consideration.
CI_0 = All India wholesale price index for cement as published by the Economic Adviser to Govt. of India, Ministry of Industry & Commerce, as valid on the last stipulated date of receipt of tenders including extension if any.

(b) Steel :

$$V_S = 0.85 \times W \times 0.20 \times \frac{SI - SI_0}{SI_0}$$

V_S = Variation in steel cost i.e. increase or decrease in the amount in rupees to be paid or recovered
W = Value of work done during period under consideration (Civil Works).
SI = All India wholesale price index for steel (bars & rods) as published by the Economic Adviser to Govt. of India, Ministry of Industry & Commerce, for the period under consideration. However, the price index shall be limited to (i) for the month when the last consignment of steel reinforcement for the work is procured or (ii) for the month in which half of the stipulated contract period is over which ever of these two is earlier.
SI_0 = All India wholesale price index for steel (bars & rods) as published by the Economic Adviser to Govt. of India, Ministry of Industry & Commerce, as valid on the last stipulated date of receipt of tender respectively including extension if any.

(c) Other materials (Civil component except Cement & Steel) :

$$V_M = 0.85 \times W \times 0.35 \times \frac{MI - MI_0}{MI_0}$$

V_M = Variation in material cost i.e. increase or decrease in the amount in Rupees to be paid or recovered.
W = Value of work done during period under consideration (Civil Works)
MI = All India wholesale price index for all commodities as published by the Economic Adviser to Govt. of India, Ministry of Industry & Commerce, for the period under consideration, and applying weightages to the individual commodities / group items .
MI_0 = All India wholesale price index for all commodities valid on the last stipulated date of receipt of tender including extension, if any, as published by the Economic Adviser to Govt. of India, Ministry of Industry & Commerce and applying weightages to the individual commodities / group items .

d) Labour:

$$V_L = 0.85\ W \times 0.25 \times \frac{LI - LI_0}{LI_0}$$

V_L = Variation in labour cost i.e. amount of increase or decrease in Rupees to be paid or recovered.
W = Value of work done during period under consideration (Civil Works)
Y = Component of labour expressed as percent of total value of the work
LI & LI_0 = Minimum daily wage in rupees for the minimum rated workers as per minimum wages act of by the Ministry of Labour & Employment, Govt. of India as applicable for the period under consideration and that valid on the date of receipt of tender including extension respectively.

e) Petrol, Oil and lubricant (P.O.L)

$V_F = 0.85 \times W \times .05 \times \frac{FI - FI_0}{FI_0}$

V_F = Variation in cost i.e. amount of increase or decrease in rupees to be paid or recovered.
W = Value of work done during period under consideration (Civil Works)
Z = Component of Diesel expressed as percent of total value of the work
FI & FIo = Average Price per litre of Diesel at Guwahati for the period under consideration and on the date of receipt of the tender including extension respectively.

1.15.2 **Price Escalation for Electrical Works –**

The compensation for escalations for Electrical works shall be assessed for — a) Wires, cables & accessories, b) Other materials and c) Labour as follows —

(a) Electrical accessories, wires, cables etc. :

$V_{EI} = 0.85 \times W \times 0.40 \times \frac{EII - EIIo}{EIIo}$

V_{EI} = Variation in cost of electrical accessories, wires, cables etc. i.e. increase or decrease in the amount in rupees to be paid or recovered.

W = Value of work done during period under consideration (Electrical works).

E/I = All India wholesale price index for "Electrical accessories, wires, cables etc." as published by the Economic Adviser to Govt. of India, Ministry of Industry & Commerce, for the period under consideration.

E/I_0 = All India wholesale price index for "Electrical accessories, wires, cables etc." as published by the Economic Adviser to Govt. of India, Ministry of Industry & Commerce, as valid on the last stipulated date of receipt of tenders including extension if any.

(b) Other materials (other than electrical accessories, wires, cables etc.) :

$V_M = 0.85 \times W \times 0.35 \times \frac{MI - MI_0}{MI_0}$

V_M = Variation in material cost i.e. increase or decrease in the amount in Rupees to be paid or recovered.

W = Value of work done during period under consideration (Electrical works).

MI = All India wholesale price index for all commodities as published by the Economic Adviser to Govt. of India, Ministry of Industry & Commerce, for the period under consideration, and applying weightages to the individual commodities / group items.

MI_0 = All India wholesale price index for all commodities valid on the last stipulated date of receipt of tender including extension, if any, as published by the Economic Adviser to Govt. of India, Ministry of Industry & Commerce.

(c) Labour :

$$V_L = 0.85\ W \times 0.25 \times \frac{LI - LI_0}{LI_0}$$

V_L = Variation in labour cost i.e. amount of increase or decrease in Rupees to be paid or recovered.

W = Value of work done during period under consideration (Electrical works).

Y = Component of labour expressed as percent of total value of the work

LI & LI_0 = Minimum daily wage in rupees for the minimum rated workers as per minimum wages act of by the Ministry of Labour & Employment, Govt. of India as applicable for the period under consideration and that valid on the date of receipt of tender including extension respectively.

1.15.3 **Price Escalation for Air-Conditioning Works –**

The compensation for escalations for Air-Conditioning works shall be assessed for — a) Basic metals, b) Equipment, c) Other materials and d) Labour as follows —

(a) Basic Metals :

$$V_{Mt} = 0.85 \times W \times 0.25 \times \frac{MtI - MtIo}{MtIo}$$

V_{Mt} = Variation in cost of basic metals i.e. increase or decrease in the amount in rupees to be paid or recovered.

W = Value of work done during period under consideration (HVAC works).

MtI = All India wholesale price index for "Basic Metals, Alloys & Metal Products" as published by the Economic Adviser to Govt. of India, Ministry of Industry & Commerce, for the period under consideration.

MtI_0 = All India wholesale price index for "Basic Metals, Alloys & Metal Products" as published by the Economic Adviser to Govt. of India, Ministry of Industry & Commerce, as valid on the last stipulated date of receipt of tenders including extension if any.

(b) Equipment :

$$V_E = 0.85 \times W \times 0.15 \times \frac{EI - EI_0}{EI_0}$$

V_E = Variation in equipment cost i.e. increase or decrease in the amount in Rupees to be paid or recovered.

W = Value of work done during period under consideration (HVAC works).

EI = All India wholesale price index for "Machinery & Machine Tools" as published by the Economic Adviser to Govt. of India, Ministry of Industry & Commerce, for the period under consideration.

EI_0 = All India wholesale price index for "Machinery & Machine Tools" as published by the Economic Adviser to Govt. of India, Ministry of Industry & Commerce, as valid on the last stipulated date of receipt of tender – respectively including extension if any.

(c) Other materials (other than basic metals & equipment) :

$$V_M = 0.85 \times W \times 0.35 \times \frac{MI - MI_0}{MI_0}$$

V_M = Variation in material cost i.e. increase or decrease in the amount in Rupees to be paid or recovered.

W = Value of work done during period under consideration (HVAC works).

MI = All India wholesale price index for all commodities as published by the Economic Adviser to Govt. of India, Ministry of Industry & Commerce, for the period under consideration.

MI_0 = All India wholesale price index for all commodities valid on the last stipulated date of receipt of tender including extension, if any, as published by the Economic Adviser to Govt. of India, Ministry of Industry & Commerce.

(d) Labour :

$$V_L = 0.85\ W \times 0.25 \times \frac{LI - LI_0}{LI_0}$$

V_L = Variation in labour cost i.e. amount of increase or decrease in Rupees to be paid or recovered.

W = Value of work done during period under consideration (HVAC works).

Y = Component of labour expressed as percent of total value of the work

LI & LI_0 = Minimum daily wage in rupees for the minimum rated workers as per minimum wages act of by the Ministry of Labour & Employment, Govt. of India as applicable for the period under consideration and that valid on the date of receipt of tender including extension respectively.

The above mentioned components are expressed as percent of total value of work. The escalation for the work having schedule time of completion as 18 months or less even if the time of completion extended beyond 18 months will not be paid. The escalation for each head beyond initial ±5% shall only be paid or recovered.
In the event of price of materials, the wages of labour or P.O.L. required for the execution of the work decreases there shall be downward adjustment of the cost of work so that such price of materials or wages of labour or P.O.L. shall be deductible

from the value of work under this contract and in this regard the formulae herein above under this clause shall be applicable. No other escalation whatsoever, except as stated above shall be payable under this contract under any circumstances.

1.16. Unbalanced Unit Rates

In the case of Tender where the unit price of any single item appears unworkable or too high such Tender will be considered unbalanced and in case the tenderer is unable to provide satisfactory explanation the Owner reserves the right to disqualify such Tender.

1.17 Abnormally High Quoted Rates

In case the quoted rates of items exceed the estimated rates by more than +50%, such items shall be called **"Abnormally High Rated Items",** and there would be a ceiling of 15% in excess of quantities provided in BOQ for these items. For such items, if quantities to be executed are more than 15% over the quantities indicated in BOQ, rates for quantities in excess beyond 15%, of BOQ shall be the average of rates quoted by other bidders for payment. If the average rates are more than the rates quoted by the contractor then the rate of the contractor will be considered.

1.18 Anti-Corruption Policy:

Member Secretary, Pollution Control Board, Assam's anti-corruption policy requires the bidders, suppliers and contractors associated with the Board to observe the highest standard of ethics during the procurement and execution of such contracts. In pursuance of this policy, terms set forth below are as follows:

i. They are not to indulge in any corrupt practices. These are defined as giving, receiving or soliciting directly or indirectly, anything of value to influence improperly the actions of the Board.

ii. In case there is any improper demand from any employee of the Board (directly or indirectly), they are to inform the Board's Chief Vigilance Officer (CVO). Currently the CVO is

Prof. Alika Khare

Telephone no. 0361-2582705,

Email: alika@PCBA.ernet.in

Fax: + 91 - (0) 361 – 2690762

1.19 Requirement of Technical Representative(s) and Recovery Rate

The contractor shall depute at least the following qualified and experienced Engineers to supervise the execution of the works in such manner as will ensure work of the best quality. In case the contractor fails to depute the required technical representative, the Engineer-in-Charge shall have full powers to suspend the execution of the work until such date as suitable Technical Representative is appointed and the contractor shall be held responsible for the delay so caused to the work. In addition, if the Engineer-in-Charge, whose decision in this respect is final and binding on the contractor, is convinced that the minimum required Technical representatives have not been appointed or are not effectively attending the work, a recovery shall be affected from the contractor as per the following table:

Sl.no	Qualification of Technical Representative	Discipli-ne	Min. Nos. required for the work	Recovery rate in the event of non-fulfilling the Minimum Requirement (Rs.)
1	Graduate/ Diploma Engineer	Civil	1	20000/- per month
2	Diploma Engineer	Electrical	1	15000/- per month

NOTE: Diploma Engineers with 8 years experience will be considered equivalent to a Graduate Engineer.

1.20 Recovery for Non Deployment of Machineries

The contractor shall depute machineries as per list proposed by him as per ANNEXURE VII (A). In case the contractor fails to deploy the machineries as per commitment, recovery at the prevailing rates of hire charge of machineries shall be affected from the contractor.

SECTION - 2

INSTRUCTIONS TO TENDERERS

GENERAL :

Tenderers are advised to read these instructions carefully to ensure that his response complies fully therewith. Failure to provide the information and documents required by this invitation to tender may render the tender to be unacceptable. For tenderer's convenience, the instructions to tenderers are divided into three main sections, as follows :

2.1.0 General Conditions of Tendering

2.2.0 Tender Requirement

2.3.0 Proposal of the Tender

2.1.0 General Conditions of Tendering

2.1.1 Tender document

One set of tender document along with two sets of BOQ are issued/ sent herewith along with the drawings. Tenderer shall submit the tender document along with their offers. Tenderer shall also sign each page of the tender document as token of his acceptance.

2.1.2 Tender validity

Tender shall remain valid for acceptance for a period of 120 (one hundred twenty) days from the date of opening of the tender. The tenderer shall not be entitled during the said period to revoke or cancel his tender or to vary the tender given or any term thereof. In case of tenderer revoking or cancelling his tender or varying any term in regard thereof, the owner shall forfeit the earnest money paid by him along with the tender. Tender shall be revalidated for extended period as required by owner in writing.

2.1.3 Tender submission

2.1.3.1: Tenders must be submitted by the time and date mentioned in the Notice Inviting Tender in the office of Member Secretary, Pollution Control Board, Assam. The Board takes no responsibility for any delay, loss or non-receipt of tender documents sent by post. Tenders received after the time and date fixed for receipt of tenders shall be rejected.

2.1.3.2: The tender and all details submitted subsequent to the tender shall be signed by any one, legally authorised to enter into commitment on behalf of the tenderer. Tenderer shall submit power of attorney in favour of the person who is authorised to enter into commitments on behalf of the tenderer. Owner will not be bound by any power of attorney granted by the tenderer or changes in the constitution of the firm made subsequent to submission of the tender or the award of the contract. The owner may, however, recognize any such power of attorney and changes after obtaining proper legal advice, the cost of which will be chargeable to the tenderer.

The cancellation of any document such as power of attorney, partnership deed etc. should be communicated by the tenderer to the owner in writing well in time, failing which it shall have no responsibility or liability for any action taken by it on the strength of the said documents.

Should the tenderer have a relative or relatives or in the case of a firm or a company, one or more of its shareholders or a relative or relatives of the shareholder(s) employed in a superior capacity in Member Secretary, Pollution Control Board, Assam, the authority inviting tenders shall be informed of the fact at the time of submission of the tender, failing which the tender may be disqualified or, if such fact subsequently comes to light, the owner reserves the right to take any other action as it deems fit in accordance with any applicable law, rules, regulations or the like in force for the time being.

2.1.4 Arrangement of tender

The tender shall be neatly arranged, and typewritten on white paper with consecutively numbered pages. They should not contain any terms and conditions printed or otherwise, which are not applicable to the tender. Insertions, postscripts and corrections shall not be recognized unless confirmed by the tenderer's signature.

2.1.5 Tenderer's responsibility for quotation

Although the details presented in this tender document consisting of conditions of contract, scope of work, technical specifications and drawings have been compiled with all reasonable cares, it is the tenderer's responsibility to ensure that the information provided are adequate and clearly understood.

The contractor shall be deemed to have inspected and examined the site of work and the surroundings and information available in connection therewith and to have satisfied himself before submitting his tender as to all the prevailing conditions and deemed to have obtained all necessary information as to the risks, contingencies and other circumstances which may influence or effect his tender. Tenderer's quotation is the responsibility of tenderer and no relief or consideration can be given for errors and omissions.

2.1.6 Clarifications requested by tenderer

Tenderer may request clarification at any time up to one week prior to the tender closing date. Such clarification requests shall be addressed to the Chief Project Engineer IIT, Guwahati.

2.1.7 Tender clarifications/amendments by owner

Owner may issue clarifications/ amendments in the form of addendum/ corrigendum during the tendering period (date of issue to date of receipt of tender) and may also issue amendments subsequent to receiving the tenders. For the addendum/ corrigendum issued during the tendering period, tenderer shall confirm their impact, in the tender. For clarifications issued by owner subsequent to receiving the tenders, the tenderer shall confirm receipt and for any impact on the quoted prices, the tenderer shall follow the instructions issued along with addendum/ corrigendum.

Tenderer shall examine the tender documents thoroughly and submit to the owner any apparent conflict, discrepancy or error in drawings, specifications, schedule of items and any other conditions. The owner shall issue appropriate clarification or amendment. Any failure by tenderer to comply with the aforesaid shall not excuse the tenderer, if subsequently awarded the contract, from performing the services in accordance with the agreement.

Techno-commercial discussion with the tenderers shall be arranged, if needed. The tenderer shall depute his representative(s) for attending the discussion. The representative(s) attending the discussion shall produce authorisation from his organisation.

2.1.8 **Scope of work**

The complete scope of work has been defined in the tender document. Only those tenderers who undertake total responsibility for the complete scope of work in line with basic scheme and scope as defined in the tender document shall be considered.

2.1.9 **Deviations in terms and condition**

Tenderers are required to submit offers strictly as per the terms and conditions and specifications given in the tender document and not to stipulate any deviations/ exceptions. **Conditional tenders are liable to rejection**.

2.1.10 **Confidentiality of documents**

Tenderer shall treat tender documents and contents therein as private and confidential. If, at any time during the tender preparation period, tenderer decides not to submit the tender, all documents must be immediately returned.

2.1.11. **Owner's right**

Owner reserves the right to accept a tender other than the lowest and to accept or reject any tender in whole or in part, or to reject all tenders with or without notice or reasons. Such decisions by owner shall bear no liability whatsoever consequent upon such decisions.

Owner may allot the work in whole or in parts at its own discretion. The quoted rates shall remain valid for such division. Such decisions by owner shall bear no liability whatsoever to tenderer's consequent upon such decisions.

2.1.12 **Applicable language**

The tenders and all correspondences incidental to and concerning this tender shall be in the English language. For document submitted in any other language, an English Translation shall also be submitted.

2.1.13 **Caution and disclaimer**

Tenderer may make his own interpretation of any and all information provided in the tender documents. Owner shall not be responsible for the accuracy or completeness of such information and/or interpretation.

Tenderer shall be responsible for obtaining and verifying all necessary data and information and although certain information is provided in the tender documents, it shall be confirmed by tenderer.

2.1.14 **Earnest money**

The tender is to be accompanied by earnest money (interest free) for the amount indicated in NIT in the form of a Demand Draft / Banker's Cheque drawn on any Nationalised/scheduled-A Bank in favour of 'Member Secretary, Pollution Control Board, Assam', payable at 'Guwahati'.

If the tenderer, after submitting his tender, revokes his offer or modifies the terms and conditions thereof during the validity of his offer except where the owner has given opportunity to do so, the earnest money shall be liable to be forfeited. Tenders not accompanied by earnest money shall not be considered.

After placement of order on successful tenderer, the earnest money will be returned to the unsuccessful tenderers.

Should an 'Invitation to Tender' be withdrawn or cancelled by the owner, which it shall have the right to do at any time, the earnest money paid with the tender will be returned to tenderers without any interest.

The successful tenderer shall be required to deposit initial security deposit of 2% of the total contract value with the owner in the manner indicated in Clause No. 19.1 of the 'General Conditions of Contract'. Should the successful tenderer fail or refuse to duly sign the agreement or furnish the initial security deposit within the period fixed by the owner as indicated above, the earnest money shall be forfeited without prejudice to his being liable to any further loss or damage incurred in consequence by the owner.

2.1.15 Earnest **money refund order**

Earnest Money to unsuccessful tenderers shall be returned directly by owner.

2.1.16 **Contract**

The tenderer, whose tender owner has accepted, shall enter into formal agreement with owner as per terms of these tender documents.

The entire work covered in the tender document shall be treated as works contract. Tenderer should quote for the work accordingly. **The quoted rates shall be firm** and should include all taxes, royalties, duties, octroi, excise, freight, works contract tax applicable in the state etc. whatsoever from time to time.

2.1.17 **Contract document**

The statement of agreed deviations, if any, shall be prepared based on the finally retained and agreed deviations by the Owner and all correspondences and **MOM's** held between the Owner and the tenderer prior to issue of Fax/Telegram/Telex /Letter of Intent shall be treated as Null and Void. Any deviations or stipulations made and accepted by the OWNER after award of the job shall be treated as amendments to the contract documents made as above.

2.1.18 **Compliance to requirements of tender document**

Tenderer shall confirm his compliance to the requirement of tender document as per enclosed Annexure.

2.2 **Tender requirement**

2.2.1 **Technical and un-priced Bid**

Tenderer is advised that owner intends to fully evaluate the technical and un-priced Bids submitted. It is important that tenderer clearly demonstrates his ability, giving to owner a high level of confidence that the tenderer will be able to perform the works within the schedule and meeting the other requirements listed in the tender document. Failure to do so may result in disqualification of the tender.

Tenderer shall provide narrative on his approach for execution of services in line with the owner's own project execution approach. Priced Commercial Tenders of only those contractors whose Technical and un-priced commercial tenders are found suitable for the work shall be opened. As a minimum, the following shall be covered.

2.2.2 Organization

2.2.2.1: A description of the tenderer's corporate organization and operations. Description of any relationship with any parent company, or any other company which tenderer proposes as a sub-contractor for any portion of the works. Details of organization of proposed sub-contractor, if any.

An organization chart showing details of the tenderer's head office organization, levels of responsibility and lines of communication, indicating names of key personnel at management level.

Organization charts together with an assignment schedule (by position), proposed for the execution of this work along with the bio-data of key personnel.

2.2.2.2: The tenderer shall mention clearly if the electrical works are proposed to be executed directly by them. In that case, copies of the valid electrical contractor's license may be submitted along with the tender. In case, the tenderer proposes to execute the electrical part through sub-contractor, the name of the of electrical sub-contractor proposed to be engaged shall be furnished along with the copy of the valid electrical contractor's license.

Organizational capacity of an contractor or their sub-contractor, will be judged on the basis of the data furnished by him in respect of personnel and plant, equipments/testing equipments along with the tender. The firm is expected to have at least one Graduate Engineer, one Jr. Engineer/Foreman, two Supervisor (possessing valid supervisor's license) and three electrician/wireman (possessing valid license) under permanent employment. It is expected that the contractor or their sub-contractor has experience in executing complete electrification works of large multistoried buildings along with telephone/ intercom, fire alarm system, external lighting etc.

The past performance of an applicant is established in respect of works executed by the firm in terms of a) quality & workmanship of job, b) quality of materials supplied, c) time of completion and d) relation with the client.

For this purpose, testimonials etc. from client for whom the applicant has executed similar types of works in the past will have to be submitted by the applicant, Reference to the previous client and also visit to such works executed by the applicant, may be made for necessary about the performance.

If the ability of the tenderer to perform the electrical work is found to be not satisfactory from the documents furnished along with the tender, the owner shall have the right to split the electrical work. The extra financial involvement for executing the work through other agency due to split of work will be reimbursed from the contractor from his bills.

2.2.2.3: In case the tenderer is a partnership firm, certified copy of the partnership deed together with a certified extract from the register of firms containing names and addresses of all the partners of the firm should be furnished along with the tender.

2.2.2.4: In case of a company (whether private or public), certified copy of the certificate of incorporation together with certified Memorandum of Articles of Association and a list containing names and addresses of all the directors should accompany the tender.

2.2.2.5: In case of a proprietorship firm, the name and address of proprietor, should be furnished.

2.2.3. **Project scheduling & monitoring**

The tenderer shall follow project schedules and project monitoring in accordance with overall completion, and the manner given in special conditions of contract. Tenderer should submit along with a completion schedule **bar /pert/cpm chart** covering all major activities.

2.2.4 Financial documents

2.2.4.1: Audited balance sheet including profit and loss accounts for the last three years shall be submitted.

2.2.4.2: Valid Income Tax Clearance Certificate issued by Income Tax Authorities issued during last 12 months and attested copy of registration certificate under state sales tax Act. in the prescribed Performa. Attested copies of the valid ITCC in the Performa prescribed by the Govt. Of India should accompany the tender. The ITCC should be in the name of the firm/individual quoting for the work. In the absence of the above ITCC, tenderer may not be awarded the work tendered for in the light of Central Govt directives/instructions.

2.2.5: Latest Solvency Certificate from any Nationalised/Scheduled Bank shall be submitted.

2.2.6 Pricing requirements

2.2.6.1 All rates set forth in tenderer's quotation, shall be in Indian Rupees.

2.2.6.2: The rate should be written both in figures and words. In case of difference between the two, the lower of the two shall be considered.

2.2.6.3: The tenderers are requested to furnish the rebate, if any, only in the specified place of 'Bill of Quantities' in the price bid only. Rebate if offered at any other place shall be considered INVALID.

2.2.6.4: No condition, whatsoever, shall be stipulated in price part of the bid. Any condition if stipulated shall be treated as **Null and Void**.

2.2.7 Quality assurance & quality control programme

Tenderer shall include in his offer the quality Assurance Programme containing the overall quality management and procedures which is required to be adhered during the execution of contract. After the award of the contract detailed quality assurance programme to be followed for the execution of contract under various divisions of work will be mutually discussed and agreed to.

2.2.7.1: The CONTRACTOR shall establish document and maintain an effective quality assurance system as outlined in recognised codes.

2.2.7.2: Quality Assurance system Plans/Procedures of the Contractor shall be furnished in the form of a quality assurance manual. This document should cover details of the personnel responsible for the Quality assurance, plans or procedures to be followed for quality control.

2.2.7.3: The Owner /Consultant or their representative reserve the right to inspect/witness, review any or all stage of work at shop/site as deemed necessary for quality assurance.

2.3: Proposal of the tender : The tenderer shall arrange his tender in the following order:

ATTACHMENT

a) Submission of tender letter along with original set of tender document and drawings duly sealed & signed.

b) Earnest Money Deposit and its details.

c) Power of Attorney in the name of person who signs the tender document,

d) Organization details

e) Project schedule

f) Balance Sheets along with Profit and Loss Account

g) Valid ITCC and STCC

h) Latest Solvency Certificate

i) ANNEXURE I to ANNEXURE-XII (duly filled in)

j) Any other relevant documents, tenderer desires to submit

k) BOQ duly filled and signed with seal.

