MADHYA PRADESH JAL NIGAM

(A GOVERNMENT OF MADHYA PRADESH UNDERTAKING)

TENDER DOCUMENT ON FORM 'F'
FOR
LUMP– SUM CONTRACT
FOR

Engineering, Procurement, Construction, Testing, Commissioning, Trial Run and Operation & Maintenance of Various Components of **Halon Multi-Village Scheme, District Mandla** in Single Package on 'Turn-Key Job Basis' including Trial Run and Operation & Maintenance of the Entire Water Supply Scheme for 10 Years

NIT No. 19/Proc./MPJNM/2022-23, Dated: 10.05.2022
Probable Amount of Contract: Rs. 643.74 Crore
Earnest Money Deposit: Rs. 50.00 Lakh

MANAGING DIRECTOR
MADHYA PRADESH JAL NIGAM
2ND FLOOR, D-WING,
VINDHYACHAL BHAWAN
BHOPAL - 462004

MADHYA PRADESH JAL NIGAM MARYADIT

(A Govt. of Madhya Pradesh Undertaking)
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CIN - U41000MP2012SGC028798

NIT No. 16-40/Proc./MPJNM/2022-23 **Bhopal, Dated 10/05/2022**

SHORT NOTICE

TENDER DOCUMENT FOR LUMP-SUM CONTRACT FOR ENGINEERING, PROCUREMENT, CONSTRUCTION, TESTING, COMMISSIONING, TRIAL RUN AND OPERATION & MAINTENANCE OF VARIOUS COMPONENTS OF MULTI-VILLAGE SCHEMES IN SINGLE PACKAGE ON 'TURN-KEY JOB BASIS' INCLUDING TRIAL RUN AND OPERATION & MAINTENANCE OF THE ENTIRE WATER SUPPLY SCHEME FOR 10 YEARS

S. No.	NIT. No.	Scheme (MVS)	District	Total Villages (including Bulk Supply Villages)	Bulk Supply Villages	PAC (Rs. Cr.)	EMD (Rs. Lakh)	Cost of Tender Document (Rs.)	Time for Completion (including rainy season) (months)
1	16	Gandhisagar 2	Mandsaur & Neemuch	915	147	1,435.07	50.00	50,000	28
2	17	Gandhisagar 1	Mandsaur & Ratlam	820	208	1,166.32	50.00	50,000	28
3	18	Machagora	Chhindwara	711	486	748.50	50.00	50,000	28
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5	20	Basai-2	Datia & Shivpuri	231	67	487.68	50.00	50,000	28
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7	22	Bina Khurai	Sagar & Vidisha	323	88	410.89	50.00	50,000	28
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24	39	Mahuar	Shivpuri	50	8	71.45	35.73	50,000	24
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1. Detailed tender document can be seen and downloaded from the Madhya Pradesh Government E-Procurement Portal (https://mptenders.gov.in).
2. Cost of Tender Document and EMD of required amount is to be submitted online on Madhya Pradesh Government E-Procurement Portal.
3. The pre-bid meeting will be held on the date and time specified in critical dates.
4. Due date of tender: As per critical dates on MP Procurement E-government portal.
5. A bidder, whether alone, or in joint venture will be eligible to be awarded maximum of one tender of any value or tenders of cumulative value up to PAC of the largest tender (i.e., Rs. 1,435.07 Cr.) among the projects tendered in the present NIT.
6. Tenders will be opened in descending order based on PAC of the tenders.
7. The bidder shall calculate and submit online in 'Cover 2' its Bid Capacity as given in Schedule E of Pre-qualification documents. The financial offer of the bidder whose bid capacity is exhausted or is lower than the probable amount of contract given in the NIT shall not be opened.
8. The financial bid of the bidder will not be opened for the subject tender if the sum of PAC of tender whose financial bids are being opened and the cumulative quoted amount of tenders for which the bidder has been adjudged as the L-1 bidder exceeds the PAC of the largest tender (i.e., Rs. 1,435.07 Cr.) among the projects tendered in the present NIT. In case a joint venture is adjudged as L-1 Bidder, the quoted amount in full will be considered for all the members of joint venture for computation of balance for award criteria.
9. The time for completion is including rainy season and will be reckoned from the date of start of work, which is 21st day from the date of issue of LOA for engineering, procurement, construction, testing and commissioning (excluding trial run). The trial run shall be for three months after successful commissioning. However, if the Contractor fails to operate the system successfully due to any reason during trial run, the period for trial run will be extended. The Contractor must successfully run the entire system for three months during trial run. The operation & maintenance period of ten years will start after successful completion of the trial run for three months.

10. MPJN will not be responsible for any delay in submission of bid due to any reason.
11. MPJN reserves the right to accept or reject any bid, cancel the bidding process, and reject all bids, at any time prior to the award of contract, without incurring any notice and answerability to the affected bidder or bidders or any obligation to inform the affected bidder or bidders regarding the grounds for the discretion.
12. For any queries related to bid document, please call Madhya Pradesh Jal Nigam Phone No. – 0755 -2579874, 0755-2579034-35-36.
13. For any queries related to bid submission, please call M.P. Government E-Procurement Cell Help Desk Number 0120-4001002, 0120-4200462, 0120-4001005, 0120-6277787.

Managing Director
Madhya Pradesh Jal Nigam
Bhopal

MADHYA PRADESH JAL NIGAM

(A GOVERNMENT OF MADHYA PRADESH UNDERTAKING)

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Note: Copy of DPR would be available in library of MPJN for review and same may be seen in conference hall of MPJN, Bhopal during office hours. DPR is corrected time-to-time, and logical corrections have been done while preparing this bid document. Hence, DPR may not be depicting real picture of work. It is only for a tentative idea of project scope. DPR is not part of contract, it is just for understanding of the project.

PART I – ESSENTIAL INSTRUCTIONS FOR THE BIDDERS

1. Applicable Schedule of Rates (SOR)

i. The Probable Amount of Contract (PAC) of tender has been worked out on the basis of ISSR Volume 1 to 4 published by Urban Administrative and Development Department, Govt. of M.P. enforced from 2nd August 2021. This SOR will be applicable for complete construction phase i.e., main work and variation clause of this tender document.

ii. If during Operation & Maintenance Phase, any extension of pipeline or any other work is required to be executed as per JJM or otherwise, then the applicable SOR will be the prevailing SOR adopted by MPJNM at that time with up-to-date amendments at par.

2. Conditional tender shall not be accepted under any circumstances whatsoever.

3. Price escalation shall be payable as per methodology given in this tender document.

4. The bidders shall ensure that their tenders are in conformity with the conditions and clauses of this NIT and the contract agreement form in general and with regard to security deposit, mode of payment for extra work, if any, completion time, guarantee about mechanical and electrical equipment & water tightness, tests, structure stability, etc. for entire civil works in particular.

5. The Contractor shall be eligible to avail interest free mobilization advance of 10% of the Contract Amount with a maximum limit of Rs. 50 crore which shall be given on the application of the contractor in two equal instalments against Bank Guarantee of 100% of the instalment amount.

6. Detailed Project Report (DPR) and Schedules have been prepared assuming that the project is Green Field Project for Household Water Supply Villages, for bulk water supply to Bulk Water Supply Villages and for bulk water supply to Bulk Water Supply Towns (if town specified in the tender document). However, if there is existing infrastructure available in some of the Household Supply Villages, the Contractor shall prepare his design and drawing using all usable and compatible water supply assets available after confirmatory survey and same shall be dealt with in accordance with provisions of contract for variation. In case any of the existing infrastructure is not in the condition to be utilised further, the same shall be pre-approved by the GM, PIU / Engineer-in-Charge with consultation of EE, PHE.

7. The contractor shall ensure that the proposal is strictly in line with the prevailing JJM Guidelines.

8. Return of security deposit furnished by way of unconditional and irrevocable bank guarantee shall be processed only in the manner and time prescribed in this NIT.

9. The bidder / contractor shall get the gradient / reduced levels verified on his own at his own expenditure and responsibility. The Madhya Pradesh Jal Nigam (hereinafter, MPJN) shall not be responsible for any variations in gradient / reduced levels.

10. The bidder / contractor shall include all habitations / villages inside periphery of Project Area and shall include them in the design for coverage of water supply for all population inside periphery (all consumers covered under boundary of outermost villages of Project Area) of this project. Either household supply or bulk supply to the villages within project area shall be done/ensured by the contractor.

11. The Contractor shall install sufficient sluice valves to ensure equitable distribution of water and to achieve service level benchmarks as stated in the bid document even at tail-end of distribution network.

12. No payment shall be made on submission of drawing and design for civil work and general arrangement drawing for mechanical and electrical equipment. All the processes, drawings and designs shall be duly checked and verified by any Indian Institute of Technology (IIT)/ National Institute of Technology (NIT), the cost of the same shall be borne by the contractor. Contractor shall start work only after due approval, of their designs and drawings, by the competent authority.

13. Bidders shall keep their offer open for acceptance for a period as prescribed in this NIT i.e., 180 days from the date of submission of bid. The validity of the bid can be extended by mutual consent in writing.

14. As a matter of abundant caution, the bidders are advised to carefully read the tender document, review the DPR in the MPJN office or through softcopy and visit the site before submitting the tender.

15. The bidder shall calculate and submit online in 'Cover 2' its Bid Capacity as given in Schedule E of Pre-qualification documents. The financial offer of the bidder whose bid capacity is exhausted or is lower than the probable amount of contract given in the NIT shall not be opened.

16. The contractor shall be fully responsible and accountable to obtain all required permissions from the concerned departments/authorities and shall be fully responsible for abiding by all the laws, rules, bye laws and regulations (for the time being in force in India) relating to water, power, extracting of minerals, royalty, blasting, transportation, safety, traffic regulations related to the work.

17. Variations in length and size / class of pipeline and electrical line during execution period will be dealt with as follows:

i. Addition / deduction in sizes and lengths of pipelines shall be made as per SOR specified in PART I – ESSENTIAL INSTRUCTIONS FOR THE BIDDERS Clause 1 (i). The addition / deduction amount would be determined based on the applicable rates based on SOR Specified in PART I – ESSENTIAL INSTRUCTIONS FOR THE BIDDERS Clause 1 (i).

ii. The additions / deductions in capacity and lengths of electrical power lines shall be made as per current applicable SOR of respective MPKVVCL with amendments up to the date of bid submission.

iii. The items of work not included in the above ISSR, shall be adjusted on the basis of proper rate analysis, supported with documents, submitted by the Contractor, and approved by the Managing Director.

iv. Price escalation shall be payable as per methodology given in this tender document (Part III – Clause 8.5).

v. The decision of Managing Director in above cases shall be final.

18. Variation / Extra work shall be finalized by the variation approval committee (VAC) formed within the MPJN. On the recommendation of variation approval committee, the variation up to 10% of total agreement cost shall be approved by Managing Director (MD), Madhya Pradesh Jal Nigam (MPJN) and above 10% variation shall be approved by BETAC (Board Empowered Tender Approval Committee).

19. Any additional work on account of distribution network expansion or any other reason whatsoever during the operation and maintenance period as approved by Engineer-in-Charge / MPJN, must be executed by the Contractor. The payment for the additional work will be done based on the applicable SORs at the time of execution.

20. The MPJN's estimation for consumption of energy is specified in Annexure F. For reimbursement of energy charges calculation shall be done on pro rata basis from 1st year to end of design period. If energy consumption is more than as specified in Annexure F, then excess energy charges shall be paid by the firm. If any change in scheme components or water demand increases due to any reason & approved by MPJN, then reimbursement of payment for energy consumption excluding penalties, shall be made accordingly.

21. Madhya Pradesh Jal Nigam may appoint Supervision and Quality Control Consultant and authorize the Consultant to act as representative of the Engineer-in-Charge.

22. Amendments to NIT / tender documents, if any, shall be published on web site only and not in the newspapers.

23. **Site Visit and examination / knowledge of works**

i. The bidders are advised to visit the sites of work, and assess its topographical, hydrological, geological conditions, etc. and obtain for itself on their own responsibility all information that may be necessary for preparing the bid and entering into the contract.

ii. Any costs incurred by the bidders against these meetings, investigations and site visits shall be at their own cost and MPJN will not be liable to pay any such costs.

iii. The bidders are advised to inspect the site of construction before submitting their offer to ascertain the quantum of such works. The bidders shall be deemed to have full knowledge of all the relevant documents, proposed site of construction, soil samples or strata at site. It is also to be noted that no claims on variation of above data shall be admissible & considered for payment.

24. Land Acquisition/Forest Permission

i. The contractor shall not be responsible for any acquisition of land, which shall be done by Madhya Pradesh Jal Nigam. However, the responsibility of taking the permission to lay pipeline along the road, railway lines, etc., shall be that of the contractor. Madhya Pradesh Jal Nigam shall assist the contractor on receipt of such request, by issuing such letters, if so desired by the contractor.

ii. The contractor shall be responsible for timely submission of requirement of forest land permission/ any acquisition of land, where so ever required. The timely submission of the application to the forest department and subsequent follow up shall be under the scope of contractor. Madhya Pradesh Jal Nigam shall assist the contractor on receipt of such request, by issuing such letters, if so desired by the contractor. The fee/ statutory charges and cost of land occupied, if any payable to the concerned department/ authority for grant of permission will be paid/ reimbursed by MPJN.

25. All railway crossings, canal crossings, national highway crossings and state highway crossings shall be done with trench less technology or as approved by the MPJN.

26. Any bank guarantee / security deposit, if required to be submitted to any authority / agency for carrying out the works whether crossings or along the alignment will have to be submitted by the Contractor. The fee / charges related to such financial instruments (BG / SD) if charged to the Contractor will be reimbursed by MPJN.

27. Road Restoration

The Contractor will undertake road restoration or making surface good as same before construction for all the work being carried out under the scope of this NIT where road cutting is required.

The following provisions will be applicable for road excavation & restoration:

i. Contractor will submit online application to the concerned Road Authority (NHAI, MPRDC, MPPWD, CEO, ZP / RRDA / RES etc.) for permission of road excavation along with the coordinates through GM, PIU, MPJN.

ii. Permission will be accorded online within 15 days of application after getting the excavation alignment verified else will be considered deemed approved.

iii. Contractor will be required to use only road cutter for road cutting. The maximum width for road cutting should be limited to outer diameter of the pipe plus clearance of 200 mm on both sides subject to a minimum of 500 mm.

iv. Temporary road restoration shall be done by the contractor after laying of pipes and permanent road restoration shall be done after completion of satisfactory hydraulic testing of that portion of pipeline.

28. All protection works like plinth protection, slope protection, etc. for stability of structure as per site condition must be done by the contractor.

29. **Pre-Bid Meeting**

The pre-bid meeting shall be held on the date and time as specified in the critical dates on Portal at the MPJN head office, Bhopal.

v. Any change in the schedule of pre-bid meeting will be communicated on the portal only, and no intimation to bidders will be given separately.

vi. All bidders are requested to visit the site and understand the scheme prior to pre-bid meeting.

vii. Any prospective bidder may raise his queries and/or seek clarifications in writing before or during the pre-bid meeting. The purpose of such meeting is to clarify issues and answer questions on any matter that may be raised at that stage. The Employer may, at his option, give such clarifications as are felt necessary.

viii. Pursuant to the pre-bid meeting, if the Employer deems it necessary to amend the Bid Document, it shall be done by issuing amendment to the online NIT.

30. **Amendment of Bid Documents**

i. Before the deadline for submission of bids, the Employer may amend or modify the Bid Documents by publication of the same on the website.

ii. All amendments shall form part of the Bid Document.

iii. The Employer may, at its discretion, extend the last date for submission of bids by publication of the same on the website only.

31. **Third Party Damages (Only during O&M Phase)**

i. The cost for repair of third-party damages will be reimbursed to Contractor by MPJN only during Operation & Maintenance Phase.

ii. The cost will be reimbursed based on the certification of the damage & the costs involved in the repair by GM, PIU.

iii. GM, PIU will recover the cost for repair of third-party damages from the party responsible for the damage.

32. In case of change in intake well location, variation in approach bridge length will be applicable. The addition / deduction amount due to change in approach bridge length would be determined based on the applicable rates based on SOR Specified in PART I – ESSENTIAL INSTRUCTIONS FOR THE BIDDERS Clause 1 (i), tender premium / discount quoted by the contractor & the price escalation applicable based on the methodology specified in the tender document.

33. Priority of Documents

33.1. This Contract, and all other contracts and documents forming part of or referred to in this Contract are to be taken as mutually explanatory and, unless otherwise expressly provided elsewhere in this Contract, the priority of this Contract and other documents and agreements forming part hereof or referred to herein shall, in the event of any conflict between them, be in the following order:

a) this Contract; and

b) all other contracts and documents forming part hereof or referred to herein, i.e., this Contract at (a) above shall prevail over the agreements and documents at (b).

33.2. Subject to the provisions of Clause 26, in case of ambiguities or discrepancies within this Contract, the following shall apply:

i. between two or more Clauses of this Contract, the provisions of a specific Clause relevant to the issue under consideration shall prevail over those in other Clauses;

ii. between the Clauses of this Contract and the Schedules, the Clauses shall prevail and between Schedules and Annexes, the Schedules shall prevail;

iii. between any two Schedules, the Schedule relevant to the issue shall prevail;

iv. between the written description on the Drawings and the Specifications and Standards, the latter shall prevail;

v. between the dimension scaled from the Drawing and its specific written dimension, the latter shall prevail; and

vi. between any value written in numerals and that in words, the latter shall prevail.

34. Interpretations

In case of any issues with interpretation of bid document / contract agreement / conditions of contract / specifications / scope of work, MD, MPJN is authorised to take the final decision on interpretation

Managing Director
Madhya Pradesh Jal Nigam
Bhopal

PART II (SUMMARY OF PART III)

OFFICE OF THE MANAGING DIRECTOR
MADHYA PRADESH JAL NIGAM, BHOPAL

NOTICE INVITING TENDER

Online digitally sealed tenders are invited on behalf of Madhya Pradesh Jal Nigam for the following work on "TURNKEY JOB BASIS" in Form- F for lump sum contract in the office of undersigned within the time mentioned in the critical dates from eligible contractors, who fulfil the conditions mentioned in Para 3 'Eligibility Criteria' herein below. All the conditions mentioned herein below in this Part shall be read with all the conditions mentioned in Part III and vice-versa. The bidders intending to participate in this tender are required to get enrolled / registered on the M.P. Govt. E-Procurement Portal https://mptenders.gov.in.

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1. General

Tender must be submitted in online form for "Lump Sum Contract" duly filled and digitally signed as per instruction contained in this tender notice and guideline which are attached with this NIT.

1.1 **Brief Scope of Work:** The successful bidder has to carry out entire work of Planning, Survey, Soil investigation, Designing, Construction as per the Schedule program, testing, commissioning, three months trial run of completed scheme and 10 years operation & maintenance of entire water supply scheme. After getting a confirmatory survey done with the intention to serve the basic purpose of contract, that is to ensure the supply of drinking water in designated quantity to all villagers & to villages / customers / institutions / offices / towns identified for bulk water usage located within the revenue boundary of outermost villages as listed vide Appendix-I Part A under this contract for the design period as specified in this NIT. Scope of work detailed out in Annexure-F is tentative obtained from the DPR and it is mentioned as scope of work under billing break up schedule vide Annexure H. Employer reserves the right to reduce/ modify the scope of work at any stage, and also to make any changes in payment schedule if required, without incurring any liability regarding the same towards the Contractor. Any variation in the scope of work, over that detailed out in Annexure F shall be evaluated as per the condition of contract for variation and the lump sum bid price will be adjusted accordingly.

1.2 The successful bidder is required to do overall engineering of project area which shall include overall survey of villages/ habitations including household for connections and also check the capacity of source, survey including preparation of contour plan & L sections as per requirement, collection of all data required for design from relevant authority, site reconnaissance, soil investigation of all structures, bore logs as per standard norms & preservation of logs, alternate route if required to avoid hurdles by optimizing design & cost, overall design as per norms, timely submission & approvals of design as per contract for Household Supply Villages , only bulk water supply to the villages listed in Appendix-I Part B and only bulk water supply to the towns listed in Appendix-I Part C up to specified demand.

1.3 The successful bidder is required to carry out the survey including necessary data collection from concerning division of PHED of old water supply schemes and if the existing components i.e., pipeline, OHT/ GSR, etc. can be utilized from technical consideration looking at the strength, etc. then it should be taken in account. The contractor shall check the efficacy & strength of existing system & use as per their present condition. Where new/ old water supply schemes are in running condition then it shall be connected by the scheme as bulk water consumer after taking consent of Sarpanch Gram Panchayat.

1.4 The proposed work is for all the villages falling within the Project Area including their tola, majara / habitations. For Household Supply Villages, data collection, survey, investigation, design, etc entire system including in-village infrastructure is in the scope of this contract. However, for Appendix-I Part B (Bulk Supply) villages scope of this contract is to provide specified quantity of water with desired quality at the village (sump) inlet point only. Bulk water to be supplied to the towns listed in Appendix I Part C. Scope of this contract includes providing, installing and O&M of flowmeter at village/town inlet sumps.

1.5 Contractor shall ensure during confirmatory survey that all the villages coming in the Panchayats falling within the Project Area are covered by the Project (either through household supply or through bulk supply). The Contractor shall submit documentary evidence regarding the same from the concerned Panchayats.

1.6 Lump Sum tender shall be inclusive of all the items of works.

1.7 The brief details are specified in Annexure F.

2. Issue of Tender Documents

2.1 Tender documents can be downloaded from https://mptenders.gov.in.

2.2 The bidders shall have to submit their bids online and upload the relevant documents as per time schedule (critical dates).

2.3 Other conditions including qualification and details of work can also be seen in the office of the undersigned during office hours and can be downloaded online directly from the portal - https://mptenders.gov.in. This tender document shall form part of the agreement.

2.4 For details on tendering procedure through the electronic tendering system, please refer to above web site.

2.5 The Bidders are advised to get in touch with the Service Provider of the e-Procurement System, MPSEDC, Bhopal for confirming the time and date for their training session, if training is required. Provisions for training is not an obligation for Madhya Pradesh Jal Nigam / Service Provider of the e-procurement system. Training of more than one potential bidder may be clubbed together.

2.6 Madhya Pradesh Jal Nigam will not be responsible for crashing or unexpected downtime of its website and the related web portals from where the bidders will be downloading the documents and submitting the same for participation in the tender, whether or not it results in failure by a bidder to submit the bid documents, and theft, loss, or unintended disclosure of information/proposals of the bidders due to any act of commission or omission.

3. Eligibility Criteria

The bidders must fulfil the following eligibility criteria. The submission of tender must be accompanied with the documents substantiating the fulfilment of eligibility criteria otherwise tender shall be rejected:

3.1. Average Annual Turnover: The bidder or JV should have Average Annual Turnover of at least 50% of PAC in the last five financial years preceding bid due date (2016-17, 2017-18, 2018-19, 2019-20 & 2020-21) at current price level (2020-21). CA Certificate for turnover to be submitted. The turnover of the years prior to 2020-21 shall be escalated by the following escalation factor to bring them to price level of 2020-21:

S. No.	Year	Escalation factor
1	2020-21	1.00
2	2019-20	1.10
3	2018-19	1.21
4	2017-18	1.33
5	2016-17	1.46

In case of Joint Venture, the combined strength of all the partners should meet the qualifying criteria for the average annual turnover. However, any individual partner should meet not less than 26% of qualifying amount.

3.2. Working Capital: The bidder or JV shall demonstrate confirmed credit line from a scheduled commercial bank (other than a co-operative bank) recognized by the Reserve Bank of India (RBI) of not less than 15% of the PAC. In case of Joint Venture, the combined strength of all the partners should meet the qualifying criteria for the working capital. However, any individual partner should meet not less than 26% of qualifying amount. A Valid certificate from officer not below the rank of branch manager, having validity date mentioned clearly, shall be submitted as part of the bid substantiating the above.

3.3. Net Worth: Net Worth of the Bidder (and each partner of JV in case of JV) of last 3 financial years preceding bid due date (2018-19, 2019-20 & 2020-21) should be positive and Net Worth of the bidder or JV of last financial year (2020-21) should not be less than 10% of the PAC as certified by Chartered Accountant.

3.4. Not Suffer Loss: The bidder (and lead partner in case of JV) should not have suffered loss in more than one financial year during last three financial years preceding bid due date (2018-19, 2019-20 & 2020-21) due to any reasons whatsoever.

3.5. Bid Capacity: Bid Capacity of the bidder or JV should be equal to or greater than PAC.

Evaluation of Bid Capacity:

Bid Capacity = (3.0 x A x B) – C. where:

A = Maximum escalated turnover in any one year during the last 3 financial years preceding bid due date (2018-19, 2019-20 & 2020-21) (Escalation factor as given in Clause 3.1 will be used for escalation)

B = Prescribed completion period in years for the subject contract

C = Balance amount of contract work in hand to be executed during the contract period

The assessed value of Bid Capacity of bidder or JV should not be less than PAC.

Note:

i. Only Audited Balance Sheet or CA certificate based on Audited Balance Sheet shall be considered. Provisional balance sheet will not be considered.

ii. For the purpose of substantiating net worth (paid up share capital + reserves & surplus) and Not Suffer Loss, certificates from a Chartered Accountant should be submitted. It is clarified that the certificates shall be subject to verification at the discretion of the Employer.

3.6. Experience of similar nature project

The Bidder / any partner of the Joint Venture or all partners of JV jointly, must have substantially completed (at least 75% completed financially), one work costing not less than the amount equal to 25% of the PAC, within the last seven years from the date of bid notification, meeting any of the following requirements:

i. Water Supply Project involving Intake Well, Water Treatment Plant, Service Reservoir(s), and Distribution Pipeline

ii. Sewerage Project involving Sewage Treatment Plant, Pumping Stations and laying of sewerage pipelines

iii. Irrigation Project involving pressurized pipeline work

Note:

i. The project details should be certified by the client (official of the rank executive engineer or above).

ii. Financial completion percentage of the project shall be considered for the eligibility criteria.

iii. In case the project submitted for the eligibility criteria has been awarded to a Joint Venture, then the eligible amount shall be calculated according to the share of the bidder in the JV that was awarded the project. The share of the bidder in the JV shall either be certified by the client (official of the rank executive engineer or above) or through the submission of the JV agreement for that project.

iv. In case of projects executed outside India by an eligible entity registered / incorporated in India, the certificate regarding project details should be certified by Indian Embassy in the country of project execution in addition to the client certification from an official of rank executive engineer or above or equivalent rank and shall be in English.

4. Award Criteria

A bidder, whether alone, or in joint venture, will be eligible to be awarded maximum of one tender of any value or tenders of cumulative value up to PAC of the largest tender among the projects tendered in the present NIT.

Note:

i. Tenders will be opened in descending order based on PAC of the tenders.

ii. The financial bid of the bidder will not be opened for the subject tender if the sum of PAC of tender whose financial bids are being opened and the cumulative quoted amount of tenders for which the bidder has been adjudged as the L-1 bidder exceeds the PAC of the largest tender among the projects tendered in the present NIT.

iii. In case a joint venture is adjudged as L-1 Bidder, the quoted amount in full will be considered for all the members of joint venture for computation of balance for award criteria.

5. In case of JV, the JV members should nominate one of the members as Lead Partner of the JV. JV can have maximum 3 members. All the members of joint venture should have minimum 26% shareholding in the JV.

6. Valid Registration certificate in case of registered contractors or previous year's balance sheet in case of firm of repute / all partners of Joint Venture.

7. Disqualification

Even though the bidder / joint venture satisfies the above requirements, they are liable to be disqualified:

a. If the bid submitted by the bidder does not fulfil the criteria in general.

b. If they have made untrue and false representation in the forms, statements and attachments submitted in proof of the qualification requirement.

c. If any department of Government Madhya Pradesh including but not limited to PWD, WRD, NVDA / NVDD, PHED and Rural Development Department or undertaking or any Municipal Corporation or any other Corporation / Board / Society under the administrative control of these departments or state of Madhya Pradesh has:

i. Cancelled or suspended registration in last five years and not revoked up to the date of bid submission.

ii. Blacklisted the Contractor.

iii. Debarred the Contractor for participating in future tendering.

* Provided that the above said penal actions were in force on the last date of submission of the bid.

** The bidder/all JV partners shall be required to submit an affidavit giving full information of above facts.

8. Rejection of Bids

The Employer reserves the right to accept or reject of any bid, and to annul the bidding process and reject all the bids at any time prior to contract award, without incurring any liability. In all such cases reasons shall be recorded.

This tender can be viewed, downloaded, purchased, and submitted online on Madhya Pradesh Government E-Procurement Portal (https://www.mptenders.gov.in).

Managing Director
Madhya Pradesh Jal Nigam
Bhopal

PART III - DETAILED NOTICE INVITING TENDER

MADHYA PRADESH JAL NIGAM
(A GOVT. OF M.P. UNDERTAKING)
OFFICE OF THE MANAGING DIRECTOR
MADHYA PRADESH JAL NIGAM, BHOPAL

DETAILED NOTICE INVITING TENDER

Online digitally signed tenders are invited on behalf of Madhya Pradesh Jal Nigam for the following work on "TURNKEY JOB BASIS" in Form – F for lump sum contract within the time mentioned in the critical dates from the firms, who fulfil the conditions mentioned in Para 1.3 'Eligibility Criteria' herein below. All the conditions mentioned in this Part shall be read with all the conditions mentioned in Part II and vice-versa.

The bidders intending to participate in this tender are required to get enrolled / registered on M.P. Govt. E-Procurement Portal https://mptenders.gov.in.

The brief details of the works are specified in Annexure F.

ISSUE OF TENDER DOCUMENTS

(i) Tender documents can be purchased from https://mptenders.gov.in by making online payment. The last date of purchase of tender document is as mentioned in critical dates.

(ii) The bidders shall have to submit their bids online and upload the relevant documents as per time schedule (critical dates).

(iii) Other conditions including qualification and details of work can also be seen in the office of the undersigned during office hours and can be downloaded online directly from the portal - https://mptenders.gov.in. This tender document shall form part of the agreement.

(iv) For details on tendering procedure through the electronic tendering system, please refer to above web site.

(v) The Bidders, if training is needed, are advised to get in touch with the Service Provider of the e-Procurement System, MPSEDC, Bhopal for confirming the time and date for their training session.

(vi) Provision for training is not an obligation for Madhya Pradesh Jal Nigam / Service Provider of the e-procurement system. Training of more than one potential bidder may be clubbed together.

(vii) Madhya Pradesh Jal Nigam will not be responsible for crashing or unexpected downtime of its website and the related web portals from where the bidders will be downloading the documents and submitting the same for participation in the tender, whether or not it results in failure by a bidder to submit the bid documents, and theft, loss, or unintended disclosure of information/proposals of the bidders due to an act of commission or omissions.

Definitions

In this tender document, the following words shall mean–

i. 'BIS' means Bureau of Indian Standard.

ii. 'Bulk Supply Towns' / 'Bulk Water Supply Towns' means towns covered under Appendix-I Part C, where the contractor needs to supply water in bulk at sump/OHT at periphery of town. Construction of sump / OHT at town inlet and pumping, if needed, is not in the scope of this contract.

iii. 'Bulk Supply Villages' / 'Bulk Water Supply Villages' means villages covered under Appendix-I Part B, where the contractor needs to supply water in bulk at village inlet (sump / OHT) and does not cover the scope of survey, investigation, design, implementation of in-village infrastructure. Construction of sump / OHT and Operation and Maintenance of in-village infrastructure at village inlet is not in the scope of this contract.

iv. 'Completion' means completion of the work, as certified by the Engineer-in-Charge including Operation & Maintenance of the scheme for 10 Years, in accordance with the provisions of the agreement.

v. 'Completion of work' means completion of the entire contracted work including trial-run of the whole scheme for 3 months. Exhaustion of quantity of any particular item mentioned in the bid document shall not imply completion of work or any component thereof.

vi. 'Contract' means the Contract between the Employer and the Contractor to execute, complete and perform the work. The term agreement is synonym of Contract and carries the same meaning wherever used.

vii. 'Contract Amount' means the amount of contract worked out in Indian Rupees only (INR) on the basis of accepted bid.

viii. 'Contract Data' means all the documents and other information which forms part of the Contract or are annexed to the NIT and contract.

ix. 'Contractor' means a person or legal entity whose bid to carry out the work has been accepted by the Employer.

x. 'Contractor's Bid' means the complete bid document submitted by the Contractor to the Employer.

xi. 'Day' means the calendar day.

xii. 'Defect' means any part of the work not completed in accordance with the specification included in the contract.

xiii. 'Deputy Manager' means Deputy Manager of Madhya Pradesh Jal Nigam of concerned PIU.

xiv. 'Drawings' means duly approved drawings including calculation and other information provided and approved by the Engineer-in-Charge.

xv. 'Employer' means Madhya Pradesh Jal Nigam, who employs the Contractor to carry out the work. The Employer may delegate any or all functions to a person or body nominated by him for specified function. The word Employer/ Government/ Department wherever used denotes the Employer.

xvi. 'Engineer-in-Charge' means Chief General Manager, Madhya Pradesh Jal Nigam.

xvii. 'Equipment' means the Contractor's machinery and vehicles brought temporarily to the site for execution of work.

xviii. 'GM' or 'Engineer' means General Manager of Madhya Pradesh Jal Nigam of concerned PIU.

xix. 'Government' means Government of Madhya Pradesh.

xx. 'Household Supply Villages' / 'Household Water Supply Villages' means Total Villages excluding Bulk Supply Villages, where the contractor scope includes survey, investigation, design, implementation of complete in-village infrastructure including distribution network, FHTC and maintenance of in-village infrastructure.

xxi. 'In Writing' means communicated in written form, signed by the authorized signatory, and delivered against receipt.

xxii. 'Manager' means Manager of Madhya Pradesh Jal Nigam of concerned PIU.

xxiii. 'Material' means all supplies, including consumables, used by the Contractor for incorporation in the work.

xxiv. 'MD' means Managing Director of Madhya Pradesh Jal Nigam.

xxv. 'NIT' means Notice Inviting Tender

xxvi. 'Operation & Maintenance Period' shall start after successful completion of Trial Run including 100% coverage of Project Area

xxvii. 'PAC' means probable amount of contract as specified in the NIT.

xxviii. 'PIU' means Project Implementation Unit of Madhya Pradesh Jal Nigam of the area, under whose jurisdiction the work falls.

xxix. 'Project Area' means all the villages inside the area covering the revenue boundary of outer most villages listed in Appendix I Part A. Appendix I Part A, Appendix Part B & Appendix I Part C may be updated during the confirmatory survey or based on availability of water during the execution period.

xxx. 'Representative' means Supervision and Quality Control Consultant appointed by Madhya Pradesh Jal Nigam and authorized to act as representative of the Engineer.

xxxi. 'Specification' means the specification of the work included in the contract and any modification or addition made or approved by the Engineer-in-Charge.

xxxii. 'Start Date' means the date specified in the Letter of Intent/Work Order after the signing of agreement for the work.

xxxiii. 'Stipulated date of completion' means the date on which the contractor is required to achieve Substantial Completion of the execution phase works as per the NIT. The completion period specified in NIT is exclusive of trial run.

xxxiv. 'Sub-Contractor' means a person or corporate body, who has a contract with the contractor, duly authorized to carry out a part of the construction work under the contract.

xxxv. 'Substantial Completion' means the completion of substantial works given in the scope of works and start of water supply in at least 95% of the Project Area.

xxxvi. 'Temporary Work' means work designed, constructed, installed, and removed by the contractor that are needed for construction of installation of the work.

xxxvii. 'Tender/ Bid' and 'Tenderer/Bidder' are the synonyms and carry the same meaning wherever used.

xxxviii. 'Total Villages' means villages covered under Appendix-I Part A, which form the periphery of the scheme coverage area. They include both Household Supply Villages and Bulk Supply Villages.

xxxix. 'Trial Run' starts after the Substantial Completion. All the works specified in the execution phase scope of works shall be completed during this period including all major / minor items and start of water supply in 100% of the Project Area. The Trial Run shall generally be of 3 months, but it can be extended if the Contractor is not able to run all the components successfully or 100% coverage of the Project Area is not achieved. The cost of chemicals and energy charges (excluding penalties) will be paid by MPJN on reimbursement basis depending on the duration & quantity of water supplied to the villages during the Trial Run.

xl. 'Variation' means any variation in the work as approved by the competent authority under this contract.

xli. 'Work' means the work by virtue of contract, contracted to be executed, whether temporary or permanent and whether original, altered, substituted or additional.

1. Submission Requirements

1.1. **Eligible Bidder:** This Tender is open to all firms / entities incorporated / registered in India meeting the eligibility criteria as specified in this tender document:

i) Individual Person / Proprietor

ii) Proprietary firm

iii) Partnership firm / limited liability partnership

iv) Limited company or limited corporation or private limited company

v) Government Undertaking / Enterprises

vi) Joint venture or consortium of two or more (but not more than three including Lead Member) entities at (i) to (v) registered with registrar of firms / companies / with appropriate authority under Companies Act / Firms / Society Registration Act or other applicable regulations. The JV members should nominate one of the members as Lead Partner of the JV. All the members of joint venture should have minimum 26% shareholding in the JV.

A Bidder (including all members of a Joint Venture and all sub-contractors of a Bidder) should not be affiliated with a firm or entity which has provided **consulting services during the preparatory stages of the Works or of the Project of which the works form a part**.

1.2. A Bidder shall not have a conflict of interest. Bidders found to be in conflict of interest shall be disqualified. A Bidder may be considered to have a conflict of interest with one or more parties of the bidding parties in the bidding process, if they:

i. have controlling shareholders in common; or
ii. receive or have received any direct or indirect subsidy from any one of them, or
iii. have a relationship with each other, directly or through common third parties, that puts them in a position to have access to information about or influence on the Bid of another Bidder that influence the decisions of the MP Jal Nigam regarding the bidding process.

* Government-owned/ undertaking enterprises in India shall be eligible if they are legally and financially autonomous and operate in accordance with law.

Bidders shall provide evidence of their continued eligibility up to the satisfaction of the MPJN.

1.3. **Eligibility Criteria:** The eligibility criteria are as specified in Clause 3 of Part II of the NIT document.

1.4. Copy of PAN Card and Income Tax Returns filed, for the relevant financial years (2018-19, 2019-20 & 2020-21) shall be submitted.

1.5. Valid registration certificate in case of registered contractors or previous year's (2020-21) balance sheet for bidder / all partners of Joint Venture shall be submitted.

1.6. **Disqualification –** The disqualification provisions are as specified in Clause 6 of Part II of the NIT document.

1.7. The employer reserves the right to accept or reject of any bid, and to annul the bidding process and reject all the bids at any time prior to contract award, without incurring any liability, in all such cases reasons shall be recorded.

1.8. Any other information or details in connection with work can be obtained from the office of the undersigned during office hours on any working day except on the day of opening of tenders.

