SOLAPUR MUNCIPAL CORPORATION , SOLAPUR

e- TENDER NOTICE NO…….. FOR 2017-18

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NAME OF WORK : SOLAPUR CITY UNDERGROUND SEWERAGE SCHEME UNDER AMRUT MISSION.

(FOR SEWERAGE ZONE I to IV, VI & IX to XIII)

(Providing, lowering, laying, jointing and testing Sewage Collection System, Rising main, Construction of Sump and Pump house, STP Cap.20.00 MLD & 15.50 MLD based on MMBR Technology.)

TENDER DOCUMENTS

COMMISSIONER

SOLAPUR MUNCIPAL CORPORATION ,

SAVE WATER EVERY DROP COUNTS

Contractor No. of correction Public Health Engineer

Solapur Municipal Corporation, Solapur

Name of work : SOLAPUR CITY UNDERGROUND SEWERAGE SCHEME UNDER AMRUT MISSION (FOR SEWERAGE ZONE I to IV, VI & IX to XIII)

(Providing, lowering, laying, jointing and testing Sewage Collection System, Rising main, Construction of Sump and Pump house, STP Cap.20.00 MLD & 15.50 MLD based on MMBR Technology.)

TENDER NOTICE NO. ---- FOR 2017-18

I N D E X

PRESS TENDER NOTICE

सोलापूर महानगरपालिका, सोलापूर.

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केंद्र शासन पुरस्कृत अमृत अभियान अंतर्गत ÃÖÖ»ÖÖ¯Ö¸¡ शहराच्या मलनिस्सारण प्रकल्पÖ योजना कामाची “‡” निविदा सुचना सोलापूर महानगरपालिका, सोलापूर कडून मागविण्यात येत असून, कामाची रक्कम रुपये **174,38,45,985/-** इतक्या रक्कमेच्या “‡” निविदा संबंधीचा सविस्तर तपशील www.mahatenders.gov.in या संकेतस्थळावर ^¯Ö»Ö²¬Ö †ÖÆ.

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Solapur Municipal Corporation, Solapur.

E Tender Notice No. For 2017-2018

The Commissioner, Solapur Municipal Corporation, Solapur invites "e" Tender for the work of UNDERGROUND DRAINAGE SCHEME FOR Solapur MUNICIPAL Corporation AREA UNDER AMRUT MISSION.(Providing, lowering, laying, jointing and testing Sewage Collection System, Rising main, Construction of Sump and Pump house, STP Cap.20.00 & 15.50 MLD based on MMBR Technology) in State of Maharashtra Valued at Rs. 174,38,45,985/- Please visit website www.mahatenders.gov.in for detailed information.

Commissioner
Solapur Municipal Corporation,
Solapur

DETAILED TENDER NOTICE

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SOLAPUR MUNICIPAL CORPORATION, SOLAPUR
PUBLIC HEALTH ENGINEER DEPARTMENT

E-Tender Notice (2017-18)

Tender No: Date:

Commissioner, Solapur Municipal Corporation, Solapur invites tender in two envelope system for the following works from eligible, reputed & experienced Contractors/Bidder who are registered with Government of Maharashtra or Government of India in appropriate departments and its undertaking and those who have carried out similar type of work.

S. N.	Name of Work	Tender Amount	Earnest Money Deposit (Rs.)	Security Deposit (Rs.)	Work Completion Period	Cost of Blank Tender (Rs.)
1	Underground Drainage Scheme For Solapur Municipal Corporation Area Under AMRUT Mission.	174,38,45,985	87,19,230	3,48,76,920	24 Months	56,000

All notifications regarding this tender notice hereafter will be published online on the website www.mahatenders.gov.in. and www.solapurcorporation.com.

Bidders should submit Tender Fee & EMD through online e-payment mode only at **STATE BANK OF INDIA Station Road, Branch Code No. 1656, IFSC-SBIN0001656, A/C No. 34177148273**

Right to reject or cancel any or all the tenders without assigning any reason thereof what so ever is reserved by the Solapur Municipal Corporation, Solapur.

DETAILED TENDER SCHEDULE

Sr. No.	Activities	Date & Time
1	Tender publishing date	**17-10-2017**
2	Documents download start date	**17-10-2017 from 13.00 Hrs**
3	Documents download end date	**10-11-2017 up to 17.00 Hrs**
4	Pre-bid meeting date	**26-10-2017 up to 12.30 Hrs**
5	Bid submission start date	**30-10-2017 from 18.00 Hrs**
6	Bid submission closing date	**10-11-2017 up to 17.00 Hrs**
7	Bid opening date (Technical Bid)	**13-11-2017 at 12.00 Hrs**
8	Bid opening date (Commercial Bid)	**15-11-2017 at 12.00 Hrs**
	The Financial bid will be Open on the same date if possible	

Commissioner,
Solapur Municipal Corporation

Solapur Muncipal Corporation, Solapur

DETAILED TENDER NOTICE NO. ----- OF 2017-18

Online percentage rate basis Tender in B-1 Form in two envelopes system are invited for the following works from the contractors registered with MJP in class – I (civil) Unlimited or registered in CIDCO/MIDC OR ANY GOVERNMENT DEPARTMENT IN INDIA in equivalent class of MJP, by the Commissioner Solapur **Muncipal** corporation /Engineer in charge, on the Government of Maharashtra e-Tendering Portal : http://. **mahatenders.gov.in**

Note : In order to participate in e-tendering process, it is mandatory for new contractors (first time users of this website) to complete the Online Registration Process for the e-Tendering website. For guidelines, kindly refer to Bidders Manual Kit documents provided on the website

b) **NAME OF WORK :** UNDERGROUND DRAINAGE SCHEME FOR SOLAPUR CORPORATION AREA UNDER AMRUT MISSION.(**Providing, lowering, laying, jointing and testing Sewage Collection System, Rising main, Construction of Sump and Pump house, STP Cap.20.0 & 15.50 MLD based on MMBR Technology**)

c) **ESTIMATED TENDER COST** : Rs. 174,38,45,985 /-

d) **EARNEST MONEY DEPOSIT**: Rs. 87,19,230/-

e) **DOWNLOADING COST OF TENDER DOCUMENTS:-** Rs. 56000/-
(Including 6% CGST + 6% SGST) **(Non-refundable).**

f) CLASS OF CONTRACTOR : Class – I (civil) unlimited with MJP or registered in CIDCO/MIDC OR ANY GOVERNMENT DEPARTMENT IN INDIA in equivalent class of MJP

1. EARNEST MONEY DEPOSIT/TENDER FEES :

Tender fee and EMD shall be paid by

1. SBI Net Banking or
2. Other Bank Internet Bank MOPS.

For any assistance please contact help desk. Details are available online.

The online payment procedure can be seen on
https://mahatenders.gov.in→ Announcement → online payment procedure.

Online payment requires 48 hours in Bank working days for clearance and hence, payment should have been made accordingly.

The EMD will be retained in the pooling account and will be refunded to the unqualified / unsuccessful bidders after award of tender to the successful lowest bidder. The EMD of successful bidder will be ultimately refunded or will be adjusted against the security deposit after selection of the successful bidder at the time of execution of the contract. In case, the Commissioner, Solapur corporation, Solapur decided to forfeit / adjust the EMD amount of the bidder, the EMD amount in such cases shall be credited to the bank account of the Corporation. The mandate for EMD refunds / forfeit / adjustment against security deposit shall trigger from e-tender application of NIC portal."

NOTE - The bidder should make the payment well in advance so as to ensure that the payment reaches to Bank 4 (four) days before date and time for submission of tender.

2. SECURITY DEPOSIT

- 4% of the Estimated cost or Accepted Tender cost whichever is higher
- **Initial Security Deposit**.

  2% of estimated cost or accepted tender cost whichever is higher in the form of Fixed Receipt OR Bank Guarantee from Nationalized / Scheduled Bank in the name of Commissioner, Solapur corporation, Solapur for initial minimum period of 24 months (time limit)and shall be extended suitably if the work is not completed within the time limit.
- **Deductions through R.A. Bills.**

  Balance 2% amount will be recovered through each running bill at 5% of the gross amount of R.A. Bill to the extent that total required security deposit is to be recovered.
- **Additional Security Deposit**.

- 1)If the accepted offer of the contract is below 10% of the cost put to tender, 1%
- the additional security deposit in the form of Bank Guarantee of nationalized/
- Scheduled bank shall be furnished by the agency.
- 2) If the accepted offer is more than 10% below, of the cost put to tender, the difference percentage, plus 1% the additional security deposit in the form of Bank Guarantee of nationalized/ Scheduled bank shall be furnished by the agency.
- The additional Security Deposit may be uploaded scanned copy of bank guarantee Nationalized/Scheduled Bank in the name of "Commissioner, Solapur corporation, Solapur". and shall be minimum period upto completion of defect liability period.
- The above additional security deposit's in the form of Bank Guarantee's of nationalized/ Scheduled bankof Scanned copy shall be furnished in envelope No.II.

ÃÖ¤¸¡ ÃÖ¾Ö अटी शासन निर्णय क्रमांक बीडीजी-२०१६/प्र.क्र.-2/‡´ÖÖ-२ दिनांक १२/०२/२०१६, १७/०३/२०१६ (शुध्दीपत्रक) व दिनांक ०१/०४/२०१७ (शुध्दीपत्रक) मधील अटी प्रमाणे राहतील.

NOTE :- If sufficient space is not found in Envelope No. II the original Bank Guarantee shall be submitted to the concerned Commissioner, Solapur corporation, Solapur in sealed envelope within seven days after opening of commercial Bid i.e. envelope No. II :otherwise the initial earnest money deposit will be forfeited.

3. STAMP DUTY

The contractor shall bear the revenue stamp duty on total security deposit of the agreement and/or Additional Security Deposit (payable as per tender condition), as per the Indian Stamp Duty (1985) (latest revision) provision applicable during contract period.

4. TIME OF COMPLETION

Construction period 24 (Twenty four) calendar months, including Monsoon This will be counted from the date of issue of the work order.. Running the scheme for a period of one year for Rising mains, Pumping stations, sump and pump house, Pumping machinery and STP and two years o & M for the same.

5. DETAILED TENDER SCHEDULE

Sr. No.	Activities	Date & Time
1	Tender publishing date	**17-10-2017**
2	Documents download start date	**17-10-2017 from 13.00 Hrs**
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	The Financial bid will be Open on the same date if possible	

6. PRE QUALIFICATION CRITERIA

- The firm / contractor should registered with MJP in class-I/MIDC/CIDCO OR ANY GOVERNMENT DEPARTMENT IN INDIA in class 'I'& above (Civil)(equivalent class of MJP). The validity of registration should be at least up to the last date for submission of tender, then only pre-qualification will be considered. It is necessary to renew the registration before issue of work order. Bidder need to submit online copy of registration.
  - The agency shall have experience successful completion and commissioning of the works listed below with any Govt/Semi Govt./ corporation or equivalent organization. The experience of each work should be under single agreement.

Sr.No	Components in project	Experience required for
1	Collection network of RCC pipes	Contractor should have experience of Lowering, laying, jointing and satisfactory hydraulic testing and commissioning in Sewerage scheme satisfactorily **RCC** pipe line work of minimum Diameter **300 mm dia**. and above of minimum Length **14.0 km** under single contract
	Collection network of Double corrugated PE pipes	Contractor should have experience of Lowering, laying, jointing and satisfactory hydraulic testing and commissioning in Sewerage scheme Satisfactorily **DWC PE pipe/ HDPE Pipe/ RCC pipe/ GRP pipe** line work of minimum Diameter **150 mm dia.** and above of minimum Length **60 km** under single contract
2	Sewage Pumping Station.	Experience of Providing Constructing & Commissioning similar type of work.
3	Rising Main	Contractor should have experience of , Lowering, laying, jointing and satisfactory hydraulic testing and commissioning in Sewerage scheme satisfactorily **DI** pipe line work of

		minimum diameter **300 mm** . and above of minimum Length **0.10 km** under single contract
4	Sewage Treatment Plant of a particular technology	The Bidder shall have the experience of Providing, constructing, commissioning successfully a Sewage Treatment Plant (STP) of Capacity **10 MLD** of the **Moving Media Bio Reactor(MMBR)/Sequential Batch Reactor (SBR).** This STP should be in operation for minimum one year, giving satisfactory results (Quality of effluent shall be as required in Tender)
		Bidder should tie-up with a Technology provider for Sequential Batch Reactor and shall submit Technology Tie-up/ Consent Agreement as part of their bid. The technology provider shall have experience of providing **Moving Media Bio Reactor(MMBR)/SBR** for at least three STPs each of 10 MLD in India for any State/ Central Government Departments/ Organizations/ ULBs which are working satisfactorily for at least three years as on date of calling of Tender and achieving the outlet parameters as mentioned in the Tender. Performance Certificate for each work should be issued by the end user, duly certified by a officer not below the rank of Executive Engineer should be enclosed.
5	Property connections	Experience of Providing Constructing & Commissioning similar type of work.
6	RCC Weir on Nalla	Experience of Providing Constructing & Commissioning similar type of work.

- The bidder shall submit online, required experience certificate. The certificate of experience shall have to be issued by the officer not below the rank of Executive Engineer or equivalent officer or head of Government/ Semi Government/ Corporations or Councils.
- The firm shall have valid CGST and MGST registration No or TIN No.
- The firm shall have valid PAN No.

All the documents pertaining to pre-qualification criteria shall be submitted separately online in Envelop No.1 (Technical Bid)

BID CAPACITY (For the Tender costing above Rs.25.00 crores))

The bidder shall have a bid capacity more than the value of this bid. Bidding capacity of contractor for completion of work will be decided by following formula.

Sr. No.	Name of Works	Name of Division /MC	Accepted Tender Cost.	Amount of work completed			Amount of balance work	Remark
				2013-15	2014-15	2015-16		
1	2	3	4	5	6	7	8	9

BIDDING CAPACITY = 2 N A – B

Where ..

A =	Maximum value of **audited turnover** executed by the the contractor in any one year, during the last three years, upgraded to the present year (i.e. tender accepted year) by the formula given below
=	$\left(1+\frac{\text{(WPI Present - WPI Max. value years)}}{\text{WPI Max. value years}}\right)$ X Maximum value of **audited turnover** executed in a year
Where	**WPI Present :-** Wholesale price index of the month and year in which tender is invited.
	WPI Max.value years :- Average wholesale price index of the year in which the max. value of **audited turnover** executed.

N = Number of years prescribed for completion of the work for which present bid is invited.

B = Value of existing commitment of ongoing work (i.e. work in hand)

Details of **audited turnover** executed by the contractor in last three years and existing commitment of ongoing work

(in Rs. Cr.)

Abstract for BID Capacity Calculation

(Rs. In Crore)

Year	Max. value of engineering works executed in the year	Maximum value of **audited turnover** executed by the the contractor in any one year, during the last three years	Remarks

		Value	Year	
1	**2**	**3**	**4**	**5**
2014-15		Write the max value here	Write concerned year here	
2015-16				
2016-17				

(Rs. In Crore)

Year	Value of existing commitment of ongoing work to be completed during next **N** years	Total value of existing commitment of ongoing work to be completed during next **N** years. (B)
1	**2**	**3**
2016-17		
2017-18		
2018-19		
2019-20....		

Max. value of **audited turnover** executed in any one year during last Three years upgraded to present year (i.e. Tender acceptance year) by increasing the cost as per rise in whole sale price index between the year of maximum value and year of tender acceptance (A) = .

No. of year prescribed for completion of work for which present tender are invited (N) =

Total value of existing commitment of ongoing work to be completed during next **N** years (B) =

Bid Capacity = 2 N A – B

Note :-

- Since all the data is pertaining to the contractors own performance, the contractors are requested to provide its bidding capacity for this work by furnishing the calculations and supporting documents duly certified by chartered accountant to prove its contentions along with the application for issue of tender form.
- The statement showing the value of existing commitments of ongoing works during next three years for each of works in the list should be counter signed by Chartered Accountant
- Submission of false information results in blacklisting of the contracting agency.
- If support documents are not found uploaded, bid capacity will not be taken into account which will result in disqualification for this tender

7 COLLABORATION & JOINT VENTURE

- **Collaboration :-**

  The contractor who is willing to participate in tender process, and if he is not having experience of particular sub-work, then he is allowed to have collaboration with other agency or contractor registered with Maharashtra Jeevan Pradhikaran or any government department in India in appropriate class and having experience of the particular sub-work as specified in pre-qualification criteria. Contractor with whom above collaboration is done shall be responsible for successful completion of the works. However it will be the responsibility of the principal contractor to get the work done.

- In no case value of work to be done by collaborator, with whom collaboration is made, should exceed the value of work to be done by the Principal Contractor(51%).

- Collaborator shall be a registered contractor in a appropriate class required to get him eligible to quote the tender amounting to the cost of sub work for which collaboration is being done.

- The collaborating firm may have collaboration with multiple principal contractors.

- The principal Contractor shall be ultimately responsible for completion of entire work.

- Moreover with whom collaboration is made, will only be binding to carry out the work to the effect of principal contractor & should submit an agreement on 100/- stamp paper as per prescribed form (**Annexure-2**) duly Notarized at the time of pre-qualification of bidder
- The principle contractor can have maximum one collaboration

Joint Venture :-

The contractor who is interested to have blank tender form and if he do not have necessary experience of any sub work then he is allowed to have joint venture with another agency having the experience of particular work.

If there is joint venture, same shall be in appropriate format as per (**Annexure-3)** and it shall be clearly mentioned in the agreement that both the contractor will be jointly and severally responsible for the successful completion of works included in the tender with all test and trials for full tender period. It is necessary to enclose the registration certificates of joint venture firm with the Registrar of the Partnership Firm or the receipt of payment made to Registrar of the Partnership Firm on account of fees toward joint venture firm with condition of submitting registration certificate before issue of work order. Then only prequalification application will be considered.

In Joint Venture, the contractor having major share shall have registration in class mentioned in tender i.e. the class required to execute the entire work for which the Joint Venture is done. The contractor having minor share shall have registration in appropriate class , required to get him eligible to execute the proportionate cost of work, derived on the basis of his share in Joint Venture.

If in the joint venture both the parties have equal share then both the parties shall have registration in the class mentioned in the tender i.e. the class required to execute the entire work for which the joint venture is done.

8. **COST OF BLANK TENDER FORM**
   - Rs.56,000/- per set (including 6% CGST + 6% MGST).
   - Blank Tender documents will not be sold by this office. Interested contractors have to download tender documents from the website.
   - Cost of blank tender form shall not be accepted in the form of cash or cheque. The cost of the tender documents will not be refunded under any circumstances.

9. ISSUE OF BLANK TENDER FORM

The blank tender forms will have to be downloaded, from the website http://mahatenders.gov.in as per online schedule.

10. PRE-TENDER CONFERENCE

Pre-Tender conference is open to all prospective tenderers and will be held on **at** hours in the office of the Commissioner Solapur corporation, Solapur, wherein the prospective tenderers will have opportunity to obtain clarifications regarding the work and the tender conditions.

The prospective tenderers are free to ask for any additional information or clarification either in writing or orally and the reply to the same will be given in writing and this clarification referred to as common set of conditions, shall also be common and applicable to all tenderers. The minutes of this meeting along with the letters of tenderers will form the part and parcel of the tender documents. Bidder need to submit online signed copy of pre bid minutes in a technical bid.

11. VALIDITY OF THE OFFER

120 days from the date opening of tender.

12. LAST DATE & TIME OF ONLINE SUBMISSION OF TENDER FORM

up to Hrs.

13. DATE & TIME OF ONLINE OPENING OF TENDER

at in the office of the Commissioner, Solapur corporation,Solapur

14. SUBMISSION OF TENDER

Bids must be accompanied with:

a) Copy of the firm/Contractor should have been registered in MJP in Class I (Civil) Unlimited with MJP or registered in CIDCO/MIDC or any Govt. Dept. in India in equivalent Class of MJP.

b) The Firm shall have to produce the document of CGST and MGST registration No. or TIN No.

c) The firm shall have to produce the document of PAN No.

d) Scanned copy of all documents, certificates specified in Pre-qualification Criteria in Point No.6.

e) Scanned copy of duly signed declaration of contractor & Undertaking for Guarantee in prescribed format filled in agency's letter head attached with the tender. **(Annexure-A)**

f) Scanned copy of minutes of Pre-bid meeting duly signed by Contractor.

g) Scanned copy of Joint Venture/Collaboration in prescribed format.

h) Self Declaration not Black Listed by any Government/ Semi Government organization/ any local bodies and any other Private bodies in prescribed format.

Note:- Before opening Envelope No.1 concerned Commissioner should confirm the online payment receipt of Tender document and online payment receipt of EMD made by Contractor through Accountant and concerned online receipt must be uploaded to mahatenders.gov.in by Council using Tender ID and receipt for same will be issued to contractor concerned.

Bid shall be treated as invalid if scanned copies as mentioned above are not submitted online along with the bid.

The guidelines, "to download the tender document and online submission of bids procedure of tender opening" can be downloaded from website "**http://mahatenders.gov.in**".

14.1 The two envelopes No. 1 & 2 shall be digitally sealed and signed and submitted online as per the online tender schedule.

14.2 The date and time for online submission of envelopes shall strictly apply in all cases. The tenderers should ensure that their tender is prepared online before the expiry of the scheduled date and time and then submitted online before the expiry of the scheduled date and time. Offers not submitted online will not be entertained.

14.3 If for any reason, any interested bidder fails to complete any of online stages during the complete tender cycle, department shall not be responsible and any grievance regarding that shall not be entertained.

15. OPENING OF TENDER

The tenders will be opened on the date specified in the tender notice or on the date intimated to prospective bidders, in the presence of the intending bidders or their authorized representative to whom they may choose to remain present along with the copy of the original documents submitted for Pre Qualification. Following procedure will be adopted for opening of the tender.

Envelope No. I (Technical Bid)

First of all, Envelope No. 1 of the tenderer will be opened online through e-Tendering procedure to verify its contents as per requirements. Scanned copies of following documents shall be in Envelope No. 1.

a) Copy of the firm/Contractor should have been registered in MJP in Class I (Civil) Unlimited with MJP or registered in CIDCO/MIDC or any Govt. Dept. in India in equivalent Class of MJP.

b) The Firm shall have to produce the document of CGST and MGST registration No. or TIN No.

c) The firm shall have to produce the document of PAN No.

d) Scanned copy of all documents, certificates specified in Pre-qualification Criteria in Point No.6.

e) Scanned copy of duly signed declaration of contractor & Undertaking for Guarantee in prescribed format filled in agency's letter head attached with the tender. **(Annexure-A)**

f) Scanned copy of minutes of Pre-bid meeting duly signed by Contractor.

g) Scanned copy of Joint Venture/Collaboration in prescribed format.

h) Self Declaration not Black Listed by any Goverment/ Semi Government organization/ any local bodies and any other Private bodies in prescribed format.

If the various documents contained in this Envelope do not meet the requirements as stated above, a note will be recorded accordingly by the tender opening authority and the envelope No. II of such tenderers will not be considered for further action and the same will be rejected. Also tender will be liable for rejection if bidder mention his commercial offer anywhere in envelop No.1

Envelope No. II (Commercial Bid)

This envelope shall be opened online through e-Tendering procedure after opening of envelope No. 1 only, if the contents of Envelope No. 1 are found to be acceptable to the Solapur corporation. The tendered rate shall then be read out by the tender opening authority.

NOTE :- If sufficient space is not found in Envelope No. II the original Bank Guarantee shall be submitted to the concerned Commissioner, Solapur corporation, Solapur in sealed envelope within seven days after opening of commercial Bid i.e. envelope No. II :otherwise the initial earnest money deposit will be forfeited.

16) Contractor shall submit a certificate to the effect that "all the payment to the labour/staff are made in bank accounts of staff linked to Unique Identification Number (AADHAR CARD) "The Certificate shall be submitte by the contractor within 60 days from the commencement of contract.

17) Member Secretary M.J.P. Mumbai Lr. No. MJP/MS/TB-3/920 dt. 26/07/2016 100% of security deposit of total tender cost shall be refunded along with payment of final security deposit amount from Nationalized Bank for a period of 5 year Security deposit will be released only after the due verification of bank guarantee from the concerned bank.

18) As per Finance Department Maharashtra Govt. G.R. No. GST-1017/PK-81/ Karadhan-1 dt. 19/08/2017 & G.R. No. GST- 1017/PK-155/Karadhan-1 Dt. 11/09/2017 Bidder should quote his offer considering CGST & MGST.

19. RIGHT RESERVED

a) Right to reject any or all tenders without assigning any reason thereof is reserved by the competent authority, whose decision will be final and legally binding on all the tenderer.

b) Tender with stipulations for settlement of a dispute by reference to Arbitration will not be entertained.

Sd/-

COMMISSIONER
SOLAPUR CORPORATION

GENERAL CONDITIONS OF CONTRACT

Solapur Municipal Corporation

NAME OF WORK : SOLAPUR CITY UNDERGROUND SEWERAGE SCHEME UNDER AMRUT MISSION.
(FOR SEWERAGE ZONE I to IV, VI & IX to XIII)

(Providing, lowering, laying, jointing and testing Sewage Collection System, Rising main, Construction of Sump and Pump house, STP Cap.20.00 MLD & 15.50 MLD based on MMBR Technology.)

GENERAL CONDITIONS OF CONTRACT

1. DEFINITIONS

1.1 In the contract, the following terms shall be interpreted as indicated.

a) "UDD "means Urban development department
b) "AMRUT" means Atal Mission for Rejuvenation and Urban Transformation
c) "The Contract" means the agreement entered into between the owner and the contractor as recorded in the contract form signed by the parties, includes all attachments and appendices there to and all documents incorporated by references therein. Contract is the deed of contract together with all its original accompaniments and those later incorporated in it by internal consent.
d) "The Contract Price" means the price payable to the contractor under the contract for the full and proper performance of its contractual obligations.
e) "The Goods" means all of the equipments, machinery and/or other materials which the contractor is required to supply to the owner under the contract.
f) "Services" means services ancillary to the contract such as transportation and insurance and any other incidental services, such as Provision of Technical Assistance, Trial Runs, Commissioning, Training to staff and other such obligations of the contractor covered under the contract.
g) "The Owner" means, the Commissioner, Solapur Municipal Corporation the person, for the time being holding that Office and also his successors and shall include any Engineer authorized by him.
h) The "Contractor" means successful tenderer, that is the tenderer, who's tender has been accepted and who has been authorized to proceed with the

work.

i) "The Pradhikaran" shall mean the Maharashtra Jeevan Pradhikaran, a Pradhikaran constituted under the Pradhikaran Ordinance issued on 10.03.1997.

j) " M.C" means Municipal Corporation

k) "M. J. P." means, Maharashtra Jeevan Pradhikaran.

l) "The Chief Engineer M.J.P. " shall mean Chief Engineer M.J.P., the person, for the time being holding that Office and also his successors and shall include any Engineer authorized by him.

m) "The Superintending Engineer, Maharashtra Jeevan Circle, Sangli" means the Engineer, so designated by the Pradhikaran or any other Engineer who is for the time being entrusted with his functions, duties and powers and so notified.

n) "Tender" means the proposal of the contractor submitted in prescribed form setting-forth the prices for the goods to be supplied and other related services to be rendered and setting forth his acceptance of the terms and obligations of the conditions of contract and specifications.

o) "Contract Time" means period specified in the document for the entire execution of contracted works and other services to be rendered commencing from the date of notification of award including monsoon period.

p) "Month" means calendar month.

q) "Site" means location at which the contractor will have to execute the contracted work.

r) "The Engineer or Engineer-in-charge" shall mean the City Engineer /Hydraulic Engineer / water supply Engineer authorized by the Municipal Council .

s) PMC means Project Management consultant appointed by the Solapur Municipal Corporation.

2. The contractor shall erect temporary sheds for storage for material supplied by Corporation/Council and brought by him on site. Also at each construction site contractor shall have separate storage space for cement and other material.

3. All the water/waste water retaining structures shall be designed in M25 and constructed in M30.

4. Contractor shall take trial pits and trial bores at site at his own cost to ascertain the bearing capacity of the strata and accordingly submit the designs.

5. Contractor shall submit designs and drawings for all structures such as Pumping stations, pump House, Sewage Treatment Plant. (Hydraulic and structural) Sump,Thrust blocks/anchor blocks, Pumping machinery and its layout, all allied

electrical and mechanical equipments as directed by Executive Engineer/Engineer in charge/Commissioner .This designs and drawings shall be got checked from Government Engineering College/COEP or IIT at contractors own cost.

6. The contractor shall maintain the record of these materials in the prescribed proforma and registers as directed by the Executive Engineer/Engineer in charge/Commissioner. The sample of prescribed proforma is attached herewith. These registers shall be signed by both contractors and representative of Engineer-in-Charge. These registers shall be made available for inspection, verification for the department as and when required. These registers shall be in the custody of department and shall be maintained by the department.

7. Contractor shall take photographs and videos of all sub-works during construction and submit two copies in hard and soft along with final bill.

8. Contractor shall prepare record drawings of all sub-works as per execution in details by using Auto Cad programme; as directed by Executive Engineer/Engineer in charge/Commissioner. He should submit 3 Nos. C.D. (R.W) and Pen-drive along with three hard copies during the submission of final bill. Final bill will not be passed unless and until this is submitted. No extra payment will be made for submission of CDs.

9. Contractor shall maintain register for dewatering having details such as BHP of pumps, start and stop of dewatering pumps, Fuel consumed etc.

10. The material i.e. cement, steel, sand, metal, bricks, alum, pipes valves etc. brought on the work site shall be accompanied with the necessary company/manufacturing firm's test certificate. In addition these materials shall be tested as per frequency prescribed by the department and the cost of such testing shall be borne by the contractor. If the test results are satisfactory, then and then only the material shall be allowed to be used on the work. If the test results are not as per standards, these materials shall be immediately removed from the work site at contractor's cost. In case of cement, if so requested by the contractor in writing, material will be allowed to be used before receipt of test results but this will be entirely at the risk and cost of the contractor.

11. All the formwork used for construction shall be of steel or with lining of steel. Wooden shutters may be allowed at the discretion of the Executive Engineer/Engineer in charge/Commissioner for minor works.

12. Contractor shall have Cube Testing machine on site. Test cubes shall be tested in

front of Executive Engineer/Engineer in charge/Commissioner or his representative and a register for it shall also be maintained.

13. RCC designer appointed by the Contractor shall visit and inspect the work at various stages of construction and comply with the query of the department without any extra cost.

14. SCOPE AND MEANING OF CONTRACT:

The term contract hereinafter used means and includes the notice for invitation of tender, schedule 'A' i.e. schedule for departmental supply of materials, schedule 'B' i.e. schedule of items to be executed under this contract, general conditions, schedule of obligatory requirements, general and detailed specifications all appendices drawing and any other documents attached to the blank tender form issued to the contractor firm. These are subject to any alterations and modifications carried out and agreed to before the contract is finally decided and accepted by the Executive Engineer, M.J.P/Commissioner/Commissioner... The term contract and firms means the agency entering into contract with the Executive Engineer, M.J.P / Commissioner/Commissioner.

The Solapur Municipal Corporation, an urban local body of Government of Maharashtra, has proposed to execute the following work under sanctioned scheme SOLAPUR CITY UNDERGROUND SEWERAGE SCHEME UNDER AMRUT MISSION (FOR SEWERAGE ZONE I to IV, VI & IX to XIII)

This tender includes-

Providing, lowering, laying, jointing and testing Sewage Collection System, Rising main, Construction of Sump and Pump house, STP Cap.20.00 MLD & 15.50 MLD based on MMBR Technology.

15. IMPORT LICENSE AND FOREIGN EXCHANGE :

In respect of the work on contractors own design, the contractor shall quote for the indigenous equipment only. Foreign exchange and import license required by the contractor if any shall have to be arranged by the contractor independently. Department shall not take any responsibility in this regards. Delay in getting any materials shall not be entertained for extension of time limit of the contract.

16. ACQUITANCE WITH WORKS AND SITE CONDITIONS:

The contractor shall be deemed to have carefully examined the scope of work, location and alignment of various components under this tender, site conditions, the general conditions, the specifications, drawing availability of material required etc. and has fully acquainted himself regarding all aspects of works, if he shall have any doubt as to the meaning of any portion of the tender papers. He shall set

forth the particulars of the tender to the notice of Executive Engineer, M.J.P/ Commissioner/Commissioner, before submission of tender and get the doubts cleared. Once the tender is submitted duly filled, he shall be supposed to have accepted the conditions and specifications full and interpretation of the conditions be entirely at the discretion of the competent authority of the department.

17. OBSTRUCTIONS IN THE WORK :

All obstructions such as electric cables, telephone line, water and sewer mains, manholes, natural drainage, culverts, storm water drains etc. corning in the way shall be carefully looked after against any damages which otherwise will have to be made good by the contractor at his own cost. Any work of removing, repairing or remaking etc will be carried out by the contractor without any extra claims for the same in contractor with the respective departments.

18. LAND FOR THE USE BY THE CONTRACTOR FOR STORING MATERIALS ETC. :

As far as possible the contractor shall be allowed to use the Municipal Land without any charge, in possession of concern MJP/MC for stacking his materials, stores, erection of temporary structures, sheds etc with prior written permission of Executive Engineer, M.J.P/ Commissioner/Commissioner.. The location of the temporary structures to be erected shall be got approved from the Executive Engineer MJP/Commissioner/Commissioner and all the products obtained after cutting the same shall be stacked at suitable place as directed by Engineer in charge. All concern MJP/MC land occupied by the contractor for temporary use shall be handed over back in good conditions to the entire satisfactions of the concern MJP/MC. as and when demanded by him. Any damage or alterations made in the area shall be made good by the contractor. If the departmental land is not available the contractor has to make his own arrangements of land on hire or otherwise at his own cost.

19. LABOUR CAMPS :

The contractor shall at his own expenses make all necessary provisions for land, housing grains, water supply and sanitary arrangements etc for employees and shall pay direct to the authorized concerned all rents, taxes and other charges. The contractor shall also comply with all requirements of health department in regard to maintenance of anti-epidemic conditions.

20. WORK THROUGH OTHER AGENCY IN THE SAME AREA :

The Executive Engineer, M.J.P/ Commissioner/Commissioner. shall have the right to

execute the works, not included in this contract, but within the premises occupied by the contractor for the purpose of this contract, through any other agency.

21. SPECIFICATIONS

The wording of items in Schedule 'B' shall be taken as guidelines for general provisions and coverage under the item. The detailed specifications for relevant items shall be as per detailed specifications enclosed and as per P.W.D. Hand Book, Standard Specifications, Relevant and latest editions of IS.Code. The other standard, wherever quoted, shall be applicable. If the standard specifications fall short for the items quoted in the Schedule of this contract, reference shall be made to the latest Indian Standard Specifications, IRC codes. If any of the items of the contract do not fall in reference quoted above, the decision and specification as directed by the Executive Engineer/Engineer in charge/Commissioner shall be final.

It is presumed that the Contractor has gone carefully through the standard specification (Vol. I & II, 1981 edition) and the Schedule of rate of the Division, and has also studied site conditions before arriving at rates quoted by him. The special provisions and detailed specification of wording of any item shall gain precedence over the corresponding contrary provisions (if any) in the standard specification given without reproduction the details in contract. Decision of Executive Engineer/Engineer in charge/Commissioner shall be final in case of interpretation of specifications.

22. WATER AND ELECTRICITY

The contractor shall make his own arrangements at his own cost for water required for construction and hydraulic testing as well as for labour camp. The Municipal council does not take any responsibility for supply of water to contractor for construction or testing purposes during the entire work. If water is supplied by MJP/Corporation/Council, Contractor shall take connection at his cost and provide water meter on it. Water charges shall be paid by contractor as per prevailing water rates to MJP/Corporation/Council regularly every month. Power supply from MSEDCL if required for construction of work as well as for labour camp will have to be arranged by the contractor at his cost. MJP/MC does not take guarantee for continuous power supply at site.

23. LINE OUT

The contractor shall himself carry out the line out of works in the presence of the representative of the MJP/Corporation/Council and the contractor shall be responsible for accuracy of it. He shall employ a qualified Engineer for this

purpose as well as for supervision of works.

24. PROGRAMME AND PROGRESS SCHEDULE

The contractor shall furnish within 15 days from the date of work order a progress schedule indicating the date of starting, quarterly progress expected to be achieved and anticipated date of completion of each major item of the work. The schedule should be capable of achievement towards completion of whole work in the stipulated time.

i. The Contractor shall submit his own programme as per time limit stipulated in the tender, in the form of Bar Chart which should give details of milestones of physical stages of each sub work. Simultaneously with the execution of the Contract Agreement, the Contractor shall submit to The Engineer his item-wise monthly programme, which shall be nothing but detailing of the programme,

ii. The programme shall also state the milestones of part commissioning and part completion of the sub-work included in the tender. The programme shall also provide the information as to required approvals to drawings, samples, materials, equipments and their time of submissions to the MJP/Corporation/Council. The progress shall be submitted by the Contractor visa-a-vis programme every month. The works team of the Contractor shall be so motivated to know the balance work at the end of each week and the rate required in the balance period to complete the work and therefore, shall endeavor to complete the task assigned for each week timely. In case, where the updated and revised schedule is required, the same shall be submitted to the owner for approval.

If deviation exceeds 10% in scheduled programme, competent authority has right to reject the tender of successful tenderer.

In the event of contractor failing to execute the work as per scheduled programme submitted by him or in the event of unreasonable delay in the part of contractor, he shall be liable to as compensation an amount at the fixed rate subject to maximum amounting to 10% of the tender cost.

25. CHECKING QUALITY OF THE WORK :

The Engineer in charge should consider it necessary to satisfy himself to the quality of work, the contractor shall at any time during continuance of the contract period

produce sample of work done or if necessary pull down a responsible part of the work enough for such inspection and testing as the Engineer in charge may direct. The contractor shall make good the same at his cost and to the satisfaction of the Engineer in charge without extra cost.

26. CHANGES :

Any marginal and minor changes as may be found necessary by the Engineer in charge during execution shall have to be carried out by the contractor without extra cost.

27. INSURANCE OF WORKERS :

The successful tenderer should get the labour insurance done, on account of risk involved within a month from the date of work order, failing which Rs. ……..- will be withheld from the R. A. bills of the work and it will not be refunded till labour insurance is done and a documentary evidence to this effect is produced by the contractor. The successful contractor tenderer should purchase insurance policy identifying the Commissioner therein.

28. ARBITRATION

During the course of work if the dispute arises between the contractor and the Engineer - in - charge then it shall be referred to the sole Arbitration of the Commissioner, Solapur Municipal Corporation, Solapur. His decision shall be final and binding. Even if the contractor resorts to approach in the court of law then in order that the work shall proceed, the Engineer has full right to hire another contractor to get the work done, and this process shall be applicable for whatever new contractors are employed.

29. INTENT AND INTERPRETATION OF CONTRACT DOCUMENTS

29.1 The contract documents are complementary and what is called for by one is as binding as if called for by all. Any work that may be reasonably inferred from the drawings or specifications as being required to produce the intended result shall be provided by the contractor whether or not it is specifically called for, in Schedule-'B'.

The contractor shall furnish and pay for all labour, supervision, materials, equipment, transportation, construction, equipment and machinery tools,

appliances, water, fuel, power, energy, light, heat, utilities, telephone, storage, protections, safety provisions, and all other facilities like service, incidentals, approaches to site etc any nature whatsoever necessary for the satisfactory and acceptable execution, testing and completion of the work in accordance with the contract documents, ready for use and operation by the owner. The cost of all these arrangements shall be deemed to be included in the contract offer and no separate payment shall be admissible thereof.

29.2 Interpretations

Written clarifications or interpretations necessary for the proper execution or progress of the work, in the form of drawings or otherwise, will be issued with reasonable promptness by the Engineer and in accordance with any schedule agreed upon.

29.3 Drawings

Figured dimensions on drawings shall govern over scaled dimensions and detailed drawings shall govern over general drawings. The Contractor shall submit six sets of drawings according to the design.

29.4 *Signed Drawings*

Signed drawings alone shall not be deemed to be in order for work unless it is entered in the agreement or schedule or drawings under proper attestation of the Contractor and the Engineer or unless it has been sent to the contractor by the Engineer with a covering letter confirming that the drawing is an authority for work in the contract.

29.5 *Technical Words*

Work, materials or equipment described in words which so applied have a well-known trade or technical meaning shall be deemed to refer to such recognized meanings.

30. LANDS, CONDITION AND LAYOUT

30.1 Line out of the Work

30.2 Surveys and Measurements

The contractor shall carefully preserve all surveys as also setting out stakes, reference points, bench marks and monuments. If any stakes, points or benches be removed or destroyed by any act of the contractor or his employees, they may be reset at the contractor's expense. The contractor shall supply without charge the requisite number of persons with the means and materials necessary for the purpose of working survey, setting out works, and counting, weighing and assisting in the measurement or examination at any time and from time to time of the work or materials.

30.3 Contractor's Verification

The Contractor will establish at the work site a substantial B.M. and connect it to a permanent B.M. available in the area with known value. The contractor will then carry out necessary surveys and leveling, covering his work, in verification of the survey data on the working drawings furnished by the Engineer and he will be responsible for establishing the correct lines and levels and verification of the lines and level furnished on the working drawings. If any error has occurred in the work due to non-observance of this clause, the contractor will be responsible for the error and bear the cost of corrective work.

30.4 Site Office

The Contractor shall construct at his cost a semi-permanent nature site office with minimum of 20 Sq.m area and shall be provided with minimum two tables, two almaries, six Nos of chairs. The office and the furniture shall be provided and maintained by the contractor throughout the contract period at his cost. The use of the site offices shall be adequate size to accommodate the inspecting Engineers of MJP/IRMA/any other inspection committee/agency appointed by the Government of India/Maharashtra/Collector/Municipal Administration to discuss and review progress of work. No extra payment will be made on this account.

The site office shall be provided at all the conspicuous structures to be constructed/components to be executed.

31. SECURITY DEPOSIT AND INDEMNITY BOND

31.1 *Security Deposit*

The security deposit shall be returned to the contractor without any interest when the contractor ceases to be under any obligation under the contract. This shall be read with Clause No.1 and 20 of B-1 Form for Security Deposit and Defect Liability Clause respectively.

31.2 *Loss or Damage Indemnity Bond*

The contractor shall be responsible during the progress as well as maintenance for any liability imposed by law for any damage to the work or any part thereof or to any of the materials or other things used in performing the work or for injury to any person or persons or for any property damaged in or outside the work limit. The contractor shall indemnify and hold the owner and the Engineer harmless against any and all liability, claims, loss or injury, including costs, expenses, and attorney's fees incurred in the defense of same, arising from any allegation, whether groundless or not, of damage or injury to any person or property resulting from the performance of the work or from any material used in the work or from any condition of the work or work site, or from any cause whatsoever during the progress and maintenance of the work.

32. SUPERVISION AND SUPERINTENDENCE

32.1 SUPERVISORY STAFF :

The contractor shall have experienced technical qualified general supervisor for the work, who is capable of managing and guiding the work and also capable of understanding the instructions given to him by the Engineer in charge from time to time and shall be responsible to carry them out promptly. The contractor shall have during working hours, supervisor of sufficient training and experience to supervise the various items and operations of the work. Further, the Engineer in charge may notice, desire contractor high ranking member to be present on any specified date, the contractor shall comply with such directions Contractor's Supervision

The contractor shall supervise and direct the works efficiently and with his best skill and attention. He shall be solely responsible for means, methods, techniques, procedures and sequences of construction. The contractor shall co-ordinate all parts of the work and shall be responsible to see that the finished work complies fully with the contract documents, and such instructions and variation orders as the Engineer may issue during the progress of the works.

32.2 Agent

The Contractor shall keep on the work at all times during its progress a

competent resident agent preferably a qualified and experienced Engineer, capable of managing and guiding the work and understanding the specifications and contract conditions. For this purpose the contractor shall communicate to the Department, name, qualification and experience of such Engineer to be appointed for execution of this work. The agent appointed by the contractor shall not be replaced without ten (10) days written notice to the Engineer except under extra-ordinary circumstances. The agent shall be the Contractor's representative at the site and shall have authority to act on behalf of the contractor. All communications, instructions and directions given to the agent shall be binding as if given to the Contractor by the Engineer not otherwise required to be in writing will be given or confirmed in writing upon request of the Contractor. or in work-order book

33. CARE AND USE OF SITE

The Contractor shall not commence operations on land allotted for work without prior approval of the Engineer. If these lands are not adequate the Contractor may have to make his own arrangements for additional lands required for his use. The contractor shall not demolish, remove or alter any of the structures, trees or other facilities on the site without prior approval of the Engineer. All the area of Contractor's operations shall be cleared before returning them to the Engineer.

34. OVERLOADING

No part of the work or new and existing structures, scaffolding, shoring, sheeting, construction machinery and equipment, or other permanent and temporary facilities shall be loaded more than its capacity. The Contractor shall bear the cost of correcting damage caused by loading or abnormal stresses or pressures.

35. USE OF EXPLOSIVES

The Contractor shall comply with the laws, ordinances, regulations, codes, orders, other governing the transportation, storage and use of explosives, shall exercise extreme care not to endanger life or property and shall be responsible for all injury or damage resulting from the use of explosives for or on the work.

36. MANUFACTURER'S INSTRUCTIONS

The Contractor shall compare the requirements of the various manufacturer's instructions with requirements of the contract documents, shall promptly notify to the Engineer in writing of any difference between such requirements and shall not proceed with any of the works affected by such difference shall until an

interpretation or clarification is issued pursuant to article.

The contractor shall bear all costs for any error in the work resulting from his failure to the various requirements and notify the owner of any such difference.

37. PROTECTION

The contractor shall take all precautions and furnish and maintain protection to prevent damage, injury or loss to other persons who may be affected thereby. All the works and all materials and equipment to be incorporated therein whether in storage or on the site, under the care, custody or control of the contractor or any of his sub-contractors and other improvements and property at the site or where work is to be performed including building, tools and plants, pole lines, fences, guard rails, guide posts, culvert and works markers, sign structures, conduits, pipelines and improvements within or adjacent to streets, right-of-way, or easements, except those items required to be removed by the Contractor in the contract documents. The Contractors protection shall include all the safety precautions and other necessary forms of protection, and the notification of the owners of utilities and adjacent property.

The contractor shall protect adjoining site against structural, decorative and other damages that could be caused by the execution of works and make good at his cost any such damages that could be caused by the execution of works and make good at his cost any such damages.

38. UTILITIES AND SUB-STRUCTURES

Before commencing any excavations, the Contractor shall investigate, determine the actual locations, and protect the indicated utilities and structures, shall determine the existence, position and ownership of other utilities and substructures in the site or before the work is performed by communication with such property owners, search of records, or otherwise and shall protect all such utilities and substructures.

38.1 Restoration and Repair

Except for those improvements and facilities required to be permanently removed by the contractor, the contractor shall make satisfactory and acceptable arrangements with the appropriate owners, and shall repair, restore all improvements, structures, private and public roads, property, utilities and facilities disturbed, disconnected, or damaged as a result or consequence of his work or the operations of those for whom he is responsible or liable, including

that caused by trespass of any of them, with or without his knowledge or consent, or by the transporting of workmen, material or equipment to or from the site.

39. WORKMEN

The contractor shall at all times enforce strict discipline and good order among his employees and shall not employ on the works any unfit person or anyone not skilled and experienced in the assigned task. The Contractor shall in respect of labour employed by him comply with or cause to be complied with the provisions of various labour law and rules and regulations as applicable to them in regard to all matters provided therein and shall indemnify the owner in respect of all claims that may be made against the owner for non-compliance thereof by the Contractor.

In the event of the contractor committing a default or breach of any provisions of labour laws and rules and regulations, the Contractor shall without prejudice to any other liability under the acts pay the owner a sum as decided by the engineer.

39.1 Work during Night or On Sundays and Holidays

Unless otherwise provided, none of the permanent works shall be carried out during night, Sunday or authorized holidays without permission in writing. However, when work is unavoidable or necessary for the safety of life, priority of works, the Contractor shall take necessary action immediately and intimate the Engineer accordingly.

39.2 Workmanship

The quality of workmanship produced by skilled knowledgeable and experienced workmen, machines and artisans shall be excellent. Particular attention shall be given to the strength appearance and finish of exposed work.

40. MATERIALS AND EQUIPMENT

All materials and equipment incorporated in the work shall be new. Materials and equipment not covered by detailed requirements in the contract documents shall be of the best commercial quality suitable for the purpose intended and approved by the owner prior to use in the work.

40.1 *Optional Materials*

Only one brand, kind or make of material or equipment shall be used for each specific purpose through-out the works, notwithstanding that similar material or equipment of two or more manufacturers or proprietary items may be specified for the same purpose

41. USE OF APPROVED SUBSTITUTIONS OR EQUALS

The contractor shall bear all extra expenses resulting from providing or using approved substitutions or equals where they affect the adjoining or related work, including the expenses of required engineering, redesigning, drafting and permits where necessary, whether the Engineer's approval is given after receipt of tenders.

42. LAWS AND REGULATIONS

43. Governing Law
The contract documents shall be governed by the laws and by-laws of India, the State of Maharashtra and the local bodies in this region.

44. Resolving the disputes:
In case of disputes, between a Contractor and M.C./MJP, the decision of the Commissioner shall be final and binding. In case of any further dispute, the decision of Secretary UDD-2 / Member Secretary MJP or any other person appointed by the Secretary UDD-2 will be final.

45. BURRIED AND CONCEALED WORK

The contractor shall help in recording the precise location of all piping, conduits, ducts cables and like work that is buried, embedded in concrete or masonry, or concealed in wood or metal frame walls and structures at the time such work is installed and prior to concealment. Should the contractor cover such buried or work before such recording takes place, he shall uncover the unrecorded work to the extent required by the Engineer and shall satisfactorily restore and reconstruct the removed work with no change in the contract price or the contract time.

46. SAFETY PRECAUTIONS AND EMERGENCIES

Contractor's Responsibility for Safety

The contractor shall be solely responsible notwithstanding any stipulations by owner or Engineer for initiating, maintaining and supervising all safety precautions and programmes, in connection with the work and shall comply with all laws, ordinance, code rules regulations and lawful orders of any public authority having jurisdiction for the safety of persons or property or to

protect them from damages, injury or loss during the entire contract period including non-working hours.

On the occurrence of an accident arising out of the works which result in death or which is so serious as to be likely to result in death, the contractor shall within one hour of such accident intimate in writing to the Engineer the facts stating clearly and with sufficient details the circumstances of such accidents and subsequent action taken by him. All other accidents on the works involving injuries to the persons or property other than that of the contractor shall be promptly reported to the Engineer clearly and with sufficient details the facts of such accidents and the action taken by the contractor. In all cases, the contractor shall indemnify the Engineer against all losses or damages, resulting directly from the contractor's failure to report in the manner aforesaid.

This includes the penalties or fines, if any payable by the owner as a consequence of failure to give notice under Workmen's Compensation Act or otherwise to conform to the provisions of the said Act in regard to such accidents. In the event of an accident in respect of which compensation may become payable by the contractor, such sum of money as may, in the opinion of the Engineer, be sufficient to meet such liability will be kept in deposit. On the receipt of award from the Labour Commissioner in regard to the quantum of compensation, the difference in the amount will be adjusted.

It is obligatory that the contractor shall take an all Risk Insurance Policy for the works and keep it in force throughout the work period.

47. WARNINGS AND BARRICADES

The contractor shall provide and maintain barricades, guards, guard rails, temporary bridges and walkways, watchmen, headlights and danger signals illuminated from sunset to sunrise and all other necessary appliances and safeguards to protect the work, life, property, the public, excavations, equipment and materials. Barricades shall be substantial construction and shall be painted such as to increase their visibility at night. For any accident arising out of the neglect of above instructions, the contractor shall be bound to bear the expenses of defense of every suit, action or other legal proceedings, at law, that may be brought by any person for injury sustained owing to neglect of the above precautions and to pay all damages and costs which may be awarded in any such suit, action or proceedings to any such person or which may with the consent of the contractor be paid in compromising any claim by any such person.

48. ENGINEER'S STATUS DURING CONSTRUCTION, AUTHORITY OF THE ENGINEER

The Engineer shall have the authority to enforce compliance with the contract documents. On all questions relating to quantities, the acceptability of materials, equipment, or works, the adequacy of the performance of the work and the interpretation of the drawings and specifications, the decision of the Engineer shall be final and binding and shall be precedent to any payment under the contract agreement unless otherwise provided in the contract documents. The Engineer shall have the authority to stop the work or any part thereof as may be necessary to ensure the proper execution of the work, disapprove or reject the works which is defective, to require the uncovering and inspection or testing of the works to require re-examination of the works, to issue interpretations and clarifications, to order changes or alterations in the works, and other authority as provided elsewhere in the contract documents.

The Engineer shall not be liable for the results of any ruling, interpretation or decision rendered, or request, demand, instruction, or order issued by him in good faith. The contractor shall promptly comply with requests, demands, instructions and order from the Engineer.

The whole of the works shall be under the directions of the Engineer, whose decision shall be final, conclusive and binding on all parties to the contract, on all questions relating to the construction and meaning of plans, working drawings, sections and specifications connected with the work. The Engineer shall have the power and authority from time to time and at all times make an issue such further instructions and directions as may appear to him necessary or proper for the guidance of the contractor and the good and sufficient execution of the works according to the terms of specifications and the contractor shall receive, execute, obey and be bound by the same according to the true intent and meaning thereof; fully and effectually. Engineer may order any of the works contemplated thereby to be omitted, with or without the substitution of any other works in lieu thereof, or may order any works or any portion of works executed or partially executed, to be removed, changed or altered and if needful, may order that other works shall be substituted instead thereof and the difference of expenses occasioned by any such diminution or alteration so ordered and directed shall be deducted from or added to the amount of this contract.

49. DUTIES OF ENGINEER'S REPRESENTATIVE

The duties of the representative of the Engineer are to check, inspect and continuously supervise the work and to test any materials to be used or workmanship employed in connection with the works. He shall furnish the

drawings and information to the contractor, approve the contractor's drawings subject to post-facto approval and signature of the Engineer-in-Charge, recommend and approve the interim certificates and taking over certificates after thorough checking and inspection and recommend extra work required and extension of time.

Approval for or acceptance of any work or material or failure to disapprove any work or material by the representative of the Engineer shall not prejudice the power of the Engineer thereafter to disapprove such work of material and to order removal or modification thereof. If the contractor shall be dissatisfied with any decision of the representative of the Engineer, he shall be entitled to refer the matter to the Engineer, who shall thereupon confirm, reserve or vary such decision only in genuine cases.

The representative of the Engineer shall be liable to inform the Engineer about the daily progress and compare it with the programme. He shall also inform the contractor immediately about the log or lead in the progress than the programme.

50. DEFECTS AND RECTIFICATION

For period specified in the Clause 20 of B.1 form for the defect liability period for the individual type of work from the date of issuance of the completion certificate in accordance with Condition "Final Inspection and Acceptance" mentioned herein after, contractor shall remain liable for any of the works or parts thereof or equipment and fittings supplied which in the opinion of the Engineer fail to comply with the requirements of the contract or are in any way unsatisfactory or defective except fair wear and tear. The process of the assembly commissioning of all sections of pipe lines, tested hydraulically in patches, will involve some additional measures such as shaft of suitable height, fixing of air valves at more number of places on the alignment and all such measures shall be done by the contractor.

To the intent that the works and each part thereof shall at or as soon practicable after the expiry of the above period be taken over by the Engineer in the condition required by the contract to the satisfaction of the Engineer, the contractor shall finish the work (if any) outstanding at the date of completion as soon as may be practicable after such date and shall execute all such work of repair, amendment, reconstruction, rectification and making good of defects imperfections, shrinkages or other faults as may during the period of maintenance or after its expiry be required of the contractor in writing by the Engineer as a result of an inspection made by or on behalf of the Engineer prior to the expiry of

the period. The contractor at his own expenses shall carry out all such work if the necessity thereof shall in the opinion of the Engineer and due to the use of materials or to neglect or failure on the part of the contractor to comply with any obligation expressed or implied on the contractors pat under the contract. If the contractor fails to do any such work as entitled to carry out such work in which the contractor should have carried out at the contractor's own cost, the Engineer shall be entitled to recover from the contractor the cost thereof or may deduct the same from the moneys that become due to the contractor. Notwithstanding the aforesaid, if the contractor remains in default, one calendar month after the Engineer has given written instructions in writing, the Security Deposit shall become payable to the MJP/Corporation/Commissioner who will deduct the cost plus overhead expenses of such works as have been necessary to rectify the contractor's default and the balance, if any, shall be disbursed. The Contractor shall submit the operation and maintenance manual for the fruitful operation of the works. The Contractor will have a liberty to visit the operating works during the defect liability period and satisfy himself about the on-going operations in case he do not visit and a defect is observed then the Engineer's opinion shall be final and binding as to the application of defect liability.

51. RIGHT TO WITHHOLD

The Engineer may refuse to approve to any payment, or because of subsequently discovered evidence or the results of subsequent inspections or tests, nullify any such payment previously approved and paid to such extent as may be necessary in the opinion of the Engineer to protect him from loss because (a). The work is defective, (b) Third party claims have been filed or there is reasonable evidence indicating probable filing of such claims, (c) of the Contractor's failure to make payment properly to sub-contractors or for labour, materials or equipment, (d) of damage to another Contractor, or to the property of other caused by the Contractor, (e) of reasonable doubt that the work cannot be completed for the unpaid balance of the contract price, (f) of reasonable indication that the work will not be completed within the contract time, (g) of the Contractor's neglect or unsatisfactory prosecution of the work including failure to clean up. Once the provisions of law that enables or require the Engineer to withhold such payments are removed, payment will be made for amounts withheld because of them to the extent the contractor is entitled to payment.

52. FINAL INSPECTION AND ACCEPTANCE

Upon written notice from the contractor, that the entire work required by the contract documents is complete and that all submittals required by him are

made, and after the Contractor has delivered the bonds, certificates of inspection, guarantees, warranties, releases and other documents, as required by the contract documents or by law, the Engineer will make a final inspection, and he will notify the Contractor in writing of any particulars in which this inspection reveals that the work is defective, and will also notify the Contractor in writing of any deficiencies in the submittals and the document required from him.

The Contractor shall promptly make such corrections as are necessary to remedy all defects or deficiencies. After the Contractor has completed any such corrections to the satisfaction of the owner, the Engineer will issue a written completion certificate of the work and file any notice and completion required by law or otherwise.

53. CONTINUING OBLIGATION OF THE CONTRACTOR

The Contractor's obligation to perform and complete the work in accordance with the contract documents is and shall be absolute. Neither the observation during construction and final inspection of the work by the Engineer, nor any payment to the Contractor under the Contract documents, nor any use or occupancy of the work or any part thereof by the Engineer, nor any act of acceptance by the defective work by the Engineer shall constitute acceptance of work not in accordance with the contract documents.

54. TAXES TO BE DEDUCTED AT SOURCE

During the course of contract period the deduction of Income Tax/CGST and MGST or any other Central/State or local tax required to be deducted at source, will be made as per prevailing rules from the contractors bills and will be remitted to the concerned Departments. Certificate for such deductions will be issued by the Commissioner.

55. RECORDS AND MEASUREMENTS

The Engineer shall except or otherwise stated therein, determine by measurement the value in accordance with the contract of works done in accordance therewith.

All items having a financial value shall be entered in a measurement book, level book etc. as prescribed by the Engineer so that a complete record is obtained of all work performed under the contract.

The Engineer OR his authorized representative shall take measurements jointly with the Contractor or his authorized representative. Before taking measurement of any work the Engineer or the person deputed by him for the purpose shall give

reasonable notice to the contractor. If the contractor fails to attend or send an authorized representative for measurement after such notice or fails to countersign or record the objection within a week from the date of measurement, then in any such event measurements will be taken by the Engineer, or by the person deputed by him shall be taken to be correct measurements of the works and shall be binding on the contractor.

There shall be absolutely no doubt regarding the measurements and hence the contractor shall first arrange the exact branding of the alignment length on site, and mark distinctly. All hidden measurements shall be measured by steel tape, on the exact section as marked previously and depth by the regular staff generally at an average interval of 30 m or suitable interval decided by Engineer-in-Charge.

In case of difference of opinion in the measured quantity and the payable quantity of any particular measurements, the contractor must know the departmental practices developed as per the manuals and standard specifications.

Normally only excavation will not be measured. When the pipes and specials are laid in position, then only the excavation and other items will be measured.

The Contractor shall, without any extra charge, provide assistance with every appliance and other things necessary for measurements, such as leveling instruments (Auto setting), tapes, staffs, camera, paints, brushes and required labour.

Measurements shall be signed and dated by both the parties each day (for taking measurement) on the site on completion of measurements. The Contractor shall take up still colour photographs at intervals during the execution of works so that a history of development of the works is maintained.

The dated photographs, in two copies, shall be submitted to the Engineer-in-charge every time. No extra cost will be paid for this. This generation of record shall provide the used methodology of working and highlight the quality of material and workmanship. The cost of the said work shall be borne by the Contractor. It shall be the property of the Pradhikaran/Municipal Council/Corporation. and shall not be used for campaigning, advertising without permission of the Pradhikaran/ Council/Corporation.

56. WRITTEN NOTICE

Written notice shall be deemed to have been duly served or delivered in person to

the individual or member of the firm or to an Engineer of the contractor for whom it was intended, or if delivered at or sent by registered or certified mail to the last business address known to him who gives the notice. The notice on the Fax Message/ E-Mail shall be deemed to have been duly served. The address given in the contractor's tender on which all notices, letters and other communications to the contractor shall be mailed or delivered, except that said address may be changed by the Contractor by notifying the owner in writing. This shall not preclude the service of any notice, letter or other communication upon the Contractor personally.

57. USE OF COMPLETED PORTIONS

The owner shall have the right, upon written notice to the Contractor, to take possession or occupancy of, and use any completed or partially completed portions of the work, notwithstanding that the time for completing the entire work or such portions may not have expired but such taking possession or occupancy and use shall not deemed to waive of any requirement of the contract documents or a waiver or acceptance of any work not completed in accordance with the contract documents.

58. CLEANING UP

The contractor shall at all times during the work keep the site and premises, adjoining property and public property free from accumulations of waste materials, rubbish, and other debris resulting from the works, and at the completion of the work shall remove all waste materials, rubbish and debris from and about the site and premises as well as all tools, construction equipment and machinery and surplus materials, and shall leave the site and premises, clean, tidy and ready for occupancy by the owner. The Contractor shall restore to their original condition those portions of the site not designated for alteration by the contract documents paved ways, parking areas and roadways disturbed by the construction shall be redone by filing the excavation, if any, by sand compacted material and bringing it to its original shape as directed and approved by the Engineer. No waste material shall be buried or disposed off on the owner's property unless so approved in writing by the Engineer-in-Charge. Before the Contractor applies for final inspection and acceptance of the work, all items of work shall be complete, ready to operate, and in a clean condition as determined by the Engineer.

59. OWNER'S RIGHT TO CLEAN UP

If the Contractor fails to satisfactorily clean up or if a dispute arises between the Contractor or in several Contractors as to their responsibility for cleaning up, the Engineer may clean up and charge the cost thereof to the Contractor for his failure, or to the several contractors as the Engineer shall determine to be

just.

60. FOSSILS ETC.

All fossils, coins, articles of value of antiquity and structures or other remains or things of geological or archaeological interest discovered on the site shall be deemed to be the property of the owner and the Contractor shall take reasonable precautions to prevent his workmen or any other person from removing or damaging any such article or thing and shall immediately upon discovery thereof and before removal acquaint the Engineer of such discovery and carry out at the expenses of the Engineer's order as to the disposal of the same.

61. LABOUR RULES

If demanded by Municipal Authorities, the contractor will have to produce to the satisfaction of the accepting authority a valid and current license issued in his favor under the provision of Contract Labour (Regulation and Abolition) Act 1970, before starting the work, otherwise the Contractor shall have to face the further consequences. The contractor shall have to comply with the Apprentices Act 1961, and the rules and orders issued there under from time to time. If he fails to do so, his failure will be breach of contract and the Superintending Engineer, may in his discretion, cancel the contract, the Contractor shall also be liable, for any pecuniary liability arising on account of any violation of the provisions of this act, by him.

Salient features of some major labour laws/ Acts applicable to establishment engaged will be as below.

a. Workman compensation Act 1923.
b. Payment of Gratuity Act 1972.
c. Employees PF and miscellaneous provisions Act 1952.
d. Maternity Benefit Act 1951.
e. Contract Labour (Regulations and Abolition) Act 1970.
f. Minimum Wages Act 1948.
g. Payment of Wages Act 1936.
h. Equal Remuneration Act 1979.
i. Payment of Bonus Act 1965.
j. Industrial Disputes Act 1947.
k. Industrial Employment (Standing orders) Act 1946.
l. Trade Union Act 1926.
m. Child labour act 1926.
n. Inter state Migrant Workmen's (Regulation of Employment and Conditioned of Services) Act 1979.
o. The Building and other construction works (Regulation of employment and

conditions of Services Act 1946 and the cess Act of 1996).

p. Factories Act 1948.

All the relevant law and act will be applicable for this work.

62. STATUTORY INCREASE IN DUTIES, TAXES ETC.

All the taxes and duties levied by the Central Govt., State Govt and by Local Bodies at the prevailing rates applicable on the date of receipt of tender, considering this contractor should quote his offer. Any increase in tax rates till completion of work shall be fully borne by the Contractor and shall not be reimbursed to him on any account.

63. INSPECTION, TESTING & FEES.

All material & equipment, irrespective whether specified or not, shall be tested at manufacturer's works laboratory and the Test Certificate thereof shall be furnished. The test shall be witnessed by the Engineer-in-charge as well as the third party designated by the Pradhikaran/ Council/Corporation.

64. MACHINERY REQUIRED

All machinery required for erection/execution purposes such as cranes, trucks, etc. shall be arranged by the Contractor. Department shall not take any responsibility for providing such machinery even on rental basis. No concreting shall be permitted unless centering and reinforcement is approved by the Engineer-in-Charge.

65. WORK ORDER BOOK

A well bound work order book shall be maintained on site and it shall be the property of MJP/Corporation/Council and the Contractor/ his agent shall promptly sign orders given therein by the Engineer in charge of Maharashtra Jeevan Pradhikaran /Commissioner/Commissioner. officials or his superior officer, in token of having received them and comply them.This will be a permanent record The compliance shall be reported by the contractor to the Engineer in good time so that it can be checked. The blank work order book with machine numbered pages will be provided by the MJP/Corporation/Council free of charge for this purpose. The Contractor will be allowed to copy out the instruction therein from time to time. He will not record any remarks in the order book but may take up the matter recorded therein.

66. DISCREPANCIES AND OMISSIONS

The tender drawings and specifications, shall be considered as explanatory, of each other and together shall form the technical requirements and stipulations of tender documents. Detailed drawings shall have preference over small scale drawings. Similarly, detailed specifications shall have preference over general specifications. Should any discrepancy arise as to the meaning, intent or interpretation of any specification or drawing the decision of the Engineer- in-charge shall be final and binding on the Contractor.

67. PRICE VARIATION - AUTHORITY

Price variation is not applicable to this tender.

68. NO INTEREST ON DUES

No interest shall be payable by the Pradhikaran/Corporation/Council on amounts, due to contractors pending final settlement of claim. Further, no interest shall be payable by Corporation/Council on any amount/payment.

69. Any recovery advised by the MJP/_____ shall be recovered from any bill or money retained from this contract. All the recoveries either outstanding or dues under the contract or incidental there to as determined may be, stand recoverable.

Secured Advance will be granted as per provisions made in MPW Manual and MPW Account Code.

70. Mobilization Advance will not be granted.

71. The tenderer is entitled to avail exemption from central excise tax, to all items of machinery, including instruments, apparatus and appliances, auxiliary equipment and their components/parts required for setting up a water treatment plants intended to treat water to make it fit for consumption of humans or animals. Central excise duty will also be exempted on pipes of sizes 100 mm and above required for obtaining untreated (raw) water from its source to the plant and for supplying the treated (potable drinking) water to the storage place from which it would be further supplied for consumption of humans or animals. The concession would be subject to the certification by the Collector/District Magistrate/Deputy Commissioner of the District in which the water treatment plant is to be set-up. To avail exemption on duty the tenderer himself shall pursue the matter with different Government Departments. Any co-operation in this regard will be extended to the tenderer. The tenderer shall quote his offer taking into account

above exemption which he may avail.**(Now Deleted)**

72. Successful Bidder shall execute Trunk Mains on Priority basis.

SPECIAL CONDITIONS

Solapur Municipal Corporation, Solapur

Name of work : SOLAPUR CITY UNDERGROUND SEWERAGE SCHEME UNDER AMRUT MISSION (FOR SEWERAGE ZONE I to IV, VI & IX to XIII)

(Providing, lowering, laying, jointing and testing Sewage Collection System, Rising main, Construction of Sump and Pump house, STP Cap.20.00 MLD & 15.50 MLD based on MMBR Technology.)

SPECIAL CONDITIONS

1) Payment against Excess quantities of various items.

Before making payment of excess quantities as per rules, the concerned Executive Engineer/ Engineer in charge of /Corporation/Council shall get himself satisfied regarding genuineness of the claim and he should also exercise a compulsory check of minimum 10 % of measurements for a particular item. Responsibility of informing the excess quantities as per Schedule 'B' of the tender for approval of Competent authority of Maharashtra Jeevan Pradhikaran /Corporation/Council and also for correctness of claim to be submitted in future shall rest with Junior Engineer, a auditor and divisional Accountant also. While submitting the proposal for approval, concerned authorities should consider the exact position of the revised estimates, if necessary due to this excess.

For executing any quantity, the excess over the quantity specified in the tender, the contractor should be authorized by the Executive Engineer/Engineer in charge of Maharashtra Jeevan Pradhikaran/Corporation/Council in writing.

While asking the contractor to execute such excess quantity, the concerned Executive Engineer/Engineer in charge of Maharashtra Jeevan Pradhikaran/Corporation/Council should inform the Contractor in writing specifically that the payment in excess of quantities specified in the tender will be made after following concerned prescribed rules.

2) General

The quoted rate shall be total rate for the completed item of work as per the specification, and shall be inclusive of all incidental charges such as lifts, leads for materials, water for construction etc. The rates for excavation are inclusive of the edge of the excavation pit beyond foundation.

The tenderer must obtain on his own responsibility and his own expenses all the information which may be necessary for the purpose of making a tender and entering into a contract and must consider and satisfy himself with all local conditions, sites and quarries means of accesses, the nature of rock, material to be met with in all execution and all materials pertaining to work.

Specifications of item stipulated for other sub works shall be made applicable, where relevant.

3) Outline of works

The work will be on the lines of plans attached to the tender documents. The plans are however, liable to change and strata as shown there is approximate.

The item of work and their approximate quantities are given in schedule 'B' of the tender. The quantities are approximate and are liable to vary on plus or minus side.

4) Unit

The rates quoted for each item are for units mentioned in Schedule 'B' against each item.

5) Site conditions

1. It shall be presumed that the Contractor has satisfied himself as to the nature of the works, general and local conditions, particularly on those bearings on transport handling, storage of materials, availability of labour, weather conditions and has estimated the cost and quoted his rates accordingly Executive Engineer, Maharashtra Jeevan Pradhikaran/Engineer in charge of Corporation/Council will bear no responsibility for lack of such acquaintance with site conditions and consequences thereof.

2. Set of tender documents and conditions (up to a maximum of three sets) at the discretion of the Executive Engineer, Maharashtra Jeevan Pradhikaran/Engineer in charge of Corporation/Council will be supplied to the contractor after acceptance of tender.

6) Extras, Omissions and Discrepancies.

1. In all the cases of the omissions, doubts or discrepancies in the dimension in the drawing and items of works, reference shall be made to the Executive Engineer, Maharashtra Jeevan Pradhikaran/Engineer in charge of Corporation/Council , whose elucidation and elaboration shall be considered final.

7) Supply of material by the contractor.

7.1 The contractor should supply all the material mentioned in Schedule "B". This shall be conforming to relevant IS & approved MJP vendors.. All types of pipes, valve and specials will be accepted only after due third party inspection and satisfactory inspection by the third party inspection agencies appointed by the MJP. (List of third party inspection agencies appointed is periodically circulated by the MJP central office). The charges for the same shall be borne by the contractor.

7.2 Other material such as cement, tor steel etc. shall be conforming to relevant ISS testing charges for cement, steel shall be borne by the contractor. Ultra Tech cement (Ultra tech) shall be preferably be used for water retaining structures.

7.3 In case of item of supply of pipes, valves, specials etc., 60% amount of supplied item will be paid to the contractor on receipt of material (after satisfactory third party inspection), 25% amount will be released after lowering, laying, jointing and remaining 15% amount will be released after satisfactory hydraulic testing.

7.4 The contractor shall provide, at the site of work, satisfactory storage for not less than one month's average consumption of works and shall keep the cement of storage and utilization of cement in the order of its arrival at the stores and the contractor shall maintain satisfactory records, which would at any time show the dates of receipt and proposed utilization of cement lying in the storage.

7.5 The Executive Engineer, Maharashtra Jeevan Pradhikaran/Engineer in charge of Corporation/Council shall at all the times have access to the stores and sites, method of storage, records and securities provided by the contractor. The contractor shall comply with instruction that will be given by Executive Engineer, Maharashtra Jeevan Pradhikaran/Engineer in charge of Corporation/Council , in this behalf.

7.6 The contractor shall further at all times satisfy the Executive Engineer, Maharashtra Jeevan Pradhikaran/Engineer in charge of Corporation/Council on demand any production of books, of submissions of returns in Performa as directed, other proofs, that, the cement supplied is being used for the purpose for which it is supplied and available to the Executive Engineer, Maharashtra Jeevan Pradhikaran/Engineer in charge of Corporation/Council .

8 TIME OF COMPLETION OF WORK:-

If at any stage of work, it is found that the execution of work is not as per the programme given in the Bar Chart, a fine shall be imposed on the contractor as mentioned in the agreement form.

9. APPOINTMENT OF ARBITRATOR:-

In case of any disputes raised between contractor and Executive Engineer/Engineer in charge during the course of contract regarding work, there shall be no provision for the appointment of an Arbitrator. The decision of the Member secretary MJP /secretary UDD2/Any other person appointed by secretary UDD2 shall be held as valid and final. If the contractor files a case in appropriate court, the action of withdrawing the work and allotting it to any other agency shall be deemed to be continued as per the practice in vogue in the larger interest of implementation of work in time and as per original time schedule.

10. STRATA :

Strata for excavation are shown approximate based on trial pits and the Contractor shall have no right to claim extra if there is variations in the strata. The contractor will also have no claim if extra excavation is required to be done due to boulders and the Contractor will have to make such extra excavation good by filling the same by C.C. 1:3:6 (M-100) or by plum concrete with 60% plum in C.C.1:3:6 maximum

11. CHANGE IN SITE:

No claims shall be paid on account of reasonable change in site, alignment or orientation of the proposed work, within the work site marked on plan attached to the tender as the circumstances may call for.

12. TOOLS AND PLANT:

All tools, instruments and machinery and all other materials (not included in the Material Schedule 'A') shall be acquired by the Contractor. It is, however, open to the Engineer to lend or supply to the Contractor implements, machinery or other service not covered by the tender document which he can be and may consider desirable. For such tools, instruments, machinery and service provided, the Contractor will have to sign an agreement and pay Security Deposit and rental charges as may be fixed by the Engineer.

13. EXCAVATED MATERIALS:

All excavated stuff shall be MJP/CORPORATION/Council s property and shall be disposed off at lead and lift by the Contractor in a manner as directed by the Engineer.

14. DAMAGES TO UNDER/ABOVE GROUND UTILITY

During the course of excavation and laying of the pipe line utmost care of existing main, electrical and telephone cables and private water connections/sewage connections shall be taken. Any damage to existing main electrical and telephone cable and private water/ sewage connection, etc, occurs during the course of execution, same shall be restored at the cost of the contractor. In case the repairs are done by owner, the cost of such repair will be recovered from the contractor.

Rates for all type of materials are inclusive of CGST & MGST and all taxes levied by Central Government, State Government or local bodies.

Rates for supply of specials and valves are inclusive of CGST & MGST, Third party inspection charges, storage charges, overhead charges and transportation of materials up to site and stacking. Rates mentioned in the tender are inclusive of all

Central Govt, State Govt. and Local taxes, duties and cess etc.

15. Though the contractor is required to do refilling before hydraulic testing to avoid traffic hurdle, no payment for refilling of the trenches of pipe line shall be payable till satisfactory hydraulic testing is given. Re-excavation required if any during testing shall be done by contractor at his own cost.

16. The works of cross connections to existing lines are to be arranged in such a way as no major shutdowns are required to be taken and work should be completed within minimum period of time, without interrupting the major water supply in the area.

17. Activity in Bar chart and network diagram (CPM / PERT) shall be modified regularly in case any activity could not be done in time due to some extra ordinary reason. The same modified Bar Chart/Network diagram should be submitted for approval of Engineer-in-Charge or competent authority of Corporation, who will give approval after consultation with MJP.

18. Work shall be executed in stages as mentioned in CPHEEO manual for Sewerage

19. TRAFFIC MANAGEMENT DURING CONSTRUCTION

1.1. The work involves conductance of work on busy city streets & the roads. The Contractor shall at all time carry out work on the roads in a manner creating least interference to the flow of traffic, while being consistent with the satisfactory execution of the same. For the works involving construction works along the roads, the Contractor shall, in accordance with the directives of the Engineer,provide and maintain, during execution of the work, a passage for traffic either along a part of the existing carriageway, where work is under progress or along a temporary diversion constructed beside the road. The Contractor shall prepare complete plan of traffic arrangements during construction including phased traffic diversion plan as a whole, covering such diversions, as may be required and get same approved from Engineer-In- Charge at the start of the work. The diversion arrangements along any section particular section of the road shall be got approved from the Traffic authority before commencing the related work. The scope of work includes construction & maintenance of diversions till completion of the project, failing which Contractor will be fully responsible for inconvenience, injuries, accidents and liabilities arising out of the same.

1.2. Signs, lights, barriers and other traffic control devices shall be provided and maintained in a satisfactory condition till such time, as they are required as per directions of the Engineer, so as to ensure smooth and safe traffic on the road throughout the length, where the work is in progress. Necessary traffic

management arrangement at temporary diversions by signs, lights, barriers etc. is also included in the scope 1.3. The Contractor shall take all necessary measures for the safety of traffic during construction and provide, erect and maintain such barricades, including signs, markings, flags, lights and flagmen as may be directed by the Engineer for sake of information and protection of traffic approaching or passing through the sections of the roads, where the work is in progress. The barricades erected on either side of the carriageway / portion of the carriageway closed to traffic, shall be of strong design to resist violation, and painted with alternate black and white stripes, red lanterns or warning lights of similar type shall be mounted on the barricades at night and kept lit throughout from Sunset to Sunrise. 1.4. At the points, where traffic is to deviate from its normal path (whether on temporary diversion or part width of the carriageway) the channel for traffic shall be clearly marked with the aid of pavement markings, painted drums or similar devices as per the directions of the Engineer. At night, the passage shall be delineated with lanterns of other suitable light source. One-way traffic operation shall be established whenever the traffic is to be passed over part of the carriageway inadequate for two-lane traffic. This shall be done with the help of temporary traffic signals or flagmen kept positioned on opposite sides during all hours. For regulation of traffic, the flagmen shall be equipped with red and green flags and lanterns / lights. On both sides, suitable regulatory / warning signs as approved by the Engineer shall be installed for the guidance of road users. On each approach, at least two signs shall be put up, one close to the point where transition of carriageway begins and the other 120 m away. The signs shall be of approved design and of reflector type, if so directed by the Engineer. 1.5. Signs, lights, barriers and other traffic control devices, as well as the riding surface of diversions shall be maintained in a satisfactory condition till such time they are required as directed by the Engineer. The temporary travel way shall be kept free of dust by frequent applications of water, if necessary. 1.6. All arrangements for traffic during construction including provisions as above, including their operation, maintenance, dismantling and clearing shall be deemed to be included in the scope of items of construction works involving the works along the city roads and no separate payment shall be admissible therefore.

DESILTING, CLEANING

Although not included in the contract agreement the maintenance of work executed, the contractor shall carryout periodical maintenance of the work executed under the contract Viz. desalting and cleaning etc. for smooth working of the scheme. Contractor shall not claim any extra cost for this. Taking over by the Engineer or his authorized representative will always be in writing, of which copies will be given to the Engineer and his authorized representative and the Contractor. The Engineer on completion of the takeover of the works shall issue the Taking over

certificate to the Contractor. The security deposit retained by the Panchayat as per Clause 1 of B1 Form of Contract shall be released fully subject to the provision of defect liability clause, only after Taking Over certificate is issued by the Engineer.

UNDER GROUND UTILITIES, STRUCTURES, SERVICES AND THEIR SHIFTING

3.1. The indication of the type and approximate quantity of existing underground utilities and sub structures has been presented in the Contract documents from the vividly known details, but the accuracy and completeness of such indications are not warranted by the Corporation or the Engineer and utility, structures and services not so indicated may exist. Before commencing any excavations, the Contractor shall investigate; determine the actual locations, types and details of the underground utilities and structures. He shall determine the existing condition and ownership of the utilities and sub structures in the site before the work is to be performed, by communication with such owners, by search of records, or otherwise and shall protect all such utilities and sub structures.

3.2. The items pertaining to shifting of the various utilities & services have been provided in the Schedule B (BOQ), as could be best judged by the Engineer. The Contractor shall carry out shifting of utilities and services covered under such items as per the specifications & directions of the Engineer. The quantities put to tender pertaining to items of shifting of the utilities are approximate and may vary during execution as per actual requirements. In case of excess occurring in quantities of such items, the provisions of Clause 38 of B1 Form of Contract shall apply and the payment will be regulated at rates derived from the rates entered in the current schedule of rates from MJP and in the absence of which at the prevailing rates, the said rates may be increased or decreased as the case may be by the percentage which the total tendered amount bears to the estimated cost of the work as put to tender based upon the schedule of rates applicable to the year in which the tenders were invited. If any utility or services not covered under the Schedule B are met during course of execution, the contractor shall carry out the work of shifting of such utilities & services as per direction of the Engineer. The payment for such work not covered in the tender items shall be regulated as Extra Items under the provision of Clause 14 of B1 form of Contract.However, the Contractor shall not keep such extra work in abeyance on plea of approval to the rates & shall complete it expeditiously as per the urgency of the work and as directed by the Engineer.

3.3. While carrying out work of any nature and magnitude, related to shifting of utilities & services or removing sub structures, the Contractor shall seek necessary permission from the respective owner of the utility or the other department of the Panchayat as necessary. The Contractor shall abide by the regulations, procedures, specifications & technical requirements in vogue or as set forth by the respective

owners of the utilities and services. The Contractor shall provide the personnel of skills, qualifications and specialty, as required for proper conductance of shifting of particular type of utility in conformity with the stipulations of the owner of the utility. The Municipal Council shall provide to the Contractor, necessary documentation and liaison at various levels required in connection of shifting of utilities. The official charges if any paid by the Contractor on behalf of the Municipal Council to the owners of the utilities in connection of seeking permissions or as statutory requirement shall be reimbursed to the Contractor on his providing required supporting documents, bills, receipts etc. 3.4. In case shifting of major utilities and services is anticipated, in any stretch of work, the Engineer shall be notified by the Contractor well in advance, for his inspection & for confirming the time schedule of shifting as well as the extent and the method, in which the shifting is to be carried out.

QUALITY ASSURANCE

To ensure the specified quality of work, which will also include necessary surveys, temporary works etc., the Contractor shall prepare a quality assurance plan and get the same approved from the Engineer-in-charge within a fortnight, from the date of work order. For this, the Contractor shall submit an organization chart of his technical personnel to be employed on the work along with their qualifications, job descriptions, defining the functions of reporting, supervising, inspecting and approving. The Contractor shall also submit a list of equipment, plant and the machinery and instrumentation, which he proposes to deploy for the construction work and for testing in the field and / or in the laboratory and monitoring. The Contractor shall modify / supplement the organization chart and the list of machinery, equipment etc. as per the directions of the Engineer-incharge and shall deploy the personnel and equipment on the field as per the approved chart and list respectively. The Contractor shall submit written proposal, elaborating the methods & Techniques he intends to adopt for execution of the work in accordance with the specifications. The proposal shall be got approved from the Engineer-in charge by incorporating the changes as suggested by him. The quality of the work shall be properly documented through certificates; records, checklists and logbooks of results etc as per the system and formats got approved from the Engineer in Charge. Such records shall be maintained from the beginning of the work and be continuously updated and supplemented. It will be the responsibility of the Contractor to implement the quality assurance on all works under the Contract.

SITE OFFICE & FIELD LABORATORY

The Contractor shall provide site office and field laboratory of adequate area as required for facility of site work. The office shall be located at the place allotted by the Panchayat and shall be adequately furnished as directed by the Engineer in

Charge. The field laboratory shall be located adjacent to the site office. The office & the laboratory shall be provided with basic amenities like water supply, electric supply .toilet facility etc. Laboratory tables, cupboards, slotted angle storage acks, working space,washbasin, toilet facility, curing tank etc. shall be provided. The site should be equipped adequately for conducting field tests on concrete viz. cube oulds and slump measuring cone for test samples for concrete work.The Contractor shall appoint a qualified Engineer experienced in conducting the field tests and lab tests on concrete. The Contractor shall seek Engineer's approval for the appointment of the person. The contractor has to setup and establish the equipments within a month from the date of work order, failing which non-refundable penalty of Rs. 3000/- per day will be imposed on contractor for the period the Contractor remains in default.The site office building shall be maintained by the Contractor. The maintenance shall include day to day up keep of the building, surroundings, repairs to building,furniture, fittings, office equipments and periodical painting to the surfaces, wars & watch during day & night. The laboratory set up shall be maintained till physical completion of the work in all respects, while the site office shall be maintained till the period of maintenance stipulated under the contract is over & the works are handed over to the Panchayat.The cost of constructing office cum laboratory, providing furniture and laboratory equipment and expenses incurred on the salaries of the personnel, manning the set up and maintenance & up keep of the building, furniture & equipment shall be considered as incidental to the work and no separate payment will be made for the same.After completion of aforesaid period of maintenance, the Contractor shall demolish the building structure and remove all the equipments as per directions of the Engineer.

TESTING OF SAMPLES

The Contractor shall at his cost, make all arrangement and shall provide for all such facilities as the Engineer-in-charge may require for collecting, preparing and forwarding required number of samples as directed in BIS for tests or for analysis at such time and to such place or places as may be directed by the Engineer and bear all charges and cost of testing including transport. Such samples shall be deposited with the Engineer in Charge, till these are sent for testing. Samples of materials shall be got tested from Engineering College and approved by the Engineer-in-charge and shall be preserved till the completion of work. All materials to be used on work, such as cement, rubble, bricks, aggregates,TMT steel, structural steel, DI and RCC pipes, bearings, expansion joints,asphalt, pumping machinery with allied equipments etc. shall be got approved in advance from the Engineer & shall pass the test and analysis required by him, as specified in the specifications of the items concerned or relevant I.S.I.specification or such requirements, tests and / or analysis as may be stipulated by the Engineer. The contractor shall, if and when

required, submit at his cost,the samples of materials to be tested or analyzed and if so directed, shall not make use of or incorporate in the work any materials represented by the samples until the required tests or analysis have been made and the materials finally accepted by the Engineer-in-Charge. The contractor shall not be eligible for any claim or compensation either arising out of any delay in the work or due to any corrective measures required to be taken on account of & as a result of testing of the materials. All the materials listed above shall be tested from third party approved by the Engineer in charge and the reports shall be submitted to owner.

20. INCENTIVE BONUS

As an encouragement to the early completion of the project an incentive bonus will be payable to the contractor.

If contractor completes the work before scheduled time limit, he will be paid incentive bonus at the rate of 0.5% of the initial contract value or revised contract value whichever is less for every one month of early completion ahead of the original completion period or revised completion period whichever is less.

Maximum incentive payable shall not be more than 3% of the original value or revised value whichever is less.

This incentive scheme shall not apply if extension to the original completion period is required irrespective of on whose account (Owner or Contractor's account). Period less than a month will not reckoned for the incentive bonus calculations.

21. All the bills in R A bill format shall be submitted to the MJP by the contractor. The bills will be checked and scrutinized by MJP and will be submitted to the ULB for Recording, Passing and Payment by the ULB.

22. The bills vetted and submitted by the PMC will be normally cleared and payment will be released within a period of 15 days from the receipt of such vetted bills by the ULB or executing agency as the case may be. Such payment will be subject to availability of funds with the ULB or executing agency.

23. Extension of time limit will be granted by Executive Engineer MJP/Commissioner after obtaining approval/consent of competent authority of MJP/Municipal Council.

INSTRUCTIONS TO TENDERER

Solapur Municipal Corporation, Solapur

Name of work : SOLAPUR CITY UNDERGROUND SEWERAGE SCHEME UNDER AMRUT MISSION (FOR SEWERAGE ZONE I to IV, VI & IX to XIII)

(Providing, lowering, laying, jointing and testing Sewage Collection System, Rising main, Construction of Sump and Pump house, STP Cap.20.00 MLD & 15.50 MLD based on MMBR Technology.)

INSTRUCTIONS TO TENDERER

1. **AWARD CRITERIA**

The Owner will award the contract to the successful bidder whose bid has been determined to be substantially responsive and has been determined as the lowest evaluated bid, provided further that the Bidder is determined to be qualified to perform the contract satisfactorily. The tender will be awarded after bid evaluation report approved by the appropriate competent authority.

2. **ACCEPTANCE OF THE TENDER**

2.1 The acceptance of the tender rests with the appropriate competent authority. The right to reject any or all the tenders without assigning any reason thereof is reserved by appropriate competent authority. . The tenderer whose tender is accepted will have to enter into regular agreement in the type and form prescribed in the tender and abides by all the rules embodied therein, cost of agreement etc. should also be borne by the tenderer.

2.2 No corrections, additions or alterations in the tender document shall be made. No special stipulations in the tender document shall be permitted.

2.3 The tender shall be liable to be rejected outright if while submitting the same.

i) The Tender is not submitted on E-tendering portal specified in the Tender Notice.
ii) The Tenderer proposes any conditions and alterations in the obligatory conditions of the tender.
iii) Any of the pages of the tender is removed/replaced or spoiled badly.
iv) If the offer in words and in figures is not filled in appropriate place of B.1 Form.
v) If the specified Earnest Money in specified form is not paid.
vi) Any erasures are made in the tender documents.
vii) The tenderer or in case of firm or company authorized person does not sign the tender documents in the place provided for the purpose, in B.1 Tender form.

2.4 If the tendering contractors are a firm or company, they shall in their

forwarding letter should mention the names of all the partners of the firm or the company as the case may be and the names of the partners who hold the power of attorney authorizing him to conduct transactions on behalf of the Company/Firm.

2.5 Rules and conditions of the contract are subject to amendment till the time of acceptance of tender.

2.6 The notes and conditions stipulated in this notice will form a part of the agreement.

3.0 SIGNING OF CONTRACT

At the same time as the Owner notifies the successful Bidder that the bid has been accepted, the Owner will send the Bidder an acceptance letter informing the Bidder, the further necessary line of action including signing of contract etc.

4.0 FOR SPECIAL ATTENTION OF TENDERER

The tenderer is expected to visit the site before quoting the tender and get himself acquainted with the site conditions and site requirements.
The contracting firm shall study the site and general conditions in respect of approaches, labour, water supply, climate, quarries and the data included in the tender papers and get verified from the actual inspection of site etc. before submitting the tender. In case of any doubt about any item or data included in the tender or otherwise, it shall be got clarified by applying in writing to the tender inviting authority at least 3 days before the date of pre-tender conference. Once the tender is submitted, it shall be concluded with all the details required for completing the work as per tender conditions and specifications.
Responsibility of Departmental staff will be nominal and limited to extending all possible help in solving local problems for obtaining permission, obtaining power supply etc.

5.0 LOCAL ROADS

The existing public roads that are near the site of work are shown in Drawing accompanying the Tender documents. The contactor may construct and maintains additional roads as required at his own expenses.

6.0 MEDICAL AND SANITARY ARRANGEMENT TO BE PROVIDED FOR LABOUR EMPLOTED IN THE CONSTRUCTION BY THE CONTRACTOR

a) The contractor shall provide an adequate supply of pure and wholesome water for the use of labourers on works and in camps.

b) The contractor shall construct trenches, semi permanent latrines for the use of labourers , Separate latrine shall be provided for men and women.

c) The contractor shall construct sufficient number of huts on a suitable plot of land for use of the labourers according to the following specifications.

i) Hut of Bomboos and Grass may be constructed.

ii) A good site not liable to submergence shall be selected on high ground remote from jungle but well provided with trees shall be chosen wherever it is available. The neighborhood of land, jungle s trees or woods should be particularly avoided . Camp should not be established close to large cutting of earth work.

iii) The lines of huts shall have open space of at least 10 meters between rows. When a good natural site is not available in this case. Particular attention should be given to the drainage.

iv) There should be no over crowding , floor space at the rate of 3 sqm. (30 sq.ft) per head shall be provided . Care should be taken to see that the huts are kept clean and in good order.

v) The contractor must find his own land and if he wants Govt. land he should apply for it. Assessment for it if demanded will be payable by contractor. However the department does not bind itself for making available the required land.

d) The contractor shall construct a sufficient number of bathing places. Washing places should also be provided for the purpose of washing clothes.

e) The contractor shall make sufficient arrangement for draining away the surface and sullage water as well as water from the bathing and washing places and shall dispose off this waste water in such a way as not to cause any nuisance.

f) The contractor shall engage a medical officer with a traveling dispensary for a camp containing 500 or more persons, If there is no Govt. Or other private dispensary situated within 8 kilometers from the camp. In case of emergency the contractor shall arrange at his cost free transport for quick medical help to his sick workers.

g) The contractor shall provide the necessary staff for erecting the satisfactory conservancy and cleanliness of the camp to the satisfaction of the Engineer-In-Charge. At least one sweeper per 200 persons should be engaged.

h) The Assistant Director of Public Health shall be consulted before opening a labour camp and his instructions on matters such as Water Supply, sanitary, convenience for the camp site accommodation and food supply be followed by the contractor etc.

i) The contractor shall make arrangement for all antimalarials measures to be

provided for the labours employed on the work. The anti measures shall be as directed by Assistant Director of public health.

j) In addition to above all provisions of the relevant labour Act pertaining to basic amenities to be provided to the labourer shall be applicable which will be arranged by the contractor.

7. MISCELLANEOUS

7.1 For providing electric wiring or water ling etc. Recesses shall be provided if necessary through walls, slabs, beams, etc. and later-on refilled it who out any extra cost.

7.2 In case it becomes necessary for the due fulfillment of contractor for the contractor to occupy land outside the department, limits the contractor will have to make his own arrangements with the land owners and pay such rents if any, which are payable as mutually/agreed between them.

7.3 The contractor shall duly comply with provisions of the Apprentices Act 1961 (III of 1961) and the rules and order made there under from time to time under the said rules and on this failure or neglect to do so he shall subject to all the liabilities and penalties provided by the said Act and Said Rules.

7.4 It is presumed that the contractor has gone carefully through the standard specification (Vol I and II 1981 edition) and the schedule of rates of the Division, and studies of site condition before arriving at rates quoted by him. The special provisions and detailed specification of wording of any item shall gain precedence over the corresponding contrary provisions (if any) in the standard specification given without reproducing the details in contract. Decision of Engineer in charge shall be final in case of interpretation of specification.

7.5 If the standard specifications fall short for the items quoted in the schedule of this contract, reference shall be made to the latest Indian standard specifications, I.R.C. code, if any of the item of this contract do not fill in reference quoted above the decision and specification as directed by the Engineer-In –Charge. Shall be final.

7.6 The stacking and storage of building materials at site shall be in such a manner as to prevent deterioration or inclusion of foreign material and to ensure the preservation of the quality. Properties and fitness of the work. Suitable precautions shall be taken by contractor to protect the materials against atmospheric action, fire and other hazards. The materials likely to be carried away by wind shall be stored, in suitable stores or with suitable barricades and where there is likelihood of subsidence of soil, heavy ,materials shall be stored on paved platforms. Suitable separation barricades and enclosure as directed shall be provided to separate materials brought by contractor and material issued by Govt. To contractor under Schedule- A. Same applies for the materials obtained from different source of

supply.

8.0 HANDING OVER OF WORK

All work and material before taken over by Municipal Council/Corporation will be entire responsibility of the contractor for guarding, maintaining and making good, any damage of any magnitude. Interim payments made for suck work will not alter this position. The handing over by the contractor and taking over by the Executive Engineer/Engineer in charge or Commissioner or his authorized agent will be always in writing, copies of which will go to the Executive Engineer, signed by authorized representative of Maharashtra Jeevan Pradhikaran/Municipal Council/Corporation and the contractor. It is however understood that before taking over of such work Maharashtra Jeevan Pradhikaran/Municipal Council/Corporation will not put the system into its regular use, casual or incidental one, except as specifically mentioned elsewhere in this contract or mutually agreed to.

ACQUAINTANCE WITH SITE CONDITIONS AND WORK CONDITIONS

Solapur Municipal Corporation, Solapur

Name of work : SOLAPUR CITY UNDERGROUND SEWERAGE SCHEME UNDER AMRUT MISSION (FOR SEWERAGE ZONE I to IV, VI & IX to XIII)

(Providing, lowering, laying, jointing and testing Sewage Collection System, Rising main, Construction of Sump and Pump house, STP Cap.20.00 MLD & 15.50 MLD based on MMBR Technology.)

ACQUAINTANCE WITH SITE CONDITIONS AND WORK CONDITIONS

1. The Contractor shall study the site conditions, general conditions and data included in the tender papers and get it verified from actual inspection of the site etc. before submitting the tender. In case of doubts about any items or data included in this tender or otherwise, it shall be got clarified by applying in writing to the Executive Engineer/Engineer in charge /Commissioner/Commissioner, 15 days in advance before date of submission of the tender. Once the tender is submitted, it shall be considered that the Contractor has verified and made himself conversant with all the details as required for quoting the rates and completing the work as per tender conditions and specifications.

2. Contractor shall not sell or otherwise dispose off or remove except for the purpose of this contract, the rubble, stone metal, sand or other material which may be obtained from any excavation made for the purpose of the contract. All such materials shall be MJP/Council/Corporation's property and shall be disposed off in the manner and at place as may be directed by the Engineer-in-charge. Contractor may with the permission of the Engineer-in-charge in writing and when directed by him, use any of the materials free of cost.

3. Other unforeseen items to be done in the course of work will have to be done by the Contractor as per specifications in P.W.D. Hand book volume I and II and will be paid at mutually agreed rates, ISS and standard practice in vogue.
Extra charge of claims in respect of extra work shall not be allowed unless the work to which they relate are in the spirit and meaning of the specifications or unless such works are ordered in writing by the Engineer-in-charge and claimed for in the specified manner before the work is taken in hand.

MATERIALS:

4. The Contractor shall make his own arrangements for obtaining rubble, khandki, headers, metal, sand, murum etc. from MJP/Council/Corporation or private quarry. Applications of the Contractor for reasonable area of Government land required for this purpose can be recommended to Revenue Authorities without any guarantee of making the land for quarry available.

All the materials involved in the construction shall be of best quality and specifications and shall be got approved from the Engineer-in-charge before use. If necessary, materials shall be got tested from the Laboratory at his cost. Samples requiring approval shall be submitted by the Contractor to the Engineer-in-charge in good time before the use of each material. The samples shall be properly marked to show the name of the materials place.

5. The Contractor shall provide all labour, skilled as well as unskilled, pages, lime, strings, site-rails (wooden as well as Steel etc.) as and when required as per approved design and make available such other materials for surveying, lining out, setting out, checking of work, taking measurements, testing of hydraulic and other structures, without any payment by the MJP/Council/Corporation to him. He will also provide proper approach and access to all his works and stores without any extra cost over tendered rates for the items to be inspected.

6. Rates quoted include clearance of site (prior to commencement of work and its closure) in all respects and hold good for work under all conditions of sites, moisture, weather etc.

7. Failure to comply with any of the above instructions will result in the Pradhikaran/Council/Corporation's doing the needful at the risk and cost of the contractor. These conditions are for all items and as such no extra payment shall be made for observing these conditions.

8. The contractor shall make his own arrangements for quarrying of rubble, stone, murum, sand, lime, metal etc.

9. Overburden in a quarry will have to be removed by the contractor at his own cost.

10. Unless a separate item is provided in Schedule 'B' minor dewatering of foundations in excavation and during the construction of foundation Masonry if required shall be done by the Contractor without claiming extra cost.

11. Masonry shall be kept wet for atleast 15 days and concrete work shall be kept wet for atleast 21 days commencing from the date of its final laying in position. In case during execution curing is found inadequate it will be carried out MJP/Council/Corporation's and the cost thereof shall be recovered from the contractor. The contractor shall make his own arrangements for getting water at site at his own cost.

12. The proportions of cement concrete specified in the Schedule 'B' are nominal and are only an indication of approximate proportion of cement, fine aggregate and coarse aggregate which may have to be altered suitably at site to obtain the desired strength and workability. However quantity of cement shall not be less than the one specified below.

NOMINAL MIX:

1:11/2:1	(M-300)	9.00 bags/one cum of cement concrete
1:1:5: 3	(M-200)	7.90 bags/one cum of cement concrete
1:2:4	(M-150)	6.30 bags/one cum of cement concrete
1:3:6	(M-100)	4.40 bags/one cum of cement concrete
1:4:8	(M-80)	3.40 bags/one cum of cement concrete

In case of major items of concrete for R.C.C. works, the Contractor shall prepare test blocks as per I.S. specifications for testing its tensile and compressive strength at his own cost. These block will be tested in any of the Government Test Laboratories at the cost of the Contractor. The number of test blocks, frequency etc. shall be directed by Engineer-In-Charge.

13. DAMAGE BY FLOODS OR ACCIDENT:

The Contractor shall take all precautions against damage by floods and from accidents. No compensation will be allowed to the contractor for his plant, material and work etc. Lost or damaged by floods or from other causes. The Contractor shall be liable to make good any part of material which is in charge of the Contractor and which is lost or damaged by floods or from any other cause. If the work executed is damaged, trenches filled due to any reason, Contractor shall have to make it good at his cost only.

14. SUPPLY OF RATE-ANALYSIS IN CASE OF EXTRA ITEMS

In case of the EIRL the Contractor shall supply Rate Analysis based on labour and material in case he is called upon to do so.

15. WATER REQUIRED FOR CONSTRUCTION :-

The Contractor has to make his own arrangements at his cost for water required for construction, testing, filling, structures, etc. either from local bodies or from else

where, by paying the charges directly and arranging tankers etc. as per necessity. No claim for extra payment on account of non-availability of water nearby, or extra lead for bringing water shall be entertained. All required piping arrangements and pumping if required for water shall be made by the Contractor at his cost.

If Contractor fails to pay the water charges to local bodies or private parties these shall be recovered by the MJP/Council/Corporation from his bills. In case MJP/Council/Corporation 's water supply is available, a connection at a suitable place may be sanctioned but all further arrangements of pumping if required, piping etc. shall be done by the Contractor at his cost, and water charges in such a case, shall be paid by the Contractor at the rates as decided by the Executive Engineer/Engineer in charge /Commissioner/Commissioner, which shall be final and binding on the Contractor.

Whenever Schedule 'B' provides for any dewatering item, payment shall be admissible under that item, but apart from that item no extra claims for dewatering required for executing various tender items, and for executing such items in wet condition shall be entertained as all these expenses are deemed to be included in the dewatering item.

16. LEADS AND LIFTS :-

Unless otherwise specifically mentioned in the tender item, the tendered rate for all items in tender shall cover all lifts and leads encountered for the executions of the work as directed.

17. Unless otherwise specifically provided for in the tender or a separate item is provided in Schedule 'B', all the sides of excavated trenches after the work is completed or in progress are to be filled by the Contractor to the original ground level from excavated stuff at no extra cost to the Pradhikaran/Council/Corporation ,

18. Unless otherwise specifically mentioned in tender items, the net dimensions of RCC or CC members actually cast are only admissible for payment under RCC or Plain CC items. No increase in dimensions due to plastering or finishing shall be admissible for payment under RCC or plain CC items.

19. No claims for any desilting of trenches, foundation etc. filled due to floods, untimely rains, or any other reasons whatsoever shall be entertained and Contractor shall have to do this desilting operation together with dewatering operations entirely at his cost.

20. Electricity supply required for construction of work/labour camp, etc. shall be arranged by the contractor at his own cost.

FORM-B.1

FORM B.1
PERCENTAGE RATE TENDER AND CONTRACT FOR WORKS

DEPARTMENT Solapur Municipal Corporation, Solapur

REGION Pune REGION

Name of work : SOLAPUR CITY UNDERGROUND SEWERAGE SCHEME UNDER AMRUT MISSION (FOR SEWERAGE ZONE I to IV, VI & IX to XIII)

(Providing, lowering, laying, jointing and testing Sewage Collection System, Rising main, Construction of Sump and Pump house, STP Cap.20.00 MLD & 15.50 MLD based on MMBR Technology.)

GENERAL RULES AND DIRECTIONS FOR THE GUIDANCE OF CONTRACTORS

1. All works proposed to be executed by contractor shall be notified in a form of invitation to tender pasted on a Board hung up in the office of the Executive Engineer/Engineer in charge/Commissioner/Commissioner and signed by the Executive Engineer/Engineer in charge/Commissioner/Commissioner.

   This form will state the works to be carried out as well as the date of submitting and opening tenders and the time allowed for carrying out the work, also the amount of earnest money to be deposited with the tender and the amount of the security deposit to be deposited by the successful tenderer and the percentage, if any to be deducted from bills. It will also state whether a refund of quarry fees, royalties and ground rents will be granted. Copies of the specifications, designs and drawings and estimated rates, schedule rates and any other documents required in connection with the work which will be signed by the Executive Engineer/Engineer in charge/Commissioner/Commissioner for the propose of identification shall also be open for Inspection by contractors at the office of the Executive Engineer/Engineer in charge/Commissioner/Commissionerr during office hours.

   Where the works are proposed to be executed by the contractor according to the specifications recommended and approved by a competent authority on behalf of the Maharashtra Jeevan Pradhikaran/Corporation/Council, such specification with designs drawings shall form part of the accepted tender.

2. In the event of the tender being submitted by a firm, it must be signed separately by each partner thereof, and in the event of the absence of any partner, it shall be signed on his behalf by a person holding a power – of - attorney authorizing him to do so.

i)The contractor shall pay along with the tender the sum, of (Rs. 87,19,230/-) (Rs. Eighty Seven Lakhs Nineteen Thousand Two Hundred Thirty only) as and by way of earnest money. The EMD shall be paid by Net Banking. The said amount of earnest money shall not carry any interest whatsoever.

ii)In the event of his tender being accepted, to the provision of sub-clause(iii), below,
a) the said amount of earnest money shall be appropriated
towards the amount of security deposit payable by him under conditions of General conditions of contract.
i) If, after, submitting the tender, the contractor withdraws his offer or modifies the same, or if after the acceptance of his Tender, the contractor fails or neglects to furnish the balance security deposit without prejudice to any other right and powers of the Pradhikaran/Corporation/Council hereunder, or in law, Pradhikaran/Corporation/Council shall be entitled to forfeit the full amount of the earnest money deposited by him.
ii) In the event of his Tender not being accepted, the amount of earnest money deposited by the contractor shall, unless it is prior thereto forfeited under the provision of sub-clause (iii) above, be refunded to him on his passing receipt therefore.

3. Receipts for payments made on account of any work, when executed by a firm should also be signed by all the partners except where the contractors are described in their tender as a firm. In which case the receipt shall be signed in the name of the firm by one of the partners or by some other person have authority to give effectual receipts of the firm.

4. Any person who submits tender shall fill up the usual printed form stating at what percentage above or below the rates specified in Schedule - B (memorandum showing items of work to be carried out) he is willing to undertake the work. Only one rate or such percentage on all the Estimated rates/ Schedule rates shall be named. Tenders which propose any alteration in the work specified in the said form of invitation of tender, or in the time allowed for carrying out the work, or which contain separate percentage over estimated rates / schedule rates for different sub work or item, or

which any other conditions of any sort which are not filled with the percentage as the space provided for the purpose and not signed at proper place in the printed B-1 Tender Form will be liable to rejection. No printed form of tender shall include a tender for more than one work. But, if contractors who wish to tender for more works, shall submit a separate tender for each work. Tenders shall have the name and the number of work to which they refer, written outside the envelopes.

5. The competent authority shall open tenders in the presence of any intending contractors who have submitted tenders or their representatives who may be present at the time, and he will enter the amount of the several tenders in a comparative statement in a suitable form. In the event of a tender being accepted, the contractor shall for the purpose of identification, sign copies of the specifications and other documents mentioned in Rule 1. In the events of a tender being rejected, the Executive Engineer/Engineer in charge /commssioner/Commissioner shall arrange / authorized to refund the amount of the earnest money deposited to the tenderer, on his giving a receipt for the return of the money.
6. Competent authority is the final authority to reject all or any of the tenders.
7. No receipt for any payment alleged to have been made by a contractor in regard to any matter relating to this tender or the contract shall be valid and binding on Pradhikaran/Council/Corporation unless it is signed by the Executive Engineer.
8. The memorandum of the work to be tendered for and the schedule of materials to be supplied by the Pradhikaran/Corporation/Council (herein before and after called as …MJP/MC) and their rates shall be filled in and completed by the office of the Executive Engineer/Engineer in charge/Commissioner/Commissioner before the tender form is issued. If a form issued to an intending Tender has not been so filled in and completed, he shall request the said office to have this done before he completes and delivers his tender.
9. All work shall be measured net by standard measure and according to the rules and customs of the PWD/MJP and without reference to any local custom.
10. Under no circumstances shall any; contractor be entitled to claim enhanced

rates for items in this contract.

11. Every registered contractor should produce along with his tender certificate of registration, as approved contractor in the appropriate class and renewal of such registration with date of expiry.

12. Corrections and additions should be initialed.

13. The measurements of work will be taken according to the usual methods in use in the PWD/MJP and no proposals to adopt alternative methods will be accepted. The Engineer's decision as to what is the usual method in use will be final.

14. A tendering contractor shall furnish a declaration along with the tender showing all works for which he has already entered into contract, and the value of work that remains to be executed in each case on the date of submitting the tender. Such certificate shall be in the proforma attached in the tender documents.

15. In view of the difficult position regarding the availability of foreign exchange no foreign exchange would be released by the corporation/council for the purchase of plant and machinery or any other purpose for the execution of the work contracted for.

