CIPET: CENTRE FOR SKILLING AND TECHNICAL SUPPORT (CSTS)
Haldia
(Ministry of Chemicals & Fertilizers, Govt. of India)

TENDER DOCUMENT OF TECHNICAL BID
(To be used for furnishing Tender by the eligible firms)

Repairing & Renovation Work of Administrative & Academic Building of CIPET:CSTS- Haldia Centre at

CITY CENTRE, DEBHOG, HALDIA, DIST.: PURBA MEDINIPUR, PIN: 721657, WEST BENGAL

CONSULTANTS : -

ARKHTON,
Architects, Engineers, Planners
Jagannathpur, P.O.: Mahishadal
Dist.: Purba Medinipur, West Bengal.
Ph. 9434010913,
E-Mail: prantik_samanta@yahoo.com

EMPLOYER:-

CIPET :CSTS
City Centre, P.O.: Debhog
Haldia, Dist.: Purba Medinipur
West Bengal, PIN.: 721657
Ph. 03224-255533, 255534
E-Mail: cipet.haldia@gmail.com

Index

INTRODUCTION:-

Central Institute of Plastics Engineering & Technology (CIPET) was established in 1968 by Government of India with the assistance of United Nations Development Programme (UNDP) at Chennai. The main objective of setting up of the institute was to develop manpower in different disciplines of Plastics Engineering & Technology as no similar institute was in existence in the country. International Labour Organization (ILO) served as the executing agency. During the initial project period between 1968 and 1973, the institute achieved the targets envisaged and was rated as one of the most successful UNDP projects implemented worldwide. Today CIPET is a premier national institution under the Ministry of Chemicals & Fertilizers, Govt. of India fully devoted to Skill Development, Technology Support Services, Academic and Research (STAR) in all the domains of plastics viz:- Design, CAD/CAM/CAE, Tooling & Mould Manufacturing, Plastics processing, Testing and Quality Assurance. CIPET operates from various locations spread across the country catering the needs of Polymer and allied industries.

Post-independence, it became a matter of concern that Plastic Engineering & Technology was a growing science and yet there was not enough human resource to meet the demand. Imperative need was felt to establish CIPET -- the unique institute of its kind in the country and even today the institute holds a premier position. The primary objective of CIPET has been contributing towards the growth of the plastics industry through a combined program of education and research. The Institute has evolved through the years, creating closer ties with industries with the intent to create innovative plastic based solutions which are resource efficient and marketable. This has led to an exponential growth with activities and programs focusing on:

Skill Training

Technology Support

Academics

Research

CIPET: CENTRE FOR SKILLING AND TECHNICAL SUPPORT (CSTS)
(Department of Chemicals & Petrochemicals, Chemicals & Fertilizers, Govt. of India)
City Centre, PO: Debhog, Haldia,Dist. Purba Medinipur. Pin Code: 721657. West Bengal.
Ph.No : 03224-255444/255404/255534 Tele fax : 03224-253016
E – mail : haldia@cipet.gov.in, cipet.haldia@gmail.com.
Website : www.cipet.gov.in

Notice Inviting E-Tender

Date: 12-12-2019

E-Tender No.: CIPET/HAL/ E-TEN.-01/Repairing & Renovation Work/Construction/2019-2020

CIPET:CSTS- Haldia invites E- Tender in two Bid Systems (Technical and Financial) are invited from govt./govt. organization registered contractor for Repairing & Renovation Work of Administrative & Academic Building at their own campus with an estimated cost of approx. Rs. 80,41,800.00 (Rupees Eighty Lakh Forty One Thousand Eight Hundred approx).

E-Tender No. & Date	Estimated Cost (Approx) Rs.	EMD Rs.	Completion Time	Tender Fees in Rs.	Last Date & Time of online Bid submission
CIPET/HAL/ E-TEN.-01/Repairing & Renovation Work/Construction/2019-2020 **Date: 12-12-2019**	Rs. 80,41,800.00 (Rupees Eighty Lakh Forty One Thousand Eight Hundred).	1,60,836.00 /- (2 % of Contract amount)	12 months	**3,000/- (Non refundable)**	10.01.2020 13.00 Hrs.

Interested and eligible bidders may view and download detailed tender documents from CIPET's e -Tender portal www.tenderwizard.com/CIPET, www.cipet.gov.in. **All Bids must be submitted through the online portal www.tenderwizard.com/CIPET**. However, Bidders are also requested to submit a hard copy of the online Technical Bid duly sealed and signed to the Director & Head, CIPET:CSTS, City Centre, P.O.: Debhog, Haldia, Dist.: Purba Medinipur. Pin Code: 721657, West Bengal, on- **10-01-2020 up to 13.00 Hrs. Bidders are requested not to submit hardcopy of financial bid to the office.**

The Tender Fee and EMD will be accepted in the form of Demand Draft drawn on any Indian Nationalized Bank favouring **"CIPET Haldia'' Payable at Haldia** and shall be submitted at CIPET:CSTS- Haldia as specified on or before 10-**01-2020 up to 13.00Hrs**. in separate sealed cover failing which bids will be summarily rejected. However, a soft copy of the Tender Fee and EMD instruments shall also be uploaded along with the Technical Bid to be submitted online exempt from EMD Classes. Prevailing Govt. rule will be applicable for exemption of EMD for SSI unit Bidder or others as applicable. But they must deposit the security deposit of 2% of bid value in the form of demand draft in favour of "CIPET Haldia'' Payable at Haldia within seven days of accepting work order, if they will qualify as lowest bidder. No other mode of payment such as chaque, bank guarantee etc are acceptable. If after accepting the work order the bidder fails to pay the security deposit within seven days as mentioned above their order will be cancelled.

Salient information about the E-Tenders :

1. **Mode of submission:** ONLINE. No offline Tenders will be accepted.

2. **Availability of Tender Documents:** All Bid (Technical & Financial) are available ONLINE at CIPET'S e-Tender portal www.tenderwizard.com/CIPET, www.cipet.gov.in. The registered tenderers can download the Bids from this website.

3. **Who can participate for this e-Tender:** The registered tenderers of CIPET through www.tenderwizard.com/CIPET can only participate in this tender process.

4. **How to register by a vendor:**

(a) The prospective bidders have to register with CIPET through the E-tender portal of CIPET at www.tenderwizard.com/CIPET by online payment of Rs. 1,500/- + GST (As Applicable) to M/s KSEDC LTD. (KEONICS). On completion of the registration process, the bidders will be provided user ID and password. After receipt of User ID & Password, Bidders can log on at our e-Tender portal for downloading & uploading tender documents.

(b) Tender documents Fees of Rs. 3,000/- is payable to CIPET, Haldia in the form of Demand Draft from any Nationalize Bank drawn on or before opening date of the tender document.

(c) Processing Fees is Rs. 7,080/-(including taxes) payable Online separately to M/s KSEDC LTD. (KEONICS).

5. **Is there any device requirement for participation in e-Tender**: Yes, Bidders should have valid class 3 Digital Signature Certificate (DSC) device for participating in e -Tender. For integrity of data and its authenticity/ non – repudiation of electronic record and to be compliant with IT Act 2000, it is necessary for each user to have a Digital Certificate (DC), also referred to as Digital Signature Certificate (DSC) of class-III Issued by a Certifying Authority (CA) Licensed by Controller of Certifying Authorities (CCA) [refer http: //www.cca.gov.in].

6. Contact details for e-Tender related issue:

Name of Service Provider: M/s KSEDC LTD. (KEONICS)		
Contact Person	Telephone/ E-mail	Remarks
Local Representative of		For, Vendor registration/DSC/any other issue regarding e-Tender Process, Please contact M/s KSEDC LTD. (KEONICS) as the details given in the previous Columns.
M/s KSEDC LTD. (KEONICS) (Haldia) 1. Mr. Aslam Helpdesk:	Mobile: 8641967966 Email: twhelpdesk719@gmail.com, Email : cipethelpdesk@gmail.com	

7. Bidders are hereby advised that all the documents to be submitted online are kept scanned and converted to PDF format in a separate folder on their computers before starting online submission. The schedule of rate (Excel Format) may be downloaded and rates may be filled appropriately in this format only. This file may also be saved in a separate folder on your computer.

8. While uploading /submitting the documents, it should be ensured that the file name should be the name of the documents itself.

9. All pages of Tender documents with Addenda/ Corrigenda (if any) must be signed with proper official stamp and date by the Bidders / or authorized power of attorney holder at the lower right hand corner.

10. Bidders are advised to **visit CIPET's e- Tender portal regularly for any Addenda / Corrigenda** (if any) with regard to the e- Tender for which no separate paper advertisement will not be published.

11. **Pre Bid Meeting:** 19-12-2019 at 14.30 Hrs at CIPET:CSTS, Haldia. Interested bidder may participate in pre bid meeting with prior intimation to the CIPET, Haldia authority for any clarification regarding technical specification.

12. **Last date of online submission of Tender bid: 10-01-2020** before 13.00 Hrs.

13. **EMD and Tender Fee** must be in approved mode and Duly Signed & Sealed in separate cover along with filled Technical Bid and with necessary enclosures shall be submitted in physical from (hard copy) in person/by speed post on or before 10-01-2020 before 13.00Hrs at CIPET:CSTS, Haldia, non-receipt of which the Tender are liable for rejection. EMD may be converted into Security deposit after awarding the contract to L1 party on his request letter.

14. **Date & Time of Technical Bid Opening**: **10-01-2020** at 14.30 Hrs.

15. **Date & Time of Financial Bid Opening**: Technically qualified bidders will be intimated the date & time after technical bid evaluation through the e- Tender portal.

16. **Venue for Opening Bids**: CIPET:CSTS, City Centre, PO.: Debhog, Haldia, Dist. Purba Medinipur, Pin Code: 721657, West Bengal.

17. **Eligibility Criteria:**

1. Age of the Firm	More than 03 Years as on 31st December 2019.
2. Average Annual Turnover:	**Average Rs. 100.00 Lakh /Year** & above in last three financial year (2016-17, 2017-18 & 2018-19)
3. Individual Work Order:	Certificates of having Completed civil work (Earth work and Bituminous Road, Concrete Road , Drains , Fencing &Boundary Wall work will not be entertained) of **value not less than 50.00 lakh as single order in the financial year during the last three years (2016-17, 2017-18 & 2018-19)** in a govt. / govt. organization.(i.e. PWD, CPWD, Zilla Parishad, Development Authorities, Municipalities, Central / State Govt. Undertaking Organization/Institution / reputed National Organization only). **Please enclose copy of work orders, work schedule, completion certificates & necessary payment documents as supporting documents.**
4. Capabilities & Capacity:	(i) **Audited Balance Sheet of the firm for last three financial years. (2016-17, 2017-18 & 2018-19) and Copies of certificates / documents i.e. I.T.C, GST, PAN** (ii) **Profile of the Firm including staff strength, T&P, List of Machineries etc.** (iii) **Registration / Enlistment with Govt. / Govt. Organizations. (i. e. PWD, CPWD, Zilla Parishad,**

Development Authorities, Municipalities, Central / State Govt. Undertaking Organization only).

CIPET reserves the absolute right to accept / reject any or all bids at any stage of the process without assigning any reason whatsoever.

Director & Head
CIPET, Haldia

INSTRUCTIONS TO BIDDERS

Section- A

INTRODUCTION

CIPET:CSTS, Haldia Centre intends to undertake Repairing & Renovation Work of Administrative & Academic Building at CIPET:CSTS, Haldia campus at

The Director & Head
CIPET:CSTS, Haldia
City Centre, P.O.: Debhog,
Haldia, Dist.: Purba Medinipur,
West Bengal, Pin: 721657
Phone No. 03224-255533, 255534
E-Mail: cipethaldia@gmail.com

The bidder shall bear all costs associated with the preparation and submission of the bid, and OWNER (CIPET) will, in no case, be responsible or liable for these costs, regardless of the conduct or outcome of the bidding process.

1.0 GENERAL GUIDANCE FOR e-TENDERING

Instructions/ Guidelines for electronic submission of the tenders online have been annexed for assisting the contractor to participate in e- Tendering.

2.0 REGISTRATION OF CONTRACTOR

Any contractor willing to take part in the process of e-Tendering will have to be enrolled & registered with the Government e-Procurement system, through logon to www.tenderwizard.com/CIPET (the web portal of public works department).

3.0 DIGITAL SIGNATURE CERTIFICATE (DSC)

Each contractor is required to obtain a class-III Digital Signature Certificate (DSC) for submission of tenders, from the approved service provider of the National Informatics Centre (NIC) on payment of requisite amount. The details are available at the website stated in Clause 2. DSC is given as a USB e-Token.

4.0 COLLECTION OF NIT& TENDER DOCUMENTS

The contractor can search, download Notice for Invitation of Tender (NIT) and Tender Documents electronically from Internet through log-on to the website mentioned above in Cl. 2 using Digital Signature certificate. This is the only mode of collection of Tender Documents.

5.0 PARTICIPATION IN MORE THAN ONE WORK

A prospective bidder may participate in the job either on the capacity of individual or as a firm. If found one has applied severally in a single job, all his applications will be rejected for that job.

A prospective Tender (including his participation in partnership) shall be allowed to participate in a single work as mentioned in the list of Works(s) of NIT.

6.0 SUBMISSION OF TENDER

General process of submission: Tenders are to be submitted online through the website stated in Clause 2 in two folders at a time for each work, one in Technical proposal and the other in Financial proposal within the prescribed date and time using the Digital Signature Certificate (DSC). The documents are to be uploaded in virus free scanned copy duly Digitally Signed. The documents should be encrypted (transformed into non readable formats).

A) TECHNICAL PORPOSAL

The Technical proposal should contain scanned copies of the following Tender Documents in two covers (folder) namely Statutory Cover and Non-Statutory Cover:-

A-1) Statutory Cover containing

i) Application (ITB, Section-B, From -1)

ii) Demand Draft towards Tender Fee & Earnest Money Deposit (EMD) as prescribed in the NIT against each of the serial of work in favour of CIPET Haldia.

iii) If any contractor is exempted from payment of Tender Fee & EMD, copy of relevant Government order needs to be furnished. Decision of CIPET Authority will be final in this regard,

iv) NIT (Properly download / digitally sign and upload the same)

v) Special Terms & Conditions and supporting documents as required (properly download, digitally sign and upload the same)

A-2) Non –Statutory Cover containing

i) Valid and up to date Professional Tax (PT) deposit receipt Challan, GST Registration Certificate, Income Tax Return certified by CA Acknowledge ment Receipt, Income Tax & PAN Card and Aadhar /voter ID Card.

ii) Proprietorship Firm-Trade License

iii) Partnership Firm-Registered Deed of partnership Firm, Registered power of Attorney, Trade License.

iv) Private Limited Company- Registration Certificate under Company Act, Memorandum of Association (MOA) & Articles of Association (AOA), Registered power of Attorney, Trade License.

v) Power of Attorney (For Partnership Firm/ Private Limited Company).

vi) In case of proprietorship and partnership Firms, the Tax Audit Report under I.T.Act in 3CD Form and in case of Private Limited Company, the Audit Report under Companies Act to be furnished along with Balance Sheet, Profit & Loss Account for the last 3 years (year just preceding the current financial year will be considered as year-1) including all schedules forming the part of Balance Sheet and profit & Loss Account should be in favour of applicant. No other name along with applicant's name in such enclosure will be entertained.

vii) Registered Unemployed Engineer's Co-operative Societies/ Labour Co.-Op. Societies are required to furnish the following valid and up to date document:-

a) Current "No Objection Certificate" from the Assistant Registrar of Co-operative societies.
b) Supporting documents showing area of operation.
c) Bye-laws duly approved by the Assistant Registrar of Co-operative Societies.
d) Name with address and signature of the present Board of Directors of the Co-operative Society.
e) Minutes of last Annual General Meeting and Audit Report of the Co – operative Society with the evidence of submission of the same to the Authorities.

viii) Financial Statement for assessment of available Bid Capacity as per prescribed format (ITB, Section- B, Form-II)

ix) Organization chart showing the structure of the company with names of key personnel and Technical Staff with Bio-data along with Structure & Organization. (ITB, Section- B, Form-III)

x) Affidavit (Ref:-format shown in "Affidavit-X" & "Affidavit-Y" of ITB, Section-B).

xi) Credential as mentioned in the Sl. 16 of page 3

xii) Experience profile (Form – IV)

xiii) Deceleration (Form-V)

Note :- Failure of submission of any of the above mentioned documents will render the tender liable to be summarily rejected for both Statutory & Non Statutory Cover.

THE ABOVE STATED NON- STATUTORY/TECHNICAL DOCUMENTS SHOULD BE UPLOADED IN THE FOLLOWING MANNER

Click the check boxes beside the necessary documents in the My Document list and then click the tab "Submit Non Statutory Documents" to send the selected documents to Non-Statutory folder. Next Click the tab "Click to Encrypt and upload" and then click the "Technical" Folder to upload the Technical Documents.

Sl. No.	Category Name	Sub- Category Description	Document Name (For details see cl. 6 A-2 OF Section-A of ITB & relevant clauses of NIT)
A.	CERTIFICATES	CERTIFICATES	1. P.T. deposit receipt Challan
			2. GST Registration Certificate
			3. I.T.R. Acknowledgement Receipt
			4. I.T. PAN Card
			5. Voter ID Card
B.	COMPANY DETAILS	COMPANY DETAILS	1. Proprietorship Firm - Trade License.
			2. Proprietorship Firm - Registration Certificate Deed, Registered Power of Attorney, Trade License.
			3. Pvt. Ltd. Company- Registration Certificate under Company's Act, MOA & AOA, Registered power of Attorney, Trade License.
			4. Registered Un-employed Engineers and Labour Co-operative Societies Ltd.-According to CI.6(x) of NIT.
C.	CREDENTIAL	CREDENTIAL	1. Experience Profile- List of completed Projects of similar nature (ITB, Section – B, Form –IV). With Supporting documents like work completion certificate, work orders, work schedules etc.
			2. Amount of Final Bill/ Payment Certificate from the concerned office of CIPET which is applicable for eligibility in this bid [According to CI. 67 to 75 of NIT].
D.	EQUIPMENTS	PLANT & MACHNINERIS	1. List of machineries owned (As per NIT & Declaration ITB, Section- Form-IV).
E.	FINANCIAL (INFO)	WORK IN HAND	Authenticated copy
		PAYMENT CERTIFICATE	Only Payment Certificate of work issued by the concerned E.E. not the TDS certificate.
		TAX AUDIT REPORT, PROFIT & LOSS A/C AND BALANCE SHEET	Tax Audit Report under I.T. Act in 3CD form/Audit Report under Companies Act along with Balance sheet and profit and Loss A/c for the last 3years (year just preceding the current financial year will be considered as year – 1).
		FINANCIAL STATEMENT, ASSESSMENT OF BID CAPACITY	Financial Statement, Assessment of Bid Capacity (ITB, Section – B, Form –II).
F.	DECLARTION	STRUCTURES & ORGANISATION	1. Details of Structures and Organisation (ITB, Section – B, Form –III).
		AFFIDAVIT	1. An affidavit declaring List of Work in Progress and Work Order issued but work not started. (ITB, Section – B, Affidavit – X).
			2. An affidavit made that no adverse report against the bidder (ITB, Section – B, Affidavit –Y & Form-V).

B) FINANCIAL PROPOSAL

i. The financial proposal should contain the Bill of Quantities (B.O.Q) in one cover (folder). The contractor is to quote the rate in figure online through computer in the space marked for quoting rate in the B.O.Q.

ii. Only downloaded copy of the B.O.Q. are to be uploaded quoting the rate, virus scanned & Digitally Signed by the contractor.

7.0 OPENING & EVALUTION OF TENDER

A) Opening of Technical Proposal

i. Technical proposals will be opened by the Tender Opening Authority or the authorised representative electronically from the website using their Digital Signature Certificate by CIPET:CSTS- HALDIA

ii. Statutory Cover should be open first & if found in order, Non Statutory covers will be opened. If there is any deficiency in the statutory documents the tender will summarily be rejected.

iii. Decrypted (transformed in to readable formats) documents of the Statutory and Non Statutory cover will be downloaded by the Tender Opening Authority.

iv. Uploading of summary list of technically qualified tenderer:
Pursuant to scrutiny and decision of the Tender Opening Authority, the summary list of eligible tenderer and the serial number of work for which their proposal will be considered will be uploaded in the web portal.

v. While evaluation, the Tender Opening Authority may summon the tenderer and seek clarification/ information or additional documents or original hard copy of any of the documents already submitted and if these are not produced within the stipulated frame, their proposals will be liable for rejection.

B) Opening of Financial Proposal

i. The financial proposal of the technically qualified tenders will be opened by the Tenders Opening Authority electronically from the website using their Digital Signature Certificate by CIPET:CSTS- HALDIA.

ii. Intending technically qualified tenderer may remain present if they so desire.

iii. Decrypted (transformed in to readable formats) B.O.Q. downloaded by the Tender Opening Authority.

8.0 PENALTY FOR SUPPERSSION / DISTORTION OF FACTS

If any tenderer fails to produce the original hard copies of the documents (specially Completion Certificates and audited balance sheets), or any other documents on demand of the Tender Opening Authority within a specified time frame or if any deviation is detected in the hard copies from the uploaded soft copies or if there is any suppression of facts, the Tender will be suspended from participating in the tenders on e- Tender platform for **5 (five) years**. In addition, his user ID will be deactivated and Earnest Money Deposit will be forfeited. Besides, the CIPET Head Office / Haldia Office may take appropriate legal action such tender.

9.0 AWARD OF CONTRACT

The Tender Inviting Authority reserves the right to accept or reject any tender and to cancel the Tendering processes and reject all tender at any time and prior to the Award of Contract without thereby incurring any liability to the affected Tenderer or Tenderers or any obligation to inform the affected Bidder or Bidders of the ground for Employer's action.

The Bidder whose Bid has been accepted will be notified by the Tender Inviting and Accepting Authority through acceptance letter. CIPET HALDIA has every right to split up the works among the qualified bidders or with held any item of works for execution in this NIT and individual item may be awarded to the lowest bidder. The notification of award will constitute the formation of the Contract. All the tender documents including NIT and B.O.Q. will be the part of the Contract Document.

The Bidder meeting the minimum eligibility criteria with the lowest bid price, subject to arithmetical correction, shall be deemed as the successful bidder. In the event of more then one bidder with the lowest price bids (say equal) the bidder with the highest cumulative annual turnover of the last 3 financial year would be deemed as 'Successful bidder' with respect to the submission of proof of documents as submitted by the bidder. In case the document is not verifiable or any other reason comes across at the later stage the decision of the Director & Head of CIPET: CSTS Haldia for awarding the contract to a particular bidder shall be final and binding.

10.0 REJECTION CRITERIA

Owner requests Bidders to accept all terms & conditions stipulated in this document without taking any deviation for speedy decision. Bidders are requested to note that taking deviation or suggesting modifications to the terms & conditions contained in the bid document may result in bids be considered non-responsive, and the bid is liable for rejections. Conditional tender is liable to be rejected. Canvassing in connection with tenders is strictly prohibited and the tenders submitted by the tenders who resort to canvassing will be liable to rejection.

11.0 SIGNING OF CONTRACT

Successful Bidder will be required to sign the Contract Agreement Form within a period of 15 days of receipt of Letter of Intent / Notification of award.

12.0 OTHER DETAILS

a) Bid documents are non-transferable
b) CIPET reserves the right to accept any bid and to reject any or all bids without assigning any reason at any time or any stage. CIPET decision is final in all respects.
c) CIPET shall not be responsible for any delay, loss or non-receipt of Bid. Telex/Fax/Telegraphic offers shall not be accepted.
d) CIPET reserves its right to split the total quantities as per SOR to be executed among the bidders. The work may be awarded in part of full on finalization.

13.0 SITE ADDRESS

Central Institute of Plastics Engineering & Technology (CIPET), Haldia
City Centre, P.O.: Debhog,
Haldia, Dist.: Purba Medinipur,
West Bengal, Pin: 721657
Phone No. 03224-255533, 255534
E-Mail: cipethaldia@gmail.com

CONSULTANTS

ARKHTON,
Architects, Engineers, Planners
Jagannathpur, P.O.: Mahishadal
Dist.: Purba Medinipur, West Bengal.
Ph. 9434010913
E-Mail: prantik_samanta@yahoo.com

INSTRUCTION TO BIDDERS (ITB)

Section- B

FORM- I

APPLICATION

To

The Director & Head
CIPET, Haldia
City Centre, P.O.: Debhog,
Haldia, Dist.: Purba Medinipur,
West Bengal, Pin.: 721657
Phone No. 03224-255533, 255534
E-Mail: cipethaldia@gmail.com

Subject: …….
(Name of work)

Reference: ……..
(NIT No.)

Dear Sir / Madam,

Having examined the Statutory, Non statutory & NIT documents, I/We hereby submit all the necessary information and relevant documents for evaluation.

The necessary evidence admissible by law in respect of authority assigned to us on behalf of the group of firms for Application and for completion of the contract documents is attached herewith.

I/We are interested in bidding for the work mentioned above.

I/We understand that:

(a) Tender Inviting & Accepting Authority can amend the scope and value of the contract bid under this work.

(b) Tender Inviting and Accepting Authority reserves the right to reject any tender without assigning any reason.

The application is made by me / us on behalf of ....in the capacity of .....duly authorized to submit the Tender.

Enclosure-

1) Technical Proposal
2) Financial Proposal

Date -..... Signature of an Authorized Officer of firm
Title & capacity of the officer
Name of the Firm with Seal

FORM- II
FINANCIAL STATEMENT

Information of audited financial statement for the last year to demonstrate the current soundness of the bidder's financial position.

1) The Bidder's net worth for the last year calculated on the basis of capital profit and free reserve availability to the firm should be positive.

2) Bidder's, who met the minimum qualification criteria, will be qualified only if their available bid capacity at the expected time of bidding is more than the total the estimated cost of the works. The available bid capacity will be calculated as under.

Assed available Bid Capacity = [(A ×N×2) – B] where,

A= Maximum value of Engineering works in respect of projects executed in any one year during the last five years (update to the price level of any year indicated in table below under note) taking into account the completed as well as work in progress. The project including turnkey project / Item Rate Contractor / Construction works.

N = Number of years (i.e. .....year) prescribed for complication of the works for which Bids are invited.

B = Financial Liability of the bidder to be incurred for existing commitments and on-going works during the period of the subject contract.

B.1 Name of Application:

B.2 **Summary of assets and liabilities on the basis of the audited financial statement of the last three financial years.**

(**Attach copies of the audited financial statement of the last three financial years**)

	YEAR(2016-17) (Rs. In Lakh)	YEAR(2017-18) (Rs. In Lakh)	YEAR(2018-19) (Rs. In Lakh)
a) Current Assets (It should not include investment in any other firm):			
b) Current liabilities (It should include bank over draft)			
c) Working capital (a)- (b):			
d) Net worth (Proprietors Capital or Partners Capital or Paid up Capital +Resource & surplus):			
f) Bank loan/ Guarantee (As per clause G.2. with all sub clauses):			

To Calculate value of "A"

i. Table containing value of Engineering Works in respect to Projects (Turnkey projects/Item rate contract/Construction works) under taken by the Bidder during the last 3 years is as follows:

SL.NO.	YEAR	**VALUE OF ENGINNERING WORKS UNDERTAKEN w.r.t. PROJECT (RS. In Lakh)**
1.		
2.		
3.		

ii. Maximum value of project that have been undertaken during the F.Y.....out of the last 3 years and value thereof is Rs..... Lakh (Rupees.....).

Further, value updated to the price level of the year indicated in table is as follows.

Rs.....Lakh X..... (Updating Factor as per Table annexed). =Rs..... Lakh (Rupees.....)

Table indicating the factor for the year for updation to the price level is indicated as under.

SL.NO.	F.Y./CALENDER YEAR	UPDATION FACTOR
1.	Year -1	1.00
2.	Year -2	1.05
3.	Year -3	1.10

iii. Net worth for the last year of..... (Name of the Company) = ...

..... Signature, Name and designation of authorized Signatory. For and on behalf of..... (Name of the applicant)		..... **Name of the Statutory Auditor's firm:** **Seal of the CA audit firm:** **(Signature, name and designation and Membership No. of authorized signatory).**

To Calculation the value of "B"

3. A table # containing value of all the existing commitment and on- going working to be completed during the next---------years (prescribed time for completion of works for which Bids are invited) is follow.

Sl. No.	**Name of Work/ Project**	**Name of The Employer**	**Percentage of Participation of Bidder in the project**	**Stipulated period of completion as per**	**Value of contract as per Agreement/LOA Rs.....**	**Value of work completed**	**Balance Value of work to Be completed Rs.....**	**Anticipated Date of completion**	**Financial liability to incurred for the said work/ project during the**
1	2	3	4	5	6	7	8	9	10

Signature name and designation of Authorised Signatory

For and on behalf of ---------- (Name of the Applicant)

Note:

1. All the document to be submitted in support of From-II (Financial Statement) must be duly signed and sealed by the applicant / bidder.

AFFIDAVIT – X

(To be furnished in Non – Judicial Stamp paper of appropriate value duly notarized)

Work in progress					Work order issued but work not started			
Sl. No.	Name of work with Tender No.	Estimated Amount	Tendered Amount	% of Work Done	Sl. No.	Name of work with Tender No.	Estimated Amount	Tendered Amount

Date- ----------

Signature of an authorised officer of the firm
Title & capacity of the officer
Name of the Firm with Seal

AFFIDAVIT – Y

(To be furnished in Non – Judicial Stamp paper of appropriate value duly notarized)

1) I, the under – signed do certify that all the statements made in the attached documents are true and correct. In case of any information submitted proved to be false or concealed, the application may be rejected and on objection/claim will be raised by the undersigned.

2) The undersigned also hereby certifies that neither our firm M/s ---------- nor any of constituent partner had been debarred to participate in tender by CIPET during the last 5 (five) years prior to the date of this NIT.

3) The undersigned would authorize and request any Bank, person, Firm or Corporation to furnish pertinent information as deemed necessary and / or as requested by the Department to verify this statement.

4) The undersigned understands that further qualifying information may be requested and agrees to furnish any such information at the request of the Department.

5) Certified that I have applied in the tender in the capacity of individual / as a partner of a firm and I have not applied severally for the same job.

Date- ----------

Signature of an authorised officer of the firm
Title & capacity of the officer
Name of the Firm with Seal

FORM –III

STRUCTURE AND ORGANISATION

A.1. Name of applicant (Tenderer) :

A.2. Office Address :

Telephone No. :

Fax No. :

A.3. Name and address of Bankers :

A.4. Attach an organization chart showing the Structure of the company with names of key Personnel and technical staff with Bio-date

Date- ----------

Signature of an Authorized Officer of the firm
Title & capacity of the officer
Name of the Firm with Seal

Note: Application covers Proprietary Firm, Partnership, Limited Company or Corporation.

FROM –IV

Undertaking towards engagement of Technical Personnel (Civil Engineering), Electrical Supervisor and deployment of minimum Plant, Machinery , Equipments and Field Testing Instruments.

I do hereby declare that I will engage Technical personnel (Civil Engineering), one electrical supervisor for supervision of electrical item of works having valid supervisory certificate issued by Licensing Board, Government of West Bengal (Electrical), in relevant SCC parts as :- 1,2,3,4,5,6A,6B,7A,7B,10 & 11 as required and will deploy the plant and Machineries, Equipments, Field testing Instrument as and when require, as per condition of the NIT.

Date- ----------

Signature of an authorised officer of the firm
Title & capacity of the officer
Name of the Firm with Seal

Annexure - IV

DE CLARATION

- I, the undersigned, declare that all the statements made in the attached documents in respect of mode of ownership of machineries are true and correct.

- Certified that required specified machineries for the works or completion of work under this NIT will be installed or completed at the working site within 365 days (maximum) from the date of LOA / work Order.

- The undersigned also hereby certifies that neither our firm..... nor any constituent firm had been debarred to participate in tender by public Work Department / CIPET authority during the last 3 (three) years prior to the date of this NIT.

- The undersigned understands and agrees that further qualifying information may be requested and agrees to furnish any such information at the request of the Department.

- Certified that I have applied in the Tender in the capacity of individual / as a partner of a firm and I have not applied severally for the same job.

- Certified that I have applied in the Tender in the capacity of individual / as a partner of a firm.

- Certified that I have access to or have access to or have available liquid assets (aggregate of working capital, cash-in-hand, uncommitted Bank Guarantees) and or credit facilities not less than 10% of the estimated cost put to tender. In this respect, I have attached necessary documents with this application.

- I, the under-signed do certify that all the statements made in the attached documents are true and correct. If any declaration submitted is found / ascertain to be incorrect/ fabricated/misrepresented/fraudulent etc. Accordingly tender will be liable to be cancelled / terminated immediately & I / my firm / company shall also be liable to prosecuted under section 197,199 & 200 of India penal code, 1860 along with section – 71 & section – 73 of Indian information & Technology act 2008 & any other applicable law for the time being in force in addition to forfeiture of Earnest Money / Security Deposit.

Signed by an authorized officer of the firm

Title of the officer

Name of the firm with seal

Date:_____

FORM - V

EXPERIENCE PROFILE

LIST OF PROJECTS COMPLETED THAT ARE SIMILAR IN NATURE DURING THE LAST FIVE YEARS.

Name of The Employer	Name, Location & Nature of Work	Name of Consulting Engineer responsible for Supervision	Contract price in India Rs.	Percentage of Participation of Company	Original Date of Starting of work	Original Date of Completion of work	Actual Date of Starting of Work	Actual Date of Completion of Work	Reasons for Delay in Completion

Note: a) Certificate form the Employers to be attached

b) Non-disclosure of any information in the Schedule will result in disqualification on the firm

Date- ----------

Signature of an authorised officer of the firm
Title & capacity of the officer
Name of the Firm with Seal

BID FORM

To:
The Director & Head
CIPET, Haldia
City Centre, P.O.: Debhog,
Haldia, Dist.: Purba Medinipur,
West Bengal, Pin.: 721657
Phone No. 03224-255533, 255534
E-Mail: cipethaldia@gmail.com

Dear Sir,

Having examined the Conditions of Contract and Specifications including Addenda Nos.(Insert Numbers) the receipt of which is hereby duly acknowledged, we, the undersigned, offer to do the said work in conformity with the said Drawings, Conditions of Contract and specifications for the same .

We undertake, if our bid is accepted, to complete entire work as specified in the Contract within **Twelve Months** calculated from the date of Letter of Intent.

We agree to abide by this bid for a period of **sixty days** from the date fixed for bid opening under Instructions to Bidders and it shall remain binding upon us and may be accepted at any time before the expiration of that period.

Until a formal contract is prepared and executed, this bid, together with your written acceptance thereof in your notification of award, shall constitute a binding Contract between us.

We understand that you are not bound to accept the lowest or any bid, you may receive.

Date :
Place :

Signature with Seal
.....

Agreed upon Terms & Conditions

Bidder M/s.....

Bid Document No: **N.I.T. No. CIPET/HAL/ E-TEN.-01/Repairing & Renovation Work/Construction/2019-2020 Date: 12.12.2020**

Offer Ref. No.....

This Questionnaire duly filled in should be submitted along with Bid. Confirmation given hereunder to various Terms & Conditions should not be repeated elsewhere in the Bid.

ALL THE COMMERCIAL TERMS & CONDITIONS SHOULD BE INDICATED IN THIS FORMAT ONLY. IF REQUIRED DETAILS INCLUDING DEVIATION TO TCC, IF ANY, SHOULD BE INDICATED AS AN ANNEXURE TO THIS FORMAT.

Sl. No.	Description	Bidder's Confirmation
1	Ensure and confirm that unit prices quoted in 'Schedule of Rates' are basis of provision of bid document for the tendered scope of works.	
2	Confirm that the offer shall remain valid for acceptance for **60 days** from Final Bid Due date as per provisions of the Bid Document.	
3	Confirm acceptance of Completion Schedule as per requirement specified in Bid Document to be reckoned from date of issue of Fax of Intent (FOI)/LOA/WO, whichever is issued first.	
4	Indicate present rate of Service Tax, if applicable & payable extra, on the quoted works & services.	
5	Confirm acceptance of Price Reduction Schedule (PRS) for delay in completion/delivery beyond contractually agreed completion schedule as specified in the Bid Document.	
6	Confirm that in case of delay in completion beyond Contractual completion Date, the invoice shall be submitted for the amount duly reduced to the extent of PRS as per provisions of bidding document.	
7	Confirm in case of delay in completion beyond Contractual completion schedule any new or additional taxes and duties imposed, after contractual completion schedule shall be to bidder's account	
8	Quoted price will remain firm and fixed till complete execution of the order. Fax of Intent (FOI)/Letter of Acceptance/Work order (LOA/WO) shall be placed within offer validity, as Notification of Award of Contract.	
9	Confirm acceptance to provisions of DEFECT LIABILITY PERIOD (DLP) as per provisions of Bid Document.	
10	Confirm acceptance in to of the Terms & Conditions contained in : i) Instruction to Bidders (ITB) ii) Terms & Condition of Contract (TCC) iii) All other commercial documents/attachments of Tender Documents. b) In case of reservations, confirm that clause wise comments deviations sought have been specified as annexure to this format. c) All the terms & conditions have been indicated in this format (including annexure, if any) and have not been repeated in the bid elsewhere. It is noted that terms & conditions indicated elsewhere including any printed Terms & Conditions, shall not be considered by CIPET.	
11	Confirm unconditional acceptance to provisions of Force Majeure & Resolution of Dispute / Arbitration Clauses of Bid Document	
12	Please furnish details of EMD, as per provisions of Bid Document: EMD(DD/BC) No., amount & Date	
13	Indicate Name & Contact Telephone / Fax No. of Person(s) to whom queries, if any, are to be addressed against your bid	
14	CIPET reserves the right to make any changes in the terms & conditions of the Bid Document and to reject any or all bids including those received late or incomplete at their sole discretion at any stage or time. CIPET decision is final in all respects.	
15	Furnish your GST Registration No.	
16	Bidder confirms that he will bear all income tax liability both for corporate & personal tax against the contract, if awarded.	

17	Bidder confirms that the they have understood the magnitude of scope of works as specified in the bidding document & its attachment clearly and have assessed the site conditions in totality, before submission of quote against the said RFQ/Bid Document.	

BIDDER CONFIRMS THAT IN CASE OF CONFLICTING VERSION OF VARIOUS TERMS & CONDITIONS AT DIFFERENT PLACES THE CONFIRMATION FURNISHED AS ABOVE SHALL BE CONSIDERED OVERRIDING AND FINAL AND ANY OTHER DEVIATION INDICATED ELSEWHERE SHALL BE TREATED AS REDUNDANT.

Signature _____
Name & Designation _____
Tel. No. _____
Fax No. _____
E-mail ID _____
Office Stamp _____

Proforma of Letter of Authority for Negotiations and Signing the Agreement

No. Date:

The Director & Head
CIPET, Haldia
City Centre, P.O.: Debhog,
Haldia, Dist.: Purba Medinipur,
West Bengal, Pin.: 721657
Phone No. 03224-255533, 255534
E-Mail: cipet.haldia@gmail.com

Sub: Tender No. **CIPET/HAL/ E-TEN.-01/Repairing & Renovation Work/Construction/2019-2020**
Date: 12.12.2019

Dear Sir,

We..... .....do hereby confirm that Mr./ Ms.
(name and address)……..
is/are authorized to represent us for negotiations and to conclude the Agreement on our behalf with you against your above cited tender for……..
We confirm that we shall be bound by all and whatsoever our representatives shall commit.

Yours faithfully
Signature
Name and Designation
for & on behalf of BIDDER

Note: This letter of Authority should be on the letterhead of the Bidders and should be signed by a person competent and having the power of attorney (**power of attorney shall be annexed**) to bind the bidder.

Deviation Form

To

The Director & Head
CIPET, Haldia
City Centre, P.O.: Debhog,
Haldia, Dist.: Purba Medinipur,
West Bengal, Pin.: 721657
Phone No. 03224-255533, 255534
E-Mail: cipethaldia@gmail.com

Name of Bidder :-

Notes :

1) BIDDER may give here a consolidated list of deviations/ clarifications/ comments for all sections of the Bid documents which for an appropriate offer are considered unavoidable by him.

2) Deviations/ clarifications mentioned elsewhere in the offer shall not be binding on the CIPET and any such deviations if indicated elsewhere other than this form will render the offer non-responsive and shall liable to be rejected.

3) BIDDER shall state the reason for the deviations in the Remark column.

4) Only the deviations listed herein, in conjunction with the original tender, shall constitute the contract document for the award of the job to the BIDDER

Sec No. Cls. No./ as per tender	Requirements by Bidder	Deviation by the Bidder	Clarification	Remarks	Page No.
2.	3.	4.	5.	6.	

_____

The Bidder confirms that all clauses of the Bidding document as are not listed above are fully complied by the BIDDER.

(**Signature of Bidder**)

Repairing & Renovation Work of Administrative & Academic Building of CIPET, Haldia

VOLUME I OF VI

TERMS & CONDITIONS OF CONTRACT

BRIEF SCOPE OF WORK

Table of Contents

TERMS & CONDITIONS OF CONTRACT

SECTION- I DEFINITIONS

1 Definition of Terms:

1.1 In this CONTRACT (as here-in-after defined) the following words and expressions shall have the meanings hereby assigned to them except where the context otherwise required.

1.1.1 The EMPLOYER means Central Institute of Plastics Engineering & Technology, (Ministry of Chemicals & Fertilizers, Govt. Of India) having its Corporate office at Guindy, Chennai.

1.1.2 The "CONTRACTOR" means the person or the persons, firm or Company or corporation whose tender has been accepted by the EMPLOYER and includes the CONTRACTOR's legal representatives his successors and permitted assigns.

1.1.3 The "PROJECT-IN-CHARGE" shall mean the person designated from time to time by the CIPET and shall include those who are expressly authorized by him to act for and on his behalf for operation of this CONTRACT.

1.1.4 The "WORK" shall mean and include all items and things to be supplied/ done and services and activities to be performed by the CONTRACTOR in pursuant to and in accordance with CONTRACT or part thereof as the case may be and shall include all extra, additional, altered or substituted works as required for purpose of the CONTRACT.

1.1.5 The "PERMANENT WORK" means and includes works which will be incorporated in and form a part of the work to be handed over to the EMPLOYER by the CONTRACTOR on completion of the CONTRACT.

1.1.6 "CONTRACT DOCUMENTS" means collectively the Tender Documents, Designs, Drawings, Specification, Schedule of Quantities and Rates, Letter of Acceptance and agreed variations if any, and such other documents constituting the tender and acceptance thereof.

1.1.7 Architect/Consultant mean, **Civil Consultants,** who are the consulting architect to the Employer for this project and having registered office at ARKHTON, Jagannathpur, P.O.: Mahishadal, Dist.: Purba Medinipur, West Bengal.

1.1.8 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 Employer & Architect.

1.1.9 The "CONTRACT" shall mean the Agreement between the EMPLOYER and the CONTRACTOR for the execution of the works including therein all contract documents.

1.1.10 The "SPECIFICATION" shall mean all directions the various technical specifications, provisions attached and referred to the Tender Documents which pertain to the method and manner of performing the work or works to the quantities and qualities of the work or works and the materials to be furnished under the CONTRACT for the work or works.