1.9. The tender must be in Form 'F' for lump-sum-contract duly filled in as per instructions contained in detailed notice and said tender forms.

1.10. No two or more concerns/ firms etc. in which an individual is interested/ engaged as a Proprietor and/ or partner and/ or significant shareholder, shall tender for the execution of the same work. if they do so all such tenders are liable to be rejected.

1.11. Not more than one tender shall be submitted by a contractor or by a firm of contractors either individually or as part of JV.

2. Rates

2.1. Tenders must be in Form "F" for lump sum contract duly filled in as per instructions contained in this tender notice and in the said tender form. The lump sum tenders shall be inclusive of all charges regarding taxes, and duties including the Income Tax, royalties, octroi duties, cess, charge, fee, or any other taxes or duties levied on the contractors' work by Government, Local bodies, etc. shall be payable by the contractor to the concerned authority.

All such charges and taxes except Goods and Services Tax, shall be deemed to be included in the contractor's bid. The Goods and Services Tax, as applicable, shall be paid separately to the contractor.

The rates quoted shall be inclusive of all taxes and duties except GST as mentioned above) and shall be F.O.R. site of work; the contractor shall be fully responsible for storage, watch and ward, insurance, etc. of all stores, inventories, and assets, etc. during the construction and O&M period. The increase in taxes, levies, cesses, etc. except GST in any form shall be payable by the contractor and the Employer shall not be liable to make any payment in this regard.

2.2. The lump-sum rates must be entered digitally both in the words and figures.

2.3. Bidders shall have to keep their offer open for acceptance for a period as prescribed in the tender document i.e., 180 days from the last date of submission of bid.

2.4. The rates quoted by the contractor shall not be altered by the contractor during the term of contract.

2.5. Lead and lift for water - Contractor shall make own arrangement for supply of water for construction, testing and other purposes. No lead and lift for water will be paid.

2.6. Lead and lift of materials - No lead and lift for any material will be paid. The tendered amount shall be inclusive of all lead and lift for the materials. The contractor shall himself verify the lead of different materials before submitting his tender.

2.7. The contractor shall have to arrange for the temporary electric connection at site of work at his own cost for dewatering, curing, vibrator, testing and internal and outside electric fittings, etc.

2.8. **Dewatering -** The lump-sum offer shall include dewatering, bailing out foundation water, river water and rainwater if any, which shall be required to be done by the contractor at his own cost and his own risk and for which no payment will be admissible under any circumstances whatsoever.

The bidder shall assess the work of dewatering that may be required for execution of work and include the same in his lump-sum offer. No dewatering shall be payable separately under any circumstances whether natural, artificial, or man-made.

2.9. **Escalation –** Price escalation shall be payable as per the formula given in clause 8.5 and under Force Majeure conditions as per formula given under clause 8.9.4 of Detailed Notice Inviting Tender.

3. Submission of tenders

The bidder shall fill/ upload the Bids online and the Bid shall be digitally signed and submitted online only in pdf format as per mentioned critical dates. Bidder should consider any corrigendum/ addendum published online on the tender document before submitting their bids.

Bidder should login on the site (https://mptenders.gov.in) well in advance for bid submission so that they can upload the bid in time i.e., on or before the bid submission time. Bidder will be responsible for any delay due to any issues. There shall be three separate Online envelopes as under:

i. **Cover 1 - In the 1st cover** of online submission, Bidders are directed to submit the detail of tender document fee and EMD.

ii. **Cover 2 (Technical Bid) - In the 2nd cover** of online submission, Bidders are directed to submit Pre-qualification document, self- certified sheet duly supported by documents to demonstrate fulfilment of pre-qualification conditions (Please refer PQ document as attached Online). All the documents/ information enclosed with the Technical Bid shall be self- attested and certified by the bidder.

The Bidder shall be liable for forfeiture of its earnest money deposit, if any document/ information is found false/ fake/ untrue after opening of the technical bid. If it is found after acceptance of the bid, the bid sanctioning authority may at its discretion forfeit its performance security/ guarantee, security deposit, enlistment deposit and take any other suitable action.

The Cover 2 shall not contain any condition. Conditional Technical Bid shall be summarily rejected without assigning any reason.
The following documents shall also be submitted in Cover 2:

i. List of staff with the bidder
ii. List of Plants and Equipment owned and available for use with the bidder
iii. List of works in progress as per Para 3.6 of Detailed NIT
iv. List of works executed by the bidder during last 5 years along with the due date of completion and actual date of completion.
v. History of litigation and criminal record.

Complete technical evaluation will be based on online submitted documents.

However, at the time of issue of LoA (acceptance of bid) originals of all qualifying documents and document establishing eligibility alongwith affidavit and certificates from CA/Auditor will be required.

iii. **Cover 3 (Financial Bid) - In the 3rd cover** of online submission, bidders are directed to submit Financial Proposal in portal **(only online submission accepted).** This cover shall contain only the lump-sum offer in INR only. The bidder shall have to duly fill in their lump-sum offer in appropriate online form meant for it. This submission shall not contain any condition. Any condition stipulated in Cover 3 shall render the Financial Bid non-responsive and will be rejected without assigning any reason. The bidder shall ensure that this tendered amount quoted in the financial bid is not mentioned in any other document directly or indirectly. If any such mention is found, the tender will become invalid and shall not be considered.

Note: Only one bid will be submitted by a bidder, and a person who is a member of a bidding JV consortium, can neither bid separately nor as a part of another bidding consortium, whether directly or indirectly.

3.1. Earnest Money Deposit

i. Earnest Money Deposit (EMD) of amount specified in the tender document is to be submitted online according to the process specified on MP Govt. E-Procurement Portal.
ii. Bid not accompanied by EMD shall be liable for rejection as non-responsive.
iii. Subject to the provisions of Clause 3, EMD of Bidders whose bids are not accepted will be returned online.

3.2. Refund of Earnest Money Deposit

i. EMD of the successful Bidder will be discharged when the Bidder has signed the Agreement after furnishing the required Performance Security Deposit in the form of an unconditional and irrevocable bank guarantee and additional performance security, if any, in the form of an unconditional and irrevocable bank guarantee.
ii. Failure to sign the contract by the selected bidder, within the specified period, for whatsoever reason, shall result in forfeiture of the earnest money deposit.

3.3. Security Deposit

i. **For Capital works**

The security deposit in the form of performance security shall be submitted by the successful bidder for due performance of the contract under the terms and conditions mentioned in the bid which shall be equal to 10% (ten percent) of the sum of amount of contract in the form of the unconditional and irrevocable bank guarantee executed in favour of Managing Director, Madhya Pradesh Jal Nigam from a Scheduled Commercial Bank recognized by RBI (other than Co-Operative Banks) having an operational office in Bhopal prior to signing and execution of the agreement. The contractor can either submit Bank

Guarantee of 10% amount as described above or may submit Bank Guarantee for 5% contract amount at time of agreement in the form as mentioned above and remaining 5% will be deducted from Running Bill to make the sum equal to 10% of contract amount. The amount deducted from RA bills may also be replaceable by BG/ FDR of equal amount. Format for Bank Guarantee for Security Deposit / Performance Security is provided as Annexure 2. Format for Bank Guarantee for Withdrawal of Retention Money is provided as Annexure 3.

Additional performance security – In case the quote of the successful bidder is more than 15% below the PAC amount, then additional performance security shall be required to be submitted by the bidder. The amount of additional performance security shall be equal to difference between the quote submitted by the successful bidder and 85% of PAC. Format for Bank Guarantee for Additional Performance Security is provided as Annexure 4.

The security deposit shall be refunded after overall completion of capital work & one-year successful O&M work (certificate for such effect shall be issued by Engineer-in-Charge) i.e., fulfilling all the operation & maintenance conditions & achieving continuously all the service level benchmark of O&M for one year but after deposit of security deposit for O&M mentioned below.

ii. **For O&M works**

After one year of successful O&M but before release of capital works performance security, as mentioned above, a separate performance security for O&M which shall be equal to 2 years of operation & maintenance base cost in the form of the unconditional and irrevocable bank guarantee executed in favour of Managing Director, Madhya Pradesh Jal Nigam from a scheduled commercial bank recognized by RBI (other than Co-Operative Banks) having an operational office in Bhopal, has to be submitted by the contractor, substantially in the format given in Annexure 6. In case bank guarantee for the entire duration is not provided, the same can be provided for part duration in consultation with MPJN, however bank guarantee should be kept valid throughout the term of the O&M period through replacing the bank guarantee due to expire one month before the expiry date of the bank guarantee. The above performance security deposit shall be refunded after successful completion of O&M works of 10 years (certificate for such effect shall be issued by General Manager, PIU). The Employer (MPJN) shall be the sole judge to decide the time and manner of encashment of bank guarantee. The contractor shall submit a fresh/ renewed Bank Guarantee at least 30 days before the expiry of the existing Bank Guarantee, otherwise the MPJN shall have the right to encash the existing Bank Guarantee submitted as mentioned above.

3.4. Implication of Submission of Tender

Bidders are advised to visit the online procurement portal of the state sufficiently in advance of the date fixed for submission of the tender. A bidder shall be deemed to have full knowledge of all relevant documents soil samples of strata, bearing capacity to soil, hydrological, geological, and topographical site condition, etc. whether he inspects them or not.

The submission of a tender by a contractor means that he has read and has fully, completely and particularly understood the notice inviting tender, conditions of tender and all the contract documents and has made himself aware of all the standards and specifications in this respect, laid down in the National Building Code, relevant I.S. code and IS Specification, IRC specification, Manual for Rural Water Supply Schemes, CPHEEO Manual on Water Supply and Treatment, Annexure 'E' giving the scope and specification of the work to be done and the conditions of contract, the site of work and quarries with their approaches, etc. and has satisfied himself regarding the suitability and availability of the materials at the quarries. The responsibility of opening new quarries and construction and maintenance of approaches shall lie wholly with the contractor.

3.5. Income Tax Returns

The Bidder has to submit copies of PAN and Income Tax Return filed, for the relevant financial years (as specified in Clause 3.1 (i)) in Cover 2. This condition shall be applicable for each partner in case the bidder is participating as Joint Venture.

3.6. List of works in progress

The tender must be accompanied by a list of all the ongoing contracts held by the bidder at the time of submitting the tender in MPJN and elsewhere showing therein:

(i) Amount of each contract
(ii) Balance cost of work remaining to be done.

3.7. Prohibited Relationship

A bidder shall not be permitted to submit its tender for works in the Project Implementation Unit responsible for award and execution of this contract in which the near relatives of its owners/ partners/ directors/ key managerial personal/ significant shareholders are posted. The bidder shall intimate names of his near relatives working in the Government of Madhya Pradesh, Mantralaya, PHE Department and Madhya Pradesh Jal Nigam. The bidder shall also intimate the names of persons working with him in any capacity or employed by it and are near relatives of any gazetted officer in the M.P. Government, Mantralaya, Public Health Engineering Department or Madhya Pradesh Jal Nigam. Any breach of this condition by the contractor shall render him liable to be removed from the

approved list of registered contractors.

NOTE: By the terms near relative is meant for wife, husband, parents, sons, daughters, grandsons, granddaughters, brothers, sisters, brother-in-law, sister-in-law, father-in-law, and mother-in-law.

3.8. The lump-sum rate in INR shall be entered digitally both in words and figures. For any discrepancy in amount mentioned in figures and words, the amount in words shall be considered.

3.9. The tender must be signed by the owner/ partner of the firm or their authorized signatory. Each bidder shall mention the full name, residence, and place of business of the person signing the tender and this information shall be signed by the bidder with his usual signature. Tender by partnership firms shall mention the full names and address of all partners. An attested copy of the constitution of the firm and the registration number of the firm shall be furnished by all bidders. In case of Joint venture, the Lead partner having the authority to sign the Agreement shall place his/ her signature. Tender by corporation / company shall be signed with the legal name of entity followed by the full name and state of incorporation, and signature followed with designation of the person authorized to sign it.

3.10. The tender of one contractor for works shall not be seen, witnessed, or examined by other contractor or contractors who himself/ themselves has/ have submitted the tender for the same work. Failure to observe this condition shall render the tender of the contractor tendering as well as of those seeing, witnessing, or examining the tender liable for rejection.

3.11. Tender of any contractor who proposes any additions, deletion, alternations, variation, or modification to any of the conditions laid down in any of the documents prescribed by MPJN in this regard is liable to be rejected.

3.12. Pre-Bid Meeting

The bidder or his official representative, duly authorized by him by letter is advised to attend the pre-bid meeting at MPJN office, Bhopal.

a. Any change in the schedule of pre-bid meeting would be communicated on the portal only, and no intimation to bidders in this regard shall be given separately. Any prospective bidder may raise his queries and/ or seek clarifications in writing before or during the pre-bid meeting. The purpose of such meeting is to clarify issues and answer questions on any matter that may be raised at that stage. The Employer may, at his option, give such clarifications as are necessary.

b. Pursuant to the pre-bid meeting, if the Employer deems it necessary to amend the Bid Document, it shall be done by issuing amendment to the online NIT.

4. Opening & Acceptance of Tenders:

4.1. Place and time of opening

Date and time of opening as per Critical dates

Place of opening:

Office of **The Managing Director**, Madhya Pradesh Jal Nigam,
D-Wing, 2nd Floor, Vindhyachal Bhawan, Bhopal (M.P.) PIN – 462004

4.1.1. Cover 1 shall be opened first, and its contents shall be checked. In cases where Cover 1 does not contain all requisite documents, such bid shall be treated as non-responsive, and Cover 2 and Cover 3 of such bid shall not be opened.

4.1.2. Cover 2 (Technical Bid) shall be opened online at the time and date notified in the Critical dates.

The bidders shall have the freedom to witness opening of the Cover 2. If any or all the conditions of Cover 2 are not fulfilled, such bid shall be treated as non-responsive and Cover 3 (Financial Bid) of bidders shall not be opened.

4.1.3. Cover 3 (Financial Bid) of the Bidders who fulfil all the requirements of Cover 1 & Cover 2 shall be opened online at the time and date notified. The bidders shall have freedom to witness opening of the Cover 3.

4.1.4. After opening Cover 3, all responsive bids shall be compared to determine the lowest bid.

4.1.5. The tiebreaker among those bidders who submit the lowest evaluated & equally quoted bid will be in the following order:

- **a)** The Bidder with higher bid capacity.
- **b)** The Bidder with higher average annual turnover.
- **c)** The Bidder with higher Net Worth.
- **d)** Draw of lots

4.1.6. The Employer reserves the right to accept or reject any bid, and to annul the bidding process and reject all the bids at any time prior to the award of the contract, without incurring any liability whatsoever. In all such cases reasons shall be recorded.

4.1.7. Confidentiality

Information relating to examination, evaluation, comparison, and recommendation of contract award shall not be disclosed to bidders or any other person not officially concerned with such process until final decision on the bid is taken. Any attempt by a bidder to influence the Employer in the evaluation of the bids or award of the contract decisions may result in the rejection of the tender.

4.2. Conditional Tender

Any condition, additions, deletion, alternations, variation, or modification in Cover 1 or Cover 2 or Cover 3 is liable to be rejected without assigning any reason whatsoever.

4.3. No Canvassing

Canvassing for support or opposition in any form for the acceptance/ rejection of any tender is strictly prohibited. Any bidder doing so will render himself liable to penalties which may include removal of his name from the register of approved contractors or penal action under Section-B of M.P. Vinirdishat Bhrashta Acharan Nivaran Vidheyak, 1982.

4.4. Unsealed Tenders

The unsealed tenders shall be rejected, if not properly digitally sealed.

4.5. Authority of Acceptance

The authority competent to accept the tender reserves the right for accepting tenders for the whole work or part of it or distributing the work between one or more contractors/ firms.

4.6. Validity of Offer

Tender shall remain valid initially up to 180 days from the last date of submission of bid and in the event of the bidders withdrawing the offer before the aforesaid date for any reason what-so-ever, the Earnest Money deposited with the tender shall be forfeited by the Madhya Pradesh Jal Nigam. The validity of the bid can be extended by mutual consent in writing for a reasonable period only. The decision of the MD as to the reasonable period shall be final.

4.7. Legal address – Notices

Bidder shall mention in their tender, their place of residence and postal address clearly. The delivering of any communication at the above-named place or posting in a post-box or sending by registered post to the contractor shall be deemed to be sufficient service thereof. Any change in address shall be intimated, in writing to the Managing Director, Madhya Pradesh Jal Nigam, 2nd Floor, D-Wing, Vindhyachal Bhawan, Bhopal - 462004.

Nothing contained in the agreement and its contract conditions shall be deemed to preclude or render inoperative the service of any notice, letter, or other communication upon the contractor or its representative personally.

4.8. History of litigation and criminal record

The bidder must provide accurate information on any litigation, criminal proceeding or arbitration resulting from contracts (or otherwise) completed or under execution by him over the last 7 years. A history of arbitration awards against the applicant or any partner of the Joint Venture must be furnished.

In case the bidder has not provided such information and it comes to the notice of the employer, the tender will be rejected at whatsoever stage. In such cases, all the losses that will arise out of this issue will be recovered from the bidder/contractor and he will not have any defence.

Even though the bidder meets the criteria, it shall be disqualified, if it has made misleading or false representation in the form, statements and attachments submitted and/ or record of poor performance such as abandoning the work, not properly completing the contract, inordinate delays in completion, or financial failures etc.

4.9. Contractor's representative

The contractor shall, in his own absence, constantly and continuously keep on the works a competent representative, and any direction, instruction or explanations given by the Engineer-in-Charge or his representative to such representative shall be deemed to the direction, instruction or explanations given to the contractor in person. The contractor shall further provide all staff that is necessary for the supervision, execution, and measurement of the work to ensure full compliance with the terms of contract.

5. Specifications

5.1. The general specifications for the work have been given in the Annexure E. Nothing in this clause shall, however, curtail the right of the Engineer-in-Charge to alter the specification for any part or whole of the work if necessary, in the interest of work.

5.2. Materials of construction

All materials required for construction pertaining to this tender shall be in accordance with specifications mentioned in Annexure-E, standard specification of CPWD (with all amendment issued up to last date of submission of tender), I.R.C. specifications and B.I.S. code of practice. The B.I.S. specification will be given preference in case there is difference in CPWD specification and B.I.S. specification and the entire work pertaining to this tender shall be executed in accordance with the above specification.

5.3. Workmanship

The work shall be carried out according to the specification as mentioned in Annexure-E. The structure should have even and smooth finish. The decision of the Engineer-in-Charge in respect of workmanship shall be final.

All material used in the civil work should be of quality approved by the Engineer-in-Charge. The rejected material should be removed from the site immediately at the cost of contractor. All component of civil work including electrical and mechanical work should be of such workmanship and quality that they are liable to perform with maximum efficiency in the normal working condition. Use of non-corrodible materials for conveying chemicals and to resist abrasive action of sand and use of suitable paints and coatings for under water fittings to prevent contamination of water are expected to be provided by the Contractor.

5.4. Structural appearance

The structure should necessarily have acceptable architectural appearance. In this respect the opinion of the Madhya Pradesh Jal Nigam will be final and binding upon the contractor. The contractor shall have to modify and improve the appearance of the structure if desired by the Madhya Pradesh Jal Nigam without any extra payment.

5.5. Tests of Material & Structure

5.5.1. The structure as a whole and also its individual components will have to be tested for stability and water tightness, and necessary tests as required as per CPHEEO manual and BIS shall have to be carried out at Contractor's own cost.

5.5.2. The contractor shall make arrangement for testing of construction materials and concrete at site itself.

5.5.3. Testing of concrete, steel, cement, sand, metal, and all other material will be carried out at a place/lab/ institution as decided by Engineer-in-Charge at the cost of contractor as and when Engineer-in-Charge considers necessary. The contractor shall have to make all arrangements for sampling, transporting and other facilities for such testing.

6. Supply of material

6.1. No material shall be supplied by the Madhya Pradesh Jal Nigam.

6.2. No lead will be paid for any material such as water, cement, sand, metal, pipes, etc. or whatsoever.

7. Other Essential Conditions

7.1. Subcontracting

Subcontracting shall be permitted with the following conditions:

a. The Contractor may subcontract up to 25 per cent of the contract value with the prior approval of the Employer in writing, but the employer will not assign the Contract. Subcontracting shall not alter the Contractor's obligations.

b. The Contractor shall not sublet any specialized nature of work under this contract without specific prior approval from the Employer in writing.

c. Where such approval is granted, the Contractor shall not be relieved of any obligation or duty or responsibility, which it undertakes under the Contract.

d. Following shall not form part of subcontracting:
   i. Hiring of labour through a labour contractor
   ii. The purchase of Materials to be incorporated in the works
   iii. Hiring of plant & machinery

e. The sub-contractor will have to be registered in the appropriate category in the centralised registration system for contractors of the GoMP.

7.2. Taxes

All charges regarding taxes, and duties including the Income Tax, royalties, octroi duties, cess, charge, fee, or any other taxes or duties levied on the contractors' work by Government, Local bodies, etc. shall be payable by the contractor to the concerned authority.

All such charges and taxes except Goods and Services Tax, shall be deemed to be included in the contractor's bid. The Goods and Services Tax, as applicable, shall be paid separately to the contractor. The contractor is required to submit the GSTIN within 7 days of signing of agreement.

The rates quoted shall be inclusive of all taxes and duties except GST as mentioned above) and shall be F.O.R. site of work; the contractor shall be fully responsible for storage, watch and ward, insurance etc. of all stores, inventories, and assets, etc. during the construction and O&M periods. The increase in taxes, levies, cesses, etc. except GST in any form shall be payable by the contractor and the Employer shall not be liable to make any payment in this regard.

7.3. The royalty charges for extracting mining minerals for Govt. work will be paid by the contractor to the Collector or mining authorities as per rules. Employer shall not be liable to make any payment in this regard. However, the contractor has to produce 'No royalty due' Certificate from the Collector(s) of the concerned district(s) before preparation of the final bill. Statutory payments such as Worker's Welfare Tax and TDS on payments, as applicable, shall be deducted from the payments due to the contractor.

7.4. Rules of Labor Camps

The contractor shall be bound to follow the Madhya Pradesh Model rule relating to layout, water supply and sanitation on labor camps (vide Annexure - A) and the provisions of the National Building code of India, with regard to constructions and safety.

7.5. Fair Wages

The Contractor's shall pay not less than the fair wages to laborers engaged by him on the work, as per rules enclosed at Annexure 'B'.

7.6. Work in the Vicinity

The Managing Director reserves the right to take up departmental work or to award works on contract in the vicinity without prejudice to the terms of contract.

7.7. Best Quality of Construction Materials

Material of the best quality shall be used as approved by the Engineer-in-Charge.

If any of the quarry material of more than one quality is found, the material approved by the Engineer-in-Charge, will be used by the contractor. If the material of required specification conforming to B.I.S. code is not available in the nearby area/ quarry, the contractor shall arrange the same from the place where it is available.

7.8. Removal of Undesired Persons

The contractor shall on receipt of the requisition from the Engineer-in-Charge at once remove any person employed by him on the work who in the opinion of the Engineer-in-Charge is unsuitable or undesirable.

7.9. Amount Due from Contractor

Any amount due to Madhya Pradesh Jal Nigam from the contractor on any account of concerning work may be recovered from him as arrears of land revenue.

7.10. Tools and Plants

The contractor shall arrange all tools and plant to perform the contract. No tools and plants shall be provided by the Madhya Pradesh Jal Nigam.

7.11. Right to Increase or Decrease

The competent authority reserves the right to increase or decrease any item of work during the currency of the contract and the contractor will be bound to comply with the order of the competent authority without any claim for compensation, but payment will be made as per the condition of contract for variation.

7.12. Time Schedule and Interim Progress

The work shall be done by the contractor according to the schedule fixed by the Competent Authority for which a bar/ PERT/ CPM chart showing completion schedule shall have to be submitted by the contractor along with the progress to be achieved fortnightly, along with schedule program, within 30 days of signing the agreement. The Employer reserves the right to direct for change in detailed construction program after discussions with the Contractor to complete overall work within the time allowed under the contract.

7.13. Time of Contract

Time is the essence of the contract. Delay in the completion of the work shall amount to breach of contract by the contractor and shall entitle the Employer to treat the contract as repudiated and to claim damages from the party at breach. The work shall be carried

out strictly within the time period allowed for the construction for the respective schemes (including rainy season from the date of start of work, which is 21st day from the date of issue of LOA) by the contractor. The completion time for the respective schemes shall be reckoned from the 21st day from the issue of Letter of Acceptance (LOA). Liquidated damages will be dealt with in accordance with Clause 13 of the form of lump-sum contract.

7.13.1. Milestones

Following shall be the milestones based on the execution time to be adhered to by the Contractor for the respective schemes:

Milestone	Task Completion
Milestone 1	1/8th of the whole work before 1/4th of the whole time allowed has elapsed
Milestone 2	3/8th of the whole work before 1/2nd of the whole time allowed has elapsed
Milestone 3	3/4th of the whole work before 3/4th of the whole time allowed has elapsed
Milestone 4	Complete work within the stipulated time

7.14. Compensation for Delay

Without prejudice to the provisions of clause 7.13, if the Contractor fails to achieve the milestones for the respective schemes as defined in clause 7.13.1, and the delay in execution of work is attributable to the contractor, the Employer shall retain an amount from the sums payable and due to the contractor as per following scale:

i. Slippage up to 25% in financial target during the milestone under consideration - 2.5% of the value of the work that remained unexecuted in the related time span.
ii. Slippage exceeding 25% but up to 50% in financial target during the milestone under consideration - 5% of the value of the work that remained unexecuted in the related time span.
iii. Slippage exceeding 50 % but up to 75% in financial target during the milestone under consideration - 7.5% of the value of the work that remained unexecuted in the related time span.
iv. Slippage exceeding 75% in financial target during the milestone under consideration - 10% of the value of the work that remained unexecuted in the related time span.

The decision of Managing Director, Madhya Pradesh Jal Nigam in this regard shall be final and binding upon both the parties.

7.15. Payment

The payment of running account bills shall be made in INR only by RTGS/ ECS preferably or by 'Payee's Account' cheque drawn only on the Bank fixed by the Managing Director. No Bank commission charges for realizing such payments shall be payable by MPJN.

7.16. Transport of Material

The contractor shall make his own arrangement for transport, handling, and storage of all materials. The Madhya Pradesh Jal Nigam shall not be responsible or liable in any manner to arrange for priorities for getting wagons or any other materials. However, all possible assistance only by way of recommendations will be given, if it is found necessary in opinion of the Engineer-in-Charge. If it is proved ineffective, the Contractor shall have no claim for any compensation on this account.

7.17. Compliance with Labour Regulations

During continuance of the Contract, the Contractor and his sub-Contractors shall abide at all times by all existing labour laws for the time being in force in India, including, enactments and rules made thereunder, 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 labour laws that are applicable to construction industry are given in the Contract Data. 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/ bye laws/ Acts/ Rules/ regulations including amendments, if any, on the part of the Contractor, the Employer shall have the right to deduct from any money due to the Contractor. The Employer 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.

7.18. The Contractors shall make his own arrangement at his own cost for housing of his staff and stores for the work and M.P. Model Rules relating to layout, water supply and sanitation shall be followed.

7.19. Observance of Law

The contractor shall abide by all the laws for the time being in force in India including the regulations and by-laws of any local authority and/ or of any water or power (electricity) companies, with whose system the structure is proposed to be connected.

7.20. Accident - Hoardings - Lighting Observations

i. When there is any Likelihood of accidents, the contractor shall comply with all and any requirements of law on the subject, and shall provide suitable hoarding, lighting, and watchman as necessary or directed by Engineer-in-Charge.

ii. It shall be the contractor's sole responsibility to protect the public and its employees against accident from any cause and it shall indemnify Madhya Pradesh Jal Nigam against any claims for damages for injury to any person or any property, resulting, from any such accidents; and shall, where the provision of the Workmen's Compensation Act apply, take steps to properly insure against any claims thereunder.

iii. On the occurrence of any accident which results in the death of any of the workman or workmen employed by the contractor or which is so serious as to be likely to result in the death of any such workman or workmen, the contractor shall, within 24 hours of the happening of such accident, intimate in writing to the concerned PIU of the Madhya Pradesh Jal Nigam and Police about the facts of such accident. The contractor shall indemnity Madhya Pradesh Jal Nigam against all loses or damage sustained by Madhya Pradesh Jal Nigam resulting directly or indirectly from his failure to give intimation in the manner aforesaid including the penalties or fines if any payable by Madhya Pradesh Jal Nigam as consequence of failure to give notice under the Workmen's Compensation Act.

iv. In the event of an accident in respect of which compensation may become payable under the Workman's Compensation Act VIII of 1923 whether by the contractor or by the Government as principal employer it shall be lawful for the Engineer-in-Charge to deduct out of monies due and payable to the contractor such sum or sums of money as in the opinion of the said Engineer-in-Charge may be sufficient to meet such liability. The opinion of Managing Director shall be final in regard to all matters under this clause.

7.21. Insurance

Copies of Work compensation policies of labour and insurance of whole site should be given to engineer in charge before starting of the work. It shall be the duty of contractor to keep these policies in force during the existence of contract and get them renewed as and when required.

7.22. Site Order book

An order book, to be called as site order book shall be kept and maintained at the office of Madhya Pradesh Jal Nigam at the site of work. All orders regarding the work are to be entered in this book. All entries shall be signed and dated by Madhya Pradesh Jal Nigam officers in direct charge of the work or his authorized representatives and noted by the contractor or his duly authorized representative. The site order book shall not be removed from work site, except with the written permission of the Engineer-in-Charge.

7.23. Blasting

If limited/ suppressed blasting is necessarily required to be resorted to by the contractor in excavation of foundation, it shall be the sole and exclusive responsibility of the contractor to observe all rules and regulations regarding permission, license procurement and storage of material thereof.

8. Special Conditions

8.1. Details of Joint Venture

When the application is made by a joint venture/ consortium of two or more firms, it shall be signed by their duly authorized representatives and accompanied by a legal document signed by all the parties to the joint venture/ consortium confirming therein a clear and definite manner the proposed administrative arrangements for the management and execution of the contract, the delineation of duties, responsibilities and scope of work to be undertaken by each of the parties, the authorized representative of the joint venture, and an undertaking that the parties are jointly and severally liable to the Madhya Pradesh Jal Nigam for the performance of the contract. One of the firms shall act as the lead firm representing the joint venture/consortium and the duties, responsibilities and power of such lead firm shall be specifically indicated. The JV members should nominate one of the members as Lead Partner of the JV. JV can have maximum 3 members. All the members of joint venture should have minimum 26% shareholding in the JV.

Experience and past performance of each of the parties of the joint venture/ consortium on works of similar nature within the last three years, current works in hand and other contractual commitments shall be as per Clause 3: Eligibility Criteria of Part II.

The joint venture must satisfy the criteria mentioned in Clause 3: Eligibility Criteria of Part II. The relevant figures of each of the partner shall be added together to arrive at the joint venture's total capacity.

The formation of joint ventures after submission of tender, and any change in the joint venture, will be subject to the written approval of the Managing Director prior to the opening of price bids.

Also, that –

(a) Any change in composition of the JV, whether by way of transfer of shares by existing members, or by issue of new shares to new members or in any other manner, be subject to prior approval of the MP Jal Nigam, until completion of the Operation and Maintenance period.

(b) In no event, shall the lead member of JV consortium be allowed to exit the JV consortium or dilute its membership below 26%, until completion of the Operation and Maintenance period.

(c) A check must be done for the JV consortium, as well as for its members and if its members are corporate bodies, then for the members of such corporate bodies as well. This is to ensure that any person otherwise disqualified/ banned from participating in the NIT, is not able to do so indirectly by virtue of being a member of the JV consortium or by being a member of any member(s) of the JV consortium.

Breach of the above conditions entitles Madhya Pradesh Jal Nigam to rescind the contract without any liability, but subject to its right to receive the prescribed liquidated damages and other rights it may have under the contract, this NIT or under law.

Also, in case of breach of the above provisions, it shall attract disqualification/ ban from participating in this NIT and future tenders, without prejudice to the rights of Madhya Pradesh Jal Nigam under this NIT and/or applicable laws.

8.1.1. Bid shall be signed so as to legally bind all partners, jointly and severally, and shall be submitted with a copy of the joint venture agreement providing the joint and several liabilities with respect to the contract, as given in Annexure-1. All partners of the Joint Venture shall submit a signed copy of Joint Bidding Agreement, as given in Annexure 3, Schedule C of Prequalification Document. All members of Joint Venture shall individually submit signed copy of Power of Attorney as provided in Annexure 3, Schedule A of Prequalification Document. All members of the joint venture shall jointly submit signed copy of Power of Attorney for Lead Member of Joint Venture as provided in Annexure 2, Schedule C of Prequalification Document.

8.1.2. All witnesses and sureties shall be person of status and probity and their full names, occupations and addresses shall be stated below their signatures.

8.2. Executive Authority of Works

All works to be executed under this contract shall be executed under the direction and subject to the approval in all respects, of concerned Engineer-in-Charge of the Madhya Pradesh Jal Nigam under which the work is being executed, for time being who shall be entitled to direct at what point or points and in what manner they are to be commenced and from time to time carried out.

8.2.1. Engineer-in-Charge

The Engineer-in-Charge wherever used in the contract means the Chief General Manager of Madhya Pradesh Jal Nigam under which the work is executed.

8.2.2. The Engineer-in-Charge shall have the power to direct his subordinate staff such as Manager, Dy. Manager as his representative for management and execution of works and any direction, explanation given by his representatives shall be held to have been given by the Engineer-in-Charge.

8.3. Agreement

The notes and specifications given in this detailed notice inviting tender and its Annexures are to be read in conjunction with instructions and conditions given in the short notice inviting tenders and the conditions of contract. These have been intended to supplement the provisions, in the NIT and the condition of contract. All, these conditions shall be binding on the parties to the contract and shall form part of the agreement.

8.3.1. Execution of Agreement

The Bidder whose tender has been accepted shall have to execute the agreement in the prescribed form within twenty days from the date of issue of information of its tender acceptance by the Competent Authority (confirmation of fax message or e-mail at the contractor's address or fax number shall be deemed sufficient evidence for receipt of information at bidder's end) and shall execute the unconditional and irrevocable bank guarantee in favour of the Employer. Failure to do so will result in the Earnest Money being forfeited by the Madhya Pradesh Jal Nigam and its tender being cancelled.

8.3.1.1. Contractor's fax number and e-mail address

The contractor shall provide his fax number and e-mail address to Engineer-in- Charge and any confirmation of message sending at this number or e-mail address shall be deemed as if the message has been delivered to the contractor.

8.4. Technical Staff

The contractor shall employ technical staff to ensure that no work front / site of works is ever without supervision from qualified personnel. Lack of supervision staff is not acceptable and minimum staff as given below shall be deployed during the execution of works.

Technical Personnel

Position	Minimum Qualification	Minimum Number	
		For work costing up to Rs. 100 Crore	For work costing above Rs. 100 Crore
Project Engineer	BE (Civil)	01	01
Graduate Site Engineer	BE	03	One per Rs. 40 Crore or part thereof
Laboratory Technician	Diploma / BE (Civil Engineer)	01	02
Diploma Engineer	Diploma / BE (Civil Engineer)	One per Rs. 20 Crore work	One per Rs. 20 Crore work

Project Engineer – An overall in charge having a minimum of 10 years' experience shall be available at site office or local office to take the instructions of the Employer for implementation.

Graduate Site Engineer – A graduate engineer, having minimum 5 years' experience in the field of water supply works, shall be present at each work site where the execution of concreting work or other important civil, mechanical, or electrical works are under execution. However, one Graduate Engineer may get the work from maximum four diploma engineers employed under him, but presence of any one engineer is a must at the time of execution of work at that site.

Diploma Engineer - A diploma engineer, having minimum 3 years' experience/ BE (Civil) having minimum 1-year experience in the field of water supply works, shall be present at each work site where the execution of concreting work or other important civil, mechanical, or electrical works are under progress.

Technical staff should be available at site, whenever required by the Engineer-in-Charge to take instructions.

In case the contractor fails to employ the technical staff as aforesaid; Engineer-in-Charge shall have the right to take suitable remedial measures. The Contractor shall give the names and other details of the Graduate Engineer/ Diploma Engineer whom he

intends to employ or who is under employment, at the time he commences the work.

The Contractor shall submit a certificate to the effect that the Graduate Engineer/ Diploma Engineer is exclusively in his employment.

A retired Engineer/ Assistant Engineer who is holding Diploma may be treated at par with the Graduate Engineer.

Experienced non-engineer employee of the contractor may be considered at par as diploma engineer after approval of the Engineer-in-Charge.

In case the contractor fails to employ the technical staff as aforesaid, he shall be liable to pay to the Madhya Pradesh Jal Nigam, a sum of INR 30,000/- (INR Thirty Thousand only) for each of defaults in case of Graduate Engineer and INR 20,000/- (INR Twenty Thousand only) for each month in case of Diploma Engineer.

8.5. Price Adjustment

8.5.1. Applicability

1. The price adjustment clause shall apply only for the works executed from the date of start of work (21st day from LOA) until the end of the scheduled completion date or extensions granted for reasons attributed to the Employer.
2. The Contractor shall not be entitled to any benefit arising from the price adjustment clause for extension in the contract period for reasons attributed to the Contractor.
3. In the Force Majeure event, the price escalation clause shall apply as given in the Force Majeure clause.

8.5.2. Procedure

Enforcement date of SOR means the date of applicability of the ISSR Volume 1 to 4 published by the Urban Administrative and Development Department, Govt. of Madhya Pradesh, which is 02.08.2021. This date will be considered for applicability of price adjustment provisions for all the components.