16. The contractor will have to construct shed, for storing controlled and valuable material issued to him under Schedule “A” of the agreement or brought him on work site, at work site having double locking arrangement. The materials will be taken for use in the presence of the department person. No. materials will be allowed to be removed from the site of works without written permission of the Engineer-in-charge.

17. The tenderer will have to produce to the satisfaction of the accepting authority a valid and current license issued in his favour under the provision of Contractor Labour Regulation and Abolition Act. 1973 before starting work, failing withacceptance of the tender will be liable for withdrawal and Earnest money / Security Deposit will be forfeited to the Corporation.

18. The contractor shall comply with the provision of the Apprentices Act. 1961 and the rules and orders issued there under from time to time. The contract shall also be liable for any pecuniary liability arising on account of any violation by him of the provisions of the Act.

19. In this tender 15 sub-works are included .As per Government resolution the work will be taken up in single phase. The work order will be issued accordingly by fixing time limit. Contractor has to complete the work within stipulated time for each phase. If he fails, action as per clause 2 will be initiated against the contractor.

20. As per clause 6 of B-1 form, extension of time limit will be governed. If contractor fails to apply for extension of time limit as per clause 6 to keep the tender alive, MJP/Municipal Council/Municipal Corporation will grant the extension considering the progress of work and in the light of clause 2.

As per Government Resolution Price Variation Clause is not applicable to tender.

The tender Rates are inclusive of all taxes such as CGST and MGST

21. Contractor shall be deemed to have examined the work and site conditions including labour, the general and special conditions, specifications and drawings and shall be deemed to have visited the work site and to have fully informed himself regarding the local conditions and carried out his own

22. investigations to arrive at rates quoted in the tender.

There shall be no corrections or overwriting and if any that shall be dully initialed by Contractor himself.

Note: The Commercial Offer must be filled online using individual's digital certificate. (An online form will be provided for this during online bid preparation stage).

. I / We hereby, tender for the execution for the ……. Maharahtra Jeevan Pradhikaran/Municipal Corporation/Council (hereinbefore and hereinafter referred to as ….MJP/MC) for the work specified in the underwritten memorandum within the time specified in such memorandum

at---------- (----------) in figures as well as in words percent below/above the estimated rates entered in schedule 'B' memorandum showing items of work to be carried out and in accordance with all respects with the specifications, designs, drawings, and instructions in writing referred to in Rule hereof and in clause 12 of the annexed conditions of the contract and agree that what materials for the work are provided by the Pradhikaran/Corporation/Council such materials are at the rates to be paid for them shall be as provided in schedule "A" here to.

Memorandum

a) General description *:*

a) if several sub works are included they should be detailed in a separate list

Name of work : SOLAPUR CITY UNDERGROUND SEWERAGE SCHEME UNDER AMRUT MISSION (FOR SEWERAGE ZONE I to IV, VI & IX to XIII)

(Providing, lowering, laying, jointing and testing Sewage Collection System, Rising main, Construction of Sump and Pump house, STP Cap.20.00 MLD & 15.50 MLD based on MMBR Technology.)

b) Estimated Cost. Rs.174,38,45,985/-

c) Earnest Money. Rs.87,19,230/-

c) The amount of earnest money to be deposited shall be in accordance with the provision of paras 206 and 207 of the M.P.W. Manual.

d) **Security Deposit**.
Total 4% of estimated cost put to tender or accepted tender cost whichever is higher

d) This deposit shall, be in accordance with paras 213 and 214 of the M.P.W. Manual.

i) **Initial Security Deposit**
2% of estimated cost put to tender or accepted tender cost whichever is higher shall be in form of FDR from any Nationalized / Scheduled Bank or Bank Guarantee

ii) Balance 2% amount of Security deposit, will be recovered through each Running Bill at The rate of 5% of the gross amount of running bill till the required total amount of Security Deposit is recovered

e) Percentage, if any, to be deducted from bills so as to make up the total amount required as security deposit by the time, half the work as measured by the cost is done.
5% (Five) Percent

e) This percentage where no security deposit is taken, will vary from 5 % to 10 % according to the requirement of case where security deposit is taken see note to clause 1 this conditions of contractor.

f) **Additional Security Deposit.**

- If the accepted offer of the contract is below 10% of the cost put to

tender, 1%

- the additional security deposit in the form of Bank Guarantee of nationalized/
- Scheduled bank shall be furnished by the agency.
- 2) If the accepted offer is more than 10% below, of the cost put to tender, the difference percentage, plus 1% the additional security deposit in the form of Bank Guarantee of nationalized/ Scheduled bank shall be furnished by the agency.
- The additional Security Deposit may be uploaded scanned copy of bank guarantee Nationalized/Scheduled Bank in the name of "Commissioner, Solapur Municipal Corporation". and shall be minimum period upto completion of defect liability period.
- The above additional security deposit's in the form of Bank Guarantee's of nationalized/ Scheduled bank of Scanned copy shall be furnished in envelope No.II.

  सदर सर्व अटी शासन निर्णय क्रमांक बीडीजी-२०१६/प्र.क्र.-2/‡´ïö-२ दिनांक १२/०२/२०१६, १७/०३/२०१६ (शुध्दीपत्रक) व दिनांक ०१/०४/२०१७ (शुध्दीपत्रक) मधील अटी प्रमाणे राहतील.

  NOTE :- If Bank Guarntee as stated above is not submitted then the bid will not be considered though the bid is lowest.

g)Time allowed for the work from date of written order to commence.

24(Twenty-four) Calendar Months. (Including monsoon)

(Security Deposit shall be based on estimated cost put to tenderor tendered cost whichever is higher)

I/We agree that the offer shall remain open for acceptance for a minimum period of 120 days from the date fixed for opening for the same and thereafter until it is withdrawn by me/ us notice in writing duly addressed to the authority opening the tenders and sent by registered post A.D. or otherwise delivered at the office of such authority. Term deposit Receipt No./Demand draft No.

dated and date in respect of the sum of `…….( in wards `……) is herewith forwrded. The amount of earnest money shall not bear interest and shall be liable to be forfeited to the Pradhikaran/MunicapalCouncil/Corporation should I/We fail to (i) abide by the stipulation to keep the offer open for the period mentioned above of (ii) sign and complete the contract documents as required by the Engineer and furnish the security deposit as specified in item. (d) of the memorandum contained in paragraph (1) above within the time limit laid down in clause (1) of the annexed General Conditions of contract, the amount of earnest money may be adjusted towards the security deposit or refunded to me/us in writing unless the same or any part thereof has been forfeited as aforesaid.

I/We have secured exemption from payment of earnest money after executing the necessary bond in favour of the Pradhikaran/MunicapalCouncil/Corporation a true copy of which is enclosed herewith should any occasion for forfeiture of earnest money for this work arise due to failure on my/our part to abide by the stipulations to keep the offer open for the period mentioned above or to sign and complete the contract documents and furnish to security deposit as specified in item (d) of the Memorandum contained in paragraph (1) above within the time limit laid down in clause (i) of the annexed General Conditions of contract, the amount payable by me/us at the option of the Engineer, be recovered out of the amount deposited in lump sum for securing exemption in so far as the same may be extend in terms of the said bond and in the event of the deficiency out of any other moneys which are due to payable to me/us by the Pradhikaran/MunicapalCouncil/Corporation under any other contract or transaction of any nature whatsoever or otherwise.

Should this tender be accepted I/We hereby agree to abide by and fulfill all the terms and provisions of the conditions of contract annexed hereto so far as applicable and in default thereof to forfeit and pay Pradhikaran/Municipal Council/Corporation the sum of money mentioned in the said conditions. Term Deposit Receipt No. ……. Dated from

Strike out (a) such security deposit is to be taken.

The Bank…… at in respect of sum of Rs. …… ……. Is herewith forwarded representing the earnest money (a) the full value which is to be absolutely forfeited to the Pradhikaran/MunicapalCouncil/Corporation should I/We not deposit in the full amount of security deposit specified in the above memorandum in Accordance with (d) of clause (i) of the tender for works shall be refunded.

Contractor

Signature of the contractor
before submission of tender.

Address

date of 2017

Witness

Signature of witness to

contractor's signature.

The above tender is hereby accepted by me for and one behalf of Solapur Municipal Corporation

Dated

Commissioner , Solapur Municipal Corporation

CONDITIONS OF CONTRACT

(Modification as per the GR PWD NO. CAT-1087/ CR- 94/Bldg-2, dated 14.6.1989)

Security Deposit

Clause 1 : The person / person whose tender may be accepted (hereinafter called the Contractor, which expression shall unless excluded by or repugnant to the context include his heirs, executors, administrators and assigns) shall (A) within ten days (which may be extended by the Chief Engineer/Commissioner/Commissioner concerned upto 15 days if the Commissioner/Commissioner thinks fit to do so) of the receipt by him of the notification of the acceptance of his tender deposit with the Engineer in-charge in Cash or Government securities endorsed to the Engineer in charge (if deposited for more than 12 months) of sum sufficient which will make up the full security deposit specified in the tender or (B) (permit Pradhikaran/Corporation/Council at the time of making any payment to him for work done under the contract to deduct such sum as will amount to 4% of all moneys so payable; such deductions to be held by Corporation/Council by way of security deposit). Provided always that in the event of the Contractor depositing a lumpsum by way of security deposit as contemplated at (A) above, then and in such case, if the sum so deposited shall not to 4% of the total estimated cost of work or tendered cost whichever is higher, it shall be lawful for Pradhikaran/Corporation/Council at the time of making any payment to the contractor for work done under the contract to make-up the full amount of Four (4) percent by deducting a sufficient sum from every such payment as last aforesaid until the full amount to the security deposit is made up. All compensation or other sums of moneys payable the contractor to Pradhikaran/Corporation/Council under the terms of his contract may be deducted from or paid by the sale of sufficient part of his security deposit or from the interest arising there from, or from any sums which may become due by Pradhikaran/Corporation/Council to the contractor under any other contract or transaction on any account whatsoever and in the event of his security deposit being reduced by reason of any such deduction or sale as aforesaid, the

contractor shall, within ten days thereafter, make good in cash or Government securities endorsed as aforesaid or Bank Guarantee issued by bank for any sum or sums which may have been deducted from or raised by sale of his security deposited or any part thereof. The Security deposit referred to, when paid in cash may, at the cost of the depositor, be converted into interest bearing securities provided that the depositor has expressly desired this in writing.

If the amount of the security deposit to be paid in a lump sum within the period specified at (A) above is not paid the tender/contract already accepted shall be considered as cancelled and legal steps taken against the Contractor for recovery of the amounts. The amount of security deposit lodged by Contractor shall be refunded along with the payment of the final bill, if the date upto, which the Contractor has agreed to maintain the work in good order, is over. If such date is not over only 90% amount of the security deposit shall be refunded along with the payment of the final bill. The amount of security deposit retained by Pradhikaran/Corporation/Council shall be released after expiry of period upto, which the Contractor has agreed to maintain the work in good order, is over. In the event of Contractor failing or neglecting to complete rectification work within the period upto, which the Contractor has agreed to maintain the work in good order then subject to provisions of Clause 17 and 20 hereof, the amount of security deposit retained by Pradhikaran/Corporation/Council shall be adjusted towards the excess cost incurred by the Pradhikaran/Corporation/Council on rectification work.

Compensation Delay

Clause 2 : The time allowed for carrying out the work as entered in the agreement shall be strictly observed by the Contractor and shall be reckoned from the date on which the order to commence work is given to the Contractor. The work shall throughout the stipulated period of the contract be proceeded with, all due diligence (time being deemed to be essence of the contract on the part of the Contractor) and the Contractor shall pay as compensation an amount equal to one percent or such smaller amount as the Chief Engineer/Commissioner /Commissioner(whose decision in writing shall be final) may decide of the amount of the estimated cost of the whole work as shown by the tender for everyday that the work remains uncommenced or unfinished after the proper dates. And

further to ensure good progress during execution of the work, the Contractor shall be bound in all cases in which the time allowed for any work exceeds one month to complete, for complete minimum quantum of work as compared to accepted tender cost as stated below.

¼ of the work in ¼ of the time.
½ of the work in ½ of the time.
3/4 of the work in ¾ of the time.
Full work in Twenty Four months including monsoon

Note: The quantity of the work to be done within a particular time to be specified above shall be fixed by an Officer competent to accept the contracts after taking into consideration the circumstances of each case .and insert in the blank space kept for the purpose

In the event of the contractor failing to comply with these conditions he shall be liable to pay as compensation an amount equal to one percent or such smaller amount as Chief Engineer/Commissioner/Commissioner (whose decision in writing shall be final) may decide of the said estimated cost of the whole work for everyday that the due quantity of work remains incomplete provided always that the total amount of compensation to be paid under the provisions of this clause shall not exceed 10% of the estimated cost of the work as shown in the tender. The amount of compensation will be recovered within 6 months period.
Commissioner should be the final authority in this respect, irrespective of the fact that tender is accepted by State level technical Committee. However Commissioner /Commissioner shall seek the consent of the MJP and/or approval of the State level technical committee.

Action when whole of security deposit is forfeited.

Clause 3: If any clause in which under any clause of this contract the Contractor shall have rendered himself liable to pay compensation amounting to the whole of his security deposit (whether paid in one sum or deducted by installment) or in the case of abandonment of the work owing to serious illness or death of the Contractor or any other cause, the Engineer in charge on behalf of the Pradhikaran/Corporation/Council shall have power to adopt any of the following courses, as he may deem best suited to the interest of the MJP/Corporation/Council

To rescind the contract (for which rescission notice in writing to the Contractor under the hands of Engineer in-charge shall be conclusive evidence) and in that case the security deposit of the Contractor shall stand forfeited and be absolutely at the disposal of the Pradhikaran/Corporation/Council

b) To carry out the work or any part of the work departmentally debiting the Contractor with the cost of the work, expenditure incurred on tools, plant and charges on additional supervisory staff including the cost of work-charged establishment employed for getting unexecuted part of the work completed and crediting him with the value of the work done departmentally in all respects in the same manner and at the same rates as if it has been carried out by the Contractor under the terms of his contract. The certificate of the Engineer in-charge as to the cost and other allied expenses so incurred and as to the value of the work so done departmentally shall be final and conclusive against the Contractor.

c) The order that work of the Contractor be measured up and take such part thereof as shall be unexecuted out of his hands and to give it to another contractor to complete in which case all expenses incurred on advertisement for fixing a new contracting agency, additional supervisory staff including the cost of work-charged establishment and the cost of the work executed by the new contract agency will be debited to other contractors and the value of the work done or executed through the new contractor shall be credited to the Contractor in all respects and in the same manner and at the same rates as if it had been carried out by the Contractor under the terms of his contract. The certificate of the Engineer in-charge as to all the costs of the work and other expenses incurred as aforesaid for getting the unexecuted Work done by the new contractor and as to the value of the work so done shall be final and conclusive against the Contractor.

In case the contractor shall be rescinded under clause (a) above, the contractor shall not be entitled to recover or to be paid, any sum for any work therefore actually performed by him under this contract unless and until the Executive Engineer/Engineer in charge/Commissioner/Commissioner shall have certified in writing the performance of such work and the amount payable to him in respect thereof and he shall only be entitled to be paid the amount so certified. In the event of either the courses referred to

in clause (b) or (c) being adopted and the cost of the work executed departmentally or through a new contractor and other allied expenses exceeding the value of such work credited to the contractors, the amount of excess shall be deducted from any money due to the contractor by Pradhikaran/Council/Corporation under the contract or otherwise however or from his security deposit or the sale proceeds thereof provided however that the contractor shall have to claim against MJP/Corporation/Council event if the certified value of the work done departmentally or through a new contractor exceeds the certified cost of such work and allied expenses, provided always that whichever of the three courses mentioned in clauses (a), (b) and (c) is adopted by the MJP/ Corporation/Council, the contractor shall have no claim to compensation for any loss sustained by him by reason of not having purchased or procured any materials, or entered into any engagements, or made any advance on account of or with a view to the execution of the work or the performance of the contract. The extra cost involved in the completion of the balance work carried out through the other contractor under

Amount of 3 (c) shall be recoverable from the contractor over and above the compensation levied under Clause 2 and the Security Deposit shall be apportioned against the total recoveries for this purpose also.

Action when the progress of any particular portion of the work is unsatisfactory.

Clause 4 : If the progress of the any particular portion of the work is unsatisfactory, the MJP/Corporation/Council shall not withstanding that the general progress of the work is in accordance with the condition mentioned in clause 2 be entitled to take action under clause 3(b) after giving the contractor 10 days notice in writing. The contractor will have no claim for compensation, for any loss sustained by him owing to such action.

Contractor liable to pay compensation if action not taken under clause 3 and 4.

Clause 5 : In any case in which any of the powers conferred upon MJP/Corporation/Council by Clause 3 and 4 hereof shall have become exercisable and the same shall not have been exercised the non exercise thereof shall not constitute waiving of any of the conditions hereof the such powers shall not withstanding be exercisable in the event of any future case of default by the

contractor for under any clauses hereof he is declared liable to pay compensation amounting to the whole of his security deposit and the liability of the contractor for past and future compensation shall remain unaffected. In the event of the MJP/Corporation/Council taking action under Sub-Clause (a) or (c) of clause 3, he may, if he so desires, take possession of all or any tools and plants, materials and stores, in or upon the work or the site thereof or 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 the case of contract rates not being applicable at current market rates to be certified by the MJP/Corporation/Council whose certificate thereof shall be final. In the alternative the MJP/Corporation/Council may after giving notice in writing to the contractor or his clerk of the work, foreman or other authorized agent require him to remove such tools, plant, materials or stores from the premises within a time to do specified in such notice, and in the event of the contractor failing to comply with any such requisition, the MJP/Corporation/Council 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, and the certificate of the MJP/Corporation/Council as to the expenses of any such removal and the amount of the proceeds and expense of any such shall be final and conclusive against the contractor

Extension of time

Clause 6 : If the contractor shall desire an extension of the time for completion of work on the ground of his having been unavoidably hindered in its execution or on any other ground, he shall apply in writing to the MJP/Corporation/Council before the expiration of the period stipulated in the tender on before the expiration of 30days from the date on which he was hindered as aforesaid or on which the cause for asking extension occurred, whichever is earlier and the Corporation/Council or in the opinion of Executive Engineer/Commissioner/Commissioner, as the case may be, if in his opinion, there were reasonable grounds for granting the extension, grant such extension as he think necessary or proper. The decision of the MJP/Corporation/Council in this matter shall be final.

Final Certificate.

Clause 7 : On the completion of the work the contractor shall be

furnished with a certificate by the MJP/Corporation/Council (hereinafter and hereinbefore called the Engineer-in-charge) of such completion but neither such certificate shall be given nor shall the work be considered to be complete until the contractor shall have removed from the premises on which the work shall have been executed, all scaffolding surplus materials and rubbish , tools, plants and equipments and shall have cleaned off the dirt from all woodwork, doors, windows, walls, floor or other parts of any building in or upon which the work has been executed or of which he may have had possession for the purpose of executing the work nor until the work shall have been measured by the Engineer-in-charge or where the measurements have been taken by his subordinate until they have received approval of the Engineer-in-charge the said measurements being binding and conclusive against the contractor, if the contractor shall fail to comply with the requirements of this clause as to the removal of scaffolding, surplus materials and rubbish and cleaning off the dirt on or before the date fixed for the completion of the work, the Engineer-in-charge may at the expense of the contractor, remove and rubbish and dispose off the same as the thinks fit and clean off such dirt as aforesaid and the contractor shall forthwith pay the amount of all expenses so incurred but shall have no claim in respect of any such scaffolding tools and plants equipments or surplus materials as aforesaid except for any sum actually realized by the sale thereof.

Payment on intermediate certificate to be regarded as advance.

Clause 8 : No payment shall be made for any work estimated to cost less than Rupees one thousand till the whole of work shall have been completed and a certificate of completion given. But in the case of works estimated to cost more than Rupees one thousand the contractor shall on submitting a monthly bill therefore be entitled to receive payment proportionate to the part of the work then approved recommended by the Engineer-in-charge, whose certificate of such recommended and passing of the sum of payable shall be final and conclusive against the contractor. All such intermediate payments shall be regarded as payment by way of advance against the final payments only and not as payments for work actually done and completed and shall not preclude the Engineer-in-charge for requiring any bad. unsound, imperfect or unskillful work to be removed or taken away and reconstructed or re erected nor shall any such payment be

considered as an admission of the due performance of the contract or any part thereof in any respect or the occurring of any claim nor shall it conclude determine or affect in any other way the powers of the Engineer-in-charge as to the final settlement and adjustment of the accounts or otherwise or is any other way very or affect the contract. The final bill shall be submitted by the contractor within one month of the date fixed for the completion of the work otherwise the Engineer-in-charge's certificate of the measurements and of the total amount payable for the work shall be final and binding on all parties.

Payment at reduced rates on account of items of work not accepted as completed, to be at the discretion of the Engineer-in-charge.

Clause 9: The rates for several items of works estimated to cost more than ` 1000/- agreed to within, shall be valid only when the item concerned is accepted as having been completed fully in accordance with the sanctioned specification. In cases where the items of are work not accepted as so completed by the Engineer-in-charge may make payment on account of such items at such reduced rates as he may consider reasonable in the preparation of final or on account bills.

Bills to be submitted monthly

Clause 10 : A bill shall be submitted by the contractor in each month on or before the date fixed by the Engineer-in-charge for all work executed in the previous month and the Engineer-in-charge shall take or cause to be taken the requisite measurements for the purpose of having the same verified and the claim, so far as it is admissible shall be adjusted and paid if possible within ten days from the presentation of the bill. If the contractor does not submit the bill within the time fixed as aforesaid, the Engineer-in-charge may depute a subordinate to measure up the said work in the presence of the contractor or his duly authorized agent whose counter signature to the measurement list shall be sufficient warrant and the Engineer-in-charge may prepare a bill from such list which shall be binding on the contractor in all respects

Bills to be on printed form.

Clause 11 : The contractor shall submit all bills on the printed forms to be had on application at the office of the Engineer-in-charge. The charges to be made in the bills shall always be entered at the rates specified in the tender or in the case of any extra work ordered in pursuance of these conditions and not mentioned or provided for in the tender at the rates hereinafter provided for such work

Stores supplied by MJP

Clause 12 : If the specification or estimate of the work provides for the use of any special description of materials to be supplied from the store of the MJP/Corporation/Council or if it is required that the contractor shall use certain stores to be provided by the Engineer-in-charge (such material and stores and the prices to be charged therefore as hereinafter mentioned being so far as practicable for the convenience of the contractor but not so as in any way to control the meaning or effect of this contract specified in the schedule or memorandum hereto annexed) the contractor shall be supplied with such materials and stores as may be required from time to time to be used by him for the purposes of the contract only and value of the full quantity of the materials and stores so supplied shall be set off or deducted from any sums then due, or thereafter to become due to the contractor under the contract or otherwise or from the security deposit or the proceeds of sale thereof if the security deposit is held in Government Securities, the same or a sufficient portion thereof shall in that case be sold for the purpose. All materials supplied to the contractor shall remain the absolute property of MJP/Corporation/Council and shall not be removed from the site of the work and shall at all times be open to inspection by the Engineer-in-charge. Any such materials issued at cost but remained unused and in perfectly good condition at the time of completion or termination of the contract shall be returned to the MJP/Corporation/Council, store if the Engineer-in-charge so required by a notice in writing given under his hand, but the contractor shall not be entitled to return any such material supplied to him as aforesaid but remaining unused by him or for any wastage in or, damage to any such materials. The contractor shall, however return all unused material at the time of completion, which was issued to him free of cost by the Engineer in charge and which has remained surplus with the contractor after accounting for the actual utilization of such material from the total quantity that was issued by the Engineer in charge. Cost of any material issued free of cost by the engineer and which has remained surplus with the Engineer from the contractor as mentioned in Schedule – 'A'

Storage of controlled material

Clause 12 (A) : All stores of materials such as cement, steel etc. supplied to the contractor by MJP/Corporation/Council should be kept by the contractor in a separate store near the work site under

lock and key and will be accessible for inspection by the MJP/Corporation/Council or his agent at all the times.

Works to be executed in accordance with specifications drawings.

Clause 13 : The contractor shall execute the whole and every part of the work in the most substantial and workman like manner and both as regards materials and every other respect in strict order accordance. The contractor shall also conform exactly fully and faithfully to the designs, drawings and instructions in writing relating to the work signed by the Engineer-in-charge and lodged in his office and to which the contractor shall be entitled to have access for the purpose of inspection at such office or on the site of the work, during office hours. The contractor will be entitled to receive one sets of contract drawing and working drawings as well as one certified copy of the accepted tender along with the work order free of cost. Further, copies of the contract drawings and working drawings if requires by him shall supplied at the rate of ` 2000/- per set of contract drawings and ` 100/- per working drawing except where otherwise specified.

Alteration in specifications & designs not to invalidate

Clause 14 : The Engineer-in-charge shall have power to make any alterations in or additions to the original specifications, drawing, design and instructions that may appear to him to be necessary or contracts, advisable during the progress of the work and the contractor shall be bound to carry out the work in accordance with any instructions in this connection which may be given to him in writing signed by the Engineer-in-charge and such alterations shall not invalidate the contract and any additional 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 and at the same rates as are specified in the tender for the main work. And if the additional and altered work includes any class of work for which no rate is specified in this contract, then such class of work shall be carried out at the rates entered in the Schedule of Rates of the Division with due consideration for leads and lifts involved for materials and labour or at the rates mutually agreed upon between the Engineer-in-charge and the contractor, whichever are lower However, if the Engineer-in-charge is not empowered by MJP/Corporation/Council to approve the rates of such additional or altered work then as far as possible he shall obtain prior approval to the changes and to the rates payable for

such changes from competent authority of MJP/Corporation/Council not entered in before ordering the Contractor to take up the alternation/ additional work. If the additional or altered work for which no rate is in the schedule or rates of the Division, is ordered to be carried out before the rates are agreed upon then the contractor shall within seven days of the date of receipt by him of the order to carry out the work, inform the Engineer-in-charge of the rate which it is his intention to charge for such class of work, and if the Engineer-in-charge does not agree to this rate he shall by notice in writing be at liberty to cancel his order carry out such class of work and arrange to carry out in such manner as he may consider advisable provided always that if the contractor shall commence the work or incur any expenditure in regard thereto before the rates shall have been determined as lastly hereinbefore mentioned then in such case he shall only be entitled to be paid in respect of the work or incur any expenditure in regard there to before the rates shall have been determined as lastly hereinbefore mentioned then in such case he shall only be entitled to be paid in respect of the work carried out or expenditure incurred by him prior to the date of the determination of the rate as aforesaid according to such rate or rates as shall be fixed by the Engineer-in-charge. In the event of a dispute the decision of the Chief Engineer will be final.

Extension of time in consequences additions or alterations

Where, however, the work is to be executed according to the designs, drawings and specifications recommended by the contractor and accepted by the competent authority the alterations above referred to shall be within the scope of such designs, drawings and specifications appended to the tender. The time limit for the completion of the work shall be extended in the proportion that the increase in its cost occasioned by alterations or additions bears to the cost of the original contract work and the certificate of the Engineer-in-charge as to such proportion shall be conclusive.

Clause 15 :

No claim to any payment or compensation for alteration in or restriction of Work except specified in this clause.

i) If at any time after the execution of the contract documents the engineer shall for any reason what so ever (other than default on the of the contractor for which the MJP/Corporation/Council is entitled to rescind the contract) desires that the whole or any part of the work specified in the tender should be suspended for any

period of that the whole or part of the work should not be carried at all, he shall give to the contractor a notice in writing of such desire and upon the receipt of such notice the contractor shall forthwith suspend or stop the work wholly or in part as required after having due regard to the appropriate stage at which the work should be stopped or suspended so as not to cause any damage or injury to the work or any part of it could be or could have been safely stopped or suspended shall be final and conclusive against the Contractor. The Contractor shall have no claim to any payment or compensation whatsoever by reason of or in pursuance of any notice as aforesaid on account of any suspension, stoppage or curtailment except to the extent specified hereinafter.

ii) Where the total suspension of work ordered as aforesaid continued for a continuous period exceeding 90 days the contractor shall be at liberty to withdraw from the contractual, obligations under the contract so for as it pertains to the unexecuted part of the work by giving a 10days prior notice in writing to the Engineer within 30days of the expiry of the said period of 90 days of such intention and requiring the Engineer to record the final measurements of the work already done and to pay final bill. Upon giving such notice the Contractor shall be deemed to have been discharged from his obligation to complete the remaining unexecuted work under his contract. On receipt of such notice the Engineer shall proceed to complete the measurement and make such payment as may be finally due to the Contractor within a period of 90 days from the receipt of such notice in respect of the work already done by the Contractor. Such payment shall not in any manner prejudice the right of the Contractor to any further compensation under the remaining provisions of this clause.

iii) Where the Engineer in-charge requires the Contractor to suspend the work for a period in excess of 30 days at any time or 60 days in the aggregate, the contractor shall be entitled to apply to the Engineer within 30 days of the resumption of work after such suspension for payment of compensation to the extent of peculiarly loss suffered by him in respect of working machinery rendered idle on the site or on the account of his having had to pay the salary or wages to labour engaged by him during the said

period of suspension, provided always that the Contractor shall not be entitled to any claim in respect of any such working machinery ,salary or wages for the first 30 days whether consecutive or in the aggregate of any suspension whatsoever occasioned by unsatisfactory work or other default on his part. The decision of the Engineer- in -charge in this regard shall be final and conclusive against the Contractor.

iv) In the event of

a) any total stoppage of work on notice from the Engineer under sub-clause (1) in that behalf.

b) Withdrawal by the Contractor from the contractual obligation to complete the remaining un-executed work under sub-clause (2) on account of continued suspension of work for a period exceeding 90 days.

c) Curtailment in the quantity of item or items originally tendered on account of any alteration, omission or substitutions in the specifications, drawings, designs or instructions under Clause 14 where such curtailment exceeds 25% in quantity and the value of the quantity curtailed beyond 25% at the rates for the item specified in the tender is more than ` 5,000/-

It shall be open to the Contractor within 90 days from the service of

i) the notice of stoppage of work or

ii) the notice of withdrawal from the contractual obligations under the contract on account of the continued suspension of work or

iii) notice under Clause 14(i) resulting in such curtailment

to produce to the Engineer satisfactory documentary evidence that he had purchased or agreed to purchase material for use in the contracted work before receipt by him of the notice of stoppage, suspension or curtailment and required the Corporation/Council to take over on payment such material at the rates determined by the Engineer, provided, however, that such rates shall in no case exceed the rates at which the same was acquired by the Contractor. The MJP/Corporation/Council shall thereafter take over the material so offered, provided the quantities offered are not in excess of the requirements of the unexecuted work as specified in the accepted tender and are of quality and specifications approved by the Engineer

Clause 15 A : The Contractor shall not be entitled to claim any *No. claim to*

compensation from MJP for the loss suffered by him on account of delay by MJP/Corporation/Council in the supply of materials entered in Schedule 'A' where such delay is caused by.

compensation on account of loss due to delay in supply of material by MJP.

i) Difficulties relating to the supply of railway wagons.
ii) Force majeure.
iii) Act of God.
iv)Act of enemies of the State or any other reasonable cause beyond the control of MJP/Council/Corporation.

In the case of such delay in the supply of materials,MJP/ Corporation/Council shall grant such extension of time for the completion of the works as shall appear to the MJP/Corporation/Council to be reasonable in accordance with the circumstances of the case. The decision of the MJP/Corporation/Council as to the extension of time shall be accepted as final by the Contractor.

Clause 16 : Under no circumstances whatsoever shall the Contractor be entitled to any compensation from MJP/Corporation/Council on any account unless the Contractor shall have submitted claim in writing to the Engineer-in-charge within one month of the case of such claim occurring.

Time limit for unforeseen claims.

Clause 17 : If at any time before the security deposit or any part of thereof is refunded to the Contractor it shall appear to the Engineer-in-charge or his subordinate –in-charge of the work that any work has been executed with unsound, imperfect or unskilled workmanship or with materials of inferior quality, or that any materials or articles provided by him for the execution of the work are unsound or quality is inferior to that contracted for, or are otherwise not in accordance with the contract, it shall be lawful for the Engineer-in-charge to intimate this fact in writing to the Contractor and then notwithstanding the fact that the work, materials or articles complained of may have been inadvertently passed, certified and paid for, the Contractor shall be bound forthwith to rectify, or remove and reconstruct the work so specified in whole or in part, as the case may require or if so required shall remove the materials or articles at his own charge and cost and in the event of his failing to do so within a period to be specified by the Engineer-in-charge in the written intimation aforesaid, the Contractor shall be liable to pay compensation at the rate of one percent on the amount of the

Action and compensation payable in case of bad work.

estimate for everyday not exceeding 10 days during which the failure so continues and in the event of any such failure the Engineer-in-charge may rectify or remove and re execute the work or remove and replace the materials or articles complained of as the case may be at the risk and expense in all respects of the Contractor. Should the Engineer in charge consider that any such inferior work or materials as prescribed above may be accepted or made use of, it shall be within his discretion to accept the same reduced rates as he may fix therefore.

Work to be open to inspection.

Clause 18 : All work under or in course of execution or executed in pursuance of the contract shall at all times be open to inspection and supervision of the Engineer-in-charge and his subordinates and the Contractor shall at all times during the usual working hours, and at all other times at which reasonable notice of the intention of the Engineer-in-charge and his subordinates to visit the works shall have been given to the Contractor, either himself be present to receive orders and instructions or have a responsible agent duly accredited in writing present for that purpose. Orders given to the Contractor's duly authorized agent shall be considered to have the same force and effect as if they had been given to the Contractor himself.

Contractor or responsible agent to be present

Notice to be given before work is covered up

Clause 19 : The Contractor shall give not less than five days' notice in writing to the Engineer-in-charge or his subordinate in-charge of the work before covering up or otherwise placing beyond the reach of measurement any work in order that the same may be measured and correct dimensions thereof taken before the same is so covered up or placed beyond the reach of measurement and shall not cover up or place beyond the reach of measurement any work without the consent in writing of the Engineer-in-charge or his subordinate in-charge of the work, and if any work shall be covered up or placed beyond the reach of measurement, without such notice having been given or consent obtained, the same shall be uncovered at the Contractor's expense, and in default thereof no payment or allowance shall be made for such work or for the materials with which the same was executed.

Contractor liable for damage done and for imperfections

Clause 20 : If during the period as listed below, from the date of completion as certified by the Engineer-in-charge pursuant to Clause 7 of the Contract or for the period as mentioned below after commissioning the work whichever is earlier in the opinion of the

Engineer in-charge, the said work is defective in any manner whatsoever the contractor, shall forthwith on receipt of notice in that behalf from the MJP/Corporation/Council, duly commence execution and completely carry out at his cost in every respect all the work that may be necessary for rectifying and setting right the defects specified therein including dismantling and reconstruction of unsafe portion strictly in accordance with and in the manner prescribed and under the supervision of the MJP/Corporation/Council. In the event of the Contractor failing or neglecting to commence execution of the said rectification work within the period prescribed therefore in the said notice and/ or to complete the same as aforesaid as required by the same notice, the MJP/Council/Corporation may get the same executed and carried out departmentally or by any other agency at the risk, on account and at the cost of the Contractor. The Contractor shall forthwith on demand pay to the MJP/Corporation/Council the amount of such costs, charges and expenses sustained or incurred by the MJP/Corporation/Council of which the certification of the MJP/Corporation/Council shall be final and binding on the Contractor, Such costs, charges and expenses shall be deemed to be arrears of land revenue and in the event of the Contractor failing or neglecting to pay the same no demand as aforesaid without prejudice to any other rights and remedies of the MJP/Corporation/Council, the same may be recovered from the Contractor as arrears of land revenue. The MJP/Corporation/Council, shall also be entitled to deduct the same from any amount which may then be payable or which may thereafter become payable by the MJP/Corporation/Council to the contractor either in respect of the said work or any other work whatsoever or from the amount of security deposit retained by the MJP/Corporation/Council. During defect liability period, the work of daily maintenance and general repairs and expenses thereon would be out of scope of the tender. However, if any defects in the sub work or in the material are found, the same will be rectified by the Contractor at his cost and will be binding on him, failing to which legal action would be taken as per tender clauses. Ten percent amount will be withheld from security deposit depending upon the nature of work, till the defect liability period is over.

1. Pumping Machinery.

a) Pumping machinery and other allied mechanical, electrical installation (excluding those in the treatment plant contract), surge arrestors, water hammer control devices, chlorinators (excluding those provided in the treatment plant contract)	Five Years
Repairs to the works at (a) above.	Five Years

2. WTP/STP/ESR/GSR/BPT/Sewage Pumping Stations, Sump and Pump House, Balancing Tank Etc. head works, approach bridge

a) Based on Contractor's own design.	Five Year.
b) Based on Departmental design.	Five Years
c) Special repairs to ESR/ GSR/ BPT	Five Years
d) Ordinary repairs to ESR/GSR/BPT/ Sump and Pump House, etc.	Five Years

3. Pipe Lines.

i) Pumping Mains, Gravity Mains, Leading Mains including all the fixtures	Five Years
ii) Distribution system, laterals, branch sewers of sewerage system, etc.	Five Years
iii) Repairs to pipe lines under the works at (a) and (b) above.	Five Years

The instructions contained in the Government of Maharashtra (Public Works Department) Resolution dated 14th June, 1989 shall henceforth be applicable to all the works for which defect liability periods have been specified as above

Contractor to supply plant, ladders, scaffoldings, etc.

Clause 21 : The Contractor shall supply at his own cost all material (except such special materials, if any, as may in accordance with the contract be supplied from the MJP/Corporation/Council stores), plant, tools, appliances, implements, ladders, tackles, scaffolding and temporary works requisite or proper execution of the work, in the original, altered or substituted from the whether included in the specification or other documents forming part of the contract of referred to in these conditions or not and which may be necessary for the purpose of satisfying or complying with the requirements of the Engineer in charge as to any matter as to which under these conditions he is entitled to as satisfied or which he is entitled to require together with the carriage therefore to and from the work

And is liable for damages arising from non-provisions of lights, fencing, etc

The Contractor shall also supply without charge the requisite number of persons with the means and materials necessary for the purpose of setting out works and counting, weighing and assisting in the measurement or examination at any time and from time to time of the work or the materials, Failing which the same may be provided by the Engineer-in-charge at the expense of the Contractor and expenses may be deducted from any money due to the Contractor under the contract or from his security deposit or the proceeds of sale thereof or a sufficient portion thereof. The Contractor shall provide all necessary fencing and lights required to protect the public from accident and shall also be bound to bear the expenses of defense of every suit, action or other legal proceedings that may be brought by any person for injury sustained owing to neglect of the above precautions and to pay any damages and costs which may be awarded in any such suit action or other legal proceedings that may be brought by any person for injury sustained owing to neglect of the above precautions and to pay any damages and costs which may be awarded in any such suit action or proceedings to any such person, or which may with consent of the Contractor be paid for compromising any claim by any such person.
List of machinery in contractors possession and which he proposes to use on the work should be submitted along with the tender.

Clause 21 A : The Contractor shall provide suitable scaffolds and working platforms, gangways and stairways and shall comply with the following regulations in connection herewith.

a) Suitable scaffolds shall be provided for workmen for all works that cannot be safely done from a ladder or by other means.
b) A scaffolds shall not be constructed, taken down or substantially allowed except
i) Under the supervision of a competent and responsible person, and
ii) As far as possible by competent workers possessing adequate experience in this kind of work.

c) All scaffolds and appliances connected herewith and ladders shall.
   i) be of sound material
   ii) Be of adequate strength having regard to the loads and strains to which they will be subjected, and

iii) Be maintained in proper condition.

d Scaffolds shall be so constructed that no part thereof can be displaced in consequence of normal use.

e Scaffolds shall not be over – loaded and so far as practicable the load in consequenceof normal use

f Before installing lifting gear on scaffolds special precautions shall be taken to ensure the strength and stability of the scaffolds.

g Scaffolds shall be periodically inspected by a competent person.

h Before allowing a scaffold to be used by his workmen the Contractor shall whether the scaffold has been erected by his workmen or not, take steps to ensure that it complies fully with the regulations herein specified.

i Working platform, gangway, stairways shall:-

1) be so constructed that no part thereof can sag unduly or unequally.

2)be so constructed and maintained, having regard to the prevailing conditions as to reduce as far as practicable risks of persons tripping or slipping, and

3) kept free from any unnecessary obstruction.

j) In the case of working platform, gangways, working places and stairways at a height exceeding 2 meters (to be specified).

a) every working platform, gangways shall be closely boarded unless other adequate measures are taken to ensure safety,

b) every working platform, gangway shall have adequate width, and

c) every working platform, gangway, working place and stairway shall be provided with railing/ barricading

k) Every opening in the floor of a building or in a working platform shall except for the time and to the extent required to allow the excess of persons or the transport or shifting of material be provided with suitable means to prevent the fall of persons or material.

l)When persons are employed on a roof where there is a danger of falling from the height exceeding 3 meters (to be specified) suitable precautions shall be taken to prevent the fall of persons or material

m) Suitable precautions shall be taken to prevent persons being struck by articles, which might fall from scaffolds or other working places.

n) Safe means of access shall be provided to all working platforms and other working places.

Liability of contractors forany damage done in or outside the work

area

o)The Contractor will have to make payments to laborers as per Minimum Wages Act.

Clause 21 B : The Contractor shall comply with the following regulations as regards the Hoisting appliances to be used by him.

a) Hoisting machines and tackles, including their attachments, anchorages and supports shall.

i) be of good mechanical construction, sound material and adequate strength and free from patent defect, and

ii) be kept in good repairs and in good working order.

Employment of female labor work on Sunday

b) Every rope used in hoisting or lowering materials or as a means of suspension shall be of suitable quality and adequate strength and free from patent defect.

c) Hoisting machines and shackles shall be examined and adequately tested after erection on the site and before use and be re-examined in position at intervals to be prescribed by the MJP/Corporation/Council.

d) Every chain, ring, hook, shackle, swivel and pulley block used in hoisting or lowering materials or as means of suspension shall be periodically examined.

e) Every crane driver or hoisting appliance operator shall be properly qualified.

f) No person who is below the age of 18 years shall be in control of any hoisting machine, including any scaffold, which gives signals to the operator.

g) In case of every machine and every chain, ring, hook, Shackle, swivel and pulley block used in hoisting or lowering or as a means of suspension, the safe working load shall be ascertained by adequate means.

h) Every hoisting machine and all gear referred to in proceeding regulation shall be plainly marked with the safe working load

i) In case of hoisting machine having a variable safe working load, each safe working load and the conditions under which it is applicable shall be clearly indicated.

j) No part of any hoisting machine or any gear referred to in regulation (g) above shall be loaded beyond the safe working load except for the purpose of testing.

k) Motors, gearing, transmissions, electric wiring and other dangerous parts of hoisting appliances shall be provided with

efficient safeguards.

l) Hoisting appliances shall be provided with such means, which will reduce to minimum, and the risks of the accidental descend of load.

m) Adequate precaution shall be taken to reduce to a minimum the risk of any part of suspended load becoming accidentally displaced

Measures for prevention of fire.

Clause 22 : The Contractor shall not set fire to any standing jungle, trees, brushwood or grass without a written permission from the MJP/Corporation/Council. When such permission is given and also in all cases when destroying, cut or dug up trees, brushwood, grass, etc. by fire, the Contractor shall take necessary measures to prevent such fire spreading to or otherwise damaging surrounding property. The Contractor shall make his own arrangements for drinking water for the labor employed by him.

Liability of Contractor for any damage done in or outside work area.

Clause 23 : Compensation for all damages done intentionally or unintentionally by Contractor's labour whether in or beyond the limits of the MJP/Corporation/Council property including any damage caused by the spreading of fire mentioned Clause 22 shall be estimated by the Engineer-in-charge or such other officer as he may appoint and the estimate of the Engineer-in-charge subject to the decision of the Chief Engineer/Commissioner on appeal shall be final and the Contractor shall be bound to pay the amount of the assessed compensation on demand, failing which the same will be recovered from the Contractor as damage in the manner prescribed in Clause 1 or deducted by the Engineer-in-charge from any sums that may be due or become due from MJP/Corporation/Council to Contractor under this contract or otherwise.

The Contractor shall bear the expenses of defending any action or other legal proceedings that may be brought by any person for injury sustained by him owing to neglect of precautions to prevent the spread of fire and he shall pay any damages and cost that may be awarded by the court in consequence.

Employment of female labor

Clause 24 : The employment of female laborers on works in neighborhood of soldiers barracks should be avoided as far as possible.

Clause 25 : No work shall be done on Sunday without the sanction in writing of the Engineer-in-charge.

Work on Sunday.

Clause 26 : The contract shall not be assigned or sublet without the written approval of the Engineer-in-charge, and if the Contractor shall assign or sublet his contract or attempt to do so, or become insolvent or commence any proceedings to get himself adjudicated and insolvent or make any composition with his creditors or attempt so to do so or if bribe, gratuity, gift, loan, perquisite, reward of advantage, pecuniary or otherwise shall either directly or indirectly be given, promised or offered by the Contractor or any of his servants or agents to any public officer or person in the employment of MJP/Corporation/Council in any relating to his office or employment or if any such officer or person shall become in any way directly or indirectly interested in the contract, the Engineer-in-charge may thereupon by notice in writing rescind the contract, and the security deposit of the Contractor shall thereupon stand forfeited and be absolutely at the disposal of MJP/Corporation/Council and the same consequences shall ensure as if the contract had been rescinded under Clause 3 hereof and in addition the Contractor shall not be entitled to recover or be paid for any work thereof actually performed under the contract.

Work not to be sublet.. Contract may be rescinded and security deposit forfeited for subletting it without approval or for bribing a Public Officer or if Contractor becomes insolvent.

Clause 27 : All sums payable by a Contractor by way of compensation under any of these conditions shall be considered as a reasonable compensation to be applied to the use of MJP/Corporation/Council without reference to the actual loss or damage sustained, and whether any damage has or has not been sustained

Sum payable by way of compensation to be considered as reasonable without reference to actual loss

Clause 28 : In the case of tender by partners, any change in the constitution of a firm shall be forthwith notified by the Contractor to the Engineer-in-charge for his information.

Changes in the constitution of the firm to be notified.

Clause 29 : All works to be executed under the contract shall be executed under the direction and subject to the approval in all respects of the Executive Engineer MJP/Commissioner/Commissioner, for the time being, who shall be entitled to direct at what point or points and in what manner they are to be commenced and from time to time carried out.

Directions and control of the Engineer in charge

Directions and control of the Engineer in charge .

Clause 30.1 : Except where otherwise specified in the contract and subject to the powers delegated to him by MJPCorporation/Council under the code, rules then in force, the decision of the Executive Engineer/Commissioner/Commissioner for the time being shall be final, conclusive and binding on all parties of the contract, upon all questions relating to the meaning of the specifications, designs, drawings and instruction hereinbefore mentioned and as to the quality of workmanship, or materials used on the work or as to any other question, claim, right, matter or thing whatsoever, in any way arising out of or relating to the contract, designs, drawings, specifications, estimates, instructions, orders, or these conditions, or otherwise concerning the works, or the execution, or failure to execute the same, whether arising during the progress of work, or after the completion or abandonment thereof.

Clause 30.2 : The Contractor may within thirty days of receipt by him of any order passed by the Chief Engineer/Commissioner/Commissioner as aforesaid appeal against it to the Chief Engineer MJP with the contract work or project provided that.

a) The accepted value of the contract exceeds ` 10 lakhs(`. Ten lakhs)

b) Amount of claim is not less than ` 1.00 lakh (` One Lakh).

Clause 30: If the contractor is not satisfied with the order passed by the Chief Engineer/Commissioner/Commissioner as aforesaid, the contractor may, within thirty days of receipt by him of any such order, appeal against it to the Member Secretary, MJP who if convinced that prima facie, the contractors, claim rejected by Chief Engineer/Commissioner/Commissioner is not frivolous and that there is some substance in the claim of the contractor as would merit a detailed examination in the claim of the contractor and decision by Secretary Urban development department for suitable decision. The decision of the MS MJP shall be final and binding on the contractor and the Engineer-in-charge.

Clause 31 : ***Deleted***

Lump sums in estimates

Clause 32 : When the estimate on which a tender is made includes lump sums in respect of parts of the work, the Contractor shall be entitled to payment in respect of the items of work involved or the

part of the work in question at the same rates as are payable under this contract for each item, or if the part of the work in question is not in the opinion of the engineer-in-charge capable of measurement, the Engineer-in-charge may at his discretion pay the lump sum amount entered in the estimate and the certificate in writing of the Engineer-in-charge shall be final and conclusive against the Contractor with regard to any sum or sums payable to him under the provisions of this clause.

Action where no specifications

Clause 33 : In the case of any class of work for which there is no such specification as is mentioned in Rule I of Form B-1, such work shall be carried out in accordance with the Divisional specifications and in the event of there being no Divisional specifications, the work shall be carried out in all respect in accordance with all instructions and requirements of the Engineer-in-charge.

Definition of work

Clause 34 : The expression 'Work' or 'Works' where used in these conditions, shall unless there be something in the subject or context repugnant to such construction, be constructed to mean the work or works contracted to be executed under or in virtue of the contract, whether temporary or permanent and whether original, altered, substituted or additional.

Contractor's percentage whether applied to net or gross amount of bill.

Clause 35 : The percentage referred to in the tender shall be deducted from/ added to the gross amount of the bill before deducting the value of any stock issued.

Quarry fees and royalties

Clause 36 : All quarry fees, royalties, octroi duties and ground rent for stacking materials, if any should be paid by Contractor, which will not be entitled to a refund of such charges from the MJP/Corporation/Council. (Please see special clause for royalty).

Compensation under Workmen's Compensation Act.

Clause 37 : The Contractor shall be responsible for and shall pay any compensation to his workmen payable under the Workmen's Compensation Act., 1923 (VIII of 1923), (hereinafter called the said Act) for injuries caused to the workmen. If such compensation is payable/ paid by the MJP/Corporation/Council as principal under sub-section (1) of Section 12 of the said Act on behalf of the Contractor, it shall be recoverable by the MJP/Corporation/Council from the Contractor under the sub-section (2) of the said section. Such compensation shall be recovered in the manner laid down in

Clause 1 above.

Clause 37 A : The Contractor shall be responsible for and shall pay the expenses of providing medical aid to any workman who may suffer a bodily injury as a result of an accident. If such expenses are incurred by MJP/Corporation/Council, the same shall be recoverable from the Contractor forthwith and be deducted without prejudice to any other remedy of the MJP/Corporation/Council from any amount due or that may become due to the Contractor.

Clause 37 B : The Contractor shall provide all necessary personal safety equipment and first aid apparatus available for the use of the persons employed on the site and shall maintain the same in condition suitable for immediate use at any time and shall comply with the following regulations in connection herewith.

a) The workers shall be required to use the equipments so provided by the Contractor and the Contractor shall take adequate steps to ensure proper use of the equipment by those concerned
b) When work is carried on in proximity to any place where there is a risk of drowning, all necessary equipment shall be provided and kept ready for use and all necessary steps shall be taken for the prompt rescue of any person in danger.
c) Adequate provision shall be made for prompt first-aid treatment of all injuries likely to be sustained during the course of the work.

Clause 37 C : The Contractor shall duly comply with the provisions of 'The Apprentices Act, 1961' (III of 1961), the rules made thereunder and the orders that may be issued from time to time under the said Act and the said Rules and on his failure or neglect to do so he shall be subjected to all the liabilities and penalties provided by said Act and said Rules.

Clause 38 : I) Quantities in respect of the several items shown in the tender are approximate and no revision in the tendered rate shall be permitted in respect of any of the items so long as subject to any special provision contained in the specifications prescribing a different percentage of permissible variation in the quantity of the item does not exceed the tender quantity to more than 25% and so long as the value of the excess quantity beyond this limit at the rate of the item specified in the tender, is not more than ` 5,000/- (Whichever is more)

Quantities put to tender are approximate. Excess quantity beyond quantity put to tender will be governed as per Cl.38

ii) the Contractor shall, if ordered in writing by the Engineer so to do, also carry out any quantities in excess of the limit mentioned above in sub –clause (1) hereof on the same conditions and in accordance with the specifications in the tender and the rates

a) derived from the rates entered in Current Schedule of Rates and in the absence of such rates
b) At the rates prevailing in the market. The said rates being increased or decreased as the case may be by the percentage which the total tendered amount upon the schedule of rates applicable to the year in which the tender were accepted

For the purpose of operation of this clause ,this cost shall be worked out from the DSR prevailing at the time of inviting of tender. The cost of Clause 38 is Rs **174,38,45,985/-(Rs.One Hundred Seventy Four Crore Thirty Eight Lakhs Fourty Five Thousand Nine Hundred Eighty Five Only)**

iii) This clause is not applicable to extra items.

iv) Claims arising out of reduction in the tendered quantity of any item beyond 25% will be governed by the provision of Clause 15 only when the amount of such reduction beyond 25% at the rate of the item specified in the tender is more than ` 5,000/- This reduction is exclusively the reduction in Clause Nos. 14 & 15 of the work and site conditions.

v) There is no change in the rate if the excess is less than or equal to 25%. Also there is no change in the rate if the quantity of work done is more than 25% of the tendered quantity, but the value of the excess work at the tendered rates does not exceed ` 5,000/-

vi) The quantities to be paid at the tendered rates shall include,
a) tendered quantity plus 25% excess of tendered quantity or the excess quantity of the value of ` 5,000/- at tendered rate whichever is more

Interim payment for excess quantity

Clause 38 A : The Executive engineer MJP/Engineer in charge /Commissioner of Municipal council/corporation shall see that claim towards excess quantity under this clause 38 is submitted to higher authority immediately on its cropping up. The Executive Engineer/Engineer in charge /Commissioner of Municipal council/corporation while making such payment shall see that the total expenditure shall not exceed sanctioned cost of the scheme. If the proposal of Clause 38 is submitted to competent authority for payment then interim 50% payment will be released as under

a) At accepted tender rate or current schedule rate whichever is less subject to condition that total expenditure on the tender shall not exceed sanctioned cost of the scheme

Clause 38-B : If the rate entered in to schedule B for the work of excavation of pipeline is a combined rate for different strata then the rate entered in Schedule-B will be applicable for quantity 25% in addition to the quantity mentioned in schedule-B of all items of excavation for pipe line trenches and for excess over 25% of Schedule-B quantity ,the rate payable to the contractor shall be worked out from the CSR by considering following percentage of excavation in different strata irrespective of actual strata met at the site for the increased quantity.

Payment for average rate of excavation

1) Excavation in all types of soils,. Sand, gravel and soft murum with lead up to 50 meter and lift as involved. Including dewatering, shoring and strutting etc. excluding refilling etc. % of average rate for lift 0.00 to 1.50 meter and____ % for lift ____.

2) Excavation in hard murum and boulders with lead up to 50 m and lead and lift as involved including dewatering, shoring and strutting etc. excluding refilling etc. ____% of average rate for lift _____ meter and %____ for lift ___.

3) Excavation in soft rock and old cement and lime masonry with lead upto 50 m and lift as involved, including dewatering, shoring and strutting, excluding refilling etc. ___% of average rate for lift ____ and ___% for lift ____.

4) Excavation in hard rock and concrete road by chiseling wedging line drilling by mechanical means or by all means other than blasting with lead upto 50m and lift as involved, including dewatering, shoring and strutting etc. excluding refilling ____% of average rate for lift 0.00 to 1.590 m _____% and 1.50 to 3.00 m.

(*Note-Sheet is attached separately*)

Clause 39 : The Contractor shall employ any famine, convict or other labour of a particular kind or class if ordered in writing to do so by the Engineer-in-charge.

Employment of famine labour, etc

Clause 40: No compensation shall be allowed for any delay caused in the starting of the work on account of acquisition of land or, in the case of clearance works, on account of any delay in accordance to sanction of estimates.

Claim for compensation for delay in starting the work.

Clause 41: No compensation shall be allowed for any delays in the execution of the work on account of water standing in borrow pits or

Claims for compensation for delay in execution of the work.

compartments. The rates are inclusive for hard or cracked soil, execution in mud, sub-soil, water standing in borrow pits and no claim for an extra rate shall be entertained unless otherwise expressly specified.

Entering upon or commencing any portion of work

Clause 42 : The Contractor shall not enter upon or commence any portion of work except with written authority and instructions of the Engineer-in-charge of his subordinate in charge of the work. Failing such authority the Contractor shall have no claim to ask for measurements of or payment for work.

Clause 43 :

i) No Contractor shall employ any person who is under the age of 18 years.

ii) No Contractor shall employ donkeys or other animals with breaching of string or thin rope. The breaching must be at least three inches wide and should be of tape (Nawar).

iii) No animal suffering from sores, lameness or emaciation or which is immature shall be employed on the work.

Minimum age of persons employed, the employment of donkeys and other animals and the payment of fair wages.

iv) The Engineer-in-charge or his agent is authorized to remove from the work, any person or animal found working which does not satisfy these conditions and no responsibility shall be accepted by the MJP/Corporation/Council for any delay caused in the completion of the work by such removal.

v) The Contractor shall pay fair and reasonable wages to the workmen employed by him in the contract undertaken by him, In the event of the dispute arising between the Contractor and his workmen on the grounds that the wages paid are not fair and reasonable, the dispute shall be referred without delay to the Engineer in charge who shall decide the same. The decision of the Executive engineer shall be conclusive and binding on the Contractor but such decision shall not in any way affect the conditions in the contract regarding the payment to be made by the MJP/Corporation/Council at the sanctioned tender rates.

vi) Contractor shall provide drinking water facilities to the workers. Similar amenities shall be provided to the workers

engaged on large work in urban areas

vii) Contractor to take precautions against accidents which taken place on account of labour using loose garments while working near machinery.

Method of payment

Clause 44: Payment to Contractors shall be made by cheque drawn on Executive Engineer /Commissioner/Commissioner/ Engineer in charge's account provided the amount exceeds ` 1000/- Amounts not exceeding 1000/- will be paid in cash.

Acceptance of conditions compulsory before tendering for work.

Clause 45: Any Contractor who does not accept these conditions shall not be allowed to tender for work.

Employment of scarcity labour

Clause 46 : If Government declares a site of scarcity or famine to exist in any village situated within 16 Kms of the work, the Contractor shall employ upon such parts of the work, as are suitable for unskilled labour, any person certified to him by the Executive Engineer/Engineer in charge Commissioner of Municipal council/corporation, or by any person to whom the Executive Engineer/Engineer in charge Commissioner of Municipal council/corporation may have delegated this duty in writing to be in need on relief and shall be bound to pay to such person wages not below the minimum wages which Government may have fixed in this behalf. Any disputes which may arise in connection with the implementation of this clause shall be decided by the Engineer in charge whose decision shall be final and binding on the Contractor.

Price not to exceed controlled price fixed by Govt.

Clause 47: The price quoted by the Contractor shall not in any case exceed the control price, if any, fixed by Government or reasonable price which is permissible for him to charge a private purchaser for the same class and description, the control price or the price permissible under the provisions of Hoarding and Profiteering Preventing Ordinance, 1948 as amended from time to time. If the price quoted exceeds the controlled price or the price permissible under Hoarding and Profiteering Prevention Ordinance, the Contractor will specifically mention this fact in his tender along with the reasons for quoting such higher prices. The purchaser at his discretion will in such case exercise the right of revising the price at any stage so as to conform to the controlled

price as permissible under the Hoarding and Profiteering Prevention Ordinance. This discretion will be exercised without prejudice to any other action that may be taken against the Contractor.

Rate inclusive of all taxes

Clause 47 A : The tender rates are inclusive of all taxes, rates, cess and are also inclusive of the livable tax in respect of sale by transfer of property in goods involved in the execution of work contract under the provision of CGST & MGST rules of Finance Department.
The rates to be quoted by the contractor must be inclusive of all taxes including CGST & MGST No extra payment on this account will be made to the contractor

CGST & MGST on surplus material

Clause 48 : In case of materials that may remain surplus with the Contractor from those issued, the date of ascertainment of the materials being surplus will be taken as the date of sale for the purpose of CGST & MGST and CGST & MGST will be recovered on such date.

Employment of local labour

Clause 50 : The Contractor shall employ at least 80 percent of the total number of unskilled labour to be employed by him on the said work from out of the persons ordinarily residing in the district in which site of the said work is located. Provided, however, that if required number of unskilled labour from that district is not available, the Contractor shall in the first instance employ such number of persons as is available and thereafter may with the previous permission in writing of the Engineer-in-charge of the said work obtain the rest of the requirement of unskilled labour from outside of district.

Wages to be paid to the skilled and unskilled labours employed by contractor.

Clause 51 : The Contractor shall pay the labourers – skilled and unskilled according to the wages prescribed by Minimum Wages Act applicable to the area in which the work of the Contractor is located. The Contractor shall comply with the provision of the Apprentices Act, 1961 and the Rules and Orders issued there under from time to time.. The Contractor shall be liable for any pecuniary liability arising on account of any violation by him of the provisions of the Act. The Contractor shall pay the labourers – skilled and unskilled- according to wages prescribed by Minimum Wages Act applicable to the area in which the work lies.

Clause 52 : All amounts whatsoever which the Contractor is liable to pay to the MJP/Corporation/Council in connection with the execution of the work including the amount payable in respect of i)materials and/ or stores supplied/ issued hereunder by the Corporation/Council to the Contractor,

ii) hire charges in respect of heavy plant, machinery and equipment given on hire by the MJP/Corporation/Council to the Contractor for execution by him of the work and/ or for which advances have been given by the MJP/Corporation/Council to the Contractor shall be deemed to be arrears of the land revenue and MJP/Corporation/Council without prejudice to any other rights and remedies of the Corporation/Council recover the same from the contractor as a arrears of land revenue

Clause 53 : The Contractor shall duly comply with all the provisions of the Contract Labour (Regulation and Abolition) Act, 1970 (37 of 1970) and the Maharashtra Contract Labour (Regulation and Abolition) Rules 1971 as amended from time to time and all other relevant statutes and statutory provisions concerning payment of wages particularly to workmen employed by the contractor and working on the site of the work. In particular and contractor shall pay wages to each worker employed by him on the site of the work at the rates prescribed under the Maharashtra Contract Labour (Regulation and Abolition) Rules 1971. If the contractor fails or neglect to pay wages at the said rates or makes short payment and the MJP/Corporation/Council makes such payment of wages in full or part thereof less paid by the contractor, as the case may be, the amount so paid by the MJP/Corporation/Council to such workers shall be deemed to be debt payable by the Contractor and the MJP/Corporation/Council shall be entitled to recover the same as such from the contractor or deduct same from the amount payable by the MJP/Corporation/Council to the contractor hereunder or from any other amounts payable to him by the MJP/Corporation/Council.

Clause 54 : Where the work are required to work near Machine and are liable to accident they should not be allowed to wear

loose clothes like Dhoti, Jhabba etc.

Clause 55 : The Contractor shall comply with the provisions of the Apprentices Act, 1961 and the Rules and Orders issued there under from time to time

Clause 56 : In view of the difficult position regarding the availability of the Foreign exchange, no foreign exchange, will be released by the Department for the purchase of the Plant and Machinery required for the execution for the work concerned work.

Clause 57 : Conditions of Malaria Eradication.

Anti-Malaria and other health measures.

a) The anti malaria and the health measures shall be as directed by the Joint Director (Malaria and Filarial) of Health Service, Pune.

b) Contractor shall see that most autogenic conditions are not created so as to keep vector population to minimum level

c) Contractor shall carry out anti malaria measures in the area as per guidelines prescribed under National Malaria Eradication Programme and as directed by the Joint Director (M & F) of Health Services, Pune

d) In case of default in carrying out prescribed anti malaria measures resulting in increase in malaria incidence contractor shall be liable to pay to Government the amount spent by Government on anti malaria measures to control the situation in addition to fine.

e) Relations with Public Authorities.

The contractor shall make sufficient arrangements for draining away the sullage water as well as water coming from the bathing and washing places and shall dispose of this water in such a way as not to cause, any nuisance. He shall also keep the premises clean by employing sufficient number of sweepers.

The contractor shall comply with all rules, regulations, bye-laws and directions given from time to time by any local or public authority in connection with this work and shall pay fees or charge which are leviable on him without any extra cost to Government

Clause 58 : The successful contractor will have to enter into agreement in form specified by MJP/Corporation/Council on a stamp of required amount as per rules in force. The stamp charges shall be borne by the contractor

Clause 59 :.Deleted

Insurance

Clause 60 : The contractor shall provide and maintain barricades, guards, guard rails, temporary bridges and walkways, watchmen, headlights and danger signals illuminated from sunset to sunrise and all other necessary appliances and safeguards to protect the work, life, property, the public excavations, equipment and materials. Barricades shall be substantial construction and shall be painted such as to increase their visibility at night. For any accident arising out of the neglect of above instructions, the contractor shall be bound to bear the expenses of defence of every suit, action or other legal proceedings, at law, that may be brought by any person for injury sustained owing to neglect of the above precautions and to pay all damages and costs which may be awarded in any such suit, action or proceedings to any such person or which may with the consent of the contractor be paid in compromising any claim by any such person.

Clause 61 : The contractor shall take out necessary insurance policy /policies so as to provide adequate insurance cover for execution of the awarded work from the Director of insurance Maharashtra State Mumbai. However if contractor desire to effect insurance with local office of any insurance company same should be under the Co-insurance-come- servicing arrangement approved by the director of insurance if the policy taken out by the contractor is not Co – Insurance basis(GIF- 60% and insurance company -40%) the same will not be accepted and the amount of the premium calculated by director of insurance will be recovered directly from the amount payable to the contactors for the executed contract work.

1 Loss of or damage to the Civil and Mechanical and Electrical equipments supplied/installed including the materials such as

pipes, valves, specials etc. brought on site

Loss of or damage to contractor's equipments including his vehicles.

Loss of or damage to property (except the works, Plant material and Equipment) in connection with the contractor, and :

Personal injury or death due to vehicles of the contractor and or due to any accident that may arise at or around the site to the Contractor personnel or to the MJP/Council/Corporation staff or to any other person not connected with MJP/Council/Corporation /Contractor

2. Policies and certificates for insurance shall be delivered by the Contractor to the Engineer for the Engineer's approval before the date of actual starting of work. All such insurance shall provide for compensation to be payable in the types of proportions of currencies required to rectify the loss or damage incurred

3. If the contractor did not produce any of the policies and certificates required the Engineer may effect the Insurance for which the contractor should have produced the policies certificates and recover the premium it has paid from payment otherwise due to the contractor or, if no payments due to payment of the premiums shall be of debt due.

4. Alternations to the terms of an insurance shall not be made without the approval of the Engineer

5. The minimum insurance cover for loss damages to physical property, injury and death shall be 10% of the contract cost per occurrence with number of occurrences as 3(Three). After each occurrence the contractor shall pay additional premium necessary so as to keep the insurance police valid always till the defect liability period is over

6. No payment will be released to the contractor until the insurance coverage with the Govt. Insurance fund, Maharashtra State is provided and unless the proof of insurance coverage is produced by the Contractor to the Engineer-in-Charge

Clause 62:During execution of work excavation is required to be carried out for various sub-works for which royalty is required is to be paid by the contractor.

During execution of work and till completion if point of royalty is raised by collector office it will be sole responsibility of the contractor to pay royalty charges/compensation if any to concern. Until the certificate from the collector office regarding royalty charges is not submitted by the contractor, final bill and security deposit for such work will not be payable to the contractor.

Clause 63: Government of Maharashtra Industry and labour Department vide GR No. BCA/2009/P.R.-KV/108/labour 7-A Dated 17.06.2010 has instructed that labour cess 1% of bill amount and labour amenity will be recovered from contractors R.A.Bills.

Clause 64: As you are aware the infrastructure and other major sectors in India has been facing stress for past five years many of the factors involved are internal to the company or related to financials.

1) However in the projects which are already operational, it has been observed that, often the liquidity crunch faced by them is due to elongation of the realization period for their receivables from the government agencies / state government etc. The delay in the payment of receivable on account of non processing of the same is affecting the working capital of these projects. The funds mobilized by them, from their own sources as well as from financial sector, partly become non productive. The project subsequently tend to become NPAS in the books of their respective bankers. It is imperative that it be ensured that these project do not suffer merely on account of delay in payments of bills raised by them related to the projects awarded to various companies and the work already executed in line with the terms and conditions of the tender.

2) Further it has also been brought to our notice that many of the infrastructure companies are unable to bag contracts / orders merely because they are restructure by their bankers. It is understood that in the bidding / tender process it is interpreted that these companies may not have the capacity to execute that work to the satisfaction of the concern departments. It may be pointed out that these companies have

the support of their banker and have the necessity capacity, structure, technical knowledge and capability to deliver. Under the circumstances, discriminating against them merely because their account has been restructured is a major set back for them. It wil affect their order book as well as capacity utilization and lead them towords nonviablity. It is suggested that while taking a dicision regarding award of work / supply order through tender /bid process, companies which are restructured by banks should not be considered in eligible for tender competition.

3) I shall be grateful if you could kindly send these instructions to all public sector companies in you state.

Commissioner
Solapur Municipal Corporation

GENERAL SCOPE OF WORK

Solapur Municipal Corporation, Solapur

Name of work : SOLAPUR CITY UNDERGROUND SEWERAGE SCHEME UNDER AMRUT MISSION (FOR SEWERAGE ZONE I to IV, VI & IX to XIII)

(Providing, lowering, laying, jointing and testing Sewage Collection System, Rising main, Construction of Sump and Pump house, STP Cap.20.00 MLD & 15.50 MLD based on MMBR Technology.)

GENERAL SCOPE OF WORK

Solapur city is divided in to thirteen Drainage Zones i.e. Drainage zone no. I to XIII. The drainage zone no. I to VI is old city area. The remaining drainage zone VII to XIII is extended area of city. It is proposed to lay collection systems for Zone I to Zone IV, VI and Zone IX to XIII consisting of HDPE (DWC) and RCC pipes of Diameter from 150 mm to 1200 mm of length 298 Km and for above all excluding Zone IX & X Nala interception and diversion proposed. It is also proposed to construct pumping stations at two STP locations for Zone IX (Desai nagar) & X (Hyderabad Road). Sewage collected and treated for Zone IX & X with Sewage Treatment Plant of capacity 20.0 & 15.5 MLD based on MMBR Technology respectively. House sewer connections, effluent reuse system also proposed in the work.

SCHEDULE-A

Solapur Municipal Corporation, Solapur

Name of work : SOLAPUR CITY UNDERGROUND SEWERAGE SCHEME UNDER AMRUT MISSION (FOR SEWERAGE ZONE I to IV, VI & IX to XIII)

(Providing, lowering, laying, jointing and testing Sewage Collection System, Rising main, Construction of Sump and Pump house, STP Cap.20.00 MLD & 15.50 MLD based on MMBR Technology.)

MATERIAL TO BE ISSUED UNDER SCHEDULE 'A'

Statement showing the material to be supplied from the store for the work contracted to be executed and preliminary and ancillary works and the rate at which they are to be charged.

Sr. No.	***Particulars of Material***	***Approx. Quantity & Unit***	***Rate at which the material will be charged for***	***Place of delivery***
1	2	3	4	5
1				
		---- NIL ----		

Solapur Municipal Corporation, Solapur

Name of work : SOLAPUR CITY UNDERGROUND SEWERAGE SCHEME UNDER AMRUT MISSION (FOR SEWERAGE ZONE I to IV, VI & IX to XIII)

(Providing, lowering, laying, jointing and testing Sewage Collection System, Rising main, Construction of Sump and Pump house, STP Cap.20.00 MLD & 15.50 MLD based on MMBR Technology.)

CONDITIONS FOR MATERIAL SCHEDULE 'A'

1. Other materials except as shown in Schedule 'A' required for the work shall be procured and supplied by the contractor at his cost. In such cases the test certificate for their quality shall have to be produced by the contractor.

2. Material shall be available for delivery on any working day from 11.00 A.M. to 05.00 P.M. with at least week's intimation in advance.

3. The contractor shall maintain proper account of consumption of all material supplied to him by the department as per Schedule 'A' in the register which may be if required, modified as prescribed by …..Muncipal Corporation/Council and shall submit the extract of the same monthly to the Executive Engineer/Engineer in charge. The Executive Engineer/Engineer in charge shall reserve the right to stop further issue of material to the contractor, if monthly account of the previously issued material is not submitted by the contractor. He shall be fully responsible for the consequence arising out of this.

   The contractor shall responsible for proper handling and safe custody of material issued to him by Municipal Corporation/Council, for use on the work and shall return to Government all surplus material after completion of work, if and as ordered by the Executive Engineer vide Clause 12 of B.1 Form. The cost of damages or unserviceable material as would be fixed by the Engineer-in-charge shall be recovered from the contractor. The material, which is not found, accounted properly after considering reasonable percentage of wastage shall be charged at panel rates or determined by the Engineer-in-charge

4. The contractor shall at his own cost make arrangement for storing cement brought by him by constructing a pakka shed and platform, etc. with double locking arrangements. Any damage to the cement due to inadequate provision of store

theft, etc. will to the account of the contractor.

5. If there is delay in supplying the materials due to reasons outside the control of the Department or due to the materials being out of stock, no claim for compensation will be considered on the ground of delay in the supply of materials.

6. All the materials mentioned in Schedule 'A' required for the work shall be obtained from the Department's store only where otherwise provided. The material obtained from other sources shall not be allowed to be used except under written permission of the Engineer-in-charge and after producing necessary test certificate.

7. The contractor shall inspect the material thoroughly before taking delivery of the same and shall take the delivery in good and sound condition and sign the unstamped receipt in token of receipt. Damages to the material noticed afterwards will be to the account of the contractor.

8. Quantities in Schedule 'A' are approximate and shall vary according to actual and bonafied use.

9. All the materials remaining unused after the completion of the work are to be returned to Municipal Corporation/Council at their store at the cost of the contractor and the credit if due will be given as per rules enforce.

10. Once the materials are issued to the contractor at the ….MC's store, he shall remove the same immediately to his stores, failing which rent as decided by Engineer-in-charge shall be recovered from the contractor.

11. The contractor shall submit account of all the materials issued to him previously before demand for any fresh materials is made. Materials that cannot be accounted for shall be recovered from him at the rates decided by the Executive Engineer/Engineer in charge.

12. The contractor will have to provide the manufacturer test report from Government Laboratory regarding steel to be provided by the contractor.

13. If the contractor fails to return the balance materials with the firm, the same shall be recovered at two times the issue rate or at the prevailing market rate, whichever is higher.

14. C.I. flanged and S/s specials required other than that not available with the department for the work will be supplied by contractor as per necessity of the

work.

15. The contractor shall be responsible for safety of materials (even if it is laid in ground) till satisfactory Hydraulic Test is completed and work is finally handed over to the ….MC.

16. If the material supplied to the contractor at the place other than mentioned in Schedule 'A', the transport charges will be paid as per prevailing DSR for the shortest between stipulated place of delivery and actual place of delivery. In addition Octroi on such a material, if paid by the contractor, same shall be reimbursed to the contractor on production of proof of payment of such charges to Municipal Corporation/Council.

SCHEDULE-B

(Attached Separately)

ANNEXURE-1

INFORMATION ABOUT WORK IN HAND

(To be supported with certificate signed by concerned Superintending Engineer/City Engineer) in case Col. 8 shows the cost of completed work as more than 80%)

Sr. No.	Name of Works	Name of Division /MC	Accepted Tender Cost.	Cost of supply of pipes	Balance cost (4-5)	Cost of work completed as on _____ (Excluding supply of pipe)	Proportion of Col.7 to Col.6 %	Reason for delay (if any) for completion of balance work.
1	2	3	4	5	6	7	8	9

Contractor No. of correction Public Health Engineer

ANNEXURE-2

DETAILS OF MACHINERY AVAILABLE WITH THE TENDERER

FOR THE USE ON THIS WORK

Sr.No	Name of Equipment	No. of unit	Name of Make	Capacity	Age and Condition	Remark

ANNEXURE-3

FORM OF BANK GUARANTEE
BANK GUARANTEE
(***Security for Performance***)

In consideration of the Chief Engineer/Commissioner/Commissioner (hereinafter called "MJP/…….. Municipal Council" (..MC) having agreed to exempt hereafter called "The said contractor") from the demand, under the terms and conditions of an Agreement dated (hereafter called "the said Agreement") made between the MJP/Commissioner/Commissioner …MC and the said contractor for the Security Deposit for the due fulfillment by the said contractor of the terms and conditions contained in the said Agreement, on production of the Bank Guarantee for Rs_____(In words Rs_____) we, (hereinafter referred to as "the Bank" at the request of the said contractor do hereby undertake to pay to the MJP/MC an amount not exceeding the above said amount of Guarantee against any loss or damage caused to or would be caused to or suffered by the MJP/…MC by reason of any breach by the said contractor or any of the terms or conditions.

2. We, _____ do hereby undertake to pay the amounts due and payable under this Guarantee without any demur, in hereby on a demand from the MJP/…MC stating that the amount claimed is due by way of loss or damage caused to or would be to or suffered by the MJP/…MC by reason of breach of the said contractor of any of the terms or condition contained in the said agreement or any reason of the contractor's failure to perform the said Agreement. Any such demand made on the Bank shall be conclusive as regards the amount due and payable by the Bank under this Guarantee. However, our liability under this Guarantee shall be restricted to an amount not exceeding the above said amount Guarantee.

3. WE undertake to pay to the MJP/…MC any money so demanded not withstanding any dispute or disputes raised by the Contractor in any suit or proceeding pending before any court or Tribunal relating thereto our liability under this present being absolute and unequivocal.

The payment so made by us under this bond shall be a valid discharge of our liability for payment there under and the contractor shall have no claim against us for making such payment

4. We _____ further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said Agreement and that it shall

continued to be enforceable till all the dues of the MJP/….MC under or by virtue of the said Agreement have been fully paid and its claims satisfied or discharged till MJP/…MC certified that the terms and conditions of the said Agreement have been duly and properly carried out by the said contractor and accordingly discharges this guarantee unless a demand or claim under this guarantee is made on us in writing on or before we shall be discharged from all liability under this guarantee thereafter.

5. We _____ further agree with the MJP/…MC that the MJP/….MC shall have the fullest liberty without our consent and without affecting in any manner our obligations here under to vary any of the terms and conditions of the said Agreement or to extend time of performance by the said contractor from time to time or to postpone for any time or from time to time any of the powers exercisable by the MJP/…MC against the said contractor and to forbear or enforce any of the terms and conditions relating to the said Agreement, and we shall not be relieved from any liability by reason of any such variation, or extension being granted to the said contractor, or for any forbearance act or omission on the part of the MJP/…MC any indulgence by the MJP/….MC to the said contractor or by any such matter or thing whatsoever which under the law to sureties would, but for this provisions, have effect of so relieving us.

6. This guarantee will not be discharged due to the change in the constitution of the Bank or of the Contractor.

7. We, lastly undertake not revoke this guarantee during its currency except with the previous consent of the MJP/….MC in writing.

Dated the day of 2017-18

For _____

(Indicate the name of the Bank)

Note: However, these forms will be as per the current practices of MJP/….MC and Banks.

ANNEXURE-4

UNDERTAKING FOR GUARANTEE

I/We Guarantee that :

1 I/We will replace repair and adjust free of all charges to the employer any part of the work which fails to comply with the Specifications or amendment to such specifications as refereed to in our specifications attached to tender, fair were and tear except until the completion and for a period mentioned under clause 20 from the date or completion of contract.

2 All the work will be reliable.

3 All the work will be of a type which has been proved in service to be suitable for the duty required by the specifications and will be manufactured and tested in accordance with the appropriate standard specifications approved by the Engineer-in-charge.

4 I/We accept the abide by the clause relating to quality and guarantee of work.

DATE : CONTRACTOR

ANNEXURE-5

DECLARATION BY CONTRACTOR

Solapur Municipal Corporation, Solapur

Name of work : SOLAPUR CITY UNDERGROUND SEWERAGE SCHEME UNDER AMRUT MISSION (FOR SEWERAGE ZONE I to IV, VI & IX to XIII)

(Providing, lowering, laying, jointing and testing Sewage Collection System, Rising main, Construction of Sump and Pump house, STP Cap.20.00 MLD & 15.50 MLD based on MMBR Technology.)

DECLARATION

I hereby declare that I have made myself thoroughly conversant with the local conditions regarding all materials such as stones, murum, sand, availability of water etc. and labour on which I have based my rates for this work. The specifications and requirements of lead for this work have been carefully studied and understood by me before submitting the tender. I undertake to use only the best materials, to be approved by the Chief Engineer/Commissioner/Commissioner/Engineer in charge of the work or his duly authorized representative, before starting the work and also to abide by his decision.

I hereby undertake to pay the labours engaged on the work as per Minimum Wages Act 1984 applicable to the zone concerned.

Contractor's Signature

ANNEXURE-6

COLLABORATION AGREEMENT

Annexure-B

COLLABORATION AGREEMENT

This agreement made at (Place) _____ this day (date, month and year) between M/s. _____ (Name of the bidder, who intends to collaborate and its registered office address) here-in-after referred as (Principal contractor) which expression shall unless it be repugnant to the context or contrary to the meaning there of be deemed to mean and includes its successors in business and permitted assigns of the ONE PART and M/s ----------(name of the collaborator and its registered address) here-in-after referred as (Collaborator) which expression shall unless it be repugnant to the context or contrary to the meaning there of be deemed to mean and includes its successors in business and permitted assigns of the OTHER PART.

WHERE AS

1) MJP/…… Municipal Corporation/Council has floated a tender for the work ----------

Ta.---------- Dist

(Principal contractor) ----------registered with Maharashtra Jeevan Pradhikaran/MCGM/MIDC/CIDCOANY GOVT ORGANIZATION in Class ----------is a well established contractor engaged in the activities of execution of water supply projects.

1. (Collaborator) ----------Registered with Maharashtra Jeevan Pradhikran/MIDC/MCGM/CIDCO/ANY GOVT in Civil/Mechnical Class--------- is well established contractor having the experience of work mentioned in para 4.

1. The principal contractor desires to collaborate with the collaborator for execution of following works, as he don't have sufficient experience of this particular work included in tender as mentioned in para 1 above.

Sr.No.	Name of work	Amount
	Total :-	

(Note *:- It is obligatory to furnish above information otherwise collaboration agreement will not be considered).*

1. The Parties hereto have come together to set up a collaboration in order to quote

for the tender mention in para 1 above and on award of the tender to jointly execute the work as mentioned in para 4 above as well as to guarantee it's perfect execution utilizing the technical experience. The principal contractor involved in this collaboration, directly or indirectly will hold fully responsible towards MJP/…… Municipal Corporation to look after the execution of the said work as per the terms and conditions and specifications mentioned in tender.

NOW IT IS HEREBY AGREED BY AND BETWEEN THE PARTIES HERETO AS UNDER :-

1) In consideration of the mutual understanding, trust and confidence each of the parties in other, they have mutually agreed to form a collaboration to submit the tender and if the tender is accepted by the MJP/…….. Municipal Corporation/Council then carry on the business as a collaboration in respect of development and execution of the said work in accordance with the terms and conditions that may be imposed or agreed by and between the …….. MJP/Municipal Corporation/Council and the Principal contractor hereto.

2) The collaborator shall be responsible for completion of works for which the collaboration is made, however the principal contractor shall be ultimately responsible and liable for completion of entire works in accordance with the terms and conditions on which the award to execute the work is made by MJP/…….. Municipal Corporation/Council under the said tender.

3) In the event of any dispute or difference or misunderstanding arises between both of them in course of execution of the work after the award of the work to the Principal contractor by MJP/……. Municipal Corporation, the same shall be referred to Member Secretary, Maharashtra Jeevan Pradhikaran and his decision in this respect shall be final and binding on both the parties.

IN WITNESS WHERE OF the parties hereunto have set and subscribed there respective hands and seals the day, month and year first above written.

SIGNED, SEALED AND DELIVERED
BY THE WITH NAME

(Name of First Party) **(Name of Second Party)**

WITNESS :-

1.

2.

ANNEXURE-7

JOINT VENTURE AGREEMENT

ANNEXURE –7

JOINT VENTURE AGREEMENT

JOINT VENTURE AGREEMENT

This agreement of joint venture made and entered into at _ on this _____ day of …….. by and between.

1. PARTY NO.1:- _____
   _____
   _____
2. PARTY NO.2:- _____
   _____

1. Name of joint venture firm _____
   _____

1. Period of Joint Venture is valid upto _____.

DEFINITION

In this deed the following words and expressions shall have the meaning set out below

The joint venture (J.V.) shall mean _____ *(Party No.1)* _____ _____ and _____ *(Party No.2)* _____ Collectivity acting in collaboration for the purpose of this agreement.

"Appex Co-ordination Body (ACB) shall mean the body comprising the managing director of _____ *(Party No.1)* _____ and managing director of _____ *(Party No.2)* _____ - as the two partners of the Joint Venture. New firm will be _____ *(Name of joint venture firm)* _____ _____".

"The Employer" shall mean the Executive Engineer of Maharashtra Jeevan Pradhikaran (MJP)/COMMISSIONER/COMMISSIONER

The 'work' shall mean ……
……
……

.....
.....
.....

"The contract" shall mean the contract emerged into or to be entered into between the joint venture and the employer for the work.

JOINT VENTURE

Whereas Parties hereto declare that they agree and undertake to form a joint venture for the purpose of applying for pre-qualification for tender and if pre-qualified to execute the work, as an integrated joint venture. The J.V. shall be called as "*Name of joint venture firm*".

The parties are not, under this agreement entering into any permanent partnership or joint venture to tender for undertake any contract other than the subject work.

WITNESS

Whereas the Executive Engineer of M.J.P/COMMISSIONER/COMMISSIONER. hereinafter referred as the Executive Engineer/COMMISSIONER/COMMISSIONER, have invited pre-qualification for the work of.....
.....
.....
.....
.....

Whereas "as *Name of joint venture firm* wish to apply for pre-qualification for tender and if pre-qualified to execute the work if awarded as per the terms for the bid documents contract.

Now Therefore This Deed of Partnership Witnesses As Follow :-

1. That these recitals are and shall be deemed to have been part and parcel of the present Agreement of joint venture.

1. That this Agreement shall come into force from the date of this Agreement i.e. ___ day of _____.....

1. That the operation of this agreement for joint venture firm concerns and is confined to this work only.

1. That the name of the joint venture firm shall be "*Name of joint venture firm*.

2. That "*Name of joint venture firm*" shall jointly execute the work according to all terms and conditions as stated in the relevant instruction contained in the bid document contract as integrated joint venture styled.

1. That this agreement for J.V. shall regulate the relations between the parties and shall include without being limited to them the following condition.

a. "*Name of joint venture firm*" shall be the lead company in charge of the joint venture, for all intents and purpose.

a. The parties here to shall be jointly and severally liable to employer for all act, deeds and things pertaining to the contract.

a. That the managing director of the lead partner of the joint venture shall be the manager of the joint venture firm and shall have the power to control and manage the affairs of the joint venture.
b. That on behalf of the "*Name of joint venture firm, the manager*" shall have the authority to incur liabilities, receive instructions and payments, sign and execute the contract for and on the joint venture. All payment and under the contract shall be made into the joint venture's bank account.

a. One bank account shall be opened in the name of J.V. to be operated by the individual signatory as mutually decided by the representatives of joint venture partners.
b. That each partners of the J.V. agrees and undertakes to place at the disposal of the joint venture the benefit of its individual experience, technical knowledge and skill and shall in all respects bear its share of the responsibilities including the provision of information, advice and other assistance required in connection with the work. The share and the participation of the all the partner in the joint venture shall broadly be as follows.

Name of partner Percentage of shares

1. *Party No.1*

2. *Party No.2*

a. And all rights, interests, liabilities, obligations, work experience and risks (and all net profit or net losses) arising out of the contract shall be shared or born by the parties in proportion to these share. Each of the parties shall furnish its proportionate share in any bounds, guarantees, sureties required for the work as well as its proportionate share in any working capital and other financial requirements, all in accordance with the decisions of the ACB.
b. Any loan/advances shall be shared by the *Party No.1 and Party No.2* at the ratio of & respectively.
c. All funds, finance or working capital required for carrying out and executing the works or contract shall be procured and utilized by the parties as mutually agreed by them.

a. **Site management :-**

A project manager appointed by ACB will manage the execution of the work on the site. The project manager shall be authorized to represent the joint venture on site, in respect of matters arising out of or under the contract.

a. The *Name of joint venture firm* shall be jointly and severally responsible and liable towards the employer for the execution of the contract condition.
b. The joint venture deed shall be registered with the Registrar of partnership firms, Govt. of Maharashtra.
c. This joint venture agreement shall not be dissolved till the completion of defect liability period as stipulated in the tender document condition of works.
d. This joint venture agreement is deemed to be null and void in case the joint venture firm is not qualified by the employer or unsuccessful in the award of work.
e. That question relating to validity and interpretation on this deed shall be governed by the laws of India. Any disputes in interpretation of any conditions mentioned herein shall be referred to Member Secretary, Maharashtra Jeevan Pradhikaran and his decision in this respect shall be final and binding to both the parties. Neither the obligation of each party hereto performs the contract nor the execution of the work shall stop during the course of this arbitration processing or as a result there of.
f. That no party to the J.V. has the right to assign any benefits, obligations or liability under the agreement to any third party without obtaining the written consent of the other partner and employer.
g. Bank account in the name of the joint venture firm may be opened with any scheduled or nationalized bank and the representatives of the J.V. partner are authorized to operate upon individually.

h. That both the parties to the J.V. shall be responsible to maintain or cause to maintain proper books of accounts in respect of the business of the joint venture firm and the same shall be closed as at the end of the every financial year.
i. That the financial year of the firm shall be the year ended on the 31st March of every year.
j. That upon closure of the books of account balance sheet and profit and loss account as to that state of affairs of the firms as the end of the financial year and as to the profit or loss made or incurred by the firm of the year ended of that day, respectively shall be prepared and the same shall be subject to audit by a chartered accountant.

LEGAL JURISDICTION

All matters pertaining or to commencing from this joint venture agreement involving the employer shall be subject to jurisdiction of high court of judicature at Mumbai.

NOTICES AND CORRESPONDENCE

All correspondence and notice to the joint venture shall be sent to the following address.

(Address)

SIGNED, SEALED AND DELIVERED
BY THE WITH NAME

(Name of First Party) **(Name of Second Party)**

WITNESS :-

1.

2.

ANNEXURE-8

BAR CHART

Sr. No.	Name Of Subwork	Month																					
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24

Contractor No. of correction Public Health Engineer

Solapur Municipal Corporation, Solapur

Name of work : SOLAPUR CITY UNDERGROUND SEWERAGE SCHEME UNDER AMRUT MISSION (FOR SEWERAGE ZONE I to IV, VI & IX to XIII)

(Providing, lowering, laying, jointing and testing Sewage Collection System, Rising main, Construction of Sump and Pump house, STP Cap.20.00 MLD & 15.50 MLD based on MMBR Technology.)

QUALITY OF INCOMING SEWAGE

Quality of waste-water coming in STP (Contractor must verify its quality on its own without any challenge to the department and any liability to the Department)

1	PH	7.56
2	BOD	310 Mg/l
3	COD	460 Mg/l
4	Oil and Grease	18
5	TSS	68 Mg/l
6	Ammonical Nitrogen	8.6 Mg/l
7	Nitrate Nitrogen	12 Mg/l
8	Total Phosphorus	1.08 Mg/l

Solapur Municipal Corporation, Solapur

Name of work : SOLAPUR CITY UNDERGROUND SEWERAGE SCHEME UNDER AMRUT MISSION (FOR SEWERAGE ZONE I to IV, VI & IX to XIII)

(Providing, lowering, laying, jointing and testing Sewage Collection System, Rising main, Construction of Sump and Pump house, STP Cap.20.00 MLD & 15.50 MLD based on MMBR Technology.)

QUALITY OF OUTGOING SEWAGE

Sr. No.	*Parameters / Pollutants*		**Values after treatment**
1	pH	:	6.5 to 8.5
2	Biochemical Oxygen Demand (BOD_5)	:	≤ 10 mg/l
3	Chemical Oxygen Demand (COD)	:	≤ 50 mg/l
4	Total Suspended Solids (TSS)	:	≤ 30 mg/l
5	Total Phosphorous (TP)	:	≤ 2 mg/l
6	Total Nitrogen (TN)	:	≤ 10 mg/l
7	Ammonical Nitrogen (NH3-N)	:	≤ 2 mg/l
8	Fecal Coliform	:	≤ 230 MPN/100 ml

GENERAL SPECIFICATIONS

GENERAL SPECIFICATION

GS-1

1) All the materials used in the work shall be of best quality and the material rejected shall be removed from the site by the contractor within 36 hours in the presence of the Engineer in charge at his own cost.

2) All other rules regarding workmen compensations etc will be binding on the contractor.

Unwanted persons shall be dispensed with if called upon by the Engineer in charge.

3) Other unforeseen items to be executed in course of work will have to be done by the contractor as per specifications, in P.W.D. Hand book volume I and II (Latest Edition) I.S. code of practice and as per standard specifications book of latest edition.

4) The contractor shall be responsible and liable to pay for the damages caused by him to public property etc.

5) All T and P machinery shall be provided by the contractor. Non availability of the same shall not be an excuse for application for extension of time limit.

6) Water of good quality for labour, construction, washing and such other purposes shall be provided by the contractor without any claim for extra cost.

7) Materials belonging to contractor if not removed from site of works after completion of the work within a period of 15 days shall be taken over by Maharashtra Jeevan Pradhikaran department at contractors risk and cost and then shall be auctioned at the contractor's risk and cost. The amount so recover shall be credited to contractor's account after recovery of any dues or over payments etc.

8) The final bill and deposits will not be paid unless the site is cleared off all rubbish materials and contractor's stores etc from the site of the work.

9) The contractor will have to pay the royalties and municipal taxes, if charged by the Maharashtra Jeevan Pradhikaran. The same will not be refunded.

10) Specifications given for relevant nature and type of work, for any particular item of the tender shall also be applicable to the other item of work when similar work is repeated or carried out in part or full although the item numbers may not have been mentioned especially against the particular specifications.

11) The contractor shall be responsible for obtaining permission from Government local bodies, private party for storing, stacking of materials required for execution of work.

12) Necessary sign board, danger flags, red lamps shall be provided by the contractor to avoid accidents. Necessary guarding will also have to be provided.

13) Before entering any land, the contractor shall make independent enquiry regarding ownership of land. Any action regarding trespassing will be at the risk of contractor.

14) Materials remaining unsold or unserviceable as per discretion of the Executive Engineer shall be confiscated destroyed or disposed off without any compensation to the contractor, who will be responsible for all legal disputes at his own cost and consequences without reference to the department.

15) In case of legal disputes for materials brought and stores at site without permission of the Executive Engineer, the contractor will be responsible for all legal disputes at his own cost and consequences without reference to the department.

GS 2: SPECIFICATION OF WORK :

The work shall be carried out as per practices and procedures laid down in P.W.D. Hand book Volume - I & II Latest Edition and Public Works Department's standard specifications (Latest Publication of Government of Maharashtra) with amendments from time to time and as per I. S. applicable for respective items of works, as directed by the Engineer in charge.

GS 3: MOTIVE POWER :

No electric power supply shall be entered by the Maharashtra Jeevan Pradhikaran/Corporation/Council during construction and testing of various structures under different sub-works. The contractor shall have to make his own arrangement for the same at is cost. During trial period of the plant, power supply shall be made available by the department. The firm should inform within one month from the date of receipt of work order, the total electrical load required for successful operation of the treatment plant. This electrical load shall also include lighting load for inside and outside light points etc. attached to the buildings in proper as well as premises of the plant.

GS 4: FOUNDATION CONDITIONS AND PRESCRIBED BEARING CAPACITIES

The tenderer shall acquaint himself for results of S.B.C. by taking actual trial pits on site and refilling them afterwards at his cost. The foundation depth shall be considered as minimum 3.00 m below G.L.

for the construction of BPT, MBR & E.S.R.. The bearing capacities of the actual strata met with the foundation levels shall wherever be required got tested from reputed institution, at contractor's cost and in the presence of Engineer-in-charge. Detailed design shall be prepared and submitted by the contractor and got approved from the department after actual confirmation of S.B.C.

GS 5: WATER TIGHTNESS TEST

All the water retaining and carrying structures will have to be tested for their water tightness by filling them with water up to their designed F.S.L. Similarly the pipe line will have to be tested hydraulically. Structures will be considered water tight when the reductions in filled up level is not more than 6 mm in 48 hours with outer surface dry. As regards pipe line, they should hold pressure as directed by Engineer in charge without reduction for thirty minutes. The contractor will have to give all such hydraulic tests by making his own arrangements for water supply, filling and disposing off water after the test. He shall repeat this test if necessary until the above results are achieved and certified by the Engineer-in-charge without any claim for extra cost. The contractor shall carry out the rectification of the structures or pipe lines to achieve the above tests at his own cost. The structures and pipe lines shall be kept filled with water upto F.S.L. after the above test are over at his own cost.

GS 6: SATISFACTORY COMPLETION OF VARIOUS ITEMS :

The sub works included in the schedule of works for BPT MBR WTP/STP & ESR on Lump sum basis.

The various items of the sub work are to fit in perfectly in the whole system physically, hydraulically, architecturally and mechanically.

GS 7: DISPOSAL OF EXCAVATED STUFF :

All materials obtained from any excavation carried out under this contract will be the property of Solapur Municipal Corporation, Solapur and the contractor shall not have any claim on it. It will not be used by the contractor for any other purpose than the legitimate use on the work itself. Stuff still remaining surplus shall be spreaded over the different site of work or disposed off as directed by the Engineer in charge without extra cost.

GS 8: SUBMISSION OF DETAILED DESIGNS AND DRAWINGS AFTER ACCEPTANCE OF TENDER :

For Lump sum job works the contractor shall submit complete detailed designs and drawings within 15 days from the date of issue of work order for approval If the department to the same. Piecemeal submission of designs and drawings shall not be permitted to commence the actual work at site unless detailed structural designs and working drawing are approved by the department. If called

upon, the contractor shall also submit within reasonable time relevant books and other literature which have been referred to by him in working out the design for civil, mechanical or electrical works involved in the construction. Such books and literature will be returned to him. Reason of secrecy in regard to details of designs, materials, equipments etc shall not be placed by the contractor in the name of 'TRADE SECRET' for not furnishing the requisite details called for the Maharashtra Jeevan Pradhikaran/ Solapur Municipal Corporation . The design get approved from Govt. Engineering College structural consultants approved enlisted in MJP shall be subjected to modifications if found necessary and such modification shall not violet the contract. The contractor shall be responsible for the correctness and soundness of the designs submitted by him. The structures shall be as per recognized engineering practices and if any provisions, are found inadequate or faulty, necessary modifications will have to be carried out by him at any stage up to the expiry of guarantee period and no extra payment will be made on the account.

Six copies of all the approved designs and drawings should be furnished by the contractor to the department free of cost.

GS-9: REQUIREMENT OF STRENGTH OF CONCRETE

The contractor shall make field arrangements for testing of all materials for cement concrete i.e. slumps test, compression test etc. The concrete cube moulds 3 Nos. of 15 x 15 x 15 cm size shall be kept during concreting operation. Three cubes shall be prepared from at site during concreting to be used in work for compression test, for each concreting to be used in work for compression test, for each concreting of the structures. One cube shall be tested for test at 7 days age and two at 28 days in Regional Testing Laboratory at Govt. Polytechnic/Engineering college / or at any approved laboratory, by Engineer –In-Charge. ALL THE TESTING CHARGES SHALL BE PAID BY CONTRACTOR. The entire responsibility of the testing of materials will be borne by the contractor.

Mixing of concrete shall be done with Concrete Mixers.

a) The contractor will make his own arrangement for receiving all materials, tools, etc. required for the work.

b) No extra charges for the carriages of water will be allowed.

c) The rates for all items are inclusive of all charges such as carting, lifting etc. No extra payment for any lead and lifts will be paid for any item.

d) The contractor should not be subleted without written permission of the Engineer-In-Charge.

e) The conditions in the tender notice will be binding on the contractor and the Tender Notice will form a part of agreement.

f) The material required for carrying out the work for which the tender is offered shall be brought by the tenderer.

GS-10: ORDINARY CONCRETE

Full payment shall be made when 75% of the result are equal and above the specified strength and the remaining 25% of the result are above 75% of specified strength.

Cases failing outside the above limit shall be examined by the Engineer-In-Change on merits in each case.

1) The charges for preliminary design of concrete mix shall be entirely borne by the contractor .

2) For grades of concrete M-20 and above where cement is to be used by weighment, the cost of extra cement required to make up under weight bags shall be borne by the contractor.

3) For the item of concrete and other items in the agreement where cement is not to be used by weighment the cement bags are received from the manufacturer shall be assumed to contain cement of 50 kg. net weight. The work shall carried out as per this method of reckoning.

GS-11: GENERAL NOTES

The Employer requires that all goods and materials to be used in the works are new unused, of the most recent or current models and incorporate all recent improvements in design and material.

Only the Employer's Requirements and design brief are specified in the following section. These are not restrictive. The Contractor has to draft, the technical specification and the specification of standards for goods, materials and workmanship with recognized codes and standards.

GS-12: SUBMITTALS

The submittals include but is not limited to work required to comply in accordance with general and specified procedures for transmittal of submissions; submission review and subsequent actions; schedule of submissions; resubmission; construction schedule; coordination of drawings; submission of drawings; insert and sleeve location drawings; reproduction of submitted drawings; sample; and construction photocopies.

GS-13: DESIGN, DRAWINGS, DOCUMENTS AND DATA

General Obligations

The Contractor shall carry out, and be responsible for, the design of the Works. Design shall be prepared by qualified designers/professionals who comply with the criteria stated in the Employer's Requirements. The Contractor undertakes that the designers shall be available to attend discussions with the Engineer In-charge at all reasonable times during the Contract Period.

Basic Design Parameters

The bidder is required to examine and check the Employer's design criteria, specifications etc., as included in the Bid documents to confirm their correctness in its bid and to assume full responsibility for them.

Submission of Design Calculations, Drawings and Other Documents by the Contractor

(a) After signing the Contract, within 28 days from the date intimated by the Employer to proceed with the work, the Contractor shall supply to the Engineer In-charge 6 (six) hard copies (along with workable soft copies in a CD) each of the design calculations for the process and sizing of all components of the plant including mechanical and electrical equipment, supported by flow diagrams, and general arrangement drawings, reference catalogues /literature of manufacturers, other reference documents used for the design purpose, for approval of the Engineer In-charge . The Contractor shall incorporate all necessary comments of the Engineer In-charge in the above design and drawings, if any, and shall re-submit further 6 (six) copies each of the revised design and drawings within 14 (fourteen) days for final approval of the Engineer In-charge. The Contractor shall thereafter submit 6 (six) copies each of the approved design and workable soft copies of all approved designs, calculations and drawings. The entire cost shall be borne by the Contractor and the Employer does not hold reliability on this account at any cost and any time.

(b) Design calculations and drawings shall be submitted in sequence as per schedule to be drawn and agreed upon mutually, immediately after submission of the general arrangement drawing. The entire process of submission of all such documents by the Contractor in initial copies and final copies after approval of the Engineer In-charge shall be completed within 90 days from the date of the work order. These documents shall cover:

- Site Plan.
- Layout Plan and hydraulic flow diagram, process design, P & I diagram
- Architectural Drawings
- GA drawing of each / individual unit
- Detailed structural design and good for execution drawings pertaining to all components of the plant and other associated works.
- Drawings showing the size, position and other necessary details of all mechanical and electrical equipment and fixtures.
- Wiring diagrams, pressure control, pumps and motor control gear particulars.
- Details of foundations, position of openings, etc., for the pumps, motors, starting cubicles, LT/HT panels, etc.
- Elementary diagram and manufacturers' shop and part drawings for all equipments.
- Services like internal illumination and ventilation, building water supply, sanitation and plumbing, area lighting, etc.
- Landscaping & Plant beautification plan
- Any other design and drawings to fulfill the Employer's requirement.

Format of Drawings

All drawings submitted for approval shall be ISO standard size sheets. Every drawing shall have a title block in the bottom right corner showing:

Employer's Name :

Contract No. :

Consultant :

Contractor :

Project :

Drawing Title :

Drawing Number :

Revision Number :

Date :

Each drawing shall bear the signature of the Project Manager on behalf of the Contractor to the effect that the drawing whether his own or from any other source has been checked by the Contractor before submission to the department.

Each revision shall be properly recorded to show the number, date, specific description of revision(s) carried out, and signature of the Project Manager in the revision block. The Contractor shall be responsible for incorporating all the comments issued by the Engineer In-charge.

Construction Documents

As-Built Drawings

The Contractor shall prepare, and keep up-to-date, a complete set of "As Built" records of the execution of the Works, showing the exact "as built" location, sizes and details of the work as executed, with cross references to relevant specifications and data sheets. These records shall be kept on the Site and shall be used exclusively for the purposes of this Sub-clause. Two hard copies shall be submitted to the Engineer In-charge prior to the Tests on Completion.

In addition, the Contractor shall prepare and submit to the Engineer In-charge "As Built drawings" of the Works, showing all Works as executed. The drawings shall be prepared as the Works proceed, and shall be submitted to the Engineer In-charge for his inspection. The Contractor shall obtain the consent of the Engineer In-charge as to their size, the referencing system, and other pertinent details.

Prior to the issue of substantial completion Certificate, the Contractor shall submit to the Engineer In-charge one soft copy, workable CD, one full-size original copy of the relevant "As Built Drawings", and any further Construction Documents specified in the Employer's Requirements. The Works shall not be considered to be completed for issue of substantial completion certificate until such documents have submitted to the Engineer In-charge.

Coordination Drawings

Coordination drawings shall be prepared and shall comprise composite section drawings showing coordination of mechanical and electrical work to structural work. The composite drawings shall be in sufficient detail to show overall dimensions of ductwork, piping, conduit, and related items and clearance between structural members, lighting and related features for review and approval of relative locations of work in allocated spaces. The drawings shall indicate any conflicts of clearance

problems between various trades. Coordination drawings shall be submitted to the Employer's Representative. Coordination drawings will not be submitted for approval but for review only.

Equipment and Interconnection Diagram

Equipment room layout drawings shall be based on actual requirements of equipment furnished and be consolidated for all trades, shall be to scale and shall show all pertinent structural and penetration features and other items, such as electrical cabinets, which affect available space. All mechanical and electrical equipment including electrical conduits, accessories, ductwork and piping shall be shown to scale in plan and also in elevation and / or section and resolve any conflicts or clearance problems. Physical descriptions of the various mechanical and electrical items shown on these drawings shall be submitted concurrently.

Quality

Proof of quality of manufacture and reliability in field application. Such proof will normally constitute evidence that the product / equipment has been manufactured by the manufacturer, or fabricator of the quality assured for a unit or item over a period of time and has an established field service record. It shall include installation locations, dates and year of operating service. If there is no experience for an identical unit or item it may relate to a similar unit or item by the same manufacturer.

Manufacturer's Data

Manufacturer's data shall include catalogue cuts, brochures, circular, specifications, equipment operations and maintenance manuals and other printed information in sufficient detail and scope to verify compliance to the requirements.

Performance Data

Performance Data shall include certified curves of equipment responses and performance characteristics as required.

Parts and Special Tools Lists

a) Parts lists shall include a complete list of component parts of an item of equipment together with an expanded view or equivalent means to identify the parts.

b) Special Tools lists shall include all tools and devices required for assembly, disassembly, operation and maintenance of the equipment and an indication of the use of each item.

c) The lists shall further identify the sources of manufacture and supply of consumable supplies and those parts, special tools and supplies that are normally furnished with the purchase of the

equipment or are specified to be furnished.

d) In additions, a list shall be provided showing items recommended by the manufacturer to support normal maintenance based on the manufacturer's anticipated life cycle of the part for continuous normal operation.

Certificates of Compliance

Certificate of compliance shall include material or product manufacturer's statement that the supplied items or systems conform to the specifications.

Test Reports

Test reports shall be provided as required and as follows:

a) Shop tests shall show the results of required shop tests of equipment or systems certified in writing by the manufacturer or its authorized Representative. However, the Employer / its representative along with consultant is free to visit and inspect the equipment and systems at manufacturing unit before dispatch. The cost toward such inspections shall be borne by the contractor.

b) Field test reports shall show the results of required field tests and compliance with approved procedures and shall be certified in writing.

Maintenance Instructions

Maintenance instructions shall cover finish material including but not limited to hard-surfaced materials. Instructions shall include cleaning, tarnishing, dents and stains from various chemicals.

SUBMISSION REVIEW AND SUBSEQUENT ACTION PROCEDURES

i) Submission will be returned by the Employer's Representative to the Contractor indicating the appropriate action to be taken by the Contractor as follows:

a) Except in cases where local jurisdictional authority approval is required to validate a particular submittal, fabrication, manufacturer, construction or purchasing may proceed.

b) The submission does not comply with contract requirements, and fabrication, manufacturer and construction shall not proceed. The Contractor shall make revisions and resubmit. The Contractor has 14 calendar days from date of receipt of advice of the Engineer In-charge as to compliance with his comments and to resubmit drawings evidencing such compliance.

ii) Failure of the Contractor to process submissions for review shall not relieve the Contractor of

his responsibilities under the contract.

iii) Do not proceed with work dependent on submissions until the submissions have been verified by the Contractor and reviewed by the Employer. Making good work which has proceeded in error because of non-compliance with these requirements shall be at the Contractor's expense. Review of Resubmissions shall not relieve the Contractor of his responsibility for execution of the works in accordance with contract document.

iv) The Contractor shall not be relieved of responsibility for deviations from the contract or errors of any kind in the submissions or from the necessity of furnishing work required by the contract which may have been omitted from the submissions reviewed by the Engineer In-charge. The Engineer In-charge's review of individual items in submissions shall not be constructed as a review of the complete assembly in which it functions.

v) No authorization of an increase in total contracting price or time or completion shall be implied by comments marked on submissions or submission transmittals by the Engineer In-charge .

vi) Review of submission shall not absolve the Contractor from the responsibility of correctly locating all items in the works.

vii) Employer's approval of substitutions, alternatives and deviations:

Whenever and wherever the Contractor proposes to make substitutions to the specified construction method or process or proposes the use of non-specified manufacturer's, products or to deviate from the material specified, the Contractor must make a full submission as required in the contract. The Contractor is advised that only the Employer has the final authority to approve or reject proposed substitutions, alternates and / or deviations from the contract.

