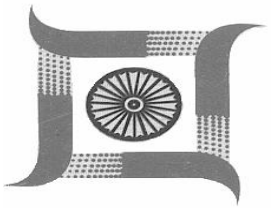
GOVT. OF JHARKHAND
DRINKING WATER & SANITATION DEPARTMENT



TECHNICAL BID DOCUMENT

VOLUME- I, II, IV & V

PART-I

1 **Name of the Work** :- ----------

2	Estimated Cost	:-	Rs. **----------** Lakh
3	Time of Completion	:-	--- Months + -- months (trial and run)
4	Date of publication of Tender on Web site	:-	---.---.--- at ---.--- PM
5	Date of pre bid meeting	:-	---.---.--- / ---.--- PM
6	Last date /Time for receipt of Bid	:-	---.---.--- / ---.--- PM
7	Last date /Time for submission of original copies of Cost of Bidding document & Bid security etc.	:-	---.---.--- / ---.--- PM
8	Date of opening of Tender	:-	---.---.--- / ---.--- PM
9	Name & address of office inviting tender		

Executive Engineer,
Drinking Water & Sanitation
Division ----------

10 Contact no of Procurement office :-
11 Helpline no of e-procurement cell

Further details can be seen on website **http://jharkhandtenders.gov.in**

STANDARD BIDDING DOCUMENT

JHARKHAND

PROCUREMENT OF

CIVIL WORKS

COMPLETE BIDDING DOCUMENT

INVITATION FOR BID
(IFB)

GOVERNMENT OF JHARKHAND
DRINKING WATER AND SANITATION DEPARTMENT
INVITATION FOR BIDS (IFB)

NATIONAL COMPETITIVE BIDDING

e -Tender Reference no- …… Dated:- …….

The undersigned, on behalf of the Government of Jharkhand, invites bids for the work mentioned in table below through e-Procurement from eligible and approved Contractors, registered in appropriate class with Drinking Water & Sanitation Department, Government of Jharkhand ,Central Govt. / State Govt. or any PSU or any agency of International or National repute may participate in the bid but registration with Drinking Water & Sanitation Department, Government of Jharkhand will be essential within a period of two months from date of award after issue of Letter of Acceptance. The bid shall be submitted online in the Website https://jharkhandtenders.gov.in.The bidder(s) should have necessary portal enrolment with their own Digital Signature Certificate:

Sl no	Name of the work	Approximate value of work (Rs in Lakhs)	Bid Security (Rs. in Lakhs)	Cost of Tender Paper(Rs)	Class of Contractor eligibility	Time of Completion	Name of the concern Office
1	2	3	4	5	6	7	8
1	----------	**----------**	**---------**	**----------**	**1S (Unlimited)**	**------- Month +------ month (trial and run)**	**Drinking Water & Sanitation Division --- ----------**

Note – Updated estimated cost and earnest money should be taken as mentioned in the website.

2. Period of availability of tenders online/ date & time of bidding online / last date of seeking clarification / date of opening of tender papers are as given below.

Sl no	Procurement officer	Place of opening	Availability of tender online (date & time)		Date & time of opening of technical bid
			From	To	
1	2	3	4	5	7
1	Executive Engineer, Drinking Water & Sanitation, Division ----------.	E E DW&S, Division ----------.	**……../ ---.--- PM**	**……/ ---.--- PM**	**……/ ---.--- PM**

3. Cost of Bidding document for a non refundable fee as indicated shall be in the form of demand draft of any scheduled Bank payable at **---------- in favour of Executive Engineer, Drinking Water & Sanitation Division ----------.**

4. Bids must be accompanied by scanned copy of security amount specified for the work in the table, payable at **----------** and drawn in favour of **Executive Engineer, D.W. & S. Division Division ----------**, Bid security will have to be in anyone of the forms as specified in the bidding document and shall have to be valid for 45 days beyond the validity of the bid.

5. Original of Cost of Bidding document, additional cost & Bid security shall be deposited in the office of the **Executive Engineer Drinking Water & Sanitation. Division ----------** in all working days between **……. / ---.--- A.M. to …….. upto ---.--- P.M** either by registered post / speed post or by hand. Only those applications will be entertained whose cost of Bidding documents, bid security is received before **…… upto ---.--- P.M.** The Executive Engineer, **D.W. & S. Division Division ----------** will not be held responsible for postal delay, if any, in the delivery of the document or non receipt of the same. Apart from office of Executive Engineer, the said documents can also be submitted in the office of concerned Superintending Engineer, Drinking Water & Sanitation Circle or concerned office of Regional Chief Engineer, Drinking Water & Sanitation Department.

6. A pre-bid meeting will be held on **…….. at ---.--- PM** at the office of **---------- ----------** to clarify the issues and to answer questions on any matter that may be raised at that stage as stated in Clause 9.2 of 'Instructions to Bidders' of the bidding document.**

7. Scanned copy of GST registration certificate, Ucan registration certificate, PAN card, & Letter of Registration as contractor shall be uploaded by the tenderer or otherwise it may be rejected.

8. The work is to be completed in time, otherwise penalty for non –completion of work in time Shall be imposed as stated in Bid Document. Also provision of Bonus for early completion of work is there.

9. Bidders who have pending work in the department are not eligible to participate.

10. Bidders should provide their Banker's contact details for any references, if contacted by the Department.

11. If any work is awarded to a bidder after submission of bid , his bid capacity will be reduced by that amount-Para 1.4B of Qualification information (Section-2).

12. Other details can be seen in the bidding documents.

13. As per PWD Code Clause 163 (a) Tenders quoted below 10 (ten) % of the amount mentioned in Bill of Quantity shall be rejected.

Executive Engineer
Drinking Water & Sanitation
Division **----------**

Note: Bid Security will be a fixed sum rounded off to the nearest one thousand Rupees.

SECTION 1
INSTRUCTIONS TO BIDDERS
(ITB)

Section 1: Instructions to Bidders

Table of Clauses

A. GENERAL

1. Scope of Bid

1.1 The Employer (named in appendix to ITB) invites bids for the construction of works (as defined in these documents and referred to as "the works") detailed in the table given in IFB. The bidders may submit bids for any or all of the works detailed in the table given in IFB.

1.2. In Turn Key projects, indicative cost of the project will be given and bidders have to submit their bid amount with regard to survey, investigation, collection of design data, design and drawing, preparation of detail project report and approval of the above from competent authorities (State Government) for the entire projects and construction of the project according to approved design and drawing of Head works and Distribution system etc. (Complete Project).

1.3 The successful bidder will be expected to complete the works by the intended completion date specified in the Contract data.

1.4 Throughout these bidding documents, the terms 'bid' and 'tender' and their derivatives (bidder/ tenderer, bid/tender, bidding/tendering, etc.) are synonymous.

2. Source of Funds

The expenditure on this project will be met from the State Fund of Jharkhand.

3. Eligible Bidders

3.1. This invitation for Bids is open to all bidders as mentioned in IFB.

3.2. All bidders shall provide in Section 2, Forms of Bid and Qualification Information, a statement that the Bidder is neither associated, nor has been associated, directly or indirectly, with the Consultant or any other entity that has prepared the design, specifications and other documents for the Project or being proposed as Project Manager for the Contract. A firm that has been engaged by the Employer to provide consulting services for the preparation or supervision of the works, and any of its affiliates, shall not be eligible to bid.

4. **Qualification of the Bidder**

4.1. All bidders shall provide in Section 2, Forms of Bid and Qualification Information, a preliminary description of the proposed work method and schedule, including drawings and charts, as necessary. The proposed methodology should include programme of construction backed with equipment planning and deployment duly supported with broad calculations and quality assurance procedures proposed to be adopted justifying their capability of execution and completion of work as per technical specifications, within stipulated period of completion.

4.2* In the event that Pre-qualification of potential bidders has been undertaken, only bids from pre-qualified bidders will be considered for award of Contract. These qualified bidders should submit with their bids any information updating their original prequalification applications or alternatively, confirm in their bids that the originally submitted prequalification information remains essentially correct as of date of bid submission. The update or confirmation should be provided in section 2. A copy of the original prequalification application and the letter of prequalification should also be furnished. With the updated information, the bidder must continue to be qualified in accordance with the criteria laid down in the prequalification document. All bidders shall also furnish the following information in Section 2.

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* Delete, if Post-qualification is to be carried out.

(i) Evidence of access to or availability of credit facilities (minimum 10% of estimated cost) certified by the bankers.

(ii) Undertaking that bidder would be able to invest a minimum of cost upto 25% of the contract value of work, during implementation of contract.

(iii) Power of attorney.

4.3* If the Employer has not undertaken prequalification of potential bidders, all bidders shall include the following information and documents with their bids in Section 2:

(a) copies of original documents defining the constitution or legal status, place of registration, and principal place of business; written power of attorney of the signatory of the Bid to commit the Bidder;

(b) Total monetary value of construction work performed for each of the last five years.

(c) experience in works of a similar nature and size for each of the last five years, and details of works underway or contractually committed; and clients who may be contacted for further information on these contracts;

(d) major items of construction equipment proposed to carry out the Contract;

(e) qualifications and experience of key site management and technical personal proposed for Contract;

(f) reports on the financial standing of the Bidder, such as profit and loss statements and auditor's reports for the past five years;

(g) evidence of access to line (s) of credit and availability of other financial resources facilities (10% of contract value), certified by the Bankers(not more than 3 months old)

(h) Undertaking that the bidder will be able to invest a minimum amount up to 25% of contract Value exclusively for this work, during implementation.

(i) authority to seek references from the Bidder's bankers;

(j) information regarding any litigation, current or during the last five years, in which the Bidder is involved, the parties concerned, and disputed amount;

(k) Proposals for subcontracting components of the works amounting to more than 10 percent of the Bid Price(for each, the qualifications and experience of the identified sub-contractor in the relevant field should be annexed); and

(l) the proposed methodology and programme of construction, backed with equipment planning and deployment, duly supported with broad calculations and quality control procedures proposed to be adopted, justifying their capability of execution and completion of the work as per technical specifications within the stipulated period of completion as per milestones (for all contracts overRs.2.5 Crore).

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* Delete, if pre-qualification is to be carried out.

4.4 Bids from Joint ventures are acceptable.*

4.4.1 Joint Venture partners would be limited to three (including the lead partner)

4.4.2 One of the partners, who is responsible for performing a key in contract (lead partner of the JV) management or is executing a major component of the proposed contract, shall be nominated as being in charge during Bidding periods and in the event of successful Bid, during contract execution. The partner in charge shall be authorized to incur liabilities and receive instructions for and on behalf of the partner(s) of the Joint Venture. This authorization shall be evidenced by submitting a power of attorney signed by legally authorized signatories of all partners.

4.4.3 All the partners of Joint Ventures shall be, jointly and severally liable, during the Bidding process and for the execution of the contract in accordance with the contract terms, and a statement of this affect shall be included in the authorization. The Bid shall be signed so as to legally bind all the partners, jointly and separately. Bid security and performance guarantee, as required, will be furnished by the lead partner and Joint Venture partner(s) out of their accounts in proportion to their participation in Joint Venture.

4.4.4. Qualifying criteria for Joint Venture will be permitted for projects costing any amount Joint Venture must comply with the following requirements:-

(a) The Joint Venture must satisfy collectively the criteria for this purpose the following data of each member of the Joint Venture may be added together to meet the collective qualifying criteria.

(i) Annual Turn over (Cl. 4.5 (A) (a) of ITB)

(ii) Particular Construction Experience. (Cl. 4.5 (A) (b) of ITB)

(iii) Personal Capabilities. (Annexure II)

(iv) Equipment Capabilities. (Annexure I)

v) Financial Capabilities [Cl.4.3 (g) & Cl.4.3(h) of ITB]

(b) The Lead partner shall meet the following qualifying criteria in proportion to the partnership in JV but not less than 50%.

(i) Annual Turnover. (Cl. 4.5 (A) (a) of ITB)

(ii) Particular Construction Experience. (Cl. 4.5 (A) (b) of ITB)

(iii) Financial Capabilities. [Cl. 4.3 (g) & 4.3 (h) of ITB]

(c) Other partner shall meet the following qualifying criteria in proportion to the partnership in JV but not less than 25%.

(i) Annual Turnover. (Cl. 4.5 (A) (a) of ITB)

(ii) Particular Construction Experience. (Cl. 4.5 (A) (b) of ITB)

(iii) Financial Capabilities. [Cl. 4.3 (g) & 4.3 (h) of ITB]

4.4.5 A copy of the Joint Venture Agreement (JVA) entered into the between the partner shall be submitted with the application. Alternatively, a letter of Intent to execute a JVA in the event of successful Bid shall be signed by all partner(s) and submitted with the application together with a copy of the proposed agreement. The JVA shall include among other things a Joint Venture's objectives and proposed management structure, the contribution of each partner to the Joint Venture operation, the commitment of the partner to Joint Venture in the event of the default or withdrawal of any partner an arrangement for providing the required indemnities:

(i) Stepping into the shoes of the existing partner(s) of JV with all liabilities of the existing partners from the beginning of the contract.

(ii) With the prior approval of the employer.

(iii) Notwithstanding demarcation or allotment of work between two JV partner(s), JV shall be liable for non-performance of the whole contract irrespective of their demarcation or shared of work.

In case of successful Bid being accepted by employer the payments under the contract will only be made to the JV not to the individual partner(s).

4.4.6 Joint Venture Agreement shall contain a Clause to the effect that their shall be a separate JV Bank Account (distinct from the Bank Account of the individual partners) to which the individual partner shall contribute their share / or working capital.

Joint Venture Agreement shall also contain a Clause to the effect that the financial obligations of the JV shall be discharged through the said JV Bank Account only and also all the payments received or paid by the employer by the JV shall be through that Account alone.

4.5 **A. To qualify for award of the contract, each bidder in its name should have in the last five years as referred to in Appendix.**

(a) The contractor/ firm must have achieved a minimum annual financial turnover of **--------** Lakh (in all classes of Civil engineering construction works only) in any one year.

(b) The contractor/ firm must have satisfactorily completed (not less than 90% of contract value), as a prime contractor of value not less than at least:-

(i) For contract value up to 10 Crore:-

Similar* nature of work or sum total of the mini water supply schemes (with pipeline and ESR) amounting to 50% value of the bid amount in the last five financial year. (minimum annual financial turnover in all classes of civil engineering construction works shall not be less than the estimated cost of the project);

(ii) for contract value more than 10 crores:-

i) Three similar* works each of value not less than Rs…… (25% of estimated value of contract)or

ii) Two similar* works each of value not less than Rs……(30% of estimated value of contract) or

iii) One similar* work of value not less than Rs. …… (50% of estimated value of contract) in the last five years);

* Similar work means work with components mentioned in Para "C (ii or iii)" mostly.

(c) Executed in last five years, the minimum quantities of the following items of work as indicated in Appendix

(i) No component wise experience required for work value below 10 Crore.

(ii) For work value between 10 Cr to 50.00 cr.

Intake Well / WTP– 25%
ESR – 25%
Pipe line – 25%

(iii) For work value more than 50.00 cr.

Intake well – (25%)
WTP – (25%)
ESR – (50%)
Pipe line – (25%)

*(d) The contractor or his identified sub-contractor should possess required valid electrical license for executing the building electrification works and should have executed similar electrical works for a minimum amount as indicated in Appendix in any one year.

*(e) The contractor or his identified sub-contractor should possess required valid license for executing he water supply/sanitary engineering works and should have executed similar water supply/sanitary engineering works for a minimum amount as indicated in Appendix in any one year.

4.5. **B. Each bidder should further demonstrate**

(a) Availability (either owned or leased or by procurement against mobilization advances) of the following key and critical equipment for this work:

NOTE: (To be indicated for bids valued over Rs. 2.50 Crore) Based on the studies, carried out by the Engineer the minimum suggested Major equipment to attain the completion of works in accordance with the prescribed construction schedule are shown in the Annexure-I The

bidders should, however, undertake their own studies and furnish with their bid, a detailed construction planning and methodology supported with layout and necessary drawings and calculations (detailed) as stated in clause 4.3(C) above to allow the employer to review their proposals. The numbers, types and capacities of each plant/equipment shall be shown in the proposals along with the cycle time for each operation for the given production capacity to match the requirements.

(b) Availability for this work of personnel with adequate experience as required; as per **Annexure-II.**

(c) Liquid assets and/or availability of credit facilities of no less than amount indicated in Appendix (credit lines/letter of credit/certificates from Banks for meeting the funds requirements etc.- usually the equivalent of the estimated cash flow for 3 months in peak construction period.)

C. **To qualify for a package of contracts made up of this and other contracts for which bids are invited in the IFB,** the bidder must demonstrate having experience and resources sufficient to meet the aggregate of the qualifying criteria for the individual contracts.-

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* Delete, if not applicable.

4.6 Sub-contractors' experience and resources shall not be taken into account in determining the bidder's compliance with the qualifying criteria except to the extent stated in 4.5 (A) above.

4.7. Bidders who meet the minimum qualification criteria will be qualified only if their available bid capacity is more than the total bid value. The available bid capacity will be calculated as under assessed:

Available Bid capacity = (A*N*2-B) where

A = Maximum value of civil engineering works executed in any one year during the last five years (updated to the price level of the year indicated in Appendix) taking into account the completed as well as works in progress.

N = Number of years prescribed for completion of the works for which bids are invited.

B = Value (updated to the price level of the year indicated in Appendix) of existing commitments and on going works to be completed during the next **----** years (period of completion of the works for which bids are invited)

Note: The statements showing the value of existing commitments and on-going works as well as the stipulate period of completion remaining for each of the works listed should be countersigned by the engineer in charge, not below the rank of an Executive Engineer or equivalent.

Note: Assessment of Bid Capacity is given in Clarifications at the end of SBD.

4.8. Even though the bidders meet the above qualifying criteria, they are subject to be disqualified if they have:

- made misleading or false representations in the forms, statements and attachments in proof of the qualification requirements; and/or
- Record of poor performance such as abandoning the works, not properly completing the contract, inordinate delays in completion, litigation history, or financial failures etc.; and/or

- participated in the previous bidding for the same work and had quoted unreasonably bid prices **(too high or too Low)** and could not furnish rational justification to the employer.

5. **One Bid per Bidder**

5.1. Each bidder shall submit only one bid for one package. A bidder who submits or participates in more than one Bid (other than figuring as a subcontractor or in cases of alternatives that have

been permitted or requested) will cause all the proposals with the Bidder's participation to be disqualified.

6. **Cost of Bidding**

6.1 The bidder shall bear all costs associated with the preparation and submission of his Bid, and the Employer will in no case be responsible and liable for those costs.

7. **Site Visit**

7.1. The Bidder, at the Bidder's own responsibility and risk should visit and examine the Site of Works and its surroundings and obtain all information that may be necessary for preparing the Bid and entering into a contract for construction of the Works. The costs of visiting the Site shall be at the Bidder's own expense.

B. BIDDING DOCUMENTS

8. Content of Bidding Documents

8.1. The set of bidding documents comprises the documents listed below and addenda issued in accordance with Clause 10:

Section	Particulars	Volume No.
	Invitation for Bids	I
1	Instruction to Bidders	
2	Qualification Information, and other forms	
3	Conditions of contract	
4	Contract Data	
5	Technical Specifications	II
6	Form of bid	III
7	Bill of Quantities	
8	Securities and other forms	
9	Drawings ,if any	IV
10	Documents to be furnished by bidder	V

8.2. One copy of each of the volumes I, II, III and IV will be issued to the bidder. Documents to be furnished by the bidder in compliance to section 2 will be prepared by him and furnished as Volume- V in two parts (refer clause 12).

8.3. The bidder is expected to examine carefully all instructions, conditions of contract, contract data, forms, terms, technical specifications, bill of quantities, forms, Annexes and drawings in the Bid Document. Failure to comply with the requirements of Bid Documents shall be at the

bidder's own risk. Pursuant to clause 26 hereof, bids which are not substantially responsive to the requirements of the Bid Documents shall be rejected.

9. **Classification of Bidding Documents**

9.1.1 A prospective bidder requiring any clarification of the bidding documents may notify the Employer in writing or by cable (hereinafter "cable" includes telex and facsimile **& Email)** at the Employer's address indicated in the invitation to bid. The Employer will respond to any request for clarification which he received earlier than 15 days prior to the deadline for submission of bids. Copies of the Employer's response will be forwarded to all purchasers of the bidding documents, including a description of the enquiry but without identifying its source.

9.1.2 Bidding document is available on Internet on official website of Govt. of Jharkhand (www.jharkhandtenders.gov.in).It can be downloaded and submitted to the competent authority with the cost of document in the shape of cash or Demand draft as stated in IFB along with Bid Security money in time.

9.2 **Pre-bid meeting**

9.2.1. The bidder or his official representative is invited to attend a pre-bid meeting which will take place at the address, venue, time and date as indicated in appendix.

9.2.2. The purpose of the meeting will be to clarify issues and to answer questions on any matter that may be raised at that stage.

9.2.3. The bidder is requested to submit any questions in writing or by cable **(cable as defined in 9.1.1)** to reach the Employer not later than one week before the meeting.

9.2.4. Minutes of the meeting, including the text of the questions raised (without identifying the source of enquiry) and the responses given will be transmitted without delay to all purchasers of the bidding documents. Any modification of the bidding documents listed in sub-Clause 8.1 which may become necessary as a result of the pre-bid meeting shall be made by the Employer exclusively through the issue of an Addendum pursuant to Clause 10 and not through the minutes of the pre-bid meeting.

9.2.5. Non-attendance at the pre-bid meeting will not be a clause for disqualification of a bidder.

10. AMENDMENT OF BIDDING DOCUMENTS

10.1. Before the deadline for submission of bids, the Employer may modify the bidding documents by issuing addenda.

10.2. Any addendum thus issued shall be part of the bidding documents and shall be communicated in writing or by cable to all the purchasers of the bidding documents. Prospective bidders shall acknowledged receipt of each addendum in writing or by cable to the Employer. The Employer will assume no responsibility for postal delays.

10.3. To give prospective bidders reasonable time in which to take an addendum into account in preparing their bids, the Employer may, at his discretion, extend as necessary the deadline for submission of bids, in accordance with Sub-Clause 20.2 below.

C. PREPARATION OF BIDS

11. **Language of the Bid**

11.1. All documents relating to the bid shall be in the English language.

12. **Documents Comprising the Bid**

The bid to be submitted by:

12.1. The bidder as Volume V of the bid document (refer Clause 8.1.) shall be in two separate parts

Part I shall be named "Technical Bid" and shall comprise

(i) Bid security in the form specified in Section 8.

(ii) Qualification Information and supporting documents as specified in Section 2.

(iii) Certificates, undertaking, affidavits as specified in Section 2.

(iv) Any other information pursuant to Clause 4.2 of these instructions

(v) Undertakings that the bid shall remain valid for the period specified in Clause 15.1

Part II shall be named "Financial Bid" and shall comprise

(i) Form of Bid as specified in Section 6

(ii) Priced Bill of Quantities for items specified in section 7, each part will be separately sealed and marked in accordance with the Sealing and Marking Instructions in Clause 19.

12.2. The bidder shall submit bid online.

12.3. Following documents, which are not submitted with the bid, will be deemed to be part of the bid.

Section	Particulars	Volume No.
	Invitation for Bids(IFB)	Volume I
1	Instruction to Bidders	
2	Qualification Information, and other forms	
3	Conditions of Contract	
4	Contract Data	
5	Technical Specifications	Volume II
6	Drawings	Volume IV

13. Bid Prices

13.1. The contract shall be for the whole works as described in Sub-Clause 1.1. based on the priced Bill of Quantities submitted by the Bidder.

13.2. The bidder shall fill in rates in figures only as the rate in words will be generated automatically in the BOQ template. Items for which no rate or price is entered by the bidder will not be paid for by the Employer when executed and shall be deemed covered by the other rates and prices in the Bill of Quantities.

13.3. All duties, taxes, and other levels payable by the contractor under the contract, or for any other cause shall be included in the rates, prices and total Bid Price submitted by the Bidder.

13.4. *The rates and prices quoted by the bidder shall be fixed for the duration of the Contract and shall not be subject to adjustment on any account (For contracts upto 12 months period). OR

* The rates and prices quoted by the bidder are subject to adjustment during the performance of the Contract in accordance with the provisions of Clause 47 of the Conditions of Contract. (For contracts more than 12 months period).

14. **Currencies of Bid and Payment**

14.1. The unit rates and the prices shall be quoted by the bidder entirely in Indian Rupees. All payment shall be made in Indian Rupees.

* Choose one and delete the other

15. Bid Validity

15.1. Bids shall remain valid for a period not less than 120 days after the deadline date for bid submission specified in Clause 20. A bid valid for a shorter period shall be rejected by the Employer as non-responsive. In case of discrepancy in bid validity period between that given in the undertaking pursuant to clause 12.1 (v) and the Form of Bid submitted by the bidder, the latter shall be deemed to stand corrected in accordance with the former and the bidder has to provide for any additional security that is required.

15.2. In exceptional circumstances, prior to expiry of the original time limit, the Employer may request that the bidders may extend the period of validity for a specified additional period. The request and the bidders' responses shall be made in writing or by cable. A bidder may refuse the request without forfeiting his bid security. A bidder agreeing to the request will not be required or permitted to modify his bid, but will be required to extend the validity of his bid security for a period of the extension, and in compliance with Clause 16 in all respects.

15.3 Deleted.

15.4 Bid evaluation will be based on the bid prices without taking into consideration the above correction.

16. Bid Security

16.1. The Bidder shall furnish, as part of his Bid, a Bid security in the amount as shown in column 4 of the table of IFB for this particular work. This bid security shall be in favour of Employer as named in Appendix and may be in one of the following forms:

a. Receipt in challan of cash deposit in the Govt. Treasury in India.

b. Deposit-at-call receipt from any scheduled Indian bank from any of the branches of SBI/ Nationalised / Scheduled Bank situated within India, approved by the Reserve bank of India.

c. Indian Post Office/**Fixed Deposit** /National Savings Certificates duly endorsed by the competent authority in India.

d. Bank Guarantee from any scheduled Indian Bank from any of the branches of SBI/ Nationalised / Scheduled Bank situated within the state of India in the format given in Section 8.

e. Fixed deposit receipt, a certified cheque or an irrevocable letter of credit, issued by any scheduled Indian Bank approved by the Reserve Bank of India.

16.2. Bank guarantees (and other instruments having fixed validity) issued as surety for the bid shall be valid for 45 days beyond the validity of the bid.

16.3. Any bid not accompanied by an acceptable Bid Security and not secured as indicated in Sub-Clauses 16.1 and 16.2 above shall be rejected by the Employer as non-responsive.

16.4. The Bid security of unsuccessful bidders will be returned within 28 days of the end validity period specified in sub-Clause 15.1.

16.5. The Bid security of the successful bidder will be discharged when the bidder has signed the Agreement and furnished the required Performance Security.

16.6. The Bid security may be forfeited

(a) if the Bidder withdraws the Bid after Bid opening during the period of Bid validity;

(b) if the Bidder does not accept the correction of the Bid Price, pursuant to Clause 27; or

(c) in the case of a successful Bidder, if the Bidder fails within the specified time limit to

(i) sign the Agreement; or

(ii) furnish the required Performance Security.

17. Alternative proposals by Bidders

17.1. Bidders shall submit offers that fully comply with the requirements of the bidding documents, including the conditions of contract (including mobilization advance or time for completion), basic technical design as indicated in the drawing and specifications. Conditional offer or alternative offers will not be considered further in the process of tender evaluation.

18. Format and Signing of Bid

18.1 **Deleted.**

18.2. Instruction to Bidders (for SBD contract) to be followed. Bids submitted online have to be digitally signed by the bidder.

18.3 Bidders shall follow the Method of submission of bid as mentioned in Instruction to Bidders (for SBD contract).

D. SUBMISSION OF BIDS

19. Sealing and Marking of Bids

19. (A) Instructions & documents to be furnished for online bidding

19.1 Guidelines for online submission of bids can be downloaded from the website http://jharkhandtenders.gov.in

19.2 Interested bidders can download the bid from the website http://jharkhandtenders.gov.in

19.3 Bidders in order to participate in the bidding process have to get 'Digital Signature Certificate (DSC)' as per Information Technology Act-2000 to participate in online bidding. This certificate will be required for digitally signing the bid. Bidders can get the abovementioned digital signature certificate from any approved vendors (CCA). Bidders, who already possess valid Digital Certificates, need not procure new Digital Certificate.

19.4 Bidders have to submit their bids online in electronic format with digital Signature Bids without digital signature will not be accepted. No proposal will be accepted in physical from.

19.5 Bids will be opened online as per time schedule mentioned in the Invitation for Bid (IFB).

19.6 Bidders should be ready with the scanned copies of cost of documents & bid security as specified in the tender document. Before submission of bids online, bidders must ensure that scanned copies of all the necessary documents have been attached with bid.

19.7 Bidders have to produce original Demand Draft towards cost of Bid Document & bid security as mentioned in the Invitation for Bids (IFB) to the Chairman, e-Procurement Cell during the period & time as mentioned in the I.F.B. failing which bid will not be accepted. The details of cost of documents, bid security specified in the tender documents should be the same as submitted online (scanned copies), otherwise bid will summarily be rejected.

19.8. Uploaded document of successful bidder will be verified with the original before signing the agreement. The successful bidder has to provide the originals to the concerned authority,

19.9 The department will not be responsible for delay in online submission of bids due to any reason, what so ever.

19.10 All required information for bid must be filled and submitted online.

19.11 Other details can be seen in the bidding documents.

19.12 Only online withdrawal or modification of bids, if any, in pursuance of relevant clauses of the SBD is acceptable.

19. (B) **Details of documents to be furnished for online bidding**

1. Scanned copies of the following documents to be up-loaded in. pdf format on the website http://jharkhandtenders.gov.in

Technical bid folder.

i- D.D. towards cost of Bid Document.
ii- Bid security in the form specified in Section-8 of SBD.
iii- Qualification information and supporting document s as specified in Section-2 of SBD.
iv- Certificates, undertakings, affidavits as specified in Section-2.
v- Any other information pursuant to Clause-4.2 of ITB.
vi- Undertakings that the bid shall remain valid for the period specified in Clause-15.1 of ITB.

2. Scanned copies of the following documents to be up-loaded on the website http://jharkhandtenders.gov.in
in financial bid folder.
   i. Form of bid has specified in Section-6 in pdf format.

3. Duly filled in & Digitally signed BOQ.

4. Uploaded documents of successful bidder will be verified with the original before signing the agreement. The successful bidder has to provide the originals to the concerned authority on receipt of such a letter, which will be sent though registered post or speed post or delivered by hand.

5. Each uploading shall be digitally signed by the bidders.

20. Deadline for Submission of the Bids

20.1. Bidders shall follow invitation for Bid.

20.2. The Employer may extend the deadline for submission of bids by issuing an amendment in accordance with Clause 10, in which case all rights and obligations of the employer and the bidders previously subject to the original deadline will then be subject to the new deadline.

21. Late Bids

21.1. Any Bid received by the Employer after the deadline prescribed in Clause 20 will be returned to the bidder.

22. Modification and Withdrawal of Bids

22.1. Bidders may modify or withdraw their bids by giving notice in writing before the deadline prescribed in Clause 20 or pursuant to Clause 23.

22.2. **Deleted.**

22.3. No bid may be modified after the deadline for submission of Bids except in pursuance of Clause 23.

22.4. Withdrawal or modification of a Bid between the deadline for submission of bids and the expiration of the original period of bid validity specified in Clause 15.1 above or as extended pursuant to clause 15.2 may result in the forfeiture of the Bid security pursuant to Clause 16.

E. BID OPENING AND EVALUATION

23. **Bid Opening**

23.1 The Employer will open all the Bids submitted online including modification made pursuant to Clause 22, in the manner specified in Clause 20 and 23.3. In the event of the specified date of Bid opening being declared a holiday for the Employer, the Bids will be opened at the appointed time and location on the next working day. A notice for the same shall be posted on the website

23.2. **Deleted.**.

23.3 **Deleted.**.

23.4.(i) Subject to confirmation of the bid security by the issuing bank, the bids accompanied with valid security will be taken up for evaluation with respect to the Qualification Information and other information furnished in Part I of the bid pursuant to clause 12.1.

(ii) After receipt of confirmation of the bid security, the bidder will be asked in writing/e-mail (usually within 10 days of opening of the Technical Bid) to clarify or modify his technical bid, if necessary, with respect to any rectifiable defects.

(iii) The bidders will respond by e-mail in not more than 7 days of issue of the clarification letter ,which will also indicate the date, time and venue of opening of the Financial Bid (usually on the 21st day of opening of the Technical bid)

(iv) Immediately (usually within 3 or 4 days), on receipt of these clarifications the Evaluation Committee will finalize the list of responsive bidders whose financial bids are eligible for consideration.

23.5. **Deleted.**

23.6. **Deleted.**

23.7. In case bids are invited in more than one package, the order for opening of the “Financial Bid” shall be that in which they appear in the “Invitation for Bid”.

23.8. The Employer shall prepare minutes of the Bid opening, including the information disclosed to those present in accordance with Sub-clause 23.6.

24. Process to be Confidential

24.1 Information relating to the examination, clarification, evaluation, and comparison of Bids and recommendations for the award of a contract shall not be disclosed to Bidders or any other persons not officially concerned with such process until the award to the successful Bidder has 19 been announced. Any effort by a Bidder to influence the Employer’s processing of Bids or award decisions may result in the rejection of his Bid.

25. Clarification of Financial Bids

25.1. To assist in the examination, evaluation, and comparison of Bids, the Employer may, at his discretion, ask any Bidder for clarification of his Bid, including breakdowns of unit rates. The request for clarification and the response shall be in writing or by cable, but no change in the price of substance of the Bid shall be sought, offered, or permitted except as required to confirm the correction of arithmetic errors discovered by the Employer in the evaluation of the Bids in accordance with Clause -27.

25.2. Subject to sub-clause 25.1, no Bidder shall contact the Employer on any matter relating to his bid from the time of the bid opening to the time the contract is awarded. If the bidder wishes to bring additional information to the notice of the Employer, it should do so in writing.

25.3. Any effort by the Bidder to influence the Employer in the Employer’s bid evaluation, bid comparison or contract award decisions may result in the rejection of the Bidders’ bid.

26. Examination of Bids and Determination of Responsiveness

26.1. During the detailed evaluation of “Technical Bids”, the Employer will determine whether each Bid

(a) meets the eligibility criteria defined in Clause 3 and 4; (b) has been properly signed; (c) is accompanied by the required securities and; (d) is substantially responsive to the requirements of the Bidding documents. During the detailed evaluation of the “Financial Bid”, the responsiveness of the bids will be further determined with respect to the remaining bid conditions, i.e., priced bill of quantities, technical specifications, and drawings.

26.2. A substantially responsive “Financial Bid” is one which conforms to all the terms, conditions, and specifications of the Bidding documents, without material deviation or reservation. A material deviation or reservation is one (a) which affects in any substantial way the scope, quality, or performance of the Works; (b) which limits in any substantial way, inconsistent with the Bidding documents, the Employer’s rights or the Bidder’s obligations under the Contract; or (c) whose rectification would affect unfairly the competitive position of other Bidders presenting substantially responsive Bids.

26.3. If a “Financial Bid” is not substantially responsive, it will be rejected by the Employer, and may not subsequently be made responsive by correction or withdrawal of the non-conforming deviation or reservation.

27. Correction of Errors

27.1. “Financial Bids” determined to be substantially responsive will be checked by the Employer for any arithmetical errors. Errors will be corrected by the Employer as follows:

(a) where there is a discrepancy between the rates in figures and in word, the rate in words will govern; and

(b) where there is a discrepancy between the unit rate and the line item total resulting form multiplying the unit rate by the quantity, the unit rate as quoted will govern.

27.2. The amount stated in the "Financial Bid" will be corrected by the Employer in accordance with the above procedure and the bid amount adjusted with the concurrence of the Bidder in the following manner:

(a) If the Bid price increases as a result of these corrections, the amount as stated in the bid will be the 'bid price' and the increase will be treated as rebate;

(b) If the bid price decrease as a result of the corrections, the decreased amount will be treated as the 'bid price'. Such adjusted bid price shall be considered as binding upon the Bidder. If the Bidder does not accept the corrected amount the Bid will be rejected, and the Bid security may be forfeited in accordance with Sub-clause 16.6(b)

28. **Deleted**

29. **Evaluation and Comparison of Financial Bids**

29.1. The Employer will evaluate and compare only the Bids determined to be substantially responsive in accordance with Sub-Clause 26.2.