1.1.11 **The "DRAWINGS" shall include plans and tracings or prints or sketches thereof with any modifications approved in writing by PROJECT - IN-CHARGE and such other drawing as may, from time to time, be furnished or approved in writing by the PROJECT -IN-CHARGE.**

1.1.12 The "TENDER" means the proposal along with supporting documents submitted by the CONTRACTOR for consideration by the EMPLOYER.

1.1.13 The "COMPLETION CERTIFICATE" shall mean the certificate to be issued by the PROJECT -IN-CHARGE when the works have been completed entirely in accordance with CONTRACT DOCUMENT to his satisfaction.

1.1.14 The "FINAL CERTIFICATE" in relation to a work means the certificate regarding the satisfactory compliance of various provision of the CONTRACT by the CONTRACTOR issued by the PROJECT -IN-CHARGE/EMPLOYER after the period of liability is over.

1.1.15 “DEFECT LIABILITY PERIOD” in relation to a work means the specified period from the date of COMPLETION CERTIFICATE upto the date of issue of FINAL CERTIFICATE during which the CONTRACTOR stands responsible for rectifying all defects that may appear in the works executed by the CONTRACTOR in pursuance of the CONTRACT and includes warranties against Manufacturing/Fabrication/ Erection/Construction defects covering all materials plants, equipment, components, and the like supplied by the CONTRACTOR, works executed against workmanship defects.

1.1.16 "TEMPORARY WORKS" shall mean all temporary works of every kind required in or about the execution, completion or maintenance of works.

1.1.17 "PLANS" shall mean all maps, sketches and layouts as are incorporated in the CONTRACT in order to define broadly the scope and specifications of the work or works, and all reproductions thereof.

1.1.18 "SITE" shall mean the lands and other places on, under, in or through which the permanent works are to be carried out and any other lands or places provided by the EMPLOYER for the purpose of the CONTRACT.

1.1.19 "APPROVED" shall mean approved in writing including subsequent written confirmation of previous verbal approval and "APPROVAL" means approval in writing including as aforesaid.

1.1.20 "METRIC SYSTEM" - All technical documents regarding the construction of works are given in the metric system and all work in the project should be carried out according to the metric system.

All documents concerning the work shall also be maintained in the metric system.

SECTION-II GENERAL INFORMATION

2 General Information

Location of Site: The proposed location of Project site is
City Centre, P.O.: Debhog,
Haldia, Dist.: Purba Medinipur,
West Bengal, Pin.: 721657
Phone No. 03224-255533, 255534
E-Mail: cipethaldia@gmail.com

2.1.1

2.2 **Site Inspection**: The Tenderer is encouraged to visit & examine the site of works and its surroundings and obtain all information that may be necessary to prepare the tender and entering into a contract for construction of the works. No claim / extension of time whatsoever be entertained on account of prevailing site conditions. The cost of visiting the site shall be at the tenderers own expense.

2.3 **Scope of Work**: Scope of work of Construction of Repairing & Renovation Work of Administrative & Academic Building including all Civil, Electrical, Sanitary Water Supply Internal & External as per Site Conditions and requirements of related works complete in all respects as per the Owner/Architects satisfactions.

The CONTRACTOR shall provide all necessary materials, equipment, labour etc. for the execution and maintenance of the WORK till completion unless otherwise mentioned in the Tender Document.

2.4 **Water Supply**: Contractor shall make their own arrangements for water supply required for the work including that required by sub-contractors & labourers. Water must be clean, fresh and free from earth, vegetable or organic matter, acid or alkaline substance in solution or suspension. All pumping installations, pipe net work and distribution & storage system will have to be carried out by the Contractor at his own risk and cost.

However, the Employer may supply water with payble as actual basis and this does not relieve the Contractor of his responsibility in making his own arrangement and for the timely completion of the various works as stipulated.

2.5 **Power Supply:**

2.5.1 The Contractor shall arrange with the concerned Electricity Supply Authorities for a temporary meter and supply to the site and shall provide all temporary wiring, power and lighting points for the whole of the works and clear away when no longer required. He shall pay all charges for the same and for electricity consumed, including that consumed by Subcontractors.

2.5.2 CONTRACTOR shall also make arrangements for DG set so that the work is not hampered in case of power shortage/failure.

2.5.3 No claim for compensation due to any failure or short supply of electricity shall be admissible.

2.6 **Land for Contractor's Field Office, Godown and Workshop**:

The EMPLOYER shall at his own discretion and convenience and for the duration of the execution of the work make available near the site, land for construction of Contractor's Temporary Field Office, godowns 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 and get the same approved by the PROJECT -IN-CHARGE.
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 PROJECT-IN-CHARGE. If the CONTRACTOR fails to comply with these requirements, the EMPLOYER may at the expenses of the CONTRACTOR remove such surplus, and rubbish materials and dispose off the same as he deems fit and get the site cleared as aforesaid; and 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 EMPLOYER reserves the right to ask the CONTRACTOR any time during the pendency of the CONTRACT to vacate the land by giving 7 days notice on security reasons or on national interest or otherwise. Rent may be charged for the land so occupied from contractor by the Employer.

The CONTRACTOR shall put up temporary structures as required by them for their office, fabrication shop and construction stores only in the area allocated to them on the project site by the EMPLOYER or his authorized representative. No tea stalls/canteens should be put up or allowed to be put up by any CONTRACTOR in the allotted land or complex area without written permission of the EMPLOYER.

No unauthorized buildings, constructions or structures should be put up by the CONTRACTOR anywhere on the project site.

For uninterrupted fabrication work, the CONTRACTOR shall put up temporary covered structures at his cost within Area in the location allocated to them in the project site by the EMPLOYER or his authorized representative.

No person except for authorized watchman shall be allowed to stay in the plant area/ CONTRACTOR's area after completion of the day's job without prior written permission from PROJECT-IN-CHARGE.

2.7 **Land for Residential Accommodation**:-:No Land shall be made available for residential accommodation for staff and labour of CONTRACTOR.

SECTION-III GENERAL INSTRUCTIONS TO TENDERERS

3 Submission of Tender:

3.1 TENDER must be submitted without making any additions, alterations, and as per details given in other clauses hereunder. The rate shall be filled only in the schedule given in this Tender Document.

3.2 Addenda/Corrigenda to this Tender Document, if issued, must be signed, 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 of quantities are issued in addenda.

3.3 Covering letter along with its enclosures accompanying the Tender Document and all further correspondence shall be submitted in duplicate.

3.4 The tenderers are strictly advised to adhere to the terms and conditions stipulated in the tender document.

4 Documents:

4.1 General: The tenders shall accompany the following:

i) The duly signed & filled in original tender document.

ii) Earnest money in the manner specified in Clause 6 hereof.

iii) Power of Attorney or a true copy thereof duly attested by a Gazetted Officer in case an authorised representative has signed the tender.

iv) Information regarding tenderers in the proforma enclosed.

v) Organisation chart giving details of field management at site, the tenderer proposes to have for this job.

vi) Details of construction plant and equipments available with the tenderer for using in this work.

vii) Details of present commitment as per proforma enclosed to tender.

viii) Data required regarding SUB-CONTRACTOR(s)/ Supplier/ Manufacturers and other technical informations the tenderer wish to furnish.

4.2 **All pages are to be Initialed**: All the tender pages shall invariably be signed with date by the tenderer / or by a person holding power of attorney authorizing him to sign on behalf of the tenderer at the lower right hand corner.

4.3 **Rates to be in Figures and Words**:
The tenderer shall quote all the rates and amounts in figures and words in English. In case of any discrepancies are found between the RATES in FIGURES and WORDS or the AMOUNT quoted in the tender, the following procedure shall be followed:

a) When there is difference between the rates in figures and words, the rate which corresponds to the amount worked out by the tenderer shall be taken as correct.

b) When the rate quoted by the tenderer in figures and words tally but the amount is incorrect the item rate quoted by the tenderer shall be taken as correct.

c) When it is not possible to ascertain the correct rate by either of above methods, the rate quoted in words shall be taken as correct.

4.4 Corrections and Erasures: All correction(s) and alteration(s) in the entries of tender paper shall be signed in full by the TENDERER with date. No erasure or over writing is permissible.

4.5 Signature of Tenderer:
The TENDERER 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 names of all partners in the tender. It should be signed in the partnership's name by all the partners or by duly

authorised representatives 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.

5 Transfer of Tender Documents:

Transfer of Tender Documents purchased by one intending tenderer to another is not permissible.

6 Earnest Money Deposit:

6.1 The tenderer shall furnish, as part of his tender, an interest free earnest money deposit by way of demand draft / Banker's Cheque in favour of **'CIPET-Haldia'** along with tender document. The tenders not accompanying the earnest money deposit shall summarily be rejected.

6.2 The earnest money deposit of unsuccessful tenderers will be returned within 30 days of the end of the tender validity period specified in Sub-Clause 7.1.

6.3 The earnest money deposit of the successful tenderer shall be adjusted against security deposit/performance security to be deducted from RA bills.

6.4 The earnest money deposit may be forfeited:-

a) If the tenderer withdraws the tender after tender opening during the period of tender validity; or

b) In the case of a successful tenderer, if the tenderer fails to sign the agreement within 15 days of the receipt by him of the Notification of Acceptance of Tender.

7 Tender Validity:

7.1 Tenders shall remain valid for a period not less than **'sixty days'** from the date of opening of the tender. A tender valid for a shorter period shall be rejected by the EMPLOYER as non – responsive.

7.2 The tenderers shall not be entitled during the said period of 'two months', without the consent in writing of the EMPLOYER, to revoke or cancel his tender or to vary the tender given or any term thereof. In case of tenderer revoking or canceling his tender or varying any term in regard thereof without the consent of EMPLOYER in writing, the EMPLOYER shall forfeit Earnest Money deposited by him alongwith tender.

7.3 In exceptional circumstances, prior to expiry of the original time limit, the EMPLOYER may request that the tenderers may extend the period of validity for a specified additional period. The request and the tenderers responses shall be made in writing or by cable. A tenderer may refuse the request without forfeiting his earnest money deposit. A tenderer agreeing to the request will not be required or permitted to modify his tender.

8 Addenda/Corrigenda

8.1 Addenda/ Corrigenda if any to the Tender Documents will be issued in duplicate prior to the date of opening of the tenders.

8.2 Tenderer will retain his copy of each Addendum/Corrigendum and attach original copy duly signed along with his offer. All Addenda/Corrigenda issued shall become part of Tender Documents.

9 Right of Employer to Accept or Reject Tender:

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

10 Time Schedule

10.1 Time is the essence of the contract and the WORK shall be executed strictly as per the TIME SCHEDULE specified in TENDER/CONTRACT Document. The time shall be reckoned from the date of award of contract and it includes the time required for mobilisation as well as testing, rectifications if any, retesting and completion in all respects to the entire satisfaction of the PROJECT -IN-CHARGE

10.2 A joint programme of execution of the WORK will be prepared by the PROJECT -IN-CHARGE and CONTRACTOR based on priority requirement of this project. This programme will take into account the time

of completion mentioned in 10.1 above and the time allowed for the priority works by the PROJECT-IN-CHARGE.

10.3 Monthly/Weekly construction programme will be drawn up by the PROJECT -IN-CHARGE jointly with the CONTRACTOR, based on availability of work fronts and the joint construction programme as per 10.2 above. The CONTRACTOR shall scrupulously adhere to these targets /programmes by deploying adequate personnel, construction tools and tackles and he shall also supply himself all materials of his scope of supply in good time to achieve the targets/programmes. In all matters concerning the extent of targets set out in the weekly and monthly programmes and the degree of achievements the decision of the PROJECT-IN-CHARGE will be final and binding on the CONTRACTOR.

11 Signing of the Contract:

11.1 The successful tenderer shall be required to execute an AGREEMENT in the proforma annexed to the TENDER DOCUMENT within 15 days of the receipt by him of the Notification of Acceptance of Tender. In the event of failure to execute the agreement within the stipulated period, the tenderer shall forfeit the Earnest Money Deposit and the employer is free to award the contract to any other tenderer.

12 Note to Schedule of Rates:

12.1 The Schedule of Rates should be read in conjunction with all the other sections of the tender.

12.2 The tenderer shall be deemed to have studied the DRAWINGS, SPECIFICATIONS and details of work to be done within TIME SCHEDULE and to have acquainted himself of the condition prevailing at site.

12.3 All the Rates must be filled as per the Schedule of Rates in original Tender Documents. Rates quoted on separate typed sheets and any variation in item description or specification shall not be accepted. Any exceptions taken by the tenderer to the Schedule of Rates shall be brought out in the terms and conditions of the offer.

12.4 The quantities shown against the various items are only approximate. Any increase or decrease in the quantities shall not form the basis for alteration of the quoted rates.

12.5 **The EMPLOYER reserves the right to interpolate the rates for such items of work falling between similar items of lower and higher magnitude.**

13 Evaluation of Tenders:

13.1 Only Those Tenders which are complete in all respects and are strictly in accordance with the Terms and Conditions and Technical Specifications of Tender Document, shall be considered for evaluation. Such Tenders shall be deemed to be under consideration immediately after opening of Tender and until such time an official intimation of acceptance /rejection of Tender is made by CIPET to the Tenderer.

13.2 Zero Deviation: Bidders to note that this is a ZERO DEVIATION TENDER. CIPET will appreciate submission of offer based on the terms and conditions in the enclosed Conditions of Contract, Instructions to Bidders (ITB), Scope of Work, technical specifications etc. Bidder may note that no technical and commercial clarifications will be sought for, after the receipt of the bids. In case of any deviation/non-conformity observed in the bid, it will summarily be rejected.

14 Award of Contract:

14.1 The Acceptance of Tender will be intimated to the successful Tenderer by CIPET either by Telex/ Telegram/ Fax or by Letter.

14.2 CIPET shall have the sole discretion in the matter of award of CONTRACT and the decision of CIPET shall be final and binding.

15 Clarification of Tender Document:

A prospective tenderer requiring any clarification of the tender documents is required to attend the pre tendered meeting as mentioned in the tender documents at the date , time and place specified in the tender documents .

SECTION-IV GENERAL OBLIGATIONS

16 Priority of Contract Documents

16.0 Except if and the extent otherwise provided by the Contract, the provisions of the Terms & Conditions of Contract 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 of one another, but in case of ambiguities or discrepancies the same shall be explained and adjusted by the PROJECT-IN-CHARGE who shall thereupon issue to the Contractor instructions thereon and in such event, unless otherwise provided in the Contract, the priority of the documents forming the Contract shall be as follows :

1) The Contract Agreement;
2) The Letter of Acceptance;
3) The (Instructions to Bidders) ITB;
4) Terms & Conditions of Contract (TCC)
5) Any other document forming part of the Contract.

Works shown in the DRAWING but not mentioned in the SPECIFICATIONS OR described in the SPECIFICATIONS without being shown in the DRAWINGS shall nevertheless be deemed to be included in the same manner as if they had been specifically shown upon the DRAWINGS and described in the SPECIFICATIONS.

17 Contractor to obtain his own Information:

The CONTRACTOR in fixing his rate shall for all purposes whatsoever reason may be, deemed to have himself independently obtained all necessary information for the purpose of preparing his tender and his tender as accepted, shall be deemed to have taken into account all contingencies as may arise due to such information or lack of same. 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 of the works at the scheduled rates and to have satisfied himself to the sufficiency of his tender. Any error in description of 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, omissions or errors that may be found in the 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 transport and communication, whether by land, water or air, and as to possible interruptions thereto and the access 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 sites 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 effecting these works. He is deemed to have acquainted himself as to his liability of payment of Government Taxes, Customs duty and other charges, levies etc. Any neglect or omission 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 scheduled rates and times in strict accordance with the CONTRACT.

No verbal agreement or inference from conversation with any effect or employee of the EMPLOYER before, during or after the execution of the CONTRACT agreement shall in any way affect or modify and of the terms or obligations herein contained. Any change in layout due to site conditions or technological requirement shall be binding on the CONTRACTOR and no extra claim on this account shall be entertained.

18 Contract Performance Security:

18.1 **10 % of the gross bill amount of RA bills shall be deducted as Security Deposit/Contract Performance Guarantee which shall be refunded to the CONTRACTOR after the expiry of DEFECTS LIABILITY PERIOD.**

19 Time of Performance:

19.1 Time for Mobilisation:

The work covered by this CONTRACT shall be commenced within **fifteen (15) days** including over all completion schedule, the date of letter/Fax of Intent and be completed in stages on or before the dates as mentioned in the TIME SCHEDULE FOR COMPLETION OF WORK. The CONTRACTOR should bear in mind that time is the essence of this agreement. No request for revision/alteration of construction time is entertained after tender opening.

19.2 Time Schedule of Construction:

19.2.1 The CONTRACTOR should prepare a detailed monthly or weekly construction program jointly with the PROJECT-IN-CHARGE within 15 days of receipt of LETTER/FAX OF INTENT or ACCEPTANCE OF TENDER. The WORK shall be executed strictly as per the Time Schedule given in the CONTRACT DOCUMENT. The period of construction given includes the time required for mobilization testing, rectifications, if any, retesting and completion in all respects in accordance with CONTRACT DOCUMENT to the entire satisfaction of the PROJECT-IN-CHARGE.

19.2.2 During the performance of the CONTRACT, if in the opinion of the EMPLOYER proper progress is not maintained suitable changes shall be made in the CONTRACTOR's operation to ensure proper progress. The above time schedule shall be reviewed periodically and reports shall be submitted by the CONTRACTOR as directed by EMPLOYER.

20 Force Majeure:

20.1 CONDITIONS FOR FORCE MAJEURE

In the event of either party being rendered unable by Force Majeure to perform any obligations required to be performed by them under the CONTRACT the relative obligation of the party affected by such Force Majeures shall upon notification to the other party be suspended for the period during which Force Majeures event lasts. The cost and loss sustained by the either party shall be borne by the respective parties. The term "Force Majeures" as employed herein shall mean acts of God, earthquake, war (declared or undeclared), revolts, riots, fires, floods, rebellions, explosions, hurricane, sabotage, civil commotions and acts and regulations of respective Government of the two parties, namely the EMPLOYER and the CONTRACTOR. Upon the occurrence of such cause(s) and upon its termination, the party alleging that it has been rendered unable as aforesaid thereby, shall notify the other party in writing immediately but not later than 72 (Seventy-two) hours of the alleged beginning and ending thereof giving full particulars and satisfactory evidence in support of its claim. Time for performance of the relative obligation suspended by the Force Majeures shall then stand extended by the period for which such cause lasts. If deliveries of bought out items and/or works to be executed by the CONTRACTOR are suspended by Force Majeure conditions lasting for more than 2 (two) months the EMPLOYER shall have the option to terminate the CONTRACT or re-negotiate the contract provisions.

20.2 If the CONTRACT shall be terminated under the provisions of the above clause, the CONTRACTOR shall with all reasonable diligence remove from the SITE all the CONTRACTOR's equipment and shall give similar facilities to his SUB-CONTRACTORS to do so.

21 Price reduction schedule:

21.1 Time is the essence of the CONTRACT. In case the CONTRACTOR fails to complete the WORK within the stipulated period, then, unless such failure is due to Force Majeure as defined in Clause 20 here above or due to EMPLOYER's defaults, the Total Contract price shall be **reduced by ½ % of the total Contract Price per complete week of delay or part thereof subject to a maximum of 5 % of the Total Contract Price**, by way of reduction in price for delay and not as penalty. The EMPLOYER may deduct the said amount from payments due to the CONRACTOR or the said amount will be recovered from amount due to the Contractor/ Contractor's Contract Performance Security payable on demand. The decision of the PROJECT-IN-CHARGE in regard to applicability of Price Reduction Schedule shall be final and binding on the CONTRACTOR.

22 Rights of the employer to forfeit security deposit/contract performance security:

22.1 Whenever any claim against the CONTRACTOR for the payment of a sum of money arises out or under the CONTRACT, the EMPLOYER shall be entitled to recover such sum by appropriating in part or whole the Contract Performance Security of the CONTRACTOR. 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 EMPLOYER on demand any balance remaining due.

23 Failure by the contractor to comply with the provisions of the contract:

23.1 If the CONTRACTOR refuses or fails to execute the WORK or any separate 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 his 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 EMPLOYER at its option by written notice to the CONTRACTOR:

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 EMPLOYER on that behalf, whereupon the CONTRACTOR shall stop forthwith any of the CONTRACTOR's work then in progress, except such WORK as the EMPLOYER may, in writing, require to be done to safeguard any property or WORK, or installations from damage, and the EMPLOYER, 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 any of his sureties if any, shall be liable to the EMPLOYER for any excess cost occasioned by such work having to be so taken over and completed by the EMPLOYER over and above the cost at the rates specified in the schedule of quantities and rate/prices.

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 EMPLOYER for any excess cost over and above the cost at the rates specified in the Schedule of Quantities/ rates, occasioned by such works having been taken over and completed by the EMPLOYER.

23.2 In such events of Clause 23.1(a) or (b) above.

a) The whole or part of the Contract Performance Security furnished by the CONTRACTOR is liable to be forfeited without prejudice to the right of the EMPLOYER to recover from the CONTRACTOR the excess cost referred to in the sub-clause aforesaid, the EMPLOYER shall also have the right of taking possession and utilizing in completing the works or any part thereof, such as 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 of 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 of the WORK or part thereof by the EMPLOYER 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 CONTRACT to the EMPLOYER under the terms of the CONTRACT authorised or required to be reserved or retained by the EMPLOYER.

23.3 Before determining the CONTRACT as per Clause 23.1(a) or (b) provided in the judgment of the EMPLOYER, the default or defaults committed by the CONTRACTOR is/are curable and can be cured by the CONTRACTOR if an opportunity given to him, then the EMPLOYER may issue Notice in writing calling the CONTRACTOR to cure the default within such time specified in the Notice.

23.4 The EMPLOYER shall also have the right to proceed or take action as per 23.1(a) or (b) 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 EMPLOYER to give any prior notice to the CONTRACTOR.

23.5 Termination of the CONTRACT as provided for in sub- clause 23.1(a) above shall not prejudice or affect their rights of the EMPLOYER which may have accrued upto the date of such termination.

24 Contractor remains liable to pay compensation if

24.1 In any case in which any of the powers conferred upon the EMPLOYER BY CLAUSE 23.0 thereof shall have become action not taken under clause 23.0: 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 clause or clauses hereof he is declared liable to pay compensation amounting to the whole of his Contract Performance Security, and the liability of the CONTRACTOR for past and future compensation shall remain unaffected. In the event of the EMPLOYER putting in force the power under above sub-clause (a) or (b) vested in him under

the preceding clause he may, if he so desired, take possession of all or any tools, and 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 PROJECT-IN-CHARGE whose certificate thereof shall be final, otherwise the PROJECT-IN- CHARGE may give notice in writing to the CONTRACTOR or his clerk of the works, foreman or other authorised 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 PROJECT-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 PROJECT-IN-CHARGE as to the expenses of any such removal and the amount of the proceeds and expenses of any such sale shall be final and conclusive against the CONTRACTOR.

25 Change in constitution:

25.1 Where the CONTRACTOR is a partnership firm, the prior approval of the EMPLOYER shall be obtained in writing, 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 CONTRACTOR enters into any agreement with other parties, where under, the reconstituted firm would have the 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 23** hereof and the same action may be taken and the same consequence shall ensure as provided in the said clause.

26 Termination of Contract

26.1 TERMINATION OF CONTRACT FOR DEATH: If the CONTRACTOR is an individual or a proprietary concern and the individual or the proprietor dies or if the CONTRACTOR is a partnership concern and one of the partner dies then unless, the EMPLOYER is satisfied that the legal representative of the individual or the proprietary concern or the surviving partners are capable of carrying out and completing CONTRACT, he (the EMPLOYER)is entitled to cancel the CONTRACT for the uncompleted part without being in any way liable for any compensation payment to the estate of the deceased CONTRACTOR and/or to the surviving partners of the CONTRACTOR'S firm on account of the cancellation of CONTRACT. The decision of the EMPLOYER in such assessment shall be final and binding on the parties. In the event of such cancellation, the EMPLOYER shall not hold the estate of the deceased CONTRACTOR and/or the surviving partners of the CONTRACTOR'S firm liable for any damages for non-completion of CONTRACT.

26.2 Termination of Contract in case of Liquidation / Bankruptcy etc.

If the Contractor shall dissolve or become bankrupt or insolvent or cause or suffer any receiver to be appointed of his business of any assets thereof compound with his Creditors, or being a corporation commence to be wound up, not being a member's voluntary winding up for the purpose of amalgamation or reconstruction, or carry on its business under a Receiver for the benefits of its Creditors any of them, EMPLOYER shall be at liberty :- To terminate the contract forthwith upon coming to know of the happening of any such event as aforesaid by notice in writing to the Contractor or to give the Receiver or liquidator or other person, the option of carrying out the contract subject to his providing a guarantee upto an amount to be agreed upon by EMPLOYER for due and faithful performance of the contract.

26 .3 Termination of Contract for Non-Performance and subsequently putting the Contractor on Holiday

In case of termination of CONTRACT herein set forth (under clause 23.0) except under conditions of Force Majeure and termination after expiry of contract, the CONTRACTOR shall be put under holiday [i.e. neither any enquiry will be issued to the party by EMPLOYER against any type of tender nor their offer will be considered by CIPET against any ongoing tender (s) where contract between CIPET and that particular CONTRACTOR (as a bidder) has not been finalized] for **three years** from the date of termination by EMPLOYER to such CONTRACTOR.

27 Contractor's office at site:

27.1 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, notice or other communications. The CONTRACTOR at all time shall maintain a site instruction book and compliance of these shall be communicated to the PROJECT-IN CHARGE from time to time and the whole document to be preserved and handed over after completion of works.

27.2 Security & Protection:

a) The contractor shall at his cost, provide any necessary enclosures, gates, entrances etc., for the protection of the work and materials and for altering and adapting same as may be required and removing at completion of the works and making good all works disturbed.

b) During inclement weather the contractor shall suspend concreting or plastering for such time as the EMPLOYER may direct and shall protect such work in course of execution from damage by approved measures

c) Should the work be suspended by reason of rain, strike, lock outs or any other cause, the contractor shall at his cost take all precautions necessary for the protection of the work and shall make good any damage arising from any of these causes.

d) The contractor shall at his expense cover up and protect from injury from any cause, all new work and supply all temporary doors protection to windows, and any other requisite protection for the whole work executed, whether by himself or special tradesmen of Sub-Contractors and any damage caused must be made good by the contractor at his own expense.

e) All fences trees, shrubs, grasses, lawn and other surfaces around the buildings or approaches there to, which are required to be maintained are to be kept free from damage due to operations in connection with the work, at Contractor's expense.

f) The contractor shall, at his expense, protect all projecting sills, jambs, copings, stone or concrete treads and moldings and all concrete steps, wood work and joinery and the like from injury during the progress of the work, by rough timber casings securely fixed.

27.3 Objects of value and antiquity found on site:

All Objects of value, or antiquity found on the site shall remain the property of EMPLOYER and such findings shall be immediately reported to the EMPLOYER.

27.4 Useful Excavated Materials:

a) Any sand, gravel, muhurrum or rock taken from excavation will remain the property of the Employer and in the event of it not being allowed to use in the work, the Employer reserves the right to dispose it off in any way he wishes or to direct the Contractor to cart it away as excavated materials

b) Should suitable sand or gravel muhurrum or rock be found in the excavations and the contractor be allowed to use the same in the work, in place of materials to be brought by him from outside he will be required to pay the Employer the full market value of the same.

27.5 Measurement of all concealed items to be recorded prior to covering up

Measurements of all items of work including extra items if any, such as work in foundations including excavations plinth filling, masonry concrete etc., Steel in all RCC Work, pipe to be encased etc., shall be got recorded from the Employer or his authorized Site Supervisor before they are covered up.

28 Contractor's subordinate staff and their conduct

28.1 The CONTRACTOR, on or after award of the WORK shall name and depute a qualified engineer 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 PROJECT-IN- CHARGE sufficient and qualified staff to superintend the execution of the WORK, 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 PROJECT-IN- CHARGE additional properly qualified supervisory staff is considered necessary, they shall be employed by the CONTRACTOR without additional charge on accounts thereof. The CONTRACTOR shall ensure to the satisfaction of the PROJECT-IN-CHARGE that SUB- CONTRACTORS, if any, shall provide competent and efficient supervision, over the work entrusted to them.

28.2 The CONTRACTOR shall be responsible for the proper behaviour 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 occupiers of land and properties in the neighborhood and in the event of such employee so trespassing, the CONTRACTOR shall be responsible therefore and relieve the EMPLOYER of all consequent claims or actions for damages or injury or any other grounds whatsoever. The decision of the PROJECT-IN-CHARGE upon any matter arising under this clause shall be final. The CONTRACTOR shall be liable for any liability to EMPLOYER on account of deployment of CONTRACTOR's staff etc. or incidental or arising out of the execution of CONTRACT.

The CONTRACTOR shall be liable for all acts or omissions on the part of his staff, Foremen and Workmen and others in his employment, including misfeasance or negligence of whatever kind in the course of their work or during their employment, which are connected directly or indirectly with the CONTRACT.

29 Sub-letting of works:

29.1 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 whatsoever without the consent in writing, of the EMPLOYER except as provided for in the succeeding sub-clause.

i) SUB-CONTRACTS FOR TEMPORARY WORKS ETC.: The EMPLOYER may give written consent to Sub-contract for the execution of any part of the WORK at the site, being entered in to by CONTRACTOR provided each individual Sub- contract is submitted to the PROJECT-IN-CHARGE before being entered into and is approved by him.

ii) LIST OF SUB-CONTRACTORS TO BE SUPPLIED: At the commencement of every month the CONTRACTOR shall furnish to the PROJECT-IN- CHARGE list of all SUB-CONTRACTORS or other persons or firms engaged by the CONTRACTOR and working at the SITE during the previous month with particulars of the general nature of the Subcontract or works done by them.

iii) **CONTRACTOR'S LIABILITY NOT LIMITED BY SUB- CONTRACTORS**: Notwithstanding any sub-letting with such approval as aforesaid and notwithstanding that the PROJECT-IN-CHARGE shall have received copies of any Subcontracts, the contractor shall be and shall remain solely responsible for the quality, proper and expeditious execution of the Contract in all respects as if such sub-letting or Subcontracting had not taken place, and as if such work had been done directly by the CONTRACTOR. The CONTRACTOR shall bear all responsibility for any act or omission on the part of sub-contractors in regard to work to be performed under the CONTRACT.

iv) **EMPLOYER MAY TERMINATE SUB-CONTRACTS: If any SUB-CONTRACTOR engaged upon the works at the site executes any works which in the opinion** of the PROJECT-IN-CHARGE is not in accordance with the CONTRACT documents, the EMPLOYER may by written notice to the CONTRACTOR request him to terminate such subcontract and the CONTRACTOR upon the receipt of such notice shall terminate such Subcontract and dismiss the SUB-CONTRACTOR(S) and the later shall forthwith leave the works, failing which the EMPLOYER shall have the right to remove such SUB- CONTRACTOR(S) from the site.

v) **NO REMEDY FOR ACTION TAKEN UNDER THIS CLAUSE**: No action taken by the EMPLOYER under the clause shall relieve the CONTRACTOR of any of his liabilities under the CONTRACT or give rise to any right or compensation, extension of time or otherwise failing which the EMPLOYER shall have the right to remove such SUB-CONTRACTOR(S) from the site.

30 Power of entry:

30.1 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 PROJECT -IN-CHARGE.

i) Fail to carry out the WORK in conformity with the CONTRACT documents, or

ii) Fail to carry out the WORK in accordance with the Time Schedule, or

iii) Substantially suspend work or the WORK for a period of fourteen days without authority from the PROJECT-IN-CHARGE, or

iv) Fail to carry out and execute the WORK to the satisfaction of the PROJECT-IN-CHARGE, or

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

vi) Commit, 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 fourteen days, after notice in writing shall have been given to the CONTRACTOR by the PROJECT-IN-CHARGE requiring such breach to be remedied, or

vii) if the CONTRACTOR shall abandon the WORK , 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 EMPLOYER shall have the power to enter upon the WORK and take possession thereof and of the materials, temporary WORK, construction 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 EMPLOYER in his absolute discretion may think proper to employ and for the purpose aforesaid to use or authorise the use of any materials, temporary work, CONSTRUCTION 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 PROJECT-IN-CHARGE to be reasonable, and without making any payment or allowance to the CONTRACTOR for the use of the temporary said works, construction plant and stock or being liable for any loss or damage thereto, and if the EMPLOYER shall by reason of his taking

possession of the WORK or of the WORK being completed by other CONTRACTOR (due account being taken of any such extra work or works which may or be omitted) then the amount of such excess as certified by the PROJECT-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 forthwith be made good and paid to the EMPLOYER by the CONTRACTOR and the EMPLOYER shall have power to sell in such manner and for such price as he may think fit all or any of the construction plant, materials etc. constructed by or belonging to and to recoup and retain the said deficiency or any part thereof out of proceeds of the sale.

31 Other agencies at site:

31.1 The CONTRACTOR shall have to execute the WORK in such place and conditions 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 entertained due to WORK being executed in the above circumstances.

32 Notice:

32.1 TO THE CONTRACTOR: Any notice hereunder may be served on the CONTRACTOR or his duly authorised 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.

33 Right of various interests:

33.1 i) The EMPLOYER reserves the right to distribute the work between more than one agency (ies). The CONTRACTOR shall cooperate & provide other agency (ies) reasonable opportunity for access to the WORK for the carriage and storage of materials and execution of their works.

ii) Wherever the work being done by any department of the EMPLOYER or by other agency(ies) employed by the EMPLOYER is contingent upon WORK covered by this CONTRACT, the respective rights of the various interests involved shall be determined by the PROJECT-IN-CHARGE to secure the completion of the various portions of the work in general harmony.

34 Royalties:

34.1 All charges on account of royalty. tollage, rent, octroi terminal or sales tax and/or other duties or any other levy on materials obtained for the work or temporary work or part thereof (excluding materials provided by the EMPLOYER) shall be borne by the CONTRACTOR.

34.2 The CONTRACTOR shall not sell or otherwise dispose of or remove except for the purpose of this CONTRACT, the sand, stone, clay, ballast, earth, rock or other substances, or materials obtained from any excavation made for the purpose of the WORK or any building or produce upon the site at the time of delivery of the possession thereof, but all such substances, materials, buildings and produce shall be the property of the EMPLOYER provided that the CONTRACTOR may with the permission of the PROJECT-IN-CHARGE, use the same for the purpose of the work by payment of cost of the same at such a rate as may be determined by the PROJECT-IN- CHARGE.

35 Liens:

35.1 If, at any time there should be evidence or any lien or claim for which the EMPLOYER might have become liable and which is chargeable to the CONTRACTOR, the EMPLOYER shall have the right to retain out of any payment then due or thereafter to become due an amount sufficient to completely indemnify the EMPLOYER against such lien or claim and if such lien or claim be valid, the EMPLOYER 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 unsettled after all payments are made, the CONTRACTOR shall refund or pay to the EMPLOYER all money that the latter may be compelled to pay in discharging such lien or claim including all costs and reasonable expenses. EMPLOYER reserves the right to do the same.

35.2 The EMPLOYER shall have lien on all materials, equipments including those brought by the CONTRACTOR for the purpose of erection, testing and commissioning of the WORK.

35.3 The final payment shall not become due until the CONTRACTOR delivers to the PROJECT-IN-CHARGE a complete release or waiver of all liens arising or which may arise out of his agreement or receipt in full or certification by the CONTRACTOR in a form approved by PROJECT-IN-CHARGE that all invoices for labour, materials, services have been paid in lien thereof and if required by the PROJECT-IN-CHARGE in any case an affidavit that so far as the CONTRACTOR has knowledge or information the releases and receipts include all the labour and material for which a lien could be filled.

36 Delays by employer or his authorized agents:

36.1 In case the CONTRACTOR's performance is delayed due to any act or omission on the part of the EMPLOYER or his authorized agents, then the CONTRACTOR shall be given due **extension of time** for the completion of the WORK, to the extent such omission on the part of the EMPLOYER has caused delay in the CONTRACTOR's performance of his WORK.

36.2 No adjustment in CONTRACT PRICE shall be allowed for reasons of such delays and extensions granted except as provided in TENDER DOCUMENT, where the EMPLOYER reserves the right to seek indulgence of CONTRACTOR to maintain the agreed Time Schedule of Completion. In such an event the CONTRACTOR shall be obliged for working by CONTRACTOR's personnel for additional time beyond stipulated working hours as also Sundays and Holidays and achieve the completion date/interim targets.

37 Payment if the contract is terminated:

37.1 If the CONTRACT shall be terminated as per Tender pursuant to Clause no. 23 of TCC, the CONTRACTOR shall be paid by the EMPLOYER in so far as such amounts or items shall not have already been covered by payments of amounts made to the CONTRACTOR for the WORK executed and accepted by PROJECT-IN-CHARGE prior to the date of termination at the rates and prices provided for in the CONTRACT and in addition to the following:

a) The amount payable in respect of any preliminary items, so far as the Work or service comprised therein has been carried out or performed and an appropriate portion as certified by PROJECT-IN- CHARGE of any such items or service comprised in which has been partially carried out or performed.

b) Any other expenses which the CONTRACTOR has expended for performing the WORK under the CONTRACT subject to being duly recommended by PROJECT-IN-CHARGE and approved by EMPLOYER for payment, based on documentary evidence of his having incurred such expenses.

37.2 The CONTRACTOR will be further required to transfer the title and provide the following in the manner and as directed by the EMPLOYER.

a) Any and all completed works.

b) Such partially completed WORK including drawings, information and CONTRACT rights as the CONTRACTOR has specially performed, produced or acquired for the performance of the CONTRACTOR.

38 No waiver of rights:

38.1 Neither the inspection by the EMPLOYER or any of their officials, employees, or agents nor any order by the EMPLOYER for payment of money or any payment for or acceptance of the whole or any part of the Work by the EMPLOYER nor any extension of time, nor any possession taken by EMPLOYER shall operate as a waiver of any provision of the CONTRACT, or of any power herein reserved to the EMPLOYER, or any right to damages herein provided, nor shall any waiver of any breach in the CONTRACT be held to be a waiver of any other subsequent breach.

39 Certificate not to affect right of employer and liability of contractor:

39.1 No interim payment certificate(s) issued by the Project-in-Charge of the EMPLOYER, nor any sum paid on account by the EMPLOYER, nor any extension of time for execution of the work granted by EMPLOYER shall affect or prejudice the rights of the Employer against the CONTRACTOR or relieve the CONTRACTOR of his obligations for the due performance of the CONTRACT, or be interpreted as approval of the WORK done or of the equipment supplied and no certificate shall create liability for the EMPLOYER to pay for alterations, amendments, variations or additional works not ordered, in writing, by EMPLOYER or discharge the liability of the CONTRACTOR for the payment of damages whether due, ascertained, or certified or not or any sum against the payment of which he is bound to indemnify the EMPLOYER.

40 Language and measures:

40.1 All documents pertaining to the CONTRACT including Specifications, Schedules, Notices, Correspondence, operating and maintenance Instructions, DRAWINGS, or any other writing shall be written in **English language**. **The Metric System** of measurement shall be used in the CONTRACT unless otherwise specified.

41 Transfer of title:

41.1 The title of Ownership of supplies furnished by the CONTRACTOR shall not pass on to the EMPLOYER for all Supplies till the same are finally accepted by the EMPLOYER after the successful completion of PERFORMANCE TEST and GUARANTEE TEST and issue of FINAL CERTIFICATE.

41.2 However, the EMPLOYER shall have the lien on all such works performed as soon as any advance or progressive payment is made by the EMPLOYER to the CONTRACTOR and the CONTRACTOR shall not subject these works for use other than those intended under this CONTRACT.

42 Brand names:

42.1 The specific reference in the SPECIFICATIONS and documents to any material by trade name, make or catalogue number shall be construed as establishing standard or quality and performance and not as limited competition. However, TENDERER may offer other similar equipments provided it meets the specified standard design and performance requirements.

SECTION-V : PERFORMANCE OF WORK

43 Execution of work:

43.1 All the Works shall be executed in strict conformity with the provisions of the CONTRACT Documents and with such explanatory detailed drawings, specification and instructions as may be furnished from time to time to the CONTRACTOR by the PROJECT-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 workmanlike manner with the quality of material and workmanship in strict accordance with the SPECIFICATIONS and to the entire satisfaction of the PROJECT-IN-CHARGE. The CONTRACTOR shall provide all necessary materials, equipment, labour etc. for execution and maintenance of WORK till completion unless otherwise mentioned in the CONTRACT.

44 Co-ordination and inspection of work:

44.1 The coordination and inspection of the day-to-day work under the CONTRACT shall be the responsibility of the ARCHITECT and the EMPLOYER. The written instruction regarding any particular job will normally be passed by the ARCHITECT/EMPLOYER or their authorised representative.

A work order book will be maintained by the CONTRACTOR for each sector in which the aforesaid written instructions will be entered. These will be signed by the CONTRACTOR or his authorised representative by way of acknowledgement within 12 hours.

45 General conditions for construction and erection work:

45.1 The working time at the site of work is 48 hours per week. For carrying out work beyond working hours the CONTRACTOR will approach the PROJECT-IN-CHARGE or his authorised representative and obtain his prior written permission. No extra claims will be entertained by the EMPLOYER on this account.

45.2 The CONTRACTOR must arrange for the placement of workers in such a way that the delayed completion of the WORK or any part thereof for any reason whatsoever will not affect their proper employment. The EMPLOYER will not entertain any claim for idle time payment whatsoever.

45.3 The CONTRACTOR shall submit to the EMPLOYER reports at regular intervals regarding the state and progress of WORK in the prescribed formats. The details and proforma of the report will mutually be agreed after the award of CONTRACT. The CONTRACTOR shall provide display boards showing progress and labour strengths at worksite, as directed by the PROJECT-IN-CHARGE.

46 Alterations in specifications, design and extra works:

46.1 The WORK covered under this CONTRACT having to be executed by the CONTRACTOR on a lumpsum firm price/item rate quoted by him, the EMPLOYER will not accept any proposals for changes in VALUE OF CONTRACT or extension in time on account of any such changes which may arise to the CONTRACTOR's scope of WORK as a result of detailed Engineering and thereafter during the execution of WORK. The only exception to this will be a case where the EMPLOYER requests in writing to the CONTRACTOR to upgrade the SPECIFICATIONS or the size of any major pieces of equipments, plant or machinery beyond what is normally required to meet the scope of WORK as defined in the CONTRACT DOCUMENT. In such cases, a change order will be initialed by the CONTRACTOR at the appropriate time for the EMPLOYER's prior approval giving the full back-up data for their review and for final settlement of any impact on price within 30 (thirty) days thereafter.