The formula for adjustment of prices is:

R = The value of work done during the month. It will include the amount of secured advance granted, if any during the month, less the amount of secured advance recovered, if any during the month, less value of material issued by MPJNM, if any during the month.

i. Adjustment for Labour Component

Price adjustment for increase or decrease in the cost due to labour shall be paid in accordance with the following formula:

VL = 0.85 X Pi / 100 X R (Li – Lo) / Lo

VL = increase or decrease in the cost of work during the month under consideration due to changes in rates for local labour

Lo = the consumer price index for industrial workers for the State for the location nearest to the work site on the enforcement date of SOR, as published by Labour Bureau, Ministry of Labour, Government of India

Li = the consumer price index for industrial workers for the State for the location nearest to the work site for the month under consideration as published by Labour Bureau, Ministry of Labour, Government of India

Pi = Percentage of Labour component of the work

ii. Adjustment for Cement Component

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

Vc = 0.85 X Pc / 100 X R (C1-Co) / Co

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

Co = The all-India wholesale price index for Ordinary Portland Cement (OPC) on the enforcement date of SOR, as published by the Economic Advisor, DPIIT, Ministry of Commerce & Industry Government of India, New Delhi

C1 = The all India wholesale price index for Ordinary Portland Cement (OPC) for the month under consideration as published by the Economic Advisor, DPIIT, Ministry of Commerce & Industry Government of India, New Delhi

Pc = Percentage of cement component of the work

iii. Adjustment of Steel Component

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

Vs = 0.85 X Ps /100 X R (Si - So) / So

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

So = The all-India wholesale price index for mild steel long products on the enforcement date of SOR, as published by the Economic Advisor, DPIIT, Ministry of Commerce & Industry Government of India, New Delhi

Si = The all India average wholesale price index for mild steel long products for the month under consideration as published by the Economic Advisor, DPIIT, Ministry of Commerce & Industry Government of India, New Delhi

Ps = Percentage of steel component of the work

Note: For the application of this clause, index of mild steel long products has been chosen to represent steel group.

iv. Adjustment of DI component

Price adjustment for increase or decrease in the cost of DI material procured by the Contractor shall be paid in accordance with the following formula:

Vd = 0.85 X Pd /100 X R (D1-Do)/Do

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

Do = The all-India wholesale price index for pig iron on the enforcement date of SOR, as published by the Economic Advisor, DPIIT, Ministry of Commerce & Industry Government of India, New Delhi

Di = The all India average wholesale price index for pig iron for the month under consideration as published by the Economic Advisor, DPIIT, Ministry of Commerce & Industry Government of India, New Delhi

Pd = Percentage of DI component of the work

Note: For the application of this clause, index of Pig Iron has been chosen to represent DI material group.

v. Adjustment of HDPE Component

Price Adjustment for increase or decrease is the cost of HDPE shall be paid in accordance with the following formula:

Vr = 0.85 X Pr / 100X R (Ri – Ro) / Ro

Vr = Increase or decrease in the cost of work during the month under consideration due to changes in rates for HDPE Resin

Ro = The official retail price of HDPE resin at the IOCL depot nearest to the work site on the enforcement date of SOR

Ri = The official retail price of HDPE resin at the IOC depot nearest to the work site for the 15th day of the month under consideration

Pr = Percentage of HDPE component of the work

Note: For the application of this clause, price of HDPE resin has been chosen to represent HDPE component.

vi. Adjustment of POL (Fuel and Lubricant) Component

Price adjustment for increase or decrease in cost of POL (Fuel and Lubricant) shall be paid in accordance with the following formula:

Vf = 0.85 X Pf / 100 X R (Fi– Fo) / Fo

Vf = Increase or decrease in the cost of work during the month under consideration due to changes in rates for fuel and lubricants

Fo = The official retail price of High-Speed Diesel (HSD) at the existing consumer pumps of IOCL nearest to the work site on the enforcement date of SOR

Fi = The official retail price of High Speed Diesel (HSD) at the existing consumer pumps of IOC nearest to the work site for the 15th day of month under consideration

Pf = Percentage of fuel and lubricants component of the work

Note : For the application of this clause, the price of High-Speed Diesel has been chosen to represent fuel and lubricants group.

vii. Adjustment for Plant and Machinery Spares component

Price adjustment for increase or decrease in the cost of plant and machinery spares procured by the Contractor shall be paid in accordance with the following formula:

Vp = 0.85 X Pp /100 X R (Pi – Po) / Po

Vp = Increase or decrease in the cost of work during the month under consideration due to changes in rates for plant and machinery spares

Po = The all-India wholesale price index for manufacturer of machines for mining, quarrying and construction on the enforcement date of SOR, as published by the Economic Advisor, DPIIT, Ministry of Commerce & Industry Government of India, New Delhi

Pi = The all India wholesale price index for manufacturer of machines for mining, quarrying and construction for the month under consideration as published by the Economic Advisor, DPIIT, Ministry of Commerce & Industry Government of India, New Delhi

Pp = Percentage of plant and machinery spares component of the work

Note : For the application of this clause, index of manufacturer of machines for mining / quarrying and construction has been chosen to represent the Plant and Machinery Spares group.

viii. Adjustment of Other Materials Component

Price adjustment for increase or decrease in cost of local materials other than cement, Steel, Bitumen and POL procured by the contractor shall be paid in accordance with the following formula:

Vm = 0.85 X Pm / 100 X R (Mi – Mo) / Mo

Vm = Increase or decrease in the cost of work during the month under consideration due to changes in rates for local materials other than cement, Steel, Bitumen and POL

Mo = The all-India wholesale price index (all commodities) on the enforcement date of SOR, as published by the Economic Advisor, DPIIT, Ministry of Commerce & Industry Government of India, New Delhi

Mi = The all India wholesale price index (all commodities) for the month under consideration as published by the Economic Advisor, DPIIT, Ministry of Commerce & Industry Government of India, New Delhi

Pm = Percentage of local material component (other than Cement, Steel, Bitumen and POL) of the work. Plant and Machinery spares component of the work

The following percentages will govern the price adjustment for the entire contract:

S. No.	Component	Percentage of component in the work
1	Labour component - Pi	10
2	Cement component - Pc	5
3	Steel component – Ps	5
4	Pig Iron - Pd (for DI Pipe)	40
5	HDPE / Resin component - Pr	20
6	POL component - Pf	5
7	Plant & Machinery Spares component - Pp	7.5
8	Other Materials component - Pm	7.5
	Total	**100**

Note: Ordinarily the 8 components shown above are components of the civil works. However, for specific works in which some components not included in the aforementioned 8 components, form a substantial part of the works the same can be provided using similar formula and related indices. In all cases the sum total of percentage of different components shall be 100%.

(Amended as per vide Govt. Order No. F-53-55-2018-19-Yo-1314 Bhopal dated 28-3-2018)

8.5.3. 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.

8.5.4. For the purpose of clarity, it is pointed out that the price adjustment may be either positive or negative, i.e., if the price adjustment is in favour of the Employer, the same shall be recovered from the sums payable to the contractor.

8.6. Notice to be given before Work is covered up

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

8.7. Dispute Resolution System

(i) No dispute can be raised anywhere else except before the Competent Authority i.e., Managing Director, Madhya Pradesh Jal Nigam in writing after giving full description and grounds of dispute. It is clarified that merely recording protest while accepting measurement and/ or payment shall not be considered as raising a dispute.

(ii) Limitation: No dispute can be raised after 45 days of its first occurrence. Any dispute raised after expiry of 45 days of its first occurrence shall not be entertained and the Employer shall not be liable for claims arising out of such dispute.

(iii) After receiving the dispute, it shall be put up within the MPJN Technical committee for discussion & recommendations to the Competent Authority i.e., Project

Director, who shall decide the matter within 45 days.

(iv) Appeal against the order of the Competent Authority i.e., Project Director must be preferred within 30 days to the Appellate Authority i.e., Managing Director of MPJN. The Appellate Authority i.e., Managing Director (MD) of MPJN shall decide the dispute within 45 days.

(v) Appeal against the order of the Appellate Authority can be referred before the Madhya Pradesh Arbitration Tribunal constituted under Madhya Pradesh Madhyastham Adhikaran Adhiniyam, 1983.

(vi) The contractor shall have to continue execution of the works with due diligence notwithstanding pendency of a dispute before any authority or forum.

* **Note:** This clause shall supersede the dispute resolution related provisions in Clause 17 of Form F.

8.8. Action and compensation payable in case of poor work

If at any time before the paper of unconditional and irrevocable bank guarantee is returned to the Contractor, it shall appear to the Engineer-in-Charge or his subordinates in charge of the work that any work has been executed with unsound, imperfect or unskilled workmanship or with materials of inferior quality or, that any materials or articles provided for the execution of the work are unsound or of a quality inferior to the contracted for, or otherwise not in accordance with contract, it shall be lawful for the Engineer-in-Charge to intimate this fact in writing to the contractor and then not withstanding of the fact that the work, materials or articles complained of may have been inadvertently passed, certified the work, and paid for, the contractor shall be bound forthwith to rectify or remove and reconstruct the works specified in whole or parts as the case may require, or if so required shall remove the materials or articles so specified and provide other proper & suitable materials or articles at his own charge and cost and in the event of his failing to do so within a period to be specified by the Engineer-in-Charge in the written intimation aforesaid, the contractor shall be liable to pay compensation at the rate of one percent on the amount of the estimate of that part of work for every day not exceeding ten days during which the failure so continues and in the case of any such failure, the Engineer-in-Charge may rectify or remove and re-execute the work or remove and replace the materials or articles complained of, as the case may be at the risk and expense in all respects of the contractor. Should the Engineer-in-Charge consider that any such inferior work or materials as described above may be accepted or made use of, it shall be within his discretion to accept the same at such reduced rates and as he may fix thereof. (Please refer Clause 13 under 'Conditions of Contract' for the penalty due to delay in work).

8.9. Force Majeure:

8.9.1. The term "Force Majeure" means an exceptional event or circumstance:

(a) which is beyond a Party's control,
(b) which such Party could not reasonably have provided against before entering into the Contract,
(c) which, having arisen, such Party could not reasonably have avoided or overcome, and
(d) Which is not substantially attributable to the other Party.

8.9.2. Force Majeure may include, but is not limited to, exceptional events or circumstances of the kind listed below, so long as conditions (a) to (d) above are satisfied:

i. war, hostilities (whether war be declared or not), invasion, act of foreign enemies,

ii. rebellion, terrorism, sabotage by persons other than the Contractor's Personnel, revolution, insurrection, military or usurped power, or civil war,

iii. riot, commotion, disorder, strike or lockout by persons other than the Contractor's Personnel,

iv. munitions of war, explosive materials, ionizing radiation or contamination by radioactivity, except as may be attributable to the Contractor's use of such munitions, explosives, radiation or radioactivity, and

v. natural catastrophes such as earthquake, hurricane, typhoon or volcanic activity.

8.9.3. In the event of either party being rendered unable by force majeure to perform any duty or discharge any responsibility arising out of the contract, the relative obligation of the party affected by such force majeure shall upon notification to the other party be suspended for the period during which force majeure event lasts. The cost and loss sustained by either party shall be borne by respective parties and the other party shall not be liable in any manner whatsoever.

8.9.4. For the period of extension granted to the Contractor due to Force Majeure, the price adjustment clause shall apply, as per following formula:

$V_{fm} = 0.75 \times P_{fm} \times (I_t - I_o) / I_o$ Where

V_{fm} = Adjustment of value of work affected as per Force Majeure clause for that part of work as per Price Break-up Schedule

Pfm = Value of part of work affected as per Force Majeure clause on the basis of Price Break- up Schedule

I_o = Wholesale Price Index published by RBI for All Commodities applicable on the enforcement date of SOR as specified in Clause 8.5.2.

I_t = Wholesale Price Index published by RBI for All Commodities at the time of consideration

Note: However, if there is any delay in acquisition of land as per Para 18, Part – I of NIT, the Employer shall give possession of the whole Site or such parts of the Site as are sufficient to enable the Contractor to commence and proceed with the execution of the Works in accordance with the approved Work Program and possession of such further portions of the Site as may be required to enable Contractor to proceed with the execution of the Works with due diligence in accordance with the agreed program or proposals, as the case may be shall be provided to the Contractor. In the event of non-possession of site as per Contractor's program arises, the Contractor will reschedule his program according to availability of site. If the Employer fails to give possession of the whole or part of the Site to the contractor in accordance with above provisions, the Employer is deemed to have delayed the start of the relevant activities and this shall be considered for price escalation.

8.9.5. The time for performance of the relative obligation suspended by the force majeure shall stand extended by the period for which such cause lasts. Should the delay caused by force majeure exceed twelve months, the parties to the contract shall be at liberty to foreclose the contract after holding mutual discussions.

8.10. Extension of Time

If the contractor shall desire an extension of the time ("**EOT**") for completion of the work on the grounds of his having been unavoidably hindered in its execution or any other ground, it shall apply in writing to the Engineer-in-Charge and the Officer with whom he has signed the agreement. The Engineer-in-Charge shall, if in his opinion, (which shall be final) find reasonable grounds, may authorize such extension for the respective schemes for such period as is reasonably necessary under the circumstances. Any further extension of time for the respective schemes shall be subjected to the previous sanction of the Managing Director (grounds to be shown therefore, for which a register will be maintained for the occurrence of the hindrances and its resolution, which will be duly signed by the contractor and the Engineer-in-charge.

i) The contract is for completion of works and therefore non approval of EOT shall not in any way invalidate the contract. The contractor will have to complete the works.

ii) In the event of delays attributable to the contractor, the EOT shall not be given by the Engineer-in-Charge and the Liquidated Damages shall be levied from the contractor in accordance with the provisions of the contract.

iii) In the event, the delays are not attributable to the contractor, the EOT may be issued by the Engineer-in-Charge without imposition of Liquidated Damages either suo moto or on a written request of the contractor.

It is clarified that out of the total delays in completion of works, the EOT shall be issued only for the part, which is not attributable to the contractor.

(Amended as per Govt. Order No. F-53-55-2018-19-Yo-1154 Bhopal, dated 23-03-2018)

8.11. Defect Liability Period

The defect liability period in respect of the entire structure as a whole or in parts of individual components included in the contract shall be up to the end of one year after the successful testing and commissioning of the works.

8.12. Contractor liable for damage done and for imperfection for the period up to the end of Operation and Maintenance after completion certificate

If the contractor or its work people, or servants shall break, deface, injure or destroy any part of the building in which they may be working or any building, road, road kerbs, fences, enclosures, water pipe, cables, drains, electric or telephone posts or wires, trees, grass or grass land or cultivated ground contiguous to the premises on which the work or any part of it is being executed, or if any damage shall happen to the work while in progress, from any cause whatsoever, or any imperfections become apparent in it, within the Operation and Maintenance period after a certificate, final or otherwise of its completion shall have been given by the Engineer-in-Charge as aforesaid, the contractor shall make the same good at his own expenses or in default the Engineer- in-Charge may cause the same to be made good by other workmen and deduct the expenses (of which the certificate of the Engineer-in-Charge shall be final) from any sums that may be then or any time thereafter may become due to the contractor or from his security deposit or of sufficient portion thereof.

9. Termination by Engineer-in-Charge/ MPJN

9.1. Termination for Employer's Convenience

9.1.1. The Employer may at any time terminate the Contract for any reason by giving the Contractor a notice of termination that refers to this Sub-Clause 9.1.

9.1.2. Upon receipt of the notice of termination under Sub-Clause 9.1.1, the Contractor shall either immediately or upon the date specified in the notice of termination:

(a) cease all further work, except for such work as the Employer may specify in the notice of termination for the sole purpose of protecting that part of the Facilities already executed, or any work required to leave the Site in a clean and safe condition

(b) terminate all subcontracts, except those to be assigned to the Employer pursuant to paragraph (d) (ii) below

(c) remove all Contractors' Equipment from the Site, repatriate the Contractors' and its Subcontractors' personnel from the Site, remove from the Site any wreckage, rubbish and debris of any kind, and leave the whole of the Site in a clean and safe condition

(d) In addition, the Contractor, subject to the payment specified in Sub-Clause 9.1.3, shall

(i) Deliver to the Employer the parts of the Facilities executed by the Contractor up to the date of termination

(ii) To the extent legally possible, assign to the Employer all right, title and benefit of the Contractor to the Facilities and to the Plant and Equipment as of the date of termination, and, as may be required by the Employer, in any subcontracts concluded between the Contractor and its Subcontractors

(iii) Deliver to the Employer all non-proprietary drawings, specifications and other documents prepared by the Contractor or its Subcontractors as at the date of termination in connection with the Facilities.

9.1.3. In the event of termination of the Contract under Sub-Clause 9.1.1, the Employer shall pay to the Contractor the following amounts:

(a) The Contract Price, properly attributable to the parts of the Facilities executed by the Contractor as of the date of termination

(b) The costs reasonably incurred by the Contractor in the removal of the Contractor's Equipment from the Site and in the repatriation of the Contractor's and its Subcontractor's personnel.

(c) Any amounts to be paid by the Contractor to its Subcontractors in connection with the termination of any subcontracts, including any cancellation charges

(d) Costs incurred by the Contractor in protecting the Facilities and leaving the Site in a clean and safe condition pursuant to paragraph (a) of Sub-Clause 9.1.2.

(e) The cost of satisfying all other obligations, commitments and claims that the Contractor may in good faith have undertaken with third parties in connection with the Contract and that are not covered by paragraphs (a) through (d) above.

9.2. Termination for Contractor's Default

9.2.1. The Employer, without prejudice to any other rights or remedies it may possess, may terminate the Contract forthwith in the following circumstances by giving a notice of **termination** and its reasons therefore to the Contractor-

a) If the Contractor becomes bankrupt or insolvent, has a receiving order issued against it, compounds with its creditors, or, if the Contractor is a corporation, a resolution is passed or order is made for its winding up (other than a voluntary liquidation for the purposes of amalgamation or reconstruction), a receiver is appointed over any part of its undertaking or assets, or if the Contractor takes or suffers any other analogous action in consequence of debt.

b) If the Contractor assigns or transfers the Contract or any right or interest therein in violation of the provision of the Contract.

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

d) If the contractor fails to achieve mutually agreed deadline (as set in mutually agreed Project Execution Plan/ CPM/ Bar chart/ PERT chart) for consecutive 3 months, Employer shall issue contract termination notice giving suitable time to contractors which may be up to time agreed between Employer and Contractor. In case, Contractor does not improve its performance as per contract termination notice, which shall be within overall plan under mutually agreed project execution plan, Employer will terminate the contract and encash performance securities.

For the purpose of this Sub-Clause:

a) corrupt practice is defined as offering, giving, receiving or soliciting, directly or indirectly, anything of value to influence improperly the actions of another party;

b) fraudulent practice is any act or omission, including a misrepresentation, that knowingly or recklessly misleads or attempts to mislead, a party to obtain a financial or other benefit or to avoid an obligation;

c) collusive practice is an arrangement between two or more parties designed to achieve an improper purpose, including to influence improperly the actions of another party;

d) coercive practice is impairing or harming, or threatening to impair or harm, directly or indirectly, any party or the property of the party to influence improperly the actions of a party;

e) obstructive practice is

i. deliberately destroying, falsifying, altering or concealing of evidence material to the investigation or making false statements to investigators in order to materially impede an Employer's investigation into allegations of a corrupt, fraudulent, coercive or collusive practice; and/ or threatening, harassing or intimidating any party to prevent it from disclosing its knowledge of matters relevant to the investigation or from pursuing the investigation;

or

ii. acts intended to materially impede the exercise of the Employer's inspection and audit rights.

In persuasions of its policy, the Employer will sanction a firm or individual, including declaring ineligible, either indefinitely or for a stated period of time, to be awarded a contract if it at any time determines that the firm has, directly or through an agent, engaged in corrupt, fraudulent, collusive, coercive or obstructive practices in competing for, or in executing, a contract.

9.2.2. The Employer, without prejudice to any other rights or remedies it may possess, may terminate the Contract forthwith by giving a notice of termination and its reasons therefore to the Contractor, if the Contractor:

(a) has abandoned or repudiated the Contract

(b) has without valid reason failed to commence work on the Facilities promptly or has suspended the progress of Contract performance for more than twenty-eight (28) days after receiving a written instruction from the Employer to proceed

(c) persistently fails to execute the Contract in accordance with the Contract or persistently neglects to carry out its obligations under the Contract without any cause

(d) refuses or is unable to provide sufficient materials, services or labour to execute and complete the Facilities in the manner specified in the program furnished under the Contract, at rates of progress that give reasonable assurance to the Employer that the Contractor can attain Completion of the Facilities by the Time for Completion as extended, then the Employer may, without prejudice to any other rights it may possess under the Contract, give a notice to the Contractor stating the nature of the default and requiring the Contractor to remedy the same. If the Contractor fails to remedy or to take steps to remedy the same within fourteen (14) days of its receipt of such notice, then the Employer may terminate the Contract forthwith by giving a notice of termination to the Contractor that refers to this Sub-Clause 9.2.

9.2.3. Upon receipt of the notice of termination under Clauses 9.2.1 or 9.2.2, the Contractor shall, either immediately or upon such date as is specified in the notice of termination:

(a) cease all further work, except for such work as the Employer may specify in the notice of termination for the sole purpose of protecting that part of the Facilities already executed, or any work required to leave the Site in a clean and safe condition.

(b) terminate all subcontracts, except those to be assigned to the Employer pursuant to paragraph (d) below

(c) deliver to the Employer the parts of the Facilities executed by the Contractor up to the date of termination

(d) to the extent legally possible, assign to the Employer all right, title and benefit of the Contractor to the Facilities and to the Plant and Equipment as of the date of termination, and, as may be required by the Employer, in any subcontracts concluded between the Contractor and its Subcontractors

(e) deliver to the Employer all drawings, specifications and other documents prepared by the Contractor or its Subcontractors as of the date of termination in connection with the Facilities.

9.2.4. The Employer may enter upon the Site, expel the Contractor, and complete the Facilities itself or by employing any third party. The Employer may, to the exclusion of any right of the Contractor over the same, take over and use with the payment of a fair rental rate to the Contractor, with all the maintenance costs to the account of the Employer and with an indemnification by the Employer for all liability including damage or injury to persons arising out of the Employer‘s use of such equipment, any Contractor‘s Equipment owned by the Contractor and on the Site in connection with the Facilities for such reasonable period as the Employer considers expedient for the supply and installation of the Facilities.

Upon completion of the Facilities or at such earlier date as the Employer thinks appropriate, the Employer shall give notice to the Contractor that such Contractor’s Equipment will be returned to the Contractor at or near the Site and shall return such Contractor’s Equipment to the Contractor in accordance with such notice. The Contractor shall thereafter without delay and at its cost remove or arrange removal of the same from the Site.

9.2.5. Subject to Sub-Clause 9.2.6., the Contractor shall be entitled to be paid the Contract Price attributable to the Facilities executed as of the date of termination, the value of any unused or only used Plant and Equipment on the Site, and the costs, if any, incurred in protecting the Facilities and in leaving the Site in a clean and safe condition pursuant to paragraph (a) of Sub-Clause 9.2.3. Any sums due to the Employer from the Contractor accruing prior to the date of termination shall be deducted from the amount to be paid to the Contractor under this Contract.

9.2.6. If the Employer completes the Facilities, the cost of completing the Facilities by the Employer shall be determined.

If the sum that the Contractor is entitled to be paid, pursuant to Sub-Clause 9.2.5, plus the reasonable costs incurred by the Employer in completing the Facilities, exceeds the Contract Price of the entire Facilities if entire Facilities have been completed or the price for part of the Facilities if part of the Facilities have been completed, the Contractor shall be liable for such excess.

If such excess is greater than the sums due, the Contractor under Sub-Clause 9.2.5, the Contractor shall pay the balance to the Employer, and if such excess is less than the sums due the Contractor under Sub-Clause 9.2.5, the Employer shall pay the balance to the Contractor. For facilitating such payment, the Employer shall encash the Bank Guarantees of the Contractor available with the Employer and retain such other payments due to the Contractor under the Contract in question or any other Contract that the Employer may have with the Contractor.

The Employer and the Contractor shall agree, in writing, on the computation described above and the manner in which any sums shall be paid.

9.3. In the Clause 9.0, the expression — Facilities executed shall include all work executed, Installation Services provided, and all Plant and Equipment acquired (or subject to a legally binding obligation to purchase) by the Contractor and used or intended to be used for the purpose of the Facilities, up to and including the date of termination.

9.4. In the Clause 9, in calculating any monies due from the Employer to the Contractor, account shall be taken of any sum previously paid by the Employer to the Contractor under the Contract, including any advance payment paid pursuant to the Contract.

9.5. Assignment

Neither the Employer nor the Contractor shall, without the express prior written consent of the other party (which consent shall not be unreasonably withheld), assign to any third party the Contract or any part thereof, or any right, benefit, obligation or interest therein or thereunder, except that the Contractor shall be entitled to assign either absolutely or by way of charge any monies due and payable to it or that may become due and payable to it under the Contract.

(It should be read in conjunction with clause 7.1 of Detailed NIT Part-III and clause 3 of Tender for Lump sum contract, condition of contract).

9.6. Termination due to non-performance during O&M period

The MPJN shall reserve the right to terminate the contract by giving one month notice for non-fulfilment of all the requirement of operation & maintenance as per condition defined in relevant clauses of the Contract.

i. If the contractor/ operator is/ are not fulfilling any/all the requirement of operation & maintenance i.e., keeping the record of staff & regular attendance, insurance, PF, etc. as per rule, not maintaining the record of flow, electric consumption, chemical consumption, not fulfilling the service level standard consecutively for three months.

ii. not maintaining the structures consecutively for two years

iii. not maintaining electric & mechanical equipment consecutively for six months

iv. non-compliance of other relevant clauses as mention in GCC & bid then the contract shall be terminated in any of the non-compliance/ non-maintaining the above points, at risk & cost of contractor/ operator and can be given to any contractor/ operator of MPJN, preferably nearly working on same cost/rate of previous contractor till that time the new operator shall be appointed.

In this situation contractor/ operator shall be required to hand over the overall assets in proper condition within 7 days from the issue of such order without interruption to the water supply.

The contract of the original contractor/ operator shall be determined after the completion of operation & maintenance period.

The payment or recovery shall be made as per relevant bid clauses.

(It should be read in conjunction with clause 14 of Tender for Lump Sum contract condition of contract & other relevant clauses of NIT).

10. Payment upon Termination:

It shall be paid as defined in Clause 9 of the Contract.

11. Legal Jurisdiction

Arbitration shall always remain the primary method of resolution of dispute relating to or arising out of this contract. Judicial proceedings shall not be an alternative for arbitration.

Subject to the provisions of the clause relating to Dispute Resolution, the Commercial Court, Bhopal or the Commercial Division at the High Court of Madhya Pradesh, Jabalpur, as the case may be, constituted under the provisions of the Commercial Courts, Commercial Division and Commercial Appellate Division of High Courts Act, 2015 shall have the exclusive jurisdiction relating to all the disputes relating to and regarding this contract. No other Courts in India or in any other legal system or country shall have the original jurisdiction. The Commercial Court, Bhopal or the Commercial Division at the High Court of Madhya Pradesh, Jabalpur shall apply only the laws for time being in force in India. The law, whether substantive law or procedural law, of any other legal system or country, other than those of India, shall have no application to this contract or to the dispute arising out of this contract.

12. Conditions applicable for contract

All the conditions of the tender notice shall be binding on the Contractor and the Employer in addition to the conditions of the contract in the prescribed form.

13. The MPJN's estimation for yearly consumption of energy for design period is specified in Annexure F. For reimbursement of energy charges calculation shall be done on pro rata basis from 1st year to design period. If energy consumption is more than derived as above, then excess energy charges shall be borne by the firm.

If any change in scheme components or water demand increases due to any reason & approved by MPJN, then reimbursement of payment for energy consumption excluding penalties, shall be made accordingly.

14. Mobilization Advance

14.1. The Contractor shall be eligible to avail interest free mobilization advance ("**Mobilization Advance**") of 10% (ten per cent) of the Contract Amount with a maximum limit of Rs. 50 Crore which shall be given on the application of the Contractor in two equal instalments.

14.2. The Mobilization Advance shall be provided against a Bank Guarantee of 100% of the amount of instalment of Mobilization Advance in the format provided in tender document. Format for Bank Guarantee for Mobilization Advance is provided as Annexure 5.

14.3. The Contractor may apply to the Employer for the 1st (first) instalment of Mobilization Advance at any time after the execution of the Agreement, along with an irrevocable and unconditional guarantee from a Bank for an amount equivalent to 100% (one hundred per cent) of such instalment of Mobilization Advance, in the form provided in the tender document, to remain effective till the complete and full repayment of Mobilization Advance.

14.4. At any time, after the utilization of the complete amount of the 1st (first) instalment of Mobilization Advance, the Contractor may apply to the Employer for the 2nd (second) instalment of the Mobilization Advance along with an irrevocable and unconditional guarantee from a Bank for an amount equivalent to 100% (one hundred per cent) of such instalment, in the form provided in the tender document, to remain effective till the complete and full repayment of such instalment. The request for the 2nd (second) instalment of the Mobilization Advance should be submitted along with documentary proof of utilization of the complete amount of the 1st (first) instalment of Mobilization Advance.

14.5. The Mobilization Advance shall be recovered through proportionate deductions to be made in the Running Bills of the Contractor. Deductions of Mobilization Advance shall commence from the Running Bill in which the cumulative running bills shall have

reached 10% (ten per cent) of the Contract Amount. The mobilization advance amount recovered in each Running Bill shall be 25% (twenty-five per cent) of the amount due and payable under the Running Bill. The Parties further agree that no payments in excess of 50% (fifty per cent) of the Contract Amount shall be released to the Contractor until the Mobilization Advance has been fully recovered.

14.6. If the Mobilization Advance has not been fully repaid prior to Termination due to any reason, the balance Mobilization Advance shall immediately become due and payable by the Contractor to the Employer.

15. Following documents annexed with this tender document shall form part of the Contract.

ANNEXURE – 1	: Joint Venture
ANNEXURE – 2	Form of Guarantee for Performance Security / Security Deposit
ANNEXURE – 3	Form of Guarantee for Withdrawal of Retention Money
ANNEXURE – 4	Form of Guarantee for Additional Performance Security
ANNEXURE – 5	Form of Guarantee for Mobilization Advance
ANNEXURE – 6	Form of Guarantee for Performance Security / Security Deposit for O&M Period
ANNEXURE – A	: Model rules, relating to labour, water supply, sanitation, etc.
ANNEXURE – B	: Contractor's labour regulations
ANNEXURE – E	: Specifications
ANNEXURE – F	: Main Items of Work (Brief Scope)
ANNEXURE – H	: Break-up schedule of payment
APPENDIX — I	: List of Villages

Managing Director
Madhya Pradesh Jal Nigam
Bhopal

MADHYA PRADESH JAL NIGAM
(A GOVT. OF M.P. UNDERTAKING)

TENDER FOR LUMP SUM CONTRACT FORM 'F'

I/ We do hereby tender to execute the whole of the work described in the drawing Nos.…… and according to the annexed specification as signed by …….. by…….. and …….. dated …… for the sum of INR……. and should this tender be accepted I / we do hereby agree and bind myself/ourselves to abide by and fulfil all the conditions annexed to the said specification or in default thereof to forfeit and pay to the Madhya Pradesh Jal Nigam the penalties of sums of money mentioned in the said conditions.

Dated …….
Bidder's Signature…….
Address…….
Witness…….. Address……..

The above tender is hereby accepted by me on behalf of the Madhya Pradesh Jal Nigam.

The ……2022……..

Signature of authority by which the tender is accepted

* To be expressed in words and figures.

SECURITIES

Name	Address	Occupation or Profession	Remarks

CONDITIONS OF CONTRACT

1. The person(s) whose tender may be accepted hereinafter called the Contractor(s) shall within twenty days of the receipt by him/ them of the notification of the acceptance of his/ their tender execute an unconditional and irrevocable bank guarantee in favour of the Employer (Managing Director, Madhya Pradesh Jal Nigam) for a sum equal to the percent of the sum specified in the clause 3.3 of Detailed Notice Inviting Tender, for a period on the basis of condition for refund of Security Deposit (Para 3.3). All damages to be borne, or other sums of money payable by the contractor(s) to the Madhya Pradesh Jal Nigam under the terms of this contract may be deducted from the running bill or from any sums which may be due or may become due to the contractors by the Madhya Pradesh Jal Nigam on any account whatsoever. The Employer shall be entitled to get the bank guarantee encashed if in his opinion the contractor has committed the breach of contract.

   The Contractor(s) shall provide everything of every sort and kind (with the exception noted in the schedule attached) which may be necessary and requisite for the due and proper execution of the works included in the contract according to the true intent and meaning of the drawings and specification taken together, which are to be signed by Engineer-in-Charge, and the contractor(s) whether the same may or may not be particularly described in the specification or shown on the drawing; provided that the same are reasonably and obviously to be inferred therefrom and in case of any discrepancy between the drawings and the specification,c the Engineer-in-Charge is to decide which shall be followed.

2. The contractor(s) shall set out the whole of the works in conjunction with an officer to be deputed by the M.D. and during the progress of the works to amend on the requisition of the Engineer-in-Charge any errors which may arise therein and provide all the necessary labor and materials for so doing. The contractor(s) shall provide all plant, labour and materials (with the exception noted in the schedule attached) which may be necessary and requisite for the works. All materials and workmanship are to be the best of their respective kinds and must meet the standard of the state of art. The contractor(s) shall handover all the work in all respects clean and perfect at the completion thereof.

3. Complete copies of the drawings and specification signed by the Engineer-in-Charge shall be furnished by him to the contractor(s) for his/ their own use and the same or copies thereof are to be kept on buildings in-charge of the contractor's (s‟) agent who is to be constantly kept on the ground by the contractor(s) and to whom the instructions can be given by the Engineer-in-Charge. The contractor shall not sublet the works or any part thereof without the consent in writing of the Engineer-in-Charge.

4. The Engineer-in-Charge is to have at all times access to the works which are to be entirely under his control. He may require the contractor(s) to dismiss any person in the contractor(s) employ upon the works who may be incompetent or misconduct himself and the contractor(s) shall forthwith comply with such requirements.

5. The contractor(s) shall not alter, vary or deviate from the approved drawings or specifications or execute any extra work of any kind, whatsoever. In case of daily labour, all vouchers for the same shall be delivered to the Engineer-in-Charge or the officer in charge at least during the week following that in which the work may have been done and only such day work is to be allowed for as such as may have been authorized by the Engineer-in-Charge to be so done, unless the work cannot from its character be properly measured and valued.

6. Any authority given by the Engineer-in-Charge for any alternations or additions in or to works is not to vitiate the contract, but all additions, omission or variations made in carrying out the work are to be measured and valued and certified by the Engineer-in-Charge and added to or deducted from the amount of the contract as the case may be at rates in force in the Schedule of Rates of Urban Administration and Development Department (ISSR Volume 1 to 4) enforced from 02nd Aug 2021 with amendments up to date for all civil works in general and Current SOR of respective MPKVVCL with amendments up to the date of bid submission for electrical works, as specified. In such cases in which rates do not exist in the said ISSR/ SOR, the Managing Director will fix the rates to be paid, whose decision shall be final and binding.

7. All works and materials brought and left upon the ground by the contractor(s) or his/ their orders for the purpose of forming part of the works shall be considered to be the property of the Madhya Pradesh Jal Nigam and the same shall not to be removed or taken away by the Contractor(s) or any other person without the special license and consent in writing of the Engineer-in-Charge but Madhya Pradesh Jal Nigam shall not to be in any way answerable for any loss or damage which may happen to or in respect of any such work or materials either by the same being lost or stolen or injured by weather or otherwise.

8. The Engineer-in-Charge shall have the full power to require the removal from the premises of all materials which in his opinion, are not in accordance with the specification and in case of defaults the Engineer-in-Charge shall be at liberty to employ other persons to remove the same without being answerable or accountable for any loss or damage that may happen or arise to such materials. The Engineer-in-Charge shall also have the full power to require other proper materials to be substituted and in case of default the Engineer-in-Charge may cause the same to be supplied and all costs which may attend such removal and substitution are to be borne by the contractor(s).

9. If in the opinion of the Engineer-in-Charge, any of the work is executed with improper materials or defective workmanship, the contractor(s) shall, when directed by the Engineer-in-Charge, forth with re-execute the same and substitute proper materials and workmanship and in case of default of the contractor(s) in so doing within a week the Engineer-in-Charge shall have the full power to employ other persons to re-execute the work and the cost thereof shall be borne by the contractor(s).

10. Any defects, shrinkage or other faults which may appear within Defect Liability Period from the completion of the project arising out of defective or improper materials or workmanship shall upon the direction of the Engineer-in-Charge to be amended and made good by the contractor(s) at his/ their own cost unless the Engineer-in-Charge shall decide that he/ they ought to be paid for the same and in case of default, the Madhya Pradesh Jal Nigam may recover from the contractors the cost or making good the works.

11. From the commencement of the works to the completion of the same, they are to be under the contractors(s) charge. The contractor(s) shall be held responsible for and to make good all injuries, damage and repairs occasioned or rendered necessary to the same by fire or other causes and they are to hold the Madhya Pradesh Jal Nigam harmless from any claims for injuries to persons or for structure damage to property happening from any neglect, default, want of proper care or misconduct on the part of the contractor(s) or of any one in his/their employ during the execution of the works.

12. The Engineer-in-Charge shall have the full power to send workmen upon the premises to execute fittings and other works not included in the contract for whose operations the contractor(s) shall afford every reasonable facility during ordinary working hours, provided that such operations shall be carried on in such a manner as not to impede the progress of the work included in the contract but the contractor(s) shall not to be responsible for any damage which may happen to or be occasioned by any such fittings or other works.

13. The works comprised in this tender are to be commenced immediately upon receipt of the order of commencement given in writing by the Engineer-in-Charge when possession of the site can be had. The whole work including all such additions and variations as aforesaid (but excluding such, if any, as may have been postponed by an order from the Engineer-in-Charge) shall be completed in every respect including rainy season from the date of start of work, which is 21st day from the date of issue of LOA and if from any cause whatever other than wilful obstruction or default on the part of the Engineer-in-Charge or his staff and except as hereinafter provided the whole of such work shall not be finished to the satisfaction of the Engineer-in-Charge within the said period, the contractor(s) shall forfeit to the Madhya Pradesh Jal Nigam from his/ their bills, and/ or encash the bank guarantee, and/or recover liquidated damages for default @ 0.05 % of total contract value per day..

    The above liquidated damages shall be applicable for every completed day of such default provided that the entire amount of damages to be forfeited under the provisions of the clause shall not exceed 10% on the quoted cost of the whole work as shown in the tender.

    Nevertheless, and in case of any extension of time, the aforesaid provisions with amount for damages in defaults of due completion shall apply in case of non- completion of the works within the extended time. Provided that the contractors(s) shall not be entitled to any extension of time in respect of the extra work involved in the extra depth of foundation mentioned in clause (5).

14. If the Contractor(s) shall become bankrupt or compound with or make any assignment for the benefit of his/ their creditors or shall suspend or delay the performance of his/ their part of the contract (except on account of causes mentioned in clause 13 or in consequence of not having proper instructions for which one contractor(s) shall have duly applied). The Engineer-in-Charge may give to the contractor(s) or his/ their assignee or trustee, as the case may be notice requiring the work to be proceeded with and in case of default on the part of the contractor(s) or his/ their assignee or trustee for a period of seven days. It shall be lawful for the Engineer-in-Charge to enter upon and take possession of the works and employ any other persons to carry on and complete the same and to authorize him or them to use the plant, materials and property of the contractor(s) upon the works, and the costs and charges incurred in any way in carrying on and completion the said works are to be paid to the Madhya Pradesh Jal Nigam by the Contractor(s). The Managing Director, Madhya Pradesh Jal Nigam shall be the final authority to determine the amount spent to complete the unfinished work. The certificate of Engineer-in-Charge and approved by Managing Director as the value of the balance work done shall be final and binding on the contractor.