29.2. In evaluating the Bids, the Employer will determine for each Bid the evaluated Bid Price by adjusting the Bid Price as follows:

(a) Making any corrections for errors pursuant to clause 27; or

(b) Making an appropriate adjustments for any other acceptable variations, deviations; and

(c) Making appropriate adjustments to reflect discounts or other price modifications offered in accordance with Sub-Clause 23.6

29.3 The Employer reserves the right to accept or reject any variation or deviation. Variations and deviations and other factors, which are in excess of the requirements of the bidding documents or otherwise result in unsolicited benefits for the Employer shall not be taken into account in Bid evaluation.

29.4. The estimated effect of the price adjustment conditions under Clause 47 of the Conditions of Contract, during the period of implementation of the Contract, will not be taken into account in Bid evaluation.

29.5. If the Bid of the successful Bidder is seriously unbalanced in relation to the Engineer's estimate of the cost of work to be performed under the contract, the Employer may require the Bidder to produce detailed price analyses for any or all items of the Bill of Quantities, to demonstrate the internal consistency of those prices with the construction methods and schedule proposed. After evaluation of the price analyses, the employer may require that the amount of the performance security set forth in clause 34 be increased at the expense of the successful Bidder to a level sufficient to protect the Employer against financial loss in the event of default of the successful Bidder under the Contract.

29.6. A bid which contains several items in the Bill of Quantities which are unrealistically priced low and which cannot be substantiated satisfactorily by the bidder, may be rejected as non-responsive.

30. **Deleted**

F. AWARD OF CONTRACT

31. **Award of Criteria**

31.1. Subject to Clause 32, the Employer will award the Contract to the Bidder whose Bid has been determined

(i) To be substantially responsive to the bidding documents and who has offered the lowest evaluated Bid Price; and

(ii) To be within the available bid capacity adjusted to account for his bid price which is evaluated the lowest in any of the packages opened earlier than the one under consideration. In no case, the contract shall be awarded to any bidder whose available bid capacity is less than the evaluated bid price, even if the said bid is the lowest evaluated bid. The contract will in such cases be awarded to the next lowest bidder at his evaluated bid price.

32. Employer's Right to Accept or Reject any Bid or all Bids **alongwith blacklisting for concealing any fact. In case the Bidder (By itself or in a Consortium or JV) is found to have been debarred or blacklisted by the Union Government or any State Government or any Undertaking /PSU of the Union Government or any State Government.**

32.1. Notwithstanding Clause 31, the Employer reserves the right to accept or reject any Bid to cancel the bidding process and reject all bids, at any time prior to the award of Contract, without thereby incurring any liability to the affected Bidder or Bidders or any obligation to inform the affected Bidder or Bidders of the grounds for the Employer's action.

32.2* Bidder would give an undertaking mentioning all the ongoing projects in detail. If it is found that any bidder has not mentioned even one ongoing project the bid will be rejected, if due to this the Bid capacity gets manipulated

32.3* After award of contract, if the Bidder is found to have concealed any fact relevant to projects, the employer may blacklist the Bidder or Bidders within 180 days, with due process as-

(i) 3 years Blacklisting for the project cost Rs. 2.50 Crore to Rs. 10.00 Crore
(ii) 5 Years Blacklisting for the project Cost above Rs. 10.00 Crore to Rs. 100.00 Crore
(iii) 10 Years Blacklisting for the project Cost above Rs. 100.00 Crore.

33. **Notification of Award and Signing of Agreement**

33.1. The Bidder whose Bid has been accepted will be notified of the award by the employer prior to expiration of the Bid validity period by cable, telex or facsimile confirmed by registered letter. This letter (hereinafter and in the Conditions of Contract called the "Letter of Acceptance") will state the sum that the Employer will pay the contractor in consideration of the execution, completion, and maintenance of the Works by the contractor as prescribed by the contract (hereinafter and in the contract called the "Contract Price").

33.2. The notification of award will constitute the formation of the Contract, subject only to the furnishing of a performance security in accordance with the provisions of Clause

33.3. The Agreement will incorporate all agreements between the Employer and the successful Bidder. It will be signed by the Employer and the successful Bidder within 14 days from date of issue of Letter of Acceptance after depositing Performance Security money upon furnishing by the successful Bidder of the Performance Security, the Employer will promptly notify the other Bidders that their Bids have been unsuccessful.

34. **Performance Security**

34.1. Within 14 days of receipt of the Letter of Acceptance, the successful Bidder shall deliver to the Employer a Performance security in any of the forms given below for an amount equivalent to

2% of the Contract price plus additional security for unbalanced Bids in accordance with clause 29.5 of ITB and Clause 52 of Conditions of Contract:

34.2. A bank guarantee from any of the branches of SBI/ Nationalized / Scheduled Bank situated within India in the form given in Section 8; or Certified Cheque/Bank Draft as indicated in Appendix.

34.2 If the performance security is provided by the successful Bidder in the form of a Bank Guarantee, it shall be issued from any of the branches of SBI/ Nationalized / Scheduled Bank situated within India.

34.3 Failure of the successful Bidder to comply with the requirements of Sub-Clause 34.1 shall constitute grounds for cancellation of the award and forfeiture of the Bid Security.

35. **Advance Payment and Security**

35.1. The Employer will provide an Advance Payment on the Contract Price as stipulated in the Conditions of Contract, subject to maximum amount, as stated in the Contract Data.

36. **Deleted**

37. **Corrupt or Fraudulent Practices**

37.1 The employer will reject a proposal for award if it determines that the bidder recommended for award has engaged in corrupt or fraudulent practices in competing for the contract in question and will declare the firm ineligible, either indefinitely or for a stated period of time, to be awarded a contract with GOI Deptt./State Deptt. and any other agencies, if it at any time determines that the firm has engaged in corrupt or fraudulent practices in competing for the contractor, or in execution.

If it is found and verified that bidder has submitted false paper with the bid regarding his work experience/financial experience or concealed any fact regarding project the department will take action against him regarding suspension/black listing as per provision in Drinking Water & Sanitation Department's registration rules.

37.2 Furthermore, Bidders shall be aware of the provision stated in Sub-Clause 23.2 and Sub-Clause 59.2 of the Conditions of Contract.

37.3* For the consideration of liability against any bidder or consultant as the case may be, the value of the agreement with/the work order issued to the concerned bidder or consultant shall be taken into account.

APPENDIX to ITB

Clause Reference with respect to

Section-I

1. Name of the Employer is : Govt. of Jharkhand through Engineer in Chief. DWSD Nepal House Doranda, Ranchi. [C1. 1.1]

2. The last five years

   2014 - 2015

   2015 - 2016

   2016 - 2017

   2017 - 2018

   2018 - 2019

3. This annual financial turn over amount is Rs. **--------- Lakh** (Rupees ---------- ---------- only) [C1.4.5A (a)]

4. Value of work is Rs. **--------- Lakh** (Rupees ---------- --------- only) [C1.4.5A (b)]

5. Quantities of work are: As prescribed by concerned Department / employer

R.C.C. Gangway	-------- metre length and -------- Meter Wide
Supplying & laying of Pipeline	(100 mm to ------- mm dia) – ---------- mts
E.S.R.	(i) ---------- Lakh Litre capacity with ------ M staging
R.C.C Intake Well	------- M Inner dia and -------- M depth (Intake well with pump house)
Clear water Pump –C.F Pump-	(i) -------- LPS, discharge and ----- M Head (------- HP) ---- nos.
Raw water Pump – V.T. Pump	(i) --------- LPS, discharge and ----- M Head (---- HP) ------ nos
Water Treatment Plant	-------- MLD
One unit of	----------

6. The cost of Mechanical & Electric work is Rs. **----------.------** (Rupees ---------- ---------- Only) excluding labour cess. [C1. 4.5A (d)]

7. The cost of water supply works is Rs. **----------** Lakh including labour cess [C1.4.5A (e)]

8. Liquid assets and/or availability of credit facilities is Rs**. ---------** Lakh [C1.4.5B (c)]

9. Price level of the financial year ___----------_____ [C1. 4.7]

10. The pre-bid meeting will take place at Office of **----------.** [C1.9.2.1]

    (Address of the venue) on **----.----** P.M Hr. and **…….** (time and date)

11. The technical bid will be opened at Office of Executive Engineer, D.W. & S. Division **----------**
------. [C1. 23.1] (Address of the venue) on **---.-----** P.M. and **……..** (time and date)

12. Address of the Employer Office of Executive Engineer, D.W. & S. Division **----------.**.

13. Identification: [C1. 19.2(b)]
Bid for (Name of work) ----------

Bid reference No. ..... ……

Do not open before **……** and 4**.00** P.M. (time and date)

14. The bid should be submitted latest **……** up to **0.00** PM.(date and time) [C1. 20.1(a)]

15. The bid will be opened at Office of Executive Engineer, D.W. & S. Division **----------** . [C1.23.1] (place) on **0.00** P.M.and **……** (time and date).

16. The Bank draft in favour of Executive Engineer, Drinking Water & Sanitation **Division ----------** payable at **----------.** [C1.34.1]

17. The name of Dispute Review Expert is Executive Engineer, D.W. & S. Division **----------** [C1.36.1]

18. Escalation factors (for the cost of works executed and financial figure to a common base value for works completed)

Years before	Multiply factor
One	1.1
Two	1.21
Three	1.33
Four	1.46
Five	1.61

ANNEXURE-I

List of Key Plant & Equipment to be deployed on DWSD Contract work

[Reference C1. 4.5 (B) (a)]

* The actual number of equipments to be decided by the concerned DWSD Division/ Circle/ Zone/ Department before floating the tender.

Sl. No.	Type of Equipment*	Max ag e as on 1.1.2019 _(Years)	Water Supply/ Drainage Contract package Size**			
			Rs 1+ to 5 crores	Rs. 5+ to 30Crore	Rs. 30+ to 50Crore	Rs. 50+ Crores & above
1	Concrete Mixes with Integral Weigh Batching facility	5	1	2	2	3
2	Vibrator	5	2	4	4	6
3	Crane (1.5 MT to 2.5 MT)	5	1	1	2	2
4	Truck/ Tractor with trailer	5	1	1	2	3
5	Hydraulic Excavator	5	0	1	1	2
6	Digital level instrument****	5	1	3	5	7
	Total		**6**	**12**	**16**	**23**

** On the basis of nature of construction work, list of key plant and equipment to be decided.

*** Life of machine minus 2 years or 5 years on 01.01.2019 whichever is more.

**** Required for Piped Water Supply/ Drainage/ Sewerage Scheme.

ANNEXURE-II

List of Key Personal to be deployed on Contract Work

[Reference C1.4.5 (B) (b)]

Contract Sl Package Size

Sl. No.	Personnel*	Qualification	Rs 2.5+ to 10 Crores	Rs. 10+ to 30 Crores	Rs. 30+ to 50 Crores	Rs. 50+Crores & above
1	Project Manager	B.E. Civil + 10 Years Exp. (5 years as Manager in DWSD works) or retired SE and above of DWSD	1	1	1	1
2	Site Engineer	B.E. Civil + 7 Years Exp. (3 years in DWSD) or retired A.E. & above of DWSD.	1	2	3	4
3	Site Supervisor	B.E. Mech./ Civil + 5 Years Exp. Or Dip. Mech./ Civil +7 years Exp. Or retired JE & above of WSD.	2	4	6	10
4	Surveyor	B.E. Civil + 3 Years Exp. Or Dip. Civil + 5 years Exp.	1	2	2	3
5	Social Mobilizer		**1**	**1**	**1**	**1**
	Total		**6**	**10**	**13**	**19**

* The designation and number of the personnel has to be decided by the concerned Drinking Water and Sanitation Division/ Circle/ Zone/ Department as per actual requirement.

SECTION 2

QUALIFICATION INFORMATION

QUALIFICATION INFORMATION

The information to be filled in by the bidder in the following pages will be used for purposes of post qualification as provided for in Clause 4 of the Instructions to Bidders. This information will not be incorporated in the Contract.

1. **For Individual Bidders**

1.1. Constitution or legal status of Bidder

[Attach copy]

Place of registration: _____

Principal place of business: _____

Power of attorney of signatory of Bid

[Attach]

1.2. Total value of Civil Engineering construction work performed in the last five years** (in Rs. Million)

2014_____2015_____ β

2015_____2016_____

2016_____2017_____

2017_____2018 _____

2018_____2019_____

1.3.1. Work performed as prime contractor, work performed in the past as a nominated sub-contractor will also be considered provided the sub-contract involved execution of all main items of work described in the bid document, provided further that all other qualification criteria are satisfied (in the same name) on works of a similar nature over the last five years.**

Project Name	Name of the Employer *	Description of work	Contract No.	Value of Contract (Rs crore)	Date of issue Of work order	Stipulated Period of completion	Actual date of completion *	Remarks Explaining Reasons for delay& work Completed

* Attach certificate(s) from the Engineer(s)-in-Charge

** Immediately preceding the financial year in which bids are received.

β Attach certificate from Chartered Accountant.

#1.3.2. Quantities of work executed as prime contractor, work performed in the past as a nominated subcontractor, will also be considered provided the sub-contract involved execution of all main items of work described in the bid document, provided further that all other qualification criteria are satisfied (in the same name and style) in the last five years:**

Year	Name of the work	Name of the Employer *	Quantity of work performed								Remarks* (indicate contract Ref)
			Construction of High yield tube well/ Intake well/ Infiltration well in nos.)	Treatment plant i/c clarifloculators, filter beds, air blowers, sump etc. in MLD	Pump house in nos.	Pump and motor& erection & commissioning of transformers in H.P/ KVA	Chlorinator units in nos.	Rising main and distribution network in meters.	RCC overhead water tower size wise in KL	Other related works	
2014_2015_ 2015_2016_ 2016_2017_ 2017_2018_ 2018_2019_											

1.4 Information on Bid capacity (works for which bids have been submitted and works which are yet to be completed) as on the date of this bid.

(A) Existing commitments and on-going works:

Description of works	Place & State	Contract No.	Name & Address of Employer	Value of Contract (Rs Cr)	Stipulated Period of Completion	Value of Works* remaining To be completed (Rs Cr)	Anticipated date of completion
1	2	3	4	5	6	7	8

* Attach certificate(s) from the Engineer(s)-in-Charge
@ the item of work for which data is requested should tally with that specified in ITB clause 4.5 A(c).
** Immediately preceding the financial year in which bids are received.
# Delete, if prequalification has been carried out

(B) Works for which bids already submitted:

Description Of work	Place & State	Name & Address of Employer	Estimated value of works (Rs Cr)	Stipulated period of completion	Date when decision is expected	Remarks If any
1	**2**	**3**	**4**	**5**	**6**	**7**

1.5 Availability of key items of Contractor's Equipment essential for carrying out the Works [ref. Clause 4.5(B) (a).The Bidder should list all the information requested below. Refer also to Sub Clause 4.3(d) of the Instructions to Bidders.

Item of Equipment	Requirement		Availability Proposals			Remarks (from whom to be purchased)
	No.	Capacity	Owned/Leased to be procured	Nos./Capacity	Age/ Condition	

1.6 Qualifications and experience of key personnel required for administration and execution of the Contract [Ref. Clause 4.5(B)(b)]. Attach biographical data. Refer also to sub Clause 4.3 (e) of instructions to Bidders and Sub Clause 9.1 of the Conditions of Contract.

Position	Name	Qualification	Year of Experience (General)	Years of experience in the Proposed position
Project manager				
Etc.				

1.7. Proposed sub-contracts and firms involved. [Refer ITB Clause 4.3(k)]

Sanctions of the works	Value of Sub-contract	Sub-contractor (Name & Address)	Experience in similar Work

Attach copies of certificates on possession of valid license for executing water supply/sanitary work/building electrification works [Reference Clause 4.5(d) & Clause 4.5(e)]

*1.8. Financial reports for the last five years: balance sheets, profit and loss statements, auditors' reports (in case of companies/corporation), etc. List them below and attach copies.

1.9. Evidence of access to financial resources to meet the qualification requirements in Cash in hand, lines of credit, etc. List them below and attach copies of support documents.

1.10 Name, address, and telephone, telex, and fax numbers of the Bidders' bankers who may provide references if contacted by the Employer.

1.11 Information on litigation history in which the Bidder is involved

Other Party(ies)	Employer	Cause of Dispute	Amount involved	Remarks showing Present Status

1.12 Statement of compliance under the requirements of Sub Clause 3.2 of the instructions to Bidders. (Name of Consultant engaged for project preparation is ** …….)

_____
_____

1.13 Proposed work methods and schedule. The Bidder should attach descriptions, drawings and charts as necessary to comply with the requirements of the Bidding documents. [Refer ITB Clause 4.1 & 4.3 (1)]

1.14 Programme

1.15 Quality Assurance Programme

2. **Deleted**

3. **Additional Requirements.**

3.1. Bidders should provide any additional information required to fulfil the requirements of Clause 4 of the Instructions to the Bidders, if applicable.

(i) Affidavit

(ii) Undertaking

*** (iii) Update of original pre qualification application

*** (iv) Copy of original pre qualification application

*** (v) Copy of pre qualification letter

** Fill the Name of Consultant.

*** Delete, if pre qualification has not been carried out.

SAMPLE FORMAT FOR EVIDENCE OF ACCESS TO OR AVAILABILITY OF CREDIT FACILITIES

(Clause 4.2 (i) OF ITB)

BANK CERTIFICATE

This is to certify that M/s. _____ is a reputed Company with a

good financial standing.

If the contract for the work, namely _____ is awarded to the above firm, we shall be able to provide overdraft/credit facilities to the extent of Rs. _____to meet their working capital requirements for executing the above contract during the contact period.

_____

(Signature)

Name of Bank

Senior Bank Manager

Address of the Bank

AFFIDAVIT

1. I, The undersigned, do hereby certify that all the statements made in the required attachments are true and correct.

2. The undersigned also hereby certifies that neither our firm M/S _____

_____have been blacklisted nor have abandoned any work in any Govt. Dept in India / Drinking Water and Sanitation Department, Jharkhand or any contract awarded to us for such work have been rescinded, during last five years prior to the date of this bid.

3. The undersigned hereby authorize(s) and request(s) any bank, person, firm or corporation to furnish pertinent information deemed necessary and requested by the Department to verify this statement or regarding my (our) competence and general reputation.

4. The undersigned understand and agrees that further qualifying information may be requested, and agrees to furnish any such information at the request of the Department/Project implementing agency.

_____

(Signed by an authorized Officer of the Firm)

_____

Title of officer

_____

Name of Firm

_____

DATE

UNDERTAKING

I, the undersigned do hereby undertake that our firm M/s _____

_____ would invest a minimum amount up to 25% of the value of the work

(Exclusively for this work) during implementation of the Contract.

_____

(Signed by an Authorized Officer of the Firm)

_____

Title of Officer

_____

Name of Firm

_____

DATE

SECTION 3

CONDITIONS OF CONTRACT

Conditions of Contract

Table of Contents

CONDITIONS OF CONTRACT

A. GENERAL

1. **Definitions**

1.1 Terms which are defined in the Contract data are not also defined in the Conditions of Contract but keep their defined meanings. Capital initials are used to identify defined terms.

The Adjudicator/ Arbitrator synonymous with (Dispute Review Expert) is the person appointed jointly by the employer and the contractor to resolve disputes in the first instance, as provided for in clause 24 and 25. It is to be conducted under the rules of Indian Arbitration and Conciliation Act, 1996 (26 of 1996) any statutory modifications or re-enactment thereof.

Bill of Quantities means the priced and completed Bill of Quantities forming part of the Bid.

The **Completion Date** is the date of completion of the Works as certified by the Engineer in accordance with Sub clause 55.1.

The **Contract** is the contract between the Employer and the Contractor to execute, complete and maintain the Works. It consists of the documents listed in Clause 2.3 below.

The **Contract Data** defines the documents and other information which comprise the Contract.

The **Contractor** is a person or corporate body whose Bid to carry out the Works has been accepted by the Employer.

The **Contractor's Bid** is the completed Bidding document submitted by the Contractor to the Employer and includes Technical and Financial bids.

The **Contract Price** is the price state in the Letter of Acceptance and thereafter as adjusted in accordance with the provisions of the Contract.

Days are calendar days; **months** are calendar months.

A **Defect** is any part of the Works not completed in accordance with the Contract.

The **Defects Liability Period** is the period named in the contract Data and calculated from the

Completion Date.

The **Employer is Government of Jharkhand** who will employ the contractor to carry out the Works.

The **Employer's representative** will be the Executive Engineer concerned to be notified by the Employer. The Employer's representative will act on behalf of employers.

The **Engineer** is the person named in the Contract Data Awarding contract on behalf of Employer (or any other competent person appointed and notified to the contractor to act in replacement of the

Engineer) who is responsible for supervising the Contract, administering the Contract, certifying payments due to the Contractor, issuing and valuing Variations to the Contract, awarding extensions of time & valuing the compensation events.

Equipment is the Contractor's machinery and vehicles brought temporarily to the Site to construct the Works.

The **Initial Contract Price** is the Contract Price listed in the Employer's Letter of Acceptance.

The **Intended Completion Date** is the date on which it is intended that the Contractor shall complete the Works. The Intended Completion Date is specified in the Contract Data. The Intended Completion date may be revised only by the Engineer by issuing an extension of time.

Materials are all supplies, including consumables, used by the contractor for incorporation in the Works.

Plant is any integral part of the Works which is to have a mechanical, electrical, electronic or chemical or biological function.

The **Site** is the area defined as such in the Contract Data.

Site Investigation Reports are those which were included in the Bidding documents and are factual interpretative reports about the surface and the sub-surface conditions at the site.

Specification means the Specification of the Works included in the Contract and any modification or addition made or approved by the Engineer.

The **Start Date** is given in the Contract Data. It is the date when the Contractor shall commence execution of the works. It does not necessarily coincide with any of the Site Possession Dates.

A **Subcontractor** is a person or corporate body who has a contract with the Contractor to carry out a part of the work in the Contract which includes work on the Site.

Temporary Works are works designed, consulted, installed, and removed by the contractor which are needed for construction or installation of the Works.

A **Variation** is an instruction given by the Engineer, which varies the works.

The **Works** are what the Contract requires the Contractor to construct, install, and turn over to the

Employer, as defined in the Contract Data.

2. **Interpretation**

2.1. In interpreting these Conditions of Contract, singular also means plural, male also means female or neuter, and the other way around. Headings have no significance. Words have their normal meaning under the language of the Contract unless specifically defined. The Engineer will provide instructions clarifying queries about the Conditions of Contract.

2.2. If sectional completion is specified in the Contract Data, references in the Conditions of Contract to the Works, the Completion Date, and the Intended Completion Date apply to any Section of the Works (other than references to the Completion date and Intended Completion date for the whole of the works).

2.3. The documents forming the Contract shall be interpreted in the following order of priority:

(1) Agreement

(2) Letter of Acceptance, notice to proceed with the works

(3) Contractor's Bid

(4) Contract Data

(5) Conditions of Contract including Special Conditions of Contract

(6) Specifications

(7) Drawings

(8) Bill of Quantities and

(9) Any other document listed in the Contract Data as forming part of the Contract including IFB & ITB.

3. **Language and Law**

3.1. The language of the Contract and the law governing the contract are stated in the Contract Data.

4. **Engineer's Decisions**

4.1. Except where otherwise specifically stated, the Engineer will decide contractual matters between the Employer and the Contractor in the role representing the Employer.

5. **Delegation**

5.1. The Engineer may delegate any of his duties and responsibilities to other people after notifying the Contractor and may cancel any delegation after notifying the Contractor.

6. **Communications**

6.1. Communications between parties which are referred to in the conditions are effective only when in writing. A notice shall be effective only when it is delivered (in terms of Indian Contract act).

7. **Sub-Contracting**

7.1. The Contractor may sub-contract any portion of work, up to a limit specified in Contract Data, with the approval of the Engineer but may not assign the Contract without the approval of the Employer in writing. Sub-contracting does not alter the Contractor's obligations. Maximum number of Sub Contractor will be two and they will have to meet all qualifying criteria in the ratio of work allotted. Peripheral works will only be permitted for sub-contracting and major works not to be considered. Peripheral works will not include work of High yield Tube well/Intake well/ Infiltration well/ Water Treatment Plant/ Pump machinery/ ESR/ UGR/Rising and Distribution main etc.

8. **Other Contractors**

8.1. The Contractor shall cooperate and share the site with other contractors, public authorities, utilities, and the employer between the dates given in the Schedule of other Contractors. The contractors shall as referred to in the Contract Data, also provide facilities and services for them as described in the Schedule. The Employer may modify the schedule of other contractors and shall notify the contractor of any such modification.

9. **Personnel**

9.1. The Contractor shall employ the key personnel named in the Schedule of Key Personnel as referred to in the Contract Data to carry out the functions stated in the Schedule or other personnel approved by the Engineer. The Engineer will approve any proposed replacement of key personnel only if their qualification, abilities, and relevant experience are substantially equal to or better than those of the personnel listed in the schedule.

9.2 If the Engineer asks the Contractor to remove a person who is a member of the Contactor's staff of his work force stating the reasons the Contractor shall ensure that the person leaves the Site within seven days and has no further connection with the work in the Contract.

10. **Employer's and Contractor's Risks**

10.1. The Employer carries the risks which this Contract states are Employer's risks, and the contractor carries the risks which this Contract states are Contractor's risks.

11. **Employer's Risks**

11.1. The Employer is responsible for the expected risks which are (a) in so far as they directly affect the execution of the Works in India, the risks of war, hostilities. invasion, act of foreign enemies, rebellion, revolution, insurrection or military or usurped power, civil war, riot commotion or disorder (unless restricted to the Contractor's employees), and contamination from any nuclear fuel or nuclear waste or radioactive toxic explosive; or (b) a cause due solely to the design of the Works, other than the Contractor's design.

12. **Contractor's Risks**

12.1. All risks of loss or damage to physical property and of personal injury and death which arise during and in consequence of the performance of the Contract other than the excepted risks are the responsibility of the Contractor.

13. **Insurance**

13.1. The Contractor shall provide, in the joint names of the Employer and the Contractor, insurance cover from the Start Date to the end of the Defects Liability Period, in the amounts and deductibles stated in the Contract data for the following events which are due to the Contractor's risks:

a) Loss of or damage to the Works, Plants and Materials;

b) Loss of or damage to Equipment;

(c) Loss of or damage of property (except the Works, Plant, Materials and Equipment) in connection with the Contract; and

(d) Personal injury or death.

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

13.3. If the Contractor does not provide any of the policies and certificates required, the Employer may effect the insurance which the Contractor should have provided and recover the premiums the Employer has paid from payments otherwise due to the Contractor or, if no payment is due, the payment of the premiums shall be a debt due.

13.4. Alterations to the terms of insurance shall not be made without the approval of the Engineer.

13.5. Both parties shall comply with any conditions of the insurance policies.

14. **Site Investigation Reports**

14.1. The Contractor, in preparing the Bid, shall rely on any site investigation reports referred to in the Contract data, supplemented by any information available to the Bidder.

15. **Queries about the Contract Data**

15.1. The Engineer will clarify queries on the Contract Data.

16. **Contractor to Construct the Works**

16.1. The Contractor shall construct and install the Works in accordance with the Specification and Drawings.

17. The Works to be completed by the Intended Completion date

17.1. The Contractor may commence execution of the Works on the Start Date and shall carry out the Works in accordance with the programme submitted by the Contractor, as updated with the approval of the Engineer, and complete them by the Intended Completion Date.

18. **Approval by the Engineer**

18.1. The Contractor shall submit Specifications and Drawings, showing the proposed Temporary works to the Engineer, who is to approve them if they comply with the Specifications and Drawings etc.

18.2 The Contractor shall be responsible for design of Temporary Works.

18.3. The Engineer's approval shall not alter the Contractor's responsibility for design of the Temporary Works.

18.4 The Contractor shall obtain approval of Engineer to the design of the Temporary Works where required.

18.5 All drawings prepared by the Contractor for the execution of the temporary or permanent Works, are subject to prior approval by the Engineer before their use.

19. **Safety**

19.1. The Contractor shall be responsible for the safety of all activities on the Site.

20. **Discoveries**

20.1. Anything of historical or other interest or of significant value unexpectedly discovered on the site is the property of the Employer. The Contractor is to notify the Engineer of such discoveries and carry out the Engineer's instructions for dealing with them.

21. **Possession of the Site**

21.1. The Employer shall give possession of all parts of the site to the Contractor.

22. **Access to the Site**

22.1. The Contractor shall allow the engineer and any person authorized by the Engineer access to the Site, to any place where work in connection with the contract is being carried out or is intended to be carried out and to any place where materials or plant are being manufactured/ fabricated /assembled for the works.

23. **Instructions**

23.1. The Contractor shall carry out all instructions of the Engineer pertaining to works which comply with the applicable law where the site is located.

23.2 The Contractor shall permit the Employer to inspect the Contractor's accounts and records relating to the performance of the Contractor and to have them audited by auditors appointed by the Employer, if so required by the Employer.

24**.** **Deleted.**

25**.** **Deleted.**

26**.** **Deleted.**

B. TIME CONTROL

27. **Programme**

27.1. Within the time stated in the Contract Data the Contractor shall submit to the Engineer for approval a Programme showing the general methods, arrangements, order, and timing for all the activities in the Works along with monthly cash flow forecast.

27.2. An update of the Programme shall be a programme showing the actual progress achieved on each activity and the effect of the progress achieved on the timing of the remaining work including any changes to the sequence of the activities.

27.3. The Contractor shall submit to the Engineer, for approval, an updated Programme at intervals no longer than the period stated in the Contract data. If the Contractor does not submit an updated Programme within this period, the Engineer may withhold the amount stated in the Contract Data from the next payment certificate and continue to withhold this amount until the next payment after the date on which the overdue Programme has been submitted.

27.4. The Engineer's approval of the Programme shall not alter the Contractor's obligations. The

Contractor may revise the Programme and submit it to the Engineer again at any time. A revised

Programme is to show the effect of Variations and Compensation Events.

28. **Extension of the Intended Completion Date**

28.1. The Engineer shall extend the intended completion date if a variation is issued or on account of reasons such as (i) unavailability of free work front, (ii) delay in utility shifting, (iii) delay in environmental clearance (iv) delay in approval of subcontract by employer and (v) force majeure (Natural calamities or conditions beyond human control). If delay is attributed to the contractor such as poor mobilisation of man, materials and machineries, the extension of time will be granted with liquidated damages and for that period price escalation will not be given. The proposal for extension of time will be submitted by the contractor with supporting documents, recommended by the engineer after proper scrutiny of reasons of the delay and approved by the competent authority.

28.2. The Engineer shall decide whether and by how much to extend the Intended Completion date Within 21 days of the Contractor asking the Engineer for a decision upon the effect of a Variation and submitting full supporting information. If the Contractor has failed to give early warning of a delay or has failed to cooperate in dealing with a delay, the delay by this failure shall not be considered in assessing the new Intended Completion Date.

28.3. The Engineer shall within 14 days of receiving full justification from the contractor for extension of Intended Completion Date refer to the Employer his decision. The Employer shall in not more than 21 days communicate to the Engineer the acceptance or otherwise of the Engineer's decision. The contractor will have to extend the date of Performance Security according to new Intended completion date (validity date of Bank Guarantee etc)

29. **Deleted**

30. **Delays Ordered by the Engineer**

30.1. The Engineer may instruct the Contractor to delay the start or progress of any activity within the Works.

31. **Management Meetings**

31.1. Either the engineer or the Contractor may require the other to attend a management meeting. The business of a management meeting shall to review the plans for remaining work and to deal with matters raised in accordance with the early warning procedure.

31.2. The Engineer shall record the business of management meetings conducted at least once in a month to review progress of work / plan for completion of remaining works and is to provide copies of his record to those attending the meeting and to the Employer. The responsibility of the parties for actions to be taken is to be decided by the Engineer either at the management

meeting or after the management meeting and stated in writing to all who attended the meeting.

32. **Early Warning**

32.1. The Contractor is to warn the Engineer at the earliest opportunity of specific likely future events or circumstances that may adversely affect the quality of the work, increase the Contract Price or delay the execution of works. The Engineer may require the Contractor to provide an estimate of the expected effect of the future event or circumstance on the Contract Price and Completion Date. The estimate is to be provided by the Contractor as soon as reasonably possible.

32.2. The Contractor shall cooperate with the Engineer in making and considering proposals for how the effect of such an event or circumstance can be avoided or reduced by anyone involved in the work and in carrying out any resulting instruction of the Engineer.

C. QUALITY CONTROL

33. **Identifying Defects**

The Engineer shall check the Contractor's work and notify the Contractor of any defects that are found. Such checking shall not affect the Contractor's responsibilities. The Engineer may instruct the Contractor to search for a Defect and to uncover and test any work that the Engineer considers may have a Defect.

34 . **Tests**

34.1. If the Engineer instructs the Constructor to carry out a test not specified in the Specification to check whether any work has a Defect and the test shows that it does, the Contractor shall pay for the test and any samples.

35. **Correction of Defects**

35.1. The Engineer shall give notice to the contractor of any Defects before the end of the Defects Liability Period, which begins at completion and is defined in the Contract Data. The defects Liability Period shall be extended for as long as defects remain to be corrected.

35.2 Every time notice of a defect is given, the Contractor shall correct the notified Defect within the length of time specified by the Engineer's notice.

36. **Uncorrected Defects**

36.1. If the contractor has not corrected a Defect within the time specified in the Engineer's notice, the Engineer will assess the cost of having the Defect corrected, and the Contractor will pay this amount.

D. COST CONTROL

37. **Bill of Quantities**

37.1. The Bill of Quantities shall contain items for the construction, installation, testing, and commissioning work etc. to be done by the Contractor.

37.2. The Bill of Quantities is used to calculate the Contract Price. The Contractor is paid for the quantity of the work done at the rate in the Bill of Quantities for each item. Cost of Project is to be

controlled by controlling the quantities of work mentioned in the Bill of Quantities.

38. **Changes in the Quantities**

38.1. If the final quantity of the work done differs from the quantity in the Bill of Quantities for the particular item by more than 25 percent provided the change exceeds 1% of initial Contract Price, the Engineer shall adjust the rate to allow for the change, duly considering.

(a) Justification for rate adjustment as furnished by the contractor,

(b) Economics resulting from increase in quantities by way of reduced plant, equipment, and overhead costs,

(c) Compensation events.

38.2. The Engineer shall not adjust rates from changes in quantities if thereby the Initial Contract Price is exceeded by more than 10 percent, except with the Prior approval of the Employer.

38.3. If requested by the Engineer, the Contractor shall provide the Engineer with a detailed cost breakdown of any rate in the Bill of Quantities.

39. **Variations**

39.1. All Variations shall be included in updated Programmes produced by the Contractor.

40. **Payments for Variations**

40.1. The Contractor shall provide the Engineer with a quotation (with breakdown of unit rates) for carrying out the Variation when requested to do so by the Engineer. The Engineer shall assess the quotation, which shall be given within seven days of the request or within any longer period stated by the Engineer and before the Variation is ordered.

40.2 If the work in the Variation corresponds with an item description in the Bill of Quantities and if, in the opinion of the Engineer, the quantity of work above the limit stated in Sub Clause 38.1 or the timing of its execution do not cause the cost per unit of quantity to change, the rate in the Bill of Quantities shall be used to calculate the value of Variation. If the cost per unit of quantity changes, or if the nature of timing of the work in the Variation does not correspond with items in the Bill of Quantities, the quotation by the contractor shall be in the form of new rates for the relevant items of work.

40.3. If the Contractor's quotation is unreasonable, the Engineer may order the Variation and make a change to the Contract Price which shall be based on Engineer's own forecast of the effects of the variation on the Contractor's costs.

40.4. The Contractor shall not be entitled to additional payment for costs which could have been avoided by giving early warning.

41. **Cash Flow Forecasts**

41.1. When the Programme is updated, the contractor is to provide the engineer with an updated cash flow forecast.

42. **Payment Certificates**

42.1. The Contractor shall submit to the Engineer monthly statements of the estimated value of the work completed less the cumulative amount certified previously.

42.2. The Engineer shall check the Contractor's monthly statement within 14 days and certify the amount to be paid to the Contractor.

42.3. The value of work executed shall be determined by the Engineer.

42.4. The value of work executed shall comprise the value of the quantities of the items in the Bill of Quantities completed

42.5. The value of work executed shall include the valuation of Variations.

42.6. The Engineer may exclude any item certified in a previous certificate or reduce the proportion of any item previously certified in any certificate in the light of later information.

43. **Payments**

43.1. Payments shall be adjusted for deductions for advance payments, retention, other recoveries in terms of contract and taxes at source, as applicable under the law. The Employer shall pay the Contractor the amounts certified by the Engineer as soon as possible. No interest/ claim will be entertained by the Dept. for delayed payment.

43.2. Items of the Works for which no rate or price has been entered in will not be paid for by the Employer and shall be deemed covered by other rates and prices in the Contract.