SECTION - 3

EVALUATION PROCEDURE FOR TECHNO-COMMERICAL BID TO QUALIFY FOR OPENING OF PRICE BID FOR AWARD OF WORK

3.1: Techno-Commercial bids which do not fulfill any of the qualifying criteria specified in the NIT shall be rejected and shall not be considered for further evaluation.

3.2 Technical bids received will be ranked by awarding marks out of 100 (T) by an Evaluation Committee based on the marks earmarked for the following sub-heads.

3.2.1 Financial capacity: 10

i) Having turn-over from construction works only not less than 30% of the value of work during the immediate last three consecutive years shall be awarded 5 marks,

ii. Each additional year having turn-over not less than 30% of the value of work shall carry 2.5 marks

3.2.2 Experience: 15

Having experience of executing similar Works during the last seven years.

i. Each work of value not less than 80% of the value of work – 7.5 marks

ii. Each work of value not less than 60% of the value of work – 3.75 marks,

iii. Each work of value not less than 40% of the value of work – 2.5 marks

3.2.3 Maximum size work during last 7 years. 15

Each works of minimum value not less than 80% the value of work under consideration completed during the last seven years shall carry 5 marks.

i. Each works of minimum value not less than 60% the value of work under consideration completed during the last seven years shall carry 3 marks.

3.2.4 Record of completion in time of major works during the last 7 years. 15

i. Each work of value not less than 80% of the value of work shall carry 7. 5 marks

ii. Each work of value not less than 25% of the value of work shall carry 5 marks

3.2.5 Experience of executing works in the North-East region of India during the last 7 years. 10

i. Each work of value not less than 25% of the value of work – 2.5 marks.

3.2.6 Firm's Infrastructure (Shall be awarded as per the proposed man power, tools and plants for respective projects) **10**

3.2.7 Testimonials from clients of major works that have been completed or are nearing completion. 10

i. Each testimonial regarding good quality and good progress shall be awarded 5 marks. Value of work shall not be less than 25% of the value of work under consideration.

3.2.8 Quality of work of value not less than 25% of the value of the work under consideration in recent works (through inspections or through testimonials if inspections are not feasible) very good- 5 marks, good-3 and satisfactory- 1.5 marks, 15

The minimum mark to be secured by a bidder to qualify for opening of the price bid of the work shall be 50

3.3 Price Bids and justified estimate: Price bids of only those contractors who have secured the minimum qualifying marks as mentioned herein above shall be opened. During the opening of the price bid a justified estimate prepared based on the prevailing market rates as on the date of tender and kept under sealed cover for the work shall also be opened and value of the justified estimate shall be declared to all the members present in the opening of the price bids. The justified estimate shall be prepared as per PWD(Assam) Rate Schedule 2013-14 and by detailed analysis of rates by taking market rates of labour, materials, T&P, cartage etc. by following standard norms and practices for the items which are not available in the PWD(Assam) Rate Schedule.

Reasonability of the rates quoted by the contractors shall be determined by comparing to the justified estimated rates. Quoting of tender with deviation beyond 10% of the justified estimate may be a reason for rejection of any tender.

3.4 Details to be furnished along with the enclosure:

The applicants shall enclose all relevant documents / supplementary papers etc. along with the application. The key information / documents to be furnished along with the application are listed below:

a. Details as per ANNEXURE-II, duly filled up & signed.
b. Attested / Notarized copy of deed of articles of association of the firm.
c. Power of attorney in the name of person who signed the application.
d. Financial Statement in ANNEXURE-III, duly filled up.
e. Solvency Certificate in ANNEXURE-IV
f. Details about past experience as per ANNEXURE-VIII (A), (B) & (C).
g. Audited Balance sheet of the company for last five (5) years.
h. Attested / Notarized copy of the latest Income Tax Clearance Certificate.
i. Attested / Notarized copy of the latest Sales Tax Clearance Certificate.
j. Attested / Notarized copies of work order & completion certificate in support of information furnished ANNEXURE-VIII (A) & (B)

k. Testimonials from clients of major works that have been completed or are nearing completion regarding quality of work/ completion time etc.

l. ANNEXURE-VII (A), (B)) duly filled in and signed.

m. Organisation chart, list of manpower / employees, list of zone / branch offices/ ANNEXURE-V (A) duly filled in and signed.

n. All other ANNEXURE(s) duly filled and signed.

NOTE:

1. Contractors / firms shall submit all the documents mentioned at para 3.4 of Section -3 without fail. Marks shall be awarded based on the data/ information submitted with an undertaking that data/ information furnished are true in all respects. If after verification any such dada/ information are not found true or has attempted to conceal any unfavorable data/ information his tender shall be summarily rejected.

2. The list of plant and machineries and manpower viz Degree/ Diploma Engineers proposed to be engaged are to be mentioned clearly as asked in ANNEXURE-VII (A) & (B) and ANNEXURE – V(A) & (B) at Para 3.3 if not mentioned, marks will not be awarded.

ANNEXURE - I

Acknowledgement letter to NIT no. ....

To,

The Member Secretary
Pollution Control Board, Assam
Bamunimaidam, Guwahati-21.

Sub: "Construction of……
……..
…….. (Name of the work should be written above)

Dear Sir,

We acknowledge receipt of your invitation to Tender which was received on .... and understand that the documents received remain the property of Pollution Control Board, Assam. We indicate below our intentions with respect to the letter Inviting Tender.

A) We intend to tender as requested and furnish following details with respect to our quoting office :

i) Postal address :

ii) Telephone no. :

iii) Fax no. :

iv) Contact person :

B) We are unable to tender for the reasons given below and hereby return the Tender Documents.
Reasons for non-submission of tender :

Company's name :

Signature :

Name :

Designation :

ANNEXURE-II

Particulars of contractor:

1. Name & Address of Contractor/ firm :

   Telephone no. :

   Fax no. :

2. Whether the firm is private or public limited (attested copies of deed for articles of Association to be enclosed) :

3. Name of person holding the power of attorney :
   (attested copy of power of attorney to be enclosed)
   State his present nationality and liabilities :

4. Name of partners, their present nationalities with their liabilities(attested copy of partnership deed to be enclosed) :

5. Name & Address of Bankers :

I/ We authorise Member Secretary, Pollution Control Board, Assam to make any investigation to verify the correctness of the statements and documents submitted with this application and obtain clarifications or information on the technical a financial aspects of the applicant.

Seal of the Company Signature of Company/ Contractor

Date :.....

ANNEXURE-III

Financial statement :

(to be given separately for each partner in case of Joint Venture/ Consortium)

1. Name of the contractor/ firm :

   (partner in case of Joint Venture/ consortium)

2. Capital

   a) Authorised :

   b) Issued & paid up :

3. Attach audited balance sheet and profit & Loss statement for the last three years.

4. Financial Position

   a) Cash

   b) Current assets

   c) Current Liabilities

   d) working capital

   e) Net Worth

   f) Annual turnover for last 3 years.

5. Total Liabilities :

   a) ratio of current assets to current liabilities.

   b) Ratio of cash, temporary investment held in lieu of cash and current receivable to current liabilities.

   c) Ratio of total liability to net worth.

6. Annual value of RCC building construction works, undertaken for each of the last three years.

Current year(projected)	One Year before	Two Year before

---

7. Net profit before tax :

   a) Current Period

   b) During the last financial year

c) During each of the three previous financial years.

The profit and loss statements have been certified through ..... by.....

8. Applicant's financial arrangements

a) Own resources :

b) Bank credits :

c) Others (specify) :

9. Details and value of property owned by the Applicant

(Attached Valuation Report Bankers reference).

10. Approximate value of works in hand :

11. Value of anticipated orders for next financial year :

Seal of Company Signature of Company/ Contractor

Date .....

ANNEXURE-IV

Banker's solvency certificate from schedule bank :

This is to certify that to the best of our knowledge and information

M/s. .....

(Name and Address of the applicant/ contractor)

a customer of our bank is respectable and can be treated as good for any engagement upto a limit of Rs. ..... (**in figure**).....(**in words**).

This certificate is issued without any guarantee or responsibility on the part of in the Bank or any its officers.

Signature and Seal of the Bank

Name of the Bank .....

Address .....

Date .....

ANNEXURE -V (A)

Details of key personnel to be employed for the proposed works (civil):

	Designation	Name of Nominee	Qualification, Experience & present of posting
Head quarters			
Project Management			
Site Office			
Planning **&** monitoring			
Engineering Supervision & Measurements			
Quality Control			
Material Management			
Accounts			
Other Staff			

NOTE: Non deployment of Engineers as per the list will attract penalty as per clause no.1.21 of Section-I of SCC.

Seal of Company

Signature of Company/Contractor

Date : .....

ANNEXURE –V (B)

Details of key personnel to be employed for the proposed works (electrical):

	Designation	Name of Nominee	Qualification, Experience & present of posting
Head quarters			
Project Management			
Site Office			
Planning & monitoring			
Engineering Supervision & measurements			
Quality Control			
Material Management			
Accounts Other Staff			

Note: In case, the electrical works are proposed to be executed through sub-contractor, list of key personnel under permanent employment of the sub-contractor shall be furnished. Non deployment of Engineers as per the list will attract penalty as per clause no.1.21 of Section-I of SCC.

Seal of Company

Signature of Company/Contractor

Date : .....

ANNEXURE- VI

SCHEDULE OF LABOUR RATES

Sl. No.	Designation/Category	Rate per day per head
1.	Head Mason	
2.	Mason	
3.	Head Carpenter	
4.	Carpenter	
5.	Head Plumber	
6.	Plumber	
7.	Rod bender/binder	
8.	Welder	
9.	Painter	
10.	Mixer machine operator	
11.	Concrete vibrator operator	
12.	Mechanics	
13.	Fitter	
14.	Electricians	
15.	Grinder operator	
16.	Helper	
17.		
18.		
19.		

NOTE : Labour wages quoted shall include all benefits as per (Current) Labour Acts/ Regulation

Seal of Company Signature of Company/Contractor

Date : .....

ANNEXURE VII (A)

Construction plants & equipments (civil) proposed to be used by the contractor for the work :

Description (Type, Model, Make etc.)	Manufacturer with year of manufacture	Capacity t/m^3	Nos. Proposed to be used for the work

NOTE: Non deployment of Equipments as per the list will attract penalty as per clause no.1.22 of Section-I of SCC

We hereby confirm that the number and type of equipment he will deploy for construction will not be less than those listed above, and agrees to bring more equipment, if so warranted in the opinion of the engineer, at no extra cost to IIT, Guwahati..

Seal of the Company

Signature of Company/ Contractor

Date : .....

ANNEXURE-VII (B)

Construction plants & equipments (electrical) proposed to be used by the contractor for the work :

Description (Type, Model, Make etc.)	Manufacturer with year of Manufacture	Capacity t/m^3	Nos. Proposed to be used for the work

NOTE: Non deployment of Equipments as per the list will attract penalty as per clause no.1.22 of Section-I of SCC.

We hereby confirm that the number and type of equipment he will deploy for construction will not be less than those listed above, and agrees to bring more equipment, if so warranted in the opinion of the engineer, at no extra cost to Member Secretary, Pollution Control Board, Assam.

Seal of the Company Signature of Company/ Contractor
Date : .....

Note: In case , the electrical works are proposed to be executed through sub-contractor, plants and equipments /testing equipments possessed by the sub-contractor shall be furnished.

ANNEXURE – VIII (A)

List of similar Civil Works executed during last five years :

Sl. No.	Full Postal Address of client & Name of Officer-in-Charge	Descrip-tion of the work with contract no.	Value of contract	Date of Commence - ment of work	Stipulated date of completion	Actual date of completion

Note: Original or attested copies of work order and completion certificates from the client should be attached by the applicant.

ANNEXURE – VIII (B)

List of similar Electrical Works executed during last five years :

Sl. No.	Full Postal Address of client & Name of Officer-in-Charge	Descrip-tion of the work with contract no.	Value of contract	Date of Commence - ment of work	Stipulated date of completion	Actual date of completion

Note: Original or attested copies of work order and completion certificates from the client should be attached by the applicant.

ANNEXURE – VIII (C)

List of Building Works undertaken in North-East Region

Sl. No.	Full Postal Address of client & Name of Officer-in-Charge	Descrip-tion of the work with contract no.	Value of contract	Date of Commence - ment of work	Stipulated date of completion	Actual date of completion

Note: Original or attested copies of work order and completion certificates from the client should be attached by the applicant.

ANNEXURE-IX

List of concurrent commitments:

Sl. No.	Full Postal Address of client & Name of Officer-in-Charge	Descri p-tion of the work	Value of contra ct	Date of Comm encem ent of work	Sche-duled comple -tion period	%age completion as on date		Expec-ted date of complet ion	Rema rks
						Phys ical	Finan cial		

Seal of Company
Date :.....

Signature of Company/ Contractor

Note: Original or attested copies of work order from the client should be attached by the applicant.

ANNEXURE-X

Compliance to requirement of tender documents:

We confirm that our tender complies with the total techno-commercial requirements of Bidding document without any deviation.

Signature of Company/ Contractor

ANNEXURE - XI

TENDER VALIDITY

Tender shall remain valid for acceptance for a period of 120(One hundred twenty) days from the date of opening of the tender. The tenderer shall not be entitled during the said period to revoke or cancel his tender or to vary the tender given or any term thereof. In case of tenderer revoking or cancelling his tender or varying any term in regard thereof, the OWNER shall forfeit the earnest money paid by him along with the tender. Tender shall be revalidated for extended period as required by Owner in writing.

Signature of Company/ Contractor

ANNEXURE – XII

Turnover for Civil Engineering Construction during the last five years :

Year 2011-2012 =

Year 2010-2011 =

Year 2009-2010 =

Year 2008-2009 =

Year 2007-2008 =

Seal of Company
Date :.....

Signature of Company/ Contractor

Note: Original or Attested / Notarized copies of work order and completion certificates from the client should be attached by the applicant.

TECHNICAL SPECIFICATIONS (CIVIL WORKS)

SECTION - 1

1.0. GENERAL :

1.1: The works shall be carried out in conjunction with specifications, schedule of items and the construction drawings issued from time to time. The latest specifications given in the PWD(Assam) Rate Schedule with up-to-date corrections; relevant to this work, with a cross reference to relevant codes of practice published by the Bureau of Indian Standards or published by the Indian Roads Congress in respect of matters not covered by the PWD(Assam) Rate Schedule specifications shall be followed.

1.2: In interpreting the specifications the following sequence shall be followed unless otherwise given in writing by the Engineer-in- charge:

(a) Nomenclature of items of the schedule of items.

(b) Drawings and working details.

(c) Technical Specifications given in the tender.

(d) PWD(Assam) Rate Schedule specifications with upto date correction slips.

(e) Relevant Indian Standard Codes with latest revisions.

In absence of the specifications in any of the above, the specifications furnished by the Engineer-in-charge based on sound engineering practices shall be final and binding.

1.3: The schedule of quantities, the structural and Architectural drawings shall be properly co-related and all these documents should be read and operated in harmonious conjunction. In case of any discrepancy in items given in the Schedule of Quantities appended with the tender and architectural drawings relating to the relevant item the former shall prevail unless otherwise given in writing by the Engineer-in-charge.

1.4: All the works shall be carried out in sound workmanship and true to line, level, plumb and as per the best practice of the trade.

1.5 : All mandatory tests specified in PWD(Assam) Rate Schedule specifications shall be got done from the approved laboratories as desired by the Engineer- in-charge and all expenses viz. cost of samples , testing charges, including cartage, conveyance etc. whatsoever shall be borne by the contractor. If after any such test and in the opinion of the Engineer-in-Charge any work or portion of work is found to be defective and unsound the contractor shall pull down and re-execute the same at his own cost. Defective material/ materials failing in mandatory test shall be removed from the site.

1.6: All materials to be supplied by the contractor shall be new. All packed items shall arrive at site in original packing only. Any items found defective or damaged shall be replaced by the contractor at his own expenses. The sources of materials stated in the specifications are those from which materials are generally available. However, materials not conforming to specifications shall be rejected even if they come from the stated source. The contractor should satisfy himself that sufficient

quantity of material of acceptable specification is available from the stated or other sources.

1.7: All the materials brought at site shall be stored and stacked in a proper manner. The materials requiring protection from the sun and rain shall be kept in side the temporary structures to be erected at site by the contractor. The contractor shall also follow the manufacturer's instructions for storing and stacking the materials. The storage facilities are to be created by the contractor at his own expense.

The contractor shall consult the Engineer-in-Charge regarding collection and stacking of basic materials required for the work. They should not stack any materials in any place other than those approved by the Engineer-in-Charge within the plot area. On completion of the work the area used will be restored, properly dressed to satisfaction of the Engineer-in-Charge at no extra cost

1.8: The contractor shall be responsible for co-coordinating the work with works of other trades sufficiently ahead of time to avoid unnecessary hold ups. Hangers, sleeves, recesses etc. shall be left in time as the work proceeds.

1.9: A site order book will be kept at the site of the work in which instructions shall be recorded by Site Engineer / Architect or their representatives. The contractor or his authorised agent shall sign the site order book to acknowledge the instructions in all events and follow the same.

1.10: The plumbing drawings issued from time to time to the contractor are diagrammatic but shall be followed as closely as actual construction work will permit. Any deviation from the drawings required as per building construction shall be made by the contractor at site with the permission of the Engineer- in- Charge. The architectural drawings shall take precedence over the services drawings as far as the civil and other trades works are concerned.

1.11: All works shall be adequately protected, to the satisfaction of the Engineer-in-charge, so that same is free from damage throughout the period of construction upto the time of handing over. Special care must be taken to prevent damage and scratching of all fittings and fixtures, Tool marks on exposed fixtures shall not be accepted. Protective paper on fixtures shall be removed with hot water only at the final completion of the work. Before handing over the possession of work, the contractor shall clean all elements of the complete installation, remove plasters, splashier, stickers, rust stains and other foreign matter and leave every part in acceptable condition and ready for use to the satisfaction of the Engineer-in-Charge/ Architect.

1.12: Rates for all items in which use of cement is involved, is inclusive of charges for curing.

SECTION - 2

The intent of this section of the specification is to define the general technical requirements of the major items of Building and site development works.

2.1 SITE CLEARANCE:

Before the work is started, the area coming under the building and upto an extent of 6m as required beyond the periphery of the building shall be cleared of shrubs, rank vegetation, grass, brushwood, trees and saplings of girth upto 30 cm measured at height of 1 M above the existing ground level including removal of roots of trees and saplings to a depth of 60cm below the ground level and all rubbish removed to a dumping ground within the project site as directed by the Engineer In-charge. Nothing extra shall be paid for the site clearance.

2.2 SETTING OUT OF REFERENCE MARKS:

A masonry pillar to serve as a bench mark shall be erected at a suitable point in the area, which shall be visible from the large area. These bench mark pillar shall be constructed as per the drawing to be issued by the Engineer In-charge and connected with the standard bench mark. Number of reference pillars shall be made with reference to the bench mark and levels recorded with the levels marked on them to indicate the correct formation level before the work is started. The contractor shall supply the labour and materials for constructing bench mark, setting out and making profiles and connecting bench mark with the standard bench mark at his own cost. The reference pillars, pegs, bamboos and the bench mark shall be maintained by the contractor at his own cost for checking profiles during execution.

2.3. EARTH WORK

2.3.1. Site levels: After site clearance and before commencement of excavation or filling the contractor shall take levels at 3 metre intervals in either direction or at lesser intervals as considered necessary at site for the entire plot. A record of these levels shall be signed jointly by the Contractor and the Engineer-in-charge. The records shall be kept by the Engineer-in-charge. The required labour and equipments for taking levels shall be supplied by the contractor at his own cost.

2.3.2. Earth work in excavation :

a) **Classification of soils**: The earth work shall be classified under the following categories.

i**) All kinds of soils**: Generally any strata such as sand, gravel, loam, clay, mud, black cotton, moorum, shingle, river or nallah bed boulders, soling of roads, paths etc. and hard core, macadam surface of any description (water bound, grouted, tarmac etc.), lime concrete, mud concrete and theirs mixtures which for excavation yields to the application of picks, shovels, jumper, sacrifiers, ripper and other manual digging implements.

ii) **Ordinary rock** : Generally any rock, which can be excavated by splitting with crow bars or picks and does not require blasting, wedging or similar means for excavation such as lime stone, sand stone, hard laterite, hard conglomerate and un-reinforced cement concrete below ground level. If required light blasting may be

resorted to, for loosening the materials but this will not in any way entitle the material to be classified as hard rock.

iii) **Hard rock** : Generally any rock or boulder for the excavation of which blasting is required such as quartzite, granite, basalt, reinforced cement concrete (reinforcement to the cut through but not separated from concrete) below ground level and the like.

iv) **Hard rock (blasting prohibited)** : Hard rock required blasting as described under para (iii) above but where the blasting is prohibited for any reason and excavation has to be carried out by chiseling, wedging or any other agreed method.

b**) Protections**:

i) Excavation where directed by the Engineer-in-Charge shall be securely fenced and provided with proper caution signs, conspicuously displayed during the day and properly illuminated with red light during the night to avoid accident.

ii) The contractor shall take adequate protective measures to see that the excavation operations do not damage the adjoining structures or dislocate the services. Water supply pipes, sluice valve chambers, sewerage pipes, manholes, drainage pipes and chamber, communication cables, power supply cables etc. made within the course of excavation shall be properly supported and adequately protected so that these services remain functional.

iii. Adequate shoring and strutting shall be provided to prevent slip during foundation excavation and till completion of foundation work or underground structures.

iv) Dewatering during excavation, foundation work and backfilling to keep the foundation pit free from water shall be provided.

No extra payment on account of the above protection works shall be paid.

c) Blasting:

Where hard rock is encountered and blasting operations are considered necessary, the contractor shall obtain approval of the Engineer-In-charge in writing for resorting to blasting operations. It will be the responsibility of the contractor to carry on the blasting operation with proper licenses from the competent authority and following all statutory rules.

The contractor shall be responsible for any damages arising out of accident to workman, public or property due to storage, transportation and use of explosive during blasting operations.

The contractor shall be responsible for safe and proper custody and accounting the explosive materials.

For details the Explosive Act and Rules as amended up to date shall be referred.

d) Backfilling in foundation trenches:

Only selected earth from excavation shall be allowed for backfilling. The backfilling shall be done after dewatering the pit and laying the selected earth in layers of 20 cm and compacting to 90% proctor density. Backfilling when not allowed by the

excavated soil partly or fully shall be done with approved quality Brahamaputra sand or hill sand and laid in layers of 20 cm and compacted up to 90% proctor density. Back filling in foundation trenches either with selected excavated soil or imported soil shall not be paid.

e) Disposal of excavated earth:

All surplus earth available from excavation during execution and not utilized in back filling shall be disposed off within the IIT Campus at a suitable location to be shown by the Engineer-in-Charge.

This surplus earth may be allowed to be utilized for site development work outside the peripheral foundation line of the building and laid in 20cm thick layers and compacted to the required density. In such case the area to be filled up shall be prefixed by the Engineer-in-Charge and the levels of such work done shall be measured before filling is done over such layers by imported soil. Only selected approved soil from excavation shall be allowed inside the building area for filling. Such site development work done by surplus excavated earth shall not be paid.

f) Measurements:

Measurements of excavation for foundation work including backfilling in foundation trenches:

Measurements shall be taken on the vertical lines with 300mm tolerance all around the finished concrete/brickwork/masonry work for foundation and that for plinth beams/walls150mm around the finished surfaces. No extra payment shall be made on account of removal of slipped earth and backfilling thereof, dewatering, shoring and strutting etc.

2.3.3 Earth work in filling:

a) Removal of top vegetation: The top vegetation including grass with roots, trees and saplings of girth up to 30 cm measured at height of 1 M above the existing ground level including removal of roots of trees and saplings to a depth of 60 cm below the ground level and all rubbish shall be removed to a dumping ground within the project site as directed by the Engineer In-charge. Decomposed organic soil shall be removed to the extent, which may not cause perceptible settlement to the filled formation. Nothing extra shall be paid for the site clearance.

b) Types of soil for filling: All filling work for site development & in plinth shall be done by the approved quality Brahmaputra sand or hill sand.

For site filling with excavated earth, the clause no.2.3.2(e) shall be followed.

c) Mode of filling and compaction control:

i) Where cutting and filling are involved in hill slope the cutting for site preparation will be done up to the proposed formation level or to such levels as required as per drawing and all excavated soils shall be removed as given under clause .2.3.2(e) above. Filling works shall be done in layers not more than 20cm thick along with the progress of the sub-structure work and compacted by mechanical compactor to achieve minimum 90% proctor density.