15. The contractor(s) shall be paid on the completion of each calendar month commencing from the date of work order, a sum equal to the total value of work done in accordance with Annexure "H" (Price Break Up Schedule) since the last payment according to the certificate of the Engineer-in-Charge. When the works shall be completed, the contractor(s) shall be entitled to receive one moiety of the amount remaining due according to the best estimate of the same that can be made and the contractor(s) shall be entitled to receive the balance of all moneys due or payable to him/ them under or by virtue of the contract within six months from the completion of the works provided always that no final or other certificate is to cover or relieve the contractor(s) from his/ their liability under the provision of clause 10 whether or not the same be notified by the Engineer-in-Charge at the time or subsequently to the granting of any such certificate.

16. A certificate of the Engineer-in-Charge or an award of the referee hereinafter referred to, as the case may be, showing the final balance due or payable to the contractor(s) shall be conclusive evidence of the works having been duly completed and that the contractor(s) shall be entitled to receive payment of the final balance but without prejudice of the liability of the contractor(s) under provision of Clause 10.

17. Provided always that in case any question dispute or difference shall arise between the Engineer-in-Charge and the contractor(s) as to what additions, if any, ought in fairness to be made to the amount of the contract by reason of the works being delayed through no fault of the contractor(s) or by reason or on account of any directions or requisitions of the Engineer-in-Charge involving increased cost to the contractor(s) beyond the cost of properly attending the carrying out of the contract according to the true intent and meaning of the signed drawings and specification, or as to the works having been duly completed or as to the construction of these presents or as to any other matter or thing arising under or out of this contract, except as to matters left during the progress of the works to the sole

decision or requisition of the Engineer-in-Charge under clauses Nos. 1, 4, 8 and 9, or in case the contractor(s) shall be dissatisfied with any certificate of the Engineer-in-Charge under clause 6 or under the provision in clause 13 or in case he shall with-hold or not give any certificate to which he/they may be entitled, or as to the right of the contractor(s) to receive any compensation or as to the amount of such compensation payable to him/them under clause 18, then such question, dispute or difference or such certificate or the value or matter which should be certified, as the case may be, is to be from time to time resolved as detailed in clause 8.7.

18. If at any time before or after the commencement of the work, Madhya Pradesh Jal Nigam shall, for any reason whatsoever:

    i. Causes alterations, omissions or variation in the drawings and specification involving any curtailment of the works as originally contemplated; or

    ii. Does not require the whole of work as specified in the tender to be carried out,

    The contractor(s) shall have no claim to any payment or compensation whatsoever on the account of any profit or advantage which he/ they may have derived from the execution of the work in full as specified in the tender but which he/ they did not derive in consequence of the curtailment of the works by reason of alterations, omissions or variations or in consequence of the full amount of the work not having been carried out.

    But the contractor(s) shall be entitled to compensation for any loss sustained by him/ them by reason of his/ their having purchased or procured any materials or having entered into any engagements or having made any advances to labour or having taken any other preliminary or incidental measures on account of or with a view to the execution of the works or the performance of the contract.

Signature of the Contractor

Dated……

Managing Director

Madhya Pradesh Jal Nigam Bhopal

Dated……

ANNEXURE 1 - INSTRUCTIONS REGARDING JOINT VENTURE (JV)

If a Joint Venture (JV) is the bidder, following conditions and requirements shall be required to be fulfilled:

1. Bids submitted by a joint venture of two or more firms (but not more than three) as partners shall comply with the following essential conditions:
    a. one of the partners shall be nominated as being the Lead Partner, and this authorization shall be evidenced by submitting a power of attorney signed by all the partners or their duly authorized signatories (of all the partners);
    b. the bid and, in case of a successful bid, the Agreement, shall be signed so as to be legally binding on all partners;
    c. the lead partner shall be authorized to incur liabilities and receive instructions for and on behalf of any and all partners of the joint venture and the entire execution of the contract, including payment, shall be done exclusively with the lead partner;
    d. all the partners of the joint venture shall be liable jointly and severally for the execution of the contract in accordance with the contract terms, and a statement to this effect shall be included in the authorization mentioned under (c) above, as well as in the bid and in the Agreement (in case of a successful bid);
    e. The joint venture agreement shall clearly, unambiguously, unequivocally, and precisely state the role of all members of JV in respect of planning, design, construction equipment, key personnel, work execution, and financing of the project. All members of JV shall have active participation in execution of the work during the currency of the contract. This condition shall not be varied/modified subsequently without prior approval of the employer;
    f. The joint venture agreement shall be on the non-judicial stamp paper of at least Rs. 1000/- and notarized, so as to be legally valid and binding on all partners;
    g. a copy of the Joint Venture Agreement (substantially in the format provided in the tender document) entered into by the partners shall be submitted with the bid.
    h. All the members of joint venture should have minimum 26% shareholding in the JV. Lead Partner shall not be allowed to exit at any stage prior to completion of the project.
    i. The joint venture agreement should be made on Rs. 1000/- Non-Judicial stamp Paper, duly Notarized/ registered.
    j. If the bidder has executed the works in the past as Lead Partner (or Partner) in a Joint Venture then the bidders, experience and physical performance will be only considered to the extent of their shareholding in those joint venture, irrespective of the actual experiences and physical performance of the individual member of those

joint venture and irrespective of any internal understanding among the members of those joint venture(s).

k. Provision that none of the parties of the JV shall be allowed to sign, pledge, sell or otherwise dispose all or part of its respective interests in JV to any party including existing partner(s) of the JV throughout the execution period. The Employer reserves right for any consequent action (including blacklisting) against any or all JV partners in case of any breach in this regard.

2. The figures of qualifying amount for each of the partners of a joint venture shall be added together to determine the joint venture's compliance with the minimum qualifying criteria required for the bid. All the partners collectively and individually must meet the respective criteria specified in full. Failure to comply with this requirement shall result in rejection of the joint venture's bid.

3. The performance security of a Joint Venture shall be executed and furnished in the name of the Lead Partner.

4. The JV shall attach the power of attorney of the signatory(ies) of the bid authorizing signature of the bid on behalf of all the members of the joint venture. All partners of the Joint Venture shall submit a signed copy of Joint Bidding Agreement, as given in Annexure 3, Schedule C of Prequalification Document. All members of Joint Venture shall individually submit signed copy of Power of Attorney as provided in Annexure 3, Schedule A of Prequalification Document. All members of the joint venture shall submit signed copy of Power of Attorney for Lead Member of Joint Venture as provided in Annexure 2, Schedule C of Prequalification Document.

5. The JV shall attach the legally binding agreement among all partners of the joint venture, which shows the compliance with requirements as indicated in the 'Instructions to Bidders'. Format for Joint Bidding Agreement is provided at Annexure 3, Schedule C of Prequalification Document.

6. JV shall furnish details of participation proposed in the joint venture in the format specified in pre-qualification documents.

ANNEXURE 2 - FORM OF GUARANTEE FOR PERFORMANCE SECURITY / SECURITY DEPOSIT

FORM OF BANK GUARANTEE

Form of Guarantee for Performance Security / Security Deposit

Bank Guarantee No.	:	
Date of Issue	:	
Beneficiary	:	Managing Director, Madhya Pradesh Jal Nigam Maryadit
Applicant	:	
Guarantee Amount	:	
Amount in Words	:	
Claim Expiry Date	:	(12 months after the completion of defect liability period)

WHEREAS:

A. Managing Director, Madhya Pradesh Jal Nigam, D Wing, 2nd Floor, Vindhyachal Bhawan, Bhopal – 462004, Madhya Pradesh (hereinafter called the "**Authority**") had invited tenders for "(name of the project)" (the "**Project**") vide NIT No. _____, Date: _____.

B. Pursuant to the evaluation of proposals and approval of competent authority, the Authority has accepted the bid of _____ Name and Address of Selected Bidder (hereinafter called the "**Contractor**") and issued its Letter of Acceptance No. , Date: _____ (Date of LOA).

C. The Contractor has undertaken to execute the Project subject to and in accordance with the provisions of the Agreement to be entered into by Authority and Contractor (the "**Agreement**").

D. The Agreement requires the Contractor to furnish a Performance Security enforceable in Bhopal from a Scheduled Commercial Bank recognized by Reserve Bank of India (other than Co-Operative Banks) having an operational office in Bhopal for due and faithful performance of its obligations, under and in accordance with the Agreement, during the Construction Period and Defect Liability Period (as defined in the Agreement) in a sum of Rs. Amount in figures (Amount in words) (the "**Guarantee Amount**").

E. We, …….. through our branch at ……. (the "**Bank**") have agreed to furnish this bank guarantee (hereinafter called the "**Guarantee**") by way of Performance Security.

NOW, THEREFORE, the Bank hereby, unconditionally, and irrevocably, guarantees and affirms as follows:

1. The Bank hereby unconditionally and irrevocably guarantees and undertakes to pay to the Authority upon occurrence of any failure or default in the due and faithful performance of all or any of the Contractor's obligations, under and in accordance with the provisions of the Agreement during the Construction Period and Defect Liability Period on its mere first written demand, and without any demur, reservation, recourse, contest or protest, and without any reference to the Contractor, such sum or sums up to an aggregate sum of the Guarantee Amount as the Authority shall claim, without the Authority being required to prove or to show grounds or reasons for its demand and/or for the sum specified therein.

2. A letter from the Authority, under the hand of an officer not below the rank of a Chief Engineer of the Authority, that the Contractor has committed default in the due and faithful performance of all or any of its obligations under and in accordance with the Agreement shall be conclusive, final and binding on the Bank. The Bank further agrees that the Authority shall be the sole judge as to whether the Contractor is in default in due and faithful performance of its obligations during and under the Agreement and its decision that the Contractor is in default shall be final and binding on the Bank, notwithstanding any differences between the Authority and the Contractor, or any dispute between them pending before any court, tribunal, arbitrators or any other authority or body, or by the discharge of the Contractor for any reason whatsoever.

3. In order to give effect to this Guarantee, the Authority shall be entitled to act as if the Bank were the principal debtor and any change in the constitution of the Contractor and/or the Bank, whether by their absorption with any other body or corporation or otherwise, shall not in any way or manner affect the liability or obligation of the Bank under this Guarantee.

4. It shall not be necessary, and the Bank hereby waives any necessity, for the Authority to proceed against the Contractor before presenting to the Bank its demand under this Guarantee.

5. The Authority shall have the liberty, without affecting in any manner the liability of the Bank under this Guarantee, to vary at any time, the terms and conditions of the Agreement or to extend the time or period for the compliance with, fulfilment and / or performance of all or any of the obligations of the Contractor contained in the Agreement or to postpone for any time, and from time to time, any of the rights and powers exercisable by the Authority against the Contractor, and either to enforce or forbear from enforcing any of the terms and conditions contained in the Agreement and/or the securities available to the Authority, and the Bank shall not be released from its liability and obligation under these presents by any exercise by the Authority of the liberty with reference to the matters aforesaid or by reason of time being given to the Contractor or any other forbearance, indulgence, act or omission on the part of the Authority or of any other matter or thing whatsoever which under any law relating to sureties and guarantors would but for this

provision have the effect of releasing the Bank from its liability and obligation under this Guarantee and the Bank hereby waives all of its rights under any such law.

6. This Guarantee is in addition to and not in substitution of any other guarantee or security now or which may hereafter be held by the Authority in respect of or relating to the Agreement or for the fulfilment, compliance and/or performance of all or any of the obligations of the Contractor under the Agreement.

7. Notwithstanding anything contained hereinbefore, the liability of the Bank under this Guarantee is restricted to the Guarantee Amount and this Guarantee will remain in force for the period specified in paragraph 8 below and unless a demand or claim in writing is made by the Authority on the Bank under this Guarantee all rights of the Authority under this Guarantee shall be forfeited and the Bank shall be relieved from its liabilities hereunder.

8. We,_____ (indicate the name of bank) further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said Agreement and that it shall continue to be enforceable till all the dues of the Authority / Government under or by virtue of the said Agreement have been fully paid and its claims satisfied or discharged or till Authority certifies that the terms and conditions of the said Agreement have been fully and properly carried out by the said contractor(s) and accordingly discharges this guarantee. Unless a demand or claim under this guarantee is made on us in writing on or before the _____[Claim Expiry Date – 12 months after the completion of defect liability period], the Bank shall be discharged from all liability under this guarantee thereafter.

9. The Bank undertakes not to revoke this Guarantee during its currency, except with the previous express consent of the Authority in writing and declares and warrants that it has the power to issue this Guarantee and the undersigned has full powers to do so on behalf of the Bank.

10. Any notice by way of request, demand or otherwise hereunder may be sent by post addressed to the Bank at its above referred branch, which shall be deemed to have been duly authorised to receive such notice and to effect payment thereof forthwith, and if sent by post it shall be deemed to have been given at the time when it ought to have been delivered in due course of post and in proving such notice, when given by post, it shall be sufficient to prove that the envelope containing the notice was posted and a certificate signed by an officer of the Authority that the envelope was so posted shall be conclusive.

11. This Guarantee shall come into force with immediate effect and shall remain in force and effect for up to the date specified in paragraph 8 above or until it is released earlier by the Authority pursuant to the provisions of the Agreement.

Signed and sealed this ……. day of ……., 20…… at ……..

SIGNED, SEALED AND DELIVERED

For and on behalf of the Bank by:

(Signature)

(Name)

(Designation)

(Code Number)

(Address)

NOTES:

(i) The bank guarantee should contain the name, designation and code number of the officer(s) signing the guarantee.

(ii) The address, telephone number and other details of the head office of the Bank as well as of issuing branch should be mentioned on the covering letter of issuing branch.

ANNEXURE 3 - FORM OF GUARANTEE FOR WITHDRAWAL OF RETENTION MONEY

FORM OF BANK GUARANTEE

Form of Guarantee for Withdrawal of Retention Money

Bank Guarantee No.	:	
Date of Issue	:	
Beneficiary	:	Managing Director, Madhya Pradesh Jal Nigam Maryadit
Applicant	:	
Guarantee Amount	:	
Amount in Words	:	
Claim Expiry Date	:	(12 months after the completion of defect liability period)

WHEREAS:

A. …… (insert name and address of the contractor) (hereinafter called the "**Contractor**") has executed an agreement (hereinafter called the "**Agreement**") with the Managing Director, Madhya Pradesh Jal Nigam, D Wing, 2nd Floor, Vindhyachal Bhawan, Bhopal – 462004, Madhya Pradesh, (hereinafter called the "**Authority**") for the Engineering, Procurement, Construction, Testing, Commissioning, Trial Run and Operation & Maintenance of Various Components of …… Multi-Village Scheme, District …… in Single Package on 'Turn-Key Job Basis' including Trial Run and Operation & Maintenance of the Entire Water Supply Scheme for 10 Years, subject to and in accordance with the provisions of the Agreement.

B. In accordance with Clause 3.3. i. of Part III of the Agreement, the Contractor may withdraw the retention money (hereinafter called the "**Retention Money**") after furnishing to the Authority a bank guarantee for an amount equal to the proposed withdrawal. The amount of proposed withdrawal is Rs. ……. cr. (Rupees ……. crore) and the amount of this Guarantee is Rs. …….. cr. (Rupees ……. crore) (the "**Guarantee Amount**").

C. We, …….. through our branch at ……. (the "**Bank**") have agreed to furnish this bank guarantee (hereinafter called the "**Guarantee**") for the Guarantee Amount.

NOW, THEREFORE, the Bank hereby unconditionally and irrevocably guarantees and affirms as follows:

1. The Bank hereby unconditionally and irrevocably guarantees and undertakes to pay to the Authority upon occurrence of any failure or default in the due and faithful performance of

all or any of the Contractor's obligations, under and in accordance with the provisions of the Agreement during the Construction Period and Defect Liability Period on its mere first written demand, and without any demur, reservation, recourse, contest or protest, and without any reference to the Contractor, such sum or sums up to an aggregate sum of the Guarantee Amount as the Authority shall claim, without the Authority being required to prove or to show grounds or reasons for its demand and/or for the sum specified therein.

2. A letter from the Authority, under the hand of an officer not below the rank of a Chief Engineer of the Authority, that the Contractor has committed default in the due and faithful performance of all or any of its obligations under and in accordance with the Agreement shall be conclusive, final and binding on the Bank. The Bank further agrees that the Authority shall be the sole judge as to whether the Contractor is in default in due and faithful performance of its obligations during and under the Agreement and its decision that the Contractor is in default shall be final and binding on the Bank, notwithstanding any differences between the Authority and the Contractor, or any dispute between them pending before any court, tribunal, arbitrators or any other authority or body, or by the discharge of the Contractor for any reason whatsoever.

3. In order to give effect to this Guarantee, the Authority shall be entitled to act as if the Bank were the principal debtor and any change in the constitution of the Contractor and/or the Bank, whether by their absorption with any other body or corporation or otherwise, shall not in any way or manner affect the liability or obligation of the Bank under this Guarantee.

4. It shall not be necessary, and the Bank hereby waives any necessity, for the Authority to proceed against the Contractor before presenting to the Bank its demand under this Guarantee.

5. The Authority shall have the liberty, without affecting in any manner the liability of the Bank under this Guarantee, to vary at any time, the terms and conditions of the Agreement or to extend the time or period for the compliance with, fulfilment and / or performance of all or any of the obligations of the Contractor contained in the Agreement or to postpone for any time, and from time to time, any of the rights and powers exercisable by the Authority against the Contractor, and either to enforce or forbear from enforcing any of the terms and conditions contained in the Agreement and/or the securities available to the Authority, and the Bank shall not be released from its liability and obligation under these presents by any exercise by the Authority of the liberty with reference to the matters aforesaid or by reason of time being given to the Contractor or any other forbearance, indulgence, act or omission on the part of the Authority or of any other matter or thing whatsoever which under any law relating to sureties and guarantors would but for this provision have the effect of releasing the Bank from its liability and obligation under this Guarantee and the Bank hereby waives all of its rights under any such law.

6. This Guarantee is in addition to and not in substitution of any other guarantee or security now or which may hereafter be held by the Authority in respect of or relating to the

Agreement or for the fulfilment, compliance and/or performance of all or any of the obligations of the Contractor under the Agreement.

7. Notwithstanding anything contained hereinbefore, the liability of the Bank under this Guarantee is restricted to the Guarantee Amount and this Guarantee will remain in force for the period specified in paragraph 8 below and unless a demand or claim in writing is made by the Authority on the Bank under this Guarantee all rights of the Authority under this Guarantee shall be forfeited and the Bank shall be relieved from its liabilities hereunder.

8. We,_____ (indicate the name of bank) further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said Agreement and that it shall continue to be enforceable till all the dues of the Authority / Government under or by virtue of the said Agreement have been fully paid and its claims satisfied or discharged or till Authority certifies that the terms and conditions of the said Agreement have been fully and properly carried out by the said contractor(s) and accordingly discharges this guarantee. Unless a demand or claim under this guarantee is made on us in writing on or before the _____[Claim Expiry Date – 12 months after the completion of defect liability period], the Bank shall be discharged from all liability under this guarantee thereafter.

9. The Bank undertakes not to revoke this Guarantee during its currency, except with the previous express consent of the Authority in writing and declares and warrants that it has the power to issue this Guarantee and the undersigned has full powers to do so on behalf of the Bank.

10. Any notice by way of request, demand or otherwise hereunder may be sent by post addressed to the Bank at its above referred branch, which shall be deemed to have been duly authorised to receive such notice and to effect payment thereof forthwith, and if sent by post it shall be deemed to have been given at the time when it ought to have been delivered in due course of post and in proving such notice, when given by post, it shall be sufficient to prove that the envelope containing the notice was posted and a certificate signed by an officer of the Authority that the envelope was so posted shall be conclusive.

11. This Guarantee shall come into force with immediate effect and shall remain in force and effect for up to the date specified in paragraph 8 above or until it is released earlier by the Authority pursuant to the provisions of the Agreement.

Signed and sealed this ……. day of ……., 20…… at ……..

SIGNED, SEALED AND DELIVERED

For and on behalf of the Bank by:

(Signature)

(Name)

(Designation)

(Code Number)

(Address)

NOTES:

(i) The bank guarantee should contain the name, designation and code number of the officer(s) signing the guarantee.

(ii) The address, telephone number and other details of the head office of the Bank as well as of issuing branch should be mentioned on the covering letter of issuing branch.

ANNEXURE 4 - FORM OF GUARANTEE FOR ADDITIONAL PERFORMANCE SECURITY

FORM OF BANK GUARANTEE

Form of Guarantee for Additional Performance Security

Bank Guarantee No.	:	
Date of Issue	:	
Beneficiary	:	Managing Director, Madhya Pradesh Jal Nigam Maryadit
Applicant	:	
Guarantee Amount	:	
Amount in Words	:	
Claim Expiry Date	:	(12 months after the completion of defect liability period)

WHEREAS:

A. Managing Director, Madhya Pradesh Jal Nigam, D Wing, 2nd Floor, Vindhyachal Bhawan, Bhopal – 462004, Madhya Pradesh (hereinafter called the "**Authority**") had invited tenders for "(name of the project)" (the "**Project**") vide NIT No. _____, Date: _____.

B. Pursuant to the evaluation of proposals and approval of competent authority, the Authority has accepted the bid of _____ Name and Address of Selected Bidder (hereinafter called the "**Contractor**") and issued its Letter of Acceptance No. , Date: _____ (Date of LOA).

C. The Contractor has undertaken to execute the Project subject to and in accordance with the provisions of the Agreement to be entered into by Authority and Contractor (the "**Agreement**").

D. In accordance with Clause 3.3. i. of Part III of the Agreement, the Contractor is required to furnish Additional Performance Security enforceable in Bhopal from a Scheduled Commercial Bank recognized by Reserve Bank of India (other than Co-Operative Banks) having an operational office in Bhopal for due and faithful performance of its obligations, under and in accordance with the Agreement, during the Construction Period and Defect Liability Period (as defined in the Agreement) in a sum of Rs. Amount in figures (Amount in words) (the "**Additional Guarantee Amount**").

E. We, …….. through our branch at ……. (the "**Bank**") have agreed to furnish this bank guarantee (hereinafter called the "**Additional Guarantee**") by way of Additional Performance Security.

NOW, THEREFORE, the Bank hereby, unconditionally, and irrevocably, guarantees and affirms as follows:

1. The Bank hereby unconditionally and irrevocably guarantees and undertakes to pay to the Authority upon occurrence of any failure or default in the due and faithful performance of all or any of the Contractor's obligations, under and in accordance with the provisions of the Agreement during the Construction Period and Defect Liability Period on its mere first written demand, and without any demur, reservation, recourse, contest or protest, and without any reference to the Contractor, such sum or sums up to an aggregate sum of the Additional Guarantee Amount as the Authority shall claim, without the Authority being required to prove or to show grounds or reasons for its demand and/or for the sum specified therein.

2. A letter from the Authority, under the hand of an officer not below the rank of a Chief Engineer of the Authority, that the Contractor has committed default in the due and faithful performance of all or any of its obligations under and in accordance with the Agreement shall be conclusive, final and binding on the Bank. The Bank further agrees that the Authority shall be the sole judge as to whether the Contractor is in default in due and faithful performance of its obligations during and under the Agreement and its decision that the Contractor is in default shall be final and binding on the Bank, notwithstanding any differences between the Authority and the Contractor, or any dispute between them pending before any court, tribunal, arbitrators or any other authority or body, or by the discharge of the Contractor for any reason whatsoever.

3. In order to give effect to this Additional Guarantee, the Authority shall be entitled to act as if the Bank were the principal debtor and any change in the constitution of the Contractor and/or the Bank, whether by their absorption with any other body or corporation or otherwise, shall not in any way or manner affect the liability or obligation of the Bank under this Additional Guarantee.

4. It shall not be necessary, and the Bank hereby waives any necessity, for the Authority to proceed against the Contractor before presenting to the Bank its demand under this Additional Guarantee.

5. The Authority shall have the liberty, without affecting in any manner the liability of the Bank under this Additional Guarantee, to vary at any time, the terms and conditions of the Agreement or to extend the time or period for the compliance with, fulfilment and / or performance of all or any of the obligations of the Contractor contained in the Agreement or to postpone for any time, and from time to time, any of the rights and powers exercisable by the Authority against the Contractor, and either to enforce or forbear from enforcing any of the terms and conditions contained in the Agreement and/or the securities available to the Authority, and the Bank shall not be released from its liability and obligation under these presents by any exercise by the Authority of the liberty with reference to the matters aforesaid or by reason of time being given to the Contractor or any other forbearance, indulgence, act or omission on the part of the Authority or of any other matter or thing whatsoever which under any law relating to sureties and guarantors would but for this

provision have the effect of releasing the Bank from its liability and obligation under this Additional Guarantee and the Bank hereby waives all of its rights under any such law.

6. This Additional Guarantee is in addition to and not in substitution of any other guarantee or security now or which may hereafter be held by the Authority in respect of or relating to the Agreement or for the fulfilment, compliance and/or performance of all or any of the obligations of the Contractor under the Agreement.

7. Notwithstanding anything contained hereinbefore, the liability of the Bank under this Additional Guarantee is restricted to the Additional Guarantee Amount and this Additional Guarantee will remain in force for the period specified in paragraph 8 below and unless a demand or claim in writing is made by the Authority on the Bank under this Additional Guarantee all rights of the Authority under this Additional Guarantee shall be forfeited and the Bank shall be relieved from its liabilities hereunder.

8. We,_____ (indicate the name of bank) further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said Agreement and that it shall continue to be enforceable till all the dues of the Authority / Government under or by virtue of the said Agreement have been fully paid and its claims satisfied or discharged or till Authority certifies that the terms and conditions of the said Agreement have been fully and properly carried out by the said contractor(s) and accordingly discharges this guarantee. Unless a demand or claim under this guarantee is made on us in writing on or before the _____[Claim Expiry Date – 12 months after the completion of defect liability period], the Bank shall be discharged from all liability under this guarantee thereafter.

9. The Bank undertakes not to revoke this Additional Guarantee during its currency, except with the previous express consent of the Authority in writing and declares and warrants that it has the power to issue this Additional Guarantee and the undersigned has full powers to do so on behalf of the Bank.

10. Any notice by way of request, demand or otherwise hereunder may be sent by post addressed to the Bank at its above referred branch, which shall be deemed to have been duly authorised to receive such notice and to effect payment thereof forthwith, and if sent by post it shall be deemed to have been given at the time when it ought to have been delivered in due course of post and in proving such notice, when given by post, it shall be sufficient to prove that the envelope containing the notice was posted and a certificate signed by an officer of the Authority that the envelope was so posted shall be conclusive.

11. This Additional Guarantee shall come into force with immediate effect and shall remain in force and effect for up to the date specified in paragraph 8 above or until it is released earlier by the Authority pursuant to the provisions of the Agreement.

Signed and sealed this ……. day of ……., 20…… at ……..

SIGNED, SEALED AND DELIVERED

For and on behalf of the Bank by:

(Signature)

(Name)

(Designation)

(Code Number)

(Address)

NOTES:

(i) The bank guarantee should contain the name, designation and code number of the officer(s) signing the guarantee.

(ii) The address, telephone number and other details of the head office of the Bank as well as of issuing branch should be mentioned on the covering letter of issuing branch.

ANNEXURE 5 - FORM OF GUARANTEE FOR MOBILIZATION ADVANCE

FORM OF BANK GUARANTEE

Form of Guarantee for Mobilization Advance

Bank Guarantee No.	:	
Date of Issue	:	
Beneficiary	:	Managing Director, Madhya Pradesh Jal Nigam Maryadit
Applicant	:	
Guarantee Amount	:	
Amount in Words	:	
Claim Expiry Date	:	(12 months after the completion of defect liability period)

WHEREAS:

A. …… (insert name and address of the contractor) (hereinafter called the "**Contractor**") has executed an agreement (hereinafter called the "**Agreement**") with the Managing Director, Madhya Pradesh Jal Nigam, D Wing, 2nd Floor, Vindhyachal Bhawan, Bhopal – 462004, Madhya Pradesh, (hereinafter called the "**Authority**") for the Engineering, Procurement, Construction, Testing, Commissioning, Trial Run and Operation & Maintenance of Various Components of …… Multi-Village Scheme, District …… in Single Package on 'Turn-Key Job Basis' including Trial Run and Operation & Maintenance of the Entire Water Supply Scheme for 10 Years, subject to and in accordance with the provisions of the Agreement.

B. In accordance with Clause 14 of Part III of the Agreement, the Authority shall make to the Contractor an interest free advance payment (herein after called "**Advance Payment**") equal to 10% (ten per cent) of the Contract Price; and that the Advance Payment shall be made in two equal instalments subject to the Contractor furnishing an irrevocable and unconditional guarantee by a scheduled bank for an amount equivalent to 100% (one hundred per cent) of such instalment to remain effective till the complete and full repayment of the instalment of the Advance Payment as security for compliance with its obligations in accordance with the Agreement. The amount of {first/second} instalment of the Advance Payment is Rs. ……. cr. (Rupees ……. crore) and the amount of this Guarantee is Rs. ……. cr. (Rupees ……. crore) (the "**Guarantee Amount**").

C. We, …….. through our branch at ……. (the "**Bank**") have agreed to furnish this bank guarantee (hereinafter called the "**Guarantee**") for the Guarantee Amount.

NOW, THEREFORE, the Bank hereby, unconditionally, and irrevocably, guarantees and affirms as follows:

1. The Bank hereby unconditionally and irrevocably guarantees the due and faithful repayment on time of the aforesaid instalment of the Advance Payment under and in accordance with the Agreement, and agrees and undertakes to pay to the Authority, upon its mere first written demand, and without any demur, reservation, recourse, contest or protest, and without any reference to the Contractor, such sum or sums up to an aggregate sum of the Guarantee Amount as the Authority shall claim, without the Authority being required to prove or to show grounds or reasons for its demand and/or for the sum specified therein.

2. A letter from the Authority, under the hand of an officer not below the rank of a Chief Engineer of the Authority, that the Contractor has committed default in the due and faithful performance of all or any of its obligations for the repayment of the instalment of the Advance Payment under and in accordance with the Agreement shall be conclusive, final, and binding on the Bank. The Bank further agrees that the Authority shall be the sole judge as to whether the Contractor is in default in due and faithful performance of its obligations during and under the Agreement and its decision that the Contractor is in default shall be final and binding on the Bank, notwithstanding any differences between the Authority and the Contractor, or any dispute between them pending before any court, tribunal, arbitrators or any other authority or body, or by the discharge of the Contractor for any reason whatsoever.

3. In order to give effect to this Guarantee, the Authority shall be entitled to act as if the Bank were the principal debtor and any change in the constitution of the Contractor and/or the Bank, whether by their absorption with any other body or corporation or otherwise, shall not in any way or manner affect the liability or obligation of the Bank under this Guarantee.

4. It shall not be necessary, and the Bank hereby waives any necessity, for the Authority to proceed against the Contractor before presenting to the Bank its demand under this Guarantee.

5. The Authority shall have the liberty, without affecting in any manner the liability of the Bank under this Guarantee, to vary at any time, the terms and conditions of the Advance Payment or to extend the time or period of its repayment or to postpone for any time, and from time to time, any of the rights and powers exercisable by the Authority against the Contractor, and either to enforce or forbear from enforcing any of the terms and conditions contained in the Agreement and/or the securities available to the Authority, and the Bank shall not be released from its liability and obligation under these presents by any exercise by the Authority of the liberty with reference to the matters aforesaid or by reason of time being given to the Contractor or any other forbearance, indulgence, act or omission on the part of the Authority or of any other matter or thing whatsoever which under any law relating to sureties and guarantors would but for this provision have the effect of releasing

the Bank from its liability and obligation under this Guarantee and the Bank hereby waives all of its rights under any such law.

6. This Guarantee is in addition to and not in substitution of any other guarantee or security now or which may hereafter be held by the Authority in respect of or relating to the Advance Payment.

7. Notwithstanding anything contained hereinbefore, the liability of the Bank under this Guarantee is restricted to the Guarantee Amount and this Guarantee will remain in force for the period specified in paragraph 8 below and unless a demand or claim in writing is made by the Authority on the Bank under this Guarantee all rights of the Authority under this Guarantee shall be forfeited and the Bank shall be relieved from its liabilities hereunder.

8. The Guarantee shall cease to be in force and effect on _____[Claim Expiry Date – 90 (ninety) days after the end of two-thirds of the completion period from the date of payment of the Advance payment to the Contractor]. Unless a demand or claim under this Guarantee is made in writing on or before the aforesaid date, the Bank shall be discharged from its liabilities hereunder.

9. The Bank undertakes not to revoke this Guarantee during its currency, except with the previous express consent of the Authority in writing and declares and warrants that it has the power to issue this Guarantee and the undersigned has full powers to do so on behalf of the Bank.

10. Any notice by way of request, demand or otherwise hereunder may be sent by post addressed to the Bank at its above referred branch, which shall be deemed to have been duly authorised to receive such notice and to effect payment thereof forthwith, and if sent by post it shall be deemed to have been given at the time when it ought to have been delivered in due course of post and in proving such notice, when given by post, it shall be sufficient to prove that the envelope containing the notice was posted and a certificate signed by an officer of the Authority that the envelope was so posted shall be conclusive.

11. This Guarantee shall come into force with immediate effect and shall remain in force and effect up to the date specified in paragraph 8 above or until it is released earlier by the Authority pursuant to the provisions of the Agreement.

Signed and sealed this ……. day of ……., 20…… at ……..

SIGNED, SEALED AND DELIVERED

For and on behalf of the Bank by:

(Signature)

(Name)

(Designation)

(Code Number)

(Address)

NOTES:

(i) The bank guarantee should contain the name, designation and code number of the officer(s) signing the guarantee.

(ii) The address, telephone number and other details of the head office of the Bank as well as of issuing branch should be mentioned on the covering letter of issuing branch.

ANNEXURE 6 - FORM OF GUARANTEE FOR PERFORMANCE SECURITY / SECURITY DEPOSIT FOR O&M PERIOD

FORM OF BANK GUARANTEE

Form of Guarantee for Performance Security / Security Deposit for O&M Period

Bank Guarantee No.	:	
Date of Issue	:	
Beneficiary	:	Managing Director, Madhya Pradesh Jal Nigam Maryadit
Applicant	:	
Guarantee Amount	:	
Amount in Words	:	
Claim Expiry Date	:	(6 months after the completion of O&M period)

WHEREAS:

F. Managing Director, Madhya Pradesh Jal Nigam, D Wing, 2nd Floor, Vindhyachal Bhawan, Bhopal – 462004, Madhya Pradesh (hereinafter called the "**Authority**") had invited tenders for "(name of the project)" (the "**Project**") vide NIT No. _____, Date: _____.

G. Pursuant to the evaluation of proposals and approval of competent authority, the Authority has accepted the bid of _____ Name and Address of Selected Bidder (hereinafter called the "**Contractor**") and issued its Letter of Acceptance No. , Date: _____ (Date of LOA).

H. The Contractor has undertaken to execute the Project subject to and in accordance with the provisions of the Agreement to be entered into by Authority and Contractor (the "**Agreement**").

I. The Agreement requires the Contractor to furnish a Performance Security enforceable in Bhopal from a Scheduled Commercial Bank recognized by Reserve Bank of India (other than Co-Operative Banks) having an operational office in Bhopal for due and faithful performance of its obligations, under and in accordance with the Agreement, during the Operation & Maintenance Period (as defined in the Agreement) in a sum of Rs. Amount in figures (_____ Amount in words) (the "**Guarantee Amount**").

J. We, …….. through our branch at ……. (the "**Bank**") have agreed to furnish this bank guarantee (hereinafter called the "**Guarantee**") by way of Performance Security.

NOW, THEREFORE, the Bank hereby, unconditionally, and irrevocably, guarantees and affirms as follows:

12. The Bank hereby unconditionally and irrevocably guarantees and undertakes to pay to the Authority upon occurrence of any failure or default in the due and faithful performance of all or any of the Contractor's obligations, under and in accordance with the provisions of the Agreement during the Operation & Maintenance Period on its mere first written demand, and without any demur, reservation, recourse, contest or protest, and without any reference to the Contractor, such sum or sums up to an aggregate sum of the Guarantee Amount as the Authority shall claim, without the Authority being required to prove or to show grounds or reasons for its demand and/or for the sum specified therein.

13. A letter from the Authority, under the hand of an officer not below the rank of a Chief Engineer of the Authority, that the Contractor has committed default in the due and faithful performance of all or any of its obligations under and in accordance with the Agreement shall be conclusive, final and binding on the Bank. The Bank further agrees that the Authority shall be the sole judge as to whether the Contractor is in default in due and faithful performance of its obligations during and under the Agreement and its decision that the Contractor is in default shall be final and binding on the Bank, notwithstanding any differences between the Authority and the Contractor, or any dispute between them pending before any court, tribunal, arbitrators or any other authority or body, or by the discharge of the Contractor for any reason whatsoever.

14. In order to give effect to this Guarantee, the Authority shall be entitled to act as if the Bank were the principal debtor and any change in the constitution of the Contractor and/or the Bank, whether by their absorption with any other body or corporation or otherwise, shall not in any way or manner affect the liability or obligation of the Bank under this Guarantee.

15. It shall not be necessary, and the Bank hereby waives any necessity, for the Authority to proceed against the Contractor before presenting to the Bank its demand under this Guarantee.

16. The Authority shall have the liberty, without affecting in any manner the liability of the Bank under this Guarantee, to vary at any time, the terms and conditions of the Agreement or to extend the time or period for the compliance with, fulfilment and / or performance of all or any of the obligations of the Contractor contained in the Agreement or to postpone for any time, and from time to time, any of the rights and powers exercisable by the Authority against the Contractor, and either to enforce or forbear from enforcing any of the terms and conditions contained in the Agreement and/or the securities available to the Authority, and the Bank shall not be released from its liability and obligation under these presents by any exercise by the Authority of the liberty with reference to the matters aforesaid or by reason of time being given to the Contractor or any other forbearance, indulgence, act or omission on the part of the Authority or of any other matter or thing whatsoever which under any law relating to sureties and guarantors would but for this

provision have the effect of releasing the Bank from its liability and obligation under this Guarantee and the Bank hereby waives all of its rights under any such law.

17. This Guarantee is in addition to and not in substitution of any other guarantee or security now or which may hereafter be held by the Authority in respect of or relating to the Agreement or for the fulfilment, compliance and/or performance of all or any of the obligations of the Contractor under the Agreement.

18. Notwithstanding anything contained hereinbefore, the liability of the Bank under this Guarantee is restricted to the Guarantee Amount and this Guarantee will remain in force for the period specified in paragraph 8 below and unless a demand or claim in writing is made by the Authority on the Bank under this Guarantee all rights of the Authority under this Guarantee shall be forfeited and the Bank shall be relieved from its liabilities hereunder.