44. **Deleted.**

45. **Tax**

45.1. The rates quoted by the Contractor shall be the basic rate (without GST). GST will be automatically calculated by the B.O.Q. template at the prevailing rate. During execution of project, if GST rate is changed by GST council, the payment shall be made accordingly.

45.2 In items in which there is provision of Tax exemption by State govt./GOI ,the employer will pay the contractor total amount including the tax. The contractor shall have to deposit the amount of Tax exemption availed in Govt. Treasury and the contractor will be solely responsible for any lapses in Tax deposit.

45.3 Service tax has not been considered in this bill of quantity, the same will be reimbursed to the contractor as per prevailing Govt. circular on production of proof of payment by the contractor. (Deleted)

45.4 The rate is inclusive of 1% labour cess and accordingly the same will be deducted from each bill.

46. **Currencies**

46.1. All payments shall be made in Indian Rupees.

47. **Price Adjustment**

47.1. Contract Price shall be adjusted for increase or decrease in rates and price of materials in accordance with the following principles and procedures and as per formula given in the contract data: Price adjustment shall be applicable only in the month in which variation in rates and prices exceeds 3% above/below from basic price-indices.

(a) The price adjustment shall apply for the work done from the start date given in the contract data up to end of the initial intended completion date or extensions granted by the Engineer and shall not apply to the work carried out beyond the stipulated time for reasons attributable to the contractor.

(b) The price adjustment shall be determined during each month from the formula given in the contract data.

(c) Following expressions and meanings are assigned to the work done during each month:

R = Total value of work done during the month. It will exclude value for works executed under variations for which price adjustment will be worked separately based on the terms mutually agreed.

47.2. To the extent that full compensation for any rise or fall in costs to the contractor is not covered By the provisions of this or other clauses in the contract, the unit rates and prices included in the contract shall be deemed to include amounts to cover the contingency of such other rise or fall in costs.

48. **Retention**

48.1. The Employer shall retain from each payment due to the Contractor the proportion stated in the Contract Data until Completion of the whole of the Works.

48.2. On Completion of the whole of the Works half the total amount retained is repaid to the contractor and half when the Defects Liability Period has passed and the Engineer has certified that all Defects notified by the Engineer to the Contractor before the end of this period have been corrected.

48.3. On completion of the whole works, the contractor may substitute retention money with an “on demand” Bank guarantee.

49. **Liquidated Damages**

49.1 The Contractor shall pay liquidated damages to the Employer at the rate per day stated in the Contract data for each day that the Completion Date is later than the Intended Completion Date (for the whole of the works or the milestones as stated in the contract data). The total amount of liquidated damages shall not exceed the amount defined in the Contract Data. The Employer may deduct liquidated damages from payments due to the Contractor. Payment of liquidated damages does not affect the Contractor’s liabilities.

49.2. If the Intended Completion date is extended after liquidated damages have been paid, the

Engineer shall correct any over payment of liquidated damages by the Contractor by adjusting the next payment certificate. The Contractor shall be paid interest on the over payment calculated from the date of payment to the date of repayment at the rates specified in Sub Clause 43.1.

49.3. If the Contractor fails to comply with the time for completion as stipulated in the tender, then the contractor shall pay to the employer the relevant sum stated in the Contract Data as Liquidated damages for such default and not as penalty for everyday or part of day which shall elapse between relevant time for completion and the date stated in the taking over certificate of the whole of the works on the relevant section, subject to the limit stated in the contract data.

The employer may, without prejudice to any other method of recovery deduct the amount of such damages from any monies due or to become due to the contractor as per relevant recovery laws.. The payment or deduction of such damages shall not relieve the contractor from his obligation to complete the works on form any other of his obligations and liabilities under the contract.

49.4. If, before the Time for Completion of the whole of the Works or, if applicable, any Section, a Taking – Over Certificate has been issued for any part of the Works or of a Section, the liquidated damages for delay in completion of the remainders of the Works or of that Section shall, for any period of delay after the date stated in such Taking-Over Certificate, and in the absence of alternative provisions in the Contract, be reduced in the proportion which the value of the part so certified bears to the value of the whole of the Works or Section, as applicable. The provisions of this Sub-Clause shall only apply to the rate of liquidated damages and shall not affect the limit thereof.

50. **Bonus**

50.1. If the contractor achieves completion of the whole of the works prior to the Intended Completion date prescribed in Contract Data the Employer shall pay to the contractor a sum stated in Contract Data as bonus for every completed month which shall elapse between the date of completion of all items of works as stipulated in the contract, including variations ordered by the Engineer and the time prescribed in Clause 17.

For the purpose of calculating bonus payments, the time given in the Bid for completion of the whole of the works is fixed and unless otherwise agreed, no adjustments of the time by reason of granting an extension of time pursuant to Clause 28 or any other clause of these conditions will be allowed. Any period falling short of a complete month shall be ignored for the purpose of computing the period relevant for the payment of bonus.

51. **Advance Payment**

51.1. The employer shall make advance payment to the contractor of the amounts stated in the contract data by the date stated in the contract data, against provision by the contractor of an unconditional Bank guarantee in a form and by a bank acceptable to the employer in amounts

and currencies equal to the advance payment. The guarantee shall remain effective until the advance payment has been repaid, but the amount of guarantee shall be progressively reduced by the amounts repaid by the contractor, **Interest will be charged @ 10% quarterly compounded.**

The interest will be charged with the instalment of recovery of mobilisation advance.

51.2. The Contractor is to use the advance payment only to pay for Equipment, Plant and Mobilization expenses required specifically for execution of the works. The Contractor shall demonstrates that advance payment has been used in this way by supplying copies of invoices or other documents.

51.3. The advance payment shall be repaid by deducting proportionate amounts from payments otherwise due to the Contractor, following the schedule of completed percentages of the Works on a payment basis. No account shall be taken of the advance payment or its repayment in assessing valuations of work done, Variations, price adjustments, or Liquidated Damages.

51.4. Deleted

52. **Securities**

52.1. The Performance Security (including additional security for unbalanced bids) shall be provided to the Employer no later than the date specified in the Letter of Acceptance and shall be issued in an amount and form and by a bank or surety acceptable to the Employer, and denominated in Indian Rupees. The Performance Security shall be valid until a date 28 days from the date of expiry of Defects Liability Period and the additional security for unbalanced bids shall be valid until a date 28 days from the date of issue of the certificate of completion.

. The person/persons whose tender(s) may be accepted (hereinafter called the contractor) shall permit Government at the time of making any payment to him for work done under the contract to

deduct a sum of 9% (Nine percent) from the gross amount of each running bill till full amount of security deposit 10% (ten percent) of agreement value or value of work (whichever is higher) is reached. If value of work exceeds the agreement value, security deposit (10%) will be recovered for the exceeded work

53. **Deleted**

54. **Cost of Repairs**

54.1. Loss or damage to the Works or Materials to be incorporated in the Works between the Start Date and the end of the defects Correction periods shall be remedied by the Contractor at the Contractor's cost if the loss or damage arises from the Contractor's acts or omissions.

E. FINISHING THE CONTRACT

55. **Completion**

55.1. The Contractor shall request the Engineer to issue a Certificate of Completion of the Works and the Engineer will do so upon deciding that the Work is completed.

56. **Taking Over**

56.1. The Employer shall take over the Site and the Works within seven days of the Engineer issuing a certificate of Completion.

57. **Final Account**

57.1. The Contractor shall supply to the Engineer a detailed account of the total amount that the Contractor considers payable under the contract before the end of the Defects Liability Period. The Engineer shall issue a Defect Liability Certificate and certify any final payment that is due to the Contractor within 56 days of receiving the Contractor's account if it is correct and complete. If it is not, the Engineer shall issue within 56 days a schedule that states the scope of the corrections or additions that are necessary. If the Final Account is still unsatisfactory after it has been resubmitted, the Engineer shall decide on the amount payable to the Contractor and issue a payment certificate, within 56 days of receiving the Contractor's revised account.

58. **Operation and Maintenance Manuals**

58.1 If "as built" Drawings and/or operating and maintenance manuals are required, the Contractor shall supply them by dates stated in the Contract Data.

58.2 If the Contractor does not supply the Drawings and/or manuals by the dates stated in the Contract Data, or they do not receive the Engineer's approval, the Engineer shall withhold the amount stated in the Contract Data from payments due to the Contractor.

59. **Termination**

59.1. The Employer or the Contractor may terminate the Contract if the other party causes a fundamental breach of the Contract.

59.2. Fundamental breaches of Contract include, but shall not be limited to the following:

(a) the Contractor stops work for 28 days when no stoppage of work is shown on the current Programme and the stoppage has not been authorized by the Engineer;

(b) The Engineer instructs the Contractor to delay the progress of the Works and the instruction is not withdrawn within 28 days;

(c) The Employer or the Contractor is made bankrupt or goes into liquidation other than for a

reconstruction or amalgamation;;

(d) The Engineer gives Notice that failure to correct a particular Defect is a fundamental breach of Contract and the Contractor fails to correct it within a reasonable period of time determined by the Engineer.

(e) The Contractor does not maintain a security which is required;

(f) The Contractor has delayed the completion of works by the number of days for which the maximum amount of liquidated damages can be paid as defined in the Contract data; and

(g) If the Contractor, in the judgment of the Employer has engaged in corrupt or fraudulent practices in competing for or in executing the Contract.

For the purpose of this paragraph: "corrupt practice" means the offering, giving, receiving or soliciting of anything of value to influence the action of a public official in the procurement process or in contract execution. "Fraudulent practice" means a misrepresentation of facts in order to influence a procurement process or the execution of a contract to the detriment of the Borrower, and includes collusive practice among Bidders (prior to or after bid submission) designed to establish bid prices at artificial non-competitive levels and to deprive the Borrower of the benefits of free and open competition."

59.3. When either party to the Contract gives notice of a breach of contract to the Engineer for a cause other than those listed under Sub Clause 59.2. above, the Engineer shall decide whether the breach is fundamental or not.

59.4. Not withstanding the above, the Employer may terminate the Contract for convenience.

59.5. If the Contract is terminated the Contractor shall stop work immediately, make the Site safe and secure and leave the Site as soon as reasonably possible.

60. **Payment upon Termination**

60.1. If the Contract is terminated because of a fundamental breach of Contract by the Contractor, the Engineer shall issue a certificate for the value of the work done less advance payments received

up to the date of the issue of the certificate, less other recoveries due in terms of the contract, less taxes due to be deducted at source as per applicable law and less the percentage to apply to the work not completed as indicated in the Contract Data. Additional Liquidated Damages shall not apply. If the total amount due to the Employer exceeds any payment due to the Contractor shall be a debt payable to the Employer.

60.2. If the Contract is terminated at the Employer's convenience or because of a fundamental Breach of Contract by the Employer, the Engineer shall issue a certificate for the value of the work done, the cost of balance by the contractor and available at site, the reasonable cost of removal of

Equipment, a repatriation of the Contractor's personnel employed solely on the Works, and the

Contractor's costs of protecting and securing the Works and less advance payments received due in terms of the contract and less taxes due to be deducted at source as per applicable law.

61. **Property**

61.1. All materials on the Site, Plant, Equipment, Temporary Works and Works are deemed to be the property of the Employer, if the Contract is terminated because of a Contractor's default.

62. **Release from Performance**

62.1. If the Contract is frustrated by the outbreak of war or by any other event entirely outside the control of either the Employer or the Contractor the Engineer shall certify that the Contract has been frustrated. The Contractor shall make the Site safe and stop work as quickly as possible after receiving this certificate and shall be paid for all work carried out before receiving it and for any work carried out afterwards to which commitment was made.

F. SPECIAL CONDITIONS OF CONTRACT

1. **LABOUR**

The Contractor shall, unless otherwise provided in the Contract, make his own arrangements for the engagement of all staff and labour, local or other, and for their payment, housing, feeding and transport. The Contractor shall, if required by the Engineer, deliver to the Engineer a return in detail, in such form and at such intervals as the Engineer may prescribe, showing the staff and the numbers of the several classes of labour from time to time employed by the Contractor on the Site and such other information as the Engineer may require.

2. **COMPLIANCE WITH LABOUR REGULATIONS**

During continuance of the contract, the Contractor and his sub-contractors shall abide at all times by all existing labour enactments and rules made there under, regulations, notifications and bye laws of the State or Central Government or local authority and any other labour law (including rules), regulations, bye laws that may be passed or notification that may be issued under any labour law in future either by the State or the Central Government or the local authority. Salient features of some of the major laws that are applicable to construction industry are given below. The Contractor shall keep the Employer indemnified in case any action is taken against the Employer by the competent authority on account of contravention of any of the provisions of any Act or rules made there under, regulations or notifications including amendments. If the Employer is caused to pay or reimburse, such amounts as may be necessary to cause or observe, or for non-observance of the provisions stipulated in the notifications/byelaws/Acts/Rules/regulations including amendments, if any, on the part of the Contractor, the Engineer/Employer shall have the right to deduct any money due to the Contractor including his amount of performance security. The Employer/Engineer shall also

have right to recover from the Contractor any sum required or estimated to be required for making good the loss or damage suffered by the Employer.

The employees of the Contractor and the Sub-Contractor in no case shall be treated as the employees of the Employer at any point of time.

SALIENT FEATURES OF SOME MAJOR LABOUR LAWS APPLICABLE TO

STABLISHMENTS ENGAGED IN BUILDING AND OTHER CONSTRUCTION WORK

a) Workmen Compensation Act 1923:- The Act provides for compensation in case of injury by accident arising out of and during the course of employment.

b) Payment of Gratuity Act 1972 :- Gratuity is payable to an employee under the Act on satisfaction of certain conditions on separation if an employee has completed 5 years service or more on death, the rate of 15 days wages for every completed year of service. The Act is applicable to all establishments employing 10 or more employees.

(c) Employees P.F. and Miscellaneous Provision Act 1952: The Act Provides for monthly contributions by the employer plus workers @ 10% or 8.33%. The benefits payable under the Act are :

(i) Pension or family pension on retirement or death, as the case may be.

(ii) Deposit linked insurance on the death in harness of the worker, (iii) (iii) Payment of P.F.

accumulation on retirement/death etc.

d) Maternity Benefit Act 1951:- The Act provides for leave and some other benefits to women employees in case of confinement or miscarriage etc.

e) Contract Labour (Regulation & Abolition) Act 1970:- The Act provides for certain welfare measures to be provided by the Contractor to contract labour and in case the Contractor fails to provide, the same are required to be provided, by the Principal Employer by Law. The Principal Employer is required to take Certificate of Registration and the Contractor is required to take license from the designated Officer. The Act is applicable to the establishments or Contractor of Employer, if they employ 20 or more contract labour.

f) Minimum Wages Act 1948:- The Employer is supposed to pay not less than the Minimum Wages fixed by appropriate Government as per provisions of the Act, if the employment is a scheduled employment. Construction of Buildings, Roads, Runways are scheduled employments.

g) Payment of Wages Act 1936:- It lays down as to by what date the wages are to be paid, when it will be paid and what deductions can be made from the wages of the workers.

h) Equal Remuneration Act 1979:- The Act provides for payment of equal wages for work of equal nature to Male and Female workers and for not making discrimination against Female employees in the matters of transfers, training and promotions etc.

i) Payment of Bonus Act 1965: - The Act is applicable to all establishments employing 20 or more employees. The Act provides for payments of annual bonus subject to a minimum of 8.33% of wages and maximum of 20% of wages to employees drawing Rs.3500/-per month or less. The bonus to be paid to employees getting Rs.2500/- per month or above upto Rs.3500/- per month shall be worked out by taking wages as Rs.2500/ -per month only. The Act does not apply to certain establishments. The newly set-up establishments are exempted for five years in certain circumstances. Some of the State Governments have reduced the employment size from 20 to 10 for the purpose of applicability of this Act.

j) Industrial Disputes Act 1947:- The Act lays down the machinery and procedure for resolution of Industrial disputes, in what situations a strike or lock-out becomes illegal and what are the requirements for laying off or retrenching the employees or closing down the establishment.

k) Industrial Employment (Standing Orders) Act 1946:- It is applicable to all establishments employing 100 or more workmen (employment size reduced by some of the States and Central Government to 50). The Act provides for laying down rules governing the conditions of employment by the Employer on matters provided in the Act and get the same certified by the designated Authority.

l) Trade Unions Act 1926: - The Act lays down the procedure for registration of trade unions of workmen and employers. The Trade Unions registered under the Act have been given certain immunities from civil and criminal liabilities.

m) Child Labour (Prohibition & Regulation) Act 1986:- The Act prohibits employment of children below 14 years of age in certain occupations and processes and provides for regulation of employment of children in all other occupations and processes. Employment of Child Labour is prohibited in Building and Construction Industry.

i) Inter-State Migrant workmen's (Regulation of Employment & Conditions of Service) Act 1979

: - The Act is applicable to an establishment which employs 5 or more inter-state migrant workmen through an intermediary (who has recruited workmen in one state for employment in the establishment situated in another state). The Inter-State migrant workmen, in an establishment to which this Act becomes applicable, are required to be provided certain facilities such as housing, medical aid, traveling expenses from home up to the establishment and back, etc.

o) The Building and Other Construction workers (Regulation of Employment and Conditions of Service) Act 1996 and the Cess Act of 1996 :- All the establishments who carry on any building or other construction work and employs 10 or more workers are covered under this Act. All

such establishments are required to pay cess at the rate not exceeding 2% of the cost of construction as may be modified by the Government. The Employer of the establishment is required to provide safety measures at the Building or construction work and other welfare measures, such as Canteens, First-Aid facilities, Ambulance, Housing accommodations for workers near the work place etc. The Employer to whom the Act applies has to obtain a registration certificate from the Registering Officer appointed by the Government.

p) Factories Act 1948 :- The Act lays down the procedure for approval of plans before setting up a factory, health and safety provisions, welfare provisions, working hours, annual earned leave and rendering information regarding accidents or dangerous occurrences to designated authorities. It is applicable to premises employing 10 persons or more with aid of power or 20 or more persons without the aid of power engaged in manufacturing process.

SECTION 4

CONTRACT DATA

CONTRACT DATA

Clause Reference
With respect
to section 3

Items marked "N/A" do not apply in this contract.

1. The Employer is

   Name : Govt. of Jharhkand through Engineer in Chief, DWSD Nepal House Doranda, Ranchi.

   Address: DWSD Nepal House Doranda, Ranchi. [Cl.1.1.]

   Name of Employer's Representative: Executive Engineer, D W & S Division **----------.**

2. The Engineer is Executive Engineer, Drinking Water and Sanitation Division **----------.**

   Name of Authorized Representative:

3. The dispute review expert appointed by Engineer in Chief or the

   administrative head of the said DWSD [Cl. 1. 1]

   Name -------- NA ----------

   Address ----------

4. The Defects Liability Period is **365** days from the date of completion. [Cl. 1. 1&35]

5. The Start Date shall be 07 days for the date of issue of the Notice to [Cl.1.1.]

   Proceed with the work.

6. The Intended Completion Date for the whole of the Works is **------** months [Cl. 1.1,17&28]

   months after start of work with the following milestones: [C1.2.2&49.1]

   Physical works to be completed. Period from the start date

   Milestone dates: [C1.2.2&49.1]

   Physical works to be completed. Period from the start date

   Milestone 1 i.e. 15% (of whole work) --- months

   Milestone 2 i.e. 45% (of whole work) months ---- months

   Milestone 3 i.e. 75 % (of whole work) months ---- months

   Milestone 4 i.e. Full -----months.

7 .The Site is located at **----------** rural area. [Cl. 1.1] .

8. The name and identification number of the Contract is ..... [Cl. 1.1]

9. The works consist of Distribution System ,E.S.R. , Raw Water rising main,Clear Water rising main ,W.T.P. Distribution System ,E.S.R. , Raw Water rising main,Clear Water rising main ,W.T.P. Etc _ [Cl. 1.1]

The works shall, inter alia, include the following, as specified or as directed:

	Clause Reference with respect to section3
.	
R.C.C. Gangway	----- metre length and ------- Meter Wide
Supplying & laying of Pipeline	(100 mm to ------- mm dia) – ----------.---- mts
E.S.R.	(i) ------- Lakh Litre capacity with ----- M staging
R.C.C Intake Well	------- M Inner dia and ------- M depth (Intake well with pump house)
Clear water Pump –C.F Pump-	(i) ------- LPS, discharge and ------- M Head (-- HP) ----- nos.
Raw water Pump – V.T. Pump	(i) -------- LPS, discharge and ----- M Head (--- HP) ------- nos
Water Treatment Plant	-------- MLD
One unit of	----------

Other items as required to full fill all contractual obligations as per the Bid documents.

10. The following documents also form part of the Contract: [Cl. 2.3 & (9)]

11. The law which applies to the Contract is the law of Union of India [Cl. 3.1]

12. The language of the Contract documents is English [Cl. 3.1]

13. Limit of subcontracting 10 % of the Initial Contract Price only for peripheral works and major works like Intake works, WTP, ESR ,Pumping Machinery, Pipe Networks, Drilling works etc. not to be considered for subcontracting.

[Cl. 7.1]

14. The Schedule of Other Contractors ---------- [Cl. 8]

	Clause Reference with respect to Section3
15. The Schedule of Key Personnel as per Annex.-II to Section I	[Cl.9]

16. The minimum insurance cover for physical property, injury and death is Rs.5 lakhs per occurrence with the number of occurrences limited to four. After each occurrence, Contractor will pay additional premium necessary to make insurance valid for four occurrences always. [Cl.13]

17. Site investigation report. [Cl.14]

18. The Site Possession Dates shall be [Cl.21]

21. The period for submission of the programme for approval of Engineer shall be 21 days from the issue of Letter of Acceptance. [Cl.27.1]

22. The period between programme updates shall be 90 days. [Cl.27.3]

23. The amount to be withheld for late submission of an updated programme shall be Rs **3.00** lakhs. [Cl. 27.3]

24. **Deleted.**

25. The currency of the Contract is Indian Rupees. [Cl. 46]

clause Reference with respect to section 3

26. The formula (e) for adjustment of prices are: [Cl. 47]

Adjustment for labour component

(i) Price adjustment for increase or decrease in the cost of labour shall be paid in accordance with the following formula.

$V_L = 0.85 \times R \times (L_1 - L_0)/L_0$

V_L = Increase or decrease in the cost of work during the month under consideration due to change in the rates of labour.

L_0 = The consume price index for industrial workers for the state on 28 days preceding the date of opening of Bids as published by Labour Bureau, Ministry of Labour, Government of India.

L_1 = The consumer price index for industrial workers for the state for the month under consideration as published by Labour Bureau, Ministry of Labour, Government of India.

R = Cost of Labour as defined in table at the end of Cl. 26.

Adjustment for cement component

(ii) Price adjustment for increase or decrease in the cost of slag cement procured by the contractor shall be paid in accordance with the following formula:

$V_c = 0.85xRx(C_i - C_0)/C_0$

V_c = increase or decrease in the cost of work during the month under consideration due to changes in rates for cement.

C_o = The all India wholesale price index for slag cement on 28 days preceding the date of opening of Bids as published by the Ministry of Industrial Development, Government of India, New Delhi.

C_i = The all India average wholesale price index for cement for the month under consideration as published by Ministry of Industrial Development, Government of India, New Delhi

R = Cost of slag cement as defined in table at the end of Cl. 26.

Adjustment for steel component i/c MS

(iii) Price adjustment for increase or decrease in the cost of steel rods procured by the Contractor shall be paid in accordance with the following formula:

$Vs = 0.85xRx(S_i - S_0)/S_0$

V_s = Increase or decrease in the cost of work during the month under consideration due to changes in the rates for steel

S_o = The all India wholesale price index for steel Rods on 28 days preceding the date of opening of Bids as published by the Ministry of Industrial Development, Government of India, New Delhi

Si = The all India average wholesale price index for steel Rods for the month under consideration as published by Ministry of Industrial Development, New Delhi

R = Cost of steel rods as defined in table at the end of Cl. 26.

Note : For the application of this clause, index of steel Rods has been Chosen to represent steel group.

Adjustment for D.I. pipes and specials component

(iv) Price adjustment for increase or decrease in the cost of D.I. pipes and specials procured by the Contractor shall be paid in accordance with the following formula:

$Vs = 0.85x0.65xR_{DI} x (S_1 - S_0)/S_0$

V_s = Increase or decrease in the cost of work during the month under consideration due to changes in the rates of pig iron.

R_{DI} = Value of the D.I . work

S_o = Whole sale price index of foundry Grade pig iron on 28 days preceding the date of opening of bids as published monthly by office of economic advisor, Ministry of commerce and industry GoI.

S_1 = Whole sale price index of foundry Grade pig iron for the month under consideration as published monthly by office of economic advisor, Ministry of commerce and industry GoI.

Adjustment for Machinery & Machine Tools

(v) Price adjustment for increase or decrease in the cost of machinery and machine tools procured by the Contractor shall be paid in accordance with the following formula :

$V_p = 0.85 \times R \times (P_1 - P_0)/P_0$

V_p = Increase or decrease in the cost of work during the month under consideration due to changes in rates for machinery and machine tools.

R = Value of the work

P_0 = The all India wholesale price Index for machinery and machine tools on 28 days preceding the date of opening of Bids as published by the Ministry of Industrial Development, Government of India, New Delhi.

P_1 = The all India average wholesale price index for machinery and machine tools for the month under consideration as published by Ministry of Industrial Development, Government of India, New Delhi.

Note : For the application of this clause, Index of machinery and machine tools has been chosen to represent the machinery and machine tools group

The following percentages will given the price adjustment for the entire project

Sl. No.	Component	Percentage
1	Labour – R	20% for the work involving labour component (Supply items and those items not involving labour will be excluded)
2	Cement - R	Only those items which involves cement. Percentage of cement to the quantity of such item will be governed by BIS code, Govt. manuals, mutually agreed by both parties)
3	Steel – R	Only those items which involves steel. Percentage of the quantity of item will be governed by actual measurement and deducing the percentage and mutually agreed by both parties)
4	DI pipe	Absolute
5	Machinery & Machine Tools	Absolute

Note: The above percentage will be applicable for the work components executed during the month only for price adjustment of all components mentioned above.

The basic rate of Cement & Steel for arriving at total cost (R) as per table above will be the rate given in the JSOR valid on 28 days preceding opening of bid.

27. The proportion of payments retained (retention money) shall be 9 % from each bills subject to a maximum of 10% of final contract price including Performance Security money. [Cl. 48]

28.	Amount of liquidated damages for delay in completion of works	[C1.49]
		$(1/2000)_{th}$ of the Initial Contract Price, rounded off to the nearest Thousand, per day.
29.	Maximum limit of liquidated damages for delay in completion of work.	10 per cent of the Initial Contract Price rounded off to the nearest thousand. [Cl. 49]
30.	Amount of Bonus for early	1 per cent of the Initial Contract Price (excluding O& M cost) (part of a month to be excluded), rounded off to the nearest thou. per month. [Cl. 50]
31.	Maximum limit of bonus for early	6 per cent of the Contract Price rounded off to the nearest thousand.. [Cl. 50]

Clause Reference with respect to section 3

3 2. The amounts of the advance payment are: [C1.51&52]

Nature of Advance

i	Mobilization	10% of the Contract price	Amount (Rs.) Conditions to be fulfilled On submission of unconditional Bank Guarantee, (to be drawn before the end of 20% of Contract period). The contractor may furnish four bank guarantees of 2.5% each, valid for full period.
ii	Equipment	90% for new and 50% of depreciated value for old equipment. Total amount will be subject to a maximum of 5% of the Contract price.	After equipment is brought to site (provided the Engineer is satisfied that the equipment is required for performance of the contract) and on submission of unconditional Bank Guarantee for amount of advance.
Iii	**Deleted.**		

33. Repayment of advance payment for mobilization and equipment: [Cl. 51.3]

The advance loan shall be repaid with percentage deductions from the interim payments certified by the Engineer under the Contract. Deductions shall commence in the next Interim Payment Certificate following that in which the total of all such payments to the Contractor has reached not less than 20 per cent of the Contract Price or 6 (Six) months from the date of payment of first instalment of advance, whichever period concludes earlier, and shall be made at the rate of 20 per cent of the amounts of all Interim Payment Certificates until such time as the loan has been repaid, always provided that the loan shall be completely repaid prior to the expiry of the original time for completion pursuant to Clauses 17 and 28.

34. **Deleted.**

35. The Securities shall be for the following minimum amounts equivalent [Cl. 52]

as a percentage of the Contract Price:

Performance Security for 2 per cent of contract price plus Rs..... (to be decided after evaluation of the bid) as additional security in terms of ITB Clause 29.5. The standard form of Performance Security acceptable to the Employer shall be an unconditional Bank Guarantee of the type as presented in Section 8 of the Bidding Documents. [Cl 50]

[C1.50] Clause reference

with respect to Section 3

36. The Schedule of Operation and Maintenance Manuals _____ [Cl. 58]

as specified in Technical specification

37. The date by which "as-built" drawings on GIS platform (in scale as directed) in 2 sets are [Cl. 58]

required is within 28 days of issue of certificate of completion of whole

or section of the work, as the case may be.

38. The amount to be withheld for failing to supply "as built" drawings on GIS platform by [Cl. 58]

the date required is Rs 5.00 Lakhs.

39. The following events shall also be fundamental breach of contract: [Cl. 59.2]

"The Contractor has contravened Sub-clause 7.1 and Clause 9 of GCC."

40. The percentage to apply to the value of the work not completed representing the Employer's additional cost for completing the Works shall be 20 per cent. [Cl. 60]

SECTION 5

TECHNICAL SPECIFICATION

1.0 GENERAL SPECIFICATIONS (Material)

1.1 Materials and methods of construction for all civil works shall be as per relevant Indian standard specification, part of which are incorporated in the standard specification of DWSD and P.W.D. Jharkhand and all will be followed during the execution of the work. The work shall be executed as per the guidelines and provisions of B.I.S. All materials shall conform to Indian standard code of practice National Building Code and CPHEEO manual to maintain quality of work. List of relevant I:S codes are placed as annexure 'A'

1.2 General

All materials shall be best of their kind and shall conform to the relevant latest Indian standard.

All materials shall be of approved quality as per samples and from origins approved by the Engineer in Charge. A set of specimen samples of all approved materials shall be kept in sealed container or otherwise at site, cost of which is to be borne by the contractor.

1.3 Bricks

Only 1st class kiln burnt bricks shall be used unless other wise specified. They shall be of a uniform deep cherry color; thoroughly burnt, regular in shape with sharp and square areas and they must emit a clear ringing sound on being struck. They must be free from cracks, chips, flaws, stones or lumps of any kind and they shall not absorb water more than one seventh of their own weight after soaking them in water for 15 minutes. The bricks shall show no sign of efflorescence either dry or subsequent to soaking in water.

1.4 Sand

The source from which sand is to be obtained shall be subject to the approval of Engineer-in-charge. The sand shall be clean, sharp and gritty to touch and be freed from soil and other impurities by washing. The sand shall be washed to such a degree that when a handful is mixed with clean water in a glass and allowed to stand for an hour the precipitate of mud over the sand shall not exceed 5%. The sand should conform to IS 382-1982 for fine and coarse aggregates from natural sources.

1.5 Coarse Sand

It is to be screened through a sieve of 64 meshes to the square inch so as to exclude large particles from the work. The fineness modulus shall not be less than 1.0

1.6 Fine sand

It is to be screened through a sieve of 64 meshes to the square inch so as to exclude large particles from the work. The fineness modulus shall not be less than 2.5

1.7 Stone chips

It shall be obtained from crushing trap quartzite or hard stones and from quarries approved by Engineer-in-charge. It shall be of approved quality and proper grade. It shall pass through ¾ "mesh and retained on ¼ "mesh. It shall be free from dirt, leaves, clay and any organic matter. The material conforming generally to IS 383-1983 for coarse and fine aggregate from natural sources or IS 515-1959 for natural and manufactured aggregates for use in mass concrete with latest revisions.

1.8 Cement

Ordinary or lowest heat Portland cement conforming I.S.S. 269 –1989 of A.C.C. / ULTRATECH/ LAFARGE shall be used after due approval of the Engineer-in-charge. All cement shall be fresh when delivered. Cements of different types are not to be mixed with one another. Consignments shall be used in the order of delivery. Admixture if any shall be used only after approvals of Engineer in charge.

1.9 Reinforcement

Steel reinforcement shall be of mild steel of tested quality conforming to I.S.S. – 432 - 1966/ H.Y.S.D. bars conforming to ISS-1786/1779-of SAIL/TATA/ make approved by department

All the reinforcement shall be clean and free from rust, mild scales, dust, paint, oil, grease, adhering soil or any other material or coating that may impair the bond between the concrete and the reinforcement, or cause corrosion of the reinforcement or disintegration of concrete. Neither the size nor length of bar or wire shall be less than the size or length described in the bar schedule or elsewhere and the length shall not be more than 50 mm in excess of the length as described.

Welded joints in reinforcement may be used but in cases of important connection, tests shall be made to prove that the joints are of the full strength of bars connected, welding of reinforcement shall be done in accordance with the recommendations of the relevant Indian standards for welding mild steel bars used in the reinforced concrete construction.

Bending and overlapping, placing in position, fabrication, binding, reinforcement with wire of approved gauge shall be done as per I.S. 432 – 1960 (revised) and I.S. 1786 – 1966 and I.S. 2502 (revised). Handling and storage of materials for concrete or RCC should be followed as per I.S. 4082 –1977.

1.10 Water

The water to be used in making and curing of concrete, mortar etc. shall be free from objectionable quantities of silts, organic matter, injurious amount of oils, acids, salts and other impurities etc. as per IS-456-1978. The Engineer-in-charge or his authorized representatives will determine whether or not such quantities of impurities are objectionable. Such comparison will usually be made by comparison of compressive strength, water requirement, time of setting and other properties of concrete made with distilled or every clean water and concrete made with the water proposed for use, Permissible limit for solids when tested in accordance with I.S. 3025-1964. Shall be as tabulated below

1.	Organic	Permissible limit for solids Maximum permissible limit. 200 mg/litre.
2.	Inorganic	3000 mg/litre.
3.	Sulphate (As SO_4)	500 mg/litre.
4.	Chloride (As CI)	2000 mg/litre for P.C.C and 1000 mg/litre for R.C.C. work
5.	Suspended matter	2000 mg/litre.

If any water to be used in concrete, suspected by the Engineer-in-charge/or his authorized representative of exceeding the permissible limits of solids, samples of water will be obtained and get it tested by Engineer-in-charge in accordance with IS-3025-1964.

1.11 Cement Mortar

The mortar shall consist of cement and sand mixed in proportion defined in relevant schedule item for various item of work. Only measured quantity shall be used. The sand shall be shoveled in a wooden measure of a clean masonry platform, after removing the measure box and spreading out sand if necessary, the cement (in required proportion) shall be emptied on the top of sand. The sand and cement shall be then turned over with shovels once dry and made into the form of a hollow cone; into this water can be poured and the whole shall then be turned over completely twice. The color and consistency shall at this stage be quite uniform, if not, further turning shall be done. Water shall be added by measured quantities. Only such quantities of mortar shall be mixed at one time as can be used at once before it can set. No mortar, which has once caked or begun to set, shall be used, nor shall such mortar be remixed; but it shall be removed from the site of the work immediately.

1.12 Cement concrete

The concrete shall consist of an aggregate of the proportion by volume/ weight as defined in relevant schedule item or work. Only measured quantity shall be used. The aggregate shall consist of stone ballast of quality approved by Engineer-in-charge and shall consist of graded size 20 mm and down wards as per PWD specification or the size mentioned in the item description. The quality of cement concrete should conform to the specification mentioned in BOQ and standard and specification as laid down in different IS codes for concrete to be used for different component and for different design concrete.

1.13 Laying:

The cement, sand and stone chips shall be mixed properly in mechanical mixer in such a manner as to avoid loss of water. The concrete shall be mixed for minimum period of 2 minutes or until it is of even colour and uniform consistency throughout. As soon as the concrete is mixed it should be removed to the work in iron vessels as rapidly as practicable. The concrete laid will be vibrated for compaction by the vibrators. Slum test will be carried at site during execution of work. Cube (crushing) test of concrete will have to be carried out at the frequency as mentioned in relevant IS code of practice and record of such test will be preserved for future reference.

1.14 Curing:

The concrete laid shall not be disturbed and shall be kept thoroughly damped by means of wet matting and sand until it shall have become thoroughly set and hard enough to prevent its drying and cracking.

1.15 Forms:

Contractor shall furnish on the site of work sufficient number of centering, moulds or templates for its expeditious execution. The forms shall be made in such a way and of such materials as will ensure a smooth surface on the finished concrete. Forms and centering shall be left in place until the concrete has set sufficiently to permit the removal without danger to the structure and as per direction of E/I.