46.2 The PROJECT-IN-CHARGE shall have to make any alterations in, omission from, additions to or substitutions for, the Schedule of Rates, 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 the such altered/ extra/ new items of WORK (upto 100% of the stated quantities in SOR/BOQ) in accordance with any instructions which may be given to him in writing signed by the PROJECT-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 of completion of WORK may be extended for the part of the

particular job at the discretion of the PROJECT-IN- CHARGE, for only such alterations, 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 additional, altered or substituted WORK are specified in the CONTRACT for the WORK, the CONTRACTOR is bound to carry on 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 PROJECT-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.

c) If the rates for the altered, additional or substituted WORK cannot be determined in the manner specified in sub-clause(s) and (b) above, then the CONTRACTOR shall, within 7 days from the date of receipt of order to carry out the WORK, inform the PROJECT-IN-CHARGE of the rates with his intention to charge for such class of WORK, supported by the rate analysis or rates claimed, and the PROJECT-IN-CHARGE shall determine the rate or rates on the basis of the prevailing market rates, labour cost at schedule of labour rates plus 10% to cover contractor's supervision, overheads and profit and pay the CONTRACTOR accordingly. The opinion of the PROJECT- 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) Where the item of work will be executed through nominated specialist agency as approved by the PROJECT-IN-CHARGE, then the actual amount paid to such nominated agency supported by documentary evidence and as certified by PROJECT-IN-CHARGE shall be considered plus 10% (ten percent) to cover all contingencies, overhead, profits to arrive at the rates.

47 Drawings to be supplied by the employer

47.1 The drawings attached with tender are only for the general guidance to 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.

47.2 Detailed working drawings on the basis of which actual execution of the WORK is to proceed, will be furnished from time to time during the progress of the 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 PROJECT-IN-CHARGE discrepancies, if any, therein before actually carrying out the Work.

47.3 Copies of all detailed working drawings relating to the WORK shall be kept at the CONTRACTOR's office on the site and shall be made available to the PROJECT-IN- CHARGE at any time during the CONTRACT. The drawings and other documents issued by the EMPLOYER shall be returned to the EMPLOYER on completion of the WORK, as they are being the sole property of the EMPLOYER.

48 Setting out works:

48.1 The EMPLOYER shall furnish the CONTRACTOR with only the four corners of the Works site and a level bench mark and the CONTRACTOR shall set out the Works and shall provide an efficient staff for the purpose and shall be solely responsible for the accuracy of such setting out.

48.2 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 all 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 center line marks, either existing or supplied and fixed by the CONTRACTOR. The work shall be set out to the satisfaction of the EMPLOYER. The approval there of joining with the CONTRACTOR by the EMPLOYER in setting out the work, shall not relieve the CONTRACTOR of any of his responsibility.

48.3 Before beginning the Works, the CONTRACTOR shall at his own cost, provide all necessary reference and level posts, pegs, bamboos, flags, ranging rods, strings and other materials for proper layout of the works in accordance with the schemes for bearing marks acceptable to the EMPLOYER. The center, longitudinal or face lines and cross lines shall be marked by means of small masonry pillars. Each pillar shall have distinct mark at the centre to enable the odolite to be set over it. No work shall be started until all these points are checked and approved by the EMPLOYER in writing but such approval shall not relieve the CONTRACTOR of any of his responsibilities. 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.

48.4 Pillars bearing geodetic marks located at the sites of units of WORKS under construction should be protected by the CONTRACTOR.

48.5 **On completion of WORK, the CONTRACTOR must submit the geodetic documents according to which the WORK was carried out.**

49 Responsibility for level and alignment:

49.1 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 effectively 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 EMPLOYER

50 Materials to be supplied by contractor:

50.1 The CONTRACTOR shall procure and provide within the VALUE OF CONTRACT the whole of the materials required for the construction including steels, cement and other building materials, tools, tackles, construction plant and equipment for the completion and maintenance of the WORK except the materials which will be issued by the EMPLOYER and shall make his own arrangement for procuring such materials and for the transport thereof. The EMPLOYER may give necessary recommendation to the respective authority if so desired by the CONTRACTOR but assumes no further responsibility of any nature. The EMPLOYER will insist on the procurement of materials which bear ISI stamp and/or which are supplied by reputed suppliers.

50.2 The CONTRACTOR shall properly store all materials brought by him to the SITE to prevent damages due to rain, wind, direct exposure to sun, etc. as also from theft, pilferage, etc. for proper and speedy execution of his works. The CONTRACTOR shall maintain sufficient stocks of all materials required by him.

50.3 No material shall be dispatched from the CONTRACTOR's stores before obtaining the approval in writing of the PROJECT-IN-CHARGE.

51 Discrepancies between instructions:

51.1 Should any discrepancy occur between the various instructions furnished to the CONTRACTOR, his agent or staff or any doubt arises as to the meaning of any such instructions or should there be any misunderstanding between the CONTRACTOR's staff and the PROJECT-IN- CHARGE's staff, the CONTRACTOR shall refer the matter immediately in writing to the PROJECT-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.

52 Action where no specification is issued:

52.1 In case of any class of WORK for which there is no SPECIFICATION supplied by the EMPLOYER 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 PROJECT-IN-CHARGE.

53 Inspection of works:

53.1 The PROJECT-IN-CHARGE will have full power and authority to inspect the WORK 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 PROJECT-IN- CHARGE every facility and assistance to carry out such inspection.

53.2 The CONTRACTOR is to provide at all time 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 measurements of the WORK by the PROJECT- IN-CHARGE.

53.3 The CONTRACTOR shall make available to the PROJECT-IN- CHARGE free of cost all necessary instruments and assistance in checking or setting out of WORK and in the checking of any WORK made by the CONTRACTOR for the purpose of setting out and taking measurements of WORK.

54 Tests for quality of work:

54.1 All workmanship shall be of the respective kinds described in the CONTRACT DOCUMENTS and in accordance with the instructions of the PROJECT-IN-CHARGE and shall be subjected from time to time to such test at CONTRACTOR's cost as the PROJECT-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 PROJECT-IN-CHARGE.

54.2 All the tests that will be necessary in connection with the execution of the WORK as decided by the PROJECT-IN-CHARGE shall be carried by the CONTRACTOR at any Government or in other testing laboratory as directed by PROJECT-IN-CHARGE. The charges/expenses for carrying out such tests shall be borne by the CONTRACTOR.

55 Samples for approval:

55.1 The CONTRACTOR shall furnish to the PROJECT-IN-CHARGE before commencement of the work, the specifications, adequate samples of all materials to be used in the WORK. The CONTRACTOR shall use such fully approved samples/materials in the actual work.

56 Action and compensation in case of inferior works:

56.1 If it shall appear to the PROJECT-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 substandard, to that contracted for, or otherwise not in accordance with the CONTRACT, the CONTRACTOR shall on demand in writing from the PROJECT-IN-CHARGE or his authorised 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 cost. In the event of failure to do so within the period specified by the PROJECT-IN-CHARGE in his demand aforesaid, the CONTRACTOR shall be liable to pay compensation at the rate of 1 % (One percent) of the estimated cost of the whole WORK, for every week limited to a maximum of 10% (ten 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 PROJECT-IN-CHARGE may on expiry of notice period, rectify or remove, re-execute the WORK or remove and replace with others, the materials or articles complained of to as the case may be at the risk and expense in all respects of the CONTRACTOR. The decision of the PROJECT-in-charge as to any question arising under this clause shall be final and conclusive.

57 Suspension of works:

57.1 Subject to the provisions of this clause, the CONTRACTOR shall, if ordered in writing by the PROJECT-IN-CHARGE, or his representative, temporarily suspend the WORKS or any part thereof for 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 the suspension was not consequent to any default or failure on the part of the CONTRACTOR.

58 Right of Employer to undertake part of work:

58.1 Upon failure of the CONTRACTOR to comply with any instructions given in accordance with the provisions of this CONTRACT the EMPLOYER has the right, instead of assuming charge of entire WORK, to place additional labour force, tools, equipments and materials on such parts of the WORK, and the EMPLOYER may designate or also engage another CONTRACTOR to carry out the WORK. In such cases, the EMPLOYER shall deduct from the amount which otherwise might become due to the CONTRACTOR, the cost of such work and material with ten percent (10%) added to cover all departmental charges and should the total amount thereof exceed the amount due to the CONTRACTOR, the CONTRACTOR shall pay the difference to the EMPLOYER.

59 Possession prior to completion:

59.1 The PROJECT-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 PROJECT-IN- CHARGE delays the progress of WORK, equitable adjustment in the time of completion will be made and the CONTRACT agreement shall be deemed to be modified accordingly.

60 Defects Liability Period (Thirty Six months period of liability from the date of issue of completion certificate):

60.1 The CONTRACTOR shall guarantee the installation/WORK for a period of 60 months from the date of completion of WORK as certified by the PROJECT-IN-CHARGE which is indicated in the 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 PROJECT-IN-CHARGE or in default, the PROJECT- IN-CHARGE may carry out such works by other contractor and deduct actual cost incurred towards labour, supervision and materials consumables or otherwise plus 100% towards overheads (of which the certificate of PROJECT-IN-CHARGE shall be final) from any sums that may then be or at any time thereafter, become due to the CONTRACTOR or from his Contract Performance Security, or the proceeds of sale thereof or a sufficient part on thereof.

60.2 **30 % of the security deposit shall be refunded to the contractor on expiry of two years from the actual date of completion of the work.**

60.3 **The balance 70 % of the security deposit shall be refunded to the contractor on expiry of three years from the actual date of completion of the work.**

60.4 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 PROJECT- IN-CHARGE in writing. If during the period of liability any portion of the WORK /equipment, is found defective and is rectified/ replaced, the period of liability for such equipment/ portion of WORK shall be operative from the date such rectification/ replacement are carried out and Contract Performance Guarantee shall be furnished separately for the extended period of liability for that portion of WORK/ equipment only. Notwithstanding the above provisions the supplier's, guarantees/warranty for the replaced equipment shall also be passed on to the EMPLOYER.

60.5 **LIMITATION OF LIABILITY**

Notwithstanding anything contrary contained herein, the aggregate total liability of CONTRACTOR under the Agreement or otherwise shall be limited to 100% of Agreement / Contract Value. However, neither party shall be liable to the other party for any indirect and consequential damages, loss of profits or loss of production.

61 Care of works:

61.1 From the commencement to completion of the WORK, the CONTRACTOR shall take full responsibility for the care of all works including all temporary works and in case any damages, loss or injury shall happen to the WORK 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 respects with the requirement of the CONTRACT and the PROJECT-IN- CHARGE's instructions.

61.2 DEFECTS PRIOR TO TAKING OVER: If at any time, before the WORK is taken over, the PROJECT-IN-CHARGE shall: a) Decide that any works done or materials used by the CONTRACTOR or by 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 hereinafter, called `Defects' in this clause), and

b) CONTRACTOR shall be notified by the EMPLOYER in writing the above said defects alleged to exist or to have occurred, then the CONTRACTOR shall at his own expenses and with all speed make good the defects so specified. In case CONTRACTOR shall fail to do so, the EMPLOYER may take, at the cost of the CONTRACTOR, such steps as may in all circumstances, be reasonable to make good such defects. The expenditure so incurred by the EMPLOYER will be recovered from the amount due to the CONTRACTOR.

The decision of the PROJECT-IN-CHARGE with regard to the amount to be recovered from the CONTRACTOR will be final and binding on the CONTRACTOR.

61.3 DEFECTS AFTER TAKING OVER: In order to obtain COMPLETION CERTIFICATE, the CONTRACTOR 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 has been taken over, the period allowed for carrying out such WORK will be normally one month. If any defect not remedied within a reasonable time, the EMPLOYER may proceed to do the WORK at CONTRACTOR's cost and all such expenses be deducted from the final bill of the CONTRACTOR by the EMPLOYER.

62 Guarantee/transfer of guarantee:

62.1 For works like water-proofing, acid and alkali resisting materials, pre-construction soil treatment against termite or any other specialized works etc. the CONTRACTOR shall invariably engage SUB-CONTRACTORS who are specialists in the field and firms of repute and such a SUB-CONTRACTOR shall furnish guarantees for their workmanship to the EMPLOYER, through the CONTRACTOR. In case such a SUB-CONTRACTOR/ firm is not prepared to furnish a guarantee to the EMPLOYER, the CONTRACTOR shall give that guarantee to the EMPLOYER directly.

63 Replacement of defective parts and materials:

63.1 If during the progress of the WORK, EMPLOYER shall decide and inform in writing to the CONTRACTOR, that the CONTRACTOR has manufactured any plant or part of the plant unsound or imperfect or has furnished plant inferior to the quality specified, the CONTRACTOR on receiving details of such defects or deficiencies shall at his own expenses within 7 (seven) days of his receiving the notice, or otherwise within such time as may be reasonably necessary for making it good, proceed to alter, re-construct or remove such work and furnish fresh equipments upto the standards of the specifications. In case the CONTRACTOR fails to do so, EMPLOYER may on giving the CONTRACTOR 7 (seven) day's notice in writing of his intentions to do so, proceed to remove the portion of the WORK so complained of and at the cost of CONTRACTOR's, perform all such works or furnish all such equipments provided that nothing in the clause shall be deemed to deprive the EMPLOYER of or affect any rights under the CONTRACT, the EMPLOYER may otherwise have in respect of such defects and deficiencies.

63.2 The CONTRACTOR's full and extreme liability under this clause shall be satisfied by the payments to the EMPLOYER of the extra cost, of such replacements procured including erection/installation as provided for in the CONTRACT; such extra cost being the ascertained difference between the price paid by the EMPLOYER for such replacements and the CONTRACT price portion for such defective plants and repayments of any sum paid by the EMPLOYER to the CONTRACTOR in respect of such defective plant. Should the EMPLOYER not so replace the defective plant the CONTRACTOR's extreme liability under this clause shall be limited to the repayment of all such sums paid by the EMPLOYER under the CONTRACT for such defective plant.

64 Indemnity

64.1 If any action is brought before a Court, Tribunal or any other Authority against the Employer or an officer or agent of the EMPLOYER, for the failure, omission or neglect on the part of the CONTRACTOR to perform any acts, matters, covenants or things under the CONTRACT, or damage or injury caused by the alleged omission or negligence on the part of the CONTRACTOR, his agents, representatives or his SUB- CONTRACTOR's, or in connection with any claim based on lawful demands of SUB-CONTRACTOR's workmen suppliers or employees, the CONTRACTOR, shall in such cases indemnify and keep the EMPLOYER and/or their representatives harmless from all losses, damages, expenses or decrees arising out of such action.

65 Construction aids, equipments, tools & tackles:

65.1 **CONTRACTOR shall be solely responsible for making available for executing the WORK, all requisite CONSTRUCTION EQUIPMENTS, Special Aids, Barges, Cranes and the like, all Tools, Tackles and Testing Equipment and Appliances, as required.**

SECTION-VI CERTIFICATES AND PAYMENTS

66 Schedule of rates and payments:

66.1 i) CONTRACTOR'S REMUNERATION: The price to be paid by the EMPLOYER to CONTRACTOR for the whole of the WORK to be done and for 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 and payment to be made accordingly for the WORK actually executed and approved by the PROJECT-IN-CHARGE. The sum so ascertained shall constitute the sole and inclusive remuneration of the CONTRACTOR under the CONTRACT and no further or other payment whatsoever shall be or become due or payable to the CONTRACTOR under the CONTRACT.

ii) SCHEDULE OF RATES TO BE INCLUSIVE: The prices/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 risks of every kind to be taken in executing, completing and handing over the WORK to the EMPLOYER by the CONTRACTOR. The CONTRACTOR shall be deemed to have known the nature, scope, magnitude and the extent of the WORK and materials required through the CONTRACT DOCUMENT may not fully and precisely furnish them.

Tenderer's 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 WORK. The opinion of the PROJECT-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.

iii) SCHEDULE OF RATES TO COVER CONSTRUCTION EQUIPMENTS, MATERIALS, LABOUR ETC.: Without in any way limiting the provisions of the preceding sub-clause the Schedule of Rates shall be deemed to include and cover the cost of all construction equipment, temporary WORK (except as provided for herein), pumps, materials, labour, insurance, fuel, consumables, 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 WORK or any portion thereof finished, complete in every respect and maintained as shown or described in the CONTRACT DOCUMENTS or as may be ordered in writing during the continuance of the CONTRACT.

iv) SCHEDULE OF RATES TO COVER ROYALTIES, RENTS AND CLAIMS:
The Schedule of Rates (i.e., VALUE OF CONTRACT) 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 WORK, also all royalties, rents and other payments in connection with obtaining materials of whatsoever kind for the WORK and shall include an indemnity to the EMPLOYER which the CONTRACTOR hereby gives against all actions, proceedings, claims, damages, costs and expenses arising from the incorporation in or use on the WORK 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, GST, Municipal Taxes or duties, taxes or charges (from or of any other 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 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 of WORK which occur from any causes including orders of the EMPLOYER in the exercise of his power and on account of extension of time granted due to various reasons and for all other possible or probable causes of delay.

vii) 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 committed. The Schedule of Rates are fully inclusive of rates which have been fixed by the CONTRACTOR and agreed to by the EMPLOYER and cannot be altered.

Payment for any additional work which is not covered in the Schedule of Rates, shall only be released on issuance of change order.

67 Procedure for measurement and billing of work in progress:

67.1 BILLING PROCEDURE:
Following procedures shall be adopted for billing of works executed by the CONTRACTOR.

67.1.1 All measurements shall be recorded in sextuplicate on standard measurement sheets supplied by EMPLOYER and submitted to EMPLOYER/CONSULTANT in printed format for scrutiny and passing.

67.1.2 EMPLOYER/CONSULTANT shall scrutinise and check the measurements recorded on the sheets and shall certify correctness of the same on the measurement sheets.

67.1.3 PROJECT-IN-CHARGE shall pass the bills after carrying out the comprehensive checks in accordance with the terms and conditions of the CONTRACTS, within 7 days of submission of the bills, complete in all respects and send the same to the Employer's Head Office located at Chennai for pre-audit and thereafter to effect payment to the CONTRACTOR.

67.1.4 **CIPET shall make all endeavour to make payments of undisputed amount of the bills submitted based on the joint measurements within 30 (Thirty) days from the date of certification by the Project-in-Charge, Architect and Corporate approval**.

67.1.5 Measurements shall be recorded as per the methods of measurement spelt out in EMPLOYER /CONSULTANT SPECIFICATIONS / CONTRACT DOCUMENT. EMPLOYER/ CONSULTANT shall be fully responsible for checking the measurements quantitatively and qualitatively as recorded in the Measurement Books/ Bills.

67.1.6 While preparing the final bill overall measurements will not be taken again. Only volume of work executed since the last measured bill along with summary of final measurements will be considered for the final bill. However, a detailed check shall be made as to the missing measurements if any and in case there are any and such missing items or measurements the same shall be recorded in the final bill.

67.2 SECURED ADVANCE ON MATERIAL:
Unless otherwise provided elsewhere in the tender, no `Secured Advance' on security of materials brought to site for execution of contracted items(s) shall be paid to the Contractor whatsoever.

67.3 **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, the latest Indian Standard Specifications shall be followed.

67.4 ROUNDING-OFF OF AMOUNTS:

In calculating the amount of each item due to the CONTRACTOR in every certificate prepared for payment, sum of less than 50 paise shall be omitted and the total amount on each certificate shall be rounded off to the nearest rupees, i.e., sum of less than 50 paise shall be omitted and sums of 50 paise and more upto one rupee shall be reckoned as one rupee.

68 Lumpsum in tender:

68.1 The payment against any Lumpsum item shall be made only on completion of that item as per the provision of the CONTRACT after certification by PROJECT-IN-CHARGE.

69 Running account payments to be regarded as advance:

69.1 Each running account payment shall be regarded as " advance payment" against the final bill payment and not as payments for WORK actually done/ completed. The final bill shall be submitted by the CONTRACTOR within one month of the date of physical completion of the WORK, otherwise, the PROJECT-IN-CHARGE's certificate of the measurement and of total amount payable for the WORK accordingly shall be final and binding on all parties.

70 Notice of claims for additional payments:

70.1 Should the CONTRACTOR consider that he is entitled to extra payment for any extra/additional WORKS or MATERIAL other than that in original SPECIFICATIONS carried out by him in respect of WORK he shall forthwith give notice in writing to the PROJECT-IN-CHARGE indicating the full details of amount claimed. that he claims extra payment. Such notice shall be given to the PROJECT-IN-CHARGE upon which

CONTRACTOR bases such claims and such notice shall contain full particulars of the nature of such claim with full details of amount claimed. Irrespective of any provision in the CONTRACT to the contrary, the CONTRACTOR must intimate his intention to lodge claim on the EMPLOYER within 10 (ten) days of the commencement of happening of the event and quantify the claim within 30 (thirty) days, failing which the CONTRACTOR will lose his right to claim any compensation /reimbursement/damages etc. or refer the matter to arbitration. Failure on the part of CONTRACTOR to put forward any claim without the necessary particulars as above within the time above specified shall be an absolute waiver thereof. No omission by EMPLOYER to reject any such claim and no delay in dealing therewith shall be waiver by EMPLOYER of any of this rights in respect thereof.

70.2 PROJECT-IN-CHARGE shall review such claims within a reasonable period of time and cause to discharge these in a manner considered appropriate after due deliberations thereon. However, CONTRACTOR shall be obliged to carry on with the WORK during the period in which his claims are under consideration by the EMPLOYER, irrespective of the outcome of such claims, where additional payments for WORKS considered extra are justifiable in accordance with the CONTRACT provisions, EMPLOYER shall arrange to release the same in the same manner as for normal WORK payments. Such of the extra works so admitted by EMPLOYER shall be governed by all the terms, conditions, stipulations and specifications as are applicable for the CONTRACT. The rates for extra works shall generally be the unit rates provided for in the CONTRACT. In the event unit rates for extra works so executed are not available as per CONTRACT, payments may either be released on day work basis for which daily/hourly rates for workmen and hourly rates for equipment rental shall apply, or on the unit rate for WORK executed shall be derived by interpolation/ extrapolation of unit rates already existing in the CONTRACT. In all the matters pertaining to applicability of rate and admittance of otherwise of an extra work claim of CONTRACTOR the decision of PROJECT-IN-CHARGE shall be final and binding.

71 Payment of contractor's bill:

71.1 No payment shall be made for works estimated to cost less than Rs.15,00,000/- 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.15,00,000/-, that CONTRACTOR on submitting the bill thereof be entitled to receive a payment proportionate to the part thereof approved and passed by the PROJECT-IN-CHARGE, whose certificate of such approval and passing of the sum so payable shall be final and conclusive against the CONTRACTOR.

71.2 Payment due to the CONTRACTOR shall be made by the EMPLOYER by Account Payee cheque forwarding the same to the registered office or the notified office of the CONTRACTOR. In no case will EMPLOYER be responsible if the cheque is mislaid or misappropriated by unauthorised person/persons. In all cases, the CONTRACTOR shall present his bill duly pre-receipted on proper revenue stamp and the payment shall be made in **Indian Currency**. This payment will be made after making necessary corrections/deductions as stipulated elsewhere in the CONTRACT DOCUMENT for materials, Contract Performance Security, taxes etc.

71.3 **Payment of final bill shall be made to the CONTRACTOR within 60 days from the date of submission of final bill on joint measurements, after completion of all the obligations under the CONTRACT.**

72 Completion certificate/Virtual Completion Certificate (VCC).

72.1 The PROJECT-IN-CHARGE shall normally issue to the CONTRACTOR the COMPLETION CERTIFICATE within one month after receiving application from the CONTRACTOR and after verifying from the completion documents and satisfying himself that the WORK has been completed in accordance with and as set out in the construction and erection 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.

72.2 Within one month of the completion of the WORK in all respects, the CONTRACTOR shall furnish with a certificate by the PROJECT-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 cleared off the SITE completely nor until the WORK shall have been measured by the PROJECT-IN-CHARGE whose measurement shall be binding** and conclusive. The WORKS will not be considered as complete and taken over by the EMPLOYER, until all the temporary works, labour and staff colonies are cleared to the satisfaction of the PROJECT-IN-CHARGE. If the CONTRACTOR fails to comply with the requirements of this clause on or before the date fixed for the completion of the WORK, the PROJECT-IN-CHARGE may at the expense of the CONTRACTOR remove such scaffolding, surplus materials and rubbish and dispose off the

same as he thinks fit and clean off 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.

72.3 COMPLETION CERTIFICATE DOCUMENTS:

For the purpose of Clause 72 the following documents will be deemed to form the completion documents:

i) The technical documents according to which the WORK was carried out.
ii) Certificates of final levels as set out for various works.
iii) Certificates of tests performed for various WORKS.
iv) Material appropriation, Statement for the materials issued by the EMPLOYER for the WORK and list of surplus materials returned to the EMPLOYER's store duly supported by necessary documents.

73 Final decision and final certificate:

73.1 Upon expiry of the period of liability and subject to the PROJECT-IN-CHARGE being satisfied that the WORKS have been duly maintained by the CONTRACTOR during monsoon or upto the period of defect liability and that the CONTRACTOR has in all respect duly made-up any subsidence and performed all his obligations under the CONTRACT, the PROJECT-IN- CHARGE shall 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 CONTRACT until FINAL CERTIFICATE shall have been given by the PROJECT-IN- CHARGE notwithstanding any previous entry upon the WORK and taking possession, working or using of the same or any part thereof by the EMPLOYER.

74 Certificate and payments on evidence of completion:

74.1 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 EMPLOYER of the due performance of the CONTRACT or any part thereof or of occupancy or validity of any claim by the CONTRACTOR.

75 Deductions from the contract price:

75.1 All costs, damages or expenses which EMPLOYER may have paid or incurred, which under the provisions of the CONTRACT, the CONTRACTOR is liable/will be liable to pay to the EMPLOYER. All such claims shall be billed by the EMPLOYER to the CONTRACTOR regularly as and when they fall due. Such claims shall be paid by the CONTRACTOR within 15 (fifteen) days of the receipt of the corresponding bills and if not paid by the CONTRACTOR within the said period, the EMPLOYER may, then, deduct such amounts from any moneys due i.e., Contract Performance Security or becoming due to the CONTRACTOR under the CONTRACT or may be recovered by actions of law or otherwise, if the CONTRACTOR fails to satisfy the EMPLOYER of such claims.

SECTION-VII TAXES AND INSURANCE

76 Taxes, Duties, Octroi etc:

76.1 The CONTRACTOR agrees to and does hereby accept full and exclusive liability for the payment of any and all Taxes, Duties, including Excise duty, octroi etc. now or hereafter imposed, increased, modified, all the sales taxes, duties, octroi etc. now in force and hereafter increased, imposed 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 Government 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 of all SUB-CONTRACTORS, with all applicable **Central, State, Municipal and local law and regulation and requirement of any Central, State or local Government agency or authority.**

CONTRACTOR further agrees to defend, indemnify and hold EMPLOYER harmless from any liability or penalty which may be imposed by the Central, State or Local authorities by reason or any violation by CONTRACTOR or SUB-CONTRACTOR of such laws, suits or proceedings that may be brought against the EMPLOYER 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.

Tax deductions will be made as per the rules and regulations in force in accordance with acts prevailing from time to time.

77 Taxes :

The rates quoted by the Contractor are deemed to be inclusive of the sales and other levies, duties, royalties, cess, toll, taxes of Central and State Governments, local bodies and authorities except GST, that the Contractor will have to pay for the performance of this Contract. GST as applicable at the time of payment to the contractor shall be paid separately. Contractors will have to get themselves registered under GST and quote GSTIN in their bids. The Employer will perform such duties in regard to the deduction of such taxes at source as per applicable law.

77.1 Tenderer should quote all his prices including the liability of GST whether on the works contract as a whole or in respect of bought out components used by the CONTRACTOR in execution of the CONTRACT. EMPLOYER shall not be responsible for any such liability of the CONTRACTOR in respect of this CONTRACT.

78 Statutory variations

78.1 Tenderer should quote prices inclusive of excise-duty and sales tax applicable on finished product. Any statutory variations in Excise Duty and sales tax on finished product during the contractual completion period, shall be to the Employer's account for which the Contractor will furnish documentary evidence(s) in support of their claims to EMPLOYER . However, any increase in the rate of such taxes and duties (E.D. and S.T.) beyond the contractual completion period shall be to Contractor's account and any decrease shall be passed on to the EMPLOYER.

79 Insurance:

i) EMPLOYEES STATE INSURANCE ACT:
The CONTRACTOR agrees to and does hereby accept full and exclusive liability for the compliance with all obligations imposed by the Employee State Insurance Act 1948 and the CONTRACTOR further agrees to defend, indemnify and hold EMPLOYER harmless for 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 EMPLOYER arising under, growing out of or by reasons of the work provided for by this 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 CONTRACTOR's or SUB- CONTRACTOR's employees, who are employed in the WORK provided for or those covered by ESI from time to time under the Agreement.

ii) WORKMEN COMPENSATION AND EMPLOYER'S LIABILITY INSURANCE:
Insurance shall be effected 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 later's employees if such employees are not covered under the CONTRACTOR's Insurance.

iii) ACCIDENT OR INJURY TO WORKMEN:
The EMPLOYER shall not be liable for or in respect of any damages or compensation payable at law in respect or in consequence of any accident or injury to any workman or other person in the Employment of the CONTRACTOR or any SUB-CONTRACTOR save and except an accident or injury resulting from any act or default of the EMPLOYER, his agents or servants and the CONTRACTOR shall indemnify and keep indemnified the EMPLOYER against all such damages and compensation (save and except and aforesaid) and against all claims, demands, proceeding, costs, charges and expenses, whatsoever in respect or in relation thereto.

iv) COMPREHENSIVE GENERAL LIABILITY INSURANCE

a) This insurance shall protect the Contractor against all claims arising from injuries, disabilities, disease or death of member of public or damage to property of others due to any act or omission on the part of the Contractor, his agents, his employees, his representatives and Sub-Contractor's or from riots, strikes and civil commotion.

b) Contractor shall take suitable Group Personal Accident Insurance Cover for taking care of injury, damage or any other risks in respect of his Engineers and other Supervisory staff who are not covered under Employees State Insurance Act.

c) The policy shall cover third party liability. The third party (liability shall cover the loss/ disablement of human life (person not belonging to the Contractor) and also cover the risk of damage to others materials / equipment/ properties during construction, erection and commissioning at site.

The value of third party liability for compensation for loss of human life or partial/full disablement shall be of required statutory value but not less than Rs. 2 lakhs per death, Rs. 1.5 lakhs per full disablement and Rs. 1 lakh per partial disablement and shall nevertheless cover such compensation as may be awarded by Court by Law in India and cover for damage to others equipment/ property as approved by the Purchaser. However, third party risk shall be maximum to Rs. 10(ten) lakhs to death.

SECTION-VIII : LABOUR LAWS

80 Labour laws:

80.1 i) No labour below the age of 18 (eighteen) years shall be employed on the WORK.

ii) The CONTRACTOR shall not pay less than what is provided under law to labourers engaged by him on the WORK.

iii) The CONTRACTOR shall at his expense comply with all labour laws and keep the EMPLOYER indemnified in respect thereof.

iv) The CONTRACTOR shall pay equal wages for men and women in accordance with applicable labour laws.

v) If the CONTRACTOR is covered under the Contract labour (Regulation and Abolition) Act, he shall obtain a licence from licensing authority (i.e. office of the labour commissioner) by payment of necessary prescribed fee and the deposit, if any, before starting the WORK under the CONTRACT. Such fee/deposit shall be borne by the CONTRACTOR.

vi) The CONTRACTOR shall employ labour in sufficient numbers either directly or through SUB-CONTRACTOR's to maintain the required rate of progress and of quality to ensure workmanship of the degree specified in the CONTRACT and to the satisfaction of the PROJECT-IN-CHARGE.

vii) The CONTRACTOR shall comply with the provisions of **the payment of Wage Act 1936**, **Employee Provident Fund Act 1952, Minimum Wages Act 1948. Employers Liability Act 1938. Workmen's Compensation Act 1923, Industrial Disputes Act 1947, the Maternity Benefit Act 1961 and Contract Labour Regulation and Abolition Act 1970, Employment of Children Act1938 from time** to **time or any modifications thereof or any other law relating thereto and rules made there under time.**

81 Contractor to indemnify the Employer:

81.1 i) The CONTRACTOR shall indemnify the EMPLOYER and every member, office and employee of the EMPLOYER, also the PROJECT-IN-CHARGE and his staff against all actions, proceedings, claims, demands, costs and expenses whatsoever arising out of or in connection with the matters of **damage to the property or to any person or any third party** and all actions, proceedings, claims, demands, costs and expenses which may be made against the EMPLOYER for or in respect of or arising out of any failure by the CONTRACTOR in the performance of his obligations under the CONTRACT DOCUMENT. The EMPLOYER shall not be liable for or in respect of or arising out of any failure by the CONTRACTOR in the performance of his obligations under the CONTRACT DOCUMENT. The EMPLOYER 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 the CONTRACTOR shall indemnify and keep indemnified the EMPLOYER 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 EMPLOYER have to pay any money in respect of such claims or demands as aforesaid the amount so paid and the costs incurred by the EMPLOYER 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 EMPLOYER to make such payments notwithstanding the same, may have been made without the 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 provision of Workmen Compensation Act or any other Act, the EMPLOYER is obliged to pay compensation to a workman employed by the CONTRACTOR in execution of the WORK, the EMPLOYER will recover from the CONTRACTOR the amount of the compensation so paid, and without prejudice to the rights of EMPLOYER under Section 12, Sub- section (2) of the said act, EMPLOYER shall be at liberty to recover such amount or any part thereof by deducting it from the Contract Performance Security or from any sum due to the CONTRACTOR whether under this CONTRACT or otherwise. The EMPLOYER shall not be bound to contest any claim made under Section 12, Sub-section (i) of the said act, except on the written request of the CONTRACTOR and upon his giving to the EMPLOYER full security for all costs for which the EMPLOYER might become liable in consequence of contesting such claim.

82 Health and sanitary arrangements for workers:

82.1 In respect of all labour directly or indirectly employed in the WORKS 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 EMPLOYER from time to time for the protection of health and sanitary arrangements for all workers.

82.2 The CONTRACTOR shall provide in the labour colony all amenities such as electricity, water and other sanitary and health arrangements. The CONTRACTOR shall also provide necessary surface transportation to the place of work and back to the colony for their personnel accommodated in the labour colony.

SECTION-IX APPLICABLE LAWS AND SETTLEMENT OF DISPUTES

83 Arbitration:

83.1 Unless otherwise specified, the matters where decision of the Project-in-Charge is deemed to be final and binding as provided in the Agreement and the issues/disputes which cannot be mutually resolved within a reasonable time, all disputes shall be referred to arbitration by Sole Arbitrator.

The Employer shall suggest a panel of three independent and distinguished persons to the bidder/contractor/supplier/buyer (as the case may be) to select any one among them to act as the Sole Arbitrator.

In the event of failure of the other parties to select the Sole **Arbitrator within 30 days from the receipt of the communication** suggesting the panel of arbitrators, the right of selection of the sole arbitrator by the other party shall stand forfeited and the EMPLOYER (CIPET) shall have discretion to proceed with the appointment of the Sole Arbitrator. The decision of Employer on the appointment of the sole arbitrator shall be final and binding on the parties.

The award of sole arbitrator shall be final and binding on the parties and unless directed/awarded otherwise by the sole arbitrator, the cost of arbitration proceedings shall be shared equally by the parties. The Arbitration proceedings shall be in English language and venue shall be Haldia, India. Subject to the above, the provisions of (Indian) Arbitration & Conciliation ACT 1996 and the Rules framed there under shall be applicable. All matter relating to this contract are subject to the exclusive jurisdiction of the court situated in the state of West Bengal.

Bidders/suppliers/contractors may please note that the **Arbitration & Conciliation Act 1996** was enacted by the Indian Parliament and is based on United Nations Commission on International Trade Law (UNCITRAL model law), which were prepared after extensive consultation with Arbitral Institutions and centers of International Commercial Arbitration. The United Nations General Assembly vide resolution 31/98 adopted the UNCITRAL Arbitration rules on 15 December 1976.

83.2 FOR THE SETTLEMENT OF DISPUTES BETWEEN GOVERNMENT DEPARTMENT AND ANOTHER AND ONE GOVERNMENT DEPARTMENT AND PUBLIC ENTERPRISE AND ONE PUBLIC ENTERPRISE AND ANOTHER THE ARBITRATION SHALL BE AS FOLLOWS:

"In the event of any dispute or difference between the parties hereto, such dispute or difference shall be resolved amicably by mutual consultation or through the good offices of empowered agencies of the Government.

If such resolution is not possible, then, the unresolved dispute or difference shall be referred to arbitration of an arbitrator to be nominated **by Secretary, Department of Legal Affairs ("Law Secretary") in terms of the Office Memorandum No.55/3/1/75-CF, dated the 19th December 1975 issued by the Cabinet Secretariat (Department** of Cabinet Affairs), as modified from time to time. The Arbitration Act 1940 (10 of 1940) shall not be applicable to the arbitration under this clause. The award of the Arbitrator shall be binding upon parties to the dispute. Provided, however, any party aggrieved by such award may make a further reference for setting aside or revision of the award to Law Secretary whose decision shall bind the parties finally and conclusively.

84 Jurisdiction:

84.1 The CONTRACT shall be governed by and constructed according to the laws in force in INDIA. The CONTRACTOR hereby submits to the jurisdiction of the Courts situated at HALDIA for the purposes of disputes, actions and proceedings arising out of the CONTRACT, the courts at HALDIA only will have the jurisdiction to hear and decide such disputes, actions and proceedings.

SECTION-X SAFETY CODES:

85 Safety regulations:

85.1 i) In respect of all labour, directly employed in the 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, The Mines Act and such other acts as applicable.

ii) The CONTRACTOR shall observe and abide by all fire and safety regulations of the EMPLOYER. Before starting construction work CONTRACTOR shall consult with PROJECT-IN-CHARGE and must make good to the satisfaction of the EMPLOYER any loss or damage due to fire to any portion of the work done or to be done under this agreement or to any of the EMPLOYER's existing property.

86 First aid and industrial injuries:

86.1 i) CONTRACTOR shall maintain first aid facilities for its employees and those of its SUB-CONTRACTOR.

ii) CONTRACTOR shall make outside arrangements for ambulance service and for the treatment of industrial injuries. Names of those providing these services and their telephone numbers shall be prominently posted in CONTRACTOR's field office.

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

The CONTRACTOR shall abide by the safety code provision as per C.P.W.D. Safety code and Indian Standard Safety Code from time to time.

VOLUME II OF VI

TECHNICAL SPECIFICATIONS

FOR

CIVIL WORKS

GENERAL INFORMATION

A. GENERAL:

The work under this tender shall be executed strictly in accordance with constructional and material requirements defined under these specifications. The Contractor shall carefully acquaint himself with these specifications to determine his contractual obligations for the work. The conditions of these specifications will be binding on the Contractor and no deviation shall be permissible unless specifically approved by the Consultant / Project-in-charge in writing. In absence of any detailed Specifications these specification, latest Indian Standard specifications and code of practice shall become applicable. Wherever the codes and specifications are silent then the same shall be governed by sound engineering practices and the decision of the Project-in-charge / consultant in matters of interpretation etc., shall be final and binding on the Contractor.

B. DRAWINGS / DIMENSIONS:

Figured dimensions on drawings shall supersede measurements by scale and drawings to a large scale take precedence over those to a smaller scale. Special dimensions or directions in the specifications shall be checked on site. Measurements and other information concerning the existing site on the drawings are believed to be correct, but the Contractor shall verify them for himself and also examine the nature of the ground as no claim or allowance whatsoever shall be entertained hereinafter on account of any errors or omissions in the levels or the description of the ground turning out to be different from what was expected or shown on the drawings.

C. CORRELATION OF DRAWING:

Before commencement of work, the Contractor shall correlate all relevant structural, Construction and services drawings and satisfy himself that the information available is complete and unambiguous. The Contractor shall be responsible for any error / difficulty in execution / damage incurred owing to any discrepancy in the drawings which has been overlooked by him and has not been brought to the notice of the Project-in-charge / Consultant before execution.

D. B.I.S CODES OF PRACTICE:

Wherever any reference is made in the specifications to **any bureau of Indian Standard (IS)** code of practice, it shall be understood to indicate the latest version of the code of practice in usage at the time of construction.

E. ALL SIMILAR RATES TO HAVE SAME QUOTED RATE

It shall be noted by the bidder that a similar item repeated at various sub heads of the tender, he should quote same rates. For any reasons different rates are quoted the lowest rate shall be considered for deriving the substituted / extra item rate if required.

SPECIFICATIONS

1. SPECIFICATIONS FOR EXCAVATION AND EARTHWORK

1.1 SCOPE

The scope of work broadly includes but is not necessarily limited to the following i.e. clearing of the site, excavation of foundation trenches, back-filling, disposal of surplus earth as required including dewatering, shoring and strutting. Contractor shall provide all tools, labour, equipment and incidentals necessary, required for completion of all aspects of work covered in these specifications.

1.2 TYPES OF SOIL

Contractor shall thoroughly acquaint himself with the types of soil in excavation by an inspection of nature of the ground at site & scrutiny of the investigation details available with the Consultant.

1.3 CLEARING THE SITE

The site on which the structure is to be built shown on the drawing and the area required for setting out and other operations like road, drains, sheds, etc. should be cleared and all obstructions, loose stones, materials, and rubbish of all kinds, stump, brush wood and trees removed as directed, roots being entirely grubbed up. All useful materials obtained will be the property of the Project-in-charges and will be handed over to the Consultant. Rejected materials will be removed by the contractor to his own dump.

1.4 GROUND LEVELS AND SITE LEVEL PLAN

Before starting the excavations, the requisite block levels of the entire plot shall be taken by the contractor in consultation with the Consultant and a proper record of these levels to be kept, which shall be jointly signed by the Contractor and the Consultant. A block level plan showing-all the ground levels of the plot shall be prepared and shall jointly be signed by the Contractor and the Consultant/Project-in-charge.

1.5 SETTING OUT

After clearing the site, and preparing the site level plan, the Contractor will set out the center lines of the building or other involved works and get the same approved from the Consultant. It shall be the responsibility of the Contractor to install substantial reference marks; bench marks etc. and maintain them as long as required by the Consultant. The Contractor will assume full responsibility for proper setting out, alignment, elevation and dimension of each and all parts of the work

1.6 EXCAVATION AND PREPARATION OF FOUNDATIONS FOR CONCRETING

1.6.1 General Foundation trenches shall be dug wet or dry to the dimensions as shown on the drawings or as directed by the Consultant. The excavated materials shall be stacked at a sufficient distance away from the edge of the excavated pit so as not to endanger the stability of the sides. The soil heap shall not exceed more than 2 m from the ground.

The contractor shall, at his expense and without any extra charge, make provision for all shoring and strutting, extra excavation in slope, extra excavation in working space, dredging or bailing out water, and the excavation shall be kept free from water when the foundation work is in progress.
If excavation is carried out to greater width, length or depth than specified, extra depth shall be made up by filling in lean concrete and extra length or width by filling in with earth rammed hard or by masonry as shall be borne in full by the contractor.

If required to protect the sides of pits and trenches, timber shoring and strutting shall be erected. The timbering shall be closed or open depending on the nature of the soil and work, and arrangement of timbering including sizes and spacing of members used shall be as approved by the Consultant. NO extra charges shall be admissible on this account.