CONSTRUCTION PHOTOGRAPHS

i) Work shall include progress photographs for each work of construction taken each month made by a professional photographer.

ii) Photographs shall show general extent of the works by both exterior and interior views. Each viewpoint will be selected and the number of monthly repetitive photographs taken from exactly the same viewpoint as decided by the owners authorized representative.

iii) Submit six 200mm x 254mm glossy color prints of each photograph to the owners authorized representative at the first of each month duly attached / pasted in the Progress Report.

iv) Title and mount each photograph per the owners authorized representative's requirements. As a

minimum include on title: Project name, direction of view, and date when taken.

v) Video shooting during major construction stages of plant or at least once every month must be carried out by the contractor and shall be submitted to the Employer / authorized representative.

QUALITY ASSURANCE

The Contractor shall institute a quality assurance system to demonstrate compliance with the requirements of the Contract. Such system shall be in accordance with the details stated in the Contract. Compliance with the quality assurance system shall not relieve the Contractor of his duties, obligations or responsibilities.

Details of all procedures and compliance documents shall be submitted to the Engineer In-charge for his information before each design and execution stage is commenced. When any document is issued to the Engineer In-charge, it shall be accompanied by the signed quality statements for such document, in accordance with the details stated in the Contract. The Engineer In-charge shall be entitled to audit any aspect of the system and require corrective action to be taken. The quality assurance system and the audit of any aspect of system and necessary corrective action shall be at contractor's risk and cost.

Quality assurance shall include, but shall not be restricted to as noted herein.

The Quality Assurance system should ensure the quality and quantity continuously through monitoring systems as envisaged in Project Management and Construction proforma so as to give daily progress report, labour / manpower deployed, quantity executed on periodic basis, observations thereof through following proforma placed at the end of this subsection.

- Bar bending schedule
- Pour Card
- Post Concreting check ups
- Form work check up
- Tests on materials

QUALITY ASSURNCE IN GENERAL

i) Maintain continuity of quality assurance surveillance throughout fabrication of products and execution of work.

ii) Submit details of quality assurance tests and methods inclusive of the specification.

iii) Perform inspection and testing in accordance with specified reference standards, or as otherwise approved by the Employer's Representative.

iv) Calibrate measuring and testing devices periodically against certified standard equipment. Calibration shall be verified by inspection firm.

QUALITY ASSURANCE OF THE WORKS ON SITE

i) Provide an assurance system to ensure quality assurance by phased inspection as follows:

Preparatory Phase Inspection

Perform inspections prior to commencement of each part of the works which shall include a review of requirements with the supervisors directly responsible for that part of the works. Such review shall be in the form of written statements of the processes to be followed and critical characteristics, tests and similar evaluations which will be a part of inspection procedures. Verify that products incorporated with that part of the works which have been tested and applicable submissions have been made for control testing. Verify that preceding work has been completed and approved. Verify products incorporated with that part of the works conform to submission data and Contract requirements and that necessary materials and equipment are easily and readily available.

Continuing Inspection

i) Perform inspection on a continuing basis as each part of the works commences and on a regular basis to ensure constant compliance with the tender requirements.

ii) Provide samples of materials to be tested in required quantities at locations where testing is performed.

iii) Provide labour, instruments, testing devices, facilities and required shelter at the site:

a) To determine ambient and material temperature by thermometers with Celsius scale.

b) To determine relative humidity of air and moisture content of materials.

c) To facilitate inspection and tests.

d) For obtaining and handling of samples at site and plant.

iv) Upon receipt of items at the job site, the Contractor's quality assurance representative at the site shall be responsible on receipt of items at the site for noting damage suffered by them during transit and for directing that they be replaced.

v) The Contractor shall be responsible for protecting and maintaining items on the site free from

damage during storage, erection, installation and maintenance.

vi) When it is discovered on inspection that work is proceeding with incorrect materials or methods, ensure that corrections are immediately made and that improperly complete work is replaced.

QUALITY ASSURANCE OF OFF-SITE WORKS

i) The Contractor shall impose quality assurance methods at the location of manufacture, fabrication and assembly of items to be incorporated in the works to ensure that they conform to requirements of the Contract Documents. This quality assurance shall not apply to proprietary catalogue production products except as may be deemed necessary by the Contractor or as directed by the Employer's Representative.

ii) The Contractor's quality assurance representative off-site shall be responsible for the release of items for transit to the job site.

iii) In addition to the Contractor shall provide notice to the Employer's representative in writing at least 4 weeks in advance of packing of every batch of product components or assemblies so that the Employer or Employer's Consultants and their designated representatives may have opportunity at his / their choice of inspecting any such product components or assemblies prior to transportation at the cost of the bidder.

SCHEDULE OF QUALITY ASSURANCE OPERATIONS

Provide the Employer's Representative with a minimum of three copies of a schedule of quality assurance operations, both on-site and off-site, to outline the procedures, instructions and reports which will be used, as follows:

i) Quality assurance organization.

ii) Qualifications of quality assurance personnel.

iii) Authority and responsibilities of each quality assurance person.

iv) Schedule of inspections and tests with personnel assigned to each task and duration of each task.

v) Schedule of required services to be provided by inspection and testing firms.

vi) Co-ordination required in order that quality assurance is integrated.

vii) Test methods which will be utilized.

viii) Methods of performing and documenting quality assurance operations.

TESTS REQUIRED BY JURISDICTIONAL AUTHORITIES

i) The Contractor shall be responsible for inspection and testing required by jurisdictional authorities in conformance with the performance requirements.

iii) If the Engineer In-charge so desires, he may delegate inspection and testing of materials or Plant by an independent body / agency. Any such delegation shall be effected for this purpose shall be considered as an assistant of the Engineer-in-Charge. Notice of such appointment (not being less than 14 days) shall be given by the Engineer In-charge to the Contractor.

QUALITY ASSURANCE REPORTS

i) Document each test and inspection on a report and submit the report in triplicate to the Employer's Representative.

ii) Reports shall be in an approved format and shall certify off-site items produced correctly for on-site work of installed correctly, as applicable. Similarly the report shall certify items that are defective with a statement of records on corrective measures taken.

iii) Include on each report the purpose of the inspection or test, a description of methods used, observations made and personnel involved.

iv) The Contractor shall also maintain in the approved format a log book of all tests performed which shall include the date of test, type of test and the results of the test.

v) If inspection and testing procedures are sub-contracted to an approved inspection and testing firm, only copies of test reports signed by the approved inspection and testing firm will be acceptable.

GS-14 GOODS AND SERVICE TAX

The GST shall be deducted from the contractor at appropriate rate as may be determined by the GST department from time to time on basis of actual work done by the contractor from each R.A. bill and shall be remitted to GST department. No payment on account of reimbursement of GST will be made to contractor by Solapur Municipal Corporation/ Maharashtra Jeevan Pradhikaran.

GS-15 CONDITION RELATING TO INSURANCE

Contractor shall take out necessary insurance policy / policies so as to provide adequate insurance

cover for execution of the awarded contract work from the Director of insurance, Maharashtra State Mumbai 51, only. Its postal address for correspondence is 264-1St floor, MHADA, Opposite Kala Nagar, Bandra (East), Mumbai-51 (Tel. No. 26438403 / Fax – 26438461 / 26438690). Insurance policy / policies taken out from any other company will not be accepted. However if the contractor desires to effect insurance with the local office of any insurance company, the same should be under the co-insurance cum servicing arrangement approved by the Director of Insurance. The policy taken out by the contractor is not on co-insurance basis (G.I.F. 60% and Insurance Company 40%). The same will not be accepted and amount of premium calculated by Director of Insurance will be recovered directly from the amount payable to the contractor for the executed contract work which may be noted.

GENERAL TECHNICAL SPECIFICATIONS

1.1 GENERAL

This section deals with civil construction of the entire plant, piping etc. complete work under this contract.

i) All the civil & structural works shall be carried out as per latest CPWD / PWD specifications Vol. I to III and Vol. IV to VI with up to date corrections slips issued up to the date of submission of tender unless otherwise specified herein. In case the CPWD / PWD specifications are not found applicable or inadequate, then the relevant BIS specifications (latest version) on the date of submission of tender shall be used. Further, in case, any of above two is not applicable, to particular/specialized works, then the manufacturer's specifications or their relevant instructions shall be followed. Specifications mentioned anywhere in the bid document will prevail over CPWD / PWD Specifications and BIS specifications as the case may be.

ii) All raw materials including Cement and reinforcement/structural steel wherever to be used by the contractor shall confirm the latest BIS/CPWD / PWD specifications. All mandatory tests as required by BIS/CPWD / PWD specifications shall be carried out and test certificates to be submitted to Engineer – in charge. However, the contractor shall be fully responsible for required performances of civil/ structural work. Costs of such tests are to be borne by the contractor.

iii) For testing of all materials, following shall be strictly adhered to -

a) All the tests shall be done in laboratories approved by the Employer. The contractor is required to take written approval from Engineer In-charge, in this respect.

b) Cement and Steel shall be of a make approved by the Employer as detailed out in respective material sections of this document.

1.1.1 **MATERIALS**

1.1.1.1 Cement

i) The Contractor shall procure minimum 43 grade, unless otherwise stated separately confirming to BIS specifications, ordinary Portland cement, as required in the work only, from reputed manufacturers such as L&T, ACC, Gujarat Ambuja, Cement Corporation of India, Vikram, J.P. etc. and as approved by the Employer, Ministry of Industry, Government of India and holding license to use BIS certification mark for their product, whose name shall be got approved from Engineer In-charge. Supply of cement shall be taken either in silos or in 50 kg. Bags bearing manufacturer's name and BIS marking. Samples of cement arranged by the Contractor shall be taken by the Engineer In-charge and got tested in accordance with provisions of relevant BIS codes. Cost of such tests shall be borne by the contractor. In case test results indicate that the cement arranged by contractor does not conform to be relevant BIS codes, the same stand rejected and shall be removed from the site by the Contractor at his own cost within one week time of written order from the Engineer In-charge.

ii) The cement shall be brought at site in bulk supply of approximately 50 tones from the manufacturer direct, or as decided and approved by the Engineer In-charge, as the case may be.

iii) The cement godown of the sufficient capacity should be constructed by the contractor and at all time it should have a stock of minimum of 2000 bags. The contractor shall facilitate the inspection of the cement godown by the Engineer In-charge at any time. Storage of cement shall be as per CPWD / PWD specification.

iv) Cement brought at site and cement remaining unused after completion of work shall not be removed from site without written permission of the Engineer In-charge.

1.1.1.2 Steel

(a) Reinforcement Steel & Structural Steel

i) The contractor shall procure high strength CRS steel reinforcement bars and structural steel conforming to relevant BIS codes from main producers such as SAIL, TISCO, RATHI or as approved by the Ministry of Steel. The steel reinforcement, structural steel shall be brought to the site in bulk supply of 10 tons or more or as decided by the Engineer In-charge. For small or occasional

quantities of steel reinforcement bars that less than 10 MT, the Engineer In-charge may authorize the contractor to purchase the same from authorized dealers of the approved manufacturers. The contractor shall have to obtain and furnish test certificates to the Engineer In-charge in respect of all supplies of steel brought by him to the site of work. Samples shall also be taken and got tested by the as per the provisions in this regard in relevant CPWD / PWD/BIS codes. Cost of such tests shall be borne by the contractor. In case the test results indicate that the steel arranged by the contractor does not conform to CPWD / PWD/BIS codes, the same shall stand Engineer In-charge rejected and shall be removed from the site of work by the Contractor at his cost within a week's time after written orders from the.

ii) The steel reinforcement, structural steel shall be stored by the contractor at site of work in such a way as to prevent distortion and corrosion. Bars of different sizes and lengths shall be stored separately.

iii) For checking nominal mass, tensile strength, bend test, re-eand- test etc. specimen of sufficient length shall be cut from each size of the bar at random at frequency not less than that specified below: -

Size of Bar	For consignment below 100 tonnes	For consignment over 100 tonnes
Under 10 mm dia.	One sample for each 25 tonnes or part thereof	One sample for each 40 tonnes or part thereof.
10mm to 16 mm dia.	One sample for each 35 tonnes or part thereof	One sample for each 45 tonnes or part thereof.
Over 16 mm dia.	One sample for each 45 tonnes or part thereof	One sample for each 50 tonnes or part thereof.

Steel brought to site and steel remaining unused shall not be removed from site without the written permission of the Engineer-in-charge.

1.1.1.3 Quarry Materials

The Contractor shall be wholly responsible to identify the suitable sources for quarry materials required for the Works, such as earth, sand, stone, murum, etc., and to make his own arrangements for collection and transportation of the materials irrespective of the leads and lifts required. The quarry thus identified by the Contractor should have proper license from the concerned Government. All materials supplied by the Contractor shall satisfy the requirements set forth in the Specifications and shall be subject to the approval of the Engineer In-charge. The Contractor shall take this into account while offering his rates and no claims whatsoever shall be entertained for extra costs on this account.

1.1.2 PRECAUTIONS DURING EXECUTION

i) The successful tenderer shall comply with all instructions in all respects issued by the Employer in respect of road maintenance and inter utility code of conduct for excavating trenches across and along various roads and other places.

ii) The contractor shall have to provide GI sheet barricading up to a minimum height of 2m above ground level all around the site of excavation and trenches as per direction of Engineer In-charge. Such barricading must be provided before taking up the excavation work and must remain in position till complete filling back of excavated trenches and resurfacing work, if any. The GI sheets must be painted in red & White stripes with fluorescent paint.

iii) Proper supporting of all underground services such as water mains, sewers, cables, drains, water and sewer connections shall be provided by the contractor without any additional cost. If the services/connections are damaged, the contractor will be responsible for the restoration of the same to original specifications at his own cost.

iv) The contractor shall provide necessary warning sign boards painted and written with luminous paint as per direction of Engineer In-charge. The warning notice boards should be put at least 100 metres before the approach to the area on either side where the work is going on. In addition proper lighting arrangement will be made for all excavations works.

v) Proposed alignment of rising mains to cross cables, water mains, and other underground services. Contractor shall be required to work under these constraints. Costs of such items are to be included in the bid of the contractor. Necessary statutory permission for road cutting will have to be arranged by the Contractor at his own cost and fee deposited to the concerned dept. will be reimbursed by the Employer on actual basis.

vi) During excavation of trenches, the underground services (UGS) such as water mains, electric poles/cables/Telephone cable and sewer line etc. may become exposed and unsupported. It will be the responsibility of the contractor to make suitable and necessary arrangement for supporting such UGS to keep them functional. Such arrangement will be done as per direction of the Engineer In-charge. No separate payment for supporting the services will be made by the dept. Any damages caused to the above mentioned underground services due to negligence of the contractor or otherwise shall be made good by the contractor at his own cost. After laying the pipe, the contractor shall have to construct masonry pillars, to support the water lines/U.G.S. before the temporary supports are removed and filling of trenches is done.

vii) Existing drains shall not be blocked by excavated earth or any other materials; the contractor shall ensure that sullage/storm water flow uninterrupted.

In addition: throughout the design, construction, commissioning, operation and maintenance stages of the project, the following safety principles shall apply:

Workforce, contractors, visitors and the public shall be safeguarded against hazards, risk of serious injury and disease.

Adequate training shall be made available for the use of all related equipments.

Appropriate responsibilities will have to be assigned throughout each stage of a project.

Safety consciousness shall have to be promoted by effective internal communication, signs and media.

Safety performance shall be easily audited during operation and maintenance.

All accidents or potential serious incidents shall have to be reported and investigated.

Routine requirement to enter confined spaces needs to be eliminated, where practicable.

Safe access to all working areas shall have to be provided. Concrete slab over wet wells, tanks and chambers shall have double steel reinforcing.

Lifting eyes and bolts for slabs to be stainless steel or any other durable and non-corrosive material.

Protection against falling needs to be provided, where the drop exceeds 1.5 m.

Where the drop exceeds 2.0 m, edge protection will have to be provided.

Power driven machinery needs to be guarded.

Within plants and installations, all wells, sumps, channels. Chambers, tanks etc., containing liquid shall be covered, walled and railed.

Electrical equipments and controls will have to be protected from unauthorized access.

Individual electrical drives to be capable of being isolated and locked off.

Electrical motors should be rated as continuous run.

Junction boxes for submersible pumps and float controls shall be above floor level not in the wet well.

Major hazards to be identified and posted on site.

Protection against counter measures against spillage of dangerous chemicals to be provided.

Appropriate training for the end users to be identified and stipulated in construction and procurement documents.

All equipment to be regularly checked and prominently marked accordingly.

Safety information and operating documents to be provided by suppliers.

All electrical equipment in sumps, wet wells, inlet channels, inlet chambers, cited below coping level to be explosion proof.

Lighting, appropriate to the needs of the end user, to be provided in working areas.

Emergency contact list, showing telephone numbers of key personnel and emergency services during office hours, to be circulated to all parties involved in the project.

All treatment plants, installation and construction sites shall be provided with perimeter fencing adequate to protect the public from entry. All fencing shall be securely fixed and inspected.

All treatment plants, installations and construction sites shall be adequate warning signs at or near the perimeter.

Access to construction sites shall be controlled to prevent unauthorized access.

Any confined space requiring routine person entry, which contains sewage, sludge or other foul water to be ventilated.

Safe lifting is unrestricted areas is 16 kg. For heavier objects and/or in very tight locations, provision of crane or access for truck mounted crane to be made.

Fixed vertical ladders to be avoided in:

Inlet sump

Dry wells with a height greater than 3 m

1.1.3 REBOUND HAMMER TEST

As per CPWD / PWD specification, Rebound Hammer Test for concrete is mandatory and the same shall be carried out as per the provision. Rebound Hammer required for conducting the test shall be procured by the contractor at his own cost for testing and the same shall be made available at site as and when required by the Engineer In-charge.

1.1.4 BAR BENDING SCHEDULE

The Contractor will be required to prepare the bar bending schedule prior to taking up all the

reinforcement cutting and bending works at site. No reinforcement work will be allowed without the bar bending schedule.

Note: All the data and details as provided are indicative only and bidders are advised to verify them before submission of their offer. No extra payments shall be made against any discrepancy found anywhere in the bid document.

1.2 CIVIL AND BUILDING WORKS

1.2.1 General

This part of the specification covers the design loads to be considered and specifications of material and workmanship for the civil works. Material used and workmanship for the civil works of Raw Sewage Pumping Station, Sewage treatment plant, campus development, civil works associated with pipe laying etc. to be done under the contract will adhere to the provisions laid down in this chapter.

The bidder shall have to get Soil Analysis carried out for determining the Safe Bearing Capacity (SBC) of the soil as per relevant code through a reputed firm. The charges for the same shall be included in the offer. The lesser SBC out of the two i.e. one which is given in the tender and other one got carried out by the tenderer will be followed for design of foundation of various structures. Nothing extra shall be paid due to decrease in SBC.

The bidder should ascertain about the actual Sub Soil Water Table at site. Price quoted shall be inclusive of cost of pumping Sub Soil Water / seepage water from any other source required for execution of work. No extra payment shall be made due to variation in Sub Soil Water Level if mentioned anywhere in the tender documents either for designing or execution, on account of fluctuation due to any reason whatsoever.

Materials for which specifications are not given the requirement of respective Indian Standards are to be fulfilled. The contractor shall get prior approval of the materials proposed to be used under the contract from the Engineer In-charge.

1.2.2 Design Considerations:

1.2.2.1 Design Submissions

The contractor shall be responsible for the safety of structures, correctness of design and drawings, even after the approval of the same by Engineer In-charge. Complete detailed design calculations of foundations and superstructure together with general arrangement drawings and explanatory sketches shall be submitted to the Engineer-in-charge. Separate calculations for

foundations or superstructures submitted independent of each other shall be deemed to be incomplete and will not be accepted by the Engineer-in-charge.

The design considerations described hereunder establish the minimum basic requirements of plain and reinforced concrete structures, masonry structures and structural steel works. However, any particular structure shall be designed for the satisfactory performance of the functions for which the same is being constructed.

1.2.2.2 Design Standards

All civil designs shall be based on the latest BIS/PWD/CPWD norms.

1.2.2.3 Design Loading

1.2.2.3.1 General

All buildings and structures shall be designed to resist the worst combination of the following loads/ stresses under test and working conditions: dead load, live load, wind load, seismic load, stresses due to temperature changes, shrinkage and creep in materials dynamic load, vehicular load and uplift pressure etc.

Dead Load

This shall comprise all permanent construction including walls, floors, roofs, partitions, stairways fixed, service equipments and other items of machinery. In estimating the loads of process equipment for the purpose of design, the empty weight of the equipment including all fixtures and attached piping, but excluding contents, shall be considered. Dead loads shall be taken as per relevant BIS codes.

Live Load

Live loads shall be in general as per BIS: 875. Surcharge load for underground structures, if any shall be considered as per actual condition. Equipment load shall be considered as per manufacturer's specification

In the absence of any suitable provisions for live loads in BIS codes or as given above for any particular type of floor of structure, assumptions made must receive the approval of the Department / prior to taking up the design work. Apart from the specified live loads or any other load due to material stored, any other equipment load or possible overloading during maintenance or erection shall be considered and shall be partial or full whichever causes the most critical condition.

Wind Load

Wind loads shall be as per BIS: 875.

Earthquake Load

Earthquake load shall be computed as per B.I.S. 1893 taking into consideration soil foundation system, importance factor appropriate to the type of structure, basic horizontal seismic coefficient/ seismic zone factor & average acceleration coefficient as applicable.

Dynamic Load

Dynamic Loads due to working of machines / equipments such as pumps, blowers, compressors, switch gears, travelling cranes, etc. shall be considered in the design of structures as given by the manufacturers or in BIS code, whichever is more.

Vehicular Load

IRC Class AA (wheeled vehicle) loading shall be considered for design of structures under or by the side of roads.

1.2.2.4

Design Conditions for Underground or Partly Underground Liquid Retaining Structures

Liquid retaining/conveying structures including the members covering the same (such as roof of a chamber, channel etc.) shall be designed by BIS: 3370 latest. Shear shall be checked by working stress method as per BIS: 456. Minimum temperature and shrinkage reinforcement shall be adequately considered in each direction.

All underground or partly underground liquid containing structures shall be designed for the following conditions:

Liquid depth up to full height of wall including free board: no relief due to soil pressure from outside to be considered.

Structure empty (i.e. Empty of liquid, any material, etc.) : Full earth pressure and surcharge pressure wherever applicable, to be considered;

Partition wall between dry sump and wet sump: to be designed for full liquid depth up to full height of wall; including free board

Partition wall between two compartments: to be designed as one compartment empty and other full including free board;

Structures shall be designed for uplift in empty conditions with the water table and due care should be taken for seasonal variation on higher side, wherever required.

Underground or partially underground structures shall also be checked against stresses

developed due to any combination of full and empty compartments with appropriate ground/uplift pressures below base slab. The design shall be such that the minimum gravity weight (empty conditions) exceeds the uplift pressure at least by 15%.

1.2.2.5 Foundations

A detailed topography survey and soil investigation report has been enclosed with the bid documents. All the data and details as provided are indicative only and bidders are advised to verify them before submission of their offers. No extra payment shall be made against any discrepancies in the above documents.

Foundation depths and the type of footings shall be appropriately computed from the parameters given in the soil report or obtained during the soil testing by the contractor whichever is stringent, and got reviewed and approved by department.

The minimum depth of foundations for all structures, equipments, buildings and frame foundations and load bearing walls shall be as per the recommendation of BIS provided adequate bearing pressure is available at that depth.

Bearing capacity of soil shall be determined as per BIS: 6403.

Care shall be taken to avoid the foundations of adjacent buildings or structure foundations, either existing or not within the scope of this contract. Suitable adjustments in depth, location and sizes may have to be made depending on site conditions. No extra claims for such adjustments shall be accepted by the Employer.

A structure subjected to groundwater pressure shall be designed to resist floatation. The dead weight of empty structure shall provide a factor of safety of 1.2 against uplift during construction and service.

1.2.2.6 Pressure Release Valve

Use of pressure release valves to reduce uplift pressure due to ground water table shall not be allowed.

1.2.2.7 Design Requirements

1.2.2.7.1 General

The Civil & Structural design shall be carried out in accordance to BIS: 456 and BIS: 3370 and other relevant Indian Codes. For the seismic forces, the structure should be designed as per IS: 1893 and all the factors as applicable.

The following are the design requirements for all reinforced or plain concrete structures.

a) All blinding and leveling concrete shall be of minimum 100 mm thickness of concrete mix- M10, unless otherwise specified.

b) Liquid Retaining Structures/Buildings:

All structural reinforced concrete for liquid retaining structures or buildings shall be of a minimum M25 grade with a maximum 20 mm aggregate size.

c) The minimum reinforcement in walls, floors and roofs of liquid retaining structures in each of two directions at right angles shall be adequately considered using CRS STEEL bars.

d) All buildings shall be provided with damp proofing for basement and floors and water proofing for roofs as specified in specific requirements.

e) Any structure or pipeline crossing below roads shall be designed for Class AA of IRC loading or as classified by the respective authority. NP2 RCC pipe (with encases) shall be used below roads inside the plant.

f) All pipes and conduits laid below the structural units shall be embedded in reinforced concrete of grade M20 of minimum thickness 150 mm.

f) Suitable admixtures may be used with the approval of engineer in charge.

1.2.2.7.2 Minimum Thickness

The following minimum thickness shall be used for different reinforced concrete members, irrespective of design thickness.

Walls for liquid retaining structures except at (x) below	200 mm
Roof slabs for liquid retaining structures (other than flat slabs)	150 mm
Bottom slabs for liquid retaining structures	200 mm
Floor slabs including roof slabs, walkways, canopy slabs	125 mm
Wall of cables/ pipe trenches, underground pits	150 mm
Column footings	300 mm
Parapets, Chajja	100 mm
Pre-Cast trench cover	75 mm
Beams, columns	230 mm
Channels, launder	150 mm

1.2.2.7.3 Minimum Cement Content:

The following Minimum cement content shall be used for different grades of reinforced concrete as

per IS456 & IS3370:

Grade of Concrete	Minimum Cement in Concrete (Kg/m3) of finished concrete)
M20	300
M25	300
M30	320
M35	340

1.2.3 Materials & Standards

The term "materials" shall mean all materials, goods and articles of every kind whether raw, processed or manufactured and equipment of every kind to be supplied by the Contractor for incorporation in the Works.

Except as may be otherwise specified for particular parts of the works the provision of clauses in "Materials and Workmanship" shall apply to materials and workmanship for any part of the works.

All materials shall be new and of the kinds and qualities described in the Contract and shall be at least equal to approved samples.

Materials and workmanship shall comply with the relevant CPWD Specification (with amendments) current as on the date of submission of the tender.

Where the relevant standard provides for the furnishing of a certificate to the Engineer-in-charge, at his request, stating that the materials supplied comply in all respects with the standard, the Contractor shall obtain the certificates and forward it to the Engineer-in-charge.

The specifications, standards and codes listed below are considered to be part of this Bid specification. All standards, specifications, codes of practices referred to herein shall be the latest editions including all applicable official amendments and revisions as on the date of submission of the tender.

In case of discrepancy between two standards the provisions, more stringent shall be followed.

BIS No.	Title
4082	Recommendation on stacking and storage of construction materials at site (first revision)
7969	Safety code for handling and storage of building materials
1498	Classification and identification of soils for general engineering purposes (first revision) (Amendments 2) (Reaffirmed)
2682 : 1984	Chlordane emulsifiable concentrates (second revision) (Amendment 1) (Reaffirmed 1994)

3764: 1992	Excavation work - Code of safety (first revision)
6313(Part2)	Code of practice for anti-termite measures in buildings : Part 2 Pre-constructional chemical treatment measures (Reaffirmed)

875 (Part 1)	Code of practice for design loads (other than earthquake) for buildings and structures : Part 1 Dead loads -Unit weights of building material and stored materials
875 (Part 2)	Code of practice for design loads (other than earthquake) for buildings and structures : Part 2 Imposed loads
875 (Part 3)	Code of practice for design loads (other than earthquake) for buildings and structures : Part 3 Wind loads
875 (Part 4)	Code of practice for design loads (other than earthquake) for buildings and structures : Part 4 Snow loads
875 (Part 5)	Code of practice for design loads (other than earthquake) for buildings and structures : Part 5 Special loads and load combinations
1080 : 1986	Code of practice for design and construction of shallow foundations on soils (other than raft, ring and shell)
1904	Code of practice for design and construction of foundations in soils: General requirements
2950(Part1)	Code of practice for design and construction of raft foundations: Part 1 Design
2974(Part1)	Code of practice for design and construction of machine foundations: Part 1 Foundations for reciprocating type machines
2974(Part2)	Code of practice for design and construction of machine foundations: Part 2 Foundations for impact type machines (hammer foundations)
2974(Part3)	Design and construction of machine foundations - Code of practice : Part 3 Foundations for rotary type machines (medium and high frequency)
2974(Part4)	Code of practice for design and construction of machine foundations: Part 4 Foundations for rotary type machines of low frequency
2974(Part5)	Code of practice for design and construction of machine foundations: Part 5 Foundation for impact machines other than hammers (forging and stamping press, pig breakers, drop crusher and jolter)
6403	Code of practice for determination of bearing capacity of shallow foundations.
8009(Part1)	Code of practice for calculation of settlement of foundations : Part 1 Shallow foundations subject to symmetrical static vertical loads
8009(Part2)	Code of practice for calculation of settlement of foundations: Part 2 Deep foundations subjected to symmetrical static vertical loading.
11089	Code of practice for design and construction of ring foundation
13094	Guidelines for selection of ground improvement techniques for foundation in weak soils.
13301	Guidelines for vibration isolation for machine foundations
SP 36 (Part 2): 1988	Compendium of Indian Standards on soil engineering: Part 2 Field testing
2720	Methods of test for soils

(Parts 1 to 41)	
6452	Specification for high alumina cement for structural use
6909	Specification for supersulphated cement
8041	Rapid hardening Portland cement
8042	White Portland cement
8043	Hydrophobic Portland cement
8112	43 grade ordinary Portland cement
13330	Sulphate resisting Portland Cement
383	Coarse and fine aggregates from natural sources for concrete
432 (Part 1& 2)	Mild steel and medium tensile steel bars and hard-drawn steel wire for concrete reinforcement
456	Code of practice for plain and reinforced concrete
516	Method of test for strength of concrete
650	Standard sand for testing of cement
1199	Methods of sampling and analysis of concrete
1343	Code of practice for Pre-stressed concrete
1566	Hard-drawn steel wire fabric for concrete reinforcement
1786	High strength deformed steel bars and wires for concrete reinforcement
2386 (Part 1 to 8)	Methods of test for aggregates for concrete
2502	Code of practice for bending and fixing of bars for concrete reinforcement
2595	Code of practice for radiographic testing
2645	Integral cement waterproofing compounds
3025	Methods of sampling and test (physical and chemical) for water used in industry
3085	Method of test for permeability of cement mortar & concrete
3370 (Part 1to 4)	Code of practice for concrete structures for the storage of liquids
3466	Masonry cement
3812	Fly ash for use as pozzolana and admixture
4031 (Part 1)	Methods of physical tests for hydraulic cement : Part 1 Determination of fineness by dry sieving
5816	Method of test for splitting tensile strength of concrete cylinders
6452	Specification for high alumina cement for structural use
7861 (Part 1)	Code of practice for extreme weather concreting : Part 1 Recommended practice for hot weather concreting
7861 (Part 2)	Code of practice for extreme weather concreting : Part 2 Recommended practice for cold weather concreting
8142	Method of test for determining setting time of concrete by penetration resistance
9012	Recommended practice for Concreting
9013	Method of making, curing and determining compressive strength of accelerated cured concrete test specimens
9077	Code of practice for corrosion protection of steel reinforcement in RB and RCC construction
9103	Admixtures for concrete
9284	Method of test for abrasion resistance of concrete
10262	Recommended guidelines for concrete mix design
13311 (Part 1)	Non-destructive testing of concrete - Methods of test : Part 1 Ultrasonic pulse velocity

13311 (Part 2)	Non-destructive testing of concrete - Methods of test : Part 2 Rebound hammer
SP 20 (S &T)	Handbook on masonry design and construction
SP 21 (S &T)	Summaries of Indian Standards for building materials
SP 23 (S & T)	Handbook on concrete mixes (based on Indian Standards)
SP 24 (S & T)	Explanatory handbook on Indian Standard Code for plain and reinforced concrete
SP 34 (S & T)	Handbook on concrete reinforcement and detailing
3696 (Part 1)	Safety code of scaffolds and ladders : Part 1 Scaffolds
4014 Part 1 & 2	Code of practice for steel tubular scaffolding
2116	Sand for masonry mortars
2212	Code of practice for brick work
2250	Code of practice for preparation and use of masonry mortars
SP 25 (S & T)	Handbook on caused and prevention of cracks in building
1123	Method of identification of natural building stones
1127	Recommendations for dimensions and workmanship of natural building stones for masonry work
1129	Recommendation for dressing of natural building stones
1597 (Part 1)	Code of practice for construction of stone masonry : Part 1 Rubble stone masonry
3622	Specification for sandstone (slab and tiles)
4101 (Part 1)	Code of practice for external facing and veneers : Part 1 Stone facing
303	Plywood for general purposes
4990	Plywood for concrete shuttering work
6313 (Part 1)	Code of practice for anti-termite measures in buildings : Part 1 Constructional measures
6313 (Part 2)	Code of practice for anti-termite measures in buildings : Part 2 Pre-constructional chemical treatment measures(first revision) (Amendments 3)
737	Wrought aluminium and aluminium alloy sheet and strip for general engineering purposes
883	Design of structural timber in building - Code of practice
1003 (Part 1)	Timber panelled and glazed shutters : Part 1 Door shutters
1003 (Part 2)	Timber panelled and glazed shutters : Part 2 Window and ventilator shutters
1038	Steel doors, windows and ventilators
1081	Code of practice for fixing and glazing of metal (steel and aluminium) doors, windows and ventilators
1361	Steel windows for industrial buildings, ventilation blinds for windows
1826	Venation blinds for windows
1948	Aluminium doors, windows and ventilators
1977	Structural steel (ordinary quality)
2062	Steel for general structural purposes
2191 (Part 1)	Wooden flush door shutters (cellular and hollow core type) : Part 1 Plywood face panels
2202 (Part 1)	Wooden flush door shutters (solid core type) : Part 1 Plywood face panels
2202 (Part 2)	Wooden flush door shutters (solid core type) : Part 2 Particle board and hard board face panels
3548	Code of practice for glazing in building

3629	Specification for structural timber in building (first revision) (Reaffirmed 1991)
4020 (Parts 1-16)	Door shutters, method of test
4021	Timber door, window and ventilator frames
4351	Specification for steel door frames
4913	Code of practice for selection, installation and maintenance of timber doors and windows
4962	Specification for wooden side sliding doors
5509	Fire retardant plywood
5539	Specification for preservative treated plywood
6248	Specification for metal rolling shutters and rolling grills
7205	Safety code for erection of structural steel work
7452	Hot-rolled steel sections for doors, windows and ventilators
12896	Classification of Indian timbers for door and window shutters and frames
2074	Ready mixed paint, air drying, red oxide-zinc chrome, priming
809	Rubber flooring materials for general purposes
1195	Bitumen mastic for flooring
1196	Code of practice for laying bitumen mastic flooring
1197	Code of practice for laying of rubber floors
1198	Code of practice for laying, fixing and maintenance of linoleum floor
1237	Cement concrete flooring tiles
1322	Bitumen felts for waterproofing and damp-proofing
1443	Code of practice for laying and finishing of cement concrete flooring tiles
1580	Bituminous compounds for water proofing and caulking purposes
1609	Code of practice for laying damp-proofing treatment using bitumen felts
1661	Code of practice for application of cement and cement-lime plaster finishes
2114	Code of practice for laying in-situ terrazzo floor finish
2571	Code of practice for laying in-situ cement concrete flooring
3384	Specification for bitumen primer for use in waterproofing and damp proofing
3414	Code of practice for design and installation of joints in buildings
3461	Specification for PVC - asbestos floor tiles
3462	Specification for unbacked flexible PVC flooring
3478	Specification for high density wood particle boards
3502	Steel Chequered plates
3629	Specification for structural timber in building
3670	Code of practice for construction of timber floors
4443	Code of practice for use of resin type chemical resistant mortars
4457	Ceramic unglazed vitreous acid resisting tile
4631	Code of practice for laying of epoxy resin floor toppings
4860	Acid resistant bricks
4971	Recommendations for selection of industrial floor finishes
5318	Code of practice for laying of flexible PVC sheet and tile flooring
5389	Code of practice for laying of hardwood parquet and wood block floors
5491	Code of practice for laying of in-situ granolithic concrete flooring topping
9197	Epoxy resin, hardness and epoxy resin compositions for floor toppings
9472	Code of practice for laying mosaic parquet flooring
10440	Code of practice for construction of RB and RBC floors and roofs
459	Corrugated and semi-corrugated asbestos cement sheets
777	Glazed earthenware wall tiles

1414	Code of practice for fixing wall covering
1661	Code of practice for application of cement and cement-lime plaster finishes
1946	Code of practice for use of fixing devices in walls, ceilings and floors of solid construction
2095	Gypsum plaster boards
2098	Asbestos cement building boards
2402	Code of practice for external rendered finishes
2441	Code of practice for fixing ceiling covering
3630	Code of practice for construction of non-load bearing gypsum block partitions
4671	Expanded polystyrene for thermal insulation purposes
5390	Code of practice for construction of timber ceiling
5509	Fire retardant plywood
7316	Decorative plywood using plurality of veneers for decorative faces
1322	Bitumen felts for waterproofing and damp-proofing
1346	Code of practice for waterproofing of roofs with bitumen felts
1580	Bituminous compounds for water proofing and caulking purposes
1609	Code of practice for laying damp-proofing treatment using bitumen felts
1834	Hot applied sealing compound for joint in concrete
2508	Low density polyethylene films
2527	Code of practice for fixing rainwater gutters and down pipes for roof drainage
2645	Integral cement water proofing compounds
3037	Bitumen mastic for use in waterproofing of roofs
3067	Code of practice for general design details and preparatory work for damp-proofing and waterproofing of buildings
3384	Specification for bitumen primer for use in waterproofing and damp proofing
4365	Code of practice for application of bitumen mastic for water proofing of roofs
5871	Bitumen mastic for tanking and damp-proofing
6494	Code of practice for waterproofing of underground water reservoirs and swimming pools
7198	Code of practice for damp-proofing using bitumen mastic
7290	Recommendations for use of polyethylene film for waterproofing of roofs
9759	Guidelines for dewatering during construction
13182	Waterproofing and damp-proofing of wet areas in building Recommendations
1172	Code of basic requirements of water supply, drainage and sanitation
1239 (Part 1)	Mild steel tubes, tubular and other wrought steel fittings : Part 1 Mild steel tubes
1536	Centrifugally cast (spun) iron pressure pipes for water, gas and sewage
1537	Vertically cast iron pressure pipes for water, gas and sewage
1592	Asbestos cement pressure pipes
3114	Code of practice for laying of cast iron pipes
5822	Code of practice for welded steel pipes for water supply
1626 (Part 1)	Asbestos cement building pipes and pipe fittings, gutters and gutter fittings and roofing fittings : Part 1 (Pipe and pipe fittings)
2064	Selection, installation an maintenance of sanitary appliances - Code of practice
2065	Code of practice for water supply in buildings
3076	Low density polyethylene pipes of potable water supplies; sewage and industrial effluents
4984	Specification for high density polyethylene pipes for potable water supplies;

	sewage and industrial effluents
4985	Specification for un-plasticised PVC pipes for potable water supplied
7634 (Part 2)	Code of practice for plastics pipe work for potable water supplies : Part 2 Laying and jointing polyethylene (PE) pipes
7634 (Part 3)	Code of practice for plastics pipe work for potable water supplies : Part 3 Laying and jointing of UPVC pipes
1916	Steel cylinder pipes with lining and coating
4127	Code of practice for laying of salt glazed stoneware pipes
12709	Glass fibre reinforced plastic pipes, joints and rings for potable water supply
3597	Concrete pipes-methods of test
7319	Perforated concrete pipes
NBC	National Building Code of India
SP 35 (S & T)	Handbook of water supply and drainage with special emphasis on plumbing
277	Galvanized steel sheet (plain and corrugated)
458	Precast concrete pipes (with and without reinforcement)
651	Salt glazed stoneware pipes and fittings
782	Caulking lead
783	Code of Practice for laying of concrete pipes
1626 (Part 1)	Asbestos cement building pipes and pipe fittings, gutters and gutter fittings and roofing fittings : Part 1 (Pipe and pipe fittings)
1726	Cast iron manhole covers and frames
1742	Code of Practice for building drainage
3006	Specification for chemically resistant glazed stoneware pipes and fittings
4111 (Parts 1 to 5)	Code of Practice for ancillary structures in sewerage system
4733	Methods of sampling and test for sewage effluents
12592 (Parts 1 & 2)	Precast manhole covers & frames
2470 (Parts 1 & 2)	Code of Practice for installation of septic tank
784	Pre-stressed concrete pipes
1893	Criteria for earthquake resistant design of structures
4326	Earthquake resistant design and construction of buildings- Code of practice
13920	Ductile detailing of reinforced concrete structures subjected to seismic forces - Code of practice
13935	Repair and seismic strengthening of buildings - Guidelines
2190	Selection, installation and maintenance of first-aid fire extinguishers - Code of practice
3696 (Part 2)	Safety code of scaffolds and ladders : Part 2 Ladders
4912	Safety requirements for floor and wall openings, railings and toe boards
10005	S.I. units and recommendations for use of their multiples and of certain other units
6060	Code of practice for day lighting of factory buildings
3103	Code of practice for industrial ventilation
3483	Code of practice for noise reduction in industrial buildings
2440	Guide for day lighting of buildings
1200 (1 to 28)	Method of measurement of Building and Civil Engg. Works
7973	Code of practice for architectural and building working drawings
962	Code of practice for architectural and building drawings
13415	Code of safety for protective barrier in and around buildings

8969	Safety code for erection of concrete framed structures

In addition to the above-referred codes, CPHEEO manual on sewerage and sewage treatment and other relevant codes shall be applicable as per requirement. Copies of all relevant codes, reference literature shall have to be submitted to the Employer.

1.2.4 Samples and Tests of Materials

The Contractor shall submit samples of such materials as may be required by the Engineer-in-charge and shall carry out the specified tests directed by the Engineer-in-charge at the Site, at the supplier's premises or at a laboratory approved by the Engineer-in-charge. Samples shall be submitted and tests carried out sufficiently early to enable further samples to be submitted and tested if required by the Engineer-in-charge.

The cost of such test and material shall be borne by the contractor and nothing shall be paid on this account.

ITEM: Excavation for foundation in earth, soils of all types, sand, gravel, soft, murum, hard murum with boulders, soft rock and hard rock....etc. complete.

General The specifications contained in the standard specification volume IInd published by Public Works and Housing Department, Govt. of Maharashtra, Chapter Bd.A (1,A-2, A-3, A-4 & A-6 etc. on page No. 259) (Red Book) shall apply

The excavation shall be done to the required depth and section as per design drawing and as directed by Engineer-in-Charge. Extra depth shall be made up clear with concrete or other suitable materials as directed by Engineer-in-charge. At the cost of contractor. The excavated material shall be not be placed nearer than 300 m. from the edges of excavated portion. No. Compensation shall be admissible to the contractor due to any delay such as permission etc. After refilling of the trenches, the balanced stuff should be disposed off as directed. Refilling and disposal will be paid separately in relevant items if Schedule 'B'.

Site Clearance

The area to be excavated shall be cleared off.All trees and bushes and rubbish and other objectionable materials removed shall be burnt or disposed off as directed by the Engineer-in-Charge. The cost of such clearing shall be deemed to have been included in the rates accepted for different items under excavation.

During excavation, if masonry, concrete structure roots of trees etc are met with the same shall be removed without extra cost. The loss to public or private utility services such as telephone or electric cables/water mains or such other if comes across the trenches, shall have to be made good at the cost of the contractor. The permission for such crossing if required form the competent authority shall be obtained through Department. However delay in obtaining such permission shall not be considered as cause of delay for the works and no compensation shall be admissible to the contractor due to such delay.

Dewatering

No distinction shall be made as to whether the material being excavated is dry, moist or wet. The item also includes bailing out of water manually to keep the trenches reasonably dry for all further works of concerning, lowering ,laying & Jointing and testing of the pipe line till the completion of the work. Separate item of Dewatering is incorporated in the tender, if any ground water sources are met during excavation. No extra over the tendered provision shall be paid to contractor for this reason on any account.

SHORING AND STRUTTING

The item includes all shoring and strutting that may be required. On no account the width of trenches more than these mentioned here in after shall be measured. If excavation width more than the specified is required for the purpose of keeping machinery, steeping due to loose material or for any other reasons the same shall be at the Contractors cost.

Fencing, Lighting and Watching :-

The contractors shall made all proper arrangement for protecting the work by means of fencing, watching, and lighting at night, as directed by the Engineer-in-charge. The post of fencing shall be of timber, securely fixed in the ground not more than 3m. apart, and they shall not be less than 75 mm in diameter or less than 1.2 m. above the surface of the ground. There shall be two rails, one near the top of the posts and the other about 450 mm above the surface of the ground and each shall be from 50 mm to 70 mm in diameter and sufficiently long to run form post to post, to which they shall be bound with strong rope. The method of projecting not be allowed on any account. All along the edges of the excavated trenches a bank of earth about 1.20 m high shall be formed where required by the Engineer-in-charge for further protection. Proper provision shall be made for lighting at night and watchman shall be kept to see that this is properly done. In the event of the contractors not fully complying with the provisions of these clauses. The Engineer-in-charge may put up a fence or improve the fence already put up or provide or improve the lighting or adopt such measures as he may deem necessary without prior intimation to the contractor and all the cost of such procedure as may be adopted by the Engineer-in-charge, shall be borne by the contractor.

In addition to the normal lighting arrangements, the contractor shall be provide, wherever a sewer work is in progress, battery operated linking lights (6 Volts) in the beginning and end of a trench with a view to provide suitable indication to the vehicular traffic. The contractor shall also provide and display special boards painted with fluorescent paints indicating the progress of the work along a particular road.

The items of excavation are including necessary lighting at night at suitable intervals, but not more than 15 meter along the excavated trenches and at all crossing and barricading the same by fencing so as to avoid the accident. Chowkidars shall be employed at place where the trenches cross over any traffic road to caution the vehicles and pedestrians etc. The arrangements shall be maintained till completion of work and at the cost of the Contractor.

Alignment and levels. :-

Before the excavation of trench is commenced, sight rails shall be erected at every 30 m. and at all points of change of direction, gradient and at ends. The excavation work shall be proceeded by a joint survey along with alignment of the main, to obtain ground level at every 30 m. or less distance. Temporary Bench Marks shall be constructed at every 300 m. distance along the alignment and shall be maintained till the completion of the work. All labour and materials for the survey work of fixing Bench Marks etc. shall be provided by the contractor at his own cost. Since the lines to be laid are drainage lines., the grade and level are very important factors. Those shall be maintained very carefully. For any mistakes in survey the Contractor is fully responsible. He should not lay the pipes, unless the alignment is thoroughly checked by the Engineer-in-Charge or his authorized representative who is empowered to sign the work order book in token of checking the exact grade and level of the trenches excavation.

Excavation at random places shall not be measured by the Pradhikaran's Engineer. Any non-technical practices during the excavation of the contracted work shall be viewed very seriously by the Pradhikaran and a note to that effect will be recorded against the Contractor in his name.

Depth and Grades of trenches :-

The trenches shall be excavated to the required grades and depth as shown on approved drawings or as directed by the Engineer-in-charge. If not so, the payment for the item will not be paid to the Contractor.The depths of excavation and the level of the pipe inverts shall be checked by means of boning rods of suitable lengths. Additional depths if required to be excavated for pits for sockets, collars, specials, joints, and for any other working facility shall not be measured and paid separately. The minimum cover above the pipe shall be 0.90 m.

The bottom of trench shall be leveled both longitudinally land transversely or stepped as directed by Engineer-in-charge.

The Contractor shall notify the Engineer when the trenches are ready for bedding so that the Engineer can inspect and record the depth. Only on explicit approval by Engineer, the bedding shall be provided by the Contractor. If any public utility i.e. electrical cable, telephone cable, water connections, sewer connections, gutter damage etc. then same will be rectified by contractor at his own cost.

Width of trenches for excavation :-

The maximum width of trench allowable for different diameter of pipe sewer is given in the table below. The offset for width is allowable for every additional depth of trenches as tabulated for soft strata only.

The sides of the trenches shall be as nearly vertical as possible. The bottom of the trench shall be flat side to side.

Sr.No.	Dia of Pipe	Lift 0.0 m. to 1.50 m.	Lift 1.5 m. to 3.00 m.	Lift 3.00 m. to 4.50 m.	Lift 4.50 m. to 6.00 m.
1	150 mm to 300 mm	1.00 m.	1.30 m.	1.60 m.	2.00 m.
2	400 mm	1.10 m.	1.40 m.	1.70 m.	2.05 m.
3	450 mm	1.15 m.	1.45 m.	1.75 m.	2.10 m.
4	500 mm	1.20 m.	1.50 m.	1.80 m.	2.10 m.
5	600 mm	1.30 m.	1.60 m.	1.90 m.	2.20 m.
6	700 mm	1.40 m.	1.70 m.	2.00 m.	2.30 m.
7	800 mm	1.50 m.	1.80 m.	2.10 m.	2.40 m.
8	900 mm	1.60 m.	1.90 m.	2.20 m.	2.50 m.
9	1000 mm	1.70 m.	2.00 m.	2.30 m.	2.60 m.
10	1100 mm	1.80 m.	2.10 m.	2.40 m.	2.70 m.
11	1200 mm	1.90 m.	2.20 m.	2.50 m.	2.80 m.

The maximum width as mentioned in the table of different depth of trenches or the actual width which ever is less shall be taken into account for measurement and payment. No. extra width is allowable due to large quantity or big boulders met with in the trenches. Dressing and consolidation of the trenches.

The bed of the trenches shall be well rammed before laying of the murum or sand for bedding hollows, if any, shall be filled with murum duly rammed and watered to required level and grade at cost of the Contractor.

The contractor shall properly assess the work involved In above description and quote accordingly. The Executive Engineer's decision regarding any of the issue of scope of work here in and rates payable shall be final, conclusive and binding on contractor.

Any damages to the telephone cables / electrical cables shall be borne by the

contractor, if demanded by the concerned authority. The cost of damages shall be directly paid by the Executive Engineer to the authority and such amounts shall be recoverable from the contractor through his due payments/ security deposits. In case water mains is damaged by the contractor during execution and quantity of water is wasted due to his negligence, that amount of wastage of water shall be recoverable from the contractor as per the MJP's water rate prevailing at the time of execution through his running bill.

For excavated width whichever is less shall be recorded and paid for. Extra widths for pits at sockets, collars, specials, joints, construction and also for working liabilities shall neither be measured nor paid for. However, excavation required for providing and casting fixity block, thrust blocks, encasing etc. will be measured and paid for under relevant item of excavation. The pits for welding joints will also be paid under relevant item of excavation.

CLASSIFICATION OF MATERIALS IN TRENCHES

The exact classification of the strata met with during the excavation shall be done by the representative of Engineer-in-Charge and accordingly measurement shall be recorded under different items of excavation provided under Annexure to Clause-38 of tender for the purpose of excess quantity. In case of any, dispute regarding classification of strata, the decision of Engineer-in-Charge shall be final and binding. The strata classifications and its quantity shown are indicative only. The Contractor therefore, shall carry out his own assessment regarding the strata at different depth along the alignment, before submission of the tender.

Disposal of Surplus Stuff :-

The contractor shall carefully excavate the road surfaces and stack the materials obtained from for road surface cutting systematically for selectively reusing the same for remarking the road. At times it may be necessary for the contractor to remove the excavated stuff to a suitable destination away from the excavation work. This stuff stacked as directed within 50 m. lead shall be brought back for refilling by the contractor without any extra payment on this account.

The excavated stuff remaining in balance after refilling and remaking of road shall be conveyed, unloaded and leveled by the contractor at a destination as directed by Engineer-in-charge within a radius of 5 Kms form site of work. The same shall be paid to the contractor separately under relevant item of Schedule 'B' If it is seen that the surplus excavated stuff is being sold by the agency the agency will be penalized as decided by the Engineer-In-Charge.

ITEM: EXCAVATION BY CHISELLING MECHANICAL MEANS

(In Hard Strata)

Excavation in hard strata shall be done by chiseling, wedging or line drilling as specified any mechanical all means or ordered by the Engineer. The excavation refers to excavation generally for foundation, wet or dry, in hard rock by chiseling, wedging or line drilling and shall comply with the specifications.

MODE OF MEASUREMENT AND PAYMENT

The excavation shall be measured in Cubic meters only. Dimensions shall be measured correct to two decimal of meter and quantity shall be calculated to two places of Decimal of Cubic meters. The item mentioned in Schedule-B in which includes disposing excess excavated material remained after refilling will not be paid separately for disposing excavated material.

1.7 **WIDTH OF TRENCHES**

The maximum width of the trenches admissible for payment shall be as under

Sr. No.	Internal dia of pipe	Width of excavation of trenches	Nature of strata
1.	80 mm and below	0.70 M	In soft and hard material
2.	100 m	0.75 M	In soft and hard material
3.	150 mm	0.75 M	In soft and hard material
4.	200 mm	0.85 M	In soft and hard material
5.	250 mm	0.85 M	In soft and hard material
6.	300 mm	0.90 M	In soft and hard material
7.	350 mm	0.95 M	In soft and hard material
8.	400 mm	1.10 M	In soft and hard material
9.	450 mm	1.15 M	In soft and hard material
10.	500 mm	1.20 M	In soft and hard material
11.	550 mm	1.25 M	In soft and hard material
12.	600 mm	1.25 M	In soft and hard material
13.	700 mm	1.30 M	In soft and hard material
14.	750 mm	1.40 M	In soft and hard material
15.	More than 750 mm	OD + 0.60 M	In soft and hard material

Item :- Providing laying in situ P.C.C. (M-150) 1:2:4 & C.C. 1 : 1 1/2 :3 (M – 200) .....etc. complete.

This shall comply as per standard specification No. Bd-E-1 on page No.287 or latest edition.

Materials

a) Cement :-

All cement for use on the works except otherwise stated shall be the standard ordinary Portland cement manufactured in India and shall conform to the I.S. 269 latest version. It shall be of make and quality approved by the Engineer-in-charge.

The cement shall be stored in weather proof godown specially constructed for the purpose, of such a manner as to prevent deterioration due to moisture or instruction of foreign matter. The weather proof godown shall have solid impervious floor raised 300 mm above the general ground level so that the cement stored there on shall not come in direct contact with the sub-soil moisture. The passages and the general construction shall be such that it affords full protection from whether effects. Large stock cement shall not be kept at the works but only sufficient quantities should be kept to maintain continuity of work.

Storage of Cement :-

If cement is supplied in bags a suitable weighing scale shall be provided and shall required by the Engineer be used for checking the weight of every bag at the contractor's expense. Bags under weight by more than 2 percent of the nominal weight shall be rejected and removed from the site.

No cement has been store for more than 90 days ordinarily be allowed to be used on the works. Cement stored for longer period more than 90 days shall be used on work only with the specific written permission of the Engineer-in-charge who shall ascertain its quality after due testing in the laboratory before giving such permission. All expenses in connection with the test shall be borne by the contractors.

For testing the quality of cement, samples shall be taken from every consignment arrived at the site of work at the option of the Engineer. The contractors shall afford every facility to the Engineer for inspection for sampling the cement. The cement godown shall be so arranged by the contractors that each consignment could be stocked separately and in such manner so as to allow counting bags in each row with case. The test result shall, ordinarily. Be available within a week of sampling and the contractors shall not use any part of the consignment until the results of the tests are received and found satisfactory. However, the use of such cement becomes imperative before the test result are received, the contractors may do so entirely at their own risk and cost and the whole of such work carried out by them is liable for rejection, if the tests results are found unsatisfactory. Any consignment failing to meet the requirements to I.S. 269 shall be rejected and shall be removed from

the work site within 48 hours of the intimation from the Engineer. The decision of the Engineer-in-charge in this respect shall be final and binding on the contractors.

The cement in connection with the testing of cement such as transport of samples, testing fees, etc. shall be borne by the contractors.

The cement used in any type of concrete shall always be measured by weight and one cubic meter shall be taken as per table 30 of A.C.C. Hand Book.

b) Aggregates :-

All the aggregates shall confirm to the latest I.S. 383. The aggregate shall consist of naturally occurring sand and gravel or stone crushed or uncrushed or a combination thereof. They are classified broadly under two categories, viz (i) Sand of fine aggregates and (ii) coarse, aggregates, depending upon their size. The fine aggregates are those which pass through I.S. Sieve No. 480. and the coarse aggregate are those which retained on I.S. sieve 480.

(i) Storage of Aggregate :-

The fine and coarse aggregates shall be stored separately and in such a manner that segregation of the various sized particle shall not occur, the stock shall be formed on a platform of weak concrete, timber or similar approved hard standing and aggregates shall be kept clean and free from foreign substance.

(ii) Aggregates shall not be unloaded on to roadways or pathways the Engineer may reject any stock pile of part of a stock pile if improper storage has opinion, caused contamination with foreign substances.

(iii) Storage piles of aggregate shall be arranged with proper drainage and protection from rainfall in order to prevent excessive changes in moisture content taking place during concerning.

(iv) The aggregates both fine and coarse shall be hard, strong, durable, clean, free from veins and adherent coatings. The use of flaky and elongated pieces of aggregates shall be prohibited.

(v) The aggregate shall not contain deleterious materials such as iron pyrite, coal, mica, shale or similar laminate material, clay, alkali, soft fragments, sea shells, organic impurities etc. in such quantity as to affect the strength of durability of concrete or the reinforcement embedded in such reinforcement concrete.

(vi) The maximum quantities of deleterious material that may be permitted shall conform to the following limits by weight.

Deleterious substance	Fine aggregates percent by weight		Coarse aggregates percent by weight.	
	Uncrushed	Crushed	Uncrushed	Crushed
1. Local and lignite	1.00	1.00	1.00	1.00
2. Clay lumps	1.00	1.00	1.00	1.00
3. Soft fragments	-	-	3.00	-
4. Material passing through 75 micro sieve.	3.00	3.00	3.00	1.00
5. Shale	1.00	-	-	-

(vii) The total of various deleterious materials occurring in any sample shall, no case, exceed 5 percent.

(viii) If the aggregate supplied is unclean, it shall be washed. If it is not properly graded, it shall be screened by hand or by mechanical means and the various sizes proportioned to get the required grading.

(ix) Storing of aggregate on dusty, muddy and grassy spots shall be avoided. They shall be stored on the works in such a manner as to prevent intrusion of foreign matter and protected from exposure to dust. They shall be placed in stock piles individual units of suitable sizes and in suitable layers to prevent segregation. They shall not be allowed to run down slopes.

Sand or fine aggregates :-

All fine aggregates shall consist of clean, hard, strong, durable uncoated siliceous gitty material consisting of well graded particles obtained from rock fragment. It shall be free from clay lumps injurious amount of dust, mica shell, soft or flaky particles, shale, alkali, organic matter lead or other deleterious substances.

i) The sand shall be taken from sources approved by the Engineer-in-charge. The sand or fine aggregate shall conform to the latest I.S. No. 383

ii) If the Engineer-in-charge considers if necessary, it shall be washed and / or screened before use, at the expense of the contractors.

iii) The sand shall have a fineness modulus of not less than 2.5 and not more than 3.0 and the grading shall confirm as far as possible to the following analysis.

I.S. Sieve No.	Percentage Passing	
	Natural sand or crushed gravel	Crushed Stone
480	95-10	90-100
240	70-95	60-90
120	45-85	40-80
60	25-60	20-50
30	5-30	5-30
15	0-10	0-15

iv) the specific gravity of sand shall not be less than 2.6

v) In no case shall fine aggregate be accepted, containing more than 2 % by dry weight not more than 3.5% by dry volume, not more than 5% by dry volume of clay, loam, or silt. If any sample of fine aggregate shown more than 5% of clay, loam, silt in one hour's settlement after shaking in excess of water, the lot represented by the sample shall be rejected.

vi) The following two field tests are recommended for ascertaining the percentage of clay lumps and impervious organic material and the contractors shall carry out the same if the Engineer-in-charge deems necessary.

1. Test for determining silt in sand: -

Fill a calibrated tumbler with sand to half its volume and water there to until the tumbler is three quarters full. Shake up the mixture vigorously and allow it to settle for about an hour. The volume of silt visible on top the sand shall be measure. If the volumes of the silt standing over the sand exceed 5% of total volume of sand. The same shall be rejected.

2. Calorimetric test for impurities :-

The sample of sand shall be mixed with equal volume of 3% solution (about one ounce, in a quarter of water) of caustic soda / sodium hydroxide taken in a plain glass and the mixture shall be allowed to stand for 24 hours. The liquid standing above the sand shall not be darker than lights straw (pale yellow) color. If the color marked yellow or brown, the test would indicate presence of organic material in excessive amount.

In case suitable sand is not available in adequate quantities within a reasonable and economical limit, the contractor may be allowed to use the crushed or pulverized stone or gravel

either alone or mixed within natural sand in parts. The stone or gravel shall be clean sharp and free from dust etc. and shall conform to the latest. I.S. 383. The percentage of crushed stone to be mixed with sad shall be such as to obtain in fineness modules of blended sand within the units specified above and / or as approved by Engineer after laboratory test.

Coarse Aggregates :-

All coarse aggregates use in concrete work shall consist of crushed rock gravel or other approved inert material.

i) Broken or crushed rock from sound blue basalt or black trap free from zealot or other common impurities shall be used in the concrete as coarse aggregate. The particles of aggregate shall be clean, hard, tough durable, free from deleterious substance and shall contain no soft, flat or elongated pieces. The course aggregate shall have specific gravity not less than 2.6 and the water absorption measured after being immersed for 24 hours in water shall not be more than 6% by weight. The maximum percentage of deleterious materials in the coarse aggregate shall not exceed 5 % by weight in the aggregate when tested in conformity with I.S. No.383.

ii) The nominal size of the coarse aggregate for reinforced concrete work shall be 20 mm larger coarse aggregate up to 40 mm size may be used if approved by the Engineer-in-charge, in plain concrete work. The maximum size of coarse aggregate shall be as large as possible within the limits specified but in no case shall be greater than one quarter than one quarter of the maximum thickness of the member, provided that the concrete can be placed in from work without difficulty so as to surround all reinforcement thoroughly and to fill the corners of the form work. The minimum size of coarse aggregate shall be, as mentioned earlier, such as to retain most of the material (90%-95%) on L.S. Sieve No. 480.

iii) The aggregate shall be screened and, if necessary, blended to give the required grading when tested in the laboratory at contractors cost by means of standard mesh sieve, the grading shall fall within the following limits.

Sieve Size	**Percentage retain by weight**	
	Plain C.C.	**R.C.C.**
40 mm	-	-
25 mm	10 to 15	-
20 mm	35 to 40	15 to 0
10 mm	75 to 80	100 to 80

No. 480	98 to 100	100 to 95

The percentage given above are for guidance and the Engineer-in-charge reserves the right to modify the same to any other lower or higher value if considered necessary by him, in consonance with the requirements of the work.

iv) in the event of undesirable segregation occurring in coarse aggregates, the contractor shall separate the coarse aggregates in two or more suitable fraction as directed by the Engineer-in-charge, who shall set up the required limit of each such fraction. The grading so specified shall be such as to give a dense, water tight concretes of specified proportion and strength and required consistency.

v) The Engineer-in-charge shall have the right and authority to carry out routine control tests and analysis of the broken rock at any stage of the work processing and / or concerning operation and the contractors shall give all necessary facilities in respect of such testing. The sampling and testing shall be carried out as per standard I.S. practice entirely at the cost of the contractor.

Water

The water use for the preparation of concrete., for washing sand etc. and for curing shall be clean and free from objectionable quantities of silt, organic material, acid , alkali, salts, oil and other deleterious impurities and it shall be obtained from the sources approved by the Engineer-in-charge. Potable water shall generally be found fit for preparation of concrete. The quantity of water to be added shall generally be properly measured and controlled.

i) Water Cement Ratio :-

Suitable water cement ratios for the different mixes and used shall be determined in consultation with the Engineer-in-charge and they shall generally not be exceeding 0.5 (i.e. 50% by weight), the exact values being fixed after taking into account all relevant factors such as strength required, weather condition, water absorbed by material, work ability and slump required consistent with the work requirements, method of compaction etc. The concrete mix shall be designed with the materials which will be used hence forth for the preparation of concrete. The same task shall be repeated if there is change in the quarries for the fine and the coarse aggregate.

Concrete :-

All cement concrete, whether used in R.C.C. work or plain concrete work shall be M-150, M-200 and M-250, as per latest LS. Code.

Gauge Boxes

Gauge boxes approved type shall be used for measuring sand and coarse aggregate in required proportion whenever concrete is allowed to be prepared by mixing the aggregate on volumetric basis. Such boxes shall be of seasoned timber or steel and shall be of such size and shape and shall be used in a manner as to enable the proportion of the material to be checked readily. The cement used in concrete is however shall not be used by measuring it in gauge boxes, but it shall be measured by weight, whatever may be the type of concrete.

Manufacture and Placement of concrete :-

a) Batching :-

Whether controlled or ordinary concrete is to be mixed, the quantity of cement shall be determined by weight. If the mixers weight per bag is to be used, the same shall be verified by weighing a reasonable number of bags.

Whenever direct use of bagged cement is allowed, one bag of cement shall be considered to contain 50 kg of net weight of cement. This shall, however, be verified at site by weighing for which the contractor shall provide an accurate weighing apparatus on work sites

Having once decided the mix, the Engineer-in-charge may permit further mixing of the aggregate to be done on volumetric basis.

Wherever the concrete is to be laid in trenches, the trench shall cleaned, watered and compacted before placing. The sub soil water which met shall be removed and the trench shall be kept dry during and after two hours of placing of concrete. For more depth of P.C.C. mechanical vibrator shall be used for compaction by the contractor.

The damages to concrete during laying of pipe line shall be rectified free of cost. The rate for the concrete includes all labour, material centering shuttering securing etc. all leads and lifts.

Mixing of concrete shall be done with concrete mixer.

For providing Electric wiring duct, tubes of the required diameter and length shall be provided through walls beams and floors, slabs as and when directed without any extra cost.

a) The contractor will make his own arrangement for receiving all material tools etc. required for the work.

b) No extra charges for the carriages of water will be allowed.

c) The rates for all items are inclusive of all charges such as carting, lifting, etc. No extra payment for any lead and lifts will be paid for any item.

d) The contractor should not be Sublette without written permission of the Engineer-in-Charge

Cement cubes of size 15 cm x 15 cm x 15 cm are taken during the concreting of important structure like RCC well, water treatment plant, elevated service reservoirs, bridge etc. to check the strength of the concrete and its acceptability it is observed that while taking cubes the requirement specified in the relevant Indian Standard specification are not observed properly and cubes are not cast in the required numbers. Due to this the acceptability of the concrete can not be decided correctly. Similarly, proper care is also not taken for curing of the cubes the requirements specified in the ISS in respect of casting of concrete cubes and curing thereof, with acceptability criteria of concrete are reproduced below, which shall be following scrupulously.

FREQUENCY OF SAMPLING (IS:456:2000 (Clause 15.2)

a) Number of samples to be taken during concreting based on the quantum of concrete cast shall be as below.

Quantity of concrete in Cum	No. of samples
01 to 05	1
06 to 15	2
16 to 30	3
31 to 50	4
50 and above	4 + 1 for every 50 Cum. part thereof.

At least one sample shall be taken from each shift of concrete and three test specimens (cubes of size (15 x 15 x 15 cm) shall be cast from each such sample for testing of the compressive strength additional three cubes will also have to be taken for 7 days test.

The test strength of the sample shall be the average the strength of the three specimen.

ACCEPTANCE CRITERIA (IS:456:2000 Clause 16)

The concrete cost shall be supposed to be acceptable in the compressive strength (i.e. average strength of the three specimen) of the samples fulfill the following requirements.

a) Every sample has a test strength not less then characteristic value.

OR

b) The strength of one or more samples, though less the characteristic value is in each case, not

less then the greater of following.

i) The characteristic strength minus 1.35 times the standard deviation.

and

ii) 0.80 times the characteristics strength.

c) And the average strength of all the samples is not less than the characteristic strength plus

$$1.65 * \frac{1.65}{\text{No. of samples}} = \text{times the standard deviation}$$

d) However, it should be noted that individual variation should not be more than the percent of average.

STANDARD DEVIATION VALUES

Grade of Concrete	Assumed Standard deviation in Kg/Cm^2
M-100	35.00
M-200	46.00
M-250	53.00
M-300	80.00

CURING OF CONCRETE CUBES (IS:516:1959, CLAUSE 3.3)

The test specimen (cubes) shall be stored on the site at place free from vibration, under damp matting, sacks or other similar material for 24 hours + ½ hour from the time of adding the water to the other ingredients. The temperature of the place of storage shall be within the range of 22^o to 32^oC. After the period of 24 hours, stored in clean water at temperature of 24^o to 30^oC until those are transported to the testing laboratory. Samples shall be sent to the testing laboratory well packed in damp sand, damp sacks or other suitable material as to arrive there in a damp condition, not less than 24 hours before the time of test.

On arrival at the testing laboratory, the specimen shall be stored in water at a temperature of $27^o + 2^o$ C until the time of test. Record of the daily minimum and maximum temperature shall be kept, both during the period specimen remain on the site and in the laboratory.

TEST PROCEDURE (IS:516:1959 CLAUSE 5.5)

Specimen stored in water shall be tested immediately on removal from water and while those are still in the wet condition. Surface water and grit shall be wiped off the specimens and any projecting fins removed. Specimen, when received dry, shall be kept in water for 24 hours before taken for testing.

The dimensions of the specimens to the nearest 0.2 mm and also weight shall be noted before testing.

OTHER THINGS

Here, it should be specifically noted that age of concrete cube will be age as on the date of testing i.e. time difference between addition of water to dry ingredient and actual testing.

MIX DESIGN

The following instructions shall be followed as regards preliminary design of mix and methods of batching of plain cement and reinforced cement concrete. These instructions should be treated as supplementary to the relevant provision in the specifications for the respective items contained in the book of standard specification and will be carried the provisions contained therein, wherever they are contrary to the following instructions.

The preliminary design and batching for various grades of concrete shall be governed by the following guidelines.

No.	Concrete Grade	Guidelines
1	Upto M-150	This should only be ordinarily concrete. No change may be prescribed in the present practice as regards preliminary design of mix and permitting volume batching.
2.	M-200 to M-250	Preliminary mix design must be carried out for these mixes. However, weigh batching shall be insisted for cement, fine aggregate and course aggregate.
3.	Above M-250	Preliminary mix design must be prepare for such mixes weigh batching should be for cement fine aggregate and course aggregate.

For the grades of concrete M-200 and above the preliminary mix design shall be carried out from the approved laboratory. The rate quoted by the contractor in the agreement for these items shall be final and binding on him, irrespective of content of cement required as per preliminary mix design and there shall be no adjustment in the agreement rate for these item on this account.

The charges for preliminary design of concrete mix shall be entirely borne by the contractor.

For grades of concrete M-200 and above where cement is to be used by weightment, the cost of extra cement required to make up the under weight bags shall be borne by the contractor.

For the items of concrete of grades lower than M-200 and other items in the agreement where

cement is not to be used by weightment the cement bags as received from the manufacturer and shall be assumed to contain cement of 50 kg net weight.

This shall be as per specification of P.W.D. (Hand Book) and as directed by Engineer-in-charge. Only trap stone shall be used other than the specification for this item in Standard Specification Book.

(a) Proportions of concrete for types of work

i) M-100 – For leveling course and foundation of chairs and thrust blocks etc

ii) M-150 PCC with temperature nominal 0.15% reinforcement for footing thrust blocks, anchor blocks, chairs and encasing of pipes etc.

iii) M-200 PCC for water retaining structure

iv) M-300 for Construction of Jack well, Pump House & Water Retaining Structure. Such as ESR, WTP, MBR, BPT.

v) M-250 Pump house and bridges (excluding sub-merged portion)

b) General specifications of this work shall be as per standard specification of Public Works Department, latest edition, for PCC Bd.-E1 to E-7 and for RCC Bd.F2 to F16.

c) Whenever concrete is to be laid in trenches, the trench shall be cleaned, and watered before placing. The sub-soil water which is met shall be removed and the trench shall be kept dry during and after 2 hours of placing concrete.

d) Pedestal pier shall be perpendiculars to center line of pipe.

e) Proper seat shall be left on top of pedestal pier to construct saddle. Seat shall be strictly done within 24 hours, failing which MJP will not accept it for payment

f) RCC saddle shall be constructed as per detailed drawing. The top of saddle where pipe rests shall be provided with wearing plate fixed in CM 1.3 smoothly and CM grouting may be done after pipe is placed and no extra payment will be made for this.

MODE OF MEASUREMENT AND PAYMENT.

The tender rate shall be for one cubic meter of concrete. The concrete shall be measured for its length, breadth and depth limiting dimensions to those specified in drawing or as per direction of Engineer-in-Charge.

ITEM: MILD STEEL AND TOR STEEL REINFORCEMENT FOR RCC

WORKS

The item provides for supply of mild steel, tor steel bars, cutting, bending with G.I. wire and placing in position, welding for reinforcement in the RCC.

Mild steel and tor steel bars shall confirm to Specification A-10 of Standard Specification of Public Works Department, Latest Edition.

The binding wire shall confirm to Specification A-15 of Standard Specification of Public Works Department, Latest Edition.

During contractor's supply, if any, the steel bars shall be supplied directly to the site of work.

Bending reinforcement confirm accurately to the dimensions and shapes in the details drawings (approved) or as directed by the Engineer-in-charge.

Bars shall be bend cold only. In no way bending by heat will be allowed.

Bars with kinks, bends or cracks shall not be used.

Details of length, size, laps and bending diagram shall be got approved by the Engineer-in-charge.

As far as possible full length of bars shall be placed as per drawing details. When full lengths are not available, bars be supplies only after written permission of the Engineer-in-charge. Supplies shall be staggered and in tension zone shall be avoided strictly. Bars shall be lapped as specified in IS:456-2000 with due regards to the grade of concrete. Welding may be used for large diameter of bar only after permission of Engineer-in-charge.

Welding, if permitted shall conform to specification B.10.7 of Standard Specification of Public Works Department.

All reinforcement shall be accurately placed in position with spacing and cover shown in detailed drawing and firmly held during the placing and setting of concrete. Bars shall be ties at all intersections. Binding wire of 1.63 mm or 1.22 mm diameter (about 16 or 18 gauge) shall be used. Spacing of the bars shall be maintained by means of stays, blocks ties, spacers, hangers or other approved supports at sufficient close intervals so that bars will not be displaced. During placing vibrating or compacting concrete, placing bars for reinforcement on a layer of fresh concrete as the work progress will not be permitted. The use of pieces of broken stones or bricks or wooden blocks for maintaining spacing or cover shall not be permitted. Layers of bars shall be separated by precast cement blocks, spacer bars or other devices.

Full details of numbers, sizes, lengths, weights, laps, welds, spacing of bars placed in position in different parts of the work shall be recorded by the contractor and certified and signed by the

Engineer-in-charge or his representative to show that all reinforcement has been placed correctly as per sanctioned drawing or as directed by the Engineer-in-charge in writing, before placing concrete. No concrete shall be placed in position until the certified the correctness of reinforcement, recording the steel measurements and has given permission in writing to place concrete. After approval of reinforcement as above, it will be the contractor's responsibility to seal that the spacing of reinforcement and arrangements are not tampered with in any way before or during concreting. Any steel is required to be procured by Contractor. He shall produce the test certificate. In addition, actual test shall be carried out according to IS:432-1982, in an Government laboratory and the cost of test shall be borne by the contractor, including all transport, etc.

This item includes,....

a) Cost of labour, materials, use of tools, plant and tackle and other incidental items to complete the work satisfactorily.

b) Supplying, conveying, cleaning, cutting, bending, binding with (1.63 mm or 1.22 mm diameter – 16 to 18 gauge) wire on spot, welding and placing reinforcement in position and maintaining it clean and in position till the concrete is laid.

c) Cost of sampling and testing, as required.

In no case, any foreign material e.g. oil, grease, etc. which prevent bonding between steel and concrete shall remain on steel on steel bars during placing of concrete.

MODE OF MEASUREMENT AND PAYMENT

The tender rate shall be on weight basis for MT of MS/tor steel reinforcement. The weight of steel reinforcement used for the item of concrete will be measured in tonnes based on total compacted weight for the sizes and lengths of bars as shown in drawing or as directed by Engineer-in-charge.

The lengths of the bars shall be measured correct to 2 places of decimals of meters. The weights for payments shall be calculated according to standard weights mentioned in the ISI Hand Book correct upto 0.10 Kg.

ITEM: BURNT BRICK MASONRY SECOND CLASS

4.1 **GENERAL**

This specification lays down the requirements for B.B. Masonry 1st class in cement mortar of specified proportion required for various structures, including necessary scaffolding, watering etc. The specifications shall conform to IS:2212-1991 its latest revision.

4.2 **MATERIALS**

BRICKS : Bricks shall be first class and shall conform IS:1077-1992.

4.3 **MORTAR**

The quantity of mortar to be used per Cum of B.B. masonry shall be about 30 to 32% or 300 to 320 liters for conventional bricks and 32 to 33% or 320 to 330 liters for ISI bricks. The proportion of mortar shall be as specified in the item of the tender.

4.4 **CONSTRUCTION**

JOINTS : Joints shall not exceed 12 mm (about ½") in thickness and shall be uniform throughout.

All other specifications of KB-1 for B.B. masonry first class shall apply to this class of masonry also.

Mode of Measurement :

The contract rate shall be for a unit of one cubic meter of Masonry. The concrete shall be measured for its length, breadth and depth limiting dimensions to those specified on the plan or as directed by Engineer-in-Charge. No deduction shall be made for reinforcement in concrete in RCC work. Individual dimension shall be measured in Cum. And quantities shall be worked out correct upto three places of decimal of a cubic meter.

4.5 **HALF BRICK MASONRY**

The half brick masonry shall be in cement mortar specified in the item but not weaker than 1:4.
Mode of measurement : Per Sq,mt.

The half brick masonry shall be reinforced by 2 No. of 6 mm dia M.S. longitudinal bars or 2 No. of hoop item strips of 25 x 1.6 mm size, at even third course properly bent and bounded in vertical joints of the brick work or to main walls as directed by the Engineer-in-charge, if continuous strip is not available, strips shall be rivet jointed with a minimum overlap of 8 cm. All the bricks shall be laid stretch wise breaking joint with the upper and lower courses. Fixtures, plugs, hold, fasts, frame down, windows shall be based into brick work while laying only and of the correct levels and positions. Holes of required size and stage shall be left in the brick work during laying for fixing pipes or service lines, passage of water etc. After the pipeline work is completed, extra hollow left around the hole shall be plugged with 1:3 cement mortar or 1:3:6 cement concrete. Hold fasts for frames of doors and windows shall be accommodated in the joints of the brick which laying. The joints in the courses where reinforcements is places shall admit of a mortar cover at least 5 mm for the brick work

with 15 bricks and not more than 12 mm for conventional brick work. A set of mason's tools shall be maintained on work for each group of 3 masons or less for frequent use and checking. The ends of walls shall be bonded into the side walls where necessary.

The joints shall be raked out to depth not less than the thickness of the joints.

This item shall include :

a) Providing and fixing mild steel reinforcement bars or hoop iron strips as mentioned above.

b) Leaving holes for fixtures or pipes and making them good after completion of the work.

c) Building in frames, hold fasts etc. and forming chassis and grooves.

Mode of measurement

The contract rate shall be for a unit of one Square meter and quantities shall be worked out correct upto three places of decimal of a Sqmt.

ITEM: CEMENT PLASTER : Internal Neeru finish

GENEAL

This specification lays down the requirement of cement plaster to be applied to concrete or brick masonrysurface. In cement mortar of specific proportion and thickness.

PREPARATION

For masonry all joints in the frame work that is to be plastered shall be raked out to a depth not less than the width of the joints or as directed by the Engineer-in-charge. The raking shall be done taking care not to allow any chipping of masonry. In new work the raking out shall be done while the mortar in the joints in still green. Smooth surface of concrete or plaster etc. must be suitably roughened to provide necessary bond for the plaster all dirt, soot oil paint or any other materials that might interfere with satisfactory bond shall removed and surface wetted before plastering is started.

General : The item shall comply with specification B.11.b subject to the additional clauses Bd.L 1.2, Bd.L 1.3, Bd.L 1.4 and the following

Finishing : When no finish is specified the plastered surface shall be rubbed well to an even plane with a wooden float for external surfaces and finished smooth with a steel trowel for internal surfaces.

When cement finish is specified, coat of pure Portland cement slurry 1.5 mm (1/6') thick shall be applied to the plastered surface while the second coat is still fresh. If neeru finish is specified, then the surface shall be finished as per specification for Item Bd.L-10.

The thickness of the cement plaster shall be 12 mm excluding cement or neeru finish.

Mode of measurement

As per NdL-1.7 on square meter basis

MATERIALS

Cement mortar shall be prepared from cement and as specified for RCC work and mixed in the proportion specified. Sand shall be screened and washed if called upon to do so. Water proofing compound of directed make in directed quantities shall be added where it is water proof plaster, scaffolding shall be prepared from sound materials and shall be provided, where ever situation demands for facility of proper working.

GAUGES

Patch of plaster 15 x 15 cm shall be put on about 3 m apart as gauges to ensure even plastering in one place.

FINISHING

In any continuous face of wall, finishing treatment of any type shall be carried out continuously and day to day breaks made to coincide with architectural breaks in order to avoid unsightly junctions. All mouldings shall be worked true to template and drawn neat, clean and level. All exposed angles, junctions and openings shall be carefully finished.

WATERING

All pointing work shall be kept damp continuously for a period of 14 days. To prevent excessive evaporation of the sunny and wind ward side of the building in hot, dry weather matting or gunny bags may be hung over on the outside of the plaster in the beginning and kept moist. If the contractor fails to water the work to the satisfaction of the Engineer-in-charge, the requisite labour, materials and equipment to water the work properly shall be engaged departmentally at the cost of the contractor.

Cost all scaffolding is included in the tender rate.

ITEM: SAND FACED CEMENT PLASTER

GENERAL

The item shall comply with the specification B.11 in all pertinent particulars. In addition Bd.L.1.2, Bd.L 1.3, Bd.L 1.4 and the following specifications shall also be complied with.

Base Coat : The base coat plaster shall be of cement mortar 1:4. Water proofing compound of approved make like Pudlo, Sika, Accorproof shall be added according to the maker's instruction in

Bd.L 2 which a thickness of 15 mm for brick work and concrete surfaces and 20 mm for rubble stone masonry. Keys shall be formed on the surface by thoroughly combing it with wavy horizontal lines about 12 mm apart and about 3 mm deep when the mortar is still plastic.

Sand Faced Treatment : The cement mortar fo sand faced plaster shall have washed Kharsalia or Kasaba or similar type of approved sand with slightly larger proportion of coarse material The proportion of cement to sand shall be 1:4. The water is added gradually to make the mixture homogeneous. The thickness of finishing coat shall not exceed 8 mm. After applications the surface should be finished with a wooden float lined with cork and tapped gently to retain a coarse surface texture. When the finishing coat has hardened the surface shall be kept moist continuously for 14 days.

Item to include relevant portion of Bd.L 1.6. it shall also be include the base coat and san face treatment of above.

Mode of Measurement and payment per Bd.L 1.7 on square meter basis

The specification lays down the requirements of applying sand faced plaster in specified thickness with cement mortar to concrete or masonry surface in specified coats. This shall conform to specification for ordinary cement plaster where ever it is not irrelevant and in addition following shall also be applicable.

Tools and accessories used in plastering work be thoroughly cleaned before plastering is done.

The programming of other building operations before during and after plastering shall be according to the instructions contained in Clause 4 of IS:1661-1960 or its latest revision. The item shall be executed as per Red book specification BdL-7 to 7.50 page No. 351)

Care shall be taken that other parts of work of adjacent work are not damaged while plastering.

The base coat plaster shall be of cement mortar of specified proportion 1:4 and thickness as mentioned in the item or otherwise, it shall be of cement mortar 1:3 and thickness 15 mm to 20 mm. The base coat shall be laid in a similar manner as stipulated in. However, instead of finishing the top surface smooth keys shall be formed on the surface thoroughly combined in with wavy horizontal lines about 12 mm apart and about 3 mm deep when the mortar is still plastic. The base coat shall be cured for suitable period as per relevant code.

ITEM: DOORS, WINDOWS AND ROLLING SHUTTERS

The specification for this work are as per Standard Specification BD-T-2 and T-7 and as directed by

Engineer-in-Charge. (The item shall be executed as per Red book specification)

ITEM: PAINTING WHITE WASH

This item is to be executed as per Standard Specification and as directed by Engineer-in-Charge. (The item shall be executed as per Red book Specification)

ITEM: STEEL ROLLING SUTTERS

The specifications lays down requirements of providing and fixing steel rolling shutters with accessories locking arrangement top hood cover and painting in three coats of synthetic enamel paint of approved quality and shade

The specification for this work as per standard specification of Red Book - and as directed by

Engineer-in-Charge.

MATERIALS

The rolling shutters shall conform to IS:6248:1979. Rolling shutter shall be supplied of specified type with accessories. The size of the rolling shutters shall be as specified in the drawings. The shutters shall be constructed with interlocking lathe sections foamed from cold rolled steel strips not less than 0.9 mm thick and 80 mm wide for shutters upto 3.5 m width and not less than 1.25 mm thick and 80 mm wide for shutters 3.5 m width and above unless otherwise specified. Guide channels shall be of mild steel deep channel section and or rolled pressed or built up (fabricated) jointless construction. The thickness of sheet used shall not be less than 3.15 mm.

Head cover shall be made of M.S. sheet not less than 0.9 mm thick for shutters upto 3.5 m width. For shutters having width 3.5 mm and above the thickness of M.S. sheet for the hood cover shall not be less than 1.25 mm.

The spring shall be of best quality and shall be manufactured from tested high tensile spring steel wire or strip of adequate strength to balance the shutters in all positions. The spring pipe shaft etc. shall be supported on stron M.S. or Malleable C.I. brackets the brackets shall be fixed on or under the lintel as specified with raw plugs and screws bolts etc.

The rolling shutters shall be self rolling type upto 8 Sq.mt clear area without ball bearing and upto 12 Sqm.. Clear area with ball bearing. If the rolling shutters are of larger size, then gear operated type shutters shall be used.

The locking arrangement shall be provided at the bottom of shutters at bottom ends. The

shutters shall be opened from outside.

The shutters shall be complete with door suspension shafts, locking arrangements, pulling hooks, handless and other accessories.

WORKMANSHIP

Rolling shutters and top hood with all accessories shall be supplied of specified type and shall be got approved before fixing by the Engineer-in-Charge. The fixing shall be done in true line and level. The damaged work shall be made good to the level of original works. The fixing work shall be done to the entire satisfaction of the Engineer-in-Charge. After the erection and fixing the rolling shutters with hood shall be painted with synthetic enamel paint in three coats. The paint shall be of approved quality and shade.

MODE OF MEASUREMENT AND PAYMENT

The item shall include –

a) Providing and fixing the rolling shutters of specified size, material with all accessories, locking arrangement and top hood cover.

b) Painting the same with approved synthetic enamel paint in three coats.

c) Redoing the damaged works

The item will be measured and paid in Sqmt. Basis of the shutter area.

ITEM: WATER PROOFCEMENT PAINTING

GENERAL

This specification lays down the requirement of applying cement based paint in specified coats to concrete or masonry surface.

MATERIALS

Cement paint with a base of white portland cement of approved manufacture. Colour and shade shall be used. Approved quality cement based paint shall be brought to site in original air tight containers with seal intact.

Scaffolding wherever necessary shall be provided to the entire satisfaction of the Engineer-in-Charge.

PREPARATION

The surface to be painted shall be cleaned of all loose dust, and dirt paints and all cracks, holes and surface defects shall be repaired with cement plaster cured and allowed to set hard. Before the panting is commenced the surface is wetted well and water is allowed to run off. Any grease, oil paint, shall be removed by approved methods.

APPLICATION OF PAINT

Mixing of paint and procedure of painting shall be as specified by the manufacturer when no specification are following specification shall generally apply.

The dry cement shall be thoroughly mixed with clean fresh water to produce paint of required consistency (normally that of ordinary paints). The paint shall be kept stirred and used within one hour of mixing hardened or damaged paint shall not be used. The paint shall be applied by brushes in the manner specified by the manufacturer.

The number of coats shall be specified in the wording of the item. When more than one coat is to be given the subsequent coats shall be applied after the preceding coat has thoroughly hardened, inspected and approved.

CURING

Each application of paint should be wetted at the end of the day with a fine water spray, depending on climatic conditions. Wetting shall be done only after an interval of at least 6 to 8 hours after the applications. In dry weather the painted surfaces shall be kept dump for at least two days and protected from direct sun.

MODE OF MEASUREMENT AND PAYMENT

The item includes,

a) All materials and labour for painting.

b) All equipment and scaffolding.

c) Curing as per specification

d) Non uniform colour or shade shall be rectified without any extra cost.

The item shall measured and paid in per Sqmt basis of area painted.

ITEM: PROVIDING, FIXING RSJ AND OTHER STRUCTURAL STEEL WORK

The specification of the work as per standard specification Bd.C2 and the item cover fixing MS/RS girders, M.S. angle, channels, flats, base plate gusset plates, cleat, bracket etc. and other accessories as per requirement and as directed and fabricating the assembly by cutting, drilling holes etc and

erecting and fixing item as site with necessary riveted or welded joints fixtures with nuts and bolts etc. wherever necessary together with their proper fixing and embedding in masonry or slabs of concrete as directed. Structural steel works materials shall be procured by the Contractor from open market at his cost. The item includes 3 coats of oil paint of shade as directed to all structural work.

All above operations including cost of materials and labour thereof are included in the tender item. The measurement and payment shall be on the weigh basis in the unit as mentioned in Schedule-B actually erected at site as directed shall be admissible for payment. RSJ channels, angles, flats, gusset plates, brackets base plate, cleats, packing pieces actual used as directed shall be admissible for payment but not the rivets, nuts and bolts etc.. the riveted or welded joints or fixing with nuts are included in the tendered rates. The specifications for this item given in Standard Specification (Red Book) published by B&C Department will be followed.

STRUCTURAL STEEL WORK (for pipe line, outlet arrangement work only)

Requirements specified in this section will form a part of detailed specifications for items of works failing under this category. Indian Standard shall apply as if included herein. Design of structure shall be compliance with Indian Standard (IS) viz. Rivet IS:1148-1964 for bolts IS:1148-1964 and IS:800-1962 for structural fabrication IS:800-1962, etc.

PRINCIPAL ITEMS

1) Structural steel members
2) Steel joints
3) Plates and connection
4) Steel chair assembly
5) Pipe supports and hangers for piping in all locations
6) Pipe railing
7) Ladders and stairs
8) Misc. metal work for water supply and sewerage disposal installations.

QUALITY ASSURANCE

Unless otherwise specified all work specified herein and shown on the drawings shall conform to the applicable requirements of the following specifications and codes.

A) Fabrication and erection of structural steel shall be in accordance with IS:800-1962. (latest edition)

B) **WELDING INSPECTION**

The contractor shall perform all structural field welding under continuous inspection of a representative of the Pradhikaran. Notice will be given at least 24 hours in advance of needed inspection.

SUB METALS

SHOP DRAWINGS

The contractor shall submit shop drawings for approval before fabrications of any of the work. Complete fabrication details with material and specification lists showing all welds, fabrication and finish details, and shop painting will be shown with the drawing. In approving shop drawings, the owner does not assume responsibility for accuracy of the work relative to other components as constructed.

SHOP FABRICATION

GENERAL

A) The maximum possible fabrication on structural steel work shall be manufactured off-site in a fabrication shop.

B) Shop connections shall be welded or bolted, unless otherwise indicated.

C) In so far as possible all work shall be fitted and assembled in shop ready for erection.

MEMBERS

A) All members shall be free from twists, kinks, buckness or open joints.

B) All members, holes and their spacing shall be so accurately made that when assembled the parts shall cone together and bolt without distortion.

C) Parts assembled with bolts shall be in close contact, except where separators are required where unlike metals are in contact, to insulate as necessary to prevent corrosion.

D) Bolt holes will be provided to secure special items, if any, to structural members.

E) Bearing surface shall be planned to true beds. Abutting surface shall be closely fitted. Steel requiring accurate alignment shall be provided with slotted holes and/or washers for aligning the steel.

F) All materials shall delivered in the order, in which they will be required so as to avoid all delay in completion of the project.

WELDING

A) Welding in shop and field shall be done by qualified operators who have experience of similar

work. The standard for welders will be as required by IS:817-1966.

B) All steel before being fabricated shall be thoroughly wire brushed, cleaned of all scale and rust and thoroughly straightened by approved methods, that will not injure the materials being worked on. Welding shall be continuous along the entire line of contact except where tack or intermittent welding is permitted. Where exposed welds shall be cleaned of flux and slag and ground smooth.

ERECTION

A) Erection shall include the installation and erection of all steel as called for in this section. The contractor shall verify correctness before starting erection.

B) As erection progresses, the work shall be securely bolted up to take care of all dead-load, wind and erection stresses.

C) No final bolting or welding shall be done until each portion of the structure has been properly aligned and plumbed.

D) Bolts shall be drawn up tight and threads set so that nuts cannot become loose.

E) **DAMAGED MEMBERS**

During erection, members which are bent, twisted or damaged shall be straightened or replaced as directed. If heating is required in straightening, a heat method shall be used, which will ensure uniform temperature throughout the entire members. Members which in the opinion of the Pradhikaran are damaged to an extent impairing appearance, strength or service ability, shall be removed and replaced with new members.

F) **ANCHOR BOLTS AND ANCHORS**

Anchor bolts and anchors shall be properly located and built into connection work. Bolts and nuts shall be preset by the use of templates or such other methods as may be required to locate the anchors and anchor bolts accurately. Embedded anchor bolts that are submerged in process, water or pump room floors, or are in enclosed tanks or spaces exposed to process gas or moisture shall be of stainless steel with nuts of same material. To such stainless steel bolts, a non-oxidizing lubricant grease will be applied before bolting.

G) **BEARING PLATES**

Bearing plates shall be provided under beams and columns resting on walls or footings. Bearing plates may be attached or loose and aligned on steel wedges or shims. After the

supported members have been plumbed and properly positioned and the anchor nuts tightened, the entire bearing are under the plate shall be dry packed solidly with bedding mortar. Wedges and shims shall be cut off flush with edge of bearing plate and shall be left in place.

H) **SUBSTITUTIONS**

Unless otherwise directed, the exact sections, shapes, thickness, sizes, weights and the details of construction shown for the structural steel work, shall be furnished. However the contractor, because of his stock or shop practices, may suggest change of the net area of section is not thereby reduced, if the section properties are at least equivalent and if the overall dimensions are not exceeded. All substitutions or otherwise deviations from drawings and/or specifications shall be specifically noted or 'clouded' on the shop drawing submittals.

I) **FLAME CUTTING**

Flame cutting by the use of a gas cutting torch in the field for correcting fabrication errors will not be permitted on any major member in the structural framing. The use of a flame cutting torch will be permitted only on minor members, when the members is not under stress, and only after the approval of the Pradhikaran has been obtained.

J) **STORAGE OF MATERIALS**

Structural materials, either plain or fabricated shall be stored above ground upon platforms, skids, or other supports. Materials shall be kept free from dirt, grease and other foreign matter and shall be protected for corrosion.

K) **TEST REPORTS**

Certified physical and chemical mill test reports for material used for major structural members shall be furnished. All tests shall be performed in accordance with applicable Indian Specification Standards.

MATERIALS AND WORKMANSHIP

A) **STRUCTURAL STEEL AND MISCELLANEOUS METAL WORKS**

i) **GENERAL**

This work shall include the furnishing and installation of all structural steel and miscellaneous metal work and related work including grating and grating supports, pipe hangers and supports, tanks, manhole steps, equipment guards, anchors and other

appurtenances and any other shown on the drawings or herein specified. All materials shall be new, sound and of the best quality available.

ii) **MATERIAL**

Steel rolled sections, plates and bars shall conform to the latest editions of IS:226, 808, 1730, 1731, 1732 and 3954. Pipe used for columns or other structural purposes shall conform to IS:1161-1968. Iron for castings shall conform to IS:210.

B) **STEEL JOINTS**

These shall be fabricated true to size and details shown on drawings in strict conformance with requirements of reference standards.

C) **COMMON BOLTS**

Bolts and nuts shall conform to IS:1363-1967.

D) **WELDING ELECTRODES**

The electrodes shall conform to the requirements of IS:814, latest edition.

E) **SHOP PAINTING**

Structural steel not designated to be galvanized shall e shop coated, using priming coat of red lead as specified in painting section, of these specifications. The portion of steel to be embedded in concrete shall not be painted.

F) **GALVANIZING**

All metal work shown or specified to be galvanized, shall be zinc coated, as per IS:2629-1966. The zinc coating should be free from defects and shall have uniform thickness of coating.

Galvanizing coating marred or damaged during erection or fabrication shall be repaired by any approved process as directed by the Engineer.

G) **SHOP PAINTING**

Before leaving the shop all steel not shown or specified to be galvanized shall be given one coat of primer red lead. Final painting shall be in specified coats of approved and approved brand oil paint. The portion of steel to be embedded in concrete shall not be painted.

H) **TEST REPORTS**

Certified physical and chemical mill test reports for material used for major structural

members shall be furnished by the contractor.

I) **SHOP DRAWINGS**

Five sets of shop drawings shall be submitted to the Engineer, for approval before fabrications of any of the work. In approving shop drawings, the Engineer does not assume responsibility for accuracy of the work relative to other plant components, as constructed.

J) **ANCHOR BOLTS**

Anchor bolts shall be galvanized and shall be fabricated as shown or as specified by the equipment manufacturer.

Suitable expansion bolts may be used in lieu of anchor bolts, at certain locations. It shall be the responsibility of the contractor to request the substitution and obtain the Engineer's approval, regarding type an location of expansion and bolts proposed to be used prior to pouring concrete.

K) **STEEL GRATING**

Seat angles and anchors shall be of steel, grating and support shall be galvanized. Gratings to be supplied and installed as detailed in the drawings.

L) **MECHANICAL EQUIPMENT GUARDS**

All rotating belts, pulleys and shafting shall be covered and guarded in conformity with applicable safety requirements or as directed by the Engineer.

MODE OF MEASUREMENT

This item will be calculated as per Metric Tone basis.

ITEM: Refilling The trenches with available excavated stuff with soft material.....etc. complete.

The item shall be done as per standard specification No. Bd-A-10, Page No.263

After lowering, laying, jointing and welding of pipe line, site gunitting and concreting work, refilling of trenches with available excavated stuff shall be done For beding only approved quality of excavated materials from trenches shall be used. Beding shall be done before laying of pipe line to the desired grade as directed by Engineer-in-charge.

For refilling purpose, approved excavated stuff shall only be used. The refilling shall be done in layers of 15 to 20 cms. Each layers should be watered and compacted properly before the upper layer is laid till the required level is reached. First 2 layers of 15 to 20 cms shall be free from stones or chips or any harmful material, to protect the pipe from damage. Only soil or soft murum shall be used for filling. Originally filling shall be done 30 to 40 cms above natural ground or road level. Sinking

below the road or ground level, if noticed till the completion of work, the contractor shall have to make it level at his cost.

This item includes,..

a) Clearing useful excavated material of rubbish bracking clods, stone, etc.

b) Conveying the useful excavated material upto 500 M and filling in layers, watering and compacting.

c) All labour, equipment and other arrangements necessary for the satisfactory completion and completion of the item.

After water tightness test etc. the trench shall be refilled in layers and shall be rammed manually. The filling shall be kept above ground level for subsequent settlement. In the case of trench in rock, cushioning from approved excavated materials shall be provided at sides and 0.30 m. on top of pipe line by manually to avoid the damages to the laid pipes. The item includes free lead of 50 meters for actual operation. After refilling of trenches, it shall be watered and compacted satisfactory by the roller as directed by Engineer-in-charge.

The contractor shall have to cart the selected excavated stuff from site of work to any other site for refilling as per requirements as directed. The payment shall be made to contractor under relevant item No.11 for disposal in Schedule 'B'

Mode of Payment :-

The payment of refilling shall be made to the contractor only after completion of water tightness satisfactory test etc. of the pipe line. The measurement of work shall be taken in cubic meter up two place of decimals. Mode of measurement and payment of the rate shall be for a unit of 1 Cum of compacted trench filling with approved excavated material.

The measurement shall be net for the compacted filing and no deduction for shrinkage or voids shall be made. However, deduction for pipe volume will be made. Depth of filling for measurement will be limited from natural ground level only. No payment will be made for filling for 30 to 40 cms above natural ground level, if so insisted by the Engineer-in-charge.

Surplus excavated material is the property of Pradhikaran. So contractor is not empowered to sell this excavated material to any other agency.

This disposal will not be considered for initial 500 M lead from edge of pipe line trenches and so will not be paid for.

The material shall be conveyed by means of suitable devices/manner.

The material conveyed to the place of disposal shall either be stocked or spread as directed by Engineer-in-charge or his representative.

The route opening and maintenance, payment of any royalties, compensation to land owners and for damaged of any etc. during the process of conveyance etc. shall be the entire responsibility of the contractor.

10% amount will be withheld till satisfactory hydraulic testing of pipe line.

90 % payment s made after completion of lowering ,laying and remaining 10% amount will be withheld till satisfactory hydraulic testing of pipe line is given.

ITEM: Filling in plinth and floors/trenches with contractor's murum.....etc. complete.

For beding, only murum brought from outside as approved by Engineer-in-charge. Shall be used. Beding shall be done before laying of pipes to the desired grade, line and level with necessary watering and compaction etc. complete. This shall be executed when B.C. Soil and hard rock met at the bottom of trench for certain length. The filling in trench around the pipes and 0.30 m on top of pipe line shall be done in B.C. Soil and rock as directed. The item includes lead beyond 0.50 kms. And lift as required.

If the approved quality of murum is available within 5 Kms. Lead at any of work, the same shall be used for beding and refilling as directed by Engineer-in-charge. The payment shall be made as per relevant item No.11 of disposal in Schedule 'B' this can be possible only, if the execution of work is done simultaneously at more site.

ITEM: Dewatering the excavated trenches and pools of water...as directed.

The item shall comply as per standard specification No.Bd-A-9, on page No. 261.

This item is provided for Dewatering during excavation of entire work when it is not possible to bail out the water manually, the item includes all machinery, fuel, labour etc. The contractors shall provide all dewatering pumps, engines and machinery required to keep the trenches dry laying sewer lines, drains or foundations and all other excavations shall be clear of water, whether sub-soil water, storm water leakage from tanks, wells drains, sewers water, mains, tide water etc. so that there may be no accumulations of such water. And that no setting out may be done the pumping shall be continued so long after execution of any portion of work and repeated so after as the Engineer-in-charge may determine to be sufficient at any particular time, or he may himself supply pumps and

power at contractor expenses, so he may stop the work all together until he is satisfied and also impose a fine upon the contractor. It is the contractor's responsibility to keep dewatering machinery in up to date working condition to keep the trenches dry for laying pipes or for placing the concrete.

Mode of Pyament :-

Mode of Payment:-

25% payment will be released after completion of 50% work & remaining 75% shall be made after completion of Work, in a zone. The necessary documents shall be submitted by the agency The provision of dewatering is on lumpsum basis for whole items of the sub work No.1 to be executed. However the payment will be made, in proportionate with the quantity of work executed. No extra payment will be made if quantity of items is increased. Maximum quantity of dewatering will be considered hot trunk sewer line in nalla bed and rest of the quantity will be considered for laterals, as directed by Engineer-in-charge.

ITEM: G.I. HAND RAILING

(Sub Work No....., Item No.....)

The item shall be executed as specified in the tender item and as shown on drawing. The vertical supports shall be properly fixed at base either in masonry or concrete by nuts and bolts duly embedded in the form, right anchorage holes in the vertical support to pass G.I. piping in it or welding to fix the G.I. pipes to supports together with M.S. cleats, etc. are included in this item. The G.I. piping shall be provided along with required specials, fixtures, fastening, etc. and G.I. piping shall be bent in circular or spiral railing pipes and shall be jointed by G.I. collar or welded as per necessity. The diameter of G.I. piping, number of rows size and type to vertical posts together with its centre to centre distance height, etc. shall be as specified in the tender item an in absence thereof as per the MJPs type design in force. The rate shall also include two coats of approved shade oil paint. Cost of all the materials which shall be procured by the Contractor, labor involved for executing this item is included in tender item. The measurements and the payment shall be on the basis of lengths in running meters occupied by the complete railing assembly in plan.

The agency should provide G.I. pipe railing having one meter height consisting 50 x 50 x 6 mm thick MS angles and vertical at 1.50 m c/c and additional post at every corner bends or curved point with three rows of 25 mm G.I. pipe of medium class variety of horizontal at 3 coats of oil paints over one coat of anti corrosive paint approved colour including cost of labour, transport, materials etc. complete

Mode of payment

The payment shall be made on running meter basis

ITEM: PROVIDING AND FIXING MANHOLES FRAME AND COVER COWL TYPE VENTILATORS

The cost of providing the above item is included in tender item. These are to be properly fixed at place and manner as directed, painting with two coats of anti-corrosive black paint is also included in this item. If locking arrangement are required they shall be done by Contractor as directed without any extra cost.

Mode of Measurement

This item will be measured and paid as per unit basis.

ITEM: LIGHTING CONDUCTOR

(Sub Work No.3, Item No.5)

The contractor shall ensure that any structure. Must or other installation provided by him is adequately designed to minimize damage to the works from lighting strike.

Any lighting conductors shall be design in accordance with the edition of the appropriate Indian Standard Code of Practice IS:2903:1969.

Mode of measurement : Per No.

ITEM COLOUR WASH

General

It item refers to providing and applying of applying of approved colour wash to surfaces which are not given any finishing.

COLOUR WASH

This is prepared by adding necessary colouring matter of approved make to the white wash which has been stained. The colour shall be as approved by the Engineer. For all colour wash, a sample must first be applied, allowed to dry and approved by the Engineer-in-Charge before the work proceeds. It should be noted to large surface such as a the walls of a room . Care must be taken to mix sufficient colour wash to complete the whole surface to be treated, otherwise it is taken to mix impracticable to obtain exactly the same shade of colour in two successive mixtures. Sufficient gum or rice size should be added to prevent the colour wash coming off when rubbed with fingers.

Preparation of surfaces : The surfaces shall be prepared by brooming down, brushing or other means as may be ordered by the Engineer-in-Charge. The surface shall be thoroughly cleaned down and

freed from all foreign matter before the base coat is applied.

Sub-base:Sub-base of two coats of white wash shall be applied as specified in Item No. Bd.P-1.

Application of colour wash: The colour wash shall be applied over the base coat. It shall be applied in the same way as white wash. The number of coats shall be as mentioned in the item, each coat being applied after the earlier coat has dried.

Mode of measurement : Per sq m

ITEM: POLISHED SHAHABAD/TANDUR/KOTAH STONE FLOORING

The specification for this item shall be same as for item No. B.M.1

1. All the stone slabs shall be square in shape. The dimensions shall be 0.60 x 0.60 m or other dimensions as specified in the special provisions or as directed by Engineer-in-Charge. Tolerance in thickness $\pm$ 3 mm
2. The exposed surface of the specified stone flags shall be machine polished to a smooth, even and true plane and the edges machine cut square and to the required shape when necessary. Samples shall be got approved by the Engineer-in-Charge who will keep them in his office for reference.
3. The thickness of joints shall not exceed 1.5 mm
4. Joints shall be grouted with neat cement slurry
5. When the bedding and joints of the flooring have completely set, the surface shall be machine polished to give a smooth, even and true plane to the floor and thoroughly cleaned.

Mode of measurement : Per sq meter

ITEM: GLAZED TILES FOR SKIRTING AND DADO

Plastering : Cement plaster of about 12 mm for brick walls and 20 mm for stone masonry walls shall be applied to the part of the wall where dado or skirting is to be fixed as per specification No. B.11. The proportion of mortar shall be as mentioned in the item.

Fixing tiles : Dado or skirting work shall be done only after fixing tiles on the floor. The white glazed tiles shall be soaked in water for at least 2 hours before being used for skirting or dado work. Tiles shall be fixed when the cushioning mortar is still plastic and before it gets very stiff. The back of tiles shall be covered with a thin layer of neat cement plaster and the tile shall then be pressed in the mortar and gently tapped against the wall with a wooden mallet. The fixing shall be done from the

bottom of wall upwards without any hollows in the bed or joints. Each tile shall be fixed as close as possible to the one adjoining. The tiles shall be joined with white cement slurry. Any difference in the thickness of tiles shall be evened out in cushioning mortar to that all tile faces are in the vertical plane. The joints between the tiles shall not exceed 1.5 mm in width and they shall be uniform between the tiles in dado work, care shall be taken to break joints vertically. After fixing the dado, skirting etc. they shall be kept continuously wet for 14 days.

If doors, windows or other openings are located within the dado area, the sills, jambs, angles etc. shall be provided with white glazed tiles and appropriate specials according to the foregoing specification and such tiled area shall be measured net along with the dado.

Cleaning : After the tiles have been fixed the surplus cement grout that may have come out of the joints shall be cleaned off before it sets. After the complete curing the dado or skirting work shall be washed thoroughly clean.

Item to include : The rate shall include all labour, materials, tools and equipment required for the following operations to carry out the item as specified above.

- Plastering
- Fixing the tiles including all angles, etc., after applying neat cement paste
- Jointing the tiles with white cement slurry
- Curing
- Cleaning the dado and skirting.

Mode of measurement and payment : Same as for item No. Bd.M-9.

ITEM: PROVIDING AND LAYING C.C.FLOORING

Providing and laying cement concrete flooring 40 mm thick with cement concrete M-25 laid to proper line, level and slope in alternate days including compaction, filling joints marking lines to give appearance of tiles 30cm x 30cm or other approved design, finishing smooth (with extra cement) in approved colour as directed and curing etc. complete.

MODE OF MEASUREMENT AND PAYMENT

The item shall be measured and paid in weight per Sqm. basis.