1.16 Brick masonry work

Materials:

The brick works shall consist of bricks and mortar in accordance with general specification and plans.

Soaking bricks:

All bricks shall be soaked in clean water in tank for a period of at least twelve hour immediately before use. The contractor shall provide at his expense tanks of sufficient capacity to admit of the simultaneous immersion of bricks for the work its normal rate of progress.

Laying:

All the best shaped uniformly coloured bricks shall be picked out and used for face work without any extra payment to the contractor. All bricks work shall be constructed in English bond and shall follow the type bond junctions etc. All courses unless other wise specified or ordered by the Engineer in charge shall be truly horizontal and the walls shall be taken up truly plumb. Mortar joints shall never exceed 10 mm in thickness and this thickness shall be uniform throughout. Vertical joints in alternate courses shall not come directly over one another. The joints shall be racked out not less than 12mm deep when the mortar is green so as to provide proper key for the plaster or pointing to be done. Each face brick shall be set with both bed and vertical joints quite full of mortar. No damaged or broken brick shall be used in any part of the work except such as may be cut to size for closing the course. Closers shall be clean out to size as indicated in English bond and shall be situated near the end of walls. The masonry shall be carried up regularly and no step shall be allowed more than 60cm. Where the masonry of one part has to be delayed, the work must be raked back at an angle not exceeding 45 ^{o} Angles and Junctions. At all angles forming the junction of walls, the brick shall at each alternate course be carried into their respective walls so as to thoroughly unite the work with English bond. Care shall be taken that when a brick is left out to allow support for the scaffold pole on the wall face, such brick shall always be a header and that not more than one header for each pole shall be left out.

1.17 Scaffolding:

Proper scaffolding shall be provided whenever necessary having two sets of vertical supports and shall be subject to the approval of the Engineer in charge; who may order the contractor to alter or strengthen the scaffolding if he considers it necessary, without thus becoming responsible either for the safety of the work or workmen or for any additional payment**.** Holes shall be made good by bricks to match the face work when scaffolding is removed.

1.18 Curing:

All bricks work shall be keep well watered for 14 days after laying.

1.19 Reinforced Cement Concrete:

All R.C.C. work shall be of the grade M -15, M20, M 25 or as per IS 456: 2000 and as given in specifications. The materials will be measured when dry. The stone chips should be thoroughly washed in clean water and stacked. Vibrator will be used for all R.C.C and P.C.C work. The aggregate shall consist of stone ballast of quality approved by Engineer-in-charge and shall consist of graded size 20 mm and downwards as per PWD specification or the size mentioned in the item description. Cube (crushing) test of concrete will have to be carried out at the frequency as mentioned in relevant IS code of practice and record of such test will be preserved for future reference.

1.20 Laying:

Cement, sand and stone chips shall be mixed properly in a mechanical mixer in such a manner as to avoid loss of water. The concrete shall be mixed for minimum period of 2 minutes or until it is of even color and uniform consistency throughout. As soon as the concrete is mixed it should be removed to the work in iron vessels as rapidly as practicable. The concrete laid will be vibrated for compaction by vibrators. Slum test will be carried at site during execution of work.

1.21 Curing:

The concrete laid should not be disturbed and shall be kept damped by means of wet matting and sand until it shall have become thoroughly set and hard enough to prevent its drying and cracking.

1.22 Forms:

Contractor shall furnish on the site of work sufficient number of centering, forms, moulds or templates for its expeditious execution, the forms shall be made in such way and of such material as will ensure a very smooth surface on the finished concrete. Forms and centering shall be left in place until the concrete has set sufficiently to permit the removal without danger to the structure.

1.23 Reinforcement:

Steel bars for reinforcing concrete shall be of such shape to afford an approved mechanical bond with concrete to ensure intimate control between steel and concrete. Steel reinforcement shall be either mild steel of tested quality confirming to IS-432-1996 or cold worked steel high strength deformed bars as per IS-1786-1979 in strength grade Fe-415 or hot rolled high yield strength steel deformed bars with minimum yield strength of 425 N/mm^2 as per IS – 1939 –1966 (Amended 1968) Reinforcement bars will be rejected if the actual weight vary more than 5% from the standard weight. All bars must conform to the requirement of Indian standard specification. They shall be protected at all time before placed in the concrete from mechanical injury and the weather and when placed in the work, they shall be free from dirt, scales, loose or scaly rust, paint and oil. Bars which are to be embodied in concrete but remain exposed for sometime after being placed in the work shall, if directed be immediately coated with a thin grout of equal part of cement and sand. Bars shall be bend to the shape shown on the drawings and in conforming to approved templates. When bars are cut and bent on the work site the contractor shall employ competent men and provide the necessary appliances for the purpose. All steel shall be rigidly held in place with 18 gauge annealed steel wire, cement mortar (1:2) cubes. M.S. chairs and spacer shall be used in order to ensure accurate positioning of reinforcement. All joints in steel reinforcement shall be overlapped. The length of overlap for tension and compression shall be as per the requirement of Indian standard specification. In water retaining structures a clear cover of 25 mm over steel should be provided.

1.24 Construction Joints

Construction joints shall be provided, where directed approved by the Engineer-in-charge. Such joints shall be kept in minimum and shall be right angles to the direction of main reinforcement. In case of column and walls the joint shall be horizontal and 8 to 15 cm below the bottom of the beam or slab running into the column or wall head or below the anchor reinforcement of beam and slab coming into the column and wall and the portion of the column or wall between the stopping level and the top of slab shall be concerted with the beam or slab.

1.25 Vertical Joints

At the end of any days work or run of concrete, the concrete should be finished off against temporary shutter stop, which should be vertical and securely fixed. This stop should be removed as early as weather permits.

1.26 Horizontal Joints:

Horizontal joints should be washed down two hours after a casting in the manner described above for vertical joints. If the concrete has been allowed to hard excessively, the surface shall be chipped over its whole surface to depth of at least 10 mm and there after thoroughly washed. Before fresh concrete is added on the other side of a construction joints, the surface of the old concrete will be thoroughly wetted then covered with a thin layer of cement mortar (1:2). All the construction joints in all concrete structure having contact with water or soil shall be provided with approved PVC water stops on both side with hot asphalt or approved metallic strips.

1.27 Expansion joints:

Expansion joints shall be provided wherever directed by the engineer in charge, or where necessary as per standard specification and practice. The filler to be used shall be of approved material.

1.28 Cube test:

Cube test for RCC work shall be done as per the frequency based on volume of concrete casted in the work as specified in IS Code and CPWD specification in laboratories to be specified by the department and its compressive strength should be within the allowable limit. The cost of testing has to be born by the contractor. Test certificates of concrete cubes have to be attached along with each bill without which no payment will be made.

1.29 Cement Plaster:

12 mm thick cement plaster in (1:4) proportion shall be applied on outside surface of all concrete works from 30cm below ground level up to top. The surface in contact with water will have 12 mm thick cement plaster of not less than (1:3) proportion with 3% water proofing compound. The concrete surface shall be properly hacked, washed, cleaned and applied with thick cement slurry before applying. All brick work unless otherwise specified will be plastered externally and internally with 12mm cement plaster (1:6) proportion. The plaster shall be protected from sun, rain and frost at the contractor's expense by such means as the Engineer in charge may approve. To protect the plaster from the sun, ordinarily the whole surface shall be covered with wet sacks. The contractor shall keep the plaster continuously waited for a period of seven days after application.

1.30 Flooring

Except where in otherwise specified flooring will have minimum 15cm thick sand filling, one brick flat soling and 100mm thick PCC(1:2:4) in ground floor and 25mm thick patent stone flooring shall be provided over this base. In case flooring in raw water pump house 25mm patent stone flooring shall be provided directly over R.C.C. slab in strip placed in suitable manner to avoid construction cracks.

1.31 Door and Window:

All the doors and windows shall be of good quality well seasoned and well-dressed Sal wood with oxidized iron fittings. All windows shall be provided with M.S. grill of approved design. Rolling shutter of approved make with pusher and pull operated properly fabricated with M.S. lathers including all accessories and necessary fitting of approved quality as per PWD specification will be provided in the pump house. All the doors and windows shall be painted with two coats of enamel paints over a coat of primer. The materials, the size, the shape and the fitting of doors and windows shall be approved by Engineer in Charge before put in position.

1.32 Roof and Roof treatment:

R.C.C. M. 15 grade roof slab of adequate thickness shall be provided unless specified. The roof shall be treated with 25 mm PCC.

1.33 Snowcem Wash/Plastic emulsion paint:

All the building shall have two coat of snowcem wash of approved shade over a coat of cement primer on outer surface and two coat plastic emulsion paint over inner surface including preparing the plastered surface smooth with sand paper, scaffolding, centering etc. all complete as per building specification.

1.34 Painting:

All steel or wood shall have two coats of synthetic enamel paint over a coat of primer as specified by the manufacturer of the paint. The make, shade and color of the paints shall have to be approved by the Engineer-in-charge before use.

1.35 Pipe Laying Works:

DI pipes will be laid as per the provision of relevant BIS specifications.

1.36 Testing

The line of pipes after laying and jointing shall be tested to a pressure at least doubles that of working pressure. Labour for testing the pipes at his own expense.

1.37 Painting:

All exposed surface of pipes, specials valves, Steel doors and windows, etc, shall have two coats of synthetic enamel paint of approved shade over a coat of red oxide primer etc all complete as per approval and direction of the Engineer–in-charge

1.38 Trial Run:

The trial run shall consist of a period of three months after completion of job.. The contractor shall provide the skilled plant- operator/pump operators, supervisors along with other service staffs for this duration of trial run after completion of the total work on Turnkey job basis. The contractor staffs shall train the staffs/persons nominated by the Engineer in charge during this period. The contractor shall run the plant during this period and shall maintain a logbook to ascertain the quality and quantity of treated water, and chemicals consumed etc. Any shortcomings in quality and quantity of water shall be corrected by the contractor adopting proper correction measures and as per direction of Engineer in charge. No extra payment will be made for trial and run. However the cost of chemicals and electric charges will be born by the department.

2.0 COMPONENTWISE TECHNICAL SPECIFICATION

Sl.No. - 2.1. INTAKE WELL WITH PUMP HOUSE.

Detailed specification as per commercial bid.

2.1.1 Intake well and pump house:

Designing, constructing and commissioning intake well cum pump house structure at locations mentioned above after proper Geotechnical investigation and survey work by various methods to choose suitable places for construction of intake well that will be capable to draw water as mentioned above during the whole year continuously. It should have a circular shape. This will be constructed with M30 grade RCC. The well will be provided with adequate of non corrosive screen for inlet of water from the river and as per approved design and direction of E/I..

(A) FOUNDATION OF INTAKE WELL CUM PUMP HOUSE

The foundation of Intake well, cum pump house will be designed and constructed keeping in view of the strata met in foundation, maximum scour depth, weight of super structure, velocity forces, wind forces, live load of pumps, motors, pipes, dynamic forces due to vibrations of pumps, water thrust, seismic force, other live loads over structures including uplift pressure etc. complete. Any other forces required to be taken for safe design which are not mentioned here will also be taken into consideration for the design. The stability of Intake well, cum pump house will also be checked for seismic forces.
The foundation of the Intake well cum pump house shall be kept below scour level. The depth of foundation should also be sufficient from consideration of bearing capacity, settlement, and suitability of strata at foundation level and stability of structure as a whole against overturning and sliding. The foundation shall be designed for worst combination of loads and forces. Indian standard specifications shall be followed strictly during the execution of work.
For laying foundation concrete under water, it shall be done by skip boxes or termite pipe. Pumping out of water shall not be permitted from the time of placing of concrete up to 72 hrs. thereafter.
The minimum grade of concrete used in structure will be CC M 30 and stresses in concrete will be taken from IS: 3370/2010.

The number and size of bracing of pillars of Intake well cum pump house will be designed keeping in view the various stresses developed due to self load of pump house, super structure live load, due to pumps, motors and pipe column assembly of pumping sets, water forces due to river floods, velocity forces, wind force, dynamic forces, due to vibration of motors, water thrust in discharge pipe, due to water hammer and other live loads over slabs, roofing, balconies, other loads due to buoyancy effect and any other forces required to be taken for safe design will also be taken into consideration which are not mentioned here. The bracing be designed for the various combinations of forces. Its stability shall be checked for the worst condition including the condition will be in R.C.C. The minimum grade of concrete shall be M30.

The height of pillars above G.L. of intake well should be up to minimum 1meter above H.F.L. and depth below G.L should be as per design considering all forces and detention time of water in the intake well - 20 minutes and also providing relevant BIS approved screen S/S infiltration sheet of

appropriate size and number as per approved design to fetch required quantity of water. Pump house should be above intake well duly braced with R.C.C. bands and stiffeners having R.C.C. slab at the top and adequate no of column. The floor of pump house will be R.C.C. floor which will be designed for sufficient load of pumps as well as other accessories & live load, the entire construction of pump house will be of R.C.C framed structure (M25) and wall of 10" thickness of 75A B/W in 1:4 cement mortar. The Pump House shall be circular in shape, 0.75 meter wide Cantilever chajjas at approximately 2.4 M height on the outer side of pump house shall be provided over window / ventilators. Good architectural appearance shall be provided to pump house. Other details as per specification given in rate bid part of bid.

3 ton capacity by chain pulley block complete set should be provided. Flooring, plastering, snowcem work, and painting work should be done of intake well and pump house. All work has to be done including all taxes, royalty, carriages of materials, dewatering charges during construction work etc.

The intake pipes between the intake well cum pump house shall be ISI mark C.I.D.F. pipe class-B conforming to IS 1537. Duly inspected by empanelled Agencies. The length of pipe shall be as per requirement at site to draw river water from the river.

The electrification of the whole pump house inside and outside the Intake well shall be done in such a manner that the standard level of illumination is obtained at all places. The wiring should be either concealed or with PVC conduits of superior quality. The total number of light points shall be not less than 5 inside the pump house. The inside of Intake well shall be illuminated with the help of 2 fountain lights. The outer illumination should also have two sodium vapour lamps.

Including cost of dewatering and construction of coffer dam all complete as per approved design and direction of E/I.

2.2 RCC GANGWAY

(detailed specification as per commercial bid)

2.2.1 RCC APPROACH BRIDGE

One RCC "Approach Bridge" for intake well shall be constructed with M – 25 grade Reinforced cement concrete and HYSD / TMT bars, as per drawings and specifications from the Intake well up to the bank of river. Foundation of the bridge shall be footing foundation.

DI K- 9 Water Pipe Lines on gangway shall be laid on the bridge on the CC saddle piece from Raw Water Pump House on the Intake well up to the bank. There shall be parapet railing with RCC Pillars 2 (two) meters centre to center on both sides of the bridge. There shall be 3 (three) nos. of 25-mm dia G.I. railing. Clear width of the bridge for movement of Trolley, for carrying, Pumps, Motors, Pipes, Specials, Valves, Electrical accessories and other materials to and from the Pump House as well as for walk way of maintenance and other personnel

The "Approach Bridge" and allied works shall be constructed conforming to IS: 876 and IS: 456 – 2000, IRC: 78 – 2000 and other relevant IS and IRC Codes.

Sl.No. 2.3 (A) Water treatment Plant (Unconventional)

Designing (aesthetically), providing constructing high rate **Unconventional Water Treatment Plant** i.e. Simplified Water Treatment Plant consisting of Civil, including cost of providing and applying epoxy paint to inside surface of water retaining structures in contact with chlorine and providing anti termite treatment to entire structure below ground level, ceramic tiles for flooring, Acrylic emulsion with silicon additives paints from out side, stainless steel railing , mechanical and electrical components of various sub-works as given below, including necessary hydraulic

testing, structural testing, equipment testing and trial run for a period of 3 months, etc. complete as directed by Engineer-in-charge (turn-key job).

1) Aeration fountain

2) Inlet arrangements

3) Mixing channel with ventury flume and flow measuring arrangement

4) Inlet channel

5) Flocculator- Conforming to I.S. 7208-1974 (Type-C) with detention period of 30 minutes

6) Tube settlers-Designing, fabricating and constructing Tube Settlers with square or any other shaped tube like Circular, Cheveron, Hexagonal etc .having proven performance

7) Rapid sand gravity filters

8) Filter house

9) Chemical house

10) Alum tanks- 2Nos. with mixing, carrying and dosing arrangements with piping.

11) 100 kg chlorine cylinder for capacity up to 5 MLD and chlorine tonner for capacity above capacity above 5 MLD.

12) TCL solution tank with mixing, carrying and dosing arrangement with piping.

13) Bypass arrangement

14) External and internal electrification

15) Laboratory equipments

16) Wash water tanks of capacity equal to 12 minutes to wash specified no. of filter beds at time at 600 liter/ m2 / M under head of 12 M at under drain.

17) Wash water pumps with 100% standby

18) Air blowers capable of delivering 600 LMP per square metre of free air of filter area at 0.4 Kg / sqcm at the under drains (100 % standby). Air blower shall be adopted for WTP having capacity more than 3 MLD only. below 3 MLD capacity, Air blowers shall not be adopted.

19) Pure water sump of capacity equal to 1 hour pumping capacity.

20) Pure water pump house over the sump / by the side of sump.

21) Drainage arrangements

22) Alum store

23) Sanitary block with necessary water supply and drainage arrangements and internal WBM roads.

24) These rates are applicable for seismic zones 2, 3 and 4.

25) Rates given below are inclusive of uplift pressure if any and dewatering during the entire work.

26) All RCC structures shall be constructed in M-250. Structures in contact with water shall be in M-300.

27) Unconventional Treatment Plants less than 1 MLD capacity shall not be constructed.

Note: Conditions from Sr. No. 1 to 27 shall form a part and parcel of the tender and must be included in draft tender papers for the work of unconventional treatment plants.

Sl.No. 2.3 (B) Water treatment Plant (Conventional)

Doing Detailed survey, investigation, soil testing and Designing (aesthetically), providing and constructing and commissioning **Conventional Water Treatment Plant** consisting of Civil Works, including cost of providing and applying Epoxy paint to inside surface of water retaining structures in contact with Chlorine and providing anti-termite treatment to entire structure below ground level, Mechanical and Electrical components of various sub-works as given below: including necessary hydraulic testing, structural testing, equipment testing and trial run for 3 months, etc. complete as directed by Engineer-in-charge. (Turn-key job).

1. **Aeration Fountain:** Plan area not less than 0.625 square meter per MLD

2. **Ventury Flume**: With necessary devices, consisting of simple mechanical indicator (Pedestal type gauge) with approach zones on upstream and downstream side 10 time throat width.

3. **Flash Mixer** Rapid mixing device, detention time 60 seconds to give velocity gradient 300 to 400 sec-1 vane mixer type conforming to IS 7090 of 1985

4. **Flocculator:** Conforming to I.S. 7208 of 1974 (Type-C) with detention period of 30 minutes.

5. Clarifier: Horizontal flow circular tank, detention period 2.5 hours, overflow rate 30 cubic meter per square meter per day, Weir loading not more than 300 cubic meter per meter per day, with mechanical sludge scraper conforming to I.S. 10313/1982 with necessary inlet outlet arrangement.

6. Rapid Sand Filters and Filter House: Filter designed for filtration rate of 4800 lit/m^2/hr, at normal flow and maximum 6000 lit/m^2/hr with overloading backwash, maintenance minimum 2 beds for plant up to 10 MLD, filters to be located in filter house with roof slab, pipe gallery and platform minimum 5.5 meter in width With constant rate filtration or declining rate filtration.

a) **Filter Sand**: Effective size 0.45 to 0.70 mm, uniformity coefficient not more than 1.7, nor less than 1.3.0.7 m depth, sand 0.45 m, in depth, sand and gravel conforming to I.S. 849 (1)-77 back wash by air wash, Standard appurtenances.

b) **Wash Water Tank** : Suitable to supply water to wash specified number of filter beds at a time 12 minute at 600 lit/M^2/min.under a head of 12 m at under drain.

c) Wash Water Pumps: Capacity to fill water tank in 1 hours with 100% standby

d**) Air Blowers:** Capable of delivering 600 lpm/m^2 of free air, of filter area at 0.4 Kg/cm^2 at the under drains (100% stand by) for period of 5 min.

7. Chemical House in Two Storeys

a) Ground floor to accommodate 7 days chemical (alum ,lime, bleaching powder) requirement and sundry storage.(minimum 4 m height)

b) First floor to accommodate alum and lime tanks chain pulley block etc.(minimum 5 m height)

c) Solution tanks - Minimum 3 tanks (One for preparation, Second for dosing and third as standby), each tank capable of giving 8 hours maximum dose without interruption, minimum free board 0.30 M trays for dissolving, level indicator mechanical agitation devices, solution feed and drain lines, solution feed device (Constant head device strength of solution up to 10% only) conforming to I.S.9222 part-I/ 1979.

8. Pure water Sump and Pump House

a) capacity of sump-one hour of design flow.

b**) Pump House** : Pump house of required size over the sump or by the side

9. Store House : Suitable for chemical (alum ,lime, bleaching powder) storage of three months and 7 days temporary storage, 7 days TCL requirement in mansoon with 20% extra capacity for other sundry articles.

10. Vacuum feed type chlorinators : (make to be approved by Department)

a) conforming to I.S. 10533- A Part-II 1983

b) Rate of withdrawal

Temperature Degree "c"	Kg. of chlorine discharge per day cylinder	
45	67	Tones

10	6.35	9.50	110
15	10.75	16.10	130
20	14.50	21.24	254
27 & above	18.70	28.12	315

c) Chlorinator equipment and container room : to conform to I.S. 10553 Part-I 1983
d) 100% standby shall be provided
11. By pass arrangement - C.I. pipes
i) By passing all units of TP
ii) By passing flash mixer, clariflocculator.
iii) By passing flash mixer, clariflocculator and filter units.
12. Disposal of waste from WTP: Safe disposal arrangement to nearby nalla including cost of pipes.
13. For WTP of capacity 30 mld and more additional arrangement for backwash water recycle shall be provided, including sump, pumping machinery, rising main etc. complete..
14. Drainage arrangement To decant all units of WTP with CI pipes upto boundary of each unit and further extension with RCC pipes to nearby nalla.
15. Electrical installation : Both internal and external including entire plant area.
16. Laboratory equipment : As per requirement by CPHEEO manual
17. Sanitary blocks: Carpet area-15 square meter minimum up to 25 MLD. and 25 square meter above 25 MLD
18. Administrative block and internal road. To **accommodate** office room, chlorine room, laboratory room, panel board room, blower room etc. and all required internal WBM road to connect all units from main gate of plot.
19. Rates given blow are inclusive of uplift pressure if any and dewatering during entire work.
20 All R.C.C. structure shall be constructed in M-30.

21. All pipes conduits channel with 20% over loading capacity.

Sl.no. 2.4 Supplying & installation of V.T. Motor Pump sets

Contrator will have to do Survey work, collection of data work, design of pumps and motor and get it approved by department before execution and Supplying installing & commissioning of water lubricated single/double stage **vertical Turbine** pump as per IS 1710/1972 and mounted on common base plate by a suitable tyre coupling with hollow/ solid shaft squarely cage induction Motor of suitable for 415 /440 volts 3 phase. 50 C/S A.C. supply having speed 1460 rpm with MS fabricated column assembly including cost of supplying fitting & fixing all required accessories such as CI. D.F. sluice Valve, CI. D.F NR valve. CI D.F pipe and specials of required size and length for suction main and delivery main and C.I.D/F specials as required fully automatic star delta starter of MS channel for pump base cost of construction of PCC foundation, foundation bolt, cost of floor mounted type cubical panel as per technical specification including cost of its internal wiring, including main service connection by power cable with transformer to main switch, main switch to pannel board, volt metre, Ammeter, OCB, switch, main switch, Starter, etc, cost of providing and laying aluminum conductor PVC insulated. PVC sheathed unarmed 1.1 KV grade cable on floor/ground of required length for complete commissioning of pump set as and where required cost of earthling of installation as per IE rules including cost of copper wire (to be provided in bunch of two) etc. cost of necessary power connection and testing of pump set at site on full load all complete job in accordance with details as noted below as per standard specification and direction of E/I.
NOTE: -1.the rates are inclusive of all inter linkage required to joint the existing system with the new one
2. The rate includes cost of materials, labors, carriages, loading, unloading, commissioning and trail run of three months etc. complete job on turn- key basis

Details of VT Pump: -

Discharge capacity: - As per commercial Bid.
Total Head: - As per commercial Bid.

Maximum turbidity of water that pumps should handle: -5000ppm.

No of stage: - Single/ double.
Total suspension length of column pipe: - as required

Lubrication: - Water

Materials for construction: -
Impeller: - Bronze

Impeller shaft: - Stainless steel.

Line drive shaft: - High tensile steel

Suction strainer: - MS fabricated

Column pipe discharge elbow: - MS fabricated

Bowl: - Fine grained Cast Iron.

Sluice Valves & NR Valves: - ISI marked

C.I D.F pipe of required length delivery main including necessary C.I D.F specials should be provided.
Details of Motor: -

Type: - Vertical hollow/ solid shaft squirrel cage induction motor with class B insulation

Power supply: - 415/440 volt

Motor HP: - suitable for pump

Details of Starter: -

Type:-Fully automatic star delta starter.

Accessories

Volt meter- ISI marked o to 500 volt (4" dia)

Ammeter -ISI marked o to 100 amp

Main switch -

Selector switch-standard make

Electrical equipment-

Electrical motor with vertical hollow/solid shaft

Auto transformer starter-1nos

L.T. panel-

Capacitors-

Earthing-

Illumination-

First aid kit-

Fire extinguishers-

Digital Electronic water level indicator-

CIVIL WORK

The pump will be installed on M.S. channel by making P.C.C. (1:2:4) foundation including providing suitable length of C.I.D.F. pipe in suction and delivery main of pipe with sluice valve. N.R. Valve, Foot Valve etc.
List of tools:-

Mechanical tools:-

Electricals tools:-

Note-

(a) Above tool kit common V.T. pumps

Note:-(Detailed quantity & specification of above mentioned all items will be as per technical specification.

Sl.no. 2.5 Supplying & installation of C.F Motor Pump sets.

Supplying installing & commissioning of Horizontal split casing centrifugal pump as per IS 1520/1980 and mounted on common base plate by a suitable type coupling with SPDP squirrel cage suitable capacity induction Motor of suitable for 415 /440 volts 3 phase. 50 C/S A.C. supply having speed 1450 rpm including cost of supplying fitting & fixing all required accessories such as CI. D. /F sluice Valve, C.I. D/.F NR valve. C.I D/.F pipe and specials of required size and length for suction main and delivery main as required suitable fully automatic star delta starter including cost of construction of PCC foundation and foundation bolt, cost of floor mounted type cubical panel board including cost of providing and laying aluminum conductor PVC insulated PVC sheathed unarmed cable on floor/ground of required length for complete commissioning of pump set cost of earthen of installation as per IE rules including cost of 8 SWG Copper (to be provided in bunch of two) cost of necessary P.C.C. foundation, power connection and testing of pump set at site on full load all complete job in accordance with details as noted below as per standard specification and

direction of E/I. including trial run for three months.

NOTE: _ 1.the rates are inclusive of all inter linkage required to joint the existing system with the new one

2. The rate includes cost of materials, labors, carriages, loading, unloading, commissioning and trail run of three months etc. complete job on turn- key basis

Details of Centrifugal Pump: -

Type- Horizontal split casing centrifugal pump

Speed: -1450 rpm

Materials for construction: -

Impeller: - Bronze.

Impeller shaft: - Stainless steel.

Base plate –M.S fabricated

Sluice Valves & NR Valves: - ISI marked

C.I D.F pipe of required length will be provided as suction and delivery pipe including necessary C.I D.F specials, Foot valves etc.

Details of Motor: -

Type: - SPDP squirrel cage induction motor with class B insulation

Power supply: - 415/440 volt 3

Phase, 50 C/S AC supply. Speed: - 1450 rpm

Motor HP: - suitable for above pumps

Details of Starter: -

Type: _Fully automatic star delta starter.

Accessories

Volt meter- ISI marked o to 500 volt (4" dia)

Ammeter -ISI marked o to 100 amp

Main switch -

Selector switch-standard make

Phase indicating neon lamp-3nos

Mechanical Equipment;

Centrifugal pumps –

Sluice valve –

Non return valve –

Kinetic air valve with isolation valve of PN –1 rating

Pipe work –

Dismantling joints –

Over head gantry crane

Electrical equipment-

Electrical motor -

Auto transformer starter-

L.T. panel-

Capacitors-

Earthing-

Illumination-

First aid kit-

Fire extinguishers-

Digital Electronic water level indicator-

CIVIL WORK

The pump will be installed on M.S. channel by making P.C.C. (1:2:4) foundation including providing suitable length of C.I.D.F. pipe in suction and delivery main of pipe with sluice valve. N.R. Valve, Foot Valve etc.

Sl.no. 2.6 INFILTRATION GALLERY

Electric Resistance welded (ERW) LCG Cage Type Apollo V – Wire wound Screens for the installation in river beds. Size 300 mm dia or designed dia with slot opening 1.00 mm, thickness 10 mm having tensile load 206.01 KN as per IS 8110-2000 and material of construction will be Low Carbon Galvanized Steel. End Connection with suitable flange for bolting one screen to another. Screen will be of continuous Trapezoidal wire spirally wound around fabricated cage. The wrapping wire having a "V" Shaped (Wedge) Profile wire with flat surface on the outside and producing expanding slots on the inside of various dimensions, resistance welded to a cylindrical body made of number of longitudinal special high tensile support rods to provide smooth unrestricted bore which are in turn welded into cylindrical ring couplings on both side of the screen 300 mm dia specially made to suit the infiltration application. These screens will be suitable anchored to the bed of the river, strong enough to sustain the flow of water in maximum discharge in the river.

Sl .No- 2.7 Twin type Staff quarter -1 no.

Detail specification as per commercial bid.

Sl .No- 2.8 (A) Elevated Service Reservoir

Designing (aesthetically) and constructing RCC elevated service reservoirs after testing the soil bearing capacity by reputed firm or Institution of following capacity with RCC staging consisting of columns, internal and external bracings spaced vertically not more than 4.5 meters centre to centre including excavation in all types of strata, foundation concrete, cement plaster with water proofing compound to the inside face of the container including refilling disposing of the surplus stuff within a lead of 50 meters, all labour and material charges including lowering, laying, erecting, hoisting and jointing of pipe assembly of inlet, outlet, washout, overflow and bypass arrangements as per design and it's connection with distribution main, providing and fixing accessories such as M.S. ladder, C.I. manhole frame and covers water level indicators, lightening conductor, G.I. pipe railing around walk way and top slab providing spiral stair case from ground level to roof level, M.S. grill gate of 2 Mtrs height with locking arrangement, brick masonry chamber for valves ventilating shaftsproviding and applying three coats of cement paint to the structure including roof slab & epoxy paint to internal surface and anti termite treatment for underground parts of the structures and giving satisfactory water tight-ness test as per I. S. code. The job to include painting the name of the scheme and other details on the reservoir as per direction of Engineer-in-charge.

Notes -

1. The design of the structure be in accordance with relevant I.S. 3370 -1965 or revised.
2. The design shall satisfy the stipulations as per I.S. 1893 - 1984 and I.S. 13920/1993 for seismic force and I.S. 11682/1985 for RCC staging of overhead tanks
3. For design having more than 6 columns, provision of internal bracing is obligatory. External bracing is also obligatory.
4. The entire structure shall be in M-30 for water retaining portion and M25 non water retaining structure.
5. Plain round mild steel bars grade - I confirming to I.S. 432 part - I or high yield strength deformed bars confirming to I.S. 1786 or I.S. 1139 shall be used, grade - II mild steel bars will not be allowed.
6. Irrespective of the type of foundation proposed in the design, one set of bracing be provided at the ground level.
7. The rates include providing M. S. ladder for ESR's up to 2 lakhs liters capacity and providing spiral staircase for E.S.R. above 2 lakhs liters capacity.
8. Staging will have to be designed with stresses of M – 25 for ESR. and all construction should be done in M-25.
9. These rates are including the cost of uplift pressure if any and entire dewatering during execution. In case of water logging area where water is struck at shallow depth extra provision of dewatering shall be made as per site condition.
10. The rates are inclusive the cost of pipes, specials and valves required for inlet, outlet washout overflow and by-pass arrangement with cost of erecting, laying and jointing of pipes and valves including cost of jointing materials all complete with provision of water level indicator & lightening conductor arrangement .
11. For ESR up to 500cum capacity C.I double flanged pipes up to 300mm dia shall be provided and C.I. specials shall be used for above 500cum capacity C.I/M.S pipes assembly with minimum 8mm thickness up to 500mm dia and minimum 10mm thickness above 500mmdia can be used with proper anticorrosive epoxy treatment from inside and out side.

Sl .No- 2.8 (B) GROUND SERVICE RESERVOIR

2.8.1 A R.C.C. Ground Water Service reservoir of effective capacity shall be constructed at the treatment plant site. The unit shall be rectangular / Circular in plan having at least 0.30m free board. Clear water reservoir shall have inlet channels connected with filter outlet channel. Walls of the reservoir and roof shall be of R.C.C. M25 grade. The whole structure shall be constructed of R.C.C. as per specification and as per the latest edition of IS 3370, IS 456. The floor level is to be in consistent with the filter

outlet channels. The reservoir bottom floor shall be provided with proper slope to drain out at the time of its cleaning operation. The reservoir is to be designed for cases (i) Tank empty and wet soil outside, and (ii) Tank full and soil outside. The structure shall be checked against up lift pressure of sub-soil water with margin not less than 1.10. There will be adequate number of ventilators suitably placed and shall be provided with mosquito proof nettings. Proper surface drain shall be constructed around, which will ultimately be connected to the general drainage system. The top floor of the reservoir will have sufficient opening with C.I. vent pipes and cowl. All pipes and valves connected both in inlet and outlet chambers shall be of ductile iron and as per I. S. Specifications. Two manholes with Cast iron cover should be provided.

2.8.2 GROUND WATER SUMP:

The pump house shall be adequately spaced and shall be located by the side of ground water sump. It will have a dry pump pit. The pump pit shall accommodate at least 2 number Pumping sets of suitable capacity. The floor of pump pit shall be at such a level matching with the clear water reservoir that positive suction is ensured. 1500 wide R.C.C. stair shall be provided to reach to the pump pit floor. Railing made out of 25 mm G.I. pipe in three rows fixed in R.C.C. Post on both / one side of the stair. The walls of the pump pit below plinth level shall be of RCC. The floor of entire pump chamber and walls shall be suitably designed to take the sub-soil water pressure & earth pressure. Walls below ground level shall be plastered with 12 mm thick cement plaster (1:3) with 3% water proofing compound. The wall, facing earth, below ground level shall have two layers of tar felt. The pump base shall be separately cast and 40 mm thick gap between the floor and the pump base shall be filled with tar felt or other suitable materials to check vibrations being transmitted to other part of the structure at the same time to prevent leakage of sub-soil water.

Manually operated 3.0M.T. capacity Gantry crane with chain pulley block shall be provided in the pump house. The pump house shall be provided with gantry girders and proper size rails for 3.0 M.T. Capacity gantry crane. The crane should move horizontally from one end to other and across. The space from the top of the rail to the ceiling shall not be less than 1800 mm.

The floor and walls up to the plinth level of the pump chamber shall have mosic tiles of approved colour and shape, properly finished and polished. Central platform and stairs connecting pump pit shall also have anti-skid tiles. The brick wall shall be plastered with 12 mm thick (1:4) cement plaster inside and out side.

The inner surface of wall of the pump chambers shall be painted with plastic emulsion paint and outer surface with snowcem.

The pump chamber shall be kept well lighted and ventilated with natural light and passage of air through long glass panels and window as per approved drawing.
The front will have glass cover where needed to develop elegant architectural look

2.9 Compound wall (Detailed specification as per commercial Bid)

3.0 SPECIFICATION OF PIPE WORK FOR RAW WATER RISING MAIN, CLEAR WATER PUMPING MAIN AND CLEAR WATER DISTRIBUTION SYSTEM:

3.1.1 RAW WATER MAINS

M.S Pipe

M.S pipe shall be used for laying of Raw Water/ Clear Water Rising Main as per approved design.

Specification for M.S. Pipe laying.

Welding : The welding of pipes in the field should comply with IS 816 : 1969. Electrodes used for welding should comply with IS 814 : 1991.

3.1.2 ***Preparing Pipe faces for Welding:***

Before aligning, assembling and welding, the pipe faces shall be cleaned by scraping by wire brushes or any other method specified by the authority.

3.1.3 ***Testing of welded joints:-***

The welded joints shall be tested in accordance with procedure laid down in IS 3600 (Part I) : 1985. One test specimen taken from at least one field joint out of any 10 shall be subjected to test.