The bottoms of all excavation shall be trimmed and leveled in accordance with drawings / directions of the Consultant / Project-in-charge. The bottoms of all excavation shall be rammed and wetted before deposition of concrete. The contractors shall report to the Consultant / Project-in-charge when the excavation is ready to receive concrete. NO concrete shall be placed in foundations until the contractor has obtained the approval of Consultant / Project-in-charge.

1.6.2 PROTECTION

All foundation trenches and similar excavations shall be strong, fenced and marked with red lights at night for watchmen to avoid accidents. Adequate protective measures shall be taken to see that the excavation does not affect or damage adjoining structures. All measures required for the safety of the excavation, the people working in and near the foundation trenches, property and the people in the vicinity shall be taken care by the Contractor at his own cost, being entirely responsible for any injury and damage to property caused by his negligence or accident due to his construction operations.

1.6.3 **STACKING OF EXCAVATED MATERIALS:**

Work for excavation shall include sorting out of useful materials and stacking them on site as directed. Materials suitable and useful for back-filling, plinth, filling, leveling of the plot or other use shall be stacked at convenient places, but not in such a way as to obstruct free movement of men, equipment and vehicles or encroach on the area required for constructional purposes.

1.7 BACKFILLING

1.7.1 Earth obtained from excavation (or approved earth brought from out side for which no extra payment shall be made) shall be filled in layers as described in 1.7.3 around the foundations and under floors, In case extra earth used for filling is required under floors, plinth protection including sit outs, courtyards, the contractor will do at their own cost. The lump sum offer shall be deemed to include the earth filing required under floors and plinth protection with plinth height shown in Drawing above the bottom of foundation concrete and finished courtyard level shown in Drawing below D PC /coping level of the main building.

1.7.2 QUALITY OF FILL

Fill shall be of well compacted, well graded earth or sand and shall be free from tree stumps, organic matter, seed and peat etc Where earth or sand from source other than excavation at site is used, the quality of such earth or sand shall be the same as that obtained from excavation at site, or superior to it. Fine sand for filling is River Sand. Black cotton soil shall not be used for back filling or plinth filling.

1.7.3 COMPACTION

The fill shall be spread in layers not exceeding 20 cm thick and each layer shall be watered and thoroughly consolidated by suitable mechanical rollers, rammers, vibrators or other approved plant or system of compaction. The fill material shall be pulverized before depositing in place. An optimum moisture content shall be maintained for the filled materials. Compaction shall be done so as to achieve a dry density of not less than 90% of the maximum density obtained at optimum moisture content, except for the upper 20 cm layer which shall be compacted to a density of not less than 95% of the maximum density. In order that the fill shall be reasonably uniform through out, the material shall be dumped in place in approximately horizontal layers “Edge dumping”, a process by which the materials is pushed off edge of the fill and allowed to roll down the slope shall not be carried out. If there is traffic over the fill during construction, either by construction equipment or otherwise, it should be routed to make the compaction as uniform load shall be maintained and also care shall be taken to prevent any wedging action.

1.8 SURPLUS EXCAVATED MATERIAL

All excavated material certified as surplus and not useful, shall be removed by the Contractor from the site in an approved manner at his own cost and risk so as indemnify owner from any claims any time of whatsoever nature.

2. SPECIFICATIONS FOR ANTI-TERMITE TREATMENT

2.1 GENERAL

Prevention of termite from reaching the super structure can be achieved by creating a chemical barrier between the ground and the building by treating the soil beneath the building and around the foundations. The work shall be carried out as per IS 6313 part II. of 2001 or the latest edition. This shall be provided to sides and bottom of trenches and footings including treating the backfill of foundations up to ground level and the vertical surface of wall, and filling of each under floors and treating the surface at ground level 900 mm around the building.

2.2 MATERIAL

Anti termite treatment, shall be carried out strictly in accordance with CPWD specifications using Chloropyrifos (CPP) an **Emulsified concentrate @ 1% concentration or any other approved chemical.**

2.3 PRE-CONSTRUCTION CHEMICAL TREATMENT

This is a process in which chemical treatment is applied to a building in the early stages of its construction at the rate specified In **IS 6313 part II of 2001** or the latest edition. Hand operated pressure pump shall be used for uniform spraying of the chemical. To have proper check for uniform spraying of chemical graduated containers shall be used. Proper check should be kept that specified quantity of chemical is used for the required areas during the operation.

2.4 TIME OF APPLICATION

Soil treatment shall start when foundation trenches and pits are ready to take lean concrete in foundations. Laying of lean concrete shall start when chemical emulsion has been absorbed by the soil and the surface is quite dry. Treatment should not be carried out when it is raining or soil is wet with rain or sub soil water. The foregoing applies also in the case of treatment to the filled earth surface within the plinth before laying the sub grade for the floor.

2.5 DISTURBANCE

The treated soil barriers shall not be disturbed after they are formed. If by chance, treated soil barriers are disturbed, immediate steps shall be taken to restore the continuity and completeness of the barrier system.

2.6 TREATMENT OF COLUMN PITS AND WALL TRENCHES

a) The bottom surface and the sides (up to a height of above 300 mm) of the excavation made for column pits and trenches shall be treated with the chemical at the rate specified in IS 6313 Part II of 2001 or the latest edition.

b) After the column foundation and the wall foundation come up, the back fill in immediate contact with the foundation structure shall be treated at the rate specified in IS 6313 Part II of 2001 or the latest edition of the vertical surface of the substructure for each side If water is used for ramming the earth fill, the chemical treatment shall be carried out after the ramming operation is done by prodding the earth at 150 mm centers close to the wall surface and spraying the chemical with the above dose. The earth is usually returned in layers and the treatment shall be carried out in similar stages. The chemical emulsion shall be directed towards the concrete to masonry surface of the columns and walls so that the earth in contact with these surfaces is well treated with the chemical.

c) In the case of R.C.C. framed structure with columns and plinth beams and R.C.C basement with concrete, mix is rich and dense (being 1:2:4 or richer), it is unnecessary to start the treatment from the bottom of excavation for columns and plinth beams. The treatment shall start at the depth of 500 mm below ground level. , From this depth the back-fill around the columns, beams and R.C.C. basement wall shall be treated at the rate as per IS 6313 Part II of 2001 or the latest edition. The other details of treatment shall be as laid down in the Clause (b) above.

2.7 TREATMENT OF TOP SURFACE OF PLINTH FILLING

The top surface of the filled earth within plinth wall shall be treated with chemical emulsion at the rate as per IS 6313 Part II 2001 or the latest direction (surface area) before the sand/sub-grade is laid. Holes up to 50 to 70 mm deep at 150 mm centers both ways shall be made with crow bars on the surface to facilitate saturation of the soil with chemical emulsion.

2.8 TREATMENT OF JUNCTION OF WALL AND FLOOR

To achieve continuity of the vertical chemical barrier on inner wall surface from the ground level, small channel 30 X 30 mm shall be made at all the junctions of wall and columns with the floor (before laying the sub-grade) and rod holes made in the channel up to ground level 150 mm apart and the chemical emulsion poured along the channel as per rate of application, mentioned in IS 6313 Part II (2001) or the latest edition so as to soak the soil right up to bottom. The soil shall be tamped back into place after this operation.

2.9 TREATEMENT OF SOIL ALONG EXTERNAL PERMIETER OF BUILDING

During progress of work, provide hole in the soil with iron rods along the external perimeter of the building at intervals of about 150 mm and depth 300 mm and filling these holes with chemical emulsion at the rate (as per IS 6313 Part II of 2001 or the latest edition) per meter of perimeter of the external wall.

2.10 TREATMENT FOR EXPANSION JOINTS

Anti termite treatment shall be supplemented by treating through the expansion joint after the sub grade has been laid as per IS 6313 Part II of 2001 or the latest edition.

2.11 TREATMENT OF SOIL SURROUNDING PIPES AND CONDUITS

When pipes and conduits enter the soil inside the area of the foundations, the soil surrounding the points of entry shall be loosened around each such pipe, or conduit for a distance of 150 mm and up to depth of 75 mm before treatment is commenced When they enter the soil external to the foundations, they shall be similarly treated unless they stand clear of the walls of the building by about 75 mm for distance of over 300 mm from ground level.

2.12 SAFETY PRECAUTIONS

All chemicals used for anti-termite treatment are poisonous and hazardous to health. These chemicals can have an adverse effect upon health when absorbed through the skin, inhaled as vapors or spray mists or swallowed. Person using or handling these chemicals should be warned of these dangers and advised that absorption through the skin is the most likely source of accidental poisoning. They should be cautioned to observe carefully the safety precautions given below.

These chemicals are usually brought to site in the form of emulsifiable concentrates. The containers should be clearly labeled and should be stored carefully so that children and pets cannot get at them. They should be kept securely closed.

Special care should be taken to prevent skin contact with concentrates. Prolonged exposure to dilute emulsions should also be avoided Workers should wear clean clothing and should wash thoroughly with soap and water, especially before eating or smoking. In the event of severe contamination, clothing should be removed at once and the skin washed with soap and water, if chemicals splash into the eyes they should be flushed with plenty of fresh water and immediate medical attention should be sought.

The concentrates are oil solutions and present a fire hazard owing to the use of petroleum solvents. Flames should not be allowed nearby during the mixing. Care should be taken in the applications and present a fire hazard owing to the use of petroleum solvents Flames should not be allowed nearby during the mixing.

Care should be taken in the application of chemicals to see that they are not allowed to contaminate wells or springs which serve as source of drinking water.

2.13 GUARANTEE

The contractor shall guarantee through a guarantee bond, the anti-termite work for 10 years from the date of completion of the project, and shall indemnify the Project-in-charge against any defects that arise therein during the guarantee period as aforesaid. They shall immediately rectify, any defects that may occur therein, and repair all other damage occurring to any part of the structure on account of defect in Anti-termite treatment, during the guarantee period of aforesaid.

3. SPECIFICATION FOR CAST – IN – SITU REINFORCED CEMENT CONCRETE

3.1 GENERAL

3.1.1 DESCRIPTION

This section covers the requirements for finishing of cement concrete, proportioning, batching, mixing, testing, placing, compacting, finishing, jointing, curing and all other work as required for cast in place reinforced concrete. The contractor shall provide all the materials including cement, steel, labour, equipment, 'form work', scaffolding etc., required for completion of all reinforced concrete works as per drawings and documents. Cement concrete shall be composed of cement, fine aggregate, coarse aggregate, water, with or without admixture as approved, proportioned and mixed as specified herein.

3.1.2 RELATED WORK SPECIFIED ELSEWHERE

a) Steel reinforcement
b) Form work

3.1.3 APPLICABLE CODES AND STANDARDS

The codes and standards generally applicable to the work of this section are listed hereinafter.
IS 383 Coarse and fine aggregates from natural sources for concrete
IS 456 Code of practice for plain and reinforced concrete
IS 516 Methods of testing for strength of concrete
IS 1199 Methods of sampling and analysis of concrete
IS 1838 Performed fillers for expansion joints in concrete non-extruding and resilient type
IS 1946 Code of practice for use of fixing devices in walls, ceiling and floors of solid Construction
IS 2389 Methods of testing of aggregate for concrete's
IS 2505 Concrete vibrators, immersion type
IS 2645 Integral cement water proofing compounds
IS 3414 Code of practice for design and installation of joints in buildings
IS 3558 Code of practice for use for immersion vibrators for consolidating concrete
IS 4082 Recommendation on stacking and storage of construction materials at
IS 7861 Code of practice for extreme weather concretizing
IS 7861 Recommended practice for hot weather (part I) concretizing
IS 8112 Ordinary Portland Cement grade 43
IS 12269 Ordinary Portland Cement grade 53

PART— I
The following clauses are intended to amplify the requirements of the reference document listed above and the contractor shall comply with these clauses

3.2 SUBMITTALS

3.2.1 Material Report

3.2.2 Prior to start of delivery of materials required, the following shall be submitted by the contractor to the Consultant / Project-in-charge for approval

Suppliers and / or sources of all consumable materials including cement, steel, fine and coarse aggregates, water additives, bricks and timber etc.

Quality Inspection Plan to ensure continuing quality control of ingredients by periodic sampling, testing and reporting to the Consultant on the quality of materials being supplied.

3.3 PLANT AND EQUIPMENT

The contractor shall submit the following to the Consultant well in advance.
The proposed program, methods and details of plant and Equipment for be used to testing of ingredients and concrete samples.
The proposed programme methods and details of plant & equipment to be used for concrete work.

3.4 REPORTS FOR INSPECTION AND TESTING

During concreting operations, the contractor shall conduct inspection and testing as described under the list of mandatory tests in this volume and all reports thereon shall be submitted in summary form to the Consultant / Project-in-charge.

3.5 SCHEDULES

Before commencement of the work the contractor shall prepare working schedules of concreting giving dates and rate of pour for each item of work and submit the same to the Consultant / Project-in-charge for their approval.

3.6 MATERIALS

Before bringing to the site, all materials for cement concrete shall be approved by the Consultant / Project-in-charge. All approved samples shall be deposited in the office of the Consultant / Engineer-incharge before placing orders for the materials with suppliers The materials brought on to the work shall
conform in every respect to their approved samples.

Fresh samples shall be deposited with the Consultant / Project-in-charge whenever type or source of any material changes The contractor shall check each fresh consignment of materials as it is brought on to the works to ensure that they conform to the specification and / or approved samples.

The Consultant / Project-in-charge shall have the option to have any of the materials tested to find whether they are in accordance with specifications at the contractor ‘s expense. All bills vouchers and test certificates which in the opinion of the Consultant / Project-in-charge are necessary to convince him as to the quality of materials or their suitability shall be produced for his inspection when required.

Any materials which have not been found to the specification and not approved by the Consultant / Project-in-charge shall be rejected forthwith and shall be removed from the site by the Contractor’s at his own cost within the time stipulated by the Consultant / Project-in-charge. The Consultant / Project-in-charge shall have the powers to cause the contractors to purchase and use materials from any particular source, as may in their opinion be necessary for the proper execution of work.

3.6.1 CEMENT

Cement shall be provided by the Contractor. On the following types of cement as specified shall be used
a. Ordinary Portland Cement 43 grade confirming to BIS 8112-1987
b. Ordinary Portland Cement 53 grade confirming to BIS 12269-1987

Cement at site shall be stored in dry weather proof go-downs (or shed) built by the Contractor at his own costs in stacks which are not higher than 10 bags. The cement go-down shall be constructed as per CPWD specifications. The contractor shall conduct all necessary tests as specified in the IS, at his own cost to ascertain himself on quality of the material.

3.6.2 AGGREGATES

a) Aggregates from natural sources shall be in accordance with IS:383. The contractor shall submit to the Consultant / Project-in-charge certificates of grading and compliance from the suppliers for all consignments of aggregate. In addition at site from time to time, the contractor shall test the aggregates in accordance with IS: 2386 parts I, II, III and IV. The contractor shall allow for and provide all necessary apparatus for carrying out each test and for supplying test records to the Consultant.

b) For fair faced concrete, the contractor shall ensure that aggregates are free from iron pyrites and impurities which may cause discoloration.

c) The fine aggregates shall be river sand, stone dust or other approved sand. It shall be free from clay, loam, earth or vegetables matter and from salt or other harmful chemical impurities It shall be dean sharp, strong angular and composed of hard siliceous material.

The grading of sand as determined by the method prescribed in IS: 2386 part I shall be within the limits of grading zone III given in Table 1. When the grading falls outside the percentage limits given for sieves other than 600 micron, 300 micron, and 150 micron (I.S) sieves by not more 5 percent, it shall be regarded as falling within this zone. The 5 percent can be excess submission on one more sieves.

TABLE 1

FINE AGGREGATE

I. S. Sieve Percentage passing for Grading

IV	ZONEI	ZONEII	ZONEIII	ZONE
10 mm	100	100	100	100
4.75 mm	90-95	90-100	90-100	95-100
2 36 mm	60-95	75-100	85-100	95-100
1.18mm	30-70	55-90	75-100	90-100
600 micron	15-34	35-59	35-60	80-100
300 micron	5-20	8-30	8-30	20-65
150 micron	0-10	0-10	0-10	0-15

The maximum quantity of silt as determined by the method prescribed in IS: 2386 Part II shall not exceed 8%.

Stone dust shall be within the limits of Grading Zone III given in table 1. When the grading falls outside the percentage limits given for the sieves other than 600 micron and 300 micron (IS) sieves by not more than 5 percent and on 150 micron sieves by not more than 20 percent it shall be regarded as falling within this zone. The 5 percent can be excess summation on one or more sieves.

COARSE AGGREGATE

The coarse aggregate shall be crushed stone or broken stone. Coarse aggregate obtained from crushed or broken stone shall be angular, hay, strong, dense, durable clean and free from soft, friable, thin, flat, elongated flaky pieces. The coarse aggregate should be from the approved source/quarry. Coarse aggregate River shingle or pit gravel shall be rounded, sound hard, clean, non porous, suitably graded in size with or without broken fragments and free from flat particle of shale, clay, silt, loam and other impurities.

Except where it can be shown to the satisfaction of the Consultant than a supply of properly graded aggregate of uniform quality can be maintained over the period of the obtaining the coarse aggregate in different sizes & blending them in correct proportions as and when required.

The maximum size of coarse aggregate shall be such that the concrete can be placed without difficulty so s to surround all reinforcement thoroughly and fill the comers of form work.

3.6.3 WATER

Water used in the works shall be potable water and free from deleterious materials. Water used for mixing and curing concrete as well as for cooling and/or washing aggregate shall be fresh and clean, free from injurious amounts of oil, salts, acids, alkali, other chemicals and organic matter.

Water shall be from the source approved by the Consultant / Project-in-charge and shall be in accordance with Clause 4.3 of IS: 456.

Before starting any concreting work and whenever the source of water changes, the water shall be tested for its chemical and other impurities to ascertain its suitability for use in concrete for approval of the Consultant. No water shall be used until tested and found satisfactory. Cost of all such tests shall be borne by the contractor.

3.6.4 ADMIXTURES AND ADDITIVES

Chemical admixtures are not to be used until permitted by the Consultant/Project-in-charge in case their use is permitted, the type, amount and method of use of any admixture proposed by the contractor shall be submitted to the Consultant for approval

The contractor shall further provide the following information concerning each admixture to the Consultant/Project-in-charge.

a) Normal dosage and detrimental effects, if any, of under dosage and over dosage.
b) The chemical names of the main ingredients in the admixture.
c) The chloride ion content, if any, expressed as a percentage by weight of admixture.
d) Whether or not the admixture leads to the entertainment of air when used in the manufacturer's recommended dosage.
e) Where two or more admixtures are proposed to be used in any one mix, the manufacturer's written confirmation of their compatibility.

In reinforced concrete, the chloride ion of any admixture as determined in accordance with IS: 6925 and the total chloride ion in all admixtures used in concrete mix shall not exceed 0.30n percent by weight of cement. The admixtures when used shall conform to IS: 9103. The suitability of all admixtures shall be verified by trial mixes.

The addition of calcium chloride to concrete containing embedded metal will not be permitted under any circumstances.

Regarding admixtures when used shall be based on lingo-sulphonates with due consideration to clause 5.2 and 5.30 of IS: 7861.

Waterproofing admixtures shall comply with IS: 2645.

3.7 PLANT

The contractor shall obtain the approval of the Consultant/Project-in-charge for all plant items he proposes to use for the manufacture and placing of concrete.

The arrangement shall maintain all items of plant at all times in a clean and efficient working condition.

3.8 STORAGE

All goods and products covered by these specifications shall be procured well in advance and stored as specified below.

3.8.1 CEMENT

Cement shall be stored on a raised floor in dry weather **proof & dust free but** well ventilated shed.

Cement bags shall be stacked close together away from external walls and in stacks of not more than ten bags to avoid lumping under pressure.

Cement stored during monsoons or cement expected to be in store for more than eight weeks shall be completely enclosed in 700 micron polyethylene sheet so arranged that the flap closes on the top stack. The contractor shall ensure that protective polyethylene sheet is not damaged at any time during use.

Consignments of cement shall be used in order of delivery A record shall be kept of the batch numbers of cement deliveries in such a form that the part of the works in which the cement is used can be readily identified. If during delivery or by test, the cement is found to be defective, the same shall be returned back forthwith.

The contractor shall be responsible for the storage of cement at the site and no claim will be entertained in the event of any damage occurring to cement due to faulty storage by the contractors or on account of his negligence.

Cement stored on site for a period longer than eight weeks shall be tested to the satisfaction of the Consultant/Project-in-charge before it is used in the works. Cement that has failed the tests conducted shall not be used in the works and shall be removed from the site immediately without fail.

3.8.2 STORING OF AGGREGATE

Aggregates shall be stored on a suitable well drained raft of concrete, timber, metal or other approved material. The storage of aggregates on the ground will not be permitted.

Each size of aggregate shall be stored separately in such a manner as to prevent spillage and mixing of one aggregate with an adjacent aggregate The dividing walls of any bin shall be of sufficient height and the aggregate shall be so deposited that a distance of 100 mm shall be left between the top of the division wall and any part of the aggregate stack

When stack piling, the aggregate shall not form pyramids resulting in segregation of different size particles. The stacks shall be regular and of a height not exceeding two meters.

3.9 GRADES OF CONCRETE

The grades of concrete shall be in accordance with the following table. The grade of concrete to be used in each section of work will be shown in the drawings or in the Bill of Quantities:

CHARACTERSTIC STRENGTH

Grade of Concrete	**Grade of Concrete Characteristic strength i.e. compressive strength of 15 cm. Cubes at 28 days (N/mm2)**	**Nominal maximum aggregate size (mm)**
10	10	25
15	15	25
20	20	20
25	25	20
30	30	20
35	35	20

Unless otherwise specified in the drawings, the maximum nominal size of coarse aggregates for different grades of concrete shall be as under:

a) For concreting in very narrow space or in very small thickness 12 mm
b) For all reinforced concrete work except in massive foundations 20 mm
c) For all ordinary plain concrete and massive reinforced foundations 10 mm

All mix design grades viz., M10, M15, M20, M25, M30 etc., shall be designed and have a minimum cement content as follows:

Grade	Qty (in kg)
M-10	200
M-15	300
M-20	400
M-25	600
M-30	800

Minimum content of cement remaining unchanged, as specified above for each type of concrete mix, the proportion and quantities of local sand and aggregate are to be worked out and determined in the field/laboratory as per Road Research Note No.4, Department of Scientific and Industrial Research, United Kingdom for design of concrete mixes or as per ACI 613 with the approval of the Engineer. Any change in the source of aggregates will require the re-designing of the concrete mix for the Engineer's approval.

3.10 Mix Design

At the commencement of the contract, the Contractor shall make preliminary tests to determine the proportions by weight of cement, fine aggregates, coarse aggregates and water necessary to produce required grades of concrete. The mix proportions shall be selected to ensure that workability of the fresh concrete is suitable for the conditions of handling and placing and when concrete hardens, it shall have the required strength, durability and surface finish. The Contractor shall get approval of the Engineer to such proportions before start of concreting. However, such approval shall not relieve the

Contractor of his responsibility to produce concrete having compressive strengths as laid down in the foregoing table.
No departure from the approved proportions will be permitted during the works unless and until the Engineer gives written authorization for any change in proportion. The Engineer shall have authority at any time to check whether the mixing of concrete is being carried out according to the approved proportions.

For the major and important RC works and for all special works, the design of mixes shall be made by the Contractor at his own cost, for each grade of concrete as well as for various workability. The design of mixes shall be made according to relevant I.S. codes or to approved standard methods.
The concrete made by designing the mix is termed hereinafter as "Design Mix Concrete".

3.11 Water/Cement Ratio

Where a particular water/cement ratio is stipulated in the design or drawing along with the characteristic grade of concrete, the design of mix shall be carried out by adjusting the other variable factors to obtain characteristic strength of concrete with stipulated water/cement ratio.

In the structures where the impermeability and shrinkage of concrete have an important bearing on the durability and serviceability of the structures, such as water retaining structures, basements, underground premises, tunnels, pump houses, exposed structures near sea side or deserts, pre-stressed structure, thin precast members etc., the water/cement ratio shall be kept low and preferably not exceeding 0.45.

The water cement ratio as achieved in the mix design or as specified in the drawings shall be adhered to strictly and shall not be varied without the permission of the Engineer.

3.12 Workability

The workability of fresh concrete shall be such that the concrete is just suitable for the conditions of handling and placing so that after compaction, it becomes completely consistent and homogeneously surrounds all the reinforcement and completely fills the formwork.

The workability of fresh concrete at the place of batching/mixing shall be measured by compacting factor test and at the place of disposition by means of slump test. During the finalization of trial mixes, the relationship between compacting factor and slump test shall be established for each grade of concrete as well as for various levels for workability.

Normally, in the condition of low water cement ratio as well as for medium/high workability, the workability shall be achieved by increasing the cement content.

In cases where the cement content is to be limited to reduce the heat of hydration, and the water / cement ratio is also to be kept low to reduce the permeability or due to other requirements the desired workability may be achieved with the use of limited doses of plasticizer or air entraining agent. In such cases, the method of mixing and dosage of the plasticiser / air entraining agent shall be according to the manufacturer's specification and with the approval of the Engineer.

Consistency and workability of concrete shall be checked by measuring the slump of a truncated cone of concrete straight from the mixer under normal working conditions. The conical mould shall be of metal, 300 mm high and 100 mm and 200 mm in diameter at top and base respectively.

Moulds shall be prepared by the Contractor. The slump range of concrete shall be as per the tabulation given below, as well as standards.
Slump tests shall be performed as per IS:1881 at intervals established by the Engineer at the Contractor's cost in such a way as to check that the degree of consistency established by the Engineer for work in progress is maintained. The table below gives the general slump range to be followed for various types of construction unless otherwise shown on drawings or instructed by the Engineer.

Various types of construction	....Slump (in mm)...	Max.	Min.
Reinforced foundation walls and footings		80	35
Plain footings, caissons and structure walls		75	30
Compressor foundations and for heavy mass constructions		50	20

Pumps and other misc. equipment foundations	75	35
Columns, slabs, beams and reinforced walls	100	50

3.13 Durability

The durability of concrete, depending on the exposure condition, is to be taken into account while designing the mix. For given aggregates, the cement content should be sufficient to make sufficiently low water/cement ratio and Appendix A of IS: 456 shall be taken as guideline for durability considerations.

3.14 Trial Mixes

After approval of the mix design by the Engineer, the Contractor shall make in presence of the Engineer the trial mixes for each grade of concrete as well as for required workability.

Before starting the trial mixes, necessary preparatory works like determination of sieve analysis of the aggregates, densities of different ingredients, moisture contents in the aggregates, shall be completed according to the relevant BIS Codes.

Each trial mix shall be handled and compacted by the method which the Contractor proposes to use for that mix in the works and the mixes shall not show tendency of inadequate compaction by the method proposed.

The compacting factor and the slump of each trial mix shall be determined immediately after mixing and the values shall not exceed the maximum value obtained in the mix design.

Five (5) 150 mm test cubes shall be made from each trial mix. These shall be cured and tested in accordance with relevant BIS codes. In order to have the specified characteristic strength in the field, the concrete mix as designed in the design mix shall have higher average compressive strength depending on the degree of quality of control at site.

Before commencement of the concreting works of particular grade of concrete, the Contractor must complete the work of trial mixes and subsequent testing of the test cubes obtained there from and the desire of the approved mix for that particular grade of concrete.

The entire cost of all the trial mixes including all the preparatory works for trial mixes, preparation of test cubes and their testing shall be borne by the Contractor.

3.15 Nominal Mix Concrete

Nominal mix concrete may be used for all concrete of grade M-10 and below. If design mix concrete cannot be used for any reason for grade M-15 and M-20, nominal mix concrete may be used with the permission of the Engineer. Nominal mix concrete shall be in accordance with Table-3 of clause 8.3 of I S 456. The stipulations of clauses 8.3.1 and 8.3.2 of IS: 456 shall also be taken into consideration..

3.16 Volumetric Mix Concrete

Where concrete is specified in volumetric proportions such as 1:4:8, 1:3:6, 1:2:4, 1:1.5:3, 1:1:2 etc., in the Bill of Quantities, coarse & fine aggregates shall be measured by volume & cement by weight. The water cement ratio shall be within 0.45 & 0.70 depending upon the workability.

3.17 Batching of Concrete

3.17.1 Cement

Cement shall always be batched by weight. A separate weighing device shall be provided for weighing cement. Where the weight of cement is determined by accepting the weight per bag, a number of bags shall be weighed separately to determine the average net weight of cement per bag and the same shall be checked regularly.

3.17.2 Aggregates:

For both design mix concrete and nominal mix concrete, the aggregates,(coarse and fine) shall be batched by weight.

In particular cases, or where weight-batching is not possible, proportioning by volume batching may be allowed by the aggregates throughout the period of construction. For this purpose, the Contractor shall submit to the Engineer sufficient data indicating the weight/volume relationship of the aggregates shall be made by the Contractor to the satisfaction of the Engineer. Where aggregates are moist and volume batching is adopted, allowance shall be bulking in accordance with IS (Part III).
Suitable adjustments shall be made for the variation in the weight of aggregates due to variation in their moisture contents.

3.18 Water

3.18.1 General

Water may be measured either by weight or by volume. When measured by volume, it shall be by well calibrated conical shaped jar or vessel or from a calibrated tank filled to the mixer.

Adjustment of Water Due to Moisture Contents in Coarse and Fine Aggregates It is very important to maintain the water cement ratio constant at its correct value. For the correct determination of the amount of water to be added in the concrete mix, to maintain the water cement ratio constant, the amount of moisture content in both coarse and fine aggregates shall be taken into consideration, be checked as frequently as possible, the frequency for a given job being determined by the Engineer according to weather condition.

Determination of Moisture Content in the Aggregates

Determination of moisture content in the aggregates shall be according to IS 2386 (Part-III). Where tests are not conducted, the amount of surface water may be estimated from the following table:

Aggregates	Surface water	Carried by Aggregates
	% by weight	l/m3
Very wet sand	7.50	120
Moderately wet sand	5.00	80
Moist San	2.50	40
Moist gravel stone chips*	125.25	20-40

• coarser the aggregate, less the water it will carry

3.18.2 Admixtures

Any solid admixture, to be added, shall be measured by weight, but liquid or semi-liquid admixture may be measured by weight or volume.
The Bidder shall indicate the brand name, the Manufacturer and the properties of any admixture to be used for the concrete as per Bill of Quantity items or on his own initiative.

3.18.3 Accuracy of Batching

The accuracy of batching shall be within the following tolerance:
1 Cement within + 2% by weight
2 Aggregate within + 5% by weight
3 Water within + 0.5% by weight.

3.19 Mixing of Concrete

3.19.1 Machine Mixing

Concrete shall always be mixed in mechanical mixer. Water shall not, normally, be charged into the drum of the mixer until all other ingredients are already in the drum and mixed for at least one minute. Mixing shall be continued until there is uniform distribution of materials and the mass is uniform in colour and consistency. The

mixing time from the time of adding water shall be in accordance with IS 1791, but in no case less than 2 minutes or at least 40 revolutions.

3.19.2 Hand Mixing

When hand mixing is permitted by the Engineer, it shall be carried out on a water tight platform and care shall be taken to ensure that mixing is continued until the mass is uniform in colour and consistency. In case, of hand mixing, 10% extra cement shall be added to each batch at no extra cost to EMPLOYER,

3.20 Transportation of Concrete

Concrete shall be transported from the place of mixing to the place of placing concrete as rapidly as practicable by any means, which will prevent the segregation or loss of any of the ingredients and maintain the required workability. No water shall be mixed with the concrete after it has left the mixer.

Where concrete is transported over long distances, the Contractor shall provide suitable means by which different grades of concrete are readily identifiable at the place of final deposit.

3.21 Preparatory Works/Surface Preparation

3.21.1 For Concrete Directly on Earth Foundation

Earth foundation on which direct placement of concrete is specified, shall be rammed and consolidated as directed by the Engineer such that it does not crumble and get mixed with concrete during or after placement. If the foundation is quite wet, the same shall be kept dry and then sufficiently consolidated, if necessary, a thin top layer of the wet soil shall be removed and replaced by sand or other suitable materials as directed by the Engineer without extra cost to EMPLOYER, Care shall also be taken that earth from the sides also does not get mixed with the concrete, during or after placement, before it has sufficiently set and hardened.

The earth foundation, over which concrete is to be placed directly, shall not be kept abandon at the specified level and concrete shall be placed immediately following otherwise suitable measures shall be taken, as directed by the Engineer **without extra cost** to EMPLOYER.

3.21.2 For Construction Joints

Concrete shall be cast, as far as possible, continuously until the parts of structure to be built are finished. Should this not be feasible, the type, number and location of construction joints shall be approved by the Engineer prior to placing concrete.

All such joints shall have continuous square bond grooves to produce substantial and water-tight-key and the exposed faces of joints shall be monolithic with the main mass of concrete formed and completed under substantially shattered faces. The Contractor shall take all the necessary steps by means of timber edgings etc. to ensure an exact horizontal straight finish to outside edge of any lift of concrete. Subject to the approval of the Engineer, the Contractor is at liberty to arrange his own construction joints but the following restrictions are to be observed:

1. There shall be no vertical construction joints
2. No longitudinal joints shall be made in the walls and floors of trenches and pits unless otherwise shown in the drawings.
3. Concrete pouring shall be reasonably large, but in no case shall the height of pouring concrete exceed 1.5 m without the Engineer's firm approval. Such approval of the Engineer shall not in any way relieve the Contractor of his responsibility to ensure that the construction is water tight and that no segregation takes place.
4. Laitance shall be removed from the surface of concrete before it has set hard by washing and wire brushing so as to expose the stones of the top layer without undue erosion of the mortar or damage to the under laying concrete.

All beds and joints in concrete faces, which have become set, are to be picked all over and all loose materials removed before fresh concrete is deposited thereon. The indentations shall be at least 12 mm deep and not less than seventy five percent of the area of the existing concrete face to be covered over.

Immediately before depositing fresh concrete, the exposed surface shall be cleaned of foreign matter by further wire brushing, if necessary. It shall then be thoroughly washed and surplus water removed. The surface, while still moist, shall be covered with layer of 1:1 cement mortar which must be vigorously stippled into the surface by means of a stiff brush, the depositing of the fresh concrete following on closely. Pockets to form keys shall be left in the surface of the concrete at constructional joints, 75 mm deep and approximately **equal to 20% of the exposed surface.**

All costs in connection with the forming of construction joints shall be to the account of the Contractor and shall be deemed to be included in the rates for concreting and formwork and shall not be separately paid for. In a column, the joint shall be formed 75 mm below the lowest soffits of the beams, including haunches, if any.

Concrete in a beam shall be placed throughout without a joint but if the provision of a joint is unavoidable, then the joint shall be vertical and at the centre of, or within, middle third of the span, unless otherwise shown on the drawings.

3.21.3 On Vertical Surfaces of Masonry

When the concrete is placed on the vertical surface of masonry (as in the case of thin concrete fins projected from the vertical masonry surface), a groove of dimension as directed by the Engineer shall be cut in the masonry to ensure a proper bond and the surface shall be cleaned thoroughly. Before the placement of concrete, the surface shall be kept moist by spraying water at least for the period of 2 hours and a thick coat of cement slurry shall be applied immediately before the placement of concrete.

Inside the Form Works (Cleaning, Surface Preparation etc.)

The interior of the form works, where the concrete is to be placed, shall be thoroughly washed by high pressure water jet or air jet to completely clean the entire volume from the dirts, grease/oil foreign and deleterious materials etc. The reinforcements shall be completely cleaned and free from all sorts of dirts grease/oil, rust, foreign/deleterious materials etc. Before placement of concrete, the form works coming in contact with concrete, shall be coated highly with form oil or raw linseed oily material or provided with any approved material to prevent adhesion of concrete to the form work, but utmost care shall be taken so that such oily material does not come in contact with the reinforcement.

3.22 Placing and Compaction of Concrete

Before placing the concrete, the Contractor shall ensure that:

1. All mixing and placing equipment is thoroughly cleaned
2. All concreting space is free from debris and rubbish
3. All forms have been thoroughly wetted or oiled and firmly installed in line and plumb to the Engineer's approval.
4. All reinforcement is cleaned of loose rust, scales and other injurious adherents and is firmly bound and correctly placed and has been so approved by the Engineer.
5. All inserts, sleeves, foundation bolts and embedded parts have been correctly and firmly installed to conform to the Engineer's drawings and have been carefully checked to comply with the drawings. Special care shall be taken to locate and check sleeves or inserts, which may not be symmetrically placed with respect to centre lines.

The Contractor and Engineer shall separately inspect and check the above mentioned points and record and sign the results in a register which shall be maintained by the Contractor in a approved form. No concrete shall be placed without the Engineer having inspected and approved in writing. Inspite of ensuring the above requirements, the Contractor shall fill pour cards furnishing the necessary details of the job, duly signed by the Engineer. This, however, will not absolve the Contractor from his responsibility to correctly execute the work. Pour cards shall contain the following information:

Design Index
- Date
- Slump
- Workability
- Work test specimen
- Type of finishing and admixtures used (if any)

- Period of removal of shuttering/props/forms.

a. The concrete pouring method shall be submitted to the Engineer for approval and shall always be such as to avoid any possibility of segregation of the components or shifting of the reinforcement.

b. Special grout or mix shall be used for difficult and intricate locations as specified by the Engineer. During placing, the concrete shall be thoroughly worked around reinforcement, embedded parts and corners of the formwork.

c. Greatest possible care shall be taken by the Contractor that reinforcement and embedded parts, particularly foundation bolts and sleeves, are not displaced during placement of concrete. While concreting mats and other such locations where top and bottom reinforcement are adopted, top reinforcement shall be thoroughly cleaned of all slurry and mortar sticking to them at the time of concreting top layers.

d. The concrete shall be placed and compacted before setting commences and should not be subsequently disturbed. No water shall be mixed with the concrete after it has left the mixer. Method of placing should be such as to preclude segregation. Approved mechanical vibrator shall be used for compacting concrete, and concrete shall not be non vibrated or under vibrated. No concrete shall be placed until the place of deposit has been thoroughly inspected and approved by the Engineer, all inserts and embedment properly secured in position and checked and forms properly oiled. No concrete shall be placed in the absence of the Engineer.

e. Concrete shall be placed on clean bed having the designed level. The bed shall be cleaned of all debris and other objectionable materials. Seepage water, if any, shall be controlled or diverted.

f. Concreting shall not be carried on during rains unless all precautions have been taken by the Contractor and necessary permission has been given by the Engineer. Suitable measures shall be taken to control the temperature of concrete.

g. Where plums are permitted in massive concrete, they shall be washed and carefully placed. No stone shall be closer than 30 cm to an exposed face, nor nearer than 15 cm to an adjacent stone.

h. Concrete shall not be dropped from a height of more than 2 m except through a chute, the design and type of which shall be subjected to approval of the Engineer.

i. The concrete shall be placed, spread and compacted by approved mechanical vibrator. Vibrators shall not be used for pushing concrete to adjoining areas.

j. For members involving vertical placing of concrete (e.g. columns, walls etc.), each lift shall be deposited in horizontal layer extending for the full width between shuttering and of such depth that each layer can be easily and effectively vibrated and incorporated with the layer below by means of compaction being employed.

k. For members involving horizontal placing of concrete (e.g., slabs, beams etc.), the concrete shall be placed along the line of starting point in such quantities as will allow members to be cast to their full depth along the full width between side shuttering and then gradually brought towards the finishing point along its entire front parallel to the starting line. Vibration and surface finish shall follow behind the placement as closely as possible.

l. Utmost care shall be taken to avoid the displacement of reinforcements/ embedded parts or movement of form work or damage to faces of the form work or transmission of any harmful vibration/shocks to the concrete which has not yet hardened sufficiently.

m. All members shall be concreted at such a rate that no cold joint is formed and fresh concrete is placed always against green concrete, which is still plastic and workable.

n. Should any unforeseen occurrence result in a stoppage of concreting for one hour or such other time as might allow the concrete, already placed, to begin to set before the next batches can be placed, the Contractor shall make at his own cost, suitable tongue, and groove construction joint, as approved by the Engineer. Any additional reinforcement required as directed by the Engineer shall also be provided by the Contractor at his own cost. Before placement of new batches of concrete over that construction joint, the surface preparation according to this specification stipulated earlier, shall be done by the Contractor.

o. The concrete shall be worked well up against whatever surface it adjoins and compacted to such a degree that it reaches its maximum density as a homogeneous mass, free from air and water holes and penetrates to all corners of moulds and shuttering and completely surrounds the reinforcement. All measures shall be taken to make the shape, size, and location of the finished concrete including its embedment, holes, openings etc, well within the accepted tolerance limit.

3.23 Construction Joints

Normally, the construction joints including crack inducing joints shall be constructed as per locations and details indicated on the drawings. Where the location of the joint is not specified in the drawings, it shall be in

accordance with the following guidelines. In all construction joints, the reinforcements shall pass through as per drawings and the same shall not be disturbed in any way.

a) In Columns

i) In case of Projection from **Basement Slab, 300 mm from the top of base slab or 75 mm from the top of the haunches whichever is higher.**
ii) In framing the beam at different elevation, 75 mm below the lowest soffit of the beam and in case of projection from beams and slabs 75 mm from the top surface of the beam/slab or at the top surface of beam/slab whichever facilitates formwork.
iii) For columns below flat slabs, 75 mm below the lowest soffit of the slab.

b) In Walls (Horizontal Construction Joints)
i) For Walls Projecting From Base Slab, 300 mm from top of base slab.
ii) For Walls supporting the suspended slab, 75 mm from the lowest soffit of the slab.

Note: In the case of water retaining structures and structures under the influence of ground water, approved water bars of suitable size shall be provided to make the joint completely watertight.

c) In Beams
Beams shall be cast, as a rule, without a joint. But if provision of a joint is unavoidable, the joints from simply supported beam shall be vertical and at the middle of the span; in continuous beam, the same shall be at the point of minimum shear force.
d) In Suspended Slabs
i) In slab of small span, there shall be reconstruction joints.
ii) In slabs of large span and continuous slabs, the Construction joint, if allowed by the Engineer, shall be vertical at the middle of span and at right angles to the principal reinforcement.

e) In Walls (Vertical Construction Joint)

As a rule, walls shall be cast monolithically without any vertical construction joint, unless specified in the drawing. However, for a long wall, Engineer may allow vertical construction joint and the same shall be at the place of minimum shear force.

f) In Slabs Resting on Ground
i) For Plain Concrete
Concreting shall be done in alternate panels not exceeding 10 m^2 in area. The largest panel dimension shall be 5 m.
ii) For Nominally Reinforced Slab The area of pour shall not exceed 40 m^2 and the maximum panel dimension shall not exceed 8m.
iii) For the Basement Slabs Which Act as Structural Member There shall be no construction joint.
g) In Ribbed Beams The beams shall be monolithic with the slab in one continuous operation.

3.24 Cold Joints :

An advancing face of pour, which could not be covered before expiry of initial setting time for unexpected reasons, is called a cold joint. The Contractor shall remain always vigilant to avoid cold joints. If however, a cold joint is formed due to unavoidable reasons, the following procedures shall be adopted for treating it:

1. If the concrete is so green that it can be removed manually and if vibrators can penetrate the surface without much effort, fresh concrete can be placed directly over the old surface and the fresh concrete along with the old concrete shall be vibrated systematically and thoroughly.