Measurements for earth work in excavation for site preparation:

The original site levels shall be recorded as given under para 2.3.1 above. The final levels after excavations is complete to the proposed formation level, shall be taken jointly again by the contractor and the Engineer-in-charge in the same sections where original levels were taken and the final profile drawn and volume computed.

ii) Where only filling is involved the filling work within the building area shall be taken up after completion of the sub-structure of the building up to existing ground level. The disposal of the excavated earth shall be done as per clause no. .2.3.2(e) The filling work shall follow the sub-structure work up to the formation level. The filling works shall be done in layers not more than 20cm thick along with the progress of the sub-structure work and compacted by mechanical compactor .The filling work within the building area shall mean the area covered within the outer foundation lines of building peripheral columns.

The filling work for site development beyond the peripheral foundation line shall be taken up in such a manner that it would not create any hindrance in the progress of sub-structure work and the filling work inside the building and in layers not more than 20cm thick and compacted by mechanical compactor to achieve minimum 90% proctor density.

Filling works for site development may be allowed to be done with the selected earth available from foundation excavation. In such case ,the area to be filled up will be prefixed by the Engineer-in-charge and the level of the filling work done shall be determined before filling with imported e soil is done over that layer. Contractor shall not be entitled for payment of such filling work done with excavated soil from foundation trenches. All filling works shall be done in layers not more than 20cm and compacted by mechanical compactor.

d) Mode of measurement:

The measurement shall be given after quantity is worked out in profile with respect to spot levels at a grid of 3m taken before and after the filling work. No allowance for settlement of ground below fill will be considered.

2.4. ANTI TERMITE TREATMENT:

2.4.1: General: Chemical treatment of soils for the protection of buildings from attack of subterranean termites shall be done as per IS : 6613 (Part - II) 1981. Treatment shall be got done only from the approved specialised agencies. Graduated containers shall be used for dilution and spraying of chemical shall be done using hand operated pressure pumps. Proper check should be kept to ensure the specified quantity of chemical is used for required area during the operation.

2.4.2: Materials: Heptachlor emulsifiable concentrate, Chlorpyriphos emulsifiable concentrate or any other approved quality chemicals shall be used with percentage concentration as specified by the manufacturer.

2.4.3: Scope: This work shall cover treatments for masonry foundations and basements, RCC foundations and basements, top surface of plinth filling, at junctions of walls and floors, soil along external perimeter of building, expansion joints, walls retaining soil above floor levels, soils surrounding pipes, wastes and conduits and any other places that are in contact with soil and liable to be attacked

by the termites. Treatment of all the above areas shall be done following the procedure as prescribed in the CPWD specification volume-I.

2.4.4: Measurements: The measurements for all the operations described above shall be the plinth area of the building at ground floor level. Nothing extra shall be measured for payment

2.5 Piling work

2.5.1 BORED CAST-in-SITU PILES: All piling works until and unless specified shall be of uniform diameter bored cast in-situ piles. The work shall be executed as per IS code 2911 (Part-I Sec.-2) – 1979 and its further amendments upto date. The work shall be carried out as per the foundation layout plan and relevant structural drawings.

2.5.1.1 Boring & boring equipments

The boring operation shall be done by rotary and / or percussion type drilling rigs using direct mud circulation or reverse mud circulation methods. Bailer or chiesel method if used should be used with caution to avoid the effect of suction. The size of cuting tool shall not be less than the diametre of pile by more than 75mm in order to install the pile of diametre as per the drawing. Equipments to be sued for piling work shall be got approved from the engineer-in-charge before erecting for piling works. Use of drilling mud for stabilising boreholes shall be restored as per directions of the engineer-in-charge.

2.5.1.2 Stabilization of boreholes

A minimum length of temporary casing unless otherwise specifically desired shall be inserted in each borehole in order to seal the borehole against ingress of ground water and against contamination of concrete. Additional length of casing may be used depending on the condition of the strata, ground water level etc. when concreting is carried out under water, a temporary casing shall be installed to the full depth of the borehole or 2m into non-collapsible stratum, so that fragments of ground cannot drop from the sides of the hole into the concrete as it is placed. The temporary casing may not be required except near the top when concreting is done under drilling mud.

Drilling mud of suitable consistency may also be used instead of additional casing for stabilisation of boreholes.

The slurry should be maintained at 1.5m above the ground water level if casing is not used

2.5.1.3 Basic properties of drilling mud. The bentonite suspension used for piling work shall satisfy the following requirements :-

a. The suspension of bentonite used in piling work shall have thixotropic property which permits the material to have the consistency of fluid whcn introduced into the borehole. It forms a jelly at undistrubed state and becomes fluid again when agitated.

b. The liquid limit or bentonite when tested in accordance with IS-2720 (Part-V) – 1965 shall be more than 300% and less than 450%

c. The sand content of the bentonite powder shall not be more than 7%.

d. The density of the freshly prepared bentonite suspension shall be between 1.034 and 1.10gm/ml, depending upon the pile dimension and type of soil in which the piles shall be installed. However, the density of bentonite suspension after mixing with deleterious materials/ excavated materials in the borehole may be upto 1.25 gm/ml.

e. The marsh viscosity when tested by a marsh cone shall be between 30 to 60 seconds; in special case it may be allowed upto 90. It be noted that in the later case, special methods of pumping shall be bu used.

f. The differential free swell shall be more than 540%

g. The P^H value shall be between 9 and 11.5

2.5.1.4 Control of drilling mud

In case a hole is bored by use of drilling mud, the specific gravity of the mud suspension near about the bottom of the hole shall, whenever practicable, be determined by suitable slurry sampler in a first few piles and at suitable interval of piles and recorded as directed by the Engineer-in-charge. Consistency of the drilling mud suspension shall be controlled through out the boring as well as in concreting operation in order to keep the hole stabilized as well as to avoid concrete getting mixed up with the thicker suspension of the mud.

2.5.1.5 Cleaning of borehole before concreting :

In case, a bored pile is stabilized by drilling mud or by maintaining water heads within the hole, the bottom of the hold shall be cleaned very carefully before concreting work is taken up. The cleaning of the hole shall be ensured by careful operation of boring toll and / or flushing of the drilling mud through the hole / holes provided at the bottom of the boring tool. Flushing of boreholes before concreting shall be done with fresh drilling fluid/ mud.

2.5.1.6 Concrete

The mix as stated in the item shall be used for concrete subject to slump of concrete shall range from 150 to 180mm depending as per relevant IS code.

Concreting

Concreting of the piles shall be done by tremie concreting without permitting the concrete to fall freely through the drilling mud and to avoid segregation. In addition to the normal precautions to be taken in termie concreting, the following requirements are particularly applicable to the use of tremie concrete in piles

a) The concrete shall be coherent, rich in cement as specified and of slump not less than 150mm.

b) The hopper and tremie should be a closed system embedded in the placed concrete, through which water cannot pass.

c) The tremie should be large enough with due regard to the size of the aggregate. For 20mm aggregate, the tremie pipe shall be of diameter not less than 200mm. Aggregates more than 20mm shall not be used.

d) The first charge of concrete should be placed with a sliding plug pushed down the tube ahead of it or with a steel plate of adequate charge to prevent mixing of concrete and water. However, the plug should not be left in the concrete as a lump. The tremie pipe should always penetrate well into the concrete with an adequate margin of safety against accidental withdrawal of the pipe is surged to discharge the concrete

e) The pile should be concreted wholly by tremie and the method of deposition should not be changed part way up the pile, to prevent the laitance from being entrapped with the pile.

f) All tremie tubes shall be cleaned before and after use.

g) Normally concreting of the piles should be uninterrupted. In the exceptional case of interruption of concreting, but which can be resumed within 1 or 2 hours, the tremie shall not be taken out of the concrete. Instead it shall be raised and lowered slowly, from time to time to prevent the concrete around the tremie from setting. Concreting should resumed by introducing a little richer concrete with a slump of about 200mm for easy displacement of the partly set concrete. If the concreting cannot be resumed before final set up concrete already placed, the pile so cast shall be rejected or accepted with modifications.

h) In case of withdrawal of tremie out of the concrete, either accidentally or to remove a choke in the tremie, the tremie may be reintroduced in the following manner to prevent impregnation of laitance or scum lying on the top of the concrete already deposited in the bore.

i) The tremie shall be gently lowered on the old concrete with very little penetration intially. A vermiculite plug should be introduced in the tremie. Fresh concrete of slump between 150mm and 175mm shall be filled in the tremie which will push the plug forward and will emerge out of th tremie displacing the laitance / scum. The tremie will be pushed further in steps making fresh concrete sweep away laitance/ scum in its way. When tremie is burried by about 60 to 100cm, concreting may be resumed.

j) The top of concrete in a pile shall be brought at least 60cm above the cut-off level to permit removal of all laitance and weak concrete before capping and to ensure good concrete at the cut-off level for proper embedment into the pile cap. Prior to pile cap/ tie beam top 60cm must be dismantled at contractor's cost. The rates quoted should cover these scopes of works.

2.5.1.7 Control of piling installation: Piles shall be installed as accurately as possible as per design, drawing either vertically or to the specified batter.

a) **Control of alignment**: The maximum allowable tolerance for the piling installation shall be as follows:-

Horizontal displacement : 50mm

Vertical displacement of pile toe with respect to the

Top of pile at working level : 1.5% of the length of pile

b) **Control of cover** : The minimum clear cover to all main reinforcement in pile shaft and to the bottom of the pile shall be not be less than as specified in the drawing.

Provision shall be made to maintain clear cover in sides as well as at the bottom as specified during insertion of reinforcement cage, during concreting as well as during withdrawal of tremie pipes to the satisfaction of the engineer-in-charge

2.5.1.8 Effective length of piles for measurement: The effective length of piles shall be measured from the bottom of the borehole to the bottom of the pile cap (cut-off level) as specified in the drawing. When concrete is placed by tremie method, concrete shall be cast to the piling platform level (working level) to permit overflow of concrete for visual inspection or to a minimum of one meter above cut-off level whichever is higher. In circumstance where cut-off level is below ground water level the need to maintain a pressure on the unset concrete equal to or greater than water measure should be observed and accordingly length of extra concrete above cut-off level shall be determined. However measurement shall be given for effective length only.

2.5.1.9 Defective piles :

In case, defective piles are formed, they shall be removed or left in place whichever is convenient without affecting the performance of the adjacent piles or the cap as a whole. Additional piles shall be provided to replace them as directed at the contractor's cost. Any deviation from the designed location, alignment or load capacity of any pile shall be noted and adequate measures taken well before the concreting of the pile cap and plinth beam if the deviations are beyond the permissible limit. For all the defects attributable to the contractor in this connection shall be rectified at the contractor's cost.

2.5.1.10 Pile load Tests: The pile load test shall have to be carried out as per the latest edition of IS-2911-Part—IV.

Information to be submitted: The tenderer should submit the following information along with the tender.

a) Full details of method of installing the piles

b) Details of pile installing rings

c) Proposed construction program matching with the capacity of equipment and taking into consideration the various idle and non-productive periods on account of shifting of equipment and testing and possible delays keeping in view the completion date as stipulated in the tender.

d) Execution plan: within 15 (fifteen) days of receiving the letter of intent the contractor will submit 6 (six) copies of drawings showing the sequence of pile boring. The drawings will be prepared on the basis of a master plan giving identification nos. of piles, which will be furnished by the Engineer-in-charge

e) Test results : The test data and result for the various ingredient of reinforcement cement concrete cubes and cylinders, driving of the shell, static load test on single pile and group and on working piles will be submitted regularly and as and when directed by the Engineer-in-charge. For resulting the ingredients of RCC the relevant clauses of the "technical specification for cement concrete (plain and reinforced)" will apply.

2.5.2 DRIVEN CAST IN SITU CONCRETE PILES

2.5.2.1 Scope :

This specification covers driven reinforced cement concrete cast in situ piles including movement of pile driving equipment as per drawings as made available from time to time and all related items of work like sand filling in the holes left after casting the piles, testing the load bearing capacity of individual piles and group of piles, etc. The relevant clauses of the 'Technical Specification for Cement Concrete (plain or Reinforced)" appearing in this document elsewhere, fall within the scope of this specification.

IS: 2911 (Part-I/Sec-1) shall form a part of this specification and shall be complied with unless they are at variance with the specification where the latter will prevail.

Other items of work like excavation, casting pile caps, beams etc. which in most cases, will be required to be executed in connection with piling, will fall under the scope of other relevant sections of the Technical Specifications which appear separately in this document.

2.5.2.2 General :

The work to be provided for by the contractor, unless otherwise specified shall include but not be limited to the following.

a) Furnish all labour, supervision, services, materials, equipment, tools, plants, transportation etc. required for the supply and installation of piles or desired capacity.

b) Mark the proposed sequence of driving on six (6) copies of identification plan. The identification plan will be prepared by the contractor as per the basic plan furnished by the Engineer-in-Charge.

c) Furnish detailed drawings in six (6) copies of the pile driving equipment giving all salient dimensions and loads.

d) Submit detailed daily report of pile driving incorporating information as required by the Engineer-in-Charge.

e) Carry out load tests to the satisfaction of the Engineer-in-Charge including casting and dismantling of test caps if necessary and submit the test results in approved proforma.

f) Make necessary earthwork and approaches for movement of the pile driving rig.

g) Provide all necessary work mentioned under the "Technical Specification for cement concrete (plain or reinforced)" as may be applicable

h) No work under this specification will be provided by any agency other than the contractor unless specifically mentioned otherwise elsewhere in the contract

2.5.2.3 Codes and standard

All work under this specification shall unless specified otherwise, conform to the latest revisions and/ or replacements of the following or any other Indian standards specifications and codes of practice. In case any particular aspect of work is not specifically covered by Indian standard specifications, any other standard practice as may be specified by the Engineer-in-Charge shall be followed :

IS : 383 : Indian Standard specifications for coarse and fine aggregates from natural sources for concrete.

IS : 432 : I.S. specification for mild steel and medium tensile steel bars

IS : 455 : Indian Standard specification for Portland slag cement

IS: 456 : Code of practice for plain and reinforced concrete.

IS : 516 : Indian Standard specification for methods of test for strength of concrete.

IS : 1199 : Indian Standard specification for method of sampling and analysis of concrete.

IS : 1786 : Indian Standard specification for cold worked steel high strength deformed steel bars and wires for concrete reinforcement.

IS : 2502 : Code of practice for bending & fixing of bars for concrete reinforcement.

IS : 2722 : Indian Standard specification for portable swing weight batches for concrete (single and double bucket type).

IS : 2751 : Code of practice for welding of mild steel bars used for reinforced concrete construction.

IS : 2911 (Part – I/ sec-1): Code of practice for design and construction of pile foundations – Driven cast-in-situ concrete piles.

IS : 2911 (Part-IV) : Code of practice for design and construction of pile foundations – Load Test on piles.

IS : 4926 : Indian Standard specification for ready mixed concrete.

IS : 5121 : Safety code for piling and other deep foundations.

2.5.2.4 Conformity with design

The contractor will prepare check lists in approved proforma, which will be called "Pile Installation Cards". At each important stage of the work as decided by the Engineer-in-Charge, the work will be checked and approved by the Engineer-in-Charge for correctness and conformity with the design, specifications and drawings, before allowing the next phase of the work to commence. The intermediate checks and approvals by the Engineer-in-Charge will not, however, absolve the contractor from his total responsibility to execute the work as per the specification and drawings and to remove and/ or rectify all work which is defective or inaccurate.

2.5.2.5 Materials

(a) General

All materials whether incorporated in the works or used temporarily as aids or for executing enabling works will be of best approved quality conforming to the latest Indian Standard Specification.

(b) Pile shoes and shells

Piles shoes shall be manufactured out of best quality cast iron or steel with proper treatment, the composition and thickness of the materials being of special importance where they are likely to be in contact with harmful chemicals and organic materials causing deterioration in service. The shell tubes, which are to be left in place, should also receive similar consideration in selection. Price quoted shall include all the considerations.

(c) Cement Cement used shall conform to IS:1489, IS : 8112 or IS : 12269 (Portland Cement), IS : 6909 (Super-Sulphated cement), IS : 12330 (Sulphate resisting Portland cement) or any other IS specification as indicated in the schedule of items

(d) Aggregates: Aggregates both fine and coarse shall comply with the requirements of IS:383. Size of coarse aggregates shall be selected considering the size of the section. Generally, 20 mm down coarse aggregates shall be used.

(e) Steel: Reinforcement steel shall be Fe-500SD of TISCON conforming to IS: 1786 (Fe-500D)

2.5.2.6 Storage of Materials

a) General All materials shall be stored so as to prevent deterioration or intrusion of foreign matter and to ensure the preservation of their quality and fitness for the work. Any material which has deteriorated or has been damaged or is otherwise considered defective by the Engineer-in-Charge shall not be used, failing which, the Engineer-in-Charge shall be at liberty to get the materials removed and the cost incurred thereof shall be realized from the contractor's dues.

b) Cast iron or steel shoes and shells

All cast iron or steel shoes and shells will be painted with two coats of anticorrosive paint or smeared with protective layer of grease and kept stored in weatherproof sheds, off the ground, on sturdy racks in such a manner as to enable quick and easy inspection.

2.5.2.7 Quality control

a) The contractor shall establish and maintain quality control for different items of work and materials as may be directed by the Engineer-in-charge to assure compliance with contract requirements and maintain and submit to the Engineer-in-charge records of the same. The quality control requirements stipulated under the "Technical Specifications for cement concrete (plain and reinforced)" will apply wherever relevant. In addition, the requirements will include but not be limited to the following:

i) Location and plumb : Control survey for accuracy in plan and check for verticality.

ii) Driving: Correlation of wt. of hammer, length of stroke, and number of strokes per minute and rate of penetration.

iii) Casting of piles: Check inside casing, reinforcement cage, concrete mix, placing, consolidation and curing.

iv) Inspection of piles

v) Load tests

b) Non-conformance: Any work which fails to conform to the specification will be subject to the issue of a non-conformance report in line with the quality control procedures to be implemented at site. Corrective or remedial action, design modification or product rejection will be reviewed in accordance with site quality plan.

2.5.2.8 Installation All installation requirements shall be in accordance with IS:2911(Part-I) and as supplemented or modified herein or by other best possible standards where the specific requirements mentioned in this section of the specification might not have covered all the aspects to the full satisfaction of the Engineer-in-charge.

a) General

The tenderer shall furnish complete information about the type of piles offered with sketches of pile sections showing reinforcement, method of driving the piles, details and availability of driving equipment, formula or data curve on which the tenderer

bases the load carrying capacity of piles as well as the criteria for determining suitable and sufficient 'founding' of individual piles and any other relevant details.

The tenderer will be supplied with bore hole logs or any other data indicating the nature of the soil expected to be encountered. The information furnished to the contractor shall be taken as a guidance only and variation there from shall not affect the terms of the contract. All piles will have to be driven to the required set and/ or based on load tests, as decided by the Engineer-in-charge. In case the contractor is required to drive piles to greater or shallower depths than that is envisaged the rates will be adjusted as per relevant items in the schedule of items and no other extra claims will be entertained. The tenderer should, in his own interest, investigate the site thoroughly and take additional bore holes if he feels it necessary to assess the type of equipment to be used and the depths to which the piles may have to be driven finally.

b) Type of pile

All piles shall be adequately reinforced cast in situ concrete piles driven as specified on the drawing/s. The reinforcement and diameters of piles should be exactly as indicated in the drawing and specification. Only cast in situ piles with complete reinforcement for the total length and casing driven to total depth required for pouring controlled concrete mixture shall be accepted. In spite of different methods of driving, concreting, etc. of different types of cast in situ piles, the allowable vertical load carrying capacity of piles shall be as follows:

Nominal diameter of pile		Max. allowable load carrying capacity of Single pile
500 mm	:	70 M.T.
600 mm	:	100 M.T.

c) Identification of piles

A plan, in triplicate, showing clearly the designation of all piles by an identifying system shall be filed with the Engineer-in-charge before installation of piles is started.

d) Sequence of construction

The piles shall be installed in such a sequence that the carrying capacity of previously installed pile is not reduced. The driving shall not cause appreciable upheaval of the ground or cause unusual soil resistance to rest of the pile driving. It shall be ensured that the soil is not flowing out laterally during driving operation. The Engineer-in-charge shall decide on the sequence of the groups of piles and the contractor shall have to follow this sequence.

e) Driving of piles

Piles shall be installed with due consideration to the adjacent structures and by a method which leaves their strength unimpaired and which develops and retains the required bearing resistance. Equipment and the method of driving the pile shall be such that the pile is installed in its proper position and alignment. The pile shall not be out of plumb by more than 2% of the pile length. If any pile goes out of plumb by more than 2% of the pile length, the design of the foundation shall have to be modified in a manner approved by the Engineer-in-charge to support the resulting vertical and lateral forces properly. The cost of modification, however, has to be borne by the contractor at no extra cost to the owner. A maximum positional deviation of 7.5 cm at the cut off level from the designed location of pile may be permitted, beyond which modification in the design shall become necessary.

Jetting shall not be done except which permitted in writing by the Engineer. The driving shall start from the existing ground level. After completion of driving, concrete shall be placed and compacted to fill up the hole left by the driving up to 500 mm above the cut of level. The balance depth between the G.L. and the top of concrete shall be filled up with sand so that the next pile does not move out of place during construction. To construct the pile cap, the ground will be excavated to expose the top portion of the piles, which will be dismantled neatly up to the cut off level removing all cracked, loose and unsound concrete, the top surface of the piles will be kept rough to ensure bond with the pile cap in which they will be ultimately embedded. The reinforcement rods of the pile should project out of the top by at least the value of bond length for the bar depending on its diameter and grade of concrete in pile cap. This length of bar will be later on bent and embedded in the pile cap concrete.

During the process of driving, should an obstruction be encountered, through which piling tube cannot penetrate, the contractor shall be compensated for the cost of removal of such obstruction at actual cost plus 10%.

Liquefaction of soil or localized compaction of soil due to driving of piles, if occurring, may create conditions when determination of load bearing capacity by the usual method of 'set' sometimes gives erroneous results. The pile, in such cases, shall be driven to the set desired or the desired strata based on the experience gained on the various load tests as desired by the Engineer but in no case shall it be less than M 15 grade.

The contractor shall ensure that any green concrete in the nearby piles or any pile loaded in testing operation is not disturbed by driving the tube adjacent to it.

2.5.2.9 Concrete in pile

a) This shall conform to the requirements of "Technical specification for cement concrete (plain and reinforced)" enclosed herewith, to the extent it has been referred to or as applicable to this specification. The concrete shall be of controlled grade and approved quality of M 30. The stipulation lay down in IS: 2911 (Part – I), regarding selection of mix shall be generally followed unless otherwise specified by the Engineer-in-charge.

Concreting shall start as soon as possible after the hole is completed. Concrete shall be so placed as to fill the entire volume of the hole without segregation and formation of voids caused by faulty consolidation or entrapped air. The volume of concrete placed shall be observed in the initially cast piles and the average figure obtained shall be used to check whether there is undue deviation in concrete consumption for the subsequent piles.

Where the concrete is cast in place in a tube, its consistency shall be suitable to the method of compaction employed in the formation of piles. If necessary, concrete shall be as dry as possible to minimize shrinkage and to minimize the possibility of cement being washed down by flow of subsoil water while casing is withdrawn. Care shall be taken against segregation of concrete while passing the reinforcement cage, and against inflow of soil and water during withdrawal of the tube by maintaining sufficient head of concrete inside the tube. The extraction of casing shall not cause any shearing or necking of the poured concrete thereby reducing the capacity of piles.

The method of concreting shall strictly conform to the above specification and no deviation shall be allowed.

As mentioned in section 3.5, concreting of the pile shall have to be done at least 300 mm above the cut off level of the pile. The remaining part of the hollow formed by the withdrawal of driving tube from ground down to the top of the concreted pile shall be filled up with sand.

b) Trimming of pile heads

Completed piles shall be trimmed to the cut-off levels shown on the drawings or until sound concrete is found. In the event of trimming being carried below the cut-off level, the pile shall be made up to the concrete cut-off level, with concrete of the same quality as used in the piles as the contractor's expense. A non-conformance will be raised in such circumstances. Reinforcement shall be exposed for the full bond length appropriate to the diameter of the bar and projected in the pile cap as per drawing. All concrete and cement shall be removed from the bars, which shall also be wire-brushed to remove any loose rust, dirt and scale.

c) Lengthening of piles

Where it is necessary to increase the length of any pile after it has been installed, the head of the pile shall be cut-off to expose the reinforcement for a full bond length of the bars to lap with the new bars. The exposed surface of the concrete shall be chiseled to form a key brushed to remove loose material and covered with 25 mm thick cement mortar (1:2 mix) immediately before the new concrete is placed.

2.5.2.10 Reinforcement in piles

Steel reinforcement conforming to IS:1786 grade suitable for reinforced cement concrete for general building work shall be applicable for the specification to the extent it has been referred to or applicable.