ITEM : POLISHED SHAHABAD/TANDUR/KOTAH STONE FLOORING

The specification for this item shall be same as for item No. B.M.1

1. All the stone slabs shall be square in shape. The dimensions shall be 0.60 x 0.60 m or other dimensions as specified in the special provisions or as directed by Engineer-in-Charge. Tolerance in thickness $\pm$ 3 mm

2. The exposed surface of the specified stone flags shall be machine polished to a smooth, even and true plane and the edges machine cut square and to the required shape when necessary. Samples shall be got approved by the Engineer-in-Charge who will keep them in his office for reference.

3. The thickness of joints shall not exceed 1.5 mm

4. Joints shall be grouted with neat cement slurry

5. When the bedding and joints of the flooring have completely set, the surface shall be machine polished to give a smooth, even and true plane to the floor and thoroughly cleaned.

Mode of measurement : Per sq meter

ITEM: GLAZED TILES FOR SKIRTING AND DADO

Plastering : Cement plaster of about 12 mm for brick walls and 20 mm for stone masonry walls shall be applied to the part of the wall where dado or skirting is to be fixed as per specification No. B.11. The proportion of mortar shall be as mentioned in the item.

Fixing tiles : Dado or skirting work shall be done only after fixing tiles on the floor. The white glazed tiles shall be soaked in water for at least 2 hours before being used for skirting or dado work. Tiles shall be fixed when the cushioning mortar is still plastic and before it gets very stiff. The back of tiles shall be covered with a thin layer of neat cement plaster and the tile shall then be pressed in the mortar and gently tapped against the wall with a wooden mallet. The fixing shall be done from the bottom of wall upwards without any hollows in the bed or joints. Each tile shall be fixed as close as possible to the one adjoining. The tiles shall be joined with white cement slurry. Any difference in the thickness of tiles shall be evened out in cushioning mortar to that all tile faces are in the vertical plane. The joints between the tiles shall not exceed 1.5 mm in width and they shall be uniform between the tiles in dado work, care shall be taken to break joints vertically. After fixing the dado,

skirting etc. they shall be kept continuously wet for 14 days.

If doors, windows or other openings are located within the dado area, the sills, jambs, angles etc. shall be provided with white glazed tiles and appropriate specials according to the foregoing specification and such tiled area shall be measured net along with the dado.

Cleaning : After the tiles have been fixed the surplus cement grout that may have come out of the joints shall be cleaned off before it sets. After the complete curing the dado or skirting work shall be washed thoroughly clean.

Item to include : The rate shall include all labour, materials, tools and equipment required for the following operations to carry out the item as specified above.

- Plastering
- Fixing the tiles including all angles, etc., after applying neat cement paste
- Jointing the tiles with white cement slurry
- Curing
- Cleaning the dado and skirting.

Mode of measurement and payment : Same as for item No. Bd.M-9.

ITEM: PROVIDING AND LAYING C.C.FLOORING

Providing and laying cement concrete flooring 40 mm thick with cement concrete M-25 laid to proper line, level and slope in alternate days including compaction, filling joints marking lines to give appearance of tiles 30cm x 30cm or other approved design, finishing smooth (with extra cement) in approved colour as directed and curing etc. complete.

MODE OF MEASUREMENT AND PAYMENT

The item shall be measured and paid in weight per Sqm. basis.

ITEM; RUBBLE STONE SOLING

GENERAL

After the structural foundation, plinth construction and filling are completed, rubble soling of specified thickness shall be laid over the consolidated plinth filling, hand packed and compacted. The specification of the work as per Standard Specification Bd.A-12)

MATERIALS

The stones to be used shall be broken rubble with fairly regular shape and free from weathered, soft and decayed portion. The rubble shall be of sound stones of the type mentioned in the item and selected for their larger size. Stones shall be of the full height of the soling and the length and width shall not generally exceed 2 times the height. The stones to be used for wedging in the joints between larger stones, shall be chips of the largest size possible to fit in the interstices. All sound and suitable rubble obtained from the foundation excavation and approved by the Engineer shall be necessarily made use of first unless otherwise directed.

CONSTRUCTION

The bed on which rubble filling is to be laid shall be cleared of all loose materials, leveled, watered and compacted and got approved by the Engineer before laying rubble soling.

Rubble soling shall be laid to the specified thickness closely packed by hand and firmly with their broadest face downwards. The interstices between adjacent stones shall be wedged in with stones of the proper size and shape and well driven in with wooden mallets to ensure a tightly packed layer. Such wedging shall closely follow the placing of the larger stones. After hand packing and wedging, compaction of the soling shall be done thoroughly with lograммers. Adequate care shall be taken by the contractor while laying and compacting the rubble soling to see that the masonry or any part of the structure Is not damaged. Rubble soling shall be started only after the masonry is fully cured.

BROKEN RUBBLE

a) Supplying broken rubble of approved of approved quality and size at site.

b) All labour, material, tools and equipment for handling, laying, hand packing and compacting the rubble.

Any other incidental charges to complete the work as per sanctioned plan.

MODE OF MEASUREMENT & PAYMENT

Rubble soling shall be measured and paid in cubic meters limiting the dimensions to those shown on the drawings or as directed by the Engineer. The dimensions shall be measured correct to 2 places of decimals of a meter and quantities worked out correct to 2 places of decimals of a cubic meter. No deduction shall be made for voids.

ITEM; PROVIDING AND APPLYING WASHABLE OIL BOUND DISTEMPER.

The surface to be distempered shall be cleaned and all cracks, boles and surface defects shall be repaired with gypsum and allowed to set hard. All irregularities shall be sand papered smooth and wiped clean. The surface so prepared must be completely dry and free from dust before distempering

is commenced. In the case of walls newly plastered, special care shall be taken to see that it is completely dry before any treatment is attempted.

The washable oil bound distemper of the approved shade of colour conforming to IS:428:1969, shall be used after applying priming coat of petrifying liquid or other primer as may be recommended by the manufacturers of the distemper.

The rate shall include all labour, material, equipments and tools for carrying out the following operations.

- Providing the primer and distemper and mixing the distemper.
- Scaffolding
- Preparing the surface to receive the primer and finishing coats.
- Applying the priming coat
- Applying the distemper as specified above in the number of coats, mentioned in the item.

Mode of Measurement & Payment

This item will be measured and paid in Sqm basis.

PROVIDING FUSION BONDED EPOXY COATING

(Sub-work No, Item No.),

Providing fusion bonded epoxy coating to reinforcement bars as per ASTM-755 specification for a thickness of 175 (+50) microns including extra cost on account of careful handling, extra cost on account of using PVC coated binding wire instead of G. I. wire, extra cost on account of touch-up material supplied by coating agency and repair work extra cost account of transportation to and fro from steel yard at ---------- to …….. plant at Daman and Plant at Daman to work site by trailer, loading, unloading, including all taxes (Central and Local), etc. complete.

MODE OF MEASUREMENT AND PAYMENT

The item shall be measured and paid in weight per MT basis.

ITEM: MURUM BEDDING

(Sub-Work No, Item No.),

General

The specification contained in the Standard Specification Volume-II published by Public Works and Housing Department, Govt. of Maharashtra, Chapter Bd.A-10, Page 263 shall apply. In addition to above, following specifications shall govern.

Murum bedding shall be done with approved quality of soft murum, selected from excavated stuff and approved by the Engineer-in-Charge. The murum shall be collected from available excavates stuff and to be utilized if murum is not available from selected excavated stuff, it should be brought from outside and rates payable will be as stipulated in the tender item. Thickness of murum bedding will be 15 cm.. The contractor shall be paid for one Cubic Meter of the filling laid and compacted and will be paid upto two place of decimal of Cum.

Murum bedding shall be laid in exact 15 cm thickness for full width of excavation, it shall be well rammed with hand rammers so that pipe line is laid on firm bedding. Collection of murum from excavated stuff and carting upto the work site is included in the item and contractor shall make his own arrangement for procurement and carting of murum at his cost.

Mode of Measurement and Payment

Quantity shall be measured in Cubic Meter. The dimensions shall be measured upto two Decimal of Cubic meters and quantity shall be calculated upto two places of Decimal of Cubic meter. Payment for murum bedding will be made after lowering, laying and jointing of the pipe.

ITEM: PROVIDING AND ERECTING WIRE FENCING

Providing and erecting 1.5 meter high wire fencing with seven rows of barbed wire supported on mild steel angles (50 x 50 x 6 mm) at 2.5 meters centre to centre including excavating pit for foundation, fixing posts in cement concrete blocks of size 45 x45 x 45 cm, fastening the wire and painting the mild steel angles with one coat of red lead primer and two coats of painting etc. complete.

MODE OF MEASUREMENT

This item will be measured and paid as per Rm. basis.

ITEM: Disposing of excavated stuff .....etc. complete.

1) After refilling of trenches, surplus excavated stuff remaining at the site of work have to be disposal off at suitable places within five Km. distance, as directed by Engineer-in-charge.
2) Surplus excavated materials is the property of M.J.P. and therefore contractor is not empowered to sell this excavated materials to any other agency.
3) This disposal will not be considered for initial 50 M. lead from site of work, so will not be paid for
4) The materials shall be conveyed by means of suitable devices.
5) The material conveyed to the place of disposal shall either be stacked or spread as directed by Engineer-in-charge or his representative.
6) The route for operation and maintenance, payment of any royalties, compensation to land owners

and for damages if any etc. during the process of conveyance etc. shall be the entire responsibility of the contractor.

7) This item includes all labours, materials and equipments required for loading, conveyance, unloading, stacking or spreading the material.

8) The tender rate shall be for one cubic meter of excavation quantity conveyance to the place of disposal.

9) The quantity conveyed and disposed of shall be calculated from the trench excavation after deduction of quantities for bedding, concrete or any other refilled materials and balanced net excavation quantity will be payable under this item.

ITEM: Open timbering in trench .....etc. complete.

Providing and fixing approved type of shoring .....etc. complete.

The item shall comply as per relevant item of Schedule 'B' as per standard specification of latest Edition of Red Book and N.B.O. Item No.4, 15 page No. 59. This item shall be executed with prior permission of Superintending Engineer.

When the depth of trench required to be excavated is more than 1.5 M. and the strata met with is unstable, timbering of trenches shall be done to prevent caving or collapse of side walls. Precautions to prevent extensive caving shall be adopted for minimizing danger when the depths exceed 1.5 m as stated above. Only in such cases, the timbering shall be done from top to bottom of the trench.

The sheeting and the other members like polling Boards, struts walling shall be strong enough to withstand against the soil pressure. Timbering shall be done only at the required places. The location of timbering is required to be carried out shall necessarily be approved and finalized by competent authority. Timbering unnecessary provided shall not be measured and paid for. The contractor shall take photographs of timbering work done by him at his own cost and shall be submitted to the Department from time to time.

Shoring :-

Wherever shoring may deemed necessary by the Engineer-in-charge the contractor shall provide the same in the best possible manner with the best materials and to the satisfaction of the Engineer-in-charge. The contractor shall employ such kinds or kinds of shoring as the Engineer-in-charge any consider the exigencies of the work of require and it is to be distinctly understood that the work „shoring is to comprise all clauses of such work and all appliances and appurtenances including polling boards, sheet piling of runners (Whether the joints be butt, groove and tongue, feather edge

and groove, birds mouth and double splay, rebated or otherwise), together with walling struts prop, point blank shores, blocks, wedges, iron dog, bolts, screws, nails and everything that may be required for due execution of the work. No part of the shoring shall at any time be removed by the contractor without obtaining permission from the Engineer-in-charge. While taking out shoring plank the hollows if any, formed must simultaneously be filed in with of earth well rammed with rammers and with water.

Shoring left in trenches :-

The Engineer-in-charge may order portions of shoring to be left in the trenches at such places, where it is found absolutely necessary to do so as to avoid any damages which may be caused to building cables, gas-mains water mains, sewers etc. in close proximity of the excavation, by pulling out the shoring from the excavations. No extra payment shall be made to the contractor on account of shoring left in trench.

Engineer-in-charge may put up or improve shoring :-

In the event of the contractors not complying with the provisions of this contract in respect of shoring, already put up or adopt such other measures as he may deem necessary and all the cost of such procedures adopted by the Engineer-in-charge shall be borne by the contractor.

Liability for Timbering :-

a) No work done by the Engineer-in-charge or his workmen for the fact that the timbering has complied with his specification shall absolve the contractor from his responsibility and he will be responsible for making good any damage caused as a result of the timbering failing to give proper support to the sides of the Excavation.

b) The timbering to the sides of excavation for structures shall be carried out in such a way that there is no obstruction caused to the work. The supporting struts and walling shall be removed by the contractor in stages to suit the progress of work.

c) If the Engineer-in-charge is not satisfied that the standard of timbering is equal to that the sides of the excavation have not been secured in a manner to render such excavating safe for working, he may, one hour after notifying the contractor or his representative in writing, employ his own men to alter the timbering and the cost of such workman and materials employed shall be paid for by the contractors.

Contractor's responsibility for secure shoring and or all damages :-

The contractors will be held responsible for providing secure shoring and for adopting every other precaution which may be necessary or proper for protecting and building which may be damaged or be liable to damage by the excavation of any trench or otherwise by the excavation of the works in the vicinity of such building. If the Engineer-in-charge shall require the adoption of any special or extra measures or precautions the contractors shall forth with adopt & supply the same but this proportion is not to be read or understood as in any degree of relieving the contractors from responsibility or from liability under relevant clause contract, in respect of claims made against the department by for loss or damage which may be caused to any such building by the excavation of any of the works or otherwise. After the work is completed near buildings, the contractors shall remove any shoring and make good any cutting out or other damage that may have been done.

Mode of Payment :-

The item shall be measured and paid for on square meter basis. The area shall be calculated by considering the length and height of open timbering and shoring provided for each side of trench separately. The timbering shall be paid to the extent of 85% only after its objective of protecting the excavation till the lowering, laying, jointing, testing of the sewer line is completed and the section is refilled. 15% payment shall be made after the zone

ITEM: Providing and constructing 100 mm dia. C.I. Pipe ventilator…….etc. complete.

The item is provided for escape and ventilation of the gasses formed in the system. This is includes required excavation in any strata in all lift, providing, laying, erecting and jointing 100 mm dia C.I. soil vent pipe of length 6 m. providing P.C.C. 1:2:4 base at bed and block/of size cement concrete in M-150 size grade 0.45 x 0.45 x 2.00 m. height as shown in the drawing attached, 12 mm thick plaster in C.M. 1:3 proportion shall be provided to the concrete block. The item also includes providing and fixing wire gauge dome vent pipe. In case of any discrepancy in drawing and the specification, the decision of Engineer-in-charge shall be final and binding on the contractor. The location shall be given by the Engineer and the item shall be paid on number basis.

ITEM: Reinstating the road surface, includes

a) Providing and laying Water Bound Macadam road……..etc. complete.

b) Providing and laying hot mix hot laid per mix carpet……etc. complete.

c) obtaining necessary permission & necessary deposits t contractors cost.

The item shall comply as per relevant item of Schedule 'B' and as per the detailed

specifications given as under.

Sr. No.	Description of Item	Reference of Red Book
1.	Excavation for roadway in earth soil of all sorts, sand gravel or soft murum …….etc. complete.	Specification No. Rd.-2,P.No.180
2.	Supplying 80 mm trap / granite / quartzite /gneiss stone metal……..etc. complete.	Specification No. Rd.-19,P.No.197
3.	Supplying 40 mm trap / granite / quartzite / gneiss stone size metal ..etc. complete.	Specification No. Rd.-22,P.No.201
4.	Supplying hard murum at the road side ……etc. complete.	Specification No. Rd.-23,P.No.202
5.	Supplying soft murum at the road side……..etc. complete.	Specification No. Rd.-24,P.No.203
6.	Spreading 50 mm / 60 mm / 80 mm metal ……..etc. complete.	Specification No. Rd.-29 A, P. No. 205.
7.	Spreading 40 mm metal including sectioning complete.	Specification No. Rd.-29 A, P.No. 205
8.	Spreading gravel / sand / soft murum / hard murum / over rubble soling/WBM surface complete.	Specification No. Rd.-28 A, P.No. 205
9.	Compacting the sub-grade / graval oversize / metal……..etc. complete.	Specification No. Rd.-32 A, P.No. 205
10.	Compacting the sub-grade / graval / oversize / metal (100 mm loose) layers……etc. complete.	Specification No. Rd.-35 A, P.No. 209
11.	Providing and laying hot mix hot laid premix carpet 25 mm average thickness……..etc. complete.	Specification No. MOTO 39 B.
12.	Providing and laying premix seal coat to the black topped surface……..etc. complete.	Specification No. MOTO 39 B.

Item: Repairing the damaged cables of telephone , water supply pipe lines etc during the trench excavation for sewage collecting net work. including cost of material required for repairs pipe, specials etc including excavation and refilling etc complete per km of completion of laying of sewer laterals and trunk mains .

Damages to Services :-

The work of excavation shall be proceeded very carefully by the contractor. Before actual excavation trial trenches shall be carefully taken by the contractor for assessing the services e.g. water mains, drainage lines, telephone and Electrical cables that are likely to be encountered in the excavation of pipe-line trenches. The trial trenches shall not be paid for separately. After assessing the alignment and level of other services, the contractor shall get approved the exact alignment from the Engineer and proceed with the work accordingly.

Any damages to the private and Government properties shall be reinstated by the contractor .If any damages are caused or likely to be caused, The contractor shall remove the service connections from water mains and re-do them as directed by the Engineer-in-charge. This shall be done with least inconvenience to the connection holder and without any extra cost for any diameters

Item includes :-

1) All type of excavation for repairs of damages of telephone cables, electric lines, water mains up to 100 mm dia

2) All type of materials pipes, specials jointing materials such as C.I.D. Joints , couplers rubber rings , rubber sheet nut bolts etc up to 100 mm dia

If water mains of R.C.C./A.C./C.I./G.I./M.S./PVC/D.I. etc. of diameter more than 100 mm and above are encountered the contractor shall relay such lines to keep service continued as directed by the Engineer-in-charge, If in the opinion of the Engineer, it is possible to obviate such mains, the contractor shall realign the pipe line in tender scope as directed by the Engineer-in-charge without any compensation for the excavation discarded by the Pradhikaran.

The pipe and special required for shifting/relaying of mains shall be supplied by the Pradhikaran free of cost for dia above 100 mm if available with the Pradhikaran. If such required materials are not available with the Pradhikaran, the special materials as directed by the Engineer-in-charge shall be procured by contractor and shall be payable to him. The payment of such materials shall be regulated at mutually decided rates based on reasonable markets rates or CSR prevailing at the time whichever is less. The contractor shall procure the materials without waiting for finalization of rates in order to meet the urgency. Proper account of the materials shall be kept by contractor.

All the labour and materials charges shall be payable to the contractor only when continuous length requiring shifting / relaying of mains of dia of above 100 mm exceed 5 m. The basis for such payment shall be the rates of respective works terms covered in Schedule 'B' of the tender for the items available in the tender or rates derived from tendered rates for similar items. In case of item

not covered in Schedule 'B', the prevailing C.S.R. shall be applicable. For the relaying / shifting work involving dia above 100 mm in continuous length below 5 m. no labour and material charges (except pipes and specials) shall be payable. No any material or labour charges will be paid to the contractor which damages of pipe line below 100 mm.

Mode of payment :-

The item shall be measured and paid for on kilometer length basis. The length shall be considering the actual length of sewer laterals / trunk main network completed and hydraulically tested by contractor . All the damages and repairs are carried out by contractor

ITEM: Providing and reinstating the tar / Concrete road

Tar road : This item shall be executed as per the description given in the schedule B of relevant item and as directed by Engineer-in-charge.

Item to include: The work includes supply and spreading of 40 mm metal. The murrum of good quality be laid in 5 to 6 cm over the spread metal. The complete layer then compacted. 75 mm thick bituminous bound macadam layer be placed over the compacted surface. 20 mm thick bituminous carpet shall be provided over this surface. The tar surface shall be done in the level of nearby road surface.

Mode Of Payment: The reinstating of road payment shall be recorded on Sqm basis after full completion of work.

Concrete road : This item shall be executed as per the description given in the schedule B of relevant item and as directed by Engineer-in-charge.

Item to include: The work includes supply and spreading of 40 mm metal. The murrum of good quality be laid in 5 to 6 cm over the spread metal. The complete layer then compacted. 75 mm thick bituminous bound macadam layer be placed over the compacted surface.cement concrete of M-20 of 0.2 M thick shall be laid matching the nearby level of road.

Mode Of Payment: The reinstating of road payment shall be recorded on Sqm basis after full completion of work.

Specifications for Sewerage Collection System

DETAILED ITEMWISE SPECIFICATION

Sub Work No. :- Sewerage Collection System for Zone I to IV, VI & IX to XIII

Providing, lowering, laying and jointing DWC HDPE Pipes ..... etc. complete.

The pipes and fitings shall be manufactured out of virgin PE material as per ISO 21138 - 2007 or latest edition. The pipes shall be manufactured out of PE 100 grade compounded resin. The factory testing of pipes shall be carried out as specified in ISO 21138.

The resin used shall be tested through third party inspection agencies like Bodycote and according to the specification for the resins.

No recycled material shall be used in manufacturing.

The stiffness class as mentioned in the BoQ shall be followed.

The jointing material shall be SBR or EPDM rubber ring with socket and spigot type of joints.

The laying and jointing shall be carried out as per relevant IS - 16098 duly applying the following sections

Transportation –

Annex A -1

Handling A-2

Pipe Storage site A-3

Construction methods A-4

Table 21 min. trench width

Table 22 minimum cover

A 4.1.2.4 Bedding

A 4.4.2.2 Underground services

A 4.1.2.3 Dewatering

A 4.2.2 Jointing

A 4.2.4 Sewer connections

1. Annex B

Structural Design.

2. Annex C

Determination of oxidation Induction Time

3. Annex D

Methods for visually assessing the effects of heating.

4. Annex E

Test method for mechanical strength or flexibility of fabricated fitting

5. Annex F

Water tightness of joints.

6. Annex G

Test methods for resistance to combined temp. cycling and external loading.

DWC Pipes for use in underground Sewerage System

Technical Specification

Class SN 8 Structured Double Wall (Non-Smooth External Annular Corrugated wall & Smooth Internal wall) Polyethylene Piping System for non-pressure underground Sewerage & Drainage Applications.

Scope

This specification covers the requirements for manufacturing, supplying, transportation, handling, stacking, installation, jointing, and testing of Class SN 8 Structured Double Wall (Non-Smooth External Annular Corrugated wall & Smooth Internal wall) Polyethylene Piping System for non-pressure underground Sewerage & Drainage Applications herein after called the DWC PE Piping System.

Applicable Codes

The manufacturing, testing at factory, supplying, transportation, handling, stacking, installation, jointing, and testing at sites shall comply with all currently applicable statutes, manuals, regulation, standards & codes. In particular, in addition to all relevant National Standards, following International standards with latest revisions shall be referred. If requirements of these specifications are at variance with any other standards, this particular document shall govern the proceedings.

I) EN 13476-1

Plastics piping Systems for non-pressure underground drainage and sewerageStructured-wall piping systems of Polyethylene (PE) Part 1 : General requirements and performance characteristics.

II) EN 13476-3

Plastics piping Systems for non-pressure underground drainage and sewerageStructured-wall piping systems of Polyethylene (PE) Part 3 : Specifications for pipes and fittings with smooth internal and profiled external surface and the system, Type B Other International Codes / Standards (EN/ ISO) which are integral part of above two standards as normative references form a significant portion of this specification document.

Manufacturing

The DWC PE Piping System of stiffness class designation SN 8 shall confirm to the European Union standards as mentioned above and shall be configured as per the indicative Cross-sectional Drawing

annexed herewith. Each pipe shall be coupler (on-line or off-line) and spigot type along with rubber sealing ring (as designated under above international specifications)

Transportation

The arrangement of loading the pipes in a telescopic manner is advised, i.e. smaller diameters inserted into the next higher sizes of pipes. While loading the pipes onto the truck, care should be taken that the coupler- end should be arranged alternatively in the corresponding layers so as to avoid the damage to the coupling/ socket ends.

Handling

Following Recommendations shall be followed while handling the pipes:Adherence to National Safety requirements Pipes to be smoothly lowered to the ground Pipes should not be dragged against the ground to avoid the damages to the Coupler/pipes.800mm and larger diameter pipes are carried with Slings at two points spaced approximately at 3 Meters apart For smaller diameters (400mm 800mm) one lift point shall be sufficient & can be handled either manually or mechanically Do not use a loading Boom or Fork Lift directly on or inside pipe.

Pipe Storage at Site

Stockpiling shall be done temporarily on a Flat Clear Area as per Fig. 1 & 2.For avoiding collapse of Stacks, use Wooden Posts or Blocks Stacking shall not be higher than 2.5 Meters While stacking, alternate the socket/coupler ends at each row of stacked pipes as per Fig. 2.Lowering, Laying & jointing of Pipes The width of a Sewer Trench depends on the soil condition, type of side protection needed and the working space required at the bottom of Trench for smooth installations. Increase in width over required minimum would unduly increase the load on pipe and cost of road restoration. Considering all above factors, the Minimum Trench Width is specified as per Table below :-Indicative Minimum Trench Widths.

Pipe Diameter (mm)	Trench Width (M)
75-170	0.6
250	0.7
400	0.9
600	1.2
800	1.3
1000	1.8

In actual practice the trench width can be as narrow as possible but adequate to allow the workmen to execute the job satisfactorily. The pipe segment between two manholes shall be laid approximately in straight line without any vertical undulations. However, on the strength of its flexibility, the DWC PE Piping system can be laid in very smooth curve if found necessary. The piping system shall rest on the

carefully prepared bedding portion of the Backfill Envelope (ref fig. III, Annexure I) and at appropriate jointing locations the trenches shall be excavated deeper to accommodate the bulges of coupler-spigot joints. However, special care shall be ensured as mentioned below:-

Excavation of trenches shall be carried out in accordance with the drawing & specifications and as directed by the field engineer as well. The piping system shall be laid and jointed in true to gradient with the help of sight rails and boning rods as detailed in CPHEEO, MoUD, GoI Manual on Sewerage and sewerage treatment. The levels need be checked with calibrated modern Levelling Instrument. Specific care shall be taken to prevent entry of sand / mud /slush/ any other foreign material etc into the system during the installation operation.The structural property of the system suggests that a minimum cover of 300 mm adequate even for maximum quantum of superimposed (live) load. In case of wider trenches than required (above table), the permission of the competent authority shall be necessary.

The bedding area (ref. fig. III) is an essential portion of Back fill Envelope and shall be constructed with proper bedding material as computed in accordance with appropriate international code of practice for structural bedding design mentioned in the list of normative references under EN 13476.The bedding shall be laid to specified thickness and gradient with proper manual compaction of the aggregate.

The moulded on-line coupler (or separate coupler integrated to the pipe in case of lower sizes) will have a suitable internal surface for push-fitting the said end over the spigot end of the next pipe. On first valley of the corrugation of said spigot end (destined to receive the pushed coupler) the sealing rubber ring of standard (EN 13476) quality shall be placed so that the coupler end of the pipe smoothly but tightly slides over the sealing ring for making an absolute watertight joint. Similar system is also used for fabricated accessories or moulded fittings required such as Tee, Bends, Elbows, Reducer end caps for the purpose of installation of the system related to drainage/sewerage.

Jointing

For quality connections following steps are to be ensured, failing which the performance aspects are to be severely compromised:-

The non-coupler (socket) end needs to be thoroughly cleared and shall be free from any foreign material Clean and lubricate the coupler end of the pipe, if required Lubricate the exposed Gasket in the same manner, if required. Keep the non-coupler end free from dirt, backfill material, and foreign matter so that the joint integrity is not compromised. Push the coupler into non-coupler and align properly. Always push coupler end into non-coupler end. For smaller diameter pipes simple manual

insertion shall be sufficient. It should be ensured that the coup -coupler end to ensure installation and tight joining seal. Therefore prior to insertion always place 'homing mark ' on appropriate corrugation of non coupler end. Construction of backfill envelope and final backfilling of the trenches DWC PE Piping System with well compacted Backfill Envelope along with the bottom and sides of trench (native soil) work together to support soil overburden and superimposed (traffic) loads. The carefully constructed Backfill Envelop has three distinct but non-isolated stages (Ref. enclosed C/S Drawing III, Annexure I).The construction need to be done stage by stage as per the sequence stated below:

- Bedding portion
- Up to Haunch level
- Remaining portion

The material for backfill envelop shall be in accordance with the structural design of flexible buried conduit as per relevant international codes mentioned in the list of Standards as normative references of EN 13476 /1 & 3. It can be the same material that were removed in the course of excavation or it can be fine sand/course sand/gravel / moram /other form of course / fine aggregates depending on the ffected Design Load [Overburden + Superimposed (Live) load]. However, in no circumstances, the flexible pipe should not be embedded in cement concrete (un- reinforced or reinforced) which invariably induces undesired rigidity in the system.The remaining portion of backfilling which do not contribute to the structural integrity of the system may be the materials that were removed in the course of excavation or any other foreign material as may be required to suit the particular site condition. These materials shall consist of at least clean earth and shall be free from large clod or stone above 75 mm, ashes, refuse and other injurious materials. After completion of lying of pipes, etc, first the Backfill Envelope shall be constructed as per design around the pipe. Voids must be eliminated by knifing under and around pipe or by some other indigenous tools. The compaction, by hand rammers or compactors with necessary watering to a possible maximum level of proctor density shall be ensured. Backfilling shall start only after ensuring the water tightness test of joints for the concerned sewer segments. However, partial filling may be done keeping the joints open. Precautions shall be taken against floatation (if at all necessary) as per the specified methodology and the minimum required cover For indicative.

Continuity Test /Hydraulic Testing

Continuity of the pipe segments in between two manholes is required to be ensured in the same

modality as practiced for non-pressure RCC pipeline. Hydraulic testing of pipes shall be done, if specifically asked for by the client for any specific stretch. The procedure for hydraulic testing shall be similar to that for non-pressure RCC pipes.

Hydraulic testing of pipes shall be done, if specifically asked for by the client for any specific stretch. The procedure for hydraulic testing shall be similar to that for non-pressure RCC pipes.

Measurements:

The lengths of pipe shall be measured in the running meters nearest to a cm as laid, lowered and jointed from inside of one manhole to the inside of the other manhole. The length shall be taken along the entre line of the pipes. All fittings such as bends, junction, etc., which shall not be measured separately. Excavation, refilling, shoring and timbering in trenches and cement concreting where ever required shall be measured separately under relevant item of work.

Security money for testing should be kept at 10 % of the value of the work.

After testing of the complete sewerage system to the satisfaction of the engineer in-charge the same shall be released.

Rate

The rate shall include the cost of material and labour involved in all the operation described above including the cost of concrete which shall be paid separately.

Item No……:- Providing, lowering, laying and jointing R.C.C.Pipes ……etc. complete.

The relevant item shall comply as per Schedule 'B'

Contractor shall provide R.C.C. S/S Pipes of required diameter and class in standard length as per schedule conforming to latest version of I.S. 458/1956 and the materials required for manufacturing of pipes such as cement shall confirm to I.S. 269 of latest version, sand or fine aggregate and coarse aggregate shall confirm to I.S. 383 of latest version reinforcement shall confirm to I.S. 432,1786, 1566, 1139, and 226 of latest version R.C.C. work shall confirm to I.S. 456 – 2000, and rubber rings shall be confirm to latest version I.S. The contractor shall supply all the latest I.S. codes related to this item to the Department at his cost.

The pipes supplied by the contractor shall be transported from factory & stacked along the alignments of the line in such a way that no hindrance is created to the traffic / pedestrians. Cracked / damaged pipes shall be rejected outright. Damaged pipe shall not be allowed to be transported at work site. If it happens contractor shall be penalized for such activities in terms of fine as decided by the Engineer-In-Charge. Contractor should take prior permission from Engineer - in - charge before

placing the order for RCC pipes. The work is to be carried out zone by zone and in no case pipes required for other zones than the one in which work is going on shall be ordered or brought to site. The work in one zone shall be completed including house connections, commissioned and then only the work for other shall be taken in hand.

After supply of R.C.C. Pipes and rubber rings at the site of work by the contractor, the same material shall be issued to the contractor on "Unstamped Receipt." Record of consumptions and balance shall be maintained and shall be kept in the custody of Department. One rubber ring shall be supplied with each full length socketed pipe at the site of work and the contractor at his own cost shall submit certificate of testing for the same. The contractor at his own cost shall keep the material at site with chowkidar. The site Engineer can checked the balance material any time at site store of the contractor, if any shortage is found, the cost of Short materials with penal rate shall be recovered through R.A. Bill of contractor in single installment without any excuse after the pipes are supplied by the contractor, the responsibility of security and safety shall still rest with the contractor till the pipes are laid, jointed and tested commissioned and the work completed and taken over by the ..MC.

The pipe shall be laid to line, levels and slopes as indicated on the drawings or as directed by the Engineer, Sight rails or leveling instruments in sufficient numbers shall be provided for this purpose by the contractor.

The pipe shall be laid to line, levels and slopes as indicated on the drawings or as directed by the Engineer. Sight rails or leveling instruments of sufficient numbers shall be provided for this purpose by the contractor.

The handling laying of the concrete pipes shall confirm to IS – 783– 1959 (relevant para) The joints shall be done as per paragraph 10.2.3.1 of I.S. 783 – 1959. Any pipe damaged during laying shall be replaced by the contractor at his cost proper alignments tools and facilities shall be provided by the contractor for lowering the pipes, fittings in to trenches to prevent damage. Dumping shall not be permitted. Chain pulley block may be used for pipes above 300 mm. diameter.

All joints shall be done leak proof by providing spun yarn in C.M. 1:1 With hardcrete. The leaking Joint found shall be made water tight at the cost of contractor.

No materials shall be supplied by MJP for manufacturing of R.C.C. pipes and any other allied works.
The pipe shall be inspected, as per relevant latest I.S.S. by Third Party Inspection (TPI) agency approved by the ULB and enlisted with MJP and certificate to that extent shall be produced by the contractor. The charges of TPI are deemed to have been included in the rates. The payment of RCC Pipes

shall not be made till receipt of TPI certificate. The seal of TPI agency shall be embossed inside portion of each pipe after inspection including the details such as date of manufacturing, batch no. class and diameter of pipe and name of ULB.

Sight rails and boning staves :-

In laying the pipe sewers, the center for each manhole must be marked by a peg, or otherwise, as may be determined by the Engineer. The contractors are then to dig holes for and set up two posts (about 100 mm x 100 mm x 1800 mm) at each manhole at nearly equal distance from the peg and a sufficient distances there from to be well clear of all intended excavation, so arranged that a sight rail when fixed level against the post will cross the center of manhole. The posts must also be so set up that the longitudinal direction of the rail may be as clear as possible of the direction of any of the lines of pipes or drains converging to the manhole. If walls of building afford suitable means of fixing the sight-rail, the post may, however be dispensed with. The sight rails must not in any case be more than 30 M. apart. Intermediate rails therefore are put up if necessary.

Construction of boning staves:-

Boning staves shall be prepared by the contractors about 75 mm x 50 mm made of a square section of various length, each length being of a certain fraction of meter and with a fixed tee – head and a fixed intermediate cross piece, each about 300 mm. long. The top edge of the cross piece must be fixed at distance below the top edge of this tee-head, equal to as the case may be, the outside diameter of the pipe or thickness of the concrete bed to be laid. The boning staff must be marked on both sides to indicate its full length. According to the circumstances of each case, a suitable length of boning staff will be determined upon, and the reduced level of the bed of the pipe or bottom of concrete of drain at each added to the selected boning staff will be marked by a horizontal line on both posts, or on walls or fences to which the sight-rail is to be fixed.

Sites Rails :-

a) The sight-rails (about 25 cm wide and 40 mm thick) is to be screwed with the top edge against the level marks. The centerline of the pipe sewer or the drain will be marked on the rail and this mark will denote the meeting point of the centerlines of any converging drains or pipe sewers. A line drawn from the top edge of one rail to the top edge of the next rail will be vertically parallel with the bed of the sewer or drain and the depth of the bed of the sewer or drain at any intermediate point may be easily determined by letting down the selected boning staff until the tee head comes in the line of sight from rail to rail.

b) The posts and rails are to be perfectly square and smooth on all sides and edges. The rails are to be painted with white oil paint on both sides, and the tee heads and cross piece of the boning staves are to be painted with black oil paint.

c) If the pipes of drains converging to a manhole coming at various levels, there must be rail fixed for every different level when a rail comes withing 0.60 M. of the surface of the ground, a higher sight – rail must be fixed for use with the rail over the next point.

d) The posts and rails must in no case be removed until the trenches is excavated, the drains are constructed or the pipes are laid and permission given to proceed with the filling in.

Laying of RCC Pipes :-

a) The pipes are to be laid with socket facing up the gradients beginning at the lower end. No pipe to be laid until the trench has been excavated its required depth for distance of 20 m. in front of the pipe to be laid (This distance may very as directed by the Engineer In Charge)

b) All the pipes are to be laid perfectly, both in line and gradient. The pipes in a trench shall be laid and fitted previous to the jointing being commenced.

c) Properly fitted temporary wooden stoppers shall be provided and constantly used to close the ends of all in completed pipelines. The stoppers are only to be removed when pipes are being laid and jointed.

Jointing R.C.C. Pipes :-

a) Each concrete pipes with the rubber rings accurately positioned on the spigot shall be pushed well into the socket of the previously laid pipe by means of uniformly applied pressure with the aid of a jack or similar appliance.

b) Concrete pipes of the spigot and socket type with roll on rubber rings shall be used, and the manufacturer's instructions shall be deemed to form a part of this specification.

c) Rubber rings shall be lubricated before making the joint and the lubricant shall only be soft soap water or an approved lubricant supplied by the manufacture.

d) In case of R.C.C. pipe entering or leaving a manhole a flexible joint may be provided at least with-in 0.60 m. from the outer end of the manhole.

e) A drop in water level of not more than 50 mm in one hour shall be permitted, in case of hydraulic test of manhole.

f)

All works to be water tight :-

a) The drains, manholes and all joints of pipes must be made thoroughly sound and water tight and if any joint which is proved to be leakage at any time during the progress of works or during the contractors subsequent period of maintenance shall be immediately made sound by the contractors at their own expenses. The contractors shall at their own cost prove all works to be water tight for filling it with water to such a height as desire by the Engineer-In-Charge. Any additional precautionary measures or appliances that may be found necessary to ensure the water tight joints of pipes shall be adopted by the contractor without extra charges, the responsibility of making them complete watertight rest with the contractor. Hardcrete shall only be used for preparing mortar for jointing of RCC Pipes.

b) Immediately after the test with the double disc or cylinder has been completed and any defect hereby disclosed have to be made good, the contractor shall prove the joints of the stretch of the under-ground pipe whether of stoneware, Cast iron or R.C.C. Pipes, to be water tight by the filling in pipes with water before filling in the trenches to the level of 1.5 M. above top of the highest pipe in the stretch and heading the water up for the period of one hour of such further time as the Engineer may direct. The apparatus used for the purpose of testing shall be approved by the Engineer. The contractor, if Required by the Engineer, shall pump the excavation dry and keep it so during the period of testing. No test applied at part of a stretch when complete. The loss of water over a period of 30 minutes should be measured adding water from a measuring vessel at regular 10 minutes interval, and noting the quantity required to maintain the original water level. (For purpose of this test, the average quantity added should not excess 1 liter / hour / 100 liner meters/ 10 of nominal internal diameter.)

Any leakages including excessive sweating which cause a drop in the test water level will be visible and the defective part of the work should be removed and made good. The testing of laid pipeline shall be given as per specification CPHEEO manual for sewer work.

Inspection of the joints :-

After the joints of any pipes in underground work have thoroughly set the Engineer (or any person whom he may appoint) may inspect the joints and if he has any doubt at their soundness contractor shall arrange to cut, open and clean away the cement as the case may be of any joint, that he may select and to make good the same at their expense provided that unless defect to be found, they shall not be required to open more than one joint in 20 M. of pipes though if the defect be found the Engineer may direct them to open as many joints as be may seem necessary.

Cleaning of the pipes :-

a) As soon as stretch of R.C.C. pipes has been laid complete from manhole, the contractor shall run through the pipes both back words and forwards a double disc or solid or closed cylinder 75 mm or less in diameter than the internal diameter of the pipes.The open end of an incomplete stretch of pipe line shall be securely closed as may be directed by the Engineer to prevent entry of mud or silt or any foreign material etc.

b) If, as a result of the removal of the obstruction, the Engineer considers that damages may have been caused to the pipe shall be entitled to order the length to be retest at the expense of the contractor. If such retest prove unsatisfactory, the contractor shall amend the work and carry out such further tests as are required by the Engineer, at his own expenses.

c) It shall also be ascertained by the contractor that each stretch from manhole to manhole is absolute clear and without any obstruction visual examination of the interior of the pipe line suitably enlightened by the projected sunlight or other means.

Fracture of Pipes :-

a) In the events of pipes being fractured at the time of laying, refilling due to dumping of the material for refilling have been improperly selected or any other causes, the contractor in every instance will be held responsible and will be called up to replace the defective pipes at his own cost, if such defect appears before the expiration of the period of maintenance.

b) Any pipe or length of pipe found to be defective shall be immediately removed and replaced at the contractors expense, and leaking joints shall be remade, the inspections tests shall then be repeated as often as necessary, until the whole line under inspection or test is accepted by the Engineer.

All Works to be cleared clean and perfect :-

a) The contractor, shall after completion or whenever required by the Engineer, prove all pipes and fittings to be clear, clean and perfect, and for this purpose shall, at their own expense and in the presence of the Engineer, or his appointee provide suitable instruments and appliances and pass then through the pipes and shall if required, through in water and show that it passed freely through every portion of the work. Brick mortar and rubbish shall not be allowed to fall into the manholes or sewer lines while fixing or if allowed shall be removed by the contractor at their own expenses.

Mode of Payment

For Item No. , (Supply of Pipes)

a) The pipes HDPE/RCC required for completion of one zone shall only be brought. Unless the zone is commissioned and completed, the procurement of pipes in other zone shall not be taken up. 60 % payment will be made against supply of S/S R.C.C. pipes with rubber rings at site along with inspection certificates from TPI agency. Remaining 40% payment will be made only after lowering, laying, jointing, satisfactory water tightness testing of the laid pipe line, property connections, and commissioning of the complete zone is completed. The item shall be measured and paid for one running meter length of actual pipeline laid.

For Item No. (Laying of Pipes)

a) 50 % payment shall be made after lowering, laying & jointing R.C.C. pipes and 50% payment shall be released after satisfactory water tightness test of the laid pipeline, property connections, and commissioning of the complete zone is completed. The item shall be measured and paid for one running meter length of actual pipeline laid.

Item No .....to .....:- Excavation for foundation in earth, soils of all types, sand, gravel, soft, murum, hard murum with boulders, soft rock and hard rock....etc. complete

General The specifications contained in the standard specification volume IInd published by Public Works and Housing Department, Govt. of Maharashtra, Chapter Bd.A (1,A-2, A-3, A-4 & A-6 etc. on page No. 259) (Red Book) shall apply.

The excavation shall be done to the required depth and section as per design drawing and as directed by Engineer-in-Charge. Extra depth shall be made up clear with concrete or other suitable materials as directed by Engineer-in-charge. At the cost of contractor. The excavated material shall be not be placed nearer than 300 m. from the edges of excavated portion. No. Compensation shall be admissible to the contractor due to any delay such as permission etc. After refilling of the trenches, the balanced stuff should be disposed off as directed. Refilling and disposal will be paid separately in relevant items if Schedule 'B'.

Site Clearance

The area to be excavated shall be cleared off.All trees and bushes and rubbish and other objectionable materials removed shall be burnt or disposed off as directed by the Engineer-in-Charge. The cost of such clearing shall be deemed to have been included in the rates accepted for different items under excavation.

During excavation, if masonry, concrete structure roots of trees etc are met with the same shall be removed without extra cost. The loss to public or private utility services such as telephone or electric cables/water mains or such other if comes across the trenches, shall have to be made good at the cost of the contractor. The permission for such crossing if required form the competent authority shall be obtained through Department. However delay in obtaining such permission shall not be considered as cause of delay for the works and no compensation shall be admissible to the contractor due to such delay.

Dewatering

No distinction shall be made as to whether the material being excavated is dry, moist or wet. The item also includes bailing out of water manually to keep the trenches reasonably dry for all further works of concerning, lowering ,laying & Jointing and testing of the pipe line till the completion of the work. Separate item of Dewatering is incorporated in the tender, if any ground water sources are met during excavation. No extra over the tendered provision shall be paid to contractor for this reason on any account.

SHORING AND STRUTTING

The item includes all shoring and strutting that may be required. On no account the width of trenches more than these mentioned here in after shall be measured. If excavation width more than the specified is required for the purpose of keeping machinery, steeping due to loose material or for any other reasons the same shall be at the Contractors cost.

Fencing, Lighting and Watching :-

The contractors shall made all proper arrangement for protecting the work by means of fencing, watching, and lighting at night, as directed by the Engineer-in-charge. The post of fencing shall be of timber, securely fixed in the ground not more than 3m. apart, and they shall not be less than 75 mm in diameter or less than 1.2 m. above the surface of the ground. There shall be two rails, one near the top of the posts and the other about 450 mm above the surface of the ground and each shall be from 50 mm to 70 mm in diameter and sufficiently long to run form post to post, to which they shall be bound with strong rope. The method of projecting not be allowed on any account. All along the edges of the excavated trenches a bank of earth about 1.20 m high shall be formed where required by the Engineer-in-charge for further protection. Proper provision shall be made for lighting at night and watchman shall be kept to see that this is properly done. In the event of the contractors not fully complying with the provisions of these clauses. The Engineer-in-charge may put up a fence or improve the fence already put up or provide or improve the lighting or adopt such measures as he

may deem necessary without prior intimation to the contractor and all the cost of such procedure as may be adopted by the Engineer-in-charge, shall be borne by the contractor.

In addition to the normal lighting arrangements, the contractor shall be provide, wherever a sewer work is in progress, battery operated linking lights (6 Volts) in the beginning and end of a trench with a view to provide suitable indication to the vehicular traffic. The contractor shall also provide and display special boards painted with fluorescent paints indicating the progress of the work along a particular road.

The items of excavation are including necessary lighting at night at suitable intervals, but not more than 15 meter along the excavated trenches and at all crossing and barricading the same by fencing so as to avoid the accident. Chowkidars shall be employed at place where the trenches cross over any traffic road to caution the vehicles and pedestrians etc. The arrangements shall be maintained till completion of work and at the cost of the Contractor.

Alignment and levels. :-

Before the excavation of trench is commenced, sight rails shall be erected at every 30 m. and at all points of change of direction, gradient and at ends. The excavation work shall be proceeded by a joint survey along with alignment of the main, to obtain ground level at every 30 m. or less distance. Temporary Bench Marks shall be constructed at every 300 m. distance along the alignment and shall be maintained till the completion of the work. All labour and materials for the survey work of fixing Bench Marks etc. shall be provided by the contractor at his own cost. Since the lines to be laid are drainage lines., the grade and level are very important factors. Those shall be maintained very carefully. For any mistakes in survey the Contractor is fully responsible. He should not lay the pipes, unless the alignment is thoroughly checked by the Engineer-in-Charge or his authorized representative who is empowered to sign the work order book in token of checking the exact grade and level of the trenches excavation.

Excavation at random places shall not be measured by the Pradhikaran's Engineer. Any non-technical practices during the excavation of the contracted work shall be viewed very seriously by the Pradhikaran and a note to that effect will be recorded against the Contractor in his name.

Depth and Grades of trenches :-

The trenches shall be excavated to the required grades and depth as shown on approved drawings or as directed by the Engineer-in-charge. If not so, the payment for the item will not be paid to the Contractor.The depths of excavation and the level of the pipe inverts shall be checked by means

of boning rods of suitable lengths. Additional depths if required to be excavated for pits for sockets, collars, specials, joints, and for any other working facility shall not be measured and paid separately. The minimum cover above the pipe shall be 0.90 m.

The bottom of trench shall be leveled both longitudinally land transversely or stepped as directed by Engineer-in-charge. The Contractor shall notify the Engineer when the trenches are ready for bedding so that the Engineer can inspect and record the depth. Only on explicit approval by Engineer, the bedding shall be provided by the Contractor. If any public utility i.e. electrical cable, telephone cable, water connections, sewer connections, gutter damage etc. then same will be rectified by contractor at his own cost.

Width of trenches for excavation :-

The maximum width of trench allowable for different diameter of pipe sewer is given in the table below. The offset for width is allowable for every additional depth of trenches as tabulated for soft strata only.

The sides of the trenches shall be as nearly vertical as possible. The bottom of the trench shall be flat side to side.

Sr.No.	Dia of Pipe	Lift 0.0 m. to 1.50 m.	Lift 1.5 m. to 3.00 m.	Lift 3.00 m. to 4.50 m.	Lift 4.50 m. to 6.00 m.
1	150 mm to 300 mm	1.00 m.	1.30 m.	1.60 m.	2.00 m.
2	400 mm	1.10 m.	1.40 m.	1.70 m.	2.05 m.
3	450 mm	1.15 m.	1.45 m.	1.75 m.	2.10 m.
4	500 mm	1.20 m.	1.50 m.	1.80 m.	2.10 m.
5	600 mm	1.30 m.	1.60 m.	1.90 m.	2.20 m.
6	700 mm	1.40 m.	1.70 m.	2.00 m.	2.30 m.
7	800 mm	1.50 m.	1.80 m.	2.10 m.	2.40 m.
8	900 mm	1.60 m.	1.90 m.	2.20 m.	2.50 m.
9	1000 mm	1.70 m.	2.00 m.	2.30 m.	2.60 m.
10	1100 mm	1.80 m.	2.10 m.	2.40 m.	2.70 m.
11	1200 mm	1.90 m.	2.20 m.	2.50 m.	2.80 m.

The maximum width as mentioned in the table of different depth of trenches or the actual width which ever is less shall be taken into account for measurement and payment. No. extra width is allowable due to large quantity or big boulders met with in the trenches. Dressing and

consolidation of the trenches.

The bed of the trenches shall be well rammed before laying of the murum or sand for bedding hollows, if any, shall be filled with murum duly rammed and watered to required level and grade at cost of the Contractor.

The contractor shall properly assess the work involved In above description and quote accordingly. The Executive Engineer's decision regarding any of the issue of scope of work here in and rates payable shall be final, conclusive and binding on contractor.

Any damages to the telephone cables / electrical cables shall be borne by the contractor, if demanded by the concerned authority. The cost of damages shall be directly paid by the Executive Engineer to the authority and such amounts shall be recoverable from the contractor through his due payments/ security deposits. In case water mains is damaged by the contractor during execution and quantity of water is wasted due to his negligence, that amount of wastage of water shall be recoverable from the contractor as per the MJP's water rate prevailing at the time of execution through his running bill.

For excavated width whichever is less shall be recorded and paid for. Extra widths for pits at sockets, collars, specials, joints, construction and also for working liabilities shall neither be measured nor paid for. However, excavation required for providing and casting fixity block, thrust blocks, encasing etc. will be measured and paid for under relevant item of excavation. The pits for welding joints will also be paid under relevant item of excavation.

CLASSIFICATION OF MATERIALS IN TRENCHES

The exact classification of the strata met with during the excavation shall be done by the representative of Engineer-in-Charge and accordingly measurement shall be recorded under different items of excavation provided under Annexure to Clause-38 of tender for the purpose of excess quantity. In case of any, dispute regarding classification of strata, the decision of Engineer-in-Charge shall be final and binding. The strata classifications and its quantity shown are indicative only. The Contractor therefore, shall carry out his own assessment regarding the strata at different depth along the alignment, before submission of the tender.

Disposal of Surplus Stuff :-

The contractor shall carefully excavate the road surfaces and stack the materials obtained from for road surface cutting systematically for selectively reusing the same for remarking the road. At times it may be necessary for the contractor to remove the excavated stuff to a suitable destination away from the excavation work. This stuff stacked as directed within 50 m. lead shall be brought back for refilling by the contractor without any extra payment on this account.

The excavated stuff remaining in balance after refilling and remaking of road shall be conveyed, unloaded and leveled by the contractor at a destination as directed by Engineer-in-charge within a radius of 5 Kms form site of work. The same shall be paid to the contractor separately under relevant item of Schedule 'B' If it is seen that the surplus excavated stuff is being sold by the agency the agency will be penalized as decided by the Engineer-In-Charge.

EXCAVATION BY CHISELLING MECHANICAL MEANS

(In Hard Strata)

Excavation in hard strata shall be done by chiseling, wedging or line drilling as specified any mechanical all means or ordered by the Engineer. The excavation refers to excavation generally for foundation, wet or dry, in hard rock by chiseling, wedging or line drilling and shall comply with the specifications.

MODE OF MEASUREMENT AND PAYMENT

The excavation shall be measured in Cubic meters only. Dimensions shall be measured correct to two decimal of meter and quantity shall be calculated to two places of Decimal of Cubic meters. The item mentioned in Schedule-B in which includes disposing excess excavated material remained after refilling will not be paid separately for disposing excavated material.

ITEM NO .....Providing laying in situ P.C.C. (M-150) 1:2:4 .....etc. complete. (The specification will be applied for all sub works included in the tender.)

This shall comply as per standard specification No. Bd-E-1 on page No.287 or latest edition.

Materials

a) Cement :-

All cement for use on the works except otherwise stated shall be the standard ordinary Portland cement manufactured in India and shall conform to the I.S. 269 latest version. It shall be of make and quality approved by the Engineer-in-charge.

The cement shall be stored in weather proof godown specially constructed for the purpose, of such a manner as to prevent deterioration due to moisture or instruction of foreign matter. The weather proof godown shall have solid impervious floor raised 300 mm above the general ground level so that the cement stored there on shall not come in direct contact with the sub-soil moisture. The passages and the general construction shall be such that it affords full protection from whether effects. Large stock cement shall not be kept at the works but only sufficient quantities should be

kept to maintain continuity of work.

Storage of Cement :-

If cement is supplied in bags a suitable weighing scale shall be provided and shall required by the Engineer be used for checking the weight of every bag at the contractor's expense. Bags under weight by more than 2 percent of the nominal weight shall be rejected and removed from the site.

No cement has been store for more than 90 days ordinarily be allowed to be used on the works. Cement stored for longer period more than 90 days shall be used on work only with the specific written permission of the Engineer-in-charge who shall ascertain its quality after due testing in the laboratory before giving such permission. All expenses in connection with the test shall be borne by the contractors.

For testing the quality of cement, samples shall be taken from every consignment arrived at the site of work at the option of the Engineer. The contractors shall afford every facility to the Engineer for inspection for sampling the cement. The cement godown shall be so arranged by the contractors that each consignment could be stocked separately and in such manner so as to allow counting bags in each row with case. The test result shall, ordinarily. Be available within a week of sampling and the contractors shall not use any part of the consignment until the results of the tests are received and found satisfactory. However, the use of such cement becomes imperative before the test result are received, the contractors may do so entirely at their own risk and cost and the whole of such work carried out by them is liable for rejection, if the tests results are found unsatisfactory. Any consignment failing to meet the requirements to I.S. 269 shall be rejected and shall be removed from the work site within 48 hours of the intimation from the Engineer. The decision of the Engineer-in-charge in this respect shall be final and binding on the contractors.

The cement in connection with the testing of cement such as transport of samples, testing fees, etc. shall be borne by the contractors.

The cement used in any type of concrete shall always be measured by weight and one cubic meter shall be taken as per table 30 of A.C.C. Hand Book.

b) Aggregates :-

All the aggregates shall confirm to the latest I.S. 383. The aggregate shall consist of naturally occurring sand and gravel or stone crushed or uncrushed or a combination thereof. They are classified

broadly under two categories, viz (i) Sand of fine aggregates and (ii) coarse, aggregates, depending upon their size. The fine aggregates are those which pass through I.S. Sieve No. 480. and the coarse aggregate are those which retained on I.S. sieve 480.

(i) Storage of Aggregate :-

The fine and coarse aggregates shall be stored separately and in such a manner that segregation of the various sized particle shall not occur, the stock shall be formed on a platform of weak concrete, timber or similar approved hard standing and aggregates shall be kept clean and free from foreign substance.

(ii) Aggregates shall not be unloaded on to roadways or pathways the Engineer may reject any stock pile of part of a stock pile if improper storage has opinion, caused contamination with foreign substances.

(iii) Storage piles of aggregate shall be arranged with proper drainage and protection from rainfall in order to prevent excessive changes in moisture content taking place during concerning.

(iv) The aggregates both fine and coarse shall be hard, strong, durable, clean, free from veins and adherent coatings. The use of flaky and elongated pieces of aggregates shall be prohibited.

(v) The aggregate shall not contain deleterious materials such as iron pyrite, coal, mica, shale or similar laminate material, clay, alkali, soft fragments, sea shells, organic impurities etc. in such quantity as to affect the strength of durability of concrete or the reinforcement embedded in such reinforcement concrete.

(vi) The maximum quantities of deleterious material that may be permitted shall conform to the following limits by weight.

Deleterious substance	**Fine aggregates percent by weight**		**Coarse aggregates percent by weight.**	
	Uncrushed	**Crushed**	**Uncrushed**	**Crushed**
1. Local and lignite	1.00	1.00	1.00	1.00
2. Clay lumps	1.00	1.00	1.00	1.00
3. Soft fragments	-	-	3.00	-
4. Material passing through 75 micro sieve.	3.00	3.00	3.00	1.00
5. Shale	1.00	-	-	-

(vii) The total of various deleterious materials occurring in any sample shall, no case, exceed 5 percent.

(viii) If the aggregate supplied is unclean, it shall be washed. If it is not properly graded, it shall be screened by hand or by mechanical means and the various sizes proportioned to get the required grading.

(ix) Storing of aggregate on dusty, muddy and grassy spots shall be avoided. They shall be stored on the works in such a manner as to prevent intrusion of foreign matter and protected from exposure to dust. They shall be placed in stock piles individual units of suitable sizes and in suitable layers to prevent segregation. They shall not be allowed to run down slopes.

Sand or fine aggregates :-

All fine aggregates shall consist of clean, hard, strong, durable uncoated siliceous gitty material consisting of well graded particles obtained from rock fragment. It shall be free from clay lumps injurious amount of dust, mica shell, soft or flaky particles, shale, alkali, organic matter lead or other deleterious substances.

j) The sand shall be taken from sources approved by the Engineer-in-charge. The sand or fine aggregate shall conform to the latest I.S. No. 383

ii) If the Engineer-in-charge considers if necessary, it shall be washed and / or screened before use, at the expense of the contractors.

iii) The sand shall have a fineness modulus of not less than 2.5 and not more than 3.0 and the grading shall confirm as far as possible to the following analysis.

I.S. Sieve No.	**Percentage Passing**	
	Natural sand or crushed gravel	**Crushed Stone**
480	95-10	90-100
240	70-95	60-90
120	45-85	40-80
60	25-60	20-50
30	5-30	5-30
15	0-10	0-15

iv) the specific gravity of sand shall not be less than 2.6

v) In no case shall fine aggregate be accepted, containing more than 2 % by dry weight not more than 3.5% by dry volume, not more than 5% by dry volume of clay, loam, or silt. If any sample of fine aggregate shown more than 5% of clay, loam, silt in one hour's settlement after shaking in excess of water, the lot represented by the sample shall be rejected.

vi) The following two field tests are recommended for ascertaining the percentage of clay lumps and impervious organic material and the contractors shall carry out the same if the Engineer-in-charge deems necessary.

1. Test for determining silt in sand: -

Fill a calibrated tumbler with sand to half its volume and water there to until the tumbler is three quarters full. Shake up the mixture vigorously and allow it to settle for about an hour. The volume of silt visible on top the sand shall be measure. If the volumes of the silt standing over the sand exceed 5% of total volume of sand. The same shall be rejected.

2. Calorimetric test for impurities :-

The sample of sand shall be mixed with equal volume of 3% solution (about one ounce, in a quarter of water) of caustic soda / sodium hydroxide taken in a plain glass and the mixture shall be allowed to stand for 24 hours. The liquid standing above the sand shall not be darker than lights straw (pale yellow) color. If the color marked yellow or brown, the test would indicate presence of organic material in excessive amount.

In case suitable sand is not available in adequate quantities within a reasonable and economical limit, the contractor may be allowed to use the crushed or pulverized stone or gravel either alone or mixed within natural sand in parts. The stone or gravel shall be clean sharp and free from dust etc. and shall conform to the latest. I.S. 383.

The percentage of crushed stone to be mixed with sad shall be such as to obtain in fineness modules of blended sand within the units specified above and / or as approved by Engineer after laboratory test.

Coarse Aggregates :-

All coarse aggregates use in concrete work shall consist of crushed rock gravel or other approved inert material.

vi) Broken or crushed rock from sound blue basalt or black trap free from zealot or other common impurities shall be used in the concrete as coarse aggregate. The particles of aggregate shall be clean, hard, tough durable, free from deleterious substance and shall contain no soft, flat or elongated pieces. The course aggregate shall have specific gravity not less than 2.6 and the water absorption measured after being immersed for 24 hours in water shall not be more than 6% by weight. The maximum percentage of deleterious materials in the coarse aggregate shall not exceed 5 % by weight in the aggregate when tested in conformity with I.S. No.383.

vii) The nominal size of the coarse aggregate for reinforced concrete work shall be 20 mm larger coarse aggregate up to 40 mm size may be used if approved by the Engineer-in-charge, in plain concrete work. The maximum size of coarse aggregate shall be as large as possible within the limits specified but in no case shall be greater than one quarter than one quarter of the maximum thickness of the member, provided that the concrete can be placed in from work without difficulty so as to surround all reinforcement thoroughly and to fill the corners of the form work. The minimum size of coarse aggregate shall be, as mentioned earlier, such as to retain most of the material (90%-95%) on L.S. Sieve No. 480.

viii) The aggregate shall be screened and, if necessary, blended to give the required grading when tested in the laboratory at contractors cost by means of standard mesh sieve, the grading shall fall within the following limits.

Sieve Size	**Percentage retain by weight**	
	Plain C.C.	**R.C.C.**
40 mm	-	-
25 mm	10 to 15	-
20 mm	35 to 40	15 to 0
10 mm	75 to 80	100 to 80
No. 480	98 to 100	100 to 95

The percentage given above are for guidance and the Engineer-in-charge reserves the right to

modify the same to any other lower or higher value if considered necessary by him, in consonance with the requirements of the work.

ix) in the event of undesirable segregation occurring in coarse aggregates, the contractor shall separate the coarse aggregates in two or more suitable fraction as directed by the Engineer-in-charge, who shall set up the required limit of each such fraction. The grading so specified shall be such as to give a dense, water tight concretes of specified proportion and strength and required consistency.

x) The Engineer-in-charge shall have the right and authority to carry out routine control tests and analysis of the broken rock at any stage of the work processing and / or concerning operation and the contractors shall give all necessary facilities in respect of such testing. The sampling and testing shall be carried out as per standard I.S. practice entirely at the cost of the contractor.

Water

The water use for the preparation of concrete., for washing sand etc. and for curing shall be clean and free from objectionable quantities of silt, organic material, acid , alkali, salts, oil and other deleterious impurities and it shall be obtained from the sources approved by the Engineer-in-charge. Potable water shall generally be found fit for preparation of concrete. The quantity of water to be added shall generally be properly measured and controlled.

i) Water Cement Ratio :-

Suitable water cement ratios for the different mixes and used shall be determined in consultation with the Engineer-in-charge and they shall generally not be exceeding 0.5 (i.e. 50% by weight), the exact values being fixed after taking into account all relevant factors such as strength required, weather condition, water absorbed by material, work ability and slump required consistent with the work requirements, method of compaction etc. The concrete mix shall be designed with the materials which will be used hence forth for the preparation of concrete. The same task shall be repeated if there is change in the quarries for the fine and the coarse aggregate.

Concrete :-

All cement concrete, whether used in R.C.C. work or plain concrete work shall be M-150, M-200 and M-250, as per latest I.S. Code.

Gauge Boxes

Gauge boxes approved type shall be used for measuring sand and coarse aggregate in

required proportion whenever concrete is allowed to be prepared by mixing the aggregate on volumetric basis. Such boxes shall be of seasoned timber or steel and shall be of such size and shape and shall be used in a manner as to enable the proportion of the material to be checked readily. The cement used in concrete is however shall not be used by measuring it in gauge boxes, but it shall be measured by weight, whatever may be the type of concrete.

Manufacture and Placement of concrete :-

a) Batching :-

Whether controlled or ordinary concrete is to be mixed, the quantity of cement shall be determined by weight. If the mixers weight per bag is to be used, the same shall be verified by weighing a reasonable number of bags.

Whenever direct use of bagged cement is allowed, one bag of cement shall be considered to contain 50 kg of net weight of cement. This shall, however, be verified at site by weighing for which the contractor shall provide an accurate weighing apparatus on work sites

Having once decided the mix, the Engineer-in-charge may permit further mixing of the aggregate to be done on volumetric basis.

Wherever the concrete is to be laid in trenches, the trench shall cleaned, watered and compacted before placing. The sub soil water which met shall be removed and the trench shall be kept dry during and after two hours of placing of concrete. For more depth of P.C.C. mechanical vibrator shall be used for compaction by the contractor.

The damages to concrete during laying of pipe line shall be rectified free of cost. The rate for the concrete includes all labour, material centering shuttering securing etc. all leads and lifts.Mixing of concrete shall be done with concrete mixer.For providing Electric wiring duct, tubes of the required diameter and length shall be provided through walls beams and floors, slabs as and when directed without any extra cost.

a) The contractor will make his own arrangement for receiving all material tools etc. required for the work.

b) No extra charges for the carriages of water will be allowed.

c) The rates for all items are inclusive of all charges such as carting, lifting, etc. No extra payment for any lead and lifts will be paid for any item.

d) The contractor should not be Sublette without written permission of the Engineer-in-Charge

Cement cubes of size 15 cm x 15 cm x 15 cm are taken during the concreting of important structure

like RCC well, water treatment plant, elevated service reservoirs, bridge etc. to check the strength of the concrete and its acceptability it is observed that while taking cubes the requirement specified in the relevant Indian Standard specification are not observed properly and cubes are not cast in the required numbers. Due to this the acceptability of the concrete can not be decided correctly. Similarly, proper care is also not taken for curing of the cubes the requirements specified in the ISS in respect of casting of concrete cubes and curing thereof, with acceptability criteria of concrete are reproduced below, which shall be following scrupulously.

FREQUENCY OF SAMPLING (IS:456:2000 (Clause 15.2)

a) Number of samples to be taken during concreting based on the quantum of concrete cast shall be as below.

Quantity of concrete in Cum	No. of samples
01 to 05	1
06 to 15	2
16 to 30	3
31 to 50	4
50 and above	4 + 1 for every 50 Cum part thereof.

At least one sample shall be taken from each shift of concrete and three test specimens (cubes of size (15 x 15 x 15 cm) shall be cast from each such sample for testing of the compressive strength additional three cubes will also have to be taken for 7 days test.

The test strength of the sample shall be the average the strength of the three specimen.

ACCEPTANCE CRITERIA (IS:456:2000 Clause 16)

The concrete cost shall be supposed to be acceptable in the compressive strength (i.e. average strength of the three specimen) of the samples fulfill the following requirements.

a) Every sample has a test strength not less then characteristic value.

OR

b) The strength of one or more samples, though less the characteristic value is in each case, not less then the greater of following.

i) The characteristic strength minus 1.35 times the standard deviation.

and

ii) 0.80 times the characteristics strength.

c) And the average strength of all the samples is not less than the characteristic strength plus

$$1.65 * \frac{1.65}{\text{No. of samples}} = \text{times the standard deviation}$$

d) However, it should be noted that individual variation should not be more than the percent of average.

STANDARD DEVIATION VALUES

Grade of Concrete	Assumed Standard deviation in Kg/Cm^2
M-100	35.00
M-200	46.00
M-250	53.00
M-300	80.00

CURING OF CONCRETE CUBES (IS:516:1959, CLAUSE 3.3)

The test specimen (cubes) shall be stored on the site at place free from vibration, under damp matting, sacks or other similar material for 24 hours + ½ hour from the time of adding the water to the other ingredients. The temperature of the place of storage shall be within the range of 22^o to 32^oC. After the period of 24 hours, stored in clean water at temperature of 24^o to 30^oC until those are transported to the testing laboratory. Samples shall be sent to the testing laboratory well packed in damp sand, damp sacks or other suitable material as to arrive there in a damp condition, not less than 24 hours before the time of test.

On arrival at the testing laboratory, the specimen shall be stored in water at a temperature of $27^o + 2^o$ C until the time of test. Record of the daily minimum and maximum temperature shall be kept, both during the period specimen remain on the site and in the laboratory.

TEST PROCEDURE (IS:516:1959 CLAUSE 5.5)

Specimen stored in water shall be tested immediately on removal from water and while those are still in the wet condition. Surface water and grit shall be wiped off the specimens and any projecting fins removed. Specimen, when received dry, shall be kept in water for 24 hours before taken for testing. The dimensions of the specimens to the nearest 0.2 mm and also weight shall be noted before testing.

OTHER THINGS

Here, it should be specifically noted that age of concrete cube will be age as on the date of testing i.e. time difference between addition of water to dry ingredient and actual testing.

MIX DESIGN

The following instructions shall be followed as regards preliminary design of mix and methods of batching of plain cement and reinforced cement concrete. These instructions should be treated as supplementary to the relevant provision in the specifications for the respective items contained in the book of standard specification and will be carried the provisions contained therein, wherever they are contrary to the following instructions.

The preliminary design and batching for various grades of concrete shall be governed by the following guidelines.

No.	Concrete Grade	Guidelines
1	Upto M-150	This should only be ordinarily concrete. No change may be prescribed in the present practice as regards preliminary design of mix and permitting volume batching.
2.	M-200 to M-250	Preliminary mix design must be carried out for these mixes. However, weigh batching shall be insisted for cement, fine aggregate and course aggregate.
3.	Above M-250	Preliminary mix design must be prepare for such mixes weigh batching should be for cement fine aggregate and course aggregate.

For the grades of concrete M-200 and above the preliminary mix design shall be carried out from the approved laboratory. The rate quoted by the contractor in the agreement for these items shall be final and binding on him, irrespective of content of cement required as per preliminary mix design and there shall be no adjustment in the agreement rate for these item on this account.

The charges for preliminary design of concrete mix shall be entirely borne by the contractor.

For grades of concrete M-200 and above where cement is to be used by weightment, the cost of extra cement required to make up the under weight bags shall be borne by the contractor.

For the items of concrete of grades lower than M-200 and other items in the agreement where cement is not to be used by weightment the cement bags as received from the manufacturer and shall be assumed to contain cement of 50 kg net weight.

This shall be as per specification of P.W.D. (Hand Book) and as directed by Engineer-in-charge. Only trap stone shall be used other than the specification for this item in Standard Specification Book.

(a) Proportions of concrete for types of work

i) M-100 – For leveling course and foundation of chairs and thrust blocks etc

ii) M-150 PCC with temperature nominal 0.15% reinforcement for footing thrust blocks, anchor blocks, chairs and encasing of pipes etc.

iii) M-200 PCC for water retaining structure

iv) M-300 for Construction of Jack well, Pump House & Water Retaining Structure. Such as ESR,

WTP, MBR, BPT.

v) M-250 Pump house and bridges (excluding sub-merged portion)

b) General specifications of this work shall be as per standard specification of Public Works Department, latest edition, for PCC Bd.-E1 to E-7 and for RCC Bd.F2 to F16.

c) Whenever concrete is to be laid in trenches, the trench shall be cleaned, and watered before placing. The sub-soil water which is met shall be removed and the trench shall be kept dry during and after 2 hours of placing concrete.

d) Pedestal pier shall be perpendiculars to center line of pipe.

e) Proper seat shall be left on top of pedestal pier to construct saddle. Seat shall be strictly done within 24 hours, failing which MJP will not accept it for payment

f) RCC saddle shall be constructed as per detailed drawing. The top of saddle where pipe rests shall be provided with wearing plate fixed in CM 1.3 smoothly and CM grouting may be done after pipe is placed and no extra payment will be made for this.

MODE OF MEASUREMENT AND PAYMENT.

The tender rate shall be for one cubic meter of concrete. The concrete shall be measured for its length, breadth and depth limiting dimensions to those specified in drawing or as per direction of Engineer-in-Charge.

ITEM: SPECIFICATIONS FOR MILD STEEL AND TOR STEEL REINFORCEMENT FOR RCC WORKS

The item provides for supply of mild steel, tor steel bars, cutting, bending with G.I. wire and placing in position, welding for reinforcement in the RCC.

Mild steel and tor steel bars shall confirm to Specification A-10 of Standard Specification of Public Works Department, Latest Edition.

The binding wire shall confirm to Specification A-15 of Standard Specification of Public Works Department, Latest Edition.

During contractor's supply, if any, the steel bars shall be supplied directly to the site of work.

Bending reinforcement confirm accurately to the dimensions and shapes in the details drawings (approved) or as directed by the Engineer-in-charge.

Bars shall be bend cold only. In no way bending by heat will be allowed.

Bars with kinks, bends or cracks shall not be used.

Details of length, size, laps and bending diagram shall be got approved by the Engineer-in-charge.

As far as possible full length of bars shall be placed as per drawing details. When full lengths are not available, bars be supplies only after written permission of the Engineer-in-charge. Supplies shall be staggered and in tension zone shall be avoided strictly. Bars shall be lapped as specified in IS:456-2000 with due regards to the grade of concrete. Welding may be used for large diameter of bar only after permission of Engineer-in-charge.

Welding, if permitted shall conform to specification B.10.7 of Standard Specification of Public Works Department.

All reinforcement shall be accurately placed in position with spacing and cover shown in detailed drawing and firmly held during the placing and setting of concrete. Bars shall be ties at all intersections. Binding wire of 1.63 mm or 1.22 mm diameter (about 16 or 18 gauge) shall be used. Spacing of the bars shall be maintained by means of stays, blocks ties, spacers, hangers or other approved supports at sufficient close intervals so that bars will not be displaced. During placing vibrating or compacting concrete, placing bars for reinforcement on a layer of fresh concrete as the work progress will not be permitted. The use of pieces of broken stones or bricks or wooden blocks for maintaining spacing or cover shall not be permitted. Layers of bars shall be separated by precast cement blocks, spacer bars or other devices.

Full details of numbers, sizes, lengths, weights, laps, welds, spacing of bars placed in position in different parts of the work shall be recorded by the contractor and certified and signed by the Engineer-in-charge or his representative to show that all reinforcement has been placed correctly as

per sanctioned drawing or as directed by the Engineer-in-charge in writing, before placing concrete. No concrete shall be placed in position until the certified the correctness of reinforcement, recording the steel measurements and has given permission in writing to place concrete. After approval of reinforcement as above, it will be the contractor's responsibility to seal that the spacing of reinforcement and arrangements are not tampered with in any way before or during concreting.

Any steel is required to be procured by Contractor. He shall produce the test certificate. In addition, actual test shall be carried out according to IS:432-1982, in an Government laboratory and the cost of test shall be borne by the contractor, including all transport, etc.

This item includes,....

a) Cost of labour, materials, use of tools, plant and tackle and other incidental items to complete the work satisfactorily.

b) Supplying, conveying, cleaning, cutting, bending, binding with (1.63 mm or 1.22 mm diameter – 16 to 18 gauge) wire on spot, welding and placing reinforcement in position and maintaining it clean and in position till the concrete is laid.

c) Cost of sampling and testing, as required.

In no case, any foreign material e.g. oil, grease, etc. which prevent bonding between steel and concrete shall remain on steel on steel bars during placing of concrete.

MODE OF MEASUREMENT AND PAYMENT

The tender rate shall be on weight basis for MT of MS/tor steel reinforcement. The weight of steel reinforcement used for the item of concrete will be measured in tonnes based on total compacted weight for the sizes and lengths of bars as shown in drawing or as directed by Engineer-in-charge.

The lengths of the bars shall be measured correct to 2 places of decimals of meters. The weights for payments shall be calculated according to standard weights mentioned in the ISI Hand Book correct upto 0.10 Kg.

ITEM: Dewatering the excavated trenches and pools of water...as directed.

The item shall comply as per standard specification No.Bd-A-9, on page No. 261.

This item is provided for Dewatering during excavation of entire work when it is not possible to bail out the water manually, the item includes all machinery, fuel, labour etc. The contractors shall provide all dewatering pumps, engines and machinery required to keep the trenches dry laying sewer lines, drains or foundations and all other excavations shall be clear of water, whether sub-soil water, storm water leakage from tanks, wells drains, sewers water, mains, tide water etc. so that there may be no accumulations of such water. And that no setting out may be done the pumping shall be continued so long after execution of any portion of work and repeated so after as the Engineer-in-charge may determine to be sufficient at any particular time, or he may himself supply pumps and power at contractor expenses, so he may stop the work all together until he is satisfied and also impose a fine upon the contractor. It is the contractor's responsibility to keep dewatering machinery in up to date working condition to keep the trenches dry for laying pipes or for placing the concrete.

Mode of Payment :-

Mode of Payment:-

25% payment will be released after completion of 50% work & remaining 75% shall be made after completion of Work, in a zone. The necessary documents shall be submitted by the agency The provision of dewatering is on lumpsum basis for whole items of the sub work No.1 to be executed. However the payment will be made, in proportionate with the quantity of work executed. No extra payment will be made if quantity of items is increased. Maximum quantity of dewatering will be considered hot trunk sewer line in nalla bed and rest of the quantity will be considered for laterals, as directed by Engineer-in-charge.

ITEM: **Refilling The trenches with available excavated stuff with soft material.....etc. complete.**

The item shall be done as per standard specification No. Bd-A-10, Page No.263

After lowering, laying, jointing and welding of pipe line, site gunitting and concreting work, refilling of trenches with available excavated stuff shall be done

For beding only approved quality of excavated materials from trenches shall be used. Beding shall be done before laying of pipe line to the desired grade as directed by Engineer-in-charge.

For refilling purpose, approved excavated stuff shall only be used. The refilling shall be done in layers of 15 to 20 cms. Each layers should be watered and compacted properly before the upper

layer is laid till the required level is reached. First 2 layers of 15 to 20 cms shall be free from stones or chips or any harmful material, to protect the pipe from damage. Only soil or soft murum shall be used for filling. Originally filling shall be done 30 to 40 cms above natural ground or road level. Sinking below the road or ground level, if noticed till the completion of work, the contractor shall have to make it level at his cost.

This item includes,..

a) Clearing useful excavated material of rubbish bracking clods, stone, etc.

b) Conveying the useful excavated material upto 500 M and filling in layers, watering and compacting.

c) All labour, equipment and other arrangements necessary for the satisfactory completion and completion of the item.

After water tightness test etc. the trench shall be refilled in layers and shall be rammed manually. The filling shall be kept above ground level for subsequent settlement. In the case of trench in rock, cushioning from approved excavated materials shall be provided at sides and 0.30 m. on top of pipe line by manually to avoid the damages to the laid pipes. The item includes free lead of 50 meters for actual operation. After refilling of trenches, it shall be watered and compacted satisfactory by the roller as directed by Engineer-in-charge.

The contractor shall have to cart the selected excavated stuff from site of work to any other site for refilling as per requirements as directed. The payment shall be made to contractor under relevant item No.11 for disposal in Schedule 'B'

Mode of Payment :-

The payment of refilling shall be made to the contractor only after completion of water tightness satisfactory test etc. of the pipe line. The measurement of work shall be taken in cubic meter up two place of decimals. Mode of measurement and payment of the rate shall be for a unit of 1 Cum of compacted trench filling with approved excavated material.

The measurement shall be net for the compacted filing and no deduction for shrinkage or voids shall be made. However, deduction for pipe volume will be made. Depth of filling for measurement will be limited from natural ground level only. No payment will be made for filling for 30 to 40 cms above natural ground level, if so insisted by the Engineer-in-charge.

Surplus excavated material is the property of Municipal Council. So contractor is not empowered to sell this excavated material to any other agency.

This disposal will not be considered for initial 500 M lead from edge of pipe line trenches and so will not be paid for.

The material shall be conveyed by means of suitable devices/manner.

The material conveyed to the place of disposal shall either be stocked or spread as directed by Engineer-in-charge or his representative.

The route opening and maintenance, payment of any royalties, compensation to land owners and for damaged of any etc. during the process of conveyance etc. shall be the entire responsibility of the contractor.

10% amount will be withheld till satisfactory hydraulic testing of pipe line.

90 % payment s made after completion of lowering ,laying and remaining 10% amount will be withheld till satisfactory hydraulic testing of pipe line is given.

ITEM: Filling in plinth and floors/trenches with contractor's murum.....etc. complete.

For beding, only murum brought from outside as approved by Engineer-in-charge. Shall be used. Beding shall be done before laying of pipes to the desired grade, line and level with necessary watering and compaction etc. complete. This shall be executed when B.C. Soil and hard rock met at the bottom of trench for certain length. The filling in trench around the pipes and 0.30 m on top of pipe line shall be done in B.C. Soil and rock as directed. The item includes lead beyond 0.50 kms. And lift as required.

If the approved quality of murum is available within 5 Kms. Lead at any of work, the same shall be used for beding and refilling as directed by Engineer-in-charge. The payment shall be made as per relevant item No.11 of disposal in Schedule 'B' this can be possible only, if the execution of work is done simultaneously at more site.

Item No. 11:- Open timbering in trench .....etc. complete. &providing and fixing approved type of shoring .....etc. complete.

Open timbering in trench …….etc. complete.

Providing and fixing approved type of shoring …….etc. complete.

The item shall comply as per relevant item of Schedule 'B' as per standard specification of latest Edition of Red Book and N.B.O. Item No.4, 15 page No. 59. This item shall be executed with prior permission of Superintending Engineer.

When the depth of trench required to be excavated is more than 1.5 M. and the strata met with is unstable, timbering of trenches shall be done to prevent caving or collapse of side walls. Precautions to prevent extensive caving shall be adopted for minimizing danger when the depths exceed 1.5 m as stated above. Only in such cases, the timbering shall be done from top to bottom of the trench.

The sheeting and the other members like polling Boards, struts walling shall be strong enough to withstand against the soil pressure. Timbering shall be done only at the required places. The location of timbering is required to be carried out shall necessarily be approved and finalized by competent authority. Timbering unnecessary provided shall not be measured and paid for. The contractor shall take photographs of timbering work done by him at his own cost and shall be submitted to the Department from time to time.

Shoring :-

Wherever shoring may deemed necessary by the Engineer-in-charge the contractor shall provide the same in the best possible manner with the best materials and to the satisfaction of the Engineer-in-charge. The contractor shall employ such kinds or kinds of shoring as the Engineer-in-charge any consider the exigencies of the work of require and it is to be distinctly understood that the work „shoring is to comprise all clauses of such work and all appliances and appurtenances including polling boards, sheet piling of runners (Whether the joints be butt, groove and tongue, feather edge and groove, birds mouth and double splay, rebated or otherwise), together with walling struts prop, point blank shores, blocks, wedges, iron dog, bolts, screws, nails and everything that may be required for due execution of the work. No part of the shoring shall at any time be removed by the contractor without obtaining permission from the Engineer-in-charge. While taking out shoring plank the hollows if any, formed must simultaneously be filed in with of earth well rammed with rammers and with water.

Shoring left in trenches :-

The Engineer-in-charge may order portions of shoring to be left in the trenches at such places, where it is found absolutely necessary to do so as to avoid any damages which may be caused to building cables, gas-mains water mains, sewers etc. in close proximity of the excavation, by pulling out the shoring from the excavations. No extra payment shall be made to the contractor on account of shoring left in trench.

Engineer-in-charge may put up or improve shoring :-

In the event of the contractors not complying with the provisions of this contract in respect of shoring, already put up or adopt such other measures as he may deem necessary and all the cost of such procedures adopted by the Engineer-in-charge shall be borne by the contractor.

Liability for Timbering :-

a) No work done by the Engineer-in-charge or his workmen for the fact that the timbering has complied with his specification shall absolve the contractor from his responsibility and he will be responsible for making good any damage caused as a result of the timbering failing to give proper support to the sides of the Excavation.

b) The timbering to the sides of excavation for structures shall be carried out in such a way that there is no obstruction caused to the work. The supporting struts and walling shall be removed by the contractor in stages to suit the progress of work.

c) If the Engineer-in-charge is not satisfied that the standard of timbering is equal to that the sides of the excavation have not been secured in a manner to render such excavating safe for working, he may, one hour after notifying the contractor or his representative in writing, employ his own men to alter the timbering and the cost of such workman and materials employed shall be paid for by the contractors.

Contractor's responsibility for secure shoring and or all damages :-

The contractors will be held responsible for providing secure shoring and for adopting every other precaution which may be necessary or proper for protecting and building which may be damaged or be liable to damage by the excavation of any trench or otherwise by the excavation of the works in

the vicinity of such building. If the Engineer-in-charge shall require the adoption of any special or extra measures or precautions the contractors shall forth with adopt & supply the same but this proportion is not to be read or understood as in any degree of relieving the contractors from responsibility or from liability under relevant clause contract, in respect of claims made against the department by for loss or damage which may be caused to any such building by the excavation of any of the works or otherwise. After the work is completed near buildings, the contractors shall remove any shoring and make good any cutting out or other damage that may have been done..

Mode of Payment :-

The item shall be measured and paid for on square meter basis. The area shall be calculated by considering the length and height of open timbering and shoring provided for each side of trench separately. The timbering shall be paid to the extent of 85% only after its objective of protecting the excavation till the lowering, laying, jointing, testing of the sewer line is completed and the section is refilled. 15% payment shall be made after the zone

Item No……. :- Providing and constructing B.B. Masonry circular Manhole chamber…….etc. completed.

Providing and constructing B.B. Masonry circular Manhole chamber…….etc. completed.

The item includes excavation in all types of strata for all lifts, P.C.C. for foundation in M-150 grade of various thickness B.B. Masonry in 1:3 proportion of various thickness ranging from 23 cm to 46 cm as per type design, R.C.C. slab in M-150 grade including cost of reinforcement, 20 mm thick cement plaster in two coats in C.M. 1:3 proportion from inside and outside, top C.C. coping in – 150 grade (1:2:4) providing and fixing C.I. Dapuri steps or P.V.C. coated of approved make steps at 0.30 m c/c, refilling, disposal of surplus excavated stuff up to 5 Kms. Lead including curing, testing etc. complete as directed.

Following specifications contained in standard specifications book (Red Book) shall apply.

i)	Excavation in all type of strata.	Bd-A-1 to A-6 on Page No. 259
ii)	P.C.C. 1:2:4 (M-50 grade)	Bd-E-1 Page No. 287
iii)	R.C.C. Work such as slab etc.	Bd-G-1 Page No. 313
iv)	R.C.C. work such as slab etc.	Bd-F-3,22,23 & 24 on Page No. 282,292 & 293.
v)	Reinforcement	Bd-F-17 Page No. 306

vi)	20mm thick cement plaster in C.M. 1:3	Bd-L-5 Page No. 368
vii)	Refilling.	Bd-A-10 Page No. 263

Slab shall be provided at intermediate stage as per type drawing. The intermediate slab is to be cast in situ. The reinforcement in this slab is expected to be around 1% of concrete volume and design of reinforcement shall be given by contractor and got approved by Executive Engineer. The frame and cover for the top slab (Manhole) should be of Steel Fibber Reinforced Concrete (S.F.R.C.) of Bharat, Pratibha and K.K. Technology. The brochure of S.F.R.C. frame and cover shall be submitted by the contractor and got approved from Engineer-in-charge. The frame and cover shall be branded with the letter 'A.M.C.'

Kiln burnt bricks for manhole of approved quality only be used and shall be got approved from Engineer-in-charge. The samples of bricks shall be tested as per I.S. for various test in Government Engineering College. The testing certificate shall be produced by the contractor at his own cost. No. extra payment shall be made to the contractor on account of testing including transportation of samples etc. All the materials such as cement, bricks, aggregate, frame and cover, steps etc. shall be brought at the site of work at the cost of contractor.

The detailed specification for materials such as cement, fine and coarse aggregate and others shall be referred as per specification of I. No. (3) as mentioned in this tender.

The manhole than they have been raised above the highest subsoil water level expected in the monsoon shall similarly tested for water tight as far the pipe lines. The procedure for testing shall be as follows.

The mouths of all pipes entering the manhole shall be suitably plugged with bricks, wooden or any other types of plug. The manhole under test shall then be filled with water up to the general subsoil water level and observe for and period of one hour. If the level dose not drop by more than 50 mm in one hour, it shall be assumed that the manholes is watertight.

During the period of test, the outside trench shall be kept free from any accumulation of subsoil water. In case of a drop of more than 50 mm in water level, the contractor shall note the places from where the leakage's taking places and take step to stop the leakage's satisfactory.

All manholes shall be tested for water tightness in all conditions by adopting the procedure as mentioned above. The manholes shall be cleared of all debris etc. and shall be thoroughly cleaned.

No utility services such as cable, pipe line etc. shall be allowed to remain inside the manhole. Care should be taken to shift the same outside the manhole with the cost or contractor.

The type design/drawing or various types, sizes and depth of manhole is attached herewith. In case of any discrepancy between the drawing and specification the decision of Engineer-in-charge shall be final and binding on the contractor. The rate given in Schedule 'B' is for particular depth. The Depth of chamber is the height of masonry as shown in the type design. For the purpose of measurement the top of bottom P.C.C. to the top of slab/cover as shown in the drawing shall be considered.

During course of execution any manhole chamber/cover damaged due to whatever may be the reason shall be made good by the contractor at his own cost. This shall be applicable till scheme is commissioned. After execution if it is found that manhole chamber level is not matching with the road level that shall be matched by the contractor at his own cost.

Mode of payment:-

90% payment after completion of construction work and 10% after hydraulic testing of manhole.

ITEM: **Providing, lowering, laying and jointing S.W. pipe.....etc. complete.**

Drop arrangement shall be provided 0.80 m. height in manholes for R.C.C. pipes sewer line. S.W. pipes property connections etc. of diameter various from 150 to 300 mm. It is necessary to avoid splashing of sewerage on the man working in manhole. Through the manhole and the drops arrangement are separate item, the combined structure shall be homogeneous and bound to each other. The junction or joint of S.W. pipe for drop arrangement at manhole shall be done watertight in C.M. 1:1 with hardcrete. Stone ware pipes and specials shall be provided per standard specification No. Bd-V-39, Page No. 573 and latest I.S. Edition.

The stone ware pipes and specials of various diameters shall be got approved from Engineer-in-charge. The contractor shall submit the certificate of testing to the department at his own cost.

The item includes providing and fixing S.W. Pipe of required diameter double junction Tee, right angles bend, blank flange cap with chain etc. at the site of work. After fixing in proper position, the joints of S.W. Pipes and specials shall be filled with spunyarn in C.M.1:1 with Hardcrete the open mouth of double tee junction shall be plugged so as to make the watertight. The cap with chain shall be provided to inner portion of S.W. pipe in manhole. If there is any discrepancy in the enclosed drawing and the specification, the decision of Engineer-in-charge. Shall be final and binding on the contractor. The items shall be measured and paid for on meter basis. The depth of drop arrangement

shall be measurable from invert of branch sewer to invert of main sewer. For excavation of pipe line trenches all the conditions under relevant item no. 2. will be followed.

No Extra payment for excavation refilling, disposing etc. for drop arrangement shall be made to the contractor, it means the work of drop arrangement shall made

during the construction of manhole etc. for encasing in M-150 the S.W. drop arrangement shall be made as relevant items of schedule 'B' to the contractor.

1 Applicable code:

The laying of GSW pipes and fittings / specials shall comply with all currently applicable statutes, regulations, standards and codes. In particular the following standards, unless otherwise specified herein, shall be referred. In all cases, the latest revision of the standards/codes shall be referred to. Other IS: Codes not specifically mentioned here but pertaining to the use of GSW pipes, fittings & specials shall be part of this Specification.

Table No.1

I.S. Number	Title
IS: 651-2007	Code for salt glazed stoneware pipes and fittings
IS: 4127-1983	Code of practice for laying of glazed stoneware pipes

2 Glazed stone ware pipes and fittings:

Class of pipes based on crushing strength of the pipes GSW pipes are classified as under:-

Table No. 2
(Refer Clause 7.6 IS 651-2007)

Internal Diameter	**Class**		
mm	**SP 1 KN/m**	**SP 2 KN/m**	**SP3 KN/m**
Up to 150	16	18	21
200-300	16	21	24

2.2 The length of barrel of straight and tapers of pipes and half section channels (excluding the internal depth of the socket) shall be 600 mm ,750 mm, 900 mm and 1000 mm.

2.3 The length of junction shall be 600 mm, 750 mm, or 900 mm.

2.4 The permissible tolerance on length shall be within -1.5 % and + 4 % of length.

2.5 The maximum permissible deviation from straightness of the barrel of the pipe, measured on the inside of the curve and tested by means of a straight edge, shall be 1 % of length of the pipe.

2.6 The interior and exterior surfaces of the pipes and fittings which remain exposed after jointing are glazed. The portion which remains covered after jointing may or may not be glazed.

2.7 Hydraulic test, absorption test, test for acid resistant, Test for alkali resistant and crushing strength test shall be carried out as provided in clause 7 of the IS: 651: 2007

2.8 A right hand fittings is such that when viewed from the spigot towards the socket, the arm of a junction or the socket of a bend projects to the right.

2.9 A left hand fittings is such that when viewed from the spigot towards the socket, the arm of a junction or the socket projects to the left.

2.10 All pipes and fittings should be sound and free from visible defect.

2.11 The glazed of pipes and fittings shall be free from crazing.

2.12 The pipes and fittings shall give a sharp clear sound when struck with a light

hammer.

2.13 Dimensions of barrels and sockets shall be as under:

Table No.- 3 (in mm)
(Refer Table No.-1 IS 651-2007)

S. No.	Internal Diameter	Class	Mean Thickness of Barrel and of socket	Internal depth of socket	Excess shoulder Measurement	Length of Grooving of spigot
			Min	Min	Min	Min
1	2	3	4	5	6	7
I)	100	SP1	12	50	10	75
		SP2	14	55	11	82.5
		SP3	18	60	14	90
II)	150	SP1	15	57	11	85.5
		SP2	16	60	12	90
		SP3	20	62	12	93
III)	200	SP1	16	63	12	94.5
		SP2	18	65	13	97.5
		SP3	22	68	15	102
IV)	230	SP1	19	63	12	94.5
		SP2	21	65	14	97.5
		SP3	24	68	16	102
(V)	250	SP1	20	70	16	105
		SP2	22	66	17	99
		SP3	26	69	18	103.5
(VI)	300	SP1	25	70	16	105
		SP2	24	72	18	108
		SP3	28	74	19	111

3. Marking of pipes and fittings:

3.1 Every pipe and fittings shall have legibly impressed upon it before firing the following:

a) Name or trade-mark of the manufacturer,

b) Size (Internal dia),

c) Class of pipe.

3.2 Each pipe and fittings may also be marked with the standard mark (ISI Marked).

4 Pipes and fittings:

4.1 The internal diameter of barrels of straight pipes, junctions and bends of size 100mm to 300mm shall be as per table 9.2.

4.2 The internal diameter of the barrels of straight pipes for pipes of 100 mm to 350 mm shall be within ±3 % of the diameter.

4.3 The mean thickness of the barrel and the socket of the pipes junctions and bends shall not be less than mean thickness given in col 4 of Table 1 of IS:651 : 2007. Such mean thickness of the barrel or sockets of any individual pipe junctions and bends shall be scertained by making several minimum 4

measurements and adding the measured minimum thickness (not in the groove) to the maximum thickness and dividing the sum by two. The mean thickness of the barrel and socket shall be determined separately.

4.4 The difference between the minimum and maximum measured thickness of barrel and sockets mentioned in para 11.4.2 shall not exceed ±3 % (in mm) for 100-350 mm diameter of pipes.

4.5 Tolerance on angles of bends shall be within ±3º.

4.6 Socket

4.6.1 The interior of the socket shall be conical, having a minimum taper of 1 mm,

measured on the diameter, per 15 mm length, thus the diameter of a socket 50

mm deep will be at least 3 mm greater at the top than at the bottom. The depth

of the sockets shall be in accordance with as given in Table 11.2.

4.6.2 The width of the shoulder of socket of any individual pipe or fitting shall exceed

the mean thickness of the barrel by not less than the values given in Table 2. If rubber ring joints are used, taper may not be provided.

4.7 Grooving:-

4.7.1 The interior of the socket and exterior of the spigots shall be grooved circumferentially, and such grooving on the spigot shall be for a length equal to one and half times the depth of sockets, and the depth of such grooves shall be between 1 mm to 2.5 mm. If rubber ring joints are used, as agreed to between the manufacturer and the buyer, grooving may not be provided.

4.8 Bends :-

4.8.1 Dimensions of bends shall be in accordance with tables 2 to 6 of IS: 651:2007.

4.8.2 The barrel and branches of half section channel junctions may be of any of the diameters shown in col.2 of table 9.2. But the diameter of the branches shall not exceed that of the barrel diameter. The angle at junction shall be 45º ±3º or 90º ±3º.

4.8.3 The taper pipes and half section tapers channels may be in any normal combination of diameter and lengths.

5 Loading and Unloading

At every point of loading or unloading, pipes or casting must be handled by approved lifting tackles. Unloading by rolling down planks or any other form of inclined ramp will not be allowed unless the written consent of the engineer to the method proposed has been obtained. Pipes are to be carefully stacked on site with timber packing under and between the pipes. The pipes are to be laid up at the gradients beginning at the lower end. No pipe is to be laid until the trench has been excavated to its required depth for a distance of 20m, in front of the pipe to be laid. (this distance may very as directed by the Engineer.

6. Laying

6.1 Handling of Stoneware pipes into Trench in shallow trenches manual handling is enough, but in deep trenches they should be lowered into the trench by means of ropes. Under no circumstances shall the pipes be dropped or dumped into the trench.

6.2 Detection of Cracks in pipes and fittings: The pipe and fittings shall be inspected for defects, and be rung with a light hammer preferably while suspended to detect cracks.

6.3 Cleaning pipes and fittings: All lumps, blisters and excess coating material shall

be removed gently from the socket and spigot end of each pipe and the outside of the spigot and the inside of the socket shall be wiped clean and dry before the pipe is laid.

6.4 Placing the pipes in Trench: Every precaution shall be taken to prevent foreign

materials from entering the pipes when it is being placed in the line. Normally the socket ends should face the up-stream. When the line runs uphill the socket ends should face the up-grade.

6.5 After placing a length of pipe in the trench on concrete bedding where that is specified, the spigot end shall be centered in the socket and the pipe forced home and aligned to gradient. The pipe shall be secured in place with approved backfill material or concrete tamped under it except at the socket. Pipe and fittings which do not allow a sufficient and uniform space for joints shall be removed and replaced with pipe and fittings of proper dimensions to ensure such uniform space. Precautions shall be taken to prevent dirt from entering the joint space (see Drawing No.-8).

6.6 At time when pipe laying is not in progress, the open ends of pipe shall be closed by a watertight plug or canvas or other means approved by the site engineer.

6.7 Sight rails shall be provided at all changes of directions or gradients at distances of about 30 m along straight lengths. The centre line shall be marked on each horizontal rail which is fixed at true level. All inverts shall be laid there from with the help of proper boning rods.

6.8 Cutting of pipes: The cutting of pipe for inserting, fittings or closure pieces shall be done in a neat and workmanlike manner without damage to the pipe or cement lining so as to leave smooth and at right angles to the axis of the pipe.

6.9 Pipelines Crossing Railway Lines: Irrigation channels or similar works the administrative authority should consult the appropriate authorities before preparing plans and specification for this part of work.

6.10 Connection to an Existing sewer: The connection to an existing sewer shall be done through manholes.

6.11 Connection to manholes: Before connecting a pipe to a manhole, a relieving arch or any other similar protection device should be made in the manhole for the safety of the pipe.

6.12 Strength and loading of stone ware pipes : The superimposed load should not normally exceed 1600 kg per meter length, which is the minimum crushing strength specified in IS: 651. The superimposed load on a laid pipe may be $W = C\ w\ B^2$

Where

W= Load on pipe in kilogram/linear meter.

C= coefficient which depends upon the ratio of depth of trench to the trench width

11.3.

W= weight of filling materials in kg/m^3 given in table 11.4.

B= width of trench in meters.

Table 11.3

Value of 'C'

Ratio of Depth to Trench Width	Sand And Damp Top- Soil	Saturated Topsoil	Damp Clay	Saturated Clay
1	2	3	4	5
0.5	0.46	0.46	0.47	0.47
1.0	0.85	0.86	0.88	0.90
1.5	1.18	1.21	1.24	1.28
2.0	1.46	1.50	1.56	1.62
2.5	1.70	1.76	1.84	1.92
3.0	1.90	1.98	2.08	2.20
3.5	2.08	2.17	2.30	2.44
4.00	2.22	2.83	2.49	2.66
4.5	2.34	2.47	2.65	2.87
5.0	2.45	2.59	2.80	3.03

WEIGHT OF COMMON FILLING MATERIALS

Table 4

Material	**Weight Kg/m³**
Dry sand	1600
Ordinary (damp) sand	1840
Wet Sand	1920
Damp clay	1920
Saturated clay	2080
Saturated topsoil	1840
Sand and damp soil	1600

11.7 Jointing:

7.1 The stoneware pipes shall be cement jointed or provided with bituminous.

7.2 The materials shall consist of the following.

(a) Spun yarn or tarred gaskets.

(b) Cement.

(c) Sand

7.3. In each joint, spun yarn soaked in neat cement slurry or tarred gasket shall be passed round the joint and inserted in it by means of a caulking tool. More yarn or gasket shall be added if necessary

and shall be well caulked. Yarn or gasket so rammed shall not occupy more then one fourth of the depth of socket.

7.4 Cement mortar (1:1) (one part of cement to one part of sand) shall be slightly moistened and carefully inserted by hand into the remaining space of the joint after caulking of yarn or gasket. The mortar shall than be caulked into the joint with a caulking tool. More cement mortar shall be added until the joint space has been completely filled with tightly caulked mortar. The joint shall then be finished off neatly outside the socket at an angle of 45 degrees (IS 4127-1983)

7.5 The cement mortar joints shall be cured at least for seven days before testing.

7.6 The approximate quantity of cement and spun yarn required for each joint for certain common sizes of pipes are given below for guidance.

Table 5

Nominal Dia of Pipe mm	Cement Kg	Spun Yarn Kg
100	1	0.25
150	1.5	0.35
200	2	0.70
250	2.5	0.80
300	3.25	1.10
350	4.5	1.25
400	5.5	1.50

7.7 The joint with cast iron or concrete pipes shall be made with cement joints.

8 Testing:

8.1 Each section of sewer shall be tested for water tightness preferably between manholes.

8.2 Before commencing the hydraulic test the pipelines shall be filled with water for about a week before commencing the application of pressure to allow for the absorption by pipe wall.

8.3 The sewers are tested by plugging the upper end with a provision for an air out let pipe with stopcock. The water is filled through a funnel connected at the lower end provided with a plug. After the air has expelled through the air out let, the stop cock is closed and water level in the funnel is noted after 30 minutes and gravity of water required to restore the original water level is determined. The pipe line under pressure is then inspected while the funnel is still in position. There shall be no any leaks in the pipe or joints (small sweating on the pipe surface is permitted).

8.4 Any sewer or part there of that does not meet the test shall be emptied and

repaired or re-laid as required and tested again..

8.5 The leakage of quantity of water to be supplied to maintain the test pressure during the period of 10 minutes shall not exceed 0.2 liters/mm dia. of pipe per kilometer length per day.

8.6 It should be done as per clause 7.1.5 of CPHEEO manual on sewerage and sewage treatment.

9 Refilling:

9.1 No trench shall be filled in unless the sewer stretches have been tested and approved for water tightness of joints. However partial filling may be done keeping the joints open to avoid disturbance. Soft material screened free from stones or hard substances shall first be used and hand pressured under and around the pipes to half their height.

9.2 Similarly soft material shall be put up to a height of 30cm above top of pipe and then this will be moistened with water and well rammed. The reminder of the

trench can be filled with hard material, in stages, each not exceeding 60 cm. At each stage the filling shall be well rammed, consolidated and completely saturated with water and then only further filling shall be continued. It should be done as per procedure given in clause 7.1.9 of CPHEEO manual on sewerage and sewage treatment.

10 **Measurement:**

10.1 The mode of payment shall be as per the running meter of the pipes provided, laid, lowered and jointed. Retention money for testing to be kept at 10% of Urban Administration & Development Department Page 135 valve of items of work. After satisfactory test of the complete system to the satisfaction of the site Engineer.

11 Rates :

11.1 The rate shall include the cost of the material and labour involved in all the

operation described in the item on running meter basis.

ITEM: Providing and constructing 100 mm dia. C.I. Pipe ventilator…….etc. complete.

The item is provided for escape and ventilation of the gasses formed in the system. This is includes required excavation in any strata in all lift, providing, laying, erecting and jointing 100 mm dia C.I. soil vent pipe of length 6 m. providing P.C.C. 1:2:4 base at bed and block/of size cement concrete in M-150 size grade 0.45 x 0.45 x 2.00 m. height as shown in the drawing attached, 12 mm thick plaster in C.M. 1:3 proportion shall be provided to the concrete block. The item also includes

providing and fixing wire gauge dome vent pipe. In case of any discrepancy in drawing and the specification, the decision of Engineer-in-charge shall be final and binding on the contractor. The location shall be given by the Engineer and the item shall be paid on number basis.

ITEM: Providing and making all necessary arrangement for property connection.....etc. complete.

The item shall comply as per relevant item of Schedule 'B' specification as below.

Sr. No.	Description of Items	Reference to Specification
1.	Providing, Lowering, Laying and Jointing 150 mm dia S.W. Pipe .....etc. complete	Specification No. Bd-V39 P.No.573 Latest Edition.
2.	Excavation in all types of strata.....etc. complete.	Specification No.Bd-A1,A2,A3,A4,A6, P.No. 259 and Latest Edition
3.	Providing and laying in situ C.C. M-150 (1:2:4) for encasing the pipe line.....etc. complete.	Specification No. Bd-E1 P.No.287 Latest Edition
4.	Refilling the trench.....etc. complete.	Specification No. Bd-A10, P.No.263 Latest Edition
5.	Disposal of surplus excavated stuff.....etc. complete.	Specification shall be adopted as per relevant item No. 13 of Schedule 'B'
6.	Providing and constructing of B.B. Masonry chamber.....etc. complete.	As per relevant item of schedule 'B' and as directed by Engineer-in-charge,

The location of property connection shall be as per site condition and as per direction of Engineer-in-charge.

The samples of materials such as cement, sand aggregate, bricks shall be tested in laboratory of Government College of Engineering for necessary test and certificate of testing shall be submitted to the department by the contractor at his own cost. The certificate of testing of S.W. pipe shall also be submitted by the contractor at his cost.

The joints of S.W. pipes shall be filled by providing spun yarn, cement mortar 1:1 with hardcrete for water tightness. The chamber shall be cleaned from all debris etc.

and shall be thoroughly cleaned. No utility services such as cables, pipe line etc. should be allowed to

remain inside the chamber care should be taken to shift the same outside the chamber.

The water tightness test for S.W. pipe line and chamber shall be given by plugging the mouth of pipes entering the manhole with the help of bricks etc. during the testing, the outside trench shall be kept free from any accumulation. In case of a drop in water level. The contractor shall note the places from where the leakage's taking places and take step to stop the leakage satisfactory. No extra payment for excavation, refilling, disposing shall be allowed for drop arrangement work.

The S.W. Pipe shall be laid from property chamber to manhole, for whatever may be the length of pipe, with encasing of concrete in M-150. The location of property connection shall be as per the direction of Engineer-in-charge. Contractor shall not construct the chamber without permission from the Engineer-in-charge. The depth of S.W. Pipe line shall be as per site condition, with proper grade and alignment and as directed by Engineer-in-charge.

All property chambers shall be tested for water tightness test. The frame and cover for property chamber should be of fiber reinforced concrete (SFRC) of Bharat, Pratibha & KK Technology. The testing certificate should be submitted by the contractor & got approved from Engineer in charge . The frame and cover shall be branded with letter M.N.P.

ITEM: **Reinstating the road surface, includes**

a) Providing and laying Water Bound Macadam road……..etc. complete.

b) Providing and laying hot mix hot laid per mix carpet……etc. complete.

c) obtaining necessary permission & necessary deposits t contractors cost.

The item shall comply as per relevant item of Schedule 'B' and as per the detailed specifications given as under.

Sr. No.	Description of Item	Reference of Red Book
1.	Excavation for roadway in earth soil of all sorts, sand gravel or soft murum …….etc. complete.	Specification No. Rd.-2,P.No.180
2.	Supplying 80 mm trap / granite / quartzite /gneiss stone metal……..etc. complete.	Specification No. Rd.-19,P.No.197
3.	Supplying 40 mm trap / granite / quartzite / gneiss stone size metal ..etc. complete.	Specification No. Rd.-22,P.No.201
4.	Supplying hard murum at the road side ……etc. complete.	Specification No. Rd.-23,P.No.202

5.	Supplying soft murum at the road side.....etc. complete.	Specification No. Rd.-24,P.No.203
6.	Spreading 50 mm / 60 mm / 80 mm metal .....etc. complete.	Specification No. Rd.-29 A, P. No. 205.
7.	Spreading 40 mm metal including sectioning complete.	Specification No. Rd.-29 A, P.No. 205
8.	Spreading gravel / sand / soft murum / hard murum / over rubble soling/WBM surface complete.	Specification No. Rd.-28 A, P.No. 205
9.	Compacting the sub-grade / graval oversize / metal.....etc. complete.	Specification No. Rd.-32 A, P.No. 205
10.	Compacting the sub-grade / graval / oversize / metal (100 mm loose) layers.....etc. complete.	Specification No. Rd.-35 A, P.No. 209
11.	Providing and laying hot mix hot laid premix carpet 25 mm average thickness.....etc. complete.	Specification No. MOTO 39 B.
12.	Providing and laying premix seal coat to the black topped surface.....etc. complete.	Specification No. MOTO 39 B.

Item: Repairing the damaged cables of telephone , water supply pipe lines etc during the trench excavation for sewage collecting net work. including cost of material required for repairs pipe, specials etc including excavation and refilling etc complete per km of completion of laying of sewer laterals and trunk mains .

Damages to Services :-

The work of excavation shall be proceeded very carefully by the contractor. Before actual excavation trial trenches shall be carefully taken by the contractor for assessing the services e.g. water mains, drainage lines, telephone and Electrical cables that are likely to be encountered in the excavation of pipe-line trenches. The trial trenches shall not be paid for separately. After assessing the alignment and level of other services, the contractor shall get approved the exact alignment from the Engineer and proceed with the work accordingly.