19. We,_____ (indicate the name of bank) further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said Agreement and that it shall continue to be enforceable till all the dues of the Authority / Government under or by virtue of the said Agreement have been fully paid and its claims satisfied or discharged or till Authority certifies that the terms and conditions of the said Agreement have been fully and properly carried out by the said contractor(s) and accordingly discharges this guarantee. Unless a demand or claim under this guarantee is made on us in writing on or before the _____[Claim Expiry Date – 6 months after the completion O&M Period], the Bank shall be discharged from all liability under this guarantee thereafter.

20. The Bank undertakes not to revoke this Guarantee during its currency, except with the previous express consent of the Authority in writing and declares and warrants that it has the power to issue this Guarantee and the undersigned has full powers to do so on behalf of the Bank.

21. Any notice by way of request, demand or otherwise hereunder may be sent by post addressed to the Bank at its above referred branch, which shall be deemed to have been duly authorised to receive such notice and to effect payment thereof forthwith, and if sent by post it shall be deemed to have been given at the time when it ought to have been delivered in due course of post and in proving such notice, when given by post, it shall be sufficient to prove that the envelope containing the notice was posted and a certificate signed by an officer of the Authority that the envelope was so posted shall be conclusive.

22. This Guarantee shall come into force with immediate effect and shall remain in force and effect for up to the date specified in paragraph 8 above or until it is released earlier by the Authority pursuant to the provisions of the Agreement.

Signed and sealed this ……. day of ……., 20…… at ……..

SIGNED, SEALED AND DELIVERED

For and on behalf of the Bank by:

(Signature)

(Name)

(Designation)

(Code Number)

(Address)

NOTES:

(i) The bank guarantee should contain the name, designation and code number of the officer(s) signing the guarantee.

(ii) The address, telephone number and other details of the head office of the Bank as well as of issuing branch should be mentioned on the covering letter of issuing branch.

ANNEXURE A - MODEL RULES RELATING TO LABOUR, WATER SUPPLY AND SANITATION IN LABOUR CAMPS

NOTE: These model rules are primarily meant for labor camps, which are not of a permanent nature. These rules lay down the minimum necessary standards which shall be adhered to. Standards in permanent, or semi-permanent labor camps shall not obviously be lower than those for temporary camps.

1. Location: The camp shall be located in elevated and well drained ground in the locality.
2. Layout: Labor huts shall be constructed for one family of 5 persons each. The layout to be shown in the prescribed sketch
3. Hutting: The Huts shall be built of local materials. Each hut shall provide at least 20 sq. meters of living space.
4. Sanitary facilities: Latrines and urinals shall be provided at least 16 meters away from the nearest quarters separately for men and women and specially so marked on the following scale.
5. Latrines: Pit privies at the rate of 10 users or two families per seat. Separate urinals are not required as the privy can also be used for this purpose.
6. Drinking Water: Adequate arrangements shall be made for the supply of drinking water. Filtered and chlorinated water supply shall be arranged. When supplies are from intermittent sources, a covered storage tank shall be provided with a capacity for five litres per person per day. Where the supply is to be made from a well, it shall conform to the sanitary standard laid down in the report of the Rural Sanitation Committee. The well shall be at least 30 meters away from any latrine or other source of pollution. If possible, hand pump should be installed for drawing the water from well. The well shall be effectively disinfected once every month and the quality of the water shall be got tested at the Public Health Institution between each work of disinfection.

   Washing and bathing shall be strictly prohibited at places where water supply is from a river. The daily supply shall be disinfected in the storage reservoir and given at least 30 minutes contact with the disinfectant before it is drawn for use.
7. Bathing and Washing: Separate bathing and washing place shall be provided for men and women for every 25 persons in the camp. There shall be one gap and space of 2 sq. meters for washing and bathing. Proper drainage for the wastewater shall be provided.
8. Waste Disposal: Dustbin shall be provided at suitable places in camp and the residents shall be directed to throw all rubbish into those dustbins. The Dustbins shall be provided with cover. The contents shall be removed every day and disposed of by trenching.

9. Medical Facilities:

(A) Every camp where 1,000 or more persons reside shall be provided with at least one full time doctor and a dispensary. If there are women in the camp a full-time female nurse shall also be employed.

(B) Every camp where less than 1,000 but more than 250 persons reside shall be provided with a dispensary and a part time nurse/midwife shall also be employed. Services of a doctor shall be made available on call basis.

(C) If there are less than 250 persons in any camp, a standard first aid kit shall be maintained in charge of whole-time persons, trained in first aid. Services of a doctor and nurse shall be made available on call basis.

Provision for ambulance facility shall be made for every camp irrespective of its strength. All the medical facilities mentioned above shall be for all residents in the camp including a dependent of worker, if any, free of cost.

Sanitary Staff: For each labor camp there shall be a qualified sanitary inspector and sweepers shall also be provided in the following scales:

1.	For camps with strength over 200 but not exceeding 500 persons	One sweeper for every 75 persons above the first 200 for which 3 sweepers shall be provided.
2.	For camps with a strength over 500 persons	One sweeper for every 100 persons above first 500 for which 6 sweepers should be provided.

10. Personal Protection Equipment:

It shall be the duty of contractor to provide and ensure that all the labours are using personal protection equipment like helmets, fluorescent jackets, hand gloves, safety boots, ear plugs, etc. during the time of construction at site.

ANNEXURE B - CONTRACTOR'S LABOUR REGULATIONS

The contractor shall pay not less than fair wages to laborers engaged by him in the work.

Explanation:

(a) "Fair Wages" means wages payable to the laborers on the date of payment whether for time or piece work as notified from time to time and where such wages have not been so notified the wages prescribed by the Labor Department for the division in which the work is done.

(b) The contractor shall, notwithstanding the provisions of any contract to the contrary, cause to be paid a fair wage to laborers indirectly engaged on the work including any labor engaged by his sub-contractors in connection with the said work as if laborers had been immediately and directly employed by him.

(c) In respect of all laborers directly or indirectly employed on the works for the performance of the contractor's part of this agreement, the contractor shall comply with or cause to be complied with all the Labor Laws for the time being in force in India.

(d) The Engineer-in-Charge shall have the right to deduct from the money due to contractor any sum required for making good the loss suffered by a worker or workers by reason of non-fulfilment of the conditions of the contract for the benefit of the workers, non-payment of wages or of deduction made from his or their wages which are not justified by their terms of the contract or non-observance of regulations.

(e) The contractor shall be primarily liable for all payments to be made under and for the observance of the laws including regulations without prejudice to his right to claim indemnity from his sub-contractors.

(f) All the labor laws including regulations shall be deemed to be a part of this contract and any breach thereof shall be deemed to be a breach of this contract.

(g) The contractor shall obtain a valid license under the Contract (Regulation and Abolition) Act, in force and rules made thereunder by the competent authority from time to time before commencement of work and continue to have a valid license until the completion of the work.

Any failure to fulfil this requirement shall attract the penal provisions of the laws and this contract arising out of the resulted non-execution of the work assigned to the contractor.

ANNEXURE E – GENERAL SPECIFICATIONS

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1. General Brief Specifications

1.1. Specifications

Specifications refer to

1) Operational Guidelines for the Implementation of Jal Jeevan Mission (JJM) (Har Ghar Jal), Department of Drinking Water and Sanitation (DDWS), Ministry of Jal Shakti (MoJS), Government of India (GoI)
2) Manual for Preparation of Detailed Project Report for Rural Piped Water Supply Schemes published by Ministry of Drinking Water & Sanitation (MoDWS), Government of India (GoI)
3) Manual on Water Supply and Treatment by CPHEEO, Ministry of Urban Development, Government of India (GoI)
4) Specification of R.C.C. work and other civil works, pipes, gates, sluice valves, specials and all other materials shall be governed by relevant latest BIS codes and specifications.
5) National building code of India (latest edition)
6) Code of practice for earthquake resistance designs IS-1893
7) Specification for civil engineering works shall be governed by "Standard Specification Published" by CPWD Govt of India with up to date amendments.
8) Government specification for electric works in Govt. Deptt. in Madhya Pradesh in force from 1972 with up to date amendments.
9) Any other specification not covered under the above said standard or/ and required to be changed as per site conditions shall be fixed by the Engineer-In-Charge.

1.2. Definitions

The following definitions shall apply:

i. "Approved Drawings" means drawings which the Engineer-in-Charge has marked "Approved" and returned to the Contractor. Approval in this context means that the work described thereon may proceed.

ii. “Engineer-in-Charge” means Chief General Manager, Madhya Pradesh Jal Nigam .

iii. "Preliminary" and "Approved" as applied to designs and documents shall have the same meanings as applied above to drawings. A drawing which forms part of an approved design or document shall not be considered as approved drawing unless it has been marked "Approved".

iv. "Preliminary drawings" means drawings which the Contractor submits to the Engineer-in-charge for approval and any drawings returned by the Engineer-in-charge marked "Preliminary" or not marked "Approved".

v. 'Representative' means Supervision and Quality Control Consultant appointed by Madhya Pradesh Jal Nigam and authorized to act as representative of the Engineer-in-Charge.

1.3. Production, Submission and approval of engineering documents

The production, submission and approval procedure for design & drawings and documents shall comply with the following requirements.

1.3.1. Numbering and Titling

The Contractor shall institute a reference numbering system for designs, drawings and documents so that each number used is unique. The numbering and title information on designs, drawings and documents shall be designed so that management, transmittal and communication therewith can be carried out expeditiously.

1.3.2. Submission Procedure

i. Every drawing submitted by the Contractor to the Engineer-in-Charge for checking and approval shall be based on previously approved designs or documents. Interrelated drawings shall be submitted at the same time in a complete and three sets.

ii. In the case of first submissions by the Contractor to the Engineer-in-charge for approval, each design, drawing and document shall reach the review office in time to allow 30 working days (excluding weekends and national holidays) for checking by the Engineer-in-Charge before return to the Contractor.

1.3.3. Program of Submission

i. The Contractor shall prepare a program for submitting drawings and documents to the Engineer-in-Charge. The Program shall be submitted for approval. The program shall also make reasonable provisions for re-submission of unapproved design, drawings and documents and for the time needed to transmit such designs, drawings and documents. No designs, drawings and documents will be accepted for review until the program for their submission has been approved by Engineer-in-Charge.

ii. Number of Copies: The contractor shall submit to the Engineer, for approval, three copies of all submissions. Only one copy will be returned to the Contractor. After

approval, the contractor shall submit to the Engineer 5 hard copies with one laminated copy of all approved drawings with the date of approval marked along with CDs (duly prepared in Auto CAD Software and PDF). Five copies of all approved design and documents shall also be submitted along with CDs.

iii. After acceptance to tender (date of issue of LOA), the contractor will have to submit structural details, designs and drawings at the earliest however, no later than following schedule:-

a. Head works (Intake well, WTP, Raw Water Rising Main) – within 60 days

b. Distribution system (Village pipe network, ESRs, MBR, CWPM, etc.) – within 120 days

c. Other components (electric substation, all allied electrical & mechanical works of water supply scheme, other petty works) – within 150 days

1.3.4. Design Report

On completion of all working drawings, the Contractor shall submit a design report for the Project in the form of a comprehensive written description explaining the technical factors and design criteria for each Plant element and each structure and major building installation and showing the hydraulic, structural, mechanical and electrical computations which governed the design of each.

1.3.5. Manufacturer's and Contractor's Certificate

i. Where certificates are required by the Specification or relevant Reference Standard, the original and one copy of each such certificate shall be provided by the Contractor.

ii. Certificates shall be clearly identified by serial or reference number wherever possible to the material being certified and shall include information required by the relevant Reference Standard or Specification Clause.

iii. The instruction manuals shall describe the installation as a whole and shall give a step-by-step procedure for any operation likely to be carried out during the life of such item of Plant, including the erection, commissioning, testing, operation, maintenance, dismantling and repair.

iv. Maintenance instructions shall include charts showing lubrication, checking, testing and replacement procedures to be carried out daily, weekly, monthly and at longer intervals to ensure trouble-free operation. Where applicable, fault location charts shall be included to facilitate tracing the cause of malfunction or breakdown.

v. A section dealing with procedures for ordering spares shall also be included in the instruction.

vi. Three draft copies of the manual shall be submitted to the Engineer's Representative prior to commissioning the works. Five final copies of the amended and corrected manuals and drawings shall be provided at the commencement of the period of Maintenance.

vii. All the electrical and mechanical equipment's shall be subjected to approval by third party inspection at place of manufacture, at contractor's cost.

viii. Transit insurance of all equipment's shall be the contractor's responsibility.

ix. Contractor shall have to take the certificate from the electrical inspector regarding all electrical equipment before commissioning of plant. Important instructions charts shall be framed and fixed at appropriate and prominent places.

1.3.6. Maintenance Instructions

A maintenance manual shall be provided as supporting documents to the equipment manufacturer's instructions. The manual shall have following at the minimum:

i. Checking, testing and replacement procedures to be carried out on all mechanical and electrical plant items on a daily, weekly and monthly basis or at longer intervals to ensure trouble free operations.

ii. Fault location and remedy charts to facilitate tracing the cause of malfunctions or breakdown and correcting faults.

iii. Complete list of recommended lubricants, oils and their charts.

iv. Spares schedule that shall consist of a complete list of item wise spares for all electrical and mechanical plant items with ordering references and part numbers.

v. Complete list of manufacturer's instructions for operation and maintenance of all bought-out equipment. The list shall be tabulated in alphabetical order giving the name of the Supplier/ Manufacturer, identification of the plant item giving the model number and the literature provided including instruction leaflets and drawing numbers.

vi. Preventive maintenance details.

1.3.7. Record Drawings

The Contractor shall submit record drawings including those drawings submitted by the Contractor to show the whole of the plant as installed and all civil works as built. The Contractor shall also submit all water supply project components / assets with required details with geo tagging in GIS platform in KML/KMZ file format with necessary attributes. These shall include all such drawings, diagrams and schedules as are necessary for a complete understanding of the works. Information given on record drawings shall include tolerance, clearances, loadings, finishes, materials and ratings of Plant and associated civil works.

The Contractor shall ensure that the approved and completion drawings are marked up, to show the condition of plant as installed and associated Civil Works as built and two copies of such marked up prints shall be submitted to the Engineer-in-Charge for approval, prior to the preparation of Record Drawings. Submission to and approval by the Engineer-in-Charge of Record Drawings shall be pre-requisite for the last taking over certificate. All the Record Drawings shall be of minimum A2 size in five copies out of which 3 sets shall be plastic laminated for long-life. In addition, one set of soft copies of all the Record Drawings shall also be furnished. The text of all the reports shall be prepared on a widely used MS Word/ MS Excel and all the Drawings shall be prepared using AutoCAD Software and in pdf form. When reports, drawings are furnished to MPJN, 2 copies of the processor files together with 2 copies of a descriptive memorandum linking these files to the text, drawings etc., shall also be provided to the MPJN on CD, portable hard drive, pen drive, data base preferable on MS office, AutoCAD latest versions and in pdf form.

1.3.8. Program of Work

i. The works to be carried out under this Contract form an essential part of the execution of this Water Supply Project. Satisfactory progress of the entire project as a whole depends upon the timely completion of these works. For this reason, great importance needs to be attached for proper programming for the works with adequate provision for guarding against all the delays normally encountered in execution of various activities.

ii. Within four weeks from the date of issue of order of commencement for the works, the Contractor shall submit to the Engineer-in-Charge for his approval a detailed program of work together with a description of his proposed methods of working.

iii. Particulars to be shown on the program shall include:

- Submission of drawings;
- Placing of work orders;
- Stages of manufacture;
- Tests at place(s) of manufacture;
- Deliveries to Site;

- Construction of Civil works ready for erection of Plant;
- Mechanical completion of erection at site;
- Tests at site;
- Finishing and completion of civil and electrical woks.

iv. The contractor shall include with the program, a critical path network diagram which commences from the date of issue of Order of Commencement and includes inter alia the various activities as per the program of works, furnished as specified in Annexure F for respective schemes.

- activity duration in months and event times should be in months from the first event on the network and event numbers:
- a tabulation of months from the starting date of the network to enable earliest and latest event dates to be read off; duration in months to be the last day of the month and the monsoon months of 15th June to 15th October to be specially indicated in the Table
- the timing of events shown in the program of work to be adhered to and shown in the network
- the erection program shall be shown in detail (with not more than 15 activities) with durations in weeks shown in brackets behind the duration in months on the network diagram wherever considered necessary
- the program for setting-up, treating, delivery, storage (if necessary) and placing of filter media (where appropriate) the placing being a part of the erection program referred to above
- program for submission of Instruction Manuals and Record Drawings.

v. Contractor shall submit the quarterly financial planning along with the work program. This financial planning shall be according to physical planning.

vi. The dates and times in the program shall allow for compliance and the completion date for the whole of the works (except for tests on completion and except for Maintenance) shall comply with the overall time for completion required in the tender.

vii. Any approval of or consent to the Contractor's program by the Engineer-in- Charge shall not relieve the Contractor of his duties and responsibilities under the Contract.

1.3.9. Progress

i. The Contractor shall submit to the Engineer-in-Charge during the first week of each month a "Monthly Progress Report" with weighted activities all in an approved format so that actual progress at the end of the preceding month may be compared with the Contractor's program with photographs. Submission of monthly progress report shall be mandatory, if there is no progress at site, report shall be submitted with comment as no progress with the reasons.

ii. The progress report shall also include status report on the following approved individual formats:

- Drawings;
- Supplies of Plant Items;
- Construction program;
- Construction Progress;
- Overall Progress Curve;

iii. From time to time the Managing Director or Engineer-in-Charge may call meetings in their office or at the Engineer's Site Office, as they deem necessary for the purpose of control of the Contract, a responsible representative of the Contractor shall attend such meetings.

iv. The Contractor shall regularly review his program in the light of the progress actually achieved and shall submit for approval updated PERT/ CPM network and bar charts at intervals to be agreed with the Engineer-in-Charge. If progress falls behind that needed to ensure timely completion of the various parts of the works, the Contractor shall submit proposals for improving his methods and pace of working to the satisfaction of the Engineer-in-Charge and shall take such measures as are needed to ensure that the works are completed in time.

2. General Specification

2.1. Design Period for Components

Design period for various components should be according to the Manual on Water Supply and Treatment published by CPHEEO, as updated from time to time. Accordingly, project components should be designed to meet the requirements of the following design period:

S. No.	Items	Design Period (in years)
1	Source – Surface Water	50
2	Intake works	30
3	Pumping	
i.	Pump house (Civil works)	30
ii.	Electric motor and pumps	15
4	Water Treatment Units	15
5	Pipe connection to several treatment units and other small appurtenances	30
6	Raw water and clear water conveying mains	30
7	Clear water reservoirs at the head works, balancing tanks and service reservoirs (overhead or ground level)	15
8	Distribution system	30

2.2. SBC of soils for foundation of civil structures

The depth of excavation shall generally be guided by the underground strata and safe bearing capacity of the soil. The foundation/ mat concrete shall be laid minimum 1.50m below GL or as specifically approved by MPJN. Safe bearing capacity & other soil test shall be conducted by the contractor at its own cost through any NIT/ Government Engineering College/ NABL Laboratory and any accrediting institution as per ISO/ IEC 17011 or laboratory accredited as per ISO/ IEC 17025. The result of SBC shall be submitted before start of work along with the detailed structural design. The design of foundation shall not be permitted for SBC of more than 15 tonne/ m^2 in strata containing any type of soil, even if the reported SBC is more than 15 tonne/ m^2 however, in case of rocky strata it may be considered as maximum 25 tonne/ m^2 or approved by the MPJN. No payment shall be made to the contractor for carrying out these tests or on account of change in design due to strata. No dewatering in any condition shall be payable.

It shall be the responsibility of the contractor to test and check the bearing capacity of soil and submit it with the design. This bearing capacity shall be tested by plate load bearing test method at WTP and plate load test/ any other method applicable as per IS code at other structures like Intake/ OHT/ MBR/ GLR/ Buildings etc., by any NIT/ Govt. Engg. College/ NABL Laboratory and any accrediting institution as per ISO/ IEC 17011 or laboratory accredited as per ISO/ IEC 17025. No dewatering in any condition shall be payable. The foundation shall be filled with minimum 150mm thick levelling course in cement concrete grade M-15 with 20mm metal.

2.3. Material For Construction

The material used for construction shall be governed by the provision of Part-IV of National Building Code of India and relevant IS Code of specification with up to date amendment.

2.3.1. Bricks

The brick shall be Common Burnt Clay Bricks of Class designation 5, as per IS: 1077. Crushing strength and water absorption shall be tested as per IS: 3495 and others as given in Annex-A. Fly ash brick / ACC block with same specifications as per applicable IS code may also be used.

2.3.2. Sand

The sand shall be as per IS: 383. The preferable sand shall be Narmada river sand. The sand for plaster shall be confirming IS: 1542.

2.3.3. Metal/ Aggregate

Metals/ Aggregate shall be confirming to IS: 383.

2.3.4. Steel For Reinforcement

All the iron and steel required for the work will be procured by the contractor at his own cost. The Madhya Pradesh Jal Nigam shall not supply any quantity of steel under any circumstances, whatsoever. The contractor shall be required to produce the test certificate of the manufacturers to the department before use of steel for the work. No untested steel will be allowed to be used under any circumstances. The Madhya Pradesh Jal Nigam however reserves the right to get the received/ supplied steel tested at the cost of the contractor.

Steel for reinforcement shall be confirming to latest BIS specification IS: 1786 for Deformed Steel Bars and wires. All the steel above 6mm dia shall be deformed bars with strength grade of Fe-500 or Fe-415. If the steel being used is of 6mm diameter bars at any place, then it shall be plain steel conforming to IS: 432. The contractor shall be required to produce the test certificate from manufacturer to the Engineer-in-Charge, before use of steel for the work. No untested steel shall be allowed to be used under any circumstance. The preferable makes of steel for reinforcement are specified in Clause 24 – Approved list of manufacturers.

2.3.5. Cement

In accordance with the instructions contained in Govt. of M.P. PHED, Bhopal, Memo No. F-16-28/34 2/87 dated 28-1-1991 cement required for the work will be procured by the contractor at his own cost from time to time as per requirement.

The cement to be used in the work shall be 43/ 53 grade Ordinary Portland Cement (OPC) conforming to IS: 8112 or IS: 12269 approved by the Engineer-in-Charge, for all important and water retaining structures. Minor works e.g., PCC, thrust blocks, anchor blocks, etc. may, however, be constructed with OPC conforming to IS: 269 or PPC conforming to IS: 1489. Ordinary Portland cement shall be of the make specified in Clause 24 – Approved List of Manufacturers. It shall be tested for following test at contractor's cost. For under water

concreting rapid hardening cement shall be used.

S. No.	Type of test	Frequency
a)	Test for initial and final setting time as per IS: 1199	One test for 10 Tonnes or part thereof.
b)	Test for determination of Compressive strength of cement as per IS: 1199	One test for 50 tonnes or part thereof.
c)	Specific Gravity	As per Specification
d)	Soundness	As per Specification

2.3.6. Concrete

All concrete shall be mixed in concrete mixer and compacted by mechanical vibrators. Slump tests shall be carried out during concreting and sample test cubes prepared as per direction of Engineer-in-Charge tested by the contractor at his own cost. The results of the tests shall conform with the required standards and if the test results are not found satisfactory or otherwise also if the Engineer-in-Charge considers that a structural test is necessary, the same shall be carried out as instructed by the Engineer-in-Charge at contractor's expenses and if the results of this be unsatisfactory the contractor will be bound to dismantle and reconstruct the particular portion of work which has given unsatisfactory test results. The contractor shall make arrangement for testing of construction material and concrete at site itself.

In general concrete shall be designed as per IS: 456 (latest edition) and concrete for water-retaining structures shall be designed as per IS: 3370-Part-II (latest edition). All the components, which are in contact of water and its roof slabs or domes, shall be of minimum Grade M-30 e.g., jack well, intake well-approach bridge up to H.F.L. inlet chamber, raw water channel, flash mixer, flocculators, filters, module chambers, wash water tank, clear water sump, reservoirs, pure water channel etc. All other components not in contact with water shall be of minimum M-25 Grade. The cement content per cubic meter of concrete shall not be less than the provisions of IS: 456 latest addition.

In general, the clear cover to reinforcement shall be as per IS: 456 (latest edition) but additional cover, for corrosive water of 12mm shall be provided on all water retaining faces of the structural members as per the provisions of IS: 3370 (Part II) (latest edition).

The concrete shall be prepared as per mix design. All ingredients of concrete shall be weighed and mixed as per the mix design. All concrete shall be mixed by concrete mixer and compacted with concrete vibrator only.

The contractor shall setup a laboratory for testing of metal/ aggregate, concrete, cement etc. on the site. Slump test shall be carried out by contractor at its own cost. During concreting, sample test cube shall be prepared as per the frequency prescribed in IS: 456 and shall be tested by contractor at his own cost. To assess the strength of cube immediately, accelerated curing testing may also be conducted as required by the Engineer-in-Charge. If the result of the test shall not be in conformity with the required standard and if the Engineer-in-Charge considers that the structural test is necessary, the same shall be carried out by the contractor at its own cost. If the result of this comes unsatisfactory again then the contractor shall be bound to dismantle and reconstruct the particular portion of work.

The formwork shall be of steel or fresh ply to get the smooth finish.

2.4. Railing

The railing, wherever provided shall consist of 1.2m high medium class G.I pipe posts at 1.5m c/c welded with reinforcement and embedded in cement concrete with 3 rows of 32mm diameter at Intake well & WTP & 25mm diameter medium class G.I pipes railing, at ESRs/ GLSRs, duly painted in two or three coats, so as to give smooth and even finish, with synthetic enamel paint over prime coat.

2.5. Painting & Finishing

Two coats of Weather Shield Apex painting on the entire civil works shall be done outside above ground level, interior with oil bound distemper, while 2 coats enamel oil painting shall be done on doors, windows, ventilator and all steel fabrication work i.e., railing, gantry girder etc. over one coat of primer. The number of coats may be more than the above specified coats to give smooth and even surface. All MS items of works in contact with water shall have epoxy coating.

2.6. Designs For Seismic Forces

All the structures shall be designed for seismic loads that may come on the structure during its lifetime and the design of structure shall be conforming to IS: 1893 'Criteria for earthquake resistance design of structures'.

2.7. Electrical Works

2.7.1. General

The work shall be carried out as per drawing approved and directed by the Engineer-in-Charge. Electrification of structures both inside and outside shall be done in such a manner that standard level of illumination is obtained at all places. Proper earthing arrangements as per relevant IS specifications shall be provided. The wiring shall be in concealed only. The total number of

light points shall be such that minimum 300 Lux illumination inside the structures is available, Sufficient Power points shall be provided.

The intake well below pipe floor, module pipe gallery shall be illuminated with the help of sodium vapour lamps or LED amp to provide suitable illumination. On the outside also LED streetlamps of suitable illumination to keep the area well lighted shall be provided. On Approach Bridge decorative lighting shall be provided on each side, suitably spaced in such a way that it provides prescribed LUX illumination.

2.7.2. Earthing

(i) General

Protective conductors shall be provided for all electrical installations and associated mechanical Plant and Equipment, exposed steel work and buildings.

Protective conductors shall be provided in accordance with the requirements of IS:3043 and the latest edition of the I.E. Wiring Regulations/ Code of Practice for Electrical Wiring Installation IS:732.

(ii) Earthing Conductor

Earth electrodes where used shall be galvanized iron rods in accordance with IS: 3043 having outer diameter not less than 38mm. The rod shall penetrate a minimum of three meters below ground level. Where multi-rods are used a distance of not less than the driven length shall separate them.

Earth rods shall have hardened tips and caps and be extendable. Galvanized iron flats buried at a minimum depth of 600mm shall be used for interconnection of rods.

Where soil conditions make the use of rod type electrodes impracticable a grid configuration may be used comprising horizontally buried bare galvanized iron strip of dimensions 50mm x 5mm minimum. GI strip shall be buried at a minimum depth of 600 mm.

Each earth electrode rod if used shall be provided with an approved non-ferrous clamp for the connection of the earthing conductor or tape as required. These connections shall each be housed in individual concrete inspection chamber set flush to the finished ground level and shall allow disconnection for testing of individual electrodes. The chamber shall be permanently marked 'Electrical Earth'.

All materials used for the earth electrode installation shall be purpose made for the application and site conditions and shall be approved by the Engineer-in-Charge.

Unless otherwise stated in writing in this agreement, all excavation of trenches for the installation of the earth electrodes and the inspection pit shall be carried out by the Contractor.

After the earth installation has been completed the Contractor shall demonstrate to the Engineer-in-Charge that the resistance of the electrodes to earth and the continuity of the earth network are within the limits specified. Any additional earth electrodes and test instruments required for the tests shall be provided by the Contractor.

Marker posts and plates shall be provided to mark the route of buried tape electrodes. The markers shall be similar to those provided for cable routes.

(iii) Main Earthing Terminal

A main earth terminal shall be installed in an approved location adjacent to the incoming supply to a building. This shall be labelled and comprise a 50mm x 6mm minimum cross section copper strip as per IS: 3043. The bar shall be of sufficient length to accommodate bolted earth bonding connections from transformers, major items of Plant and Equipment and electrical switchgear, building structural steel work, concrete reinforcement, the earth electrode system and the lightning protection system. The earthing conductor shall be clearly marked as such and shall be accessible for disconnection to facilitate testing of the earth electrode system. For small installations an earthing terminal comprising a single brass stud of 12mm minimum diameter shall be acceptable.

(iv) Instrument Earth

A separate instrumentation earth shall be established in each control panel. This shall comprise one or more copper earth bars not less than 25x6mm cross-section electrically isolated from the steel work of the panel and amounting of power cables. The instrument earth bar or bars shall be connected radially to the main earth bar of the control panel.

The instrument earth bar shall be provided for earthing the signal earth connection of each instrumentation and control device and the screen or screens of each instrument cable.

The earth bar shall have sufficient brass terminals to terminate all devices etc. as detailed plus not less than 25% spare terminals.

The screens of instrumentation signal cables shall be earthed at one point only. This shall normally be the nearest instrument earth bar at the control panel end.

Instrumentation signal screens shall be cut back and insulated at the field end. The overall earth resistance shall be brought down to less than one ohm.

2.7.3. Colours

All cables cores shall be colour coded throughout their length and shall be so connected between switchboard, distribution board, plant and equipment and accessories, that the correct sequence or phase colours are preserved throughout the system.
The colour coding should be as follows :

- 3 phases : red, yellow and blue
- single phase or dc : red and black
- earth : green / yellow
- control : blue (dc), red (ac)

2.7.4. Conductors

Copper conductors shall be used for power cables up to 10 sq mm. Aluminium conductors shall be used for power cables above 10 sq mm. Copper conductors shall be used for control and instrumentation throughout. Cores of cross-sectional area greater than 4 mm^2. Small power and control cables shall be of a minimum cross section of 2.5 mm^2. Internal wiring of control panels shall be of a minimum cross-section 1.5mm^2 flexible and standard.

Instrumentation and control cabling shall be of a minimum cross-section 1.5mm^2 for external use and 1.0mm^2 for internal use.

2.7.5. Cable Fixing

Ties and strapping shall be suitable for securing cable and cable groups to cable tray or ladder. They shall be resistance to chemicals. Plastic coated metal ties used in order to obtain corrosion resistance shall not be acceptable. Nylon ties shall be resistant to the effects of ultra-violet light and shall be self-extinguishing.

Large single cables shall be secured with cable clamps or cable cleats.

2.7.6. Cable Identification

At each end of each cable, in a uniform and visible position a label shall be fixed on the cable in accordance with the cable schedule. Labels shall be made of PVC and shall be indelibly marked to the approval of the Engineer-in-Charge. The label shall be retained using proprietary nylon strips passing through two fixing holes at either end of the label. If the cable gland is not normally visible, then the label shall be fixed inside the panel by means of screws.

2.7.7. Marking Location of Underground Cables

The location of all underground cables shall be engraved on brass or other non-corrodible plates

to be fixed to the exterior surface of all walls of buildings 300mm above ground level and directly above the point where cables pass through the wall.

In addition, concrete marker posts shall be installed at intervals of not more than 50m at all junctions and changes of direction along the cable route. Such marker posts shall be not less than 200mm high and of substantial construction. A drawing or sample of a typical marker post shall be submitted for the approval.

The markers shall be marked 'electric cable' both in English and Hindi.

2.7.8. Lamp Test

Facilities shall be provided to test all lamps on an assembly. This shall comprise a common lamp test section. Operation of the lamp test circuit shall energies a relay in each section of the assembly in order to light each lamp and enunciator. The lamp test circuit shall pass through auxiliary contracts on section isolators if fitted. A short time delay shall ensure that the lamp test supply is retained to allow visual checking of all lamps.

On small assemblies, less than ten starters, individual lamp test buttons on each section shall be acceptable unless otherwise specified.

2.7.9. Telemetry Outstation

This section shall house the telemetry outstation and associated cable marshalling equipment.

The interior of the telemetry outstation section shall be accessible without isolation of any drive or circuit. Therefore, all voltages in excess of 24V shall be screened to prevent access.

Each circuit shall be protected by an MCB such that maintenance work can be carried out with the minimum of interference to running plant.

Interconnection of inputs and outputs to the telemetry outstation shall be made via single edge knife type terminals to allow easy disconnection.

Analogue signals for connection to any telemetry outstation shall be connected via a signal isolator which shall allow disconnection of the outstation signal without disturbance to the operation of the works.

2.7.10. Emergency stop Circuitry

Each drive or group of drives shall be provided with an emergency stop facility which shall comprise a red coloured, mushroom headed, stay-put-twist to release push button. The work shall be carried out strictly in accordance with latest Indian electrification rule, latest specification of M.P.E.B. and relevant I.S. specification. Electrification of chemical room,

module chamber room, chlorine room, chlorine storage room, clear water pump house, office room. storeroom, L.T. switchgear room, toilet blocks, laboratory block etc. shall be done by contractor in such a manner that standard level of illumination is obtained. The wiring shall be concealed only. Separate pipes shall be provided for ordinary, power wiring and circuit wiring. Circuits shall be decided as per rules. Power wiring shall only be done in rigid steel conduit pipes. All accessories and pipes shall be I.S.I. Mark. In wiring copper conductor shall be used. The electrification shall be done by experienced electrical worker, having valid license. The contractor shall provide MCC for the load of complete Treatment Plant except the clear water pumps load.

2.7.11. Lighting and Fixtures

The general requirements for lighting fixtures and wiring are given below. The contractor shall however work out details of illumination and arrangement and submit necessary drawings to the departments. The drawing shall be approved by "Chief Electrical Inspector" or his subordinate authorized officer.

Detailed Recommended Level Of Illumination

S. No.	Units	Recommended Level of Illumination
1	Module Control Room	300 Lux
2	Rooms and passages	200 Lux
3	Office, pump houses	300 Lux
4	Filter gallery	200 Lux
5	Inspection boxes	300 Lux
6	Stores	200 Lux
7	Chlorine room and cylinder room	200 Lux
8	Chemical House	200 Lux
9	Laboratory	300 Lux
10	Sanitary blocks	150 Lux
11	Around clariflocculator, ESRs, MBRs	150 Lux
12	Around filters	200 Lux
13	Around clear water sump and channel	150 Lux
14	Intake well, pump house	200 Lux
15	Approach Bridge	200 Lux

The switches and switch fuse unit shall be I.S.I. mark confirming to IS: 13947.

Approved make LED Batten lights of at least 2 x 20 watts subject to fulfilling of minimum lux requirements, complete with all fittings shall be provided. Approved make and accepted standard LED street lighting luminaries, consisting of all required necessary accessories shall be provided by the contractor. Approved make ceiling fans of 1200mm sweep and pedestal fan of 380mm size shall be provided by the contractor.

Approved make air circulatory fans mounted on motor floor in order to cool the motors shall be provided by the contractor.

The cost of providing and laying the cables from I.T. switch gear room to different units, street light fitting (except from sub-station) fitting for wash water pump, air blower and additional fitting for blowers is pump house, surge vessel, etc. shall be considered to be included in the relevant rates.

Approved make means the make specified in Clause 24 – Approved List of Manufacturers.

The street light fitting shall be mounted on steel tubular poles swaged type as per I.S. 2713 complete including fixing on ground with concrete block with base plate etc. of 7.00m height from ground level.

All equipment's and material shall be suitably designed and guaranteed for normal life and satisfactory operation under the climatic conditions prevalent at site. They should perform as per the characteristics without showing any sign of overload, overheating etc.

Detailed specification shall be given for all the mechanical and electrical equipment's duly guaranteed for their satisfactory performance for at least 12 months from the date of commissioning of plant.

Before putting the plant in operation all electrical installations, wiring etc. shall be certified by the contractor and clearance from Govt. Electrical Inspector shall be taken.

2.7.12. Motor Control Center/ Distribution Boards

There shall be fixed execution design in sheet metal housing and shall be suitable for power and light requirement and equipment under the contract. A distribution board (D.B.) with M.C.B. shall be located in chemical house to provide power to alum and lime mixing agitator. Power supply to this distribution board shall be from main M.C.C. in pump house. This M.C.C. in form of L.T.O.C.B./ A.C.B. shall be provided and fixed by the contractor in pump house. The cooling etc. shall also be done by contractor.

The weatherproof distribution board to energize flash mixer, clari-flocculator shall be located at suitable point.

For external and internal illumination in the module chamber room, a separated D.B. shall be mounted in this room. This D.B. shall consist of control for wash water pump air compressor and lighting, etc.

For external and internal lighting of chlorine room and storage room a separate D.B. shall be mounted. This will connect with L.T.O.C.B./ A.C.B. A separate D.B. shall be mounted to control the external and internal lighting of pump house.

A Distribution Board for control of streetlight shall also be mounted in the pump house/ office reception area.

2.7.13. Cables

All power and control cables should be of standard make and I.S.I. mark.

2.7.14. Starter/ Push Button

Motor starter shall be as mentioned below.

a) Motors up to 5HP - DOL starter
b) Motors above 5 HP up to 100 HP - Star-delta starters
c) Motors above 100 HP - soft starter

2.7.15. Earthing For Motors

As per I.E. rule, 440 V motors shall be earthed to two independent earth station common to all motor/ M.C.C. etc. using shortest routes, and by interconnecting earth wires/ strips lightening Arrestor shall be provided at two distant location of buildings.

The earthling shall be done after digging the pit of standard size and depth with 600mm x 600mm x 3mm thick copper earth plate including accessories and providing masonry enclosure in C.M. with cover plate having locking arrangement and G.I. watering pipe of 20mm size 2.7m long etc. with charcoal or coke and salt filling etc. complete.

2.7.16. Lightening Conductor

Lightening conductor of 25mm diameter and 300mm long copper tube having single prong at top with 85mm diameter, thick copper base plate including holes shall be provided. It shall have 20 x 3mm thick copper strip with necessary support to connect the strip to surface up to earthing plate. It shall be provided at the highest point in the plant.

2.7.17. Electric Connection Charges

Power supply (excluding electric connection charges/ security deposit) at all points i.e. Intake, WTP, BPT, all OHT, staff quarters, office building, store etc. shall be in the scope of contractor.