Pile has to be reinforced throughout its length. In spite of different methods of driving, concreting, etc. of different types of cast-in-situ driven piles, the minimum area of longitudinal reinforcement within the pile shaft shall be 0.4 percent of the sectional area calculated on the basis of outside diameter of the casing of the shaft when mild steel plain bars conforming to IS:432 grade-I are used. For other grades of steel noted above, the area of reinforcement may be adjusted suitably, but in no case shall the number of vertical reinforcing bars be less than six and the bar diameter less than 12 mm. The minimum diameter of the links or spirals shall be 6 mm and their spacing shall not be less than 150 mm. In addition to the binders/ links, spacer bars of 8 mm diameter shall be welded at the inside face of the cage of suitable intervals.

Reinforcement used in cast in situ piles shall be made up into cages sufficiently well wired or spot welded to withstand handling without damage. The bars shall be so spaced as not to impede the placing of the concrete. Care shall be taken to preserve correct cover and alignment of reinforcement throughout the whole operation of placing the concrete by means of concrete rollers or by any other means approved by the Engineer. Any distortion or displacement of reinforcement, during the compaction of concrete of while extracting the tube, shall be avoided. The reinforcement in the pile shall be exposed for a minimum length of the anchor length in tension above cut off level to permit it to be adequately bonded into the pile cap. All reinforcement in piles including the dowels projecting above the piles, shall be measured and paid separately.

2.5.2.11 Dowels

The contractor shall provide necessary dowels as directed by the Engineer-in-charge. In case of inadequate length of dowels, the same shall be extended by welding or by mechanical devices, if necessary as per direction of the Engineer-in-charge. The expenditure on this account shall be borne by the contractor.

2.5.2.12 Inspection

Before placing the reinforcement and concrete in the driven pile, the same shall be inspected by lowering a battery or flash lamp or by any other method approved by the Engineer-in-charge to ensure water tightness of the tube. In case of water in any bore or damage to any cast iron shoe, the tube shall be extracted and re-driven after earth filling of the hole, with a fresh shoe at the cost of the contractor.

2.5.2.13 Record for driving of Piles

A joint record of the entire penetration shall be maintained by the contractor in proforma approved by the Engineer for every pile for the behavior of such pile during its entire process of construction. Such records shall be submitted to the Engineer-in-charge regularly as the job progresses. Any sudden changes in the rate of penetration, which cannot be ascribed to the nature of the ground or any deviation from the designed location, alignment or load carrying capacity of any pile or any upheaval or subsidence noticed on any pile driven under this contract shall be promptly reported to the Engineer-in-charge and adequate corrective measures shall be taken free of any charge as decided by the Engineer-in-charge.

Upon completion of the pile driving, all records together with the records of such additional borings or other sub-surface information that were obtained during the process of diving shall also be filled with the Engineer-in-charge in triplicate.

2.5.2.14 Defective Piles

Piles that are defective or piles with deviation in alignment of the tube or position of the base more than that permissible under this specification shall be pulled out or left in placed as per the direction of the Engineer-in-charge. Additional piles shall be driven to replace them and/ or the pile cap shall be redesigned in consultation with the Engineer-in-charge. All the additional costs associated with the corrective action shall be borne by the contractor.

2.5.2.15 Idle Period

The phasing of construction and movement of plant shall be done as desired by the Engineer-in-charge. The phasing may involve some extra movement of the plant or some idle period, but the contractor will not be entitled for any claim due to this reason.

During the actual testing of the piles, the contractor's plant and personnel may remain temporarily idle. Again, during the period of re-design, if any (based on the pile test result), the plant personnel of the contractor may remain idle for any reason whatsoever.

For such idle periods mentioned above, the contractor will not be entitled to any claim and rates quoted by him shall include the same. However, during the testing of piles and hold ups, pile driving operation may be allowed on other piles wherever possible, if decided by the engineer-in-charge with a view to minimize idle times.

If due to change in loading, elevations or any other alteration, some amendments become necessary in the design of foundations, the contractor shall not be entitled to

any claim whatsoever for such amendments in the pile layout during the progress of work including claims for any idle labour or tools and plant on this account.

2.5.2.16 Test Pile

The contractor shall construct test piles, if desired by the Engineer-in-charge, before he starts systematic piling operation at locations indicated. For this purpose, the pile construction process shall be the same as usual piling process to be followed on this job. Initial test shall be carried out on such piles as per the relevant provision in IS : 2911 (Part-IV).

2.5.2.17 Testing and acceptance criteria

a) General

The contractor shall carry out all sampling and testing in accordance with the relevant Indian standards and as supplemented herein for the following items at his own cost unless otherwise specified in the contract. Whenever directed, the contractor shall get the specimens tested in a laboratory approved by the Engineer-in-charge and submit to him the test results in triplicate within three (3) days of completion of the test.

b) Components of R.C.C.

The testing and acceptance criteria for the components of Reinforced Cement Concrete shall be as stipulated in the relevant clauses of the Technical Specification for Cement Concrete (Plain and Reinforced) appearing in the document.

c) Static Load Test on working Piles.

In order to determine the carrying capacity of piles static load tests shall be undertaken by the contractor on single pile or pile groups, as indicated on drawings. Piles to be tested shall be cast at least 30 days before loading unless otherwise directed by the Engineer-in-charge. Before any load test is made, the proposed arrangement of the structure, dead load to be used in making the load test, and method of application of load to the pile shall have to be approved by the Engineer-in-charge. All load tests shall be made under the supervision of the Engineer-in-charge. All responsibilities for conducting the test safely and properly lie with the contractor.

The test load to be applied on pile or piles shall be one and a half times the proposed load value of the pile or piles as claimed by the contractor. The test load shall be applied in 6 increments equal to one fourth, half, three fourth, one, one and one fourth and one and one half times, the proposed working load. Readings of settlements and rebounds shall be referred to a constant elevation bench mark and shall be recorded with the help of minimum two dial gauges of 0.02 mm sensitivity and resting on diametrically opposite sides. Each stage of loading, except the final test load of one and one half times the working load, shall be maintained till the rate of movement of the pile top is not more than 0.02 mm per hour. The final test load shall be maintained for 24 hours and hourly reading of settlements is to be recorded. The total test load shall be removed in decrements not exceeding 1/5 of the total test load with intervals of not less than one hour. The rebounds shall be recorded after each decrement is effected and the final rebound shall be recorded 24 hours after the entire test load has been removed. A complete record in triplicate shall be filled with the Engineer on the loads and readings obtained duly verified and counter-signed by the Engineer.

The test shall be used as usual foundation piles if they satisfy the acceptance criteria, and no extra payment shall be made except for load tests on the piles.

If so desired by the Engineer-in-charge, special test caps may have to be cast and subsequently dismantled at no extra cost.

d) Acceptance Criteria

The pile or piles tested shall be accepted to carry the proposed working load provided that the total settlement of the pile top under the load does not exceed 12 mm.

2.5.2.18 Information to be submitted

The tenderer should submit the following information along with his tender

a) Full details of method of driving the pile

b) **Details of pile driving rigs**.

c) Proposed construction program matching with the capacity of equipment and taking into consideration the various idle and non producing period on account of shifting of equipment and testing and possible delays keeping in view the completion date as stipulated in the tender.

d**) Execution Plan:** Within 15 (fifteen) days of receiving the letter of Intent the contractor will submit 6(six) copies of drawings showing the sequence of pile driving. The drawings will be prepared on the basis of a master plan giving identification number of the piles, which will be furnished by the Engineer-in-charge.

e) Test Results: The test data and result for the various ingredients of R.C.C. concrete cubes and cylinders, driving of the shell, static load test on single pile and group and non-destructive dynamic test on working piles will be submitted regularly and as and when directed by the Engineer. For testing the ingredients of R.C.C. the relevant clauses of the "Technical Specification for Cement Concrete (Plain and Reinforced)" will apply.

2.5.2.19 Rates

The rate for the item of installation of pile shall include the cost of all materials consumed in the work or incidental to it as well as testing of materials, the cost of plants and equipment, labour, supervision, transport, taxes, insurance, royalties and revenue expenses, securities and safety measures, approaches, power, fuel, lubricants, services, preliminary and enabling works, camps, stores etc. and overheads and profits complete. The rates shall be include the entire cost of driving, supplying and installing concrete including the cost of providing extra concrete above cut off level and subsequent dismantling and removing the same. Rate for providing reinforcement including cutting, bending, binding and placing in position shall be quoted separately. The work to be provided for by the contractor for installing cast-in-situ piles is given under clause 2.1 and elsewhere in this specification. In case no specific items is provided in the schedule to cover any particular item of work, it is implied that the contractor will include the cost of executing such work in the rates quoted for connected items in the schedule.

2.5.2.20 Methods of measurement

a) Measurement of length for payment will be done by letting down a tape with a heavy weight attached at the end, through the hole left by driving, before the reinforcement cages is lowered and concreting commences. The additional depth driven and covered with the shoes or any other materials like aggregates or concrete will not be considered for payment.

Unless specified otherwise in the schedule of items, piles of specific size and length will be measured in numbers. For any addition or reduction over the above-specified lengths, the extra/ rebate for specific sizes will be measured in length. Reinforcement in piles shall be measured in weight.

b) Load Test

Measurement will be taken for static/ dynamic, lateral load or pull out tests on single piles or groups as per specification and schedule of items on each occasion of test.

c**) Other Items**

The mode measurement of the other connected item of work like excavation, casting pile caps and beams etc. will be governed by the relevant clauses of the Technical Specification.

2.6. BRICK WORKS:

2.6.1. Bricks:

a) Bricks shall be the best quality locally available, well burnt but not over burnt, free from salt Peter action and generally conform to specification for brick class designation 75, crushing strength shall not be less than 75 kg/cm^2. Bricks shall not absorb water more than 20% of their own dry weight after 24 hours immersion in cold water, rectangular faces with parallel sides, and sharp, straight and right angled edges, have a fine compact and uniform texture. The bricks shall be free from cracks, chips, flaws, stones or lumps of any kind and shall not show efflorescence either dry or subsequent to soaking in water. They shall not have any part un-burnt.

b) The size of brick shall conform to the sizes as specified. Bricks of one standard size shall be used in the whole work unless specially permitted by the Engineer in-charge.

c) After immersion in water, absorption by weight shall not be exceed 20% of dry weight of the brick when tested according to IS: 1077. Unless otherwise specified the load to crush the brick when tested according to IS: 1077 shall not be less than 75 Kg/Sqcm.

d) Prior approval of Engineer in-charge shall be obtained from time to time for the brands of bricks to be used in the work after compliance with the above specifications and tests.

2.6.2 Mortar: Only specified mortar as per BOQ shall be used for brick work as per the relevant items.

2.6.3 Construction details:

a) Soaking: All bricks shall be immersed in water for 24 hours before being used into work so that they will be saturated and will not absorb water from the mortar.

b) Bats : No bats or cut bricks shall be used in the work unless absolutely necessary around irregular openings or for adjusting the dimensions of different courses and for closures, in which case , full bricks shall be laid at corners, the bats being placed on the middle of the courses.

c) Laying: The bricks shall be laid in mortar to line, level and shapes shown on the plan, slightly pressed and thoroughly bedded in mortar and all joints shall be properly flushed and packed with mortar so that they will be completely filled with mortar and no hollows left anywhere. Bricks shall be handled carefully so as not to damage their edges. They should not be thrown from any height to the ground but should be put down gently. All course shall be laid truly horizontal and all vertical joints shall be made truly vertical . Vertical joints on one course and the next below should not come over one another and shall not normally be nearer then quarter of a brick length. For battered faces beading shall be at right angles to the face. Fixtures, plugs, frames etc. if any, shall be built in at place shown in the plans while laying the courses only and not later by removal of bricks already laid.

Care shall be taken during construction to see that edges of bricks at quins, sills, heads etc., are not damaged.

The verticality of the walls and horizontality of the courses shall be checked very often only by plumb bob and spirit level respectively.

d) Bond: Unless otherwise specified, brick work shall be done in English Bond. All walls, coming in contract with reinforced concrete columns, beams etc., should be properly bounded by inserting reinforcements. Extra labour shall be included in the rates (reinforcements will be measured and paid separately against reinforcement item provided in the BOQ).

e) Joints: Joints shall not exceed 10 mm thickness and this thickness shall be uniform throughout. The joints shall be raked out not less than 10 mm deep when the mortar is green where pointing is to be done. When the brick surface are to be plastered, the joints shall be raked to a depth of 5 mm when the mortar is green, so as to provide good key to plaster.

f): **Curing:** All brick works shall be kept well cured at least for 14 days after laying .

g) Half Brick work: Half brick work of 115mm thick shall be provided with reinforcement of two numbers 6mm dia. approved quality M.S. bars at every third course as per technichnical specification/item. Reinforcement provided shall be paid separately.

h) Measurements:

Brickwork with 230mm thick shall be measured in Cubic metre. Any extra work over the specified dimension will be ignored unless otherwise specifically mentioned in the drawing.

Wall of half brick thickness or less shall be measured separately and paid in sqm, half brick thickness shall be taken as 115mm. Brick wall beyond half brick thickness shall be measured in cum. When a fraction of half brick occurs due to architectural reasons or otherwise as per the requirements of the owner the same shall be measured as half brick work provided such fraction is more than 2 cm. Fraction up to 2 cm thickness shall be made up in mortar and paid for as per specified thickness under brick work.

2.7 RANDOM RUBBLE MASONRY

2.7.1: General- The random rubble masonry work shall be done as per specifications, drawings and as directed.

2.7.2. Stone: The stone shall be of the type specified such as granite, trap, limestone, sand stone, quart-zite, etc. and shall be obtained from the quarries, approved by the Engineer-in-Charge. Stone shall be hard, sound, and durable and free form weathering decay and defects like cavities, cracks, flaws, sand holes injurious veins, patches of loose or soft materials and other similar defects that may adversely affect it strength and appearance. As far as possible stones shall be of uniform colour, quality or texture. Generally stone shall not contain crypts crystalline silica or chart, mica and other deleterious materials like iron-oxide, organic impurities etc. Stone with round surface shall not be used. The percentage of water absorption shall generally not exceed 5% of its weight. For laterite this percentage is 12%.

2.7.3 Mortar: Mortar used in the masonry work shall be as specified in the items. Mortars coming over the finished stone surfaces during the execution shall be washed fully so that the stone edges on the finished surface of the masonry work are clearly visible.

2.7.4 Curing: The masonry work in cement mortar shall be kept constantly moist on faces for minimum period of 7 days after the mortar is well set.

2.7.5 Measurement: Measurement will be taken on the finished work in cubic metre.

2.8. CONCRETE (PLAIN AND REINFORCED)

2.8.1 Scope: This specification establishes the materials, mixing, placing, curing, etc. of all types of cast-in-situ and pre-cast concrete used in foundation under-ground and over-ground structures, floors, etc., Any special requirement as shown or noted in the drawings shall supersede over the provisions of this specification.

2.8.2 Materials:

a) Cement: Cement shall be Ordinary Portland cement / Portland Pozzolana cement from reputed manufacturers of cement, having an annual production of at least one million tons or more conforming to IS: 1489 (Part-I & II). The cement shall be stored in a dry waterproof godown. The mandatory tests of cement shall be carried out by the contractor at his own cost in PCBA Laboratory.

b) Fine Aggregate: For all concrete work, it shall be coarse sand conforming to the grading as given below : (zone I or II only applicable to concrete). Quality of sand shall be got approved by the Engineer-in-charge before bulk purchase. Silt content shall not exceed 4% by weight. The grading of fine aggregate shall be as follows:

IS Sieve Designation	Percentage Passing by weight	
	Grading Zone I	Grading Zone II
10 mm	100	100
4.75 mm	90-100	90-100
2.36 mm	60-95	75-100
1.18 mm	30-70	55-90
600 micron	15-34	35-59
300 micron	5-20	8-30
150 micron	0-10	0-10

c) Coarse aggregate: For concrete it shall be broken/crushed stone graded coarse aggregate. Coarse aggregate up to 20 mm size. Grading shall be within the limit as given below:

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

Note : If directed by Engineer-in-charge, the aggregate (fine as well as coarse) shall be washed to remove all dust, dirt, clay particles etc., at contractor's expenses.

d)Water : Water to be used in concrete, brick work, plasters shall be clean, fresh and non-saline. Sample of water shall be got tested before use according to relevant IS code if required by Engineer-in-charge.

2.8.3 Grade of Concrete:

Whenever grade of concrete is mentioned as M_{20}, M_{25}, M_{30} etc., as per items only design mix concrete shall be used. The mix shall be designed to produce the required grade of concrete having required workability and characteristic strength as per IS: 456. As long as a quality of materials do not change a mix design done earlier shall be considered adequate for later work. However, in case the quality of materials changes, the Engineer-in-charge may ask for a new design mix. The concrete mix design will be carried out by the contractor at his own cost in PCBA Laboratory. While designing the mix durability requirements as given in IS:456 shall be taken into account.

Proportioning of the mix shall mean the process of determining the proportions of various ingredients to be used to produce concrete of required strength, workability, durability and other properties.

The Engineer-in-charge shall verify the strength of the concrete mix, before giving his sanction of its use. However, this does not absolve the contractor of his responsibility as regards achieving the prescribed strength of the mix. If during the execution of the work, cube tests show lower strength than required, the Engineer-in-charge shall order fresh trial mixes to be made by the contractor. No claim to alter the rates of concrete work shall be entertained due to such changes in mix variations. Any variation in cement consumption shall be taken into consideration for material reconciliation only. Preliminary mix designs shall be established well ahead of start of work. The design mix shall conform to the guidelines of IS: 10262.

a) Mixing : All cement concrete (plain or reinforced) shall be mixed in mechanical mixers. Wherever designation of concrete is given as M-20 or M-30, only design mix shall be followed.

b) Consolidation : Concrete for all reinforced concrete works in footings, columns, beams, slabs and the like shall be deposited and well consolidated by vibrating, using portable mechanical vibrators. Concrete in other items such as in chajjas, lintels, shelves

etc., shall be laid and well consolidated by beating and tamping. Care shall be taken to ensure that concrete is not over vibrated so as to cause segregation and bleeding.

c) Finish to concrete work:

(i) All concrete while being poured against form work shall be worked with vibrators, rods, trowels as required so that good quality concrete is obtained.

(ii) 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.

(iii) All soffits of RCC slabs, loft slab, cupboard slab, shelves and working platform in kitchen etc. and other exposed surfaces of RCC work not continuous to brick work shall be plastered with cement to give an even and smooth surface.

2.8.4 Curing: Concrete shall be cured by keeping it continuously moist for the specified period of time to ensure complete hydration of cement and its hardening. Curing shall be started after 8 hours of placement of concrete and in hot weather after 4 hours. The water used for curing shall be off the same quality as that used for making of concrete. Curing shall be assured by use of an ample water supply under pressure in pipes, with all necessary appliances such hose, sprinklers etc. A layer of sacking, canvas, hessian, or other approved material, which will hold moisture for long period and prevent loss of moisture from the concrete, shall be used as covering. Type of covering which would stain, disfigure, or damage the concrete, during and after the curing period shall not be used. Only approved covering shall be used for curing. Exposed surfaces of concrete shall be maintained continuously in damp or wet condition for at least the first **14 days** after placing of concrete.

The contractor shall have all equipment and materials required for curing on hand and ready to use before concrete is placed.

For curing the concrete in pavements, floor, flat roofs or other level surfaces, ponding method of curing is preferred after the expiry of first 24 hours during which (i.e. first 24 hours) the concrete shall be cured by use of wet sacking, canvas hessian, etc. The minimum water depth of 25mm for ponding shall be maintained. The method of containing the ponded water shall be approved by the Engineer-in-charge. The ponded areas shall be kept continuously filled with water, and leaks, if any, shall be promptly repaired.

Alternatively, membrane curing may be used in lieu of moist curing with the permission of the Engineer-in-charge. Such compounds shall be applied to all exposed surfaces of the concrete by spraying or brushing as soon as possible after the concrete has set. Minimum film thickness of such curing compounds shall be as per the recommendation of the manufacturer so as to obtain as efficiency of 90% as specified by BS: 8110. This film of curing compound shall be fully removed from the concrete surface after the curing period specified earlier. The Engineer-in-charge may not allow curing by curing compounds for those surfaces where use of curing compound may be detrimental to future finishes according to him.

2.8.5. Sampling and testing of concrete:

a) 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 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 as listed below. A temporary room of adequate size not less than 10 sqm to 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:-

	Aggregate Size	Size of Sieves
1	Sieve set (for aggregate 40 mm down)	
	80mm	60cms dia
	63mm	60cms dia
	40mm	45cms dia
	20mm	45cms dia
	12.5mm	45cms dia
	10mm	45cms dia
	4.75mm	45cms dia
	2.36mm	45cms dia
2	Sieve set (for aggregate 20 mm down)	
	40mm	45cms dia
	20mm	45cms dia
	16mm	45cms dia
	12.5mm	45cms dia
	10mm	45cms dia
	4.75mm	45cms dia
	600 micron	20 cms dia
	300 micron	20 cms dia
	150 micron	20 cms dia
	75 micron	20 cms dia

(iii) Weighting machines

(iv) Physical balance of capacity 200 gms with weight box (accuracy 0.5 gm.)

(v) Counter scale of 20 kg. Capacity.

(vi) Weights

Sl.no	Weight	Numbers
1	5 kg	1
2	2 kg	2
3	500 gm	2
4	200 gm	2
5	100 gm	2

(vii) Slump cones 2 Nos.

(viii) 15 cm moulds 18 Nos.

(ix) Electric/ Kerosene heater 1 No.

(x) Pans etc. As directed by the Engineer-in-charge.

(xi) Vicat apparatus with needles, test tubes, breakers, thick glass plates etc.

(xii) Measuring cylinders 1000 ml., 500 ml.

(xiii) Wash bottles Capacity 500 ml- 2Nos.

(xiv) Sink 1 No.

(xv) Litre : Measures

(xvi) 2Lit 2 Nos.

(xvii) 4Lit 1 No.

(xviii) 0.5 Lit 1 No.

(xix) Compressive test machine of suitable capacity 1 No.

b) Compressive strength: 7 days compressive strength test 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.

c) 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.

d) 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.

e) 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 Engineer-in-charge.

f) Prepare 9 cubes with cement concrete mix proposed to be used for the job. Keep the same water cement ratio that will actually be used. Slump could be a good indication.

g) 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 machined plate. The plate should be of the same size as cube mould plates.

h) 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 3 and 1/2 hours. Thereafter, the cubes must be taken out of the boiling water, de-mould 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 :-

$$Y = 8.2 + 1.609\ A$$

where Y = the predicted 28 days cube result in N/mm^2

A = accelerated cube result in N/mm^2

2.8.6. 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.

In respect of projected balconies, projected slabs at roof level and projected verandah, the payment of the RCC work shall be made under item, of RCC slabs, the payment for centring and shuttering of such items shall similarly be paid under the item of Centering and Shuttering of RCC slab nothing extra shall be paid for the side shuttering at the edges of these projected balconies and projected verandahs. All exposed edge shall however, be finished as per specification and nothing extra shall be paid for this.

In the item of RCC walls, railing and roofs etc. nothing extra shall be paid for making deigns as per patterns given by Architects or thickness of sections.

The rates for railing are inclusive of all the labour and the materials including execution as given description of the item, portion of railings, which is embedded in the masonry, or RCC shall not be taken for measurements.

The compaction of the Pre-cast concrete shall be done by vibrating table or external vibrator, as approved by the Engineer-in-charge. The rate quoted for the item shall include the element both for form work and mechanical vibration.

2.8.7 Measurement

Measurement will be taken on the concrete surface in cubic metre.

2.9. FORM WORK

2.9.1. Materials and design

a) The form work shall be made of sufficiently rigid steel and/or ply board.

Joints of the shuttering must not allow loss of liquid from concrete. In shuttering the joints shall be perfectly closed and lined with craft paper or other types of approved materials. The from work shall be constructed as to remain sufficiently rigid during placing of the concrete. All shuttering and framing must be adequately stayed and braced to the satisfaction of the Engineer in-charge for properly supporting the concrete during the period of hardening. The forms shall have sufficient strength and rigidity to hold concrete and withstand the pressure, lines and levels. The surface of all forms in contact with concrete shall be clean, rigid, watertight and smooth. Suitable devices shall be used to hold corners, adjacent ends and edged of panels of other forms together in accurate alignment.

b) The form work shall conform to the shape, lines and dimensions to suit the R.C.C members as shown on drawing. Form work shall be adequately designed to support the full weight of workers, fresh placed concrete without yielding to settlement or deflection and to ensure good and truly aligned concrete finish in accordance with the construction drawings. A camber in all direction of 6 mm for every 5 metre span in all slab and beam centering shall be given to allow for unavoidable sagging due to compression or other causes.

c) The form shall be so designed that the sides of the beams shall be first removed leaving the soffit of beams and supporting props in position. Props shall be designed to allow accurate adjustment & to permit of their being removed without jarring the concrete.

d) Temporary opening shall be provided at the base of columns forms and at other points where necessary for facilities of cleaning and observations immediately before concrete is deposited.