3.1.4 If the results of the tensile test do not conform to the requirements specified, retests of two additional specimen from the same section shall be made, each of which shall conform to the required specifications. In case of failure of one or two, extensive gouging (scooping out) and repairing shall be carried out as directed by the authority.

3.1.5 If internal pressures exceed 1.5 N/mm2, special attention should be given to the assembly of the pipe and first run of weld. Non-destructive testing of the completed weld may be carried out on pipelines by radiographic (see IS 4853 : 1982) or ultrasonic method (see IS 4260 : 1986) as agreed upon between the user and the manufacturer.

3.1.6 ***Welding of Closure Gaps***

Final welding of closure gaps should be carried out within a temperature range of average air temperature ± 80 C. For buried pipelines final welding may best be done after intermediate pipes have been backfilled.

3.1.7 Blank Flanges

3.1.7.1 Blank flanges shall be used at all ends left unattended at the temporary closure of work. Blank flanges may also be necessary for commissioning a section of the pipeline or for testing the pipeline laid. For temporary closures, non-pressure blank flanges consisting of mild steel plates tack-welded at the pipe ends may be used. For pipes subjected to pressures, the blank flanges should be suitably designed. To prevent the floating of pipes, care should be taken to see that empty pipes with ends blank flanged should not be left in uncovered trenches, where water is likely to accumulate.

3.1.8 Pipe Laying

3.1.8.1 Laying of Pipes Underground

3.1.*8.2 General*

The procedure for trenching shall be carefully followed. Before the pipe is lowered, the trench shall be carefully examined to determine that even bedding is provided for the pipeline and that the pipe may be lowered into it without damaging the coating.

3.1.*8.3 Lowering and Assembling of Pipes and Specials*

The procedure for lowering varies with the method adopted for coating the pipeline. Where the coating is to be done in the trench, the pipe may be lowered in the trench on supports sufficiently high so as to facilitate out-coating. The pipe should be lowered progressively with the help of shear legs or cranes using wide belts of slings. In case of coated pipes, extra care shall be taken to preserve the coating while lowering. Slings may be removed progressively without the necessity of digging under the pipe. Where the trench is sheeted, the pipes shall be lowered into the trench by removing at a time, one or two struts only, care being taken to see that no part of the shoring is disturbed or damaged. If necessary, additional struts may be fixed during lowering. After the pipe is lowered, it shall be laid in correct line and level by use of leveling instruments, sight rails theodolites etc. Care shall be taken to see that the longitudinal joints of the consecutive pipes are staggered by at least 300 and should be kept in upper third of the pipeline, if there are two longitudinal joints they should be on the sides. While assembling, the pipe faces shall be brought close enough to leave a uniform gap not exceeding 3 mm. The spiders from inside and tightening rings from outside or other suitable equipment should be used to keep the two faces in shape and position till at least one run of welding is carried out.

The pipe faces shall first be tack-welded alternately at one or more diametrically opposite pairs of points. After completing tack-welding, full welding shall be carried out in suitable runs following a sequence of welding portions of segments diametrically opposite.

3.1.8.4 Backfilling:

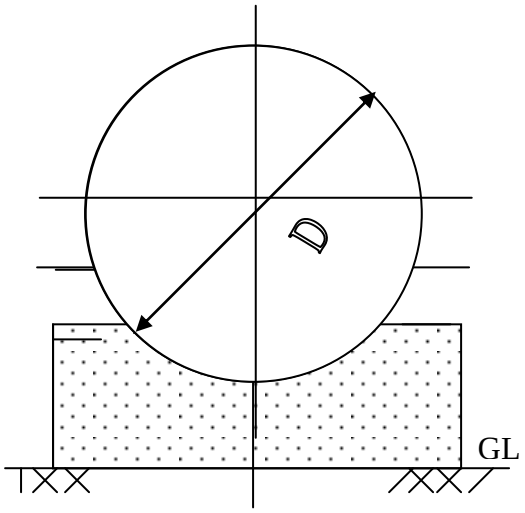
Backfilling should closely follow the welding of joints of the pipe so that the protective coating should not be subsequently damaged. Material harmful to the pipeline shall not be used for backfilling. Refilling shall be done in layers not exceeding 300 mm. Each layer shall be consolidated by watering and ramming, care being taken to prevent damage to the pipeline. The filling on the two sides of the pipeline should be carried out simultaneously.

The spiders provided during assembly and welding shall be retained until the trench is refilled and consolidated. Where timbers are placed under the pipeline to aid alignment, these shall be removed before backfilling. For further precautions and use of material in backfilling, reference should be made to IS 3114 : 1994.

3.1.8.5 Laying of Pipes Above Ground

3.1.8.6 General

The procedure for handling the pipes as described in 5 and for lowering and assembling the pipes underground as described in 8.1.2 (IS 5822 : 1994) should be followed for lifting and laying the pipes on supports or on ground. The pipeline may be allowed to rest on ground if the soil is non aggressive. The ground should, however, be dressed to match the curvature of the pipe shell for an arch length subtending an angle of 1200 at the centre of pipes. Alternatively, the pipeline should be laid either on saddle or roller and rocker supports as specified by the authority. Figures 1 and 2 show supports generally adopted on steel pipelines.



3.1.8.7 Anchorages

The pipe shall be anchored by concrete anchor blocks or other means to resist unbalanced water pressures and temperature stresses. Provision should be made to anchor the main during construction and in service where floatation could occur.

3.1.9 TESTING OF PIPELINE

3.1.9.1 General

Before putting it into commission, the welded pipeline shall be tested both for its strength and leakage.

3.1.9.2 COATINGS

3.1.9.3 Buried Pipes

Buried steel pipelines are liable to external corrosion and should be protected by the use of suitable coatings and shall be in accordance with IS 10221 : 1982.

3.1.*9.4 Paints*

Paints should be applied as specified by the authority.

Where the pipeline is partly above ground and partly underground, the coating used on the buried portion should be continued well clear of the ground.

3.1.9.5 Internal Coating or Lining

Where water to be conveyed is aggressive in nature, the pipeline should be provided with an internal coating or lining, Such linings are usually of bitumen, coal tar, epoxy resin, concrete or cement mortar or plastic lining. Care should be taken to see that the material used for coating is non-toxic. The lining may be applied to the pipe before or after laying. In the former case, it should be made continuous at the joints after laying. Methods of applying internal lining vary according to the size of the pipe depending upon the working space inside the pipe. In case of large diameter pipelines, cement mortar lining preferably be carried out after the pipeline is laid in position and the backfill in the trenches is properly consolidated. This will prevent the lining from being damaged due to deformation of pipeline, due to self weight and also due to handling of pipes during laying operation.

3.1.9.6 Dry Film Thickness

Both for internal and external painting, the thickness of the dry paint film is very important from the point of view of determining the protective life. The minimum dry film thickness of the paint system should be specified and measurements to that effect be made by using instruments like elcometer of similar other reliable measuring devices.

3.1.10. RAW & CLEAR WATER RISING MAINS AND DISTRIBUTION MAIN

DI Pipes

Ductile iron spun pipe K-9 & K-7 shall be used for laying for Raw/ Pure Water Rising Main and distribution mains as per approved design.

All D.I Pipes to be used in the project should conform to I:S D.I K7 & K9 pipe BIS marked I.S. 8329/ 2000. As far as possible, pipes should be taken from manufacturers having ISO – 9001 certification. Third party inspection of pipe shall be done by empanelled agencies.

The Manufacturers must ensure that the pipe joints will work properly in laid condition under various circumstances and working conditions.

Since the pipe joint design is system is not a part of the IS standard, the pipe manufacturer should have valid joints performance type test certification from a Government recognized or international testing agency.

Pipes and fittings should be procured from the same manufacturer as far as possible to avoid undue complicacy of non-compatibility and mismatch. Approximately 20% of the fittings should be procured with mechanical joint to facilitate easy laying in congested area. The pipe fittings should conform to IS 9523/2000. The material of rubber gaskets for use with mechanical joints and push on joints shall conform to IS 5382. Unless otherwise agreed between the manufacturer and the purchaser, dimensions of the rubber gasket shall be as per manufacturers own design.

Since the hydraulic design is done as per the CPHEEO recommended Design 'C' Value of 140 for D.I. pipes, the pipe manufacturer should submit "C" value test certificate from recognized professional institute or agency showing the minimum value of Hazen William's 'C' value of 140, corroborating the guideline of CPHEEO's Manual for Water supply and Treatment.

Manufacturer should ensure that parts of the pipe which come in contact with the potable water will not have any detrimental effect on the quality of water and should not impart any bad taste or foul odor as per clause 8.5 and 14 of the IS: 8329/2000.

To take care of longitudinal thrust developed during transmission and to avoid subsequent disintegration of joints at thrust zones, 5 to 10% of pipes are to be procured with restrained joint system. Inbuilt restrained joints can be used in place of Concrete thrust blocks and will be much more cost effective than concrete thrust block.

Laying of DI pipes shall be as per IS 12288. The width of trench at top and bottom, between faces of sheeting shall be such as to provide minimum 30 cms clearance on either side of the pipe for pipe diameters less than 600 mm and 45 cms for pipe diameters 600 mm and above 600 mm.

Before laying of pipe the bottom of trench shall be trimmed off to present a plain surface and all irregularities shall be leveled. Where large stone or boulders or rock is met in excavation, murum or sand bedding of 10 cms thick shall be provided below pipe. All care should be taken to protect the pipe and the coating.

Surge protection devices have to be taken as mentioned it in article 6.17.3 Control Measures of CPHEEO manual.

3.1.11 HYDRAULIC TESTING OF LINE

The test of the pipeline in the field shall be carried out after the stretch of suitable length is laid. Testing shall be carried out in the following manner.

The pipeline shall be subjected to hydraulic test in full length or in part as may be found necessary. The pipes shall be subjected to a test pressure of 1.5 times the actual working pressure expected in the pipeline as per hydraulic design in the strip under observation.

There should be drop not more than 0.5kg/cm^2 within a period of two hours after the pressure has been built up by the use of suitable pumps. In case of leak anywhere in the field joints, the same shall be repaired entirely at the cost of the contractor, which shall include cost of excavation repairs etc. The rate of pipe is inclusive of this cost.

The contractor shall provide skilled and unskilled labour free of cost for Departmental check of the work.

3.1.12. SPECIAL NOTE:

I. No pipe shall be laid when; in the opinion of the Engineer-In-Charge trench conditions are unsuitable.

II. Pipes shall be laid in reasonably dry trenches and under no circumstances on slushy murum bedding.

III. The contractor shall use the pipes after checking and testing and he shall be held responsible for replacement of such pipes if already inadvertently fixed or joined.

IV. Before the lowering of pipes and laid in position the contractor shall see that the invert at the support is correct and pipe is brought to uniform grade and level. This should be checked with the help of dumpy level and should be got approved in advance from the Engineer-in-Charge.

V. Temporary benchmarks shall be provided by the contractor at a minimum distance of every 100m without any claim for extra cost. The benchmarks shall be either of stone masonry or mass concrete.

VI. The pipes shall be laid confirming to the profile, line, level, curvature, straightness etc. as per the drawings. No variation, unless previously approved by engineer in charge, will be allowed.

VII. The contractor shall bear the cost for wastage, breakage in pipes and specials. The length of pipe and specials will be paid as per exact length in laid condition, for both fabrication and laying job.

VIII. All temporary supports made to the pipeline during laying and jointing shall be removed before pipeline is filled with water for hydraulic testing.

IX. Flanged caps or plugs, casting of thrust block, the hydraulic test pump with the required piping etc. shall be arranged for testing purpose by the contractor at his own cost.

X. The hydraulic test shall be made in the presence of Engineer-in-Charge.

XI. When any section of a main is provided with concrete thrust blocks or anchorages, the pressure test shall not be made within 28 days of casting of the R.C.C. block.

3.1.13 Excavation in average soil, soft and hard moorum, concrete boulders etc.

a) General: The trench shall be so dug that the pipe may be laid to the required alignment, at the required grade and depth as per orders of the Engineer in charge. The depth of the trench should be sufficient to have a minimum cover of 100 cms over the laid pipe. In cases where this is not feasible a decision in this regard shall be taken as directed by Engineer in charge. The trench shall be executed only so far in advance of pipe laying as per the orders of the Engineer in charge. The trench shall be so braced and drained that the workmen may work there in safely and there shall be no danger to the nearby structures. If any stems and roots of trees are encountered in the excavation of trenches these will have to be cut and destroyed under the supervision and direction of Engineer in charge. If water lines, drainage lines, Electric or Telephone cables are encountered in the excavation of trenches, the work of excavation or laying of line etc. will have to be carried out without damaging the lines and cables and under the supervision of the concerned staff. Appropriate clearances shall be kept from the existing utilities as directed by Engineer in charge. Extra claim for dewatering will not be entertained.

b) Barricades, guards and safety provisions: To protect from injury and to avoid damage to property, adequate barricades, construction signs, torches, red lanterns and guards as required shall be placed and maintained during the progress of the work and until it is safe for traffic to use the road ways. All material, pipe equipment and pipes which may serve as obstructions to traffic shall be enclosed by fences or barricades and shall be protected by proper lights when visibility is poor.

c) Maintenance of traffic and closing streets: The work shall be carried in such a manner which will cause the least interruption to traffic, and the road street may be closed in such a manner that it causes the least interruption to the traffic. Where it is necessary for traffic to cross open trenches, suitable bridges shall be provided. Suitable signs indicating that the work is under progress or a street is closed etc. shall be placed and necessary detour signs for the proper maintenance of traffic shall be provided.

d) Structure Protection: Temporary support, adequate protection and maintenance of all underground and surface structure drains, sewers cables and other obstructions encountered in the progress of the work shall be furnished under the direction of Engineer in charge.

e) Excavation in soft rock and hard rock to be carried out by chiseling or any other method (This includes excavation done by poclain, Splitter or any other mechanical means) to the required width and depth. Other specifications are the same as per above. Blasting will not be allowed in the work. Extra claim for dewatering will not be entertained.

3.1.14 Refilling of Trenches

a) General: The refilling of trenches shall be carried out immediately after the hydraulic test is over. Refilling shall be done for 25 cms above the ground level and then it shall be thoroughly wetted and properly compacted with a mechanical earth rammer so that mud etc. shall not be formed.

b) Clearing up the site: All surplus material and all tools and temporary structures shall be removed from the site as directed by Engineer in charge. All dirt, rubbish and excess earth from the excavation shall be hauled to a dump and the work site left clean to the satisfaction of the Engineer in charge .The item includes bailing out water manually or by dewatering pump sets. The pumped water shall be carefully disposed off in nearby nalla etc. without causing any damage or inconvenience to neighboring existing structures and property holders.

3.1.15 Pipe Laying:- D.I. Pipe

Pipe laying of higher diameter such as 1000 mm can be lowered by crane or, Chain pulley block or a set of shear legs as per availability taking care to see that earth does not get into the pipe. The pipe laying should be done as per IS 12288. Pipes shall be laid in straight lines, free from all sharp bends and should be in proper alignment Each pipes before it is laid shall be examined and tested with a hammer to prove its soundness and then shall be brushed through and washed to remove all solid or dirt lying inside the pipe.

3.1.16 Jointing:- EPDM push-on rubber gasket conforming to I.S. 5382 (Latest amendment) suitable for joints will be used to connect D.I. k_9 pipe in tyton jointing special type of rubber gasket are to be used.

The following points should be ensured :

(i) The inside of sockets and outside of Spigots should be cleaned for at least the insertion depth of each joint.

(ii) Glands and gasket should be wiped, clean and inspected for damage.

(iii) Where the lifting gear has been used to place the pipe in the trench, it should be used to support the pipe and assist in centralizing the spigot in the rocket. Where the pipe line is subjected to movement due to ground settlement or temperature variation, a suitable gap should be left between the end of spigot and the bottom of the socket.

(iv) Before assembly, the outside of the spigot and the inside of the socket of the two pipe line components to be joined must be thoroughly cleaned. Where these are no minimum and maximum insertion depths on the pipe line, these should be marked.

(v) Insertion of the gasket, be facilitated by the prior application of a thin film of lubricant to the sealing chamber of the socket only.

(vi) The gasket should be inspected to ensure it is not deformed or damaged. The rubber gasket should be cleaned fixed and then placed in the socket. Case must be taken to ensure that the gasket is correctly seated in the socket.

(vii) Make sure that joint ring fits evenly around the whole circumference and smooth out any bulges which would prevent the proper entry of the spigot end. In the larger diameter this operation may be assisted by forming additional loops in the ring opposite the first, then pressing the loops flat one after the other.

(viii) Apply a thin filter of lubricant to the inside surface of the joint ring where it will come in contact with entering spigot.

(ix) The incoming spigot must be aligned and entered carefully into the socket until it makes the contact with joint ring. Final assembly of joint is completed from this position.

(x) The joint is then made by forcing the spigot of the pipe past the joint ring of the receiving pipe, thus compressing the ring, until the socket face is positioned between the recommended and the minimum insertion marks.

(xi) If this final assembly cannot be attained by the application of reasonable force, the spigot should be with drawn and the position of the joint ring examined and replaced if necessary. Where necessary the spigot can be withdrawn from the bottom of the spigot by moving the far end of the pipe upwards and sideways for a distance of 150mm, and the returning go the straight position.

(xii) Having successfully inserted the spigot, the joint should then be checked to see if the gasket is correctly seated. This is done by inserting a metal rule into the

socket gap. The depth of penetration should be equal around the whole circumference. If a difference if found, the gasket may have been displaced and the joint should be dismantled and re-made.

3.1.17 Pipe Anchoring:- All plugs, tees, reducers, bends and valves should be provided with thrust blocks of concrete to resist the thrust arising form the internal pressure and dynamic loading. Anchors and thrust blocks shall be designed to withstand the forces resulting from internal pressure when the pipeline is under test.

3.1.18 Thrust blocks:

One of the most common methods of providing resistance to thrust forces is the use of thrust blocks. Figure below depicts a typical bearing thrust block on a horizontal bend. Resistance is provided by transferring the thrust force to the soil through the larger bearing area of the block such that the resultant pressure against soil does not exceed the bearing strength of the soil. Design of the thrust blocks consists of determining appropriate bearing area of block for a particular set of conditions. The parameters involved in the design include pipe size, design pressure, angle of bend (or configuration of the fitting involved), and the horizontal bearing strength of the soil.

General criteria for thrust block design:

- Bearing surface should, wherever possible, be placed against undisturbed soil. Where it is not possible, the fill between the bearing surface and undisturbed soil must be compacted to at least 90 percent Standard Proctor density.
- Block height (h) should be equal to or less than one-half the total depth to the bottom of the block (Ht), but not less than the pipe diameter, D.
- Block height can be chosen such that the calculated block width (b) is varies between one and two times of height.

Equaling the thrust force in pipe to the strength attained from bearing area of soil, we get

$$T = \frac{A_b \times \cup}{S_f} \qquad \overline{\quad}$$

Where in

T = Thrust force in Kgf.

A_b = Bearing are of soil in cm^2 = h x b

$\overline{u}$ = Horizontal bearing strength of soil in kgf/cm^2

S_f = Factor of safety (usually 1.5)

Then for a horizontal bend:

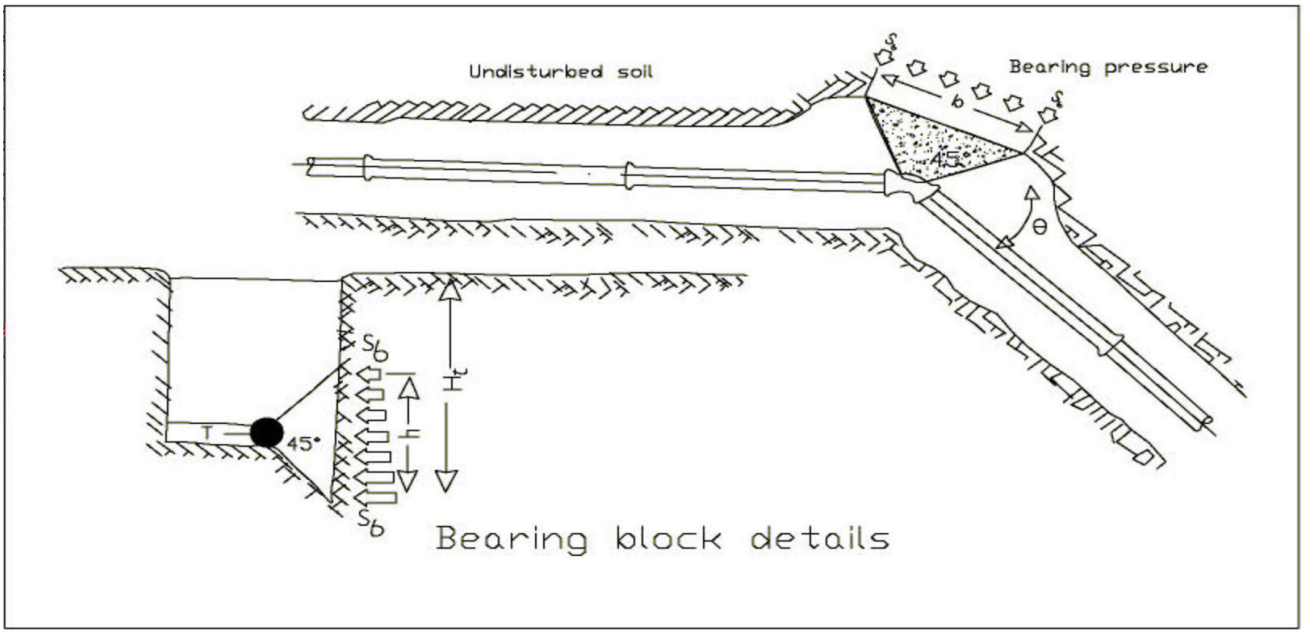
$$T = \frac{(h \times b) \times \cup}{S_f} \quad \text{—}$$

$$2PA\sin(\theta/2) = \frac{(h \times b) \times \cup}{S_f} \quad \text{—}$$

$$b = \frac{S_f\, 2PA\sin(\theta/2)}{h \times \cup} \quad \text{—}$$

A similar approach may be used to design bearing blocks to resist the thrust forces at tees and dead ends.

Typical values for horizontal bearing strengths of various soil types all listed in table below.



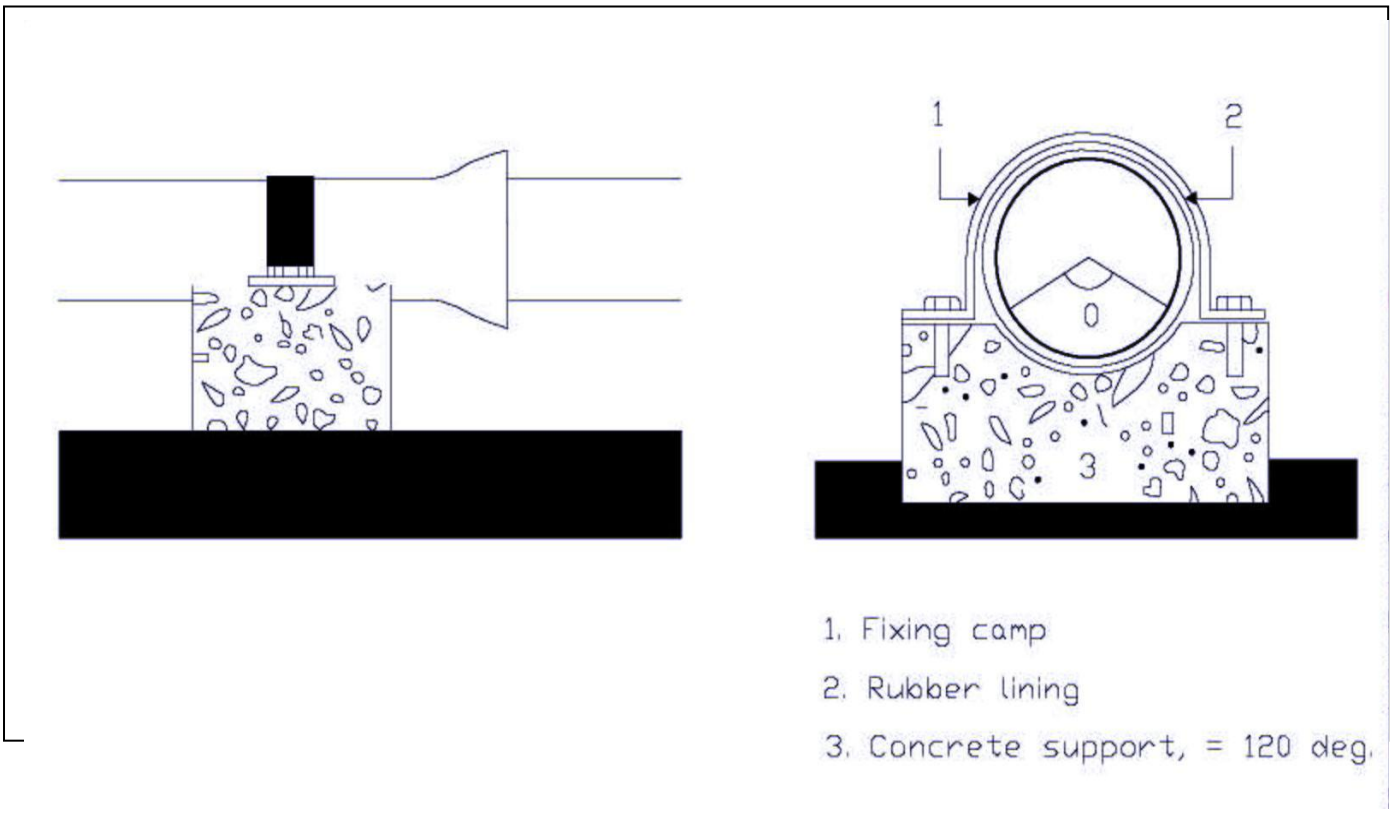
3.1.19.1 Trial Run:

The trial run shall consist of a period of three months for total complete jobs of this tender. The contractor shall provide the skilled plant operator/pump operators, supervisors along with other service staffs for this duration of trial run after completion of the total work on Turnkey job basis. The contractor staffs shall train the staffs/persons nominated by the Engineer in charge during this period. The contractor shall run the plant round the clock during this period and shall maintain a logbook to ascertain the quality and quantity of water, consumption of power. Any shortcomings in quantity of water shall be corrected by the contractor adopting proper correction measures and as per direction of Engineer in charge.

Testing of Pipe line:

The completed pipeline shall be tested in sections. Testing can be begin with comparatively short lengths and to increase the length of test sections progressively to 1.5 km. The test pressure should not be less than the any of the following.

- The maximum sustained operating pressure.
- The maximum static pressure plus 5 kg/cm^2.
- The sum of the maximum sustained operating pressure (or the maximum working pressure) and the maximum calculated surge pressure.



3.1.20 VALVES

A. Sluice valves, scour valves, non return valves, pressure released valves and Kinetic air valves

The all valves shall be ISI Marked and standard required size from the manufacturer approved by department.

The manufacturers test certificate for the material shall be provided at the time of the testing. Required supports to the valves in C.C. shall be provided.

The dimensional drawing shall be submitted by the contractor prior to manufacture showing all the construction details etc. of valve for approval. The valves shall be painted after testing as directed by the Engineer-in-Charge.

Testing

Valves shall be tested at manufacturers works in presence of inspecting authority of the department as under.

Review of material test certificate

Hydrostatic tests as per IS.

Operation test for functioning of orffice.

3.1.21. Valve chambers:

The valve chambers should be constructed for protection of valves from traffic load to avoid damage by people. The valve chambers should be constructed as per the type design drawings. The construction of the chamber should be as per specification and should be able to withstand the superimposed load due toe vehicular traffic. The top of the chamber should be covered by RCC pre cast slabs. All the civil work should be as per the general specification mention earlier and as per applicable I.S. standards.

3.1.22 Detailing of already laid pipeline:-

Before commencement of pipeline work, the contractor with the help of Executive Engineer will prepare a map showing full detail of distribution network already laid in this scheme. A chart on the basis of the map will be prepared detailing node to node dia, length, age of the pipe and remarks regarding whether that very segment is fit for re use or not. A copy of such document jointly signed by contractor and Executive Engineer will be submitted to H.Q. for further action and documentation. Not any extra payment for such work will be made to the contractor. No work of pipeline has to be commenced before submission of above mentioned data/ sheet.

3.2 SPECIFICATION OF RCC ELEVATED SERVICE RESERVOIR

Criteria for design of RCC water tower/ sump

The structural design shall conform to the following standards specifications and codes of practice of I.S.I. and shall be done by working stress method only.

IS: 456: Code of practice for plain and reinforced concrete (latest edition)

IS: 875 Code of practice for structural safety of building, loading standards (latest edition)

IS: 3370 Part I to IV: Code of practice for concrete structures for storage of liquids (latest edition)

IS : 1893: Criteria for Earth quake resistant Design of structures (latest edition)

General

Capacity of the container of the tank shall be the volume of the water it can store between the designed full supply level and the lowest supply level.

Free Board is the indication of space provided above full supply level and shall be measured at a vertical distance above F.S.L. up to sofit of beam supporting the roof slabs/Dome.

The walls of container shall be designed for free board full condition.

The tank foundation and other members of the structure shall also be designed for free board full condition.

Parts of the tank in contact with stored water and enclosing water vapor above F.S.L. shall be in concrete M-250.

The tenderer is advised to verify actual strata and safe bearing capacity before tendering and designing the structure and offer suitable design with full justification.

Not with standing anything mentioned above if directed by the Engineer-in-charge the contractor shall carry out actual strata exploration as mentioned in para 0.2 of IS 1892-1979 through a Govt. laboratory and adopt bearing capacity so arrived for the design.

The factor of safety shall be adopted as per clause 6.1 (a) of IS-6403-1971.

If the foundation consists of individual column footing, minimum clear distance between center of columns shall be equal to twice the width of footing and clear distance between edges of footing shall be not less than width of footing.

The foundation should be checked for negative pressure on soil due to combined direct and bending stresses. Negative pressure shall not be allowed on the foundation soil.

Classification of soil and characteristics of soil relevant to S.B.C and A.B.P. shall be as per the soil investigation reports of Government institution/Government approved investigations.

For the design of foundations of the solid raft type, the 'Plate Theory' shall be adopted.

In normal circumstances minimum 100 mm thick plain cement concrete with 100 mm projection around in grade M 100 with coarse aggregate as metal shall be provided as leveling course. Where injurious soils or aggressive water are anticipated the leveling course shall be of grade not weaker than M 150 and if necessary Sulphate resisting or other special cement shall be used and the thickness of the leveling course shall be kept not less than 150 mm. The ground level within the foundation area of the structure shall be consolidated properly with a suitable slope to drain out rainwater outside the foundation Zone.

In the vicinity of mines, collieries and blasting sites or areas which may be subjected to blast or shock, the tanks shall be designed for dynamic forces adopted to shock.

Column may be assumed as fixed at the top of footing.

Following shall be the minimum thickness of various members of the tank container

Roof Slab	100 mm
Bottom Slab	100 mm
Roof dome	100 mm
Container dome	150 mm
Vertical wall of container	200 mm

LOADS

For all RCC and PCC components unit weight of concrete shall be taken as 25000 N/Cum and 24000 N/Cum respectively.

Water load and snow load shall be taken as per IS 875-1964 or its latest revision.

Live load on gallery all round the elevated tank shall be considered as 5000 N/Sqm. Seismic forces shall be as per IS 1893-1975 or its latest revision.

DESIGN

Shape of the structure shall be the most economical as directed by Engineer-in-Charge and shall be selected depending upon site conditions.

Design shall be based on the worst possible combination of various loads, moments, shears, and resultant stresses in the tank for the following cases.

(i) Tank Full

(ii) Tank Empty with Earth pressure if any from outside

(iii) Uplift pressure if any

Tank full means depth of water inside the container up to full height of the container including free board.

Design shall be based on accepted bases and methods of design as well as the provision of IS 3370, IS 456, IS 1343 code of practice for pre-stressed concrete IS 2210. However, methods based on experimental investigation as mentioned in para 18.2 'C' in IS 456 shall not be entertained.

Design of members other than those excluded by Clause 2.4.4 above (i.e. roof, walls, floor etc. of the container) shall be based on consideration of adequate resistance to cracking as well as adequate strength. Calculation of stresses shall be as per para 3.3.2 of IS 3370 (Part II) 1965 or its latest revision.

PERMISSIBLE STRESS IN CONCRETE FOR RESISTING TO CRACKING

For calculations relating to the resistance of members to cracking the permissible stresses in tension (direct and due to bending) and shear shall conform to the values specified in Table I of IS 3370 (Part II_1965). "The permissible tensile stresses due to bending apply to the face of the member in contact with the liquid." In members less than 225 mm thick and in contact with the liquid on one side, these permissible stresses in bending apply also to the face remote from liquid.

For Strength Calculation

For strength calculation the permissible concrete stress shall be in accordance with Para-44 of IS 456-1978 where the calculated shear stress in concrete alone exceeds the permissible value reinforcement acting in conjunction with diagonal compression in the compression in the concrete shall be provided to take the whole of the shear. The maximum reinforcement shall conform to clause.

25.5.1.1. 25.5.1.2 of 456.

PERMISSIBLE STRESSES IN STEEL

For strength calculation (concrete assumed to be cracked) the permissible stresses in reinforcement shall be as per Table 2 of IS 3370 (Part II) 1965 or its latest revision. For TOR steel, the stress shall be as per IS 1986-1979 cold worked steel high strength deformed bars for concrete reinforcement or its latest revision.

The modular ratio 'm' for difference concrete mix shall be as under :

Grade of concrete Modular ratio 'm'

M :150 19

M :200 13

M : 250 11

Modulus of elasticity of concrete Ec shall be taken as 5700 Eck where Ec is characteristic cube strength of concrete in N/Sq.mm. as per clause 5.2.3.1 of IS 456

AGE FACTOR

Age factor for increasing strength shall not be considered for the design.

UNITS

Design should be in Metric units only.

DETAILING

Minimum Reinforcement for Water Retaining Members

The minimum reinforcement in walls, floors, roofs in each of two directions at right angles shall have an area of 0.3% of the concrete section in that direction for sections up to 100 mm thick. For sections of thickness greater than 100 mm and less than 450 mm the minimum reinforcement in each of the two directions shall be linearly reduced from 0.3% for 100 mm thick section to 0.2% for 450 mm thick section. For sections of thickness greater than 450 mm minimum reinforcement in each of directions shall be kept at 0.2%. In concrete sections of thickness 225 mm or 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.

The minimum reinforcement specified in 2.9.1 above may be decreased by 20% in case of high yield strength deformed bars conforming to IS 1786-1966 or IS 1139-1966.

Covers to Reinforcement

Minimum clear cover to reinforcement shall be 40 mm for durability of the structure.

For members of structure in contact with water effective cover shall not be more than 60 mm, for bars subjected to bending stresses. For bars subjected to pure tension the effective cover shall not be more than 75 mm.

Spacing of Reinforcement

Spacing of reinforcement shall be as per para 25.3 of IS 456

Spacing of lateral ties for column shall satisfy the provision of Para 25.5.3.2 'C' of IS 456-1978.

Reinforcing steel which accounts for resisting moments, tension etc. i.e. other than temperature and shrinkage steel, shall comprise of minimum 8 mm dia for ribbed bars

and 10 mm dia for mild steel bars. For compressive member the minimum dia of main reinforcement shall not be less than 12-mm dia.

NOTE

In case of dispute regarding interpretation of any of the above clause the decision of the owner or his representative will be final and binding on the designer and contractor.

In case of any clause not included in the above criteria, the decision of the owner or his authorised representative will be final and binding on the designer and contractor.

Carriage shall be paid as per actual lead as approved by competent authority.

GENERAL

Soil testing reports of the recognized institute must be submitted by the tenderer before start of the work at his own cost. The design must be on the basis of soil testing report. The design shall be in accordance with various relevant I.S. specifications (I.S. 456-1978, I.S. 875-1987, I.S. 3370-1965, I.S.432 part-1, I.S. 1786, I.S. 1139)

The design shall satisfy the stipulations as per I.S. 1893-1984 and I.S. 13920-1995 for seismic forces and I.S. 11682-1985 for RCC staging of overhead water tank.

Plain round M.S. bar grade I conforming to I.S. 432 part –1 or high yield strength deformed bars I.S. 1786 of 1139 shall be used. Grade II M.S. bars shall not be used.

Entire structure shall be in minimum R.C.C. M- 25 and the water retaining components should be in M-30 grade of concrete.