2. In case the concrete has hardened a bit more than (1), but can still be easily removed by a light hand pick, the surface shall be raked thoroughly and the loose concrete removed completely without disturbing the rest of the concrete in depth. Then a rich mortar layer of 12 mm thickness, shall be placed on one cold joint and then the fresh concrete shall be placed on the mortar layer and vibrated thoroughly penetrating deep into the layer of concrete.

3. In case the concrete at the joint has become so stiff that it cannot be remoulded and mortar or slurry does not rise in spite of extensive vibration, a tongue and groove joint shall be made by removing some of the older concrete and the joint shall be left to harden at least for 12-24 hours. It will then be treated as regular construction joint and the surface preparation of the same, before placement of concrete, shall be as described in the appropriate clauses of these specifications.

3.25 Sub-standard concrete

Should the work strength of controlled concrete fall below the specified strength, Engineer shall decide:

1. To reject the work, in which case the Contractor shall replace the defective work with concrete of required strength and bear all costs for dismantling and replacing including cost of associated form work, reinforcement, embedded parts & all associated works.

2. To accept the work at a reduced rate, in which case the unit rate payable for sub-standard work will be reduced by EMPLOYER, directly in proportion to the work strength as compared to the specified strength. The Engineer may, in addition, require other tests performed on the respective structural member so accepted period to its acceptance with or without necessary corrective measures and in each such case, the Contractor shall bear all costs for all such tests or corrective measures, besides the reduction in the unit rates as specified herein.

3. Concrete of strength below fifteen (15) percent of the specified strength will not be accepted.

4. The test load shall be 125% of the maximum superimposed load for which the structure was designed. Such test load shall not be applied before 56 days after the effective hardening of concrete. During the test, struts strong enough to take the whole load shall be placed in position leaving a gap under the members. The test load shall be maintained for 24 hours before removal.

5. If, within 24 hours of the removal of the load, the structure does not show a recovery of at least 75% of the maximum deflection shown during the 24 hours under load, the test loading shall be repeated after a lapse of alteast 72 hours. The structure shall be considered to have failed to pass the test if the recovery after the second test is not at least 75% of the maximum deflection shown during the second test. If the structure is certified as failed by the Engineer, the cost of the load test shall be borne by the Contractor.

3.26 Optional Tests

The Engineer, if he so desires, may order tests to be carried out on cement, sand, coarse aggregate, water in accordance with the relevant Indian Standards.

Tests on cement shall include
1. Fineness test
2. Test for normal consistency
3. Test for setting time
4. Test for soundness
5. Test for tensile strength
6. Test for compressive strength
7. Test for heat of hydration (by experiment and by calculation) in accordance with IS:269.

Tests on sand shall include
1. Sieve test.
2. Test for organic impurities.
3. Decantation test for determining clay and silt content.
4. Specific gravity test.
5. Test for unit weight and bulkage factor.
6. Test for sieve analysis and fineness modulus.

Tests on coarse aggregates shall include
1. Sieve analysis.
2. Specific gravity and unit weight of dry, loose and rodded aggregate.

3. Soundness and alkali aggregate reactivity.
4. Petrographic examination.
5. Deleterious materials and organic impurities.
6. Test for aggregate crushing value.

Any or all these tests would normally be ordered to be carried out only if the Engineer feels the materials are not in accordance with the specifications or if the specified concrete strengths are not obtained and shall be performed by the Contractor at an approved test laboratory at the cost of the Contractor. If the work cubes do not give the stipulated strengths, the Engineer reserves the right to ask the Contractor to dismantle such portions of the work which, in his opinion, are unacceptable and re-do the work to standards stipulated, at the Contractor's cost. The unit rate for concrete shall be all inclusive, including making preliminary mix design and test cubes works, cubes, testing them as per specification, slump tests, optional tests etc.,

3.27 Concrete for Equipment or steel structures foundations:-

Concrete for equipment foundation, whether principal or auxiliary, shall be poured continuously so that the structure becomes monolithic, particular care being exercised to see that the base slabs, if any, are of compact impervious construction. Tunnels, passages, apertures and so forth shall be provided in accordance with the drawings for the installation of mechanical and electrical equipment, pipes or cables. The top elevation of the equipment foundations or parts shall be accurately cast to 20/50 mm (or more as may be specified on the drawings) above the level required for grouting and it shall be pneumatically chiseled off and well roughened just prior to the erection of the equipment concerned. All embedded anchor bolts or bolt sleeves shall be accurately and firmly set with the aid of approved templates, steel supports and/or other accessories. For holding the embedded bolts or sleeves in the correct position during concreting, template shall have to be of steel of suitable section approved by the Engineer. Two sets of templates shall have to provided, one to hold the bottom and the other the top of the bolts or sleeves. The bottom template shall be securely and rigidly fixed by providing anchorage arrangement and by welding to the lowest part of the steel reinforcement and other structural supports. The top templates shall be securely fixed by tying with guy wires and turn buckle arrangements to firm and rigid adjoining structures and staging. The bottom template that is embedded in concrete will be measured and paid for as embedded steel.

Bolt pockets, where required, shall be cast with wooden taper wedges. These shall be withdrawn at an appropriate time when the concrete has set, the pockets cleaned, roughened and then covered or blocked thoroughly to prevent debris getting into these. The exposed portions of bolts and embedded parts shall be kept well greased and adequately protected from damage throughout construction. Any damages found shall have to be corrected at the Contractor's cost. EMPLOYER, shall have the right to use the foundations, pads, piers, slabs, floors and all concrete work as needed for other works or equipment erected prior to its "Taking Over".

3.28 Requirements for Concreting in Special Cases

3.28.1 Concreting in Deep Lifts

N.A.

3.28.2 Concreting Under Water

N.A.

3.28.3 Cold Weather Concreting

N.A.

3.28.4 Hot Weather Concreting

N.A.

3.28.5 Concreting in Large Pours (Mass Concrete)

N.A.

3.29 Finishes to Exposed Surface of Concrete

The Contractor is to include his quoted rate for concrete, the provision of normal finishes in both formed and unformed surfaces as and where required by the Engineer without any extra cost to EMPLOYER, Some common finishes are indicated below:

3.29.1 Surfaces which do not Require Plastering

Surface in contact with casing shall be brought to a fair and even surface by working the concrete smooth against casings with a steel trowel while it is being deposited and also by working over the surface with a trowel immediately after the removal of the casings or centering, removing any irregularities and stopping air holes, etc. Use of mortar plaster is not permissible for correcting levels, removing unevenness etc. However, if in the opinion of the Engineer, such plastering is unavoidable, then the thickness of plaster shall in no case exceed 5 mm and the plastering shall be in CM (1:3).

3.29.2 Faces of Foundations which will be Back Filled

Neither the smoothness of the surface not the positions of the joints in the form work are important. Small blemishes caused by entrapped air are permitted. No special surface finish is required.

3.29.3 Exposed Surfaces

Surface of beams/columns flushing with the block work or other structures where it is intended to plaster, shall be backed adequately as soon as the shuttering is stripped off so that proper bond with the plaster can develop.

3.29.4 Surface for Non-integral Finish

Where a non integral finish such as floor finish is specified or required, the surface of the concrete shall be struck off at the specified levels shall be furnished and finished rough.

3.29.5 For Monolithic Finish

Where no more finishing course is to be supplied as in the case of basement floor, industrial flooring or the screed concrete flooring etc., the concrete shall be completed and struck off at the specified levels and slopes in a screed board and then floated with a wooden float. Steel trowel ling is then started after the concrete has hardened enough to prevent the excess of fines and water to rise to the surface but not hard enough to prevent proper finishing. Trowelling shall be such that the surface is flat, smooth and neatly finished.

3.30 Curing of Concrete

3.30.1 General

The purpose of curing is either to provide sufficient water at optimum temperature or to prevent loss of moisture from the concrete itself so that the cement inside the concrete is sufficiently hydrated which, of course, is a slow and prolonged process. As soon as the concrete has hardened sufficiently, the curing shall be started.

3.30.2 Different Methods of Curing

Any one of the following may be used for curing as approved by the Engineer.

a) Curing by Direct Water

This is done either by pounding or spraying water.

Ponding

Ponding is widely used for curing slabs and pavement. Earth bands are formed over the slabs and water is pumped or poured into them and the same is replenished at interval to make up for the loss of evaporation. As this type of curing is one of the best methods, 10 days of curing after final setting is sufficient.

By Spraying Water Curing is done by spraying water by suitable means at approved time intervals. While spraying, it shall be ensured that the complete area is covered. In order to avoid cracking, cold water shall not be applied to massive members immediately after striking the form work, while the concrete is still warm.

Alternative wetting and over drying shall be avoided.

Curing by spraying water shall be continued atleast for 18 days.

a) Curing of Concrete with Absorbent Material Kept Damp The entire concrete surface is covered either with hessian, burlap, sawdust, sand, canvas or similar material and kept wet continuously for at least 12 days after final settings.

b) Curing by Covering Concrete Surface with an Impressive Sheet This is achieved by covering the entire concrete surface with water proof paper or plastic sheets specially manufactured for this purpose. The waterproof papers are stuck together by adhesive compound and the plastic sheets can be welded at site. Such type of covering shall be kept at least for 24 days after the final setting. It is preferable to have sheet as white in appearance since the white colour will reflect hot sunrays and keep the concrete temperature at reasonable level.

c) Curing by Providing Protective Membrane by Applying curing compound This is achieved by applying a membrane forming compound (curing compound) over the concrete surface. Generally, these are available in the emulsion form. The application of the curing compound should be started immediately after stripping off the shuttering in case of formed surface and after the surface has hardened in case of unformed surface.

The curing compound membrane forming emulsions dry up within 3 to 4 hours after application and forms a continuous coherent adhesive membrane over the concrete surface. Such membrane serves as a physical barrier to prevent the loss of moisture from the concrete itself. Membrane forming emulsions are generally coloured black or white to improve visibility for ensuring uniform application. Black colour shall never be used for curing in very hot weather. In order to prevent glare, a colouring pigment may be added to white compounds. Black curing compounds are either Bituminous or Asphaltic emulsions and shall be used to surfaces which are to be covered by back filling or on the floor which is to be covered with tiles and linoleum.

White curing compound shall be used for the surfaces of tall structures under exposure of hot sun where other method of curing can not be properly ensured.

d) Curing by Chemical Coating For chemical curing, sodium silicate or calcium chloride is used. The use of calcium chloride shall be done with the approval of the Engineer. Normally, the sodium silicate mixed with water is applied over concrete surface and, when it dries up, it forms a thin varnish like film, which fills up the pores, and surface voids and prevents evaporation of water. This also acts like curing compound but only difference is that curing compounds are available in ready mixed emulsion forms while sodium silicate is to be mixed with water at site.

3.30.3 Limitation to Use of Different Methods of Curing

i) Curing by the processes as indicated in Section B – Clause 3-24 and more specifically as per sub-clause 2(b) of the above clause gives very good results in normal warm climate for maturity of concrete. ii) In cold weather, the process as indicated in sub-clause 2(b) of clause 3-24 gives very good result for maturity of concrete. iii) Where water cement ratio is less than 0.5, the methods indicated in sub-clause 2(d) and 2(e) of clause 3-24 of Section B, shall not be used. iv) In warm climate also, where the methods of curing as indicated in sub-clauses 2(a) and 2(b) of clause 3-24 cannot be properly ensured, any suitable method of curing as indicated in subclasses 2(c) to 2(e) of clause 3-24 of Section B, as approved/directed by the Engineer, shall be adopted.

3.31 Testing of Concrete

3.31.1 General

The Contractor shall carry out, entirely at his own cost, all sampling and testing in accordance with the relevant IS standards and as supplemented herein. The Contractor shall get all tests done in an approved laboratory and submit to the Engineer, the test result in triplicate within 3 days after completion of the test.

3.31.2 Consistency Test (Tests of Fresh Concrete)

At the place of deposition/pouring of the concrete, to control the consistency slump tests and/or compacting factor tests shall be carried out by the Contractor in accordance with IS 1199 as directed by the Engineer.

The results of the slump tests/compacting factor tests shall be recorded in a register for reference duly signed by both the Contractor and the Engineer. That register shall be considered as the property of EMPLOYER, and shall be kept by the Contractor at site in safe custody.

The results of the slump tests/compacting factor tests shall tally, within accepted variation of 12%, with the results in the respective design mix, in case of mix design concrete and with the values indicated in the table under clause 6.1 of IS:456 in case of nominal mix concrete. For any particular batch of concrete, if the results do not conform to the requirements as specified in IS 456, the Engineer has the right to reject that batch and the Contractor shall remove the same immediately from the site, at no cost to EMPLOYER,.

3.31.3 Strength Test of Concrete

While placing concrete, the Contractor shall make six (6) 150 mm test cubes from particular batches of concrete as desired by the Engineer. The frequency of taking test cubes shall be either according to clause 14.2 of IS:456 or as directed by the Engineer.

The cubes shall be prepared, cured and tested according to IS 516. Out of the six (6) test cubes, 3 shall be tested for compressive strength at 7 days after casting and the remaining 3 at 28 days after casting A register shall be maintained at site by the Contractor with the following details entered and signed by both the Contractor and the Engineer. That register shall be considered as the property of EMPLOYER,

a) Reference to the specific structural member
b) Mark on cubes
c) The grade of concrete
d) The mix of concrete
e) Date and time
f) Crushing strength at 7 days
g) Crushing strength at 28 days
h) Any other information directed by the Engineer.

3.31.4 Acceptance Criteria for Test Cubes

The acceptance criteria of concrete on strength requirement shall be in accordance with the stipulations under clause 15 of IS:456.

3.31.5 Non-destructive Tests on Hardened Concrete

If there is doubt about the strength or quality of a particular work or the test results do not comply with the acceptance criteria as stipulated under clause 15 of IS:456, non-destructive tests on hardened concrete like core tests and/or load tests or other type of non destructive tests like ultrasonic impulse test etc. shall be carried out, as may be directed by the Engineer, by the Contractor at entirely his own cost.
The core tests and load tests shall comply with the requirements of clause 16.6 of IS: 456.

3.31.6 Concrete Below Specified Strength

In case of failure of test cubes to meet the specified requirements, the Engineer may take one of the following actions:

1. Reject the work and instruct that section of the works to which the failed cubes relate shall be cut out and replaced at the Contractor's expense.
2. Instruct the Contractor to carry out additional tests and/or works to ensure the soundness of the structure at the Contractor's expense.
3. Accept the work with reduction in the rate in appropriate item.

3.31.7 Concrete failed in Non-destruction Tests

In case test results of the core tests or load tests in a particular work do not comply with requirements of respective clause (16.3 for core test and 16.5 for load tests) of IS 456, the whole or part of the work concerned shall be dismantled and replaced by the Contractor as may be directed by the Engineer at no extra cost to EMPLOYER, and to the satisfaction of the Engineer. No payment for the dismantled concrete including relevant form work, reinforcement, embedded fixtures etc. shall be made. In the course of dismantling if any damage occurs to the adjacent structure or embedded item, the same shall be made good, free of charge by the Contractor, to the satisfaction of the Engineer.

3.32 EXPANSION JOINTS

3.32.1 GENERAL

Expansion joints shall be provided where shown on the drawings or as directed by Consultant. They shall be constructed with an initial gap between the adjoining parts of the works of the width specified in the drawings.

The contractor shall ensure that no debris is allowed to enter expansion joints Expansion joints shall be provided as per drawings. Contractor shall ensure that expansion joints are made water-tight and that no leakage occurs through these joints for which he shall be responsible to redo at his own cost.

3.32.2 OPEN JOINT FILLERS

Where shown on the drawings, open joints in the structure shall be filled with joint fillers.

The joint filler shall be easily and uniformly compressible to its original thickness, tampable, easily cut or sawn, robust, durable, resistant to decay due to termite or weathering, unaffected by water and free of any constituent which will bleed into or stain the concrete.

The joint filler shall be of same thickness of the joint width, it shall extend through the full thickness of the concrete unless otherwise specified and shall be sufficiently rigid during handling and placing to permit the formation of straight joints

3.32.3 JOINT SEALING COMPOUNDS

Joints sealing compounds shall seal joints in concrete against the passage of water prevent the ingress of grit or other foreign material and protect the joint filler. The compound shall have good extensibility and adhesion to concrete shall have good extensibility and adhesion to concrete surfaces and shall have resistant to flow and weathering. Polysulphide joints where specified on the drawings shall be seated with polysulphide liquid polymer, stored, mixed handled, applied and cured strictly in dimensions, thoroughly cleaned and treated with recommended primer strictly in accordance with the manufacturer's written instructions prior to sealing. The Contractor shall use only competent personnel experienced in the application of polysulphide for such work. Where specified in the drawings, rubber/bituminous based sealant shall be of an approved manufacturer. The treatment of the joint and the use of sealing compound shall be strictly in accordance with the manufacturer's written instructions.

3.32.4 WATER BARS

Where water bars are shown on the drawings, the joints shall incorporate an approved PVC external type water-bar complete with all necessary molded or prefabricated intersection pieces assembled in accordance with the drawings with bends and butt joints in running lengths made by heat welding in an electrically heated jig.

Jointing and fixing of water-bars shall be carried out strictly in accordance with the manufacturers written instructions.
The water-bars shall be installed so that they are securely held in their correct position during the placing and compacting of the concrete.
Where reinforcement is present adjacent to water-bars, adequate clearance shall be left between the reinforcement and water-beds to facilitate of the concrete.

3.33 CRACKS

If any cracks develop in the reinforced cement concrete construction which in the opinion of the Consultant may be detrimental to the strength of the construction, the contractor at his own expense shall test the structural element in question If under these test loads the cracks shall develop further the contractor at his own expense shall dismantle the construction, cart away the debris, replace the construction and carry out all consequential work there to at no extra cost.

If the cracks are not detrimental to the stability of the construction in the opinion of the Consultant, the contractor at his own expense shall grout the cracks with pneumatically applied mortar. At his own expense and risk he shall also make good all other building works such as plaster, molding, surface finish of floods, roofs, ceiling etc. which in the opinion of the Consultant have suffered damage either in appearance or stability owing to such cracks.
The repair work shall be carried out to the satisfaction of the Consultant/Project-in-charge. The decision of the Consultant/Project-in-charge as to the extent of the liability of the contractor in the above matter shall be final and binding on the contractor.

3.34 SUPERVISION

All concreting work shall be done under strict supervision of the qualified and experienced representatives of the Contractor as well as those of the Consultant The contractor's Engineer and supervisor who are in charge of concreting work shall be skilled in this class of work and shall personally supervise all the concreting operations.

Special attention shall be paid to the following:-

(a) Proportioning, mixing and quality testing of the materials with particular control on the water cement ratio.

(b) Laying of material in place and thorough compaction of the concrete to ensure solidity and freedom from voids and honey combing.

(c) Proper curing for the requisite period.

(d) Reinforcement and inserts/embodiments position are not disturbed during concreting and consolidation by vibration.

3.35 QUALITY CONTROL

The Consultant/Project-in-charge reserves the right to make changes in the mix proportions including the increased cement content or/and a change in the Contractor's control procedure, should the quality control during progress of the works prove to be inadequate in his opinion. All the concrete work shall be true to level, plumb and square within the acceptable tolerance. The corners, edges and rises in all cases shall be unbroken and finished properly and carefully.

3.36 TOLERANCES

The acceptable tolerances for formed concrete surfaces shall be given below: -

a) Variation from plumb for -
   i. Columns and walls to be rendered 6 mm in 3 meters
   ii. Exposed columns and walls 3 mm in 3 meters

b) Variation in cross sectional dimensions of columns and beams and in the thickness of slabs and walls: - 6 mm & + 12 mm

All the works executed beyond the tolerance limits are liable to be rejected and no extra cost shall be paid to the contractor for reconstructing the same as desired by the Consultant/Project-in-charge.

3.37 TESTING ROOM

A testing room of not less than 10 sqm equipped with the following apparatus and qualified concrete technician, labour and materials required for carrying out tests therein shall be provided by the contractor at his own cost:

1. Sieve Set (For aggregate 20 mm down)
   40 mm, 20 mm, 16 mm, 12.5 mm, 10 mm, 4.75 mm, 600 micron, 300 micron, and 75 micron having diameter of 45 cms.

2. Weighing

a) Physical balance cap. 200 gms with weigh box (accuracy 0.5 gm)
b) Counter Scale cap 20 Kg
c) Weights

5 kg	1 No	500 gms	1 No.
2kg	2 Nos.	200 gms	1 No.
1 kg	1 No.	100 gms	1 No.

3. Slump Cones 2 Nos
4. 15 cms moulds 18 no.
5. Electric/Kerosene Heater
6. Pans etc. as directed by the Consultant
7. Measuring Cylinders of 1000 ml., 500 ml and 100ml.
8. Wash bottles of the Capacity of 500 ml., 2 Nos.
9. Sink
10. Work benches, shelves, desks and any other furniture and lighting as required by the Consultant.
11. Spring balance dial type cap. 100 kg

12. Litre measures
    a) 10 Lit 1 No.
    b) 5 Lit 1 No.
    c) 2 Lit 2 Nos
    d) 1 Lit 1 No.
    e) 1/2 Lit 1 No.
13. Cube Testing Machine 100 Tons.
14. Oven.
15. Cores/ Apparatus for conducting Proctor Density Tests.

3.38 CO-ORDINATION OF WORK

The contractor is fully responsible for coordinating with the other agencies for sanitary, electrical work, etc. to ensure execution of their work related to commencement of concreting. Nothing extra shall be payable to the contractor, if the works pertaining to concreting have to be dismantled and redone due to lack of co-ordination on the part of the contractor in ensuring completion of works of such agencies before concreting had been undertaken.

4 SPECIFICATIONS FOR STEEL REINFORCEMENT

4.1 GENERAL

4.1.1 DESCRIPTION

This section covers the requirements for fabricating, delivering and placing of steel reinforcement in position for casting all types of concrete work

4.1.2 RELATED WORK SPECIFIED ELSEWHERE

Applicable Codes and Standards:

The codes and standards generally applicable to the work in this sections are listed below: -

IS: 280 Mild wire for general engineering purpose
IS: 432 Part I Mild steel and medium tensile steel bars Part II Hard drawn steel wire
IS: 456 Code of practice for plain and reinforced concrete
IS: 1139 Hot rolled mild steel, medium tensile steel and high yield strength steel deformed bars for concrete reinforcement
IS: 1566 Hard drawn steel wire fabric for concrete reinforcement
IS: 2502 Code of Practice for bending and fixing of bars for concrete reinforcement

The following clauses are intended to amplify the requirements of the reference documents listed above and the contractor/Project-in-charge shall comply with these clauses.

4.2 SUBMITALS

4.2.1. BAR BENDING SCHEDULE

The Contractor shall prepare Bar Bending Schedule for reinforcement before fabrication

4.3 MATERIALS

4.3.1 STEEL REINFORCEMENT

Steel reinforcement to be procured by the Contractor for works shall be either of the following types:-

(a) Mild steel of Grade 1 tested quality conforming to IS: 432-Part-__

(b) 3370 Code of practice for concrete structures for (Part I to IV) the storage of liquids

(c) High yield strength cold worked deformed steel bars of tested quality conforming to IS: 1786 or hot rolled high tensile deformed steel bars of tested quality conforming to IS: 1139.

(d) Hard drawn steel fabric conforming to IS: 1566.

(e) Where galvanized reinforcement is specified in the drawings, the bars or mesh shall be hot-dip galvanized after bending generally in accordance with IS: 2629 and IS: 4759. Galvanized reinforcement shall be coated with a layer of zinc no where less than 0.05 mm in thickness.

All reinforcement shall be stored horizontally above ground level on supports, skids or other approved supports, clear of any running or standing water. Contact with soil should be avoided. Proper drainage and protection from the elements shall be provided to minimize corrosion.

Before steel reinforcement is placed in position, the surface of the reinforcement shall be cleaned of rust, dust, grease and other objectionable substances. In order to confirm the quality periodical tests as specified as the relevant IS shall be conducted by the contractor at his own cost.

4.3.2. BINDING WIRE

Binding wire shall be black annealed steel wire conforming to IS: 280 and of minimum 18 gauge.

4.3.3. WELDING ELECTRODES

Electrodes used for welding of steel bars shall be of ordinary mild steel grade electrodes conforming to IS: 814 and shall be of the best quality approved by Consultant/Project-in-charge.

4.4 STORAGE

Reinforcement steel shall be handled and stored in a manner that bending or distortion of the bars is avoided and contamination of steel is prevented.

All reinforcement shall be stored horizontally above ground level on supports, skids or other approved supports, clear of any running or standing water Contact with soil should be avoided. Proper drainage and protection from the elements shall be provided to minimize corrosion Bars of different classifications and diameters shall be stored separately A record shall be kept of the batch numbers of reinforcement deliveries in such a form that the part of the works in which particular reinforcement is used can be readily identified. Welding electrodes shall be stored in moisture control-led environment in accordance with the manufacturer's recommendations.

4.5 FABRICATION

Reinforcement steel shall be carefully and accurately cut, bent or formed to the dimensions and configurations shown on the drawings and as per bar bending schedules approved by the Consultant / Project-in-charge. All reinforcement shall be bent cold using appropriate pin size. Bars may be preheated only on approval of the Consultant. Quenching shall not cool hot bars. Bends shall be in accordance with IS: 2502.
It shall be ensured that the bars are not straightened in any manner that will injure the material. Any bars incorrectly bent shall be used only if means for straightening and rebinding be such as not to affect adversely the material. Reinforcement shall not be re-bent or straightened without prior review by the Consultant. No reinforcement shall be placed in position on the works without approval of the Consultant, whether or not it is partially embedded in hardened concrete.

Reinforcement steel having a reduced section, visible transverse cracks in bends, or otherwise damaged in anyway shall not be used.

Spiral reinforcement shall be accurately fabricated to the diameter and pitch shown on the drawings. One and one half finishing turns shall be provided at both top and bottom unless shown otherwise. Cut ends of galvanized rods shall be given a protective coat of an approved zinc paint immediately after cutting.

4.6 LAPPING

As far as possible bars of maximum length available shall be used. All bars shall be in one length unless otherwise shown on the drawings or agreed with the Consultant/Project-in-charge.

Laps shown on the drawings or otherwise specified by the Consultant shall be based on the used of bars of maximum length by the contractor. In case the Contractor wishes to use shorter bars, laps shall be provided at the Contractor's cost in the manner and locations approved by the Consultant /Project-in-charge.

Not more than 1/3 rd of the bars or as specified in the drawings shall be lapped at one section.
Reinforcement bars shall not be welded unless shown on the drawings or instructed by the Consultant / Project-in-charge.

4.7 PLACEMENT

All reinforcement shall be placed accurately and maintained in the position indicated on the drawings. The contractor shall provide approved type of supports for maintaining the bars in position and ensuring required spacing and correct cover of concrete to the reinforcement as called for in drawings. Pre-cast cement concrete blocks of required shapes and size, MS. chairs and spacers bars shall be used in order to ensure accurate positioning of reinforcement. Pre-cast concrete blocks shall be cast well in advance and shall be at least equal in quality to the class of concrete specified in the work.

In fair faces of concrete, temporary spacers only shall be used and removed or withdrawn as compaction of concrete proceeds. Spacers will not be permitted to be left in fair faces of concrete.

All intersections of the reinforcements shall be securely tied with two strands of binds wire twisted tight to make the skeleton or net work rigid so that the reinforcement is not displaced during placing of concrete. Tack welding of crossing bars shall not be done except as authorized or directed by the Consultant / Project-in-charge. Nothing extra will be paid for tack welding.

The contractor shall take all responsible precautions to ensure that when handling or erecting reinforcement no damage shall be done to finished concrete . Bars that are partially embedded in concrete shall not be filed bent unless concurrence has been obtained from the Consultant / Project-in-charge.

Walkways and borrow runs for placing and compacting the concrete shall be independent of the reinforcement.

Loose binding wire and other extraneous metal shall be removed from inside the form work prior to concrete placing.

Without relieving the Contractor of the responsibilities for the correctness thereof, the reinforcement shall be inspected and approved by the Consultant in writing before any concrete is placed and the contractor shall allow sufficient time for such inspecting and any subsequent remedial action to be carried out No part of the reinforcement shall be used for conducting electrical currents.

4.8 COVER TO REINFORCEMENT

Unless shown otherwise on the drawings, minimum cover for all reinforcement shall be provided as per IS: 456 care shall be taken to maintain the correct cover to reinforcement.
For concrete members exposed to weather, earth, action of harmful chemicals, acid vapor, saline atmosphere, sulphurous smoke etc minimum cover for reinforcement shall be increased by 15 cm to 40 mm as directed by the Consultant / Project-in-charge.

The maximum cover for reinforcement shall not be greater than that specified above or shown on the drawings plus 10 mm except for bundled bars.

For bundled bars, minimum, concrete cover shall be equal to the equivalent diameter of the bundle but need not be greater than 50 mm.

Exposed reinforcement intended for binding with future extensions shall be protected from corrosion as shown in the drawings.

4.9 CLEANING

After placing, the reinforcement shall be maintained in a clean condition until the concrete is placed. On no account the bars shall be oiled or painted or mould oil used on the formwork be allowed to come in contact with the bars.
Before concreting is commenced, the bars shall be thoroughly cleaned with dry gunny bags if they are coated lightly with rust or other impurities.

4.10 WORK WILL INCLUDE

a) All cutting to lengths, labour in bending and cranking, forming hook ends, handling, hoisting and all that is necessary to fix reinforcement in work as per Drawings and specifications This shall also include all that is fairly intended and is necessary for completion of work.

b) Cost of pre-cast concrete cover blocks to maintain cover and holding reinforcement in position, chairs, spaces, dowels, pins, laps, etc.
c) For fabricating and fixing reinforcement in any structural member irrespective of its location, dimension and level.
d) Work at all levels.
e) All the above mentioned works shall be included in the quoted rates Nothing extra shall be payable to the contractor on this account
f) Reinforcement Steel procurement shall be done by the Contractor.

5 SPECIFICATIONS FOR FORMWORK

5.1 GENERAL

5.1.1 DESCRIPTION

This section covers the requirements for providing, fabricating and erecting of form work including propping, bracing, shoring, strutting, rising, bolting, wedging and all other temporary and all other temporary supports to the concrete during the process of setting subsequent removal of forms.

5.1.2 RELATED WORK SPECIFIED ELSEWHERE

a. Cast-in-place Reinforced Concrete

5.1.3 APPLICABLE CODES AND STANDARDS

The codes and standards generally applicable to the work of this section are listed hereinafter

IS: 456 Code of practice for plain and reinforced concrete.
IS: 4990 Ply wood for concrete shuttering work.

5.2 SUBMITTALS

5.2.1 TYPE OF FORM WORK

Prior to start of delivery of material for formwork, the contractor shall prepare samples of different types of formwork for about 10 sqm and obtain approval of the Consultant/Project-in-charge.

5.2.2 DESIGN OF FORMS

Before fabricating of forms, the contractor shall submit design calculations for proposed form work to Consultant/Project-in-charge for his approval However, the approval of his responsibility for adequately constructing and maintaining the forms so that they will function properly.

5.2.3 TIE BOLTS

In case the contractor proposes to use tie bolts running through the concrete, the location and size of such tie bolts shall be submitted to the Consultant/Project-in-charge for his Approval.

5.3 MATERIALS

5.3.1 Formwork shall be timber, plywood, steel or any other material capable of resisting damage to the contact faces under normal conditions of erecting forms, fixing steel and placing concrete. The selection of materials suitable for formwork shall be made by the Contractor based on the maximum quality consistent with the specified finished and safety.

5.3.2 TIMBER

Timber used for formwork shall be easily workable with nails without splitting. It shall be stable and into liable to warp when exposed to sun and rain or wetted during concreting.

5.3.3 PLYWOOD

Plywood used for formwork shall be 12 mm thick shuttering quality plywood complying with IS: 4990 and of make approved by the Consultant

5.3.4 STEEL

Steel form work shall be made of minimum 2 mm thick or more as required black sheets stiffened with angle iron frame made out of M S angles 40 mm X 6mm.

5.4 DESIGN CRITERIA

Formwork shall be designed for the loads and lateral pressures due to dead weight of concrete, superimposed live loads of workmen, materials and plants and for other loads as indicated on the drawings. Forms shall be designed to have sufficient strength to carry on the hydrostatic head of concrete as a liquid without deflection tolerances exceeding the acceptable limits.

Where necessary to maintain the tolerances indicated on the drawings. The formwork shall be cambered to compensate for anticipated deflections due to the weight and pressure of the fresh concrete, and also due to any other construction loads. Unless otherwise shown or specified, the camber shall be provided as below:-

Types of member	Compression Steel As % of tensile steel	Camber Co-efficient
Simple span	0%	0.066
Continuous Restrained	50%	0.037
span Cantilever Cantilever	0%	0.032
	50%	0.020
	0%	0.086
	50%	0.046
Camber in cms Where	(K X L X 2.54)/D	
K =	Camber coefficient	
L =	Length of member in meter	
D =	Depth of member in meter	

5.5 ERECTION OF FORMWORK

Forms shall be used wherever necessary to confine the concrete during vibration and to shape it to the required line. The formwork shall conform to shapes, lines, levels and dimensions of the concrete sections shown on the drawings.

Forms shall have sufficient strength to withstand the pressure resulting from placement and vibration of concrete and shall be maintained rigidly in position. Form work shall be adequately supported by adequate number and size of struts, braces, ties and props to ensure rigidity of forms during concreting. Where props rest on natural or filled up ground, to avoid any settlement, the soil shall be thoroughly compacted and bases of props shall be sufficient size so as to restrict the bearing on the ground to 50 t/ sqm Forms shall be tight enough to prevent loss of mortar from the concrete and to produce dense, homogenous and uniformly coloured concrete completely free from honeycombing or surface roughness. Joints in formwork shall be designed to prevent leakage, not only between individual elements forming the panels but also from the horizontal and vertical junction between the panels themselves.

If form work is held together by bolts or wires, those shall be so fixed that no reinforcement bar is exposed on surface against which concrete is to be laid. The Consultant may at his discretion allow the contractor to use tie bolts running through the concrete at his own cost.

Hole left in the concrete by these tie-bolts shall be filled as specified by him at the Contractor’s expense. Formwork shall be constructed so as to facilitate loosening and permit removal without jarring the concrete Wedges, clamps and bolts shall be used wherever practicable instead of nails. All formwork erected shall be approved by the Consultant/Project-in-charge before concreting is started.

5.6 CLEANING AND OILING OF FORMS

At the time concrete is placed in the forms, the surface of the forms in contact with the concrete shall be free from encrustations of mortar, grout or other foreign materials. Temporary openings shall be left at the bottom of formwork to enable, sawdust, shavings, wire cuttings and other foreign material to be worked out form the interior of the forms before the concrete is placed.

The surface of the forms to be in contact with the concrete shall be coated with an approved coating that will effectively prevent sticking and will not stain the concrete surfaces. After each use the surfaces of forms in contact with concrete shall be cleaned, well settled and treated with form oil approved by the Consultant Project-in-charge. Lubricating (machine) oils shall not be used.

Oiling shall be done before reinforcement has been placed and care shall be taken that no oil comes in contact with the reinforcement while it is being placed in positions.
Immediately before concreting is commenced the formworks shall be carefully examined to see that all dirt, shavings, sawdust and other refuse have been removed and the formwork shall be wetted thoroughly to prevent absorption of water from concrete. The formwork shall be kept wet during concreting and for the whole time that it is left in place.

5.7 REMOVAL OF FORM WORK

Form works shall be removed carefully so as to prevent damage too the concrete. Wooden wedge only shall be used between the concrete surface and the form where force is necessary to separate the form from the concrete. Metal wedge, bars or tools shall not be used for this purpose. Any concrete damaged in the process of removing the forms shall be repaired in accordance with the provision of concrete specifications.

Unless otherwise permitted by the Consultant, the forms shall not be stripped in less than the minimum periods specified in IS: 456. However the Consultant may increase the above period if he considers it necessary for structural stability

All non-supporting forms shall be loosened and removed during regular working hours, and as soon as the concrete has hardened sufficiently to prevent damage from the removal of the forms All false work and forms supporting concrete beam and slabs, or other members subject to direct bending stress, shall not be removed or released until the concrete has attained sufficient strength to ensure structural stability and to carry both the dead and live loads including any construction loads which may be placed upon it.

No construction loads exceeding the combination of superimposed dead load plus specified live load shall be supported on any unshared portion of the structure under construction, unless analysis indicates adequate strength to support such additional loads Form work shall be removed in such a manner so as not to impair safety and serviceability of the structure It shall be removed gradually to prevent sudden application of loads to the concrete All concrete to be exposed shall have sufficient strength to prevent any damage caused by removal of formwork.

5.7.1. HACKING:

Immediately after removal of forms, the concrete surface intended to be either plastered or finished, shall be roughened with brush hammer or with chisel and hammer as directed by the construction manager to make the surface sufficiently coarse and rough to provide a bonding key for plaster.

No extra payments shall be made to the Contractor for such work on concrete surface after removal of the form work.

No payment shall be made for temporary formwork used in concreting, or for form work required for joints or bulk-heads, in floor or elsewhere, whether such joints are to be covered later with concrete or mastic or other materials.

5.7.2. POCKETS AND OPENINGS:

Where boxes, pockets or openings are required (not exceeding 0.1 sqm) to be formed in the concrete. No deduction shall be made for the area of box or pockets in measuring the area of concrete surface shuttered. In other words the area of shuttering shall be reckoned as if box of pocket or openings were not present.

However, on measuring the concrete quantity, the volume of the box or pocket shall be deducted. If the area of box or pocket or openings against the shuttered faces exceeds 0.1 sqm. It shall be paid not as a box or pocket or opening but as formwork at the rates for formwork.
No extra payment shall be made for holes to be made in the form work for inserting electrical conduits hooks for fans etc.

5.8 REUSE OF FORMS

Immediately after the forms are removed, they shall be cleaned with jet of water and a soft brush before they are reused.

The contractor shall not be permitted reuse of any forms which in the opinion of the Consultant has worn out and has become unfit for formwork.
The Consultant/Project-in-charge may in his absolute discretion, order rejection of any forms he considers unfit for use in the works, and order their removal from the site.

6 SPECIFICATIONS FOR BRICK MASONRY WORK:-

6.1 SCOPE:-

The Contractor shall provide all labour, materials, scaffolding operations, equipment and incidentals necessary required for the completion of all brickwork called for in the drawings and documents and that which is fairly intended for smooth completion of the work.

6.1.1 BRICKS (CLASS 50):-

The bricks shall be well burnt locally available from good brick earth and shall be of uniform size (9"x 4.5"x3") unless otherwise specified They shall be of uniform deep red, cherry or copper colour, thoroughly well burnt without being verified and regular in shapes.

6.1.3 MORTARS:-

All brick work shall laid with specified mortar of good workable consistency.

6.1.4 SOAKING OF BRICKS:-

All bricks required for masonry in cement or composite lime mortars shall be thoroughly soaked in clean water for at least one hour in advance of sufficient quantity size for immediate use. The cessation of bubbles when the bricks are immersed in water is an indication of thorough soaking of bricks.

6.1.5 LAYING:-

a) Bricks shall be laid in English bond, unless otherwise specified. Half or cut bricks shall not be used except where necessary to complete the bond. Closers in such cases shall be cut to the required size and used near the ends of the walls.

b) The walls shall be taken up truly plumb. All courses shall be laid truly horizontal and all vertical joints join shall be truly vertical. Vertical joints in alternate courses shall come directly one over the other. The thickness of brick courses shall be kept uniform and for this purpose straight edge with graduations showing the thickness of each brick course including joint shall be used. Bricks shall be laid with frogs upwards.

c) The walls of a structure shall be carried up regularly and nearly at one level and no portion of the work shall be left more than 3 ft. below the rest of the work. Where this is not possible the work shall be raked back according to bond (and not left toothed) at an angle not exceeding 45°.

d) All iron fixtures pipes, outlets of water, holdfasts of doors and windows, etc., which are required to be built in walls, shall be embedded in cement mortar or in cement concrete as specified, in their correct positions as the work proceeds. Nothing extra shall be paid for such extra cement mortar or of the nature stated above.

6.1.6. JOINTS:-

Bricks shall be so laid that all joints are quite full of mortar. The thickness of the bed joints shall in no case exceed 3/8", unless otherwise specified. The face of joints shall be raked to a minimum depth of 0.5" by raking tool daily during the progress of work when the mortar is still green, so as to provide proper key for the plaster or pointing to be done. Where plastering or pointing is not required to be done, the joints shall be struck flush and finished at the time of laying. The face of brick work shall be cleaned daily and all mortar droppings removed

6.1.7 BRICK-IN-EDGE COPING

The top course of all plinths, parapets, steps and tops of walls below R C.C. slabs or beams shall be laid with brick on edge, unless otherwise specified Proper care shall be taken that the bricks forming the top corners and ends of walls shall be properly radiate and keyed in to position.

6.1.8. CURING:-

Green Work shall be protected from rain by suitable covering Brick Masonry with cement or composite mortar shall be kept constantly moist on all faces for a minimum period of 7 (Seven) days. In case of fat lime mortar, curing shall commence two days after the laying of masonry and shall continue for 7 (seven) days

6.1.9 SCAFFOLDING:

Double scaffolding having two sets of vertical supports shall be provided The supports shall be sound and strong Tied together with horizontal pieces over which the scaffolding planks shall be fixed. In building up to two stories, single scaffolding shall be allowed In this case, the inner end of the horizontal scaffolding pole shall rest in a hole provided in the header course only. Only one header or each pole shall be left out. The holds left in masonry work for supporting the scaffoldings shall be filled and made good, before plastering. The Contractor shall be responsible for providing and maintaining sufficiently strong scaffolding so as to withstand all loads likely to come upon it.

6.2 HALF BRICK AND THREE INCH THICK MASONRY:-

6.2.1. The work shall be done exactly similar to the specification 'BRICK WORK' except that all courses shall be laid with stretchers.

6.2.2 Cement Mortar 1:4 (1 cement: 4 sand) shall be used unless otherwise specified in the description of the item.

6.2.3 The description of the item shall mention whether or not, reinforcement is to be provided, when the brick work is to be reinforced, hoop iron band 1" x 1/16" (2.5 c.m. x 1.6. mm) shall be embedded in the cement mortar at every fourth course or as described in the description of the item. The hoop iron shall be hooked (given a doubel lap) with minimum of 9" hooks at all angles and junctions. At either end of the wall, 2" (5 c.m.) lengths of the hoops shall be bent up or down so as to take a firm grip of the brick work. When hoop iron is not available. The Consultant may allow equivalent reinforcement in the form of mild steel.

6.3 RUBBLE MASONRY:-

N.A.

7. SPECIFICATION FOR DOORS & WINDOWS :

7.1 MATERIAL

7.1.1 TIMBER

7.1.1.1 TEAK WOOD

Teakwood shall be second class Indian Teakwood conforming to IS: 4021 of good quality, well seasoned and free from defects such as cracks, dead knots, sapwood etc. No individual and sound knot shall be more than 15 sq.cm in size and the aggregate area of such knots shall not exceed 2% of the areas of the piece. The timber shall be fairly close grained having not less than 2 growth rings per cm. Width in cross – section.