2.9.2 Vertical shuttering: The vertical shuttering shall be carried down to such solid surface as is sufficiently strong to afford adequate support and shall remain in position until the newly constructed work is able to support itself. Props of approved quality shall be used. Tubular steel props shall be preferable. In case timber props and bullies are allowed to use these shall be of minimum 10 cm diameter and shall be straight and adequately strong. The spacing of such struts shall be designed to carry loads imposed on it without

undue deflection of the members supported by the props and shall be approved by the Engineer in-charge. Any alterations suggested by the Engineer-in-charge shall be carried out at Contractor's expenses. Bracing shall be provided as directed without extra cost.

2.9.3 Water tightness of shuttering: The Contractor shall ensure that the forms are checked for water tightness just before concreting operation starts and shall make good any deficiencies. If instructed by the Engineer in-charge building paper or any other approved materials will have to be used without any extra charge for the same.

2.9.4 Cleaning and treatment of forms: All rubbish, particularly wood chipping, shaving and saw dust, shall be removed from the interior of the forms before the concrete is placed and the form work in contact with the concrete shall be cleaned and thoroughly wetted. Interior of all moulds and boxes must be thoroughly washed out with hose pipe or otherwise so as to be perfectly cleaned and free from all extraneous matter before deposition of concrete. Prior approval of the form work should be taken from Engineer in-charge before placing reinforcement on the form work.

2.9.5 Stripping: Form shall be left in place until their removal is authorized by the Engineer in-charge and shall then be removed with care so as to avoid injury to concrete. Under no circumstances shall form be struck until the concrete reaches as strength of at least twice the stress to which the concrete may be subjected at the time of striking.

2.9.6 Stripping time: Stripping time shall be as follows:

LOCATION	Stripping time
a) Vertical formwork to columns, walls, beams	48 hours
b) Soffit formwork to beams (Props to be re-fixed immediately after removal of formwork)	14 days
c) Props to slabs: i) Spanning up to 4.5 m ii) Spanning over 4.5 m	 14 days 21 days
d) Props to beams and arches i) Spanning up to 6 m ii) Spanning over 6 m	 21 days 28 days

2.9.7 Formwork in Lifts for Continuous Surface:

Where forms for continuous surface are placed in successive units, (as for example in columns or R.C.C walls the forms shall fit tightly over the completed surface so as to prevent leakage of mortar from the concrete and to maintain accurate alignment of the surface.

2.9.8. 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 surface shall be exposed to ascertain that the concrete has sufficiently hardened.

a) Where the shape of the element is such that form work has re-entrant angles, the framework shall be removed as soon as possible after the concrete has set, to avoid shrinkage cracking occurring due to the restraint imposed.

2.9.8. Measurement: Measurements shall be taken of the area of shuttering in contact with the concrete surface. Dimensions of the form work shall be measured correct to a cm.

Centering and shuttering where height exceeds 4.0 meter in one floor shall be measured and paid for separately under the relevant items.

2.10 STEEL REINFORCEMENT:

2.10.1 Only Fe500 Super Ductile reinforcement steel conforming to Fe500D grade of IS 1786:2008 as per item shall only be used. As and when desired by the Engineer-in-charge the contractor shall be required to produce the test certificate from the approved test house at his own cost. The mandatory test of Reinforcement Steel shall be carried out by the contractor at his own cost in PCBA Laboratory.

2.10.2 Cleaning of reinforcement: Before steel reinforcement is placed in position, the surface of the reinforcement shall be cleaned out of rust, dust, grease and any other objectionable deleterious substances.

2.10.3 Bar bending schedule of reinforcement: On receipt of structural drawing, Contractor shall prepare bar bending schedule of reinforcement and shall obtain approval of the Engineer in-charge.

2.10.4 Placing and security: Reinforcement bars shall be accurately placed and secured in position by 20 gauge soft black annealed steel wire and firmly supported or wedged by pre-cast concrete blocks of suitable thickness at sufficiently close intervals so that they will not sag between the supports or get displaced during the placing of concrete or any other operation of the work. Contractor shall maintain reinforcement in its correct position without displacement and correct specified cover.

2.10.5 Welding: Welding of bars shall not be carried out unless specifically authorized in writing by Engineer in-charge as per I.S. Code of Practice in place of splicing. However, no extra payment shall be allowed for the same.

2.10.6 Inspection of reinforcement: No concreting shall be commenced until Engineer in-charge has inspected the reinforcement in position and until his approval has been obtained. A notice of at least 72 hours shall be given to the Engineer in-charge by the contractor for inspection of reinforcement. If in the opinion of the Engineer in-charge, any materials are not in accordance with the specification or the reinforcement is incorrectly spaced, bent or otherwise defective, the contractor shall immediately remove such materials from the site and replace with new material and rectify any other defects in accordance with the instruction of the Engineer in-charge and to his satisfaction.

2.10.7 Cover for reinforcement: To be followed as per IS Code of practice if not specified.

2.10.8 Net measurement: Reinforcements shall be placed as shown on the structural drawings and payment will be made on the net measurements in accordance with the drawing and taken at the site. Only such lapse, dowels, chairs and pins in reinforcement as approved by the Engineer in-charge or shown in drawings shall be paid for. The contractor shall allow in the quoted rates for all wastage, which will not be paid separately.

2.11. CEMENT PLASTER (INTERNAL & EXTERNAL)

2.11.1 Preparation of Surface: The walls to be plastered shall have all joints raked out to a depth of 10 mm, if not already done. R.C.C. surface shall be properly hacked to get good key to the plaster. All dust and oily matter, if any, shall be brushed and cleaned and surface to be plastered shall be kept wet for 6 hours before plastering is commenced.

2.11.2 Proportion of Mortar: It shall be as specified in the items in the BOQ.

2.11.3 Application of Plaster: The mortar shall be applied evenly with force on the surface to be plastered. The mortar surface shall be finished at once by being rubbed over with a trowel till the cement appears on the surface. All corners, angles and

junctions shall be truly vertical and horizontal as the case may be, carefully and neatly finished. Rounding of corners and junctions where required shall be done without extra charge. The mortar shall adhere to the surface intimately when set and there should be no hollow sound when struck. The thickness of plaster shall be minimum 6 mm/ 12 mm/ 15 mm as specified in the items.

2.11.4 When neat cement finish is specified over the plaster surface, a coat of pure Portland cement slurry, 1.5 mm thick shall be applied and well rubbed to the plaster surface while the plaster surface is still fresh.

2.11.5 When no finish is specified, the plastered surface shall be rubbed well to an even plane with a wooden float for external surface and finished smooth with a steel trowel for internal surface.

2.12. WOOD WORK:

2.12.1 Timber as specified to be used for wood work shall be kiln seasoned, chemically vacuum pressure treated as per the relevant items in the schedule of quantities will be of required variety obtained from approved sources. Timber samples shall be approved by the Engineer-in-charge before quantities are brought to site in bulk.

Shutters of paneled doors , glazed & mosquito proof windows shall be machine made with kiln seasoned, chemically vacuum pressure treated timber frames as per relevant BIS code & specification of item and with panels of required thickness of phenol bonded particle board pre-laminated in both sides as per nomenclature of item.

2.12.3 Permissible tolerance on wood work shall be as under:-

a) Door frames	=	2mm + 3mm
b) Door shutters.		
i) On width and height	=	+ 3mm.
ii) On thickness of	=	+ 1.2mm.

2.12.4 The samples of species to be used shall be got approved by the contractor from the Engineer-in-charge before bulk purchase. Approved samples shall be kept with the Engineer-in-charge If so desired.

2.12.5 Transparent glass conforming to IS 1761-1960 shall be used. Thickness of glass shall be as specified in the item. Glazing for toilets shall be opaque type.

2.12.6 Test: As and when desired by the Engineer-in-Charge the contractor shall be required to produce the test certificate from the approved test house at his own cost.

2.13. HARDWARE

2. 13.1. Mongery shall be provided to all doors and windows, shutters with necessary matching screws of suitable size etc.

2. 13.2. Fittings and fixtures to all doors and windows etc. shall be of anodized aluminium mat finished ISI marked of make and of approved quality.

2. 13.3. M.S. butt hinges for doors shall be ISI marked heavy quality in steel of size 100 x 65 x 2.12 mm for doors with mild steel pin and shall be oxidized finished. These shall be fixed with machine screws with steel frame as specified.

2. 13.4 All fittings shall be ISI marked for the categories where marked fitting are manufactured.

2. 13.5 Other fittings as provided in the different items of work and as required by the owner shall be provided as per the requirement of the owner.

2. 13.6 One sample piece of each fitting shall be produced for approval of Chief Project Engineer. The bulk supply order shall be placed by the contractor only after approval is accorded by Chief Project Engineer.

2. 13.7 Schedule of Hardware/Fittings too door and window shutters of all dwelling units shall be as under :-

2. 13.8 Common fittings for all doors

(a) All doors (Panelled/ Glazed/ Party glazed)

i) Butt Hinges 100 mm : 4 per shutter

ii) Aluminium anodized

Tower Bolt 250x12 mm : 1 per shutter on top

iii) Aluminium anodized

Tower Bolt 150x12 mm : 1 per shutter on bottom rail

iv) Aluminium anodized

Handles 125 mm D type with base plate : 2 per shutter

v) Floor door stopper hanging

type with rubber cushion : 1 per shutter

vi) Rubber buffer 40mm dia

and 50 long : 1 per shutter

Additional Fittings :

b) To main entrance door of all type of residential quarters:

i) Godrej mortice lock with a rail of alloy caste CP handles with 6 levers and two keys : 1 per shutter as directed

ii) Magic eye wide angle best quality to be fixed at 1400 mm height from finished floor level : 1 per shutter as directed

iii) Aluminium anodized Aldrop/Sliding bolt 16 mm dia and 250 mm long : 1 per shutter as directed

The above specifications are given in general. Hardware if otherwise specified in the drawings or in the items, the same shall be provided by the contractor as per the item.

Payment for the above items shall be made as per the schedule of items unless otherwise specified. For example, where the above items are specified along with the shutters, no separate payment shall be made. Where separate items are provided payment shall be made against the items.

2.14. STEEL/ALUMINIUM WORK :

Steel work in door frame made of MS angle and MS flat welded built-up section with provision for fixing hinges and MS flat lugs for fixing with masonry/RCC etc., complete shall be carried out as per drawing. MS flat hooks for bolting arrangement for sliding and tower bolts, curtain brackets and cleats shall also be welded to the MS frame as per drawing. All steel work shall be painted with a priming coat of approved steel primer.

All works shall be carried out to proper line and specifications. All welding of steel work shall be tested for the quality of weld as laid down in IS 8222-1970 before erection. Where ever it appears shall mean continuous fillet welding unless otherwise directed by Engineer-in-Charge or shown in the drawing. Machine girding at shop shall be done over the weld to remove the excess deposit and scales.

2. 14.1. Aluminium doors windows and ventilators:

Alumunium doors, windows and ventilators wherever proposed shall be supplied and fixed with following specifications unless otherwise specified in relevant item and nothing extra shall be paid beyond the quoted rate.

2. 14.2. All aluminium extruded sections (as per IS: 733 - 1983) are to be

provided of Hindalco/ Bhoruka/ Indal or approved equivalent sections as per drawings and as directed.

2.14.3. All sections shall be anodized in natural mat finished of 15 Microns unless otherwise mentioned.

2. 14.4. Shipping Tolerance will be + 10% . Sections will be as per tolerances

given in relevant I.S. specifications and will also be applicable for bend, flatness, twist angularity etc.

2. 14.5. Fabrications shall be got done through specialised firm in their workshop and covered with polyethylene paper till completion and handing over the possession.

2.14.6. Sliding windows shall withstand the arduous duties of applications in 2,3 or 4 track or combine unit.

2.14.7. Sliding shutters are to be jointed by special cleats, rollers mounted on ball bearing are to be fitted to obtain smooth operation. Shutters shall mover within robust frames with grooves for weather strips to exclude wind, water or dust ingress.

2.14.8. Total sliding systems is to be secured by spring operated flush latch.

2.14.9. All glass pans shall be fixed using gaskets of ethylene - propylene or PVC (EPDM).

2.14.10. All doors and windows are to be provided with all required fittings in anodized aluminium as stated in item without additional cost unless otherwise directed. Samples of doors, windows and ventilators shall be brought to site and fitted in a position for approval of the Engineer-in-charge before bulk purchase and manufacture.

2.14.11. Measurement

Unit of measurement shall be given in the B.O.Q.

2.15 . ROOF TILES

2.15.1 General

Well burnt machine made clay Tiles of approved design and manufacturer shall be laid on sloped roof with following specifications.

a) The tiles shall be machine made and of approved quality, well and uniformly burnt, free form cracks, twist, flaws and any imperfections in shape or size. They shall be uniform in colour and must give a clear ringing sound when struck. The dry tiles on immersion in water for one hour shall not absorb more than 1/6 of its dry weight.

Sample of the tiles proposed to be used should be got approved from the Engineer-in-charge in advance before supply is made. Tiles not confirming to the above specifications and to the approved sample shall be rejected.

Some samples of approved tiles are in the Office of the Chief Project Engineer, PCBA and can be seen during office hour before submitting tenders.

2.15.2 Laying

Tiling shall consist of a layer of flat trough shaped laid on RCC roof terrace edges.

a) The flat tiles must lap accurately one over the other. The moulded notch at the lower and of each flat tile must fit completely into the head of the tiles next below it.

b) All the lines of the tiles shall be straight in both directions.

c) All ridges, hips and eaves tiles shall be laid in cement mortar 1:4 (1 cement : 4 coarse sand).

d) The valleys shall be formed in proper manner with cutting the tiles in its proper shape & neatly and shall be set in cement mortar 1:4 for half the length.

e) Tiles, ridges & hips which are to be set in cement mortar, shall be soaked in water for two hours before laying and shall be kept wet for seven days after they are laid . Laying operation shall include all scaffolding work involved at all heights.

Roof tiles of equivalent specifications shape and design may also be allowed to be used after getting fully satisfied regarding its specifications, shape and design by the Engineer-in-charge and the Architect.

2.15.3: Rate: Rate should include supply and fixing of tiles including ridge, valley etc.

2.15.3 Measurement

Measurement for payment will be taken in sqm on the finished work. No separate payment shall be made for ridge, valley, etc.

2.16 WATER PROOFING OF ROOF, TERRACE AND SUNKEN FLOOR:

2.16.1 Roof

A protective water proofing layer with polymer base polyurethane coating of approved brand and shade over the machine made clay tiles shall be provided as per manufacturer's specifications and as directed by the Engineer-in-Charge. Surface to be treated should be absolutely free from dust, loose particles, oils, grease before application. Rate quoted should cover the entire operations. And measurement for payment shall be taken once on the finished surface and paid under the relevant item of BOQ.

2.16.2 Terrace and Sunken floors:

Water proofing treatment of the sunken floors, terraces and sloping roofs will be done with approved polymer modified cementitious composite (PMCC) slurry and fibre glass cloth as per manufacturer's specifications and as directed by Engineer-in-Charge. Work shall be done in the following steps.

a) Cleaning the roof surface and parapet wall from dust, dirt, cement slurry etc. by means of wire brush, dust removing brush, scraper etc.

b) Wetting the surface prior to application of 'PMCC' without free water standing.

c) Application of 1st coat of acrylic polymer modified cementitous slurry coating over the mother roof slab surface and to be taken to the vertical parapet walls and turned down the exterior surface of the parapet walls.

d) Laying fibre glass cloth over the PMCC applied surface upto 300 mm height of vertical walls when the first coating is still green and allowed to air cure at least 4 (four) hours.

e) Application of one coat of PMCC Brush Topping coat over the treated surface and allowed for air cure for at least 4 (four) hours and water cure for next two days.

f) The treated surface shall be covered by laying a protective layer of 12 mm plaster of cement mortar 1:4 (1 cement : 4 coarse sand) with approved water proofing compound as per manufacturer's specifications. Normal curing of the roof should be done prior to allowing traffic.

The rate for the item should include all the operations. Measurement shall be taken once on the finished surfaces.

2.17. FLOORING: The flooring shall be laid as per specifications of items of B.O.Q and detailed specifications. The rate of items of flooring is inclusive of providing sunk flooring in bath rooms, kitchen etc. and nothing extra on this account is admissible.

2. 17.1. Cement Concrete Flooring: Cement concrete flooring shall in general conform to IS: 2571. Cement concrete flooring shall consist of a sub base (laid on the compacted earth or sand or sand fill in case of ground floor only) a base course laid on the sub-base and then finishing layer of flooring. The bed for flooring shall be prepared either level or sloped as per drawings and as instructed by Engineer-in Charge.

The sub-base which shall be laid on the prepared bed shall be of specified thickness and as per drawings.

The sub-base shall be of boulders/ gravel/ bricks/ sand / cement concrete as per drawings. In case of upper floors, the structural RCC slab shall be treated as sub-base.

Base course shall be of cement concrete of specified mix and of specified thickness as indicated in drawings/ item descriptions .

The floor space on which base course is to be laid shall be divided into square/ rectangular or as per designed panels to prevent cracks in the floor finish. No dimension of the panels shall exceed 2m and length of the panel shall not exceed 1.5 times its breadth. Base course shall be laid on alternate panels and shall have mitred joints at the corners of the room and intermediate joints shall be in straight line with panel joints.

The flooring shall butt against masonry wall which shall not be plastered.

When the base course is to be laid on hardened base, the sub-base be roughened by steel wire brushing and cleaned. Before laying the base course, neat cement slurry shall be brushed into the prepared surface.

Cement concrete shall be placed in position and beaten with trowel and finished smooth. Beating shall cease as soon as surface is found covered with cream of mortar. Necessary slope shall be provided.

2.17.2. Curing:

Each finished portion of floor, on completion shall be kept wet ponding for a minimum period of 7 days.

2.17.3 Pre-cast Hydraulically Pressed Plain Cement Tiles Flooring :

Cement concrete tile shall conform to IS: 1237 and shall be of approved shade, with 10mm down size stone aggregates and shall be of specified thickness and approved

shade. Cement shall be of light shade and all tiles required for the work shall be made from the same lot of cement to maintain uniform shade.

Pigments when used with mortar or for grounding shall conform to Table -1 of IS:2114. Cement mortar shall be of specified mix and thickness.

Workmanship shall in general conform to IS: 1443. The base on which tiles are to be laid shall be cleaned of all dust, dirt and properly wetted without allowing water pools. Cement mortar of specified thickness shall then be spread over base for two rows of tiles and 3-5 meters in length. The mortar shall be laid in slope as per requirements and thickness of mortar shall not be less than 10mm at any place. The top of the mortar shall be kept tough so that cement slurry can be absorbed. Laying shall be from centre & proceed outwards in the two directions at 90^0. Cut tiles of uniform sizes shall be laid along periphery, if necessary. Neat cement slurry @ 4.4 kg of cement per sqm shall be spread over the mortar bed for laying 20 tiles at a time. The tiles shall then be fixed in this grout one after the other, each tile being gently tapped and properly bedded in line and level. The joints shall not exceed 1.5mm in width. After the day's work, the excess cement slurry on top and the joints shall be cleaned with broom stick and washed before the slurry sets hard. Next day, the joints shall be filled with the cement grout of the same shade as the matrix.

Tiles along the periphery shall be continued by average 12mm under the wall plaster, shuttering or dado.

The flooring shall be cured for 7 days by keeping it wet with ponding. Heavy traffic on the flooring shall be permitted only after 14 days.

Grinding shall be commence after 14 days when the tiles and the joints are properly set. Grinding shall be done by machines except for skirting and small areas, First grinding shall be done with carborundum stones of 48 to 60 grade grit fitted the machine. Water shall be properly used during grinding. When the chips show up and the floor has been uniformly rubbed, it shall be cleaned with water baring all pin holes. It shall then be covered with a thin coat of grey/ white cement mixed with pigments to match with colour of the flooring. This grout shall be kept moist for a week. Thereafter the second grinding shall be started with carborundum stone of 120 grit. Grinding and curing shall follow again. Final grinding shall be with carborundum of grade 220 to 350 grit using water in abundance. The floor shall be washed clean with water, oxalic acid powder shall then be dusted at 33 gms/ sqm. on the surface rubbed with machine fitted hessian bobs or rubbed hard with woolen rags. The floor shall then be washed clean and dried with a soft cloth or linen. If any tile is disturbed or damaged, it shall be refitted or replaced proper jointed and polished.

2.17.4 Pre-cast hydraulically pressed terrazzo tile flooring :

Terrazzo tiles shall be of specified thickness and shade shall generally conform in all respect to IS-1237.

Pigments ,Cement Mortar, Workmanship ,Curing, Grinding and Polishing shall be followed as given for Pre-cast Hydraulically Pressed Plain Cement Tiles Flooring.

2.17.5 Glazed Tiles work:

Glazed tiles shall conform to relevant IS codes and shall be of specified shade, size and of approved manufacturer.

Pigments, cement mortar, shall be as specified as in PCC tiles.

The tiles shall be laid over coating of specified adhesive (as per approved manufacturer's specification) laid on base floor/ wall plaster. The joints of the tiles shall

be flush pointed with cement paste (white cement and pigment conforming to IS-2114, Table -1) matching the shade of colours.

Curing shall be as specified as in PCC tiles

2.17.6 Kota Stone Flooring :

The slabs shall be of selected quality and shade, hard sound, dense homogenous in texture, free from cracks, decay weathering and flacks. These shall be machine cut to size of 550x550mm unless otherwise specified. For kitchen slab where specified the stone slab shall be for full width of kitchen slab and length of minimum 1800mm. Kota stone slabs in treads and risers of stair cases shall be in single piece. In the floors where dimensions are not in the multiple of 550mm equal borders shall be left on opposite sides and shall be made up with matching size of kota stone slab. No extra payment shall be made for such extra border work.

The slabs shall have the top (exposed) face polished before being bought to site. Before starting the work, the contractor shall get the samples of slabs approved by the Engineer-in-Charge.

Each slab shall be machine cut to the required size and shape and fine chisel dressed at all edges to full depth and machine rubbed to smooth surface finish. All angles and edges of the slabs shall be True Square and free from chippings giving a plane and smooth surface.

Cement mortar 1:6 (1 cement: 6 coarse cement sand by volume) of specified thickness shall be laid over the base after making it rough and cleaning thoroughly. The mortar shall be laid for flooring one slab at a time over the base slab thoroughly washed, cleaned and kept moist.

The slab shall be washed clean before laying. It shall be laid over cement mortar bedding on top, pressed, and tapped gently to bring it in level. It shall be then lifted and laid aside. Top surface of the mortar then shall be connected by adding fresh mortar at hollow or and depressions. The mortar then shall be allowed to harden and cement slurry of honey like consistency @ 4.4 kg of cement per sq. shall be spread over the mortar. The edged of the slabs shall be buttered with white cement with or without pigment grout to match the shade of the slabs. The slabs shall then be gently placed in position and tapped with wooden mallets till it is properly bedded on level. The joints shall be as fine as possible. Surface cement on the surface of the slab shall be removed. The slabs in flooring shall continue for not less than 10mm under the plaster/ skirting. The finished surface shall be true to levels and slope as instructed by the Engineer-in-Charge.

The slabs shall be laid in patterns as per drawings and size shall not be less than 31mm x 310mm. Cut uniform size may be used along periphery as required.

The floor shall be cured for a minimum period of 7 days by wetting.

Unevenness at the meeting edges of slabs shall be removed by fine chiseling polishing etc. shall be done in accordance with what has been specified for Pre-cast Hydraulically Pressed Plain Cement Tiles Flooring except that cement slurry shall not be applied on the surface before each polishing.

SECTION - 3

3.1 The intent of this section of the specification is to define the general technical requirements of the major items of Sanitary and water supply works.

3.2. GLAZED STONEWARE PIPES

3.2.1 Specifications

Wherever specified for drainage/ sewer lines, glazed stoneware pipes shall be used. These pipes shall be of first class approved quality, straight, free from any roughness inside or outside and conforming to IS: 651-1980.

3.2.2 Laying

The pipes shall be laid on a bed of 15 cm thick cement concrete 1:5:10 mix or as specified in items with sockets leading uphill and should rest on solid and even foundations for the full length of the barrel. Socket holes shall be formed in the foundation sufficiently deep to allow the pipe jointer room to work right round the pipes and as short as possible to admit the socket and allow the joint to be made.

If the bottom of the trench consists of rock or very hard ground that cannot be easily excavated to a smooth surface, the pipes shall be laid on concrete cradles to ensure even bearing.

The pipes with their crown level at 1.2m depth and less from finished ground level shall be surrounded with 15 cm thick cement concrete 1:5:10 mix or as specified in items all around. Pipes laid at a depth greater than 1.2 m at crown shall be laid in concrete at the side upto the level of the centre of the pipe and slopped up from the edges to meet the pipe tangentially.