Any damages to the private and Government properties shall be reinstated by the contractor .If any damages are caused or likely to be caused, The contractor shall remove the service

connections from water mains and re-do them as directed by the Engineer-in-charge. This shall be done with least inconvenience to the connection holder and without any extra cost for any diameters

Item includes :-

3) All type of excavation for repairs of damages of telephone cables, electric lines, water mains up to 100 mm dia

4) All type of materials pipes, specials jointing materials such as C.I.D. Joints , couplers rubber rings , rubber sheet nut bolts etc up to 100 mm dia

If water mains of R.C.C./A.C./C.I./G.I./M.S./PVC/D.I. etc. of diameter more than 100 mm and above are encountered the contractor shall relay such lines to keep service continued as directed by the Engineer-in-charge, If in the opinion of the Engineer, it is possible to obviate such mains, the contractor shall realign the pipe line in tender scope as directed by the Engineer-in-charge without any compensation for the excavation discarded by the Pradhikaran.

The pipe and special required for shifting/relaying of mains shall be supplied by the Pradhikaran free of cost for dia above 100 mm if available with the Pradhikaran. If such required materials are not available with the Pradhikaran, the special materials as directed by the Engineer-in-charge shall be procured by contractor and shall be payable to him. The payment of such materials shall be regulated at mutually decided rates based on reasonable markets rates or CSR prevailing at the time whichever is less. The contractor shall procure the materials without waiting for finalization of rates in order to meet the urgency. Proper account of the materials shall be kept by contractor.

All the labour and materials charges shall be payable to the contractor only when continuous length requiring shifting / relaying of mains of dia of above 100 mm exceed 5 m. The basis for such payment shall be the rates of respective works terms covered in Schedule 'B' of the tender for the items available in the tender or rates derived from tendered rates for similar items. In case of item not covered in Schedule 'B', the prevailing C.S.R. shall be applicable. For the relaying / shifting work involving dia above 100 mm in continuous length below 5 m. no labour and material charges (except pipes and specials) shall be payable. No any material or labour charges will be paid to the contractor which damages of pipe line below 100 mm.

Mode of payment :-

The item shall be measured and paid for on kilometer length basis. The length shall be considering the actual length of sewer laterals / trunk main network completed and hydraulically tested by contractor . All the damages and repairs are carried out by contractor .

ITEM:Providing Drop Arrangement..... etc . complete

Drop arrangement shall be provided 0.80 m. height in manholes for R.C.C. pipes sewer line. S.W. pipes property connections etc. of diameter various from 150 to 300 mm. It is necessary to avoid splashing of sewerage on the man working in manhole. Through the manhole and the drops arrangement are separate item, the combined structure shall be homogeneous and bound to each other. The junction or joint of S.W. pipe for drop arrangement at manhole shall be done watertight in C.M. 1:1 with hard Crete. Stone ware pipes and specials shall be provided per standard specification No. Bd-V-39, Page No. 573 and latest I.S. Edition.

The stone ware pipes and specials of various diameters shall be got approved from Engineer-in-charge. The contractor all submit the certificate of testing to the department at his own cost.

The item includes providing and fixing S.W. Pipe of required diameter double junction Tee, right angles bend, blank flange cap with chain etc. at the site of work. After fixing in proper position, the joints of S.W. Pipes and specials shall be filled with spunyarn in C.M.1:1 with Hardcrete the open mouth of double tee junction shall be plugged so as to make the watertight. The cap with chain shall be provided to inner portion of SW. pipe in manhole. If there is any discrepancy in the enclosed drawing and the specification, the decision of Engineer-in-charge. Shall be final and binding on the contractor. The items shall be measured and paid for on meter basis. The depth of drop arrangement shall be measurable from invert of branch sewer to invert of main sewer. For excavation of pipe line trenches all the conditions under relevant item no. 2. will be followed.

No Extra payment for excavation refilling, disposing etc. for drop arrangement shall be made to the contractor, it means the work of drop arrangement shall made during the construction of manhole etc. for encasing in M-150 the S.W. drop arrangement shall be made as, relevant items of schedule 'B' to the contractor.

ITEM NO. 19 : Reinstating damaged house connection

This item shall be executed as per the description given in the schedule B of relevant item and as directed by Engineer-in-charge.

Item to include: Excavation upto 2-3 m and providing and fixing PVC/Gi pipe with necessary specials and jointing material and the water supply of same connection shall be resumed within a period of 24 hours.

Mode of measurements: The item of house connection for payment shall be recorded on No basis

after completion of work

Providing air vent

The item pertaining for providing and fixing of air vent of 80 mm dia of C.I. pipe S&s . the item includes making the hole to the chambers of required size. the pipe of 80 mm dia shall be fixed in the chamber at the upper most portion and jointing with accessories. Watertight jointing shall be done. The 80 mm dia CI pipe shall be fixed vertically 1.8 m high above the ground level with tight fixtures and care shall be taken so that no no hinderance to the traffic will be caused.the jointing of pipes and fixtures shall be CM1:2 prop and pipe shall be painted with atwo coats of anticorrosive paint. The pipe shall be fixed with concrete block of 30 x 30 x 30 cm size. The work shall be completed as per direction of engineer in charge.

Mode of measurements: The item of air vent for payment shall be recorded on Running meter basis after completion of work

Specifications for Sewage Pumping Mains

Item no. providing, lowering, laying, jointing, testing ductile iron pipes & specials

1. Scope

This specification covers the requirements for manufacturing, supplying, laying, jointing, testing and commissioning of Ductile iron pipeline and fittings including associated civil works required for the same. Reference should also made to the requirements of Part 6 where appropriate.

1.1 Standards

The following standards, specifications and codes are part of this specification. In all cases, the latest revision of the codes including all applicable official amendments and revisions shall be referred to. In case discrepancy between this specification and those referred to herein, this specification shall govern.

IS: 8329	Centrifugally Cast (spun) ductile Iron pressure pipes for water, gas and sewage.
IS: 638	Sheet rubber jointing and rubber insertion jointing.
IS: 1387	General requirements for supply of metallurgical materials.
IS: 1500	Methods for Brinell hardness test for metallic materials.
IS: 9523	Ductile Iron fittings for pressure pipes for water, gas and sewage.
IS: 12820	Dimensional requirements of rubber gaskets for mechanical joints and push on joints for use with cast iron pipes and fittings for carrying water, gas and sewage.
ISO: 4179	Ductile iron pipes for pressure and non pressure – Centrifugal cement mortar lining – General requirements.
ISO: 2531	Ductile iron pipes, fittings and accessories for pressure pipe lines.
IS: 5382	Specification for Rubber Sealing Rings for Gas Mains, Water Mains and Sewers
AWWA C600	Installation of ductile iron water mains and their appurtenances.
IS: 11906	Recommendations for cement-mortar lining for cast iron, mild steel and ductile iron pipes and fittings for transportation of water

IS: 3764	Excavation Work – code of Safety.
IS: 12288	Code of practice for use & laying of Ductile iron pipes.
IS: 460	Test sieves – Part I
IS: 8112	Specification for 43 Grade Ordinary Portland Cement.
BS: 3416	Bitumen based coatings for cold application, suitable for use in contact with potable water.
BS EN 545	Ductile iron pipes, fittings, accessories and their joints for water pipelines – Requirements and Test Methods.

Manufacturing

1.2.1 General

DI pipes and fittings (Class K9) shall be in accordance with IS 8329 and IS 9523.

Pipes and fittings shall be procured from reputed manufacturers with Engineer□s approval. Engineer shall at all reasonable times have free access to the place where the pipes and fittings are manufactured for the purpose of examining and testing the pipes and fittings and for witnessing the test and manufacturing.All tests specified either in this specification or in the relevant Indian Standards specified above shall be performed by the supplier/contractor at his own cost and in presence of Engineer if desired. For this, sufficient notice before testing of the pipes and fittings shall be given to Engineer.If the test is found unsatisfactory, Engineer may reject any or all pipes and fittings of that lot. The decision of Engineer in this matter shall be final and binding on the contractor and not subject to any arbitration or appeal.The pipes and fittings shall be stripped, with all precautions necessary to avoid warping or shrinking defects. The pipes and fittings shall be free from defects. Any defect in pipes and fittings in the opinion of Engineer shall be rejected and shall be replaced by new one.In the case of spigot and socket pipes and fittings the socket shall be without the centering ring. In the case of flanged pipes the flanges shall be at the right angles to the axis of the pipe and machined on face. The bolt-holes shall be drilled and located symmetrically off the centerline. The bolt hole circle shall be concentric with the bore and bolt holes equally spaced. The flanges shall be integrally cast with the pipes and fittings and the two flanges of the pipe shall be correctly aligned.

1.2.2 Materials

The materials used in the manufacture of pipes and fittings shall comply with requirements specified in IS8329 and IS 9523

1.2.3 Dimensions and Tolerances

The internal diameter, thickness and length of barrel, dimensions of pipes and fittings shall be as per the relevant tables of IS 8329/ IS 9523 for different class of pipes and fittings. Pipe class K9 or as per requirement, pipe nominal diameters of 450, 800 and 1000mm and standard length of 6m is recommended and other properties for pipes and fittings shall be as per IS 8329/IS9523. Each pipe supplied shall be of uniform thickness throughout its length. The tolerances for pipes and fittings regarding dimensions, mass, ovality and deviations from straight line in case of pipes shall be as per IS 8329/ IS 9523.

1.2.4 Testing

a) Mechanical Tests

Mechanical tests shall be carried out during manufacture of pipes and fittings as specified in IS 8329/IS 9523. The frequency and sampling of tests for each batch of pipes shall be in accordance with IS 8329. The test results so obtained for all the pipes and fittings of different sizes shall be submitted to Engineer. The method for tensile tests and the minimum tensile strength requirement for pipes and fittings shall be as per IS 8329/ IS 9523.

b) Brinell Hardness Test

For checking the Brinell hardness, the test shall be carried out on the test ring or bars cut from the pipes used for the ring test and tensile test in accordance with IS 1500. The test shall comply with the requirements specified in IS 1500/IS 8329.

c) Retests

If any test piece representing a lot fails in the first instance, two additional tests shall be made on test pieces selected from two other pipes from the same lot. If both the test results satisfy the specified requirements, the lot shall be accepted. Should either of these additional test pieces fail to pass the test, the lot shall be liable for rejection.

d) Hydrostatic Test

For hydrostatic test at works, the pipes and fittings shall be kept under test pressure as specified in IS 8329/ IS 9523 for a period of minimum 15 seconds, during which the pipes shall be struck moderately with 700g hammer for conformation of satisfactory sound. They shall withstand the pressure test without showing any leakage, sweating or other defect of any kind. The hydrostatic test shall be conducted before surface coating and lining.

1.2.5 Joints

a) **General**

Jointing of DI pipes and fittings shall be done as per IS 12288 and manufacturer□s recommendations. After jointing, extraneous material, if any, shall be removed from the inside of the pipe. Rubber sealing rings/gaskets used for jointing shall be of SBR or EPDM rubber and conform to IS 638, IS 12820 and IS 5382.

b) Spigot and Socket joints

These shall have sockets which are integral with the pipe and incorporate an elastomeric rubber ring gasket conforming to IS 12820.The gaskets/sealant used for joints shall be suitable for water conveyance. In jointing DI pipes and fitting, the contractor shall take into account the manufacturer□s recommendations as to the methods and equipment to be used in assembling the joints. In particular the Contractor shall ensure that the spigot end of the pipe to be jointed is smooth and has been properly chamfered, so that the rubber ring as per IS 12820 and IS 5382 is correctly positioned in line, before the joint is made. The rubber rings and any recommended lubricant shall be obtained only through the pipe supplier or as otherwise directed by the Engineer.

c) Gaskets for Flanges

The gaskets used between flanges of pipes shall be of SBR or EPDM rubber conforming to IS 638 of thickness between 1.5 to 3 mm suitable for conveyance of sewage and waste water and as specified by manufacturer.

d) Flanged joints

These shall be of PN 16 rating and shall comply with dimensions and drilling details as specified in IS 8329. these shall have isolation gaskets between the flanges, isolation sleeves around all bolts and isolation washers under all bolt heads and nuts. All material shall be supplied by a reputed manufacturer and shall be approved by the Engineer.Each bolt should be tightened a little at a time taking care to tighten diametrically opposite bolts alternatively. The recommended bolting torque to be followed for assembling flanges shall be as specified in manufacturer□s instructions. The practice of fully tightening the bolts one after another is highly undesirable. The bolts shall be of mild steel unless otherwise specified. They shall be coated with coal tar epoxy coating after tightening.

1.2.6 Coatings

a) General

Unless otherwise specified, DI pipes and fittings shall be Zinc coated with Bitumen over coating in accordance with following specifications. At buried DI pipes and fittings shall also have factory or site applied polythene sleeving. Coating shall not be applied to pipe and fittings unless its surface is clean, dry and free from rust. Pipe coatings shall be inspected at site and any damage or defective areas shall be made good to the satisfaction of the Engineer.

b) Zinc coating

Zinc coating shall comply with ISO 8179 and shall be applied as a spray coating. The mass of sprayed metal shall not be less than 130g/m3 in accordance with ISO 8179.

c) Bitumen coating

Bitumen coating shall be of normal thickness of 75 microns unless otherwise specified. It shall be a cold applied compound complying with the requirements of BS 3416 Type II, suitable for tropical climates, factory applied in accordance with the manufacturer□s instructions.Damaged areas of coating shall be repainted on site after removing any remaining loose coating and wire brushing any rusted areas of pipe.

d) Polythene Sleeving

Where polythene sleeving is specified to be applied in addition to bitumen coating above it shall comply with ISO 8180. Site applied sleeving shall be stored under cover out of direct sunlight and its exposure to sunlight shall be kept to a minimum. Pipes having a factory applied sleeving must be stored in the same conditions. Joints in the sleeving shall be properly overlapped and taped in accordance with manufacturer□s instructions to provide in continuous sleeving.

1.2.7 Cement mortar lining

All pipes and fittings shall be internally lined with cement mortar in accordance with ISO 4179/IS: 11906. Cement mortar lining shall be applied at the factory in conformance with the above mentioned standards. No admixtures in the mortar shall be used without the approval of the Engineer.Pipe linings shall be inspected on site and any damage or defective areas shall be made good to the satisfaction of the Engineer.Lining shall be uniform in thickness all along the pipe. The minimum thickness of factory applied cement mortar lining shall be 5 mm for DN 450 mm pipe; and 6 mm for DN 800/1000 mm pipes, respectively.

1.2.8 Marking

Each pipe and fitting shall have cast, stamped or indelibly painted on it the following appropriate marks:

a) The nominal diameter.

b) Class reference

c) Mass of pipe.

d) Date of manufacture and

e) Manufacturer□s name, initials or identification mark.

Marking shall be done as per IS 8329 and IS 9523.

1.2.9 Third party Inspection of the pipes is mandatory in the manufacturing unit. The test certificate shall be produced in this effect by the contractor at his own cost. The agencies performing the TPI shall be enlisted in the list of Maharashtra Jeevan Pradhikaran.

TRANSPORTATION, HANDLING AND INSPECTION.

Transportation – Pipes should be loaded in such a way that they are secured and that no movement should take place on the vehicle during transit.

The pipes should be loaded on vehicles in pyramid or straight sided information. In case of pyramid loading, the pipes in the bottom layer should be restrained by the use of broad wooden wedges secured to the vehicle being loaded. The pyramid is to be formed by resting pipes between the pairs of pieces in the preceding layer with the sockets in layers reversed. Straight sided loading may be used with supports along the sides of the vehicles. The use of straight sided loading is advantageous for utilizing full capacity of the vehicle.

Off – Loading – Cranes should be preferred for off – loading. However, for pipes up to 400 mm nominal bore, skid timbers and ropes may be used.

When using mechanical handling equipment, it is necessary to employ sufficient personnel to carry out the operation efficiently with safety. The pipes should be lifted smoothly without any jarking motion and pipe movement should be controlled by the use of guide ropes in order to prevent damage caused by pipes bumping together or against surrounding objects.

Where the crane operator does not have a clear view, he should be guided by the personnel supervising the operation. When cranes are used, the whole sequence of operation should be carried out smoothly and without snatch. Properly designed hooks and

adequate stead ropes are essential. The hooks should be of suitable shape to ensure positive engagement when entered into the ends of the pipes and then should pass over any protective packing fitted around the pipe ends.

The use of slings passed around bundles of pipes is not recommended because bundles become unstable as the sling is drawn tight or released. However, when it is necessary to use the central slinging method for lifting single pipe, a broad webbing sling is recommended which minimizes the risk of the pipe slipping. Chain slings may slip and are dangerous.

Staking – Pipes being taken to a stock ground for storage and held pending further distribution should be arranged into stacks. The first layer of pipes should be laid on a firms formations consisting of solid timers set level on the ground. Subsequent layers should be placed according to the method of staking adopted. Care should be taken so that the pipes do not rest on their sockets. The height of any stack should not exceed 2 m.

Methods adopted for staking pipes are described in above paragraph.

Square Stacking – In square stacking method, second and subsequent layers are set at right angles to the pervious layer with spigots and sockets alternating in each layer and sockets project beyond spigot end. The pipes rest directly upon those beneath it and care is needed in placing to prevent damage.

Parallel Stacking with Timbers -All the pipes are parallel with the sockets of successive layers reversed end-to-end with sockets projecting beyond spigot end.

Timber battens, placed about 600 mm from each end at right angles to the pipes, are used to separate the successive layers. Wedges at both ends of each batten prevent pipe movement.

Nested Stacking (Pyramid Stacking)–Nested stacking consist of placing each pipe between the two pipes underneath it, with the sockets being all at one end of each layer and layer should be firmly anchored to prevent the stack collapse.

Stringing – Stringing consist of placing pipes on the ground in line ready for laying. Care should be taken to prevent damage during this operation.

Pipes and fittings/specials shall be transported from the factory to the work sites at places along the alignment of pipeline as directed by Engineer and as specified by manufacturer. Contractor shall be responsible for the safety of pipes and fittings/specials in transit, loading/unloading. Every care shall be exercised in handling pipes and fitting/specials to avoid

damage. While unloading, the pipes and fittings/specials shall not be thrown down from the truck on to hard surfaces. They should be unloaded on timber skids with steadying ropes and/or by any other approved means. Padding shall be provided between coated pipes, fittings/specials and timber skids to avoid damage to the coating. Suitable gaps between pipes should be left at intervals in order to permit access from one side to the other. In case of spigot socket pipes, care should be taken regarding orientation of pipes while unloading. As far as possible pipes shall be unloaded on one side of the trench only.

The pipes shall be checked for any visible damage (such as broken edges, cracking or spalling of pipe) while unloading and shall be sorted out for replacement. Any pipe which shows damage in the opinion of Engineer shall be discarded and replaced by new one. Dragging of pipes and fitting/specials along concrete and similar pavement with hard surfaces shall be prohibited.

INSPECTION OF PIPES :-

The pipes shall be got inspected through EIL/SGS/RITES. All charges of EIL/SGS/RITES inspection shall be borne by the contractor. The testing shall be done as per relevant IS.

Mode of Payment :- On receipt of the pipe on site 85% payment shall be released and remaining 15% percent payment will be released after Laying & satisfactory hydraulic testing.

1.5 Storage

Each stack of pipes shall contain only pipes of same class and size, with consignment or batch number marked on it with particulars of suppliers wherever possible. Storage shall be done on firm level and clean ground and wedges shall be provided at bottom layer to keep the stack shall be in pyramid shape or the pipes laid length wise and crosswise in alternate layers. The pyramid stack shall be made for smaller diameter pipes for conserving space in storing them. The height of the stack shall not exceed 1.5m Fittings/specials shall be stacked under cover and separated from pipes.Rubber rings shall be stored in a clean, cool store away from windows, boiler, electrical equipment and petrol, oils or other chemicals. In the field the rubber rings shall be handled such that they are not left out on the ground in the sun or overnight under heavy frost or snow conditions.

1.6 Laying

1.6.1 Trenching

Trenching includes all excavation, which is carried out either by hand or by machine and shall be carried out in accordance with all general requirements of civil works specifications mentioned for subwork 1. In addition to those general requirements, the following requirements shall apply to pipelines:

The excavation shall be done such that it does not get far ahead of laying operations. Before excavating trench the alignment of pipeline shall be approved by Engineer. Cuttings length and other appurtenances shall be provided to suit detailed pipe configurations required.To protect persons from injury and to avoid damage to property, adequate barricades, construction signs, red lanterns and guards as required shall be placed and maintained during the progress of the construction work and until it is safe for the traffic to use the roadways. The relevant Indian standards and the rules and regulations of local authorities in regards to safety provisions shall be observed.The road metal and also the rubble packing shall first be stripped off for the whole width of the trench/pit and separately deposited in such place or places as may be determined by Contractor and approved by Engineer.

During excavation, large stones and rubble shall be separated and removed from the excavated soil and stacked separately. The material from excavation shall be deposited on either side of the trench leaving adequate clear distance from the edges of the trench and pit, or as may be necessary to prevent the sides of the trench pit to slip or fall, or at such a distance and in such a manner as to avoid covering fire hydrants, sluice valves, manholes covers etc. and so as to avoid abutting the wall or structure or causing inconvenience to the public and other service organizations or otherwise as Engineer may direct.

Contractor shall take into account additional excavation if any as Engineer may require in order to locate the position of water pipes, drains, sewers etc., or any other works which may be met with, in or about the excavation of trenches while quoting the rates for excavation of trenches while quoting the rates for excavation. Such service lines if met with during excavation shall be properly maintained by Contractor, by means of shoring, strutting, planking over, padding or otherwise as Engineer may direct, and shall be protected by the Contractor from damage during the progress of the work. Any damage to the service lines shall be borne by Contractor. All precautions shall be taken during excavation and laying operations to guard against possible damage to any existing structure pipe line of water, gas, sewage etc.

1.6.2 Bedding

The depth and type of bedding shall be as shown on the Drawings and the requirements specified in subwork.

1.6.3 Laying of Pipes and Fittings

Pipes and fittings shall be laid in accordance with IS12288 and manufacturer□s instructions. In addition the requirements specified in Part-6 Clause 6.9.5 shall also be followed.

All precautions shall be taken during excavation and laying operations to guard against possible damage to any existing structure/pipeline of water, gas, sewage etc. After excavation of trenches pipes shall not be lowered unless the dimensions of trenches and bedding work for pipes at the bottom of the trenches are approved and measured by Engineer. Pipes and fittings/specials shall be carefully lowered in the trenches. Special arrangements such as cranes, tripods with chain pulley block for lowering the pipes and fittings shall be made by Contractor. In no case pipes and fittings shall be dropped. Slings of canvas or equally non-abrasive material of suitable width or special attachment to fit the ends of pipe and fittings/specials shall be used to lift and lower the coated pipes and fittings/specials. The pipes and fittings/specials shall be inspected for defects and be rung with a light hammer preferably while suspended to detect cracks. If doubt persists, further confirmation shall be done by pouring a little kerosene/dye on the inside of the pipe at the suspected spot. No sign of kerosene/dye should appear on the outside surface. Pipes and fittings damaged during lowering aligning shall be rejected by Engineer and shall be replaced by new one.

All the pipes are to be laid perfectly true both in alignment and to gradient specified. In case of spigot and socket pipe the socket end of the pipe shall face upstream, except when the pipeline runs uphill in which case the socket ends should face the upgrade. The laying of pipes shall always proceed upgrade of a slope. After placing a pipe in the trench, the spigot end shall be centered in the socket and the pipe forced home and aligned to required gradient. The pipes shall be secured in place with approved backfill material tamped under it except at the socket. Pipes and fittings which do not allow a sufficient and uniform space for joints shall be removed and replaced with pipes and fittings/specials of proper dimensions to ensure such uniform space. Precautions shall be taken to prevent dirt from entering the jointing space. At times when pipe laying is not in progress, the open ends of pipe shall be closed by a watertight plug or other means approved by Engineer. During the period that the plug□s on, the Contractor shall take proper precautions against floating of the pipe owing to entry of water into the trench. Wherever it is necessary to deflect pipe from a straight line, either in the vertical or horizontal plane, to avoid obstructions or where long radius curves are permit-

ted the deflection allowed at joints shall not exceed 2o for 800 and 1000mm; and 3o for 350 mm diameter pipes. The cutting of pipe for inserting valves, fittings or specials shall be done in a neat and workman like manner by using tools and taking precautions as per manufacturer□s recommendations without damage to the pipe so as to leave a smooth end at right angles to the axis of the pipe. For this purpose, pipe cutting machine shall be used.

1.6.4 Thrust Blocks and Anchor Blocks

Thrust blocks and anchor blocks shall be provided as per the design and drawing provided by the Engineer-in-charge.

1.6.5 Back filling

Trenches shall be back filled with approved selected excavated material only after the successful testing of the pipeline as directed by Engineer. Back filling shall be in accordance with requirements and as directed by the Engineer In Charge.

1.6.6 Pipelines Under Existing Roads

Pipelines laid along a road shall be laid in trench. The sewage rising mains shall be continuously ascending and shall not form many vertical kinks.

1.6.7 Reinstatement of Roads

Reinstatement of roads/footpath shall be done as per the requirements of local authorities and requirements specified in sub work 1

1.7 Cleaning of Pipes and Fittings

Pipelines shall be cleaned of all dirt, debris, dust or other deposits before hydraulic test to the satisfaction of engineer. The requirements specified in sub work 1 shall be followed.

1.8 Hydraulic Testing

Pipelines and fittings shall be subjected to hydraulic pressure tests in the presence of the Engineer which shall comply with IS 12288 unless otherwise specified.

Testing shall be carried out in two stages:

a. Test of sections as construction proceeds.

b. A test of the whole of the pipeline on completion.

The Contractor shall equip himself with all plant, equipment, fittings and water necessary for the hydraulic tests. The Contractor shall submit to the Engineer, well in advance of the time of tests, details of his proposals, including the supply of water either by tankers or bore holes.

No connections from the existing pipelines will be allowed, nor will any connections to the pipeline and pipe work which would involve cutting, tapping or altering the Permanent Works be allowed. Test gauges shall be of approved manufacture having dials at least 200 mm diameter, graduated such that the test pressure is at least 75% of the full scale reading shall be used. If necessary different gauges shall be supplied for different pipeline sections. Two gauges shall be provided for the sole use of the Engineer and shall remain in Engineer□s possession for the duration of the Contract. All gauges shall be dead weight tested and calibrated at the commencement of work and at regular intervals as required by the Engineer.

The contractor□s arrangements for testing shall include a suitable means of quick installation and removal of the Engineer□s gauges during testing.

1.8.1 Testing procedure

The Sectional Hydraulic Test shall be carried out after the pipeline section to be tested has been laid, jointed and back filled to a depth sufficient to prevent floatation, but leaving the joints exposed which have not been tested. The sections to be tested shall be to the approval of the Engineer and shall not be longer than 2000m or 500m when either the pipeline is laid adjacent to or underneath the carriage way or when section includes an air valve chamber. The joints between each tested section shall be left exposed until the pipeline has passed the Test on completion.

In addition to the above requirements the Contractor shall perform a hydraulic test on the first 200 m length of pipeline to be laid under the contract. This test shall be undertaken within one month of the Contractor commencing the laying of pipes. Should the pipeline fail the test or the Contractor fails to undertake the test, all laying and welding work shall come to a halt until that section of pipeline passes a hydraulic test.

Each length of the pipeline to be tested shall be capped or blanked off at each end and securely strutted or restrained to withstand the forces which will be exerted when the test pressure is applied. Testing against closed valves will not be permitted. Washout valves shall be fitted with blank flanges and these together with in-line valves shall be left open. Air valves already fitted shall be permitted to function during the test.

Proposals for testing where thrusts on structures are involved, even where thrust flanges on the piping are installed, shall be submitted, with the calculations of the forces to be carried, to the Engineer for approval.

The method of filling the pipeline with water shall be approved by the Engineer. The length under test shall be filled making certain that all air is displaced through an air valve installed

at the top of the blank flange situated at the high end of the line. The length shall then remain under constant moderate pressure, 10 to 20m head of water, for a period of several hours until the pressure can be maintained without additional pumping.

The pressure shall then be slowly increased at a maximum rate of 1 bar per minute to the full test pressure and pumping discontinued for 3 hours or until the pressure has dropped by 10m, whichever occurs earlier. Thereafter pumping shall be resumed and continued until the test pressure has been restored. The quantity of water pumped restore the pressure shall be the measure of leakage from discontinuation of pumping until its resumption.

The pipe length shall pass the test if the leakage is not more than 1.079 litres per mm diameter per kilometer per 24 hours for each 100m head of pressure applied and the full test pressure has been sustained for at least eight hours.

Notwithstanding the satisfactory completion of the hydraulic test, if there is any discernible leakage of water from any pipe or joint the Contractor shall, at his own cost, replace the pipe, repair the pipe or re-make the joint and repeat the hydraulic test.

No pipeline shall be accepted until the leakage on any length is not more than the rate of leakage specified above and all sources of leakage have been rectified.

The Test on Completion shall be carried out after all the pipeline sections have been satisfactorily tested and the joints between each section completed to provide a continuous test length between contract interfaces.

Pipelines shall be tested as above except where the Engineer issues such instructions as are necessary for testing parts of the Works that have been designed for stresses limited by considerations other than those applying to the pipeline systems.

1.8.2 Test Pressures

Test pressures are to be measured in bars at the center of the blank flange situated at the lowest end of the pipeline under test. Unless otherwise specified or shown on the drawings pipeline test pressure shall be in accordance with the following:

DI pipe and fittings 16 bar

For testing of sections of pipeline containing air valve chambers the Contractor should verify from manufacturer that the air valves are capable of operating under and sustaining the test pressure.

1.9 Pipeline Disinfection

Upon completion of a newly laid main shall be cleaned, disinfected using chlorine solution in accordance with procedure specified in IS 12288. Alternative methods may be adopted with the approval of the Engineer. The chlorinated water shall stand in pipeline for a minimum period of 24 hours and all valves in the system shall be operated twice during this period.

The chlorinated water shall be neutralized and disposed off as directed by Engineer.

After final flushing and before the pipeline is placed into service, water samples shall be collected and tested for bacteriological quality and shall not indicate the presence of coliforms. If the initial disinfection fails to produce satisfactory results, disinfection shall be repeated and satisfactory samples are obtained.

The Contractor is expected to carry out the cleaning, disinfecting and dewatering work as a part of laying the pipes and his rates for laying the pipes should include the cost of cleaning and other related works.

1.10 Chamber Markings

Details like valve type, size, cistern number shall be painted on all valve chambers as directed by Engineer. Where valve chambers are flush with the ground, suitable marker posts shall be provided adjacent to the chambers at a suitable location with all details approved by Engineer.

In case of the pipeline laid above ground details such as chainage, invert levels of pipe saddle number culvert number, anchor/thrust block number etc., shall be suitably painted either on the pipeline or the supporting structure in distinct color.

1.11 Measurement and Payment

The measurement for pipes for items specified in Bill of Quantities shall be on running of the net length along the center line of the pipe excluding the length of specials and appurtenances. Payment for pipes shall be made in running meters after production of test certificates specified and directed by Engineer.

Specials shall be paid separately on the basis of each piece used. For the payment purpose, flanges shall be either included in or excluded as described in the Bill of Quantities. However material such as nuts, bolts and washers, etc., shall be included in the respective items.

Valves and Expansion joints shall be paid on number basis after erection and successful testing.

Payment for laying the pipes and specials shall be made 60% ON SUPPLY, 25% ON LAYING AND 15% ON TESTING

ITEM: PROVIDING AND SUPPLYING DI/CI/MS SPECIALS

(Sub-work No..... item No.....),

The items include providing ,supplying DI/CI/MS Double flanged specials suitable for diameter as required and of required thickness and including all materials labour charges with epoxy paint from inside and outside including all taxes (Central & local) Octroi if necessary, inspection charges, transportation to stores/ sites & stacking etc complete. As per requirement a machine ends DI specials suitable for PCCP/BWSC/D.I .pipes will also be supplied under this item.

The mode of measurement of payment shall be on weight (Kg) basis.

Scope: The item cover supply of DI/CI/MS double socket and flanged specials of various diameters including conveyance of specials form manufacture's works to site stores, stacking them properly and protecting till commissioning of work. ***General:*** The specials shall confirm to relevant I.S.S.

Materials: The specials shall be manufactured form cast iron conforming to IS 210 Gr. 20.

Coating: The specials shall be coated by bitumen by not dipping process.

Tests: The specials shall be tested at factory for 25 kg/sq/cm/ Pressure.

Flanges: The flanges shall be drilled to IS-1538.

Tolerance: The tolerance in weight and dimensions shall be as per ISS. Only the specials fitting within tolerance limit shall be accepted

ITEM:DISMANTLING JOINTS

Providing and fixing Dismantling joints

Providing dismantling joints of appropriate diameter of M.S.as per detailed drawing suitable for PCCP pipes including epoxy coating of approved make from inside, outside, transportation, loading, unloading octroi, inspection charges as per directions from Engineer-in-charge etc.

MODE OF MEASUREMENT

Diameter wise on No.& kg basis.

ITEM: PERMANENT TEST POINTS

Providing permanent test points on the pipe line as per drawing and as directed by Engineer In Charge including providing and fixing sluice valves road box for sluice valve of Size 80mm to 250mm in one brick masonry chamber 300mm x 300mm clear C.M 1:5 with 12 mm thick 1:3 cement plaster both inside and outside on M -100 C.C 150mm thick etc complete as specified & directed.

MODE OF MEASUREMENT

On No. & kg basis

ITEM:*GAS CUTTING HOLES*

Gas cutting holes up to 50 mm dia (for plugs) (either square Cut of 'V' cut) to pipe, plates etc. of required thickness including cost of Gas, tools, machinery, conveyance of labour and machinery etc. complete and as directed by Engineer-in-Charge..

MODE OF MEASUREMENT

On rmt basis

ITEM: ALL CAST IRON SPECIALS

Material

All Cast iron specials such as C.I. detachable joints shall confirm to I.S. 1538- 1993 (Part 1 to 24). The Supply at departmental stores shall be of various diameters as specified. The specials shall be free from any defects. It should be possible to cut/drill the special to suit site condition to fit in the position. The hardness of the external surface shall not exceed 210 HBS. Rings shall confirm to IS 5382- 1985. Ring shall be homogeneous and free from porosity, grit and surface defects ,such as pitting, irregularities. Dimension of rings shall be as per IS 10292-1988.

MANUFACTURE :

The dimensions of flanged sockets and flanged spigots shall be as per Tables 7 & 8 of IS 1538-1993, respectively. Supply and Stacking at Departmental Store or Work Site : As specified under the agreement.

Markings :

Each fitting shall have cast stamped or indelibly painted on it the following markings :

1. Manufacturer's Name or trademark or identification mark.
2. The nominal diameter,
3. Mass of fitting,
4. Last 2 digits of year of manufacture,
5. Any other mark required by the purchaser.

Item to Include:

The item includes the supply of Cast Iron detachable joints, including all taxes, levies excluding octroi, transporting, loading, unloading and stacking at departmental store or work site as directed. The necessary test certificate also shall be provided along with the supply. Octroi paid shall be reimbursed on producing documentary evidence for the payment made.

MODE OF MEASUREMENT AND PAYMENT :

The item shall be measured as number of sets for the specified diameter of pipe. The rate shall be for supply of one number of detachable joint of specified diameter.

ITEM: CAST IRON JIFFY COLLAR COUPLING WITH RINGS

The item provides to supply at departmental store the Cast Iron jiffy collar coupling with rings etc. complete as per the specified diameter of pipe / pipes. (Dia. between 80 mm & 750 mm). The joints shall conform the provisions of IS: 1538-1993 and IS 5382-1985.

MATERIAL

All Cast iron specials such as C.I. mechanical compression collar coupling shall confirm to I.S. 1538-1993 (Part 1 to 24). The Supply at departmental stores shall be of various diameters as specified in supply order. The specials shall be free from any defects. It should be possible to cut it drill the special to suit the site condition and fit in position etc. The hardness of the external surface shall not exceed 210 HBS. Sealing Rings shall confirm to IS 5382-1985. Ring shall be homogeneous and free from porosity, grit and surface defects, such as pitting, irregularities. Dimension of rings shall be as per IS 10292- 1988.

Manufacture:

Generally as per item WS/B/2.3. The dimensions of jiffy collar coupling shall be as per Table 9 IS 1538-1993.

Supply and Stacking at Departmental Store :

Specified under agreement.

Markings:

Each fitting shall have cast stamped or indelibly painted on it the following markings:

Manufacturer's Name or trademark or identification mark.

The nominal diameter,

Mass of fitting,

Last 2 digits of year of manufacture,

Any other mark required by the purchaser

Item to Include :

The item includes the supply of Cast Iron jiffy collar coupling, including all taxes, levies excluding octroi, transporting, loading, unloading and stacking at departmental store or work site as directed. The necessary test certificate also shall be provided along with the supply. Octroi paid shall be reimbursed on producing documentary evidence of payment made.

MODE OF MEASUREMENT AND PAYMENT:

The item shall be measured as numbers of collar couplings for the specified diameter of pipe. The measurement and payment shall be per No.

ITEM: Flat rubber gaskets.

The item provides to supply at departmental store the flat rubber gaskets for flanged joints. Following two types of rubber gaskets, depending upon the hardness of rubber ay be supplied as specified in the supply order:

1. Type A: 50 to 65 Hardness in IRHD and
2. Type B: 65 to 80 Hardness in IRHD.

In each of two types, 2 Grades, Grade 1 & 2 are again prescribed.

Material:

The rubber gaskets shall be manufactured from either a) Sheet Rubber or b) Sheet Rubber reinforced with fabric (Rubber insertion jointing). For manufacturing rubber gaskets, natural rubber or synthetic

rubber or a blend thereof, shall be used, with suitable composition and vulcanization to attain the required degree of hardness.

The fabric for rubber insertion jointing shall have a minimum breaking strength of 120 N/mm2,under test conditions according to IS: 1969- 1968.

Manufacture:

The rubber gaskets shall be free from porosity, grit and surface defects such as pitting and irregularities. The rubber shall be homogeneous. The manufacturing of sheet rubber and rubber insertion jointing shall be in accordance with the IS: 638-1979. The thickness and number of fabric plies shall be as per the IS. Unless mentioned in the supply order the size of each rubber sheet shall have suitable bolt holes conforming to IS 1538-1993, for the pipe diameter specified in the order.

Supply and Stacking at Departmental Store:

As specified under agreement.

Markings:

Each piece of rubber sheet jointing or rubber insertion jointing shall be marked with the following:

1. The name of manufacturer or the Trade Mark,
2. Type, Grade and Thickness,
3. Month and Year of manufacture,
4. Any other Marking as specified in the purchase order Item to Include:

The item includes the supply of flat rubber gasket at departmental store, suitable for flanged joints (3⁄6 mm thick) with bolt holes and nominal bore, pitch circle diameter as per IS: 1538- 1993 and gasket as per IS: 638-1979, including all taxes, levies except octroi, transporting, loading, unloading and stacking at departmental store as directed. The necessary test certificate also shall be provided along with the supply. Octroi paid shall be reimbursed on producing documentary evidence for the payment made. Mode of Measurement and Payment:

ITEM: PROVIDING AND SUPPLYING C.I.FLANGED / S/S SPECIALS

(Sub-Work No., Item No),

The item includes supply CI flanged/s/s specials as per latest IS and approved by Engineer-in-Charge. The cost of specials should be including all taxes central and local, railway freight, transportation upto site of work or departmental store.

The item will be measured and paid as per kg. basis.

Item No :- Excavation for pipe trenches in earth, soil of all types, sand, gravels

soft murum, hard murum, hard murum with boulder soft rock hard rock ……..etc. complete.

This item shall be executed as per provision in general technical specifications and detailed specifications in collection network and relevant item of schedule B

The item shall comply as per relevant item of Schedule "B"

The excavation shall be done as per standard specification No. Bd-A1, A3 page No. 259 and Bd- V – 1.3 page No. 547 or as per standard specification of latest edition.

The excavation shall be done to the required depth and section as directed by Engineer-in-charge. The depth of excavation shall be such that minimum one meter cover will be available on pipeline. Extra excavation done for whatever reasons shall not be paid under any circumstances. The excavated material shall not be placed nearer than 1.00 meter from the edges of excavated trenches. After refilling of the trenches, the balance stuff should be disposed of as directed. Refilling and disposal will be paid separately in relevant items, as per schedule 'B'

The excavation is to be done for pipeline trenches for foundation or C.C. blocks fixity blocks, and encasing.

Necessary shoring and strutting of sufficient strength should be provided to sides of excavated trenches to prevent falling of sides, as per separates item of schedule 'B'.

During execution of works at all endangered places where traffic prevails, trenches shall be strongly fenced and marked with red lights. All necessary arrangement for diversion of traffic should be made before starting of excavation and all precautionary measures should be taken so as to avoid accidents while work in progress.

Dewatering during excavation for pipe trenches should be done manually or by pump, for which rate is included in excavation item. No separate payment will be admissible even for excavation in nalla / river portion, site clearance etc.

During excavation, if masonry, concrete structure roots of trees etc are met with the same shall be removed without extra cost. The loss to public or private utility services such as telephone or electric cables/water mains or such other if comes across the trenches, shall have to be made good at the cost of the contractor. The permission for such crossing if required form the competent authority shall be obtained through Department. However delay in obtaining such

permission shall not be considered as cause of delay for the works and no compensation shall be admissible to the contractor due to such delay. The bottom of trench shall be leveled both longitudinally land transversely or stepped as directed by Engineer-in-charge. For excavation of pipeline trenches. The maximum width of the trench., allowed for payment shall be as below for all types of pipes and for required lifts.

Sr.No.	Dia of Pipe line	Width.
1.	500 mm	1.20 m.

The excavation in hard rock shall be done as per standard specification No. Bd – A – 4, A -6 Page No. 259,260 and page No. 547 Bd. – VL – 3, All other specifications shall be followed strictly as per item No. 13 (a), above.

The item includes the cutting of tar road and making it in its original position etc. complete. As directed y the Engineer-in-charge. Nothing extra for tar / metal road crossing shall be paid for. If the contractor is preferred to excavate the pipe trenches in all types of strata by means of breaker, poclain or any other mechanical equipment to get the work done speedly, nothing extra shall be paid to the contractor on this account.

Item no. - Murum bedding/ Filling the plinth and floors with approved excavated stuff ---- etc complete

This item shall be executed as per provision in detailed specifications in collection network and wt-well and relevant item of schedule B

Refilling the trenches with available excavated stuff with soft material first over pipeline and then hard material in 15 cm layers with all leads and lifts including consideration., surcharging, etc. complete.

The item shall be executed as per standard specification No. Bd- A 10 page no. 265 for refilling purpose. Approved excavated stuff shall only be used. The refilling shall be done in layer of 15 to 20 cms. Each layer should be well watered and compacted properly. After hydraulic testing the trench shall be refilled in layers and should be rammed manually. The filling shall be kept above G.L. for subsequent settlement. In case of trench in rock, cushioning of murum shall be provided on top and sides of pipe line. The item includes free lead of 50 M. for actual operation.

Mode of payment – The refilling payment shall be paid after satisfactory hydraulic testing of the pipeline.

Item No. :- Filling in plinth and floors/trenches with contractor's murum.....etc. complete.

This item shall be executed as per provision in detailed specifications in collection network and wt-well and relevant item of schedule B

For bedding, only murum brought from outside as approved by Engineer-in-charge. shall be used. Beding shall be done before laying of pipes to the desired grade, line and level with necessary watering and compaction etc. complete. This shall be executed when B.C. Soil and hard rock met at the bottom of trench for certain length. The filling in trench around the pipes and 0.30 m on top of pipe line shall be done in B.C. Soil and rock as directed. The item includes lead beyond 0.50 kms. and lift as required.

If the approved quality of murum is available within 5 Kms. Lead at any of work, the same shall be used for beding and refilling as directed by Engineer-in-charge. The payment shall be made after satisfactory hydraulic testing given by the contractor.

ITEM: PROVIDING & FIXING SLUICE VALVES & BUTTERFLY VALVES, SPECIFICATION FOR MANUFACTURE, SUPPLY AND DELIVERY OF SLUICE VALVES, BUTTERFLY VALVES

SLUICE VALVES

These specifications cover general provisions and requirements and are supplementary to the General conditions of contract.

GENERAL

The Sluice Valves proposed to be procured through this tender are to be used for drinking water supply schemes under execution.

WORK UNDER THIS CONTRACT

The work entitled manufacture, supply and delivery of Sluice valves for transmission mains shall comprise the manufacture, supply and delivery of the goods as mentioned in the Bill of Quantities.

a)	Sluice Valves	PN 1.0 of IS: 2906:1984. of various sizes, ranging from 350 mm to 1200 mm.
b)	Sluice Valves	PN 1.0 of IS:780:1980, of various sizes, ranging from 200 mm to 300 mm.

NOTE :

The above goods to be used for conveyance of potable water at temperatures varying from 10 degree centigrade to 40 degree centigrade.

The tender price shall include all labour and machinery and all materials necessary for the proper, manufacture of the goods, for tests at the contractor's works for the insurance and for delivery to works for the proper maintenance and for discharging every obligations and requirement of the contract, in accordance with the intent of the contract documents, as stated in the General Conditions of Contract.

STANDARDS

Where reference is made to a particular standard, it shall be the latest revision of the Indian Standard Institution. Unless otherwise specified, the sluice valves shall be in accordance with the provisions of IS:780:1980 and IS:2906:1984 or sizes of the sluice valves covered under relevant standards.

MARKING OF SLUICE VALVES

Each sluice valve shall be marked as per IS:780:1980, Para-II for sizes (50 mm to 300 mm) and IS:2906:1984, page: 11.1 (for sizes 350 mm to 1200 mm).

PACKING AND HANDLING

The contractor shall dispatch from the manufacturer's works goods adequately protected to prevent damage and deterioration during transportation and storage, etc. The packing is to be quite robust to withstanding rough handling during the transit by road/ rail/ sea and storage.

Each package / create will contain sluice valve of one size only in relevant class.

The packing procedure followed shall be in accordance with para 12 of IS:780:1980 and para 12.1 of IS:2906:1984

The contractor shall use proper handling equipment or follow suitable handling method as approved by the Engineer to unload the materials at the delivery site to prevent damage to the goods and equipments. Third party inspection from agency approved by MJP should be carried out at contractor's cost only.

The contractor should produce manufacturer's test certificate conforming that the valves have been tested in accordance with I.S. specifications, stating the actual pressure and the medium used in the test. The design workmanship, material, strength and dimensions of all parts shall be as per I.S.S. The product shall be of proven quality rendering reliable service during maintenance and requirement.

THIRD PARTY INSPECTION

Third party inspection shall be carried from 1) M/s Central Institute of Plastic Engineering & Technology, Aurangabad. 2) M/s Dr.Amin Controler Pvt.Ltd, Mumbai 3) M/s WAPCOS Ltd., Gandhi Nagar

The valve shall be tested in factory by third party in presence of Maharashtra Jeevan Pradhikaran representative at least for

a. Review of martial of construction

b Overall dimension of all component

c. Hydraulic testing.

This item shall be executed as per provision in the detailed relevant item of Schedule "B". This includes cost of supply, freight, transportation and allied taxes and delivery at the site of work. The item includes, labour, cost of jointing materials such as nuts bolts, rubber packing of champion make for making flanged joint etc. and fixing the valves in proper position and alignment including hydraulic testing conducted along with testing of pipe line for ascertaining the chain ages of the valves so fixed as occupied in the pipe line. The length of vales shall be recorded for actual length of valve without any financial implication Plain ended sluice valves will not be accepted. The sluice valves shall confirm to IS-780 and IS – 2906 – 1984 or as per subsequently modified IS of relevant year. This shall be of solid wedge gate construction with cast iron body and brass / Gunmetal trim. (or in a variety of other materials specification as ordered.) These sluice valves shall stand to the working pressure of 10 Kg/Sq.cm.

After supply of above material at the site of work by the contractor., the same shall be issued to the contractor on "Unstamped Receipt" The contractor at his owns cost shall keep material at site store. The contractor shall maintain the register of consumption, duly signed by the site Engineer. Site Engineer can be checked the balanced materials, any time at site store of contractor., If any shortage is found, the cost of short materials with penal rate shall be recovered from the contractor in single installment through bill without any prior intimation to the contractor.

Mode of Measurement

This item will be measured and paid as per unit basis 60% payment shall be released after supplying CIDF sluice valve at site of work and 25% payment shall be released after lowering, laying and jointing

in position and completion of satisfactory hydraulic testing etc, the laying of valve shall be done as per specification No. Bd-V-, 6 Page No. 510. The item includes hydraulic testing of valves also alongwith the pipe line testing. Without inspection certificate, materials will not be accepted. . 15% amount of this item will be withheld for hydraulic testing respectively and will be released after satisfactory hydraulic test..Payment against the item of fixing valves is 75 % after laying and 25% after hydraulic testing. The valves shall be got inspected through IRS/SGS/QS&S all charges of inspection shall be borne by the contractor. laying of valve shall be done as per specification No. Bd-V-, 6 Page No. 510. The item includes hydraulic testing of valves also alongwith the pipe line testing. Without inspection certificate, materials will not be accepted.

Item No. :- Providing, lowering, laying and fixing in position C.I. D/F Reflux valve ……..etc. complete.

C.I.D.F. Refluxe valve as per I.S. 532 part 1 – 1984, PN-1 and these are of non-rusting stainless steel spindle and internal working parts stainless steel, Including loading, unloading stacking hydraulic testing etc. complete (IVC or kirloskar only.)

ITEM: PROVIDING AIR VALVES OF ALL CLASSES AND DIAMETERS.

This item includes Air valves (with IS make) and firm approved by MWSSB's letter No. 1091/33/Store/5284 dated 17.07.1992. The cost of valves should be including all taxes (Central & Local) railway freight, transportation upto site of work or departmental store.

Mode of Measurement

This item will be measured and paid as per unit basis. 15% amount of this item will be withheld for hydraulic test and will be released after satisfactory hydraulic test. basis 60% payment shall be released after supplying valve at site of work and 25% payment shall be released after lowering, laying and jointing in position and completion of satisfactory hydraulic testing etc.

Providing and supplying Kinetic Double Orifice type Air Valves as per MJP's standard specification combined with screw down isolating valve, small orifice elastic ball resting on a gun metal orifice nipple, large orifice vulcanite ball seating on molded seat ring, inlet face and drilled, including all taxes (Central and local) insurance.

Kinetic Air Valves, etc.

Unless otherwise specifically mentioned in the tender items the required sluice valves, scour valves, air valves, etc. shall be supplied by the Contractor. The materials supplied shall be flanged as

per requirement. The valves are to be carted to the site from supply place, lowered in the trenches and jointed to the pipeline as directed with cost of all jointing materials, such as lead, aloe-rope, rubber packing, nuts and bolts, fire wood, etc. and the labour cost, which included in the tender items. The joints may be either flanged or S & S lead joints depending upon the nature of valves supplied and Contractor shall have no extra claims for any particular type of joint required to be done. The required number of jointing for fixing these valves is included in the tender item. The measurement will be per number of valve and the length for tail pieces will be payable under item of laying and jointing. 85% amount will be paid on its supply and remaining 15% amount will be released on completion of fixing and satisfactory hydraulic testing. .

Item no. - Cement Concrete

Providing and laying in situ PCC 1:3:6.....etc. complete.

This item shall be executed as per provision in detailed specifications in collection network and wt-well and relevant item of schedule B

The work shall be carried out of relevant item of schedule B and standard specification of B & C department the specification as contained in the P.W.D. handbook I & II (BD-E-1/287) shall also be referred and as directed by Engineer-in-charge. The PCC RCC works shall be as per IS : 456/1976 and 2000 concrete mixer shall be used for preparing the concrete. Vibrator shall be used to consolidate the concrete while placing the concrete in position.

While concreting samples of PCC M-150 in form of test cubes shall be taken by the representative of Maharashtra Jeevan Pradhikaran and shall be tested under his supervision. The charges of such testing shall be born by the contractor.

Ultra-tech Cement in jute/PVC bags cement (weighing 50 kg. each) shall be used for all structures and produced a test certificate of samples taken from cement brought to the site for work only. Tested lot shall be permitted to be used for the work.

The minimum reinforcement in walls, floors, roofs in each of two directions at right angles shall have an area of .3% of the concrete section in that direction for sections upto 100 mm thick. For sections of thickness greater than 100 mm and less than 450mm the minimum reinforcement in each of the two directions shall be linearly reduced from 0.3% for 100 mm thick sections to 0.2 % for 450 mm thick section. For section of the thickness greater than 450 mm minimum reinforcement in each directions shall be kept at 0.2%. In concrete sections of thickness 225 mm of more, two layers of reinforcing steel shall be placed one over each face of the section to

make up the minimum reinforcement specified in this clause.

Item no. - Reinforcement steel

This item shall be executed as per provision in general technical specifications and detailed specifications in collection network and relevant item of schedule B

Item no. - Refilling

This item shall be executed as per provision in in general technical specifications and detailed specifications in collection network and relevant item of schedule B

Item No. - B.B. Masonry valve chambers

Construction of B.B. masonry valve chamber includes excavation to the required size and depth, Providing and placing in position PCC for levelling course, followed by 15 cm thick M:15 P.C.C. foundation bedding , The chamber walls shall be in B.B. masonry in c.m. 1:5 proportion and inside cement plaster in c.m. 1:3, and external cement pointing including precast R.C.C. frame and cover as directed by Engineer in charge etc complete. The curing shall be carried out as per the specifications before refilling the sides.

1) Size 1.5 x 1.5 x 3.0 m

This item shall be executed as described in schedule 'B' for relevant item and directed by Engineer-in-charge. The items like concrete, plaster, brick work etc. shall be executed as per PWD Specification and as per direction of Engineer-in-charge. The frame & Cover shall be of SFRC & be have good quality. Damaged cover and frame shall not be fixed. The chamber shall be constructed well sufficient above the G.L. so as rain water shall not enter into the chamber. The bottom shall be constructed below bottom of valve, so that nut bolts of valve can easily be operate; Hence suitable depth of chamber shall be kept according to the site condition and as directed by Engineer-in-charge.

Item No Reinstating road surface .....etc. complete.

This item shall be executed as per provision in in general technical specifications and detailed specifications in collection network and relevant item of schedule B

ITEM: HYDRAULIC TESTING OF PIPELINE :

After the work of laying pipeline is completed and before it is commissioned, the pipeline shall be tested in the field both for its strength and leakage in the following manner.

NOTE

Whether stated specifically elsewhere or not, the testing in section of 1 km shall have to be completed within 3 months of laying and jointing.

The pipeline laid length will be divided into sections specified by Engineer-in-Charge. The contractor shall recheck pipe and valves for cleanliness and shall recheck operations of the valves. The open ends of the pipeline or sections thereof shall normally be stopped off by blank flanges or cap ends additionally secured where necessary by temporary struts and wedges. All anchor and thrust blocks must have been completed and all pipe straps and other devices intended to prevent movement of pipe must have been securely fastened. The contractor shall clean out the whole pipeline and flush it with water, so as to remove dust, dirt and any foreign matter laying in the pipeline. No separate payment for the work of cleaning will be made and the rates under various items of work include thereof.

Each valves section of the pipeline shall be subjected to hydraulic test in section. For this test, the pipe shall be slowly filled with clean water by opening cross connection with the existing mains or otherwise by pumping water into the line (water and pumping arrangement is to be arranged by contractor) as directed and all air shall be expelled from the pipeline through hydrants, air valves and blow off fixed on the pipeline. Once the pipe is full, the cross connection or pumping shall be closed. The pressure in the pipeline should then be raised in stages and built up and maintained by means of suitable approved pumps, to the specified test pressure based on the elevation of the lowest point on the line or per section under test.

The pipe line should be tested hydraulically upto required pressure as per IS specification or as per detailed specification for the Sub-Work. Before starting the pressure test, the expansion joint shall be tightened the test pressure shall be maintained for at least 24 hours. The drop in pressure shall not exceed 0.7 kg/cm2 within a period of 2 hours after the full test pressure is built-up. Under this pressure no leak or sweating shall be visible at the joints. During the test, the pipe shall be struck sharp blows with 1.5 kg hammer. Water shall not spout, ooze or sweat through any part. In case of any leak observed anywhere in the field joints whether welded or bolted, the same shall be repaired entirely at the contractor's cost which shall include repairs to welding and regunitting etc. The repaired joint shall be subjected to retest. No section shall be accepted unless it

is perfectly water tight.

The entire cost of testing, retesting including cost of water taken together shall be paid under relevant item or Bill of Quantities. The contractor shall make all the arrangements for all labour, pumps, pressure gauge equipment etc. The gauges should be got tested if insisted by the Engineer-in-Charge. The contractor shall arrange for labour required for operating air valves, scour valves etc. Any labour of Pradhikaran/corporation/council employed for the above activities of the test other than supervision shall charged to the contractor as per rules.

The hydraulic testing of the water main will be carried out for entire length as directed by Engineer-in-Charge. If any leakages are observed even during defects liability period due to defective workmanship, the same shall be rectified immediately. The charges of repairs if done departmentally will be recovered from the amount of retention money. Repairs on live water mains are to be carried out immediately to avoid wastage of water and other problems such as disruption of water supply and traffic etc. In view of this, it will be very difficult to give prior intimation to concerned contractor. As such the cost of repairs, being the expenditure will be recovered from the contractor's retention money withheld in deposit without giving any prior intimation. The contractor will not challenge or claim any extra for such action on the part of the Department.

Generally the contractor shall be required to test the pipe line sections of 2 km using necessary equipment. However, if the Engineer-in-Charge directs, to test full pipeline lengths in further suitable sections in the interest of the work, the tenderers will have to carry out the test in such sections as directed by Engineer-in-Charge.

Mode of Measurement

This item will be measured and paid as per km basis measured up to 3 digits

ITEM: LOWERING, LAYING AND JOINTING DI PIPES OF GIVEN DIAMETER AND CLASS

(Items as per schedule B),

The contractor shall clear the site by removing all grasses, shrubs etc. before the start of work. The working longitudinal section of the pipeline has to be prepared by the contractor in consultation with departmental site Engineer. The Engineer-in-charge may make modifications in the alignment and or level at his desecration, depending on the site conditions. The contractor shall have to fix the alignment and grade of pipeline. All survey work for fixing the alignment and levels shall be done by the contractor at his survey work for fixing the alignment and levels shall be done by the contractor at his cost. Laying underground pipes should be lowered into the trench with tackle suitable for the weight of pipes. For smaller sizes, up to 250 mm nominal bore, the pipe may be

lowered by the use of ropes but for heavier pipes, either a well designed set of shear legs or mobile crane should be used. When lifting gear is used, the positioning of the sling to ensure a proper balance should be checked when the pipe is just clear of the ground. If sheathed pipes are being laid, suitable wide slings or scissors does should be used.

All construction debris should be cleared from the inside of the pipe either before or just after a joint is made. Passing a pull through in the pipe, or by hand, depending on the size of the pipe does this. When laying is not in progress, a temporary and closure should be securely fitted to the open end of the pipe line. This may make the pipe buoyant in the event of the trench becoming flooded, in which case the pipes should be vacant any section of stench into which the pipe is being lowered.

On gradient of 1:15 or steeper, precaution should be taken to ensure that the spigot of the pipe being laid does not move into or out of the socket of the laid pipe during the jointing operations. As soon as the joint assembly has been completed, the pipe should be held firmly in position while the trench is back filled over the barrel of the pipe. The back fill should be well compacted.

Supporting pipes above ground – it is recommended that above ground installations of spigot and socket pipes be provided with one support per pipe, the supports being positioned behind the socket of each pipe. This results in normal distance between supports of 4 m.

Pipes should be fixed to the supports with; mild steel straps so that axial movement due to expansion or contraction resulting from temperature fluctuation, is taken up at individual joint in the pipe line in addition, joints should assembled with the spigot end withdrawn 5 to 10 mm from the bottom of the socket to accommodate these thermal movements. Pipes supported in this way are capable of free deflection and axial movement at the joints, which accommodate small movements of the pipe supports.

Construction of thrust blocks and anchor shall be done in two stages viz, firstly the portion below invert of the pipeline shall be casted and then the portion above pipe is casted. Design of individual thrust blocks shall be given by the Engineer-in-charge. The distance between two successive fixity blocks shall generally not exceed 500 m.

Where a pipeline crosses water coarse, the design and method of construction should take into account the characteristic of the watercourse. The concerned authorities may be consulted to ascertain the nature of bed, scour levels, maximum velocities, high flood level, seasonal variation, well assist in evaluating the effect of river characteristics (For Example. Etc.) on design and construction.

If necessary, unsupported spans between 4 and 6 m. may, be obtained be positioning the pipe supports relative to the pipe joints.

With flanged pipes. The recommended maximum unsupported span is 8 m. The supports shall be located at the center of every second pipe.

The recommended maximum unsupported span at watercourse is 8m. The positions of pipe joints and pipe supports should be stable.The support of all flanged pipe work spans should be stable and unyielding, due to movements in the pipeline.

The straps should prevent any lateral movement or lifting of the pipe lines but now restrict expansion and construction caused by temperature fluctuations

Contractor shall take delivery of pipes from the stores and shall convey them upto work site for use after checking and testing for soundness of the pipes and shall be held responsible for replacement of such materials of cracked or damaged materials are inadvertently fixed and jointed.

The Department will issue pipes in available lengths and specials. Damages to departmental materials due to carelessness of the contractor during loading, unloading, transport, lowering, laying, cutting to required size, jointing, testing, etc. shall be at contractor's accounts and shall be recovered from him at the rates decided by the Executive Engineer.

Cutting of pipes:-

The cutting of pipe for inserting valves, fittings, etc. shall be done in a neat and workman like manner without damaged to the pipe or lining so as to leave a smooth, end at right angles to the axis of the pipe. As far as possible at a time of pipe line, the valves, specials should be laid. Due to non-availability of valves, specials if laid pipes should be cut in that case no payment will be given for the work of pipe cutting and chamfering of pipes to the contractor. Also the cost of cut piece of pipe shall be recovered from the contractor. Methods of cutting ductile iron pipes are given in.

By hacksaw :- hand or power operated hacksaw should be used with blades having teeth at a pitch of 1 mm.

By manually operated wheel cutter :- The type of cutting, wheel used for cast iron pipes is not suitable for ductile iron pipe. Special wheels, as used for cutting steel pipes, shall be used and' cut ends are trimmed with a file.

The flame cutting of pipes by means of an Oxyacetylene torch shall not be allowed.

During laying the pipe line some time it may be necessary to cut the pipe suit the site condition or to put in some special or valve or to have exact length of the section etc. The contractor at his cost shall do this cutting only. No claims for extra amount due to any particular type or individual length of cut pipes and specials being supplied or joints having been increased due to small lengths shall be entertained.

The payment for this item shall be admissible on the basis of actually laid at site including length occupied by all types of specials and incidental small pipe pieces or other types.

All the pipes and specials and valves to be taken into use shall be cleaned and brushed clear of rust and paint at both the spigot and socket ends.Before the pipes and specials are lowered and laid in trenches, the contractor shall see that the bedding is plane or the surface is brought to uniform grade and leveled with the help of cross sight rails and boning staff and approved in advance by the last 3 days by the sub-divisional officer.

The contractor shall provide, fix and maintain cross sight rails and boning staff whenever required until the time of completion without any extra claim for cost etc. and which shall be considered inclusive of the rates for excavation and lowering and laying. The contractor shall provide temporary benchmarks if called upon at a minimum distance every 150 M without any claim for extra cost. These benchmarks shall be either of stone masonry or mass concrete not less than 0.03 Cum.The contractor shall provide ladder for inspection of works at least 2 Nos. at the time of inspection for all the trenches of depth greater than 1.2 M.The pipes, specials and valves shall be lowered by means of ropes, rackles or pulley as ordered evenly and uniformly and shall be brought level with well consolidated hard murum or wooden sleeper as ordered.All the S & S pipes and specials shall be laid with sockets facing direction of flow, as per manual.Materials to be used for jointing such as spun yarn, etc. shall be first get approved in advance from the sub-divisional officer.
No jointing operations shall be started unless the sub-divisional officer approves the grade and levels.

Permissible Deflection at Socket and Spigot joints :-

When necessary to deflect pipes from a straight line avoid obstructions or where long radius curves are permitted, deflections at joint shall not exceed following.

Rubber Joints :-

For nominal Bore – 80 mm to 300 mm	5 Degree
For nominal Bore – 350 mm to 400 mm	4 Degree
For nominal Bore – 450 mm to 750 mm	3 Degree
For nominal Bore – 750 mm to 900 mm	3 Degree

End preparation of cut pipes for jointing :- The barrel left after cutting should be trimmed off by light grinding or by filling.

The pipes shall be laid in a complete straight line with center line ranged accurately by mean of string stretched between marked centers in cross sight rails and no deviation will be permissible without the permission of the sub-divisional officer. For deviations proposed by the Department from marks on sight rails, the contractor shall postpone the work of jointing without claiming extra cost. The spigot end of the pipe or specials shall be inserted in socket and of the other pipe or special and shall touch squarely without any gap.Under no circumstances, the D.I. pipes and other water mains will be laid in black cotton soil or rock surface without murum cushioning.

The above murum cushioning of a depth of 150 mm thick or as specified shall always be provided in all formation within the rate of laying pipe line unless an item for murum bedding is provided for separately in the tender.

The murum bedding shall be of the full width of the trench. Murum bedding will be necessary in rock formation boulder formation and soft soils and black cotton soil but not in murum formation itself. No brickbats or hard stone metal bigger than 20 mm gauge shall be allowed beneath the pipe line directly in touch with the pipe as in the murum bedding.All stokes such as electric wires, water and sewer mains, manhole, natural drainage, culverts, storm water drains, gutters, poles, etc. coming in the way shall carefully be looked after and any damage be prevented to the same. Any work of removing repairing and reducing such structures or obstacles in the process of laying, jointing and testing pipe line etc. should be carried out by the contractor wherever directed, without any claims for extra to the satisfaction of the Engineer-in-charge. Contractor shall foresee all such situation and make necessary arrangement to overcome those in advance.

The contractor shall not be allowed, any wastage and breakage in pipes brought by him for pipes issued departmentally, the total length of pipes laid and that returned to stores in cracked or unused conditions shall coincide with total length is used. The cost of pipes etc. cracked due to fault of contractor beyond the above permissible limit shall be recovered from him. All waste and broken pipe pieces shall be returned by the contractor to the store of issue at no extra cost. The contractor shall keep an upto date account of pipes, specials and valves etc. issued him free of cost showing quantity received vide unstamped receipt No. and date, quantity used giving chainages as and balance at hand and returned (supported by acknowledgements signed by the Sub-Divisional Officer) failing which the Engineer-in-charge shall reserve the right to keep final bill pending till this account is finalized and contractor shall not claim any compensation in that case for delay in settlement of final bill.

Pipes shall be laid in reasonably dry trenches. Under no circumstances pipes shall be laid in slushy, marshy or water logged and filled up or yielding strata before getting it inspected from Engineer-in-

charge and providing proper foundations.

Contractor shall make his own arrangements for obtaining permission for stacking or pipes etc. on the road from land Owners whether it is belonging to any other Government Department or Municipal or Local Bodies or Private Land Owners.

For crossing obstacles natural or built up such as culverts, drains, gutters, cables, pipeline, poles etc. contractor shall approach respective authorities obtain permission for crossing them immediately at the time limit of acceptance of the tender and shall take into consideration all such difficulties for the time limit allowed for execution and completion of the work. Any such work left remaining to be carried out due to want of the tender without any claim for extra cost or compensation due to non receipt of permission or any other natural or unforced and until the date of completion of the work shall be treated as incomplete. Contractor shall also not claim compensation if work is delayed on account of permission for road crossing etc. not being received in time.

Before the work of laying pipe line is started the contractor shall see that all pipes are stacked length wise above the trench between road fencing in sufficient number and without causing any construction to the traffic.

Necessary road diversion as directed shall be provided without any extra claims by the contractor for excavation the roads till completion of work, so that the traffic shall not be hampered. Necessary guide stones duly painted with white wash shall be provided on both sides of temporary diversions. Necessary sign boards, indicating diversions and road closed etc. shall be provided at prominent places along with red flags and red letters at night time and maintained till the crossing work is over and road opened for traffic. The diversion shall be removed after road surfaces are brought to original condition. Necessary storing planks for crossing the trenches shall be provided on the open trenches in the towns and wherever required without claiming extra cost.

The contractor shall take utmost care in laying the pipe line alongwith roads and in towns in order to avoid accidents to human life and animal.

Wrapping :- When ductile iron pipes are to be laid in aggressive soils, the pipes should be wrapped externally with protective coatings, such as bitumen or coal tar sheathing protective taps or by loose polythene slaving, or in certain, circumstances concrete before laying. At joints, bends and valves, precautions should be taken to provide sufficient overlap of the wrapping sleeve so that no pipe line is exposed to the aggressive soil.

Pipe line markers :- Distinctive markers should be erected at all roads, railways, river and

cannel crossings and elsewhere as required to identify the pipe lines and to indicate its positions. Markers should be placed at field boundaries, preferably in such a way that they are not obscured by vegetation. At all valve installation, plates should be provided to give the same information as on the markers. Markers should not be treated with any substances likely to be harmful to live stock.

Pipe line Anchorage :- All pipe lines having, unanchored flexible joints required anchorage at changes of direction and at dead ends to resist the static thrusts developed by internal pressure. Dynamic thrusts caused by flowing water act in the same direction at static thrust. The trust is of sufficient magnitude at high, velocities, to warrant safety consideration.

Anchorage's to resist the thrust should be designed taking into account the maximum pressure the main is to carry in service or on test, and the safe bearing pressure of the surrounding soil.

Where possible, concrete anchor blocks should be of such a shape as to allow sufficient space for the remaking of the joints.

Laying Procedure :-

Laying of DI pipes shall be done as per I.S. 12288/1987 and as amended from time to time. Rubber gaskets (SBR rings) are to be provided. SBR gasket shall confirm to IS 12820/1989 or latest edition, Lowering, Laying and jointing of pipes shall be carried out as per standard specification No. Bd-V-1.4 Page 548 and as per standard specifications No. Bd-V-1.4 page No. 549 and as per standard practice in MJP organization and as directed by the Engineer-in-charge. DI pipes shall be jointed with the CI specials with the help of CI mechanical joint. The jointing operations of mechanical joint shall be done as per instructions given in the literature of the firm manufacturing the mechanical joint. This operation shall be done as per instructions of the Engineer-in-charge of the work.

Energy socket (inner side) should be cleaned before fixing of SBR Gaskets. The gaskets shall be fixed in the grove provided in socket. The spigot end of every pipe should be marked by paint, at a distance 1 cm more than the grove length available at socket end to insure that the proper length of pipes (Spigot end) must be gone at socket end at the time of pushing the pipe.

Barricades, Guards and Safety Provisions :- To protect persons from injuries and to avoid damage to property, adequate barricades, construction signs, touches, red lanterns and guards as required, shall be placed and maintained during the progress of the construction work and until it is safe for traffic to use the roadways. Fences or barricades and be protected shall enclose all materials

that may serve as obstruction of traffic and shall be protected by illuminating proper lights when the visibility is poor. The rules and regulations of the local authorities regarding safety provisions shall be observed.

Maintenance of Traffic and closing of streets :- The work shall be carried including closing of road / street in such a manner, which will cause the least interruption to traffic. Suitable signs indicating that a street is closed shall be placed and necessary detour signs for the proper maintenance of traffic shall be provided.

Protection of property and structures :- Trees, shrubbery, fences, poles and all other property and surface structures shall be protected unless their removal is instructed by Engineer-in-charge when it is necessary it should be done under the supervision and direction of authority.

Temporary support, adequate protection and maintenance of a underground and surface structures., drains, sewers and other obstructions encountered in the progress of the work shall be provided under the direction of authority. The structures, which may have been disturbed, shall be restored after completion of the work.

Protection of the fixing Services. :- As far as possible the services like gas pipes, cables, cable ducts and drains but not sewers which are usually laid at greater depth. Where it is unavoidable, pipe line should be suitable protected. A minimum clearance of 150 mm. shall be provided between the pipeline and such services. Adequate arrangements shall be provided between the pipeline and such services. Adequate arrangements shall be made to protect and support the existing services during the laying operations. The pipe line shall be so laid as not to obstruct access to other services of inspection, repair, and replacement. When such utilities are met with during excavation, the authority concerned shall be intimated and arrangements should be made to support and protect the utilities in consolation with them.

Proper implements tools and facilities satisfactory to the Authority shall be provided and used for the safe and convenient of the work. All pipes fittings, valves, shall be carefully lowered into the trench., and piece by pipes fittings, valves, shall be carefully lowered into the trench, and piece by piece by means of ropes, derrick or any other suitable means. Under no circumstances shall pipes, materials be dropped or dumped in to trenches. Pipes over 300 mm. dia shall be handled and lowered into trenches with the help of chain pulley blocks. Tripod supports used for this purpose shall be regularly checked to prevent all risks of accidents.

Every precaution shall be taken to prevent foreign material from entering the pipe while it is

being placed in the line. A heavy tightly woven canvas bag of suitable size shall be placed over each end and left there until the connection is to be made to the adjacent pipe. During laying operations, no debris tools clothing or other materials shall be placed in the pipe. At times when pipe laying is not in progress the open ends of pipe shall be closed by a watertight plug or other means approved by Authority.

1) After laying and jointing, the pipe lines shall be tested under pressure by hydraulic test pumps to ensure that pipes and joints are strong enough to withstand the maximum pressure likely to be developed under the working conditions.

2) The field test pressure to be imposed shall not be less than the greatest of the following

i) 1.5 times the maximum sustained operating pressure

ii) 1.5 times the maximum pipe line static pressure.

iii) Sum of the maximum sustained operating pressure or the maximum pipe surge pressure.

Subject to a maximum equal to the work test pressure for any pipes and fittings incorporated to the pipeline.

The field test pressure should wherever possible be not less than two third of the working pressure, test pressure appropriate to the class of pipes and shall be applied and maintained at least 4 hours . Where the field test pressure is less than 2/3 the test pressure, the period of test shall be increased to at least 24 hours. The test pressure shall be gradually raised at the rate of nearly 1Kg/min.

In the case of spun iron pipes, the hydrostatic test pressure after installation is to be adopted instead of works hydrostatic test pressure, which is 50 Kg./Sq.cm. uniformly for all classes of pipe. If pressure measurements are not made at the lowest point of the section, an measurements are not made at the lowest point and the point of measurement to ensure that the maximum pressure is not exceeded at the lowest point. If 10 m. drop in pressure occurs the quantity of water added to re-establish the test pressure shall be pipe line per day or each 30 m. head of pressure supplied.

Method of pressure Testing :-

The pipeline shall be tested for soundness in portions as laying is in progress. The procedure for the test as adopted generally is as under.

1) At a time one section of the pipeline between two sluice valves, is taken up for testing. The section usually taken in about 300 to 500 mts. Long, or as directed by Engineer-n-charge.

2) One of the valves is closed that water is admitted into the pipe line through the other end by means of the hand operated pump by releasing the air suitably, through the cocks provided and fixed for this purpose. The necessary power pump with small capacity may also be installed to fill the pipe line and to raise the pressure. However hand pump can be tired as a supplementary arrangement.

3) After filling, the section of pipe line, the sluice valve is to be closed and the pipe section is isolated.

4) Pressure gauge will be fitted at suitable interval on the crown into the holes meant for the purpose.

5) The pipe section is then connected to the delivery side of a pump through a small valve.

6) The pump is then worked fill the pressure inside reaches the designed value which can be read from the pressure guage already fixed.

7) After the required pressure has been applied, the valve shall be closed and the pump be disconnected.

8) The pipe shall then be kept under the desired pressure for at least two hours during inspection for any defect i.e. leakage's of the joints etc. The pipeline shall be then emptied through scour valves and defectes observed in the test shall be rectified.

The hydraulic testing of the pipe line should be invariable carried out before back filling is done. A logbook should be maintained by the J.E. on site showing details as below .CH & date of line out given Date of excavation completed. Date of murum bedding Date of lowering laying jointing. Date of hydraulic testing. Dai of Pipes/length. Presure gauge reading. Sign who is present at the time of testing Contractor his represse natatives sign. Remakrs.

Sec. Egnr. SDO Ex. Engr.

1	2	3	4	5	6	7	8	9	10	11	12

The hydraulic testing should be carried out in the presence of local residents and photographs shall be taken. The agency should give Hydraulic testing immediately after line is laid.If this is not done the outstanding length should not be more than 3 Km. or complete length of component whichever is less. No bill should be paid for further work done on pipe line unless hydraulic test is given for outstanding length.Water required for testing will not be supplied by department. Agency has to do

its own arrangement. For this the contractor should produce certificate of possession of pipe testing equipment and also testing equipment for CID any other joints.The test pressure should be witnessed by Dy.Engineer and Executive Engineer, Maximum length that can be certified by D.E. without E.E.s check should be limited to 2 Km. and further testing of 10% length has to be checked by E.E.

JOINTING OF PIPES

All the jointing work shall be carried out by the contractor after giving written due intimation in advance at least for 4 days before jointing operation starts and laid pipes are approved for grade and cleaned of all inside waste material such as mud etc. and in presence of responsible Government Servant not below the rank of Junior Engineer. Unless otherwise mentioned in the wording of the item in Schedule 'B' of the tender all labour and materials required for jointing (depending upon the type of joint mentioned in item) such as lead, spun yarn, grease, oil, SBR quality rubber rings and gaskets, cement, sand, water, fire wood, nut-bolts, washers, rubber packing, RCC collars, etc. shall be produced and used by the contractor at his cost. All the materials to be used for jointing should be first got approved from the Sub-Divisional Officer.No extra claims or compensation will be admitted for items of laying pipes etc. If the pipes are required to be laid upto a depth not greater than 3 times the maximum depth shown in the sectioned longitudinal sectional drawings or estimate so also no compensation shall be paid if class of pipes to be laid is changed during execution.If the lines are laid in separate detached sections and not continuous length due to any of the reasons such as non availability of specials or due to obstacles etc. contractor shall see that no end of any pipe length is kept open even temporarily and that all open ends are immediately covered up either by suitable blank flange or cap, plug or by means of a double layer gunny cloth tied properly by means of mild steel wires and without any claim for extra cost or compensation.

The contractor shall take utmost precautions to see that no extraneous matters such as lead, stones, brick bats or animals such as rats, reptiles are allowed any access into the pipe line and in case of their existence being detected in the pipe line, the contractor shall remove them by means of rodding etc. to the complete satisfaction of the sub-divisional officer, without any claim for extra cost.No extra cost will be allowed to fixing of specials and other accessories such as valves, washouts, etc. unless provided for separately in the tender. So also no extra cost will be paid for cutting the pipes and specials as and where required for negotiation of bend or fixing valve, branch tee or achieving exact length of the line etc. The cutting operation shall be carried out preferably by means of standard pipe cutter or hacksaw unless cutting by chisel and hammer is allowed by the Engineer-in-charge. The end of pipe to be used for gasket joint shall be chamfered by means of file and made perfectly true or like

original chamfered and if portion of pipe or specials is damaged rendered useless due to careless cutting of the contractor the cost of the damaged portion as decided by the Executive Engineer will be recovered from the contractor.

If necessary, the contractor shall have to carry out the work of laying pipes by keeping gaps here and there if some pipes, specials and valves to be supplied by the Department as per Schedule 'A' would not be made available in time and the contractor shall not claim any compensation for being required to lay the pipe line in gaps and for excavating gap portion if it gets refilled etc.Insertion of gaskets shall be done by proper application of a thin film of lubricant (Vegetable oil only) to the butt seating inside the socket. The gasket shall be wiped clean, fixed and then the socket with the bulb towards the back of the socket. The groove in the socket must be located on the retaining board in the socket and retaining hole of the gasket firmly bedded in the seating. Contractor shall ensure to the satisfaction of the Sub- Divisional Officer that the gasket fits evenly around the full circumference removing any bulges which would prevent the proper entry of the spigot and for large diameter this operation should be assisted by forming a second loop in the gasket opposite to the first and then pressing the loops flat one after the other.The thin film of lubricant (Vegetable oil only) shall be applied to the inside surface of gasket which will be in contact with the entering spigot. A thin film of lubricant shall be also applied to the outside surface of the entering spigot for a distance of 25 mm from spigot end. The pipeline to be jointed should be supported centrally by the tackle used for laying and balance just clear of the trench bottom. The spigot of the pipe must be aligned and entered carefully into the adjacent socket until it makes contact with the gasket. Final assembly of the joint is completed from this position.

The spigot end of the entering pipe shall be compressed until it reaches the bottom of the socket. If the assembly is not completed with reasonable force, the spigot end shall be removed and the position of the gasket examined and then the assembly is refitted properly to the satisfaction of the Sub-Divisional Officer. The work shall generally be carried out as per instructions given in manufacturer's pamphlets. All the tools and tackles required for jointing, such as rack and layer 3 mm dia, 5 m long wire rope with thimble, hook and rope adjuster should be procured by the contractor at his own cost.

The item includes all other necessary materials including rings, etc. and labour.

HYDRAULIC TESTING

The pipeline and valves should be tested hydraulically upto the required pressure as per IS satisfactorily and all the leakages if any should be repaired at the time of hydraulic testing. The 10%

amount of the lowering, laying and jointing of pipeline shall be released after satisfactory hydraulic testing. Contractor should make his own arrangements at his own cost for water for hydraulic testing of pipeline. He should not rely upon completion of any other sub-works for such testing.

MODE OF MEASUREMENT

The item will be measured and paid on the Running Meter basis.

The laying of pipeline be measured in linear meter of pipe line laid measured along the center line on top of pipe. The rate shall include lowering, laying and jointing of pipes. Providing and laying of valves shall be paid separately under the relevant item in the bill of quantities and rates, but laying and fixing of all types of specials such as CI mechanical fittings/CI flanged specials shall be measured in linear meter. Laying of specials shall be measured in continuation with pipes and the payment of laying of specials shall be made with pipe laying under relevant Item 75% of rate will be released after proper lowering, laying, & Jointing of pipes and specials and 25% will be released after hydraulic testing of pipe line of the specified pressure as per CPHEEO manual

ITEM: C.I. MECHANICAL JOINTS

Supply of C.I. Mechanical Compression collar coupling (popularly known as Jiffy Collar Coupling) suitable for C.I. spun pipes (as per IS:1536:2001) and D.I. pipes (as per IS:8329:2000) complete with sealing rubber gasket of SBR. C.I. Follower glands and MS Nit bolts. The whole assembly should be mechanically and hydraulically tested to the provisions as paid down in IS:1538:1993 and as directed by Engineer-in-Charge.

Mode of measurement : Per No.

ITEM: LOWERING AND FIXING OF SLUICE VALVES/KINETIC AIR VALVES

(Items as per schedule B)

This item includes fixing of valves at work site including cost of transportation, loading, unloading, etc. all materials and labours required for fixing, including testing. The size of nuts, bolts and packing shall be as per IS specifications and suitable for the type of valves and as per the directions of the Engineer-in-charge. The location of the valves shall be decided by the Engineer-in-charge. Before any of these valves are fixed at the pre-determined position, these shall be cleaned, greased and it shall be checked that these are in proper working condition. Sluice valves shall be properly supported on wooden sleepers till the anchor blocks sets.

Sluice valve - PN ..... mm dia.

..... mm dia

……. mm dia

Air valve (Double Ball) ……mm dia

Kinetic Air valve PN-…… …… mm dia

Hydraulic Testing

The pipeline and valves should be hydraulically tested upto the required pressure as per IS, satisfactorily and leakages if any should be repaired at the time of hydraulic testing. The 10% amount of the lowering, laying and jointing the pipe shall be released after satisfactory hydraulic testing. Contractor should make his own arrangements at his own cost for water, for hydraulic testing of pipeline. He should not relay upon completion of the any other sub-works for such testing.

MODE OF MEASUREMENT

The item will be measured and paid on the No. basis. 75% payment will be made after lowering and fixing and remaining 25% will be released after satisfactory hydraulic test.

ITEM: Reflux Valve :-

The item includes providing, erecting, jointing with jointing material and commissioning CI, double flanged Reflux Valve of 150 mm. dia. of PN1.6 rating The valve shall conform IS:5312 (part - I). The valves shall be provided with a concrete block for support. The minimum size of reflux valve shall be so selected that, the velocity of water shall not exceed 2.0 M/Sec.

Acceptable makes : As per latest approved list of MJP .

PROVIDING AND SUPPLYING C.I./D.I. FLANGED PIPES

Sub-Work No., Item No),

The item includes supply CI/DI flanged pipes as per latest IS and approved by Engineer-in-Charge. The cost of pipe should be including all taxes central and local, railway freight, transportation upto site of work or departmental store.

The item will be measured and paid as per running meter basis.

ITEM B.B. MASONRY CHAMBER

(Items as per schedule B)

Providing and constructing B.B. masonry valve chambers of internal size …. x ….. and ….. x …… m or as size as per Schedule-B and as per approved drawing for ESR/MBR/WTP etc.

This item shall be executed as described in schedule 'B' for relevant item and directed by Engineer-in-charge. The items like concrete, plaster, brick work etc. shall be executed as per PWD Specification and as per direction of Engineer-in-charge. The frame & Cover shall be of SFRC & be have good quality. Damaged cover and frame shall not be fixed. The chamber shall be constructed well sufficient above the G.L. so as rain water shall not enter into the chamber. The bottom shall be constructed below bottom of valve, so that nut bolts of valve can easily be operate; Hence suitable depth of chamber shall be kept according to the site condition and as directed by Engineer-in-charge

The work is to be carried out as per type design or drawing of the department and as per detailed description of the item in Schedule-B of the tender. Sizes of chamber mentioned in the item are the clear internal dimensions of the chamber after completion of plastering. Unless otherwise mentioned in the wording of item in Schedule-B of the tender the rate for this item shall include following allied works.

a) The cost of extra excavation in all types of strata which is in addition to the line trench, refilling the sides and disposing off surplus stuff will be paid separately under relevant item. Excavation covered by pipe line trenches coming under M.H. chamber shall not be admissible for payment.

b) Providing and casting at site 15 cm thick bed concrete in CC M-100 below external size of complete chamber.

c) Providing B.B. masonry side walls in 225 mm thick in CM 1:5

d) Providing 20 mm thick plaster in CM 1:3 from inside.

e) Providing cement plaster 20 mm thick in CM 1:3 from outside at least upto 30 cm below ground level.

f) Providing top coping 15 cm thick in M-150 with smooth finishing to surface.

g) Providing and fixing in position pre-cast RCC manhole frame cover.

h) Unless otherwise directed by the department the finished top of the chamber constructed on road surface and shall not cause hindrance to traffic.

Mode of Measurement

This item will be measured and paid as per number basis.

Specifications for Sewage Pumping Stations (Civil Works)

DESIGNING , PROVIDING AND CONSTRUCTING PUMPING STATION

This work includes providing and constructing Sump and Pump House of size mentioned along with all the ancillary items related a specified in Schedule 'B the quantity of ancillary items are worked out on the basis of structural Design and hydraulic of the project report However the contractor shall have to Submit his own structural design and drawings for sump and pump house which will Be got check and approved from nearest Government the measurements of work for Payment shall be recorded as per approved design and drawing submitted by the Contractor the quantities of items on the of dosing and drawings submitted by The contractor and approved by the department shall not exceed the quantities Proposed in the schedule 'B'

Item No. :- Excavation for foundation in earth soils of all types, sand, gravel, ------etc completed (Excluding back filling)

The excavation shall be done as per standard specification No.Bd-A-1,page No.259 or as per standard specification (Red Book)

The excavation shall be done to the required depth and section as per Design, drawing and as directed by Engineer-in-charge. Extra depth shall be made up Clear with concert or other suitable materials as directed by Engineer –in charge at the Cost of contractor the excavated material shall not be placed near than 3.00m. From the edges of excavated portion. no compensation shall be admissible the Contractor due to any delay as permission etc. After refilling of the trenches, the Balanced stuff should be disposed off as directed. Refilling and disposal will be paid Separately in relevant items, Necessary shoring and strutting of sufficient strength should be Provided to the excavated portion to prevent falling of sides. .

During execution of woks at all endangered where traffic Prevails, trenches shall be strongly fenced barricaded and marked with red lights During excavation, if masonry, structures, roots of trees etc, are with. The Same shall be removed without extra cost the loss to public or private utility Services such as telephone or electric cables/water mains/ or such other, if comes Across the excavation, shall have to be made good and working condition at the cost Of the contractor. All necessary arrangement for diversion of traffic should be made Before starting of excavation and all precautionary measures should be taken so as to Avoid accidents while works in progress.

The bottom of trench shall be leveled both longitudinally and transversely or stepped as directed by Engineer –in-charge. Measurement of work for Payment shall be made as per dimension shown in drawing or as directed by Engineer-in-charge.

Classification of material in excavation

The exact classification of the strata and road surfaces met during The excavation shall be done by the representative of Engineer-in-charge and Accordingly measurements shall by recorded under different items of excavation provided under Schedule 'B' of an 'agreement. The excavation in soft strata shall be carried out mechanically by blasting is not permissible in case shall be final. The strata classification and its quantity shown are indicative shown are only the contractor shall therefore carry out his own assessment regarding the strata at different depth at The site of work before submission of the tender.

Item No.:- Excavation for foundation in hard Murum and hard Murom with boulders ------etc completed (Excluding back filling)

The excavation shall be done as per standard specification No.Bd-A-2, page No.259 or as per standard specification (Red Book)The excavation shall be done to the required depth and section as per Design, drawing and as directed by Engineer-in-charge. Extra depth shall be made up Clear with concert or other suitable materials as directed by Engineer –in charge at the Cost of contractor the excavated material shall not be placed near than 3.00m.From the edges of excavated portion. no compensation shall be admissible the Contractor due to any delay as permission etc. After refilling of the trenches, the balanced stuff should be disposed off as directed. Refilling and disposal will be paid separately in relevant items; necessary shoring and strutting of sufficient strength should be provided to the excavated portion to prevent falling of sides. During execution of woks at all endangered where traffic Prevails, trenches shall be strongly fenced barricaded and marked with red lights. During excavation, if masonry, structures, roots of trees etc, are with. The Same shall be removed without extra cost the loss to public or private utility Services such as telephone or electric cables/water mains/ or such other, if comes Across the excavation, shall have to be made good and working condition at the cost Of the contractor. All necessary arrangement for diversion of traffic should be made Before starting of excavation and all precautionary measures should be taken so as to Avoid accidents while works in progress.

The bottom of trench shall be leveled both longitudinally and transversely or stepped as directed by Engineer –in-charge. Measurement of works for Payment shall be made as per dimension shown in drawing or as directed By Engineer-in-charge.

Classification of material in excavation

The exact classification of the strata and road surfaces met during The excavation shall be done by the representative of Engineer-in-charge and Accordingly measurements shall by recorded under different items of excavation Provided under Schedule 'B' of an 'agreement. The excavation in soft strata shall be Carried out mechanically by blasting is not permissible in case shall be final. The strata classification and its quantity shown are indicative shown are only the contractor shall therefore carry out his own assessment regarding the strata at different depth at the site of work before submission of the tender.

Item No, :- Excavation for foundation in soft rock -----etc, completed.

The item shall comply as per relevant item of Schedule 'B', excavation shall be done as per Standard specification No. bd-A4, A-6. On page No. 259 Respectively. All others specification shall be followed strictly as per items no. (1) Above.

Item No, :- Excavation for foundation in hard rock by control blasting -----etc, completed.

The item shall comply as per relevant item of Schedule 'B', excavation Shall be done as per standard specification No. bd-A4, A-6. On page No. 259 Respectively. All others specification shall be followed strictly as per items no. (1) Above.

Item No, :- Excavation for foundation in hard rock by Chiseling -----etc, completed.

The item shall comply as per relevant item of Schedule 'B', excavation Shall be done as per standard specification No. bd-A4, A-6. On page No. 259 Respectively. All others specification shall be followed strictly as per items no. (1) above.

1.1 General

The conditions/specifications laid down hereunder will hold good whether the excavation is to be carried out over areas for leveling foundations of structures, trenches for pipes or cables or any other type of work which involves earth work like the leveling of forming/embankments etc.

a. Earthwork in excavation includes site-cleaning activities like removal of shrubs, loose stones, and rubbish of all kinds, interfering with the works and with complete removal of roots.
b. The products of the above clearing operations shall be removed from the site, dumped, stacked at a place or places, burnt or otherwise disposed of as directed by the Engineer-in-Charge within the compound.

c. A permanent base line and cross lines shall be established to serve as reference grid using MS plates, pegs, pins set in concrete or brick masonry pillars where they will be free from disturbances.
d. A permanent bench marks or marks as required necessary for the works connected to the nearest GTS benchmark shall be established for reference.
e. Excavation shall be carried out in all types of soil like top soil, silt, sand, gravel, soft murum, clay, kankar, hard materials like disintegrated rock shale which can be removed by picks, crowbars and shovels. Soil/earth may contain boulders. Loosening of rocks include the other methods of excavation other than blasting such as chiseling, wedging line drilling to avoid shattering of rocks. The Engineer-in-Charge shall decide what method shall be adopted for removal of the hard rock.
f. Excavation, whose sides are required to be maintained at a steeper slope than the stable slopes, will be required to be properly shored and strutted failing which the contractor will be required to execute the work by open cutting by the approval of Engineer-in-Charge.
g. Negligence on account of this leading to any mishap will be entirely the responsibility of the contractor.
h. Please also refer the specification for excavation in the subwork of 'sewerage collection system'; specifications for item no. 3 to 6.

1.2 Drainage in the vicinity of excavation

a. The contractor shall control the drainage in the vicinity of the Excavation so that the surface of the ground will be properly sloped to prevent surface water running into excavated areas during construction. Arrangements shall be made for preventing rain and other extraneous liquids entering the excavated parts. Seepage water shall be directed to flow away from the trenches by gravity. If any pumping is required to keep the trench and the exposed areas dry for further work the same shall be done by the contractor at his own expenses.
b. The rates quoted by the contractor shall be deemed to be inclusive of all the above costs or charges for stipulations stated above.
c. Excavated material shall not be deposited within 1.5 meters from the top edge of the excavation.
d. The contractor shall remove the excavated material to spoil heaps on the site or transport the same to a place as directed by the Engineer-in-Charge.

e. If the bottom of the excavation is left exposed by the contractor and in the opinion of the Engineer-in-Charge it has become deleteriously affected by atmospheric changes or affected by water then the contractor shall remove at his own cost such portions of the affected foundations and shall make good by filling with lean concrete or with compacted sand as directed by the Engineer-in-Charge.

f. Where Excavation is made in excess of the depths required as shown in the drawings or as directed by the Engineer-in-Charge the contractor shall at his own expense fill up to the required level with lean concrete or well compacted sand as decided by the Engineer-in-Charge.

g. Loose, soft or bad soil encountered in Excavation at the required depth on Engineer-in-Charge's directions shall be excavated to the firm bed and the difference of levels between the required level and the firm bed shall be filled up or dealt with as directed by the Engineer-in-Charge.

h. Any obstacle encountered during excavation shall be reported immediately to the Engineer-in-Charge and shall be dealt with as instructed by him. Same shall be applicable for any antiques/treasure found during excavation.

i. Any public utility services/facilities like water supply lines, gas supply line, sewers, telephone/electric cables poles etc. met with during Excavation shall not be damaged and no disruption is caused to the utility service on account of damages caused by the contractor. Such facilities shall be properly supported in their original positions by giving signs, suspension beams etc. as contractors own expenses.

j. The contractor shall not undertake any concreting or constructing work of any nature on the excavated surfaces until approved for the same is given by the Engineer-in-Charge.

k. The contractor shall be solely responsible for the protection of adjoining properties from damages that may be on account of excavation close to the properties whether the property belongs to government or to a private party.

l. The contractor shall make all arrangements for proper warnings like providing fences, danger flags, barricading, night warning lights, watch and ward etc, to caution the public as well as the laborers engaged by him about the dangers

that may be involved by excavation of trenches, pits, foundations etc. Safety code for excavation work IS: 3764-1966 shall be rigidly followed unless instructed otherwise by the Engineer-in-Charge.

m. Any useful material obtained during excavation shall be stacked as directed by the Engineer-in-Charge and will be the property of the department. The decision of the Engineer-in-Charge in this regard shall be final and binding on the contractor.

n. Any material used by the contractor out of the Excavated stuff in lieu of his own materials shall be charged to the contractor at the market rates.

1.3 Excavation in trenches and cable ducts.

a. Excavation as required in trenches, cable ducts, for manholes, other overflow structures, cross drainage works, extra depths for joints of pipes shall be carried out as shown in the drawings/directed by the Engineer-in-Charge.

b. For deep foundations necessary shoring and strutting shall be executed as directed by the Engineer-in-charge. If additional slopes are to be provided where vertical cuts are not possible the same shall be executed without any additional cost. The rates quoted shall be deemed to be inclusive of all such extra work.

c. The trench shall be kept perfectly dry by preventing the extraneous water entering the pits and also wherever necessary by pumping at the cost of the contractor. No additional cost of dewatering shall be payable unless there is an item specifically included in this sub work.

d. The trenches after laying, jointing and testing of pipes/cables are to be back filled. The trenches shall be filled with the excavated material if found suitable as directed by the Engineer-in-Charge.

e. All surplus soil/earth shall be transported and disposed of as directed by the Engineer-in-Charge. Boulders, sharp objects, brickbats, roots of trees, rubbish, rubble etc. shall not be used for back filling. The back filling shall be done very carefully so as not to damage the pipes/cables or disturb the alignment levels of the pipes/cables. The back filling shall be done in layers on both sides of the pipes, watered, and compacted by ramming to a dense layer. The thickness of each layer shall not be more than 15 cms. Special care shall be taken to avoid unequal pressures and not to disturb the pipe.

f. In case the excavated material falls short of requirement the back fill soil/earth shall be taken from borrow pits approved by the Engineer-in-Charge. The rates quoted by the contractor shall be deemed to be inclusive of all such works.

g. Sight rails and boning rods are to be used at regular intervals as directed by the Engineer-in-Charge to excavate the trenches true to line and grade.

1.4 Back filling / Earth filling

a. Back filling of earth around liquid retaining structures and pipes shall be done only after the water-tightness test is done to the satisfaction of the Engineer-in-Charge. Selected earth from the excavated earth shall be used for back filling / embankment.
b. Care shall be taken to see that unsuitable soil/earth does not get mixed up with the material proposed to be used for filling.
c. Regarding the soil/earth to be used for back filling the contractor shall have the prior approval of the Engineer-in-Charge.
d. Backfill shall be placed in successive horizontal layers of loose material not more than 15 cm thick. The material shall be brought to within + or - 2% of the optimum moisture content as described in IS: 2720 (Part VIII) after adjusting the moisture content, the layers shall be thoroughly compacted with such equipment. as may be required to obtain a density equal to or greater than 95% of maximum laboratory dry density of the soil.
e. Successive layers of filling shall not be placed until the layer under construction has been thoroughly compacted to satisfy the requirements laid down.

1.5 Filling and Embankment

a. The area where filling or embankment is to be carried out shall be cleared from loose material and the virgin soil shall be exposed. All shrubs and vegetation with roots are cleared. All soft patches shall be removed and filled with selected soil/earth and consolidated. Exposed soil/earth shall be consolidated properly to obtain 95% of maximum laboratory dry density of the soil.
b. Approved filling material shall be uniformly spread in layers not exceeding 20 cms in loose depth. All clods, lumps, etc shall be broken before compaction.
c. Successive layers of filling shall not be placed until the layer under construction has been thoroughly compacted to satisfy the requirements laid down in these specifications.
d. The contractor shall give the samples of the earth he proposes to use for back filling for testing, if required or directed by the Engineer-in-Charge along with the following characteristics of the soil/earth.
e. Only earth having plasticity index less than 20 shall be used.
f. Soil/earth having laboratory maximum dry density of less than 1500 kg per cubic meter shall not be used

g. If the layer fails to meet the required density it shall be reworked or the materials shall be replaced and method of compaction altered as directed by the Engineer-in-Charge to obtain the required density.

h. If any test indicates less than the specified degree of compaction the Engineer-in-Charge may require all the fill placed; subsequent to the latest successful tests to be removed and compacted and compaction procedure to be done once again to obtain satisfactory density.

i. The contractor shall perform all necessary tests to determine optimum moisture content and the degree of compaction. He shall furnish the results to the Engineer-in-Charge.

j. Prior to rolling, the moisture content of the material shall be brought to within +2% of the optimum moisture content as described in IS-2720 (part VIII). The moisture content shall preferably be on the wet side for potentially expansive soil/earth. After adjusting the moisture content as described in this clause, the layers shall be thoroughly compacted by means of rollers till 95% of maximum laboratory dry density is obtained.

k. If the layer fails to meet the required density it shall be reworked or the materials shall be replaced and method of compaction altered as directed by the Engineer-in-Charge to obtain the required density.

l. The embankment shall be finished to the alignment levels and grades, cross sections, dimensions shown in the drawings or as directed.

m. If sand filling is specified in the tender for filling the trenches, plinth or foundations the sand used shall be hard, free from inorganic materials and deleterious materials and approved by the Engineer-in-Charge. Filling shall be carried out in layers not exceeding 15 cms in loose depth and flooded and tamped till it meets the approval of the Engineer-in-Charge.

n. The contractor shall perform all necessary tests to determine optimum moisture content and the degree of compaction. He shall furnish the results to the Engineer-in-Charge.

1.6 Shoring / Strutting / Timbering.

a. When the depth of foundation or pipe trench is great and the soil/earth is soft and generally for depths more than 1.5 m. Stepping, sloping and or paneling and strutting of sides shall be done as directed by the Engineer-in-Charge. The decisions regarding the positions and depths at which and what type of precautions are to be provided shall be decided by the Engineer-in-Charge.

b. It shall be the responsibility of the contractor to take all necessary precautions or steps to prevent the sides of trenches from collapse. The contractor shall be responsible to make good any losses or damages caused to execute works, life and property due to his negligence.

c. Deep excavation shall be inspected after every rain, storm, or other hazards and if necessary the precautions required shall be augmented.
d. Planking and strutting shall be either “Close” or “Open” type depending upon the nature of the soil/earth and depth of excavation etc.
e. The timbering shall be of sufficient strength to resist earth pressure and ensure safety to the adjoining property and to persons. Where the excavation is subjected to vibrations due to machinery, vehicles, rail traffic, blasting and other sources, additional bracings shall be provided.
f. Generally the specifications and sizes and spacing of sheeting, walers and struts used for timbering of different depths shall be as given in the IS: 3764-1965 Safety code for excavation work unless otherwise specified in the tender else where. Shoring shall extend 30 cms, above the vertical sides.
g. Withdrawal of timbering shall be done very carefully to prevent collapse of the sides of excavation and any damage to the work executed.
h. Open timbering shall be provided wherever the Engineer-in-Charge directs, where the trenches are not close to any buildings/property/structures. In open timbering the trench shall be protected by covering 1/3 the surface area by planks.

Important Notes

1. The bottom of Excavation shall be trimmed to the required levels and when carried below such levels, by error, shall be brought to level by filling with lean concrete of grade 1:4:8 or as specified at the contractor□s cost and nothing extra shall be paid to the contractor on this account.
2. The contractor shall be responsible for assumptions and conclusions that he may make regarding the nature of materials to be excavated and the difficulty in making and maintaining the required Excavation and performing the work required as shown on the drawing and in accordance with these specifications. Cofferdams, sheeting, shoring, bracking, draining, dewatering, etc. shall be furnished and installed as required and the cost thereof shall be included in the rate quoted for the item of excavation. The contractor shall be held responsible for any damage to any part of the work and property caused by collapse of sides of Excavation. Materials may be salvaged if it can be done with safety for the work and structures, as approved by the Engineer-in-Charge. However, no extra claim shall be entertained for material not salvaged or any other damage to contractor□s property as a result of the collapse. He shall not be entitled to any claim for redoing the excavation as a result of the same.

3. The excavation for foundations shall be carried out carefully, creating least disturbance to the founding stratum. The founding stratum should be blended by the concrete layer immediately after exposure so that it does not lose its strength on exposure to air and water.
4. Where excavation requires bracing, sheeting, or shoring etc, the contractor shall submit to the Engineer-in-Charge, drawings showing arrangement and details of proposed installation, and shall not proceed until he has received approval from the Engineer-in-Charge.
5. The contractor shall have to constantly pump out the water collected in pits due to rainwater, springs etc. and maintain dry working conditions.
6. For the purpose of excavation in earthwork, all types of soil including kankar, murum, single and boulders without binding matrix are included.
7. All excavated material obtained as a result of over excavation for which payment shall not be made, and that shall also be transported and disposed off as directed and at places shown by the Engineer-in-Charge, at no extra cost to the department within plot boundary.
8. All excavated materials obtained from excavation shall remain in the department□s property. The useful portion as decided by the Engineer-in-Charge, shall be separated from the useless ones and deposited in regular stacks at places indicated and as directed by the Engineer-in-Charge.
9. In no case the excavated soil shall be stacked up to a distance of 1.5 m from the edge of excavation or one-half the depth of excavation whichever is more.
10. IS Codes
11. Some of the important relevant applicable codes for this section are IS: 1200 (Part-I)-Method of measurement of building and civil engineering works and earthwork
12. IS: 3764 - Safety -code for excavation work
13. IS: 4701 - Code of practice for earthwork on canals
14. Cradle and Manholes for collection sewer line shall be as per CPHEEO Manual.

Items No. :- Filling in plinth and floors with contractors Murom etc, completed .

The specification provided in the subwork for Sewerage collection system shall be referred This item shall be done as per standard specification No.-A-11 page No.263 for bedding and refilling of teach shall only be used the refilling shall be done in 15 to 20 cms thick layer. Each layer should be watered and compacted properly by engineer-in-charge.

Item no. :- Disposing of excavated stuff etc. Complete.

1) After refilling of trenches, surplus excavated stuff remaining at the Site of work have to be disposed off at suitable places with in one km distance as Directed by Engineer-in-charge2)

Surplus excavated materials is the property of MJP and there and therefore Contractor is not empowered to sell these excavated materials to any other agency.

3) This disposal will not be considered for initial 50m. lead from edge Of trenches and so will not be paid for.

4) The materials shall be conveyed by means of suitable devices.

5) The material conveyed to place of disposal shall either be stacked Or spread as directed by Engineer-in-charge of his representative.

6) The route for operating and maintenance, payment of any royalties, Compensation to land owners and for damages if any etc. during the process of Conveyance etc shall be the entire responsibility of the contractor.

7) this item includes all labors materials and equipments Required forLoading conveyance, unloading, stacking or spreading the material.

8) The tender rate shall be for one cubic meter of excavation quantity Conveyed to the to the place of disposal.

9) The quaintly conveyed and disposed off shall be calculated from the Trench excavation after dedication of quantities for bedding concrete or any otherRefilled material and balanced net excavation quantity will be payable under 5this items.

10) The excavated stuff shall be u8sed for construction of road as per Item No of Schedule 'B'

Item, no. :- Proving and casting in situ P.C.C. 1:2:4 ..... etc complete

The specification provided in the subwork for Sewerage collection system shall be referred
This shall comply as per standard specification no. Bd-E-1 on page No.287 or latest edition. Wherever the concrete is to be laid in trenches the trenched shall be Cleaned watered and compacted before placing. The sub soil water which met shall Be removed and the trench shall be kept dry during and after two hours of placing of concrete, for more depth of P.CC. Mechanical vibrator shall be used for compaction by the contractor. For materials such as cement, sand, coarse aggregate shall be used as described in specification for item no.

Items No. :- providing dry rubble stone soling ------etc.complete.

This item shall be executed as per detailed s specification No.Bd-A-12 On page No. 264 for trench, plinth etc as directed by Engineer-in-charge.

Rubble stone shall be brought from approved quarry by the P.W.Deparments

including landing unloading stacking, lying, transportation Charges etc complete.

If the material is rejected by Engineer-in-charge or his representative it Shall be removed immediately from of work without any extra calms by the Contractor. Rubble stone soiling shall be laid in layers including compaction watering

Etc, as directed by Engineer-in-charge**.**

GENERAL

After the structural foundation, plinth construction and filling are completed, rubble soling of specified thickness shall be laid over the consolidated plinth filling, hand packed and compacted. The specification of the work as per Standard Specification Bd.A-12)

MATERIALS

The stones to be used shall be broken rubble with fairly regular shape and free from weathered, soft and decayed portion. The rubble shall be of sound stones of the type mentioned in the item and selected for their larger size. Stones shall be of the full height of the soling and the length and width shall not generally exceed 2 times the height. The stones to be used for wedging in the joints between larger stones, shall be chips of the largest size possible to fit in the interstices. All sound and suitable rubble obtained from the foundation excavation and approved by the Engineer shall be necessarily made use of first unless otherwise directed.

CONSTRUCTION

The bed on which rubble filling is to be laid shall be cleared of all loose materials, leveled, watered and compacted and got approved by the Engineer before laying rubble soling.

Rubble soling shall be laid to the specified thickness closely packed by hand and firmly with their broadest face downwards. The interstices between adjacent stones shall be wedged in with stones of the proper size and shape and well driven in with wooden mallets to ensure a tightly packed layer. Such wedging shall closely follow the placing of the larger stones. After hand packing and wedging, compaction of the soling shall be done thoroughly with logrammers. Adequate care shall be taken by the contractor while laying and compacting the rubble soling to see that the masonry or any part of the structure Is not damaged. Rubble soling shall be started only after the masonry is fully cured.

BROKEN RUBBLE

c) Supplying broken rubble of approved of approved quality and size at site.

d) All labour, material, tools and equipment for handling, laying, hand packing and compacting the rubble.

Any other incidental charges to complete the work as per sanctioned plan.

MODE OF MEASUREMENT & PAYMENT

Rubble soling shall be measured and paid in cubic meters limiting the dimensions to those shown on the drawings or as directed by the Engineer. The dimensions shall be measured correct to 2 places of decimals of a meter and quantities worked out correct to 2 places of decimals of a cubic meter. No deduction shall be made for voids.

Item No:- providing and casting in situ C.C. of trap/ granite/ quartzite/ gneiss metal ------ for R.C.C work etc. complete .

a) R.C.C Works

1) R.C.C works as per I.S.S. 456-2000 (latest edition) in R.C.C M-200 and M-250 with 12mm to 20mm gigue metal. The work shall also be carried out standard specifications No. Bd-F-3, Bd-F-22-23-24 on page No. 282,292 and 293 respectively.
2) R.C.C words in contact with sewage shall be executed as per I.S.S 3370 part I and II in R.C.C M-250 structure shall be finished with 20-mm thick Cement plaster in C.M.1:2 from inside in suplphate Resistant cement

1) MATERIALS

a) Cement.