7.1.1.2 Hard Wood:

Hard wood shall be first class conforming to IS 4021 of good quality, well seasoned and free from defects such as dead knots, cracks, sapwood etc. No individual hard and sound knot shall exceed 6 sq.cm in size with no dimension more than 50 mm and the aggregate area of such knots shall not be more than 1% of the area of the piece. There shall not be less than 5 growth rings per cm. Width in cross-section.

7.1.1.3.1 Moisture content in timber

The maximum permissible percentage of moisture content for well seasoned timber shall be as per IS 287.

7.1.1.4 Workmanship of wood work

Workmanship for wood and joinery shall be as per IS 1200 and IS 4021.

7.1.1.5 Painting / Polishing of wood work

Painting / polishing of wood work shall be in accordance with clause Nos. of specification No.6.9.2 to 6.11.3.

7.2 WOODEN DOOR / WINDOW FRAME

Wooden door / window frame shall be made of specified wood as per item description and shall be in accordance with detailed drawings.

The wooden members of the frame shall be planed smooth and accurate to the full dimensions. Rebats, rounding, moulding etc., shall be done before the members are jointed into frames.

Joints in the frame work shall be perfect with square edges and shall be pinned with hard wood / bamboo pins of 10 to 15 mm dia.

Wood work shall be painted / polished or otherwise treated as specified. All exposed portions shall be coated with wood primer and concealed surface by bituminous paints as per clause No. 6

Before any surface treatment is applied, the wood work shall be got approved by the Project-in-charge. The frames shall be fixed only after acceptance by the Project-in-charge. The frames shall be fixed to the masonry by 300 mm x 25 mm x 6mm MS hold fasts embedded in M-15 grade concrete block of 350 mm x 100mm x 100 mm in the hole of the masonry. In case of concrete, frames shall be fixed by 96mm long 12 mm dia metallic dash fasteners.

7.3 SHUTTERS:

7.3.1. Particle Board flush shutter:
Particle board flush shutter shall in general conform to IS: 2202

7.3.1.1 Materials

7.3.1.1.1 Particle Board
Particle board shall conform to IS 3097 and shall be three layer flat pressed teak wood based and of exterior grade (Grade –1), type – 1, BWP type, bonded with phenol Formaldehyde synthetic resin conforming to IS: 848.

7.3.1.1.2 Veneers
Veneers shall conform to class – 1 of IS 303 and (BS 476 Part – 7)

7.3.1.1.3 Teak wood
Specification of Teak wood shall same as specified in clause 9.1.1.1

7.3.1.1.4 Hinges

Hinges shall be of brass and butt type conforming to IS: 205. Size of hinges shall be in accordance with shutter width and as per IS: 205.

7.3.1.2.1 Workmanship

The particle board of required size and thickness shall be lipped on all the edges with T-type, teak wood lipping. The overall board lipping composition shall be uniform and specified thickness and shall be properly sized in view of the operation of shutter.

All the four edges of the door shutter shall be square. The shutter shall be free from twist or warp in its plane. In case of double leaf shutters, the meeting of the stiles shall be rebated by one third the thickness of shutter. The rebating shall be splayed.

The shutter then shall be veneered on both faces by gluing approved shade and textured commercial type 0.5 mm thick veneering conforming to class 1 of IS 303. The veneering shall be done by gluing the veneer with BWP type, phenol formal dehyde synthetic resin conforming to IS 848 by not press process on the shutter. Workmanship and finish of the veneering shall conform to IS 303. The exposed surfaces of the lipping of the edges, shall be french polished in accordance with clause No. 6.9.2.4.2 of specification No.6. The shutter shall

be fixed to the door frame, by means of hinges @ minimum 3 hinges per leaf, maximum spacing of hinges being 600 mm or as per drawing with suitable sized screws.

The shutter when fitted to the frame shall satisfy all operational aspects of the door like smooth movement, proper closing against the door frame etc.

7.3.2 Glazed Wooden Door shutter

7.3.2.1 Materials

7.3.2.1.1 Wood

Teakwood for various members like stiles, rails etc., shall be as specified in clause No.9.1.1.1.

7.3.2.1.1 GLAZING

Glass sheets for glazing shall be

i. 4 mm thick plain glass (wt. 7.2 kg/m2) conforming IS : 2835, or
ii. 5.5 mm thick wired glass conforming to IS: 5437 or
iii. 6.3 mm thick laminated glass conforming to IS: 2553 as case may be as per item description or
iv. 5.5 mm thick toughened glass.

Glass sheets shall be free from flaws, scratches, cracks, bubbles etc.

7.3.2.1.3 WORKMANSHIP

Teakwood stiles and rails of size as specified in item description shall be cut accurately and planned smoothly to required dimensions as per drawings. The stiles and rails shall be provided with rebates for fixing the glazing and shall be jointed together to form the profile of the shutter as per drawings. The joinery work shall be as approved by Project-in-charge. Only after such approval, the joints shall be coated with white lead, pressed and secured by hardwood pins of about 6 mm dia. All the four edges of the shutter shall be square. In case of double leaf doors, rebates shall be provided at the meeting of stiles. Rebates shall be splayed type and one third the thickness of the stiles.

The glass sheets for glazing shall be fixed by teak wood beading having mitered joints as per drawings and shall be fixed by means of approved neoprene based adhesive and nailing, the spacing between the nails being no more than 300 mm.

All wooden surfaces shall be coated with 2 coats of approved make polyurethane with strainer mixed to achieve desired shade.

The shutter shall be fixed to the door frame, by means of hinge @ minimum 3 hinges per leaf, maximum spacing of hinges being 600 mm or as per drawing with suitable sized screws.

The shutter when fitted to the frame shall satisfy all operational aspects of the door like smooth movement, proper closing against the door frame etc.

7.4 **Aluminium Glazed Doors / Windows / Ventilators**

7.4.1 **General**

Aluminium glazed doors / windows / ventilators shall be of specified sectional size, dimension and profile as per drawings.

7.4.2 **Materials**

All Aluminium sections shall be extruded sections of INDAL aluminium alloy as per IS:733 and IS:1285. Aluminium sections shall be anodized as per IS: 7088 to min, 25 microns. Glass used for glazing shall be of following type in accordance with item description.

i. 5.5 mm thick wired glass conforming to IS 5437.
ii. 6.3 mm thick laminated safety glass conforming to IS 2553.
iii. 5.5 mm thick transparent sheet glass conforming to IS: 2853 (Wt. 7.2 kg/sq.m).

7.4.3 Workmanship

Frames shall be square and flat, the corner of the frame being fabricated to true right angles. Details of construction of frames, shutters etc., shall be as per drawings.

Side hung window shutters shall either be fixed to the frame with pivots, or aluminium alloy hinges. For fixing the hinges, slots shall be cut in the fixed frames and the hinges inserted inside may be riveted to the frame. The hinges shall normally be of the projecting type conforming to IS designation A-5-M of IS –617, IS 733. In which case peg stay of 300 mm long complete with locking bracket and conforming to IS codes same as for hinges shall be provided. Friction hinges may also be provided in which case peg stays are not required.

The handles for side hung shutters shall be of cast aluminium conforming to IS designation A-5-M of IS 617 and shall be mounted on a handle plate riveted to the opening frames. The handle shall have anodized finish with minimum anodic film thickness of 25 micron of Electro colour finish. The handle shall have a two point nose which shall engage with an aluminium striking plate on the fixed frame. The striking plate shall be finished in the same manner as for the handle.

In case of top hung shutters, aluminium alloy cast hinges and peg stays (same as per side hung shutters) shall be provided.

Center hung shutters shall be hung on the two pairs of cup pivots of aluminium alloy of IS designation NS – 4 of IS 737 and IS designation A-5-M of IS 617 or chromium / cadmium plated brass / bronze cup pivots riveted to the outer and inner frames to permit to swing through an angle of 850. Cast aluminium (conforming to IS designation A-5-M of IS 617) or chromium / cadmium plated bronze spring catches shall be fitted in the centre of the top bar of the shutter. The spring catch shall be secured to the frame by screwing / riveting to the frame and shall close into and aluminium catch plate riveted / welded to the outside of the outer shutter frame bar. Aluminium or cadmium plated brass chord pulley wheel in an aluminium bracket shall be fitted at the sill of the shutter with Aluminium or galvanized / cdmium plated steel screws.

The door shutters shall be fitted with pivots as specified. The handle for doors shall be of aluminium and as per design. The door shutters shall be provided with locking device, floor spring, O/H door closer and any other hardwares, specified in item.

In case of composite Door / window / ventilator units shall be coupled as per drawing. Weather bar shall be provided whenever a coupling member is fitted over an external opening shutter. Glazing shall be fixed to the extruded sections by means of extruded aluminium beading. Glass panes shall be provided with rubber lining before fixing.

The aluminium frames shall be fixed to the masonry by means of aluminium lugs fixed to the frame (by counter sunk galvanized machine screws) and grouted with M-15 grade concrete in the hole in the masonry as per drawing. In case of concrete wall, the frames shall be fixed by 96 mm long, 12 mm dia metallic dash fasteners. Any steel material coming in contact with aluminium shall be galvanized. The windows / ventilators / doors shall be checked to ensure smooth operation, perfect level and plumb.

8. SPECIFICATION FOR FLOORING & PAVING

8.1 SCOPE

The Contractor shall furnish all labour, materials, tools, equipment, machinery operations and related items necessary and required for the full performance of the contract under this section, as shown on the drawings or as specified or reasonably implied or incidental to the construction.

8.2 GENERAL

The flooring shall be laid to the level except where slopes are called for on the drawings, in which case the slopes shall be uniform and arranged to drain into the indicated outlets. Particular care shall be exercised to ensure that all flooring, skirting etc., is perfectly matched for color and finish. The Contractor shall pave the areas indicated on the plans and schedule of finishes with materials therein called for. All work shall be laid to the best practice known to the trade.

The Contractor shall furnish for approval by the Consultant, samples of each type of floor, paving etc., the samples shall be of sizes and thickness as specified.

8.3 POLISHED GRANITE STONE SLABS FOR FLOORING, STEPS, STAIRS, CLADDING ON PANTRY AND WASH BASIN COUNTERS

Providing & fixing granite of approved quality and colour of required size mm double polished M/C cut of 20mm thick over floor surface in proper line. Level in CM 1:4 including finishing the joint with matching colour cement, polishing the top surface etc., complete as per instruction of EIC/ Consultant.

Granite stone shall be of best quality machine polished, Machine Cut and of approved colour, dense and homogenous in texture free from cracks, decay, weathering and flaws. The stone shall be of required size and shall be 20 mm thick. The material shall have to be approved by Consultant before and after procurement. Before laying flooring, the surface shall be paved and thoroughly hacked, cleaned off all mortar scales, loose materials etc., unless and until the surface is approved by Consultant / Engineer-incharge, the laying shall not be done. The bedding with CM 1:4 proportion as directed by Consultant / Project-in-charge with minimum thickness of 30 mm layer shall be laid evenly and to the required slope. The granite shall be truly and evenly set in thin paste of next cement apply to the bottom and to the prepared base. The stone then shall be temped down with wooden mallet until they are exactly in true plane and in line with adjacent stone.

The stone shall be closed jointed and filled with matching cement. The entire surface of flooring shall be polished with machine upto to mirror polish achieved including necessary use of antimony trioxide anxilix acid etc., as directed by Consultant / Project-in-charge.

8.4.1 FINISHING

The finishing of the surface shall follow immediately after the cessation of beating. The surface shall be left for sometime, till moisture gets dried from its joints or top, Excessive trowel ling shall be avoided. Use of dry cement or cement and sand mixture sprinkled on the surface to stiffen the concrete or absorb excessive moisture, shall not be permitted.

8.4.2 CURING

The curing shall be done for a minimum period of ten days. Curing shall not be commenced until the top layer has hardened. Covering with empty cement gunnies shall be avoided as the color is likely to be bleached with the remanents of cement matter from the bags.

9 CERAMIC TILES GLAZED AND MATT FINISH

Ceramic tiles in toilets and other areas where called for shall be non-slip ceramic tiles of approved make and shade. The tiles shall be laid to the pattern as approved by the Consultant. The tiles shall be of uniform color, true to size and shape and free from cracks, twists, uneven edges, crazing and other defects. The size and thickness of the tiles shall be as specified.

The tiles shall be laid as per the pattern shown in the drawings over a bed of specified thickness of cement mortar leveled to a true surface. The surface of the bedding mortar shall be left rough to provide bond for the tiles. A floating coat of thick cement slurry shall be laid over the screed to proper levels and the tiles set over the same firmly to correct line and levels.

The joints shall be filled and finished neat with cement paste pigmented to the shade of the tile. The joints shall be finished neat as directed and shall be straight, regular and uniform. On completion, the surface shall be washed with water, rubbed with fine saw dust and left clean.
The finished floor surface shall be true to required levels.

9.1 VTRIFIED TILES IN FLOORING AND SKIRTING

9.1.1. VITRIFIED TILES

The tiles shall generally conform to latest IS standards shall be procured by the contractor. They shall be flat, true to shape and free from cracks, crazing spots, chipped edges and corners. The glazing shall be of uniform shade and color shall be as shown in the drawings.

The tiles shall be of specified size and thickness as per drawing. The tolerance on facial dimension value shall be +/- 1.0mm and +/- 0.5 mm in thickness.

The top surface of the tiles shall be glazed. The glazed shall be either glossy or matt as specified. The underside of the tiles shall be completely free glazed in order that the tile may adhere properly to the base. Type edges of the tiles shall be preferably free form glaze, however, and glazed if unavoidable, shall be permissible on any one edge of the tile.

9.1.2 LAYING

The Vitrified tiles shall be laid over ferrow cement slab & it shall be cleaned, wetted Mortar of specified mix shall be spread to required thickness over a small area. The slab, washed clean, shall be laid on the mortar, pissed tapped, with a wooden mallet, and brought to required level The tiles shall be laid as per the pattern shown on the drawings or as approved by Consultant / Project-in-charge.

It shall then be removed and laid a side. The top of the mortar shall then by corrected by adding fresh mortar at hollows. The mortar is then allowed to harden and cement slurry of paste like consistency shall be spread over the same at the rate of 1 bag per sq mt. area. The edges of the tile already laid shall be buttered with slurry of cement and pigment to match the shade of slabs. The tile to be laid shall then be placed back in position, pressed and properly bedded in level with adjoining tiles with as fine a joint as possible. Other tiles are also laid in similar manner to correct levels with fine joints. The surplus slurry on the surface shall be cleaned off. The tiles shall be soaked in water, washed clean, and a coat of cement slurry applied liberally at the back of tiles and set in the bedding mortar. The tiles shall be tamped and corrected to proper plans and lines.

The tiles shall be set in required pattern and butt jointed. The joints shall be as fine as possible. Where full size tiles cannot be fixed these shall be cut to the required size and their edges rubbed smooth.

9.1.3 CURING AND FINISHING

The joints shall be cleaned off of the grey cement grout with soft wire brush or trowel to a depth of 2mm to 3mm and all dust and loose mortar removed Joints shall then be flush pointed with white cement added with pigment if required to match the color of tiles. The surface shall then be kept wet for 7 days. After curing, the surface shall be washed and finished clean. The finished work shall not sound hollow when tapped with wooden mallet.

10 WATER-PROOFING FOR ROOF

The waterproofing shall be integral cement based water proofing treatment including preparation of surface as required for treatment of roofs, balconies, terraces etc. consisting of following operations:

a) Applying and grouting a slurry coat of neat cement using 2.75 kg/sqm. of cement admixed with proprietary water proofing compound conforming to IS : 2645 over the RCC slab including cleaning the surface before treatment.

b) Laying cement concrete using broken bricks/brick bats 25mm to 100mm size with 50% of cement mortar 1:5 (1 cement: 5 coarse sand) admixed with proprietary water proofing compound conforming to IS: 2645 over 20mm thick layer of cement mortar of mix 1:5 (1 cement: 5 coarse sand) admixed with proprietary water proofing compound conforming to IS: 2645 to required slope and treating similarly the adjoining walls upto 300mm height including rounding of junctions of walls and slabs.

c) After two days of proper curing applying a second coat of cement slurry admixed with proprietary water proofing compound conforming to IS: 2645.

d) Finishing the surface with 20mm thick jointless cement mortar of mix 1:4 (1 cement: 4 coarse sand) admixed with proprietary water proofing compound conforming to IS: 2645 and finally finishing the surface with trowel with neat cement slurry and making of 300 x 300mm square.

e) The whole terrace so finished shall be flooded with water for a minimum period of two weeks for curing and for final test. All above operations to be done in order and as directed and specified by the Project-in-charge.
With average thickness of 120mm & minimum thickness at khurra as 65mm.

10.1 GUARANTEE

The treatment shall carry a guarantee for 10 years against leakage of water, dampness, seating and other defects. The treated roof shall be tested by allowing water to stand on the areas to a depth of 150 mm for at least 72

hours. All guarantee shall be furnished in the format approved by the Consultant/Project-in-charge duly signed by the contractor and sub contractor.

10.2 SPECIFICATIONS FOR CURING

The finished surface shall be cured for at least 7 days

10.3 KHURRAS

The Khurras shall be constructed before the brick masonry work in parapet wall is taken up, and it shall be 5 cm x 45 cm and shall be formed of cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size) unless otherwise specified in the drawings.

10.4 LAYING

A PVC sheet 1M X 1M X 400 micron shall be laid under the khurras and then cement concrete shall be laid over it to a minimum thickness of 3 cm with its top surface lower than the level of adjoining roof surface as approved.

10.5 FINISHING

The khurras and sides of the outlet shall then be rendered with cement plaster of mix and thickness stipulated in the drawings. This shall be done when the concrete is still green and shall be finished with a floating coat of neat cement The sides of the khurras and sizes of finished outlet opening shall be as directed by the Consultant.

11 SPECIFICATION FOR PLASTERING WORK

11.1 SCOPE

The Contractor shall furnish all labour, materials scaffolding, equipment, tools, plants and incidentals necessary and required for the completion of all plaster work.

11.2 **GENERAL**

Plaster as herein specified shall be applied to all internal surface where called for All plaster work shall be executed by skilled workmen in a workman like manner and shall be of the best workmanship and in strict accordance with the dimensions on drawings subject to the approval of the Consultant/Engineer-incharge. The primary requirement of plaster work shall be to provide dense, smooth and hard enclosure and devoid of any cracks of the interior and/or exterior.

11.3 SCAFFOLDING

Double scaffolding having two seats of vertical supports shall be provided The supports shall be sound and strong, tied together with horizontal pieces over which scaffolding planks shall be fixed. The contractor shall get the scaffolding approved from the Consultant well in advance.

11.4 CHASING AND BREAKAGE

Fixing of door and window frame, shall be completed before any plaster work is commenced on a surface. No chasing or cutting of plaster shall be permitted normally. However, if the same is felt unavoidable at places, written permission shall be obtained from the Consultant before cutting any such plaster. Broken corners shall be obtained from the Consultant before cutting any such plaster, Broken corners shall be cut back out less than 150 mm on sides and patched with cement mortar as directed. All corners shall be rounded to a radius of 80 mm or as directed by the Consultant.

11.5 PREPARATION

Masonry and concrete surfaces which call for application of plaster shall be clean, free from dust and loose mortar. Efflorescence if any shall be removed by brushing and scrapping. For masonry surfaces the joints shall be raked out properly, while the concrete surfaces shall be roughed by wire brushing and hacking to provide the key, thereby ensuring proper bond to the satisfaction of the Consultant. The surface shall then be thoroughly washed with water, cleaned and kept wet before plastering is commenced.

11.6 **CHICKEN WIRE MESH**

Galvanized chicken mesh (22 gauge, 12 mm size) shall be provided at junctions of brick masonry and concrete members, to be plastered and other locations as called for, properly stretched and nailed with galvanized wire nails, ensuring equal thickness of plaster on both sides of the mesh. The width of the mesh shall be as approved by the Consultant / Project-in-charge. The chicken mesh wherever. Specified, shall be fixed in place before plastering.

11.7 Samples of each type of plaster shall be prepared well in advance of undertaking the work for the approval of the Consultant/Project-in-charge

11.7.1 MORTAR

The mortar of the specified mix shall be used Mortar shall be prepared as specified under" Brick Work". It shall be made in small quantities, as required, and applied within 15 minutes of adding water to the plaster mix

11.7.2 CEMENT:

Cement shall be as per specifications under "Concrete Work"

11.7.3 WATER:

Water shall be as per specifications under "Concrete Work"

11.7.4 SAND

For plaster work normally clean fine river sand shall be used. However, if specified in the drawing or schedule of finishes, coarse sand conforming to the specifications under Concrete work" shall be mixed with fine river sand in proportion specified or directed by the Consultant.

11.8.4 **WATER PROOFING COMPOUND**

FOSROC, ROFFE Chemicals or approved equivalent as approved by Consultant / Project-in-charge wherever specified.

11.9. CEILING PLASTER

6mm thick Ceiling plaster shall be completed before commencement of wall plaster.

Plastering shall be started from the top and worked down towards the floor. To ensure even thickness and true surface, plaster about 15 x 15 cm shall be first applied, horizontally and vertically, at not more than 2 meters intervals over the entire surface to the plaster to serve as gauges. The surface of these gauged areas shall be truly in place of the finished plaster surface. The mortar shall be laid between the gauges with a trowel ensuring through filling of joints. The mortar shall be applied in a uniform surface slightly more than the specified thickness and then brought to a true surface, by working a wooden straight edge reaching across the gauge, with small upward and side movements at a time. Finally the surface shall be finished off true with trowel or wooden float according as a smooth or a sandy granular texture is required. Excessive trawling or over working the float shall be avoided.

All corners, arises angles and junctions shall be truly vertical or horizontal as the case may be and shall be carefully finished. Rounding or chamfering corners, arises, junctions etc. Where required shall be done without any extra payment. Such rounding shall be carried out with proper templates to the sizes required. No portion of the surface shall be left out initially to be patched up late on. Grooves shall be provided at the junction of ceiling and wall plaster without any extra cost.

In suspending work at the end of the day, plaster shall be left, cut clean to line both horizontally and vertically. When recommencing the plastering, the edge of the old work shall be scraped, cleaned and wetted with cement slurry before plaster is applied to the adjacent areas, to enable the two to be properly joined together. Plastering work shall be closed at the end a of day on the body of the surface and not nearer than 15 cm to any corners or arises. It shall not be closed on the body of the features such as pilasters, bands and cornices. Horizontal joints in plaster work shall not also occur on parapet tops and copings, as these invariably lead to leakages.

11.9.1 **GROOVES**

Wherever directed all joints between concrete and brick masonry besides other locations as called for shall be expressed by a groove cut in plaster at no extra cost

11.9.2 FINISH

The plaster shall be finished to a true and plumb surface and to the proper degree of smoothness as required The work shall be tested frequently as the work proceeds with a true straight edge not less than 2.5 m long and with plumb bobs All horizontal lines and surfaces shall be tested with a level and all jambs and corners with a plumb bob as the work proceeds.

11.9.3 CURING

Curing shall be started as soon as the plaster has hardened sufficiently not to be damaged when watered. The plaster shall be kept wet for a period of atleast 7 days. During this period, it shall be suitably protected from all damages

11.9.4 PRECAUTION

Any cracks which appear in the surface and all portions, which sound hollow when tapped or are found to be soft or otherwise defective shall be cut out in rectangular shape and redone as directed by the Consultant

11.9.5 FLOATING COAT OF NEAT CEMENT

Where finishing with a floating coat of neat cement is specified in the drawings or directed by the Consultant, specification, for this item of work shall be same described above except for the additional floating coat which shall be carried out as below. When the plaster has been brought to a true surface with the wooden straight edge, it shall be uniformly treated over its entire area with a paste of neat cement and rubbed smooth, so that the whole surface is covered with neat cement coating. The quantity of cement applied for floating coat shall 1 kg. per sq. mt. smooth finishing shall be completed with trowel immediately and in no case later than half an hour of adding water to the plaster mix.

11.10 **BEARING PLASTER**

This shall be consist of cement plaster 1:3(1 cement : 3 coarse sand) 20 mm thick finished with a coat 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.

12. SPECIFICATION FOR PAINTING WORK

12.1 OIL BOUND DISTEMPER

12.1.1 MATERIALS

Oil emulsion (Oil Bound) washable distemper (IS : 428) of approved brand and manufacture shall be used. The primer shall be of the same manufacture as distemper shall be diluted with water of any other prescribed thinner in a manner recommended by the manufacturer. Only sufficient quantity of distemper required for day's work shall be prepared.

The distemper and primer shall be brought by the contractor in sealed tins in sufficient quantities at a time to suffice for a fortnight's work, and the same shall be kept in the joint custody of the contractor and the Project-in-charge. The empty tins shall not be removed from the site of work, till this item of work has been completed and passed by the Consultant / Project-in-charge.

12.1.2 PREPARATION OF SURFACE

The surface shall be thoroughly cleaned of dust. Any unevenness shall be made good by applying putty, made of plaster of Paris mixed with water on the entire surface including filling up the undulations and then sand papering the same after it is dry.

Pitting in plaster shall be made good with plaster of Paris mixed with the colour to be used. The surface shall then be rubbed down again with a fine grade sand paper and made smooth. A coat of the distemper shall be applied over the patches. The patched surface shall be allowed to dry thoroughly before the regular coat of distemper is applied

12.1.3 **APPLICATION**

15 cm double bristled distemper brushes shall be used. After each days work, brushes shall be thoroughly washed in hot water with soap solution ands hung down to dry. Old brushes which are dirty and caked with distemper shall not be used on the work.

12.1.4 **SCAFFOLDING**

The specifications in respect of scaffolding, protective measures shall be as described under white washing.

12.2 **WATER PROOF CEMENT PAINT**

12.2.1 MATERIAL

Cement paint of required colour and of approved brand and manufacture conforming to IS : 5410 shall be used. Before application of the cement paint the shade shall be got approved from the Consultant. Cement paint shall be mixed with water in two stages. The first stage shall comprise of 2 parts of cement paint and one part of water stirred thoroughly and allowed to stand for 5 minutes. Care shall comprise of adding further one part of water to mix and stirring thoroughly to obtain a liquid of workable and uniform consistency. In all cases the manufacturer's instructions shall be followed meticulously.

Cement paint shall be mixed in such quantities as can be used up within a hour of its mixing as otherwise the mixture will set and thicken, affecting flow and finish.

The lids of cement paint shall be kept tightly closed when not in use, as by exposure to atmosphere the cement paint rapidly become air set due to its hygroscopic qualities.

12.2.2 PREPARATION OF SURFACE

For new work, the surface shall thoroughly be cleaned of all mortar dropping, dirt, dust, algae, grease and other foreign matter by brushing and washing. The surface shall be thoroughly wetted with clean water before the cement paint is applied.

12.2.3 APPLICATION

For new work, the treatment shall consist of a priming coat of cement paint following by the application of two or more coats of cement paint till the surface shows on even colour. For each coat, the entire surface shall be coated with the mixture, uniformly, with proper cement paint brushes in horizontal strokes followed immediately by vertical ones which together shall constitute one coat.

The subsequent coats shall be applied only after the previous coat has dried The finished surface shall be even and uniform and shall show no brush marks.

Enough cement paint shall be mixed to finish one room at a time The application of a coat in each room shall be finished in one operation and no work shall be started in any room, which cannot be completed the same day After each days work, the brushes shall be washed in hot water and hung down to dry Old brushes which are dirty or caked with painting shall not be used.

12.2.4 SCAFFOLDING

The specifications in respect to 12.1.1 scaffolding protective measures shall be as described above under white washing.

13. SPECIFICATIONS FOR ACRYLIC EMULSION PAINTING:

13.1 Workmanship:

13.1.1 Scaffolding:

Wherever scaffolding is necessary, it shall be erected on double supports ties together by horizontal pieces, over which scaffolding planks will be fixed No ballies, bamboos or planks shall rest on or touch the surface which is being white washed Where ladders are used, pieces of old gunny bags shall be tied on their tops to avoid damage or scratches to walls.

13.1.2 Preparation of surface:

Preparation of surface shall in general be in accordance with, except that any uneveness shall be made good by applying putty (white cement based) mixed with water including up the undulation and then sand papering the same after it is dry.

13.1.3 Preparation of paint

The paint mix, shall be continuously stirred while applying for maintaining uniform consistency. Number of coats shall be as per item description. The painting shall be laid evenly and smoothly by means of crossing and laying off. The crossing and laying off consists of covering the area with paint, brushing the surface ard at first, then brushing alternatively in opposite direction 2/3 times and then finally brushing lightly in a direction at right angles to the same. In this process, no brush marks, no hair marks no clogging of paint puddles shall be permitted. The full process of crossing and laying off with constitute one coat.

The paint shall be applied by means of brush or roller.

Before starting painting with plastic emulsion paint, the prepared surface shall be reacted with two coats of primer consisting of cement primer whiting and plastic emulsion paint shall start only after the preceding coat has become sufficiently hard to resist brush marking. Subsequent coats of plastic emulsion paint shall also be started after the preceding coat is dried by evaporation of water content.

The surface of finishing shall present a flat, velvets smooth finish, even and uniform shade without patches, marks, paint drops etc.

13.1.4 Precautions:

i. Brushes shall be quickly washed in water immediately after use and kept immersed in water during break periods to prevent the paint from hardening on the brush. Old brushes, if used shall be completely dried of turpentine / oil paints by washing in warm soap water.
ii. No oil base puttied shall be used in filling cracks / holes.
iii. Washing of painted surface shall not be done within 3-4 weeks of application.

13.1.5 Protective measures

Surface of distempering over existing distempered surface, the existing distempering shall be scrapped by steel scrapers leaving a clean surface.

All nails shall be removed. Pitting in plaster shall be made good with plaster of paris mixed with dry distemper of colour to be used. The surface then shall be rubbed down again with a fine grade sand paper and made smooth. A coat of distemper shall be applied over the patches. The surface shall be allowed to drythoroughly before the regular coat of distemper is allowed.

The surface affected by moss, fungus, algae efflorescence shall be treated in accordance with IS 2395.

13.2 ACRYLIC COPOLYMER AGGREGATE FINISH

13.2.1 Material

It shall be an acrylic based textured wall coating consisting of quartz and silica aggregate, inorganic pigments and other additives to form a crack free, flexible, tough, water proof coating.

13.2.2 Preparation of Surface

The surface to be coated shall be cleaned and all dirt, dust, grease and loose particles shall be removed. Any old textures surface shall be removed with removing agent as per manufacturer’s instructions.

13.2.3 Application

Bonding agent and water shall be mixed first. Then the flakes / granules shall be added and mixed thoroughly and kneaded till no lumps are found. The dough shall be left for 20-30 minutes before starting application.

The bonding agent, flakes / granules and water shall be mixed in different ratios for different finishes as per manufacturer's specifications.
The first application shall be by steel trowel. It shall be smoothened, if the specified finish required, by a plastic trowel.

13.3 **VARNISHING**

Varnishing of wood and wood based material shall be in accordance with IS 2338 (Part – II). Surface to be Varnished shall be prepared to produce a smooth, dry and matt surface and all dust and dirt shall be removed from the surface.

The varnish shall be applied liberally with a bush and spread evenly over a portion of the surface with short light strokes to avoid fronting. It shall be allowed to flow out while the next section is being laid in. Excess, varnish shall be scraped out of the brush and then the first section be crossed, re crossed and laid off lightly. The varnish, once it has begun to set, shall not be retouched. In case of any mistake, the Varnish shall be removed and the work shall be started afresh.
Where two coats of varnish are applied, the first coat shall be hard drying under coating or flatting varnish which shall be allowed to dry hard and then be flatted down before applying the finishing coat. Sufficient time shall be allowed in between two coats.
When flat varnishing is used for finishing, a preparatory coat of hard drying under coating of flatting varnish shall first be applied and shall be allowed to harden thoroughly. It shall then be lightly rubbed down before the flat varnish is applied.
On larger areas, the flat varnish shall be applied rapidly, and the edges of each patch applied shall not be allowed to set, but shall be followed up whilst in free working conditions.

13.3.1 **French polish**

French polish shall conform to IS: 348. Suitable pigments shall be added to get the required colour. The surface to be French polished shall be rubbed down to smoothness with sand paper and shall be well dusted. Pores in the surface shall be filled up with fillers. A pad of woolen cloth covered by a fine cloth shall be used to apply the finish. The pad shall be moistened with polish and rubbed hard on the surface in a series of over lapping circles applying the polish sparingly but uniformly over the entire area to give an even surface. A trace of linseed oil may be used on the face of the pad for the purpose. The surface shall be allowed to dry and the remaining coats applied in the same way. To finish off, the pad shall be covered with a fresh piece of clean fine cloth, slightly damped with methylated spirit and rubbed lightly and quickly with circular motions. The finished surface shall have a uniform texture and high gloss.

13.4 PAINTING OF STEEL AND OTHER METAL SURFACES

13.4.1 GENERAL

Reference shall be made to the following Indian Standards: IS 2524, IS 1447.

13.4.2 **Preparation of surface**

The surface, before painting, shall be cleaned of all rust, scale, dirt and other foreign matter with wire brushes, steel wool, scrappers, sand paper etc. The surface shall then be wiped finally with mineral turpentine which shall then be removed of grease etc. The surface then shall be allowed to dry. In case of GI surface so prepared shall be treated with Mordant solution (5 liters for about 100 sq.m) by rubbing the solution generously with brush. After about half an hour, the surface if required shall be retouched and washed down thoroughly with clean cold water & allowed to dry.

13.4.3 **Application of priming and paints**

Approved quality primer and paint in specified no. of coats shall be applied as per manufacturer's recommendations either by brushing or spraying. Each subsequent coat shall be applied only after the preceding coat is dried.

13.5 SYNTHETIC ENAMEL PAINT TO WOOD WORK

13.5.1 Synthetic enamel paint of approved brand and manufacture and of the required colour shall be used for the top coat and an under coat of shade to match the top coat as recommended by the manufacture shall be used.

13.5.2 One coat of specified paint of shade suited to the shade of the top coat shall be applied after rubbing with the finest grade of wet abrasive paper to ensure a smooth and even surface, free from brush marks and all loose particles dust off.

13.5.3 Top coats of specified paint of required shade shall be applied after the first coat is thoroughly dry. Additional finishing coats shall be applied if found necessary to ensure properly uniform glossy surface.

14. SPECIFICATION FOR FALSE CEILING

1. FALSE CEILING GRID SYSTEMS

1.1.1 **ALUMINIUM GRID SYSTEM**

Aluminium grid system for supporting false ceiling tiles shall be of approved make and shall be perfectly levelled aligned at desired height and in accordance with the false ceiling pattern as per drawings.

1.1.2.1 **MATERIAL**

a. Main Runner shall be of extruded anodized (25 micron) aluminium Tee sections of 25mm x 35mm size (approved make), 2.5 mm thick.

1.1.1.2 ERECTION

The grid system shall be assembled by interlocking the main and cross runners @ 600 mm c/c max. on `bothways by means of aluminium angle cleats. The main runners shall be suspended from the ceiling by means of 3 mm thick MS flat clamp fixed to main runners @ 1200 mm max. and fixed to 6 mm dia MS hook which again is fixed to the ceiling. 3 mm thick MS flat clamp shall be connected to main runner with 25 mm long MS clamp with leveling nut and @ 1200 mm maximum. The MS hooks shall be suspended from the ceiling by means of slotting in 25mm x 3mm thick MS flat, `L' shaped, fixed to the slab by 12 mm dia Dash fasteners @ 1200 mm C/C. The overall grid system shall be rigid, in accordance with false ceiling pattern, perfectly leveled and aligned at desirable height.

1.1.2 GI GRID SYSTEM

GI grid system for supporting false ceiling tiles shall be perfectly leveled, aligned at desired height in accordance with false ceiling pattern.

1.1.3.1 **MATERIAL AND WORKMANSHIP**

a. Wall channels shall be made 0.5 mm thick GI of size 27 mm, one flange 20 mm and other 30 mm. Wall channels shall be fixed to peripheral walls by raw plugs / dash fasteners @ 450 mm C/C.

b. Intermediate Channels (main runners) GI intermediate channels shall be 0.9 mm thick, of size 45 mm and with two flanges of 15 mm each. The intermediate channels shall be suspended from the soft @ 1200 mm with 25 mm x 0.5 mm GI hanger bolted to the channel and fixed to the ceiling (by means of bolting to GI cleat fixed to the ceiling with dash fasteners).

c. Ceiling Sections (Cross runners)
GI channel shaped ceiling sections shall be 0.5 mm thick having a knurled Web of 51.1 mm and two flanges of 26 mm each with lips of 10.5 mm. The ceiling sections shall be fixed to the intermediate channels in perpendicular direction at 450 mm C/C with the help of connecting clips.

1.2 GYPSUM BOARD TILES:

Gypsum board shall conform to IS: 2095
The Gypsum boards used for false ceiling shall have following properties.

i Thermal Conductivity – 0 16 W / mk
ii Thermal Resistance
a. For 9.5 mm thick board – 0.06 m2 K/W
b. For 12.5 mm thick board – 0.08 m2 K/W
c. For 15 mm thick board – 0.09 m2 K/W
iii Fire Propagation
a. Fire Propagation
Index of performance not exceeding 12 and a sub index not exceeding 6 (when each side is tested separately to BS 476 Part – 6).
b. Surface spread of flame Class 1 (both sides) as / test to BS 476 Part – 7).
Gypsum boards shall be of specified thickness, and of specified finish (painted / prelaminated). The Gypsum `boards shall be screw fixed to the under side of false ceiling grid system with 12.5 mm dry wall screw @ 230 mm C/C by drilling machine. Joint in the board shall be finished flush with fillers, finisher and primer as per manufacturer's recommendation to give a seamless finish.
Necessary cut-outs for Electrical / AC and other fixtures shall be provided with a framing of wall channels. In case of fixing on modular grid system, the boards shall be cut to required size and fixed in the same manner as in clause 11.2.1.
The finished false ceiling shall be perfectly leveled and aligned, at desired height as per drawings.

15. LIST OF APPROVED MAKES/AGENCY OF MATERIALS (FOR CIVIL WORK)

The following guidelines are to be noted with regard to use of materials in the work.

1. The CONTRACTOR shall be required to use material of the make given in the list of approved make or specifically mentioned in the schedule of rates . EMPLOYER is free to demand the CONTRACTOR to use any particular make from the approved list of items.

   However in case of non availability of any item as per the list of approved make CONTRACTOR shall use alternative item of ISI make with prior written permission from the CONSULTANT/Project-in-charge.

2 Wherever, material bearing Standard Mark (ISI) are used in the work, the Contractor should furnish necessary documents and proof of payments made for the procurement of materials bearing Standard Mark (ISI).

3. In case it is established that Standard material (bearing ISI mark) as well as the materials indicated in the list (as mentioned in the above para) are not available in the market, then approved equivalent materials may be used in the work subject to approval from the consultant and Project-in-charge.

4. For materials bearing "Standard Mark (ISI)" ordinarily no testing is to be done. However, in case of doubt or with a view to check the quality of materials, Project-in-charge may send samples for random testing.

5. For use of materials other than materials bearing "Standard Mark (ISI)" Mandatory tests shall be conducted at the frequency specified in the contract. In case frequency of testing is not stipulated in the contract then standard specification (CPWD, ISI etc.) may be considered for frequency at which materials are to be tested.

6. Before bulk purchase of quantities of materials, it is the responsibility of the Contractor to get the samples of materials approved from consultant and Project-in-charge

Sl. No.	MATERIALS	APPROVED MAKE/APPROVED AGENCY
1.	Antitermite emulsifiable concentrate	As per CPWD/PWD specifications and ISI marked
2.	Damp proof materials / water proofing compound	Impermo, Duraseals, Acco-proof, CICO etc., Duraseed, STP, GE Silicon, Pidilite. Fosroc
3.	Reinforcement steel	Tata, SAIL, RINL as approved (Primary manufacture)
4.	Structural steel section	Tata, SAIL, RINL as approved (Primary manufacture)
5.	Portland Slag cement	Lafarge, ACC, Ultratech, Konarak as per I.S. 455 as approved
6.	White cement	JK white, Birla white
7.	Aluminum glazing section	Hindalco . Indal, Jindal
8.	Al. Glazing fabrication	As approved by CIPET/Consultant
9.	Anodised aluminum hard ware fittings	Everite , Sigma, Opel, NU-LITE, Jyothi, Allen of I.S.I Marked
10.	Locks	Godrej, Harrison
11.	Door closers	Dorma/Godrej
12.	Float glass	Asahi float, Modi float, Hindustan Glass Company,

13.	Wire mesh	Sterling Enterprises, Trimurty welded mesh
14.	Distemper	Berger, Asian paints, Nerolac as approved
15.	Synthetic enamel paint	J & N, Berger, Shalimar, Asian paints, Nerolac, ICI as approved
16.	Plastic emulsion paint	Asian paints, Berger , Nerolac, ICI, J&N, Shalimar
17.	Water proof cement paint	Snowcem, Asian paints, Nerolac, Berger as approved
18.	Glazed ceramic tiles	Johnson, Somany, Kajaria, Spartek
19.	Unglazed ceramic tiles	Bell, Kajaria, Somany, Johnson.
20.	Ceramic border tiles 3" wide	Johnson, Somany, Kajaria, Spartek
21.	Cement concrete tiles	Eurocon, Pavit, Duracrete
22.	Vitrified granamite tiles	Johnson, Bell Granito, NITCO
23.	Floor spring for Alu. Door & Door closer	Dorma/Godrej
24.	Bitumen	Indian oil, Hindustan petroleum, Bharat Petroleum
25.	Chemical Impregnated Water Proofing / Brickcoba Water Proofing Agencies	Overseas Water Proofing Co., Hindustan water Proofing, Indian Water Proofing, National Water Proofing, SIKA, FOSH ROCKS.
26.	Flush doors	Anchor, Kitply, Greenply, Moyur, Woodcraft, Alpro, I.S.I. Marked
27.	Laminates	Decolam, Greenlam, Formica, National
28.	Mirror	Modi, Saint Gobain, Atul
29.	Copolymer Acrylic aggregate Paints	Heritage or equivalent
30.	Wooden flooring	NOVO floor, COSMO floor, PERGO floor
31.	Electronic automatic door	Dorma or equivalent

16. LIST OF DOCUMENTS/REGISTERS TO BE MAINTAINED AT SITE FOR ENSURING PROPER QUALITY CONTROL OF WORK IN PROGRESS

1. A complete set of Contract Documents.
2. A complete set of drawings (Tender drawings and Good for Execution Drawings).
3. A complete set of change in specification or scope if any.
4. Material Test Register (Master Register) indicating details of various other Test Registers.
5. Cement Test Register.
6. Aggregates Test Register

   i) Fine aggregate-sand

   ii) Coarse aggregate
7. Cube Test Register
8. Register for anti-termite material used in the work.
9. Register for bricks testing. .
10. Bar bending schedule Register/Pour Cards.
11. Concrete Pouring Register.
12. Paint Test Register.
13. Register for approval of samples for various materials.
14. Site Order Book.
15. Register showing use of non specified materials and reasons thereof.
16. Hindrance Register
17. Cement & steel consumption register.
18. Levels-Record registers (for earth filling, roadwork).
19. Daily records pertaining to labour deployment.
20. Records for all the deviations during the execution of work to be maintained.
21. Records for bitumen consumption register.
22. Paint consumption register.
23. Water proofing compound consumption register.
24. Measurement Book

VOLUME III OF VI

TECHNICAL SPECIFICATIONS

FOR

SANITARY AND PLUMBING WORKS

TECHNICAL SPECIFICATIONS FOR SANITARY & PLUMBING WORKS
INDEX

SPECIFICATION OF PLUMBING AND SANITARY STALLATION

1. GENERAL

1.1 The works include installation of sanitary ware, internal water supply distribution, cold water supply, rainwater disposal from the terrace, soil and waste disposal from various fixtures.