3.2.3 Jointing

The spigot of each pipe shall be slipped home well into the socket of the pipe previously laid and adjusted in correct position.

The opening of the socket shall then be filled with a stiff mixture of cement mortar 1:1 (1 cement : 1 fine sand) . The jointing material shall be properly cured. When the socket is thus filled a fillet shall be formed round the joint with a trowel forming an angle of 45^0 with the barrel of the pipe.

3.3 CAST IRON PIPES

3.3.1 Specifications

Wherever specified the cast iron pipes for drainage shall be either vertically cast type conforming to IS:1537-1976 or centrifugally spun type conforming to IS: 15536-1976 or as specified in the item of works.

Generally all drainage lines passing under buildings floors, road with heavy traffic and in exposed position above ground or like situations shall be in cast iron.

3.3.2 Laying and Jointing

All excavation work for laying cast iron drainage pipes shall be done as described in section B.2.2. Jointing pipes shall be done as described in sub-section B4.2.2 hereunder after.

3.4. EXTERNAL WATER SUPPLY

3.4.1 Galvanised Iron pipes and fittings:

a) Specifications

Where specified G.I. pipes for water supply inside and outside the buildings shall be genuine galvanised steel tubes conforming to IS: 1239-1968 of specified grade.

All fittings shall be malleable iron galvanised fittings conforming to IS: 1239(Part II) - 1968. All fittings shall have manufacturers trade mark stamped on it. Fittings in G.I. pipelines shall include elbows, tees bends reducers, nipples, union buses, G.I. clamps of approved design, G.I flanges with 3mm rubber insertion , nuts, bolts, washers etc.

b) Laying and Fixing

Screwed G.I pipes shall be joined with screwed socket joints, using screwed fittings. After cutting and threading white lead with PTFE tapes shall be used while tightening. Other pipe jointing compound may be permitted if approved before starting the work. All pipes shall be fixed with G.I holder bat clamps clear off the wall. If pipes are fixed in chases they shall be fixed in position by iron hooks. All piping shall be kept plugged at the end of day's work.

Pipe laid underground shall be painted with two coats of anticorrosive bitumastic paint and covered with fine sand 150 mm all around. The pipes in chases shall also be painted with bitumastic paint.

c) Depth of cover for underground water pipes

The cover for the mains shall be at least 90 cm under vehicular areas and 75 cm in pedestrian areas and 30cm to 60cm at other places as directed.

3.5 NON RETURN VALVES

The valves shall be of best quality and shall generally conform to IS : 778 - 1971.

3.6 VALVE CHAMBER

Valve chamber shall be provided at suitable location as directed.

3.7 SOIL, WASTE AND VENT PIPES

3.7.1. Specifications

Cast iron pipes & fittings shall conform to IS: 1729 - 1979 or IS: 3989 - 1970 (or as revised) and shall be used for soil, waste and vent pipes. Pipes and fittings with irregular bore, blow holes and other manufacturing defects shall not be allowed to used for work.

3.7.2 Jointing

The spigot of the pipe shall be placed inside the socket & gasket caulked home to leave the depth for lead as specified in the table below. Molten pig lead shall then be poured into the joint filling the same in one pouring. While filling horizontal pipe joints with molten pig lead, care shall be taken against flow of any molten material outside the joint by putting 25mm thick plug of suitable material at the face of the bottom half of the joint. This plug shall be removed and joints checked. The lead shall be caulked by proper tools to make it even all around. The pig lead shall conform to IS : 782 - 1978.

The depth of lead required for joints in various sizes of cast iron pipes are

Nominal Dia (mm)	Depth of lead (mm)
50	25
75	25
100	25
150	38

3.7.3 Holder bat Clamps

All pipes shall be fixed clear off the wall with M.S. holder bat clamps. Holder bat clamps shall be of a standard design fabricated from M.S. galvanized flat 32x1.5mm thick and 12mm dia M.S. bar and 6mm nuts and bolts. Holder bat clamps shall be fixed in cement concrete (1:2:4) blocks 100x100x100mm. Walls shall be plastered before fixing the pipe on the surface. The clamps shall be welded with extension pieces to increase their clearance from wall as per drawing.

3.8. TRAPS

3.8.1 General

The entry of foul air to the building should be prevented by suitable traps, properly sited.

Traps should always be of a self-cleansing pattern. A trap which is not an integral part of an appliance should be directly attached to its outlet, and the pipe bore should be uniform through and have a smooth surface.

Traps for use in domestic waste installations and all other traps should be conveniently accessible and provided with cleaning eyes or other means of cleaning.

The size of the trap shall be as per the internal diameter of waste pipe of the appliances to which it is attached. Minimum internal diameter for various waste appliances are as given following table:

Item	Diameter (mm)
Drinking fountains	25
Wash basins	30
Bidets	30
Domestic sinks and baths	40
Shower bath trays	40
Domestic bath tubes	50
Hotel and Canteen sinks	50
Urinals:	
Stall urinals (with not more than	
1.20 m of channel drainage)	50
Lipase urinals	40
Floor traps (outlet diameter)	75

3.8.2 Floor Traps

Floor taps shall be cast iron deep seal type P or S traps with a minimum seal of 65mm. They shall be with or without vent. All traps shall be set in cement concrete block 1:2:4 mix without any extra additional cost.

Urinal traps shall be provided with C.P. brass domical grating . Traps shall be provided with suitable extension pieces where required, with chromium plated grating to flush with the floor without any extra cost.

3.9 INSTALLATION OF SOIL, WASTE AND VENTILATION PIPE WORK

3.9.1 Gradient

The gradient of a horizontal branch should not be flattered than 1 in 50 and not steeper than 1 in 10.

3.9.2 Layout

The pipe work in branch connections should always be arranged to allow free drainage of the system. Connections to main or branch pipes should be so arranged as to prevent cross flow from one appliance to another. Connections should be made with an easy sweep in the direction of flow.

3.9.3 Joint

All joints in pipe work and all pipe work to appliances should be made in such a manner as to be air-tight and water tight and to remain so during use.

3.9.4 Bends

Bends should be of long radius where practicable. In the case of bends in the bottom most pipes, they should necessarily be of long radius and should preferably be made of 135^0 (1/8) bends.

3.9.5 Access

Ample provision should be made for access to all work and embedding of joint in wall should be avoided as far as possible. All tee and cross pieces shall be with access doors. Where instructed by the Engineer-in-Charge, the bends with access doors shall also be provided. The bottom most pipes of every soil and waste stack shall be provided with an access piece at a height not more than 30 cm finished ground/ floor level.

3.9.6 Soil pipes

Soil pipes, whether inside or outside the building shall not be connected with any rain water pipe and there shall not be any trap in such soil pipe or between it and any drain with which it is connected.

3.9.7 Ventilating pipe

Ventilating pipes should be so installed that water cannot be retained in them. They should be fixed vertically. Whenever possible, horizontal runs should be avoided. Ventilating pipe shall be carried to such a height and in such a position so as to offer by means of the open end of such pipe or vent shift, a safe outlet for foul air with the least possible nuisance.

3.9.8 Concrete Encasing

All soil and waste pipes below ground floor and in wall chases (but not in open ducts) shall be supported and covered with 75 mm cement concrete 1:3:6 in bed and all around. Encasement of such pipes shall be done after testing of pipes.

3.9.9 Painting

All pipes in ducts, under floor and in exposed position shall be pointed with minimum three coats of paint of approved shade and quality. No extra payment shall be made for painting work.

3.10 INTERNAL WATER SUPPLY INSTALLATION

3.10.1 Pipes and fittings

a) Specifications

All pipes for water supply (both hot and cold) inside the building shall be 3 layered PPR (Poly Propelene Random Co- Polymer) pipes of approved brands.

For fittings and other details clause B4.2.2 shall apply.

a) Laying & Fixing

b) In general, laying and fixing shall be carried out as per clause 4.2.2. However , exposed pipes on wall shall be fixed with standard pattern holder bat clamps of required shape and size so as to fit tightly on pipes when tightened with screwed bolts. These clamps shall be either embedded in brick work in cement mortar 1:3 (1 cement : 3 coarse sand) or fixed on angle frames fixed in walls or suspended from ceilings. The clamps shall be spaced at regular intervals in straight length as per following table :-

Dia of Pipe	**Horizontal Length**	**Vertical Length**
mm	**M**	**M**
15	2	2.5
20	2.5	3
25	2.5	3
32	2.5	3
40	3	3.5
50	3	3.5
65	3.5	5
80	3.5	5

3.10.2 Water Fittings

a) General

All C.P brass or gunmetal water fittings as provided in the item shall be of heavy quality and approved manufacture and pattern. A sample of the fittings shall be got approved from the Engineer-in-charge before bulk purchase and all fittings shall be provided according to the approved sample.

Each fitting shall have the manufacturer's stamp on it.

b) Full Way Gate Valves:

The full way gate valves shall be of heavy gunmetal conforming to IS : 778 - 1964.

c) Mixing Taps

Combination taps, mixing valves or blenders for mixing hot and cold water and discharging the mixture through a single outlet shall be conforming to IS : 1701 - 1960 and approved make.

d) Ball Valves

The ball valves shall be of high pressure or low pressure type and shall be of the size as specified. The body of the ball valve shall be capable of withstanding a pressure of 14 kg./sqcm. A high pressure ball valve with the float immersed to not more than half of its volume shall remain closed against a test pressure of 10.5 kg/sqcm and a low pressure valves against a test pressure of 3.5 Kg/sqcm. The ball valves shall conform to IS : 1703 - 1977.

3.10.3 Fittings for Overhead Tanks

a) General

Each overhead water storage tank shall be provided with sockets for inlet, outlet, overflow, scour, etc, All openings shall be fixed mosquito proof brass grating of approved design.

b) Outlets.

The outlet pipe shall be fixed 50 to 75mm above the bottom of the tank and provided with copper gauge stainers.

c) Wash Out (Scour)

The wash out of draining pipe shall be made flush with the bottom of the tank at its lowest point.

d) Overflow

The overflow pipe shall be one size higher than the inlet pipe. The level of the overflow pipe shall be set below the inlet pipe at 25mm or diameter of the overflow pipe whichever is more.

3.11 SANITARY FIXTURES & FITTINGS

3.11.1 Workmanship

All sanitary ware shall be fixed in a neat workmanship like manner, true to level and plumb. Manufacturer's instructions shall be followed closely regarding installation and **commissioning.**

3.11.2 Sanitary ware

All porcelain sanitary ware shall be of approved make. All fittings shall be of first class quality, free from warps, cracks and glazing defects. All sanitary ware, fitting and fixtures shall be as shown in drawings and as described in details in schedule of items.

3.11.3 Fixing

All fixtures shall be fixed with chromium plated brass screws with washers wherever necessary

3.11.4 Painting

The high level cast iron flushing cisterns and G.I. flush pipes shall be painted with one coat of red oxide and three coats of paint of approved shade and quality. All supporting brackets for cisterns, wash basin and sinks shall also be painted, as directed by the Engineer-in-charge.

3.11.5 Protection

Fixtures shall be protected throughout the progress of the work from damage. Special care shall be taken to prevent damage and scratching of chromium plated fittings. Tool marks on chromium fixtures, etc shall not be accepted. Protective paper on fixtures shall be removed with hot water only at the final completion of work.

3.12 TESTING & COMMISSIONING

3.12.1 General

The Contractor shall be responsible for testing and commissioning the entire services installation described in these specifications and will demonstrate the operation of the systems to the entire satisfaction of the Engineer-in-charge.

3.12.2 Method of Testing

The tests on various services shall be carried out as described herein. The carrying out and recording of testes shall be agreed with the Engineer-in-charge.

a) Water for Testing

Water for testing shall be obtained by the Contractor from an approved source. It shall be free from bacterial contamination, silt, grit, sand etc. After testing to the required pressure, the Contractor shall satisfactorily dispose off all water, or it may be reused provided it is clean and is not contaminated.

b) Test Records

The Contractor shall be responsible for the keeping of all records of tests and on completion shall provide records and reports of the tests in triplicate. All test records shall clearly identify the item of the test and must be signed jointly by the Engineer-in-charge and the contractor.

c) Unsatisfactory works

If the tests reveal unsatisfactory materials, installation or adjustment the Contractor shall at his own expense carry out such alterations or replacement as may be necessary to rectify the defective work. The Contractor shall then repeat the tests as necessary to establish the satisfactory nature of the alterations or replacement.

d) Testing at site

The contractor shall provide on site all the necessary instruments, plant, equipment, materials, water, electricity & labour necessary for carrying out the specified tests. All tests shall be carried out as required to meet the construction programme and the Contractor shall include for all necessary isolation and other works as may required for testing the whole or parts of the installation. The Contractor shall also be responsible for re-testing, if necessary, until satisfactory tests are achieved.

3.12.3 Test Records :

Pipe Line	Test Pressure	Period	Method
Water mains , Fire Mains & Water Services	5 Kg/sq.cm or maximum working pressure plus 50% whichever is greater.	2 hours	Hydraulic pressure test.
Underground Drainage	1.5 meters head of water at highest point	30 min.	Hydraulic test.
Foul Drainage above ground	i) Not more than 4.5m head in any section of pipe. ii) 7.5mm water gauge	2 hours 3 min.	Hydraulic test Air test

3.12.4 Testing of Various Services

a) Water Services

Before the pipes for water supply are painted or covered they shall be tested to a hydraulic pressure of 5 Kg/Sq cm or maximum working pressure plus 50% whichever is greater. Pressure shall be maintained for at least 2 hours without appreciable drop in pressure. In addition to the sectional testing of water supply pipes, the contractor shall test the entire installation on completion of the job to the entire satisfaction of the Engineer-in-charge. The contractor shall rectify all leakages restore damage done to the building and furniture at his own cost.

b) Underground Drainage

The sewer and drain lines shall be tested for water fight-ness and straightness as described below

i) Water Test:-

Pipes and joints shall be subjected to a test pressure of at least 1.5 head of water at the highest point of the section under test. The test shall be carried out by suitably plugging the low end of the drain & filling the system with water. A knuckle bend shall be temporarily joined in at the top end and a sufficient length of vertical pipe joined to it so as to provide the required head or top end may be plugged with a connection to a hose ending in a funnel which could be raised or lowered till the required head is obtained & fixed suitably for observation.

ii) Test for Straightness and Obstruction

c) Sewer lines shall be tested for straightness:

i) by inserting at the high end of the sewer or drain a smooth ball of diameter 13mm less than the pipe bore. In the absence of obstructions, such as yarn or mortar projecting through the joints, the ball should roll down the invert of the pipe and emerge at the lowest end.

ii) by means of mirror at one end of the line and lamp at the other. If the pipeline is straight, this will be apparent . The mirror will also indicate obstruction in the barrel.

d) Above Ground Foul Drainage

All soil, waste and vent pipes shall be tested by filling up the whole or with water. All openings for connections etc. shall be suitably plugged. The total head shall however not exceed 4.5 meters. Contractor shall remove and replace all pipes having holes, crack , etc. All leaking joints and access doors shall be replaced or remade to the entire satisfaction of the Engineer-in-charge. Water shall be retained in stack for a minimum period of 2 hours. After all plumbing fixtures are installed, contractor shall apply the smoke test to the entire stack to the satisfaction the Engineer-in-charge.

e) Sanitary fixtures & Fittings

When the installation has been completed to the satisfaction of the Engineer-in-charge, it shall be tested in the following manner :-

i) The entire system shall be slowly filled with water allowing any trapped air to escape.

ii) When all outlets are closed, the system shall be checked for water tightness.

iii) Each outlet shall then be checked for rate of flow and correct operation.

iv) Waste outlets of wash basins, sinks shall be plugged and the basin and sink bowls shall be filled upto overflow level. Plug shall be removed and waste pipe and trap shall be checked for overflow.

f) Flushing out and sterilization of pipe work and tracks

It is essential that all internal water services, external mains and tanks are thoroughly flushed out prior to being put into service and that drinking and domestic water services mains and tanks are sterilized in accordance with Clause 133 of IS: 2065/1972-code of Practice, for Water Supply in Buildings.

The contractor shall be responsible for making any temporary pipe work connections required.

Following completion of sterilization of every part of the drinking and domestic water system, the contractor is to ensure that satisfactory bacteriological samples are obtained and tested at an approved laboratory and the results approved by the Engineer-in-charge prior to completion of the contract and handing over to the client.

3.12.6 "As Fitted" Drawings and operation & maintenance Manual'

a) 'As Fitted' Drawings

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

i) Position of all sanitary fixtures.

ii) Runs of all piping and diameters on all floors and vertical stacks.

iii) Position of control valves , access panels and all other plant and equipments.

iv) Levels of all manholes.

b) Operation & Maintenance Manuals

The contractor shall hand over to the Engineer-in-charge all operation and maintenance manuals of the plant and equipment supplied and installed by the Contractor. Only manufacturer's catalogues, wiring diagrams and installation drawings, relevant to particular, items of equipment concerned shall be submitted. General catalogues will not be acceptable.

LIST OF APPROVED MANUFACTURERS/BRAND NAMES OF VARIOUS BUILDING MATERIALS :-

Sl. No	Name of Materials	Manufactures/ Brand names
1.	Aluminum extruded sections for doors and windows	HINDALCO, INDAL, BHORUKA, ,Jindal, or equivalent by weight
2.	Anodized aluminum fittings for doors and windows	Crown, Alans, Classic, Argent, Bharat, IPSA.
3.	Mild steel butt hinges, Piano hinges	JOLLY, GARG, AMIT, ASI SUPREME, L.P. WATCHMAN
4.	Machine made paneled door, Glazed & Mosquito proof window shutters with particle board panels	1) Sarada Plywood Enterprises A-657, sukanta Nagar, Salt Lake, Calcutta-91 2) Ambika Timber Works, Village Binka Distt, Bankura 3) Tinsukia Carving Industries, Tinsukia. 4) JOINERY Wood Products Pvt. Ltd., Mamorani, Digboi Road, Makum Jn., Assam, PIN- 786170.
5	Pre-laminated particle board exterior grade-confirming to I.S: 12823-1990	Nova pan, Kit ply, Ancholam, Greenlam, Nepal Board, Archid
6.	Water proof cement paint	Super Snowcem, ICI, Berger, Jenson & Nicholson, Asian Paint, Nerolac.
7.	Acrylic Distemper & primer and factory made putty	ICI, Asian Paints, Berger, Jenson & Nicholson, Shalimar, Nerolac
8.	a) Synthetic enamel paints. b) Poly-urethane based paint c) Acrylic paint	British Paints, Nerolac, Jenson & Nicholson, Asian Paints, MRF , ICI, Sika, Fosroc Chemicals, Degussa,Pidilite,Berger
9.	Glass panes / sheets	Modifloat, Triveni, Hindustan Pelingston, Tata float, Saint Gobain
10.	Ceramic tiles	Asian, Kajaria, Somany, H & R Johnson, Bell, Diamond, Orient, NITCO,
11.	Flush Door	Kit ply, Century, Green, ,Archid, national
12.	Vitrified , Ceramic tiles	Granamite, Diamond, Bell Granito Ceramica tiles, Asian, Kajaria, Somany, H&R Jonshon, Oreva, Orient,Asian

13.	Water proofing treatment of roofs and other places	Lloyd, M.C. Bauchemie, pidilite,Roffe, Cico, Sika, & Fosroc Chemicals, Degussa,
14.	Stainless steel kitchen sinks	Parry ware, COBRA, PRINCE, AMC, Nirali
15	Toilet fittings, Sanitary wares, Flushing cistern, Plastic WC seats etc.	Parry ware, Hindustan sanitary ware, CERA, NEYCER, Commander.
	bC. P. brass fittings: stop cock, bib cock, pillar cock, concealed stop cock, angle valve etc.	Parryware, , Hindustan, Jaquar, Crabtree, Roca
	G.I. pipes	TATA, JINDAL
	G.I fittings	R,Unik, AA.
	PP-R pipes & Fittings	SFMC,WETFLOW, FINOLEX,, Vectus, Kisan, Prince, supreme,
16.	a) Gun metal valves of all type b) C.I. Soil waste, Vent, Rain Water Pipes & its fittings	LEADER, JOLOTO, L&K, Jaiswal Neco, R.I.F, ALC, L&K
17.	P.V.C lugs and pipes	Finolex, Prince, Supreme, Kisan
18.	White Cement	J.K., BIRLA
19.	Block Boards & Plywood	Green, Anchor, NATIONAL, Kitply, Century, Greenlam, ,Archid
20.	Waterproofing Compound	CICO, Sika, Roffe, Lloyd, Fosroc Chemicals, pidilite, Degussa.
21.	Pre-cast Mosaic tiles & P.C.Tiles	MODERN, NITCO, JAHAR FLOORS, HERO TILE.
22.	Machine made clay roof tiles	Tiles from Mangalore/ Calicut/ Morbi
23.	Steel Priming Coat	Steel guard nano coat
24	Pressed Steel Door frame	Behar Bobbins, AGEW Steels, Purbanchal Industries.

NOTE : Samples of all items shall be got approved from Engineer-in-Charge before bulk purchase.

SECTION – 4

GENERAL TECHNICAL SPECIFICATIONS

(ELECTRICAL)

4.0 The intent of this chapter of the specification is to define the general technical requirements of internal electrical wiring works.

4.1 STANDARDS

The work shall be carried out in conformity with this specification, the relevant specifications / code of practice of the Indian Standards Institutions, approved drawings and instructions of the Engineer-in-Charge or his authorized representative issued from time to time. In addition to the above, all works shall conform to the requirements of the following :

a) Indian Electricity Act and Rules.
b) Regulations laid down by Chief Electrical Inspector of the state, power supply authority.
c) Relevant Indian Standards and National Electrical Code.
d) Any other regulation laid down by the local authorities.

4.2 Specification of items / works including definition of terms, measurement, classification etc. not covered in this specification shall be governed by the General Specification for Electrical works – Part – I & II, 2005 of CPWD.

4.3 EQUIPMENT SPECIFICATIONS

All materials, fittings, applications, accessories to be supplied by the Contractor shall be of best quality and shall conform to the specification given hereunder. The equipment shall be manufactured in accordance with the current Indian Standards Specification. Samples of all materials before being used shall be procured by the Contractor to the Engineer-in-Charge or his authorized representatives. The material shall be used / installed only after approval by the Engineer-in-Charge.

4.3.1 Switches

All switches for wiring shall be manufactured in accordance with IS:3854 and shall be piano type unless otherwise specified.

4.3.2 Receptacles

Only three pin-type receptacles manufactured in accordance with IS:1293 shall be used with third terminal connected to the earth. All receptacles shall be provided with a switch mounted on the same enclosure. Receptacles shall be of flush mounting type except for the rating above 15/16 amps. unless otherwise specified.

4.3.3 Outlet / Switchboard boxes

Outlet boxes for socket, switches fixtures and regulators etc. shall be of minimum 18 gauge (for size up to 20 cm x 30 cm) and 16 gauge (for size above 20 cm x 30 cm) or specified in the schedule of items. Junction / outlet boxes shall be used in roof slab where concealed wiring has been adopted. The junction / outlet / switch

boxes shall be painted with anticorrosive paint before installation. Cover plates shall be of Formica or approved equivalent with colour to suit the wall. Cover plates shall be fixed by cadmium plated brass screw and suitable c.p. brass cup washers. An earth terminal with stud and washers shall be provided in each MS box for termination of protective earth conductors.

4.3.4 **Conduit and Fittings**

Conduits shall be of metallic or non-metallic type as specified :

a) All rigid metallic conduit pipes shall be of steel and be ISI marked. The minimum wall thickness shall be 1.6 mm (16 SWG) upto 32 mm dia and 2 mm (14 SWG) above 32 mm dia. The conduit shall be solid drawn or reamed by welding and finished with galvanised or stove enameled surface.

b) All non-metallic conduit pipes and accessories shall be of suitable material complying with IS:2509-1973 and IS:3419-1976 for rigid conduits and IS:6946-1973 for flexible conduits. The interior of the conduits shall be smooth and free from obstructions. The rigid pipes shall be ISI marked. The minimum wall thickness of the rigid non-metallic conduits shall be 1.6 mm upto 25 mm dia conduit.

c) No conduit less than 20 mm in diameter shall be used.

d) All metallic conduit accessories shall be only threaded type, pin grip or clamp type accessories are not acceptable.

e) Accessories for non-metallic rigid type of conduits shall be normally of grip type.

4.3.5 **Casing and Capping**

a) Casing and capping shall be of good quality PVC, free from defects like deformations, unevenness, blisters, cavities, etc.

b) The casing shall be of square or rectangular body with top of the side walls suitable for tightly fitting slide-in type capping with double grooving. All surfaces shall have smooth finish inside and outside.