43 grate Ordinary port land suplphate Resistant cement of MJP Approved Cement Company is company is only admissible.

b) Sand

This shall be clean, hard strong. Uncoated and well graded particles, the Sours of sand will be app.[proved by Executive Engineer, and in no case clay, silt, Admixtures will exceed 3% by weight or volume. Screening and washing shall be Done to stand to confirm specificatio0n. All sand shall pass through a screen with 3/16" mash only Kaman sand is permitted for R.C.C work of all grade for Construction of RCC compound wall & others works quality of Wareham sand Shall only be used

c) Coarse Aggregate

All aggregates shall confirm to I.S 383-1963,IS 515-1969 and Should be as specified in I.S 456_2000, gigue of metal to be used shall be decided According to the type of works by the Engineer-in-charge the metal of approved Qualities to be brought from quarry approved by Executive Engineer, and P.W Department

d) Storage of Material

Sand and coarse aggregates shall be properly and separately stored on Site on hard ground so as to keep them safe from admixtures of foreign material such As clay, grass etc. it shall be as per I.S.456-2000.

e) Form Work

The steel centering shall be preferable. If wooden formwork is used, It shall consist of planks not less than 40 mm thickness and of strong props etc, This Shall be provided as per I.S 456-2000, clause of formwork. Timber used for Formwork shall be best hard wood and got approved by Engineer-in-charge. The item Is covered in the rate either for plain or R.C.C items for bottom slab, beams etc. P.V.C or plastic paper should be provided over the centering to make the same Watertight,

f) Separators

From bottom covers of beam, slabs .columns .vertical Walls, etc, Separators of pre-cast cement mortar block of suitable size will be used and tied to the Reinforcement by binding wires between layers of reinforcement. Separators or M.S Case required over to the bars will be ensured beyond bout as per I.S.456-2000 and I.S.3370-1965 part-II closure 7.2

g) Water

The water used be as per I.S 456-2000, approved measures for water Will be provided by the contractor the amount of water to be used will be decided by the workability and strength consideration which will be assured by the Contractor.

g) Concrete mixing

Concrete shall be only machine mixed as per standard practice.

i) Placing

The from work shall be just moisture before placing of concrete the Concrete shall be placed in position within 20 minutes after adding water to the Concrete it shall be slowly deposited in its place in uniform layers it should Generally comply with I.S-456-2000 under clause No. 12.2

j) Tamping

While concrete is being placed in position it shall vigorously rotted And tamped by bars of appropriate size and other means to ensures dense concrete and Complete filling of forms. All around and in beaten the reinforcement the efficiency Of tamping and consolidation will be

judged by complete the efficiently of tamping and Honey combing after removal of forms and any deficiency in this respect will result in Pulling down and redoing of affected work at the cost of contractor. For work of 'any magnitude or importance. Mechanical vibrators of both immersion and surface Type will be used as a rule; no work without mechanical vibrator will be permitted. When concrete is so vibrated the water cement ratio will least practicable.

k) Curing

All R.C.C works will be watered and kept constantly wet for at least 21 Days after casting by means of wet gunny gabs this operation shall start immediately. After initial set of concrete out satisfactorily and actual expenses made shall be recovered From The contractor, bill without any prior intimation.

j) Removal of forms.

Removal of forms will be carried out as below subjects to the prior approval Of Engineer-in-charge in writing.

a)	Columns	:-	48 hrs, or as may be directed by the Engineer-in-charge.
b)	Side of beam	:-	3 days,
c)	Vertical wall	: -	6 days.
d)	Bottom of slab/chhajja /canopies etc.	: -	15 days.
e)	Bottom of beam	: -	14 days. Unto 5m. Span
f)	Bottom of beam above	: -	21 days.5 m, span

m) Inspection

The work at each stage of operation i.e. completion of from work, Completion of assembling and placing reinforcement concreting removal of forms must be get inspected by the Engineer-in-charge or sub Divisional Officer in charge Of the work who will record necessary certificate to be done in the presence do Engineer In-charge or his authorized representative for major work such as centering Reinforcement of slab etc, shall be checked by the contractor designer before Concreting at the cast of contractor in the presence of Engineer-in-charge.

n) Finishing

All R.C.C. works will be finished as provided in the item concrete surface not in contact with form work and not subjects to any further finish will be finished smooth by a float to parents a uniform appearance. Surface to receive plaster or rendering will immediately on removal of

Forms be roughened by extensive hacking by a pointed tamping tool In all cases Where is it required to match with rest of the structure and present harmonious Appearance to be decided by Engineer-in-charge, such fishing included in the rate Of contract but will not be measured

o) Testing

i) Cubes

On any day when concerting of M-2000 and after mix is done for 4 Hours or 5 cum and more, concrete cubes of 15cm, x25cm, x15cm, shall be casted Per day equally spread over period of concrete. Every time seven cubes will be Taken for testing crushing strength three No's of cubes at 7 days and three No,s of Cubes at 28 days and one at 3 month the seventh cube will be kept as reserved to Be tested immediately after 28 days in case of the cubes tests 7 days 28 days Show unsatisfactory result the casting and curing and testing of for moulds etc.5he cost of contractor the contractor shall make his own arrangement for moulds etc. Number of cubes shall be taken out as per recent circular of M.J.P. or as directed by Engineer-in-charge., cubes shall be tested in the laboratory of government Engineer College at the cast of contractor & cube test certificated shall be produce by the Contractor at the time of submission of bill.

Ii) Mater

The contractor shall test the samples of cement sand coarse aggregate, Etc, required for R.C.C work at this own coat in the laboratory of Government Engineering college and submit the result to the department for according necessary Approval for the same various tests of each material shall be carried out as per I.S. and Recent circular of M.J.P. at the cost of contractor only.

Iii) The minimum strength of 15x15x15cm. Concrete cube shall be As under.

Grade of concrete	7 days period	28days period	3Months, period
M-200 M-250	135 kg/sq, cm. 170 kg/sq.cm.	200 kg/sq.cm 250 kg/sq.cm.	220 kg.sq.cm. 275 kg/sq.c.m.
M-300	kg/sq.cm.	kg/sq.cm.	kg/sq.c.m.

The place where R.C.C is to laid shall be absolutely dry and it shall Be maintained dry from the

time of starting the work unto six hours after the work is Completed (i.e. still concrete is set). A pit shall be excavated to such a size and depth that By dewatering from this pit will keep the ground water table below the level where Concreting is to carried out.The contractor should keep the pump of required ready at the Time of work.The rate of providing and laying concrete shall include expenditure or Keeping and maintaining ground dry.

General

In general RCC work is to be executed as per IS: 456-2000 or its latest revision. The water storage tanks/reservoirs shall be followed by IS: 3370 Part I to IV & latest revision. Steel reinforcement bars shall be of High Yield Strength Deformed (HYSD)/TMT steel bars as per **IS: 1786** and shall be free from corrosion, loose rust scales, oil, grease, paint, etc. Wire mesh or fabric shall be in accordance with **IS: 1566.** The steel bar shall be capable of being bent without fracture. Bars shall be bent accurately and placed in position as per design drawing and bar bending schedule and bound together tight with 20 SWG annealed steel wire @ 10 kg/ton of reinforcement at their point of intersection.Formwork and shuttering shall be made with steel plate close and tight to prevent leakage of cement slurry, with necessary props, bracings and wedges, sufficiently strong and stable and should not yield on laying concrete and made in such a way that they can be slackened and removed gradually without disturbing the line, level and the shapes of concrete. For slab and beam small camber should be given in centering, 1 cm per 2.5 m with a maximum of 4 cm for quick drainage of water. Centering should not be removed before 14 days in general (4 days for RCC columns, 10 days for roof slab, and 14 days for beams).The centering and the form work shall be strong enough to take the shocks of the Mechanical Vibrators.

The grade of concrete to be used shall be as mentioned in specifications/shown on drawings.

Table - Minimum compressive strength of 15 cm cubes at 7 and 28 days after mixing, conducted in accordance with IS: 516	**Preliminary Test N/mm2**		**Work Test N/mm2**		**Maximum size of Aggregate mm**	**Locations for Use**
Class	**At 7 days**	**At 28 days**	**At 7 days**	**At 28 days**		
M40	33.50	50.00	27.00	40.00	20	As indicated in

						the specifications or as required
M35	30.00	44.00	23.50	35.00	20	-do-
M30	25.00	38.00	20.00	30.00	20	--do-
M25	22.00	32.00	17.00	25.00	20	--do-
M20	17.50	26.00	13.50	20.00	20	--do-

The coarse aggregate shall usually be 20 mm to 12 mm gauge unless otherwise specified. For heavily reinforced concrete members as in the case of ribs of main beams the maximum size of aggregate should usually be restricted to 5 mm less than the minimum clear distance between the main bars or 5 mm less than the minimum cover to the reinforcement whichever is smaller.

Mixing is done in the same manner as in PCC.

Before laying the concrete, the shuttering shall be clean, free from dust, dirt and other foreign matters. The concrete mix shall be mixed in the drum for at least 2 to 2.5 minutes. The concrete shall be deposited (not dropped) in its final position. In case of columns and wall, it is desirable to place concrete in full height if practical so as to avoid construction joints but the progress of concreting in the vertical direction shall be restricted to 1.2 meter. Care should be taken that the time between mixing and placing of concrete shall not exceed 20 minutes so that the initial setting process is not interfered with. During the winters concreting shall not be done if the temperature falls below 4ºC.

Concrete shall be compacted by mechanical vibrating machine until a dense concrete is obtained. The vibration shall continue during the entire period of placing concrete. Compaction shall be completed before the initial setting starts i.e. within 30 minutes of addition of water to the dry mixture. Over-vibration which will separate coarse aggregate from concrete shall be avoided. After removal of the form work in due time, the concrete surface shall be free from honey combing, air holes or any other defect.

Following Indian Standards as revised most recently along with amendments will be followed for the works included in the contract. IS:8112	Ordinary, Portland cement
IS:383	Coarse and fine aggregates from natural sources for concrete
IS:445	Portland slag cement
IS:456-2000	Code of practice for plaint and reinforced concrete
IS:516	Method of test for strength of concrete
Methods of sampling and analysis of concrete	
IS:2386	Methods of test for aggregates for

	concrete (Part I to VI)
IS:3414	Code of practice design and installation of expansion and contraction joints in building.
IS: 3370 Part- I to IV	Code of practice for water storage Tanks

Concrete shall be laid continuously, if laying is suspended for rest or for the following day the end shall be shuttered and vibrated to achieve dense concrete and made rough after deshuttering for further jointing. When the work is resumed, the pervious portion shall be roughened, cleaned and watered and a grout of neat cement shall be applied and the fresh concrete shall be laid. For successive layer the upper layer shall be laid before the lower has set.

Pre-cast concrete shall be provided with lifting device.

Standards

Standards on special subjects have been mentioned elsewhere in this Para and also shall be followed.

Forms, false work or centering

Definitions

"Forms, formwork or shuttering" shall include all temporary moulds for forming the concrete to the required shape, together with any special lining that may be required to produce the concrete finish specified.

"False work or centering" shall consist of furnishing, placing and removal of all temporary construction such as forming, props and struts required for the support of forms.

Materials

Steel shuttering shall be provided as directed by the Engineer-in-Charge.

Forms

All forms shall be of mild steel approved by the Engineer-in-Charge and shall be fabricated and prepared water tight and of sufficient rigidly to prevent distortion due to the pressure of the concrete and other incidental loads incident to the construction operations. All form shall be set and maintained true to the line designated until the concrete is sufficiently hardened. Forms shall remain in place for periods which shall be specified hereinafter. When forms appear to be unsatisfactory in any way, either before or during the placing of concrete, the Engineer-in-Charge shall order to stop the work until the defects have been corrected.

All formwork shall be approved by the engineer-in-charge before concrete is placed within it. The contractor shall be required to submit copies of his calculations of the strength and stability of the formwork or false work but not withstanding the Engineer-in-Charge□s approval of these calculations, nothing shall relieve the contractor of his responsibility for the safely or adequacy of the formwork.Formwork shall be true to line and braced and strutted 10 prevent deformation under the weight and pressure of the unset concrete, constructional load, wind and other forces. The deflection shall not exceed 3 mm. Beam bottom shall be erected with an upward chamber of 2 mm per meter of the span. The form work for a column may be erected. One side shall be left open and shall be built up in sections as placing of the concrete proceeds. Before placing the concrete, bolts and fixtures shall be in position, and cores and other devices, used for forming openings, holes, chases, recesses and other cavities shall be filled to the formwork. No holes shall be cut in any concrete unless approved. Approved mould oil or other material shall be applied to faces of formwork in contact with unset concrete to prevent adherence of the non-staying concrete. Such coating shall be insoluble in water, non-staying and non detrimental to the concrete and shall not be flaky or removed by wash water.

Tolerance in finished concrete

(As per IS code 456-2000, 0.1)

The form work shall be so made as to produce a finished concrete true to shape, lines, level, plumb and dimensions as shown in the drawing subject to the following tolerances, unless otherwise specified in drawings or directed by the Engineer-in-Charge.

For Deviation from specified

Dimensions of cross-section of columns

And beams = -6mm +12mm

b. Deviations of dimension of footings

(See Note)

Dimensions in plane = -12mm +50mm

Eccentricity = 0.02 times the width of footing in the direction of deviation but not more than 50 mm

Thickness = +/- 0.05 times the specified thickness

Note: Tolerances applied to concrete dimensions only, not to positioning of vertical reinforcing steel or dowels.

False work and Centering

Detailed plans for false work or centering shall be supplied by the contractor if specifically asked for by the Engineer-in-Charge at least 14 days in advance of the time the contractor begins construction of the false work. Notwithstanding the approval by the Engineer-in-Charge of any designs for false work submitted by the contractor, the contractor shall be solely responsible for the strength, safety and adequacy of the false work or centering. All false work shall be designed and constructed to provide the necessary rigidity and to support the loads from the weight of green concrete and shuttering and incidental construction loads. False work or centering shall be founded upon a solid footing safe against undermining and protected from softening. False work which cannot be founded on satisfactory footing shall be supported on piling which shall be spaced, driven and removed in a manner approved by the Engineer-in-Charge. The Engineer-in-Charge may require the contractor to employ screw jacks or hardwood wedges to make up any settlement in the formwork either before or during the placing of concrete. Props of the upper storey shall be placed directly over those in the storey immediately below. False work shall be set to give the finished structure the required grade and camber specified on the plans.

Formwork and Construction Joints

Where permanent or temporary joints are to be made in horizontal or inclined members, stout stopping off boards shall be securely fixed across the mould to form a watertight joint. The form of the permanent construction joint shall be as shown on the drawings. Temporary construction joints shall have blocks of timber at least 75 mm thick, slightly tapered to facilitate withdrawal and securely fixed to the face of the stopping off board. The area of the key or keys so formed shall be at least 30% the area of the member. The blocks shall be kept back at least 50 mm from the exposed face of the concrete. Where reinforcement passes through the face of a construction joint the stopping off board shall be drilled so that the bars can pass through, or the board shall be made in sections which a half round indentation in the joint faces for each bar so that when laced, the board is a neat and accurate fit and no grout leaks from the concrete through the bar holes or joints.

Removal of Forms and False work

In the determination of the time for the removal of forms, false work and housing, consideration shall be given to the location and character of the structure, the weather and other conditions influencing the settings of the concrete and the materials used in the mix.MS shuttering/formwork and scaffolding should be of standard reputed make to ensure better quality of concrete finish. Forms shall be removed in such a manner as not to injure the concrete and no formwork shall be removed

before the concrete has sufficiently set and hardened. The minimum periods which shall elapse between the placing and compacting of normal Portland cement concrete for the various parts of the structures are given in the following table, but compliance with these requirements shall not relieve the contractor of the obligation to delay the removal of the forms if the concrete has not set sufficiently hard.

Forms shall not be struck until the concrete has reached strength at least twice the stress to which the concrete may be subject at the time of removal of formwork. In normal circumstance, generally where the temperatures are above 20ºC and where ordinary Portland cement is used, form may generally be removed after the expiry of the following periods, according to the Clause 10.3, IS: 456-2000.

Table Removal of the Forms		
a.	Walls columns and vertical faces of all structural members	24 to 48 hours as may be decided by the engineer-in-charge
b.	Slabs (Props left under)	3 days
c.	Beam soffit (props left under)	7 days
d.	Removal of props under slabs	7 days
	1. Spanning up to 4.5m	14 days
	2. Spanning above 4.5 m	
e.	Removal of props under beams and arches	14 days
	1. Spanning up to 4.5m	21 days
	2. Spanning above 4.5 m	

Where sulphate resistant cement is used, manufacturer's instructions are to be followed.The Engineer-in-Charge may modify these requirements taking into account the type of cement and method of compaction used, and contractor shall obtain the Engineer-in-Charge's written approval for any decrease in time of stripping of the formwork given above. The contractor shall notify the Engineer-in-Charge when he proposes to stripe of any formwork and no formwork shall be struck except in the presence of the Engineer-in-Charge or his representative

Reuse of Forms

Only mild steel formwork of best quality as per approved vendor list given by Engineer-in-Charge shall be used for concreting purpose. These shuttering shall not be reused unless it is properly scraped cleaned and repaired, so that it gives a plane, even, fair and dense concrete surface.

Cleaning and treatment of Forms

All forms shall be thoroughly cleaned of old concrete, wood shavings, sawdust, dirt and dust sticking to them before these is fixed in position. All rubbish, loose concrete, chippings, shavings, saw dust

etc. should be scrupulously removed from the interior of the forms before concrete is poured. Wire brushes, brooms, compressed air jet and/or water jet etc. shall be kept handy for cleaning, if directed by the Engineer-In-Charge. Before formwork is placed in position, the form surface that will be in contact with concrete shall be treated with approved non-staining oil or composition, which is insoluble in water and not injurious to concrete. Care shall be taken that the oil or composition does not come in contact with reinforcing steel or stain the concrete surface. Burnt oil shall not be allowed to be used especially where the concrete surface will require finishing and/or plaster.

Materials for Concrete

Water

Water used for cement concrete mortar, plaster, grout, curing or washing of sand shall be clear and free from injurious amount of Oil, Acid, Alkali, Organic matter or other harmful substances in such amounts that may impair the strength or durability of the structure.Potable water shall generally be considered satisfactory for mixing and curing concrete. In case of doubt regarding development of strength, the suitability of water for making concrete shall be ascertained by compressive strength and initial setting time specified in the IS: 456 Code of Practice for Plain and Reinforced concrete. The Engineer-in-Charge may require the contractor to get the water tested from an approved laboratory at his own expense and in case the water contains any salts for an excess of acid, alkali, any injurious substances etc., the Engineer-in-Charge may refuse its use. And the contractor shall be required to arrange suitable water at his own cost.

Aggregate

General

Coarse and Fine Aggregates for concrete shall confirm in all respect to PWD Specification / IS: 383 Specification for Coarse and Fine Aggregates from Natural Sources for Concrete. Aggregates shall be obtained from a source known to produce satisfactory material for concrete. Aggregates shall consist of naturally occurring sand and gravel or stone, crushed or uncrushed or a combination thereof. They shall be chemically inert, hard strong, dense, durable, clean and free from veins and adherent coatings and of limited porosity. Flaky and elongated pieces shall not be used. Whenever required by the Engineer-in-Charge the aggregates shall be washed by the Contractor before use in the work.The source of aggregates shall be approved by the Engineer-in-Charge and shall not be changed during the course of the job without his approval. Rejected aggregates shall be promptly removed from the work site by the contractor at his own expense.

Deleterious Materials

Aggregates shall not contain any harmful material, such as iron pyrites, coal, mica, shale or similar laminated materials, clay, alkali, soft fragments, sea shells, organic impurities etc, in such quantities as to affect the strength or durability of the concrete and in addition to the above, for reinforced concrete, any material which might cause corrosion of the reinforcement. Aggregates which are chemically reactive with the alkalis of cement shall not be used. The maximum quantities of deleterious materials in the aggregate, shall be in accordance with IS: 2386 (Part II). Methods of Test for Aggregates for Concrete, shall not exceed the limit given in Table I of IS: 383. The sum of the percentages of all deleterious materials shall not exceed five. Deleterious materials also include material passing 75 micron IS sieve.

Coarse Aggregates

Coarse aggregate is aggregate most of which is retained on 4.75 mm IS: sieve. Coarse aggregate for concrete shall conform to IS: 383. These may be obtained from crushed or uncrushed gravel or stone and shall be clean and free from elongated, Flaky or laminated pieces, adhering coatings, clay lumps, coal residue, clinkers, slag, alkali, mica, organic matter or other deleterious matter. Coarse aggregate shall be either in single size or graded, in both cases the grading shall be within the following limits.

Table : Grading of Coarse Aggregates IS Sieve size (mm)			**Percentage Passing For Single Sized Aggregate of Normal Size**			**Percentage Passing for Graded Aggregate of Normal Size**			
40mm	**20mm**	**16mm**	**12.5mm**	**10mm**	**40mm**	**20mm**	**16mm**	**12.5mm**	
63	100	-	-	-	-	100	-	-	-
40	85-100	100	-	-	-	95-100	100	-	-
20	0-20	85-100	100	-	-	30-70	95-100	100	-
16	-	-	85-100	100	-	-	-	90-100	-
12.5	-	-	-	85-100	100	-	-	-	90-100

The Engineer-in-Charge may allow graded aggregates to be used provided they satisfy the requirements and Table IV of IS: 383.

Fine Aggregates

Fine aggregates is aggregate most of which passes 4.75 mm IS sieve but not more than 10% passes through 150 micron IS Sieve. These shall comply with the requirements of grading zones I, II and 1II as given in Table III of 15:383. Fine aggregate conforming to grading zone IV shall not be normally used in reinforced concrete unless tests have been made by the contractor to ascertain the suitability of the proposed mix proportions and approved by the Engineer-in-Charge.

As per IS: 383 Table : Grading of Aggregates

IS: Sieve Designation	Grading Zone-I	Grading Zone-II	Grading Zone-III	Grading Zone-IV
10 mm	100	100	100	100
4.75 mm	90-100	90-100	90-100	95-100
2.36 mm	60-95	75-100	85-100	95-100
1.18 mm	30-70	5-90	75-100	90-100
600 microns	15-34	35-59	60-79	80-100
300 microns	5-20	8-30	12-40	15-50
150 microns	0-10	0-10	0-10	0-15

Note: To be used in the sand fall-ing in Zone-IV, IS: 383 shall be followed.

Fine aggregates shall consist of natural sand resulting from natural disintegration of rock and which has been deposited by streams or glacial agencies, or crushed stone sand or crushed gravel sand.

Sampling and Testing

Sampling and testing shall be carried out by the contractor, at the contractor's expense, in accordance with:

IS: 516 Method of test for strength of concrete

IS: 2386 Methods of test for aggregates for concrete

Storage of Aggregates

The contractor shall at all times maintain at the site of work such quantities of aggregates as are considered by the Engineer-in-Charge to be sufficient to ensure continuity of work.

Each type and grade of aggregate shall be stored separately on hard firm ground having sufficient slope to provide adequate drainage to rain water.

Any aggregate delivered to site in a wet condition or becoming wet at site due to rain shall be kept in storage for at least 24 hours to obtain adequate drainage, before it is used for concreting, or the water content of mix must be suitably adjusted as directed by Engineer-in-Charge.

Cement

General

The cement used shall be ordinary Portland cement conforming to IS: 8112 or as specified in the particular specifications/drawings or as directed by the Engineer-in-charge.

Storage on the site

The cement shall be stored in a suitable weatherproof building and in such a manner as to permit easy access for proper inspection and counting. The cement shall be stored in such a manner as to prevent deterioration. Cement of different types and brands shall be kept in separate stacks and marked accordingly. Cement older than two months shall not be used on site.

All cement stored on the site shall be arranged in batches, and used in the same order as received from the manufacturer. A cement register shall be maintained at site in which all entries shall be completed day to day, showing the quantities received date of receipt, source of receipt, type of cement etc, and also the daily cement consumption on site. This register shall be accessible to the Engineer-in-charge for his certification.

Rejection of Cement

The Engineer-in-charge may reject any cement as a result of any tests, thereof, not withstanding the manufacturer's certificate. He may also reject cement, which has deteriorated owing to inadequate protection during storage from moisture or due to intrusion of foreign matter or other causes. Any such cement which is considered defective by the Engineer-in-Charge shall not be used, and shall be promptly removed from the site of the work by the contractor at his own expense.

Other Materials

AI materials including admixtures, joint filters and joint sealants not fully specified herein and which may be used in the work shall be of quality approved by the Engineer-in-Charge and he shall have the right to determine whether all or any of the materials offered or delivered for use in the works are suitable for the purpose Contractor shall give the samples of materials to the Engineer-in-Charge and shall get them approved before procurement and use.

Reinforcement

All reinforcement shall be clean and free from pitting, loose mill scales, dust and coats of paints. oil or other coating which may destroy or reduce the bond.

Welded Joints

Welding of joints in reinforcement for bars of 28 mm dia and below shall not be allowed. However, in case of using welded joints for bars 32 mm and above the approval of the Engineer-in-Charge shall be obtained. The Engineer-in-Charge may require the Contractor, prior to the use of welded joints to have tests carried out at he contractor's expense to prove that the joints are of the full strength of the bars connected. The welding of the reinforcement shall be done in accordance with the recommendation of IS: 2751 code of practice for welding of mild steel bars for reinforced concrete construction. Special precautions are required in the welding of cold worked reinforcing bars. No extra payment for welded joints shall be made to the contractor unless specifically mentioned in the schedule of rates or bill of quantities and approved by the Engineer-in-Charge. Tack welding may be permitted by the Engineer-in-Charge under certain conditions for fixing reinforcements.

Reinforcement Splices

Laps & anchorage length of reinforcing bars shall be in accordance with IS: 456, unless otherwise specified. If the bars in a lap are not of the same diameter, the smaller dia will guide the lap lengths. Laps shall be staggered as far as practicable and as directed by Engineer-in-Charge and not more than 50% of the bars shall be lapped at a particular section. Mechanical connections, for splicing reinforcement bars in congested locations may be used by the contractor, only if approved by the Engineer-in-Charge. Reinforcement bars shall not be lapped unless the length required exceeds the maximum available lengths of the bars at site. Unless otherwise specified the splices shall be wired contact lap splices as per the relevant standards. No splicing of vertical bars shall be allowed except at specified or approved horizontal construction joints. Splices in horizontal bars shall be lapped with at least one continuous bar between adjacent splices. The minimum spacing of splices in anyone run of bar shall be 6.0 m with splices in adjacent bars offset at least 3.0 m where walls or slab contain two layers of reinforcement, splices in opposite layer shall be offset by at least 1.50m.

Fabrication and placement

Bars shall be pre fabricated accurately to dimensions, forms and shapes, bending procedure shall be approved by the Engineer-In-Charge. Placing and typing of reinforcement shall conform to IS: 2502-1963 Code of practice for bending and fixing of bars for concrete reinforcement. Bar bending schedules for the reinforced concrete works shown on the drawings shall be prepared by the contractors and furnished to the Engineer-in-Charge at least two weeks before the commencement of bending. Dimensions shown as furnished by the collector□s shall be his responsibility and approval of the schedule shall not constitute the approval of the dimensions thereon.

Field Control

The contractor shall appoint a qualified Engineer experienced in reinforcement cutting, bending and placing the same correctly, binding and cleaning before pouring the concrete. The reinforcement shall be continuously kept in correct position during connections.

Steel Reinforcement

The reinforcement shall be High Yield Strength Deformed (HYSD) bars or TMT bars of Grade Fe-500 conforming to IS: 1786-1985 shall be used unless otherwise specified.

Placement of reinforcement should be as per IS: 456 Clause 11.3.

Approved Manufacturers: TISCO, SAIL, Rashtriya Ispat Nigam

Structural Steel

Structural steel shall conform to **IS: 226 and IS: 2062.**

Electrodes for welding shall conform to IS: 814 or IS: 815 or equivalent.

All bolts and nuts shall conform to IS: 1367. Stainless steel nuts and bolts shall be of SS 307 type. All materials shall be of new and unused stocks. Manufacturer's test certificate shall be made available to the Engineer-in-charge when called for.

Storage

The steel reinforcement and structural steel shall be stored in steel yard in such a way as to prevent deterioration and corrosion, preferably at least 150 mm above ground by supporting on wooden or concrete sleepers at contractor's expenses.

Proportioning of Concrete

The determination of the water-cement ratio and proportions of the aggregates to obtain the required strength shall be made from preliminary tests by designing the concrete mix as per provisions laid down in IS: 456-2000 &IS: 10262 or its latest revision. Design mix shall be admissible only if contractor is able to manage the quality control of design mix e.g. weighbridge, proper water measuring device etc. and designing the concrete mix as and when source of any of the consistent of concrete is changed. If contractor fails to comply with the requirements of design mix concrete, he shall have to follow the nominal mix as tabulated below

Table- Recommended Water-Cement Ratio (As per IS: 456-2000) Grade of Concrete	**Nominal Mix of Concrete**	**Quantity of Water per 50 Kg. of cement (Max)**
M 5	1:5:10	60 litres
M 7.5	1:4:8	45 litres
M 10	1:3:6	34 litres
M 15	1:2:4	32 litres
M 20	1:1.5:3	30 litres
M-25	1:1:2	26 litres

Cube tests shall be carried out by the contractor on the trail mixes before the actual concreting operation starts. Based on the strength of the concrete mix sanction for its use has to be obtained from Engineer-in-charge.

If during the execution of the works it is found necessary to revise the mix because of the cube tests lower strengths than the required one due to inconsistency of quality of material or otherwise, the Engineer-in-charge shall ask for fresh trial mixes to be made by the contractor. No extra claim shall be entertained due to such change in mix variations, as it is the contractor's responsibility to produce the concrete of the required grade. Great care shall be exercised when mixing the actual works concrete using the proportions of the selected trial mix. The final concrete mix shall have the same proportions of cement, fine and coarse aggregates and water as that of the approved selected mix.

Where the weight of cement is determined by accepting the manufacturer's weight per bag, a reasonable number of bags should be weighed separately to check the next weight. Proper control of mixing water is deemed to be of paramount importance. If mixers with automatic addition of water are used water should be either measured by volume in calibrated buckets, tins or weighed. All measuring equipment shall be maintained in a clean serviceable condition and their accuracy periodically checked and certified and the Engineer-in-Charge's approval obtained.The Engineer-in-Charge may require the contractor to carry out moisture content tests in both fine and coarse aggregates. The amount of the added water shall then be adjusted to compensate for any observed variations in the moisture contents. For the determination of moisture content IS: 2386 shall be referred to. No substitution in material, used on the work or alternation in the established proportions shall be made without additional tests to show that the quality and strength of concrete are satisfactory. No alternations shall be permitted .without the prior sanction of the Engineer-in-Charge.

Mixing of Concrete

The mixing of concrete shall be strictly carried out in an approved type of mechanical concrete mixer. The mixing equipment shall be capable of combining the aggregates, cement and water within the specified time into a thoroughly mixed and uniform mass, and of discharging the mixture without segregation. The entire batch shall be discharged before recharging. Mixing periods shall be measured from the time when all of the solid materials are in the mixing time has elapsed. The mixing time in no case shall be less than two minutes. The mixer speed shall not be less than 14 and not more than 20 revolutions per minute. Mixing shall be continued until there is a uniform distribution of the materials and the mass is uniform in color and consistency. Hand mixing of concrete shall not be permitted at all.

Grades of Concrete

The different grades of concrete shall conform to the strength as required by IS: 456-**2000**. Standard deviation shall be calculated as stated in clause 14.5 **of IS: 456-**2000. The acceptable criteria for concrete shall be as stated in clause 15 of **IS: 456-2000.**

The assumed standard deviations as given in table 6 of 18:456-2000 have to be followed. and are given hereunder :

Table : Assumed Standard Deviation Grade of Concrete	**Assumed standard Deviation N/mm2**
M 10	2.3
M 15	3.5
M 20	4.6

M 25 5.3

In order to get a quick idea of quality of concrete, the optional tests are conducted as stipulated in 14.1.1 of **IS: 456-2000** and the results are analyzed according to table 5 of **IS: 456-2000.**

Concrete

In general design mix concrete shall be used conforming to IS: 456-2000. Nominal Mix concrete batching by volume can only be if the contractor is not able to adhere to the quality control provision of the design mix. The mix proportions for all grades of nominal mix concrete shall be provided corresponding to the values specified in Table - 4.7 below for respective grades of concrete.

Table - Characteristics Compressive strength of Concrete Grade Designation	**Proportion of cement : fine aggregate: coarse aggregate**	**Specified characteristic compressive strength at 28 days (N/mm2)**
M 15	1:2:4	15
M 20	1:1.5:3	20
M 25	1:1:2	25

The maximum water-cement ratio for all concrete works shall be as specified in **IS: 456-2000** and required by the Engineer-in-Charge.

To keep the water cement ratio to the designed value, allowance shall be made for the moisture contents in both fine and coarse aggregates and determination of the same shall be made as frequently as directed by the Engineer-in-charge. The determination of moisture contents shall be according to IS: 2386 (Part III).

Controlled concrete

Controlled concrete shall be used on all concreting works except where specified Other wise. The mix proportions for all grades of concrete shall be designed to obtain strengths corresponding to the values specified in Table 1 below for respective grades of concrete.

Table – Grade of Concrete	**Specified characteristic compressive strength at 28 days [N/mm2]**
M 15	15
M20	20
M25	25
M30	30

The maximum water cement ratio for all controlled concrete works shall be as specified in IS: 456 and Preliminary tests as specified in the IS code and required by the Engineer shall be carried out, sufficiently ahead of the actual commencement of the work with different grades of concrete, made

form representative sample of aggregates and cement expected to be used on the job to ascertain the ratios by weight of cement, of total quantity of fine and coarse aggregates and the water cement ration required to produce a concrete of specified strength and desired workability The minimum cement content for each grade of concrete shall be as per Table-2 below. If the requirement of cement is found to be more than that specified below then such excess quantities of cement shall be used and for which no extra payment shall be made.

Table –

Minimum Cement Content In Concrete Grade of Concrete	**Minimum cement content as per IS: 456 in kg./cu.m of finished Concrete**
M 15	310
M20	360
M25	410
M30	500

At least 4 (four) trial batches are to be made and 7 (seven) test cubes taken for each batch noting the slump on each mix. These cubes shall then be properly cured and two cubes for each mix shall be tested in a testing laboratory approved by the Engineer at 7 (seven) days and others at 28 (twenty eight) days for obtaining the ultimate compressive strength. The test reports shall be submitted to the Engineer. The cost of mix design and testing shall be borne by the contractor. On the basis of the preliminary test reports for trial mix, a proportion of mix by weight and water cement ration will be approved by the Engineer, which shall be expected to give the required strength, consistency and workability and the proportions so decided for different grades of concrete shall be adhered to, during all concreting operations. If however, at any time the Engineer feels that the quality of material being used has been changed from those used for preliminary mix design, the contractor shall have to run similar trial mixes to ascertain the mix proportions and consistency.The mix once approved must not be varied without prior approval of the Engineer. However, should the contractor anticipate any change in the quality of future supply of materials than that used for preliminary mix design, he shall inform the same to engineer and bring fresh samples sufficiently ahead to carry out fresh trial mixes.The Engineer shall have access to all places and laboratory where design mix is prepared. Design mix will indicate by means of graphs and curves etc. the extent of variation in the grading of aggregates which can be allowed. In designing the mix proportions of concrete, the quantity of both cement, and aggregate and water shall be determined by weight. All measuring equipment shall be maintained in clean and serviceable condition and their accuracy periodical checked.To keep the water cement ratio to the designed value, allowance shall be made for the moisture contents in both

fine and coarse aggregates and determination of the same shall be made as frequently as directed by the Engineer. The determination of moisture contents shall be according to IS: 2386 (Part III).

Strength Requirements

Where ordinary Pozzolona Portland cement conforming to IS: 269 is used the compressive strength requirements for various grades of concrete shall be as shown in Table -2 of IS: 456 -2000 where rapid hardening Portland cement is used the 28 days compressive strength requirements specified in Table-2 shall be met in 7 days. The strength requirements specified in Table-2 as previously given shall apply to both controlled concrete and ordinary concrete.Other requirements of concrete strength as may be desired by the Engineer-in-Charge shall be in accordance with India Standard IS: 456-2000. The acceptance of strength of concrete shall be as per clause 14 "Sampling and Strength Test of Concrete" and clause. 15 "Acceptance Criteria" of IS: 456-2000 subject to stipulations and/or modifications stated elsewhere in this specification. if any. Concrete work found unsuitable for acceptance shall have to be dismantled and replaced to the satisfaction of the Engineer-in-charge by the contractor free of cost to the Department. No payment for the dismantled concrete, the relevant formwork and reinforcement, embedded fixtures, etc. washed in the dismantled portion shall be made. In the course of dismantling if any damage is done to the embedded items or adjacent structures, the same shall also be made good free of charge by the contractor to the satisfaction of the Engineer-in-charge. If the water quantity has to be increased in special cases, cement also be increased proportionately to keep the ratio of water to cement same as adopted in trial mix design for each grade of concrete. No extra payment for the additional cement shall be made.

Workability

The workability of concrete shall be checked at frequent intervals by slump test. Where facilities exist and if required by the Engineer-in-Charge, alternatively the Compacting Factor test in accordance with IS: 1199 shall be carried out. The degree of workability necessary to allow the concrete to be well consolidated and to be worked into the corners of formwork and round the reinforcement to give the required surface finish shall depend on the type and nature of the structure and shall be based on experience and tests. The limits of consistency for structures are as specified in Table 4.8 below:

Table : Limits of Consistency (as per IS: 456) Placing Conditions	**Degree of Workability**	**Values of Workability**
Concreting of shallow sections with vibration	Very low	20.1 0 seconds, vee-bee time or 0.75.- 0.60 com-

		pacting factor
Concreting of lightly reinforced sections with vibration	Low	10-05 seconds, vee-bee time or 0.80 - 0.85

* For smaller aggregate the values shall be lower.

Workmanship

All workmanship shall be according to the latest relevant standards. Before starting a pour the contractor shall obtain the approval of the Engineer-in-Charge or his representative in a "Pour Card" maintained for this purpose. He shall obtain complete instructions about the material and proportion to be used, slump, workability, quantity of water per unit of cement, number of test cubes to be taken, finishing to be done, any admixture to be added, etc.

Transportation and Pouring

The concrete mixer shall be as close to the place of concreting as possible but not as close as to produce vibration and disturbance to the shuttering and reinforcements. It shall be located at such a position that time lapse for transportation of unloaded concrete mix from the mixer to the place of deposition of concrete is minimum.

When there is a difference in level between the unloading platforms of concrete from the mixer to the actual place of deposition of concrete, the concrete shall be transported manually as by means of builders hoist/crane or concrete pump to the actual level of concreting, depending on requirement as approved by Engineer-in-charge.

Chutes for transporting the concrete shall not normally be used. The Engineer-in-Charge s written permission shall be taken for transporting by means of chutes. If use of chutes is permitted then the concrete shall be again thoroughly mixed by using spades manually before placing the concrete in the moulds/shuttering to avoid segregation of concrete. It shall be ensured that initial setting of the concrete shall not take place and the mix of the concrete is as good as that of freshly poured concrete delivered directly into the moulds/shuttering. It shall be ensured that the drop of concrete is not from an excessive height and that the vibration and deposition of concrete are simultaneously carried outBefore placing concrete, all equipment for mixing and transporting the concrete shall be cleaned and all debris shall be removed from the place to be occupied by the concrete. All form and soil surface shall be finished to desired levels and shall be thoroughly wetted immediately prior to placing of concrete. No concrete shall be placed until the Engineer-in-Charge has approved the excavation formwork and the reinforcement. The competent formwork maker and steel fixer shall be in attendance during concreting operation. The Pour card shall be signed by the contractor, designer and the representative of the consultants indicating the checking of the reinforcement,forms,and the

sizes of the member to be concreted. Concrete shall be handled from the place of mixing to the place of final deposit as rapidly as practicable by methods, which shall prevent the segregation or loss of any of the ingredients. If segregation does occur during transport, the concrete shall be remixed before being placed. The concrete shall be place and compacted before setting commences and shall not be subsequently disturbed. To ensure bond and water tightness between old concrete surface and the concrete to be place PVC water stops of approved make and size 150 mm wide, 10 mm thick should be used. The bonding of old and new concrete shall be done by applying cement slurry after thoroughly watering the old concrete surface and. removing all loose particles.

In specified cases, with approval of Engineer-in-charge the surface shall be cleaned and roughened by initial green cut by wire brushes or chipping. The initial green cutting may be done after 6 hours of placing concrete in order to facilitate the work. The old concrete walls/members shall be given a shear of 50 x 65 mm deep. This key shall also be thoroughly cleaned with wire brush in green stage before next lift pouring to avoid percolation of works.

Special methods of Concreting

If the contractor proposes to use the special methods of concreting not included in this specification, such as pumping concrete or using vacuum moulds he shall obtain the Engineer's approval before commencing work and comply with any subsequent specifications made by the Engineer for this special methods of concreting. Contractor is advised to use modern techniques in adapting methods of laying/finishing concrete in raft/wall etc., e.g. in raft, us of any other acceptable and proven method will be welcomed. The contractor may elaborate same on while quoting the offer. No extra payment shall be entertained for the approval of concreting by the special methods.

Placing of concrete in slabs and beams

Concrete in slabs shall be placed in one continuous operation for each span unless otherwise directed. Longitudinal construction joints, if required by reason of the width to be placed shall be located as shown on the drawings or as directed by the Engineer-in-Charge. Concrete in the stem and slab of T -beam shall be placed in one continuous operation and shall be deposited uniformly for the full length of the beam and brought up evenly in horizontal layers. Where the size of the member is such that it cannot be made in one pour, transverse vertical construction joints shall preferably be located within the area of contra flexure. For continuous spans, where required by design considerations the concrete placing sequence shall be approved by the Engineer-in-Charge.

Concreting floors

Concreting in floor shall be done in a chess board pattern, allowing sufficient time to elapse before the adjacent band in cast. The panel size is restricted to 7.5m in reinforced concrete slab. Concreting shall not be started unless the electrical conduits or any other piping Puddle Collars wherever required or laid by the concerned agency. The civil contractor shall afford all the facilities and maintain co-ordination of work with other agencies engaged in electrical and such other works as directed by the Engineer-in-Charge. Where concrete is placed on soil it shall be placed only on firm undisturbed ground. Any concrete that is placed on a well compacted fill shall have the prior approval of the Engineer-in-Charge. Concrete shall not be placed in standing water, on sub-grade or in foundation Excavation.

Compaction

Concrete during and immediately after depositing shall be thoroughly compacted. The compaction shall be done by mechanical vibration subject to the following provisions:

a. The vibration shall be internal unless special authorization of other methods is given by the Engineer-in-charge or as provided herein.

b. Vibrators shall be of type and design approved by the Engineer-in-charge. They shall be capable of transmitting vibration to the concrete at frequencies of not less than 4,500 impulses per minute.

c. The intensity of vibration shall be such as to visibly affect a mass of concrete of 25 mm slump over a radius of at least 0.5m

d. The contractor shall provide a sufficiently number of vibrators to properly compact each batch immediately after it is placed in the forms.

e.Vibrators shall be manipulated so as to have thoroughly work the concrete around the reinforcement and embedded fixtures, and into the corners and angles of the forms.

Vibration shall be applied at the point of deposit and in the area of freshly deposited concrete. The vibrators shall be inserted into and withdrawn out of the concrete slowly. The vibration shall be of sufficient duration and intensity to thoroughly compact the concrete but shall not be continued so as to cause segregation. Vibration shall not be continued at any one point to the extent that localized areas of grout are formed. Application of vibration shall be at points uniformly spaced and not further apart than twice the radius over which the vibration is visibly effective.

a. Vibration shall not be applied directly or through the reinforcement to sections or layers of concrete which have hardened to the degree that the concrete ceases to be plastic under vibration. It shall not be used to make concrete flow in forms over distances so great as to cause segregation and vibrators shall not be used to transport concrete in the forms.

b. Vibration shall be supplemented by Roding/spading as necessary to ensure smooth surface and dense concrete along form surfaces and in corners and locations impossible to reach with the vibrators. The whole process starting from the mixing of concrete to the placing and compaction shall not take more than 20 minutes and the process shall be completed before the initial setting takes place.

Curing

Curing shall be accomplished in accordance with IS: 456-2000 by keeping the concrete covered with a layer of sacking canvas, hessian or similar absorbent materials and kept constantly wet for at least ten days in continuation from the date of placing of concrete unless otherwise specified. The approval of the Engineer-in-Charge shall be obtained for the method of curing the contractor proposes to use on the work. In very hot weather precautions shall be taken to see that temperature of wet concrete does not exceed 38ºC while placing.Heavy loads shall not be placed on or moved across over the floor slabs until curing is complete. Care shall be taken to prevent floor surface from being marred during curing period. Freshly laid concrete form work shall not be jarred. Concrete placed in trenches or Excavation shall be protected from falling earth during and after placing.

Consistency

The consistency of concrete shall be frequently checked by means of a slump test performed as per the relevant Indian Standard by the Engineer-in-Charge. The maximum and minimum slump for each class of concrete shall be as directed by the Engineer-in-Charge, and any concrete as represented by the slump test which fails to comply with these directions shall be removed from the site and disposal off at the contractors cost.

Finishing Concrete

On striking the formwork, all blowholes and honeycombing observed shall be brought to the notice of Engineer-in-Charge. The Engineer-in-Charge may, at his discretion allow such honeycombing or blowholes to be rectified by necessary chippings and packing or grouting with concrete or cement mortar. If mortar is used, it shall be 1:2 mix or as specified by Engineer-in-Charge. However, if honey combing or blowholes are of such extent as being undesirable, the Engineer-in-Charge may reject the work totally and his decision shall be binding. No extra payment shall be made for rectifying these

defects. All burrs and uneven faces shall be rubbed smooth with the help of carborundum stone. The surface of non-shuttered faces shall be smoothened with a wooden float to give a finish equal to that of the rubbed down shuttered faces. Concealed concrete faces shall be Left as from the shuttering except that honeycombed surface shall be made good as detailed above. The top faces of slabs not intended to be surfaced shall be leveled and floated to a smooth finish at the levels or falls shown on the drawings or elsewhere. The floating shall not be executed to the extent of bringing excess fine material to the surface.

The top faces of slabs intended to be covered with screed, granolithic or similar faces shall be left with a rough finish.

Work in Extreme Weather

During hot weather (atmospheric temperature above 40 degree centigrade) or cold weather (atmospheric temperature at 5 degree centigrade and below) the concreting shall be done as per the procedure and precautions set out in IS: 7861 (Part I and II).

Dependence shall not be placed on salt or other chemicals for the prevention of freezing. Calcium chloride shall not be used as an accelerator except with the approval of the Engineer-in-Charge. Recommendation given in relevant clauses of IS: 456 shall be strictly adhered to.

Loading of the Structures

No concrete structures shall be loaded until the concrete is at least 28 days old and only then with the approval of the Engineer-in-Charge and subject to such conditions as he may lay down.

Testing and Acceptance Criteria of Concrete

The sampling of concrete making the test specimens, curing and testing procedures etc. shall be in accordance with **IS: 1199**, **IS: 3085** and **IS: 516**, the size of specimen being 15 cm cubes. Normally only compression tests shall be performed in accordance with **IS: 516**. For each grade of concrete and for each 8 hours of work or portion thereof the following samples shall be taken. At least six specimens shall be taken from the first 15.0 m3 or part thereof and three of these shall be tested at 7 days and the remaining at 28 days. Four additional specimens shall be taken from each additional 15.0 m3 of concrete or portion thereof of which 2 specimens shall be tested at 7 days and the remaining at 28 days. To control the consistency of concrete from every mixing plant slump tests, and/or compacting factor tests in accordance with **IS: 1199** shall be carried out by the contractor every two hours or as directed by the Engineer-in-Charge. Slumps corresponding to the test specimens shall be recorded for reference. The acceptance criteria of concrete shall be in accordance with **IS: 456-2000**. Concrete

work found unsuitable for acceptance shall have to be dismantled and replacement is to be done as per specifications by the contractor. No payment for the dismantled concrete, the relevant formwork and reinforcement embedded fixtures etc. shall be paid. In the course of dismantling if any damage is done to, the embedded items or adjacent structures the same shall be made good free of charge by the contractor to the satisfaction of the Engineer-in-Charge.

Load Test of Structures

The Engineer-in-Charge may instruct for a load test to be carried out on any structure if in his opinion such a test is deemed necessary for any of the following reasons. The works site made concrete test-cube failing to attain the specified strength, as per the criteria laid down in **IS: 456-2000**. Suspected overloading during construction of the structure under review Shuttering being prematurely removed and not as per the specification The concrete is being improperly cured. Visible deficiencies of the concrete If the results of the load test be unsatisfactory, the Engineer-in-Charge may instruct the Contractor to demolish and reconstruct the structure or part thereof at the contractor's cost. The load test of structures shall be carried out as per the clause 16.5 of **IS: 456-2000.**

Special methods of concreting

The contractor should propose to use special methods of concreting not included in the specifications, such as pumping concrete or using vacuum moulds, he shall obtain the Engineer-in-Charge's approval before commencing work and comply with any subsequent specification made by the Engineer-in-Charge for this special method of concreting. Contractor is advised to use modern techniques in adopting methods of laying/finishing concrete in raft/walls etc. e.g. in raft use of any other acceptable and proven method will be welcomed. The contractor may elaborate same on while quoting the offer.

Codes and Standards

All applicable standards, specifications, etc. and codes of practice shall generally be the latest editions, including all applicable official amendments and revisions. A complete set of all these documents shall generally be available at site, with the contractor. All work shall be carried out as per the stipulations contained in various sections of these specifications and the latest Indian Standards, Acts, Codes and best practices. In case of conflict between the stipulations contained in various sections of these specifications and stipulations of Indian Standard, Codes, etc. the requirements of stipulations contained in various sections of these specifications, shall prevail over that of Indian Standards, Codes, etc.

Some of the applicable Indian Standard Codes, etc. are referred to here below.	Specification for paving bitumen
IS:73	
IS:2060	Specification for structural steel
IS-8112	Specification for ordinary Portland cement 43 grade.
IS:280	Specification for mild steel wire for general engineering purposes
IS:383	Specification for coarse and fine aggregates from natural sources for concrete
IS:432 (Part I & II)	Specification for mild steel and medium tensile steel bars and hard drawn steel wire for concrete reinforcement
IS:455	Specification for Portland Slag Cement
IS:456	Code of practice for plain and reinforced concrete
IS:457	Code of Practice for general construction of plain & reinforced concrete for dams and other massive structure.
IS:516	Method of test for strength of Concrete
IS:650	Specification for standard sand for testing of cement
IS:702	Specification for industrial bitumen
IS:816	Code of practice for use of metal as welding for general construction in mild steel
IS:1199	Methods of sampling and analysis of concrete
IS:1200 (Part II, V, VIII, XVIII, SVIII)	Method of measurement of building and civil engineering works, water proofing and damp proofing
IS:1367	Technical supply conditions for threaded steel fasteners
IS:1489	Specification for Portland pozzolona cement (Part I) Fly ash based & (Part II) Calcite clay based
IS:1566	Specification for Hard drawn steel wire fabric for concrete reinforcement
IS:1609	Code of practice for laying damp proof treatment. Using bitumen felts.
IS:1786	Specification for high strength deformed steel bars and wires for concrete reinforcement
IS:1791	General requirements for batch type concrete mixer.
IS: 1838	Specification for performed fillers for expansion joints in concrete pavements and structures (non-extruding and resilient type)
IS:2204	Code of practice for construction of rein-

	forced concrete shell roof
IS:2210	Criteria for the design of reinforced concrete shell structures and folded plate
IS:2386 (Part 1 to VIII)	Methods for test of aggregates for concrete
IS:2438	Specification for roller pan mixer
IS:2502	Code of practice of bending and fixing of bars for concrete reinforcement
IS:2505	General requirements for concrete vibrators, immersion type
IS:2506	General requirements for concrete vibrators, screen board type
IS:2514	Specification for concrete vibrating tables
IS:2571	Code of practice for laying in situ cement concrete flooring
IS:2645	Specification for integral cement water proofing compounds
IS:2722	Specification for portable swing weigh batchers for concrete (single and double bucket type)
IS:2750	Specification for steel scaffoldings
IS:2751	Code of practice for welding of mild steel plain and deformed bars for reinforced concrete construction
IS:3025	Methods of sampling and test waste water
IS:3067	Code of practice for general design details and preparatory work for damp proofing & water proofing of buildings
IS:3150	Specification for hexagonal wire netting for general purposes
IS:3366	Specification for pan vibrators
IS:3370 (Part I & II)	Code of practice for concrete structures for the storage of liquids
IS:3384	Specification for bitumen primer for use in water proofing & damp proofing
IS:3414	Code of practice for design and installation of joints in buildings
IS:3550	Methods of test for routine control for water used in industry
IS:3558	Code of practice for use in immersion vibrators for consolidating concrete
IS:3696 (Part I & II)	Safety code for scaffolds and ladders
IS:4014 (Part I & II)	Code of practice for steel tubular scaffolding
IS:4031	Methods for physical tests for hydraulic cement
IS:4130	Safety code for demolition of buildings.
IS:4326	Code of practice for earthquake resistant design and construction of buildings

IS:4461	Code of practice for joints in surface hydroelectric power stations
IS:4656	Specification for form vibrators for concrete
IS:4925	Specification for batching and mixing plant
IS:4990	Specification for plywood for concrete shuttering work
IS:4995 (Part I & II)	Criteria for design of reinforced concrete bins for the storage of granular and powdery materials
IS:5121	Safety code for piling and other deep foundations
IS:5256	Code of practice for sealing joints in concrete lining on canals
IS:5525	Recommendations for detailing of reinforcement in reinforced concrete work
IS:5624	Specification for foundation bolts
IS:6461	Glossary of terms relating to cement concrete
IS:6494	Code of practice for water proofing of underground water reservoirs and swimming pools
IS:6509	Code of practice for installation of joints in concrete payments
IS:7193	Specification for glass fiber base coal tar pitch and bitumen felts
IS:7293	Safety code for working with construction machinery
IS:7861 (Part I & II)	Code of practice for extreme weather concreting
IS:9012	Recommended practice for shuttering
IS:9103	Specification for admixtures for concrete
IS:9417	Recommendations for welding cold worked steel bars for reinforced concrete construction.
IS:9595	Recommendations for metal-arc welding of carbon and carbon manganese steels
IS:10262	Recommended guidelines for concrete mix design
IS:11384	Code of practice for composite construction in structural steel and concrete
IS:12118	Specification for two parts polysulphide.
IS:122000	Code of practice for provision of water slops at transverse contraction joints in masonry and concrete dams
IS:12269	53 grade ordinary Portland cement
IS:12600	Portland cement, low heat
IS:23	Handbook of concrete mixes
IS:24	Explanatory Handbook on IS:456-1978

IS:34	Handbook on concrete reinforcement and detailing.

Item. No. providing and fixing in position steel bar reinforcement

(Corrosion Resistant Still) -------- Etc complete

The specification provided in the subwork for Sewerage collection system shall be referred

The specification contained in standard specification volume -II

Published by P.W and housing department, Govt, of Maharashtra chapter Bd-F-17

And F-18 /306 shall apply.

Design details an bar biding schedule will be submitted by

Contractor at his cost during course of execution and accordingly reinforcement shall

Be provided.

Actual reinforcement placed shall be measured at theoretical standard

Weights, calculated from total length of reinforcement the density of reinforcement shall

Be assumed as 7850 kg /cum.

All reinforcement shall be accurately placed in position with spacing

And covers as director and tied with binding wires /of 1:63 mm or 1.22 mm die.

Spacing of bars shall be maintained by means of stays, blocks ties spacers of other

Approved supports at sufficiently closed intervals so that bars will sag between

Neither supports nor set displaced during vibrating or vibrating concrete or by any others

Operation . Representative samples of reinforcement in each lot shall be got tested in the laboratory of Government Polytechnic, Government Engineering College for various tests as per recent circular of M.J.P. or I.S. at the cost of the contractor. M.S. reinforcement not confirming to relevant I.S.I. shall be rejected and the same shall be removed from the site of work immediately without any extra claims. The test certificates of reinforcement from Govt. Polytechnic / Govt. College of Engineering shall be submitted by the contractor during each lot.

The item includes cleaning, cutting; bending and binding with binding

wire and placing reinforcement in position and maintaining it clear and in position till

the concrete is laid. The reinforcement shall be C.R.Steel only.

PROVIDING FUSION BONDED EPOXY COATING

(Sub-work No, Item No.),)

Providing fusion bonded epoxy coating to reinforcement bars as per ASTM-755 specification for a

thickness of 175 (+50) microns including extra cost on account of careful handling, extra cost on account of using PVC coated binding wire instead of G. I. wire, extra cost on account of touch-up material supplied by coating agency and repair work extra cost account of transportation to and fro from steel yard at ---------- to ..... plant at Daman and Plant at Daman to work site by trailer, loading, unloading, including all taxes (Central and Local), etc. complete.

MODE OF MEASUREMENT AND PAYMENT

The item shall be measured and paid in weight per MT basis.

Item No:- Providing IInd class B.B. Masonry -----etc. complete in C.M. 1:6

This shall be done as per standard specification No. Bd-G-I & 5 on Page no. 313 & 315 respectively. This item includes brick masonry in C.M. 1:6 for Plinth, super structure and steps. Steps up to plinth level of 1m width including P.C.C. M-150 grade and 100mm. thick, below base of steps, also 20mm plastering Both faces and cement concrete flooring over the steps. The thickness of joints in brick work shall be 12mm for conventional bricks and 10 mm for I.S. type bricks. The ..... bricks shall be used for above work including

Transportation, loading, unloading, stacking properly at the site of work at the cost of Contractor and shall be got approved by Engineer-in-charge. The representative Samples as per recent circular of M.J.P. shall be tested for various test in the laboratory of Government Engineering College at the cost of contractor.

Brick masonry

General

All bricks shall be of class designation 10 or best locally available approved by Engineer-in-Charge made of good brick earth thoroughly burnt, and shall be of deep cherry red or copper color. Bricks shall be regular in shape and their edges shall be sharp and shall emit clear ringing sound on being struck and shall be free from cracks, chips, flaws and lumps of any kind. Bricks shall not absorb water more than one sixth .of their weight after one hour of soaking by immersing the water. Bricks shall have a minimum crushing strength of 105 kg/cm² (10.5 N/mm2). Bricks shall be fully soaked in clean water by submerging in a tank for a period of 12 hours immediately before use. Soaking shall be continued till air bubbling is ceased. Bricks shall be well bonded and laid in English bond unless otherwise specified. Every course shall be truly horizontal and wall shall be truly in plumb. Vertical joints of consecutive course shall not come directly over one another; vertical joints in alternate course shall

come directly over one another. No damaged or broken bricks shall be used. Closers shall be of clean-cut bricks and shall be placed near the ends of walls but not at the other edge. Selected best-shaped bricks shall be used for face work. Mortar joints shall not exceed 6 mm in thickness and joints shall be fully filled with mortar. Bricks shall be laid with frogs upwards except in the top course where frogs shall be placed downward. Brickwork shall be carried out not more than 1.2m height at a time. When one part of the wall has to be delayed, stepping shall be left at an angle of 45º. Corbelling or projections where made shall not be more, than X brick projections in one course. All joints shall be raked and faces of wall cleaned at the end of each day's work.These specifications deal with all types of brickwork required for buildings, manholes, drains, retaining walls or any construction made out of bricks.

Materials

Bricks

Bricks used for the construction of brick masonry shall be hard, rectangular in shape and size and well burnt of uniform deep red, cherry or copper color and shall confirm to IS: 1077-1986. The brick shall not break when it falls down from 1.0 m height above the ground. Over burnt and the under burnt bricks will not be accepted. It should give the ringing sound when struck up with the hard material. The bricks shall be brought from approved brick kilns. The bricks shall be free from cracks, chippings, flaws, stones or lumps of any kind. The bricks shall not show any signs of efflorescence and shall be homogeneous in texture. They shall emit a clear metallic ringing sound on being struck and shall have a minimum compressive strength of 10.5 N/mm2 equivalent to 105 kg/cm². They shall not absorb more than 20% of its dry weight when soaked in cold water for 24 hours or otherwise specified in the Indian Standard Specification.

Mortar

The proportion of the cement mortar used for the masonry work shall be as specified on the various drawings for different places/types of construction, specifications for each part of the work.

For cement mortar fresh Portland cement of standard specifications shall be used. Sand shall be sharp, clean and free from organic and foreign matters. For rich mortar coarse or medium sand shall be used and for weak mortar local fine sand may be used. Materials of mortar shall be measured to have the required proportion with measuring box and first mixed dry to have a uniform color in a dean masonry platform and then mixed by adding clean water slowly and gradually to have workable consistency and mixed thoroughly by turning at least three times. Fresh mixed mortar shall be used,

old and stale mortar shall not be used and mortar for an hour work only shall be mixed with water so that the mortar may be used before setting starts. Coarse sand is mixed with the required quantity of cement for the preparation of the mortar. Mortar shall be prepared in accordance with IS: 2250-1981. The sand used for the masonry mortar shall meet the requirements as specified in IS: 2116-1980. For masonry mortars, sand and cement of required proportions are mixed in small quantities in a dry state first and then water is added to make the mortar of required consistency suitable for the type of work for which it is required as directed by the Engineer-in-Charge. No left over mortar shall be used and therefore only that much quantity of mortar that can be consumed within 30 minutes shall be mixed in batches.

Sand for Brick Masonry

Table : Grading of sand for use in Masonry Mortar IS Sieve Designation	**Percentage passing by mass**
4.75 mm	100
2.36 mm	90 to 100
1.18 mm	70 to 100
600 micron	40 to 100
300 micron	5 to 70
150 micron	0 to 15

Construction

The brick masonry shall be constructed as per the Indian Standard Code of Practice for Brick Work IS: 2212-1962. The thickness of the joints shall not be thicker than those specified in Para 5.4 of the above Code of Practice. The bricks shall be thoroughly soaked in water before using them on the work for at least twelve hours and all the air bubbles shall come out during soaking process. The soaked bricks shall be stacked on wooden planks/platforms so as to avoid sticking of the earth and other materials on to the surfaces of bricks. Bricks required for construction in mud mortar or lime mortar shall not be soaked. Brickwork shall be laid in English Bond unless otherwise specified. Half bricks shall not be used except when needed to complete the bond. Each course shall be perfectly straight and horizontal. The masonry shall be true to plumb in case of vertical walls and in case of battered construction the batter or slope shall be truly maintained. The level of the courses completed shall be checked at every one meter interval or less as required. While constructing the brick work one side shall be in plumb as directed by the Engineer In Charge.

The bricks shall be laid frogs upwards. While laying the bricks they shall be thoroughly bedded and flushed in mortar and well tapped into position with wooden mallets and superfluous mortar shall be

removed. No part of the structure shall be raised more than one meter above than the rest of the work. In case it is unavoidable the brickwork shall be raked back at an angle of not more than 45 degrees so as to maintain a uniform and effectual bond, but raking shall not start within 60 cms from a corner.In case of construction of buttresses, counter forts, returns they are built course by course carefully bound into the main walls. At all junctions of walls the bricks at alternate courses, shall be carried into each of the respective walls so as to thoroughly unite both the walls together. The brickwork shall not be raised more than 14 courses per day. All the beds and joints shall be normal to the pressures applied upon them Le horizontal in vertical walls, radial In arches and at right angles to the face in battered retaining walls. Vertical joints in alternate courses shall come directly one over the other and shall be truly vertical. Care shall be taken to ensure that all the joints are fully fitted up with mortar, well flushed up where no pointing is proposed, nearly struck as the work proceeds. The joints in faces which are plastered or painted shall be squarely raked out to a depth not less than 12 mm while the mortar is still green. The raked joints shall be well brushed to remove the loose particles and the surfaces shall be cleaned with a wire brush so as to remove any splashes of mortar sticking to the surfaces during the construction. All iron fixtures, pipes, bolts, conduits, sleeves, holdfasts etc. which are required to built into the walls shall be embedded in cement mortar or cement concrete as shown in the drawings/indicated in the specifications/directed during the execution by the Engineer in-Charge as the work proceeds and no holes be left for fixing them at a later date unless authorized by the Engineer-in-Charge.

Curing

Green work shall be protected from rain by covering the work suitably. Masonry work as it progresses shall be thoroughly kept wet by watering on all the faces for at least 10 (Ten) days in continuation after completion of the parts of the work. Proper watering cans, flexible pipes, nozzles shall be used for the purpose in case of fat lime mortar curing shall start two days after construction of masonry and shall continue for seven days. No additional payment is admissible for curing and the rates quoted are deemed to be inclusive of the cost of curing.

Scaffolding

Double scaffolding sufficiently strong so as to withstand all loads that are likely to come upon it and having two sets of vertical supports shall be provided. Where two sets of vertical supports are not possible the inner end of the horizontal supporting pole shall rest in a hole provided in a header course only. Only one header for each pole shall be left out. Such holes however shall not be permitted in pillars less one meter in width or immediately near the skew backs of arches. Such holes shall

be filled up immediately after removal of the scaffoldings. Safety Code for Scaffolds and Ladders, IS: 3696-1987 (Parts I and II) shall be followed.

Mode of Measurement :

The contract rate shall be for a unit of one cubic meter of Masonry. The concrete shall be measured for its length, breadth and depth limiting dimensions to those specified on the plan or as directed by Engineer-in-Charge. No deduction shall be made for reinforcement in concrete in RCC work. Individual dimension shall be measured in Cum. And quantities shall be worked out correct upto three places of decimal of a cubic meter.

HALF BRICK MASONRY

The half brick masonry shall be in cement mortar specified in the item but not weaker than 1:4.

Mode of measurement : Per Sq,mt.

The half brick masonry shall be reinforced by 2 No. of 6 mm dia M.S. longitudinal bars or 2 No. of hoop item strips of 25 x 1.6 mm size, at even third course properly bent and bounded in vertical joints of the brick work or to main walls as directed by the Engineer-in-charge, if continuous strip is not available, strips shall be rivet jointed with a minimum overlap of 8 cm. All the bricks shall be laid stretch wise breaking joint with the upper and lower courses. Fixtures, plugs, hold, fasts, frame down, windows shall be based into brick work while laying only and of the correct levels and positions. Holes of required size and stage shall be left in the brick work during laying for fixing pipes or service lines, passage of water etc. After the pipeline work is completed, extra hollow left around the hole shall be plugged with 1:3 cement mortar or 1:3:6 cement concrete. Hold fasts for frames of doors and windows shall be accommodated in the joints of the brick which laying. The joints in the courses where reinforcements is places shall admit of a mortar cover at least 5 mm for the brick work with 15 bricks and not more than 12 mm for conventional brick work. A set of mason's tools shall be maintained on work for each group of 3 masons or less for frequent use and checking. The ends of walls shall be bonded into the side walls where necessary.

The joints shall be raked out to depth not less than the thickness of the joints.

This item shall include :

a) Providing and fixing mild steel reinforcement bars or hoop iron strips as mentioned above.

b) Leaving holes for fixtures or pipes and making them good after completion of the work.

c) Building in frames, hold fasts etc. and forming chassis and grooves.

Mode of measurement

The contract rate shall be for a unit of one Square meter and quantities shall be worked out correct upto three places of decimal of a Sqmt..

Item No. :- Providing cement Plaster.....etc complete.

This shall be done as per standard specification No.Bd-L-5 page No.368. The item shall comply with specification B.11.b subject to the additional clauses Bd.L 1.2, Bd.L 1.3, Bd.L 1.4

i) 20mmyhick cement plaster in C.M.1:2 with water proofing (Wet well) shall be provided to innerface of vertical wall of sump (Wet well) & pump house (dry well) and screen chamber.

ii) 20mm thick cement plaster in C.M. 1:3 shall be provided to external Face of brick work to pump house.

iii) 12mm thick cement plaster in C.M. 1:3 shall be provided to internal Faces of brick work to pump house, external face of screen chamber, wet well and dry landings (bottom portion), waist slab ceiling and sides, roof slap ceiling etc.

All above plaster shall be done in Sulphate Resistant Cement only Number of cubes for Cement mortar shall be taken as per I.S. and recent circular of M.J.P. and shall be tested in the laboratory of Government Engineering College at the Cost of contractor. Certificate of testing shall be submitted by the contractor to the department.Cement mortar used for plastering shall be of the mix proportions and thickness as specified on the drawings or bill of quantities or particular specifications for the various different parts of the works. The materials used i.e. cement, sand and water shall be of the same quality and of the same specifications as indicated for plain and reinforced cement concrete works according to the specifications and approved by the Engineer-in-Charge. Sand further shall meet the specifications as laid down in **IS: 1542-1977** Specification for sand for plaster.

The sand for preparation of mortar for plastering shall confirm to the following gradation, shown in **Table**

Table
: Grading of fine aggregates *Percentage by weight passing IS Sieve*

IS Sieve Desig-nation	Class -A	Class-B
4.75 mm	100	100
2.36 mm	90 to 100	90 to 100
1.18 mm	70 to 100	70 to 100
600 Microns	40 to 85	40 to 95
300 Microns	50 to 50	10 to 65
150 Microns	0 to 10	0 to 15

For the purpose of indicating the suitability for use, the sand is classified as Class A and Class B in accordance with the limits of grading. Class A sand shall be used generally for plastering and when they are not available, Class B sand may be used with the approval of Engineer-in-Charge.

The procurement of sand for Mortar for plastering and pointing shall confirm to be specifications given in Table.Surface that are to be applied with plaster shall be thoroughly cleaned to remove dust, dirt, loose particle, oil, soil, salts etc, that may be sticking to the surfaces. The surfaces shall be washed, clean and watered properly for 4 hours before applying plaster. For masonry all joints in the frame work that is to be plastered shall be raked out to a depth not less than the width of the joints or as directed by the Engineer-in-charge. The raking shall be done taking care not to allow any chipping of masonry. In new work the raking out shall be done while the mortar in the joints in still green. Smooth surface of concrete or plaster etc. must be suitably roughened to provide necessary bond for the plaster all dirt, soot oil paint or any other materials that might interfere with satisfactory bond shall removed and surface wetted before plastering is started. Plaster shall not, in any case, be thinner than specified. It shall have uniform specified thickness. When smooth finishing is required the cement plastering shall be floated over with neat cement within 15 minutes after application of the last coat of plastering. The plaster shall be protected from the sun and rain by such means as the Engineer-in-Charge may approve.

The plastered surface shall be cured for 10 (ten) days. Construction joints in plastering shall be kept at places approved by the Engineer-in-charge. When the thickness of the plaster specified is to be made up in more than one layer the second layer shall be applied only when the lower coat is still green. Wherever specified approved brands of additives like water proofing compounds, shall be added in specified quantities as recommended by the manufacturer of the compound or as directed by the Engineer-in-Charge.

Wherever scaffolds are necessary for plastering they shall be provided as specified for scaffolds under clause 3.2.2. Stage scaffolding shall be provided for ceiling plaster.To ensure even thickness and true surface, patches of plaster about 15 cm x 15 cm shall be first applied both horizontally and vertically 2.0 m apart. Plastering shall be done. From top of bottom and care shall be taken to avoid joints on continuous surface. In case any other finish like rough cast finish or dry dash finish is specified in the drawings the small shall be provided as directed by the Engineer-in-Charge.Surface which is to be plastered shall be roughened while they are still green or raked so as to give proper bond between the surface and plaster. When cement finish is specified, coat of pure Portland cement slurry 1.5 mm (1/6') thick shall be applied to the plastered surface while the second coat is still

fresh. If neeru finish is specified, then the surface shall be finished as per specification for Item Bd.L-10.

All corners junctions shall be truly vertical or horizontal as the case may be and carefully finished. Rounding or chamfering of corners shall be carried out with proper templates to the required size and shapes. The work shall be tested frequently with a straight edge and plumb bob. At the end of the day the plaster shall be left cut clean to line. When the next days plastering is started, the. day the plaster shall be left cut clean to line. When the next days plastering is started the edge of the old work shall be scrapped, cleaned and wetted with cement slurry. At the end of the day the plastering shall be closed on the body of the wall and not nearer than 15 cm to any corner. 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 at least 10 days. Any defective plaster shall be cut in rectangular shape and replaced. The thickness of the cement plaster shall be 12 mm excluding cement or neeru finish.

Mode of measurement

As per NdL-1.7 on square meter basis

MATERIALS

Cement mortar shall be prepared from cement and as specified for RCC work and mixed in the proportion specified. Sand shall be screened and washed if called upon to do so. Water proofing compound of directed make in directed quantities shall be added where it is water proof plaster, scaffolding shall be prepared from sound materials and shall be provided, where ever situation demands for facility of proper working.

GAUGES

Patch of plaster 15 x 15 cm shall be put on about 3 m apart as gauges to ensure even plastering in one place.

FINISHING

In any continuous face of wall, finishing treatment of any type shall be carried out continuously and day to day breaks made to coincide with architectural breaks in order to avoid unsightly junctions. All mouldings shall be worked true to template and drawn neat, clean and level. All exposed angles, junctions and openings shall be carefully finished.

WATERING

All pointing work shall be kept damp continuously for a period of 14 days. To prevent excessive evaporation of the sunny and wind ward side of the building in hot, dry weather matting or gunny bags may be hung over on the outside of the plaster in the beginning and kept moist. If the

contractor fails to water the work to the satisfaction of the Engineer-in-charge, the requisite labour, materials and equipment to water the work properly shall be engaged departmentally at the cost of the contractor.Cost all scaffolding is included in the tender rate.

SAND FACED CEMENT PLASTER

GENERAL

The item shall comply with the specification B.11 in all pertinent particulars. In addition Bd.L.1.2, Bd.L 1.3, Bd.L 1.4 and the following specifications shall also be complied with.

Base Coat : The base coat plaster shall be of cement mortar 1:4. Water proofing compound of approved make like Pudlo, Sika, Accorproof shall be added according to the maker's instruction in Bd.L 2 which a thickness of 15 mm for brick work and concrete surfaces and 20 mm for rubble stone masonry. Keys shall be formed on the surface by thoroughly combing it with wavy horizontal lines about 12 mm apart and about 3 mm deep when the mortar is still plastic.

Sand Faced Treatment : The cement mortar fo sand faced plaster shall have washed Kharsalia or Kasaba or similar type of approved sand with slightly larger proportion of coarse material The proportion of cement to sand shall be 1:4. The water is added gradually to make the mixture homogeneous. The thickness of finishing coat shall not exceed 8 mm. After applications the surface should be finished with a wooden float lined with cork and tapped gently to retain a coarse surface texture. When the finishing coat has hardened the surface shall be kept moist continuously for 14 days.

Item to include relevant portion of Bd.L 1.6. it shall also be include the base coat and san face treatment of above.

Mode of Measurement and payment per Bd.L 1.7 on square meter basis

The specification lays down the requirements of applying sand faced plaster in specified thickness with cement mortar to concrete or masonry surface in specified coats. This shall conform to specification for ordinary cement plaster where ever it is not irrelevant and in addition following shall also be applicable.

Tools and accessories used in plastering work be thoroughly cleaned before plastering is done. The programming of other building operations before during and after plastering shall be according to the instructions contained in Clause 4 of IS:1661-1960 or its latest revision. The item shall be executed as per Red book specification BdL-7 to 7.50 page No. 351)

Care shall be taken that other parts of work of adjacent work are not damaged while plastering.The base coat plaster shall be of cement mortar of specified proportion 1:4 and thickness as mentioned in the item or otherwise, it shall be of cement mortar 1:3 and thickness 15 mm to 20 mm. The base coat shall be laid in a similar manner as stipulated in. However, instead of finishing the top surface smooth keys shall be formed on the surface thoroughly combined in with wavy horizontal lines about 12 mm apart and about 3 mm deep when the mortar is still plastic. The base coat shall be cured for suitable period as per relevant code.

Item No - Cement paint

This shall be done as per standard specification No. Bd- Page No . & Schedule 'b' & as directed by Engineer-in-charge

Material

The cement Paint of white portland cement shall be (conforming to IS 5410) of approved brand . Colour and shade and manufacture. The cement Paint shall be brought to the site of work by the contractor in its original containers is sealed condition. The material shall be brought in at a time in adequate quantities to suffice for the whole work or at least a fortnight's work. The materials shall be kept in the joint custody of the Contractor and the Engineer-in-Charge. The empty containers shall not be removed from the site of work till the relevant item of the work has been completed and permission obtained from the Engineer-in-Charge

Scaffolding wherever necessary shall be provided to the entire satisfaction of the Engineer-in-Charge.

Preparation of Surface

For New Work, the surface shall be thoroughly cleaned of all mortar dropping, dirt all loose dust, algae, all cracks grease and other foreign matter by brushing and washing. Pitting in plaster shall be made good and a coat of water proof cement Paint shall be applied over patches after wetting them thoroughly. Holes and surface defects shall be repaired with cement plaster cured and allowed to set hard. Any grease, oil paint, shall be removed by approved methods..

Preparation of Mix

Cement Paint shall be mixed in such quantities as specified by the manufacturer as can be used up within an hour of its mixing as otherwise the mixture will set and thicken, affecting flow and finish. Cement Paint shall be mixed with admixture.

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 be taken to add the cement Paint gradually to the water and not vice versa. The second stage shall comprise of adding further one part of water to the mix and stirring thoroughly to obtain a liquid of workable and uniform consistency. In all cases the manufacturer's instructions shall be followed meticulously. The lids of cement Paint drums shall be kept tightly closed when not in use, as by exposure to atmosphere the cement Paint rapidly becomes air set due to its hygroscopic qualities. In case of cement Paint brought in gunny bags, once the bag is opened, the contents should be consumed in full on the day of its opening. If the same is not likely to be consumed in full, the balance quantity should be transferred and preserved in an airtight container to avoid its exposure to atmosphere.

Application

The solution shall be applied on the clean and wetted surface with brushes or spraying machine. The solution shall be kept well stirred during the period of application. It shall be applied on the surface which is on the shady side of the building so that the direct heat of the sun on the surface is avoided. The method of application of cement Paint shall be as per manufacturer's specification. The completed surface shall be watered after the day's work. The second coat shall be applied after the first coat has been set for at least 24 hours. Before application of the second or subsequent coats, the surface of the previous coat shall not be wetted. For new work, the surface shall be treated with three or more coats of water proof cement Paint as found necessary to get a uniform shade. For old work, the treatment shall be with one or more coats as found necessary to get a uniform shade. . The paint shall be kept stirred and used within one hour of mixing hardened or damaged paint shall not be used. The paint shall be applied by brushes in the manner specified by the manufacturer .The number of coats shall be specified in the wording of the item. When more than one coat is to be given the subsequent coats shall be applied after the preceding coat has thoroughly hardened, inspected and approved.

Precaution

Water proof cement Paint shall not be applied on surfaces already treated with white wash, color wash, distemper dry or oil bound, varnishes, Paints etc. It shall not be applied on gypsums, wood and metal surfaces. If water proofing cement is required to be applied on existing surface, previously treated with white wash, color wash etc., the surface shall be thoroughly cleaned by scrapping off all the white wash, color wash etc. completely. Thereafter, a coat of cement primer shall be applied followed by two or more coat of water proof cement. The specifications in respect of scaffolding, pro-

tective measures, measurements and rate shall be as described under 13.14. The coefficient for cement Paint on RCC Jalli shall be the same as provided in Sl. No. 7 of Table 1 under para 13.23.6.4 for painting trellis for Jaffri work.

Preparation of Surface

For new work, the surface shall be thoroughly cleaned off all mortar dropping, dirt dust, algae, fungus or moth, grease and other foreign matter of brushing and washing, pitting in plaster shall make good, surface imperfections such as cracks, holes etc. should be repaired using white cement. The prepared surface shall have received the approval of the Engineer in charge after inspection before painting is commenced.

Application

Base coat of water proof cement paint - All specifications in respect of base coat of water proofing cement paint shall be as described. Before pouring into smaller containers for use, the paint shall be stirred thoroughly in its container, when applying also the paint shall be continuously stirred in the smaller containers so that its consistency is kept uniform. Dilution ratio of paint with potable water can be altered taking into consideration the nature of surface climate and as per recommended dilution given by manufacturer. In all cases, the manufacturer□s instructions & directions of the Engineer-in-charge shall be followed meticulously. The lids of paint drums shall be kept tightly closed when not in use as by exposure to atmosphere the paint may thicken and also be kept safe from dust. Paint shall be applied with a brush on the cleaned and smooth surface. Horizontal strokes shall be given, First and vertical strokes shall be applied immediately afterwards. This entire operation will constitute one coat. The surface shall be finished as uniformly as possible leaving no brush marks. The specifications in respect of scaffolding, protective measures, measurements and rate shall be as described

CURING

Each application of paint should be wetted at the end of the day with a fine water spray, depending on climatic conditions. Wetting shall be done only after an interval of at least 6 to 8 hours after the applications. In dry weather the painted surfaces shall be kept dump for at least two days and protected from direct sun.

MODE OF MEASUREMENT AND PAYMENT

The item includes,

a) All materials and labour for painting.

b) All equipment and scaffolding.

c) Curing as per specification

d) Non uniform colour or shade shall be rectified without any extra cost.

The item shall measured and paid in per Sqmt basis of area painted.

Item No.:- Providing and laying white marble mosaic tiles----as directed etc complete.

This shall be done as per standard specification No. Bd-M-14 pageNo. 386. The colour and shade of tiles shall be got approved from Engineer-in-charge. The tiles shall be of approved manufactures of standard make.

Item No :- Providing and laying flooring of plain tiles ..... etc complete

This item shall be executed as per the detailed specification and as per relevant item described in schedule B This item shall comply as per standard specification No Bd- M-8 on Page No 383

Item No:-Providing and Laying cement concrete flooring of of 40mm. thick--------etc complete.

This shall be done as per standard specification No. Bd-m-7 page No 383. Please refer the specification for item for Concrete.

Providing and laying cement concrete flooring 40 mm thick with cement concrete M-25 laid to proper line, level and slope in alternate days including compaction, filling joints marking lines to give appearance of tiles 30cm x 30cm or other approved design, finishing smooth (with extra cement) in approved colour as directed and curing etc. complete.

MODE OF MEASUREMENT AND PAYMENT

The item shall be measured and paid in weight per Sqm. basis.

POLISHED SHAHABAD/TANDUR/KOTAH STONE FLOORING

The specification for this item shall be same as for item No. B.M.1

1. All the stone slabs shall be square in shape. The dimensions shall be 0.60 x 0.60 m or other dimensions as specified in the special provisions or as directed by Engineer-in-Charge. Tolerance in thickness $\pm$ 3 mm

2. The exposed surface of the specified stone flags shall be machine polished to a smooth, even and true plane and the edges machine cut square and to the required shape when necessary. Samples shall be got approved by the Engineer-in-Charge who will keep them in his office for reference.

3. The thickness of joints shall not exceed 1.5 mm

4. Joints shall be grouted with neat cement slurry

5. When the bedding and joints of the flooring have completely set, the surface shall be machine polished to give a smooth, even and true plane to the floor and thoroughly cleaned.

Mode of measurement : Per sq meter

28 GLAZED TILES FOR SKIRTING AND DADO

Plastering : Cement plaster of about 12 mm for brick walls and 20 mm for stone masonry walls shall be applied to the part of the wall where dado or skirting is to be fixed as per specification No. B.11. The proportion of mortar shall be as mentioned in the item.

Fixing tiles : Dado or skirting work shall be done only after fixing tiles on the floor. The white glazed tiles shall be soaked in water for at least 2 hours before being used for skirting or dado work. Tiles shall be fixed when the cushioning mortar is still plastic and before it gets very stiff. The back of tiles shall be covered with a thin layer of neat cement plaster and the tile shall then be pressed in the mortar and gently tapped against the wall with a wooden mallet. The fixing shall be done from the bottom of wall upwards without any hollows in the bed or joints. Each tile shall be fixed as close as possible to the one adjoining. The tiles shall be joined with white cement slurry. Any difference in the thickness of tiles shall be evened out in cushioning mortar to that all tile faces are in the vertical plane. The joints between the tiles shall not exceed 1.5 mm in width and they shall be uniform between the tiles in dado work, care shall be taken to break joints vertically. After fixing the dado, skirting etc. they shall be kept continuously wet for 14 days.If doors, windows or other openings are located within the dado area, the sills, jambs, angles etc. shall be provided with white glazed tiles and appropriate specials according to the foregoing specification and such tiled area shall be measured net along with the dado.

Cleaning : After the tiles have been fixed the surplus cement grout that may have come out of the joints shall be cleaned off before it sets. After the complete curing the dado or skirting work shall be washed thoroughly clean.

Item to include : The rate shall include all labour, materials, tools and equipment required for the following operations to carry out the item as specified above.

- Plastering
- Fixing the tiles including all angles, etc., after applying neat cement paste
- Jointing the tiles with white cement slurry

- Curing
- Cleaning the dado and skirting.

Mode of measurement and payment : Same as for item No. Bd.M-9.

Item No. :-Providing and fixing steel window of various sizes as per detailed drawings----etc. complete.

This item shall comply with the specification No.Bd-T-53 on page No. 509 andRelevant item of Schedule 'B'.

Item No..:- Providing and fixing rolling steel shutters

This shall be done as per standard specification No. Bd-T-56 pageNo.511 and relevant item of schedule 'B'. The specifications lays down requirements of providing and fixing steel rolling shutters with accessories locking arrangement top hood cover and painting in three coats of synthetic enamel paint of approved quality and shade.

MATERIALS

The rolling shutters shall conform to IS:6248:1979. Rolling shutter shall be supplied of specified type with accessories Such as top cover (in or out]) handles, bearings, springs, axles, locking arrangements, guide rails, iron pulleys push and pull arrangements This shall be of approved quality, make and type, 10 gauge (MS solid laths or grill) The size of the rolling shutters shall be as specified in the drawings The shutters shall be constructed with interlocking lathe sections foamed from cold rolled steel strips not less than 0.9 mm thick and 80 mm wide for shutters upto 3.5 m width and not less than 1.25 mm thick and 80 mm wide for shutters 3.5 m width and above unless otherwise specified. Guide channels shall be of mild steel deep channel section and or rolled pressed or built up (fabricated) jointless construction. The thickness of sheet used shall not be less than 3.15 mm. Head cover shall be made of M.S. sheet not less than 0.9 mm thick for shutters upto 3.5 m width. For shutters having width 3.5 mm and above the thickness of M.S. sheet for the hood cover shall not be less than 1.25 mm. The spring shall be of best quality and shall be manufactured from tested high tensile spring steel wire or strip of adequate strength to balance the shutters in all positions. The spring pipe shaft etc. shall be supported on strong M.S. or Malleable C.I. brackets the brackets shall be fixed on or under the lintel as specified with raw plugs and screws bolts etc.. Both the side guides and bottom rail shall be joint less and of shaft, spring etc. shall be of same material as that of lathe. The side guides fixed with plates welded to guides shall be property fixed with screws, bolts and concealed in plaster

The rolling shutters shall be self rolling type upto 8 Sq.mt clear area without ball bearing and upto 12 Sqm.. Clear area with ball bearing. If the rolling shutters are of larger size, then gear operated type shutters shall be used. The locking arrangement shall be provided at the bottom of shutters at bottom ends. The shutters shall be opened from outside. The shutter shall be either push and pull type as operated with special type of reduction / bevel arrangement operated with mechanical device. Shutter up to 10.20 - sqm. Or outside width less than 3 m shall be push and pull and shutter above 10.20 sq. m. or whose width is more than 3 m will be mechanically operated.

The shutters shall be complete with door suspension shafts, locking arrangements, pulling hooks, handless and other accessories.

WORKMANSHIP

Rolling shutters and top hood with all accessories shall be supplied of specified type and shall be got approved before fixing by the Engineer-in-Charge. The fixing shall be done in true line and level. The damaged work shall be made good to the level of original works. The fixing work shall be done to the entire satisfaction of the Engineer-in-Charge. After the erection and fixing, the rolling shutters with hood should be painted with on coat of approved primer and two coats of approved enamel paint (or any other approved superior quality paint as needed for protection against environment prevailing in the area)

10.4 **MODE OF MEASUREMENT AND PAYMENT**

The item shall include –

a) Providing and fixing the rolling shutters of specified size, material with all accessories, locking arrangement and top hood cover.

b) Painting the same with approved synthetic enamel paint in three coats.

c) Redoing the damaged works

The item will be measured and paid in Sqmt.basis of the shutter area

. **G.I. HAND RAILING**

(Sub Work No....., Item No.....)

The item shallm comply as per standard specifications and item as described in Schedule 'B' .The item shall be executed as specified in the tender item and as shown on drawing. The vertical supports shall be properly fixed at base either in masonry or concrete by nuts and bolts duly embedded in the form, right anchorage holes in the vertical support to pass G.I. piping in it or welding to fix the G.I. pipes to supports together with M.S. cleats, etc. are included in this item. The G.I.

piping shall be provided along with required specials, fixtures, fastening, etc. and G.I. piping shall be bent in circular or spiral railing pipes and shall be jointed by G.I. collar or welded as per necessity. The diameter of G.I. piping, number of rows size and type to vertical posts together with its centre to centre distance height, etc. shall be as specified in the tender item an in absence thereof as per the MJPs type design in force. The rate shall also include two coats of approved shade oil paint. Cost of all the materials which shall be procured by the Contractor, labor involved for executing this item is included in tender item. The measurements and the payment shall be on the basis of lengths in running meters occupied by the complete railing assembly in plan.

The agency should provide G.I. pipe railing having one meter height consisting 50 x 50 x 6 mm thick MS angles and vertical at 1.50 m c/c and additional post at every corner bends or curved point with three rows of 25 mm G.I. pipe of medium class variety of horizontal at 3 coats of oil paints over one coat of anti corrosive paint approved colour including cost of labour, transport, materials etc. complete C. I. Decorative post shall be fixed instead of M.S. angles as directed by Engineer-in-charge without any extra payment.

Mode of payment

The payment shall be made on running meter basis

Item No. :- Providing lowering, laying and jointing R.C.C. pipes-----for overflow ---Complete.

Please refer specification for Item no. 1 & 2 for sub work on 'Sewerage Collection System'.

Contractor shall provide R.C.C. S/S Pipes of required die and class in standard length as per Schedule conforming to I.S. 458-1956 including cost of all Material, including all taxes (Centre and Local) transport to site of work. The pipes Shall be stacked along the alignment of the line in such a way so that minimum hindrance is created to the traffic / pedestrians. Cracked / damaged pipes shall berejected out rightly. After the pipes are supplied by the contractor, the responsibility of security and safety shall still rest with the contractor the pipes are laid and jointed After supply of above material at the site of work by the contractor, theSame material shall be issued to the contractor on “Unstamped Receipt” The materialShall be kept at site with chowkidar by the contractor at his own cost. The site Engineer can checked the balanced material any time at site store of the contractor, ifAny shortage found the cost of short material with penal rate shall be recoveredThrough R.A. bill of contractor in single installment without any prior intimation.

The pipe shall be laid to line levels and slopes indicated on the Drawings or as directed by the Engineer, Sight rails or leveling instrument shall beProvided for this purpose by the contractor.

The handling and laying of the concrete pipes shall confirm to IS 783-1959 (relevant Para). The

joints shall be done as per paragraph 10.2.3.1 of I.S. 783-195. Any pipe damaged during lying shall be replaced by the contractor at his Cost. Proper alignment, tools and facilities shall be provided by contractor forLowering the pipes, fittings in to trenches to prevent damages. Dumping shall not be Permitted. Chain pulley block may be used for pipes above 300mm. dia. All the joints shall be done leak proof, jointing, using spun yarn inC.M. 1:1 with hardcrete is preferred. The leaking joint shall be made Water tight at the cast of contractor,Cement will not be supplied by MJP for manufacturing of R.C.C pipes And any others allied works. The specification for (A) Excavation (B) refilling (C) Murum Bedding will be applicable same for the relevant items No. 1, 2, 3, 4, &5 included in The agreement The pipes shall be inspected by the SGS/RITES and certificate to that Extent shall be produced by the contractor at his cast the payment shall not be done Till receipt of SGS/RITES certificate.

Mode of payment

75% payment against supply of s/s R.C.C pipes and rubber rings at Site along with inspection certificates for SGS/RITES. Remaining 15% payment and will Be made after lowering lying jointing and 10% payment shall be released after Satisfactory water tight testing of the pipe line the item shall be measured and paid For one running meter length of actual pipe land including specials if any.

ITEM PROVIDING AND SUPPLYING C.I./D.I. FLANGED PIPES

Sub-Work No., Item No),

a) The item includes supply CI/DI flanged pipes as per latest IS and approved by Engineer-in-Charge. The cost of pipe should be including all taxes central and local, railway freight, transportation upto site of work or departmental store.

b) The item will be measured and paid as per running meter basis.

Item No:- Providing and fixing copper lightening conductor including copper rod ..... etc complete

This shall be done accordingly to the detailed item mentioned in schedule B ABD SPECIFICATION No Bd-1 P No 539 . The rates adopted for 10 m length of copper tape . Rebate / extra rate for length beyond 10 m as per described in item.The lightening conductor shall be of copper rod of 20 mm diameter 1.5 M long with knob at the end and with conical spike at top .Copper tape conductor 20X3 mm size copper earth plate of 3 mm thick and 0.81 Sqm in area clamps, at 1 M centre to centre including providing and fixing 40 mm GI pipe up to 3 M height from ground and 0.5 M below ground including making all connections filling earth pit with charcoal, salt etc and refilling and watering etc complete as per the specification laid down in relevant IS codes..

Item No :- Providing and laying P.V.C. Water stops in between vertical wall and base slab ..... etc complete.

Propritory names where given by the Engineer in charge shall be taken only as a reference to quality . They do not oblige the contractor to use the product specified . However all water stops and joint fillers shall be got approved by the contractor before application in accordance with the instructions of the manufacturer . Rubber water stops shall include a centre bulb and shall have a tensile strength of not less than 20.7 KN/M2 and elongation at break of not less than 500 %

P.V.C. Water stops shall include a centre bulb and shall have a tensile strength of not less than 14 KN/M2 and elongation at break of not less than 300 % . Water stops shall not be exposed to direct sunlight for long period . They shall be cleaned of all foreign materials before being carefully compacted around the water stop so that no voids or porous concrete remains . Where the concrete is reinforced adequate clearance between the water stops and the reinforcement shall be maintained to permit proper compaction of concrete.

Item No :- Providing and fixing reciprocating type machinery clean screen units ..... etc complete

This shall be done as per detailed drawing and the sizes of sections mentioned in item and as directed by Engineer – in charge .

Item No :- Providing and laying cast iron with scraped non ferrus penstock of 600 mm dia ..... etc complete

Penstock shall be of the following type C.I./M.S.of I.VI. / I.V.C. / Glenfield kennedy make only with brass .This item shall also comply with recent circulars of M.J.P.and other concerned Government Departments

Item No :- Providing and fixing M.S. ladder ..... etc complete

This shall be done according to the details mentioned in item of Schedule B of tender and as per relevant specifications .P.V.C. coating shall be done on flat bars etc of ladder to avoid corrosion or deterioration . P.V.C. steps shall be provided on vertical wall of sump and pump house at the cost of contractor . such P.V.C. steps are used in manholes of sewer laterals for reference.

Ladder shall be manufactured as per the details provided in the tender item. All the materials and labour required for executing the item are to be provided by the Contractor at his cost. The ladder shall be properly fixed at site as directed and the bottom and top shall be properly embedded in 1:2:4 CC block as directed at Contractor's cost. In order to have stiffness to the ladder, cross supports or stiffeners at suitable intervals as directed shall be provided of suitable M.S. flats duly embedded in walls or welded to the ladder. The specification for this item as given in the Standard Specification Book (Red Book) published by PWD Department shall be followed.

Mode of Measurement & Payment & Payments

The item shall be measured and paid in Rmt basis.

Item No :- Dewatering the excavated trenches and pools of water ..... etc complete

Please refer specification for item no. of Dewatering in sub work of 'Sewerage Collection System'.

This item is provided for dewatering during excavation of entire work when it is not possible to bail out the water manually the item includes all machinery , fuel labour etc . The payment shall be made 50% after full depth & remaining 50% shall be made after completion of R.C.C. Work

This item shall comply as per standard specification No Bd- A-9 on Page No 261

Item No :- Providing and fixing approved make M.S. Grill ..... etc complete.

This item shall be executed as per the detailed specification and as per relevant item described in schedule B.

Item No :- Designing the pumping station ..... etc complete.

This item shall be complied as item described in schedule of the tender and directed by Engineer in charge.

Note :- Tentative sizes of sump and pump house is considered to work out the quantities for tender , but the agency has to submit final and approved detailed drawing & design showing structural and hydraulic calculations for the same as per obligatory condition and mechanical specification of tender .Necessary required accommodation to install and easy for maintenance and repairs of pumps of intermediate stage and ultimate stage should be considered in detailed drawings submitted by the agency.

Structural Designer has to visit the site before commencement of work , similarly he has to visit and certify during important concreting works . Engineering in charge may direct to arrange the visit of V.N.I.T. representative or M.J.P. Consultant along with the structural Designer of the contractor & the charges shall be borned by the contractor.

Item No - BB masonry chamber

Construction of B.B. masonry valve chamber includes excavation to the required size and depth, Providing and placing in position PCC for levelling course, followed by 15 cm thick M:15 P.C.C. foundation bedding , The chamber walls shall be in B.B. masonry in c.m. 1:5 proportion and inside cement plaster in c.m. 1:3, and external cement pointing including precast R.C.C. frame and cover as directed by Engineer in charge etc complete. The curing shall be carried out as per the specifications before refilling the sides.

Item No Sluice gate

Providing of CI gates shall conform to IS specifications mentioned in the subwork of STP. Fixing in position CI sluice gate in position as per detailed drawing s and specification including operating pedestal, operating / connecting rod of required length, painting with 3 coats of anticorrosive paint etc complete.

Item No - CI Dapuri type steps

Fixing in position Dapuri type steps made of CI with proper anchorage and providing and applying 3 coats of anticorrosive paint etc complete.

Item No - Oil Emulsion (oil bound) washable distempering.

Materials

Oil emulsion (Oil Bound) washable distemper (IS:428:1969428) of approved brand and manufacture shall be used. The primer where used as on new work shall be cement primer or distemper primer as described in the item. These shall be of the same manufacture as distemper. The distemper shall be diluted with water or 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 owner.

Preparation of the Surface.

For new work the surface shall be thoroughly cleaned of dust, old white or color wash by washing and scrubbing. The surface shall then be allowed to dry for at least 48 hours. It shall then be sand papered to give a smooth and even surface. Any evenness 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. In the case of old work, All loose pieces and scales shall be removed by sand papering. The surface shall be cleaned of all grease, dirt etc. Pitting in plaster shall be made good with plaster of Paris mixed with the color 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.

Application

Priming Coat:

The priming coat shall be with distemper primer or cement primer, as required in the description of the item. The application of the distemper primer shall be as described.

Note: If the wall surface plaster has not dried completely, cement primer shall be applied before distempering the walls. But if distempering is done after the wall surface is dried completely, distemper primer shall be applied. Oil bound distemper is not recommended to be applied, within six months of the completion of wall plaster. However, newly plastered surfaces if required to be distempered before a period of six months shall be given a coat alkali resistant priming Paint conforming to IS 109 and allowed to dry for atleast 48 hours before distempering is commenced.

For old work no primer coat is necessary.

Cement Primer coat

Cement primer coat is used as a base coat on wall finish of cement, lime or lime cement plaster or on non-asbestos cement surfaces before oil emulsion distemper Paints are applied on them. The cement primer is composed of a medium and pigment which are resistant to the alkalis present in the cement, lime or lime cement in wall finish and provides a barrier for the protection of subsequent coats of oil emulsion distemper Paints. Primer coat shall be preferably applied by brushing and not by spraying. Hurried priming shall be avoided particularly on absorbent surfaces. New plaster patches in old work should also be treated with cement primer before applying oil emulsion Paints etc.

Preparation of the Surface

The surface shall be thoroughly cleaned of dust, old white or color wash by washing and scrubbing and all cracks, boles and surface defects shall be repaired with gypsum and allowed to set hard.. The surface shall then be allowed to dry for at least 48 hours. It shall then be sand papered smooth and wiped clean to give a smooth and even surface. 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. The surface so prepared must be completely dry and free from dust before distempering is commenced. In the case of walls newly plastered, special care shall be taken to see that it is completely dry before any treatment is attempted.

Application

The cement primer shall be applied with a brush on the clean dry and smooth surface. Horizontal strokes shall be given first and vertical strokes shall be applied immediately afterwards. This entire operation will constitute one coat. The surface shall be finished as uniformly as possible leaving no brush marks. It shall be allowed to dry for at least 48 hours, before oil emulsion Paint is applied. The Specifications in respect of scaffolding, protective measures, measurements and rate shall be as described under.

Distemper Coat:

For new work, after the primer coat has dried for at least 48 hours, the surface shall be lightly sand papered to make it smooth for receiving the distemper, taking care not to rub out the priming coat. All loose particles shall be dusted off after rubbing. One coat of distemper properly diluted with thinner (water or other liquid as stipulated by the manufacturer) shall be applied with brushes in horizontal strokes followed immediately by vertical ones which together constitute one coat. The subsequent coats shall be applied in the same way. Two or more coats of distemper as are found necessary shall be applied over the primer coat to obtain an even shade. A time interval of at least 24 hours shall be allowed between successive coats to permit proper drying of the preceding coat. For old work the distemper shall be applied over the prepared surface in the same manner as in new work. One or more coats of distemper as are found necessary shall be applied to obtain an even and uniform shade. 15 cm double bristled distemper brushes shall be used. After each day's work, brushes shall be thoroughly Washed in hot water with soap solution and hung down to dry. Old brushes which are dirty and caked with distemper shall not be used on the work.

CPWP SPECIFICATIONS 2009 554

The specifications in respect of scaffolding, protective measures and measurements shall be as described under

Rate

The rate shall include the cost of all labor and materials involved in all the above operations (including priming coat) described above.

The rate shall include all labour, material, equipments and tools for carrying out the following operations.

- Providing the primer and distemper and mixing the distemper.

- Scaffolding
- Preparing the surface to receive the primer and finishing coats.
- Applying the priming coat
- Applying the distemper as specified above in the number of coats, mentioned in the item.

Mode of Measurement & Payment

This item will be measured and paid in Sqm basis.

White washing with lime.

Scaffolding

Wherever scaffolding is necessary, it shall be erected on double supports tied together by horizontal pieces, over which scaffolding planks shall be fixed. No ballies, bamboos or planks shall rest on or touch the surface which is being white washed. For all exposed brick work or tile work, 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 scaffolding planks shall be fixed. Note : In case of special type of brick work, scaffolding shall be got approved from Engineer-in-Charge in advance. Where ladders are used, pieces of old gunny bags shall be tied on their tops to avoid damage or scratches to walls. For white washing the ceiling, proper stage scaffolding shall be erected.

Preparation of Surface

Before new work is white washed, the surface shall be thoroughly brushed free from mortar droppings an foreign matter. In case of old work, all loose particles and scales shall be scrapped off and holes in plaster as well as patches of less than 50 cm area shall be filled up with mortar of the same mix. Where so specifically ordered by the Engineer-in-Charge, the entire surface of old white wash shall be thoroughly removed by scrapping and this shall be paid for separately. Where effloresence is observed the deposits may be brushed clean and washed. The surface shall then be allowed to dry for atleast 48 hours before white washing is done.

Preparation of Lime Wash

The lime wash shall be prepared from fresh stone white lime (Narnaul or Dehradun quality). The lime shall be thoroughly slaked on the spot, mixed and stirred with sufficient water to make a thin cream. This shall be allowed to stand for a period of 24 hours and then shall be screened through a clean coarse cloth. 40 gm of gum dissolved in hot water, shall be added to each 10 cubic dicimetre of the cream. The approximate quantity of water to be added in making the cream will be 5 litres of water to one kg of lime.Indigo (Neel) upto 3 gm per kg of lime dissolved in water, shall then be added and

stirred well. Water shall then be added at the rate of about 5 litres per kg. of lime to produce a milky solution.

Application

The white wash shall be applied with moonj brushes to the specified number of coats. The operation for each coat shall consist of a stroke of the brush given from the top downwards, another from the bottom upwards over the first stroke, and similarly one stroke horizontally from the right and another from the left before it dries. Each coat shall be allowed to dry before the next one is applied. Further each coat shall be inspected and approved by the Engineer-in-Charge before the subsequent coat is applied. No portion of the surface shall be left out initially to be patched up later on. For new work, three or more coats shall be applied till the surface presents a smooth and uniform finish through which the plaster does not show. The finished dry surface shall not show any signs of cracking and peeling nor shall it come off readily on the hand when rubbed. For old work, after the surface has been prepared as described above in earlier para a coat of white wash shall be applied over the patches and repairs. Then a single coat or two or more coats of white wash as stipulated in the description of the item shall be applied over the entire surface. The white washed surface should present a uniform finish through which the plaster patches do not appear. The washing on ceiling should be done prior to that on walls.

Note : In case of Hessian ceiling, on no account, lime shall be used as it rots cloth and hessian. **Protective Measures**

Doors, windows, floors, articles of furniture etc. and such other parts of the building not to be white washed, shall be protected from being splashed upon. Splashings and droppings, if any shall be removed by the contractor at his own cost and the surfaces cleaned. Damages if any to furniture or fittings and fixtures shall be recoverable from the contractor.

Measurements

Length and breadth shall be measured correct to a cm. and area shall be calculated in sqm correct to two places of decimals.

Measurements for Jambs, Soffits and Fills etc. for openings shall be as described in Corrugated surfaces shall be measured flat as fixed and the area so measured shall be increased by the following percentages to allow for the girthed area. Corrugated non-asbestos cement sheet 20% Semi corrugated non-asbestos cement sheet 10% Cornices and other such wall or ceiling features, shall be measured along the girth and included in the measurements. The number of coats of each treatment

shall be stated. The item shall include removing nails, making good holes, cracks, patches etc. not exceeding 50 sq. cm. each with material similar in composition to the surface to be prepared. Work on old treated surfaces shall be measured separately and so described.

Rate

The rate shall include all material and labor involved in all the operations described above.

Finishing

Dehradun quality lime and the wash will be mixed to a thicker consistency. The other details and specifications as described will follow.

White washing with whiting

Preparation of Mix

Whiting (ground white chalk) shall be dissolved in sufficient quantity of warm water and thoroughly stirred to form a thin slurry which shall then be screened through a clean coarse cloth. Two kg of gum and 0.4 kg of copper sulphate dissolved separately in hot water shall be added for every cum of the slurry which shall then be diluted with water to the consistency of milk so as to make a wash ready for use. Other specifications described in 13.14 shall apply in this case also.

Color washing

It item refers to providing and applying of applying of approved colour wash to surfaces which are not given any finishing.The mineral colors, not affected by lime, shall be added to white wash. Indigo (Neel) shall however, not be added. No color wash shall be done until a sample of the color wash of the required tint or shade has been got approved from the Engineer-in-Charge. For all colour wash, a sample must first be applied, allowed to dry and approved by the Engineer-in-Charge before the work proceeds. The color shall be of even tint or shade over the whole surface. If it is blotchy or otherwise badly applied, it shall be redone by the contractor. For new work, the priming coat shall be of white wash with lime or with whiting as specified in the description of the item. Two or more coats, shall then be applied on the entire surface till it represents a smooth and uniform finish. For old work, after the surface has been prepared as described in 13.14.2 a coat of color wash shall be applied over the patches and repairs. Then a single coat, or two or more coats of color wash, as stipulated in the description of the item shall be applied over the entire surface. The color washed surface shall present a uniform finish. The finished dry surface shall not be powdery and shall not readily come off on the hand when rubbed. It should be noted to large surface such as a the walls of a room . Care must be taken to mix sufficient colour wash to complete the whole surface to be

treated, otherwise it is taken to mix impracticable to obtain exactly the same shade of colour in two successive mixtures. Sufficient gum or rice size should be added to prevent the colour wash coming off when rubbed with fingers

Preparation of surfaces :

The surfaces shall be prepared by brooming down, brushing or other means as may be ordered by the Engineer-in-Charge. The surface shall be thoroughly cleaned down and freed from all foreign matter before the base coat is applied. Other specifications as described CPWP SPECIFICATIONS 2009 552

Sub-base: Sub-base of two coats of white wash shall be applied as specified in Item No. Bd.P-1.

Application of colour wash: The colour wash shall be applied over the base coat. It shall be applied in the same way as white wash. The number of coats shall be as mentioned in the item, each coat being applied after the earlier coat has dried.

Mode of measurement : Per sq m

Item No.:- Providing and applying plastic emulsion paint-----etc. complete.

This shall be done as per standard specification No. Bd-p-6 and Bd-o-8

Page No. 414 and 406 respectively.

Colour and shade shall be of standard make and Same shall be got approved from Engineer-in-charge. Best workmanship for paintingshall be used. The external faces of structure shall be painted with waterproof cement Paint and internal faces of structure shall be painted with plastic emulsion paint.

Item no. - Aluminum Doors and Windows

This specification covers major Aluminum works like Aluminum windows Aluminum door, shutters, pipe railing, etc. Deviations to this specification are not permissible unless it is brought to OWNER's attention with adequate supporting data and are with OWNER's written approval. Dimensions and data shall be in metric units.

Material

Aluminum Windows

The Aluminum windows shall conform and sections shall be less than specified in 1S: sections.

Aluminum windows may include all type of window fixed, partially fixed, partially side bottom hung, top hung, center hung, etc. or composite of any two or more. The Aluminium channels shall be square and flat. The members shall be cut to require length, mitered and electrically flame butt-welded. Sub dividing bar units shall be tennoned and riveted into the All the frames shall have the

corners welded to a true right angle and welds shall be neatly cleared off. Couplings, mullions, transom and weather bar shall be provided as per requirements.The outer frames shall be provided with fixing forces centrally in the web of the sections and fixing the frame of the sections to Masonry / RCC. Mastic cement shall be used for making the joints watertight.The sections of the windows shall be such that after fixing the glazing the same should not bend and shutters shall be smoothly operative. The necessary accessories such as hinges, stays, stopper hold, etc. shall be provided per requirement. Projecting type hinged shall be fitted with bronze or barns peg stays, 30 cm long with all windows shall be provided with handles of brass or bronze.