2.7.18. Length of Electric Power Line

Length of the electric power line 33 kV/ 11 kV shall be as per the scope of work, any change in the length will be considered as variation.

2.8. Valves & Specials

Specification for Valves, specials and other such materials shall be governed by latest relevant BIS specifications with their up-to-date amendments.

The material of these valves and specials should be DI with ISI Mark, where DI pipeline and HDPE pipelines have been laid. The valves, which are not available conforming to BIS specification shall have face to face dimensions and flanges confirming to IS: 14846. The make of valves and specials have been given here in these specifications. All Valves shall comply to IS/ BS standard and inspection and testing certificate shall be produced to Engineer- in-Charge.

All the pipes shall be fitted with sluice valve as per BIS/ BS standards and wherever necessary provided with inspection chambers.

2.9. Units of Water Treatment Plant

All units and components of Water Treatment Plant shall be designed as per recommendations of 'Manual for Preparation of Detailed Project Report for Rural Piped Water Supply Schemes', published by Ministry of Drinking Water and Sanitation, Government of India for the plants in rural areas and as per 'Manual on Water Supply and Treatment', published by CPHEEO, Ministry of Urban Development, Government of India for the plants in urban areas.

2.10. Minimum Diameter of D.I. pipelines

The minimum diameter of D.I. K-7 or K-9 pipes shall be of 100 mm.

2.11. MS pipe of above 800 mm diameter

Wherever the size of pipeline is designed as above 800 mm dia., it may be provided with Mild Steel pipes also as per specifications of relevant latest B.I.S. Code of Practice, suitably lined and out coated with cement mortar or epoxy coating (not merely painting) to prevent it from corrosion.

2.12. Boundary wall

All the sites of structures e.g. intake well, pump houses, MBRs and/ or B.P. Tanks, WTP, etc. shall be provided with boundary wall of minimum 2.0 m height from G.L. The Boundary wall shall be of minimum 20cm thick brick masonry suitably constructed on RCC beams connected with RCC columns with 'Y' shape angle iron with 2x3 rows of barbed wire fencing at top of

boundary wall and having MS fabricated gate of minimum 3.0m width. Specifications of individual works such as concreting, trenching, etc. has to be as specified in this Annexure-'E'.

2.13. Approach roads

Wherever the specifications for approach roads are not given in NIT, it shall be WBM with overlaying Bituminous layers as per MORTH specifications for Intake Well & Water Treatment Plant and all weather roads to always enable access for the remaining project structures. The width of roads shall be minimum 3.0m. The specifications of BT road consist of Granular sub-base with coarse graded material (Table 400-2), compacted WBM layers with Grading-II (a) and Grading- III (a). Primer coat with bitumen emulsion @0.60 kg/sqm, tack coat @0.30 kg/sqm, Open Graded Premix surfacing (Case-II) and seal coat using Type-A and Type-B seal coats.

2.14. Road, Rail and River crossings

The mode of laying the pipeline, crossing road, railway or river in the entire project shall be determined so as to satisfy the requirement of the authority concerned. Cost of execution of all such crossings is deemed to be included in the quoted bid rates and no extra payment shall be made on that account of this. Liaising with the concerned authorities will be under the scope of the contractor, only the fee/statutory charges and cost of land occupied, if any payable to the concerned department/authority for grant of permission will be paid/reimbursed by MPJN.

3. Specifications for Intake Well

3.1. Scope of work

The contractor is required to complete the following works including all planning, design, construction, testing, commissioning and O&M.

3.1.1. Intake Well cum Pump House

An intake well cum pump house is to be constructed at the location specified in Annexure-'F' at the selected site to draw raw water from topmost layers in different seasons and also from the lowest level of water. The various considerations to be kept in mind while designing and constructing the intake well shall be as below:-

i. Floor area should be sufficient to have panels, switch gears and capacitors, etc. The floor area shall be increased to the functional requirement for all these, if necessary.

ii. The size of the intake well should be such that it has adequate capacity to draw raw water as per the requirement given in Annexure F for respective schemes.

iii. The size of the Intake well should have adequate capacity for installation & maintenance of the pumps/motors with minimum internal diameter as specified in Annexure F for respective schemes to house the pumping equipment, as per specifications capable to draw raw water as per the requirement given in Annexure F.

iv. Intake well should have a proper grit chamber for the retention of half minute or as required from the design consideration and should have a mechanical scraping belt or bucket for de-gritting the well.

v. Suitable sluice valves/gates at the entrance of Intake well have to be provided to control the flow with manual as well electrically operated arrangement.

vi. Proper arrangement for fresh air circulation should be there so that suffocation does not occur during the maintenance of the well.

vii. An RCC staircase to Intake well with proper railing up-to bottom, with landing at intermittent points has to be provided.

viii. A separate gantry of suitable capacity is to be provided for maintenance purposes.

ix. Proper ventilation/lighting arrangement as per the BIS requirements for the pumps and motors are to be provided.

x. Proper lightening arrester arrangement as per BIS standards are to be made for Intake well.

3.1.2. Internal diameter

Internal Diameter of the intake well shall be as per the design value obtained for the required inflow; however, it shall be minimum as specified in Annexure - 'F'.

3.1.3. Inlet Port Arrangement

The intake well shall have inlet port arrangements at different levels with screens, racks, sluice valve etc. with both manual and electrically operated arrangement.

3.1.4. Approach bridge

A suitable approach bridge as specified in Annexure-'F' with suitable return arrangement is to provide to connect the Intake well with the nearest ground. The bridge should be sufficient to carry IRC class B loading.

3.1.5. Ancillary Works and Other General Considerations

The scope of work includes all the necessary works required including ancillary works if any, to be executed to make available the desired quantity of water into the Intake and/or Jack well. No extra payment will be made on this account to the contractor and rates for such work shall be deemed to be included in the quoted rates.

The job implies all works from detailed preliminary investigations to the final commissioning of the structure including all ancillary works such as construction of coffer dam for diversion of flow of river, dewatering, bailing out of water, etc. including testing during trial run period and defects liability and O&M period of this contract.

The contractor is required to arrange complete construction of civil works, supply and installations of all the pumping sets until the whole structure is handed over to the Madhya Pradesh Jal Nigam staff authorized by the Managing Director/ Engineer-in-Charge. Testing will also have to be carried out at contractor's cost and it will be the responsibility of the contractor to ensure that respective standards are achieved.

The Intake well is required to house vertical turbine pumps and other accessories, therefore coordination with the pump suppliers and hydraulic model studies will be essential for deciding arrangements of pump installations, the contractor will have to carry out any modification, addition and alteration to the design and structure to meet such requirement if needed without causing any extra liabilities on the MP Jal Nigam. He will design the Intake well cum pump house in such a manner that it also meets the efficient vortex free hydraulic and structural requirements of pumps/ motors to be installed to meet such requirements.

The trash rack of the Intake well should be suitable for ultimate capacity of this project to draw raw water as specified in Annexure-'F' through different ports at same level. In the Intake well cum pump house, pumps as specified in Annexure-'F' should be installed which may be replaced in future after O&M period, for ultimate capacity. These pumps will operate individually or in all possible combinations. The civil structure will have to be such that no vortex is formed and there is no interference or pump starvation by operating these pumps in any combination or independently. However, for structural design suitable static loading for each motor pump assembly may be considered at the points where they will be fixed. In addition to this a live load at motor and discharge pipe floor may also be considered. The essential vibration effect factors will also be considered.

3.2. Detailed investigation

It will be necessary for the contractor to depute technical personnel to visit the site of construction to get them acquainted with the prevailing site conditions and contact the office of Engineer-in-Charge to collect all relevant information for planning and designing the entire construction work of said structure. A safe R.L. of HFL should be ascertained by the contractor for planning water supply head works at the Intake well site on bank.

The contractor shall confirm any topographical and hydrological investigations done and satisfy themselves as the details provided in this document are just for guidance. No claims on variation because of any change in actual site conditions vis a vis conditions mentioned herein shall be admissible & considered for payment.

3.3. Detail Designs and Drawings

Besides this a general layout drawing showing the arrangement of installations of vertical turbine pumping sets, piping arrangement at discharge floor, location of starters, control panels, main switch board, cable laying etc. should also be supplied by the contractor. Entire civil works related to these items viz. foundations for pump, motor, cable trenches ducts and opening in steining wall of Intake, opening in slabs for pumps, gantry cables and pipes etc. in all respects are to be provided by the contractor and shall be a part of this contract.

The responsibility for design, construction, structural stability and water tightness shall rest solely with the contractor. The contractor shall have to submit four sets of as-built drawings immediately after completion of work.

Detailed design shall include all the required calculations for all the components including the following:

i. Foundation depth and its design for trash rack structure, Intake well cum pump house Staining thickness and its design for various hydraulic conditions.
ii. Pipe floor and motor floor design for anticipated loading conditions.
iii. Gantry support to be designed for ultimate loading capacity including weight of gantry girder crane.
iv. Design of shoring scaffolding.
v. Protection works against flood and erosion of banks near Intake well.
vi. Design of inlet ports and/or approach conduit.
vii. Design of Approach road/ramp with suitable approach

3.4. Foundation

The foundation of Intake well should be designed and constructed considering the strata at site, maximum scour depth, weight of superstructure, water force, wind force, live load of pumps, motors and pipes, dynamic forces due to vibrations of pumps, water thrust, seismic force, and other live loads, water thrust, uplift pressure, etc. Any other forces required to be taken for safe design, which are not mentioned here, should also be taken into consideration for the design.

The drawings showing location of proposed work are enclosed for guidance only. The work of foundation also includes dewatering of water, shoring of sides of excavation, scaffoldings, desilting of foundation, construction of coffer dam, etc. for which no extra payment shall be made to contractor. The concrete mix for RCC work in foundation should not be weaker than M30 and the stresses in concrete shall be taken as per IS: 3370 and other relevant BIS codes/ specifications.

Blasting in foundation shall be permitted only by the competent authority if the contractor guarantees that such operation shall not pose any threat of damages.

The foundation of Intake well shall be taken down to such depth that it is safe against scouring, settlement, overturning, floating logs and sliding. The depth of foundation below the scour line shall not be less than 1.5m for adequate anchorage purpose. In case of foundation resting on rock, the minimum embedment in the rock shall be 1.5m. However, minimum depth below the scour line has to be ensured considering a sufficient factor of safety as per prevailing IS and IRC norms. The minimum bottom floor level of intake well should be such so that the water can be drawn from the lowest supply level. The laying of foundation concrete under water shall be done by skip boxes or termite pipes with prior permission of the Engineer-in-Charge. Pumping out of water shall not be permitted from the time of placing concrete up to 24 hours thereafter.

Sufficient dowel/ Anchor bars should be provided in the foundation by drilling suitable diameter holes in the foundation rock and fixing for steel bars and grouting it with suitable epoxy compounds.

3.5. Trash Rack Structure

The R.C.C trash rack structure shall have minimum suitable floor area and three inlet ports should be provided at suitable levels considering summer, fair-weather and monsoon seasons.

Control sluices for lower most and monsoon level ports shall be above HFL at Intake floor level whereas all upper sluices shall be provided in the steining of the trash rack and inlet lower and operating gears from the approach floor at top manually and electrically. The opening in the trash rack structure has to be provided in such a way that it is not obstructed due to any floating logs/ big boulders or other floating bodies. And it should be able to draw designed

flow from the river at each of the ports. The top level of trash rack structure has to connect to Intake well with an approach. Rose pieces shall be designed for 50% clogging.

The RCC Intake well with RCC framed structure shall be having a diameter specified in scope of work/ detailed specifications with a minimum discharge floor area for required number of vertical turbine pump sets with all its appliances and appurtenances and minimum 6.00m height. These shall be placed such as to have a clear space of 1.5m between the pumps/ motors and the minimum distance of the pump/ motor from the wall should not be less than 1.5m and should be designed to carry the static, dynamic and impact load excluding dead load of floor. The motor floor should have a minimum floor area to accommodate starters and capacitors for motor at floor level; motor floor slab has to be designed accordingly. The arrangement of beams for slab should be given in such a way that these do not obstruct motor foundation and column assembly of pumps, valves and pipelines. The head room on discharge floor shall not be less than 3.0m below the bottom of the beams of motor floor. Sufficient sand filling in sunk wells are to be made as per IRC clause 1207.

Trash Rack Structure shall be required for river based intake. For dam based intake, suitable arrangement for arrresting silt and other floating body shall be made at intake well as approved by MPJN.

3.6. Staircase

An RCC staircase of minimum 1.0m width with railing for a suitable live load of discharge floor level to bottom of the Intake well should be provided, on the inner circumference of the steining. The stairs shall be provided in such a way that there is no obstruction to inlet ports or operation rods, etc. The intermediate landings should be provided at about 4.0m vertical intervals. The stairs should be provided with railing as per specifications.

3.7. Inlet ports

The well staining shall be provided with 3 inlet ports with suitable thimble plates, gates, manual/ electrically operated operating rods and strainers at various levels and directions to draw water from maximum draw down level to highest water level. Each inlet port shall be designed to allow a flow of raw water at the design rate of flow. The location and R.L. of these ports may be altered if required during construction by the Engineer-in-Charge. These inlet ports/ pipes shall be provided with sluices gates/valves with spindles, wheels and works gears so as to operate them from pipe floor level. The size of suction well and grit chamber shall be sufficient so that no vortex eddies or cavitation's effects are experienced on pumps.

3.8. Pipe floor or Discharge floor

Pipe floor should be provided to house all discharge pipes, valves and manifold for all the vertical turbine pumping sets as per requirement. The floor slab should be designed for a

uniformly distributed expected live load and moving loads, suitably designed openings should be provided for passing column pipes through the slab. The suitable provision for concrete bedding and thrust blocks for all discharge pipes should also be provided. A door entrance opening with steel collapsible gate should be provided in the well steining above pump discharge floor level towards the approach road/ ramp. An opening towards the approach ramp should be provided at motor floor just above the entrance of discharge floor.

The arrangement should be such that easy handling of motors/ pumps is possible with the help of gantry crane. A minimum 1.0m wide staircase from approach road/ ramp at discharge floor level to motor floor level shall be provided with G.I. pipe railing having specifications as mentioned. Discharge floor shall be of plain cement concrete with ironite flooring. An opening for silt removal shall be provided with steel frame and cover on discharge floor. A suitable hoist of minimum 2.0 MT capacity and tilting bucket shall be provided for lifting silt from the bottom of Intake.

3.9. Motor floor and Pump house

A floor slab at motor floor with minimum 1.0m cantilever projection as balcony all around on the outer side of wall steining should be provided with G.I pipe railing as per specifications. On this floor, the motors of turbine pumping sets, their starters, control panels, bus bar channels etc. shall be installed. The floor slab shall be designed for expected live loads plus point loads for pumping sets etc. 50% impact and vibration factor be taken separately. All the civil work involved for installation of pumps and to lay electric cables of motor shall be provided by the contractor. The motor floor shall be of mosaic with 1.50% ironite. An opening in floor with steel frames and cover for unloading of motors, pipes and machineries directly from discharge pipe floor. The inner dimension of well at motor floor level shall be such that a sufficient floor area is available at this floor level. Suitable rubber mats as per BIS specifications are to be provided in both the motor as well as discharge floors.

A cantilever chhajja at suitable height on the outer side of pump house should be provided all around. Good architectural appearance should be provided to balcony and chhajja to the satisfaction of department. A main entrance of 2.4m x 1.5m shall be provided facing towards the staircase. The staircase should be connected with the balcony to facilitate approach to the motor floor from discharge floor Approach road/ ramp. G.I pipe railing should be provided all around the balcony. Sufficient doors, ventilator and windows of Z-section steel or aluminium frames fully glazed shall be provided in such a way to provide at least 30% opening in floor area for light and ventilation. All doors/ windows ventilators shall be provided with fine graded netting for fly/ insect proofing. The height of pump house shall be such as to have a roof top level, so as to have a minimum of 6 m from motor floor level to inside roof level.

Note- If the contractor is using pumps with stool/ stand, in which no separate discharge and motor floors are required, then he may submit the drawings accordingly for approval.

The roof of pump house shall be of RCC and the live load over the roof should not be less than 150 Kg/Sqm.

Sufficient space for storage of spare parts and tools and plants should be provided in shape of almirah in the pump house. The total area or racks and almirah shall be wooden with sun-mica finish of good quality with locking arrangement.

3.10. Arrangement of Gantry Girder

Cantilever projection not less than 0.3m should be provided all around on the inner side of the wall at suitable height from motor floor level to support Gantry girder crane. Rails of suitable size should be provided all around this projection over which the gantry girder will move along the circumference. The gantry girder should be provided with chain pulley with spur gear in such a manner that it can move along the gantry girder. The length of chain pulley shall be capable of lifting the machines/pipes/other articles from the bottom of the Intake well discharge floor, motor floor level or from any height between the bottoms of Intake to gantry girder level. The job includes providing, installation and commissioning of de-gritting crane with grab bucket, rope girder, hoist etc. complete. A suitable Air and water jet arrangement with suitable compressor for scouring of Intake and trash rack arrangement is also to be made.

3.11. Approach bridge

An RCC approach bridge of suitable length from Intake well to nearest GL above HFL is to be constructed. The width of the bridge shall be minimum as specified in Annexure F / H excluding the raw water pipe, kerb and cable duct and shall be designed to carry I.R.C class "B"/ Applicable loading. The return on approach side is also included in this contract. The railing of bridge shall be of RCC. Full drainage arrangement from slab of the bridge is to be provided. The scope of this work includes the detailed geo technical investigation, design drawing, construction, and load testing etc. for this work.

4. Raw Water Pumping Mains

4.1. Scope of Work

The raw water pumping main shall be provided for conveying raw water in accordance with specification in Annexure ’F’. The raw water pumping main shall start from Raw Water Intake well- cum- Pump House and terminate at the inlet of Water Treatment Plant (WTP) as per the requirements specified in Annexure F. This main shall be of either MS spirally welded pipes as per IS:3589, IS:5504 or ductile iron (DI) pipes as per specifications mentioned elsewhere in this Annexure. The pipe material shall be as per the design diameter. Preferable DI pipe is to be used for diameters up to 800 mm and MS pipe above 800 mm diameter. The final decision on pipe material to be used shall be as per the directions of Engineer-in-Charge.

4.2. Layout Drawings

The contractor shall have to carry out confirmatory survey and submit the detailed layout drawing, sufficient to show the details as mentioned below:-

i. R.L. of ground, invert level of pipes and H.G.L. at every 30m interval.
ii. Location of horizontal and vertical bends.
iii. Degree of bends, degree or radius of curves, tangent distance for curves.
iv. Location and covering length of all valves and other appurtenances.
v. Details and description of all specials.
vi. Location and size of supporting pillars, bridges and culverts to cross the waterways.
vii. Location and sizes of thrust blocks and anchor blocks.
viii. Location and sizes of valve chambers.
ix. Details, dimensions and plan including complete description of expansion joints and flanges.

The layout plan submitted by the contractor, can be altered or modified by the Engineer-in-Charge to suit the requirement depending upon the field conditions even during the course of execution of work and the contractor shall not claim for compensation in any way on this account.

5. Clear Water Pumping Mains

5.1. Scope of Work

The Clear Water Pumping Main shall be provided for conveying water from Clear Water Sump of Treatment Plant CW Sump cum pump houses to MBR / BPT / OHTs / GSRs, etc. as per requirement specified in Annexure F.

Providing, laying & jointing of Clear water Pumping main pipes as per relevant IS specification with up-to-date amendments including Electro Magnetic Flow meters, valves, sluice valves, air valves, scour valves, chambers, thrust block, crossings, specials & accessories etc complete for a total length as per requirement specified in Annexure F.

MS / DI class K-9 & K-7 pipe as per IS 8329 including valves, electromagnetic flow meters, sluice valves, air valves, scour valves, air valves, chambers, thrust block specials & accessories, etc. complete.

5.2. Layout Drawings

The contractor shall have to carry out confirmatory survey and submit the detailed layout drawing, sufficient to show the details as mentioned below-

a) R.L. of ground, invert level of pipes and H.G.L. at every 30 m interval.
b) Location of horizontal and vertical bends.
c) Degree of bends, degree or radius of curves, tangent distance for curves.
d) Location and covering length of all valves and other appurtenances.
e) Details and description of all specials.
f) Location and size of supporting pillars, bridges and culverts to cross the waterways.
g) Location and sizes of thrust blocks and anchor blocks.

h) Location and sizes of valve chambers.
i) Details, dimensions and plan including complete description of expansion joints and flanges.

The layout plan submitted by the contractor, can be altered or modified by the Engineer-in-charge to suit the requirement depending upon the field conditions even during the course of execution of work and the contractor shall not claim for compensation in any way on this account.

6. Clear Water Gravity Mains

6.1. Scope of Work

The Clear Water Gravity Main shall be provided for conveying water to OHTs / GSRs / MBRs. The diameter range of pipeline is 100mm to 1000mm of DI class K-9 & K-7 / MS for a length as specified in Annexure F.

Providing, laying & jointing of Clear water gravity main pipes as per relevant IS specification with up-to-date amendments including Electro Magnetic Flow meters, valves, sluice valves, air valves, scour valves, chambers, thrust block, crossings, specials & accessories etc complete for a total length as specified in Annexure F.

If MS pipe is used, then the specification for MS pipes mentioned in this annexure will be applicable.

6.2. Layout Drawings Of Gravity Mains

The contractor shall have to carry out confirmatory survey and submit the detailed layout drawing including Longitudinal Section, sufficient to show the details as mentioned below-

a) R.L. of ground, invert level of pipes and H.G.L. at every 30 m interval.
b) Location of horizontal and vertical bends.
c) Degree of bends, degree or radius of curves, tangent distance for curves.
d) Location and covering length of all valves and other appurtenances.
e) Details and description of all specials.
f) Location and size of supporting pillars, bridges and culverts to cross the waterways.
g) Location and sizes of thrust blocks and anchor blocks.
h) Location and sizes of valve chambers.
i) Details, dimensions and plan including complete description of expansion joints and flanges.

The layout plan submitted by the contractor, can be altered or modified by the Engineer-in-charge to suit the requirement depending upon the field conditions even during the course of execution of work and the contractor shall not claim for compensation in any way on this account.

6.3. Allied Works

All works necessary for providing, laying, jointing, testing, commissioning and O&M of above

gravity/pumping mains shall fall under the scope of works including surge protection works, if any including fixing of Electro Magnetic Flow Meters at suitable places.

The main items of allied works are providing, fixing, jointing, testing, commissioning etc. of butterfly valves, reflux valve, air valves, scour valves, its chambers, manholes, cross drainage works, thrust blocks, anchor blocks, expansion joints etc. complete.

7. Water Supply Distribution Network

7.1. Brief Scope of Work

The scope of work shall be as given in Annexure F. However, following specifications shall be kept in mind while executing the works.

i. House service connection should be provided just inside the boundary of the consumer's house with the suitable GI/ MDPE pipes and Stainless Steel tap, the height of stand post must be 60 cm over ground with a 15 cm nipple.

ii. A platform of size 60cm x 60cm for each house service connection with suitable foundation should be constructed by the contractor.

iii. Bulk water meter: Suitable Battery-Operated Electro-magnetic flow meter with inbuilt GPRS modem or Mechanical Jet Type Bulk Water Meters should be provided at the entry level of each village to ascertain the quantity of clear water supplied to that particular village.

iv. All flow meters shall be installed along with dismantling joints for ease in the operation & maintenance works.

8. Electrically Welded Steel Pipes

8.1. Scope

This Specification covers the requirements for manufacturing, supplying, laying, jointing and, testing at works, and site of Electrically Welded Steel pipes, internally lined with cement mortar and externally coated with cement concrete, used for water supply mains.

8.2. Applicable Codes

The laying of pipes and fittings/ specials shall comply with all currently applicable statutes, regulations, standards and Codes. In particular, the following standards, unless otherwise specified herein, shall be referred. In all cases, the latest revision of the standards/ Codes shall be referred to. If requirements of this Specification conflict with the requirements of the standards/ Codes, this Specification shall govern.

IS: 3589	Seamless/ Electrically Welded Steel Pipes for Water, Gas, Sewage-Specification

IS: 5822	Code of Practice for Laying of Electrically Welded Steel Pipes for Water Supply
IS: 7322	Specification for Specials for Steel Cylinder Reinforced Concrete Pipes
IS: 432 Part I	Mild Steel and Medium Tensile Bars Reinforcement
IS: 432 Part II	Specifications for Mild Steel and Medium Tensile Bars and Hard Drawn Steel Wire
IS: 2328	Flattening Test for Seamless Pipes
IS: 269	Specification for Ordinary Portland Cement (OPC)
IS: 6452	Specification for High Alumina Cement for Structural Use
IS: 8041	Specifications for Curing of Rapid Hardening Portland Cement
IS: 455	Specification for Portland Slag Cement
IS: 1489	Specification for Portland Pozzolana Cement
IS: 8043	Specification for Hydrophobic Portland Cement
IS: 4853	Recommended Practice for Radiographic Inspection of Fusion Welded Butt Joints in Steel Pipes
IS: 4260	Recommended Practice for ultrasonic testing of butt welds in Ferritic Steel
IS: 3600 (Part I)	Methods of Testing Fusion Welded Joints and Weld Metal in Steel: Part I Cruciform Fillet Weld Tensile Test

Others I.S. Codes not specifically mentioned here but pertaining to the use of Electrically Welded Steel pipes shall form part of these Specifications.

8.3. General Specifications

M.S. Pipe - Above 800mm M.S. submerged arc (SAW) or ERW longitudinal pipes with 25 mm thick in-lined & out-coated with grade 43 ordinary Portland cement sand gunite conforming to IS 8112 and design as per standard norms given below.

1. It shall be designed to satisfy the design requirements as given in Annex –B clause 16.1 of IS 5822-1994 (Indian Standard Code of Practice for laying of welded steel pipe for water supply) with up to date amendments and other methods. It shall be designed by considering all forces i.e. internal pressure, dynamic effect, seismic forces, external pressure, working temperature, weight effect, anticipated water hammer (surge) etc.

2. Nominal thickness:- The nominal thickness of the steel pipe shall be the designed thickness plus permitted manufacturing tolerances for reduction in thickness of steel plate plus 2 mm thickness for corrosion allowance (according to Para B-10 of IS : 5822-1994), however the plate thickness shall not be less than 6 mm.

3. The weld shall be continuous. The edges shall be prepared suitably prior to welding, wherever required, by the process of manufacturing. The pipes and specials should be made in such a way that minimum possible wastage is taken place. No compensation shall be permissible on wastages. The specifications of ISI mark MS plate shall conform

to IS: 2062-1999 and the grade designation shall be Fe 410 W B.

4. Process of manufacturing:- The electric resistance welding or submerged arc welding as per IS: 3589-2001 shall be employed for the welding of pipes. Straightness, test at manufacturer's work, ovality, hydraulic testing etc. shall be as per IS 3589 & other code of practice.

5. Length of pipes:- The steel pipes shall be manufactured in an average length of 6.0 m to 12.0 m.

6. Diameter of steel pipe shell:- The internal diameter of steel pipe shell shall be such that after providing 25 mm thick cement mortar inner lining, the finished clear diameter of pipe shall be as per design.

7. Marking: Each pipe (steel plate) shall be ISI marked and legibly marked with following details

    i. Manufacturer's name and trademark

    ii. Nominal size and specified wall thickness

    iii. Pipe designation

8. Cement mortar lining & Out coating of Steel pipes & Specials:-

9. Thickness: The steel pipes and specials shall be in-lined and out-coated with 25mm. thick cement mortar with a maximum plus tolerance of 2 mm. The in-lining and out-coating may be applied to the pipe before the laying. As the in-lining and out- coating of the pipes and specials has been done before the laying of the pipes. Reinforcing, strength, material, quality etc. shall be as per IS 3589.

Note :- Raw water & clear water delivery & manifold shall have the same specification except thickness which shall be min. 8 mm thick & as above except in-lining out-coating which shall be liquid Epoxy coating interior & exterior of steel pipes & specials as per Annex B of IS 3589 with up-to-date amendments.

In case of raw water, clear water & gravity main, if contractor proposed more length for above 800mm dia. Pipe as given in bid then he/they shall have to give the comparative statement of cost for both type of pipes i.e. M.S. inlined & out-coated pipes as defined above and DI pipes.

If any other specifications mentioned in bid document anywhere for above narration & clashes, then above shall supersede.

8.4. Specification Requirements

The minimum requirement of MS pipes is given in this section; however, the bidder is required to design the pipe as per provisions of IS: 5822 and other applicable IS codes with up-to-date amendments.

8.4.1. Material

8.4.1.1. Steel

The steel used for manufacturing of the pipes and specials shall be Fe-410 and conforming to IS: 2062. The quality of steel, chemical composition and tensile strength of the steel shall be as specified in IS: 3589. The thickness of steel plates used for manufacturing pipes shall conform to IS: 3589 or as specified. The thickness of steel plates used shall in no case be less than that specified in IS: 3589.

8.4.1.2. Cement Mortar and Cement Concrete

The Cement Mortar and Cement Concrete used for lining of pipes and specials shall conform

to the Specifications mentioned here in this annexure. The maximum size of aggregate shall be one third the thickness of concrete cover inside the steel pipe or 10mm, whichever is less. The concrete mix shall have a minimum cement content of 450 kg/m^3 and a characteristic compressive strength of 25 N/mm^2 at 28 days. The cement mortar shall have a minimum cement content of 600 kg/m^3 and a characteristic compressive strength of 25 N/mm^2 at 28 days.

8.4.1.3. Reinforcement

All cage reinforcement used in the pipes and specials shall conform to IS: 432 (Part- 1) or IS:432 (Part-2).

8.4.1.4. Welding Electrodes

All electrodes used for welding of steel plates shall conform to IS: 814.

8.4.2. Length

The pipes shall be manufactured in lengths of 10-12m, unless otherwise specified or as agreed between the MPJN and the manufacturer, for ease in handling.

8.4.3. Joints and Ends

Pipe sections shall be of swelled and plain ends suitable for swelled jointing. The dimensions of sleeves shall be as specified in IS: 3589. Other relevant Specifications with respect to joints and ends, as per IS: 3589 shall also be applicable.

8.4.4. Tolerances

The tolerances over dimensions of pipes for different diameters of pipes shall be as specified in IS: 3589 and no negative tolerance in pipe thickness shall be accepted.

8.4.5. Manufacture

Pipes shall be made from steel plates by butt welding spirally. Pipes shall be of specified nominal diameter after internal lining with 12 mm thick cement mortar as per Specifications.

Prior to welding, edges of plates shall be prepared suitably, and the plates shall be fitted closely and during welding they shall be held firmly. Welding shall be done so that there shall be thorough fusion and complete penetration.

The ends of the steel pipes shall be perfectly vertical to its longitudinal axis.

8.4.6. Welding

For manufacturing of the steel pipes, any of the following types of welding shall be adopted as per IS: 3589.

i. Automatic submerged arc welding.

ii. Electric resistance welding.

The welding of pipes in the field and testing should comply with IS: 816.

Plates shall be held in the correct position. Abutting edges shall be properly squared. Each deposited layer of the welded metal in the fusion welding process shall be thoroughly cleaned before additional weld metal is supplied to coincide with the centre line of joint and the finished joint shall be free from all defects.

All welds shall have complete fusion with the base metal and shall be free from cracks, oxides, slag inclusion and gas pockets.

If welding is stopped for any reason, special care shall be taken when welding is resumed to obtain complete penetration between weld metal, plate and weld metal previously deposited. Three percent of all seams of pipes welded in the fabrication shop shall be Radiographed (as per IS: 4853) to render visible inspection of any internal defects such as blow holes, slag inclusion or cracks. If any defects are detected the metal at the location shall be chipped out and rewelded. In addition to Radiography of the joints, 100 percent testing by ultrasonic equipment (as per IS: 4260) shall also be included in welding tests. Any defects found out shall be rectified free of cost. Welds found deficient in quality shall be removed by chipping or melting and remade as per Specifications. Chipping or cutting the weld shall not extend to the base metal.

Sample welds shall be submitted for testing. The weld joints shall be tested in accordance with the procedure laid down in IS: 3600 (Part-I) and as specified in IS: 5822. Approval of such tests shall be required prior to welding of the pipe.

Manual welding of special sections and fittings will be permitted when it is impracticable to use an automatic welding machine.

Final welding of closure gaps for buried pipes shall be done after intermediate pipes have been backfilled.

8.4.7. Radiograph of welded joints

Soon after welding, each longitudinal / spiral and circumferential welded length, the minimum length of the weld at random for each pipe shall be radiographed to detect welding defects, as per the requirements of IS 4853 and as directed by Engineer. This sampling will be at random to ensure 100% coverage of junctions of longitudinal / spiral and circumferential joints. If the results of such radiography fail to conform to the requirements, the Contractor shall carry out at his expense 100 % radiography test for the pertinent pipe as directed and fully satisfying the

Engineer-in-Charge.

The percentage testing of radiography is as follows:

i. Pipes and Specials manufactured at Mill/ Factory - 10%

ii. Field joints welded at site - 5%

The weld ripples or weld surface irregularities and slag etc., on both inside and outside shall be removed by any suitable mechanical process to a degree such that resulting radiographic contact due to any remaining irregularities cannot mark or be confused with that of objectionable defect. The radiograph shall be made in strict accordance with the latest requirements and as per the latest and most efficient technique either with X-ray or gamma ray equipment. The safety requirements during radiography shall be in accordance with IS: 2598.

The radiographs are to be marked in such a way that the corresponding portion of the welded seam and the welder can be readily identified. All radiographs will be reviewed by the Engineer to identify the defects and determine those which requires rectification. Defects that are not acceptable shall be removed by chipping, grinding or flame gouging to sound metal and the resulting cavities shall be welded. After rectification, the joint is to be radiographed again to prove the quality of the repair. The radiographs will be judged as acceptable or unacceptable by the Engineer based on the latest standards prescribed by relevant Indian Standard specification.

All X-rays shall be taken with equipment and by personnel of the Contractor. Films shall be developed within 24 hours of exposure and be readily accessible at all times for inspection by the Engineer. The Contractor shall provide for the use of the Engineer suitable X-ray viewing equipment. X-ray films shall be properly maintained by the Contractor. A complete set of radiographs and records as described in IS: 2595, for each job shall be retained by the Contractor and shall be handed over to the Engineer on completion of the Contract. All films shall be identified by the number and chart prepared indicating location of any work associated with the pipe erection and such inspection shall be performed by the Radiographer at the discretion of the Engineer.

8.4.8. Radiographic Inspection of welded joints

All welded joints to be radiographed shall be examined in accordance with:

(i) IS 2595 - Code of Practice for Radiographic Testing

(ii) IS 4853 - Recommended Practice for Radiographic Examination of Fusion Welded Butt – Joints in Steel Pipes

(iii) IS 2598 - Safety Code for Industrial Radiographic Practice.

Radiographers performing radiograph shall be qualified in accordance with SNT-TC- 1A. Supplements and Appendices “Recommended Practice for Non-destructive Testing Personnel Qualification and Certification” published by the American Society for Non-destructive Testing as applicable for the technique and methods will be used.

Final acceptance of radiographs shall be based on the ability to see the prescribed penetrometer image and the specified hole.

Sections of welds that are shown by radiography to have any of the following types of imperfections shall be judged unacceptable and shall be repaired.

Any type of crack or zone of incomplete fusion or penetration, any elongated slag inclusion which has length greater than 6mm any group of slag inclusion in line that have an aggregate length greater than thickness in a length of 12 times thickness, except when the distance between the successive imperfections exceeds 6 L where L is the length of the longest imperfection in the group, rounded indications in excess of that specified by the acceptance standards given earlier.

8.4.9. Fabrication of specials

Specials such as bends, tapers, tees shall conform to IS: 7322. Specials shall be fabricated by cutting plates of the specified thickness to the required shape obtained by developing the form of specials on ground. Stiffeners shall be provided wherever necessary. Abutting profiles shall be obtained using templates which guide the cutting torches as to obtain a uniform cut. No hand cutting shall be permitted. Specifications for the using and testing of the plates, electrodes, welding, cleaning etc., shall be the same as for the straight pipes.

8.4.9.1. **Horizontal and vertical curves**

Standard bends of deviations from 5 degree to 90 degrees shall be fabricated out of steel plates. The cut pieces shall as far as possible be placed at the end of pipes joined in the factory. The angle of the cut pieces shall be made so as to obtain the necessary curvature. In case of deviations differing from the standards, cut pieces shall be made to suit the particular site conditions. Length of the cut pieces shall be in line with standard specials. The vertical cuts shall be so adjusted as to conform to the proposed longitudinal section. Distance pieces may be used to obtain the above conditions.

8.4.9.2. **Tapers and Tees**

Tapers and tees shall be fabricated with one or more stocks, each stock having a stiffening ring fixed circumferentially in the centre. The stiffener rings shall be made of M.S. Plate of approved thickness.

8.4.9.3. **Provisions for valves**

Provisions in the form of stubs of required diameter shall be fabricated by the Contractor and shall be fixed to the pipeline after cutting pipe with necessary pad plates.

8.4.10. Cement Concrete and Mortar Lining of Pipes and specials

8.4.10.1. **Preparation of surface before lining or coating.**

The surface of pipe to be lined or coated with cement mortar or cement concrete shall be clean. Any loose rust, loose millscale, dirt, debris, oil, grease and other detrimental materials present shall be removed by mechanical means.

8.4.10.2.**Cement Concrete lining for inside of steel pipes and specials and mortar coating outside.**

Cement Concrete shall be composed of cement, coarse and fine aggregates and water well mixed and of proper consistency to obtain a dense, homogeneous lining that will adhere firmly to the pipe surface. Thickness of cement concrete lining inside the pipe shell shall be of 12 mm and that of the mortar lining outside the pipe shell shall be 30 mm thick or as per relevant IS specifications.

8.4.10.3.**Mixing**

The concrete for internal lining shall be mixed as per provisions of IS code

8.4.10.4.**Cover**

The clear cover to the reinforcement whether steel cylinder or cage shall not be less than 9mm for lining and 12mm for coating.

8.4.10.5.**Reinforcement**

Wire fabric shall be used for external reinforcement. It shall be 50 x 50mm steel wire mesh, 13 gauge each way, and conform to IS: 432 (Part-1) or IS: 432 (Part-2). The reinforcement cage for the pipes shall extend throughout the pipe barrel and shall consist of spirals or rings and straights. The spirals or rings shall be circular in shape and shall be either wound round the steel pipe shell itself or wound round collapsible frame or drums and then slipped on the steel pipe shell. The fabric shall be wrapped on the shell by tack welding. The outer cage reinforcement for swelled end portions of the pipe shall be wound on them at the time of laying. Minimum reinforcement in the lining shall not be less than three percent of the quantity of steel pipe shell. Splices shall be made by welding or other suitable means. The fabric shall be wrapped on the shell by tack welding.