4.3.6 **Wires and Cables**

a) **Wiring cables**

- Wires shall be PVC insulated 1100 V grade as per IS:1554.
- Conductors shall be of stranded copper.
- The smallest size of conductor for lighting circuits shall have a nominal cross-sectional area of not less than 1.5 sq.mm, while minimum size of power wiring shall be 2.5 sq.mm.
- All wires shall be ISI marked.

b) **Flexible cable**

- Flexible cables shall be PVC insulated having a minimum size of 14/0.0193 mm.
- All flexible wires shall be mechanically protected by tough rubber or PVC sheath.

c) **Underground cables**

- **Power cables :** Power cables for use in 415 V system shall be of 1100 V grade, aluminium stranded conductor, PVC insulated, PVC sheathed single

wire armoured and overall PVC sheathed. All power cables for 11 kV and 33 kV shall be aluminium conductor, XLPE insulated, screened, PVC bedded galvanized steel flat armoured (non-magnetic material in case of single core cable) and PVC sheathed cable. All 415 V cables shall conform to IS:1554 and HT cables shall conform to IS:7098. Unarmoured cables will be used only where specified.

- **Control cables :** Control of cables shall be 1100 V grade, 2.5 sq.mm copper conductor, PVC insulated, PVC sheathed, single wire armoured with overall PVC sheathed as per IS:1554.

d) **Communication cables**

Communication cable shall comprise 1 pair unarmoured, 2-pair, 5-pair and multipair armoured cable of size as specified in the schedule. Minimum conductor size shall be 0.5 mm dia for telephone system and 0.71 for other communication system.

4.3.7 **Switchgear and Control Gear**

a) **General**

- All items of switchgears and distribution boards shall be metal clad type except those forming part of cubicle type switch boards.
- The types, ratings and make of the switchgear and protective gear shall be as specified in this specification and the schedule of works.
- RCCBs (ELCBs) shall conform to the ratings specified in the schedule of works.
- Each distribution boards shall have one independent and separate terminal block each for the neutral and the earth conductors.
- Each distribution boards shall be provided with earthing terminals for body earthing – one for single phase and two for three-phase.
- All DBs (single phase or three phase) shall be of 4, 6, 8 or 12 ways as specified. Number of ways as stated above, in case of three phase DB shall mean ways per phase.
- Bus-bars used shall be of electrolyte copper of appropriate size.

b) **MCB Type Distribution Board (MCBDB)**

- MCB type distribution boards shall be either single phase or 3-phase type horizontal or vertical, depending upon whether outgoing circuits are single phase or 3 phased / 1 phase.
- All MCBDBs shall have provision for accommodating MCB type isolators and RCCB (ELCB) at incoming in single pole or multiple configuration.
- All MCBDBs unless specifically mentioned and/or having different circuit configuration than the standard manufacturing range shall be factory fabricated and completely pre-wired and ready for installation at site.
- MCBDBs shall be fabricated out of 1.6 mm thick sheet steel with stove enameled paint finish and shall be wall mounted type if not specified otherwise.
- The boards shall have adequate provision for entry of incoming and outgoing cables / wires through knockout holes with or without detachable plates.

c) **Medium Voltage Switchboard**

Medium voltage switchboards or MV switchgear panels shall be as per the schedule of items and as per the following specific requirements in addition to the general requirements as per the latest editions of applicable Indian Standards.

The switchboard shall be free-standing, metal enclosed, compartmentalized, modular type, dust and vermin proof suitable for indoor installation. Switchgear enclosure shall provide degree of protection not less than IP-31 as per IS:2147. The switchgear shall be assembled out of vertical panels of uniform height not exceeding 2450 mm. The maximum height of the operating handle / switches shall not exceed 1800 mm and minimum height not below 300 mm.

switchgear shall be designed to ensure maximum safety during operation, inspection, connection of cables, relocation of outgoing circuits and maintenance with the energized bus-bar system and without taking any special precautions. The switchgear shall permit maximum interchangeability and shall be extensible on either side.

The switchboard shall be sheet steel clad with the frame fabricated out of 14 SWG cold rolled sheet steel and doors / covers out of 15 SWG cold rolled sheet steel; having integral base frame for each vertical panel. All hardware shall be corrosion resistant. All joints and connections of the panel members shall be made of galvanized, zinc passivated or cadmium plated high quality steel bolts, nuts and washers, secured against loosening.

The switchgear shall be suitable for bottom cable entry. Provision for incoming connection through busduct shall be made as per requirement of the specification and schedule of rates.

Individual circuit breakers, switch fuse units, MCCBs, bus-bars, cable termination compartment shall be housed in separate enclosed compartments separated from each other by metallic barriers.

Circuit breaker panel shall be in single front execution only. Not more than two breaker cubicles shall be housed in single vertical panel except for the incomer and bus-coupler, which shall each be housed in independent vertical panels. Motor starters, switch fuse units, MCCBs shall be in suitable arrangement in single or double front as specified in the schedule of items. All auxiliary devices for control, indications, measurement and protection such as push-button, control and selector switches, indicating lamp, metering instruments protective relays except bimetallic relays shall be mounted on the front side of the respective compartment. Components requiring frequent inspection during operation shall be easily accessible.

Main bus-bars shall be of high conductivity aluminium or electrolytic copper as specified having uniform current rating throughout their length. Horizontal and vertical bus-bars shall be sized depending upon the maximum expected current and to limit the maximum operating temperature at specified design ambient temperature to 85ºC for normal operating condition and to 200ºC for short-circuit condition considering installation in a poorly ventilated area.

Adequately sized auxiliary copper / aluminium bus-bars running horizontally in a separate enclosure shall be provided for space heaters, control supply and metering requirements. Necessary tee-off connections shall be used for distributing auxiliary supply to each vertical panel.

All bus-bars shall be colour coded and designed to withstand specified short circuit currents for one second.

Aluminium earth bus with 300 sq.mm minimum size or equivalent copper bus shall be provided throughout the length of the switchboard with provision for interconnecting to earth grid. All non-current carrying metallic parts of the mounted

equipment shall be earthed. Door and movable parts shall be earthed using flexible copper connections.

Inside the switchboards the wiring for power, control, signaling protection and instrument circuits shall be done with PVC insulated copper, conductors having 660 / 1100 V grade insulation. Minimum size of the control wire shall be 1.5 sq.mm copper for circuits having fuse rating 10 Amps. Or less. For control circuit with higher fuse rating min 2.5 sq.mm copper conductor shall be used.

"Elmex" type terminals shall be acceptable for wiring upto 10 sq.mm size and for conductors larger than 10 mm^2, bolt type terminals with crimping lugs shall be provided. Each wire shall be terminated at a separate terminal. A minimum of 10% spare terminal shall be provided for all CT terminals.

For modules rated above 100 amps., preferably copper strip connection shall be used.

The air circuit breakers shall be fully drawout type, Circuit breaker panel shall have three distinct positions : viz – 'service', 'test', 'full out' position complete with necessary safety interlocks, scraping, earth connection, shutters, safety barriers and suitable guides for easy movement of the trolley. Access to the cables shall be from the rear side after opening the door of the separate cabling compartment. Circuit breakers shall be trip free type having antipumping features and electrically operated mechanism suitable for control supply specified in the schedule of items / specification. Circuit breaker trip coils shall be rated for satisfactory operation with 50% to 110% of rated voltage and the closing coil shall be rated for 85% to 110% of the rated voltage.

All switch fuse units shall be load break, heavy duty, air break type (double break) with the operating handle mounted on compartment door, complete with necessary interlocking mechanism.

All fuses shall be non-deteriorating HRC cartridge, pressure fitting link type.

All relays shall be back connected, drawout type suitable for flush mounting and fitting with dust tight covers along with hand reset type built in flag indication.

Current transformers for metering shall have an accuracy class 1.0 and instrument safety factor less than 5. Protective current transformers shall have an accuracy class 5 P and accuracy limit factor greater than 10.

All indicating instruments shall be flush mounting type and of 96 x 96 mm square pattern, except the digital instruments. Digital instruments if required shall be as per schedule of items / specific technical specifications.

All control / selector switches shall be rotary back connected type having a cam operated contact mechanism.

4.3.8 **Miniature Circuit Breaker**

a) Miniature circuit breakers shall be of approved make and rating as specified.

b) "L" series MCBs shall be used only for normal lighting circuits.

c) "G" series MCBs shall be used for all motor loads, air conditioners, halogen and other discharge lamps and all power circuits.

4.3.9 **Moulded Case Circuit Breaker**

a) Moulded case circuit breakers shall be of approved make. Adjustable type MCCBs shall be used unless otherwise specified in the schedule of items / specific technical specification.

b) Current rating and the short circuit rating of the MCCBs shall be as per schedule of items.

4.3.10 **Medium Voltage Bus-duct**

a) Enclosure

The enclosure of the medium voltage bus-duct shall be of 14 SWG sheet steel with removable cover in one side and shall be totally enclosed, dust and vermin proof. The cover shall be fitted with dust preventing gaskets, secured with sufficient number of cadmium plated iron screws to ensure that the cover is dust tight. Suitable openings shall be provided for cable / conduit entries as required.

The enclosure shall be pained with one coat of primer paint after cleaning the surface and after dressing and degreasing. Two coats of finish paint shall thereafter be applied by spray painting process. This shall be done in the works before bringing the materials to site.

b) Bus-bars and Supports

Bus-bars shall be made of electric grade copper conforming to relevant Indian Standards and shall be supported on robust non-hygroscopic insulators at regular intervals to withstand the specified short circuit current. Bus-bars shall be suitably insulated with PVC sleeves / tapes. An aluminium / copper earth bus of suitable size to be specified shall be run along the bus-duct having necessary provision for connection to the earthing network.

4.4 **Building Wiring System**

Wiring system to be adopted shall be as specified under 'specified technical requirements' and shall conform to the general requirements as specified hereunder.

4.4.1 **Conduit Wiring System**

A. General

a) Surface or concealed conduit wiring system with ERW or GI or polyethene conduit as specified shall be adopted.

b) Conduit work whether surface or concealed shall be completed before the cables are drawn in.

c) Conduit pipes shall be jointed by means of screwed couplers and screwed accessories (in case of metallic conduits) only. In case of non-metallic conduits joints shall be properly sealed.

d) All bends in the wiring system shall be done either by bending the pipes neatly without any crack or by inserting suitable accessories like bends, elbows or similar fittings. Radius of bends in conduit pipes shall not be less than 7.5 cm.

e) All metallic parts of conduits and accessories in recessed wiring system shall be painted with anticorrosive paint before their installation.

f) In all conduit wiring system, a protective earth conductor as specified shall be drawn inside the conduit to provide for earthing of non current carrying metallic parts of the installation. Earth wires shall be terminated in the switch boxes and / or the earth terminal blocks at the DBs. In case, the earth wire specified is of large size which may not be possible to be carried inside the conduits may also be laid external to the conduit subject to approval of the Engineer-in-Charge.

In case of the metallic conduits entire conduit system shall be electrically and mechanically continuous.

g) Maximum number of PVC insulated 650 / 1100 V grade cables that can be drawn in one conduit is given sizewise in Table-1, which shall not be exceeded. Conduit sizes shall be selected accordingly.

h) When crossing through expansion joints in buildings, the conduit sections across the joint may be through flexible conduits of the same size as the rigid conduit.

B. Additional Requirements for Surface Conduit Wiring System

a) Conduit pipes shall be fixed by heavy gauge non-metallic saddles in case of non-metallic conduits and 24 gauge (up to 25 mm dia) / 20 gauge (for larger dia) steel saddles in case of metallic conduit system.

b) Saddles shall be fixed at an interval not more than 60 cm in case of non-metallic conduits and not more than 1 m in case of metallic conduit. However, on either side of the couplers or bends or similar fittings, saddles shall be fixed at a distance of 30 cm (for metallic conduit) / 15 cm (for non-metallic conduit) from the surface of such fittings.

c) Where conduits are required to be laid along the trusses / joist etc., the same shall be secured by means of saddles / girder clips etc. As per instruction /approval of the Engineer-in-Charge.

d) In all the cases when conduits are laid in masonry / concrete work, saddles shall be properly secured by inserting polyethylene plugs approved by the Engineer-in-Charge.

C. Additional Requirements for Recessed Conduit Wiring System

a) Fixing of Conduits in RCC works.

i) The conduit pipes shall be laid in position and firmly secured to the steel reinforcement bars by steel binding wires before concreting is done.

ii) Instead of using standard bends or elbows the conduit itself should be bent in long radius to facilitate easy drawing of conductors.

iii) Inspection and junction boxes should be suitably located to avoid long conduit runs and such boxes shall be properly identified to avoid unnecessary chipping of the RCC slab subsequently to locate these boxes.

iv) Special care shall be taken in laying the conduits and during the concreting work to avoid damage to the conduits.

b) Laying of conduit in wall

i) Conduits shall be laid in the wall before plastering work in neatly made chase.

ii) The conduits shall be secured by means of staples / saddles / J-hooks at intervals not more than 60 cm.

iii) The joints between the conduits and the switch boards / distribution boards shall be properly sealed.

TABLE – 1

MAXIMUM PERMISSIBLE NUMBER OF 650 / 1100 V GRADE CABLES THAT CAN BE DRAWN INTO RIGID CONDUITS

Size of cable	Size of conduit, mm			
Nominal Cross-Sectional Area mm^2	20	25	32	40
(1)	(2)	(3)	(4)	(5)
1.5	4	9	12	—
2.5	3	6	10	—
4	2	5	8	—
6	—	4	7	—
10	—	3	5	6
16	—	2	3	5

4.4.2 **Casing Wiring System**

Casing wiring system may be adopted as specified by using metallic or PVC casing and capping. All specifications for casing wiring system shall be as per the "General Specifications" for Electrical Works (Part-I internal), 2005 of CPWD.

4.4.3 **Earthing**

a) Materials

i) Earth electrodes shall be any of the following type as specified.

a) Pipe / rod earth electrode

b) Plate earth electrode

c) Strip electrode

Pipe electrode shall be of G.I. heavy class with minimum 38 mm dia and 2.5 m long as per details shown in the drawing. Rod electrodes may be of steel or copper of 2.5 m minimum length. Minimum dia shall be 16 mm in case of steel and 12.5 mm in case of copper. The electrodes shall have no joints.

Plate electrodes may be of galvanised iron / steel or copper. In case of galvanised iron or steel thickness shall not be less than 6.30 mm, which in case of copper plate electrodes, thickness shall not be less than 3.15 mm. Minimum size of plate electrodes for both GI and copper shall be 60 cm x 60 cm. Strip electrodes shall not be smaller than 25 mm x 1.6 mm if of copper and 25 mm x 4 mm if of galvanised iron. If round conductors are used as earth electrodes, their cross sectional area shall not be smaller than 3.0 mm^2 if of copper and 6 mm^2 if of G.I.

ii) The main earthing conductor (from earth electrode to the main switch board or earth bus) shall be of G.I. or copper as specified. The sizes shall also be as per specification. However, in no case the size of the main earthing conductor be less than

a) 5 mm dia (6 SWG) for G.I. or 4 mm dia (8 SWG) for copper wire.

b) 25 mm x 4 mm in case of G.I. strip.

c) 20 mm x 3 mm in case of copper strips.

iii) The earth continuity or loop earthing conductor shall be of copper, aluminium or G.I. as specified. The minimum size of the earth continuity conductor shall be as follows :

a) 2 mm dia (14 SWG) in case of bare copper (1.5 mm^2 in case of insulated)

b) 2.24 mm dia (13 SWG) in case of bare aluminium 2.5 mm^2 in case of insulated)

c) 2.5 mm dia (12 SWG) in case of G.I.

b) Installation

i) Electrodes shall be as far as practicable, be embedded below permanent moisture level to a depth of at least 1.25 m. If rock is encountered, the depth of burial may be less than the specified value, subject to approval of the Engineer-in-Charge. In such case, the electrodes may be buried inclined to the vertical with inclination not more than 30º from the vertical.

ii) In case where more than one electrode has been specified, the distance between two electrodes shall preferably be not less than twice the length of the electrode.

iii) Plate electrodes shall be buried such that its top edge is at a depth not less than 1.5 m from the surface of the ground.

iv) Earth electrode normally shall not be located closer than 1.5 m from any building and should not be installed in proximity to a metal fence to avoid the possibility of the fence becoming live due to voltage gradient of the electrodes. If the metal fence is unavoidable, it should be earthed.

v) The strip electrodes shall be buried in trenches or ditches not less than 0.5 m deep and the length of the buried conductor shall be sufficient to give the required earth resistance. It shall, however, be not less than 15 m.

4.4.4 Installation of Fixtures / Fan

i) Fixtures shall be firmly supported from the structures, support clamps, etc., may be bolted or welded to the existing steelwork or metal inserts. In case of concrete structures, where metal inserts are not available, fixtures will be fixed to or supported from concrete surfaces with the help of anchor fastener. In such cases special care shall be taken to see that anchoring is firm.

In case of concrete structures where metal inserts are not available, fixtures having smaller weights shall be supported by nylon sleeve / steel sleeve anchors inserting in neatly drilled holes or appropriate size as shown in the typical drawing. Nylon or steel sleeve / rawl plugs should be inserted by making 1.5″ deep, 0.25 dia, cylindrical hole using electric hand drill. In no case wooden plugs shall be allowed. This procedure shall be followed for fitting all types of electrical fittings, switchboard, conduits etc. on surface in wall / ceilings.

ii) Fan clamps shall be of suitable design according to the nature of construction of the ceiling on which these clamps are to be filled. In all cases the fan clamps shall be fabricated from new metal of suitable sizes and they shall be as close fitting as possible. Fan clamps for reinforced concrete roof shall be buried with the casting and due care shall be taken that they shall serve the purpose. Fan clamps for wood beams shall be of suitable flat iron fixed on two sides of the beam and according to the size and section of the beam one or two mild steel bolts passing through the beam shall hold both flat iron together. Fan clamps for steel joints shall be fabricated from flat iron to fit rigidly to the bottom flange

of the beam. Care shall be taken during fabrication that the metal does not crack while hammering to shape. In cases where false ceiling exists, the fans shall be firmly connected to the structure / ceiling and not to the false ceiling.

4.4.5 Lightning Protection

i) Lightning protection shall be done in accordance with the tender specification, IS:2309-1989 and National Electrical Code.

ii) The materials for the air-termination, down conductors etc. For the lightning protective system shall be copper or G.I., as per specification. Recommended shape and minimum sizes of the conductors for use above ground and below are given below :

Shape and minimum size of conductors for use above ground :

Materials and shape	Minimum size
Round copper wire	6 mm dia
Stranded copper wire	50 mm^2 (or 7 / 3.0 mm dia)
Copper strip	20 x 3 mm
Round galvanised iron	8 mm dia
Galvanised iron strip	20 x 3 mm

Shape and minimum size of conductors for use below ground :

Round copper wire	8 mm dia
Copper strip	32 x 6 mm
Round galvanised iron wire	10 mm dia
Galvanised iron strip	32 x 6 mm

Termination

1. Air termination network may consist of vertical, horizontal or a combination of both vertical and horizontal conductors.
2. Vertical conductors shall project at least 30 cm above the object and shall have one point.
3. Horizontal air termination shall be so interconnected that no part of the roof is more than 9 m away from the nearest horizontal conductors.
4. Horizontal air terminations should be laid down the contours such as ridges, parapets and edges of flat roofs and where necessary over flat surfaces in such a way as to join each air termination to the rest and should themselves from closed network.
5. All metallic finials, chimneys, ducts, vent pipes, railings, gutters and the like, on or above the main surface of the roof of the structure shall be bonded to and form part of, the air termination network. If portions of a structure vary considerably in height any necessary air termination of air termination network of the lower portions, in addition to their own conductors be bonded to the down conductors of the taller portions.
6. All air terminals shall be effectively secured against overturning either by attachment to the object to be protected or by means of substantial braces and fixings which shall be permanently and rigidly attached to the building.

iv) Down Conductors

1. The number and spacing of the down conductors shall be as per the tender specification as directed by the Engineer-in-Charge. However, there shall be minimum 2 down conductors for structures up to 400 sq.m area and one extra down conductor for every additional 300 sq.m or part thereof.
2. Down conductors should be distributed round the outside walls of the structure. They shall preferably be run along the corners and other projections. Lift shafts shall not be used for fixing down conductors.
3. Down conductors shall be laid in such a way that they follow the most direct path possible between the air termination and the earth termination, avoiding sharp bends, upturns and kinks. Joints shall as far as possible be avoided in down conductors. Adequate protection may be provided to the conductors against mechanical damage. Metal pipes should not be used as protection for conductors.
4. Metal pipes leading rain water from the roof to the ground may be connected to the down conductors. Such connections should have disconnecting joints for testing purpose.
5. Any extended metal running vertically through the structure should be bonded to the lightning conductor at the top and the bottom unless the clearances are in accordance with IS:2309-1989.
6. Where the provision of suitable external routes for down conductors is impracticable or inadvisable, as in buildings of cantilever construction, from the first floor upwards, down conductors may be used in an air space provided by a non-metallic, non-combustible internal duct. Any covered recess not smaller than 75 x 15 mm or any vertical service duct running the full height of the building may be used for this purpose, provided it does not contain an unarmoured or non-metal sheathed cable.

v) Joints and bonds

a) Joints

The lightning protective system shall have as few joints in it as necessary. In the down conductors below ground level these shall be mechanically and electrically effective and shall be so made as to exclude moisture completely. The joints may be clamped, screwed, bolted, crimped, riverted or welded. With overlapping joints the length of the overlap should not be less than 20 mm for all types of conductors. Contact surfaces should first be cleaned and then inhibited from oxidation with a suitable non-corrosive compound. Joints of dissimilar metal should be suitably protected against bimetallic action and corrosion.

In general, joints for strips shall be tinned, soldered, welded or brazed and at least double-riverted. Clamped or bolted joints shall only be used on test points or on bonds to existing metal, but joints shall only be of the clamped or screwed type.

b) Bonds

External metal on or forming part of a structure may have to discharge the full lightning current. Therefore, the bond to the lightning protective system shall have a cross-sectional area not less than that employed for the main conductors. On the other hand, internal metal is not so vulnerable and its associated bonds are at most only likely to carry a portion of the total lightning current, apart from their function of equalising potential. These latter bonds may, therefore, be smaller in cross-sectional area than those used for the main conductors. All the bonds should be suitably protected against corrosion. Bonds shall be as short as possible.

vi) Testing Points

Each down conductor shall be provided with a testing point in a position convenient for testing but inaccessible for interference. No connection, other than one direct to an earth electrode, shall be made below a testing point. Testing points shall be phosphorbronze, gunmetal, copper or any other suitable material.

vii) Earth Terminations

1. Each down conductor shall have an independent earth termination. It should be capable of isolation for testing purposes. Suitable location for the earth termination shall be selected after testing and assessing the specific resistivity of the soil and with due regard to reliability of the sub-soil water to ensure minimum soil moistness.
2. Water pipe system should not be bonded to the earth termination system. However, if adequate clearance between the two cannot be obtained, they may be effectively bonded and the bonds should be capable of isolation and testing. The gas pipes, however, should in no case be bonded to the earth termination system.
3. It is recommended that all earth terminations should be interconnected. Common earthing, besides equalising the voltage at various earth terminations also minimises any risk to it of mechanical damage.

viii) Earth Electrodes

Earth electrodes shall be constructed and installed in accordance with section 2.5.3.

ix) Fasteners

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 made of galvanised steel or other suitable material. If fasteners are made of steel, they should be galvanised to protect them against corrosion. If they are made of any other material suitable precautions should be taken to avoid corrosion. Some samples of fasteners are shown in IS:2309-1969.

x) Earth Resistance

Each earth termination should have a resistance in ohms to earth not exceeding numerically the product of 10 and the number of earth terminations to be provided. The whole of the lightning protective system should have a combined resistance to earth not exceeding 10 ohms before any bonding has been effected to metal in or on the structure or to surface below ground.

4.4.6 Testing of Wiring Installation

After completion of wiring a general inspection is carried out by the Engineer-in-Charge or his representative to verify that the provisions of the specification and Indian Electricity Rules, 1956 have been complied with. After inspection, the following tests shall be carried out before an installation or an addition to the existing installation is put into service.

The following tests shall be done

a) The insulation resistance shall be measured by applying between earth and the whole system of conductor or any section thereof with all fuses in place and all switches closed and except in earthed concentric wiring, all lamps in position or both poles of installation otherwise electrically connected together, a DC voltage of not less than twice the working voltage, provided that it does not exceed 500 volts for medium voltage circuits. Where the supply is derived from thee-wire (AC or DC) or a polyphase system the neutral pole of which is connected to earth either direct or through added resistance, the working voltage shall be deemed to be that which is maintained between the outer or phase conductor and the neutral.

b) The insulation resistance in megohms of an installation measured as in (a) shall be not less than 50 divided by the number of points on the circuit, provided that the whole installation need not be required to have an insulation resistance greater than 1 M ohm.

c) Control rheostats, heating and power appliances and electric signs, may, if desired, be disconnected from the circuit during the test, but in that event the insulation resistance between the case or framework, and all live parts of each rheostat, appliance and sign shall be not less than that specified in the relevant Indian Standard specification or where there is no such specification shall be not less than 0.5 M ohm.

d) The insulation resistance shall also be measured between all conductors connected to one pole or phase conductor of the supply and all the conductors connected to the middle wire to the neutral on to the other pole of phase conductors of the supply. Such a test shall be made after removing all metallic connections between the two poles of the installation and in these circumstances the insulation resistance between conductors of the installation shall be not less than that specified in (b).

e) On completion of an electrical installation (or an extension to an installation) a certificate shall be furnished by the Contractor, countersigned by the certified supervisor under whose direct supervision the installation was carried out. This certificate shall be in a prescribed form as required by the local electric supply authority. In addition to this a completion certificate, as enclosed under Appendix – I.