1.2 The contractor shall also guarantee the perfect operation of the installation and accessories supplied and installed by him. All these items shall be compulsorily of first quality and best choice.

1.3 The contractor shall ensure that all the fixtures are fed with the supply distribution system to deliver adequate pressure and flow taking into consideration the simultaneous demand.

1.4 The works shall be carried out strictly in accordance with the latest BIS specifications.

1.5 The mock-up toilets for each design shall be completed, got approved from the Project-in-charge / Consultant for all the materials to be used before bulk procurement is done by the contractor.

1.6 All the materials not approved by the Project-in-charge/Consultant and not conforming to the approved brands listed in the schedule are liable to be rejected. The contractor shall have to remove all such rejected materials and substitute it with the approved materials as required by the Project-in-charge/Consultant. No extra payment shall be admissible to the contractor on this account.

1.7 All the soil and waste shall be connected to the manhole.

1.8 All the Pipes to be used in the works shall be tested at site before incorporating it in works pertaining to solid and waste lines. Nothing extra shall be payable to the contractor on this account.

1.9 The work shall be executed according to the drawings and specifications and as per the contract documents. Any missing details in the drawings or specifications but which are fairly intended for successful functioning shall have to be supplemented by the standard BIS code or CPWD specifications.

2. SCOPE OF WORK

2.1 The scope of work under this contract shall comprise of providing and installation of all material, equipment and labour as described in detail under various heads of specification and as shown on drawings.

2.2 The contractor's work shall include all materials, tools and plants, scaffolding and everything necessary for the completion of the work to the satisfaction of Consultant/Project-in-charge. All materials and workmanship used in the execution of the work shall be the first quality unless other wise stated. All materials used in the work shall conform to the current CPWD specifications whether or not specific mention is made thereof. The contractor shall be responsible for and shall replace or make good at this own expense, any materials lost or damaged or of quality not approved.

2.3 Excavation in all types of soil refilling and carting away surplus materials to contractors own dump or as directed, for manholes, inspection chambers, gully traps water supply.

2.4 Two coats of approved ready mixed paint over red oxide primer to all exposed iron or woodwork including G.I. Pipes and C.I. gratings. All G.I. Pipes whether laid in ground or concealed in walls or floors shall be coated with bitumen.

2.5 Work shall be inclusive of making holes through concrete / masonry, making good the work and redoing and re-plastering the same to match the surroundings.

2.6 For all pipes, work shall be inclusive of all fittings and specials such as coupling, bends, unions, cleaning eyes, tees, plugs, reducer etc., and making joints and connection to valves, tanks, pumps and existing pipe lines etc as required.

2.7 Cutting chase for concealing pipes in walls and floors and making good with cement plaster 1:3.

2.8 Work quoted shall include for hoisting to and work at all levels and list of materials shall not form any criterion for any extra claims.

3. SAMPLES

3.1 Before commencement of the work the contractor shall furnish the samples of material of workmanship at the first opportunity that may be called for by the Consultant/Project-in-charge for their approval and any further samples in case of rejection until such samples are approved. Nothing extra shall be paid to the contractor for the same. Work shall be executed in accordance with the approved samples.

4. MATERIAL

4.1 All the materials to be used in the work shall be of approved make/brand as given in the statement or as directed by the Consultant/Project-in-charge.

5. DRAWINGS

5.1 All water supply, sanitary and drainage drawings are to be used as guide lines and to be followed as close as possible.

5.2 The contractor shall submit to the Consultant/Project-in-charge the shop drawings to suit the water supply sanitary and drainage layouts.

5.3 No dimensions to be measured on drawings and only written dimensions are to be followed.

5.4 Contractor shall refer for further details, dimensions to the Constructional and structural detailed drawings.

5.5 Discrepancies, variations changes in drawings should be brought to the notice of the Consultant Project-in-charge and written approval should be obtained by the contractor before starting the work.

6. AS BUILT DRAWINGS

6.1 Contractor shall submit as built drawings on completion of work, one complete set of original reproducible tracings and three prints to the Consultant/Project-in-charge for-

6.1.1 A run of all open/concealed piping, with diameters from terrace to tapping points with various controls for water supply, clean outs access panels, soils waste, vent, rain water piping at all levels.

6.1.2 Drainage water supply layout, location of inspection chambers, diameter of drainage pipes, from WC to chamber, from Gully trap to chamber, and between two chambers with ground levels of drainage pipes in chambers

WATER SUPPLY (GI PIPE CLASS `B'):

1. Scope : Scope of internal water supply will include the following.

a) All GI pipes fittings and valves of rising main from finished Ground level to over head tanks as indicated in the drawings.

b) All GI pipes with fittings and valves from over head tank to all taps, wash basins, cisterns, sinks.

2. **MATERIALS**

2.1. Galvanized Iron Pipes and Fittings:

2.1.1. The pipes shall be galvanized mild steel tubes medium grade conforming to BIS 1239. All pipes shall be electric resistance welded screwed with taper, threads and sockets with paralleled threads, Threads

shall conform to BIS 554-1964 The pipes and sockets shall be clearly finished, well galvanized in and out and free from cracks, surface flaws, laminations and other defects All screws threads shall be clean and well cut The ends shall be cut cleanly and square with axis of the tube

2.1.2. The fittings shall be malleable iron and comply with all the requirements that of pipes. The fittings shall be designed by the respective nominal bores of the pipes for which they are intended,

2.1.3 The standard weight and thickness of pipes shall be as shown in the following tables.

Nominal of Bore tubes mm	Class	Wall thick- ness in mm	Nominal weight black Tube kg/m	Nominal weight Galvanised kg/m
15	M	2.65	1.22	1.274
	H	3.25	1.45	1.504
20	M	2.65	1.58	1.642
	H	3.25	1.90	1.953
25	M	3.25	2.44	2.525
	H	4.05	2.97	3.05
32	M	3.25	3.14	3.247
	H	4.05	3.84	3.937
40	M	3.25	3.61	3.731
	H	4.05	4.43	4.545

NOTE : M = Medium, H- Heavy

3. CUTTING, LAYING AND JOINTING OF PIPES AND FITTINGS

3.1 Where pipes have to be cut or re-threaded, ends, shall be carefully filed out so that no obstruction to bore is offered. The ends of the pipes shall then be threaded conforming to requirements of BIS 554-1964 with pipe dies and tapes carefully in such a manner as will into result in slackness of joints when two pieces are screwed together. The pipe shall be clean and cleared of all foreign matters before being laid. All pipes and fittings shall be properly jointed to make the joints completely water tight and all pipes kept free from dust during fixing. Burr shall be removed from the joints after screwing.

3.2 All GI pipes below ground shall be laid in trenches and shall have a minimum cover of 600 mm, painted with two coats anticorrosive bitumastic paint, filling 150 mm thick sand all round the G.I. pipes.

3.3 The runs of the pipe shall be truly vertical and horizontal. Proper bends, elbows, tees at turning/corners shall be used.

3.4 All GI pipes with necessary fittings wherever they are laid on internal faces of the walls shall be concealed in chase, sand painted with two coats of anticorrosive bitumastic paint. On external faces they will be laid on walls fixed with GI clamps.

3.5 In the concealed portion of the piping no joint shall be provided in the pipe lines except in the fittings i.e. bend, elbows, tees and nipples where required.

3.6 As far as possible no GI pipes shall be laid under floors of the toilet/kitchen.

3.7 No GI pipe shall be laid in lime concrete, where required shall be embedded in PCC of 1:3:6 minimum 75 mm all around or as directed by the Consultant.

3.8 Sizes of the rising main, branch pipes from the rising main, down corners from the over head tank and branch from down corners shall be of size as shown in drawings.

4. **CLAMPS & HOLDER BATS**

4.1 All pipes and fittings shall be fixed truly vertical and horizontal unless unavoidable. The pipes shall be fixed to walls with standard pattern holder bat clamps of required shape and size so as to fit tightly on the pipes when tightened with screwed bolts. The clamps shall be embedded in brick work in cement mortar 1:3 (1 cement : 3 coarse sand) and shall be spaced at regular intervals in straight lengths as shown in the table given below :-

Size of pipe mm……	lengths	
	Horizontal runs (m)	Vertical runs (m)
15	2.00	2.50
20 to 32	2.50	3.00
40 to 50	3.00	3.50
65 to 100	3.50	5.00

The clamps shall be fixed at shorter lengths near the fittings as directed by the Consultant / Engineer-incharge.

4.2 All pipes shall be provided with unions at the location of fixing valves, pumps or any other fixed equipment so as to have easy detachment.

5. **TESTING**

5.1 After laying and jointing the pipes and fittings shall be inspected under working conditions of pressure and flow. Any joint found leaking shall be redone and all leaking pipes removed and replaced without extra cost. The pipe shall be slowly and carefully charged with water so that all air is expelled from the lines. The draw of taps and stop cocks shall then be plugged and hydraulic pressure of 6 kg/sq.cm. shall be applied, gradually. Pressure gauge shall be accurate and recalibrated before the test. The test pump having been stopped, the pressure shall maintain itself without measurable loss for at least half an hour.

6. CLEANING AND DISINFECTION OF SUPPLY SYSTEM

6.1 All water lines shall be thoroughly and efficiently disinfected before being taken into use and also after every major repair. The method of dis-infection shall be subject to the approval of the Consultant/Project-in-charge.

7. INTERNAL WORK:

7.1 The internal work shall include the cost of labour and material involved in all the operations described above. It shall include the cost of cutting holes in walls, floors and making good the same.

7.2 This shall also include, concealed pipe work in which case cutting of chase and making good the same or painting of pipes.

8. CUTTING CHASES IN MASONRY WALL

8.1 The chases up to 7.5 x 7.5 cm shall be made in the walls for housing GI pipes etc. These shall be provided in correct position as shown in the drawings or as directed by the Consultant. Chases shall be made by the chiseling out the masonry to proper line and depth. After GI pipes etc., are fixed in chases, the chases, shall be filled with cement with cement concrete 1:3:6 (1 cement: 3 coarse sand: 6 graded stone aggregate of 20 mm nominal size) or cement mortar 1:4 (1 cement: 4 coarse sand) as may be specified and made flush with the masonry surface. The concrete surface shall be roughened with wire brush to provide a key for plastering.

9. WATER SUPPLY FITTINGS

9.1 Unless otherwise specified all gunmetal/brass such as ball valves, non-return valves, full-way valves, stop cocks, bib taps, etc. shall confirm to relevant BIS specifications and shall be of heavy quality.

10. PAINTING

10.1 All vertical / horizontal pipes shall suitably painted with two coats anticorrosive paint of quality over a coat of primer.

11. SCOPE OF SEWERAGE DISPOSAL AND DRAINAGE

Scope of internal sewerage disposal and drainage system will include all PVC waste pipes connections up to Gully traps and PVC Soil pipe connections up to manholes including vent pipes with vertical stacks manhole including all floor traps, gully traps as shown in the drawings.

11.2 Scope of internal drainage i.e. Rain water system under this contract will include all PVC rain water pipes connecting from terrace/balcony including PVC bends upto storm water drainage line, gully chamber and including storm water Drainage system as shown in the drawings.

II SANITARY INSTALLATION

GENERAL REQUIREMENTS

a. All sanitary appliances including sanitary fittings, fixtures, toilet requisites, shall be of size, make and design of first quality as per sample approved by the Consultant / Project-in-charges as shown in the drawings. The rates shall be for center fittings only.

b. All exposed and visible G.I. pipe and fittings shall be painted with approved quality of two coats of synthetic enamel paint over a coat of primer of approved shade as approved.

c. All necessary and plumbing work shall be carried out through licensed plumbers.

d. All sanitary fittings such as water closet pans (pedestal or squatting patterns), flush pipes, brackets, wash basins, baths, sinks, soil and vent pipes etc. and fittings holders for toilet paper, glass shelves and other fittings together with the fixing of the same shall be complete in all respects and fit for proper functioning.

e. All damage done to floors, walls, R.C.C. work etc. during process of execution, fixing or installation of sanitary fittings, pipes, internal water supply and house drainage etc., shall be restored to its original condition and the cost of the same is included in the rates.

1. **SANITATRY WARES**

EUROPEAN TYPE W.C. PAN WITH LOW LEVEL FLUSHING CISTERN

European type W.C. pan shall be of white vitreous china first quality water closet ‘P’ or ‘S’ trap coupled with fittings, brackets, complete in all respects. The W.C. pan shall be free from cracks, crazes, blisters, and shall have smooth surface.

1.2 FIXING

W.C. pan shall be fixed to floor walls with C P. brass screws or by means of 75 mm long 6.5 mm counter sunk bolts and nuts embedded in floor concrete. The base of the pedestal of the pan shall squarely rest on the finished floor Any gap between the finished floor and the pedestal shall be filled with white mastic mixed with pigment to match the shade of floor or as directed by the Consultants / Project-in-charge.

Following measures shall be adopted for fixing the W.C. pan

a) The central axis of the pan shall be perpendicular to the finished face of wall.

b) The outlet of the pan shall be centrally placed in the socket of PVC connector pipe with a uniform space all around for jointing shall be done with yarn, linseed oil, white lead, cement and water-proofing compound and shall be made water tight.

d) The distance between centre line of outlet of W C pan and finished wall face shall be so adjusted as to rest square against the finished wall face.

1.3 SEAT AND LID

Seat and lid shall be of heavy quality and shall be fitted exactly on the rim of the W.C. pan with CP brass hinges rubber buffers and CP brass nuts. It should be fixed in such a way that it is easily workable.

1.4 STOPCOCK

Angle Stop cock shall be of CP brass/brass as specified in the drawing.

1.5 PAINTING

Brackets shall be painted with two coats of white synthetic enamel paint of approved manufacturer over a priming coat.

ANGLE VALVE

Angle valve shall be of 15mm dia CP brass with 15mm dia GI supply pipe of required length with nuts and washers.

The connection between angle valve and supply line laid in chase shall be made in a manner so that the flange is flush with finished face of the wall and no threaded portion of the angle valve or supply line is visible.

URINALS

Half stall type / full size urinal shall be conforming to IS:2556 Part VI. Urinals shall be of single piece construction with integral flushing box rim. These shall be mounted on walls. The flushing inlet pipe shall be of CP brass 15mm dia and waste pipe 32 mm dia GI, 750 mm long shall be embedded in wall. Necessary unions and CP bottle trap shall be provided in the waste line. Rawl plugs with CP brass screws shall be used for fixing the urinal. Fixing shall ensure that no liquid is left over in the pan after flushing.

Urinals shall be connected to sensor system as per manufacturer's instructions.
Rate quoted shall include cost of urinals inlet and outlet pipes, auto censor flushing cistern, breaking and making good the walls and flooring, making inlet and outlet connections, painting exposed brackets and GI pipes etc.

1.8 **HALF ROUND CHANNEL**

1.8.1 Half round channel shall be plain or with stop end and shall have internal dia of 100mm, approved by the Project-in-charge. The jointing work shall be done with white cement slurry. The drains shall be provided with proper slopes as indicated in drawings or as specified by the Project-in-charge. Channel shall be covered with matching tiles leaving provision for cleaning the same.

1.9 **H.C.I. NAHANI TRAP (FLOOR TRAP)**

1.9.1 Nahani trap shall be of heavy cast iron as per IS : 3989 with 100 mm inlet and 80/100mm outlet with CP pressed steel grating. It shall of self – cleaning design. (Grating shall be of either hinged or screwed down type).

It shall be fixed in cement mortar 1:2 and as directed by Project-in-charge / Consultant.

1.10. STONEWARE GULLY TRAP CHAMBER

1.10.1 The square mouth gully trap shall be of 100mm dia, conforming to IS:651 of specified and / or approved quality stoneware, complete with cast iron grating, and shall be got approved by the Project-in-charge.

The size of CI frame and cover shall be 300mm x 300mm. It shall be properly fixed as directed by the Project-in-charge.

The size of the chamber shall be 300 x 300 x 675mm (internal). It shall be constructed of brick masonry walls 115mm tk. In 1:4 cement mortar and M-15 concrete foundations. Inside and outside faces of the masonry walls shall be plastered with 1:3 cement mortar. The top of the chamber shall be provided with CI cover and frame.

1.11 BRICK MASONRY (MANHOLES / INSPECTION CHAMBER & VALVE CHAMBER)

1.11.1 The size of the manholes and valve chambers shall be as specified in the drawings. It shall be constructed of brick masonry (class 50 bricks) walls 230mm thick in CM 1:4 (1 cement : 4 sand) resting on M-15 concrete foundations. The inside and outside face of the masonry wall shall be plastered with 13mm thick plaster of cement mortar 1:3 (1 cement : 3 sand).

The top of the chamber shall be provided with reinforced concrete M-20 grade slab as per drawing and directions of the Project-in-charge.

MS rungs made out of 16 mm dia MS bars shall be fixed inside the manhole as shown in the drawing and directions of the Project-in-charge.

Valve chambers shall be provided and fixed with a light duty CI cover and frame.

The top of chambers shall be provided with reinforced cement concrete M-15 grade as per drawings and direction of Project-in-charge.

The CI manhole covers and frames shall conform to IS: 726. The type, size and grade shall be as per drawing and directions of the Project-in-charge.

The frame shall be fixed in position during concreting of top slab, inside faces of frame and cover shall be given two coats of approved anti-corrosive, paint.

The specification for brick masonry, plastering, concreting, excavation and backfilling etc., as given under relevant clauses shall be applicable for this work also.

WASHBASIN

Wash basins shall be 760 x 500 mm white vitreous china or Oval shape Counter Basin as shown in drawing of 1st quality with three tap holes, or with single tap hole or the size as given in Scope of Work. These shall be free from cracks, crazes, blisters and shall have smooth surfaces.

FIXING

The basins shall be supported on a pair of CI brackets cantilevering from wall face as directed by the Consultants There shall be no gap between top edge of the basin and finished face of wall

PILLAR TAP

Pillar tap shall be 15mm dia CP brass AOS make with auto censor.

1.15 ANGLE VALVE

Angle valve shall be 15mm dia brass with 15mm dia brass inlet tube of required length with union and CP brass cap for each of the two pillar taps

The connection between angle valve and supply line laid in chase shall be made in a manner so that the union is flush with finished face of the wall and so threaded that portion of the angle valve of supply is visible

WASTE

Waste shall be 32mm dia CP brass heavy type with solid rubber plug and bail chain.

BOTTLE TRAP

Bottle trap 32mm of approved quality.

SINK

Sink shall be SS sink with drain bolt and granite platform in sides built in 20mm tk. Polished granite of Black color / platform of size specified in schedule with integral over flow and shall have 40mm Dia outlet and shall be connected to 40 mm Dia. GI waste pipe.

FIXING

These shall be fixed in stone counter. The joint between the sink & stone shall be filled with Araldite filler to make it absolutely watertight

1.20 **C.P.BRASS FITTINGS**

C.P. Brass fittings shall be CP brass comprising of long body BIB cocks of 15mm, CP brass angle valves with CP inlet tube and CP brass cap.

2. **TOILET REQUISITES**

MIRROR

Mirror shall be of approved make and of best quality. These shall be free from bubbles, ripples or any other defects. The glass shall be uniform silver plated at the back. Size shall be 450 x 600 mm or as specified in drawing. These shall have plastic frame all around with keyhole to wall with screw for hanging as directed by the Consultants / Project-in-charge.

FIXING

The mirror shall be fixed on wall face with wooden cleats, with CP brass screws and washers, above the lavatory basins at the height, as directed by the Consultants / Project-in-charge.

TOWEL RAIL

Towel rail shall be of CP brass 600 mm long, 20 mm dia with 2 CP brass brackets or size specified in drawing

FIXING

Brackets shall be fixed to wall by means of CP brass screws to wooden plugs or raw plugs, embedded in the wall or as directed by the Consultants

BIB COCK – TWO IN ONE HEALTH FAUCIT

Bib cock of two in one shall be of 15mm CP brass with 1 long PVC pipe with health faucet.

3 SOIL, WASTE, RAIN WATER, VENT AND ANTI-SIPHONAGE PIPES & FITTINGS:

3.1 LYING AND JOINTING PVC. PIPES (INTERAL WORK)

3.1.1 Jointing

3.1.1.1 Solvent welded joints : Non heat application Method :

In this method instead of forming a socket on one pipe and an injection molded socket fitting couplers is used with a provision to take in the pipes at both ends, the surface to be jointed and the joint is made at ambient temperature Injection molded fitting only shall be used in preference to fabricated fittings only, solvent recommended by the manufacturers of the pipes shall be used and full load on the joints

applied only after 24 hours. The pipe shall be cut perpendicular to the axis of the pipe length with a metal cutting saw or an ordinary hand saw with small teeth . Pipe ends have to be beveled slightly with a beveling tool (Reamer) at an angle of about 30 degree. The total length of insertion socket (injection molded socket or couplet) shall be marked on the pipe end could be inserted into fitting socket. Attempt shall be made to push the pipe to the marked distance if not possible it shall at least be pushed for 2/3 of this distance.

Dust ,oil, water grease etc. shall be wiped cut with a dry cloth from the surface .Further the grease should be removed thoroughly removed with a suitable solvent , such as ethylene chloride or as an alternative the outside surface of their pipe and the inside of the fitting may be roughed with emery paper .

Generous coating of solvent cement shall be evenly applied on the inside of the fitting all-round the circumference for the full length of insertion and on the outside of the pipe end up to the marked line with non synthetic brush of suitable dimension .The pipe shall be pushed into the fitting socket and held for 1 or 2 minutes as otherwise the pipe may come out of the fitting due to the slippery quality of cement and the tapering inside bore of the fitting. The surplus cement on the pipe surface shall be wiped out. If the solvent cement has dried up too much or the tapering of the socket is too steep, jointing will not be proper and pipe will come out of the fitting.

In summer months joints shall be made preferable early in the morning or in the evening when it is cooler .This will prevent joint from pulling apart when the pipe cools off at night. Heat application method for jointing shall not be allowed.

3.1.1.2 Flanged Joints

For jointing PVC pipes particularly of larger sizes to valves and vessels and larger size metal pipe where the tensile strength is required the joint is made by the compression of a gasket or ring seal set in the face of C I flange .Flanges solvent welded to the P.V.C. pipes shall be supplied by the manufacturer.

3.1.1.3 Rubber Ring Joints:

Rubber ring joints can provide a water tight seal but do not resist pull. As such these may be used only as repairs collar and for jointing pipes larger than 110 mm. Such joints may be provided on pipes which are buried in the ground and supported through out on a bedding so that they are not subjected to movement and longitudinal pull .The material of rubber ring shall conform to IS:5382 where aggressive soil are met with , synthetic rubbers perform better for jointing The ring shall be housed in a groove formed in plastic or metallic housing .The ring shape and the method of compressing the ring vary considerably in different types of joints . Most joints often require the application of lubricating paste which shall be procured from the manufacturers of P.V.C .pipes .Rubber rings shall be supplied by the manufacturer's .The rubber ring joints can be either of. With spigot and socket , or With separate collar pieces having two rubber rings one at either end

3.1.2 Crossing Road or drain

Where the pipe line crosses a road or a drain, it shall be through C.I. or RCC pipe.

3.1.3 Supports for Valve and Hydrant:-

Valve and hydrant tees shall be so that the torque applied in operating a valve is not transmitted to the pipe line.

3.1.4 Inspection and Testing

Solvent welded pipe shall not be pressure tested until; at least 24 hours after the last solvent cemented joint has been done.

All control valves shall be positioned open for the duration of the test and open end closed with water tight fitting .The testing pressure on completion of the work shall not be less than one and half time the working pressure of the pipes.

Pressure shall be applied either by hand pump or power driven pump .Pressure gauges shall be correctly positioned and closely observed to ensure that at no time are the test pressure exceeded . The system shall be slowly and carefully filled with water to avoid surge pressure or water hammer. Air vents shall be open at all high points so that air may be expelled from the system during filling.

When the system has been fully charged with water and air displaced from the line air vent shall be closed and the line initially inspected for seepage at joints and firmness of supporters under load. Pressure may then be applied until the required test pressure is reached.

Clamping

The pipe shall be laid and clamped to wooden plugs fixed above the surface of the wall as shown Alternatively plastic clamps of suitable design wherever manufactured , shall be preferred .Provision shall be made for the effect of thermal movement by not gripping or distracting the pipe at supports between the anchors for suspended pipes . The supports shall allow the repeated longitudinal temperature movement to take place with out abrasion Line or point contact with the pipe shall be avoided .Heavy components such as metal valves shall be individually supported .

3.1.6 Supports:

PV.C . pipes require supports at the close interval .Recommended supports spacing for unplasticised P.V.C. pipes are given in table .This spacing may be increased by 50% for vertical runs supports.

TABLE

Pipe Dia. mm	Support spacing mm
20	700
25	750
32	825
40	975
50	975

It is essential that P.V.C. pipes shall be aligned properly before fixing them on the wooden plugs with clamps .Even if the wooden plugs are fixed using a plumb line , PVC pipe shall also be checked for its alignments before clamping .The pipe line will be wavy if the clamps are not fixed keeping the pipe plumb.

3.1.7 Connection to a water tap

Connection to a water tap shall be made by means of a G.I. adopter as shown . G.I. adopter shall preferably be supplied by the same manufacturer as that of P.V.C. pipe . In any threaded coupling between P.V.C. and GI it is preferable that P.V.C. is fitted inside the G.I. fitting . If however greater projection is desired, same shall be achieved by joining a short piece of a GI pipe (Nipple) .

3.2 Inspection chambers, gully traps, etc within the building i.e. for diversion of pipes at upper flows or on service floor shall be cast iron chambers with bolts, nuts to close the cover, all to be fabricated as per actual requirement

3.3 Supports, pedestal and base for inspection chambers, gully traps and pipes when provided as per above shall be in 1:2:4 cement concrete mix

3.4 Pipe sleeves and inserts, etc. through RCC walls of buildings either external or internal or for water tanks shall be of C.I. or M.S. provided with water bar flange.

3.5 During installation open ends of pipes shall be closed with a plug made of wood, cut in to required shape and covered with gunny bags to prevent access to dirt in to the pipe

3.6 G.I. Waste pipes and fittings shall be ‘C’ class with G.I. unions, tail piece reducers and connections to be provided between joints to either lead or C.I. Pipes.

3.7 W.C. pan connectors shall be to suit the requirements as per drawing, with 40 dia vent horn for connection to the anti-siphonage pipe Pan connector shall be of C.I. or lead

3.8 Connection to the sewer or storm water collection sumps to be perfectly water tight and as specified in the drawing

3.9 Rainwater flashing shall be of 150 X 100 or 230 X 150 fitted on to the bell mouth of rainwater pipes inlet and then covered with cast iron grating and extension piece

3.10 All rainwater pipes and fittings shall be UPVC type variety conforming to latest IS code.

3.11 The floor traps for toilet blocks shall be PVC with CP brass grating, bolted down design. The traps hall be provided with minimum water seals of 40 to 50 mm.

3.12 Where toilet slabs are sunk, the floor trap shall be of 100 x 75 heavy duty type PVC 'P' trap, with C P Brass grating, bolted down design

3.13 Bathroom CP grating shall be of bolted down design out of heavy cast brass with chromium plating of the best approved standard

3.14 Cast iron gratings shall be flat with perfect edge and of the best quality procurable of the specified width and thickness and in the available lengths

FLOOR TRAPS

Floor traps shall be deep seal, 'P' or 'S' type of approved make with CP brass gratings.

FIXING

The traps shall be placed in position and encased all around with 150 mm thick concrete 1:2:4 whenever necessary vertical pieces with sockets shall be joined to traps to accommodate CP brass gratings.

BALL VALVE

These shall be brass heavy quality with plastic floats of size that of the inlet pipe to the over head tank.

4.0 EXTERNAL SEWERAGE

The work under this section shall consists of furnishing all labour, material, equipments and appliances necessary and required to completing install the sewerage system as specified hereinafter shown in the drawings.

4.1 GENERAL REQUIREMENTS

a) All materials shall be new and of the best quality conforming to specifications and subject to the approval of the Consultant/Project-in-charge.

b) Drainage lines shall be laid to the required gradients and profiles.

c) All drainage work shall be done in accordance with the local municipal bye laws.

d) The contractor shall take necessary permissions from the local traffic police, and civic and other competent local authorities for cutting the main/municipal roads, closing and road/street to vehicular traffic for laying his services. The contractor shall not be liable for any extra payment on this account.

e) Location of all manholes, catch basins etc., shall be got confirmed from the Consultant / Engineer-incharge before the actual execution of work at site.

f) All works shall be executed as per approved drawings, working drawings or as directed by the Consultant / Project-in-charge.

ALIGNMENT AND GRADIENT.

The sewer drainage pipes shall be laid to alignment and gradient shown on the drawings but subject to such modifications as shall be ordered by the Consultant / Project-in-charge from time to time to meet the requirements of the works. No deviation from the lines, depth of cutting or gradients of sewers shown on the plans and sections shall be permitted except by the express direction in writing of the Consultant/Project-in-charge.

EXCAVATION

The excavation for sewer works shall be open cutting unless the permission of the Consultant / Project-in-charge for the ground to be tunneled is obtained in writing Where sewers have to be constructed along arrow passages, the Consultant / Project-in-charge may order the excavation to be made partly in tunnel and in such cases the excavated soil shall be brought back later on for refilling the trenches or tunnel

OBSTRUCTION OF ROADS

The contractor shall not occupy or obstruct by his operation more than one half of the width of any road or street and sufficient space shall be then left (or public and private transit, and he shall remove the materials excavated and bring them back again when the trench is required to be refilled. The contractor shall obtain the consent of the Consultant/Project-in-charge in writing before closing any road to vehicular traffic and the foot walks must be clear at all times.

4.1.4 EXCAVATION TO BE TAKEN TO PROPER DEPTH

The trenches shall be excavated to such a depth that the sewer shall rest on concrete as described in the several clauses relating there to and so that the inverts may be at the levels given in the sections In bad ground, the Consultant/Project-in-charge may order the contractor to excavate to a greater depth than that shown on the drawings and to fill up excavation to the level of the sewers with the concrete, broken stone gravel or other materials

REFILLING

After the sewer or other works has been laid and proved to be water tight, the trench or other excavation shall be refilled Utmost care shall be taken in doing this, so that no damage shall be caused to the sewer and other permanent work. The filling in the haunches and up to 75 cms. above the crown of the sewer shall consist of the finest selected materials placed carefully in 15 cms. Layers and consolidated. After this has been laid, the trench and other excavation shall be refilled in 15 cms. Layers with materials taken -from the excavation, each layer being watered to assist in the consolidation, unless the Consultant / Project-in-charge shall otherwise direct.

CONTRACTOR TO RESTORE SETTLEMENT AND DAMAGES

The contractor shall at his own costs and charges make good promptly during the whole period for the works in hand any settlement that any occur in the surfaces of roads, berms, footpaths, open spaces etc. whether public or private caused by his trenches or by his other excavations and he shall be liable for any accident caused thereby. He shall also, at his own expense and charges, repair and make good any damage done to building and other property. If in the opinion of the Consultant/Project-in-charge, he fails to make good such works with all practicable dispatch, the Consultant/Project-in-charge shall be at his liberty to get the work done by other means and the expenses thereof shall be paid by the contractor or deducted from any money that may be or become due to him or recovered from in any other manner according to the law of land.

DISPOSAL OF SURPLUS SOIL

The contractor shall at his own cost shall provide places inclusive of transportation for disposal of all surplus materials not required to be used in the works. As each trench is refilled the surplus soil shall be immediately removed and the surface properly restored the roadways and sides shall be left clear.

4.1.8 TIMBERING OF SEWERS AND TRENCHES

a) The contractor shall at all times support efficiently and effectively the sides of the sewer trenches and other excavations by suitable timbering, piling and sheeting and they shall be closed, timbered in loose or sandy strata and below the surface of the sub soil water level.

b) All timbering sheeting and piling with their wallings and supports shall be of adequate dimension and strength and fully braced and strutted so that no risk of collapse of subsidence of the wall of the trench shall take place.

c) The contractor shall he held responsible and will be accountable for the insufficiency of all timbering sheeting and pilling used as also for all damage to persons and property resulting form improper quality, strength, maintaining or removing of the same

SHORING OF BUILDINGS

The contractor shall shore up all buildings, walls and other structures, the stability of which is liable to be endangered by the work and shall be fully responsible for all damages to persons or property resulting from any accidents

4.1.10 REMOVAL OF WATER FROM SEWERS AND TRENCHES

a) The contractor shall at all times during the progress of the work keep the trenches and excavations free from water which shall be disposed of by him in the manner as will neither cause injury to the public health nor to the public or private property nor the work completed or in progress nor to the surface of any roads or streets, nor cause any interference with the use of the same by the public.

b) If any excavation is carried out at any point or points to a greater width than specified cross section of the sewer with its envelope, the full width of the trench shall be filled with concrete by the contractor at his own expense and charges to the requirements of the Consultant

WIDTH OF TRENCHES

The Consultant shall have power by giving an order in writing to the contractor to increase the maximum width in respect of which payment will be allowed for excavation in trenches for various classes of sewer, manholes and other works in certain lengths to be specifically laid down by him where on account of bad ground or other unusual conditions, he considers that such increased widths are necessary in view of the site conditions.

4.1.12 RECOMMENDED WIDTH OF TRENCHES at the bottom of the trench are as follows:-

100 mm dia pipe	55 cms
150 mm dia pipe	55 cms
225 - 250 mm dia pipe	60 cms
300 mm dia pipe	75 cms

Maximum width of the bed concrete shall also be as above. No additional payment is admissible for widths greater than specified.

SALT GLAZED STONEWARE PIPES

Stoneware pipes shall be of first class quality salt glazed and free from rough texture inside and outside and straight. All pipes shall have the manufacturers names marked on it and shall comply to IS : 651 - 1971.

I) **LAYING AND JOINTING OF STONEWARE SALT GLAZED PIPES**

a) Pipes are liable to be damaged in transit and not with standing tests that may have been made before dispatching pipe shall be examined carefully on arrival at site. Each pipe shall be rung with a wooden hammer or mallet and those that did not ring true and clear shall be rejected. Sound pipes shall be carefully stacked to prevent damage.

b) The pipes shall be laid down 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 pipe and as short as practicable to admit the socket and allow the joints to be made.

c) Where pipes are not bedded in concrete the trench bottom shall be left slightly high and carefully bottomed up as pipe laying process, so that the pipe barrels rest on firm ground If excavation has been carried too low it shall be made up with cement concrete at the contractor's cost and charges

d) If the bottom of the trench consists of rock of very hard ground that cannot be easily excavated to a smooth surface the pipes shall be laid on cement concrete bed to ensure even bearing

II) JOINTING OF PIPES

a) Tarred gaskin shall first be wrapped round the spigot of each pipe and the spigot shall then be placed into the socket of the pipe previously laid, the pipe shall then be adjusted and fixed in its correct positions and the asking caulked tightly home so as to fill not more than on quarter of the total length of the socket

b) The remainder of the socket shall be filled with stiff mix of cement mortar (1 cement: 1 clear sharp washed sand) When the socket is filled, a fillet should be formed round the joint with a trowel forming an angle of 45 degrees with the barrel of the pipe. The mortar shall be mixed as needed for immediate use and no mortar shall be beaten up and used after it has begun to set.

c) After the joint has been made, any extraneous material shall be removed from inside of the joint with a suitable scraper. The newly made joints shall be protected until set from the sun, drying winds, rains or dust. Sacking or other materialist which can keep damp shall be used. The joints shall be exposed and space left all round the pipes for inspection by the Consultant / Project-in-charge. The inside of the sewer must be left absolutely clear in bore and free from cement mortar or other obstructions throughout it entire length, and shall efficiently drain and discharge.

III) TESTING

a) All lengths of the sewer drain shall be fully tested for water tightness by means of water pressure maintained for not less than 30 minutes. Testing shall be carried out from manhole to manhole. All pipes shall be subjected to a test pressure of atleast 1.5 M head of water. The test pressure shall, however, not exceed 6 M head at any point. The pipes shall be plugged preferably with standard design plugs with rubber plugs on both sides. The upper end shall, however, be connected to a pipe for filling with water and getting the required head poured at one time.

b) Sewer lines shall be tested for a straightness by :-

i) Inserting a smooth ball 12 mm less than the internal diameter of the pipe.
In the absence of obstruction such as yarn or mortar projecting at the joints the ball should roll down the invert of the pipe and emerge at the lower end.

ii) Means of a mirror at one end and a lamp at the other end. If the pipe line is straight the full circle of light will be seen otherwise obstructions or deviations will be apparent.

iii) The contractor shall give a smoke test to the drain and sewer at his own expense and charges, if directed by the Consultant / Project-in-charge.

iv) A test register shall be maintained which shall be signed and dated by the Contractor, Consultant/ Project-in-charge.

MASONRY WORK

Masonry work for manhole, chambers, specific tanks and such other works as required shall be constructed from local best quality bricks in cement mortar 1:5 mix (1 cement: 5 coarse sand) or as specified in the schedule of quantities All joints shall be properly raked to receive plaster.

TESTING

All pipes shall be tested to a hydraulic test of 1.5 M head for atleast 30 minutes at the highest point in the section under test. Test shall be carried out similar to those for stoneware pipes given above. The smoke test shall be carried out by the contractor, if directed by the Consultant, at the expense and charges of the contractor. A test register shall be maintained which shall be signed and dated by the contractor. The works failing during the test have to be redone by the contractor and nothing extra shall be payable to his on this account.

S.W. GULLY TRAP

Gully traps shall conform to IS 65-1965. These shall be sound, free from visible defects such as fine cracks or hair cracks. The glaze of the traps shall be free from graze. They shall give a sharp clear note when struck with light hammer. There shall be no broken blisters. The size of the gully trap shall be specified along with dimension and shall be installed in a chamber as described hereafter Each gully trap shall have a C.I. grating of square size corresponding to the dimensions of inlet of gully trap. It will also have a watertight C.I. cover weighing not less than 2.72 kg. The grating cover & frame shall be sound & good casting and shall have truly square machined seating faces.

The excavation for gully traps shall be done true to dimensions and levels as indicated on plans or as directed by the Project-in-charge

4.5.1 FIXING

The gully trap shall be fixed on cement concrete foundation 600 x 600 cm square and not less than 10cm. thick The mix for the concrete will be 1:5:10 (1 cement: 5 fine sand: 10 graded stone aggregate 40mm nominal size) The jointing of gully outlet to the branch drain shall be done similar to jointing of S W pipe as directed in 213

BRICK MASONRY CHAMBER

After fixing and testing gully and branch drain, a brick masonry chamber 300 x 200 (inside) (with class50 brick in cement mortar 1:5 (1 cement: 5 fine sand) shall be built with a 115mm thick brick work round the gully trap from the top of the bed concrete upto ground level. The space between the chamber walls and the trap shall be filled in with cement concrete 1:5:10 (1 cement: 5 course sand: 10 graded stone aggregate). The upper portion of the chamber i.e. above the top level of the trap shall be plastered inside with cement mortar 1:3 (1 cement: 3 coarse sand) finished with a floating coat of neat cement, the corners and bottom to the chamber shall be rounded off as to slope towards the grating and form a hopper. C.I. cover with frame 300 x 200 mm (inside) shall then be fixed on the top of the brick masonry with cement concrete 1:2:4 (1 cement 2 coarse: 4 graded stone aggregate 20mm normal size) and rendered smooth The finished top of cover shall be left about 4 cm. above the adjoining ground level so as exclude the surface water from entering the gully trap.

5.0 EXTERNAL WATER SUPPLY

5.1.0 SCOPE OF WORK

The work shall consist of furnishing all materials Labour equipment and appliances necessary and required to completely install the water supply system as required by the Drawings.

Without restricting to the generality of the foregoing the water supply system shall include the following:

a) Water supply mains and sub mains
b) Control valves
c) Masonry chambers and other appurtenances
d) Excavation and refilling pipe trenches
e) Concrete anchor blocks
f) Ferrules, Ferrule chambers G.I. pipe below ground from ferrule to outer face of the building up to finished ground level.

CONTRACTOR TO RESTORE SETTLEMENT AND DAMAGES

The contractor shall, at his own cost, make good during the whole period the works are in hand and during defect liability period thereafter, any settlement that may occur on the surfaces of roads, beams, footpaths, gardens, open spaces etc., whether public or private caused by trenches or by other

excavations and shall be liable for any accidents caused thereby He shall also, at his own expense and charges, repair and make good any damage done to buildings and other property. If in the opinion of the Consultant/Engineer-incharge, he fails to make such works with all practicable dispatch, the Consultant/Project-in-charge shall be at liberty to get the work done by other means and the expenses thereof shall be paid by the contractor or deducted from any money that may be or become due to him or recovered from him in any other manner according to the law of the land.

DISPOSAL OF SURPLUS SOIL

The contractor shall at his own cost shall provide places inclusive of transportation for disposal of all surplus materials not required to be used in the works. As each trench is refilled the surplus soil shall be immediately removed and the surface properly restored the roadways and sides shall be left clear.

5.2 Trenches: The width and depth of trenches for different diameter of G.I under-

	Dia of Pipe	**Width of trench**	**Depth of trench**
a)	15 to 50 mm	39 cm	60cm
b)	up to 100 mm	50cm	90cm
c)	Over 100 mm	60cm	90cm

At joints the width of trench shall be widened where necessary

CUTTING AND THREADING

Where pipes have been or re-threaded the ends shall be carefully filled out so that no obstruction to flow is offered the ends of pipes shall then be carefully threaded, in such a manner as will not result in slackness or joints.

JOINTING

Screwed steel pipes shall be jointed with screwed and socket joints using screwed fittings of wrought iron, steel or malleable cast iron The pipes shall be cleaned and cleared of all foreign matter and may burrs from the ends or pipes removed before laying. In joining the pipes, the inside of the socket and the screwed end of the pipe shall be oiled and rubbed over with white lead and a few strands of fine yarn or thread wrapped round the screwed in the socket, tee etc. Care shall be taken that all the pipes and fittings are properly jointed so as to make the joints completely water tight.

5.2.3 PROTECTION

G.I. pipes below ground shall be protected against corrosion by the application of two coats of bitumen paint covered with polyethylene tape and a final coat of anticorrosive bitumen paint.

5.2.4 TRENCH FILLING OF G.I. PIPES

The pipe shall be laid on layer of 10 cm sand and filled up to 15 cm above the pipes The remaining portion of the trench shall than be filled with excavated earth and the surplus earth shall be disposed off as directed by Project-in-charge/Consultant The pipes shall be embedded in sand or soft soil free from rock and gargle and where the pipeline crosses a road or a drain, it shall be through RCC pipe

FERRULE CONNECTION

Ferrule connection shall be inclusive of necessary excavation, boring a hole in cast iron mains, tapping it providing necessary saddles, and bailing out of water.