8.4.10.6.**Equipment for lining of Pipes**

Straight sections of pipe shall be lined by use of a spinning machine specifically designed to suit for the purpose of rotating the section and centrifugally applying cement concrete lining to the interior of steel pipe. Mechanical feeding is preferable.

The Contractor shall plan for installation of sufficient number of spinning machines/ equipment for inside lining and outside coating of pipes and the proposed factories. If during the progress of works, it becomes necessary for transporting of plates/ pipes from one factory to the other for fabrication/ lining and or coating due to inadequate number of machines or breakdowns or to meet progress targets, the Contractor should arrange for such transportation of pipes from one factory to the other at his own cost.

8.4.10.7.**Concreting lining and mortar coating of pipes**

This shall be done generally in two stages to give the required thickness of the barrel.

In the first stage concreting shall be done inside the pipe shell and in the second stage placing of the mortar is done outside the pipe shell. Placing of concrete inside the steel pipe shell shall

always be done at the manufacturer's works and consolidated by spinning, vibrating, spinning combined with vibrations or other appropriate mechanical means whilst the placing of mortar outside the steel pipe shell shall be done later either at the manufacturer's works or at site.

Mortar coating outside the steel pipe shell shall not commence before the expiry of three days after the completion of concreting inside, unless otherwise it is established that the concrete lining inside has attained works cube strength of not less than 110 kg/cm^2, earlier than this period. During this entire period the concrete inside the steel pipe shell shall be under curing. The mortar outside the steel pipe shell shall be either vibrated or applied under pressure.

In the case of pipes with plain ends or slip-in type ends, the portions that should be left exposed without concreting or mortar lining shall be mutually agreed to between the purchaser and the manufacturer.

8.4.10.8.**Lining of specials**

Whenever practicable, specials shall be made form cut lengths of matured lined straight pipes. The lining shall be cut back from the end to ends to be bevelled and welded for a sufficient distance to ensure that any of the concrete lining which is intended to remain as part of lining shall not suffer damage by the cutting or welding process. The concrete lining shall be made good by rendering by hand.

Hand rendering of specials shall consist of freshly mixed concrete of a mixture equivalent to that of the lining being repaired and shall be thoroughly compacted and finished to a smooth surface of the correct form.

Cement concrete shall be used both for lining and coating of specials. The thickness of lining and coating shall be 25mm. Specials shall have the nominal dia as that of the connecting pipe after lining. Specifications for lining and coating of specials shall be as that of the straight pipes.

The application of cement concrete lining to bends, or specials sections whose shapes preclude other process of lining shall be by mechanical placement, pneumatic placement or hand trowelling finished to produce a smooth dense surface. Debris shall be removed as necessary, permitting the application of the lining to a clear surface.

Thickness shall be as required for spun lining of straight sections except that it may be varied by feathering or filleting to affect system lining with adjoining sections of pipe and thickness of lining.

8.4.10.9.**Determination of thickness of lining**

Lining thickness shall be determined on the freshly lined pipes, at intervals frequent enough to assure compliance. Thickness of lining may be determined by means of a steel pin not larger than 1.5mm in diameter or on a hardened concrete or mortar by means of a non-destructive measurement process. The lining shall be measured at four equidistant points on two cross sections of the barrel at each end of the pipe or fittings. The first set shall be at least 200 mm from the respective ends of the pipe or fitting. The second set shall be made as far into the

interior of the pipe or fitting as can be readily reached without injuring the lining.

8.4.10.10. **Curing**

After completion of concreting or mortar lining, the concrete or mortar shall be kept wet by any suitable means such as immersion in water, covering by wet gunny bags, or by mechanical sprinklers, for a period of not less than 14 days when cement conforming to IS: 269 or IS: 455 or IS: 1489 or IS: 8043 or IS: 6909 is used; not less than 7 days when cement conforming to IS: 8041 or IS: 8112 is used; not less than 3 days when cement conforming to IS: 6452 or IS: 12269 is used; and not less than 21 days when cement conforming to IS: 12330 is used.

Non-pressure steam curing may be permitted provided the requirements of non- pressure steam curing are fulfilled. For non-pressure steam curing, the pipe shall be subjected to the action of thoroughly saturated steam at a temperature of 38 to 54 degree C for a period of not less than 24 hours or for such additional time as may be necessary to enable the pipe to meet the strength requirements.

8.4.10.11. **Repair of defective or Damaged Areas of lining**

Defective or damaged areas of linings may be patched by cutting out the defective or damaged lining to the metal so that the edges of lining not removed are perpendicular or slightly undercut. A fresh mix of concrete or mortar equivalent to that of the lining being repaired shall be prepared. The cut-out area and the adjoining lining shall be thoroughly wetted, and the concrete or mortar applied to the inside or outside respectively and trowelled smooth with the adjoining lining. After any surface water has evaporated, but while the patch is still moist, it shall be cured as specified.

8.4.10.12. **Protection of work**

The lined pipe and fittings shall be protected from extreme heat due to direct sun rays, from impact of rainfall, and from freezing temperatures until the linings have cured sufficiently to withstand these conditions.

8.4.11. Workmanship

All pipes shall be cleanly finished free of cracks, surface flaws, laminations and all other defects. They shall be cylindrical, concentric and straight in axis. The ends shall be accurately cut and shaped for welds. The ends shall be square with the axis of the pipe. The repair of minor defects by welding or otherwise shall be permitted only after obtaining the prior permission from the Engineer in writing. No heating shall be permitted.

8.4.12. Handling of pipes and specials.

During manufacturing and during the entire period of the application of concrete or mortar lining protection and the curing thereof, the section shall be carefully supported and handled so as to avoid injury to the fresh lining. If a pipe section must be rolled or otherwise moved, such operation shall be done slowly and with every reasonable precaution against damage. Any portion of the lining, coating that may become damaged shall be cut and replaced.

During delivery, all sections shall be handled by such means and in such a manner that no distortion or damage is done to the protection or to the section as a whole.

8.4.13. Laying of pipes

Pipes shall be laid in accordance with standard laying procedures.

All pipes shall be laid true to line and level and on pedestals wherever required, the joints strictly conforming to welding Specifications. Joints shall be finished in a workman like manner and shall prove to be sound and watertight. The field welding shall be carefully carried out so as to induce the minimum heat distortion and local hardness in steel.

In addition, the provisions of IS: 5822 shall also be applicable.

8.4.14. Field Jointing of Insides and outsides of Concrete lined pipes.

Cement mortar shall be used for lining of inside and outside of joints. It shall be of the same Specifications as those of outside mortar coating of pipes, cement mortar lining for inside and outside of field joints shall be done only after testing the pipeline as per Clause 15.5.17.3.

8.4.14.1.**Jointing Inside**

For the inside lining of field joints, wire fabric of 50 x 50mm steel mesh, 13 gauge each way, shall be provided. Inside joints of mortar lined pipe shall be plastered with cement mortar and finished off smooth with the inside surface of the pipe by trowelling or by other equipment means. Before placing the joint mortar material against the surface of the lining, these surfaces shall be carefully cleaned and wetted to ensure good bond between the lining and joint mortar. The field joint shall be cured for a minimum of 14 days. In any case the pipeline shall not be put into serve until the mortar has cured for a minimum of 24 days. The joints shall be finished off smooth with the inside surface of the lining by trowelling.

8.4.14.2.**Jointing Outside**

For this item, the joints have been classified into two groups:

- Those coming under waterlogged area
- Those coming in other area.

Joints under waterlogged areas: These joints shall be done with Cement Mortar 1:2 with two layers of M.S. 50mm x 50mm x 13 gauge weld mesh and the thickness of mortar shall be 50mm thick and a suitable water proofing compound shall also be used.

Joints coming in other areas: These shall be done with Cement mortar 1:2, 25mm thick with one layer of 50mm x 50mm x 13 gauge wire fabric reinforcement.

Outside field joints shall be coated with cement mortar retained by suitable forms so as to bridge the joints. The mortar shall be compacted within the form to produce a dense coating without voids. The joint coating shall be kept moist for a minimum or 14 days.

8.4.15. Fixing of fixtures

Contractor has to fix the required number of fixtures at proper locations as per the approved Drawings and the instructions of Engineer. The fixtures shall be fixed to the flanges by bolts,

nuts and washers with necessary fireplay insertions etc. All types of fixtures and necessary equipment required for fixing these fixtures shall be arranged by the Contractor at his own cost.

8.4.16. Testing of Pipeline

8.4.16.1.**Mechanical Test (Tensile Test)**

Tensile test shall be carried out as specified in IS: 1894. The tensile strength and percentage elongation of pipes shall not be less than the values specified in the table below. The percentage elongation shall be determined on a gauge length of 5.65 times of square root of original cross-sectional area of the specimen (So).

Steel grade	Tensile strength MPa (min)	Percentage elongation (min)
Fe-330	330	20
Fe-410	410	18
Fe-450	450	12

8.4.16.2.**Hydrostatic Testing at Works**

Each straight pipe section whose ends are in plane at right angle to the pipe axis shall be tested hydrostatically before the pipe is coated, wrapped or lined, as per IS: 3589. The pipes shall withstand the test pressure without showing any signs of weakness, leak or sweating. The test shall be carried out in the presence of the Engineer and as per Specifications. The required pressure should be maintained for at least 2 minutes for inspection purposes. The pipes shall be fitted with an accurate pressure gauge approved by the Engineer.

The hydraulic test pressure shall be the pressure calculated from the formula P=2St/D except that the maximum test pressure shall not exceed 5 MPa.

Where:

P = Test pressure in MPa

S = Stress in MPa which shall be taken as 40 % of specified minimum tensile strength

t = Specified thickness in mm

D = Specified outside diameter in mm

In this test, no hammering shall be permitted. Any section showing more than one leak for each 1.5 metres of welded seam or more than 2.5 percent of the total lengths of welded seam will be rejected. Stopping leaks by means of caulking tools shall not be permitted. In sections showing less than one leak for each 1.5 meters of welded seam and not more than 2.5 percent of the total lengths of welded seam, the leaks shall be repaired by chipping the weld and rewelding, after obtaining the permission of the Engineer in writing. All such sections shall be clearly indicated in the logbook for reference. The repaired pipe should be retested hydrostatically for specified

pressures. If on retest a pipe shows any leak in the welded seams it will be rejected. Accepted pipe sections shall be marked with legible marks of identification. This test is compulsory on all straight pipes.

i. Testing at site: After completing the installation of pipeline, or a section of the line and welding of joints, a hydrostatic pressure test of the line shall be made before giving the lining and coating to the exposed joints. The hydrostatic pressure shall be maintained as per Clause 11.2.1 of IS: 5822, during which time the pipe shall not show any sign of sweating or oozing or spotting of water at the joints or any part. If a drop-in pressure occurs the quantity of water added in order to re-establish the test pressure, should be carefully measured. This should not exceed 0.1 litre per mm of pipe diameter per km of pipeline per day for each 30m head of pressure applied.

If the pressure measurements are not made at the lowest section, an allowance should be made for the static head between the lowest point and the point of measurement to ensure that the maximum pressure is not exceeded at the lowest point. Any defective joint or part shall be repaired and retested in the presence of the Engineer. The Contractor shall make his own arrangements for water for field testing. Water if supplied by department will be charged at non- domestic rates prevalent at the time of supply. The pipeline shall be tested in stretches of not exceeding 2 km in length. This field hydraulic test is mandatory. This clause is not negotiable.

8.4.17. Measurements

The net length of pipes of specified thickness as laid or fixed shall be measured nearest to cm. The portion of the pipe at the joints shall not be included in the length of pipe work.

Excavation, refilling, shoring and timbering in trenches masonry or concrete pillars and thrust blocks wherever required is inclusive.

8.4.18. Excavation and preparation of trenches for laying U/G pipeline

The trench shall be so dug that the pipe may be laid to the required alignment and at required depth. For road cutting and restoration of concrete/ BT roads, estimates are based on conventional method. However, as directed by the Engineer-in-charge, the contactor is required to complete this work by either (i) using concrete cutter/ trenching machine, or (ii) using trenchless technology. Roads are required to be restored as per specifications of the concerned department or as directed by the Engineer-in-Charge. When the pipeline is under a roadway, a minimum cover of 1.2m shall be provided, in other cases the minimum cover of 0.9 m above the crown of the pipe shall be provided, if due to the any condition the pipe not laid at prescribed depth deduction will be made as per UADD ISSR May 2012 with amendments up to 31.12.2020. The trench shall be shored, wherever necessary and kept dry so that the workman may work therein safely and efficiently. Under roadway and places where it is not possible to lay pipes up to required depth or laid open on ground should be encased all round with the 1:2:4 (M15) cement concrete.

8.4.19. Trenching

The trench shall be so dug that the pipe may be laid to the required alignment and at required depth. For road cutting and restoration of concrete/ BT roads, estimates are based on conventional method.

However, as directed by the Engineer-in-Charge, the contactor is required to complete this work either (i) with concrete cutter/ trenching machine, or (ii) using trenchless technology. When the pipeline is under a roadway, a minimum cover of 1.2m under major roads shall be provided, in other cases the minimum cover of 0.9m above the crown of the pipe shall be provided, if due to the any condition the pipe is not laid at prescribed depth, deduction will be made as per UADD ISSR May 2012 with amendments up to 31.12.2020. The trench shall be shored, wherever necessary and kept dry so that the workman may work therein safely and efficiently. Under roadway and places where it is not possible to lay pipes up to required depth or laid open on ground shall be encased all round with the 1:1.5:3 (M15) cement concrete.

8.4.20. Preparation of bottom of trench

The bottom of the trench shall be properly trimmed to permit even bedding of the pipeline. The curvature of the bottom of the trench should match the curvature of the pipe as far as possible, subtending an angle of 120^{o} (degree) at the centre of the pipe. Where rock or boulders are encountered, the trench shall be trimmed to a depth of at least 100 mm below the level at which the bottom of the pipe is to be laid and filled to a like depth with non-compressible material like sand or crusher dust or moorum of adequate depth to give the curved seating.

8.4.21. Recovery of other serviceable material

All serviceable materials such as woodwork, bricks, masonry etc. recovered during the operation of cleaning or excavations, which, in the opinion of the Engineer-in-Charge are suitable for reuse in restoring the surface, shall be separately stacked and disposed of as directed by Engineer-in-Charge.

8.4.22. Dewatering

Dewatering shall be carried out by the contractor, wherever necessary. The discharge of the trench dewatering pumps shall be conveyed either to drainage channels or to natural drains and shall not be allowed to spread over in the vicinity of workplace.

8.4.23. Special foundation in poor soil

Where the bottom of the trench at subgrade is found to consist of material, which is unstable to such a degree that in the opinion of Engineer-in-Charge it cannot be removed and replaced with an approved material thoroughly compacted in place to support the pipe properly, a suitable foundation for the pipe, consisting of piling, timbers or other materials, in accordance with the direction of the Engineer-in-Charge, shall be constructed.

8.4.24. Excavation in hard rock by blasting

Blasting for excavation shall be done only when the contractor obtains the license for the same and only when proper precautions are taken for the protection of persons and property. The hours of blasting shall be fixed by the Engineer-in-Charge. The procedure of blasting shall conform to the requirement of licensing authority. The excess excavation by blasting shall be filled up by 1:4:8 cement concrete. The contractor shall have to make his own arrangement for procurement and storing of explosives required for blasting.

Rubble available from excavation of hard rock, shall be the property of the contractor, for which recovery of INR 65/- per cum of the quantity of hard rock excavated shall be made from his running account bills.

8.4.25. Braced and sheeted trenches

Open-cut trenches shall be sheeted and braced as required by Engineer-in-Charge and as may be necessary to protect life and property or the work. When closed sheeting is required, it shall be so driven as to prevent adjacent soil from entering the trench either below or through such sheeting.

8.4.26. Stacking of excavated material

All excavated materials shall be stacked in such a manner that it does not endanger the work and avoids obstructing footpaths and roads, hydrants under pressure, surface boxes, fire, or other utility controls shall be left unobstructed and accessible until the work is completed. Gutters shall be kept clear or other satisfactory provisions made for street drainage and natural watercourses shall not be obstructed.

8.4.27. Barricades, guards and safety provisions

To protect persons 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 construction work and until it is safe for traffic to use the roadway. All materials, piles, equipment and pipes, which may obstruct traffic, shall be enclosed by fences or barricades and shall be protected by proper lights when visibility is poor. The rules and regulations of the local authorities regarding safety provisions shall be observed.

8.4.28. Maintenance of traffic and closing of streets

The work shall be carried out in such manner that it causes 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 a streets is closed shall be placed and necessary detour signs for the proper maintenance of traffic shall be provided.

8.4.29. Structure Protection

Temporary support, adequate protection and maintenance of all underground and surface structures, drains, sewers and other obstruction encountered in the progress of the work shall be furnished under the direction of the Engineer-in-Charge. The structures, which may have been disturbed, shall be restored upon completion of the work.

8.4.30. Protection of property and surface structures

Trees, shrubbery fences, poles and all other property and surface structure shall be protected unless their removal is shown on the drawings or authorized by the Engineer- in-Charge. When it is necessary to cut roots and tree branches such cutting shall be done under the supervision and direction of the Engineer-in-Charge.

8.4.31. Avoidance of the Existing Service

As far as possible, the pipeline shall be laid below existing services, such as water and gas pipes, cables, cable ducts and drains but not below sewers, which are usually laid at great depth. If it is unavoidable, pipeline should be suitably protected. A minimum clearance of 150 mm shall be provided between the pipeline and such other services. Where thrust or auger boring is used for laying pipeline across road, railways or other utilities, larger clearance as required by the concerned authority shall be provided. Adequate arrangements shall be made to protect and support the other services during laying operations. The pipeline shall be so laid as not to obstruct access to the other services for inspection, repair and replacement. When such utilities are met with during excavation the authority concerned shall be intimated and arrangements made to support the utilities in consultation with them.

Restoration of sewerage system: If the sewer lines are coming in the way of pipeline alignment, it shall be properly restored either by constructing manholes on both sides and connecting it with similar sewer line, so as not to disrupt the services of the sewerage system or by laying the pipeline below or above the sewerage system as per the directions of Engineer-in-Charge.

8.4.32. Preparation of Formation for Sections of pipeline to be laid above Ground

Formation should be prepared by cutting high grounds and filling in low areas. Care has to be taken while fixing the alignment and gradient of the pipeline, to balance the cutting and filling quantities, as far as possible, with minimum of lead. Care should also be taken to ensure that pipe rests fully either on cutting or on bank.

8.4.33. Disposal of surplus material

Excavated material in excess than required for backfilling the trenches, shall be disposed of as per the directions of Engineer-in-Charge. Surplus excavated stuff available at one section shall be used for back filling at other reaches, wherever required.

8.4.34. Allowable Removal of Pavement

Pavement and road surfaces may be removed as a part of the trench excavation, and the amount removed shall depend upon the width of trench specified for the installation of the pipe and the width and length of the pavement area required to be removed for the installation of gate valves, specials, man-holes or other structures. The width of pavement removed along the normal trench for the installation of the pipe shall not exceed the width of the trench specified by more than 150 mm on each side of the trench. The width and lengths of the area of pavement removed for the installation of gate valves, specials, man-holes or other structures shall not exceed the maximum linear dimensions of such structures by more than 150 mm on each side. Wherever in the opinion of the authority, existing conditions make it necessary or advisable to remove additional pavement, it shall be removed as directed by the authority.

8.4.35. Replacement of Pavements and Structures

All pavements, paved footpaths, curbing, gutters, shrubbery, fences, poles, sods or other property and surface structures removed or disturbed as a part of the work shall be restored to

a condition equal to that before the work began, furnishing all labour and materials incidental thereto. In restoring the pavement, sound granite blocks, sound brick or asphalt paving blocks may be re-used.

8.4.36. Cleaning-Up

All surplus water main materials and all tools and temporary structures shall be removed from the site as directed by the authority. All dirt, rubbish, and excess earth from the excavation shall be hauled to a dump and the construction site left clean to the satisfaction of the authority.

8.4.37. Extra material required for back filling

If in any case, it is required to bring the soil for back filling from outside, it should be of good quality and should not have chemicals e.g. sulphates, chlorides & conductivity etc., which may cause corrosion to pipes, specials and other structures, beyond the permissible limits.

9. Inner Lining & Outer Gunite for MS Pipes and Specials

Specifications provided in Clause 9 shall supersede the specifications in Clause 8.4.10 and mentioned any where else regarding Inner lining and Outer Guinite coating.

Providing and making inner cement mortar lining for MS pipes

General

The work covered by this specification comprise of all operations, materials, labour and testing/ inspection required for internal cement mortar lining of pipes, pipe fittings, specials etc. including taking necessary access openings and manholes, cuts at suitable intervals as directed by the Engineer-in-charge, and rewelding the same, after done, by means of doubler plates pipes, including necessary excavation, refilling, concrete breaking and remaking if any, breaking guniting and remaking the same, all dewatering including emptying the pipeline and refilling the same after done (water to be supplied by department free of cost within 5 km lead

at a fixed point, while all other arrangements shall be done by the Contractor). Of all Dia and wall thickness carrying raw/potable water or fresh water up to 65 degree C and 19 kg/sqcm pressure handling etc.

The item includes providing all necessary instruments, tools, machines, power generation, and labour for carrying out the job to the satisfaction of the Engineer-in-charge, as per Specifications and Standards.

Applicable Codes

IS: 269	Specification for Ordinary Portland Cement (OPC)
IS: 455	Specification for Portland Slag Cement
IS: 1489	Specification for Portland Pozzolana Cement
IS: 2116	Sand for masonry mortars - Specification
IS: 3589	Steel Pipes for Water and Sewage (168.3 to 2540 mm Outside diameter) - Specification
IS: 6452	Specification for High Alumina Cement for Structural Use
IS: 6909	Specification for super sulphated cement
IS: 8041	Specifications for Curing of Rapid Hardening Cement
IS: 8043	Specification for Hydrophobic Portland Cement
IS: 8112	Specification for 43 grade ordinary Portland cement
IS: 12269	Specification for 53 Grade Ordinary Portland Cement (OPC)
IS: 12330	Specification for sulphate resisting Portland cement
IS: 11906	Recommendations For Cement Mortar Lining For Cast Iron Mild Steel And Ductile-Iron Pipes And Fittings For Transportation Of Water

Material

Cement

Cement used for the mortar preparation shall be Portland pozzolona cement (natural) cement conforming to IS 1489/ASTM 150 type I or Type II with pozzolona materials as per ASTM C 618 or Ordinary Portland cement of 43 grade as per IS 8112**.**

Sand

Sand shall consist of inert granular materials and grains shall be strong durable and uncoated. Sand shall be clean and free from injurious amount of dust, clay, flaky particles, oil, alkali, mica and other deleterious materials. Sand shall conform to IS 2116.

Sand used for lining shall be tested with standard sieves as per IS 460 and requirements specified in IS 11906

Water

Water shall be clean and free from injurious materials like organic matter, alkali, salt etc. Water shall comply with the requirement of IS 456 (Latest Edition)

Cement Mortar

Cement mortar shall be composed of cement, sand and water and mixed well in proper consistency to obtain dense homogenous to obtain dense homogenous lining that will adhere firmly to the pipe surface. The cement sand surface shall 1:1 by volume for all thickness of lining. Water cement ratio shall be between 0.3 to 0.4 volume wise. Alternatively cement mortar shall be designed to achieve 28 days compressive strength of 200kg/cm and density of 2300kg/ cum. Water absorption shall not exceed 10%

Application and Curing Specifications

General

The materials used for lining of pipes and specials and the application of the same shall conform to the Specifications given in Annex a of IS 3589, and other pertaining IS codes.

Portland cement shall conform to the requirements of IS 269/IS 455/IS 1489/IS 6452/IS 6909/IS 8041/IS 8043/IS 8112 for cement.

The paint or otherwise materials used to prevent the rusting of steel surfaces and providing seal coat of mortar lining or coating before pipe installation shall be a quick drying, corrosion-resistant material with good bonding properties to steel and shall dry tack free and smooth within 4 hours after application. The paint material applied to the interior of pipe or fittings shall be free from contaminants that may be harmful to the end user of the potable water.

Immediately prior to the cement lining, the pipe surface shall be cleaned of any grease, oil, mill scale, loose rust etc. manually. Pipes shall be spun concreted. Mortar mix shall be applied to specified thickness as per the table within 30 minutes after water is added to the mix. Placing of mortar inside the steel pipe shall always be done with care. The concrete shall be consolidated by spinning, vibrating, spinning combined with vibrating. Mortar lining of any length of pipe shall be continuous and no unfinished surface shall remain exposed for more than 20 minutes

The weld joints, bends, specials etc. shall be properly lined with cement mortar by manual application.

Hand patching of the end of the bore of the pipe for length of not more than 100 mm shall be permitted.

Finished mortar surface shall be free from any honey combing cracks and irregularities. The mortar surface shall be smoothing dense and hard.

Thickness of cement mortar lining for various Dia of pipes, elbows, and special shall be as specified in the BOQ for relevant diameters.

The Contractor shall plan for installation of sufficient number of spinning machines/equipment for inside lining. If during the progress of works, it becomes necessary for transporting of plates/pipes from one factory to the other for fabrication/lining due to inadequate number of machines or breakdowns or to meet progress targets, the Contractor should arrange for such transportation of pipes from one factory to the other at his own cost

Lining of pipes

Straight sections of pipe shall be lined by use of a spinning machine specifically designed to suit for rotating the section and centrifugally applying cement mortar lining to the interior of steel pipe, or by a method known to provide equivalent results. Mechanical feeding is preferable.

Thickness of cement mortar lining inside the pipe shall equal the Minimum Thickness of Lining 12mm or as specified in Table 8 of annex A of IS: 3589 whichever is higher. No extra payment shall be done for lining done in excess of the specified Minimum Thickness.

Lining of specials

Whenever practicable, specials shall be made from cut lengths of matured lined straight pipes. The lining shall be cut back from the end to ends to be bevelled and welded for a sufficient distance to ensure that any of the mortar lining which is intended to remain as part of lining shall not suffer damage by the cutting or welding process. The lining shall be made good by rendering by hand.

The application of cement mortar lining to bends, or specials sections whose shapes preclude other process of lining, shall be done by mechanical placement, pneumatic placement or hand troweling finished producing a smooth dense surface.

Thickness shall be as required for spun lining of straight sections except that it may be varied by feathering or filleting to affect system lining with adjoining sections of pipe and thickness of lining.

Determination of thickness of lining

Lining thickness shall be determined on the freshly lined pipes, at intervals frequent enough to assure compliance. Thickness of lining may be determined by means of a steel pin not larger than 1.5 mm in diameter or on a hardened mortar by means of a non-destructive measurement process. The lining shall be measured at four equidistant points on two cross sections of the barrel at each end of the pipe or fittings. The first set shall be at least 200 mm from the respective ends of the pipe or fitting. The second set shall be made as far into the interior of the pipe or fitting as can be readily reached without injuring the lining.

Curing

After completion of mortar lining, the mortar shall be kept wet by any suitable means such as immersion in water, covering by wet gunny bags, or by mechanical sprinklers, for a period of not less than 14 days when cement conforming to IS: 269 or IS: 455 or IS: 1489 or IS: 8043 or IS: 6909 is used; not less than 7 days when cement conforming to IS: 8041 or IS: 8112 is used; not less than 3 days when cement conforming to IS: 6452 or IS: 12269 is used; and not less than 21 days when cement conforming to IS: 12330 is used.

Non-pressure steam curing may be permitted provided the requirement of non-pressure steam curing is fulfilled. For non-pressure steam curing, the pipe shall be subjected to the action of thoroughly saturated steam at a temperature of 38 to 54 °C for a period of not less than 24 hours or for such additional time as may be necessary to enable the pipe to meet the strength requirements.

Protection of work

The lined pipe and fittings shall be protected from extreme heat due to direct sun rays, from impact of rainfall, and from freezing temperatures until the linings have cured sufficiently to withstand these conditions.

Inspection

Procedure qualification

Prior to the application of shop/field cement lining, the contractor shall perform procedure test to demonstrate that he is able to produce cement lining in accordance with the specification. The constituents, mortar and finished pipe shall be tested. Samples shall be taken from one of the first finished test pipes or fittings and testing shall be as below

For individual constituent

- Cement/ Admixture
- Sand
- Water

For cement mortar test specimen

- Density
- Compressive strength
- Water absorption

Inspection during production

Owner shall subject the process of cement mortar lining to continuous inspection. However, such inspection shall not relieve the contractor the responsibility of meeting the specification
Any cement mortar lining not applied in accordance with the specification shall be rejected
The inspection of linings shall be made from both ends of the lined pipe segment by using strong light and/or mirror. The inspection shall be done before the setting of the cement mortar as well as after the setting of the cement mortar.
Defects in cement mortar include, but are not limited to, sand pockets, voids, over sanded areas, honey combing excessive cracking, less thickness of mortar lining and areas of unsatisfactory surface finish.
The lining surface shall be smooth and free from irregularities cracks up to 0.8 mm width and less than 300mm length are acceptable. Trough to crest height shall not exceed 1.0mm
Contractor will have to perform any other test which are required by the relevant code of practice and /or asked by site engineer

Testing

Test blocks of the same material as used for the lining shall be made in 150 mm cube moulds and subjected to cube crushing tests. Each block shall be removed from its moulds as soon as practicable and cured under the conditions of temperature and humidity identical with those in which the lining of the pipe is cured. The number of tests shall be at least 4 cubes for each age and each water cement ratio for each day’s work.

The works cube strength of the test cube shall not be less than 300 Kg/cm2 after 28 days of curing or 170 Kg/cm2 of 7 days of curing. The density of the test cube shall not be less than 2300 Kg/m3.

Test block of the materials when subjected to the testing as per IS 4031/ ASTM C 109 shall exhibit strength of not less than 200kg/ sqcm after 28 days of curing and the density shall not be less than 2300kq/ cum. Water absorption as per ASTM C 642 shall not exceed 10% for the test specimen.

Repair of defective or Damaged Areas of lining

All defects shall be cut out and redone in accordance with Annex a of IS: 3589. Defective or damaged areas of linings may be patched by cutting out the defective or damaged lining to the metal so that the edges of lining not removed are perpendicular or slightly undercut. A fresh mix of mortar equivalent to that of the lining being repaired shall be prepared. The cut-out area and the adjoining lining shall be thoroughly wetted, and the concrete or mortar applied to the inside or outside respectively and trowelled smooth with the adjoining lining. After any surface water has evaporated, but while the patch is still moist, it shall be cured as specified.

Providing and applying Cement sand gunite

Scope

The specification refers to providing and applying cement sand gunite for external coating of Mild Steel pipes, including surface cleaning and preparation, providing & fixing BRC fabric, and disposing off the rebound materials within a lead of 50 m. The item includes providing all necessary instruments, tools, machines, power generation, and labour for carrying out the job to the satisfaction of the Engineer-in-Charge, as per Specifications and Standards.

General

The pipeline that is to be laid underground shall be provided with cement gunite out-coating. The gunite shall be done in two coats and adequately cured at least three days before the pipe is laid underground.

As far as possible, guniting shall be done at 3 to 4 MS guniting yards where the pipes are stacked/being stacked.

Land, water, power supply, etc., required for guniting at selected yard sites will be arranged by the Contractor at his cost. The guniting yard shall be located near the actual site of work and irrespective of the location and distance of the yard; the rate of transportation will be firm as per corresponding item of work. After the pipe is supported above ground on rollers, the Contractor shall provide sufficient number of spiders inside the pipe to keep the pipes in circular shape and these spiders shall be retained inside until the mortar is set. Maintaining the exact circular shape of pipe is very important as the pipeline is to be provided with mortar lining.

Applicable Codes

IS: 8112	Specification for 43 grade ordinary Portland cement
IS: 9012	Recommended practice for shotcreting

Material

The materials used for guniting of pipes and specials and the application of the same shall strictly conform to the Specifications given in IS 9012, and other pertaining IS codes.

Portland cement shall conform to the requirements of IS 269/IS 455/IS 1489/IS 8041/IS 8043/IS 8112 for cement.

Sand shall consist of inert materials having hard, strong, durable uncoated grains conforming to the requirements of IS 2116.

Mixing Water shall be clean, colourless, and free from injurious quantities of organic matter, alkali, salt, or other impurities that might reduce the strength, durability, or other desirable qualities of the mortar.

The MS pipe surface shall be suitably prepared prior to starting the application of sand gunite, by removing the loose materials as directed by the Engineer-in-charge, scrapping with wire brushes, degreasing, and cleaning by compressed air.

Reinforcement

The reinforcement shall be BRC Fabric No. 14, 75 x 300 mm size. MS reinforcement steel used shall be 10/12 gauge wires respectively having permissible stress of 1265 Kg/cm2 and shall conform to the relevant Indian Standard Specifications.

The reinforcement shall be held around the pipe circumferentially to the pipe surface and shall be held secured, 25 mm away from the pipe surface with the help sufficient number of 1:1 cement mortar spacers and binding wire, etc. Adjacent sheets of fabric shall overlap at least 18 times dia. of main bars and shall be securely fastened to each other at sufficient number of places. Care shall be exercised to ensure that minimum 25 mm cover is provided particularly at the lower half portion of the pipe also.

Surface Preparation

The surface of all pipes to be coated with cement mortar shall be thoroughly cleaned by hand or by sand steel grit blasting if necessary. After cleaning, the external surface of pipe shall be given a coat of cement wash.

All oil and greases on the surface of the metal shall be removed thoroughly by flushing and wiping using suitable solvents and clean rags. The use of dirty or oily rags will not be permitted. All other foreign materials shall be moved by buffing or by scrapping and wire brushing. After cleaning, the pipe shall be protected and maintained free of all oil, grease and dirt that might fall upon from whatever source until the pipe has received its cement mortar coating. If blasting is necessary, all metal surfaces shall be thoroughly blasted to bright metal. Blasted surface which acquires a coat of rust shall be cleaned/reblasted as directed by the Engineer

Mix Proportion

Cement mortar shall consist of 3 parts sand to 1 part cement by volume. The water in the mixture shall be carefully controlled so as to attain the required strength and so that the mortar will not run, sag or segregate.

Application

The pressure in the lower chamber of 'Cement Gun' shall be sufficient to produce a nozzle velocity of 115 to 150 m/sec when a tip with 19 mm opening is used. The compressor used shall be of an adequate capacity to maintain a pressure of at least 2.1 to 2.8 kg/cm2 at the gun end.

The nozzle shall be held at such a distance (65 to 100 cm) and position so that the stratum of flowing materials shall impinge as nearly as possible at right angles to the surface being gunited. All deposits of loose sand shall be removed prior to placing any layer of gunite. Gunite shall be shot in one coat to the specified thickness. Every precaution shall be taken to prevent the formation of sand pockets and if any develop, they shall be cut out and replaced with satisfactory machine placed material. No hand patching will be allowed. The Contractor shall apply the coating in such a manner that no sloughing shall occur at any time during or following its application.

Gunite shall be placed in the top and sides of the pipe, then screeded to a uniform thickness and the ground lines or blocks removed. All rebound and waste materials shall then be removed by air blowing and gunite placed in the bottom of the fittings and screeded. When completed, the coating shall be concentric with the barrel of an even thickness. The entire surface shall then receive a final flash coat of gunite and shall be steel towelled to a true surface equal in smoothness to the spun lining in such a manner not to impair the bond between mortar and steel plate. The guniting and surface finishing shall complete in set and shall be applied continuously without the use of construction joints.

In case, for any reason whatsoever, the cement does not adhere to the walls of pipes and sloughs off, swabbing the pipe with cement slurry shall not be permitted.

If for any reason it is necessary to interrupt the placing of the gunite for a length of time that will result in the material taking a permanent set, a square shoulder shall be formed at the ends of the sections and/or elsewhere by shooting against a back or by working with a trowel or other suitable tools the irregular edges of the material last placed to a clean unbroken surface face perpendicular to the pipe that will provide a suitable connection or construction joint between such material and the material to be placed subsequently. When performing this work care shall be taken not to shatter or disturb the material remaining in place or disturb the embedded wire mesh. Before placing fresh material against the surface of such joints, they shall be carefully cleaned and wetted to ensure a good bond between the fresh material and that previously applied.

The ungunited portion at the ends of the pipe lengths left for the purpose of field welding shall be coated with M15 concrete by hand after the field welding and hydraulic testing are completed.

The application of gunite to the external surface of the MS pipes and specials shall be carried out with mechanical arrangement, using 1:3 proportion cement sand gunite. Cement shall be pneumatically projected at high velocity onto the surface, less than 2.1 kg per sq.cm to 2.80 kg per sq.cm of pressure. The final coating layer shall be 40 to 50 mm thick

After completion of guniting, the cement-mortar shall be kept wet by any suitable means such as immersion in water, covering by wet gunny bags, or by mechanical sprinklers, for a period of not less than 21 days.
A length of 15 cm at each end of the pipe shall be left ungunited to facilitate site welding. The end faces shall be vertical.

Special precautions for Maintaining Circular Shape of Pipe

Special attention of the tenderer is drawn to the fact that as the proposed pipeline is being may be provided with cement mortar lining, It is therefore, very necessary that the circular shape of the pipes is maintained till these pipes are mortar lined. The contractor shall provide adjustable steel struts of the approved design for this purpose. Minimum three sets of struts shall be provided per pipe length of 6.0 M. They shall be retained till complete refilling is done and properly consolidated or till the concrete encasing is set. Any diametric variation beyond± 2 % shall have to be rectified by the contractor at his cost, which may include, removing the section of the pipeline and relaying it along with all other ancillary operations.
Providing required number of adjustable struts and all other operations involved as above shall be deemed to have been included in the item of guniting and laying and no separate payment on this account will be admissible.

Curing

After the mortar has set, but not later than twelve (12) hours after application of the coating, curing shall be commenced. Coating shall be kept continuously moist and in the shade for at least 14 days

Inspection

Pipe coatings shall be inspected prior to transports, to laying site and broken, defective or otherwise unsatisfactory areas may be rejected at any time during construction. All defective areas shall be made good to the satisfaction of the Engineer. Coating cracks over 0.25 mm wide or over 500 mm long shall be made good.

Tests

Compressive strength test of concrete shall be conducted on 150 mm cubes in accordance with IS 516. The number of tests shall be at least 4 cubes for each age and each water cement ratio for each day.

Measurement and Payment

The guniting shall be measured in square metres. For the purpose of measurement, the dia. of the guniting shall be the external dia. of bare M.S. pipe + one thickness of gunite. The rate shall include providing all labour, material and machinery for providing and fixing reinforcement, cleaning the pipe surface providing spacers and removal of the rebound as directed by the Engineer. Guniting of welded joints shall have to be done under strict supervision of the Engineer. Guniting of welded joints shall have to be done in the trench at the same rates. Extra thickness of guniting near stiffener rings required to match the gunite over pipe shell and gunite

over the stiffener rings will not be paid extra and the tender rate shall be deemed to include the cost of such extra gunite required near stiffener.