20 mm thick cement plaster (1:3) with 5% water proofing compound of approved quality shall be provided over the bottom floor and inside surface of tank wall. 12 mm thick cement plaster (1:4) shall be provided over the exposed surface of columns, beams, bracings, bottom dome and tank wall outside surface etc. 12 mm thick cement plaster (1:6) shall be provided for the inside and outside surface of rooms.

Three coats of Snowcem painting over a coat of cement primer shall be provided in the water tower. Irrespective of the foundation proposed in the design, one set of bracing be provided at the ground level. The scope of pipe assembly work shall be up to 5 meter beyond the out side face of the wall including the cost of pipes, valves and specials including laying and jointing.

The job includes designing the structure for uplift pressure and dewatering if required during entire execution and disposal of surplus excavated stuff within a lead of 50 meter as directed by the Engineer in charge.

D.I. D/F pipe be as per relevant I.S. standard shall be used for rising, delivery, overflow and washout main of the water tower.

Provision shall be made for 60 cm wide M.S. ladder with 25 mm G.I. pipe railing on both sides for going in the tank.

Provision shall be made for cylindrical ventilator fitted with mosquito proof net and two manholes with M.S. frame and cover with locking arrangements of adequate size as top dome.

Provision shall be made for lightening conductor as per I.E. rules

Provision shall be made for M.S. water level indicator with 450 mm diameter copper ball etc.

90% part rate shall be payable for reinforcement concrete and plastering item of all types of water retaining structure till satisfactory hydraulic testing for water tightness test is given and till that work shall be treated as incomplete.

GENERAL SPECIFICATIONS

This part covers conditions pursuant to the contract and shall supplement the general conditions, detailed specifications and requirements.

3.2.1 Limits of Contract

Equipment furnished shall be complete in every respect with all mountings, fittings, fixtures and standard accessories, normally provided with such equipment and /or need for erection, completion, and safe operation of the equipment as required by applicable codes, though they may not have been specifically detailed in the technical specifications unless included in the list of exclusions. All similar standard equipment provided shall be interchangeable with one another.

3.2.2 Engineering Data

The contractor shall furnish complete engineering data of each set of equipment such as name of the manufacturer, the type of model of each principle item of equipment proposed to be furnished and erected. Standard catalogues, pages and other documents of the tenderer may be used in the tender to provide additional information and data as deemed necessary by the tenderer. The review of this data by an Engineer will cover only general confirmation of the data to the specifications and documents interfaced with the equipment provided under the specifications, external connection and of the dimension, which might affect plant layout. This review by the Engineer in charge may not indicate a thorough review of all the dimensions, quantities and details of the equipment, materials, any devices of the items indicated or accuracy of the information submitted. This review or approval by the Engineer in charge shall not be construed by the contractor and limiting his responsibilities and liabilities for mistakes, and deviations from the requirements specified under these specifications and documents. All engineering data submitted by the contractor after final process including review and approval by the Engineer in charge shall form part of contract documents and the entire work covered under these specifications shall be performed in the strict conformity unless otherwise expressly requested by the Engineer in charge.

3.2.3 Drawing

Each drawing submitted by the contractor shall be clearly marked with the name of the owner, unit designation, the specifications, number and name of the project. If standard catalogue pages are submitted the applicable items shall be marked therein. All titles, noting, markings and writings on drawing shall be in English. All dimensions shall be in metric units. All manufacturing and fabrication work in connection with the equipment prior to the approval of the drawing shall be at contractor’s risk. The contractor may make any changes in the design which are necessary to make the equipment conform to provisions and intent of contract and such changes will again be subject to the approval of the Engineer in charge and shall not relieve the contractor of any of the responsibilities and liabilities under contract.

3.2.4 Design Improvements

The Engineer or Contractor may propose changes in the specifications of the equipment or quality thereof and if the parties agree upon any such changes the specifications shall be modified accordingly. If any such change agreed upon in such that it affects price and schedule of completion, the parties shall agree in writing as to the extent of changes in period and or schedule of completion before the contractor proceeds with the change. Following such agreements, the provisions there of shall deemed to have been amended accordingly.

3.2.5 Transportation

The contractor whenever applicable shall after proper painting pack and cart all equipments in such manner as to protect them from damage and deterioration in transit by road or rail, during storage at site till the time or erection. The contractor shall be held responsible for all damages due to improper packing. While packing all the materials the limitations from point of view of availability or railway wagons, size and other modes of transport should be taken into account. The packing and protection should be in conformity with the requirements of the insurance companies and transport agencies. The contractor shall prepare detailed packing list of all packages and containers, bundles and loose materials forming each and every consignment for making all necessary arrangements for loading, unloading and other handling, right from his works up to the site and also till the equipment is erected, tested and commissioned. He shall be solely responsible for proper storage and safe custody of all equipment.

All demurrage, warehouse and other expenses incurred due to delay in clearance of the material or any other reasons shall be to the account of contractor.

3.2.6 Protection to plant

All coated surfaces shall be protected against abrasion, impact, discoloration and any other damages. All exposed threaded portion shall be suitably protected with either metallic or non-metallic protective devices. All ends of the valves and piping and conduit equipment connections shall be properly sealed with suitable devices to protect them from exposure to weather and should also be properly treated and protected in suitable manner.

3.2.7 Preservative shop coating

All exposed metallic surfaces subject to corrosion shall be protected by shop application of suitable coating. All surfaces which will not be easily accessible after the shop assembly, shall before hand be treated and protected for the life of the equipment. All surfaces shall be thoroughly cleaned of all mill-scale, oxides and other coatings prepared in the shop. Surfaces that are to be finish painted after installation or require corrosion protection until installation shall be shop painted with at least two coats of primer.

3.2.8 Material handling and storage

All the equipment furnished under the contract and arriving at site shall be promptly received unloaded, transported and stored in a storage space by the contractor. Contractor shall be responsible for examining all the shipment and notify the Engineer in charge immediately of any damages, storage, discrepancy that is for the purpose of the Engineer’s information only. The contractor shall submit to the Engineer in charge every week, report detailing all receipts during the week. However the contractor shall be solely responsible for any storage on damage in transit handling and / or in storage and erection of equipment at site. The contractor shall maintain in accurate exhaustive record detailing out the list of all equipment received by him for the purpose of erection and keep such record open for inspection of the Engineer in charge. All the equipment shall be handled

carefully to prevent any damage or loss. The Engineer in charge in addition may direct contractor to move certain other materials, which in his opinion will require indoor storage, and the contractor shall strictly comply with it.

3.2.9 Contractor's material brought to Site.

The contractor shall bring to site all equipment components, parts, materials including construction equipment tools and tackle for the purpose of the work under intimation to the Engineer in charge. All such goods shall from time of their being brought vest in the owner but may not on any account be removed or taken away by the contractor without written permission from the Engineer in charge. The contractor shall nevertheless be solely liable and responsible for any loss or destruction there of and damage there to. The owner shall have lieu on such goods for any sum or sums, which may at the time be due to owing to him by the contractor. After giving 15 days notice in writing of his intention to do so, the owner shall be at liberty to sell and dispose of any such goods in a manner as he shall think fit including public Auction or private treaty and to apply the proceeds in or towards completion of work, the contractor shall remove from the site under the directions of the Engineer in charge, the material such as construction equipment, erection tools and tackles, scaffolding etc. within 15 days of issue of a notice by the Engineer in charge to do so. Then the Engineer in charge shall have the liberty to dispose off such materials and credit the proceeds there of to the account of the contractor.

3.2.10 Maintenance tools and tackles

The contractor shall supply with the equipment one complete set of all special tools and tackles for the erection assembly and maintenance of the equipment. However these tools and tackles shall be separately packed and brought to site. The tenderer shall indicate all the above items in the annexure. This set shall be for owner's use and any of the equipment out of this set shall not be used by the tenderer.

3.2.11 Construction management

Time is the essence of the contract and the contractor shall be responsible for performance of his works in accordance with the specified construction schedule. If at any time the contractor is falling behind the schedule he shall take necessary action to make good for such delays by increasing his work force or by working over time or otherwise accelerate the progress of work to comply with the schedule and shall communicate such action in writing to the Engineer in charge satisfying that his actions will compensate for delay. The contractor shall not be allowed any extra compensation for such action.

3.2.12 Field office records

The contractor shall maintain up to date copies of all the drawings, specifications and other contract documents and any other supplementary data complete with the latest revision thereto. The contractor shall maintain in addition continuous record of all the changes to the above contract documents, drawings, specifications, supplementary data etc affected at the field and on completion of his total assignment under the contract shall incorporate all such changes on the drawings and other Engineering data to indicate as installed conditions of the equipment furnished and erected under contract such drawings and engineering data of equipments erected under the contract shall be submitted to the Engineer in charge in number of required copies.

3.2.13 Design Co-ordination

The contractor shall be responsible for the selection and the design for appropriate equipments to provide best-coordinated performance of entire

system. The basic design requirements are detailed out in technical specifications. The design of various components, sub assemblies, assemblies, maintenance and all rotating components shall be so selected that the natural frequency of the complete unit is not critical at or close to the operating range of the unit.

3.2.14 Quality Assurance Program

To ensure that the equipment and services under the scope of this contract whether manufactured or performed within the contractor's premises or at the owner's site or at only other place of work are in accordance with the specifications. The contractor shall adopt suitable quality assurance programs to control such activities at all the points necessary. Such program shall be outlined by the contractor and shall be finally accepted by the Engineers after discussions before the award of contract and such agreed program shall form part of contract.

3.2.15 Unfavorable working conditions

The contractor shall confine all his field operations to those works which can be performed without subjecting the equipment and materials to adverse effects during inclement weather conditions like monsoon, storms etc. and during other unfavorable construction conditions. No field activities shall be performed by the contractor which might adversely affect the quality and efficiency thereof, unless special precautions or measures are taken by the contractor in a proper and satisfactory manner in the performance of such works and with the concurrence of Engineer in charge, such unfavorable conditions will in no way relieve the contractor of his responsibility to perform the works as per schedule.

3.2.16 Noise and Vibrations

The equipment supplied and erected by the tenderer will comply best design and erection practice and its working shall be within permissible noise and vibration levels.

3.2.17 Rating plates, Nameplates and Labels

Each main, auxiliary item of plate is to have permanently attached to it in a conspicuous position a rating plate of non-corrosive metal upon which is to be engraved any identifying manufacturers name, equipment type or serial number together with details of loading conditions under which the items plant in question has been designed to operate and such diagram plates as may required by the Engineer in charge. Each items of plant is to be provided with a nameplate or label designating the service of the particular equipment. The inscriptions are to be approved by the Engineer in charge or shall be as detailed in the appropriate sections of the technical specifications. Such name plates or labels are to be white non hygroscopic material with engraved black lettering on alternatively in the cast of indoor circuit breakers etc. if transparent plastic material with suitably, coloured, lettering engraved on the back. Items of plant such as valves, which are subject to handling, are to be provided with an engraved chromium plated nameplate or label with engraving filled with enamel.

3.2.18 Foundation, Dressing and Grouting

The surfaces of the foundations shall be dressed to bring the top surface of the foundations to the required level prior to placement of the equipment/equipment bases on the foundations. All the equipment bases and structural steel plates

shall be grouted and finished as per these specifications unless otherwise recommended by the manufacturer. The concrete foundation surfaces shall be properly prepared by chipping, grinding as required to bring the type of such foundation to the required level to provide necessary roughness for bondage and to assure enough bearing strength. All laitance and surface film shall be removed and cleaned.

3.2.19 Painting

All the exposed metal parts of equipment including piping, structures, railings etc. wherever applicable after installation unless otherwise surface protected shall be first painted with at least one coat, rust, scales greases oil and other foreign materials shall be removed by wire brushing scraping or sand blasting and approved by the Engineer in charge for painting. Afterwards the above parts shall be finished with two coats of alloyed resin machinery enamel paints. The quality of finished paints shall be as per standards of relevant IS or equivalent and to be of the approved color by the Engineer in charge.

3.2.20 Color code for pipe services

All pipe services, wherever applicable are to be painted in accordance with the owner's color scheme by the contractor.

3.2.21 Training of owner's personnel

The contractor shall undertake to train, free of cost personnel selected and sent by the owner

3.2.22 Consumables, oils, Lubricants.

All consumables such as chemicals, oil lubricants etc. which will be required to put the equipment covered under scope of specifications in successful trial run and operations & maintenance shall be furnished by the contractor.

3.2.23 Check out of control systems

After completion of wiring and cabling the contractor shall check out the operation of all control systems for the equipment furnished and installed under the specifications and documents.

3.2.24 Equipment Performance Guarantee

The performance guarantee of the equipment under contract is detailed separately in technical specifications. This guarantee shall supplement the general performance guarantee provisions covered under general terms and conditions.

3.2.25 Guarantee

a) In the event of an emergency wherein the judgment of the Engineer in charge, delay would cause serious loss or damage, repairs or adjustments may be made by the Engineer in charge or a third party chosen by the Engineer in charge without advance notice to the contractor and the cost of such work shall be paid by the contractor or by the surety. In the event such action is taken by the Engineer in charge, the contractor will be notified promptly and he shall assist wherever possible in making the necessary corrections. This will not extinguish the contractor's liability under terms and condition of contract.

b) The cost of any special or general overhaul tendered necessary during the operation period due to defects in the plants or defective work carried out by the contractor, the same shall be borne by the contractor.

c) In case of those defective parts which are not repairable at site but are essential for the commercial operation of the equipment, the contractor and the

Engineer shall mutually agree to a program of replacement or renewal which will minimize interruption to the maximum extent in the preparation of the equipment

d) At the end of guarantee period, the contractor's liability ceases except for latent defects in respect of goods supplied by sub-contractor to the contractor where a larger guarantee is (more than twelve months) is provided by subcontractor, the owner shall be entitled the benefit of such guarantee.

e) The provisions contained in this clause will not be applicable.

1) If the owner has not operated the equipment according to generally approved industrial practices in accordance with the conditions of operation specified and in accordance with operating manuals if any.

2) In case of normal wear and tear at the parts to be specifically mentioned by the contractor in the offer.

3.2.26 Limits of Contract

Equipment furnished shall be complete in every respect with all mountings, fittings, fixtures and standard accessories, normally provided with such equipment and /or need for erection, completion, and safe operation of the equipment as required by applicable codes, though they may not have been specifically detailed in the technical specifications unless included in the list of exclusions. All similar standard equipment provided shall be interchangeable with one another.

3.2.27 Engineering Data

The contractor shall furnish complete engineering data of each set of equipment such as name of the manufacturer, the type of model of each principle item of equipment proposed to be furnished and erected. Standard catalogues, pages and other documents of the tenderer may be used in the tender to provide additional information and data as deemed necessary by the tenderer. The review of this data by an Engineer will cover only general confirmation of the data to the specifications and documents interfaced with the equipment provided under the specifications, external connection and of the dimension, which might affect plant layout. This review by the Engineer in charge may not indicate a thorough review of all the dimensions, quantities and details of the equipment, materials, any devices of the items indicated or accuracy of the information submitted. This review or approval by the Engineer in charge shall not be construed by the contractor and limiting his responsibilities and liabilities for mistakes, and deviations from the requirements specified under these specifications and documents. All engineering data submitted by the contractor after final process including review and approval by the Engineer in charge shall form part of contract documents and the entire work covered under these specifications shall be performed in the strict conformity unless otherwise expressly requested by the Engineer in charge.

3.2.28 Drawing

Each drawing submitted by the contractor shall be clearly marked with the name of the owner, unit designation, the specifications, number and name of the project. If standard catalogue pages are submitted the applicable items shall be marked therein. All titles, noting, markings and writings on drawing shall be in English. All dimensions shall be in metric units. All manufacturing and fabrication work in connection with the equipment prior to the approval of the drawing shall be at

contractor's risk. The contractor may make any changes in the design which are necessary to make the equipment conform to provisions and intent of contract and

such changes will again be subject to the approval of the Engineer in charge and shall not relieve the contractor of any of the responsibilities and liabilities under contract.

3.2.29 Design Improvements

The Engineer or Contractor may propose changes in the specifications of the equipment or quality thereof and if the parties agree upon any such changes the specifications shall be modified accordingly. If any such change agreed upon in such that it affects price and schedule of completion, the parties shall agree in writing as to the extent of changes in period and or schedule of completion before the contractor proceeds with the change. Following such agreements, the provisions there of shall deemed to have been amended accordingly.

3.2.30 Transportation

The contractor whenever applicable shall after proper painting pack and cart all equipments in such manner as to protect them from damage and deterioration in transit by road or rail, during storage at site till the time or erection. The contractor shall be held responsible for all damages due to improper packing. While packing all the materials the limitations from point of view of availability or railway wagons, size and other modes of transport should be taken into account. The packing and protection should be in conformity with the requirements of the insurance companies and transport agencies. The contractor shall prepare detailed packing list of all packages and containers, bundles and loose materials forming each and every consignment for making all necessary arrangements for loading, unloading and other handling, right from his works up to the site and also till the equipment is erected, tested and commissioned. He shall be solely responsible for proper storage and safe custody of all equipment.

All demurrage, warehouse and other expenses incurred due to delay in clearance of the material or any other reasons shall be to the account of contractor.

3.2.31 Protection to plant

All coated surfaces shall be protected against abrasion, impact, discoloration and any other damages. All exposed threaded portion shall be suitably protected with either metallic or non-metallic protective devices. All ends of the valves and piping and conduit equipment connections shall be properly sealed with suitable devices to protect them from exposure to weather and should also be properly treated and protected in suitable manner.

3.2.32 Preservative shop coating

All exposed metallic surfaces subject to corrosion shall be protected by shop application of suitable coating. All surfaces which will not be easily accessible after the shop assembly, shall before hand be treated and protected for the life of the equipment. All surfaces shall be thoroughly cleaned of all mill-scale, oxides and other coatings prepared in the shop. Surfaces that are to be finish painted after installation or require corrosion protection until installation shall be shop painted with at least two coats of primer.

3.2.33 Material handling and storage

All the equipment furnished under the contract and arriving at site shall be promptly received unloaded, transported and stored in a storage space by the

contractor. Contractor shall be responsible for examining all the shipment and notify the Engineer in charge immediately of any damages, storage, discrepancy

that is for the purpose of the Engineer's information only. The contractor shall submit to the Engineer in charge every week, report detailing all receipts during the week. However the contractor shall be solely responsible for any storage on damage in transit handling and / or in storage and erection of equipment at site. The contractor shall maintain in accurate exhaustive record detailing out the list of all equipment received by him for the purpose of erection and keep such record open for inspection of the Engineer in charge. All the equipment shall be handled carefully to prevent any damage or loss. The Engineer in charge in addition may direct contractor to move certain other materials, which in his opinion will require indoor storage, and the contractor shall strictly comply with it.

3.2.34 Contractor's material brought to Site.

The contractor shall bring to site all equipment components, parts, materials including construction equipment tools and tackle for the purpose of the work under intimation to the Engineer in charge. All such goods shall from time of their being brought vest in the owner but may not on any account be removed or taken away by the contractor without written permission from the Engineer in charge. The contractor shall nevertheless be solely liable and responsible for any loss or destruction there of and damage there to. The owner shall have lieu on such goods for any sum or sums, which may at the time be due to owing to him by the contractor. After giving 15 days notice in writing of his intention to do so, the owner shall be at liberty to sell and dispose of any such goods in a manner as he shall think fit including public Auction or private treaty and to apply the proceeds in or towards completion of work, the contractor shall remove from the site under the directions of the Engineer in charge, the material such as construction equipment, erection tools and tackles, scaffolding etc. within 15 days of issue of a notice by the Engineer in charge to do so. Then the Engineer in charge shall have the liberty to dispose off such materials and credit the proceeds there of to the account of the contractor.

3.2.35 Maintenance tools and tackles

The contractor shall supply with the equipment one complete set of all special tools and tackles for the erection assembly and maintenance of the equipment. However these tools and tackles shall be separately packed and brought to site. The tenderer shall indicate all the above items in the annexure. This set shall be for owner's use and any of the equipment out of this set shall not be used by the tenderer.

3.2.36 Construction management

Time is the essence of the contract and the contractor shall be responsible for performance of his works in accordance with the specified construction schedule. If at any time the contractor is falling behind the schedule he shall take necessary action to make good for such delays by increasing his work force or by working over time or otherwise accelerate the progress of work to comply with the schedule and shall communicate such action in writing to the Engineer in charge satisfying that his actions will compensate for delay. The contractor shall not be allowed any extra compensation for such action.

3.2.37 Field office records

The contractor shall maintain upto date copies of all the drawings, specifications and other contract documents and any other supplementary data complete with

the latest revision thereto. The contractor shall maintain in addition continuous record of all the changes to the above contract documents, drawings, specifications, supplementary data etc affected at the field and on completion of

his total assignment under the contract shall incorporate all such changes on the drawings and other Engineering data to indicate as installed conditions of the equipment furnished and erected under contract such drawings and engineering data of equipments erected under the contract shall be submitted to the Engineer in charge in number of required copies.

3.2.38 Design Co-ordination

The contractor shall be responsible for the selection and the design for appropriate equipments to provide best-coordinated performance of entire system. The basic design requirements are detailed out in technical specifications. The design of various components, sub assemblies, assemblies, maintenance and all rotating components shall be so selected that the natural frequency of the complete unit is not critical at or close to the operating range of the unit.

3.2.39 Quality Assurance Program

To ensure that the equipment and services under the scope of this contract whether manufactured or performed within the contractor's premises or at the owner's site or at only other place of work are in accordance with the specifications. The contractor shall adopt suitable quality assurance programs to control such activities at all the points necessary. Such program shall be outlined by the contractor and shall be finally accepted by the Engineers after discussions before the award of contract and such agreed program shall form part of contract.

3.2.40 Unfavorable working conditions

The contractor shall confine all his field operations to those works which can be performed without subjecting the equipment and materials to adverse effects during inclement weather conditions like monsoon, storms etc. and during other unfavorable construction conditions. No field activities shall be performed by the contractor which might adversely affect the quality and efficiency thereof, unless special precautions or measures are taken by the contractor in a proper and satisfactory manner in the performance of such works and with the concurrence of Engineer in charge, such unfavorable conditions will in no way relieve the contractor of his responsibility to perform the works as per schedule.

3.2.41 Noise and Vibrations

The equipment supplied and erected by the tenderer will comply best design and erection practice and its working shall be within permissible noise and vibration levels.

3.2.42 Rating plates, Nameplates and Labels

Each main, auxiliary item of plate is to have permanently attached to it in a conspicuous position a rating plate of non-corrosive metal upon which is to be engraved any identifying manufacturers name, equipment type or serial number together with details of loading conditions under which the items plant in question has been designed to operate and such diagram plates as may required by the Engineer in charge. Each items of plant is to be provided with a nameplate or label designating the service of the particular equipment. The inscriptions are to be approved by the Engineer in charge or shall be as detailed in the appropriate sections of the technical specifications. Such name plates or labels are to be white non hygroscopic material with engraved black lettering on alternatively in the cast of indoor circuit breakers etc. if transparent plastic material with suitably,

coloured, lettering engraved on the back. Items of plant such as valves, which are subject to handling, are to be provided with an engraved chromium plated nameplate or label with engraving filled with enamel.

3.2.43 Foundation, Dressing and Grouting

The surfaces of the foundations shall be dressed to bring the top surface of the foundations to the required level prior to placement of the equipment/equipment bases on the foundations. All the equipment bases and structural steel plates shall be grouted and finished as per these specifications unless otherwise recommended by the manufacturer. The concrete foundation surfaces shall be properly prepared by chipping, grinding as required to bring the type of such foundation to the required level to provide necessary roughness for bondage and to assure enough bearing strength. All laitance and surface film shall be removed and cleaned.

3.2.44 Painting

All the exposed metal parts of equipment including piping, structures, railings etc. wherever applicable after installation unless otherwise surface protected shall be first painted with at least one coat, rust, scales greases oil and other foreign materials shall be removed by wire brushing scraping or sand blasting and approved by the Engineer in charge for painting. Afterwards the above parts shall be finished with two coats of alloyed resin machinery enamel paints. The quality of finished paints shall be as per standards of relevant IS or equivalent and to be of the approved color by the Engineer in charge.

3.2.45 Color code for pipe services

All pipe services, wherever applicable are to be painted in accordance with the owner's color scheme by the contractor.

3.2.46 Training of owner's personnel

The contractor shall undertake to train, free of cost personnel selected and sent by the owner

3.2.47 Consumables, oils, Lubricants.

All consumables such as chemicals, oil lubricants etc. which will be required to put the equipment covered under scope of specifications in successful trial run and operations & maintenance shall be furnished by the contractor.

3.2.48 Check out of control systems

After completion of wiring and cabling the contractor shall check out the operation of all control systems for the equipment furnished and installed under the specifications and documents.

3.2.49 Equipment Performance Guarantee

The performance guarantee of the equipment under contract is detailed separately in technical specifications. This guarantee shall supplement the general performance guarantee provisions covered under general terms and conditions.

3.2.50 Guarantee

a) In the event of an emergency wherein the judgment of the Engineer in charge, delay would cause serious loss or damage, repairs or adjustments may be made by the Engineer in charge or a third party chosen by the Engineer in charge without advance notice to the contractor and the cost of such work shall be paid by the contractor or by the surety. In the event such action is taken by the

Engineer in charge, the contractor will be notified promptly and he shall assist wherever possible in making the necessary corrections. This will not extinguish the contractor's liability under terms and condition of contract.

b) The cost of any special or general overhaul tendered necessary during the operation period due to defects in the plants or defective work carried out by the contractor, the same shall be borne by the contractor.

c) In case of those defective parts which are not repairable at site but are essential for the commercial operation of the equipment, the contractor and the Engineer shall mutually agree to a program of replacement or renewal which will minimize interruption to the maximum extent in the preparation of the equipment

d) At the end of guarantee period, the contractor's liability ceases except for latent defects in respect of goods supplied by sub-contractor to the contractor where a larger guarantee is (more than twelve months) is provided by subcontractor, the owner shall be entitled the benefit of such guarantee.

e) The provisions contained in this clause will not be applicable.

1) If the owner has not operated the equipment according to generally approved industrial practices in accordance with the conditions of operation specified and in accordance with operating manuals if any.

2) In case of normal wear and tear at the parts to be specifically mentioned by the contractor in the offer.

3.3 Pre-commissioning Trials

Article I. 3.3.1 **Start up**

On completion of the erection of equipment and before start up, each item of the equipment shall be thoroughly cleaned and then inspected by the Engineer in charge and the contractor jointly for correctness and 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 mutually agreed and included in contractor's quality assurance Programme. The contractor's commissioning /start up engineers specially identified as far as possible shall be responsible for carrying out all pre-commissioning tests. On completion of inspection, checking and after pre-commissioning tests are satisfactorily over the complete equipment shall be placed on initial operation during which period, the complete equipment shall be operated integral with sub-system and supporting equipment complete plant.

3.3.2 Commissioning spares

The contractor shall make arrangements for an adequate inventory at site, of necessary commissioning spares prior to commissioning of equipments furnished and erected so that any damage or loss during these commissioning activities necessitating the requirements of spares will not come in way of timely completion of works under contract.

3.3.3 Registration and statutory Inspection

All the registration and statutory inspection fees if any in respect of work pursuant to this contract shall be to the account of contractor. Should any such inspection on registration need to be re-arranged due to the fault of contractor, the additional fees for such inspection shall also be borne by the contractor.

3.3.4 Progress Reports and Photographs

During various stages of works in pursuant of the contract the contractor shall at his own cost submit periodic progress reports as may be reasonably required by the Engineer in charge with such materials as charts, networks, photographs, test certificates etc. Such progress reports and photographs shall be in the form and size as may be required by the Engineer in charge and shall be submitted in at least three copies and shall contain the date, the name of the contractor and the title of the photographs. The report shall also indicate reasons for variance between the schedule and actual progress and the action proposed for corrective measures whatever necessary.

3.3.5 Work and Safety Regulations

a) The contractor will notify the Engineer in charge of his intention to bring on to the site any equipment or any container with liquid or gaseous fuel or other substance, which may create hazards. The Engineer in charge shall have right to prescribe the condition under which such equipments or container may be handled and used during the performance works and the contractor shall strictly adhere to such instructions. The Engineer in charge shall have the right to inspect any construction plant and to forbid its use if in his opinion it is unsafe, no claim due to such prohibition shall be entertained by the owner.

b) Where it is necessary to provide and/or store petroleum products or petroleum mixtures and explosives the contractor shall be responsible for carrying out such provision and/or storage in accordance with the rules and regulations laid down in Petroleum Act 1934 Explosive Act 1948 and petroleum and carbide of calcium manual. All such storage shall have prior approvals necessary from chief Inspector of Explosives or any Statutory Authorities. The contractor shall be responsible for obtaining the same.

3.3.6 Contractor shall make necessary arrangements for the following

I) It is necessary to carry out the testing of number of equipments in the manufacturers works. This is stated in the item wise specification. However the items, which require third party inspection as tested below with brief requirement of tests.

II) The arrangements for this shall be arranged by the contractor, the cost of testing in factory payable to manufacturer (including power charges etc.) The testing fees of inspecting authorities etc. shall be arranged by the contractor without any extra cost to the department.

Whenever department Engineers will be attending the inspection and testing to and fro charges will be born by the department as per Govt. civil service rules. However all other arrangements shall be made by the contractor.

4.0 Illumination to the pump house.

Necessary illumination shall be provided in and out at pump house as per direction of engineer-in-charge.

Article II. 5.0 Test Trial and operation

The plant shall be on trial operation for three months after testing during which period all necessary adjustments shall be made while operating over the full load range enabling the plant to be made ready for performance and guarantee test.

A trial operation report comprising observations and recordings of various parameters to be measured in respect of the above trial operation shall be prepared by the contractor. This report, besides recording details of the various

observations during trials run shall also include the dates of start and finish of the trial operations and shall be signed by the representatives of both the parties. The reports shall have sheets, recording all the details of interruptions occurred, adjustments made and any major repairs done during the trial 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 In charge to enable the latter to accord permission to carry out performance and guarantee test 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.

Article III. 6.0 Commissioning and Operation

After commissioning and testing, there will be three months trial run and thereafter twenty four months for operation and maintenance of the plant.

During trial run, the contractor shall depute his personnel full time to operate, maintain and repair the equipment. The personnel so deputed shall maintain log books and other records as directed by the Engineer In charge. During this period the owner's personnel shall continuously work with Contractor's personnel to take full responsibility of operating, maintaining, repairing, etc. of the equipment plant.

7.0 Test Trial and operation

Article IV. Trial Operation

The plant shall be on trial operation during which period all necessary adjustments shall be made while operating over the full load range enabling the plant to be made ready for performance and guarantee test.

The duration of trial operation of the complete equipment shall be at least 90 days, 16 hours daily, out of which at least 72 hours shall be of continuous operation with full load or any other duration as may be agreed to between the Engineer and the Contractor. The trial 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. In case of interruptions, the trial operation shall be prolonged for the period of interruption.

A trial operation report comprising observations and recordings of various parameters to be measured in respect of the above trial operation shall be prepared by the contractor. This report, besides recording details of the various observations during trial run shall also include the dates of start and finish of the trial operations and shall be signed by the representatives of both the parties. The reports shall have sheets, recording all the details of interruptions occurred adjustments made and any major repairs done during the trial 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 the latter to accord permission to carry out 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.

Article V. 8.0 Commissioning and operation:

The commissioning and operation period will be 3 months and follows the trail operation period mentioned in foregoing clause, for every individual set of pumping equipment, unless otherwise specifically agreed.
During the commissioning and operation period, the contractor shall depute his personnel full time to operate, maintain and repair the equipment. The personnel so deputed shall

maintain logbooks and other records as directed by the Engineer. Only electric power shall be provided by the Department during this trial run. Chemicals, fuel for generators, and consumables as required are to be provided by the tenderer. During this period the owner's personnel shall continuously work with Contractor's personnel to take full responsibility of operating, maintaining, repairing, etc. of the equipment and plant.
The contractor will have to maintain logs of following works.

1. Power availability and voltage.
2. Volume of raw water and clear water supplied
3. Different parameter of quality of raw & clear water.
4. Inventory of chemicals brought to the plant.
5. Consumption of chemicals on the basis of quality of raw water.
6. Payment of chemical will strictly be made on the basis of above mentioned logs and contractor will have to submit Xerox copy of such logs with bills/ invoice.
   Field officers will have to inspect above mentioned items periodically and will have to put their comments on the log book. These documents may be verified by senior officer.

Defect liability period will start from the date of start of O & M period for next one year or more. During this one year defect liability period as well as first year or more of O & M it will be responsibility of the contractor to replace all the items if there is any defects such as pump motor, pipe line or any other component of the project. The contractor will be paid only for labour component and cost of chemical. Electricity will be available free of cost. During the 2nd year or more of O & M period for all the items, replacement of defective parts, labour components, and cost of chemical but electric cost will be paid by the department. After completion of two years or more O & M work, the contractor will hand over the plant to the D.W. & S.D / V WSC. Before handing over it all the civil work such as pump house, water tower, WTP and sump etc. will have to be painted as per the same specification as originally done as per agreement, for which no extra payment will be made to the contractor. If there is any discrepancy in the data related with trail run, the defect liability period, mentioned at different places of SBD, data mentioned in this clause on 8 will prevail.

9.0 ***Common features of O&M:-*** (The agency will deply the manpower for smooth operation and maintenance of the scheme. The payment of these man power will be made through V.W.S.C.)

9.1.1 Detailed plans, drawings and O&M manuals

At least five to six sets of the detailed drawings, maps of each of the component of the water works along with all relevant O & M manuals should be available with the operating authority. One copy of such documents should be preserved in the office of WTP in charge, SDO and Executive Engineer concerned for reference.

9.1.2 Schedule of daily operations

Schedule of operation should be worked out and a copy of the same should be made available to the operator concerned. It should be altered as per change in raw water availability/ quality, break downs etc.

9.1.3 Schedule of inspection machinery

Schedule of inspection of machinery, equipment their lubrication and servicing programme must be prepared and should be available with the operator concerned. Junior engineer should regularly see that these inspections, lubrications and servicing are being regularly carried out.

9.1.3 Records

For each piece of equipment and machinery, a record register should be maintained in which all records of the equipment such as servicing, lubrication, replacement of parts, operating hours (including cumulative) and other important data is entered.

9.1.4 Records of quality of water

Complete records of bacteriological and chemical analysis of water from source to the consumer tap should be maintained and reviewed. Charts could also be prepared for the important characteristics of the water and any change in these characteristics as compared to the standards must be taken note of.

9.1.5 Staff position

Appropriate charts indicating the standard staff for each of the unit of operation and maintenance and staff actually in position (by names if possible) shall be maintained at each office for review.

9.1.6 Inventory of stores

A reasonable assessment of the stores and spare parts of machinery required over a period of time say one year or half a year can be made and an inventory of the same prepared. The aim should be that any material required for replacement is available at any time for the maintenance.

9.2 Features of O & M of individual components of water works:-

9.2.1 Source and Intake Works

(a) Sanitary Survey – A regular survey of the catchment area such as potential threat to quality of water due to industrial, domestic or agricultural reason should be made and if any threat is found, it should be immediately reported to the pollution control board.

(b) Measurement of flow*–in caseof spring, rivers, canals etc., there should be a permanent arrangement for recording daily flow near the intake works. Rain gauge stations should be established to record daily rainfall in the reservoir catchment. In case of reservoir, the regime tables for filling and emptying of storages should be maintained for each year.*

9.2.2 Maintenance of Dam

(a) Pre, during and post monsoon inspection of dams should be undertaken to observe settlement, longitudinal/ transverse cracks in the embankment/ masonry structures.

(b) Behavior of spillways should be observed during floods. Procedures for fool proof operation of spillway gates should be prescribed and observed.

(c) In case of earthen dams, special attention should be paid to slipping of slopes, damages and water seepage. The functioning of sand galleries, drains and relief wells should be watched carefully. In case of masonry

dams, sweating, leakages, leaching of appreciable magnitude from masonry should be immediately attended to. Pointing of damaged faces of masonry should be attended to promptly.

9.2.3 Maintenance of Intakes

(a) It should be ensured that sufficient water level is maintained at head works in order to ensure drawl of required quantity of water into intake works without vortex formations.

(b) All intake strainers should be cleaned at frequent intervals particularly during monsoon to prevent entry of fish or floating matter into intake works.

(c) All damages to structural components of intake works particularly during floods should be promptly repaired.

(d) Sufficient stocks of rubble should be maintained at intake works site for use to temporarily overcome the problems of scours at spillways and other places.

(e) A schedule of painting of steel and other structural parts of the intake works should be prepared and followed scrupulously to avoid damages to the structure.

(f) All raw water holding structures such as intake wells, jack wells and inspection wells should be desilted during and immediately after monsoon to remove settled silt.