Earthing

For checking the efficiency of earthing the following tests are recommended.

a) The earth resistance of each electrode is measured.

b) The earth resistance of earthing grid is measured.

c) All electrodes are connected to the grid and the earth resistance of the entire earthing system is measured.

These tests shall preferably be done during the summer months.

4.5 Laying

4.5.1

i) Before the cable laying work is undertaken, the route layout of the cable shall be submitted to the Engineer-in-Charge and the work shall be undertaken only after approval of the route layout.

ii) a) Whenever cables of different voltages are laid following points shall be noted while laying along well demarcated or established roads, the LV / MV cables shall be laid further from the kerb line than HV cables.

b) Cables of different voltages and also power and control cables shall be kept in different trenches with adequate separation. Where available space is restricted such that this requirement cannot be met, LV / MV cables shall be laid above HV cables.

c) Where cables cross one another, the cable of higher voltage shall be laid at a lower level than the cable of lower voltage.

iii) Proximity to communication cables.

Power and communication cables shall be as far as possible cross each other at right angels. The horizontal and vertical clearance between them shall not be less than 60 cm.

4.5.2 Methods of Laying

The cables shall be laid direct in ground, pipe, closed or open ducts, cable trays or on surface of wall etc. The method(s) of laying required shall be specified in the tender / schedule of work.

4.5.3 Laying direct in ground

i) This method shall be adopted where specified in the schedule of works. Normally this method shall be adopted when the cable route is through open ground, along roads, lanes, etc. and where no frequent excavations are likely to be encountered and where re-excavation is easily possible without affecting other services.

ii) Trenching

a) Width and depth of the trench shall be as shown in the drawing. When more than one tier of cables is unavoidable and vertical formation of laying is adopted, the depth of the trench shall be increased by 30 cm for each additional tier to be formed.

b) The trenches shall be excavated in reasonably straight lines. Wherever there is a change in the direction, a suitable curvature shall be adopted complying with the minimum bending radius specified in Table – 11. Where gradients and changes in depth are unavoidable, these shall be gradual. The bottom of the trench shall be level and free from stones, brick bats etc.

TABLE – 2

MINIMUM BENDING RADIUS – PAPER INSULATED CABLES AND XLPE CABLES

System voltage	Minimum bending radius		
	Single core	Multi core	
		Unarmoured	Armoured
11 KV	20 D	15 D	12 D
22 KV	25 D	20 D	15 D
33 KV	30 D	25 D	20 D

"D" is the overall diameter of the cable.

The excavation should be done by suitable means – manual or mechanical. The excavated soil shall be stacked firmly by the side of the trench such that it may not fall back into the trench.

c) Adequate precautions should be taken not to damage any existing cable(s), pipes or any other such installations in the route during excavation. Wherever bricks, tiles or protective covers or bare cables are encountered, further excavation shall not be carried out without the approval of the Engineer-in-Charge.

Existing property, if any, exposed during trenching shall be temporarily supported adequately as directed by the Engineer-in-Charge. The trenching in such cases shall be done in short lengths, necessary pipes laid for passing cables therein, if required.

If there is any danger of a trench collapsing or endangering adjacent structures, the sides should be well shored up with sheeting as the excavation proceeds. Where necessary, these may even be left in place when backfilling the trench.

Excavation through lawns shall be done in consultation with the department concerned.

iii) Laying of Cable in Trench

a) Sand cushioning

The excavated trench shall be provided with a layer of clean, dry sand cushion of not less than 8 cm in depth, before laying the cables therein.

However, sand cushioning may not be provided for MV cables, where there is no possibility of any mechanical damage to the cables due to heavy or shock loading on the soil above if so specified in the tender document and as per approval of the Engineer-in-Charge. Sand cushioning shall however be invariably provided in the case of HV cables.

b) The cable drum shall be properly mounted on jacks, or on a cable wheel at a suitable location, making sure that the spindle, jack etc. are strong enough to carry the weight of the drum without failure and that the spindle is horizontal in the bearings so as to prevent the drum creeping to one side while rotating.

c) The cable shall be pulled over in rollers in the trench steadily and uniformly without jerks and strain. The entire cable length shall be far as possible laid off in one stretch. PVC / XLPE cables less than 120 sq.mm size may be removed by "Flaking" i.e. by making one long loop in the reverse direction.

For short runs and sizes up to 50 sq.mm of MV cables, any other suitable method of direct handling and laying can be adopted without strain or excess bending of the cables.

d) After the cable has been so uncoiled, it shall be lifted slightly over the rollers beginning from one end by helpers standing about 10 m apart and drawn straight. The cable shall then be lifted off the rollers and laid in a reasonably straight line.

e) Testing before covering

The cables shall be tested in presence of the Engineer-in-Charge for continuity of cores and insulation resistance and the cable length shall be measured, before closing the trench.

f) Sand covering

Cables laid in trenches in a single tier formation shall have a covering of dry sand of not less than 17 cm above the base cushion of sand before the protective cover is laid.

In the case of vertical multi-tier formation, after the first cable has been laid, a sand cushion of 30 cm shall be provided over the base cushion before the second tier is laid. If additional tiers are formed, each of the subsequent tiers also shall have a sand cushion of 30 cm as stated above. Cables in the top most tier shall have a final sand covering not less than 17 cm before the protective cover is laid.

Sand covering as stated above need not be provided for MV cables where a decision is taken by the Engineer-in-Charge as per subclause (iii-a) above, but the inter tier spacing should be maintained with soft soil instead of sand between tiers and for covering.

Sand cushioning shall however be invariably provided in the case of HV cables.

g) Extra loop cable

At the time of original installation, approximately 3 m of surplus cable shall be left on each terminal end of the cable and on each side of the underground joints. The surplus cable shall be left in the form of a loop. Where there are long runs of cables such loose cable may be left at suitable intervals as specified by the Engineer-in-Charge.

Where it may not be practically possible to provide separation between cables when forming loops of a number of cables as in the case of cable emanating from a substation, measurement shall be made only to the extent of actual volume of excavation, sand filling etc and paid for accordingly.

h) Mechanical protection over the covering

Mechanical protection to cables shall be laid over the covering to provide warning to future excavators of the present of the cable and also to protect the cable against accidental mechanical damage by pick-axe blows etc. as follows :

a) Unless otherwise specified, the cables shall be protected by second class brick of nominal size 22 cm x 11.4 cm x 7 cm or locally available size, placed on top of the sand (or, soil as the case may be). The bricks shall be placed breadthwise for the full length of the cable. Where more than one cable is to be laid in the same trench, this protective covering shall cove all the cables and projects at least 5 cm over the sides of the end cables.

b) Where bricks are not easily available, or are comparatively costly, there is no objection to use locally available material such as tiles or slates or stone / cement concrete slabs. Where such an alternative is acceptable, the same shall be clearly specified in the tender specifications.

iv) Backfilling

a) The trenches shall be then backfilled with excavated earth, free from stones or other shall edged debris and shall be rammed and watered, if necessary in successive layers not exceeding 30 cm depth.

b) Unless otherwise specified, a crown of earth not less than 50 mm and not exceeding 100 mm in the centre and tapering towards the sides of the trench shall be left to allow for subsidence. The crown of the earth, however, should not exceed 10 cms so as not to be a hazard to vehicular traffic.

c) The temporary restatements of roadways should be inspected at regular intervals, particularly during wet weather and settlements should be made good by further filling as may be required.

d) After the subsidence has ceased, trenches cut through roadways or other paved areas shall be restored to the same density and materials as the surrounding area and repaved in accordance with the relevant building specifications to the satisfaction of the Engineer-in-Charge.

e) Where road berms of lawns have been cut out of necessity, or kerb stones displaced, the same shall be repaired and made good, except for turfing / asphalting, to the satisfaction of the Engineer-in-Charge and all the surplus earth or rock shall be removed to places as specified.

v) Laying of single core cables

a) Three single core cables forming one three phase circuit shall normally be held in close trefoil formation and shall be bound together at intervals of approximately 1 m.

b) The relative position of the three cables shall be changed at each joint at the time of original installation, complete transposition being effected in every three consecutive cable lengths.

vi) Route markers

a) Location

Route markers shall be provided along with the runs of cable at locations approved by the Engineer-in-Charge and generally at intervals not exceeding 100m. Markers shall also be provided to identify change in the direction of the cable route and locations of underground joints.

b) Plate type marker

Route markers shall be made out of 100 mm x 5 mm G.I. / aluminium plate welded / bolted on 35 mm x 35 mm x 6 mm angel iron, 60 cm long. Such plate markers shall be mounted parallel to and at about 0.5 m away from the edge of the trench.

c) CC marker

Alternatively, cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate of 20 mm in size) as shown in figure 2 shall be laid flat and centered over the cable. The concrete markers, unless otherwise instructed by the Engineer-in-Charge, shall project over the surrounding surface so as to make the cable route easily identifiable.

d) Inscription

The words PCBA-MV / HV CABLE as the case may be shall be inscribed on the marker.

4.5.4 Laying in Pipes / Closed Ducts

i) In locations such as road crossing, entry in to buildings, paved areas etc., cables shall be laid in pipes or closed ducts. Stone ware pipes, GI, CI or spun reinforced concrete pipes shall be used for cables as specified in the schedule of works.

ii) Following guide of the pipe fill shall be used for sizing the pipe size :

a) 1 cable in pipe ıll

b) 2 cables in pipe ıll

c) 3 or more cables ıll

d) Multiple cables ıll

iii) Where cables pass through foundation walls or other underground structures, the necessary ducts or openings will be provided in advance for the same. However, should it become necessary to cut holes in existing foundations or structures, the electrical contractor shall determine their location and obtain approval of the Engineer-in-Charge before cutting is done.

iv) At road crossing and other places where cables enter pipe sleeves adequate bed of sand shall be given so that the cables do not slack and get damaged by pipe ends.

v) At road crossings, the top surface of pipes shall be at a minimum depth of 1 m from the pavement level. When pipes are laid cutting existing road, care shall be taken so that the soil filled up after laying the pipes is rammed well in layers with watering as required to ensure proper compaction. A crown of earth not exceeding 10 cm should be left at the top.

After the subsidence has ceased, the top of the filled up trenches in road ways or other paved areas shall be restored to the same density and material as the surrounding area in accordance with the direction of the Engineer-in-Charge (Civil) up to his satisfaction.

vi) All G.I. pipes shall be laid as per layout drawings and site requirements. Before fabrication of various profiles of pipe by hydraulically operated bending machine (which is to be arranged by the Contractor), all the burrs from the pipes shall be removed. G.I. pipes with bends shall be buried in soil / concrete in such a way that the bends shall be totally concealed. For G.I. pipes buried in soil, bitumen coating shall be applied on the buried lengths. Installation of G.I. pipes shall be undertaken well before paving is completed and necessary coordination with paving agency shall be the responsibility of Electrical Contractor. The open ends of pipes shall be suitably plugged with G.I. plugs after they are laid in final position. G.I. plugs shall be supplied by the Contractor at no extra cost.

4.5.5 Laying in Open Ducts.

a) Open ducts with suitable removable covers (RCC slabs or chequered plates) are generally provided in substations, switch rooms, plant rooms, workshops etc. for taking the cables. The cable ducts should be of suitable dimensions for the number of cables involved.

b) Laying of cables with different voltage ratings in the same duct shall be avoided. Where it is inescapable to take HV & MV cables same trench, they shall be laid with a barrier between them or alternatively, one of the two (HV / MV) cables may be taken through pipe(s).

Splices or joints of any type shall not be permitted inside the ducts.

c) The cables shall be laid directly in the duct such that unnecessary crossing of cables is avoided.

d) Where specified, cables may be fixed with clamps on the walls of the duct or taken in hooks / brackets / cable trays through in ducts.

e) Where specified, ducts may be filled with dry sand after the cables are laid and covered as above, or finished with cement plaster, specially in high voltage applications.

4.5.6 Laying on Surface

The method may be adopted in places like switch rooms, workshops, tunnels, rising (distribution) mains in buildings etc. This may be necessitated in the works of additions and / or alternations to the existing installation, where other methods of laying may not be feasible. Cables may be laid in surface by any of the following methods as specified :

a) Directly clamped by saddles or clamps

b) Supported on cradles

c) Laid on troughs / trays, duly clamped.

4.5.7 Laying on Cable Tray

This method may be adopted in places like indoor substations, air-conditioning plant rooms, generator rooms etc. or where long horizontal runs of cables are required within the building and where it is not convenient to carry the cable in open ducts. This method is preferred where heavy sized cables or a number of cables are required to be laid. The cable trays may be either of perforated sheet type or ladder type as specified.

4.5.8 Jointing

i) Location

a) Before laying a cable, proper locations for the proposed cable joints, if any, shall be decided, so that when the cable is actually laid, the joints are made in the most suitable places. As far as possible, water logged locations, carriage ways, pavements, proximity to telephone cables, gas or water mains, inaccessible places, ducts, pipes, racks etc. shall be avoided for locating the cable joints.

b) Joints shall be staggered by 2 m to 3 m when joints are to be done for two or more cables laid together in the same trench.

ii) Joint pits

a) Joints pits shall be of sufficient dimensions as to allow easy and comfortable working. The sides of the pit shall be well protected from loose earth falling into it. It shall also be covered by a tarpaulin to prevent dust and other foreign matter being blown on the exposed joints and jointing materials.

b) Sufficient ventilation shall be provided during jointing operation in order to disperse fumes given out by fluxing.

iii) Safety precaution

a) A caution board indicating “CAUTION – CABLE JOINTING WORK IN PROGRESS” shall be displayed to warn the public and traffic where necessary.

b) Before jointing is commenced, all safety precautions like isolation, discharging, earthing, display of caution board on the controlling switchgear etc. shall be taken to ensure that the cable wound not be inadvertently charged form live supply. Metallic armour and external metallic bonding shall be connected to earth. Where “Permit to Work” system is in vogue, safety procedures prescribed shall be complied with.

iv) Jointer

Jointing work shall be carried out by a licensed / experienced (where there is no licensing system for jointers) cable jointer.

4.5.9 Testing

i) Testing before laying

All cables, before laying, shall be tested with a 500 V megger for cables of 1.1 KV grade, or with a 2500 / 5000 V megger for cables of higher voltage. The cable cores shall be tested for continuity, absence of cross phasing, insulation resistance from conductors to earth / armour and between conductors.

ii) Testing before backfilling

All cables shall be subjected to the above mentioned tests, before covering the cables by protective covers and backfilling and also before taking up any jointing operation.

iii) Testing after laying

After laying and jointing, the cable shall be subjected to a 15 minutes pressure test. The test pressure shall be as given in Table – III. DC pressure testing may normally be preferred compared to AC pressure testing.

TABLE – 3

TEST PRESSURE IN KV

Working Volts in KV	AC 15 minutes test		DC 15 minutes test	
	Between conductors	Conductor to earth	Between conductors	Conductor to earth
Up to 1.1	2.0	2.0	3.0	3.0
3.3	6.0	3.5	9.0	5.0
6.6	12.0	7.0	18.0	10.5
11	20.0	11.5	30.0	17.5
22	40.0	23.0	60.0	35.0
33	-	-	-	60.0

b) In the absence of facilities for pressure testing as above, it is sufficient to test for one minute with 1,000 V megger for cables of 1.1 KV grade and with 2500 / 5000 V megger for cables of higher voltages.

4.5.10 Measurement

All measurement will be made as per guidelines laid under the latest edition of the General Specifications for Electrical works (Part – I and II) of CPWD. All the works in progress will be jointly measured by the representative of the Engineer-in-Charge and the Contractor's Authorized agent. Such measurements will be got recorded in the measurement book by the Engineer-in-Charge or his Authorized representative and signed in token of acceptance by the Contractor or his Authorized representative.

4.6 Construction Equipment / Testing Instrument

The Contractor shall have all necessary construction equipment, tools and tackles, testing instruments to carry out the erection works and to commission the system as specified. A list of construction equipment which contractor possesses with quantity shall be indicated in the bid along with model numbers and make. These shall include but not limited to the following and these shall be brought to site by Contractor before the start of work.

A. Equipment

1. **Portable grinder**
2. **Portable welding machine**
3. **Portable gas cutting / welding set**
4. **Pipe threading machine**
5. **Pipe bending machine (hydraulic)**
6. **Portable drill machine suitable to take up drilling for different sizes as per requirement**
7. **Dewatering pumpsets (diesel driven)**
8. **Power hacksaw**
9. **Conduit dye set**
10. **Hydraulic crimping machine**
11. **Hand crimping tool**
12. **Portable electric blowers, vacuum cleaners**
13. **Miscellaneous items such as sling, pulleys tarpaulins, wooden sleepers, ladders, etc. as required**
14. **Safety belts, safety goggles, hand gloves**
15. **Separate tool kit for each electrician**

B. Test Instruments

1. **Insulation tester 0-500-1000 V hand driven**
2. **Insulation tester 2500 / 5000 V motor driven**
3. **Phase sequence indicator**
4. **Earth megger**
5. **Single phase variac**
6. **3 phase variac**
7. **AVO – meter / multimeter**
8. **Portable ammeter, wattmeter, P.F. meter**
9. **Portable voltmeter**
10. **Clip on meters of different ranges**
11. **Tachometer**
12. **Kelvin's double bridge for measurement of very low resistance**
13. **DC high pot test kit**
14. **LUX METER to measure illumination levels**

APPENDIX – I

FORM OF COMPLETION CERTIFICATE

Internal electrical installation

I / we certify that the installation detailed below has been installed by me / us and tested and that the best of my / our knowledge and belief it complies with Indian Electricity Rules, 1956, as well as the specification of the Member Secretary, Pollution Control Board, Assam,

Electrical installation at ……

Voltage and system of supply …….

1. Particulars of work :

a) Internal electrical installation

	No.	Total load	Type or system of wiring
i) light point			
ii) fan point			
iii) plug point			
a) 3 pin 5 amp			
b) 3 pin 15 amp			
iv) others			

		Description	HP / KW	Type of starting
Motors	i)			
	ii)			
	iii)			

v) other plants

b) i) total length of underground cables and its size

c) No. of joints

End joint
Tee joint
St. through joint

c) Earthing

i) Description of earthing electrode

ii) No. of earth electrodes

iii) Size of main earth lead

2. Test results :

a) Insulation resistance

i) Insulation resistance of the whole system of conductors to earth M-ohms

ii) Insulation between the phase conductor and neutral

Between phase R and neutral	M-ohms
Between phase Y and neutral	M-ohms
Between phase B and neutral	M-ohms

iii) Insulation resistance between the phase conductors in case of polyphase supply

Between phase R and neutral	M-ohms
Between phase Y and neutral	M-ohms
Between phase B and neutral	M-ohms

b) Polarity test

Polarity of non linked single pole branch switches

c) Earth continuity test :

Maximum resistance between any point in the earth continuity conductor including metal conduits and main earthing lead …..…… Ohms.

d) Earth electrode resistance

i) ……. Ohms
ii) ……. Ohms
iii) ……. Ohms

e) Lightning protective system

Resistance of the whole of lightning protective system to earth before any bonding is effected with earth electrode and metal in / on the structure ……..…… Ohms.

Signature and name of Junior Engineer (E) / AE(E)

Signature and name of the Contractor

SPECIFIC TECHNICAL REQUIREMENTS :

1. All wiring for light and power circuits shall be in PVC conduits recessed in wall / ceiling.
2. All wires for point wiring and the single core wires specified for sub main and circuit wirings shall be 1.1 KV grade PVC insulated FR copper multistrand wires of approved brand. The underground cables indicated in the drawings shall however, be PVC insulated and sheathed armoured aluminium underground cables of approved brands.
3. All 6A receptacles shall be flush type and shall have 5 pins with 1 pin for earth connection and 2 pins each for phase and neutral connections. 16A receptacles shall have 6 pins (suitable for connecting both 6A and 16A plug tops) with 2 pins each for phase, neutral and earth connections.
4. Samples of all the materials to be used in the work shall be submitted to the Superintending Engineer (Elect.), PCBA for approval. No material other than those approved by the PCBA shall be used in any of the works.

   In case of any materials other than those approved by the SE (Elect.) is detected, the same shall be replaced by the Tenderer with the approved quality, free of cost, failing which, the owner shall have right to withhold all pending bills due to the Contractor, until the rectification / replacement work is completed.
5. Experienced & professional sub-contractors shall be engaged for specialized works like – air conditioning, audio system and fire detection & alarm system. Prior approval of the sub-contractors from the Engineer-in-Charge is mandatory.
6. All materials, equipments and accessories shall be of makes listed as enclosed. Makes of any item(s) not specified under the list, but required in the work shall be approved by the Engineer-in-Charge prior to use in the works.

LIST OF APPROVED MAKES OF MATERIALS :

Sl. No	Name of Materials	Manufactures / Brand names
1	Conduits pipes & accessories – MS PVC	 BEC / AKG (ISI marked) BERLIA / AKG / HARSH (ISI marked)
2	Bushes	Rubber / PVC of superior quality.
3	Wire (Copper conductor)	FR copper wire (FINOLEX / HAVELLS / RR KABEL / POLYCAB / ANCHOR).
4	Cable (underground)	GLOSTER / CCI / INCAB / INDUSTRIAL CABLES / RPG / UNIVERSAL / NICCO / HAVELLS / POLYCAB / CRYSTAL / FINOLEX
5	Cover plate	Hylum sheet 3 mm thick of colour & design as approved
6	Cover plate fan box	Formica of approved shade 2 mm thick
7	Switch & Socket -	
	Flash Piano type -	ANCHOR / KOLORS / GOLDMEDAL (ISI) or equiv.

	Modular type -	MK / CRABTREE / LEGRAND / SCHNEIDER / PHILIPS
8	Switch fuse unit (HRC Type) (re-wirable type)	ENGLISH ELECTRIC / L&T / SIEMENS / CONTROL & SWITCHGEAR
9	a) Fuse bases for HRC fuse for feeder pillar b) HRC fuses	SIEMENS / L&T / STANDARD E.E. / L&T / SIEMENS
10	MCB	LEGRAND / SIEMENS / SCHNEIDER / L&T / ABB / HAVELLS / HAGER
11	Distribution Board MCB type	LEGRAND / SIEMENS / SCHNEIDER / L&T / ABB / HAVELLS / HAGER
12	Telephone cables	DELTON / FINOLEX / POLYCAB
13	Computer cable: Cat - 6	AMP / D-LINK / LEGRAND / RR KABEL / KRONE
14	Computer jack : RJ-45	AMP / D-LINK / LEGRAND / SYSTIMAX / KRONE
15	Screws	Good quality brass screws
16	Ceiling Rose	ANCHOR / MK / GOLDMEDAL / KOLORS
17	ELCB / RCCB	LEGRAND / SIEMENS / L&T / ABB / HAVELLS / SCHNEIDER / HAGER
18	MCCB	GE / L&T / SCHNEIDER / CONTROL & SWITCHGEAR / CROMPTON GREAVES / ABB / C&S / HAVELLS / LEGRAND / HAGER
19	Air Circuit Breaker	L&T / SIEMENS / SCHNEIDER / CROMPTON GREAVES / ABB / CONTROL & SWITCHGEAR.
20	Industrial type Metal clad sockets & plugs	LEGRAND / SIEMENS / SCHNEIDER / L&T / HAVELLS / ABB.
21	Meter, Metering, Equipment & C.T.s	A) AUTOMATIC ELECTRIC B) CONZERV C) RISHAV d) MECO E) NIPPON
22	Electronic Energy Meter	HPL / CONZERV / L&T / RISHAV
23	Exhaust Fan	ALSTOM / ORIENT / CROMPTON / HAVELS
24	Ceiling Fan	ORIENT / CROMPTON / BAJAJ / HAVELS / BERLIA
25	Electronic Step Fan Regulator	ANCHOR / KOLORS / MK or equiv.
26	Lugs	“DOWELLS” crimping type
27	MDBs / BDBs / SDBs	CPRI approved vendors, having facilities for powder coated finish and antirust treatment by seven / eight tank process (vendor detail shall be submitted for approval)
28	APFC Panel	SCHNEIDER or equivalent subject to approval.
29	Bus-bar trunking system	Control & Switchgear or equiv.
30	Light fittings	Makes & catalogue reference shown in the BOQ or equivalent from the brands – Philips / Crompton / Bajaj / Wipro / Havells – subject to approval.