Ventilators

Top hung ventilators shall be fixed with plain hinges riveted / welded to the fixed frame. A brass or bronze peg stay 30 cm long as in windows shall be provided. Center hung ventilators shall be hung on brass or loaded tin bronze cup pivots riveted to the inner and outer frames of the ventilators to permit the ventilators to swing through an angle of approximately 85 deg. The opening position of the ventilators shall be so balanced to keep it open at any desired angle under normal weather conditions. A bronze spring catch shall be fitted in the center of the top her of the ventilators for the operation of the ventilators. This spring catch shall be screwed to the frizz with brass screw shall close into a mild steel malleable iron catch plats riveted or welded to outside of the outer ventilators frame bar. A brass cord pulley wheel in mild steel or cord eye.

Finishing

All the steel surfaces shall be thoroughly cleaned free of mist, scale or dirt and mill scale by pickling and phosphating and before erection painted with one coat of finishing coats of synthetic enamel paints (or any other approved superior quality paint as needed for protection against environment prevailing in the area) of approved shade and quality.

Glazing

Glazing of specified shall be provided on the outside of the and otherwise specified beading of approved shape and shall be used for fixing Special metal cash putty of approved make shall be used.

Aluminium Door frames

Aluminium door frames should be fabricated from sections conforming to 1S: and member shall be free from defective and crate and shall be and fabricated as per drawing. The welding shall be created and fixed with Mg hold fasts and grouted with cement concrete M:15.The frames shall be painted with one coat of approved quality primer and 2 coats of approved quality and paint for any other approved superior quality as needed for protection against environment prevailing in the area.

Aluminium Doors

Standard sectional Aluminum door

Aluminium door made out of standard Aluminium section shall be from heavy or medium heavy uniform steel section. The type, over all size, design shall be as and drawing. The providing of a threshold or bar also to be provided to is in position for fixing in floor, 75 mm extra vertical members also should be provided. Sides shall be fixed with six hold fasts. The weights have different. Sections shall not be less than what is provided in IS:. Provision for fixing mortise lock and aldrop to be made. For double shutters concealed tones. Bolt is to be fixed.

The bottom panel of door should be fixed either by 5.5 mm thick glass or 19 mm plywood. Frames shall have arrangements for fixing putty, clips wooden beading required lugs, screws, fittings etc. Measurement will be in sq. m and will be required out to out of the frame.

This shall consist of double or single gate depending on the size of the opening. This shall consist of vertical double channel each 20.5 mm and top and bottom of T 40 10 with 38 mm steel pulley or ball bearings in every fourth double channels which collapsible gate is not provided within the opening, and is fixed along the outer surface T iron at top may be replaced by flat 40 x 10 mm. The fixing of T and channels shall be permanent, rigidly fixed .

Item no. - Structural steel work

Please refer specification for item for RCC in which the specifications for structural steel is given. In addition the PWD handbook for specification be referred.

Item no. SFRC frame & cover

Please refer specification for item no. .....for circular manhole chamber of sub work 'Sewerage Collection System'.

PROVIDING AND ERECTING WIRE FENCING (Sub Work Item No.)

Providing and erecting 1.5 meter high wire fencing with seven rows of barbed wire supported on mild steel angles (50 x 50 x 6 mm) at 2.5 meters centre to centre including excavating pit for foundation, fixing posts in cement concrete blocks of size 45 x45 x 45 cm, fastening the wire and painting the mild steel angles with one coat of red lead primer and two coats of painting etc. complete.

MODE OF MEASUREMENT

This item will be measured and paid as per Rm. basis.

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Technical Specifications

A. Raw Sewage Pumping Station of MLD Capacity

Receiving Chamber

The deep gravity outfall sewers will discharge the raw sewage into a Receiving chamber. The function of the Receiving chamber is to distribute the flow for process units. The Receiving Chamber shall be designed for ultimate peak flow. The Receiving chamber shall consist of sluice gates on upstream for flow regulation. In the sidewall of the Receiving chamber, sluice gates shall be installed such that it is possible to operate them manually, inspection as well as operation by standing on a platform constructed at a suitable elevation adjoining and circumventing the receiving chamber. The receiving chamber shall be of adequate size to meet the requirements of workability inside it. The receiving chamber shall be open to sky and shall be water tight to prevent seepage of the sewage out of the receiving chamber. The entire construction is in M30 grade concrete and as per IS 3370. RCC access platform minimum 1000 mm wide with railing as per specifications shall be provided on one side of the chamber:

Ultimate Average flow	:	MLD
Peak factor	:	-------
Ultimate Peak Flow	:	MLD
Number of Units	:	1 (One)
Detention period	:	30 Sec at Peak Flow
Min Free board	:	0.50 m above FGL

Coarse Screen Channels

One mechanical screen working and one manual screen standby of 20 mm clear spacing and each screen shall be provided of 100% peak flow capacity.

The mechanical and manual bar screens shall be made of 10 mm thick Stainless Steel (SS 304) flats respectively. The mechanical coarse screens shall be of Inclined Rake Type of 20 mm opening as per the specifications detailed elsewhere in the tender. Bin and chute arrangement shall be provided to take the screenings to the screenings dropped from chute will be collected in a wheel burrow. Manually operated CI gates are provided at the upstream and downstream ends to regulate the flow.

Adequate RCC Platforms shall be provided at the upper level to enable operation. Railings shall be provided around the entire periphery of the platform. The entire structure is to be M30 concrete and as per IS 3370 including the platform. RCC staircase 1000 mm wide shall be provided for access from the ground level to the top of the unit & to the operating platform.

Ultimate Average flow	:	MLD
Peak factor	:	-----
Ultimate Peak Flow	:	MLD
Number of Units	:	1 Mechanical (Working) + 1 Manual (Standby) each of 100% Peak Flow capacity
Approach Velocity at Average Flow (m/sec)	:	0.3
Velocity through Screen at Average Flow: (m/sec)	0.6 maximum	
Velocity through Screen at Peak Flow (m/sec)	:	1.2 maximum
Min Free board	:	0.50 m above FGL
Wheeled Trolley	:	1 No.

All other accessories, whether specified or not, but required for completeness of contract shall be in contractor's scope.

Raw Sewage Pumping Station

3.1 Sump and Pumps

Sewage enters into wet well of the pumping station after screening. The wet well shall be circular/rectangular in shape and shall be designed for an ultimate average flow of …….. MLD. The capacity of the wet well should be kept such that the detention time in the wet well shall be minimum 5 minutes of ultimate peak flow and the maximum detention time shall not exceed 30 minutes at ultimate average flow. The entire structure is to be M30 concrete and as per IS 3370 including the platform. Following criteria shall be considered to size the sump:

1. That the pump of the minimum duty/ capacity would run for at least 5 minutes considering no inflow or
2. The capacity of the sump is to be so kept that with any combination of inflow and pumping the operating cycle for any pump will not be less than 5 minutes and
3. The arrangement of the submersible pumps as per pump manufacturer's data i.e. spacing between pumps, minimum space between pump and wall etc.
4. The side water depth (live liquid depth) shall be minimum 1.5 meter. In addition to the above liquid depth an additional depression shall be provided to ensure adequate submergence of the pump as per the manufactures recommendations Pumping station should have a room adequate for installing electrical panels. Suitable arrangement should be provided for lifting of pumps.
5. The effective liquid volume shall be provided below the invert level of the screen chamber after leaving provision for a minimum of 0.1 m.

   Necessary bypass arrangement shall be provided to be used during the shutdown of the plant.

IS: 3370 and IS: 4111 (part 4) shall be followed for the design and construction of wet well.

Bidder shall note that, the civil works for raw sewage pumping station shall be carried out for ultimate average flow whereas, electro-mechanical works for pumping station shall be carried out for intermediate average flow). Hence, Pumping machinery shall be designed for present ……. MLD average flow and a peak factor of …… Adequate space shall be provided for the pumps that need to be installed in the wet well for future …….MLD average flow and peak factor of …….. The pumps shall be Submersible raw sewage pumps with centrifugal, non-clog type design. The speed of pump shall not be more than 1500 rpm. The impeller should be of a non-clog design with smooth passage and solid handling capability of 100 mm size. The pumps will have automatic coupling arrangement at discharge end for removal and a guide pipe and chain in SS 304 will be provided for removal and lowering of pumps. Pump shall run smooth without undue noise and vibration. Vibration shall be limited as per BS 4675 Part I. The motor shall be squirrel cage type, suitable for three phase supply continuous duty with class 'F' insulation. Motor shall have integral cable parts and the cable entries shall be sealed. Complete rotor shall be balanced dynamically.

Design Flow (Ultimate Avg. flow)	:	MLD
Minimum Retention Time	:	5 minutes minimum at peak flow.
No. of Pumps for present		
Flow	:	MLD with Suitable Head (4W+1S)
Type of Pumps	:	Submersible type non-clog design
Solid passage size	:	100 mm max.
Through Pumps		
Insulation	:	Class F
Protection	:	IP-68

Wet well Specific Requirement, Material of Construction and Accessories:

i. Number of Units : (1) One designed for peak flow
ii. Pumping Station Material of Construction RCC
Wet well / Sump

The size of the sump shall be suitable to accommodate the number of pumps required for operation with easy maneuverability.Electrical panel of the Pump House shall be placed in such a manner to avoid corrosion from gases. Either, it can be clubbed with MCC panel or necessary protection can be given.

Raw Sewage Sump shall be provided with following:

Electrical Hoist - comprising of I-Girder and a 1½ ton or more chain pulley (the chain pulley block capacity to be 1½ Ton or 1.5 times the maximum single unit/ weight that may be required to be

removed for maintenance) with horizontal travel on the I-beam.

Pumps Configuration	:	As mentioned above
Liquid	:	Raw Sewage
Specific gravity	:	1.05
Temperature	:	Min. 20° C
Efficiency	:	more than 70%
Installation	:	Fixed.
Casing	:	Cast Iron IS 210 Gr. FG 260
Impeller	:	Cast Iron IS 210 Gr. FG 260
Shaft	:	AISI 410
Cable gland	:	Cast Iron IS 210 Gr. FG 260
Motor Body	:	Cast Iron IS 210 Gr. FG 260
Seal cover	:	Cast Iron IS 210 Gr. FG 260
Automatic Coupling	:	CI
Duck foot bend	:	CI
Guide Pipe	:	SS 304
Lifting chain	:	SS 304
Fasteners	:	MS with GI coating

Testing of Pumps at Manufacturers Premises:

a) Hydrostatic Testing: All pressure parts of pumps prior to assembly, shall be subjected to hydrostatic tests to the satisfaction of Executive Engineer at 1.5 times the maximum pressure obtained with the delivery valve closed and suction pressure at maximum, or twice the working pressure whichever is higher for a duration of 10 minutes.

b) Balancing Test: Impeller and pump rotating assembly shall be dynamically balanced.

c) Performance Test: Each pump shall be tested for full operating range individually to BS: 5316: Part 2. Test shall be carried out for performance at rated speed with minimum NPSH as available at site.

d) Pump performance shall be within the tolerance limits specified in BS: 5316: Part 2.

3.2 A suitable plant bypass shall be provided from the pumping station to divert sewage in case of emergency.

PROPOSED TREATMENT SCHEME

A) RAW SEWAGE PUMPING STATION

1. Receiving of Raw Sewage

The deep gravity outfall sewer shall discharge into receiving chamber of pumping station. From Receiving Chamber it will be taken into downstream screens. The function of the Receiving Chamber is to reduce the incoming velocity. Receiving Chamber shall be of adequate size to meet the requirements of workability inside it. The Receiving Chamber shall be water tight to prevent seepage of the sewage out of the Receiving Chamber.

2. Coarse Screening

Coarse screens are to be provided up stream of Wet well for removal of floating and oversized material coming with the sewage. The coarse screens should be capable to screen out most of the medium & large floating and oversized material such as plastic rags, debris, weeds, paper, cloth, rags etc. which could clog the waste water pump impellers. The coarse screen shall be inclined bar screen (Single or multi rake). It should be of sturdy design to take care of all sorts of materials envisaged in the gravity sewer. The screenings shall be dropped in bin above the top of the screen channel. The screening material as collected will drop into a wheelbarrows for its disposal.

3. Raw Sewage Pumping Station

Screened sewage after coarse screening enters into wet well of the pumping station. The capacity of the wet well should be kept such that adequate detention time is available during average and peak flow conditions. The effective liquid volume shall be provided below the invert level of the incoming sewer after leaving provision for freeboard. The capacity of the sump is to be so kept that with any combination of inflow and pumping the operating cycle for any pump will not be less than 5 minutes. In addition to the above liquid depth, an additional depression shall be provided to ensure adequate submergence of the pump as per the manufacturer's recommendations.

Suitable combination of submersible pumps is to be provided in the sumps to cater the pumping requirements at average and peak flow conditions. Based on incoming flow conditions, adequate no. of pumps shall operate automatically to cater the pumping requirements.

Suitable arrangement should be provided for lifting of pumps. Electrical panel of the Pump House shall be placed in such a manner to avoid corrosion from gases. Either, it can be clubbed with MCC panel or necessary protection can be given.

The pumped flow from the pumping station shall be taken to the elevated head works Inlet chamber of the STP from where sewage will gravitate to fine screen channels.

B) SEWAGE TREATMENT PLANT (MMBR TECHNOLOGY)

Specifications for Sewage Treatment Plant

Sub work) - 15.5 & 20.0 MLD capacity STP based on MMBR Technology.

SECTION –A1

SCOPE OF SUPPLY & SERVICES

INDEX

Scope of supply & services

Sr. No. Description

General Scope:- (Zone IX)

1. A Sewage Treatment Plant (STP) of **20.0 MLD** capacity on Moving Media Bio-Reactor (MMBR) technology including its operation for one year. The chemicals and the electrical energy charges will be paid by SMC. The contractor should apply the labors free of cost.

2. The average flow over a day in the year ...2035... will be ...20.0... MLD. The Inlet structure, stilling chamber along with screens shall be designed & constructed for this capacity.

3. Total 2.0 Ha land is available for construction of **20.0** MLD Present Capacity STP of ultimate stage. Bidder shall submit detailed plant layout along with the bid showing the layout for present **20.0** mld STP.

4. The Raw Sewage shall be provided at R L(458.25 m above MSL) STP 20.0 MLD and up to the Inlet Chamber / Stilling Chamber of STP from where the contractor's scope of work will start.

5. At the end of the system, the final effluent shall be discharged into a treated Sewage Chamber at a head of not less than 3.00 m from Natural Ground Level (The Natural Ground Level shall be considered as 460.0 m above MSL). The FSL at CCT betaken .....and the FSL at the stilling chamber as .....

6. In between point of start and point of end necessary units like Stilling Chamber, Mechanical/Manual Bar Screen, Mechanical Grit Chambers, Parshall flume for flow measurement, Aerobic Attached Growth Moving Media Biological Reactor (MMBR), Secondary clari settler, Sludge Sump, Sludge Dewatering system monobelt centrifuge, with centrifuge platform, CCT / chlorination and chlorine room, Out fall sewer, piping work in CILA including Sl. Valves, reflux valves, M S Gates, Administrative building, at the chamber of battery limit, Supply of Mechanical, Electrical and Instrumentation Equipment, Cables, Electrical Panel, Plant Buildings, Laboratory and its equipment, Other Interconnecting Channels & Piping Works, Painting, Erection shall be planned, designed and constructed, erected, tested, successfully commissioning by the contractor.

7. Planning and layout : The planning of Sewage Treatment Plant means hydraulic, biological and bacteriological (disinfection) design and layout in such a way as to occupy minimum space while giving the desired effluent quality and having excellent architectural look.

Design Basis & Plant Performance
1.1 Raw Sewage Characteristics

Design Basis & Plant Perfomance Parameter	Units	Value
Flow	mld	.....
Peak Factor	-	.....
Ph	-	.....
BOD	mg/l	.....
COD	mg/l	.....
Total Suspended Solids	mg/l	.....

Coliform Count	MPN /100 ml	……

1. The structural design of every component of …20.0…… MLD capacity and their construction shall be carried out considering serviceability and durability for the intended use of plant. For the purposes of structural design, bearing capacity of soil may be adopted as ……tonne/m2 at depth of ……meter below natural ground level. The Water table shall be considered at1. 5 meter below Natural Ground Level.

2. Operation and maintenance (O&M) of constructed STP of …20.0…… MLD capacity for a period of one year excluding stabilization (Trial Run) period of all units of STP.

3. Providing training of O&M to staff of …….

4. Electricity charges (bills), diesel and cosumables will be in MNP□s scope during O&M period after the trial run.

5. Defects liability period will be 12 months from the date of completion of plant which imply an event after commissioning and successful trial for a period of 6 months stated above is completed and certified by the Engineer. The operation & Maintenance for a period of 60 (Sixty) months including the defect liability period of 12 months. This period will start after the initial successful trial and test period of 6 months.

6. Treatment Scheme – A Basic scheme for Sewage Treatment and disposal shall be as per Process Block Diagram given in figure appearing on the next page.

7. Bidder will have to make his own arrangements of water for construction.

8. The owner will provide 3 phase 4 wire power supply at the MCC incomer for commissiong of plant. However the electricity required for construction of plant is in the scope of contractor. He shall arrange for the connection. The electricity bills during trial run period beyond the guaranteed value shall be payable by the contractor.

9. Bidder shall make his own arrangements for all lifting and storage of tools / tackles / equipments, etc. in the space allotted to him by the Owner. This temporary shed shall be dismantled at the time of Bidders departure from site.

10. Space Available: 2 Ha

11. Minimum thickness of RCC members shall be 150 mm.

12. All units/components shall be provided sufficient walk way at least 1.20 m wide with suitable S S railing of 1.00 m height.

13. Contractor shall supply detailed working drawings before execution of contract bond.

14. Hydraulic testing & commissioning of all the system as specified in IS Code/Manual on Sewerage & Sewage treatment, CPHEEO Latest version, GOI, shall be carried out.

15. Wherever required, carting of excavated earth to nearby safe place and re-carting of the same for refilling after laying of sewer has to be done as per direction of Engineer-in-charge for which no extra claim shall be entertained.

16. Providing necessary barricading consisting of M.S. Plates, Angles, Toes, Pipes, bellies etc. as per site requirement and as approved by the Engineer in charge.

17. Supply of As built drawings after completion and commissioning of work.

18. Performance guarantee of all the works executed.

19. The contractors are advised to go through the specifications carefully and acquaint themselves with the nature of work, the difficulties likely to be encountered during the execution of work before tendering their rates. They should make sufficient provision in their rates to overcome such difficulties. The rates / prices offered should be inclusive of cost of all materials, labor, T&P and all taxes whether levied by Central Govt. or State Govt. or local authorities during currency of the contract etc as no claim or compensation on these accounts shall be entertained.

2. General Scope:- (Zone ...X...)

1. A Sewage Treatment Plant (STP) of ...15.5..... **MLD** capacity on Moving Media Bio-Reactor (MMBR) technology including its operation for one year. The chemicals and the electrical energy charges will be paid by ...SMC...... The contractor should apply the labors free of cost.

2. The avarage flow over a day in the year ...2035..... will be ...15.5..... MLD. The Inlet structure, stilling chamber along with screens shall be designed & constructed for this capacity.

3. Total ...2.0 Ha... land is available for construction of (...15.5..... MLD Present Capacity) STP of ultimate stage. Bidder shall submit detailed plant layout along with the bid showing the layout for present ...15.5.....mld STP.

4. The Raw Sewage shall be provided at RL (...456.53 m for STP 15.5 MLD ...m above MSL) up to the Inlet Chamber / Stilling Chamber of STP from where the contractor's scope of work will start.

5. At the end of the system, the final effluent shall be discharged into a treated Sewage Chamber at a head of not less than 3.00 m from Natural Ground Level (The Natural Ground Level shall be considered as ...460.0.....m above MSL) .The FSL at CCT be taken .....and the FSL at the stilling chamber as .....

6. In between point of start and point of end necessary units like Stilling Chamber, Mechanical/Manual Bar Screen, Mechanical Grit Chambers, Parshall flume for flow measurement, Aerobic Attached Growth Moving Media Biological Reactor (MMBR), Secondary clari settler, Sludge Sump, Sludge Dewatering system monobelt

centrifuge, with centrifuge platform, CCT / chlorination and chlorine room, Out fall sewer, piping work in CILA including Sl. Valves, reflux valves, M S Gates, Administrative building, at the chamber of battery limit, Supply of Mechanical, Electrical and Instrumentation Equipment, Cables, Electrical Panel, Plant Buildings, Laboratory and its equipment, Other Interconnecting Channels & Piping Works, Painting, Erection shall be planned, designed and constructed, erected, tested, successfully commissioning by the contractor.

7. Planning and layout : The planning of Sewage Treatment Plant means hydraulic, biological and bacteriological (disinfection) design and layout in such a way as to occupy minimum space while giving the desired effluent quality and having excellent architectural look.

Design Basis & Plant Performance
1.2 Raw Sewage Characteristics

Design Basis & Plant Performance Parameter	**Units**	**Value**
Flow	mld	.....
Peak Factor	-	.....
Ph	-	.....
BOD	mg/l	.....
COD	mg/l	.....
Total Suspended Solids	mg/l	.....
Coliform Count	MPN /100 ml	.....
Treated Waste Water Quality & Quantity (Guaranteed) Parameter	Units	Value
pH	-	.....
BOD	mg/l	.....
COD	mg/l	.....
Total Suspended Solids	mg/l	.....
Coliform Count	MPN /100 ml	.....

1. The structural design of every component of ...15.5..... MLD capacity and their construction shall be carried out considering serviceability and durability for the intended use of plant. For the purposes of structural design, bearing capacity of soil may be adopted as .....tonne/m2 at depth of 1.50 meter below natural ground level. The Water table shall be considered at1. 5 meter below Natural Ground Level.

2. Operation and maintenance (O&M) of constructed STP of ...15.5..... MLD capacity for a period of one year excluding stabilization (Trial Run) period of all units of STP.

3. Providing training of O&M to staff of .....

4. Electricity charges (bills), diesel and cosumables will be in .....s scope during the trial run.

5. Defects liability period will be 12 months from the date of completion of plant which imply an event after commissioning and successful trial for a period of 6 months stated above is completed and certified by the Engineer. The operation & Maintenance for a period of 12 (Twelve) months including the defect liability period of 12 months. This period will start after the initial successful trial and test period of 6 months.

6. Treatment Scheme – A Basic scheme for Sewage Treatment and disposal shall be as per Process Block Diagram given in figure appearing on the next page

7. Bidder will have to make his own arrangements of water for construction.

8. The owner will provide 3 phase 4 wire power supply at the MCC incomer for commissiong of plant. However the electricity required for construction of plant is in the scope of contractor. He shall arrange for the connection. The electricity bills during trial run period beyond the guaranteed value shall be payable by the contractor.

9. Bidder shall make his own arrangements for all lifting and storage of tools / tackles / equipments, etc. in the space allotted to him by the Owner. This temporary shed shall be dismantled at the time of Bidders departure from site.

10. Space Available...2.0 Ha

11. Minimum thickness of RCC members shall be 150 mm.

12. All units/components shall be provided sufficient walk way at least 1.20 m wide with suitable S S railing of 1.00 m height.

13. Contractor shall supply detailed working drawings before execution of contract bond.

14. Hydraulic testing & commissioning of all the system as specified in IS Code/Manual on Sewerage & Sewage treatment, CPHEEO Latest version, GOI, shall be carried out.

15. Wherever required, carting of excavated earth to nearby safe place and re-carting of the same for refilling after laying of sewer has to be done as per direction of Engineer-in-charge for which no extra claim shall be entertained.

16. Providing necessary barricading consisting of M.S. Plates, Angles, Toes, Pipes, bellies etc. as per site requirement and as approved by the Engineer in charge.

17. Supply of as built drawings after completion and commissioning of work.

18. Performance guarantee of all the works executed.

19. The contractors are advised to go through the specifications carefully and acquaint themselves with the nature of work, the difficulties likely to be encountered during the execution of work before tendering their rates. They should make sufficient provision in their rates to overcome such difficulties. The rates / prices offered should be inclusive of cost of all materials, labor, T&P and all taxes whether levied by Central Govt. or State Govt. or local authorities during currency of the contract etc as no claim or compensation on these accounts shall be entertained.

Process Block Diagram

CLARI SETTLER

CHLORINE CONTACT TANK

MMBR

TREATED SEWAGE FOR DISPOSAL

CHLORINE DOSING

ALUM / PAC DOSING

PARSHALL FLUME

Centrifuge

RAW SEWAGE

OVERFLOWITRATE

THICKENER

DEWATERED SLUDGE FOR DISPOSAL

SLUDGE SUMP & PUMP

GRIT CHAMBER

BAR SCREENS

STILLING CHAMBER

CENTRATE

DWPE DOSING

Process & Mechanical Works

1.1 Sewer Connection

The Raw Sewage shall be provided at m above ground level (...460.0.....m above MSL) up to the Inlet Chamber / Stilling Chamber of STP from where the scope of this work of STP will start. However there will be five rising mains of various diameters coming to this chamber for which the necessary double flanged DI K-9 barrel piece with crippling flanges shall be embedded in concrete while the concreting is on.

1.2 Sewage Treatment Plant (STP)

1. Stilling Chamber.

2. Screening Channels with Fine Mechanical & Manual screens.

3. Mechanical Grit Separators.

4. Measuring Parshall flume.

5. Moving Media Biological Reactors

6. Arrangements for Alum / PAC dosing

7. Secondary clari- settler.

8. Chlorine Contact Tank and Gas Chlorination System

9. Chlorine Tonner cum Chlorinator Room

10. Sludge Sump & Pumps

11. Sludge Thickener

12. Sludge conditioning polymer dosing system

13. Sludge dewatering feed pumps

14. Sludge Centrifuge

15. Sludge dewatering Shed

16. Administrative building

17. Blowers with Blower Shed

18. Diesel Generator Set with Room

19. Interconnecting Pipes, gates, valves, weirs, valve chambers, channels, chutes for conveyance of sewage, screenings, grit, sludge , drains , thickener overflow, centrate , chemical solutions , service water , flushing water.

20. Internal Roads & Pathways of Bituminous maccadam with premix carpet

21. Stairs with railings as per requirement

22. Walkways, Platforms with Railings.

23. Painting to all the above units, wherever required

24. Garden, landscaping and architectural aesthetic treatment

25. Any other component necessary for the completion of STP

1.3 Process / Mechanical

1.3.1 Stilling chamber

The Sewage Pumped shall be received in the Stilling Chamber. The sewage from the Stilling Chamber overflows into screen chamber where it undergoes screening. RCC access platform, a staircase and railing is provided.

1.3.2 Mechanical & Manual Fine Bar Screen

The screen with openings generally of uniform size to remove suspended or floating matters in sewage to be provided. The velocity to be maintained so as to avoid settling of grit or organic matter. This includes supply, erection, testing and commissioning of 1 No. Mechanical (Working) & 1 no manual (Standby) bar screens. This shall be provided in the screen chambers after the Stilling Chamber.

1.3.3 Grit Separators

The grit particles in the sewage need to be removed to protect mechanical equipment and pump elements form abrasion. The function of this unit is to remove inorganic grit from sewage after it gets screened in screening chamber. There shall be 1 Mechanical Working and 1 Standby Grit Separators. The Mechanical Grit Separator shall be a square in shape of suitable size, complete with mechanical grit separator mechanism, classifier and organic return pump equipment at its center. Gates shall be installed after screening chamber to regulate the flow to Mechanical Separator. There shall be a 1.2 m wide platform with pipe railing & a RCC Stair of 1.2 m width.

1.3.4 Parshall Flume

A parshall flume with measuring apparatus and totalizer shall be provided to read effectively and accurately between the varying flows of 1 MLD to 36 MLD with accuracy of 2 to 5 %

1.3.5 Moving Media Bio Reactors (MMBR)

The bioreactor shall be designed to treat the sewage with aerobic attached growth moving bed process.

There shall be minimum two no. reactors constructed in parallel with hydraulic retention time minimum 4 hrs to take the organic & solid load in the raw sewage & to deliver consistently the outlet sewage quality as per treated waste water quality mentioned. There shall be a 1.2 m wide platform with pipe railing & a RCC Stair of 1.2 m width. The continuity of access from end of parshall flume channel to the MMBR tank is desirable though not compulsory Each reactor shall have minimum 150 mm diameter DI/CI pipe with ISI marked butterfly valve in a separate valve pit having provision for extended rod with wheel for draining, rungs in all valves chambers & reactors, for maintenance & shall be connected to sludge sump for drainage of reactors by gravity.

The media shall be of Virgin polypropylene with 0.92 to 0.93 gm/cm^3 specific gravity, non degradable. The media quantity shall be adequate to provide sufficient surface area for maintaining the microbial strength as required for achieving the quality.

The surface area of media to be used for designing purpose shall not be less than 500M^2 / M^3 gross and 250 M2 / M3 net on which the biomass shall grow. Specification of these values do not absolve the contractor from giving the required minimum guaranteed effluent characteristics.

Recommended Manufacturers of media: Thermax / Kaldness / decpl

The oxygen requirement for BOD5 removal shall not be less than 1.2 Kg O2 / kgs of BOD5 removed. The air quality and quantity required shall be sufficient for maintaining minimum 2 PPM necessary dissolved oxygen at 30° C liquid temperatures at all times & mixing conditions at 10000 mg/lit MLSS whichever is more. The air shall be supplied using positive displacement rotary type air blower. All the blower shall be of same capacity and shall be provided (working + standby) each of 100% capacity.

The diffusers used shall be suitable for coarse bubble air diffusion & for design Purpose O2 transfer efficiency shall be considered not more than 17%. The air agitation or diffusion is to be applied continuously to circulate the media & keep in suspension.

The piping & Diffuser for distribution of air in reactor shall be of SS 316.

Provision to maintain bio film carriers in reactor by providing screens of MOC SS 316 suitably designed at peak flow with suitable clear spacing between two flat bars each of suitable thickness at each tank inlet / outlet.

This shall include supply, erection, testing and commissioning of all mechanical equipment/systems associated with MMBR such as Air Diffusion system, Carrier Media, Inlet Screens, Media Retaining Screens, drain valves.

Moving Media Bio Reactors : 1 stream with minimum 2 in parallel in each stream.

1.3.6 Air Blowers

The air required for Biological treatment shall be supplied by Air Blowers. This includes supply, erection, testing and commissioning of Positive Displacement type rotary air blowers to be provided for supplying air to the bio reactors and sludge sumps.

Air Blowers : Each of 100 % capacity (1 working + 1 standby for each of the two reactors)

1.3.7 Secondary Clari Settler:- 1No,

The conventional secondary clarifier or Clarifier with tubes shall be provided .Each Plant shall be one clarifier and designed at 10 - 15 M^3 / M^2 / Day surface loading. Clarifier shall be provided with inlet DI / CI pipe / RCC duct or RCC pipe of suitable size with central column & distribution drum of area not less than 10% of Tube Clarification area with minimum 50 %, submergence below liquid depth to achieve steady velocity through out the cross section of the tank & avoid turbulence. These circular secondary settling tanks with peripheral driven centrally supported MS Bridge with suspended scrappers shall be provided having minimum 1.2 m wide walkway with 6 mm thick chequerred plate / grating. This secondary settling tank shall have inside launders at the periphery of the outer wall With V notches / Radial launders of for allowing 185 M^3 / M / Day maximum weir loading for collection of clarified water. The tube media shall be square type of 50mm x 50mm size. The material of tube media shall be PVC.

The sludge hopper will be designed to collect the sludge & allow moving towards drain pit with mechanical scrappers. The solids separated shall be drained out with established frequency for further disposal. Preferable sludge so produced should be totally digested.

There shall be minimum 200 mm diameter CI Motorised Knife Gate valve with for intermittent withdrawal of sludge from the clarifier. The valve shall be provided with manual over-ride facility.

The Valve shall be installed in a separate pit with rungs.

2.3.7 Centrifuge Feed Pump sets

2. The function of this unit is to pump the sludge from the Sludge sump to Sludge centrifuge. Two nos. (One working + one stand by) Screw type sludge pumps shall be provided in sludge sump. The pumps shall be suitable to handle sludge with 2% solids.

Clari Settler : 1 Nos.

(Peripheral driven moving bridge type)

2.1.1 Thickener Feed Pumps

The function of this unit is to pump the sludge withdrawn from the Clari Settler to Sludge Thickener. Sludge Sump shall be an underground circular / square RCC structure. Two nos. (One working + one stand by) submersible / Screw type sludge pumps shall be provided in sludge sump. The pumps shall be suitable to handle sludge with 1 to 2% solids. A manually operated chain pulley block of 1 ton capacity along with girder and pillar arrangement shall be provided in sump to lift the pump sets.

This includes supply, erection, testing and commissioning of 2 Nos. (1 Working + 1Standby) Sludge Pumps provided at the Clari Settler Sludge Sump.

2.1.2 Sludge Thickener Mechanism

The function of this unit is gravity thickening so that the volumetric load for sludge dewatering is reduced. The thickener shall be provided with central driven scraper mechanism .The floor slope shall be 1: 8.

This includes supply, erection, testing and commissioning of 1 number sludge thickener mechanism suitable for installation in the RCC tank proposed by the bidder to meet the requirements specified in the scope of civil works.

2.1.3 Centrifuge Feed Pump sets

The function of this unit is to pump the sludge withdrawn from the Sludge Thickener or from Sludge Digester to Sludge centrifuge. Two nos. (One working + one stand by) Screw type sludge pumps shall be provided in sludge sump. The pumps shall be suitable to handle sludge with 4% solids.

2.1.4 Sludge Centrifuge

The sludge pumped to the centrifuge is dewatered in the centrifuge for increasing the concentration of sludge so that final disposable sludge volume is considerably reduced. Two number (1 working + 1

Standby) centrifuge is proposed .The capacity of centrifuge shall be sufficient to process the total daily sludge with 16 hrs of operation.

2.1.5 Dewatering Dosing system

Dewatering polyelectrolyte Dosing system shall be provided to dose Poly Electrolyte solution to the incoming sludge at entrance to the centrifuge. 2 nos. dosing tanks each of 8 hrs capacity with 2nos (1W+1SB) dosing pumps shall be **provided.**

2.1.6 Chlorination System

This includes supply, erection, testing and commissioning Vacuum type chlorinators including all accessories i.e. tonners, safety equipment, booster pumps, pipelines and valves etc

Minimum chlorine dose : 10 mg / lit

Chlorinators : 2 Nos. (1 working + 1 standby)

2.1.7 Flow Channels

RCC channels of sufficient size, to connect various units shall be constructed as required. The channels shall be suitable for 20% overloading over peak flow rate.

2.1.8 Flow Isolation Gates

C.I. gates shall be provided for flow isolation of Screen channels & Grit Separators.

2.1.9 Electric Hoists

This includes supply, erection, testing and commissioning two way movements electrically operated hoist with all the accessories suitable for lifting Chlorine Tonners.

2.1.10 Manual Chain Pulley Block

This includes supply, erection; testing and commissioning manually operated chain pulley block mounted on monorail with suitable structure, with all the accessories suitable for lifting arrangement shall be provided for Air Blowers, Pumps, and Sludge Centrifuge.

2.1.11 Piping & Valves

This shall include the interconnecting pipelines between different units of the STP as per requirement of intended use. It shall be noted that all interconnecting pipe work shall be in CI/DI and designed for 20% overloading over the peak flow.

2.1.12 Fire Fighting Equipment

This includes supply, installation, testing and commissioning of fire extinguishing equipments. The following minimum fire extinguishing equipments shall be provided:

Chemical Type 5 Kg. : 6 Nos.

Sand Bucket Type 10 Lits. : 10 Nos.

2.1.13 Laboratory Equipment:-To be provided at 3.0 mld plant premises.

Item Description **Sr. No1.** Supply and installation of Laboratory Equipment as per list below;	**Qty.**	
	Analytical Balance	
Electronic Analytical Balance Catalog No: BS224 Make: Sartorius Capacity: 220g Readability: 0.1 gm Pan Size: 80mm	1	
2	**Drying Oven Hot Air**	
OVEN, LABORATORY 240V 50/60HZ Catalog No: 14289-02 Make: HACH, USA	1	
3	**Hot Plates**	
PERISTALTIC PUMP type SP 311/60 Catalog No: 10.0174 Make: VELP	1	
4	**BOD Incubator**	
BOD INCUBATOR-110 Liters Catalog No: OR 405 Make: ORLAB Specifications: Volume: 110 Liters Temp. Setting: 5 to 50 deg. C Temp Stability: +/- 2 Deg. C Power: 230 V, 50 Hz, and 2 Amps Refrigerant: R134 (CFC Free) External Dimensions 126cm X W 48cm X D 60 cm	1	

Heating Power: 150 W Cooling Power: 110 W Temperature Display: 3 digit LED display Temperature setting: Digital keypad Ambient Temperature: 0 to 50 deg C Temperature Control: Automatic Microprocessor based Temperature Sensor: PT 100		
5	**Magnetic Stirrers**	
MAGNETIC STIRRER type MICROSTIRRER Catalog No: 10.0161 Make: Velp	1	
6	**COD Apparatus**	
DRB200 w/VDE 220V,WITH 15 WELLS Catalog No: LTV082.15.40001 Make: HACH, USA DRB200- Digital Reactor Block (Single Block: 15 wells for 16mm vials)		
DRB200 Digital Reactor Block for multipurpose use for COD, TOC, TNT Total Nitrogen, Unicell (Metal Prep) for Sample digestion. Features: Ø Pre-programmers for all Hach standard digestion for COD, Unicell, and TNT tests for digestion. Ø One touches operation for Hach tests. Ø Adjustable Temperature setting 37°C to 165°C in 1°C steps. Ø Adjustable Time settings 1 to 480minutes Ø Up to 3 user enter digestion/reaction storable applications Ø Digital countdown timer with automatic shut off and alarm signal Ø Separate locking and transparent protective lids		
Specifications: Temperature Range: 37° to 165°C with 1°C Pre-programs: For Hach standard digestion Temperatures (100°C/105°C/150°C) User Programs: up to 3 user enter digestion/reaction storable applications Capacity: Block: 15 wells for 16mm vials Accuracy: As per DIN, EN, ISO, EPA Methods Timer: 1 to 480minutes (8hours) Warm-up time: Less than 10minutes 150°C Power supply: Single-Block: 230V/450VA Compliance: CE, GS, cTUVus (includes UL)		
COD Reagents		
A	COD DIGESTION VIAL, LR HW PK/25 Catalog No: 21258-25 Make: HACH, USA	1
B	COD DIGESTION	1

	VIAL, HR HW PK/25 Catalog No: 21259-25 Make: HACH, USA	
C	COD DI- GESTION VIAL, HR+ PK/25 Catalog No: 24159-25 Make: HACH, USA	1
7	**Muffle Furnace**	
FURNACE, MUFFLE 1093C 240V 50/60 Catalog No: 14296-24 Make: HACH, USA Description: Digital temperature control. Insulation made of high-purity alumina-silica with a low thermal mass. Means faster heat-up time and reduced electrical consumption. Embedded heating elements for structural strength and longer life. Perforated bench case design keeps bench top cool. Accurate percentage input control. Chamber dimensions (W x H x D), 10 x 10 x 11		
cm (3.9 x 3.9 x 4.3"). Outer dimensions, 20 x 32 x 22 cm (7.9 x 12.6 x 8.7"). 1050 W. Maximum operating temperature: 1093°C. Thermally.		
8	**Water Bath**	
UTRASONIC BATH, 0.75 GAL 230V Catalog No: 24895-02 Make: HACH, USA	1	
9	**Portable pH Meter**	

a	***6230MKB portable pH, mV (ORP), Temp. Meter kit*** Cat. No: 6230MKB Make: JENCO Features: Economical, user friendly and have the right features for everyday field pH measurements. **40 Memory for Data storage (6230M and 6231M)** RS-232 computer interface with software BNC connector for pH/reference pH and mV 8 pin DIN connector for 10k thermistor Separate pin plug connector for reference pH AC adaptor or battery power **Specifications:** **pH:** Range: -2.00 to 16.00 Resolution: 0.01pH Accuracy: 0.1% LSD **mV:** Range: -1999 to 1999 mV Resolution: 1.0 mV Accuracy: 0.1% full scale LSD **Temperature:** Range: -5.0-125.00C Resolution:0. 1 0C Accuracy: 0.5 0C PH Temp Compensation: Auto/Manual –10.0 to 120.00C
PH Calibration: 1,2 or 3 points **Scope of Supply:** Handled pH, mV (ORP), and Temp meter **with RS-232C** interface. PH/Ref/Temp. Electrode; Electrode cable.	
b	**Bench top pH Meter**
6173R KB Benchtop pH, mV (ORP), Temp. Meter Kit Model: 6173R KB Make: Jenco	1 No.
Features: Quick and Easy pH measurements Built in Buffer Temp. Coefficient auto lock Power down memory 50 Memory location for data storage RS-232 interface with software Automatic temperature compensation Specifications: Range: PH: -6.00 to 20.00 mV : -2000 to 2000 mV Temp: 10.0 to 120.0C	

Resolution pH : 0.01 pH mV : 1.0 mV Temp : 0.1C Accuracy pH : 0.01 pH mV : 0.05 % full scale 1 LSD Temp : 0.5C Scope of supply: Large LCD Bench Meter with RS-232 interface. pH, mV (ORP), Temp. pH/Ref./Temp. Electrode, 3 Electrode Cable, 230 VAC Adapter	
Buffers used with 6230MKB Meter kit & 6173RKB Meter Kit	
Buffer capsules, vial of 10 each. Slopes meter at 4.01 pH Catalog No: 6B4 Make: JENCO	1
Buffer capsules, vial of 10 each. Standardize meter at 7.00 pH Catalog No: 6B7 Make: JENCO	1
Buffer capsules, vial of 10 each. Slopes meter at 10.01 pH Catalog No: 6B10 Make: JENCO	1
Electrode holder	
Catalog No: 007N Make: Jenco	1
10	**DO Meter**
DO Meter, 12 ft Probe & Cable Catalog No: 55-12 Make: YSI	
Scope of Supply: YSI D.O.Meter 55-12FT Probe Cable | Battery Alkaline 4nos 1.5V Each | Instruction Manual | Hardware Kit Fitted | KCL Soln, Membrane Booklet And O-Ring Set (5775).	
11	**Vacuum Pump**
PUMP, VACUUM 1.2 CFM 230V 50HZ Catalog No: 28248-02 Make: HACH, USA	1
12	**MPN Tubes (Durham's)**
LAURYL TRYPTOSE/MUG SOLN PK/15 Catalog No: 21821-15	1

Make: HACH, USA	
13	**Readymade media**
BRILLIANT GREEN TUBES PK/15 Catalog No: 322-15 Make: HACH, USA ***Note: Incubator is mandatory***	1
EC/MUG W/O DURHAM TUBES, PK/15 Catalog No: 24715-15 Make: HACH, USA	1
14	**Incubator**
MEL INCUBATOR BATTERY PACK Catalog No: OR 503 Make: ORLAB	1
MEL INCUBATOR POWER SUPPLY Catalog No: OR 502 Make: ORLAB	1
Required Apparatus	
BAG, STER W/THIOSULFATE PK/100	
Catalog No: 20753-33 Make: HACH, USA	
GERMICIDAL CLOTH, PK/50 Catalog No: 24632-00 Make: HACH, USA	1
INOCULATING LOOP AND HANDLE Catalog No: 21121-00 Make: HACH, USA	1
DECHLORINATING REAGENT PP PK/100 Catalog No: 14363-69 Make: HACH, USA	1
BUFFER DILUTION WATER PLWS PK/25 Catalog No: 21431-66 Make: HACH, USA	1

NOTE; - Laboratory building shall be housed in Administrative Building to be constructed by the agency. The bidder is to install, the laboratory equipment. All requirements for procurement /installation / testing/commissioning the scope of the bidder. The laboratory platforms shall be in granite top.

Electrical Works

3.1 STP – Main Electrical Panel

This includes supply, installation, testing and commissioning of STP Main Electrical Panel and individual starter panels for various loads complete in all respects with suitable switchgear. It shall be provided with metering, ACB□s with S/C & O/L releases, switch-fuse units, lamps, bus bars etc. The accessories used shall conform to the latest IS codes.

3.2 Individual Starter Panels / Local

This includes supply, installation, testing and commissioning of starter panels for ;

1) Fine Mechanical screens

2) Mechanical Grit Separator

3) Sludge pumps

4) Sludge dewatering feed pumps

5) Centrifuge units

6) Electrical Hoists

7) Street lights

3.3 Local Push Button Stations

The Local Push Button Stations shall be provided for all other drives.

3.4 Cabling, Cable Trays and Junction Boxes

This includes supply, erection, testing and commissioning of L.T Power & Control cabling required for inter-connecting all the control panels / LDB to their respective sources and loads at STP. The cabling shall be complete in all respects. Civil works like construction of cable trenches with angles, che-quered plates etc. Are also included in the scope. Cable trays & junction boxes shall be installed to accommodate the cables wherever required.

Power & Control Cables : LOT

Junction Boxes : LOT

Cable Trays : LOT

3.5 Distribution Boards

This includes supply, erection, testing and commissioning of Distribution Boards for office building, street lighting & laboratory equipmentsPower Distribution Board : 1 No.

LDB for street lighting : 1 No.

LDB for office building, blower building

& chemical room etc : As per requirement

3.6 Plant Illumination

This includes supply, erection, testing and commissioning of Indoor & Outdoor Illumination works within STP , that include installation & commissioning of fixtures, lamps, lighting poles, lighting panels etc. All the lighting shall be energy efficient.

3.7 Earthling Works

This includes earthing arrangement of all ground exposed non-current carrying metal components of electrical equipment at STP, cable trays, raceway system, cable grounding conductors armor of shielding and enclosures. Continuity of system and equipment grounds throughout the electrical installation shall be maintained. Grounds, bushings and jumpers shall be provided where normal metallic ground paths are interrupted.

Instrumentation & Control Works

4.1 Instruments

This includes supply, erection; testing and commissioning of various instruments used Sewage Treatment. The Instruments shall be as below but not limited to ;

Raw Sewage US Flow Indicator with Totalizers : 1 No.

Air Flow meter for MMBR : 2 Nos. (Minimum)

Level Switches in Sumps for auto/start

of pumps : lot as required

Pressure Gauges : lot as required

4.2 Instrument / Alarm Annunciation Panel

This includes supply, installation, testing and commissioning of sufficient windows Alarm Annunciation panel complete in all respects. It shall be provided with all accessories. This panel can be the part of Main Electric Panel.

Instrument / Alarm Annunciation Panel : 1 No.

Civil Works

5.1 Construction of Process units & works as listed below ;

1. Stilling Chamber
2. Screening Channels at the outlet of stilling chamber
3. Grit Chambers for Mechanical & Manual Grit Separators.
4. Parshall Flume
5. Moving Media Biological Reactors

6. Clari Settler.
7. Coagulant solution tank
8. Chlorine Contact Tank
9. Sludge Sump
10. Sludge Thickener
11. Pump House for thickener feed pump & centrifuge feed pump
12. Shed for centrifuge.
13. Overhead Water Storage Tank of 5 Cum above Chemical House for Chemical Solution preparation / laboratory use.
14. Chlorine Tonner cum Chlorinator Room (Floor Area not less than 30 SqM)
Gantry level 6 m ht from level of tonner room with outlet.
15. Shed for Chemical Tanks & pumps. (Floor Area not less than 20 SqM)
16. Main Electrical & Instrument Panel Room (Floor Area not less than 40 SqM)
17. Blower Room (Floor Area not less than 40 SqM)
18. Diesel Generator Room (Floor Area not less than 25 SqM)
19. Administrative building cum laboratory building (Floor Area not less than 75 SqM)
20. Centrifuge Shed (not less than 20SqM)
21. Interconnecting channels.
22. Internal Roads & Pathways
23. Stairs with railings as per requirement
24. Walkways, Platforms with Railings.
25. Painting , white washing & allied works to all the above units, wherever required
26. External water supply system in the plant
27. Any other component necessary for the completion of STP

5.2 Lowering of Ground water table during construction

The Ground water table, if encountered during construction shall be lowered sufficiently so as to enable construction in dry conditions.

6. Erection , Commissioning & testing

6.1 Complete erection of the scope of supply up to operation readiness. This includes mobilisation and provision of the required skilled and unskilled personnel, supervisory staff as well as installation of scaffolding, cranes, hoists, equipment and materials, personnel accommodation, prescribed tests and inspections.

6.2 Commissioning and optimisation of all plant components as well as conducting all necessary measurements.

6.3 Test run & performance trial of continuous 72 hrs for demonstration of all guaranteed parameters.

6.4 Trial run for 6 months after complete commissioning and completion.

7. Documentation

7.1 The Bidder shall furnish the following along with Bid:

i) Technical Data Sheets duly completed

ii) Complete description of the Plant offered.

iii) P & I Diagram

iv) Plant Layout.

v) Hydraulic Flow Diagram

VI) Document of Quality Assurance System.

Battery Limits, Interfaces and Terminal Points

Raw Sewage : At the Inlet Chamber / Stilling Chamber.

Treated Sewage : Outlet of Chlorine contact tank at RL570.95 and 575.097respectively for STP Dist.I and for STP for Dist.3.

Electricity : Incomer of MSEDCL at 415 V, 50 Hz. 3 phase if the total

connected load is less than 50 HP. If more then at 11 KV, 50 Hz. 3 phase

Service water : At one point in each STP area.

(For Chemicals / Flushing / Lab)

Screenings : At the flange of outlet chute adjacent to screen channels

with extension GI box type closed chute to let screening fall directly in wheel borough without being seen as droping down. Provision of two wheel boroughs included

Grit : At the outlet of Grit disposal flange of Grit separator with

Extension GI box type closed chute to let screening fall directly in wheel borough without being seen as droping down. Provision of two wheel boroughs included

Sludge : Sludge Outlet of Centrifuge. Sludge to fall in the trolleys

(2 included in scope) so that no manual touch is

Required)

SECTION C1

BASIC DATA FOR DESIGN

BASIC DATA FOR DESIGN

1. Raw Sewage Characteristics

Parameter	**Units**	**Value**
Flow	mld	.....
Peak Factor	-	.....
Ph	-	.....
BOD	mg/l	.....
COD	mg/l	.....
Total Suspended Solids	mg/l	.....
Coliform Count	MPN /100 ml	.....

Bidder shall submit Quality Assurance Plan along with the bid.

3.4 The level at the inlet of raw sewage pipe at the inlet of Stilling Chamber shall be 4.0 m above NGL.

3.5 The level in the Chlorine Contact Tank Shall be minimum 3.0 m above NGL.

3.6 The detailed technical specifications for all the items are covered in this part of the tender documents. In case any item is not covered or missing, the specifications as per CPHEEO manual, PWD handbook, and relevant IS code shall have to be followed upon approval of Engineer-in-Charge.

Moreover, in case of any discrepancy between specifications laid down in this document and CPHEEO specifications/relevant IS code, the decision of the Engineer-in-Charge will be final & applicable.

3.7 Wherever reference is made to Indian Standard Specifications, the latest specifications shall be applied.

3.8 List of Drawings

3.9 The List of Preliminary Drawings being provided with the bid documents for...20.0 & 15.5.....MLD MMBR STP is given in volume III Drawings.

3.10 Soil Bearing Capacity

3.11 The area where STP is to be constructed is presently under the maturation pond of the pond system. This area is proposed to be reclaimed. The maturation pond will be bye passed during construction of the proposed STP. The contractor will have to make up the site properly. The virgin soil below is B.C. Soil. The Bearing Capacity of this soil shall be taken as ..... MT/Sq.M.. However, the bidder may himself get the bearing capacity of the STP area checked before submitting the bid for proposingthe type of foundation. The successful bidder/contractor shall get the bearing capacity of the plant area tested (in the presence of Engineer-in-charge or his authorized representatives) and the design shall be based on the tested bearing capacity. The maximum safe net bearing capacity for which the structures are to be designed shall as per the actual strata met with . Any financial claim on account of difference in bearing capacity shall not be entertained afterwards. It is again reiterated that the contractor shall be responsible for soundness, safety and stability of the structures and for continuous use for its intended purpose.

3.12 Unless expressly given elsewhere in this document, the design values such as SOR, Weir loadings, velocity in various units etc shall be followed from the CPHEEO manual.

INDEX

Mechanical Works

Sr. No. Description

1. Submersible Pump & Submersible Motor

2. Mechanical Coarse & Fine Screen

3. Grit Separator Mechanism

4. Air Blower

5. Centrifugal Pumps

6. Thickener Mechanism

7. Sludge Centrifuge

8. Gas Chlorinator

9. Chemical Dosing Pumps

10. Piping & Valves

11. Isolation Gates

Submersible pumps

1.1. General

The submersible pump should be of single stage mono-block type designed for continuous duty to handle Raw Sewage shall be of single/double Vane for selected duty parameter.

Maintenance free anti-friction deep grove, permanently grease filled ball bearings should be provided and this should take care of all the axial and radial forces at any point of operation. The pump installation design should be such as to facilitate automatic installation and removal of pumps without having to enter into the sewage pit. Profile gasket should be provided in automatic coupling system so as to avoid metal to metal contact between the pump and duck foot bend to ensure leak proof joint.

The casing of pump set should be of CI of grade FG 260 as per IS 210. The impeller shall be of CFM 8 material. The pump set shall be supplied along with the guide rail, duck foot bend, lifting chain with shackles, guide-pipe, SS foundation bolts and nuts complete. The pump shall have reputed make mechanical seal & moisture sensor, thermistor for tripping of pump in case of any leakages or high temperature. It will be provided with its electronic control unit for such protection.

For easy installation and removal of the pump, a single guide rail system shall be provided. This being a permanent installation, a Pedestal and a Bracket should be provided to enable the pump to be removed from sump without the necessity of removing any nuts and bolts. The pumps should be provided with a reverse rotation trip feature to stop the unit instantly if connected to start in the wrong direction **Pump Details**

Capacity /Size /Material

Scope of Supply Pump, motor with requisite length of cable, Guide Rail System, Guide Pipe, Chains, Shackles with rings and Local Push Button Stations.	As per scope of work
Liquid handled	Raw Sewage
Solid Handling Size	50mm
Discharge in m3/hr of one pump	As per requirement
Total Pumping Head in m.	As per requirement.
Specific Gravity	1.02
Pump Details	Capacity /Size /Material
Liquid Temp. 0C max.	40
Pump Motor rpm	As per requirement.
Motor rated temp. 0C	40
Electric Supply	3ph. 50 Hz, 415 V
Material of Construction	CI IS 210 Gr FG 260
Casing	C.F 8M
Impeller	CI IS 210 Gr FG 260
Motor body	SS 410
Shaft	SS304/SS 316
Fasteners / Foundation bolt.	As per manufacturer□s standard
Lower Seal	CI with SS 304 Nuts, Bolts and Fasteners
Guide Rail System	
Guide pipe	SS 304
Chain with shackles	SS 304

Reverse Rotation

The pump shall be designed to run safely in the reverse direction of rotation due to wastewater returning through the pump. The pumps should be provided with reverse rotation trip feature for instant stoppage on long electrical connection. The mechanical seals shall be suitable for running in both directions without damage. The pumps should be provided with reverse rotation trip feature for preventing running in opposite direction in case of wrong electrical connections i.e. interchange of phase sequence.

1.3. Pump Construction:

1) Pump Casing

The pumps casing should be of cast iron as per IS 210 Gr FG 260.. The internal surfaces should be free of rough spots. The casing should have Centre line discharge. The finishing of the outer surface should be uniform and smooth.

2) Impeller

The material of impellers should be of Stainless Steel grade CFM 8, of single/double vane, non-clog semi-open design.

3) Pump Shaft

The pump shaft should be SS 410. The shaft shall be of one-piece construction.

4) Pump Bearings

Pump bearings should be of the anti-friction type. The bearings should be able to take normal axial thrust loads due to unbalanced hydraulic loads on the impellers plus the weight of all rotating parts of the pump. Pump bearings shall be designed with a minimum life of 35,000 hours. The bearings should be grease lubricated for longer life and shall be maintenance free.

5) Guide Rail Assembly

The assembly should have CI pedestal, however the fasteners and foundation nuts and bolts should be of stainless steel with upper guide rail holder etc. The pedestal and bracket should provide auto-matic coupling between pump delivery and discharge pipe.

6) Mechanical Seals

Double mechanical seal should be provided to prevent pumped liquid entering into the motor winding. The seals should be situated in the oil chamber to ensure proper lubrication. The sensor will be used for tripping the pump and also for alarm. The face combination of lower mechanical seal should be Silicon Carbide Vs Silicon Carbide and upper seal should be Carbon Vs Chrome Steel.

7) Moisture Sensor

Moisture sensor or seal monitor should be provided in the oil chamber to detect the failure of the mechanical seal. The sensor should trip the pump motor in the event of ingress of moisture into the oil chamber.

8) Lifting Chain

Each pump should be provided with SS 304 lifting chain of adequate strength. One end of the chain shall be attached to the pump and the other end fixed near the upper bracket for guide rail assembly by means of SS 304 Shackle. The chain shall have SS 304 rings fixed at an interval of about 1 m for engaging the hook of the manual hoist.

A SS 304 Chain 5 m long shall be provided to hold the ring of shackles and another end shall be tied to the platform being accessible to the operator.

9) Fasteners

All pump fasteners should be in stainless steel SS 304.

10) Foundation Nuts & Bolts

All foundation Nuts & Bolts should be in stainless steel SS 316.

11) Protective Coating

The pumps should be epoxy coated.

12) Pump Balance

All rotating parts shall be accurately machined and shall be in rotational balance. Excessive vibration shall be sufficient cause for rejection of the equipment. The mass of the unit and its distribution shall be such that resonance at normal operating speeds is avoided. In any case the amplitude of vibration as measured at any point on the pumping unit shall not exceed the limits set forth in the latest edition of Indian Standards. At the operating speed, the ratio of relative speed to the critical speed of the unit or components there of, shall be less than 0.8 or more than 1.3.

13) Submersible Cable

Each pump shall be provided with submersible cables of equal length for power as well as control so that the pump position can be interchanged with each other. The cable shall be terminated in a weatherproof junction box, which should be located outside the main pump sump. Cable between junction box & control panel can be non-submersible type. Power cables should be selected so as to carry at least 1.5 times the full load current at existing Power Factor of 0.8.

14) Spare Parts

Each installed pump should be supplied with one impeller duly machined, one set of mechanical seals, one set of wear rings (if applicable), and one set of O-rings and gasket, bearing set, set of fasteners.

1.4. Performance Tests

A) Shop Test

Each assembled pump shall be shop tested by the manufacturer to determine the following characteristic within the operating range as specified in the schedule.

a. Head Capacity Curve

b. Brake Horsepower Curve

c. Efficiency Curve

d. Balancing (Impeller only)

e. Vibration (Bare pump on no load)

f. Total Power consumed.

All tests shall be conducted in accordance with the requirements of the latest Indian Standards. In the event of any pump failing to meet the specified test requirements, it shall be rejected. Each pump performance shall be documented by obtaining concurrent readings showing motor voltage and amperage, pump discharge head. Such readings shall be documented for atleast five pumping conditions. One test shall be at the shut off head. These tests shall be carried out through reputed and authorised agencies with the involvement of CMC officials. After it has been demonstrated to the satisfaction of the Engineer-in-charge that the pumping equipment complies with these specifications the Engineer-in-charge In-charge shall be furnished with the Manufacturer's Test Certificates for the following.

Hydraulic test on casing.

 Routine test certificates on motor including HV test, Megger test, slip test, temp. rise test.

 Material test certificates certifying the grades of the materials used.

Type Test ON /OFF for the motors shall be carried out by the Engineer-In-Charge.

B) Field Test

General operational check shall be carried out after installation and before commissioning.

Submersible Pump Motors

S.1 General

The enclosure for motor shall be IP-68. Each phase of the motors shall be provided with thermistor or Bimetallic Electromechanical Temperature Detectors. The motor winding shall be suitable for Star – Delta Starter. The motor should be designed for minimum 10 starts per hour, irrespective whether it is star-delta start or otherwise. The rating of the motor shall be designed for 20% extra power margin at duty point.

S.2 Scope

This specification covers the design and manufacture of squirrel cage induction motors required for wastewater treatment plant. Contents of this specification are integral part of the contract documents. The motor shall operate satisfactorily at all operating levels in Sump / Reservoir.

S.3 References

Unless they are at variance with the clauses of this specification, the squirrel cage induction motors and their components shall comply with the applicable Indian Standards listed below. Where Indian Standards do not exist, the relevant British or German (VDE) Standards shall apply.

IS 325 Three phase induction motors

IS 1231 Dimensions of three phases, foot mounted induction motors

IS 2223 Dimensions of flange mounted AC induction motors

IS 2253 Types of construction of mounting arrangement of rotating electrical machine

IS 4691 Degrees of protection provided by enclosures for rotating electrical machinery

IS 4889 Methods of determination of efficiency of electrical machines

IS 4722 Rotating electrical machines

IS 4029 Guide for testing 3 phase induction motors.

S.4 Operating Conditions

a. Ambient Conditions

Motors shall be suitable for operating satisfactorily in humid and corrosive atmospheres found in sewage treatment plants. If not scientifically mentioned therein, a maximum ambient temperature of 40 0C and an altitude not exceeding 600 meters above mean sea level, shall be taken into consideration.

b. Frequency and Voltage Fluctuations

Motors will be required for continuous, satisfactory operation at rated output under the following conditions:

a. At rated frequency with voltage variations of + 10% of nominal value.

b. At rated voltage with frequency variations of + 5% of nominal value.

c. With a combined variation in frequency and voltage of 10%.

c. Starting

Unless otherwise specified motors shall be designed for Star Delta starting across full line voltage. Motors shall be designed for re-start under full load after a momentary lack of voltage, with the possibility of the restored supply voltage being 100% out of phase with respect to the motor residual voltage. The minimum starting torque should be 140% of Full Load Torque, with minimum torque during running up shall be 100% of Full Load Torque and minimum starting torque shall be 200% of Full Load Torque.

The submersible pump motors shall be designed for minimum 10 starts per hour.

d. Direction of Rotation

The motors shall be suitable for operating in both directions of rotation. The direction of rotation is defined as that looking towards the motor from the non-driving end.

e. Noise

The noise level shall be within the permissible limit as specified in the Indian Standard.

f. Performance

1. Starting Current For squirrel cage motors working in the voltage range of 360 V - 420 V the starting current shall be limited to 6 times the full load current subject to IS tolerance.

2. Torque Characteristics

For motors working in the voltage range of 360 V - 420 V, the minimum starting torque shall be 140% for full load torque, with minimum torque during running up 100% FLT and minimum starting torque 200% FLT.

S.5 General Requirements and Construction Details

The motor should be dry, squirrel cage type, suitable for 3 phase 415V supply, continuous duty with Class F insulation. Winding of the motor should be impregnated by resin in order to achieve required thermal withstanding capacity. Motor should have integral cable port and cable entry should be sealed. The cable must be leak-tight in respect of liquids and firmly attached to the terminal block. The motor should be designed for non-overloading characteristics. There should be thermal protection against overheating of motor winding. Motor should be sealed against entry of liquid being pumped by using two mechanical seals. The lower seal provided should have silicon carbide Vs silicon carbide face combination. Pump design should ensure that seal does not come directly in contact

with liquid being pumped as well as cooling/lubrication by oil is provided. Moisture sensor of the tripping unit should be located inside the oil chamber.

a. Windings

All motors shall be provided with Class F insulation. The windings shall be so treated as to resist the action of corrosive agents as may be present in the atmosphere of sewage treatment plant and that tend to dissolve the insulation.

Windings shall be adequately braced to prevent any relative movement during operating conditions and in this respect, particular attention is drawn to the stator windings of Star – Delta squirrel cage motors. Adequate insulation shall be provided between coils of different phases, which lie together.

Star/ delta starting is required, as shown on drawings, the motors windings shall be fully insulated for delta connection.

The rotor shall be balanced to provide a low vibration level and a long life for the bearings.

b. Shaft Extension

Motors shall be provided with a single extended shaft with key way and key as per requirements.

c. Lifting Hooks

All motors shall be provided with lifting arrangement of adequate capacity

d. Motor Casing

The motor enclosure shall be IP 68. The housing shall be of C.I. air-filled and water-tight. The housing shall be coated with epoxy after applying primer coating.

e. Bearing and Lubrication

Motors shall have grease-lubricated ball or roller bearings. In all cases, the bearing shall be chosen to provide a minimum operating life of 35,000 working hours. Bearing shall be adequate to absorb axial thrust. The bearing shall be maintenance free with grease fill for life.

f. Special Tools and Spanners

Each rating and frame size of motor shall be provided with 2 sets of any special tools required for dismantling and maintenance of the motor.

g. Name Plates

A nameplate as required under IS 325 shall be provided on each motor.

h. Test and Test Certificates

The motor shall be tested in accordance with IS 325 and IS 4029. Eight copies of the test report should be submitted for approval.

i. Fasteners

All fasteners shall be SS 316

Mechanical and Manual Fine Screen

1) General

The Fine Screen shall be provided in the screen channel downstream of stilling chamber. Screen shall have 6 mm clear spacing between the bars shall be provided in inlet screen channel for screening out floating materials such as plastic pouches, bags, rags, floating debris, weeds, paper wastes and other floating materials from the raw sewage coming from the pumping station / gravity mains.

There shall be two screens, one mechanically cleaned and the other working as standbye shall be manual. Both the screens shall be of SS 316.

The screens shall include discharge chute as required to discharge the screenings into the Dischrage Chute.

The screen shall be factory assembled & movement tested at factory before dispatch to site & shall only be installed at the site in factory assembled condition thereby avoiding chances of misalign-ments.

2) Scope

Design, Supply, Installation, Testing & Commissioning of screening equipment consisting of following:

a) A well designed screen chamber in RCC M-30, which shall be designed for average discharge of ...20.0..... MLD and ...15.5.....MLD and peak discharge of ...24.28.....and ...18.92.....MLD (peak factor of .....). The channel shall have minimum free board of 0.5 M. The walkway around shall be in RCC M-30 and 1.2 M wide protected by providing GI pipe railing 1 M high of 2 rows of 50 mm GI pipes of light duty. The chamber shall be sufficient to accommodate two screens one working and one stand-bye. The working being mechanical type and the standbye manual. A RCC staircase in M-25, 1.2 M wide from GL to Screen chamber shall be provided with required hand railing as stated above. The

screens and channels shall be designed as per the provisions of CPHEEO manual for approach velocity and the headloss through the screen. The headloss shall not exceed 15 cm.

b) Mechanized step screen having 6mm spacing between bars and suitable for installation at suitable inclination in channel.

c) Screenings Discharge Chute.

d) Level sensing instrument connected to control panel for automatic operation of screen mechanism and allied accessories.

e) Local control panel installed near screen.

3) Specification

3.1 Material of construction:

The fixed as well as movable bars, mechanism, support frame, fixings discharge chute shall be manufactured from stainless steel for long life in the aggressive sewage environment. No component of the screen assembly shall be made of carbon steel or any other material, which can get corroded in sewage environment.

3.2 Level Controller

The level controller shall be upstream type Ultrasonic level switch.

3.3 Electrical Motor

The motor shall be TEFC type with IP 55 protection and shall be suitable for operation on 415V + 10% and frequency of 50Hz + 5%.

3.4 Control Panel

The Control Panel shall have IP 55 protection, painted with Epoxy paint and shall be comprising of

- Mushroom Head Emergency stop

- Overload relays for motor protection

- MCB□s, HRC Fuses and Glass Fuses

- Circuitry to operate the screen with level sensors.

- Selector Switch to operate the screen on JOG mode

4) Testing

The Fine bar screen shall be Factory assembled and subjected to following tests at the manufacturer□s premises.

(a) Dimensional Check: The overall dimensions of the screen shall be conforming to the approved drawings.

(b) Operational Test: The complete screen including its mechanism, Electro-motor/hydraulic operating mechanism level probing system and control panel shall be integrated and mechanically operated to verify free movement and satisfactory working.

3. Grit Separator Mechanism

Grit separator, suitable for installation in the RCC tank shall generally be as specified below:

RCC Tank

The degritter shall be designed for removal of 100% of the 0.2 mm and above particle size grit of specific gravity 2.3 and above for peak flow of 2.5 Qav. The necessary inlet and outlet channels with required CI gates shall be provided. The outlet flow shall be directed to the measuring flume (Parshall flume). The minimum free board shall be 0.3 M The entire construction shall be in RCC M-30.

Grit collection unit

- Bridge cum walkway minimum 1200 mm wide shall span the full length of the tank,. The hand railings should be 1 meter high as specified in the screens. The walkway would be made of 5 mm chequered plates.

- Main drive head of worm gear type should be capable of handling the torque, and should be driven by a suitable motor and gearbox. There should be chain and sprocket transmission between gearbox and Drive head.

- Overload protection device should be mounted on the drive head.

- Heavy duty 100 NB vertical shaft suspended from the drive head.

- Two truss type torque rake arms fixed to either side of the shaft should be provided. Blades and scoops should be fixed to the rake arms. The rake arms should carry the grit to the discharge pocket.

- Suitable number of CI inlet gates, adjustable type, should be provided on the inlet side of the tank to regulate the influent flow.

Classifier / Grit cleaning & raking unit

- Main drive platform and two bells crank brackets to be anchored on the RCC rake channel.

- Main drive should consist of a suitable motor coupled to worm gear box. Through a gear transmission the raking unit is driven. The gear drive should be enclosed in an oil bath.

- The raker unit should consist of front, intermediate and bottom links and together should be connected through connecting rods, reach rods, eccentric straps, yokes, bell cranks and links. The overall balance should be maintained using counterweights.

- Bottom rake frame should be welded with the blades.

- The rake blades should bring up the grit to the top, towards the discharge end.

- The grit shall fall through the 20 SWG GI chute (properly fixed) into the wheel borough and shall be directed properly into it.

Organic return pump

- This unit should be placed directly over the return elbow suitably anchored in the tank.

- A suitable motor should drive the unit.

- The impeller in phosphor bronze construction should be supported and suspended just above the elbow. The shaft should be in SS 316 construction.

- The pump returns the organic floats back to the main collection tank.

General

- Velocity breakers and deflectors should be provided on the inlet stream.

- All wetted parts will be sand blasted and epoxy painted, using standard make bituminized coal tar epoxy paint. Other items will be synthetic enamel painted.

Air Blower

1. Intent of specification

This specification is intended to cover the design, manufacture, testing, delivery and commissioning of Blowers, accessories, etc. This specification is supplementary to the technical specification of this document.

2. Codes & Standards

The design, manufacture, testing and commissioning shall conform to the following IS standards in so far as applicable. Equivalent standards in BS / DIN shall also be applicable.

BS: 1571 Test specification for lobe type blowers, Compressors.

3. Design and construction

3.1 General

a) The equipment shall be designed to perform inter changeability of parts and case of access during inspection, maintenance and repair.

b) All parts subject to substantial temperature changes shall be designed and supported to permit free expansion or contraction without resulting in leakage, harmful distortion or misalignment.

c) Another bolts nuts and seating steelwork shall be supplied with the equipment. Only hexagonal nuts shall be used for holding down the equipment with proper lock nuts. All bolt holes shall be spot faced for nuts. In specific cases where not necessary, spot facing may be omitted.

d) Casting and welding shall conform to their respective specifications and shall be free from flaws and objectionable information, machined true and in a workmanlike manner.

3.2 Vibration isolator:

Double deflection rubber in shear or rubber in compression type vibration isolators shall be provided with each centrifugal fan. Rubber bushes, washers, wherever needed for the vibration isolators shall be included in the supply. Sufficient number of such isolators shall be provided to ensure isolation of foundation from vibration of the equipment.

3.3 Drive Motors

a) Blowers shall be provided with V-belts and sheaves. All belts shall be sized for 150% rated horse-power. All V-belt drives shall be equipped with removable guards that do not impede the airflow to the fan inlet. There shall be a minimum of two belts per drive.

b) Motors of all equipment shall be general purpose, constant speed, and preferably three-phase squirrel cage induction type of required BHP rating. The BHP rating of the motor shall provide at least 15% margin over the driven equipment rated BHP including the drive loss.

c) Motor powers for centrifugal fans with backward curve blades and axial flow fans shall be more than limit load fan power.

d) Preferably direct drive shall be employed between motor and blower.

4. Materials of construction:

The following materials shall be used for the construction of various parts:

a. „V pulleys - C.I. multi grooves

b. „V belts - reinforced rubber of

Appropriate section

c. Blowers

Body - Fine grained CI

Lobes - Fine grained CI

Shaft - Alloy steel, forged & heat

treated

Gears - Alloy steel, forged & heat

treated with induction

hardening.

The lobes shall be dynamically balanced.

The blowers shall be complete with suction filter, silencer, air pressure relief valves, mounting plates, foundation bolts and all other accessories as required.

5. Testing and inspection

The performance of all blowers and drive motors shall be tested as per applicable standards and codes.

The test reports and test certificates for the tests shall be submitted for review of the Owner / Engineer.

The Owners representatives shall be given full access to all tests. Adequate time ahead to major shop tests, the manufacturer shall inform the Owner so that, if desired, their representative can witness such tests. All materials, casing and forging shall be of tested quality.

Performance test shall be conducted on blowers BS: 1571 Part-II.

6. Cleaning painting and packing

The equipment cleaning and painting shall be governed by the stipulations of the subsection M.

The equipment shall be suitably protected in respected packing for the shipping distance and the wear conditions involved.

7. Drawing, Curves, Information

a) Besides submitting the enclosed Technical Schedule filled in, the proposal shall also include following drawings, curves and information.

b) Outline and general arrangement drawings of the blower assembly of each category.

c) Descriptive and illustrative literature and drawing from the manufacturer on the following items.

i. Blowers

ii. Drive Motors

iii. Other Accessories

iv. Characteristic curves of blowers

d) Particulars of drawings, data and instruction Manual

i. The various drawings and data shall be submitted for review and afterwards for final distribution. Various drawings and data to be furnished shall include.

ii. Outline and general arrangement drawing with data material of construction and foundation requirements.

iii. Blower characteristic curves.

iv. Drawings and data sheets on drive motor

v. Ducting layout drawings including duct support details and drain piping and valve.

vi. Other drawings and data

vii. Shop test reports

viii. Operation and maintenance instruction manuals

ix. List of spare parts and specific tools and tackles.

5. Centrifugal Pumps

1. Intent of specification

This specification covers the design, performance, manufacturing, construction features, testing and delivery of centrifugal pumps. This subsection is a supplementary to technical specification of this tender document.

2. Codes & standards

2.1 Design

The design, manufacture and performance of the horizontal centrifugal pumps as specified hereinafter shall comply with the requirements of all applicable Indian / British / American / DIN Standards, in particular the following:

IS; 5120 Technical requirement for dynamic special purpose Pumps

IS: 5659 Pumps for handling chemicals and corrosive liquids

IS: 5659 Pumps for process water

IS: 6536 Pumps for handling volatile liquids

Hydraulic Institute standards of USA

BS-500 Methods of testing pumps

PTC-8-2 Power test codes centrifugal pumps

2.2 The materials of the various components shall conform to the applicable IS / BS / ASTM / DIN standards.

2.3 In case of any contradiction with the aforesaid standards and the stipulations as per the technical specification, the stipulations of the stringent of them shall prevail.

3. General Performance requirement

3.1 The pump shall be designed to have best efficiency at the specified duty point. The pump set shall be suitable for continuous operation at any point within the "Range of operation"

3.2 Pumps shall have continuously rising head capacity characteristics from the specified duty point towards shut off point, the maximum being at shut off.

3.3 Wherever specified pumps shall be suitable for parallel operation the head Vs capacity, the BHP Vs Capacity characteristics, etc. shall match to ensure equal load sharing and trouble free operation throughout the range.

3.4 The pump motor set shall be designed in such a way that there is no damage due to the reverse flow through the pump which may occur due to any mal-operation of the system.

3.5 Motor rating

3.6 The drive motor power rating shall be selected such that a minimum margin of 15% is available over the pump input power required at the rated duty point.

3.7 In cases, where parallel operation of the pumps are specified, the actual motor rating is to be selected by the renderer considering overloading of the pumps in the event of tripping of one of the operating pumps.

3.8 Pump motor shall confirm to noise and vibration limits set by hydraulic institute standards.

3.9 The Bidder under this specification shall assume full responsibility in the operation of the pump and the motor as one unit.

4. Design & Construction

4.1 Pump Casing

4.2 Pump casing shall be designed to withstand the maximum shut-off pressure developed by the pump at the pumping temperature.

4.3 Pump casing shall be provided with adequate number of vent and priming connections with valves unless the pump is made self-venting and priming, Casing drain, as required, shall be provided complete with drain valves.

4.4 In certain cases of pump installation, where an expansion joint is located at pump discharge, the pump assembly will be subjected to an additional thrust, which will be transmitted to the foundation. This design load shall be calculated on the basis of the pump shut-off head, acting on an area corresponding to the maximum inside dimension of the bellow of the expansion joint.

4.5 Impeller

4.6 The Impeller shall be secured to the shaft and shall be retained against circumferential movement by keying, pinning or lock rings.

4.7 Wearing rings

4.8 Replaceable type wearing rings shall be furnished to prevent damage to impeller and casing. Suitable method of locking the wearing ring shall be used.

4.9 Shaft

4.10 Shaft size selected shall take into consideration the critical speed, which shall be away from the operating speed as recommended in applicable code/standard. The critical speed shall also be at least 10% away from runaway speed.

4.11 Shaft Sleeves

4.12 Renewable type fine finished shaft sleeves shall be provided at the stuffing boxes/mechanical seals. Length of the shaft sleeves must extend beyond the outer

faces of gland packing or seal end plate so as to distinguish between the leakage between shaft & shaft sleeve and that past the seals /gland.

4.13 Shaft sleeves shall be securely fastened to the shaft to prevent any leakage or loosening. Shaft and shaft sleeve assembly should ensure concentric rotation.

4.14 Bearings

4.15 Bearing and hydraulic devices (if provided for balancing axial thrust) of adequate design shall be furnished for taking the entire pump load arising from all probable conditions of continuous operation.

4.16 Sleeve / ball / roller type bearings shall be provided to take care of radial loads.

4.17 In case of ball / roller type radial bearings, the same may be utilized for taking axial loads.

4.18 In case of sleeve type radial bearings, axial thrust shall be absorbed in suitable hydraulic devices and/or thrust bearings.

4.19 Proper lubricating arrangement for the bearings shall be provided. The design shall be such that the bearing lubrication element does not contaminate the liquid being pumped. Where there is a possibility of liquid entering the bearing, suitable arrangement in the form of deflectors or otherwise must be provided ahead of bearing assembly.

4.20 Bearings shall be easily accessible without disturbing the pump assembly. A drain plug shall be provided at the bottom of each bearing housing.

4.21 In case grease / oil pump or overhead tank for bearing lubrication is provided all equipment and accessories like pumps, overhead tank, filters, piping, fittings, valves, interlocking and supervising instruments etc required for this purpose shall be supplied under this specification.

5. Stuffing Boxes

5.1 Stuffing box design shall permit replacement of packing without removing any part other than the gland.

5.2 Stuffing shall be sealed /cooled by the fluid being pumped and necessary piping, fittings, valves, instruments etc shall form an integral part of the pump assembly.

5.3 Mechanical Seals

5.4 Wherever required mechanical seals shall be provided. The pump supplier shall coordinate with the seal maker in establishing the circulation rate for maintaining a stable film at the seal face in the chamber. The seal piping system shall form an integral part of the pump assembly.

5.5 When handling liquids near their boiling point, suitable arrangement for external cooling shall be provided so as to prevent flashing at the seal faces.

5.6 For the seals under vacuum service, the seal design must ensure sealing against atmospheric pressure, even when the pumps are not operating.

5.7 Rate of leakage per stuffing box / seal shall not exceed 20 litres / hour.

5.8 Shaft couplings

5.9 All shafts shall be connected with adequately sized flexible couplings of suitable design. Necessary coupling guard for the couplings shall be provided.

5.10 Base plate & sole plate

5.11 A common base plate mounting both for the pump and motor shall be furnished. The base plate shall be of rigid construction, suitably ribbed and reinforced. Base plate and pump supports shall be so constructed and the pumping unit so mounted so to minimize misalignment caused by mechanical forces such as normal piping strains, internal differential thermal expansion and hydraulic piping thrust. Suitable drain taps and drip lip shall be provided.

5.12 Balancing

5.13 All rotating components shall be statically and dynamically balanced at shop.

5.14 All the components of pumps of identical parameters supplied under this specification shall be interchangeable.

6. Drive Motor (Prime Mover)

6.1 Only air-cooled energy efficient motors will be accepted. Cooling arrangement shall be self-circulation type having fans mounted on the motor shaft.

7. Tests and Inspection

7.1 The manufacturer shall conduct all tests required to ensure that the equipment furnished shall conform to the requirements of applicable codes and standards in this specification. The test procedures shall be submitted to the Owner for approval before conducting the tests.

7.2 Where stage inspection is to be witnessed by Owner, in addition to above, the tenderer shall submit to the Owner at the initiation of the contact, the detailed chart showing the manufacturing program and indicating the period where Owner s or his authorized inspecting agency is required at the shop.

7.3 Material of Construction

All materials used for pump construction shall be of tested quality. Materials shall be tested, as per the relevant standards and test certificates shall be made available to the Owner.

8. Performance Test at Shop

8.1 Each pump shall have to be tested to determine the performance curves of the pumps.

8.2 Performance tests are to be conducted to cover the entire range of operation of the pumps. There shall be carried out to span 125% of ranted capacity up to pump shut-off condition. A minimum of five combinations of head and capacity are to be achieved during testing to establish the performance curves, including the design capacity point and the two extremities of the range of operation specified.

8.3 During performance testing at field are found not to meet the requirement, the equipment shall be rectified by the Bidder without any extra cost prior to performance testing, the procedure for such tests will be mutually agreed between Owner and Bidder. The bidder shall furnish all necessary instruments, accessories and personnel for site testing. Prior to testing, the calibration curves of all instruments and permissible tolerance limit of instruments shall be mutually agreed upon.

9. Performance Guarantee, Tolerance and Penalties

Performance guarantee and tolerance

9.1 The tenderer shall guarantee the total dynamic head at the specified design capacity and also the corresponding pump efficiency pump input power, etc. Unless otherwise mentioned the tenderer shall specify the allowable tolerance considered by him on the guaranteed performance.

9.2 The tenderer shall undertake the rectification work if equipment does not meet the performance requirement.

10. Cleaning, Protection and Paintings

10.1 Cleaning before shipment

Surfaces of all parts shall be cleaned to remove scale, dirt, oil, water, grease and other foreign objects prior to final assembly of the equipment. All openings shall be covered to guard against damage and entry of foreign objects.

10.2 Painting

All surfaces shall be thoroughly cleaned in a manner approved by the manufacturer of necessary paint / coating to be applied on the surfaces. In case of any prevalent standard/code on selection and application of painting / coating, the same shall be strictly adhered to

10.3 Packing for Shipment

All parts shall be properly boxed, crated or otherwise protected for transportation to suit mode of transportation.

11. Drawings, Curves and Information Required

11.1 The tenderer shall submit the following besides the different information required elsewhere under this specification.

11.2 Preliminary outline drawings indicating the principal dimensions and weight of the equipment offered and location of pump suction and discharge connections.

11.3 Characteristic curves of pumps showing total dynamic head pump input power, efficiency and NPSH, against capacity ranging from shut-off condition to 125% of rated capacity.

11.4 Diagram showing the type of lubrication system, etc.

11.5 Complete descriptive and illustrated literature on the equipment and accessories being offered.

11.6 The successful tenderer shall furnish the following drawings/data for owner's approval after award of the contract.

11.7 The foundation drawings with all design loads, direction and points of application.

11.8 Final dimensioned general arrangement drawing of pump assembly.

11.9 Detailed cross-section of the pump and other equipment and the details of the materials of construction with special features, parts list etc.

11.10 Test procedures and details of tests to be conducted.

11.11 Test reports, performance curves and other particulars as required applicable clauses of this specification, for approval.

11.12 Instruction manuals

a) The instruction manuals shall present the following basic categories of information in a comprehensive manner prepared.

(i) Instruction for erection

(ii) Instruction for pre-commissioning check-up, operation, abnormal conditions, maintenance and repair.

(iii) Write-up on controls and interlocks provided

(iv) Recommended inspection points and period of inspection

(v) Schedule of preventive maintenance

(vi) Ordering information for all replaceable parts

(vii) Recommendation for type of lubricants, lubricating points, frequency of lubrication and lubricant changing schedule.

b) The information shall be organized in a logical and orderly sequence. A general description of the equipment including significant technical characteristics shall be included to familiarize operating and maintenance personnel with the equipment.

c) Necessary drawings and/or other illustrations shall be included or copies of appropriate final drawings shall be bound in the manual. Test adjustment and calibration information, as appropriate shall be included and shall be identified to the specific equipment. Safety and other warning notices and installation maintenance and operating cautions shall be emphasized.

d) A parts list shall be included showing part nomenclature, manufacturer's part number and/or other information necessary for accurate identification and ordering of replacement parts.

e) Instruction Manuals shall be securely bound in durable folder.

f) If a standard manual is furnished covering more than the specific equipment purchased, the applicable model (or other identification) member, parts number and other information for the specific equipment purchased shall be clearly identified. Sectional drawing to suitable scale and characteristics curves.

g) The instruction manual shall include the list of spare parts that have been procured along with the equipment. It shall also include list of all special tools and tackle furnished with complete drawings and instruction for use of such tools and tackle.

7. Secondary Clari Flocculator Mechanism

1. Rotating bridge type Clari Flocculator mechanism shall be provided. The Clari Flocculator shall be rugged and robust in design and shall be provided with high capacity drive head and induction motor having high torque rating, centrally or peripherally located, with positive sludge raking by means of one or more raking arms. Both the raking arms should have scraper blades fitted at the bottom, so that the sludge from scraper blades is pushed to the sump on every rotation.

2. The civil structure for the clariflocculator shall be in M-30 grade of concrete. The design shall be made using surface over flow rate of 8 to 15 Cu.M/Sq.M/day for average flow and 25 to 35 Cu.M/Sq.M/day for peak flow. The inlet shall be such that the solids do not get settled. The flocculator shall have a detention time of 15 to 20 minutes and the clarifier Side Water Depth shall not be less than 4.2 M. The tank bottom shall have a slope of 1:12 and the same shall be provided with finishing layer of Screedcrete in 1:2 Cement Morter so as to form a smooth surface on which the EPDM rubber sqeezees attached to the scrapper bridge move and push the sludge to the sludge drain. The minimum free board for the tank shall be 0.5 M. The launder for the effluent decanted by the weir shall be designed for the peak flow and shall have free board of 0.5 M. The walkway shall be 1.2 M wide with 50 mm GI light duty pipe in two rows hand railing 1 M high. The weir loading shall not exceed 185 Cu. M./M/day. There shall be a free fall of 0.15 M from the V-notch weir to the FSL in launder. The CPHEEO manual for sewage treatment shall be referred for other design parameters

3. The drive head mechanism arrangements shall consist of a turn table base casing mounted on top of the centre pier and shall have an angular ball bearing mounted internal gear that supports the underwater mechanism. The pinion meshing with the internal gear should be driven through a worm

gear reduction unit mounted on top of the turntable drive unit. The balls should ride on hardened steel strips set into grooves in the base and gear casing so that they can be readily replaced whenever required. The unit will have mechanical overload arrangement with a torque indicating arrangement along with necessary contacts for tripping the motor in the event of overloading. This condition shall be annunciated. The unit shall have push button station near the motor and starter with push button shall be provided in the control room along with necessary switches. The Clari Flocculator unit should also be provided with necessary M.S. scum trough, scum baffles, skimmer assembly, M.S. rake blades, arms and brass squeezes. The V-notch weirs shall be 6mm thick of stainless steel (SS-316) with clamps etc. for making the necessary adjustments.

4. The bridge connecting the outside wall of the tank to centre pier shall have walkway covered with chequered plates and provided with hand railing on both sides.

5. Corrosion allowance of 2 mm shall be taken in the structural sections of scraper arm, bridge etc.

6. Structural design calculations shall be submitted for all structures including scraper arm, bridge etc.

7. The equipment shall be fabricated out of mild steel plates of at least 10 mm thickness. After fabrication the equipment shall be applied with anti-corrosive paint.

8. All wetted parts should be sand blasted and epoxy painted using standard make bitumanized coal tar epoxy paint. Non-wetted parts will be synthetic enamel painted. V notch weirs MOC SS 316 all around the launder periphery with expansion anchor bolts for fixing at site should be provided.

9. There shall be four flocculators provided in flocculating zone to flocculate the sludge for settling in clarifier.

8. Thickener Mechanism

Thickener mechanism, centrally driven, suitable for installation in an R.C.C. tank constructed in M-30 grade of concrete, having a 3.5 m SWD and 0.5 m FB, should be generally as per the following specifications:

- Main bridge cum walkway should span the full length of the tank, made of I -beams, running parallel, cross braced with M.S. angles and rigidly secured by anchor bolts to the RCC tank wall.

- Chequered plate walkway of 5 mm thick and hand railings made of 25 NB GI light duty pipes in two rows of 1 m height from one end of the bridge to the drive center and a meter beyond should be provided.

- A main drive head capable of handling a continuous operating torque provided in the bridge center driven by sprocket on the input shaft should be provided. A mechanical overload protection device should be mounted on the rear end of the output shaft, which shall cut off supply to the motor during overload.

Prime mover assembly, operating the drive head shall be as follows:

a. A suitable motor, 1440 RPM, with lovejoy coupling should be driving a worm reduction gear box, which, in turn drives the drive head through a sprocket and chain transmission.

b. Guards should be provided over the coupling and chain drive.

- The sprocket teeth should be selected to achieve the required rake arm tip speed.

- Vertical shaft, made of a heavy duty pipe and a solid round bar having receipt plates / brackets for rake arms, should be freely suspended from the drive head worm gear into the tank bottom.

- Rake arms made of suitably braced heavy duty pipes, duly welded with four blades each should be positioned on either side of the vertical shaft.

- Two stub arms of heavy duty pipes at right angles to the rake arms should be provided.

- Four cross bracing in heavy duty pipes to hold the bottom scraper assembly securely should be provided.

- Central sludge well scraper should also be provided.

- 26 mm spring brass squeezees on each blade secured by clamp strips. - Influent well, made out of 6 mm thick plate, should be suspended from the bridge through hanger bolts.

- All required bolts, nuts and washers should be duly zinc plated.

- All wetted parts should be sand blasted and epoxy painted using standard make bitumanized coal tar epoxy paint. Non-wetted parts will be synthetic enamel painted. V notch weirs MOC SS 316 all around the launder periphery with expansion anchor bolts of same MOC for fixing at site should be provided.

9. Sludge Centrifuge

The centrifuge shall be of continuously operating, solid bowl centrifuge and horizontally mounted. It shall be suitable to handle municipal sludge containing 1% to 4% dry solids to be dewatered upto 20 % minimum of dry solids per hour. The frame shall be of open design with gravity discharge of the dewatered sludge.

The material of construction for all the parts coming in contact with the liquid shall be in AISI: 316 grade (stainless steel).

Construction

(a) Housing:

The housing shall consist of a welded frame with supporting feet, motor bracket, guards and collecting vessel/catcher for the product discharges. Vibration absorbers shall be provided for the machine to supporting feet to prevent most of the vibrations from the machine being transferred to the foundation.

(b) Bowl and conveyor screw:

The decanter shall be equipped with flat angle cone bowl with cylinder and cone. The solids discharge shall have replaceable wear bushings and shall be protected against wear and tear. The conveyor scroll shall be of single threaded design and wear protected. .

(c) Drive:

The bowl shall be driven by a V-belt transmission on the shaft at the conical end. Power shall be transferred to the conveyor by a two stage planetary gear box at the opposite end. An overload protection device shall be provided for the gear box.

(d) Drive motor:

The motor shall conform to IS 325 and shall be of weatherproof, jetproof and tropicalised construction.

The motor shall conform to the following data:

Type of motor 3 phase, 4 pole, 415 V, Squirrel Cage

Type of duty Continuous (S I)

Class of insulation F

Type of enclosure and cooling TEFC

Degree of protection IP55

Maximum motor speed 1500 rpm

Method of starting to suit the duty

Motor protection Thermistor

(e) The material of construction shall be as follows: Sr. No.	Component	Material
(i)	Bowl	Stainless steel: AISI 316
(ii)	Conveyor	Stainless steel: AISI 316 with wear protection
(iii)	Casing cover	SS.
(iv)	Frame	M.S

10. Gas Chlorination System

1. Chlorine Drum Connector Tubes

The plastic sheathed copper tubes connecting the liquid chlorine drums and the liquid chlorine header system shall be equipped with adaptors to accept drums.

2. Flanges and Joints for Liquid Chlorine Pipe Work

Flanges for liquid chlorine pipe work and valves shall be raised face flanged double fillet welded, stress relieved and radiographed, drilled to relevant tables of BS:4504. Joint rings shall be 2 mm Compressed Asbestos Fibre (CAF) tabbed to BS:2815 Grade B fitting within the bolt circle. Prior to installation the joint rings shall be impregnated / smeared with graphite compound or similar jointing compound compatible with liquid chlorine.

3. Liquid Chlorine Pipe Work

Pipe work conveying liquid chlorine shall be carbon steel hot finished seamless, cold drawn seamless to BS:3602 Class 23 or 27. Pipe work shall be adequately supported throughout its length and sufficient number of flanges shall be incorporated to enable maintenance or repairs to be carried out without having to work from one end of the pipe work.

The pipe work shall include rupture disc and expansion chamber as per recommendations of Chlorine Institute, USA. An alarm switch shall be provided set to function if rupture occurs.

Following any welding work on the pipe work the entire section of the affected pipe work shall be stress relieved and radiographed.

4. Valves for Liquid Chlorine

Valves for liquid chlorine duty shall be Polytetrafluorethylene sleeved plug type 2-way valves with carbon steel body and Monel plug.

Where the valves are manually operated, they shall be wrench situated with padlock type locking feature.

Power actuated valves shall have electric actuators with built-in position feedback limit switches, torque overload protector, IP 56 enclosures and manual override facilities.

5. Chlorine Pressure Gauges

Pressure gauges for use with chlorine shall be of the Bourdon tube type with a silver diaphragm isolating the tube from the liquid or gaseous chlorine. Pressure gauges shall have dials not less than 150 mm diameter except where they form an integral part of equipment, such as a chlorinator. No aluminum shall be used in the construction of the gauges; the dials and bezels shall be of bronze and internal components shall be of a stainless steel or other alloy or material resistant to corrosion by chlorine.

All pressure gauge piping shall include isolating valves at each point of connection to the main piping.

Where necessary, pressure gauges shall be fitted with adjustable electrical contacts for initiation of alarm conditions with either rising or failing pressure, to suit the system design.

6. Chlorine Gas Pipe Work

Pipe work conveying chlorine gas shall be solid draw steel tube to B.S.1387 with BSP taper threads to B.S. 21. All fittings shall be of malleable iron. Chlorine gas pipe work shall be adequately supported. Threaded joints shall be sealed using jointing compound compatible with chlorine. Poly tetrafluoroethylene tapes shall not be acceptable.

Where installation involves injectors to be located near the dosing points or remote injectors, the vacuum chlorine gas delivery lines downstream of chlorinators shall be of uPVC or approved equivalent.

7. Chlorine Gas Valves

Valves for gaseous chlorine duty shall be specifically designed for chlorine with forged steel bodies, Monel valve packing or special diaphragm in chlorine resistant materials.

8. Chlorine Gas PRV and Shut-Off Valves

Chlorine Gas Pressure Reducing and shut-off valve shall be a spring loaded, diaphragm operated valve with super-imposed electric actuator designed to reduce varying gas pressure upstream to a desired regulated pressure downstream and maintain this pressure within close limits.

The diaphragm shall be made of polytetrafluorethylene (PTFE).

The electric actuator shall ensure quick shut-off of the gas flow in the event of an evaporator breakdown or similar event.

9. Injector Motive Water Supply System

Injector water supply system shall be compatible with the flow and pressure requirements at the maximum rated output of the chlorinators offered and to limit the chlorine solution concentration to an acceptable limit at operational fluid temperature up to 33 C.

10. Chlorinators

A. The chlorinators shall be vacuum operated aqueous solution feed type units working in conjunction with wall-mounted injectors.

B. The units shall be discrete floor standing cabinets of plastic/composite construction. The chlorinators shall be suitable for manual feed rate control and incorporate a flow metering device for precise regulating of chlorine gas over a 20:1 flow range, with a metering accuracy of plus or minus 4% of the indicated gas flow rate.

C. Each chlorinator shall be fitted with the following principal components;

a. Gas inlet pressure regulating valve

b. Pressure/vacuum relief valve with safety vent

c. Vacuum regulating valve

d. Gas feed rate regulator preferably of the 'V' notch cylindrical plug and variable area orifice type

e. Variable area type flowmeter with linear feed rate indicator calibrated in kg/hr

f. Thermostatically controlled gas inlet heater

g. Wall mounted injector, preferably of adjustable throat type

h. Rigid uPVC pipework to wall mounted remote injectors.

D. Chlorinators shall be provided with panel mounted indicators for the chlorine gas inlet pressure, injector vacuum, motive water pressure, chlorine solution pressure immediately downstream of injector and a feed rate adjustment knob.

E. Chlorine gas feed piping shall be provided with valves to allow isolation of each chlorinator without disturbing the operation of the other chlorinators.

F. Rigid uPVC chlorine vent piping shall also be provided and arranged to discharge at a high level outside the room housing the chlorinators to ensure safe atmospheric dilution.

G. The chlorine supply to the injector shall shut down automatically if:

a. The water supply to the injectors shall fail

b. The injector vacuum line should break

c. The chlorine solution line should be accidentally shut down by the closing of a chlorine solution dosing valve.

H. A check valve shall be provided between chlorinator and injector to prevent accidental backflow into the chlorinator. This shall be consistent with the injector design with respect to gas flow and water pressure. While effectively preventing backflow, this valve shall allow requisite gas flow.

I. Additional safety devices shall be incorporated in the equipment to prevent hazards to the operators or damage to the components under normal operating and shutdown conditions.

J. All electrical services and control signal lines (where applicable) shall be wired to a single termination board within the chlorinator cabinet. The termination board shall preferably be totally enclosed in a gas-tight junction box with glanded cable entries and fitted with a clearly labeled warning sign stating the supply voltage. Electrical supply isolating switches interlocked with the panel doors shall also be provided in each chlorinator cabinet.

K. Chlorine Draw-Off System

a. Chlorine shall be drawn off as gas; to minimise drum handling there shall be adequate connections and drum isolating valves provided to enable one drum from each row to be connected to the automatic drum changeover device to be provided under this Contract.

b. The local supply of liquid chlorine may contain 0.1% to 0.2% ferric chloride and about 50 mg/l moisture. Tenderers shall provide for suitable devices such as filters so that the pipe work and equipment are protected against deposits or corrosion.

c. The duty/standby drums shall be located on plinth-mounted casters with four rollers per set or drums. The casters with rollers for these drums shall be supplied and installed under this Contract.

d. The installation shall include all necessary chlorine headers including supports, power actuated valves and manual isolating valves, for connection of drums to the drum changeover device.

e. The liquid chlorine pipe work interconnecting the drums, changeover panel and the liquid chlorine evaporator shall be safeguarded by a pressure relief system.

f. The pressure relief system shall comprise locked open isolating valves, bursting disc assembly, pressure gauge with adjustable alarm contacts and relief vessel.

g. The bursting disc shall preferably be made of nickel sheathed in PTFE, or approved equivalent.

L. Chlorine Solution Delivery Pipe Work And Valves

a. The Contractor shall provide all necessary rigid pipe work, valves and fittings for the delivery of the chlorine solution from chlorinator injectors/manifold to the points of application.

b. The chlorine solution delivery lines shall be of rigid uPVC or approved equivalent. The pipe work shall be adequately protected externally against corrosion and installed complete with necessary supports, thrust restraints, etc., and incorporate sufficient flexibility to allow for any thermal expansion effects.

c. When selecting material for pipe work, consideration shall be given to the deteriorating effect on some synthetic materials due to the action of ultra-violet rays. Where such materials are employed, particularly in the case of uPVC, pipe work shall be shielded from direct sunlight.

d. The valves in the chlorine solution pipe work shall be of cast iron body, flanged, rubber lined valves of the diaphragm type or approved equivalent. Locking devices and position indicators shall be provided. The diaphragm of the valves shall be PTFE faced with a backing of viton synthetic rubber (copolymer of vinylidene fluoride and hexa fluoropropylene).

e. Test pressure for the solution delivery pipe work, valves and specials shall be twice the working pressure or 1 1/2 times the shut-off head of the injector motive water pumps, whichever is higher.

M. Chlorine Solution Distributors & Injection Fittings

a. Where chlorine solution is to be dosed into flow in an open channel, chamber or downstream of a hydraulic jump it shall be applied using a chlorine solution distributor.

b. The distributor shall be either tube drilled ceramic tubular diffuser, designed to ensure uniform distribution of the specified flow rate of chlorine solution at the point of application.

c. The materials of construction of the distribution and sealing shall be compatible with 3500 mg/l chlorine solution at operational fluid temperature up to 30°C. Porous ceramic material where used shall be inert, and non-toxic, uPVC tube where used shall conform to BS:3505 Class 'E'.

d. The distributor shall be adequately supported and designed to withstand the stream velocity at the point of application and any flow or turbulence induced vibrations.

e. Where chlorine solution is to be dosed into flow in pipe lines it shall be applied using an injection fitting/device designed for specified duty flow rate.

f. The injection tube shall extend across the pipe bore and be supported with ends located in diametrically opposite flanged branches.

g. The injection fitting shall be installed in diametrically opposite flanged branches with their axis making an angle of 45° with the horizontal in a plane normal to the direction of flow within the pipe line.

h. The injection fittings shall be adequately supported and designed to withstand the flow or turbulence induced vibrations. Provisions shall include necessary support brackets also.

i. Chlorine solution distributors or injection fittings shall be supplied complete with necessary non-return and isolation valves.

N. Chlorine Plant Ventilation

a. Exhust Fans shall be placed at the floor level. The exhaust system shall directly discharge air to atmosphere outside the building.

b. Each exhaust system shall include two sets of fans, one for continuous running giving 4 air changes per hour and the other designed for intermittent running giving 20 air changes per hour.

O. Self-Contained Emergency Air Breathing Apparatus Self contained emergency air breathing apparatus shall provide complete respiratory protection independent of the surrounding toxic or oxygen deficient atmosphere for about 35 minutes depending upon the degree of exertion. The unit shall combine total reliability with a high degree of mobility to facilitate unhindered emergency rescue or maintenance work.

P. Emergency Safety Shower and Eye Bath

a. The safety shower and eye bath shall incorporate nozzles specially designed to create an intense deluge of water for rapid decontamination and an additional horizontal spray at approximately waist height level to direct water onto the lower body and legs.

b. The eye bath unit shall be fitted with fine mesh filters with built-in pressure regulating device to ensure a safe rate of flow to prevent foreign matter being further embedded into the eye and instead flush away contamination

Q. Chlorine Container Weighing Equipment

a. Equipment provided for weighing chlorine containers shall be spring type loaded with circular scale indicator and shall conform to IS:1438.

b. The weigher shall be designed suitable for suspension from the load hook of crane or hoist.

c. The weigher shall be suitable for operation with a working load of not more than 2000 kg. The indicator scale shall be calibrated in 5kg divisions, with the zero at the top of the scale and the pointer vertical with no load. The pointer shall incorporate means of tare adjustments up to 20% of the indicator scale. The indicator dial shall be slanted from the vertical plane so as to minimise parallax errors when the indicator is read from the floor with the unit hoisted to a high level.

d. The weigher shall have an overall accuracy of better than 10% of the full scale deflection and the unit shall be unaffected by the temperature variations in the range 4 to 50°C.

R. Chlorine Leak Neutralisation Pit

The Neutralization pit filled with caustic solution shall be provided adjacent to container storage area outside the room. The size shall be suitable for accommodating the fully filled chlorine tonner can get completely immersed in solution.

11. Chemical Dosing Pumps

11.1 Pumps shall be selected taking into account the chemical being pumped, form of chemical, wear leakage and resistance to corrosion.

11.2 Chemical dosing pumps shall be piston, piston diaphragm or mechanical diaphragm type as specified. Pumps may be simplex or duplex arrangements to suit the capacity or process requirements. The pump design shall incorporate positive stroke return. The maximum stroking speed shall not exceed 100 strokes per minute (spm). Pump, motor and driving arrangement shall be mounted on a robust combined base plate.

11.3 Pump liquid ends shall be selected for compatibility with the pumped liquid. Suction and discharge valves shall be the single ball type allowing a free flow self cleaning action. Ball and seat materials shall be resistant to abrasion.

11.4 Pumps shall incorporate a variable stroke mechanism to allow the output to be varied while the pump is running. Stroke adjustment shall be manual or where specified by electrical or pneumatically controlled stroke positioner. A stroke length indicator and digital stroke counter shall be fitted. Pumps shall be driven by a flange mounted IP 55 motor, via an oil bath reduction gearbox and variable stroke mechanism giving stepless adjustment between zero and maximum stroke length. Where flow proportional dosing is required the variation of output shall be achieved by varying the speed of the pump motor and not the pump stroke length. Operation of pumps shall be automatic based on

the levels through level switches. Necessary interlocks/alarms required for safe operation of plant shall be provided.

11.5 Diaphragm seal type pressure gauges shall be provided in the discharge of each pump.

11.6 The normal operating range of dosing pump shall be not less than 6:1.

11.7 Mechanical Diaphragm Pumps : Diaphragm rigidly coupled to the drive train. Single suction and discharge valves. Glandless. Accuracy : 3% of stoke.

11.8 Piston Pumps : Cylinder and piston with packed gland. Double suction and discharge valves can be fitted for greater accuracy at high pressure. Accuracy : 1% of stroke.

11.9 Piston Diaphragm Pumps : Diaphragm hydraulically operated by liquid displaced by a plunger and protected from excess pressure via a relief valve. Accuracy : 2% of stroke.

11.10 Materials shall be selected to suit the chemicals being pumped. Liquid ends shall be either polypropylene, 316 stainless steel, glass, or Hastelloy C. Diaphragm materials shall be butyl rubber, PTFE, or Hypalon and glands shall be PTFE or Neoprene.

11.11 Each pump shall be provided with inlet and outlet isolating valves and where necessary, with pressure relief and non-return valves. Dosing pumps shall be provided with backpressure loading valves and pulsation dampeners in the delivery lines depending on the downstream conditions.

11.12 A relief valve shall be incorporated in the delivery lines under conditions where the pump discharge pipe can be shut off or where pressure may rise to an excessive point. The relief valve shall be sized to handle the system pressure and to discharge maximum pump output freely, and shall be located in the discharge line between the pump and the first downstream isolating valve or in the case of dosing pumps the back pressure loading valve. Relief valves when used on pumps handling non-hazardous chemicals shall discharge the vented liquid to waste. When used on hazardous chemicals the valve outlet shall be piped back to the suction supply tank or bunded area. The open end of the return pipe shall be located where it is visible, so that any relief valve leakage/operation can be detected.

11.13 Pump transferring/dosing chemicals to systems under pressure shall incorporate a pressure gauge on the pump delivery. Air cocks shall be provided for release of air where necessary.

11.14 Unless otherwise specified flushing connections shall be provided at each pump inlet and flushing shall be manual. When flushing, water shall be discharged either locally through a drain valve or

to the point of application of the chemical. Facilities shall also be provided for flushing chemical pump suction and delivery manifolds and delivery lines to point of application.

11.15 Dosing pumps and motors shall preferably incorporate an integral reduction gearbox drive, which shall be totally enclosed, and oil bath lubricated. The gear box shall incorporate the cams for the diaphragm drive and shall be provided with filling and drain connections and visible oil level indication.

12. Piping & Valves

1 Intent of specification

This specification is intended to cover the design, manufacture, fabrication, inspection, testing at shop and delivery duly packed of various pipes and valves including all accessories required to make the system complete. This specification is supplementary to the technical specification of this document.

2 General Specifications of Pipes

1. HDPE Pipes - 6kg/cm2, As per IS: 4984.

2. M.S. Pipes - Size up to and including 40 NB

As per IS: 1239 Part – I, Heavy

- Size above 40 NB and up to 150

NB, As per IS: 1239 Part – I Medium

- 200 NB to 300 NB, As per IS: 3589, 4.5 mm Thick

- Above 300 NB, minimum 6.3mm thick as per IS : 3589

3. G.I. Pipe - 40 NB and below, Heavy

- 50 NB and above, Medium

4. SS Pipes - SS 316, Schedule 5S

5. Flanges - As per BS10 Table D, 10 mm Thick

6. Gaskets - 3 mm Thick, CAF Style 39 for MS and GI Flanges.

- 3 mm Thick Neoprene Rubber

Gaskets for HDPE Flanges

3 Ductile Iron Piping and Fittings

3.1 All pipes, fittings, bolts, nuts, jointing materials and appurtenances for piping to be required for execution of the Works shall be manufactured and erected in accordance with the erection plans, specifications and directives of the Employer. All pipe work and fittings shall be to a class in excess of the maximum pressure attained in service including any surge pressure.

3.2 The pipe work installation shall be so arranged to offer ease of dismantling and removal of valves and other major items of equipment. Flanged ductile iron dismantling joints with tie rods suitable to provide at least 50 mm clear space shall be provided. All loose flanges shall be secured to fixed flanges by suitable tie-bolts. All pipe work shall be adequately supported with purpose-made fittings. When passing through walls, pipe work shall incorporate a puddle flange. Flange adapters and unions shall be fitted in pipe work runs, wherever necessary, to permit the simple disconnection of flanges, valves and equipment. The final outlet connection of the pipe work shall match the connecting point of the transmission main.

3.3 Flanged joints shall be flat face, fabric reinforced rubber gaskets, pierced to take the bolts, and the face of all flanges shall be machined to give a true angle of 90° to the centre line of the pipe or fittings. All necessary supports, saddles, slings, fixing bolts and foundation bolts shall be supplied to support the pipe work and its associated equipment in an approved manner. Valves, meters and other devices mounted in the pipe work shall be supported independently of the pipes to which they are connected.

3.4 The whole of the jointing work and materials necessary to fix and connect the pipes, including adequate and efficient pipe support shall be included in the Contract. The Contractor shall be responsible for ensuring that the internal surface of all pipe work is thoroughly clean before and during erection and before commissioning. Before dispatch from the manufacturer□s works, the ends of the pipes, branch pipes, etc., shall be suitably capped and covered to prevent any accumulation of dirt or damage. This protection shall not be removed until immediately prior to connecting adjacent pipes, valves or pumps. Small bore pipes shall be blown through with compressed air before connection is made to instruments and other equipment. No point of passage of pipes through floors or walls shall be used as a point of support, except with the approval of the Employer.