9.2.4 Maintenance of Pumps and Pumping Machinery

9.2.5 Maintenance of transmission systems

The transmission mains would include raw/ treated water pumping as well as gravity mains from source to treatment works, treatment works to master balancing reservoir (MBR) and from M.B.R.s to service reservoirs in the distribution system. The maintenance problems to be attended to for various types of pipes used in the system are summarized below:-

(a) M.S. pipes laid above ground :-

(i) Pipes should be painted at least once in five years to prevent corrosion.

(ii) Appurtenances such as sluice valves, air valves, expansion joints, rollers should be checked, cleaned at least twice a year and worn out parts replaced. The cleaning and lubrication of rollers should also be done twice a year, preferably pre and post monsoon.

(iii) Expansion joints should be inspected every month.

(iv) *The catch drains provided for the portion of water mains laid in cutting should be cleaned before onset of monsoon so that no water accumulates in the cutting portion, resulting in uplift pressure on pipes.*

(b) All pipes:-

(i) Sufficient stocks of spare pipes and specials should be maintained for replacement of damaged ones

(ii) Regular leak detection surveys should be under taken particularly for bursting of pipes and leaky joints.

(iii) A detailed record of break down and leaks observed and repaired should be maintained section wise so that more vulnerable lengths could be identified and special measures to repair/ replace them could be undertaken.

(ii) A regular schedule of inspection and attendance to all valves including air and scour valves should be drawn up and the same followed scrupulously. Special attention should be given to air valves.

9.3 O & M of WaterTreatmentPlants

9.3.1 Problems

The person in charge of the maintenance and operation of water treatment plant should have a thorough knowledge of the functions of the several units under his control. The problems that may be posed before him may relate to those arising from (a) poor design (b) faulty execution (c) special situation during operation.
A resourceful operator should be in a position to bring to the notice of the concerned person, any faults in design and execution giving rise to problem during the course of operation and rectify them immediately. The other problems which are to be tackled at the operational stage are mainly those which arise out of :

(a) Fluctuations in the quality of the water;

(b) Fluctuations in the quantity and the changes in the flow pattern.

(c) Malfunctioning of the unit(s); and

(d) Mechanical and electrical equipment.

9.3.2 Requirements –

Maintenance should be carried out in a manner which prevents emergencies and unscheduled shutdowns. An efficient maintenance requires considerable skill which can only be acquired by experience, study and practice. Basically, any maintenance programme should observe the following general rules:

(a) Keep a set of plans giving details of the several units and indicating the layout and position of all pipelines and appurtenances ;

(b) Establish a systematic plan of daily operation;

(c) Establish a routine schedule for inspection of machinery and lubrication and maintain records thereof. Instructions for lubrication, the type of lubricant suggested and frequency of lubrication should be drawn out.

(d) Main data and record of each piece of equipment giving details of cleaning and replacement of worn parts and other data of importance such as unusual incidents on faulty operating conditions. Details for any special equipment should be obtained from manufacturers.

(e) Keep a record of analysis of water collected at various points from the source to the distribution system and observation on the effect of such quality on the several units of operation; and

(f) List out safety measures including good housekeeping,

9.3.3 RAW WATER

The problem will mainly relate to the change in the quality of the raw water due to natural causes and by inadvertent pollution of the source.
In the case of a river source, a sanitary survey of the catchment area should be undertaken at regular intervals and water samples taken at significant points where pollution is likely to take place. The analysis of these samples will reveal the degree and nature of pollution and thus help in taking the necessary measures to check or control the pollution. If the fluctuations in quality are rapid, the surveys should be undertaken at shorter intervals. Turbidity is not a special problem as the dosage of the coagulant is adjusted on a daily routine. On the other hand a sudden rise in chlorides content will indicate pollution most probably due to sewage. In such cases, more confirmatory test should be undertaken such as for nitrogen in its various forms, dissolved oxygen, oxygen absorbed and chlorine demand to help the operator to decide whether pollution has taken place and to fix the dose of per chlorination needed.
In the case of a lake as a source the periodical biological and physical examination of the samples will indicate if there is any need for control of algae which may lead to taste and odor problems or clogging of filters. Samples taken at different depths in the lake will indicate the level at which water should be drawn to get the best quality of the water.

9.3.4 FLOW MEASURING DEVICES

Float sump should be periodically cleaned to see that silt does not accumulate which may affect the proper functioning of the float. Charts and pen recorders should be stocked adequately. Annual or more frequent calibration of these devices is necessary Annual servicing and checking of the instruments in imperative.

9.3.5 CHEMICAL FEEDING UNIT

Alum preparation tank is to be painted annually by anti-corrosive paint. V-notch weirs and floats and floating arrangements should be cleaned daily. Enough spares for the mixing device in the chemical preparation should be stocked. Setting of the V-notch should be checked periodically.
Sometimes, if the alum dosing equipment is not in order, the alum slabs are just dumped in the raw water channel. This is bad practice and should not be adopted as it will mean wastage of alum and improper dosing of alum. Alum should be made into a solution and dispensed until the dosing equipment is rectified. The optimum dosing of alum and coagulant aids should be based on a proper and detailed laboratory study including Jar Test. The chemical feeding rate should be controlled, depending upon the needs from time to time.

9.3.6 RAPID MIXER

Adequate spares should be kept ready in stock for timely replacement when necessary. Life of the equipment could be prolonged by periodical painting with anticorrosive paints.

9.3.7 SLOW MIXER

Slow Mixer should be operated continuously for avoiding sludge build-up. All equipment should be painted with anti-corrosive paints every year. Mechanical devices should be properly lubricated and worn out parts replaced. In non-mechanical type of flocculators like baffle and tangential flow tanks, desludging atleast once in six months is necessary.

9.3.8 CLARIFIER OR SEDIMENTATION TANK

Annual overhauling and repainting of the unit should be done a month or two prior to monsoon.
Sludge lines should be kept free of chokages. The lines should be flushed with high pressure water if chokages are noticed. The telescopic sludge discharge device, when provided, should be checked for free vertical movement and O-rings replaced when

leaky.
The traction wheels should be checked for alignment and rubber wheels replaced, if required. The unit should be worked continuously to protect the mechanical parts from ill-effects of corrosion,malfunctioning etc.,

as well as problems from sludge build-up. Outlet weirs should be kept cleaned at all times. Algaecide or bleaching powder may be used for controlling biological growth on weirs.
The important features in the operation of a clarifier are:

(a) The introduction of water into the tank with a minimum turbulence;

(b) The prevention of short –circuiting between inlet and outlet; and

(c) The removal of the effluent with the minimum of disturbance to avoid settled material being carried out of the tank.

Very often, a basin which is not functioning properly can be modified by making changes to the inlet and outlet devices by installing stilling baffles so as to improve any or all of the important features mentioned above. Algal growth, if any, should be controlled.

9.3.9 RAPID GRAVITY FILTERS

The common problems encountered are:

(a) Defective Gauges

Rate of flow gauges and loss of head gauges frequently get out of order. The operator should be conversant with the working of gauges and should be able to handle minor repairs. Necessary spares should be stocked.

However, even if the rate of filtration gauge is under repair, the filtration rate can be checked whenever desired by closing the inlet valve and observing the time during which the level of water in the filter falls by a measured distance.

For knowing the loss of head when the gauges are out of operation, a temporary arrangement consisting of two glass tubes on each side of a calibrated scale could be provided. One tube is to be connected to the efficient pipe between filter and controller and the other tube to the filter structure above the sand. The relative elevation of the water surfaces in these tubes indicates the prevailing hydraulic gradient or loss of head through the filter.

(b) Inadequate Media on the Filter Bed

Expansion of sand bed during backwashing should be kept within the limits to avoid carry-over of sand to wash water trough which would lead to appreciable depletion of sand depth over a period of time.Sand depth should never be depleted by more than 10 cm, when the media has to be replenished.

The entire bed should be taken out and additional sand mixed to give the required effective size and uniformity coefficient. Before starting the filter, the sand has to be backwashed to stratify the bed.

(c) Air Binding

This is caused due to the development of negative head and formation of air bubbles in the filter sand. This could be overcome by more frequent backwashing during these periods. Provision should also be made wherever feasible for increasing the depth of water over the bed by about 15 to 30 cm. There are chances of air being released if back-wash is carried out by direct pumping. Air release valves should be provided on the pumping mains in such cases.

The solution lies in providing adequate depth of water at least 1.5 meters over sand. If air binding persists, loss of heads may be limited to 1.5 meters instead of normal 2 meters. This will discourage air binding and will ensure reasonable length of filter runs.

(d) Incrustation of Media

The problem may arise as in the case of water softening with lime soda when sand gets coated with material that is difficult to remove by normal backwash. The remedy lies in washing the filter occasionally with sodium hydroxide (10 kg/m2 area of bed) or bleaching power (20 kg/m2 area of bed).

(e) Cracking of sand Beds.

This occurs mostly when the water is lowered below the surface of the sand. Cracks in a sand bed under water may also arise due to the cementing of the grains by some material in the applied water. The vulnerable portion is near the filter walls, since the sand is drawn away from the walls. The rate of flow increases through such cracks allowing a heavier deposit of solids at these points, which in turn, intensifies the forces compacting the sand until a dense mass is formed. The degree of this mass may be limited, creating a dead area, resulting in an unequal distribution of the wash water. This can be overcome by the use of hand rake or by draining the bed and removing the clogged sand.

(f) Bumping of Filter Beds.

Sometimes careless and indifferent operation may lead to "bumping" or "lifting" of the filter beds when switching on the back-wash for a minute to dislodge the sand bed and recommending filtration without going through the full back-wash cycle is adopted. This practice should be discouraged as the filtrate quality deteriorates considerably.

(g) Mud balls

These are caused by the general buildup of materials not removed in back-wash. Mud balls accumulate at or near surface and in course of time clog the entire media.

By proper coagulation and settling of applied water, mud ball formation could be considerably reduced. Surface washes or surface raking, or shoveling at intervals helps reduce mud ball formation. Also compressed air scouring during backwash for periods of three minutes, instead of 1 to 2 minutes, effectively decreases mud ball concentration.

(h) Sand Boils

These are caused when disproportionately large discharges of wash water rush towards expending the sand and displacing the gravel, the situation is encountered mostly due to the poor distribution of wash-water from the under drain.

(i) Slime Growths

When slime growths are noticed on filters, the bed is cleared in the normal way and the water is lowered to the level of the sand bed. Then common salt is distributed evenly over the surface of the sand, using 7 Kg/m2 of filter area, after which the sash water valve is opened until water rises about 15 cm. above the sand level. The water is allowed to remain for 2 hours to dissolve the salt and then lowered to the bed level to be retained for 24 hours after which it is thoroughly backwashed before placing into service. If this procedure does not produce effective results, it may be necessary to replace the media.

(j) Backwash Requirements

The waste water drains carrying filter backwash should be kept free of clogging or sediment. If the backwash water is led away quickly, there will be no backing up in cater channels or into the filter bed. Incidentally, it may be worthwhile to consider setting up a plain sedimentation tank to recover the supernatant from the backwash water. For the small investment, the water recovery could be appreciable.

The requisite up flow velocity of backwash water should be maintained at the design rate for proper cleaning of the sand. The practice of backwash at reduced rate for longer periods should be avoided as it leads to wastage of water and washing becoming ineffective.

Backwashing of filters should not be based on arbitrarily fixed time schedules but the frequency should be in accordance with the filtrate quality and head lose measurement, Duration should be dependent upon the turbidity of the wasted water.

9.3.10 SLOW SAND FILTERS

The inlet float valve should be periodically checked with a view to maintain the desired level in the bed.

The outlet weir arrangement should be checked periodically with a view to ensure the design rate of filtration. Where there is telescopic arrangement, it should be functioning smoothly and without drawing in water through the sides. Where manual adjustment is to be done with increasing filter heads, this should be done at specified intervals.

The filter head indicator should always be kept in working condition. When a filter is clogged, most of the head loss is restricted to the top layer of sand and if the filter head exceeds 1m, pressures below atmospheric can occur in sand gravel and in the under drains, leading to air binding or dissolved air coming out of solution. Occurrence of negative head can be avoided by placing the sill of the outlet weir in level with the top of the sand bed.

It is most important to avoid rapid fluctuations in filtering rates. Cleaned or resanded filters should be brought up gradually to the maximum filtering rate and maintained as far as possible at a constant rate until the head reached the maximum of 1m when the bed should be taken up for cleaning.

On no account the filter bed be allowed to get reduced by disturbing the top of the sand as this will impair the bacterial efficiency of the filter.

9.3.11 CHLORINATORS

The chlorine demand of filtered water is to be satisfied and a free chlorine residual maintained to make it completely safe. Hence the operator should be careful in administering, calculated doses accurately.

Bubbling the chlorine gas through the filtered water stored in the clear water reservoir by dipping rubber rubes connected to chlorine cylinder must be avoided. Chlorine application should be done through a chlorinator only. The chlorinator should be maintained properly. If the unit is out of order, the same should be repaired quickly and recommissioned.

A complete understanding of the principles of operation of chlorine gas feeders and familiarity with tests for pinpointing leakages are essential. Low capacity units require

frequent cleaning of the Rota meter and rate setter. Large capacity chlorinators must have vaporizers. The gas piping and feeders should be completely dismantled every one or two years to clean out accumulated impurities.

9.3.12 CLEAR WATER SUMP & RESERVOIR

Roofing should be periodically checked to ensure that no leakages are there so that pollution can be prevented. Ventilator outlets should be regularly checked and cleaned to guard against mosquito breeding and bird droppings. Cleaning of the sump and reservoir should be done regularly. Level recorder should be kept in working order at all times.

The total capacity of clear water reservoirs should be adequate for storage of treated water, especially during low supply periods at night when reservoirs become full. Instances are reported, where water from the filters have backed up into the inspecting galleries, thus reducing the rate of filtration. The remedy lies in having additional clear water reservoir in the plant, or arrangement for the final water to be automatically pumped to the balancing reservoirs in the town.

9.3.13 TREATED WATER

The quality of the water before distribution may be controlled by adjusting the calcium carbonate balance in the water to safeguard against corrosion or excessive scale formation in pipes. The periodical analysis of the water can also indicate if there is any biological growth in the main and if any further chlorination is needed to check it. The samples of water collected from several points should be routinely examined for residual chlorine and other chemical and bacteriological parameters.

9.3.14 PROBLEMS RELATED TO THE QUALITY & FLOW PATTERN

When flow gets reduced, it may not be desirable to cut out certain units but it is preferable to operate all the units with reduced flow conditions. In any case, the flow-through condition in the several units should be periodically studied using appropriate traces. This will help to locate if there is any short-circuiting so that corrective measures can be adopted.

The flow conditions in open channels should be examined periodically to avoid obstructions and heading up which will affect the unit process especially the efficiency of the clarification units.

9.4 AERATORS

Aerators are required to be maintained in a clean condition so that maximum water surface and agitation are provided.

Slime and algae growth on the surface would require cleaning and periodic treatment with copper sulphate with or without lime to kill growth. The porous plates or rubes used with diffusion aerators may become partly clogged either from dust in the compressed air or from the collection of sediment on the outside surfaces. When aerators are shutdown, appropriate cleaning with detergents or acid and brush should be attempted. Clogging of diffuser plates could be minimized by (i) maintaining air filters in effective operation, (ii) not over-lubricating air compressors and blowers, (iii) maintaining air pressure on diffusers, when compressors are shut down.

9.5 MASTER BALANCING RESERVOIRS AND ELEVATED RESERVOIRS

Important aspects to be considered during maintenance are:

(i). Measurement of inflows & outflows: Whenever measuring devices are provided, it should be seen that discharge at inlets and outlets fairly tally. It should be seen that water level indicators and recorders are in proper working order.

(ii). Structural Leakages: All structural damages and leakages should be promptly repaired.

(iii). Preventing External Pollution: The manhole opening, ventilating shafts and overflow pipes should be properly closed and protected with wire gauge from.

external pollution

(iv). General cleanliness in and around the reservoirs should be maintained and observed. A garden around the reservoir structure may be provided.

(v). A programme for periodical cleaning of the reservoirs at least once in a year should be undertaken. During such cleaning process there should be facility to by-pass the supply to distribution system.

(vi). Appropriate safety measures to prevent climbing of unauthorised persons should be provided. All the railings provided shall be maintained in a safe and firm condition.

9.6 DISTRIBUTION SYSTEM

Important aspects of operation and maintenance of distribution system are detection and prevention of wastage due to leakage. The object is to control the waste within reasonable limits. Further in case of intermittent supply, possibility of pollution of empty pipelines cannot be ruled out. Special inspection of pipelines through marshy or high water table areas, crossings across waste channels, pipes, etc., and in the vicinity of sewers should be carried out at regular intervals. Such areas should be identified on plans and bacteriological tests of tap water in such areas need to be done more frequently and results compared.

A regular programme of leak detection should be undertaken for the entire distribution system such that each section of the system comes up for leak detection at least once in three years. Leaks and damages detected should be promptly repaired. The causes of wastage through leakages such as (i) high pressures in distribution, (ii) corrosive soils, (iii) corrosive water, (iv) inferior quality of pipes and fittings, (v) age of pipes, (vi) gland packing of valves etc. should also be ascertained. The repair work should tackle those causes as well.

In a distribution system complaints are received frequently from consumers about

(a) Non-availability of required quantity of water

(b) Low pressure at the supply point

*(c) Leakages * wastages through valves & pipelines*

(d) Unauthorised connections.

One of the major causes of wastage is unauthorized connections. Procedures for granting connections need to be streamlined. The officer in charge of operation & maintenance of

distribution system should have powers to inspect any household for water supply to know as from where that household is taking water.

The entire distribution system could be divided into sub-zones served preferably from one elevated service reservoir. The maintenance and operation of each zone of distribution system should be entrusted to at least a junior engineer who should be made the authorized official of the controlling authority to receive and deal with the complaints. Appropriate registers should be maintained by him to record the complaints and to note in it the follow-up action till the complaint is redressed. If the complaint is such that is cannot be dealt with at his level, he should at once refer the matter to higher authorities under intimation to the complainant. Frequent vigilance checks in the areas having maximum complaints should be made a part of the duty of the supervisory staff.

It is preferable to have meters provided by the water works controlling agency after charging appropriate monthly rentals to the consumer. This enables effective control over defective meters. Meter repair workshops should be established to attend to repairs of meters promptly. Surface boxes and chamber covers of valves should be frequently inspected and kept in proper condition. Billing for an out of order meter for more than three times consecutively, should be avoided. All attempts should be made to repair/replace out of order meters once these are detected.

Sufficient stock of meters and spares should be available at hand to keep almost every meter in the field in working order.

Comprehensive water rules should be framed to make the maintenance operation most effective.

The consumers should be made aware of difficulties and shortcomings in the maintenance and operation of water supply system. Adequate publicity and public relations are required to be developed for this purpose.

9.7 CONTROL OF QUALITY OF WATER

For a waterworks industry, ensuring an appropriate quality of water to the consumer is its primary responsibility. Quality control is, therefore, required at every step in the water supply process. The physical, chemical and bacteriological tests of water samples need to be carried out at as frequent intervals as required. Reference may be made to Chapter 15

of water supply manual of CPHEEO for more details. The results of these tests should be studied and remedial measures taken promptly as and when required.

These tests are usually needed at:

(i). Source-to determine the raw water quality;

(ii). Treatment Plants-to determine whether the treatment is in conformity with raw-water quality; and

(iii). Distribution system-to determine whether adequate residual chlorine is present in the water supply to consumers.

9.8 TASTE & ODOUR CONTROL

The following measures are applicable in taste and odour control:

(a) Routine examination of samples of raw, settled and filtered water and samples from distribution system for taste & odour;

(b) Periodic Treatment with copper sulphate and by chlorine;

(c) Routine maintenance by flushing distribution system, especially at hydrants served by dead-end mains; and

(d) Maintenance of records of consumers' complaints and corrective action taken so that it can serve as guide for future.

9.9 STAFF PATTERN

Recommended staffing Pattern for Operations & Maintenance of Waterworks for various capacities is given in Appendices 1.1 to 1.7.

9.10

1. O & M in price bid.

Supplying labour, chemical for supply of potable water as per relevant IS code and O & M manual supplied with this document. The contractor will get minimum Rs. 25,000.00 per month. If the billing amount is less than Rs. 25,000.00 per month for which contractor is not faulty. If the billing amount is more than Rs. 25,000.00 per month, the agency will get only billed amount.
Agency will have to maintain log book of quantity of water supplied which will be periodically checked by JE/AE/EE and will be cross verified by log book of JSEB power station.

2. O & M in price bid.

In addition to specification of item no. 1, the rate will also including supplying and maintaining Civil works, Pumping, Electrical & Mechanical equipments & maintenance cost of pipe line. The contractor will have to snowcem wash all the Civil Structures and paint the pump, pipes e tc inside pump house before handing over the plant.

APPENDIX- 1.1

RECOMMENDED MINIMUM OPERATION AND MAINTENANCE STAFF PATTERN SURFACE SOURCE: TYPICAL STAFF PATTERN (UPTO 5 MLD SYSTEM) WITH CONVENTIONAL TREATMENTS

System component as per flow line		**1 Pump House**	**2 Raw water rising main**	**3 Treatment works and clear water pump**	**4 Clear water rising main**	**5 Service reservoir**	**6 Gravity main**	**7 Distribution system**
Sl. No.	Category of staff							
1	Superintendent Manager (A.E.E.)	-	-	-	-	-	-	-
2	Supervisor/Asstt. Manager (A.E.)	-	-	1	-	-	-	-
3	Assistant Supervisor/Junior Manager.	-	-	-	-	-	-	-
4	Operators	4	-	3	-	-	-	-
5	Helpers/Fitters	2	1* (For every 8 Km.)	2	1* (For every 8 Km)	-	-	Fitter-1 Helper-2 (For every 10-15 Km)
6	Electrician/Mechanic	-	-	2	-	-	-	-
7	Watchman	1	-	3	-	1	1	-

Note:-

1. The above staffing pattern does not include personnel for billing, collection and accounting for water charges.
2. Above staffing pattern includes the operating staff required for one off-day in a week for staff. Suitable adjustments may have to be made between personnel in pump house and Treatment works.
3. *In case the total length of the pipe line has been less than 8 Km. under 2 and 4 one Helper/Fitter would be adequate.

APPENDIX- 1.2

RECOMMENDED MINIMUM OPERATION AND MAINTENANCE STAFF PATTERN SURFACE SOURCE-: TYPICAL STAFF PATTERN (FOR 5 TO 25 MLD SYSTEM) WITH CONVENTIONAL TREATMENTS

System component as per flow line		1 Pump House	2 Raw water rising main	3 Treatment works and clear water pump	4 Clear water rising main	5 Service reservoir	6 Gravity main	7 Distribution system
Sl. No.	Category of staff							
1	Superintendent Manager (A.E.E.)	-	-	-	-	-	-	-
2	Supervisor/Asstt. Manager (A.E.)	-	-	1	-	-	-	-
3	Assistant Supervisor/Junior Manager.	-	-	-	-	-	-	-
4	Operators	3	-	4	-	-	-	-
5	Helpers/Fitters	4	1* (For every 8 Km.)	3-1	1* (For every 8 Km)	-	-	Fitter-1 Helper-2 (For every 10-15 Km)
6	Electrician/Mechanic	-	-	2	-	-	-	-
7	Watchman	1	-	3	-	1	1	-

Note:-

1. The above staffing pattern does not include personnel for billing, collection and accounting for water charges.
2. Above staffing pattern includes the operating staff required for one off-day in a week for staff. Suitable adjustments may have to be made between personnel in pump house and Treatment works.
3. *In case the total length of the pipe line has been less than 8 Km. under 2 and 4 one Helper/Fitter would be adequate.

APPENDIX- 1.3

RECOMMENDED MINIMUM OPERATION AND MAINTENANCE STAFF PATTERN SURFACE SOURCE-: TYPICAL STAFF PATTERN (FOR 25 to 50 MLD SYSTEM) WITH CONVENTIONAL TREATMENTS

System component as per flow line		**1 Pump House**	**2 Raw water rising main**	**3 Treatment works and clear water pump**	**4 Clear water rising main**	**5 Service reservoir**	**6 Gravity main**	**7 Distribution system**
Sl. No.	Category of staff							
1	Superintendent Manager (A.E.E.)	-	-	1	-	-	-	-
2	Supervisor/Asstt. Manager (A.E.)	-	-	-	-	-	-	-
3	Assistant Supervisor/Junior Manager.	-	-	1	-	-	-	-
4	Operators	7	-	7	-	-	-	-
5	Helpers/Fitters	3	1* (For every 8 Km.)	3-1 (Lab)	1* (For every 8 Km)	-	-	Fitter-1 Helper-2 (For every 10-15 Km)
6	Electrician/Mechanic	-	-	3 Electrician-1 Mechanic-2	-	-	-	-
7	Watchman	1	-	3	-	1	1	-

Note:-

1. The above staffing pattern does not include personnel for billing, collection and accounting for water charges.
2. Above staffing pattern includes the operating staff required for one off-day in a week for staff. Suitable adjustments may have to be made between personnel in pump house and Treatment works.
3. The personnel for Sl. 1 & 2 should preferably be one from the Civil Engg. and other from the electrical & mechanical Engg. disciplines.
4. *In case the total length of the pipe line has been less than 8 Km. under 2 and 4 one Helper/Fitter would be adequate.

APPENDIX- 1.4

RECOMMENDED MINIMUM OPERATION AND MAINTENANCE STAFF PATTERN SURFACE SOURCE-: TYPICAL STAFF PATTERN (FOR 50 to 75 MLD SYSTEM) WITH CONVENTIONAL TREATMENTS

System component as per flow line		**1 Pump House**	**2 Raw water rising main**	**3 Treatment works and clear water pump**	**4 Clear water rising main**	**5 Service reservoir**	**6 Gravity main**	**7 Distribution system**
Sl. No.	Category of staff							
1	Superintendent Manager (A.E.E.)	-	-	1	-	-	-	-
2	Supervisor/Asstt. Manager (A.E.)	-	-	1	-	-	-	-
3	Assistant Supervisor/Junior Manager.	-	-	1	-	-	-	-
4	Operators	7	-	7	-	-	-	-
5	Helpers/Fitters	6	1* (For every 8 Km.)	6+2 (Lab)	1* (For every 8 Km)	-	-	Fitter-1 Helper-2 (For every 10-15 Km)
6	Electrician/Mechanic	-	-	3 Electrician-1 Mechanic-2	-	-	-	-
7	Watchman	1	-	3	-	1	1	-

Note:-

1. The above staffing pattern does not include personnel for billing, collection and accounting for water charges.
2. Above staffing pattern includes the operating staff required for one off-day in a week for staff. Suitable adjustments may have to be made between personnel in pump house and Treatment works.
3. From among three categories of personnel indicated at sl. no.-1,2, & 3 at least one should be from the electrical & Mechanical Engg. disciplines.
4. *In case the total length of the pipe line has been less than 8 Km. under 2 and 4 one Helper/Fitter would be adequate.

APPENDIX- 1.5

RECOMMENDED MINIMUM OPERATION AND MAINTENANCE STAFF PATTERN ABOVE 75 MLD UPTO 150 MLD

System component as per flow line		1 Intake works	2 Raw water pump house	3 Raw water rising main or gravity main	4 Treatment works and clear water pump house	5 Clear water rising main	6 Clear water reservoir	7 Gravity main	8 Distribution system
Sl. No.	Category of Staff								
1	Superintendent Manager/ Dy. Exe.engr.	-	-	-	1	-	-	-	-
2	Supervisor/Asstt. Manager (A.E.E.)	1	-	1	4	1	1	1	-
3	Assistant Supervisor/Junior Manager	-	-	-	4	-	-	-	-
4	Operators	-	4	-	12+4	-	-	-	-
5	Helpers/Fitters	-	4	2	16 (For every 6 Km)	2 (For every 6 kms)	4	2 (For every 6 kms)	Fitter-1 Helper- 2 (For every 10-16 Km)
6	Electrician	-	1	-	4	-	-	-	-
7	Machanic	-	1	-	1	-	-	-	-
8	Electrical Helper	-	4	-	4	-	1	-	-
9	Watchman	-	4	-	4	-	4	-	-

Note:-

1. The above staffing pattern does not include personnel for billing, collection and accounting for water charges.
2. Above staffing pattern includes the operating staff required for one off-day in a week for staff. Suitable adjustments may have to be made between personnel in pump house and Treatment works.
3. From among three categories of personnel indicated at sl. no.-1,2, & 3 at least one should be fro the electrical & Mechanical Engg. disciplines.
4. In case the total length of the pipe line has been less than 6 Km. under 5 one Helper/Fitter would be adequate.
5. Separate staff may be provided for sub-stations (on the pattern of respective electricity Boards) if there are owned and maintained by the waterworks authority.

APPENDIX- 1.6

RECOMMENDED MINIMUM STAFFING PATTERN FOR OPERATION AND MAINTENANCE SOURCE: BATTERY OF BOREWELLS/TUBEWELLS, OPENWELLS (EACH WELL YIELDS 5000 GPH MAXIMUM)

System component as per flow line		1		2	3	4	5	6
		Water works		Pump House	Rising main	Service reservoir	Gravity main	Distribution system
		Less than 10 wells	10 wells & above					
Sl. No.	Category of staff							
1	Supervisor	-	1	-	-	-	-	-
2	Asst. supervisor	1	1 for every additiona 10 wells	-	-	-	-	-
3	Operators	-	-	1 (for every 5 wells/shift)	-	-	-	-
4	Helpers fitters	-	-	1 (For every 5 wells/shift)	1* (For every 8 km)	-	1* (For every 8 Km)	3 nos. Fitter- Helper- (For every 10-16 Km)
5	Electrician/Mechanic	-	-	1	-	-	-	-
6	Chowkidar/ Wathman	-	-	3	-	1	-	-
7	Chemist	1	1	-	-	-	-	-
8	Lab. Assistant	1	1	-	-	-	-	-

1. The above staffing pattern does not include personnel for billing, collection and accounting for water charges.
2. Suitable additional operating staff to be included for one off-day/week for staff.
3. *In case the total length of the pipe line is less than 8 km Under 3 and 5 one helper/Fitter would be adequate.

APPENDIX- 1.7

RECOMMENDED MINIMUM STAFFING PATTERN FOR OPERATION AND MAINTENANCE SOURCE: LARGE DIA, HIGH YIELDING TUBEWELL

System component as per flow line		1		2	3	4	5	6
		Water works		Pump House	Rising main	Service reservoir	Gravity main	Distribution system
Sl. No.	Category of staff	Less than 5 wells	5wells & above					
1	Supervisor	-	1	-	-	-	-	-
2	Asst. supervisor	1	1 for every additiona 5 wells	-	-	-	-	-
3	Operators	-	-	1 (for every 5 wells/shift)	-	-	-	-
4	Helpers fitters	-	-	1 (For every 5 wells/shift)	1* (For every 8 km)	-	1* (For every 8 Km)	3 nos. Fitter- Helper- (For every 10-16 Km)
5	Electrician/ Mechanic	-	1 (for every 5 wells)	-	-	-	-	-
6	Chowkidar/ Wathman	-	-	1 (for each well)	-	1 (For each well)	-	-
7	Chemist	1	1	-	-	-	-	-
8	Lab. Assistant	1	1	-	-	-	-	-

1. The above staffing pattern does not include personnel for billing, collection and accounting for water charges.
2. Suitable additional operating staff to be included for one off-day/week for staff.
3. *In case the total length of the pipe line is less than 8 km Under 3 and 5 one helper/Fitter would be adequate.

APPENDIX- 1.8

SCHEDULE OF PREVENTIVE MAINTENANCE

CLARIFLOCULATORS & THEIR DRIVE

Sl. No.	Name of section or part to be attended	Maintenance to be carried out	Frequency/time interval at which inspection & maintenance to be done	Remarks
1	Trolley wheels	Lubrication (Greasing)	One Month	
2	Reduction Gear Box	Checking & toping of oil level	Three Months	
3	Tum Table mechanism	Checking & toping the oil level	Three Months	
4	Vertical slip ring motor	Dust blowing checking of carbon brushes bearing etc.	Four Months	
5	Rail/Track	Adjustment of gap between two rails & its aligning etc.	Four Months	
6	Reduction Gear Box	Checking of helical or spurgears condition	Six Months	
7	Rubber type wheels Iron wheels	Checking of wear & tear alignment & its positioning	Six Months	More frequently in the old installations.
8	M/s. Scrapers	Tightening of nuts & bolts, replacement of Broken parts	Year	
9	Turn Table mechanism	Checking of its sprockets chains, steel balls, gear boxes etc.	Two Year	

Engineer in charge may ask for immediate action by the agency under extra ordinary situation which shall be compiled by the agency immediately without any extra payment.

APPENDIX- 2.1

SUGGESTED STAFFING PATTERN FOR SUPERVISORY ENGINEERING DIVISION (WORKLOAD RS. 200 LAKHS ANNUALLY 1988) AND SUB DIVISION (WORK LOAD RS. 50 LAKHS ANNUALLY 1988) FOR O & M. OF WATER WORKS

Sl. No.	Category of Staff	Division Office	Sub-division Office
A)	**Engineering**		
1	Ex. Engineer	1	-
2	Dy. Engineer (Civil)	-	1
3	Dy. Engineer (Elec. Mech)	1*	-
4	Junior Engineer (Civil)		
	a) Diploma Holders	2	3
	b) Degree Holders	2	2
5	Junior Engineer (Elec. Mech.)	2*	1*
6	Draughtsman	1	-
7	Tracer	2	1
B)	**Correspondence & Estt. Section**		
8	Head Cleark	1	-
9	Senior Cleark	4	1
10	Junior Clerk/Typist	4	2
C)	**Account Section**		
11	Senior Accountant	1	-
12	Junior Accountant	4	1
13	Store-Keeper	1	-
14	Assistant Store-Keeper	-	1
D)	**Class IV**		
15	Peons	6	3
16	Chowkidars	As require	As required
		32	**16**

*Preferably with degree in Elec. & Mech. Engineering

C Excluding posts of chowkidars

APPENDIX- 2.2

REQUIREMENT OF STAFF FOR – O & M

1	Operation & Maintenance	Recommended staffing pattern for operation & maintenance of water works for various capacities is given in appendix 13.1 to 13.7 in the chapter on operation & maintance of water works.
2	Billing & collecting water charges	
	a) Meter Reader b) Bill Clerk	One for every 500 connections to be read monthly or a minimum of one if less than bill 500 connections (includes leave reserve/shift duty also)
	c) Water rate collectors	One for every 1500 monthly billed connections
	d) Water rate superintendent	One for every 6000 billed connections montly.
	e) Meter repairer	One for every 80 meters per month to be repaired.
	f) Assistant meter repairer	-do-
3	Laboratory personnel	Recommended laboratory personnel is suggested in chapter 15.

APPENDIX- 15.1

MINIMUM STAFF RECOMMENDED FOR WATER WORKS

LABORATORIES

		Greater than 7.5 mld	Upto 7.5 mld
(i)	Water Analyst (Chemist)	1	-
(ii)	Water Analyst (Bacteriologist	1	-
(iii)	Water analyst	-	1
(iv)	Laboratory Technician	3	1
(v)	Typist-cum-clerk	1	-
(vi)	Sample takers	3	1
(vii)	Laboratory Cleaners	3	2

APPENDIX – 3.2

PARTICULARS TO BE SUPPLIED WITH THE SAMPLES

1. Name and address of person requesting the examination.
2. Date and time of collection and dispatch.
3. Purpose of examination.
4. Source of water and its location (well, tubewell, stream, river etc.)
5. Exact place and depth below surface from which sample was taken.
6. Weather at the time of collection and particulars of recent rainfall, if any.
7. Does the water become affected in taste or odour after rainfall or under any particular circumstances?
8. Are there any complaints from the consumer? If so, the nature of the complaint.
9. Character of surroundings, and proximity to drains, cess pools, cattlesheds, manure heaps, grave yard, bathing ghats and other sources of pollution.
10. Methods of purification and disinfection if any, details, dose of chemicals and points of applications.
11. If From a dug well or a bore well.
    (a) Whether an old source or newly constructed.
    (b) Whether openor covered: nature and materials of cover.
    (c) Nature of steining or casing and depth to which constructed and whether it is in good condition
    (d) Height and condition of parapet and apron.
    (e) Method of pumping or other means of rising water.
    (f) Depth of well and of water surface from ground leve.
    (g) Whether the water is clear as it flows out of tubewell and remains clear if exposed to air (4-6 hours) or becomes discoloured and turbind.
12. If from a river or stream.
    (a) Natures of flow and weather floods are common or rare.
    (b) Whether level of water is above or below normal.
    (c) Is there any bathing ghat, boat jetty, burial ground or sewer outfall If upstream, give distance from sampling point.