5.2.6 TESTING

a) On completion the pipe line laying shall be tested to a Hydraulic pressure of 7 kg/sq.cm. (70 meter), Pressure shall be maintained for a period of two hours without drop. Any joint found leaking shall be redone and all leaking pipes removed and replaced Testing shall be done before the trenches are refilled. The contractor shall arrange all the equipment required for testing and the rate quoted shall be deemed to be inclusive of this cost.

b) Contractor shall maintain a test register and tests shall be recorded in it. The entries shall be signed and dated by Consultant, Project-in-Charge and Contractor. This register shall be handed over to the Project-in-Charge on completion of work.

c) G. I. pipes shall be measured per linear meter (to be nearest centimeter) and shall be inclusive of all fittings, earth work, pipe protection and other items as specified.

FERRULES

The ferrules for connection with CI shall generally conform to IS 2692: 1964. It shall be of non ferrous materials with CI bell mouth cover and shall be nominal bore as specified. The ferrule shall be fitted with screw and plug or valve capable of completely shutting off the water supply to communication pipe as and when required.

VALVE CHAMBERS

Contractor shall provide suitable brick masonry chambers in cement mortar 1:5 (1 cement: 5 coarse sand) on cement concrete foundations 150 mm thick 1:5:10 (1 cement: 5 coarse sand: 10 graded stone aggregate 40 mm nominal size) 15 mm thick cement plaster inside and outside finished with a floating coat of neat cement inside with cast iron surface box including excavation, back filling complete

Valve chambers shall be of following sizes :-

For depths 90 cms.	60 x 60 cms
For depths up to 100 cms. beyond	120 x 120 cms

5.4 TESTING

a) All pipes, fittings and valves shall be tested by hydrostatic pressure of 7 kg./sq.cm.
b) Pressure shall be maintained for a period of at least two hours without appreciable drop in the pressure after fixing at site (+/ -, 10%)
c) Register shall be maintained and all entries shall be signed and dated by contractor(s) and Consultant/Project-in-charge.
d) In addition to the sectional testing carried out during the construction, contractor shall test the entire installation after connections to the overhead tanks or pumping system or mains. He shall rectify all leakage, and shall replace all defective materials in the system. Any damage done due to carelessness, open or burst pipes or failure of fittings, to the building, furniture and fixtures shall be made good during the defects liability period without any extra cost.
e) After commissioning of the water supply system, contractor shall test valve by closing and opening it a number of times to observe if it is working efficiently. Valves which do not effectively operate shall be replaced by new ones at no extra cost and the same shall be tested as above.

5.5 **DISINFECTION**

a) After completion of the work, contractor shall flush clean the entire system with the City's filtered water after connection has been made.
b) After the first flushing, add commercial bleaching powder to achieve a dosage of 2 to 3 mg/Ltr of water in the system and flushed. This operation should be performed twice to ensure that the system is fully disinfected and usable.

5.6 **PRE-COMMISSIONING**

a) Ensure that all pipes are free from debris and obstructions
b) Check all valves and for effective opening and closing action Defects should be rectified or valves replaced
c) Ensure that all connection to branches have been made
d) Ensure that mains have been connected to the respective pumps, underground and overhead tanks

e) Water supply should be available at main underground tank

f) All main line valves should be closed

5.6.1 **COMMISSIONING**

a) Fill underground tank with water Add 1 kg of fresh bleaching powder after making a solution, to be added near inlet
b) Start water supply pump and allow water to fill main under ground tank Water will first fill the fire tank and then overflow to the domestic tanks.
c) After overhead reservoir drain the same to its one forth capacity through tank scour valve. This is to ensure removal of all mud, debris, etc. in the tank
d) Fill overhead tank to full
e) Release water in the main lines by opened valves in each circuit Drain out water in the system through scour valves in lower regions Ensure clean water is now coming out of the system
f) Open valves for individual sectors Observe for leakages or malfunctions, check pressure and flow at end of line by opening hydrants etc., remove and rectify defects notice.
g) The entire water supply system should be disinfected with bleaching powder and system flush clean.
h) Send four samples of water drawn from four extreme locations for testing for bacteriological test in sterilized bottles obtained from the concerned laboratory. Laboratory personal may collect the samples themselves.

RESPONSIBILITY:

Responsibility for various activities in pre-commissioning and commissioning procedures will rest with the contractor.

TORM DRAINS

6. GENERAL REQUIREMENTS

a) All materials shall be new and of the best quality conforming to specification and subject to the approval of the Consultant/Project-in-charge.
b) Drainage lines shall be laid to the required gradients and profiles.
c) All drainage work shall be done in accordance with the local municipal by laws.
d) Contractor shall obtain necessary approval and permission for the drainage system from the municipal or any other competent authority.
e) Location of all manholes, catch basins etc., shall be got confirmed by the Consultants before the actual execution of work at site.
f) All works shall be executed as directed by Consultants.

RUBBLE MASONRY

As specified under item No. 6.3 of civil works for rubble masonry with black granite stones.

REINFORCED CEMENT CONCRETE PIPES

Underground storm water drainage NP2 pipes shall be centrifugally spun RCC pipes of specified size. Pipes shall be true and straight with uniform bore throughout. Cracked, warped pipes shall not be used on the work. All pipes shall be tested by manufacturer and the contractor shall produce, when directed a certificate to the effect from the manufacturer.

TESTING

All pipes shall be tested to a hydraulic test of 1.5 M head for atleast 30 minutes at the highest point in the section under test. Test shall be carried out similar to those for stoneware pipes given above The smoke test shall be carried out by the contractor, if directed by the Consultant, at the expense and charges of the contractor. A test register shall be carried out similar to those for stoneware pipes given above. The smoke test shall be carried out by the contractor, if directed by the Consultant, at the expense and charges of the contractor. A test register shall be maintained which shall be signed and dated by the Contractor/Consultant.

PRE CAST SLABS

Pre cast layer slabs shall be casted in RCC 1:2:4 (1 cement: 2 sand: 4 coarse aggregate of 20 mm aggregate) and shall be placed over RR masonry drain as per drawing.

7. LIST OF APPROVED MAKES/AGENCY OF MATERIALS
(For Sanitary work)

The following guidelines are to be noted with regard to use of materials in the work.

1. The CONTRACTOR shall be required to use material of the make given in the list of approved make or specifically mentioned in the schedule of rates . EMPLOYER is free to demand the CONTRACTOR to use any particular make from the approved list of items.

   However in case of non availability of any item as per the list of approved make CONTRACTOR shall use alternative item of ISI make with prior written permission from the CONSULTANT/Project-in-charge.

2 Wherever, material bearing Standard Mark (ISI) are used in the work, the Contractor should furnish necessary documents and proof of payments made for the procurement of materials bearing Standard Mark (ISI).

3. In case it is established that Standard material (bearing ISI mark) as well as the materials indicated in the list (as mentioned in the above para) are not available in the market, then approved equivalent materials may be used in the work subject to approval from the consultant and Project-in-charge.

4. For materials bearing "Standard Mark (ISI)" ordinarily no testing is to be done. However, in case of doubt or with a view to check the quality of materials, Project-in-charge may send samples for random testing.

5. For use of materials other than materials bearing "Standard Mark (ISI)" Mandatory tests shall be conducted at the frequency specified in the contract. In case frequency of testing is not stipulated in the contract then standard specification (CPWD, ISI etc.) may be considered for frequency at which materials are to be tested.

6. Before bulk purchase of quantities of materials, it is the responsibility of the Contractor to get the samples of materials approved from consultant and Project-in-charge

Sr. No.	**MATERIALS**	**APPROVED MAKE/AGENCY**
1	Vitreous china sanitary ware	Parryware, Hindustan (Hindware)
2	Plastic W.C Seat cover – NA	Parryware, 127ingston, Diplomat
3	C.P Fittings/Accessories	Jaquar, MARC
4	PVC Pipes & fittings	Kishan, Supreme, Prince
5	G.I Pipes `B' class	TT Swastic , Tata , Jindal
6	Gunmetal Valves (full way check and globe valves)/fittings – as per ISI 981	L & K brand by L.K. Industries, Mathura, Leader Brand by Leader Engg. Works Jullunder, Zoloto
7	Bib cock & angle/stop cocks (brass), health faucets etc	Jaquar, MARC
8	Stone ware pipes & gully traps – as per ISI	Perfect Potteries Bharatpur Burn potteries Jabalpur
9	Manhole C.I cover and frame	NECO, BIC
10	CI pipes and fittings	NECO, BIC
11	Hand Drier	Euronics, Askon, Technocrat
12	HDPE Water tank	Sintex or equivalent
13	Liquid soap dispenser	Euronics, Kimberly Clarke
14	Auto sensor pillar cock battery operated	Jaquar, AOS (Doppler)
15	Urinal flush sensor	AOS concealed type
16	Toilet Accessories	Jaquar, Marc

VOLUME IV OF VI

TECHNICAL SPECIFICATIONS

FOR

ELECTRICAL WORKS

SPECIFICATIONS FOR ELECTRICAL WORKS

GENERAL & COMMERCIAL

1. COMPLETENESS OF TENDER :-

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

2. RATES :-

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

3. WORKS TO BE DONE BY THE CONTRACTOR :-

The scope of internal and external electrification under this contract shall include the supply of all material, labour, T&P, erection, testing and commissioning of followings –

- Main Switches, Main Panels, meter board and external cable connection.
- Sub and branch distribution boards, MCB's and RCCB's etc.
- Mains and Sub mains between various panels, meter boards and distribution boards.
- Point wiring with Conduits for all type of wiring including circuits, sub mains, light, fans, power and AC etc.
- Switches and socket outlets for light, fans, plug, power, Tel, TV, computer network etc with suitable MS/GI boxes with accessories complete.
- Earthing and Lightning Protection with earth leads/strips.
- Conduits and wiring for Telephone, EPABX, TV system, PA system, Music system and Computer networking, fire alarm, broad band etc.
- Under ground and above ground Cables and other allied works.
- Provision of emergency electrical supply and distribution for complete light, fans and other specified points is also included in the scope of work. For the purpose of emergency distribution separate DB's shall be installed for Light/fans and Power/AC at every place, so that these can be separated. Similarly arrangement for change over etc is also to be made in the panels.
- Lighting Fixtures fans and exhaust fans. (If these are supplied by the client, then the contractor will erect the fixture as required without any extra payment beyond the contract)

All the above work shall be complete in all respects up to the satisfaction of architect, consultant, Client and Engineer in charge.

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

i. Foundations for equipment and components where required, including foundation bolts.

ii. Cutting and making good all damages caused during installation and restoring the same to their original finish.

iii. Sealing of all floor openings provided by him for pipes and cables, from fire safety point of view, after laying of the same.

iv. Painting at site of all exposed metal surfaces of the installation other than pre-painted items like fittings, fans, switch gear/distribution gear items, cubical switchboard etc. Damages to finished surfaces of these items while handling and erection, shall however be rectified to the satisfaction of the Engineer-in-charge.

v. Temporary shed if required over the storage space and locking arrangement thereof, and watch and ward of the materials and completed installation till completion of the work.

vi. Water and power as may be required for installation and testing.

vii. Testing and commissioning of completed installation.

4. ELECTRIC POWER SUPPLY AND WATER SUPPLY :-

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

5. TOOLS FOR HANDLING AND ERECTION :-

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

6. CO-ORDINATION WITH OTHER AGENCY :-

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

7. CARE OF BUILDINGS :-

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

8. STRUCTURAL ALTERATIONS TO BUILDINGS :-

i. No structural member in the building shall be damaged/altered, without prior approval from the competent authority through the Engineer-in-charge.

ii. Structural provisions like openings, cutouts if any, provided by the department for the work, shall be used. Where these require modifications, or where fresh provisions are required to be made, such contingent works shall be carried out by the contractor at his cost.

iii. All such openings in floors provided by the department shall be closed by the contractor after installing the cables/conduits/rising mains etc. as the case may be, by any suitable means as approved by the Engineer-in-charge without any extra payment.

iv. All chase required in connection with the electrical works shall be provided and filled by the contractor at his own cost to the original architectural finish of the buildings.

9. WORK IN OCCUPIED BUILDINGS :-

i. When work is executed in occupied buildings, there should be minimum of inconvenience to the occupants. The work shall be programmed in consultation with the Engineer-in-charge and the occupying department. If so required, the work may have to be done even before and after working hours.

ii. The contractor shall be responsible to abide by the regulations or restrictions set in regard to entry into, and movement within the premises.

iii. The contractor shall not tamper with any of the existing installations including their switching operations or connections there to without specific approval from the Engineer-in-charge.

10. STATUTORY REGULATION AND APPROVALS :-

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

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

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

10. STANDARDS AND CODE OF PRACTICE :-

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

a) National Electrical Code

b) IS : 694 – 1977 : PVC insulated cables for working voltage up to and including 1100 volts

c) IS : 732 -1989 : Electrical wiring installation

d) IS : 1225 -1938 : Installation and Maintenance of power Cables up to and including 33 KV Rating

e) IS : 1554 : PVC insulated heavy duty electrical cables.

f) IS : 1860 : Installation operation and maintenance of passenger and goods elevator.

g) IS : 2309 -1989 : Protection of building and allied structures against lightning.

h) IS: 3043 -1987: Earthing

i) IS: 3646 (Part-1) -1992: Interior Illumination

j) IS: 3661 (Part-2) -1967: Current rating for cable

k) IS: 3661 (Part-5) -1968: Current rating for cable

l) IS: 5216 (Part-1) -1982: Recommendations on safety procedures and practices in electrical work.

m) IS: 7098 (1 & 2) : XLPE insulated cables

n) IS: 10118 (Part-1) -1982: Selection, Installation and Maintenance of switchgear and Control gear

12. MATERIAL SAMPLES AND SHOP DRAWINGS :-

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

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

13. ELECTRICAL DRAWINGS :-

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

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

14. TESTING AND COMMISSIONING :-

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

15. COMPLETION DRAWINGS

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

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

GENERAL & TECHNICAL

1 POINT WIRING :-

1.1. DEFINITION :-

A point including socket outlet point shall include all work necessary in complete wiring to the following outlets from the controlling switch or MCB. The scope of wiring for a point shall include the circuit wiring from distribution board to the switch board and from switch board to the individual point. The wiring includes the phase, neutral and earth wire as required.

i. Ceiling rose or connector (in the case of points for ceiling/exhaust fan points, pre wired light fittings and call bells).
ii. Ceiling rose (in the case of pendants except stiff pendants)
iii. Back plate (in the case of stiff pendants).

1.2. SCOPE :-

Following shall be deemed to included in point wiring.

i. Conduit/casing and capping as the case may be, accessories for the same and wiring cables between the switch box and the point outlet.
ii. All fixing accessories such as clips, nails, screws, Phil plug, rawl plug etc as required.
iii. Metal switch boxes for control switches, regulators, sockets etc, recessed or surface type of modular type or piano type with sheet as required and as mentioned in BOQ.
iv. Outlet boxes, junction boxes, pull-through boxes etc, but excluding metal boxes if any, provided with switchboards for loose wires/conduit terminations.
v. Any special block required for neatly housing the connector.
vi. Control switch or MCB, as specified.
vii. 3 pin or 6 pin socket, ceiling rose or connector as required.
viii. Connections to ceiling rose, connector, socket outlet, lamp holder,switch etc.
ix. Interconnecting wiring between points on the same circuit, in the same switch box or from another.
x. Protective (loop earthing) conductor from one metallic switch box to another in the distribution circuits, and for socket outlets.
xi. Bushes conduit or porcelain tubing where wiring cables pass through wall etc.

1.3 MATERIAL :-

i The system of wiring shall consist of ISI marked single core, PVC insulated, FR, 1100 volt grade, stranded, flexible copper conductor wires as per IS : 694 amended up to date.
ii The Conduit and accessories shall be of mild steel of ISI marked (IS:9537) ERW black, stove enameled, screwed type. The wall thickness of conduits shall be 16 SWG for 20, 25 and 32 mm dia conduits and 14 SWG for 40 and 50 mm dia conduits.

1.4. CONDUCTOR SIZE :-

Wiring shall be carried out with following sizes of wires –

a.	Light/fan/call bell/ exhaust fan point	-	1.5 sq mm.
b.	5 amp plug points	-	1.5 sq mm.
c.	Light circuit	-	1.5 sq mm.
d.	General / Primary Power point	-	4.0 sq mm.
e.	Secondary Power point	-	2.5 sq mm.
f.	Power point for AC	-	6.0 sq mm.

1.5 Size of Earth wires shall be as per following table -

Size of point/ circuit / submain wires			Earth wire	
2x1.5	sqmm.	-	1.5	sqmm.
2x2.5	sqmm.	-	1.5	sqmm.
2x4	sqmm.	-	2.5	sqmm.
2x6	sqmm.	-	4	sqmm.
2x10	sqmm.	-	6	sqmm.
2x16	sqmm.	-	6	sqmm.
4x6	sqmm.	-	2x4	sqmm.
4x10	sqmm.	-	2x6	sqmm.
4x16	sqmm.	-	2x6	sqmm.

2. MEASUREMENT :-

2.1. POINT WIRING :-

i. Unless and otherwise specified, there shall be no linear measurement for point wiring for light points, fan points, exhaust fan points and call bell points. These shall be measured on unit basis by counting.

ii. No separate measurement will be made for interconnections between points in the same distribution circuit and for the circuit protective (loop earthing) conductors between metallic switch boxes.

2.3 GROUP CONTROL POINTS WIRING :-

i. In the case of points with more than one point controlled by the same switch, such point shall be measured in parts i.e.(a) from the switch to the first point outlet as one point (Primary point), and (b) for the subsequent points each shall be treated as separate point (additional/secondary).

ii. No recovery shall be made for non-provision of more than one switch in such cases.

2.4 TWIN CONTROL LIGHT POINT WIRING :-

i. A light point controlled by two numbers of two way switches shall be measured as one point.

2.5 MULTIPLE CONTROLLED CALL BELL POINTS WIRING :-

i. In the case of call bell points with a single call bell outlet, controlled from more than one place, the point shall be measured in parts i.e. (a) from the call bell outlet to one of the nearest ceiling roses meant for connection to bell push, treated as one point and (b) from that ceiling rose to the next one and so on, shall be treated as separate point(s).

ii. No recovery shall be made for non-provision of more than one ceiling rose or connector for connection to call bell in such cases.

3. CIRCUIT AND SUBMAIN WIRING :-

3.1. CIRCUIT WIRING :-

Circuit wiring shall mean the wiring from the distribution board up to the switch board(s). (This is included in the point wiring)

3.2. SUB MAIN WIRING :-

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

4. MEASUREMENT OF SUBMAIN WIRING :-

i. Sub main wiring shall be measured on linear basis along the run of the wiring. The measurement shall include all length from end to end of conduit or casing and capping as the case may be, exclusive of interconnections inside the switch board etc.

5. SYSTEM OF DISTRIBUTION AND WIRINGS :-

i. Main distribution board shall be controlled by the circuit breaker. Each outgoing circuit shall be controlled by a circuit breaker on the phase or live conductor.

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

iii. The load of the circuits shall be divided, as far as possible, evenly between the number of ways of the distribution boards, leaving at least one spare circuit for future extension.

iv. The neutral conductors (incoming and outgoing) shall be connected to a common link (multi way connector) in the distribution board and be capable of being disconnected individually for testing purposes.

v. Wiring shall be separate for essential loads (ie those fed through stand by supply) and non-essential loads throughout.

6. BALANCING OF CIRCUITS :-

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

7. WIRING SYSTEM :-

j. Unless and otherwise specified the wiring shall be done only by the “Looping system”. Phase or live conductors shall be looped at the switch boxes and neutral conductors at the point outlets.

ii. Lights, fans and call bells shall be wired in the 'lighting' circuits. 15A/16A socket outlets and other power outlets shall be wired in the 'Power' circuits. 5A/6A socket outlets shall also be wired in the "Lighting" circuit unless mentioned otherwise.

iii. The wiring throughout the installation shall be such that there is no break in the neutral wire except in the form of a linked switch gear.

iv. Surface wiring shall run, as far as possible, along the walls and ceiling so as to be easily accessible for inspection.

v. In all types of wiring, due consideration shall be given for neatness, good appearance and safety.

8. PASSING THROUGH WALLS OR FLOORS :-

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

ii. Where a wall pipe passes outside a building so as to be exposed to weather, the outer end shall be bell mouthed and turned downwards and properly bushed on the open end.

9. JOINTS IN WIRING :-

i. No bare conductor in phase and/or neutral or twisted joints in phase, neutral, and/or protective conductors in wiring shall be permitted.

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

iii. Termination of multi stranded conductors shall be done using suitable crimping type thimbles.

10. CONFORMITY TO I.E. ACT, I.E. RULES AND STANDARDS :-

i. All electrical works shall be carried out in accordance with the provisions of the Indian Electricity Act, 1910 and Indian Electricity Rules 1956 amended up to date.

ii. The work shall also conform to relevant Indian Standard codes of practice for the type of work involved.

iii. In all electrical installation works, relevant safety codes of practice shall be followed.

iv. The complete wiring installation shall confirm to IS : 732 amended up to date.

11. GENERAL REQUIREMENTS OF COMPONENTS :-

11.1.1 QUALITY OF MATERIALS :-

All materials and equipment supplied by the contractor shall be new. They shall be of such design, size and material as to satisfactorily function under the rated conditions of operation and to with stand the environmental conditions at site.

11.2 RATING OF COMPONENTS :-

i. All components in a wiring installation shall be of appropriate ratings of voltage, current and frequency, as required at the respective sections of the electrical installation in which they are used.

ii. All conductors, switches and accessories shall be of such size as to be capable of carrying the maximum current which will normally flow through them, without their respective ratings being exceeded.

11.3 CONFORMITY OF STANDARDS :-

All components shall conform to relevant Indian Standard specification, wherever existing. Materials with ISI certification mark shall be preferred. However for conduits, wiring cables, piano/tumbler switches and socket outlets, ISI marked materials shall only be permitted.

11.4 INTERCHANGEABILITY :-

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

SWITCHGEAR AND CONTROLGEAR

1. GENERAL ASPECTS :-

i. All items of switchgear and distribution boards (DB' s) shall be metal clad type.

ii. The types, rating and/or categories of switch gear and protective gear shall be as specified in the tender schedule of work.

iii. RCCB's, ELCB's and RCBO's where specified, shall conform to the requirements of current rating, fault rating, single phase or three phase configuration and sensitivity laid down in the tender documents.

iv. While each outgoing way of distribution board (D.B.) shall be of miniature circuit breaker (MCB) as specified, and of suitable rating on the phase conductor, the corresponding earthed neutral conductor shall be connected to a common neutral terminal block and shall be capable of being disconnected individually for testing purpose.

v. **Independent earth terminal block.**

Every distribution board (single phase as well as three phase) shall have an earth terminal block identical to, but independent from neutral terminal block, to enable termination of protective (loop earthing) conductors (incoming as well as out goings) individually by screwed connection and without twisting.

vi. Earthing terminal (1 for single phase and 2 for three phase) shall be provided on the metal cladding of switches and D.B.' s for body earthing. These shall be suitably marked.

vii. Knock out holes, with or without end plates as per standard design of manufacturers, shall be provided in the metal cladding of switches and D.B.' s for termination of conduits/cables.

viii. Each distribution board shall be provided with a circuit list giving details of each circuit which it controls and the current rating of the circuit, and the size of the fuse element.

2. MCB TYPE DISTRIBUTION BOARDS (MCB DB) :-

i. MCB DB' s may be of single phase, three phase (horizontal type) suitable for feeding single phase loads or 3 phase (vertical type) suitable for feeding single phase as well as three phase loads, each phase isolation type three phase DB in which each phase can be isolated by a separate circuit breaker or RCCB, as specified. These shall be complete with accessories, but without MCB' s, which shall be specified as a separate item in the tender documents.

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

iii. MCB DB' s shall be of surface/flush mounting pattern according to the requirement of their location, and shall be suitable to accommodate MCB' s and MCB type isolators and RCCB (ELCB) at incoming in single pole or multi pole configuration, as required.

iv. MCB DB's shall be double door type, dust and vermin proof conforming to IP 42, and shall be fabricated out of CRCA sheet steel, 1.6 mm thick, with stove enameled paint finish.

v. In case of Concealed / Recessed D.B.'s, cutting of brick work, providing suitable lintel, making good the wall including plastering etc. with necessary civil work including all Civil material shall be included in contractor's scope for proper completion of work.

vi. MCB DB' s shall have removal type end plates with knock-outs at the bottom and top, and shall have hinged covers with locking arrangement.

vii. Only the knobs of the MCB' s shall protrude out of the front covers through openings neatly machine made for the purpose.

viii. The bus bars used shall be solid electrolytic copper of appropriate sections.

ix. Din bar(s) shall be provided for mounting the MCB' s.

x. The complete board shall be factory fabricated and shall be duly pre-wired in the works, ready for installation at site.

xi. The board shall be fully pre wired with single core PVC insulated copper conductors/insulated solid copper links, and terminated on to extended type terminal connectors, suitable for connections to the sizes of the respective conductors.

xii. All incoming and outgoing wiring to the pre wired MCBDB' s shall be terminated only in the extended terminal connectors to be provided within the DB. The terminal connectors shall therefore be so provided as to facilitate easy cable connections and subsequent maintenance.

3. <u>MCCB TYPE DISTRIBUTION BOARDS (MCCB DB) :-</u>

i. All MCCB DB' s shall be of three phase suitable for feeding single phase loads or 3 phase loads through SP/TP MCB's, IP 42 enclosure, sheet steel, double door with tinned copper bus bar, neutral bar, earth bar, knock outs etc. The DB's shall be original factory fabricated of approved make.

ii. The current ratings of Incomer MCCB shall be either 125 or 250 amp and the number of ways shall be as specified. Blanking plates shall be provided to close unused ways.

iii. MCCB DB shall be of surface/flush mounting pattern according to the requirement of their location, and shall be suitable to accommodate Four pole MCCB at incomer and SP/TP MCB's at outgoings, as required.

v. MCCB DB's shall be dust and vermin proof conforming to IP 42, and shall be fabricated out of CRCA sheet steel, 1.6 mm thick, with stove enameled paint finish.

v. In case of Concealed / Recessed D.B.'s, cutting of brick work, providing suitable lintel, making good the wall including plastering etc. with necessary civil work including all Civil material shall be included in contractor's scope for proper completion of work.

vi. MCCB DB' s shall have removal type end plates with knock-outs at the bottom and top, and shall have hinged covers with locking arrangement.

viii. The bus bars used shall be solid electrolytic copper of appropriate sections.

ix. Din bar(s) shall be provided for mounting the MCB' s.

4. A. <u>MINIATURE CIRCUIT BREAKERS (MCB) :-</u>

i. All MCB' s shall be ISI marked as per IS : 8828-1998.

ii. Ratings, numbers of poles, type of MCB shall be as specified in the tender documents.

iii. The breaking capacity of MCB' s shall be 10 KA.

B. <u>MOULDED CASE CIRCUIT BREAKER (MCCB's)</u>

The Moulded Case Circuit Breaker shall be magneto-thermal type or Static trip electronic release type (as specified in BOQ) for 100 Amp frame rating and current limiting type with Static trip electronic release for above 100 Amp frame rating for accurate overload and short circuit protection.

MCCB's of over 100 Amp rating shall be provided with field adjustable setting plug for accurate adjustment of continuous current. 100 Amp MCCB shall be provided with factory adjusted settings as required.

The minimum Breaking capacities of M.C.C.B.'s shall be as follows:

100 / 125 Amp	: 25 KA
160/200/250 Amp	: 35 KA
300/400/630/800 Amp	: 50 KA

5. WORKMANSHIP :-

i. Good workmanship is an essential requirement to be complied with. The entire work of manufacture/fabrication, assembly and installation shall conform to sound engineering practice.

ii. The work shall be carried out under the direct supervision of a first class licensed foreman, or of a person holding a certificate of competency issued by the state Government for the type of work involved, employed by the contractor, who shall rectify then and there the defects pointed out by the Engineer-in-charge during the progress of work.

6. COMMISSIONING ON COMPLETION :-

Before the workman leaves the work finally, he must make sure that the installation is in commission, after due testing.

7. COMPLETION PLAN AND COMPLETION CERTIFICATE :-

i. For all works completion certificate after completion of work shall be submitted to the Engineer-in-charge.

ii. Completion plan drawn to a suitable scale in tracing cloth with ink indicating the following, along with three blue print copies of the same shall also be submitted.

a) General layout of the building.

b) Locations of main switch board and distribution boards, indicating the circuit numbers controlled by them.

c) Position of all points and their controls.

d) Types of fittings, viz. fluorescent, pendants, brackets, bulkhead, fans and exhaust fans etc.

e) Name of work, job number, accepted tender reference, actual date of completion, names of Division/Sub-Division and name of the firm who executed the work with their signature.

8. ADDITION TO AN INSTALLATION :-

An addition, temporary or permanent, shall not be made to the authorised load of an existing installation until it has been definitely ascertained that the current carrying capacity and the condition of the existing accessories, conductors, switches etc affected, including those of the supply Authorities, are adequate for the increased load.

LIST OF APPROVED MAKES OF MATERIAL

The following is the list of products and the names of the approved manufacturers against each product. However approved equivalent materials of any other specialized firms may be used in case it is established that the brands specified below are not available in the market and subject to approval of alternate brand by the Owner/Architects.

1.	**Moulded case Circuit Breaker**	**:**	**L&T/Havells**
2.	**Switchfuse Units**	**:**	**L&T/Siemens.**
3.	**MCB**	**:**	**MDS/Havells**
4.	**Contactors**	**:**	**L&T/Siemens**
5.	**Panels**	**:**	**Factory fabricated as per approved design.**
6.	**HRC Fuses/ Fuse Carriers**	**:**	**L&T/Siemens**
7.	**Meters**	**:**	**AE/IMP/Anchor**
8.	**Indicating lamps**	**:**	**Concord**
9.	**L.T. CTS**	**:**	**Kappa/AE**
10.	**Selector Switches**	**:**	**L&T, Kaycee, Salzer**
11.	**LT/HT Cables/wires**	**:**	**Skytone, Gloster, Finolex, Havells**
12.	**Cable Glands**	**:**	**Siemens type as per approval sample.**
13.	**Thimbles**	**:**	**Dowells**
14.	**MCB, DBs, RCCBs**	**:**	**Indo Asian /MDS/Schneider Electric/Havells**
15.	**Plate switches/sockets**	**:**	**Crabtree , MK Electric**
16.	**Connectors**	**:**	**Indian Engg. Co.**
17.	**M.S. Conduit Pipe**	**:**	**BEC/AKG.**
18.	**P.V.C. Conduit Pipe**	**:**	**BEC/AKG/Kalinga**
19.	**P.V.C. Copper Wires**	**:**	**Skytone/ National/Kalinga**
20.	**Telephone Cables**	**:**	**Skytone/Kalinga**
21.	**Rising Main/ Plug in Box**	**:**	**English Electric/Zeta**
22.	**Industrial Type Sockets**	**:**	**Crompton/ Bhartia Cutle-Hammer**
23.	**Telephone Tag Block**	**:**	**‘ Krone ’**
24.	**Conduit Accessories**	**:**	**As per approved sample**
25.	**Fluorescent Light Fixtures**	**:**	**Philips/Bajaj or Equivalent**
26.	**Incandescent Light Fixtures**	**:**	**Philips/Bajaj or Equivalent**
27.	**Exhaust Fans**	**:**	**GEC, Crompton or Equivalent**
28.	**Ceiling Fans**	**:**	**Crompton, GEC or Equivalent**
29.	**Current Transformers**	**:**	**Automatic Electric, Kappa**

Signature of Tenderer

MANDATORY TESTS

1. The mandatory tests shall be carried out when the quantity of materials to incorporate in the work exceeds the minimum quantity specified.

2. Optional tests specified or any other tests, shall be carried out in case of specialized works or important structures as per direction of the Engineer-in-Charge.

3. Testing charges, including incidental charges and cost of sample for testing shall be borne by the contractor for all mandatory tests.

4. Testing charges for optional tests shall be reimbursed by the Department. However, the incidental charges and cost of sample for testing shall be born by the contractor.

5. In case of non-IS materials, it shall be the responsibility of the contractor to establish the conformity of material with relevant IS specification by carrying out necessary tests. Testing charges including incidental charge and cost of sample for testing shall be borne by the contractor for such tests.

THE MANDATORY TESTS SHALL BE AS FOLLOWS:

Material	Test	Field / laboratory test	Test procedure	Minimum quantity of material / Work for carrying out the test	Frequency of testing
Reinforced cement concrete work					
Water for construction purposes	Ph value Limits of Acidity Limits of Alkality Percentage of solids Chlorides Suspended matter Sulphates Inorganic solids Organic solids	Lab	IS 3025	Water from each source	Before commencement of work & thereafter: Mandatory - Once in one year from each source; Optional: once in 3 months from each source; Municipal supply - optional.
Reinforced cement concrete	b) slump test	Field	IS: 1199	a) 20 cu.m. for slabs, beams and connected columns . b) 5 Cu.m in case of columns	a) 20 cu.m. Part there of or more frequently as required by the EIC/Consultant b) Every 5 Cu.m.
	c) cube test	Lab	IS : 516	a) 20 cu.m. In slab, beams, & connected columns. b) 5 cum in columns	a) every 20 cum of a day's concreting .(Ref. as per frequency of sampling). b) Every 5 cum.
Ready mixed cement concrete (IS-4926)	Cube test	Lab	IS-516 and as per para 6.3.2 of IS-4926-2003	50 cum	One for every 50cum of production or every 50 batches, whichever is the greater frequency
Note : for all other small items and where RCC done in a day is less than 5 cum, test may be carried out as required by EIC/Consultant					

Material	Test	Field / laboratory test	Test procedure	Minimum quantity of material / Work for carrying out the test	Frequency of testing
Mortars: Lime	Chemical & physical properties of lime	Laboratory	IS; 6932 (part 1 to x)	5 M.T.	10 M.T. or part there of as decided by the EIC/Consultant
Sand	Bulking of Sand	Field		20 CU.M.	Every 20 cu.m or part there of or more frequently as decided by EIC/Consultant
	Silt content	Field	IS:383	20 CU.M.	Every 20 cu.m or part there of or more frequently as decided by EIC/Consultant
	Particle size and distribution	Field or Laboratory as decided by the EIC/Consultant	IS:383	40 CU.M.	Every 40 cu.m. of fine aggregate / sand required in RCC. Work only
	Organic Impurities	Field	..DO..	20 CU.M.	Every 20 cu.m. or part thereof or more frequently as decided by the EIC/Consultant
	Chloride & sulphate content tests		Optional		Once in three months.
Cement	Test requirement	Fineness (m2/kg)	IS 4031 (Part-II)	Each fresh lot	Every 50 MT or part thereof
		Normal consistency	IS 4031 (Part-IV)		
		Settingtime (minute) a) Initial b) Final	IS 4031 (Part-V)		
		Soundness a) Le-Chat expansion (mm) b) Auto clave (%)	IS 4031 (Part-III)		
		Compressive strength(Mp) a) 72+/-1 hr b)168+/-2hr	IS 4031 (Part-VI)		

Material	Test	Field / laboratory test	Test procedure	Minimum quantity of material / Work for carrying out the test	Frequency of testing
Stone Aggregate	a) Percentage of soft or deleterious materials	General visual inspection/ Lab test where required by the EIC/Consultant	IS 2386 Part II	One test for each source	One test for each source
	Particle size distribution	Field / Lab	-	10 cu.m	Every 40 cum. Or part thereof and
	Once in three months for each source for coarse and fine aggregates required in RCC works, for a minimum quantity - 10 cum for coarse aggregate and 40 cum for fine aggregate.				
	a) Estimation of Organic impurities	Field / Lab	IS 2386 Part II	10 Cum	-do-
	b) Specific Gravity	Field / Lab	IS 2386	10 Cum	-do-
	a) Bulk Density	Field / Lab	IS 2386	10 Cum	-do-
	b) Aggregate crushing strength	Field / Lab	IS 2386	10 Cum	-do-
	c) Aggregate impact value	Field / Lab	IS 2386	10 Cum	-do-
Timber	Moisture	Field (by moisture meter) Laboratory test as required by EIC/Consultant		1 Cu. M.	Every one Cum or part thereof
Flush Door	End immersion test Knife test Adhesion test	Laboratory	IS: 2202 (Part 1) & Part II	26 shutters	As per sampling and testing as instructed by the EIC/Consultant
Aluminium door or window fittings	Thickness of anaodic coating	Laboratory	IS: 5523	If the cost of fittings exceed Rs. 20,000/-	**Rs.20,000/- or part there of as required by the EIC/Consultant.**
Bricks	Testing of bricks / brick tiles for dimensions **Compressive strength** **Water absorption** **Efflorescence**	Laboratory	IS 3495 Part I to IV	**No of bricks to be selected & bricks lot** **20 : 2001 to 10000** **32 : 10001 to 35000.** **50 : 35001 to 50000** **20 : for every addl. 50000 or part thereof** **If < 2000, As per decision of the EIC/Consultant**	Permissible defective bricks in the sample 1 2 3

Material	Test	Field / laboratory test	Test procedure	Minimum quantity of material / Work for carrying out the test	Frequency of testing
Steel for RCC	**Physical tests** a) Tensile strength b)Retest c) Re-bound test d) Nominal mass e) Bend test f) **Elongation test** g) Proof stress	**Lab / field**	IS 1608 IS 1786 IS 1786 IS 1786 IS 1599 IS 1786 IS 1786	Each lot from each source from each diameter of bar	**Below 100 Tons** Dia < 10 mm one sample for each 25 tonnes or part thereof If dia is >10 mm but less than 16 mm: One sample each 35 tonnes or part thereof. If dia >16 mm one sample for each 45 tonnes
	Chemical Tests: 1.Carbon Constituent 2.Sulphur 3.Phosphorus 4.Phosphorus & Sulphur		IS 1786		For every fresh lot of one truck or less as directed by the Engineer-in-Charge/Consultant
Soil core test	OMC Proctor density		As per IS 12175	Two for every 50 sqm	As per notes 1 & 2 below
Mosaic tiles			As per IS 13801 Para 14.6	5000 tiles and more for each manufacturer & thereafter for every 10000 tiles or part thereof.	
Ceramic tiles			As per IS 13630	3000 tiles and more for each manufacturer and Thereafter for every 3000 tiles or part thereof.	

OTHER MANDATORY TESTS:

Soil core tests; Testing aggregate - particle size distribution; Ceramic tiles, Mosaic tiles Testing structural steel; Chequered plate, Unit weight, Thickness, Chemical and physical properties

Presence of preservative on factory made panelled door, kiln seasoned chemically treated wood products, Moisture content in wood products.

CI pipes:
Dimensional, mass, Hydrostatic; GI pipes; Lead, RCC Hume pipes; Stoneware pipes

ROAD WORK:
Soil core tests, Grading of metal for WBM, Bitumen grade, Bitumen content; Load test on concrete gratings.

OPTIONAL TESTS:
Testing aggregate-surface moisture, impact value, spectrographic alkali reaction; Dimensional tests of bricks; Testing the mass of zinc coating on GI door frame, steel windows, test for chemical and physical properties; Anodic coating on aluminium fittings and aluminium sections, Unit weight of aluminium sections; Non destructive Test of Concrete like Non-Destructive Testing(NDT), Ultra Sonic Pulse Velocity (UPV or USPV) by Rebound Hammer (Schmidt Hammer with impact energy of the hammer is about 2.2Nm and with Ultrasonic Pulse Velocity Tester.

TESTING, TOLERANCE, ACCEPTANCE AND MODE OF PAYMENT:

a) The material should pass all tests and tolerance in dimensional, chemical, physical properties should be within the limit as stipulated in relevant IS for acceptance. Such materials shall be accepted as standard.

b) Payment shall be restricted to standard unit mass, or as specified in the schedule of work, without making any cost adjustment towards mass or any other properties, provided the material pass all the tests and tolerances are within the specified limits.

c) In case of non-standard materials, materials not covered under any IS Specifications, such as aluminium sections, the payment shall be made based on the actual unit weight basis as determined by testing at random sampling.

Notes:

1. BACK FILLING IN SIDES OF FOUNDATIONS, PLINTH, UNDER FLOOR ETC.:
The back filling shall be done after the concrete or masonry has fully set and shall be done in such a way as not to cause under-thrust on any part of the structure. Where suitable excavated material is to be used for back filling, it shall be brought from the place where it was temporarily deposited and shall be used in backfilling. The scope of work for back filling/filling in foundation, plinth, under floors etc. shall include filling for all the buildings covered under the contract. Surplus earth available from one building, if required, shall be used for backfilling/filling for other buildings also within the specified lead mentioned in the item.

All timber shoring and form work left in the trenches, pits, floors etc. shall be removed after their necessity ceases and trash of any sort shall be cleared out from the excavation. All the space between foundation masonry or concrete and the sides of excavation shall be backfilled to the original surface with approved materials in layers not exceeding 150 mm. in thickness, watered and well consolidated by means of rammers to at least 90% of the consolidation obtainable at optimum

moisture content (Proctor density). Flooding with water for consolidation will not be allowed. Areas inaccessible to mechanical equipment such as areas adjacent to walls and columns etc. shall be tamped by hand rammer or by hand held power rammers to the required density. The backfill shall be uniform in character and free from large lumps, stones, shingle or boulder not larger than 75 mm. in any direction, salt, clods, organic or other foreign materials which might rot. The backfilling in plinth and under floors shall be done in similar way in layers not exceeding 150 mm. thick and shall be well consolidated by means of mechanical or hand operated rammers as specified to achieve the required density.

Test to establish proper consolidation as required will be carried out by the Contractor cost. Two tests per 50 sqm. will be taken to ascertain the proper consolidation.

2. FILLING IN PLINTH AND UNDER FLOORS:

After the available suitable excavated materials are exhausted as backfilling, the contractor shall notify the Engineer-in-Charge, of the fact and levels taken jointly with Site Engineer / Consultant/Authority of CIPET Authority. The earth, murrum, sand, gravel etc. or such materials suitable for filling proposed to be filled under floors and so mentioned in the item of schedule of quantities shall then be brought to site from approved locations and sources.

i) Earth Filling :

The earth, soft murrum etc. so brought shall be filled up in layers of 15 cm depth, each layer being well watered and consolidated by approved hand or mechanical tampers or other suitable means to achieve the required density.

ii) Gravel or Sand Filling :

Gravel if required to be filled under floors, shall be single washed gravel of approved quality and of size varying from 12 mm. to 20 mm. it shall be uniformly blinded with approved type of soil and/or sand to obtain full compaction. Gravel shall be filled in specified thickness and shall be well watered and rammed entirely to the satisfaction of the Site Engineer / Consultant.

If sand is required to be filled under floors, it shall be clean, medium grained and free from impurities. The filled in sand shall be kept flooded with water for 24 hrs. to ensure maximum consolidation. Any temporary work required to maintain sand under flooded condition shall be done by the contractor at his own cost. The surface shall then be well dressed and got approved from Site Engineer / Consultant before any other work is taken over the fill.

Signature of the Contractor:
Address:

Date:

Director & Head
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