3.5 The ductile iron pipes shall generally conform to Class K7/K9 , IS:8329-2000, pipe fittings shall conform to IS:9523-2000 and EPDM “ISI" marked rubber gasket as per IS 5382

3.6 Testing of pipes and fitting shall be carried out in accordance with relevant Indian Standard and internationally approved standard.

4 Electric Actuator

4.1 All local controls shall be protected by a lockable cover.

4.2 Each actuator shall be adequately sized to suit the application and be continuously rated to suit the modulating control required. The gearbox shall be oil or grease filled, and capable of installation in any position. All operating spindles, gears and headstocks shall be provided with adequate points for lubrication.

4.3 The valve actuator shall be capable of producing not less than 1½ times the required valve torque and shall be suitable for at least 15 minutes continuous operation.

4.4 The actuator starters shall be integrally housed with the actuator in robustly constructed and totally enclosed weatherproof housing. The motor starter shall be capable of starting the motor under the most severe conditions.

4.5 The starter housing shall be fitted with contacts and terminals for power supply, remote control and remote position indication.

4.6 The weather protection class for the actuator shall be IP-65 conforming to IS 13947.

4.7 Each starter shall be equipped as follows:

a) 2 nos. three phase magnetically operated line contactors (AC-4 duty) with no-volt release and electrical and mechanical interlock**.**

b) 1 No.Three phase thermal cut-out device.

c) 1 No.Control circuit transformer fully protected by fuses on primary and secondary circuits.

d) 1 No.Set of "Open", "Close" and "Stop" buttons.

e) 1 No.Local- Off-Remote switch with padlocking facilities.

f) 1 Nos. Set of torque and limit switches for "Open" and "Close" positions.

g) 3 Nos. Sets of auxiliary limit switches in each direction.

h) Valve position indicator and handwheel for manual operation.

i) Reduction gear unit

j) 1 No.Monitor relay (to detect loss of phase, thermostat tripped, ocal stop PB locked or local mode selected)

5 Non Return Valve

5.1 The valves shall be suitable for mounting on horizontal & vertical pipeline.

5.2 The internal parts shall be easily accessible for inspection through inspection hole.

5.3 Hydraulic passages and doors shall be designed to avoid cavitation.

5.4 Valves shall be of Wafer Swing type or ball type. Ball valves must house a freely moving ball in such a way that return flow is effectively prevented.

5.5 Valves shall be quick closing type with non-slam characteristics. In case of swing type, the non-slam characteristics shall be achieved by providing suitable combination of door and hydraulic passages without any external lever/damping arrangement.

5.6 Valves 450 mm and above shall be provided with supporting foot.

5.7 Swing door valves of size 600mm and above shall be of multidoor type.

5.8 Direction of the flow shall be clearly embossed on the valve body.

5.9 Maximum pressure drop across the valve shall be 0.4 mwc.

5.10 Maximum allowable leakage rate shall be 7cc/hr/mm diameter.

The material of construction of valve shall be as follows:

Component	**Material**
Body and Door	Cast Iron : IS 210 Gr. FG 200
Body and Door Ring	Stainless Steel Gr. 304 S11
Hinge Pin	Stainless Steel Gr. 431 S29
Bearings	Teflon

6 Specific piping requirement

From	**To**	**Type / Code**	**Material of of construction**
Drains of Stilling Chamber, Screen & Grit Chambers, MMBR	Drain Chambers	IS 1536 Class LA /DI S&S K7	CI / DI / HDPE
From Drain Chambers	Sludge Sump	IS 458 , NP3	RCC
Feed Chamber after MMBR	Clari Flocculator	IS 1536 Class LA /DI S&S / K7	CI / DI
Chlorine Contact Tank	Outlet Chamber	IS 458 , NP2	RCC
Clari Flocculator Sludge	Sludge Valve Cham-	IS 1536 Class LA /DI S&S	CI / DI

outlet	ber	K7	
Sludge Valve Chamber	Sludge sump	IS 1536 Class LA /DI S&S K7	CI / DI
Sludge Transfer Feed Pump	Sludge Thickener	IS 1239 Medium Class	Mild Steel
Thickener overflow	Raw Sewage Sump / Clari Flocculator Feed Chamber	IS 1239 Medium Class / IS 458 , NP3	Mild Steel / RCC
Thickener Underflow (Centrifuge feed pump)	Centrifuge	IS 1239 Medium Class	Mild Steel
Chlorinator Booster Pump	Suction & Delivery	IS 1239 Medium Class	Mild Steel
Chemical Solution	----------	IS 4984 class 6kg/cm2	HDPE
Air Piping	Up to MMBR	IS 1239 Medium Class / IS 3589 ,6.35mm thick	Mild Steel

7 Specific valves requirement

Application	**Type / Code**	**Material of construction**
Drains of Stilling Chamber, Screen & Grit Chambers, MMBR	Sluice Valve	Cast Iron
Clari Flocculator Sludge outlet	Motorized Sluice Valve	Cast Iron
Sludge Transfer Feed Pump	Sluice Valve/ Wafer type NRV	Cast Iron
Chlorinator Booster Pump suction & Delivery	Ball / Wafer type NRV	Cast Iron
Chemical Solution	Ball	PP
Air Piping	Butterfly	Cast Iron

8 All valves shall be provided with nameplates giving details of pressure class, size, serial number or other source of identification.

9 All surfaces shall be mechanically cleaned from mill scale and other foreign particles by wire brushing. After cleaning, primer shall be applied on steel and cast iron surfaces.

10 All the interconnecting piping and channels shall be designed for 33% hydraulic overloading on the peak flow of 2.5 Qav.

11 Electrically Operated Hoists

11.1 Electric hoists shall be complete with hoisting motor, wire rope drum, wire rope, hook, necessary gearing, sheaves, electromagnetic brake for hoisting motion, weather & dust-proof push button station, contactor panel, all wiring, limit switches, etc.

11.2 Electric hoists shall conform to IS:3938 and shall be suitable for outdoor application. All the parts of the hoist shall be designed to withstand surrounding atmospheric conditions without any deterioration.

11.3 Rope drums shall be either cast or welded to sustain concentrated loads resulting from rope pull. Drums shall be machine grooved right and left with grooves of a proper shape for the rope used.

11.4 Gears shall be cut from solid cast or forged steel blanks or shall be of stress-relieved welded steel construction or built-up from steel billets and welded together to form a one piece gear section.

11.5 Hoist ropes shall be extra flexible, improved plough steel rope with a well lubricated hemp core and having six strands of 37 wires per strand with minimum ultimate tensile strength of 1.6 x 106 KN / Sq.m.

11.6 Hooks shall be solid, forged, heat treated alloy or carbon steel of rugged construction of the single hook type and provided with a standard depress type safety latch.

11.7 Hoisting motor shall be equipped with electrically released, spring set, friction shoe type brakes having torque capable of holding 125% of the full rated hook load. Brake shall apply when either the motor controller or the main power switch is in „OFF position or in the event of power failure.

11.8 Drive motors shall be designed for frequent reversal, braking and acceleration and shall be as per IS:325. Pendant control switch, controllers and resistors, controls, electrical protective devices, cables and conductors, earthing guards etc. shall be as per IS:3938. Limit switches shall be provided for over-hoisting and over-lowering.

11.9 The electric hoists shall be of Class II duty.

11.10 25% overload test, speed tests, limit switch tests and brake test shall be conducted for the hoist and trolley at manufacturer s works.

12 Painting

1.1 Intent of specification

This specification is intended to cover supply, transportation to site in suitable „containers in properly packed condition, comprehensive insurance, unloading and storage at site, application and testing at site of paints for the tanks, equipment, pipe work, pipe supporting structures, structural steels etc. This specification is supplementary to the technical specification of this document.

1.2 Codes and Standards

1.2.1 The supply and application of painting shall be as per the following Indian Standards of latest publications.

IS: 5 - Colors for ready mixed paints

IS: 1303 - Glossary of terms relating to paints

IS: 1477 - Code of practice for painting of ferocious Metals in buildings.

IS: 2074 - Ready mixed paint, air drying, red oxide, Zinc chrome painting

IS: 2339 - Aluminum paint for general purposes, Dual container

IS: 2932 - Specification for enamel, synthetic, exterior

a) Undertaking

b) Finishing

IS: 5660 - Ready mixed paint, brushing, aluminum red oxide Primer.

In case of any contradiction between the stipulation of this specification and the technical specification the stringent of them shall prevail.

1.3 Scope of Works

The scope of work under this specification shall include the following:

1.3.1 Supply :

Required quantities of various categories and colors of paint and primers necessary for application of paint on the tanks, equipment, pipe work and structures etc.

1.4 Application, Checkup and Testing

1.4.1 Providing all labor (supervisory, skilled, unskilled and administrative), materials, point application appliances, tools and tackle, scaffolding, etc. consumables as may be required for efficient and expeditious surface preparation and application of primer and paint.

1.4.2 Surface preparation and application of paint conforming to the specification requirement and to the entire satisfaction of the Owner.

1.4.3 Final check-up and testing of the painting application work to ensure proper finish and dry film thickness.

1.5 Storage of paints and other materials at site

1.5.1 Storing and preservation of paint in closed areas. Please note that the contractor must put up the required closed sheds for which only open area will be allotted by the owner.

1.5.2 Supply and storage of paints should be in a phased manner so as to ensure the utilization of paints well before the expiry date of the product prescribed by the manufacturer.

1.6 Quality and Color of Paints

1.6.1 ONLY BEST QUALITY paints manufactured by reputed manufacturers shall be used. The list of makes of paints shall be submitted along with the offer.

1.6.2 Shade numbers of synthetic enamel paints as per IS: 5 have been indicated. If specified shade as per IS: 5 cannot be offered the nearest equivalent color shade may be offered and actual designations of these equivalent shades against specific shades shall be indicated by the Bidder.

1.7 Application Procedure

1.7.1 Surface Preparation

For surfaces on which no primer has been applied, the following steps shall be taken for preparing the surfaces before application of primer. First all oil and grease shall be removed. All rust and mill scale shall be removed by wire brushing before applying the primer. The loose dust formed after wire brushing shall be completely removed before applying any primer.

1.8 Primer Coat

1.8.1 Where first primer coat is necessary on unprimed metal surface, the under mentioned procedure for application shall be followed immediately after carrying out surface preparation as specified in clause 6.01.00.

1.8.2 Apply one coat of ready mix paint, red oxide-zinc chrome priming (conforming to IS: 2074) by brushing and allowing to air dry.

1.8.3 Surfaces where a coat of shop or site primer has been applied, the damaged / worn out / rusted surfaces shall be thoroughly cleaned and one (1) primer coat of read mixed paint, red oxide-zinc chrome primer confirming IS: 2074 shall be applied on the entire surface including the damaged worn out portion.

1.8.4 For galvanised surfaces, special wash primer shall be applied before application of finish paints. The wash primer shall be such as to ensure proper addition of the finish paint on the galvanised surfaces.

1.9 Finish paint

a) For all equipments, pipe work and structures except outdoor tanks

After the primer surfaces are thoroughly dried for not less than 24 hours one coat of under coating synthetic conforming to IS: 2932 shall be applied either by brushing or spraying and shall be allowed to air dry.

After thorough air drying of the undercoating paint, one coat of finishing synthetic enamel conforming to IS: 2932 shall be applied to the undercoated surface either by brushing or spraying and shall be applied to the undercoated surface either by brushing or spraying and shall be allowed to air dry for 48 hours.

b) For Outdoor Tanks

After the primer-coated surfaces are thoroughly one coat of Aluminum paint as per IS: 2339 shall be applied either by brushing or spraying and shall be allowed to air-dry.

After thorough air-drying of the first coat of Aluminum, the second coat of Aluminium as per IS: 2339 shall be applied to the surface either by brushing or spraying and shall be allowed to air dry.

1.10 Service Legend

Service and utility lines shall be marked on all piping near walls or partitions, at all junctions and near valves. Color of service legend shall be black of specified lettering and size on white base with black border.

1.11 Manpower mobilization should be adequate in accordance with the release of areas for painting so as to complete the work within the time schedule.

1.12 Random test samples of paint shall be supplied batch wise, for carrying out tests

1.12.1 Empty containers of used paint and balance quantity unused paint will be the property of the contractors and should be removed from the site.

1.13 Manufacturer□s specific recommendations, if any, shall be followed for surface preparation and during application of paints.

SECTION D2

ELECTRICAL WORKS

A) General Electrical Specification

1. Scope

1.1 This specification covers the general requirements of electrical equipment and installation.

1.2 This specification shall be read and construed in conjunction with the accompanying mechanical equipment specification.

1.3 In case of any discrepancy the provisions of particular equipment specification / drawings shall govern.

Schedule of requirement

a) Motor Control Center

b) Push Button Station

c) Power and Control Cables

d) Cable Trays

e) Cable Trench (outdoor and indoor)

f) Equipment Earthling

g) Instruments Control and Safety Interlocks

1.4 The scope of Bid covers the following also:

- Preparation of drawing by the vendor.

- Fabrication of equipment in line with drawings / specifications

- Manufacture of equipment as per relevant codes and standards as per accepted engineering practice.

1.5 Codes and standards

Equipment

All electrical equipment shall conform to latest applicable IS / IEC standards.

2. Installation of electrical equipments:

2.1 General / Requirements

2.2 The successful bidder shall provide necessary drawings and documents required by statutory authorities.

2.3 In accordance with the specific installation instruction as per the manufacturer's drawings or as directed by the Owner, the successful bidder shall unload, assemble, erect, install, test and commission all electrical equipments included in this contract.

2.4 Erection materials including all consumables, tools, testing instruments or any other equipment required for successful commissioning shall be arranged by successful bidder in a timely manner.

2.5 Clearing the site after completion of erection as well as regular clearance of unwanted materials from site.

2.6 The successful Bidder shall employ skilled and semi-skilled laborers for erection, testing and commissioning as required.

2.7 The successful Bidder shall set up his own facilities at site at allocated place to undertake fabrication jobs, threading etc.

2.8 The successful bidder shall check the correctness of major civil engineering works pertaining to electrical equipments like foundations, plate inserts, etc. as per the latest relevant drawings and carry out minor civil works such as, but no limited to, the grouting of base plates, channels, supports and foundation bolts, cutting holes in walls and ceiling, chipping of floor and ceiling and making good the same after installation of the equipment.

2.9 Motor Control Center, etc. shall be handled and erected as per the relevant codes of practice and manufactures drawing and instruction manuals.

2.10 Cable installation

2.11 Installation of cables shall include unloading of cable, storing, laying, fixing, jointing, termination and all other work necessary for completing the job and supply of termination kits, double compression glands and lugs together with other necessary material for jointing and termination shall be included in the successful bidder's scope of work.

2.12 The cable inside building shall be installed in trenches / trays.

2.13 2 Cables to each circuit shall be laid in continuous length only.

2.14 Termination, Clamping And Miscellaneous Details

2.15 Cable entry to motors, PB stations and other electrical devised shall be from the bottom as far as possible or from the sides.

2.16

2.17 All cable terminations shall be of aluminum for power cables and copper for control cables.

2.18 Safety Precautions

2.19 The successful bidder shall strictly follow the safety procedures at all stages of fabrication, transportation and erection of various equipment at project site, to prevent any damage to such of those items and injury to the erection personnel.

3. Specification for Testing and commissioning

3.1 The testing and commissioning for all electrical equipment at site shall be according to the procedures listed down below:

3.2 All electrical equipment shall be tested, installed and commissioned in accordance with the latest relevant standards and codes of practices published by Indian standards institution wherever applicable and stipulations made in relevant general specifications.

3.3 The testing of all electrical equipment as well as the system as a whole shall be carried out to ensure that the equipment and its components are in satisfactory condition and will successfully perform its functional operation. The inspection of the equipment shall be carried out to ensure that all materials, workmanship and installation conform to the accepted design, engineering and construction standards, as well as accepted codes of practices and stipulations made in the relevant general specifications.

3.4 Preparation of the Plant for Commissioning:

After completion of the installation at site and for the preparation of plant commissioning, the successful bidder shall check for testing of all equipment and installation in accordance with the agreed standards latest relevant codes of practices of Indian Standards institution and specific instructions furnished by the particular equipment suppliers as well as purchaser.

3.5 Checking required to be made on all equipment and installations at site shall comprise, but not limited to the following;

(i) Physical inspection for removal of any foreign bodies, external defects, such as damaged insulators, loose connecting bolts, loose foundation bolts, etc.

(ii) Check for grease, insulating / lubricating oil leakage and its proper quantity.

(iii) Continuity and insulation check in case of power and control cables.

(iv) Checking of all mechanical and electrical interlocks.

(v) Check for proper earth network of all non-current carrying parts of the equipment and installation.

4. Co-ordination with Owner's system

4.1 Owner will provide station light and power supply at the incoming of the MSEDCL from where the further work shall be done by the contractor. In order to enable the owner to arrange for the same in time, the contractor shall furnish sufficiently in advance detailed

list of electrical loads, characteristics, number and capacity of feeder required, other special requirements for control, monitoring.

4.2 All equipment offered shall be suitable for operation on power supplies as detailed in design data.

4.3 In case, power supply other than those available is required, the contractor shall make his own arrangement by providing necessary conversion, rectification, transformation equipment and accessories.

4.4 All equipment offered should have suitable provision for termination and connection of purchased power / control cables, inclusive of cable end brass double compression glands, terminal lugs and terminals. Isolation switch fuse shall be provided at each panel for incoming power supplies.

B) Specific Electrical Requirements

I) Motor Control Centre (MCC)

MCC shall be as per the following brief specification:

1. Make – Standard as per the list provided

2. Modular, free-standing, floor-mounting

3. Non – draw out (fixed type)

4. Single front / double front

5. Sheet thickness – 14 gauge CRCA

6. Location – Indoor

7. Cable entry – Top OR Bottom

8. Bus bars – Aluminum

9. Earth bus bar – GI

10. Incomer – 1 no.

Incomer shall consist of following components.

a. TPN-FSU – 1 no.

b. CTs – 3 nos. (tape wound)

c. Ammeter with selector switch – 1 set

d. Voltmeter with selector switch – 1 set

e. Supply ON indication lamps – 3 nos.

11. DOL starter (up to 7.5 kw)

DOL starter shall consist of following components:

a. TP – FSU - 1no.

b. Power contactor – 1 no.

c. Overload relay – 1 no.

d. Push button with 1 element – Stop.

e. Control fuse – 1n o.

f. Motor ON/OFF lamp – 1 no. each

12. Star delta starter (above 7.5 kW)

Star delta starter shall consist of following components:

a. TP-FSU – 1no.

b. Power contactors – 3 nos.

c. Overload relay – 1no.

d. Timer – 1no.

e. Push-button with 1 element – Stop

f. Control fuse – 1no.

g. Motor ON/OFF lamp – 1no.each

Note: Switchgear ratings for starters shall be as per manufacturers standard selection chart.

13. FSU

FSU feeder shall consist of following components

a. TPN-FSU – 1no.

b. DPMCBs – as required for instrument supply.

14. Capacitors– Not considered

15. Power wiring – minimum 2.5 sq.mm PVC insulated copper wire.

16. Control supply – 1ph, 230 VAC obtained from phase and neutral bus bars.

17. Control wiring – 1.5 sq. mm PVC insulated copper wire

18. Makes of components

a. Switchgear – standard (As per list given)

b. Control gear – standard (As per list given)

c. Indicating meters – standard (As per list given)

II) Local push-button station

1. Make – Standard (As per list given)

2. Enclosure – Aluminum die cast

3. Start push-button – Green shrouded with 1 no. element

4. Stop push button with 1 NC element – Red mushroom

5. Makes of push buttons – standard (As per list given)

III) Cables

1. Make – Standard (As per list given)

2. Power cables – PVC insulated, PVC sheathed, GI armoured, Aluminum conductor cables as per IS 1454. Minimum power-cable size shall be 3C x 4-sq. mm

3. Control cables – PVC insulated, PVC sheathed, GI armoured, solid copper conductor cables as per IS 1454. Control cable size shall be 1.5 sq.mm.

IV) Outdoor cable-routing

Cables shall be routed directly buried underground through unconstructed excavated and backfilling trench up to individual equipment or local supports as per site conditions

V) Earthing

Main below ground earth-grid, earth stations (pits, electrodes etc.) and two earth connections near the MCC shall be provided.

Equipment earthling shall be provided by using GI wire / strip depending on equipment rating.

VI) Motors

1. **Make** – Standard, conforming to IS codes. (As per list given)

2. Motors will be as per IS 325, totally enclosed, fan cooled squirrel cage induction motors. Degree of protection will be IP55. Motors are suitable for supply voltage of 415 volts 10% and frequency of 50 Hz. 5%, and combined variation 10%.

3. The motor shall have Class „F insulation with temperature rise limited to Class „B.

VII) Exhaust / Ceiling fans

The contractor shall supply and install exhaust fan at the position earmarked in consultation with engineer-in-charge. Fan impeller shall be with blades of an aerofoil design. Blades shall be mounted on streamlined hub. Impeller shall be mounted directly on the mortar shaft. Casing shall be off heavy gauge construction properly reinforced for rigidity.

1400 mm sweep ceiling fan shall be suitable for 230 V, single phase, 50 Hz and shall be complete with standard accessories. The fan shall conform to IS: 374.

Preferred makes: Crompton, Bajaj, GEC, Khaitan.

SECTION D3

INSTRUMENTATION & CONTROL WORKS

Instrumentation and control works

1.1 Instrumentation and control design concept

1.1.1 General:

The I & C philosophy conceived shall have the following basic objectives:

- High reliability

- Long range plan for maintainability

- Provision for future expansion

- Operational convenience and simplicity.

The I & C system shall conform to the specifications and recommendations of codes and standards set forth by recognized national and international technical bodies.

1.1.2 Bidder shall furnish the Process Flow Diagram for the Treatment Plant.

1.2 Measuring System

1.2.1 For sewage application, magnetic type flow meter is envisaged where the output shall be 4-20 mA DC.

1.2.2 Analytical instruments shall be suitable for IN-SITU installation with the transmitters providing 4-20 mA two wire output proportional to measured value.

1.2.3 Adequate number of direct mounted local pressure gauges is envisaged for local indications of pressure and for other applications adequate number of level switches shall be deployed for direct initiating contacts.

1.2.4 Level switches shall be displacer type. The float material shall be SS 304.

1.3 Cabling

1.3.1 All interconnecting cables to / from the panel from the field mounted instrument like level switches, magnetic flow meter, etc. shall be in the scope of the contractor. The cabling shall be carried out in a neat workman like manner, adequately protected from mechanical damage, duly clamped and suitable for easy maintenance and replacement.

1.3.2 Double compression glands shall be supplied and installed for all the cables in the plant supplier's scope.

SECTION D4

CIVIL WORKS

Detailed Specification for Civil Works

1. Earth work (Excavations and refilling)

Please refer to specifications given for ITEM NO .....for screen chamber and wet well in the sub work 'Sewage Pumping Stations (Civil Works)'.

2. Plain Cement Concrete

Please refer to specifications given for item on plain cement concrete in sub work of 'Sewerage Collection system'

3. Brick masonry and Plastering

Please refer to specifications given for ITEM NO..... for wet well in the sub work 'Sewage Pumping Stations (Civil Works)'..

4. Reinforced Cement Concrete and allied works

Please refer to specifications given for ITEM NO ..... for wet well in the sub work 'Sewage Pumping Stations (Civil Works)'.

5. Rolling shutter

Please refer specifications for item no..... for wet well in the sub work 'Sewage Pumping Stations (Civil Works)'.

6. Aluminium Doors & Windows

Please refer specifications for item no. .....for wet well in the sub work 'Sewage Pumping Stations (Civil Works)'. All doors and windows shall be aluminium with anodisation in black color and glazing and shall be protected by M.S. grills from outside.

7. Ms Collapsible Gate

This shall consist of double or single gate depending on the size of the opening. This shall consist of vertical double channel each 20.5 mm and top and bottom of T 40 10 with 38 mm steel pulley or ball bearings in every fourth double channels which collapsible gate is not provided within the opening, and is fixed along the outer surface T iron at top may be replaced by flat 40 x 10 mm. The fixing of T and channels shall be permanent, rigidly fixed with anchor bolts and hold fasts. The gate shall be provided with necessary bolts, handles, spring, catches etc. All the members of its gate shall be painted with one coat of suitable primer and 2 coats of enamels paint (or any other approved superior quality paint as needed for protection against environment prevailing in the area).

8. Typical toilet block specification

Toilets - Each toilet shall be provided with the minimum following fittings. There shall be three toilets. One for Gents, other for Ladies and one for officers.

1) Indian type W.C. (Orissa pattern) or pedestal type single trap, wash

Down western type water closet with low level flushing cistern of 6

Liters capacity with dual flush system and all requisite fittings – 1 No.

2) Lipped urinal with automatic flushing cistern and all requisite fittings – 2 Nos.

3) Wash basin 600 mm x 480 mm each with two nos. C.P. brass taps and all requisite fittings – 1 No.

4) Mirror 600 mm x 600 mm x 5.5mm thick with beveled edges, including all fittings – 1 no.

5) C.P. Brass towel rail 600 mm x 20 mm dia. – 1No.

6) Liquid soap container plastic with requisite C.P. Fittings – 1 No.

7) Overhead polyethylene water tank (min. 500 liters) with all fittings including float valve, stop cock etc.

8) 14 mm CP brass tap – 1 no.

9) Interconnected piping in GI including tees / elbows / specials / fittings, etc complete.

This specification includes all other items that may be required to complete and make the toilet block operational in all respects. All above material shall conform to relavant IS.

9. Paving including ground floor of buildings

9.1 Scope

The paving work shall include furnishing of all labor, materials and equipment. The work shall be carried out as described herein. The concrete paving shall consist of three parts i.e. base slab, sub-base and sub-grade besides floor finish wherever required. Total thickness of paving shall be as per requirement. The broken stone paving shall consist of two parts i.e. sub grade and top metal filling.

9.2 In-situ Concrete Paving

9.3 Sub-Grade

The sub-grade shall be prepared and completed up to the required. Soft area in the sub-grade shall be removed and replaced by crushed stone. The formation surface of soiling course shall first be cut to the required depth below the finished level where required and dressed off parallel to the finished

profile. Surplus earth shall be disposal off, leveled and dressed. The sub-grade shall be sloped to provide for effective drainage in the area.

The sub-grade shall be consolidated by ramming or by use of suitable mechanical compactor wherever feasible and consolidated at optimum moisture content of natural soil. All undulations in the surface that develop due to ramming or use of mechanical compactor shall be made good with earth or quarry spoils as the case may be and the sub-grade be re compacted.

9.4 Sub-Base

Sub-base shall consist of stone soling and PCC layer as given below.

a) Stone Soling

The soling shall consist of stone (63 mm down graded) obtained from borrow areas/ quarries (arranged by contractor) in layer not exceeding 200 mm in loose thickness including breaking of boulders to required sizes, filling the interstices with selected sand and compacting to specified percent of original volume of stone stack. The filling procedure shall be as laid down at relevant clause of Technical Specification for Excavation and Filling at Module - 2. Total compacted thickness of this layer shall be 225 mm.

b) P.C.C. Layer

The P.C.C. layer of sub-base shall be laid on top of the consolidated soling course to give a plain surface ready for receiving the base slab. The thickness of P.C.C. sub-base shall be 75 mm or as required and shall be of concrete of 1:4:8 proportion (with 40 mm size coarse aggregate).

9.5 Base Slab

a) Materials

The base slab shall be structural concrete slab with or without reinforcement. The thickness and grade of concrete and other details shall be as per requirement. Concrete laying shall be carried out in chess board fashion as required. For all concrete work the relevant clauses of this specification shall be deemed to form a part of paving specification also.

b) Joints

1) Isolation joints shall be provided at junctions with walls, columns, machine foundations and footings or other restraints. These joints shall be filled with preformed bitumen impregnated fiber boards confirming to IS: 1838. Control joints shall be spaced at 5 to 6 m intervals along the length and shall be capable of accommodating differential movements in the plan of the slab caused by drawing,

shrinkage and thermal gradient across the thickness. The control joints may be formed either by sawing or by pressing a T-section of mild steel while the concrete is still in the plastic stage. Control joints shall be filled with hot applied sealing compound conforming to IS: 1834 latest edition.

2) Expansion joints shall be spaced at intervals of 25 to 30 m and the clear gap between the adjacent slabs shall be provided for the full depth. The clear gap shall be filled with expansion joint filler, which is compressible enough to accommodate the expansion of adjacent parts. Preformed bitumen – impregnated fiber filler conforming to IS: 1838 (latest edition) or equivalent material shall be used for this purpose.

3) All joints shall be provided as shown as required or as directed by the engineer-in-charge. In all types of joints the edges shall be made round with the help of a kneading tool after the concrete is laid and leveled to avoid any damage at these locations.

9.6 Cleaning and Finishing

All fins and other projections shall be neatly chipped, rubbed down and made smooth by stiff fiber brushes. The use of acid shall not be permitted. All exposed corners shall be slightly rounded or chamfered. Air holes, cavities and similar imperfections shall be first saturated with water and filled with a mortar mixture of same composition as that used in concrete.

After initial set of mortar the surface shall be rubbed down with burlap. Surface shall be floated and steel trawled after achieving initial set to prevent excess fine material from working to the surface. The finish shall be brought to a smooth dense surface free from defects and blemishes.

When base slab is to receive a separate floor hardening treatment, the concrete surface shall be adequately roughened by chipped and swept clean of all dirt, grease etc. with water and hard brush and detergent if required. Before laying the topping, the concrete surface shall be thoroughly cleaned and soaked in water at least for 12 hours and surplus water shall be removed by mopping immediately before topping is laid in position.

The flooring in Administrative block and laboratory, so also the other buildings except machinery rooms shall be in first quality ceramic tiles. Appropriate specifications for the same from PWD standard specification book shall be followed. The flooring in machinery rooms shall be as per the requirement stated above.

10. Cast Iron rainwater pipe

Pipes shall be of approved manufacture, true, smooth and cylindrical, their inner and outer surfaces being as nearly as practicable concentric and shall confirm to IS: 1230 -1979. These shall be spun and uniform casting, free from laps, pin holes or other imperfections and shall be neatly finished inside and outside. The ends of pipes shall be reasonably square to their axis.

CI rain water pipes shall be of 100 mm dia or as specified in the description of the item and shall be in full lengths of 1.8 meters including socket ends of the pipes, unless shorter lengths are required at junctions with fittings. The pipes shall be supplied without ears unless otherwise specifically mentioned.

The pipes supplied shall be factory painted with a tar based composition both inside and outside which shall be smooth and tenacious unless specified otherwise.

Every pipe supplied shall ring clearly when struck all over with a light hand hammer. When shorter pipes are cut from full lengths they shall be cut with hacksaw.

11. Specifications for roof treatment

a. The terrace finishing on flat roof shall be provided.

b. Brick Bat coba waterproofing cum terracing as per Indian Water Proofing Company or equivalent consisting of 25 mm thick cement sand plaster 1:3 mixed with 1 kg of acrylic based water proofing compound for every 50 kg of cement over 50 mm thick acrylic impregnation water proof treatment of brick bat, cement mortar 1:3, etc. complete with finishing the surface joint less waterproof in required pattern.

12. Structural steel rolled sections fabrication

1) The requirements set forth in IS: 800 and IS: 9595 for design, fabrication and erection of structural steel for buildings shall govern this work except as otherwise noted on the drawing or as otherwise specified.

2) In case of conflict between clauses of this specification and those in the Indian standards, this specification shall govern.

3) The structural steel shall confirm to IS: 226 and IS: 2062 unless specified otherwise.

4) Covered electrodes for metal arc welding of structural steel shall confirm to IS 814

5) All fabrication shall be done on the specifications and other relevant IS codes and stamped “Good for Construction “fabrication drawings any defective fabrication or material pointed out at any stage shall be replaced by the CONTRACTOR free of cost.

All material shall be clean and straight. If straightening or flattening is necessary the same shall be done by a process as approved by the OWNER.

All bolts and nuts shall confirm to IS: 1363, 1364, 1367, 3640, and other relevant codes as applicable.

6) The CONTRACTOR is required to provide manufacturers quality certificate for every item of material supplied by him.

7) The storage yard for fabrication shall be prepared in advance before the material comes to site.

Any specifications not appearing in this book and the work is to be carried out for successful completion of the project and the one which is deemed to have been included in the tender for own design works like STP, the specifications from PWD detailed specifications book, MJP's specification for the item or the decision by the Engineer-in-charge shall be followed.

SECTION D5

SPECIFICATIONS FOR ERECTION, COMMISSIOING AND TESTING

Specifications For Erection, Commissioing And Testing

1. Intent of specification

1.1. This specification is intended to cover furnishing of all labor, supervision, consumable materials, tools and tackle and services necessary for receiving, unloading and storing, transportation, pre assembly at site, if required, complete erection, testing and commissioning of all items included in the complete plant and equipment for the sewage treatment plant for .....

1.2. Omission of any specific reference to any method, parts, accessories or material required for proper and efficient execution of the work shall not, in any way relieve the bidder from his responsibilities from providing such facilities and performing the complete erection, testing and commissioning at no extra cost to the Owner.

2. Equipment, material and services to be provided by the bidder

The Bidder shall perform the following in addition to design, manufacture and supply of equipment materials and accessories.

a. Leading and transportation from the manufacturer□s work site to the receiving area at the Owner□s plant site.

b. Unloading and clearing of materials from rails and other means of transport carriages.

c. Receiving and unloading at the Owner's plant site.

d. Opening of packages and inspecting all materials and equipment

e. Checking of all materials with consignment note, reporting for missing or damaged items, repairing damages and cleaning before erection.

f. Proper stacking and storing of materials under bidder custody with suitable weather protection.

g. Maintaining proper record of the materials and place of storage for quick identification as and when required.

h. Transportation/shifting of materials from storage place to erection site and vice versa.

i. Pre assembly at site after proper checking/overhauling as required.

j. Construction of site offices and covered storage's as required.

k. Cleaning up of site during and after erection

l. Erection including all civil works (of all mechanical and electrical equipment included in the scope and subsequent cleaning/flushing as required, pre-commissioning checking to ensure correctness of erection)

m. Final adjustment of foundation levels by chipping and dressing, checking location, elevation etc of anchor bolts and base plates.

n. Site testing and commissioning services as required

o. Taking up insurance covering transit storage, erection and commissioning

p. Training of Owner's personnel in operating and maintaining the system and various equipment as to make them proficient.

q. All tests required for all materials/equipment supplied by the bidder to provide quality of workmanship or any other tests as desired by the Owner shall be carried out by the bidder at no extra cost. r. All arrangement for transporting the equipment, materials and personnel of the bidder to and from the site shall be done by the bidder at his own expense. s. Watch and ward to ensure security and safety of materials under the bidder's custody

t. Furnishing of residential accommodation to all personnel including erection laborer of the bidder.

3. Detailed scope of erection, testing and commissioning

3.1. General

3.1.1 The scope of work shall include all activities at site including placing of equipment on foundation, leveling and alignment, grouting of foundation, other miscellaneous minor civil work such as dressing / chipping of foundation surfaces as required, scrapping, edge preparation, assembly and pre-assembly, inspection and testing by inspecting authority whenever required, minor rectification, welding, cutting, site adjustments, and all other incidental activities as applicable.
3.1.2 The Bidder shall furnish all labor (supervisory, skilled, unskilled and administrative), all erection materials, hardware and consumable materials as required for the complete installation, transport vehicles, mobile cranes, hydraulic jacks, all erection tools, tackles and equipment precision levels including micro level, dial and other gauges, surface cleaners, blowers, pumps and other equipment necessary for hydro testing, and all other necessary implements in sufficient numbers as may be required for timely and efficient execution of the contract. The materials supplied shall be of the best quality, the specification and quality of which have to be approved by Engineer-in-charge before the same are used for erection work.
3.1.3 Construction Site facility The services and facility at construction site will be provided by the Owner as spelt out in the specification.
3.1.4 Protection of work, inspection of work, erection programs and progress, responsibility of erection and completeness of work etc. and other general information shall be as spelt out in this specification.

4. Supervision during erection The contractor shall be required to provide, at proper time, the necessary supervisory engineers, supervisors and other supervising, personnel duly qualified and in sufficient number for transportation, erection, pre commissioning and post commissioning check up, start up, testing and trial operation of plants and equipment. The bidder shall keep competent representative who will be Resident Engineer and shall remain as "In charge" of Bidder's work-site and also remain answerable to the Engineer-in-charge for all activities of the Bidder at site. Before his placement at site, the Bidder shall submit his bio-data to the Engineer-in-charge for his approval. The resident Engineer shall supervise the work of all men of the Bidder working at site. He shall work in complete harmony and cooperation with Engineer-in-charge and Manufacturer's engineers working at site. All statutory rules and labor laws prevailing in the area must be observed by the Bidder. All safety measures against occurrence of accidents must be take effectively. Resident Engineers shall not be withdrawn without written permission of the Engineer-in-charge. If any of the Bidder's personnel was found unsuitable for the job, the bidder shall remove him forthwith and a suitable replacement shall be posted to site within a reasonable time. No compensation for withdrawal of unsuitable or unqualified person(s) from site or for posting suitable person(s) to site at any stage of the

project shall be allowed by the Owner.

5. Sequence of erection work

5.1.1 The bidder shall furnish along with his proposal a detailed erection program which shall be finalized after placement of order in consultation with the engineer-in-charge keeping in view the various site facilities and consumables encountered during various phases of work. This erection program shall be strictly adhered to unless some modification is called for due to non-availability of erection fronts. The Bidder shall take appropriate steps as directed by the Engineer-in-charge to make up for any slippage from this erection program and no additional compensation shall be allowed on this account. **5.1.2** All packing cases and packages shall be opened in present of the engineer-in-charge or his authorized representative. Timber packing cases shall be carefully opened to avoid damage to materials.

5.1.3 Each material after stripping from boxes or received loose, shall be carefully inspected, checked with shipping list and identified with erection drawing if necessary. Any short supply and / or damages part shall be reported forthwith to the Engineer-in-charge in writing. The Bidder shall be completely responsible to make all necessary arrangements, application and follow procedure to process claim on underwriters, obtain replacement repair/rectify and modify as required on all such damaged/defective/lost equipment and material at no extra cost to the Owner in order to execute the work in satisfaction to the Engineer-in-charge within the stipulated contract time. Once the materials are inspected, the same shall be preserved properly and adequately protected from theft and deterioration or damage by rain, storm, dust, and water tempering by casual visitors or workers. The Bidder shall prepare and maintain stores, ledgers and bin cards for all materials in his custody. **5.1.4** Carrying out all repairs to damages that might have suffered during transit and in subsequent storage modifications and rectification work and replacement all lost parts, are under the Bidder□s scope.

6. Erection

6.1 Erection work shall be carried out in the manner and sequence as may be directed by respective equipment manufacturer□s supervisory engineers and the Owner□s engineer.As erection **6.2** proceeds each assembled part before being boxed up with a view to erecting it finally shall be inspected and approved by the concerned supervisor. Should any defect be found out during such inspection the Bidder shall make it good as per directives from Engineer-in-charge. **6.3** The equipment shall be placed on respective foundation or support, leveled and aligned with precision measuring instruments, checked for proper clearance between moving and stationary parts

wherever applicable and grouted on the foundation. Positions of piping with respect to anchor points shall be checked for hot and cold clearances.

6.4 The installation of motors shall be carried out along with driven equipment in accordance with manufacturer□s instructions and / or as directed by the Owner.
6.5 Wherever the scope includes control panels, all connections in control panels shall be completed, checked and adjusted to ensure safety and satisfactory operation of the equipment.

6.6 All fabrication and engineering work incidental to erection, like scaffoldings structural forming for pre-assembly, transport and erection etc. shall have to be done by the bidder at his own cost. The structural steel required for such work shall be arranged by the bidder. Wherever steel is supplied by the Owner as per prior agreement with the Bidder, he shall maintain complete record of use of such steel and submit the same to the Owner. Any unused material shall be returned to the Owner. The total unaccountable wastage shall not be more than 1% of the fabricated items. Any fabrication work like cutting, grinding, welding, straightening, filling, reaming, drilling, threading, fitting up etc which in the opinion of the engineer are incidental to the erection at site shall have to be done by the bidder. Any defect in the fabrication shall have to be rectified by the bidder at his own cost.
6.7 All piping work shall be done as per Owner□s certified drawings. The scope of work of the bidder shall include installation of all items supplied by others but coming on the pipelines included under this specification. Such items are flow elements, control valves and other specialties etc. All impulse piping up to the last root value and connection on terminal equipment/piping shall also be done by the Bidder.

6.8 All pressure vessels should be directly placed on the foundation in fully fabricated form.
6.9 Particular attention shall be given towards removal of buckles and other forms of distortion.
6.10 Holes in plate work to assist in erection should be avoided. Lugs required for erection shall be removed and projections of weld shall be chipped and grounded flush.

6.11 Misalignment in vertical joints shall not exceed 10% of plate thickness or 1 mm, whichever is larger.

6.12 Misalignment in horizontal joints shall not exceed 14% of upper plate thickness with a maximum of 2 mm for plate thickness above 8 mm and a maximum of 1 mm for plate thickness less than 8 mm.

6.13 All equipment shall be safeguarded from wind or other external causes by providing suitable steel cables/guys until completion or erection.

6.14 Welding sequence shall be adopted in such a way so as to minimize distortion due to weld shrinkage and shall be got approved from the engineer prior to commencement of work.
6.15 Welding shall not be carried out on wet surfaces and shall be protected from high winds,

6.16 All materials such as electrodes, gaskets, bolts, nuts, etc shall be of reputed make and conforming to relevant Indian standards. Prior approval of engineer will have to be obtained before commencement of work. Manufacturer's test certificate shall have to be provided when called for.
6.17 All electrical equipment included in the scope shall be installed in conformity with the Indian Electricity act and Indian electricity rules as amended up to date and the latest revisions of the following codes and standards: i.e. IS: 900 Code of practice for installation and maintenance Of Induction motors ii. IS: 5561 Electrical power connectors
iii. IS: 5216 Guide for safety procedure and practices in Electrical work iv. IS: 3043 Code of Practice for Earthling

7. Safety regulations

7.1 When going to or from place to work in the plant only the prescribed walkways, paths or crossovers shall be used. Railroad crossing warnings shall be heeded.

7.2 Crawling on, over or under moveable equipment shall generally be prohibited.
7.3 All persons are to stay clear of lifts being made by overhead cranes
7.4 For overhead work, proper signs shall be placed below and when conditions justify, a watchman shall be stationed to warn employees in the vicinity.

7.5 Work on or about crane runways shall not be undertaken without the engineer's permission. Whenever it is necessary to do any work on or above the crane runways, the bidder shall furnish a flagman stationed on the floor.

7.6 Only scaffolds which meet the requirements of any governing laws shall be used in the project.
7.7 Work in area of electric wires and cables shall be generally be avoided.

7.8 All burning and welding equipment shall conform to, and be used in accordance with, regulations governing such equipment. No burning or welding shall be done at any place on the site until location where such work is to be done is approved.

7.9 Adequate fire protection shall be available before work shall be preceded.
7.10 All warning signs shall be observed.

7.11 Use of explosives shall comply with all regulations.

7.12 Proper care shall be taken in the use of compressor.

7.13 Bidder shall require his employees to wear hard hats all times when they are in an area where they are danger from falling objects.

7.14 Goggles shall be worn whenever there is a possibility of flying particles or splashing corrosive fluid.

7.15 When working around caustic or acid solutions, worker shall wear gloves, goggles and protective shoes.

7.16 When ladders are the means of access to a platform they shall be firmly secured top and bottom and the ladder rails shall extend at least one meter above the top landing. When a ladder cannot be secured a man shall be stationed at the base.

7.17 Safety belts shall be used by men working in high places when no hand rails or other guards are in place.

7.18 All accidents resulting in injury shall be reported to the engineer promptly. The report shall contain the following:

a.Name of employee and identifying information

b. Whether injury involved lost time or not

c. Occupation of injured

d. Date of accident

e. Time of accident

f. Place of accident

g. Nature of injury

h. What injured was doing at the time of accident

i. Detailed description of accident

7.19 A checklist in triplicate will be furnished for the approval of engineer wherein all items to be checked and necessary instructions will be listed. Inspection and checking shall strictly follow this checklist. On completion of the joint inspection and checking two (2) copies of the check list will have too be handed over to the Engineer. The check lists after checking will have to be jointly signed by the Bidder□s supervisor and the engineer to ensure that all inspection and checking have been prop-

erly carried out; however, such endorsement shall not relieve the bidder from the responsibility in ensuring proper erection and cleaning.

7.20 During inspection all clearance, alignment and important measurements and adjustments as may be directed shall be noted by the Bidder for future reference and guidance. Two (2) copies of such notes shall be delivered to the engineer.

8. Cleaning

8.1 The Bidder shall observe strict cleanliness during execution of the work. They shall check that all the finished surfaces are greased and covered and all pipes are covered, with plastic or suitable type cap during storage.

8.2 Before boxing up the Bidder shall examine carefully ensure that no foreign material such as welding run ends, welding beads, metal chips, rope-working tools, etc has been left inside any equipment or piping duct. **8.3** Cleaning sequence and arrangement of temporary piping will be developed by the Bidder and shall be executed by him to the satisfaction of the engineers. **8.4** In the case of motors, the following procedure shall be observed: a. Checking and cleaning of bearings and charging / filling of lubricants, wherever necessary. d. Cleaning of core and winding, drying out and varnishing the winding and measurement of air gap for motor assembled at site.

9. Pre-commissioning testing

1.1 After alignment of all equipment, alignment tests shall be carried out by the Bidder to check leveling, clearance, eccentricity etc.

1.2 Hydro testing shall be conducted for all pressure parts after installation at required pressure. All necessary blanking arrangement necessary for such hydro testing shall be furnished by the Bidder. All necessary test pump, temporary piping, etc shall be supplied by the Bidder.

10. Start up and trials runs

8.1 Test run Following the satisfactory completion of inspection, checking and cleaning of a unit, the plant will be placed in test run. During this period, all adjustments and repairs as required shall be made by the Bidder; the plant may be shut down if necessary to carry out such adjustments and repairs. On completion of satisfactory trial operation, the plant will be placed under initial operation. Prior to trial operation of any equipment the following shall be checked:

a. Proper installation of the drive and equipment on the foundation.

b. Proper alignment of drive and the equipment

c. Proper connection of supports, hangers, piping, valves, instruments and other fittings.

d. Freeness of the rotors of drive and equipment

e.Healthiness of lube oil system, changing and filling as necessary.
f. Wherever the scope includes control panels, the following tests shall be conducted.
(i) The healthiness of interlocks between various pieces of equipment and protections for the equipment.

(ii) Insulation tests by meger.

(iii) Tests where considered necessary.

(iv) Checking of healthiness and proper operation of indication lamps.

(v) Calibration and operation tests for instruments.

g. Any other feature applicable to the equipment.

h. Prior to trial operation of equipment, the drive motor shall be checked and tested by the Bidder. Following steps in motor testing shall be followed.

(i) Insulation test of winding by meger, drying out and, if necessary, high potential test.

(ii) Winding resistance measurement on all 3 phase for motors of bigger size.

(iii) Testing the motor for proper direction of rotation and reconnection, if necessary.

(iv) Adjustment and setting of limit switch torque switches and breaks for valve motors.

(v) No load test run of the motor for a minimum of eight (8) hours to check out bearing or other associated arts.

During test run, hourly record of currents on all the three phases shall be maintained and careful watch shall be maintained on the equipment for any abnormal sound, temperature of bearing, vibrations etc. Owner will provide required number of operators in shifts, if required, for trial operation of equipment under supervision of commissioning / start-up engineer. All other labors for starting, trial operation, repairs and adjustments shall be provided by the bidder. Requirement of Owner's operators, if any, shall be indicated by the bidder well in advance.

8.2 After no load trial run of the motor each rotary equipment shall be coupled and shall be subjected to a trial run. The duration of this trial run shall be mutually agreed.

11. Testing and trial run – general requirement

Any other pre-commissioning and field test not included in the above list and which are specified in the relevant standards, Electricity rules, code of Practice shall be carried out at no extra cost to Owner. Also, if the Owner wishes any particular test is to be repeated or newly carried out, the same shall be done by the Bidder without ny extra cost.

12. Loading the unit and reliability run

12.1 After the above pre-commissioning operations, the plant will be started up and loaded. During these loading operations all the controls and protections shall be finally set.

12.2 After the unit is loaded to the maximum capacity rating and the Bidder is fully satisfied with its performances he shall offer the unit for reliability run by communicating the same to the Owner / Engineer in writing. After receipt of such communication the unit will be put on reliability run. The run will be for an uninterrupted minimum period of fifteen (15) days at rated full load / part load as made available by the Owner to demonstrate to the Owner / Engineer the following:
(i) The sustained capacity of the unit

(ii) The reliability of the plant and auxiliaries

(iii) The adequacy of the various auxiliaries, ancillaries and systems and instruments and controls.

(iv) The capability of each equipment of the plant to correctly perform the functions for which it was specified.The run shall be undertaken jointly with the Owner. A joint log would be maintained to note various performance data, the malfunctions, output deficiency and short comings and would be complied and furnished at the end of the trial run. The malfunction, shortcomings and deficiencies shall be rectified by the Bidder to the satisfaction of the Owner / engineer-in-charge at no extra cost. After completion of reliability run the vendor shall prepare the unit for Performance / Acceptance test and offer the same for Performance / Acceptance test. The Performance / Acceptance test shall be carried out jointly on a mutually agreed date within 30 days from completion of reliability run within which period no de-rating of the equipment performance will be permitted. In case of delay in carrying out the performance/acceptance test for reason(s) not attributable to the Owner, the Vendor shall be required to prove the specified performance guarantee without any de rating factor.

13. Performance / acceptance test

13.1 The performance test of the plant and equipment will be conducted in accordance with good engineering practice or equivalent performance test code to establish the performance requirements as mentioned in the various specifications enclosed. The bidder shall furnish and install all standard

instruments as stipulated in the relevant code to conduct the Performance / Acceptance test and shall be complete with all primary elements, tapping points, etc, as necessary. The class of accuracy of the instruments shall be as specified in the code. The bidder shall have all the instruments calibrated in a recognized laboratory and shall furnish the certified calibration curves. The unmeasured quantities will be accounted for in a acceptable manner. Proper corrections will be made to take into account the variations of terminal conditions, which do not correspond to the specified terminal condition if such a situation arises. The correction curves for such variations in terminal condition curves for such variations in terminal condition shall be furnished in advance for acceptance by the owner/engineer. The detailed procedure of test shall be jointly agreed upon prior to commencement.

13.2 The guaranteed performance figures of the equipment shall be proved by the Bidder during these tests. Should the results of these show any deficiency from the guaranteed value, the Bidder shall modify the equipment as required at no extra cost to enable it to meet the guarantee. **13.3** Till successful completion of Performance / Acceptance test the owner shall not be responsible for providing any supervisory or skilled manpower except for owner□s operators. **13.4** The tests to be carried out on the equipment shall include the tests mentioned in other Sections of this Specification.

14. Taking over

Upon successful completion of all the tests to be performed at site on the equipment furnished and erection by the Bidder, the engineer shall issue to the Bidder a taking over certificate as a proof of the final acceptance of the equipment. Such certificate shall not unreasonably be withheld nor will the engineer delay the issuance thereof, on account of minor omissions or defects, which do not affect the commercial operation and / or cause any serious risk to the equipment. Such certificate shall not relieve the Bidder of any of his obligations which otherwise survive, by the terms and conditions of the Contract after issuance of such certificate. **15. Trial run for six months**

Upon successful testing and commissioning of the plant, the contractor shall run the plant for a period of six months. During this period the ..... will provide the electricity, chemicals, diesel. However the polyelectrolyte to be dosed shall be at the cost of contractor. All the operators and labor required for the job shall be provided by the contractor at his cost. The day to day laboratory testing of samples shall be carried out by the contractor and report submitted to the Engineer. **SECTION E1 LIST OF APPROVED MAKES List of approved makes**

1) Pumps – Horizontal, Kirloskar / Kishore / KSB / Jhonson Centrifugal (Note; The chlorinator booster pumps shall be as suggested by chlorinator vendor)

2)Submersible Sewage Pumps Aqua / Kishor / Kirloskar / KSB / Grundfos

3)Screw Pumps Roto / Hydro prokov / Tushaco

4)Dosing Pumps Asia LMI / Metachem / Positive Metering / H-welore

5)Mechanical Bar Screen Jash

6)Grit Separator Thermax / HDO / Voltas / HGE / Eimco KCP

7)Clari Tube Flocculator/ Clari-tubesettler Thermax / HDO / Voltas / HGE /Eimco KCP

8) Thickener Thermax / HDO / Voltas / HGE /Eimco KCP

9) Sludge dewatering unit Avebtura / Technofungi

10) Agitators Fibre & Fibre / Thermax / Remi

11) Air Blowers Usha / Everest / Swam / KPT

12) MMBR media Thermax / Kaldness / decp

13) Gas Chlorinator Capital Controls / Toshcon Jesco / Penwalt

14) MS / SS / GI Pipes Tata Steel / Surya Roshni / Jindal / Zenith /Mahalksmi Seamles / Maharashtra Seamless

15) HDPE Pipes Trustline / Dutron / RIL / Jain

16) Valves Intervalve / Aswan / G M Engg / Dinesh Plastics /Jyoti Plastics / Kirloskar /Shalimar / Durga / IVC

17) Isolation Gates Yashwant / Jash / Alfaplast

18) MCC LT/Industrial Switchgear (Devsons) /Subhadra / Unique controls / Jasper Engg

19) LPBS LT/Hansu / Pustron / Equivalent

20) Cables Polycab / KEI / Gloster

21) Motors Siemens / Crompton /Kirloskar

22) Cable Trays Elcon / Sales Link

Treated Waste Water Quality & Quantity (Guaranteed) Parameter	**Units**	**As required**	**As guaranteed by Bidder**
pH	-	6.0 – 8.0	
BOD	mg/l	10	
COD	mg/l	100	
Total Suspended Solids	mg/l	20	
Coliform Count	MPN /100 ml	500	

2	**Dewatered Sludge Generation (Data to be furnished by bidder) Parameter**	**As Kg/d Dry Solids**	**Concentration as %**	**Volume in m3/d**

9

) Switch gear L&T / Siemens / MDS / C&S

30) Control gear Teknik

31) Indicating meters AE / IMP

32) Annunciator System IIC / Minilec

33) Relays OEN / Eqv.

TECHNICAL DATA REQUIREMENT

Technical data requirement

The technical Schedule sheets are to be filled in by the Bidder and Returned with Bid. Bids without filled up technical schedule shall not be considered for evaluation

Dewatered Sludge Quantity from Sewage Treatment Plant

Power Consumption (Data to be furnished by bidder)

The bidder shall furnish the data about the motor terminal power consumed every day for each of the unit as well as the power that will be consumed by the plant as a whole in a day with the full capacity operation **Parameter**	**Unit**	**As Guaranteed by Bidder**
Power Consumed at Motor Terminal , per day		

Design Details / Specification Sheets of Equipment / Units

Legends – MSEP – Mild Steel Epoxy Painted. , SWD – Side Water Depth , W-Working , S- Standby

Stilling Chamber Minimum specified		**As offered by bidder**
Number	No.	1
Retention Time	min.	Minimum 1 min on peak flow
Effective Volume	m3	Bidder to Specify
Material of Construction		RCC in M30
Size		
Width, m		Bidder To Specify
Length, m		Bidder To Specify
Liquid Depth, m		Bidder To Specify
Total Depth		Bidder To Specify

Free Board, mm		Min. 500 mm
Top		Open/Close Bidder to specify (To be atleast covered with green agriculture type net)
Steps in chamber / sump		MS rungs
Bar Screens, (1 Mechanical working + 1 Manual standby) As specified		As offered by bidder
Number	Nos	1 Mechanical working + 1 Manual standby
Type	Bidder To Specify	
Channels		
Width, m (Mechanical)	Bidder To Specify	
Width, m (Manual)	Bidder To Specify	
Length, m	Minimum 4.0 m	
Liquid Depth in unclogged condition, m	Bidder To Specify	
Free Board, mm	Minimum 500 mm	
Material of Construction	RCC in M30	
Screens		
Manual Screen		
Clear Spacing (Manual)	6 mm	
Bar Size (Manual)	5 mm, minimum	
Material of Construction	SS 316	
Approach velocity at peak flow	0.8 to 1.0 m/sec	
Make Manual	Bidder to specify	
Mechanical Screen		
Clear Spacing	6 mm	
Bar Size	5 mm, minimum	
Material of Construction	SS 316	
Approach velocity at peak flow	0.8 to 1.0 m/sec	
Screening Discharge Chute	Yes	
Grit Separator As specified	As offered by bidder	
Number & Type	2Nos.mechanical (1 working + 1 Standby)	
Size of Grit	mm dia.	0. 20
Specific Gravity of Grit	-	2.30
Retention Time (peak flow)	min.	Minimum 01 min.
Settling velocity, SS at 10 Deg. C	m/sec	0.0 14
As specified	**As offered by bidder**	
Surface overflow rate at peak flow at 10 Deg. C	m3/m2/day	959
Material of Construction, Chamber.	RCC in M30	
Material of Construction, Grit Separator	Wetted parts in MSEP	
Size		
Width, m	Bidder To Specify	
Length, m	Bidder To Specify	
Liquid Depth, m	Bidder To Specify	

Total Depth, m	Bidder To Specify	
Free Board, mm	500	
2.04.00 Parshall Flume As specified	As offered by bidder	
Number & Type	1 Nos.	
Range of flow to be measured		1 to 50 MLD
Upstream channel length	M	Bidder To Specify
Downstream channel length	M	Bidder To Specify
Throat width	Mm	Bidder To Specify
Upstream channel splay angle	degrees	Bidder To Specify
Downstream channel splay angle	degrees	Bidder To Specify
Water Level Reading equipment	Ultrasonic with communication capability and totallizer	
Material of Construction	RCC M30	
Moving Media Bio Reactor / Aerobic Biological System As specified	As offered by bidder	
System Proposed	Moving Media Bio Reactor	
Bio Reactor – Media		
Media Type	Bidder to specify	
Material of Construction	Virgin PP	
Bio Reactor – Tank		
Numbers	1	
Width / Diameter , m	Bidder to specify	
Length, m	Bidder to specify	
Liquid Depth, m	Bidder to specify	
Free Board, mm	Minimum 800mm	
Tank Material of Construction	RCC in M30	
Aeration System		
Type	Coarse Bubbling	
Material of Construction	SS 316	
Blower Capacity (m3/hr) , FAD	Bidder to specify	
No. of Air Blowers	Bidder to specify with 100% as standby. Owner recommend 4 nos. 2 working + 2 standbye	
Blower RPM / Aerator RPM	< 1400	
Air Blower / aerator Drive KW / RPM	Bidder to specify	
Blower /Aerator Capacity	Bidder to specify	
Blower Pressure (mmwg) / Mixing Zone of aerator		

Flash Mixer AS SPECIFIED	**AS OFFERED BY BIDDER**	
Number & Type	1 Nos.	
Detention period	Sec	30 to 60
Diameter of tank	M	Bidder To Specify
Depth of tank	M	Bidder To Specify
Free Board	mm	500
Material of construction	RCC	M30
Mixer	RPM	Bidder To Specify
Mixer HP	HP	Bidder To Specify

Material of Construction	RCC M30
As specified	As offered by bidder
Over Flow Weirs	
Type Proposed	Radial Launders with V notches
Material of Construction	SS-304
Weir loading rate, m3/m/day	100 – 185
Sludge Removal	
By Hydrostatic Pressure	Bidder to specify
Sludge Pipe Dia	Bidder to specify
Performance – Sludge	
Expected Sludge Quantity	in kg/ day as dry solids Bidder to specify
Sludge Concentration	Minimum 1%
Sludge Volume	in m3/d Bidder to specify
Disinfection As specified	As offered by bidder
Disinfectant	Free Chlorine
Chlorine Dosage Required	10 mg/l
Dosing Arrangement	
Type	Gas chlorination-chlorination with safety equipment like canister mask, gloves, goggles, safety shower, emergency repair kit ,chlorine leak detector etc.
No of Chlorinators	1 working + 1 standby
Total Chlorine required	in kg/d, Bidder to specify
As specified	As offered by bidder
Chlorine Shed and neutral pit size	Bidder to specify, neutral pit size min to accommodate one tonner
Material of construction of chlorination shed & neutral pit	RCC frame structure for chlorinator shed and for neutral pit RCC M25 with suitable lining

Chlorine Contact Tank With Epoxy painting

AS SPECIFIED	**AS OFFERED BY BIDDER**
Numbers	1
Effective Retention time, min. at average flow	30
Width / Diameter, m	Bidder to specify
Length, m	Bidder to specify
Liquid Depth, m	Bidder to specify
Free Board, mm	300
Tank Material of Construction	RCC in M 30, with inside epoxy painting.
Chlorine Contact arrangement	Bidder to specify Separate Circular CCT
Sludge Sump As specified	**As offered by bidder**
Dry Sludge Quantity	in kg/day, Bidder to specify
Specific Gravity of Sludge	Bidder to specify
Solid Consistency in Sludge	in % , Bidder to specify
Volume of Sludge	in m3/day
Retention Time, hours	Min. 2 hrs.
Size – Sump	

Quantity	Bidder to specify
Length, m	Bidder to specify
As specified	As offered by bidder
Width, m	Bidder to specify
Liquid Depth, m	Bidder to specify
Free Board, mm	300
Tank Material of Construction	RCC in M 30
Mixing in Sump	
Type	Coarse Bubbling
Mixing Requirement, m3/m3/hr	0.7- 0.9
Liquid Depth, m	Bidder to specify
Air Grid Material of Construction	SS 316
Sludge Thickener Feed Pumps As specified	As offered by bidder
Numbers	1 W + 1 S
Type	Submersible / Screw
Capacity	Bidder to specify
Head	Bidder to specify
Material of Construction	CI Body & CI Impeller in case of centrifugal, Alloy Steel Rotor in case of Screw
Sludge Thickener As specified	As offered by bidder
Quantity	Bidder to specify
Type	Centrally driven
Total Sludge (Dry Basis)	in kg/day, Bidder to specify
Specific Gravity of Sludge	Bidder to specify
Sludge Consistency	in %, Bidder to specify
As specified	As offered by bidder
Sludge Volume	in m3/day, Bidder to specify
Solids Loading, kg/m2/day	60
Filtrate Quantity	in m3/day, Bidder to specify
Size of Thickener	
Diameter, m	Bidder to specify
Liquid Depth, m	**Minimum 3.0**
Free Board, mm	500
Hopper Slope	1:8
Tank Material of Construction	RCC in M30
Over Flow Weirs	Pipes or Openings.
Type Proposed	Bidder to specify
Material of Construction	Bidder to specify
Sludge Removal	
By Hydrostatic Pressure	Bidder to specify
Sludge Pipe Dia	Bidder to specify
Performance – Sludge	
Expected Sludge Quantity	in Kg/ day as dry solids Bidder to specify
Specific Gravity of Sludge	Bidder to specify
Sludge Concentration, % (w/w)	3.0 – 3.5
Sludge Volume	in m3/d Bidder to specify

Performance – Clarity		
TSS in Overflow	Bidder to specify in mg/l	NA

Centrifuge Feed Pumps As specified	**As offered by bidder**
Numbers	1 W + 1 S
Type	Screw
Capacity	Bidder to specify
Head	Bidder to specify
Material of Construction	As per Detailed specs
Sludge De watering Equipment As specified	As offered by bidder
Type	Solid Bowl Centrifuge
Total Sludge (Dry Basis)	in kg/day Bidder to specify
Nos. offered	1
Sludge Volume	in m3/day Bidder to specify
Solids Loading	in kg/hr Bidder to specify
Dewatered Sludge Consistency	Min. 20% Bidder to specify
Dewatered Sludge quantity	in m3/day Bidder to specify
Filtrate Quantity	in m3/day Bidder to specify
Material of Construction	SS

Dewatering Polyelectrolyte Dosing System If Required

a) Dewatering Polyelectrolyte Dosing Tank As specified	**As offered by bidder**
Quantity of Polymer	in kg/day, Bidder to specify
Chemical Solution %	Maximum 0.5 %
Volume of chemical solution	In m3/day, Bidder to specify
Service Time, hrs	8 for each tank
No of tanks	02
Size – Tank	
Numbers	1 for dosing + 1 for solution preparation
As specified	As offered by bidder
Length, m	Bidder to specify
Width, m	Bidder to specify
Liquid Depth, m	Bidder to specify
Free Board, m	300
Tank Material of Construction	Bidder to specify
b) Mixer – Dewatering Polyelectrolyte Dosing Tank As specified	**As offered by bidder**
Numbers	02
Type	Motorised – Slow Speed
Capacity	To suit polymer dosing tank
Material of Construction	SS 316
Dewatering Polyelectrolyte Dosing Pumps As specified	As offered by bidder
Numbers	1 W + 1 S
Type	Plunger / Diaphragm
Capacity	Bidder to specify

Head	Bidder to specify
Material of Construction	CI Body, PP / SS Wetted Parts

Alum Dosing System

a) Alum Dosing Tank As specified	**As offered by bidder**
Quantity of Polymer	in kg/day, Bidder to specify
Chemical Solution %	Maximum 10 %
Volume of chemical solution	In m3/day, Bidder to specify
Service Time, hrs	8 for each tank
No of tanks	02
Size – Tank	
As specified	**As offered by bidder**
Numbers	1 for dosing + 1 for solution preparation
Length, m	Bidder to specify
Width, m	Bidder to specify
Liquid Depth, m	Bidder to specify
Free Board, m	300
Tank Material of Construction	Bidder to specify
Mixer – Alum Dosing Tank As specified	As offered by bidder
Numbers	02
Type	Motorised – Slow Speed
Capacity	To suit alum dosing tank
Material of Construction	SS 316
Alum Dosing Pumps As specified	As offered by bidder
Numbers	1 W + 1 S
Type	Plunger / Diaphragm
Capacity	Bidder to specify
Head	Bidder to specify
Material of Construction	CI Body, PP / SS Wetted Parts
Instrument – Flow Meter As specified	As offered by bidder
Type	Ultrasonic
Location	Stilling Chamber outlet
No. of Flow meter	1
Size of Flow meter	Bidder to specify as per design
INSTRUMENT – Level Switch Type	Tilted Type Float Operated
No. of Level Switch	1 each for Mechanical screen, and Sludge Sump

Chemical Dosing Dose Point	**Chemical Proposed To Be Used**	**Dose in mg/l**	**Purity, %**	**Quantity in kg/d**	**Chemical Solution required per annum**
At the inlet of Flash mixer	Alum / PAC	*	*	*	*
At the inlet of Chlorine Contact Tank	Gas Chlorine	*	*	*	*
At the inlet of	Dewatering	*	*	*	*

Sludge dewatering unit	Polyelectrolyte

* Bidder to specify

& Buildings Name of shed/building	**Area specified**	**Area as proposed by bidder**
Administrative Bldg. cum Laboratory	Minimum 100 m2	
Main Electrical & Instrument Panel Room	Minimum 50m2	
Room for Bowers	Minimum 50 m2	
Chlorine tonner & Chlorinator Shed	Minimum 30 m2	
Shed for Chemical Tanks & pumps.	Minimum 20 m2	

Name of shed/building	**Area specified**	**Area as proposed by bidder**
Centrifuge Shed	Minimum 20 m2	

Electric Drives List

The following schedule to be filled by the bidder for all drives – Without the drive schedule the bid shall be considered as non-responsive

Please consider additional drive if required.	**Nos. installed**	**Nos. Operating**	**Phase**	**Ratings in kW**	**No. of Hrs of operation for ..... MLD**
Drive For					

Piping & Valves Schedule

The bidder to fill in the following pipeline schedule – Without the pipeline schedule the bid shall be considered as non-responsive. Use additional sheets if required.

A) Pipes & Fittings From	**To**	**Flow (m3/hr)**	**Pipe Dia**	**Material of construction**	**Remarks**
B) Valves Application	**Type / Code**		**Material of construction**	**Remarks**	

Instrumentation Schedule

Field Instrumentation

Please list all instruments being provided	**Location**	**Operation**	**Type**	**Nos offered by bidder**
Instrument				
Waste water flow meter	On outlet weir at Stilling Chamber	To Record & Integrate Flow	Ultrasonic	
Pressure Gauges	Discharge of Blower	Indication Of Pressure At Blower Discharge	Glycerin filled	
Pressure Gauges	Discharge Of all Pumps	Indication Of Pressure At Which liquid Is Being Pumped	Seal Diaphragm	
Level Switch	Mech. screen / Sludge / Chlorinator pump sump	Auto Control Of Pumps – Start / Stop	Displacer / Float Operated Tilted Type	
Others				

Technical Schedule – Power, Chemicals & Utilities

The technical Schedule sheets are to be filled in by the Tenderer / Bidder and returned With Bid. Bids

without filled up technical schedule shall not be considered for evaluation

a) Chemicals

The bidder should list the chemical consumption & the approximate (+/-10%) delivered rate of the chemicals at the project site to be used by them for the STP.

	This information is to be used for evaluating of the Offer .however final figure will be decided by the department as per rates prevailing in the market./considering higher figure quoted by any bidder. Chemical / Utilities	Units	Delivered Rate in Rs. / Unit	Daily Consumption
Chlorine		Kg/day	*	*
Dewatering Polyelectrolyte		Kg / day	*	

b) Power Consumption

1	2	3	4	5	6	7	9
S. No.	**Drive For**	**Total Nos.**	**Nos. Operating**	**Nos. Standby**	**Operating Hours / day**	**Drive Rating KW**	**Guaranteed Consumed Power per day kWH, at motor terminal for ..... MLD**

Total Installed Power, kW _____

Total Guaranteed Consumed Power day, kWH, at motor terminal ----------

c) Service Water

Service Water Quantity required in m3/d

d) Sludge Generated

Dewatered Sludge Quantity; (m3/d) ----------

(Tons/day) ----------

INSPECTION, TESTING, ERECTION, COMMISSIONING & PERFORMANCE RUN OF MECHANICAL & ELECTRICAL EQUIPMENTS OF PLANT

1.1 General :

All equipments prior to dispatch for the site shall be tested at works as per relevant IS codes. International codes shall be used wherever Indian standards are not available.

1.1.1. Test Instruments:

The Contractor shall satisfy the Engineer as to the accuracy of all the instruments used for tests and if required shall produce recent calibration tests, or otherwise have them calibrated at his own expense by and independent authority.

1.1.2. Test Certificates:

Copies of certificates of all works, routine tests shall be provided as detailed.

The Contractor shall obtain and submit to the Engineer and to other parties as may be directed, certificates of test of all items, certifying that they have been satisfactorily tested and describing and giving full particulars of such tests.

1.1.3. Manufacturer's Works Inspection Tests and Gaurantees:

All Schedules of Particulars shall be completed and the Guaranteed Particulars and the efficiencies of the equipment offered at the duties specified will be binding and may not be varied expect with the consent in writing of the Engineer.

The Engineer shall be provided with the facility for inspection of all equipment and material and shall be given at least 10 days notice when such equipment and material is ready for inspection at manufacturer or vendors workshops.

Full witness testing to the relevant standards and to prove guarantees given will be required for the following items:

i). All pumps for performance testing.

ii). Electric motors for type on routine one motor of each size.

iii). All control panels.

iv). Chlorinator for relevant performance test.

v). All transformers for routine and type test on.

vi) EOT Crane as per relevant standards.

In addition all other items of equipment not subject to witness testing shall be temporarily erected at the manufacturer's works and tested for satisfactory operation and shall be offered for inspection. Copies of manufacturer's test readings shall be submitted to the Engineer, all prior to packing for shipment.

Such inspection, examination, or testing, shall not release the Contractor, manufacturer or supplier of any item from any obligation under the Contract.

Certified copies of manufacturer's test readings of all items shall be submitted to the Engineer within 7 days of the satisfactory completion of the tests.

Whilst the Engineer shall be provided with facilities for witness testing and / or inspection of all items of equipment at the manufacturer's works, he may at his discretion advise that the tests shall proceed in his absence. These tests shall be made as if in his presence, and duly certified copies of test readings shall be submitted.

Where items of equipment are of identical size and duty it may be required, at the Engineer's discretion, that a reduced number of the items be subjected to witness tests; however this shall not relieve the manufacturer from the requirement of carrying out the performance tests on all items prior to offering a witness testing.

If after inspecting, examining or testing any material or equipment, the Engineer shall decide that such items or any pat thereof is defective, or not in accordance with the Specification or performances, he may reject the said items or part thereof, giving to the manufacturer within a reasonable time, notice in writing of such rejection, stating therein the ground upon which the said decision is based. All re-testing shall be at the Contractor's expense.

1.1.4. Site Testing:

The Contractor shall arrange for the full site testing of all items of equipment and shall include provision of:

a). All skilled and qualified operating and test staff for the testing of all equipment.

b). Provision and disposal of all services, lubricants, and fuels other than electricity.

c). All measuring and testing instruments to demonstrate equipment operates to the fulfillment of the works sheet.

1.1.5. Manufacture's Work Tests

1.1.5.1 Power Transformers

i). Measurement of winding resistance.

ii). Ratio polarity and phase relationship.

iii). Impedance voltage.

iv) Load losses.

v). No-load losses and no-load current.

vi). Insulation resistance.

vii). Included over voltage withstand.

viii). Separate source voltage withstand.

1.1.5.2 Type Tests

i). Impulse voltage withstand both chopped and full wave.

ii). Temperature rise.

Unless otherwise stated by the Engineer, evidence of type of tests carried out on identical transformers to those being provided under the contract will be accepted in lieu of actual tests.

1.1.5.3 Circuit Breakers And Control Gear:

i). Routine tests including pressure test, milli-volt drop (Ductor) tests.

ii). To ensure operation of the closing coil and satisfactory closing of the circuit breaker with the voltage on the coil down to 80% of its rated voltage, and that mal-operation does not occur with a voltage on the coil of 120% of its rated voltage.

iii). To ensure the satisfactory trip operation of the circuit breaker at no load conditions with the trip coil energized at 50% of its rated voltage.

iv). Test figures for heat – run tests performed on identical panel types shall be made available.

v). All interlocking, circuit breaker draws in & out operation.

1.1.5.4 Protection and Control Circuits:

Base on the completeness of the circuits in the final manufactured form within the manufacturer's works, the following tests shall be carried out:

i). Primary injection tests to ensure correct operation of the current operated protection relays and direct acting coils over their full range of settings.

ii). Balanced earth fault stability tests by primary current injection. Care must be taken to reproduce accurately the burdens of interconnecting cables. A further test to ensure correct polarity must be made after assembly.With different pilot wire schemes it may not be possible to apply primary injection testing. In this case the circuits shall be proved by secondary injection. Current transformer characteristics and calculations associated with the above tests shall be available for inspection by the Engineer.

i) Correct operation of control circuits at normal operating voltage by operating voltage by operation of local control switches, and simulation of operation from remote control positions.

1.1.5.5 Motors:

Motors over 100 KW site rating shall be subject to full performance tests which may be witnessed by the Engineer at the Motor manufacturer's works.Motors of 5.5 KW to 22 KW site rating shall be subject to performance tests but will not be witnessed.Motors under 5.5 KW site rating shall be subject to " type test " standards.

Type test certificates which shall include the following shall be provided for all motors :

i). Manufacture to BS.

ii). Class of Insulation.

iii). Type of cable fittings.

iv). Type of bearing sizes and lubricant.

v). Type and raring of motor heaters.

Motor testing shall be carried our in accordance with the requirements of BS 4999.

1.1.5.6 Instruments And Meters:

Tests to ensure operation of all ammeters, voltmeters and transducers and checks for correct calibration KWH meters shall be checked for correct rotation and creep tests shall be carried out to ensure that the meter is inoperative with voltage along, if the secondary of the current transformer is left connected with the primary current interrupted.

1.1.6. Tests On Cables During Manufacture:

All cables supplied under the Contract shall be subject to routine tests in accordance with the relevant British Standard. Cables will not be accepted on Site for installation until certificates giving proof of compliance with the Specification and date of tests have been received and approved by the

Engineer. A certificate shall be applicable to each drum.

The tests to be carried out on every drum at manufacturer's premises shall include:

a). High voltage A.C insulation pressure test between cores, each core to earth metallic sheath or armour as applicable.

b). Insulation resistance test.

c). Core continuity and identification.

d). Conductor resistance test.

1.1.7. Process Control and Indicating Instruments:

All flow, level and process measurement controllers, transmitters, recorders, indicators, vacuum and pressure gauges shall be subject to routine in accordance with BS 88, BS 1780 and BS 3680.

Test Certificates shall be provided against each item of equipment.

1.1.8. Electrical Measuring Instruments and Meters:

Tests to ensure accurate operation of all meters, voltmeters and kwh meters shall be undertaken in accordance with BS 89 and BS 37.

1.1.9. Alarm Systems:

The Contractor shall be responsible for testing all items of equipment comprising the Works alarm system for correct operation and sequence action.

1.1.10. Site Tests:

Leakage Tests at the test pressure shall be carried out on all erected pipe work and valves immediately after erection and before being built in. The Contractor shall advise the Engineer when these tests are to be carried out.

9.1.11. Tests on Cable During Installation:

During the period of site installation the Engineer will carry out inspection of the Works to ensure the standards of workmanship meet the specification and are to his satisfaction. In the event of any part of the cabling installation failing to meet these requirements the Contractor shall remedy the deficiency to the satisfaction of the Engineer.

After completion of various parts of the installation the Contractor shall provide a test engineer, labour and materials to demonstrate to the Engineer that the cables have been correctly installed.

The Contractor shall inform the Engineer prior to the testing of cables and shall be responsible for liaison with any other contractor to whose equipment the cables may be terminated to ensure all parties concerned are aware of the impending tests, to guarantee safety of personnel and that isolation of any particular equipment has been completed. Any special isolation or preparation required to be carried out before cable testing will be completed by the Contractor responsible for that equipment. All tests shall be carried out by the Contractor to the satisfaction of the Engineer.

1.1.12 Pumps Sets:

Tenderers shall complete the Schedule of Particulars and Guarantees and shall state therein, inter alia, the guaranteed efficiencies of the pumps and motors offered, and the overall guaranteed rates of energy consumption of the complete pump sets at the duties specified.The contractor's guarantees given when tendering in respect both of performance and efficiency shall be binding and considered part of the contract.The fulfillment of these guarantees shall be verified at the test works to be witnessed by Empolyer and at Site trials in accordance with the procedure given in British Standards 5316 and 4999 etc.These site trials shall be carried out under the control of the contractor's staff to the satisfaction of the Engineer. The Contractor shall provide all the necessary labor and instrumentation to conduct the tests. The discharge from the pumps shall be measured wherever possible by the volume drawn from a sump or delivered to a tank over timed intervals.

1.1.13 Electrical Plant:

After all the deficiencies apparent during the installation inspection have been rectified to the Engineer's satisfaction, the following tests shall be carried out.

1.1.13.1 Circuit Breakers and Control Gear:

Routine tests, including H.V. pressure tests.

1.1.13.2 Protection And Control Circuits:

Tests at 1.5.4 with the addition of satisfactory operation of all inter-tripping circuits in conjunction with other items of plant.

1.1.13.3 Tests on Cables after Installation:

Every cable shall be subject to the following tests after installation:

High voltage pressure tests:

The following D.C. test voltages shall be applied at full valve.

i) PLYSWS11,000 volt grade cable
Between cores 30,000 volts between any core and armour 17,500 Volts.

ii) XLPESWAPVCC 3,300 volt grade cables.
Between cores 10,000V Between any core and armour 5,800 V

iii) XLPESWAPVC OR
PVCSWAPVC 1,100 volt grade mains cable
Between cores 3,000 V Between any core and armour 3,000V

Witnessed high voltage pressure tests shall not be carried out on PVCSWAPVC control cables, but it shall remain the responsibility of the Contractor to test the insulation of these cables both between cores and between cores and earth during installation with a 'Megger' 5000 volt hand generator.The Contractor shall test all cables after installation to ensure correct phasing out of cores, continuity of cores sheath and armour over the whole length of the cable.

1.1.14. Earthing System Tests:

The Contractor shall demonstrate to The Engineer that the Resistance of the Electrodes to earth and the earth conductor continuity is in accordance with the Specification and IS 3043. The tests shall be made on completion of the installation.The test shall be performed from each major item of plant, by using an "Earth Megger" and auxiliary return conductor. The each earthing station shall be separately tested and value of earthing resistance shall be displaced under man hole cover.

1.1.15. Installation Inspection:

In additional to the progressive supervision and inspection by Employer the Contractor shall offer for inspection to Engineer, the completely created plant/ part of plant on which tests are to be carried out. After such inspection by Engineer, each equipment / sub system shall be tested by the contractor in accordance with the applicable standards in the presence of Engineer. Such tests shall include but not be limited to the tests specified in following clauses.

1.1.16. Pre-commissioning Trials, Tests Of Electrical Equipments.

1.1.16.1 Start Up:

On completion of erection of the equipment and before start-up, each item of the equipment shall be thoroughly cleaned and then inspected jointly by the Engineer and the Contractor for correctness,

completeness of installation and acceptability for start-up, leading to initial pre-commissioning tests at site. The list of pre-commissioning tests to be performed shall be as mutually agreed by the Engineer and Contractor.

1.1.16.2 Initial Operation (Initial Run)

After the pre-commissioning tests are satisfactorily over, the complete plant shall be placed on Initial Operation during which period the complete equipment shall be operated integral with sub-systems and supporting equipments as a complete plant and necessary adjustments made while operating over the full load range enabling the plant to be made ready or commissioning. The period of Initial Operation shall be as mutually agreed by the Engineer and the Contractor.An Initial Operation report comprising of observations and recordings of various parameters to be measured in respect of the above Initial operation shall be prepared by the Contractor. This report, besides recording the details of the various observations during Initial Operation shall also include the dates of start and finish of the Initial Operation and shall be signed by the representatives of both the parties. The report shall have sheets, recording all the details of interruptions occurred, adjustments made and any minor repairs done during the Initial Operation. Based on the observations, necessary modifications repairs to the plant shall be carried out by the Contractor to the full satisfaction of the Engineer to enable to latter to accord permission to carry out the commissioning the conduct. Performance and Guarantee Tests on the Plant. However, minor defects which do not endanger the safe operation of the equipment shall not be considered as reasons for withholding the aforesaid permission.The cost of all labour, energy and consumables other than water required for Pre-commissioning, Initial Operation shall be borne by the Contractor. Water required for running the plant will be supplied free by the Employer.

1.1.17. Commissioning:

The plant shall then be commissioned and put on Trial Operation at full load when Performance Guarantee Tests shall be conducted.

During the period of trial operation the Contractor shall

i). Operate the full works on behalf of the Employer.

ii). Supply the labour and materials including consumable required for the operation and maintenance of the works and bear the cost of electrical energy.

iii). Instruct the Employer's operators in the operation and maintenance of the work; a programme shall be submitted by the Contractor for the training of operators, both supervisory and subordinate levels. This program shall be submitted to the Engineer three

months before the scheduled start of commissioning. The training of the employer's staff shall be carried out with reference to the operation and maintenance manual furnished by the Contractor.

iv). Carry out maintenance repairs of defects immediately.

v). During the period of trial operation of working hours of the Contractors shall be 24 hours daily, 7 days week.

The Contractor shall provide for the expenditure on all the consumables any energy required during the trial operation. All labour and cost of any other materials shall also be met fully by the Contractor. Water for operating the Plant will be supplied free by the Employer.The Trail Operation shall be considered successful, provided that each item of the equipment can operate continuously at the specified characteristics, for the period of Trial Operation and the Performance Guarantees are successfully met.Any special equipment, tools and tackles required for the successful completion of the Performance and Guarantee Tests shall be provided by the Contractor free of cost.The guaranteed performance figures of the equipments shall be provided by the Contractor during the Performance and Guarantee tests. Should the results of these tests show any decrease from the guaranteed values, the Contractor shall modify the equipments as required to enable them to meet the guarantees? In such case, Performance and Guarantee Tests shall be repeated within one month from the date the equipment is ready for re-test and costs for modifications including labour, materials and the cost of additional testing to prove that the equipment meets the guarantees, shall be borne by the Contractor.Performance and Guarantee Tests shall make allowance for instrumentation errors as may be.

1.1.18. Completion

a) The Works will be certified as virtually completed by the Empolyer only after it has successfully completed trial operation for a continuous period of three months.

b) A Virtual Completion Certificate for plant shall not be issued unless the following documentation are dully compiled and submitted in final formats in duly bound volumes.

i) A Completion of all shop inspection results/ reports of the plant/machinery with due attestation that the plants have been manufactured to specified standards (6 copies)

ii) All erection/construction quality control checks in appropriate approved formats for installation works with attestation that installation has been carried out as per acceptable / stipulated standards (6 copies)

1.2 Start Up and Performance Run

1.2.1 Tests on Completion:

1.2.1.1 General

Prior to the commencement of Tests on Completion the Contractor shall submit the following:

- Site Acceptance Test Documents
- As built drawings
- Operation & Maintenance Manuals

Test on completion shall not be commenced until the aforementioned documents are approved.

The initial charges necessary for Tests on Completion shall be provided by the contractor. Electricity required for Tests on Completion will be provided by Empolyer free of charge for a period not exceeding 30 days. In case the test on completion period exceeds 30 days, the cost of power till start of performance run shall be borne by the contractor. The cost of any consumables and chemicals required for the tests on shall be borne by the contractor.

1.2.1.2 Dry Test Requirements

1.2.1.2.1 General

As a minimum requirement, the following dry tests shall be carried out as a general requirement:

- A general inspection to check for correct assembly and quality of workmanship
- A check on adequacy and security of Plant fixing arrangements
- A general check to ensure that all covers, access ladders, water-proofing, guard railings etc. are in place,
- A check on damp proofing, rust proofing and vermin proofing and particularly the sealing of aperture between building structure, chambers, etc. and the outside.

1.2.1.2.2 Civil and Building Works

As a minimum requirement the following dry tests shall be carried out on the civil engineering and building works:

- Check for the presence of foreign bodies in pipe work and structures.

1.2.1.2.3 Mechanical Works

As a minimum requirement the following dry tests shall be carried out on the mechanical systems:

- Carry out preliminary running checks as far is permitted by circumstances in order to ensure

smooth operation of Plant.

1.2.1.2.4 Electrical Works

As a minimum requirement the following dry tests shall be carried out on the electrical systems:

- Check phasing and polarity
- Carry out point to point check on all cables
- Check on security of cable terminations
- Check on completeness and adequacy of earthing systems;
- Check setting on protection relays, sizes of fuses and motor overload
- Carry out checks on cabling systems in accordance with the requirements the relevant standards
- Check operation of main circuit breakers by secondary injection methods
- Check rotational direction of drives.
- Check instrument loop integrity, functionality and calibration;
- Check operation of standby generator installation and mains/generator changeover procedures; a 4 hrs load test (using the normal load| Works) shall be carried out on the generator when the load is available
- Check plant functionality

1.2.1.3 Process Plants/Equipments

All process plant items/equipments shall be tested to ensure that they meet the Employer's Requirements for quality of workmanship, construction and performance.

1.2.1.4 Hydraulic Wet Test Requirement

Hydraulic wet tests shall be carried out on completion of dry tests.Potable water shall be used for hydraulic wet tests. The purposes of the 1 to prove as far as is practical the hydraulic performance of the Works. In order to demonstrate this Contractor shall ensure that each part of the Works is hydraulically loaded to its maximum rated load throughout for a period of at least seven days at twenty-four hours intervals.In order to ensure a sufficient supply of potable water to carry out these the Contractor shall provide facilities for the disposal off site in an approved manner.In order to remove doubt the following tests inter-alia shall be carried out.

- Pressure testing of all piped systems laid direct in ground in accordance to the relevant standards;

- Fill all structures and check for leaks as per IS: 3370;
- Running of all pumped systems in order to check for
- Correct functionality
- Absence of leaks
- Correct running temperatures
- Smoothness of running and the absence of undue vibration or stress
- Check drive running currents
- Carry out calibration of instruments where appropriate
- Carry out valving, diversion etc. to fully hydraulically load each element (or where there is a requirement to withstand an over overload each process element;
- Demonstrate correct functionality of electrical, control and instrumentation systems.The Contractor shall simulate where practical the conditions that will when operating as a process in order to demonstrate the correct functions process control loop etc.During these tests a check on the performance of Plant shall be made, as far as site facilities will allow, to compare its site performance with the factory test data and to identify and constraints on performance due to site conditions.

1.2.1.5 Process Wet Test

On approval by the Empolyer the Contractor shall carry out process wet tests.Raw water shall be used as the primary feed stock for process wet tests. These tests shall be carried out to demonstrate the process performance of the Works. In order to demonstrate this, the Contractor shall ensure that each part of the Works is located to its rated throughput (including a period of overload if required in order to demonstrate compliance with the Employer's Requirements) for continuous stable operating period of not less than 48 hours.The Contractor shall provide facilities for the disposal off site in an approved manner.

The following tests inter alia shall be carried out;

- Check and rectify leakage on civil structures, pumps and pipe work;
- Running of all pumped systems in order to check for;
- Correct functionality,
- Absence of leaks,
- Correct running temperatures,
- Smoothness of running and the absence of undue vibration or stress,
- Check drive running currents where the solution pumped is different from that pumped

during hydraulic wet tests;

- Carry out calibration of instruments;
- Carry out valving, diversion etc to fully hydraulically load each process element (or where there is a requirement to withstand an over load), overload each process element;
- Demonstrate correct functionality of electrical, control and instrumentation systems not checked during dry or hydraulic wet tests or which may have changed as a result of the different operating conditions now prevailing.On completion of process wet test on the various parts of the works the Contractor shall run the plant as a whole in order to demonstrate the full functionality and performance of the Works at various throughput rates for a continuous period of not less than 7 days. This shall be considered as completion of Test on Completion' and shall be certified by Empolyer.

1.2.2 Performance Run After Start Up

1.2.2.1 General

On successful completion of 'Test on Completion' i.e. start up and commissioning, certified by Empolyer, Contractor should start the performance run of the plant for 1 month.During performance run period, the Contractor shall provide following as minimum for round the clock operation.

DESCRIPTION OF STAFFING

Sr. Personnel	No.	Total Experience	Main Task of the Personnel
1 Plant In Charge (BE Civil/Environment)	1	5 years	Coordination of activities for satisfactory performance of the STP & pumping station and reporting to the Engineer-in-charge and responsible for the proper functioning & maintenance, data collection of STP & pumping station.
2 Operators (Diploma, ITI Qualified)	6	3 years	Responsible for overall operation for STP and pumping station.
4 Electrician (ITI Qualified)	1	3 years	Responsible for maintenance of electrical equipment.
5 Fitter (Mech.) (Diploma, ITI Qualified)	1	3 years	Responsible for maintenance of mechanical equipment.
6 Helpers	6	1 years	Responsible for keeping the STP premises clean and neat. Also they will assist operators in day to day activities.
6 Security Guards	4	1 year	To protect the plant from the trespassers, animals etc.
7 Gardener	1	5 years	To maintain the garden/landscaping of the plant
8 Sweeper	1	5 years	Assisting in day to day activities in office, keeping office clean & neat.

Spares: As required for replacement during performance run period. The spares used from the spare supplied under the contract shall be rep the Contractor.Empolyer shall supply power and water during Performance Run period free of cost. All other material such as chemicals, consumables, lubricants, tools & plant spares etc. shall be provided by the contractor. The contractor, if required shall provide activated sludge or any other material for the stabilisation of the plant.

The Contractor shall provide operators for various units/plants for three shifts and other staff/supporting personnel in general shift.The Contractor shall submit a weekly report to the Employer, about the operation and maintenance indicating the manpower, electric power, chemicals consumables consumed and also problems faced and rectified.During this period, the Contractor shall ensure that the design treated quality standards are met in accordance with the specification within the rate of power and chemical consumption as committed by the Contractor. The treated sewage analysis pH, SS, BOD and oil & grease shall be carried out on daily basis from the day of commissioning at a reputed laboratory as approved by Engineer-in-Charge. 90% of the treated sewage samples should fall within prescribed limits of the treated sewage. The sampling location for raw shall be at raw sewage sump and that of treated sewage shall be at chlorine contact tank.

The analysis of sewage for the above parameters at different locations outlet of SBR Process basin shall also be carried out on weekly basis Contractor shall take immediate steps to correct the operation of the meet the guaranteed performance. The charges for analysis at the laboratory to be borne by the Contractor.

The Contractor's responsibility includes the safety and security works/plants during the course of performance run of three month.

1.2.3 Performance Run Certificate

The conditions for issuance of a Performance Run Certificate as detailed in the Conditions of Contract shall comprise:

- The completion of the three months operation and maintenance under performance run of the treatment plant to the satisfaction of Employer.
- 90% of treated sewage samples fall within the prescribed limits of the treated sewage mentioned in the tender-document
- The Operation & Maintenance Manual have been updated following three month's operational experience and approved by Employer.
- All defects during the three months operation of the works have been rectified.

Empolyer shall issue a Completion Certificate for "Performance Run of Plant" after successful completion of Performance Run of plant for 90 consecutive days by contractor to the satisfaction of Empolyer.

TECHNICAL SCHEDULES

The schedule formats given on following pages for technical details of the bidders are to be necessarily filled in by the bidders. Bidder must fill these schedules.

However, the bidder, should feel that the formats or items are not sufficient to cover all types of plant, machinery, automation system etc. that are to be provided by him he is free to provide additional formats for the other items. Those formats however must provide all technical details of items supplied, to enable the employer to scrutinize the adequacy or functionality of these items in the plan. However, no financial data or cost is to be indicated in the Technical Proposal as the same are to be indicated in a separate commercial bid.

SCHEDULE – I

DEVIATIONS FROM TECHNICAL SPECIFICATIONS

NIL

We undertake that our bid is strictly as per the technical specifications, where given in the bid document.

SCHEDULE – II

DEVIATIONS FROM CONDITIONS OF CONTRACT

NIL

We undertake that our bid is strictly as per the conditions and requirements of the bid documents.

SCHEDULE – III

DESCRIPTION OF WORK

The bidder shall submit a detailed Description of Work i.e. Technical Write-up, Process & Instrumentation Diagram, Layout, Hydraulic Flow Diagram, Electrical Load List, Power Consumption & Chemical Consumption etc.

SCHEDULE –IV

SEWAGE TREATMENT PLANT - OPERATING DETAILS

SL NO	ITEM	UNIT	VALUE
I.	**Electrical Loads for Raw Sewage Pumping Station**		
1	Total connected load	KVA	
2	Maximum running load	KW	
3	Average running load	KW	
4	Average power factor		
5	Daily average power requirement	KWH/day	
6	Annual average power requirement	KWH/year	
II.	**Electrical Loads STP**		
1	Total connected load	KVA	
2	Maximum running load	KW	
3	Average running load	KW	
4	Average power factor		
5	Daily average power requirement	KWH/day	
6	Annual average power requirement	KWH/year	

SL NO	ITEM	UNIT	VALUE
V.	**Chemical Usage**		
1	Average dose for Chlorine	mg/l	
	Maximum dose for Chlorine	mg/l	
2	Average dose for Dewatering Polyelectrolyte	mg/l	
	Maximum dose for Dewatering Polyelectrolyte	mg/l	

SCHEDULE - V

FUNCTIONAL GUARANTEES

1. **General**

This schedule sets out the functional guarantees required for the calculation of Liquidated Damages for failing O&M performance guarantees.

The Bidder shall provide values of electrical energy and chemical usage for the quantity and quality of raw sewage given in the technical specifications.

2. **Functional Guarantees**

The contractor's guarantee for the performance in the O&M period to be as follows:

2.1 **Quality of Treated Effluent**

The quality of treated effluent shall be as follows:
As specified in **"Volume – I - Scope of Work"**.

2.2 **Electrical Energy Usage**

Power requirement of Raw Sewage Pumping Station	Not more than .....Units per month.
Power requirement of STP	Not more than .....Units per month.

SCHEDULE –VI

FORMAT FOR ELECTRICAL LOAD LIST & POWER CONSUMPTION

Sr. No.	Description of Equipment	Motor Rating KW	W	S	T	BKW	Operating Hrs. Hrs./day	Power Consumption (Kw.Hrs./day)
1	Mechanical Coarse Screen							
2	Raw Sewage Transfer Pumps							
3	Mechanical Fine Screen							
4	**Detritus**							
	a. Scraper Mechanism							
	b. Classifier Mechanism							
	c. Organic Return Pumps							
5	Decanters							
6	SBR Air Blowers							
7	RAS Pumps							
8	SAS Pumps							
9	**Chlorination Tank**							
	a. Water Booster Pumps							
	b. NaOH Recirculation Pump							
	c. Air Blower							
10	Sludge Sump Mixers							
11	Centrifuge Feed Pumps							
12	Centrifuge							
13	Agitators for DWPE Dosing Tanks							
14	Dewatering Polymer Dosing Pumps							
15	Service Water Pumps							
16	Auto Valves/Sluice Gates							

17	Plant Area Lighting							
	TOTAL							
	ADD LINE LOSSES & 5% OF ABOVE							
	GRAND TOTAL							

ANNEXURE-1

TECHNOLOGY TIE UP AGREEMENT

(To be made on Rs. 100 stamp paper and notarized to be submitted along with Technical Bid)

This Technology Tie-up Agreement is entered into on …… (Date) by and between …… (Bidder) (Hereinafter referred as **'XXX'**), a company incorporated under the Companies Act 1956 with a Registered Office at ……

……

AND

M/s …… (Technology Provider) (Hereinafter referred as **'YYY'**), a company incorporated under the Companies Act 1956 with a Registered Office at ……

……

WITNESSETH

WHEREAS **'XXX'** is in the business of turnkey execution of Water and Sewage / Wastewater Treatment Plants.

WHEREAS **'YYY'** is in the business of Design, Engineering and Supply of Components for Cyclic Activated Sludge / Sequential batch Reactor (SBR) Technology for Sewage / Wastewater Treatment Plants.

WHEREAS The Commissioner, EMPLOYER (Hereinafter referred as **'EMPLOYER'**) has invited sealed tenders on prescribed proforma from reputed and experienced agencies on turnkey basis for "**……(insert name of work)"**

This Tie-up Agreement is executed specifically for the above mentioned work and cannot be used for any other Works/ Project and this tie-up Agreement does not apply or constitute a Joint Venture.

AND

'XXX' is submitting its bid as lead partner and **'XXX'** has decided to enter into an exclusive Tie-up Agreement with **'YYY'** to engage them exclusively as Technology Provider for the biological treatment section using Cyclic Activated Sludge / SBR Technology as a part of the above mentioned Work for which tenders are invited by **'EMPLOYER'**.

Now, therefore both the parties hereto agree as follows:

1. **'XXX'** is submitting its bid only and exclusively with **'YYY'**.
2. **'YYY'** will be the Technology Provider to **'XXX'** for the Cyclic Activated Sludge / Sequential batch Reactor (SBR) Technology to be used for in the biological treatment section of the STP.

3. **'YYY'** shall provide following Services and Equipments to **'XXX'**:

a. Basic Engineering for the Cyclic Activated Sludge / Sequential batch Reactor (SBR) Technology.

b. Supply of all Equipments and Instruments as part of the Cyclic Activated Sludge / Sequential batch Reactor (SBR) Technology along with back-up guarantee for performance as per the tender requirement. Back-up guarantee for performance shall be applicable and valid only in case all design and documents for the complete STP is in accordance with **'YYY'** design guidelines and all documents and drawings are reviewed, stamped and signed by **'YYY'**.

c. Shall provide supervision assistance during erection, commissioning, performance testing and trial runs of the STP on Cyclic Activated Sludge / Sequential batch Reactor (SBR) Technology.

d. Shall provide supervision assistance during O & M period of the STP for the Cyclic Activated Sludge / Sequential batch Reactor (SBR) Technology Units of the STP if required on a chargeable basis.

4. **'XXX'** will be the main contractor and the authority to sign the agreement with **'EMPLOYER'** and accept responsibility and obligation for the Works will rest with main contractor and shall be responsible to the client viz. **'EMPLOYER'**. **'YYY'**, in turn, shall be responsible and liable to **'XXX'** for their scope of work. Further **'XXX'** shall furnish bank guarantees for due Security, Performance and O&M and all other such obligations under the Project as a whole.
5. **'YYY'** shall provide and commit such resources as are necessary to perform their scope of work for the successful completion of the Project. **'YYY'** shall also attend all review meetings over the Project as and when called for by **'EMPLOYER'** till the completion of the Project.
6. **'XXX'** shall make all payments due to **'YYY'** or to their accredited representative as per their Offer.
7. Each Party hereto in relation with the other is solely responsible and liable for their respective scope of work, to be mutually agreed between the Parties and incorporated in a detailed Agreement / Purchase Order to be entered into between the Parties before start of work for

the above mentioned Work. Such detailed Agreement / Purchase Order shall deal with technical and financial aspects of the Project.

8. Each Party agrees to and undertakes to indemnify and hold harmless the other Party against any liability, loss, cost, damages or expenses sustained as a result of negligent or improper performance or disturbance caused by itself or by any of its sub-contractors, suppliers or associates in connection with its share of Works as per the Contract. If any third party enforces any claim, which is attributable to the scope of work of a certain party, that Party shall settle such claims. The Parties agree to indemnify each other against all claims made by any third party in respect of any infringements of any rights protected by patents, designs or copyrights or trademarks employed in the Project by any Party.

9. In the course of working as associates, **'XXX'** / **'YYY'** will be sharing information with each other which may be proprietary /confidential information / knowledge acquired by each other. It is hereby agreed that both the parties will maintain complete secrecy regarding such information / knowledge and will not divulge to any party for any other purpose except for the success of the joint execution of the contract.

10. Disputes if any arising in connection with this agreement shall, at the first place, be referred and settled mutually and amicably between the Parties herein through their respective senior executive without making reference to the arbitration. In the extreme unlikely case, where no reconciliation is reached within sixty (60) days from reference for the dispute to the other party by the dispute raising party, such dispute shall be settled by arbitration in accordance with the provisions of the Arbitration & Conciliation Act, 1996 and/or any statutory amendments thereto. The number of arbitrators shall be three. Each Party shall nominate their respective arbitrators and both the nominated arbitrators shall appoint the third arbitrator who shall act as the Presiding arbitrator. The venue of arbitration shall be **.....(location of employer)** and the language used shall be English. The arbitral award shall be final and binding upon the Parties. Neither Party shall be released from its obligations to comply with any of the provisions of this Agreement, the contract and the detailed agreement as a result of reference of disputes to arbitration or during the course of arbitral proceeding.

11. This Tie-up Agreement shall be effective from the date as mentioned in the first page of the Tie-up Agreement and shall remain valid till the project completion and shall terminate on the happening of any of the following:

a. The bid submitted by **'XXX'** is rejected or **'XXX'** is unsuccessful in the bid.

b. The Contract for the Works has been awarded to other Third Parties.

c. The client notifies the Parties that they will not proceed with the Project.

d. Any of the Parties to the Agreement is declared insolvent by a Court of Competent Jurisdiction.

12. This Tie-up Agreement shall be subject to the laws in India and shall be subject to the jurisdiction of the court at **……..(location of employer)**.

13. For the sake of correspondence, following Addresses and the Persons concerned are to be contacted:

'XXX'	**'YYY'**
Address:	Address:
Tel No. :	Tel No.:
Fax No. :	Fax No.:
Contact Person:	Contact Person:
Designation:	Designation:

For **'XXX'** For **'YYY'**

(Authorized Signatory) (Authorized Signatory)

Name: Name:

Designation: Designation:

SITE FORMATS

FORM WORK CHECK LIST

Name of Project :
Client :
Contractor : Inspection Required on :
Name of Building:
Concrete Element & Location : Date :__/__/__ Time:__-__
Approved Drawing No. : Inspection Request No. :
Y=Yes, N=No and Na= Not Applicable. Date :__/__/__ Time :__-__

Sr. No.	Name of Activities	Contractor's Engineer	Engineer In-charge
1	Formwork design/ drawing/ sketch approved including de-shuttering arrangements.		
2	Trial panel approved (if required)		
3	Formwork alignment correct		
4	Formwork level correct		
5	Formwork dimensions correct		
6	Formwork member quality acceptable.		
7	False work member sizes correct		
8	Face boarding/ plywood/ metal thickness correct		
9	Joints between panels closed (no gaps)		
10	Joints between panels flush (no steps/ lips)		
11	Panel flatness acceptable		
12	Tie rod material sizes/ spacing/ material correct		
13	Tie rods tight, face cone flush		
14	Box outs, cast -in –items, ducts fixed correctly, securely		
15	Chamfers/ fillets sizes, straightness, fixing acceptable.		
16	Formwork clean		
17	Formwork release oil material approved		
18	Formwork release oil applied correctly		
19	Contraction / expansion joint preparation satisfactory		
20	Shutter vibrators (if required) location and fixing arrangements approved.		

INSPECTED BY: APPROVED BY:
(Contractor's Engineer) (**Engineer In-charge**)

Name: Name:
Sig. & Date Sig. & Date

SLUMP TEST REGISTER

Name of Project :
Client :
Contractor :

Sr. No.	Date/ Time	Mix/Grade of Concrete	Location of Concrete Pouring	Slump in mm	Contractor's Engineers Sign.	Engineer-In-Charge

BRICK TESTING REGISTER
(DIMENSIONAL TOLERANCE)

Name of Project :
Client :
Contractor : Date of Test:

1. Dimensions of Brick Make:……
Limits as per CPWD specifications for Class 10

Length of 20 bricks Length :
Width of 20 bricks Width :
Height of 20 bricks Ht./ thickness :

INSPECTED BY: APPROVED BY:

(Contractor's Engineer) (**Engineer In-charge)**

DAILY PROGRESS REPORT

Name of Project : ……
Client : M/s ……,
Contractor : M/s ……,
Name of Unit : …… Date: __/__/__

S.NO.	ITEM DESCIPTION	UNIT	PREVIOUS QTY.	WORK DONE	CUM. QTY.	REMARKS
1	Excavation					
2	Anti Termite Treatment					
a)	Footing					
3	PCC					
a)	Footing					
4	RCC					
a)	Footing					
b)	Pedestals					
c)	Columns					
d)	Plinth					
e)	Walls					
5	RCC M-30					
a)	Pedestals					
b)	Column					
6	Shuttering					
7	Reinforcement					
8	Water proofing					
9	Brick work in foundation					
a)	Brick work in plinth					
b)	Brick work in SS					
10	Plastering					
11	Flooring					
a)	Mosaic					
b)	Kota stone					
c)	CC flooring					
d)	Granite					
12	External Finish					
13	Painting					
14	Doors & windows					
a)	Aluminium					
b)	Steel					

Labour deployed

MASON **CARPENTER** **FITTER** **HELPER**

Contractor No. of correction Public Health Engineer

BAR BENDING SCHEDULE

Name of Project : ……
Client : M/s ……,
Contractor : M/s ……,
Name of Unit : …… Date: __/__/__
DRG. NO. : ……

MEMBER	BAR NO.	DIA OF BARS	NO. PER MEMBER	NO. OF MEMBER	TOTAL NO. OF BARS	CUTTING LENGTH	TOTAL LENGTH	SHAPES

Calculated by **Checked By**

Contractor No. of correction Public Health Engineer

CONCRETE POUR CARD

Name of Project :
Client :
Contractor :
Name of Building :
Concrete Element & Location:
Approved Drawing No. :

Inspection Required on :

Date :__/__/__ Time:__-__

Inspection Request No. :

Y=Yes, N=No and Na= Not Applicable.

Date: __/__/__ Time: __-__

No.	Name of Activities	Contractor's Engineer	Engineer in charge
1	Method statement approved		
2	Batching Plant/ mixers in working order		
3	Standby Batcher in working order.		
4	Water, coarse aggregates, cement, sand, admixture approved.		
5	Water, coarse aggregate, cement, sand, admixture stock sufficient.		
6	Concrete conveying arrangement available in working condition.		
7	Formwork approved		
8	Reinforcement approved		
9	Concrete gang present: including carpenter, steel fixer, mechanics and electricians.		
10	Access provided		
11	Safety arrangements sufficient		
12	Lighting provided		
13	Communication between various points provided.		
14	Arrangements for arranging suspension stoppage of concrete provided.		
15	Curing arrangements made		
16	Laboratory notified.		

INSPECTED BY:
(Contractor's Engineer)

APPROVED BY:
(**Engineer In-charge**)

Name:
Sig. & Date

Name:
Sig. & Date

REINFORCEMENT INSPECTION CHECK LIST

Name of Project :
Client :
Contractor :
Name of Building:
Concrete Element & Location:
Approved Drawing No. :

Inspection Required on :

Date :__/__/__ Time:__-__

Inspection Request No. :

Y=Yes, N=No and Na= Not Applicable.

Date: __/__/__ Time: __-__

S.NO.	Name of Activities	Contractor's Engineer	Engineer In-charge
1	Working drawings checked and approved		
2	Location revision being used		
3	Bar schedules approved		
4	Reinforcement steel material approved		
5	Bar bending and cutting satisfactory		
6	All corroded bars rejected		
7	Bar sizes correct		
8	Bar spacing correct		
9	Bar lap lengths correct		
10	Bar laps at correct locations		
11	Bar ties as specified and pre-coated binding wire used.		
12	Bar assembly rigid and adequately supported.		
13	All bars crossing tied up with binding wire		
14	Cover to bottom bars correct		
15	Cover to top bars correct		
16	Cover to side bars correct.		
17	Cover blocks approved including fixing		
18	Only approved cover blocks used.		
19	Quality & size of Binding wire approved.		

INSPECTED BY: APPROVED BY:
(Contractor's Engineer) (**Engineer In-charge**)

Name: Name:
Sig. & Date Sig. & Date

POST CONCRETE CHECK LIST

Name of Project :
Client :
Contractor :
Name of Building:
Concrete Element & Location :
Approved Drawing No. :

Inspection Required on :

Date :__/__/__ Time:__-__

Inspection Request No. :

Y=Yes, N=No and Na= Not Applicable.

Date :__/__/__ Time :__-__

S. NO.	Name of the Activities	Contractor's Engineer	Engineer in charge
1	Concrete started on		
2	Concrete completed on		
3	Curing satisfactory		
4	Cube strength		
5	Concrete surface condition		
6	Any repairing required		
	Remarks for Rectification by ENGINEER-IN-CHARGE Concrete Quality Acceptable : Yes/ No		

INSPECTED BY:
(Contractor's Engineer)

APPROVED BY:
(**Engineer In-charge**)

Name:
Sig. & Date

Name:
Sig. Date

DRAWINGS