13. If from lakes, impounded reservoirs and tanks.

    (a) How supplied (Channel, stream, rain).

    (b) Nature of catchment, whether conserved or not.

    (c) Nature of extent of weed growth.

14. Size and number of service reservoirs.

    (a) Whether open or covered.

    (b) How often cleaned and method of cleaning.

    (c) Date of last cleaning.

15. Number of hydrants and sewers on the distribution system.

16. Hours of pumping and supply.

17. Pupulation served.

18. Any other particulars.

Station

Signature and name in block letters of the person

Collecting and forwarding the samples.

Date.

APPENDIX- 3.3

SPECIMEN FORM FOR SHORT PHYSICAL AND CHEMICAL EXAMINATION

Name and Address

If the Laboratory:

Name and Address Sender's No. Date of

If Sender Collection……

Date and time of

receipt at laboratory……

Laboratory Ref. No. Date and time of

commencing of examination

---

1. Raw Water
2. Coagulated water
3. Filtered water
4. Water after specific treatment
5. Distribution system.

Time of collection of sample 1 2 3 4 5

	Physical	**Expressed as**
1	Temperature	^0C
2	Turbidity	JTU/NTU
3	Colour	Units of Pt-co-Scale
4	Taste & odour	Qualitative
	Chemical	
5	PH	
6	Conductivity	Micromhos/cm
7	Free CO_2	(mg/1)CO_2
8	Alkalinity	(mg/1)$CaCO_2$
	a) Phenolphthalein	
	b) Total	

9	Chlorides	(mg/1) Cl
10	Nitrites	(Qualitative)
11	Dissolved Oxygen	(mg/1) O_2
12	Hardness	(mg/1)$CaCO_3$
	Carbonate	
	Non-Carbonate	
	Total	
13	Iron	(mg/1)Fe
14	Fluorides	(mg/1) F
15	Residual Chlorine	(mg/1) Cl_2
16	Alumina in Alum	(%) Al_2O_3
17	Available chlorine In bleaching powder	(%) Cl_2
18	Coagulant Dose-Jar Test	(mg/1)
19	Chlorine Demand	(mg/1) Cl_2

Remarks:

Date: Officer-in-charge

APPENDIX- 3.4

SPECIMEN FORM FOR COMPLETE PHYSICAL, CHEMICAL AND BIOLOGICAL EXAMINATION

Name and Address

If the Laboratory:

Name and Address

If Sender

Sender's No.

Date of Collection……

Date and time of receipt at laboratory……

Laboratory Ref. No.

Date and time of commencing of examination

---

1. Raw Water
2. Coagulated water
3. Filtered water
4. Water after specific treatment
5. Distribution system.

Time of collection of sample			1	2	3	4	5
	Physical	**Expressed as**					
1	Temperature	^0C					
2	Turbidity	JTU/NTU					
3	Colour	Units of Pt-co-Scale					
4	Taste & odour	Qualitative					
	Chemical						
5	PH						
6	Conductivity	Micromhos/cm					
7	Free CO_2	(mg/1)CO_2					

8	Alkalinity	(mg/1)$CaCO_3$
	a) Phenolphthalein	
	b) Total	
9	Chlorides	(mg/1) Cl
10	Amonia	(mg/I)/N
	a) Free and Saline	
	b) Albuminoid	
11	Nitrites	(mg/I) N
12	Nitrates	(mg/1) N
13	Dissolved oxygen	(mg/1) O_2
14	Oxygen Absorbed at 27^0 C	(mg/1) O_2
	a) 3 minutes	
	b) 4 hours	
15	C.O.D.	(mg/1) O_2
16	B.O.D.	(mg/1) O_2
17	Hardness	(mg/1) Ca CO_3
	a) Carbonate	
	b) Non-Carbonate	
	c) Total	
18	Iron	(mg/1) Fe
19	Manganese	(mg/1)Mn
20	Fluorides	(mg/1) F
21	Calcium	(mg/1) Ca
22	Mangnesium	(mg/1)Mg
23	Residual Chloride	(mg/1) Cl_2
24	Sulphates	(mg/1) SO_4

25	Total Solids	
	a) Dissolved	
	b) Suspended	
c)	Volatile	
26	Alumina in Alum	(%) $Al_2 O_3$
27	Available chlorine in bleaching powder	(%) Cl_2
28	Coagulant Dose Jar test	(mg/1)
29	Langelier Index	(mg/1)
30	Chlorine demand	(mg/1) Cl_2
31	Total silica	(mg/1) SiO_2
32	Phenolic Compounds	(mg/1) Phenol
33	Synthetic detergents	(mg/1) MBAS
34	Sulphide	(mg/1)S
35	Arsenic	(mg/1) As
36	Cadmium	(mg/1) Cd
37	Hexavalent Chromium	(mg/1) Cr
38	Copper	(mg/1) Cu
39	Cyanide	(mg/1) CN
40	Lead	(mg/1) Pb
41	Selenium	(mg/1) Se
42	Zinc	(mg/1) Zn
43	Mercury	(mg/1) Hg
44	Oil and grease	(mg/1)

45	Polynuclear Aromatic Hydrocarbon	(mg/1) PAH
46	Radio activity	(pci/1)
	a) Gross alpha Activity	
	b) Gross Beta Activity	
	BIOLOGICAL	
47	Total count of planktone	(Total count of SAU Organisms/ml)

Remarks:

Date: Officer-in-charge

APPENDIX- 3.5

SPECIMEN FORM FOR SHORT PHYSICAL AND CHEMICAL EXAMINATION

Name and Address

If the Laboratory:

Name and Address Sender's No. Date of

If Sender Collection……

Date and time of

receipt at laboratory……

Laboratory Ref. No. Date and time of

commencing of examination

---

1. Raw Water
2. Filtered water
3. Chlorinated water
4. Distribution system.

Time of collection of sample			1	2	3	4
	Bacteriological	**Expressed as**				
1	Plate count	Colonies/ml				
	a) 20^0 C					
	b) 35^0 C					
2	Coliform Organisms	MPN/100 ml				

Remarks:

Date: Officer-in-charge

APPENDIX- 3.6

SPECIMEN FORM FOR COMPLETE BACTERIOLOGICAL EXAMINATION OF WATER

Name and Address

If the Laboratory:

Name and Address Sender's No. Date of

If Sender Collection……

Date and time of

receipt at laboratory……

Laboratory Ref. No. Date and time of

commencing of examination

---

1. Raw Water
2. Filtered water
3. Chlorinated water
4. Distribution system.

Time of collection of sample 1 2 3 4

	Bacteriological	**Expressed as**
1	Plate count	Colonies/ml
	a) 20^0 C	
	b) 35^0 C	
2	Coliform Organisms	MPN/100 ml
3	E. Coli	MPN/100 ml
4	Completed Test	
5	Differential Test	(KMVic)

Remarks:

Date: Officer-in-charge

APPENDIX- 3.7

MINIMUM EQUIPMENTS NEEDED FOR PHYSICAL AND CHEMICAL TESTS

	Category of Water works Laboratory		
	I	II	III
Comparator test set for residual chlorine or chloroscope	✓	✓	✓
pH kit with different discs for pH measurement	✓	✓	✓
Mains operated pH meter completed with one calomel electrode and glass electrode	✓	✓	X
Turbidimeter	✓	✓	✓
Dionic water tester or	✓	✓	✓
Conductivity meter	✓	✓	✓
Photoelectric calorimeter/Spectrophotometer	✓	✓	✓
Water bath with 6 to 8 concentric holes and disc, electrically heated	✓	X	X
Soxhelt extraction unit	✓	X	X
Kjeldahl digestion unit	✓	X	X
Hot plates	✓	✓	✓
Distilled water plant	✓	✓	✓
Demineraliser	✓	X	X
Refrigerator	✓	✓	✓
B.O.D. incubator	✓	X	X
Muffle furnace	✓	✓	✓
Electric oven	✓	✓	✓
½ H.P. motor	✓	X	X
Magnetic stirrer	✓	✓	✓
Analytical balance with weight box	✓	✓	✓
Jar-test apparatus	✓	✓	✓
Centrifuge	✓	✓	X
Gas cylinder if gas supply is not available	✓	✓	✓
Fume cupboard	✓	✓	✓

In addition, common glassware and accessories like beaker, conical flask, burette, pipette, volumetric flask etc. will be required.

APPENDIX- 3.8

EQUIPMENT NEEDED FOR BACTERIOLOGICAL EXAMINATION

1. Hot Air Oven Upto 200^0 C
2. Autoclave Or Pressure Cooker
3. Incubator 37^0 C or 44^0 C (Water/Air-Jacketed)
4. pH Meter
5. Pipette Box (Stainless Steel)
6. Wooden Racks/Aluminium Racks
7. Wire Baskets
8. Cotton/Aluminium Foils
9. Brown Paper
10. Twine
11. Burners (Bunsen) with pilot Lamp
12. Suction Flask (1 Litre Cap)
13. Suction Pump
14. Sampling Bottle (Reagent Bottles of 250 ml. Capacity)

BACTERIOLOGICAL MEDIA

1. M. Endo Broth (Dehydrated)
2. Lactose or Lauryl Traptose Broth
3. Mac conkey broth
4. Brilliant Green Bile Lactose Broth
5. Total Plate Count Agar
6. Peptone/Triyptone water

APPENDIX- 3.9

TEST TO BE DONE BY WATER WORKS LABORATORIES

Sl No.	Name of Test	Category of Water works Laboratory		
		I	II	III
1	Turbidity	✓	✓	✓
2	Colour	✓	✓	✓
3	Odour	✓	✓	✓
4	Conductivity	✓	✓	✓
5	Alkalinity	✓	✓	✓
6	Residual Chlorine	✓	✓	✓
7	pH	✓	✓	✓
8	Iron	✓	✓	✓
9	Chloride	✓	✓	✓
10	Hardness	✓	✓	X
11	Total Solids	✓	X	X
12	*Volatile Solids	✓	X	X
13	*Suspended Solids	✓	X	X
14	*Free and saline ammonia	✓	X	X
15	Albuminiod nitrogen	✓	X	X
16	Nitrites (qualitative)	✓	✓	✓
17	Nitrates	✓	X	X
18	*Fluorides	✓	✓	✓
19	Metals other than iron	✓	✓	✓
20	Jar test for determining alum dose	✓	✓	X
21	Chlorine demand	✓	✓	✓
22	Complete mineratl analysis	✓	X	X
23	Total count in nutrient agar	✓	X	X
24	Presumptive coliforms	✓	✓	✓
25	Confirmed test, BGB	✓	✓	✓
26	Completed test	✓	X	X
27	Research into media, etc.	✓	X	X
28	Microscopy	✓	X	X

* Where applicable

9.10 TEDERERS SHALL HAVE TO SUBMIT THE FOLLOWING DOCUMENTS ALONGWITH THE TECHNICAL BID:

1. **SUBMISSION ALONGWITH TECHNICAL BID**

A. Drawing and literature / technical specification:

I. P&I diagram of the scheme
II. P&I diagram of the treatment plant
III. Schematic diagram of plant units including basic floor plan of Chemical house-cum- administrative building, filter house – duly signed and stamped.
IV. Schematic diagram of Intake structures
V. Schematic diagram of Gangway.

B. Design philosophy including recycling details

C. Methodology of construction of Intake facilities.

D. Any other relevant document as intend to attach in support of their technical proposal

2. DEVIATION STATEMENT: Though the authority desires NO DEVIATION from the technical specification/ BOQ, deviation for improvement over proposed concept will be duly considered (for detail use separate sheet as below)

Sl No	Ref clause no of BOQ & page no	Deviation	Reason	Reference of relevant BIS/ manual/ similar document, if any.

10.0 BREAK UP SCHEDULE FOR PAYMENT

Item No-1 <u>Construction of Intake Well and Gangway with raw water pump house</u>

- As per measurement

Item No-2 <u>Pumping Machinery and other related works</u>

- Supplying of All accessories and found in good condition (approved by SE. Mech.) 75%
- On completion of erection work 15%
- On successful commissioning and test run to guarantee 10%

Item No-3 <u>Water Treatment Plant and other related work</u>

- On completion of excavation in foundation 10%
- R.C.C. in different component 20%
- Entire Brick, Steel and wood work 10%
- Supplying, fitting & fixing pipe of adequate size valves laying & filter media 20%
- Providing and fixing of mechanical and electrical equipment 15%
- Miscellaneous work like roads for patch Surface/under ground drain, leveling and dressing etc. 10%
- Water tightness test, testing of the whole work 5%
- On successful commissioning of pipe and test run to guarantee complete Job. 10%

Item No-4 <u>Water Tower (Elevated Service reservoir) For each reservoir.</u>

- On completion of excavation and PCC work in foundation 10%
- Completion of RCC work in foundation 15%
- On completion of work up to 1st half of staging height and including casting of room roof slab 10%

- On completion of balance staging bottom dome circular beam head beam and Conical wall 10%
- On completion of vertical side walls 10%
- On completion of top dome 10%
- On supply of C.I. pipe fittings of inlet valve 07%
- On supply and fixing of D.I., D/F pipes specials and sluice valve 03%
- On supply and fixing of MS ladders, railing, lightening, doors, windows and water level indicator 05%
- On completion of brick work, wood and still work in door and window 05%
- Snowcem, painting, white washing, colour washing etc. 01%
- Testing of the full hydraulic structure of elevated water tank 04%
- On successful commissioning and test run to guarantee 10%

Item No-5 (<u>Ground Service reservoir) For each reservoir.</u>

- On completion of excavation and PCC work in foundation 20%
- Completion of RCC work in foundation 29%
- On completion of vertical side walls 10%
- On completion of top dome 10%
- On supply of C.I. pipe fittings of inlet valve 07%
- On supply and fixing of D.I., D/F pipes specials and sluice valve 03%
- On supply and fixing of MS ladders, railing, lightening, doors, windows . 05%
- On completion of steel work in door and window 01%
- Snowcem, painting, white washing, colour washing etc. 01%
- Testing of the full hydraulic structure of GSR 04%
- On successful commissioning and test run to guarantee 10%

Item No-6 <u>Rising mains & Distribution main(Supply)</u>

- Rising mains & Distribution main (Supply of DI pipes) 85%
- Balance 15% after commissioning 15%
- Other items – as per Measurements

Item No.7 Electrical works

- Supplying, fitting and fixing of MCC panels, cable & other accessories
- Including external & internal illumination work as per IE rules 75%
- On successful commissioning & test run to guarantee 25%

The contractor may give his own payment schedule but it will be subject to approval for all items if any modification required.

RELEVANT CODES TO BE FOLLOWED

Following codes are to be followed in connection with design and execution of the work.

(If the code is amended, the amended version of code will be followed)

Sl. No.	IS No.	Description
1	General IS – 1200 (Part 1 to 28)	Measurement of building works, method, materials & detailsof construction.
2	Cement IS – 269:1989	Ordinary, Rapid hardening & low heat portland cement – 33grade
3	IS – 8112:1989	Ordinary, Rapid hardening & low heat portland cement – 43 grade
4	IS – 12269:1987	Ordinary, Rapid hardening & low heat portland cement – 53 grade
5	IS – 1489 (Part 1 & 2): 1991	Portland Pozzloan Cement
6	Sand IS – 1542	Sand for plaster
7	IS:2116 – 1980	Sand for masonry mortars.
8	Aggregates IS: 383 – 1970	Aggregates coarse and fine from natural sources for concrete.
9	Aggregates IS:515 – 1959	Aggregates for use in Mass Concrete Neutral and manufactured.
10	Bricks IS: 1077 – 1992	Common Burnt clay building bricks
11	IS: 2211 – 1991	Code of practice for brick work
12	Soil IS : 1489 – 1970	Classification & identification of soil for General Engineering purpose
13	Concrete IS:456:1978	Code of practice for plain & reinforced concrete (third version) with amendment no 2
14	IS : 455 – 1989	Portland slag cement
15	IS: 2250-1981	Preparation and use of masonry mortar
16	IS: 6452 – 1989	High Alumina cement for structural us
17	IS: 8041 – 1990	Rapid hardening Portland cement
18	IS – 3370	Part I/1965 – Code of Practice for concrete structures for the storage of Liquids-General requirements.
19	IS : 3370	Part II/1965 – do- do- reinforced concrete structures
20	IS – 3370	Part IV/1965 – do- do- Design tables
21	Test IS – 1199:1959	Sampling & Analyzing of concrete
22	IS – 8142: 1976	Tests for setting time of concrete.
23	IS – 516:1959	Tests for strength of concrete
24	IS – 9013: 1978	Tests for compressive strength
25	IS – 4031	Tests for cement
26 a	1786:1985	High yield strength deformed bar (Grade Fe 415)
26 b	IS – 1786 :1985	For Steel reinforcement
26 c	IS –2751: 1966	Welding of reinforcement
27	IS – 2502:1963	Bending and fixing of bars for concrete

28	IS – 9077:1979	Corrosion protection of steel reinforcement in R.C.C. Structure
29	IS – 2062 : 1992	Structural steel
30	IS – 2062	: (Grade A) Low Carbon structural test
31	IS – 800:	1984 Use of structural steel in general building construction
32	IS – 808: 1989	Rolled steel beams, Channels and angles.
33	Is – 1038 : 1983	Steel doors, windows and ventilators.
34	IS – 7452: 1990	Hot rolled steel section for doors, windows and ventilators
35	IS – 4021:1995	Timber door window and ventilator frames.
36	IS – 1003:1991	Timber paneled and glazed door shutters.
37	IS – 2202:1991	Wooden flush door shutters (solid core type)
38	IS – 2571:1970	Laying inside cement concrete flooring
39	IS – 4457:1982	Ceramic unglazed vitrious acid resisting tiles
40	IS – 777: 1988	Glazed EW wall tiles
41	IS – 7198:1974	Damp proofing using bitumen mastic
42	IS – 1230:1979	CI rain water pipes & fittings
43	IS – 780:1984	Sluice valves for water works purposes. (small dia 50 m to 300 mm size)
44	IS – 2906:1984	do – (higher dia 350 mm to 1200 mm size)
45	IS – 3950 : 1979	Surface boxes for sluice valves
46	IS – 13095:1991	Butterfly valves for general purposes
47	Is – 12969:1990	Method of test for quality characteristics of valves.
48	IS – 12992:1993	Spring loaded safety relief valves.
49	Is – 5312:1984	Swing check type reflux valves
50	Is – 5330:1984	Design of anchor block for pen shocks with expansion joints
51	IS – 3042:1965	Single faced sluice gate (200 mm – 1200 mm)
52	Is – 1661: 1972	Cement and cement lime plaster finishes
53	IS – 1237:1980	Flooring tiles of cement concrete.
54	IS – 2114: 1984	Laying in situ terrazzo floor finish.
55	IS – 1443:1972	Cement concrete flooring tiles, laying and finishing of.
56	IS – 1609:1991	Laying damp proof treatment using

		bituminous felt.
57	IS – 1322:1993	Bitumen felt for water proofing and damp proofing.
58	IS – 7193:1994	Glass fibre base coaltar pitch and bitumen felt.
59	IS – 6494:1988	Water proofing of under ground water reservoir and swimming pools
60	IS – 3067 :1988	General design details and preparatory work for damp proofing and water proofing of building
61	IS – 4082:1996	Stacking of storage of constructional materials at site recommendation
62	IS – 3114:1994	Laying of CI pipes.
63	IS – 1536:1989	Centrifugally cast (spun) iron pressure pipe.
64	IS – 1537: 1976	Vertically cast iron pressure pipe.
65	IS – 1538: 1993	CI fittings for pressure pipe.
66	IS – 7181:1986	DF horizontally cast iron pressure pipe. Sl No. IS No. Description
67	IS – 13382:1992	CI special for mechanical end push on flexible joints for pressure pipe.
68	IS – 5382:1985	Rubber sealing rings for water mains.
69	IS – 12820:1989	Dimensional requirements for rubber gasket for mechanical joints & push on joints.
70	IS – 1879: 1987	Malleable CI pipe fittings
71	IS – 782:1978	Caulking lead
72	IS – 11606:	1986 Methods for sampling of CI pipes and fittings
73	IS – 458:1988	Precast concrete pipe
74	IS – 783:1985	Laying of concrete pipes
75	IS – 3597:1985	Method of testing of concrete pipes.
76	IS – 10221:1982	Coating and wrapping of under ground mild steel pipe lines.
77	IS – 2974(Part 4):	1979 Foundation for Rotary type machine of low frequency
78	Is – 2911:1979 (Part 1 section 2)	Design and construction of bored cast in situ concrete piles
79	IS – 2911:1985 (Part 4)	Load test on piles
80	IS – 816:	1991 Use of metal arc welding for general construction in mild steel
81	IS – 1024:1979	Welding in bridge and structures subject to dynamic loading.

82	IS – 822: 1970	Procedure for inspection of welds
83	IS – 814:1991	Electrodes for manual metal arc welding
84	IS – 1052:	1983 Specification for collapsible gate
85	IS – 6248:1979	Specification for metal rolling shutter and rolling grill.
86	IS – 7322:1985	Specials for steel cylinder reinforced concrete pipes.
87	IS – 3950:1979	Surface boxes for sluice valves.
88	IS – 5312 (Pt I):1984	Swing check type reflux (non-return, single door) valves
89	IS – 5312(Pt II):1986	- do – (Multi door pattern)
90	IS – 5822:1994	Laying of Electrically welded steel pipes for water supply.
91	IS – 823	Procedure for manual arc welding of mild steel
92	IS – 4353	Submerged arc welding of mild steel and low alloy steels
93	IS – 73 – 07(Pt I)	Approved tests for welding procedures (fusion welding of steel)
94	IS – 7310(Pt I)	Approved tests for welders working to approved welding procedure (Part I: fusion welding of steel)
95	IS – 2595:1978	Code of practice for radiographic testing
96	IS – 4853:1968	Recommended practice for radiographic examination of fusion welded circumferential joints steel pipes
97	IS – 1182:1967	Recommended practice for radiographic examination of fusion welded butt joints.
98	IS – 2598:1966	Safety code for industrial radiographic practice.
99	IS – 5878 (Pt IV)	Code of practice for construction of tunnels conveying water (Part 4 – Tunnel supports)
100	IS – 1363	Technical supply conditions for threaded fastners
101	IS – 1367 (Pt 3)	Technical supply conditions mechanical properties and test methods for bolts, screws and studs with full loadability.
102	IS – 10028 (Part-II):1981	,latest version Transformer
103	Is – 325:1978	upto latest revision Three phase induction motors
104	IS – 2254:1985	upto latest version Vertical motor
105	IS – 8544:1977	upto latest version Starter
106	IS 3043	Earthing
107	IE Rules – 1956 (upto latest version)	All electrical installation will have to be done as per Indian Electrical rules.
108	Manual on Water Supply and Treatment Revised and Updated Edition Central Public Health and Environmental Engineering Organisation , Ministry of Urban Development, New Delhi	All provisions in the manual are binding in both Design and Execution of the work

SECTION 6

FORM OF BID

FORM OF BID

Description of the Works:

BID to :

Address :

1. We offer to execute the Works described above and remedy any defects therein in conformity with the conditions of Contract, specification, drawings, Bill of Quantities and Addenda for the sum(s)

of_____

_____

(_____)

2. We undertake, if our Bid is accepted, to commence the Works as soon as is reasonably possible after the receipt of the Engineer's notice to commence, and to complete the whole of the Works comprised in the Contract within the time stated in the document.

3. We agree to abide by this Bid for the period of *_____ days from the date fixed for receiving the same, and it shall remain binding upon us and may be accepted at any time before the expiration of that period.

4. Unless and until a formal Agreement is prepared and executed this Bid, together with your written acceptance thereof, shall constitute a binding contract between us.

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

Dated this _____ day of_____ 20.....

Signature _____in the capacity of _____

duly authorized to sign bids for and on behalf of _____

(in block capitals or typed)

Address

Witness

_____

_____

Address

_____

_____

Occupation

_____

SECTION 7

BILL OF QUANTITIES

BOQ is available in financial folder.

(Bidder can download the BOQ & upload after filling the rate)

Preamble

1. The Bill of Quantities shall be read in conjunction with the Instructions to Bidders, Conditions of Contract, Technical Specifications and Drawings.
2. The quantities given in the Bill of Quantities are estimated and provisional, and are given to provide a common basis for bidding. The basis of payment will be the actual quantities of work ordered and carried out, as measured by the Contractor and verified by the Engineer and valued at the rates and prices tendered in the priced Bill of Quantities, where applicable, and otherwise at such rates and prices as the Engineer may fix within the terms of the Contract.
3. The rates and prices tendered in the priced Bill of Quantities shall, except in so far as it is otherwise provided under the Contract, include all constructional plant, labour, supervision, materials, erection, maintenance, insurance, profit, taxes and duties, together with all general risks, liabilities and obligations set out or implied in the Contract.
4. The rates and prices shall be quoted entirely in Indian Currency.
5. A rate or price shall be entered against each item in the Bill of Quantities, whether quantities are stated or not. The cost of Items against which the Contractor has failed to enter a rate or price shall be deemed to be covered by other rates and prices entered in the Bill of Quantities.
6. The whole cost of complying with the provisions of the Contract shall be included in the items provided in the priced Bill of Quantities, and where no Items are provided the cost shall be deemed to be distributed among the rates and prices entered for the related Items of Work.
7. General directions and descriptions of work and materials are not necessarily repeated or summarized in the Bill of Quantities. References to the relevant sections of the contract documentation shall be made before entering rates or prices against each item in the Bill of Quantities.
8. The method of measurement of completed work for payment shall be in accordance with the specification for Road and Bridge Works published by the Ministry of Surface Transport (edition).
9. Errors will be corrected by the Employer for any arithmetic errors pursuant to Clause 29 of the Instructions to Bidders.
10. Rock is defined as all materials which, in the opinion of the Engineer, require blasting, or the use of metal wedges and sledgehammers, or the use of compressed air drilling for its removal, and which cannot be extracted by ripping with a tractor of at least 150 kw. with a single rear mounted heavy duty ripper.

BILL OF QUANTITIES

Sl No	Description of Item (with brief specification and reference to book of specification)	Quantity	Unit	Rate		Amount
				In Figures	In Words	

Note :

1. Item for which no rate or price has been entered in will not be paid for by the Employer when executed and shall be deemed covered by the other rates and prices in the bill of quantities (Refer: ITB Clause 13.2 and GCC Clause 43.3).
2. Unit rates and prices shall be quoted by the bidder in Indian rupee [ITB Clause 14.1].
3. Where there is a discrepancy between the rate in figures and words, the rates in words will govern. [ITB Clause 27.1(a)].
4. Where there is a discrepancy between the unit rate and the line item total resulting from multiplying the unit rate by quantity, the unit rate quoted shall govern [ITB Clause 27.1(b)].

SECTION 8

SECURITIES AND OTHER FORMS

BID SECURITY (BANK GUARANTEE)

WHEREAS, _____ [name of Bidder] (hereinafter called "the Bidder") has submitted his Bid dated _____ [date] for the construction of

_____ [name of Contract hereinafter called "the Bid"].

KNOW ALL PEOPLE by these presents that We _____

[name of Bank] of _____ [name of country] having our registered office at _____ (hereinafter called "the

Bank") are bound unto _____ [name of Employer's Representative] (hereinafter

called "the Employer's Representative") in the sum of _____ * for which payment

well and truly to be made to the said Employer's Representative the Bank itself, his successors and assigns by these presents.

SEALED with the Common Seal of the said Bank this _____ day of _____ ,20_

THE CONDITIONS of this obligation are:

(1) If after Bid opening the Bidder withdraws his bid during the period of Bid validity specified in the Form of Bid;

OR

(2) If the Bidder having been notified to the acceptance of his bid by the Employer during the period of Bid Validity:

(a) fails or refuses to execute the Form of Agreement in accordance with the Instructions to Bidders, if required; or

(b) fails or refuses to furnish the Performance Security, in accordance with the Instructions to Bidders; or

(c) does not accept the correction of the Bid Price pursuant to Clause 27.

We undertake to pay to the Employer up to the above amount upon receipt of his first written demand, without the Employer having to substantiate his demand, provided that in his demand the Employer will note that the amount claimed by him is due to him owing to the occurrence of one or any of the three conditions, specifying the occurred condition or conditions.

This Guarantee will remain in force up to and including the date _____ ** days after the deadline for submission of Bids as such deadline is stated in the Instructions to Bidders or as it may be extended by the Employer, notice of which extension(s) to the Bank is hereby waived. Any demand in respect of this guarantee should reach the Bank not later than the above date.

DATE _____ SIGNATURE _____

WITNESS _____ .SEAL _____

_____

[Signature, name and address]

* The Bidder should insert the amount of the guarantee in words and figures denominated in Indian Rupees. This figure should be the same as shown in Clause 16.1 of the Instructions to Bidders.

** 45 days after the end of the validity period of the Bid. Date should be inserted by the Employer before the Bidding documents are issued.

PERFORMANCE BANK GUARANTEE

To

_____ [name of Employer's Representative]

_____[address of Employer's Representative]

_____

WHEREAS _____ , _____ [name and address of Contractor] (hereafter called "the Contractor") has undertaken, in pursuance of Contract No. _____ dated_____ to execute _____ [name of Contract and brief description of Works] (hereinafter called "the Contract").

AND WHEREAS it has been stipulated by you in the said Contract that the Contractor shall furnish you with a Bank Guarantee by a recognized bank for the sum specified therein as security for compliance with his obligation in accordance with the Contract;

AND WHEREAS we have agreed to give the Contractor such a Bank Guarantee:

NOW THEREFORE we hereby affirm that we are the Guarantor and responsible to you on behalf of the Contractor, up to a total of_____ [amount of guarantee]*_____(in words), such sum being payable in the types and proportions of currencies in which the Contract Price is payable, and we undertake to pay you, upon your first written demand and without cavil or argument, any sum or sums within the limits of _____[amount of guarantee] as aforesaid without your needing to prove or to show grounds or reasons for your demand for the sum specified therein.

We hereby waive the necessity of your demanding the said debt from the contractor before presenting us with the demand.

We further agree that no change or addition to or other modification of the terms of the Contract or of the Works to be performed there under or of any of the Contract documents which may be made between your and the Contractor shall in any way release us from any liability under this guarantee, and we hereby waive notice of any such change, addition or modification.

This guarantee shall be valid until 28 days from the date of expiry of the Defect Liability Period.

Signature and Seal of **the guarantor** _____

Name of Bank _____

Address _____

Date _____

---

*An amount shall be inserted by the Guarantor, representing the percentage the Contract Price specified in the Contract including additional security for unbalanced Bids, if any and denominated in Indian Rupees.

BANK GUARANTEE FOR ADVANCE PAYMENT

To

_____[name of Employer's Representative]
_____[address of Employer's Representative]
_____[name of Contractor]

Gentlemen:

In accordance with the provisions of the Conditions of Contract, sub-clause 51.1 ("Advance Payment") of the above-mentioned Contract, [name and address of Contractor] (herein after called "the Contractor") shall deposit with [name of Employer's Representative] a bank guarantee to guarantee his proper and faithful performance under the said Clause of the Contract in an amount of_____ [amount of Guarantee]* _____ [in words].

We, the _____[bank of financial institution], as instructed by the Contractor, agree unconditionally and irrevocably to guarantee as primary obligator and not as Surety merely, the payment to _____[name of Employer's Representative] on his first demand without whatsoever right of obligation on our part and without his first claim to the Contractor, in the amount not exceeding_____ [amount of guarantee]* _____[in words].

We further agree that no change or addition to or other modification of the terms of the Contractor or Works to be performed there under or of any of the Contract documents which may be made between_____[name of Employer's Representative] and the Contractor, shall in any way release us from any liability under this guarantee, and we hereby waive notice of any such change, addition or modification.

This guarantee shall remain valid and in full effect from the date of the advance payment under the Contract until _____[name of Employer's Representative] receives full repayment of the same amount from the Contractor.

Yours truly,

Signature and Seal : _____

Name of Bank / Financial Institution : _____

Address; _____

Date:

---

*An amount shall be inserted by the Bank or Financial Institution representing the amount of the Advance Payment, and denominated in Indian Rupees.

Letter of Acceptance

(Letter head paper of the Employer's Representative)

_____ (Date)

To

_____(Name and address of the Contractor)

_____

_____

Dear Sirs,

This is to notify you that your Bid dated _____ for execution of the _____ (name of the contract and identification number, as given in the Instructions to Bidders) for the Contract Price of Rupees _____ (_____) (amount in words and figures), as corrected and modified in accordance with the Instructions to Bidders[1] is hereby accepted by our agency.

You are hereby requested to furnish Performance Security, in the form detailed in Para 34.1 of ITB for an amount equivalent to Rs. _____ within **14** days of the receipt of this letter of acceptance valid up to 28 days from the date of expiry of defects Liability Period i.e. up to _____ and sign the contract, failing which action as stated in Para 34.3 of ITB will be taken.

Yours faithfully,

Authorized Signature
Name and title of Signatory
(Employer's Representative)

1. Delete "corrected and" or "and modified" if only one of these actions applies. Delete as corrected and modified in accordance with the Instructions to Bidders, if corrections or modifications have not been affected.

Issue of Notice to proceed with the work

(Letter head of the Employer's Representative)

_____ (Date)

To

_____ (Name and address of the Contractor)

_____

_____

Dear Sirs,

Pursuant to your furnishing the requisite security as stipulated in ITB Clause 34.1 and signing of the Contract for the construction of _____

_____

_____at

a Bid Price of

Rs._____.

You are hereby instructed to proceed with the execution of the said works in accordance with the contract documents.

Yours faithfully,

(Signature, name and title of Employer's Representative)

Agreement Form

Agreement

This agreement, made the _____ day of _____ between _____ (Name and address of Employer) [Hereinafter called "the Employer] and _____ (Name and address of contractor) hereinafter called "the Contractor" of the other part.

Whereas the Employer is desirous that the Contractor execute (Name and identification number of Contract) (Here in after called "the Works") and the Employer has accepted the Bid by the Contractor for the execution and completion of such Works and the remedying of any defects therein, at a cost of Rs. _____

NOW THIS AGREEMENT WITNESSETH as follows:

1. In this Agreement, words and expression shall have the same meanings as are respectively assigned to them in the conditions of contract hereinafter referred to and they shall be deemed to form and be read and construed as part of this Agreement.

2. In consideration of the payments to be made by the Employer to the Contractor as hereinafter mentioned, the Contractor hereby covenants with the Employer to execute and complete the Works and remedy any defects therein in conformity in all aspects with the provisions of the contract.

3. The Employer hereby covenants to pay the Contractor in consideration of the execution and completion of the Works and the remedying the defects wherein Contract Price
or such other sum as may become payable under the provisions of the Contract at the times and in the manner prescribed by the Contract.

4. The following documents shall be deemed to form and be ready and construed as part of this Agreement viz.

(i) Letter of Acceptance

(ii) Notice to proceed with the works;

(iii) Contractor's Bid

(iv) Condition of Contract: General and Special

(v) Contract Data

(vi) Additional condition

(vii) Drawings

(viii) Bill of Quantities and

(ix) Any other documents listed in the Contract Data as forming part of the Contract.

In witnessed whereof the parties there to have caused this Agreement to be executed the day and year first before written.

The Common Seal of _____was hereunto affixed in the presence of :

Signed, Sealed and Delivered by the said _____

_____

in the presence of:

Binding Signature of Employer's Representative _____

Binding Signature of Contractor _____

UNDERTAKING

I, the undersigned do hereby undertake that our firm M/s _____ _____ agree to abide by this bid for a period _____

days for the date fixed for receiving the same and it shall be binding on us and may be accepted at any time before the expiration of that period.

_____

(Signed by an Authorized Officer of the Firm)

_____

Title of Officer

_____

Name of Firm

_____

DATE

SECTION 9
DRAWINGS

SECTION 10

DOCUMENTS TO BE FURNISHED BY BIDDER

CLARIFICATIONS

The assessment of ‘Assessed Available Bid Capacity will be carried out during evaluation of technical bids. The purpose of the Assessed Available Bid Capacity (AABC) is to ensure that the works being awarded to the contractor do not exceed what he can reasonably be expected to complete, given his earlier performance as well as ongoing commitment. Since in many proposals of the entire State are generally cleared at one go and a contractor can bid for a number of packages, it may happen that he is the lowest bidder for more works then he has the capacity to complete within the stipulated period. Accordingly, it is necessary to ensure that the sum total of works awarded to him does not exceed the AABC. This will be done by tender committee and sequencing it through an objective rule, so that at the time of award of each sequenced package, any work awarded previously in the sequence to the same contractor is deducted from his AABC, in order to work out the net AABC, and then award the package to the contractor only if the net AABC exceeds the bid value. The centralization for purposes of working one net AABC will be done at the level of the tender committee.