IS - 10221 - 1982 is applicable.

10.Ductile Iron Pipes & Specials

The specifications are for DI pipes proposed to be used under this contract for any purpose.

10.1. General

Supply of Ductile Iron (DI) pipe with EPDM rubber gasket for Drinking water.

10.1.1. Specification Quality Standard

i. Pipe: IS 8329/ ISO standard
ii. Jointing Material (EPDM rubber gasket): IS 5382
iii. Classification of Pipe: Class - K7 & K9
iv. Joint: Push-on-Joint (as per IS: 8329/ ISO standard)
v. Sampling: as per respective IS
vi. Test: as per respective IS.

10.1.2. Pipe Details

i. Length: Standard length of 4.00, 5.00, 5.50 and 6.00 meters (tolerance as per IS 4984).
ii. Diameter: The nominal diameter (inside)
iii. Wall Thickness: as per IS 8329
iv. Coating: Metallic Zinc with finishing layer of bituminous paint as per IS: 8329
v. Lining: Cement Mortar as per IS : 8329
vi. Type of Cement: Portland Cement or Sulphate Resisting Portland Cement (as Per IS: 8329)
vii. Quality Assurance: Quality Assurance Plan shall be got approved from the Engineer-in-Charge before production start.

10.2. Standards

Except as otherwise specified, the Indian/International Standards and Codes of Practice in their latest version shall be adhered to for the design, manufacturing, inspection, factory testing, packing, handling and transportation of product. Should any product be offered conforming to other standards, the equipment or products shall be equal to or superior to those specified and the documentary confirmation shall be submitted for the prior approval of the Engineer in Charge. DI pipes of ISO standard shall also be accepted.

IS: 8329 centrifugally cast (spun) ductile iron pressure pipes for water, gas and sewage

IS: 5382 Rubber sealing rings for gas mains, water mains and sewers

IS: 638 Sheet rubber jointing and rubber insertion jointing

IS: 9523 Specification for DI fittings for pressure pipes for water, gas, and sewage

BS: 4772 Specification for DI fittings

IS: 11606 Methods of sampling of cast iron pipes and fittings

IS: 1608 Mechanical testing of metals – tensile testing

IS: 12288 Code of practice for use and laying of ductile iron pipes

10.3. Specifications for Ductile Iron Pipes

10.3.1. Casting

The pipes will be centrifugally cast (spun) Ductile Iron pipes for Water, confirming to the IS 8329. The pipes used will be with push on joints (Rubber Gasket Joints). The class of pipe to be used shall be of K-9 or K-7 as per design requirement.

10.3.2. Surface coating

The pipes shall be coated with Metallic Zink coating as per appendix A, with a finishing layer of bituminous paint, and have factory provided cement mortar lining in the inside as per the provisions of Appendix B of the IS: 8329.

10.3.3. Standard length

The pipes will be supplied in standard lengths of 5.50 and 6.00 meters with chamfered ends suitable for push-on jointing. Each pipe of the push on joint variety will also be supplied with a rubber EPDM gasket, confirming to the IS: 5382. Any change in the stipulated lengths will be approved by the Engineer-in-charge.

10.3.4. Manufacture of Gaskets

The gaskets should also be supplied by the manufacturer of the pipes. They should preferably be manufactured by the manufacturer of the pipes. In case they are not, it will be the responsibility of the contractor to see that the manufacturer of the pipes gets them manufactured from a suitable manufacturer under its own supervision and have it tested at his/ sub-contractor’s premises as per the contract. The pipe manufacturer will however be responsible for the compatibility and quality of the products.

10.3.5. Flanged joints

The flanged joints will confirm to the Clause 6.2 of IS 8329. The pipe supply will also include one rubber gaskets for each flange.

10.3.6. Hydraulic test at works

Each and every pipe shall be tested hydraulically by the manufacturer as specified under clause 11 for the pressures specified in table 1 of IS: 8329. The test shall be carried out before application of surface coating and lining except Zinc coating which may be applied before the hydrostatic test.

10.3.7. Test for Gaskets

The test reports for the rubber gaskets shall be as per acceptance tests of the IS 5832 and will be in accordance with Clause 3.8 and contractor shall submit the test certificate issued by the manufacturer with the pipe supply, without which payment for pipe supply shall not be released.

10.3.8. Third party inspection

The inspection and testing of the pipes shall be carried out by the employer and/ or inspecting agency appointed by the employer, in the manufacture's workshop. The pipes will be subjected to following tests for acceptance:

(i) Visual and dimensional check as per Clause 13 and 15 of IS 8329 for length, internal and external diameter, wall thickness, deviation from straight length and ovality.
(ii) Mechanical Tests as per Clause 10 of IS 8329 for tensile strength and Brinell hardness test.
(iii) Hydrostatic Test as per Clause 11 of IS: 8329.

The sampling for the above tests shall be as per the provisions under clause 9 of the IS:8329. All the tests shall be conducted in presence of the inspecting agency. The pipes shall be dispatched only after issue of the test certificate by the inspecting agency for satisfactory test results as required. The inspection charges for such tests shall be paid by the contractor to the inspecting agency.

10.3.9. Retest

If a test piece representing a batch fails in the tensile or Brinell hardness test in the first instance, two additional tests shall be made on test pieces selected from two other pipes from the same batch. If both the test results satisfy the specified requirements, the batch shall be accepted. Should either of these additional test pieces fail in the test, the batch shall be deemed as not complying the required standards and shall be rejected.

10.3.10. Marking

All pipes will be marked as per Clause 18 of IS 8329 and show as below:

i. Manufacturer's name/ stamp
ii. Nominal diameter

iii. Class reference
iv. A white ring line showing length of insertion at spigot end

10.3.11. Packing and Transport

The pipes should be preferably transported by road from the factory and stored as per the manufacturer specifications to protect damage.

10.4. Specifications for Ductile Iron Fittings (Specials)

10.4.1. General

The Ductile Iron (DI) fittings shall be ISI marked as per IS: 9523-2000, suitable for Tyton joints to be used with Ductile Iron pipes with flanged and Tyton jointing system.

10.4.2. Types of specials

The following types of DI fittings shall be manufactured and tested in accordance with IS: 9523 or BS: 4772

i. flanged socket
ii. flanged spigot
iii. double socket bends (90°, 45°, 22½°, 11¼°)
iv. double socket branch flanged tee
v. all socket tee
vi. double socket taper
vii. All the fittings shall be of PN 16 pressure rating

10.4.3. Supply

All the DI fittings shall be supplied with one rubber ring for each socket. The rubber ring (EPDM) shall conform to IS: 12820 and IS: 5382. Flanged fittings shall be supplied with one rubber gasket per flange and the required number of nuts and bolts.

10.4.4. Manufacture of Fittings/ Specials

The metal used for manufacture of DI Fittings/ Specials shall conform to the appropriate grade as specified in IS : 1865-2005.

Two side lugs shall be provided on each Socketed fitting, across all types and sizes along with Lifting loops on fitting across all types and sizes from DN 400 & above.

D.I. Fittings shall also contain a Stub, minimum length -15mm x dia.- 10 mm., which can be cut at random to carry out Metallographic test to ascertain minimum 80% Graphite Nodularity as per Clause – 9.1 of IS: 1865-2005, in the form - V or VI as per IS: 7754-2003. Fittings

manufactured through Induction furnace route only shall be used.

The fittings/specials should preferably be manufacturer by a manufacturer of the pipes. In case they are not, it will be the responsibility of the manufacturer of the fittings/specials to provide fittings/specials, which commensurate manufacturer will however be responsible for the compatibility and quality of the product.

Note: ultimately the contractor who purchase the pipe/fittings/specials shall be responsible to operate the scheme component as per design.

10.5. Lubricant for Ductile Iron pipes and specials

10.5.1. General

This section covers the requirements for lubricant for the assembly of Ductile Iron pipes and specials suitable for Tyton push-in rubber ring joint.

10.5.2. Specification

The lubricant has to have the following characteristics:

(i) must have a paste like consistency and be ready for use
(ii) has to adhere to wet and dry surfaces of DI pipes and rubber rings
(iii) to be applied in hot and cold weather; ambient temperature 0-50°C, temperature of exposed pipes up to 70°C
(iv) must be non-toxic
(v) must be water soluble
(vi) must not affect the properties of the drinking water carried in the pipes
(vii) must not have an objectionable odour
(viii) has to inhibit bacterial growth
(ix) must not be harmful to the skin
(x) must have a shelf live not less than 2 years

10.5.3. Acceptance tests

They shall be conducted in line with the provisions of the IS 9523.

10.5.4. Packing for DI specials and Rubber Gaskets

All the DI fittings shall be properly packed with jute cloth. Rubber rings shall be packed in polyethylene bags. Rubber rings in PE bags and nuts, bolts etc. shall be supplied in separate jute bags.

10.6. Laying and jointing of DI pipes and specials

10.6.1. Use of tackle

Pipes should be lowered into the trench with tackle suitable for the weight of pipes. For smaller sizes, up to 200 mm nominal bore, the pipe may be lowered by the use of ropes but for heavier pipes suitable mechanical equipment have to be used.

10.6.2. Cleaning

All construction debris should be cleared from the inside of the pipe either before or just after a joint is made. This is done by passing a pull-through in the pipe, or by hand, depending on the size of the pipe. All persons should vacate any section of trench into which the pipe is being lowered

10.6.3. Laying on steep slopes

On gradients of 1:15 or steeper, precautions should be taken to ensure that the spigot of the pipe being laid does not move into or out of the socket of the laid pipe during the jointing operations. As soon as the joint assembly has been completed, the pipe should be held firmly in position while the trench is back filled over the barrel of the pipe.

The designed anchorage shall be provided to resist the thrusts developed by internal pressure at bends, tees, etc.

The assembly of the pipes shall be made as recommended by the pipe manufacturer and using the suitable tools.

10.6.4. Jointing

The socket and spigot ends of the pipes shall be brushed and cleaned. The chamfered surface and the end of the spigot shall have to be coated with a suitable lubricant recommended by the manufacturer of the pipes. Oil, petroleum bound oils, grease or other material which may damage the rubber gasket shall not be used as lubricant. The rubber gasket shall be inserted into the cleaned groove of the socket. It has to be checked for correct positioning.

The two pipes shall be aligned properly in the pipe trench and the spigot end shall be pushed axially into the socket either manually or with a suitable tool specially designed for the assembly of pipes and as recommended by the manufacturer. The spigot has to be inserted up to the insertion mark on the pipe spigot. After insertion, the correct position of the socket has to be tested with a feeler blade

10.6.5. Deflection of the pipes

Deflection of the pipes, if any, shall be made only after they have fully been assembled. The deflection shall not exceed 75% of the values indicated by the pipe manufacturer.

10.6.6. Anchoring of the pipeline

Thrust blocks shall be provided at each bend, tee, taper, end piece to prevent undue movements of the pipeline under pressure. They shall be constructed as per design approved by the Engineer according to the highest-pressure during operation or testing of the pipes, the safe bearing pressure of the surrounding soil and the friction coefficient of the soil. This item shall be payable as per the provision under BOQ.

10.7. Measurement and payment

The net length of pipes as laid or fixed shall be measured in running meters correct to a cm. Specials shall be included and measured in the total length. The portion of the pipe at the joints (inside the joints) shall not be included in the length of pipe work.

10.8. Excavation and preparation of trenches for laying underground pipeline

The trench shall be so dug that the pipe may be laid to the required alignment and at required depth. When the pipeline is under a roadway, a minimum cover of 1.2 m shall be provided, in other cases the minimum cover of 1 m above the crown of the pipe shall be provided. The trench shall be shored, wherever necessary and kept dry so that the workman may work therein safely and efficiently. Under roadway and places where it is not possible to lay pipes up to required depth or laid open on ground should be encased all round with the 1:2:4 (M15) cement concrete.

10.9. Recovery of other serviceable material

All serviceable materials such as woodwork, bricks, masonry etc. recovered during the operation of cleaning or excavations, which, in the opinion of the Engineer-in-Charge are suitable for reuse in restoring the surface, shall be separately stacked and disposed-of as directed by Engineer-in-Charge.

10.10. Dewatering

Dewatering shall be carried out by the contractor, wherever necessary. The discharge of the trench dewatering pumps shall be conveyed either to drainage channels or to natural drains and shall not be allowed to spread over in the vicinity of workplace.

10.11. Trenching

The trench shall be so dug that the pipe may be laid to the required alignment and at required depth. For road cutting and restoration of concrete/ BT roads, estimates are based on

conventional method. However, as directed by the Engineer-in-Charge, the contactor is required to complete trenching work in Concrete/ BT roads either (i) by using concrete cutter/ trenching machine, or (ii) by using trenchless technology. Contractor shall make such concrete/ BT roads same again in "as it is condition". When the pipeline is under a roadway, a minimum cover of 1.2 m under major roads shall be provided, in other cases the minimum cover of 0.9 m above the crown of the pipe shall be provided, if due to the any condition the pipe are not laid at prescribed depth, deduction will be made as per UADD ISSR May 2012 with amendments up to 31.12.2020. The trench shall be shored, wherever necessary and kept dry so that the workman may work therein safely and efficiently. Under roadway and places where it is not possible to lay pipes up to required depth or laid open on ground shall be encased all round with the 1:2:4 (M20) cement concrete.

10.11.1. Preparation of bottom of trench

The bottom of the trench shall be properly trimmed to permit even bedding of the pipeline. The curvature of the bottom of the trench should match the curvature of the pipe as far as possible, subtending an angle of 120° at the centre of the pipe. Where rock or boulders are encountered, the trench shall be trimmed to a depth of at least 100 mm below the level at which the bottom of the pipe is to be laid and filled to a like depth with non-compressible material like sand or crusher dust or moorum of adequate depth to give the curved seating.

10.11.2. Special foundation in poor soil

Where the bottom of the trench at subgrade is found to consist of material, which is unstable to such a degree that in the opinion of Engineer-in-Charge it cannot be removed and replaced with an approved material thoroughly compacted in place to support the pipe properly, a suitable foundation for the pipe, consisting of piling, timbers or other materials, in accordance with the direction of the Engineer-in-Charge, shall be constructed.

10.11.3. Excavation in hard rock by blasting

Blasting for excavation shall be done only when the contractor obtains the license for the same and only when proper precautions are taken for the protection of persons and property. The hours of blasting shall be fixed by the Engineer-in-Charge. The procedure of blasting shall conform to the requirement of licensing authority. The excess excavation by blasting shall be filled up by 1:4:8 cement concrete. The contractor shall have to make his own arrangement for procurement and storing of explosives required for blasting.

Rubble available from excavation of hard rock, shall be the property of the contractor, for which recovery of Rs. 65/- per cum of the quantity of hard rock excavated shall be made from his running account bills.

10.11.4. Braced and sheeted trenches

Open-cut trenches shall be sheeted and braced as required by Engineer-in-Charge and as may be necessary to protect life and property or the work. When closed sheeting is required, it shall be so driven as to prevent adjacent soil from entering the trench either below or through such sheeting.

10.11.5. Stacking of excavated material

All excavated materials shall be stacked in such a manner that it does not endanger the work and avoids obstructing footpaths and roads, hydrants under pressure, surface boxes, fire, or other utility controls shall be left unobstructed and accessible until the work is completed. Gutters shall be kept clear or other satisfactory provisions made for street drainage and natural watercourses shall not be obstructed.

10.11.6. Barricades, guards and safety provisions

To protect persons 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 construction work and until it is safe for traffic to use the roadway. All materials, piles, equipment and pipes, which may obstruct traffic, shall be enclosed by fences or barricades and shall be protected by proper lights when visibility is poor. The rules and regulations of the local authorities regarding safety provisions shall be observed.

10.11.7. Maintenance of traffic and closing of streets

The work shall be carried out in such manner that it causes 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 a streets is closed shall be placed and necessary detour signs for the proper maintenance of traffic shall be provided.

10.11.8. Structure Protection

Temporary support, adequate protection and maintenance of all underground and surface structures, drains, sewers and other obstruction encountered in the progress of the work shall be furnished under the direction of the Engineer-in-Charge. The structures, which may have been disturbed, shall be restored upon completion of the work.

10.11.9. Protection of property and surface structures

Trees, shrubbery fences, poles and all other property and surface structure shall be protected unless their removal is shown on the drawings or authorized by the Engineer- in-Charge. When it is necessary to cut roots and tree branches such cutting shall be done under the supervision and direction of the Engineer-in-Charge.

10.11.10. Avoidance of the Existing Service

As far as possible, the pipeline shall be laid below existing services, such as water and gas pipes, cables, cable ducts and drains but not below sewers, which are usually laid at great depth. If it is unavoidable, pipeline should be suitably protected. A minimum clearance of 150 mm shall be provided between the pipeline and such other services. Where thrust or auger boring is used for laying pipeline across road, railways or other utilities, larger clearance as required by the concerned authority shall be provided. Adequate arrangements shall be made to protect and support the other services during laying operations. The pipeline shall be so laid as not to obstruct access to the other services for inspection, repair and replacement. When such utilities are met with during excavation the authority concerned shall be intimated and arrangements made to support the utilities in consultation with them.

10.11.11. Restoration of sewerage system

If the sewer lines are coming in the way of pipeline alignment, it shall be properly restored either by constructing manholes on both sides and connecting it with similar sewer line, so as not to disrupt the services of the sewerage system or by laying the pipeline below or above the sewerage system as per the directions of Engineer-in-Charge.

10.11.12. Preparation of Formation for Sections of pipeline to be laid above Ground

Formation should be prepared by cutting high grounds and filling in low areas. Care has to be taken while fixing the alignment and gradient of the pipeline, to balance the cutting and filling

quantities, as far as possible, with minimum of lead. Care should also be taken to ensure that pipe rests fully either on cutting or on bank.

10.11.13. Disposal of surplus material

Excavated material in excess than required for backfilling the trenches, shall be disposed of as per the directions of Engineer-in-Charge. Surplus excavated stuff available at one section shall be used for back filling at other reaches, wherever required.

10.11.14. Extra material required for back filling

If in any case, it is required to bring the soil for back filling from outside, it should be of good quality and should not have chemicals e.g. sulphates, chlorides & conductivity etc., which may cause corrosion to pipes, specials and other structures, beyond the permissible limits.

11. Water Treatment Plant

All units and components of Water Treatment Plant shall be designed as per recommendations of Manual for preparation of detailed project report for rural pipes water supply schemes published by Ministry of Drinking Water and Sanitation, Govt. of India for plants in rural areas and Manual on Water Supply and Treatment, published by CPHEEO, Ministry of Urban Development, Govt. of India, for plants in urban areas.

11.1. Scope of Work

The scope comprises all necessary site investigations, functional planning, supply of plant, general design, detailed design, manufacture, supply, delivery to site, installation, construction, testing and commissioning of all works required for the Water Treatment Plant of capacity as specified in Annexure-'F' including all associated mechanical and electrical plants, equipment and services, civil and building works, pipe lines and appurtenances from the raw water inlet up to clear water reservoir and pump house.

The principal requirement is a spacious and convenient layout. The structure should represent a pleasing appearance with aesthetic features forming a balance between function and form. The interiors of the structure shall be eye appealing and in keeping with the objectives of the plant viz. production of potable and wholesome water. While designing and constructing, it should be ensured that all materials, design, construction and fabrication details for different units including doors and windows conform to the IS specifications and codes of practice wherever available and in their absence to the established standards.

The scope of work includes but shall not be limited to the provision of the following:

11.1.1. General

Study of available data with department and if required collection of additional field data's and site investigations.

11.1.2. Planning and Design

Planning and design of most economical type of treatment plant to generate filtered water as per requirement specified in Annexure-F with due consideration of future expansion.

The detailed design including hydraulic and structural design, development and preparation of detailed plant working drawings, diagrams and cable schedules and detailed structural steel fabrication drawings, preparation of design reports, manufacture and testing at places of manufacture, transport, delivery, erection, building-in, setting to work, commissioning, testing of all plant required for the Water Treatment Works.

The contract is including but not limited to, pipelines, pumping installations, blowers, compressors, machinery, apparatus, station pipe work, lifting, handling, ventilation equipment, electrical equipment, instrumentation, control, compatible PLC, interfacing lighting systems, earthing, fire safety and lightning protection systems, materials, articles, fittings and accessories, ancillary works of all kind and nature required for installations of the highest possible operative standards and for compliance with the standards prescribed in the Specification and with the particulars and guarantees entered by the Contractor in the schedules.

The contractor has to Design & Construct following components, if required, subject to fulfilment of the water quality parameters as specified in this document.

(i) Cascade Aerator or any other suitable system, for removal of iron in incoming Raw water if required. It shall be designed in circular shape with circular Gullet to collect water.

(ii) Sedimentation tank / Primary Settling tank shall be compulsorily provided where source is river.

(iii) Dosing equipment of coagulants, including chemicals with facilities to store Alum and chemicals for 3 months.

(iv) Flash mixers.

(v) Distribution chamber for clarifiers/ flocculators.

(vi) Clarifiers and flocculators. It shall be designed with properly designed inlet and outlet arrangement with due consideration to better efficiency of settling, mechanical sludge cleaning arrangement with sludge effluent pipe etc. complete. It shall be designed for 25% overloading including inlet and outlet.

(vii) Rapid gravity sand filters, filter galleries, wash water tank, filter back wash system and filter control block. Filter house shall be designed with rapid gravity sand filters in even numbers. The minimum walkway near the filter should be 1.5m wide and pipe gallery should be minimum 2.00m or more to accommodate all the pipes and valves and have a proper slope to drain out the wash water through wash water pipe.

(viii) Module Chamber Room: It shall be designed to accommodate module chambers of all filters including weir, wash water tank pump and air blowers. The height should be sufficient so that the wash water tank may be constructed above it.

(ix) Clear water sump to store treated water. It shall be designed for 45 minutes to 60 minutes detention subject to the minimum capacity as specified in the Annexure H. This capacity will be divided in 2 compartments capable for isolation provided with scouring arrangement overflow arrangement, manholes, air ventilation cowels, ladders, etc., in case the capacity is greater than 500 KL.

(x) Clear water Pump House to accommodate the clear water pumps, electrical panels, control room etc. It should have sufficient space to accommodate required number of

pumps and arrangement, to pump treated/ clear water to OHTs and IPS. Pumping arrangement will, at least, have minimum numbers of centrifugal pumps as specified including cable ducts, surge protection (If so required), NRV, suction pipe etc. complete. It should have sufficient height to accommodate the gantry crane of suitable capacity. It should have additional storeroom of minimum size 5.00x4.00x4.00m, Switch Board room of size 3.00x6.00m and office room of minimum 4.00x6.00m in size and toilet units of appropriate sizes.

(xi) Chlorination plant building, facilities for post and/ or pre-chlorination and storage of chlorine cylinders for 90 days requirement. It should have sufficient space to accommodate liquid or gaseous feed chlorinator with weighing machine of 2 tonne capacity. The cylinder storing room should have sufficient capacity to accommodate cylinder/ toner for at least 90 days storage. It should be forced ventilated, easily accessible from at least two sides. It should have an arrangement near the ramp to unload the truck by providing chain pulley arrangement at a height of minimum 5.00m.

(xii) Monitoring and instrumentation with their housing.

(xiii) Electrical works including incoming cable from substation to main control panel, motor control centres, local control and panels, compatible PLC, interfacing, power and control cabling, plant ventilation and lighting etc. It should be done as per details given and as per ISS/ B.I.S./ I.E. Rules.

(xiv) Pipelines, valve chambers, service water installation, sampling and water quality monitoring, instrumentation and other miscellaneous works associated with the plant.

(xv) Levelling the treatment plant site and landscaping.

(xvi) Storm water drain and sewers with appurtenances.

(xvii) Administrative building, laboratory, store, and for control arrangements housing building, including services such as electrical, Lighting, water supply, sanitation and air conditioning facilities. (The air conditioning facilities shall be provided only for control room having instrumentation).

Laboratory block shall be of minimum 60 sqm area or as per recommendation of CPHEEO Manual on Water Supply and Treatment, whichever is more; provided with one Chemist room, one office room and remaining part for storing the chemicals and conducting the test and toilet. WC block should be attached with laboratory.

(xviii) Guard Room - with not less than 6.0 sqmt floor area with toilet facilities and Building services.

(xix) Internal roads with storm water drains, landscaping and area lighting etc.

(xx) Training of PHE/ MPJN personnel in operation and maintenance of the plant during the last three months of O&M period.

(xxi) By-Pass Channel: Following bypass channels shall be designed and constructed. The channels shall be designed as a one unit provided with sluice gates arrangement for isolation of channels. These channels shall be designed for capacity with 20% overload.

- From raw water channel to flocculator by-passing primary settling tank, if primary settling tank is provided.
- From raw water channel to filters by-passing the flocculator and primary settling.
- From flocculator to sump by-passing filters.

(xxii) The sludge from plain sedimentation tank, clarifier and flocculators is to be collected in sludge receiving tanks by gravity and disposed into sludge drying beds with drainage facilities to reuse at flax mixer/ inlet channel. The back-wash water from filter is to be collected into settling tanks by gravity and to be recycled after settlement, by pumping to raw water inlet channel. The overflow from various units shall be connected to the storm water drains for safe disposal to the near water bodies with environmental acceptance. Sludge drying beds shall be designed for 5 to 7 days cycle, the settled sludge from wastewater sump will be taken to drying beds and filtrate will again be carried to flash mixer for reuse.

(xxiii) Storage Tank For Neutralization Of Chlorine - Solution storage tank of minimum dimension 3.00 x 3.00 x 2.00m size should be provided with fire resisting tiles cladding. It should be easily accessible from chlorine house or storage room.

(xxiv) Wastewater Collecting Sump- The wastewater or sludge water from flocculator, clarifier and filter plant and other units shall be collected in wastewater collecting tank of suitable detention time and depth according to the levels. It shall have such level that the wastewater tank can be cleaned easily. The overflow of wastewater from tank will be directly discharged by gravity away from treatment plant to the natural Drain. The chambers shall be provided at maximum 60.00m interval, at turning and wherever necessary.

(xxv) Wastewater Pipe From Flocculator, Filter, Clear Water Sump - The wastewater line from all the units shall be of R.C.C. NP2 class and shall be provided up to the wastewater sump.

11.2. Commissioning And Testing Of Plant

11.2.1. Basic Information

11.2.1.1.The source of water will be as specified in Annexure F.

11.2.1.2.The contractor is required to assess the raw water quality parameters themselves before designing the plant.

11.2.1.3.Location Of Treatment Plant - The location of the WTP is as specified in Annexure F.

11.2.1.4.Bearing Capacity Of Soil - It is the responsibility of the contractor to test and check the bearing capacity of soil and submit it with the design. The bearing capacity should be tested by plate load bearing test method by any NIT/ Govt. Engg. College/ NABL Laboratory or any accrediting institution as per ISO/ IEC: 17011 or laboratory accredited as per ISO/ IEC: 17025.

11.2.1.5.Treated Water Quality - The plant as a whole and the units individually should show efficiency as per requirement given in BIS specification and manual on water supply & treatment by CPHEEO, New Delhi. In case of any confusion BIS specification shall get the precedence to all manuals. The quality of treated water after filtration and chlorination shall be as per IS:10500 with up to date amendment.

11.2.1.6.Guarantees of Clarified Water and Final Treated Water - All works for the processing and treatment of raw water shall be designed to provide designed discharge. The performance tests on the treatment works shall be carried out at the flow inclusive of over loading of treated water as per CPHEEO Manual on Water Supply and Treatment.

11.3. Detailed Specification Of Components Of Treatment Plant

All the units of Water Treatment Plant shall be designed on the basis of CPHEEO Manual on Water Supply and Treatment.

11.3.1. Inlet Chamber

It shall be provided to collect the raw water form cascade aerator. It shall be designed for designed Capacity. It shall be in R.C.C. of minimum grade M-30. The chamber shall serve the purpose of dissipating the kinetic energy of incoming water and also provide necessary static head for flow through treatment plant, during normal and emergency loading conditions. The residual head at the end of pumping main shall be 2 m, which may be kept, is consideration during the design.

11.3.2. Inlet Channel

It shall be designed for designed capacity with flow measuring arrangement of parshall flume type with dial type flow indicator / ultrasonic flow measuring arrangement. The raw water channel shall be constructed in R.C.C. of minimum grade M-30, supported on columns at minimum 2.00m c/c in R.C.C. of minimum grade M-25. A puddle collar shall be provided to receive water.

11.3.3. Flow Measuring Arrangement

The flume shall be designed for designed flow (with a provision of 50% over loading) and free board of not less than 30 cm. The measuring flume shall have a side chamber for float. The flume shall be of open channel type. The entire construction shall be in R.C.C. and shall be perfectly watertight and suitably supported on R.C.C. columns. The walkway of 1.0m width with G.I. pipe railing as per specifications given shall be provided. The dial type flow indicator shall be provided near the flume to indicate the flow. The flow indicator shall have a capacity of measuring the maximum flow as per the project requirement as specified in Annexure-F including 50% overloading. The weir plate will have brass edges which shall be graduated to

read in litres per hour. The weir shall operate with clear free fall condition. It shall be ensured that the weir plates do not get submerged due to afflux. The dial of indicator shall be properly lighted. Necessary arrangements for proper desalting of stilling chamber shall be provided.

11.3.4. Bypass Channel

In order to provide the flexibility in operation the bypass channels shall be provided. The by-pass channel shall be designed for designed capacity. It shall connect the following units :-

- From raw water channel to flocculator by-passing primary settling tank.
- From raw water channel to filters by-passing the flocculator and primary settling.
- From flocculator to sump by-passing filters.

The necessary penstock with simple operating arrangement shall be provided as per IS: 3042 or some alternative arrangement, that suits to the proposal. It shall be constructed in minimum M-30 grade concrete and columns shall be minimum M- 25 grade concrete.

11.3.5. Rapid Mixing Unit

It shall be flash mixer designed for designed capacity, mixer with mechanical arrangement As per provision in Manual on water supply & treatment third edition clause 7.4.2.

11.3.6. Flash Mixer

It shall be designed for detention period of 30 to 60 seconds. It shall be circular or square tank with ratio of impeller diameter to tank diameter as 0.20 to 0.40 and the shaft speed of propeller to impart tangential velocity greater than 3m/s at the tip of the blade. The ratio of the tank height to the diameter shall be 3:1. The power-mixing device shall be capable of creating velocity gradient of 300 per second.

The power requirement of flash mixer shall be as per recommendation given in IS: 7090.

The paddles made of structural steel confirming to IS: 226. The agitator shall be mechanically driven consist of electric motor with continuous duty operating through a reduction gear. To achieve good results the chemical should be added just near the tip of blade. The design should be such that there should be no possibility of short circuiting in the tank. It shall be designed for a full flow of designed capacity.

A desludging pipe of RCC NP2 with sluice valve confirming to B.I.S. shall be provided. The length of pipe shall be as per requirement of layout plan and it shall be connected to waste water sump. Hand railing along operating platform (1.0m diameter all around) of 0.75m height shall be provided. The M.S. ladder of 0.75m wide shall also be provided. The specification of ladder and railing are given separately. It shall be constructed in RCC minimum M-25 grade concrete. Protective cover of G.I Sheet of 8 gauge shall be provided for motor.

11.3.7. Inflow Arrangement

Coagulated water from flash mixer will be conveyed to the inlet of clarifloculator through precast R.C.C. pressure pipe or CI or DI D/F of suitable diameter. It should be possible to

regulate or stop flow, to individual unit. The pipes shall be laid over firm bedding and at uniform grade. The velocity of flow through this conduit shall preferably be between 0.25 to 0.45m/s.

11.3.8. Sedimentation and Clarifloculator

It shall be designed for the detention time as per the provisions in CPHEEO Manual. It shall have properly designed inlet and outlet arrangement with due consideration to better efficiency of settling, mechanical sludge cleaning arrangement with sludge effluent pipe etc. complete. Combined units of flocculation and sedimentation shall be provided immediately after flash mixer, but it should be designed on concept of tapering velocity gradient and settling velocity with suitable motor operated mechanical cleaning device. Clarifloculator (s) shall be provided for the total designed flow with provision for 25% overloading under emergency condition as per CPHEEO manual. The inlet and outlet arrangement will also be designed for 25% overloading.

11.3.9. Flocculator

It shall be designed to provide a detention time of 30 minutes at design flow. Other design parameter viz depth of water, velocity of flow, paddle area, peripheral velocity of blade. Velocity gradient G and the factor GT shall be generally in accordance with CPHEEO manual Para 7.4.3.2. Mechanical Type Flocculator. Coagulated water will be admitted through the central hallow shaft near the water surface and then will flow radially outwards uniformly in all directions through slots. The velocity of flow through these slots should be about 0.2 to 0.3 m/s. Flocculation paddles 2 or 4 in numbers depending upon design will be mounted on a vertical shaft, which will be rotated by A.C. motor 3 phase 415 v. The partition wall and the floor slab of flocculator shall be of RCC. Area of opening at the bottom of partition wall should be large enough to maintain sufficiently low velocity of flocculated water.

11.3.10. Clarifier

The Clarifier shall be designed to provide a minimum detention period of 2.0 to 2.5 hours and surface loading of 30 to 40 m^3/ m^2/ day at design flow. The outlet shall comprise of V-notches and effluent launder or rectangular weir and outlet flume. A baffle may be provided in front of the weir to stop floating matter. A weir loading of 300 to 600 m^3/day/m length may be provided.

The outer circular wall and the floor slab of the clarifier shall be of R.C.C. The floor slab shall have a minimum slope of 1: 12. A peripheral walkway 1.2 m shall be provided with railing for each flocculator one set of 300mm dia telescopic bleed arrangement manually operated, sluice valve extension rod and bend wheel ISI marked shall be provided.

11.3.10.1. Sludge Removal in Plain Sedimentation Tanks and Clarifiers/ Flocculators and Clarifloculator

(i) The withdrawal of sludge from plain sedimentation tanks and clarifier/ flocculator/ clarifloculator be carried out into a terminal sludge collection tank for disposal into the sludge drying beds by pumping. Suitable pump sets and pump house have to be provided at the sludge collection tank.

(ii) Each plain sedimentation tank and clarifiers/ flocculators/ clariflocculator shall be provided with a scraper system to direct sludge to sludge pockets for piping to sludge control chambers. Separate draw-off pipes and valves shall be provided for each sludge pocket.

(iii) Each plain sedimentation tank and clarifiers/ flocculators/ clariflocculator shall be provided with a sludge control chamber. The chambers shall incorporate equipment for both continuous and intermittent sludge draw-off. Hydrant connections shall be provided at each chamber for flushing / washing down purposes.

(iv) The sludge from the Plain sedimentation tanks and clarifiers/ flocculators/ clariflocculator, shall be collected in the sludge receiving tanks. The pump house with suitable pumping machinery shall be provided adjacent to the sludge receiving tank for pumping out the sludge from the tank into the sludge drying beds followed by effluent disposal to the nearby water body with environmental acceptance and arrangement to pump this into inlet channel.

11.3.10.2. **Desludging Control and Plant**

Plant for the desludging system and control shall be located in the central control house as appropriate.

Control: The system shall be designed to carry out the following operations:

(i) intermittent desludging alone

(ii) continuous desludging alone

(iii) intermittent and continuous desludging simultaneously.

(iv) Pumping of sludge from sludge receiving tank into the sludge drying beds.

11.3.10.3. **Clearing of Blockages**

(i) Compressed air and pressure water shall be used to facilitate purging of sludge pipes and pockets in the event of blockages.

(ii) Control of each sludge valve shall originate from a manually pre-set electrical multi-range adjustable timer with means of independent adjustment of frequency (time between draw offs) and duration (length of draw-off) of desludging together with 'hand/ off/ auto' switching, 'state' lights (indicating state viz. 'open/close') and associated sludge control panels. Each plain sedimentation tank and clarifloculator shall be provided with its own independent sludge control system, with the associated panel located in the central control house.

(iii) Facilities for sequential sludge discharge shall be provided. Manual override facilities both for initiation of a discharge sequence and for operation of individual valves shall be provided. Valves controlled automatically on an intermittent basis shall be pneumatically operated straight through type or eccentric plug type, and shall be arranged to be 'fail safe' (e.g. on power or pneumatic failure, discharge valves shall close) and initiate an audible and visual alarm state at the Filter control Block. It shall be possible to open the

valve manually by using a lever or similar, under fail-safe conditions; alternative facilities such as compressed air bottles (one for each sedimentation tank or clarifiers/ flocculators/ clariflocculator) or foot pumps (minimum two), shall be provided for manual operation of valves. Each pneumatic valve shall be provided with a manually operated guard valve and a manual bypass facility.

(iv) Continuous desludging of plain sedimentation tanks and clarifiers shall be by adjustable bell mouth devices with cast iron bodies and bronze guides. The devices shall be provided with operating headstocks and suitably located position indication scales and arranged to operate in parallel with the intermittent desludging valves.

(v) During the periods of temporary shutdown, it is required that sludge scraping, and sludge evacuation equipment shall continue to run until all heavy solids have been removed from the system which could otherwise compact during the shutdown period and cause difficulties on start up.

11.3.10.4. **Hydraulic design**

The total hydraulic design capacity of the sludge withdrawal and discharge system shall not be less than 10% by volume of the maximum Water Flow.

11.3.10.5. **Sludge disposal pipework**

The pipe work for the plain sedimentation tanks and clarifiers/ flocculators/ clariflocculator sludge system (within structures) shall be of RCC NP3 and shall enable to empty tank into the sludge well by gravity. Valves shall be of cast iron-rubber lined type, epoxy painted outside. The valves shall be easily accessible for manual operation. The pipe work for sludge pumping shall be in cast iron/ ductile iron.

11.3.10.6. **Sedimentation Tank/ Clarifiers/ Flocculators/ Clariflocculator Scraping Mechanism**

Sludge scrapers and mechanical flocculators Sludge scraper mechanism and discharge arrangements shall be designed for raw water suspended solids loadings up to 20000 mg/l for the plain sedimentation tank and 1000 mg/l solids in clariflocculator. The design shall allow for starting up under a sludge sit down situations, and to accept without distortion any normal torsional or bending loads which may occur during erection and operation, scraper mechanism shall extend to the entire diameter of the tank.

11.3.10.7. **Plain Sedimentation Tank and Clarifier Sampling**

a) Local sampling taps of approved design shall be installed to take sample from at least three different points in each plain sedimentation tank and clariflocculator.

b) The three sampling taps for each tank shall be grouped together and shall discharge into a sink, which shall be connected to the main drainage system.

11.3.10.8. **Drainage of Plain Sedimentation Tanks and Clarifier**

Each tank shall be provided with facilities for complete gravity drainage of all water and sludge from both the main body of tank and from sludge concentrates. All valves, pipe work required for discharge to and connection with the main drainage system shall be provided, so that a tank may be emptied within 6 to 8 hours. These drains shall discharge into the main works drainage duct to be provided by the Contractor.

11.3.10.9. **Rotating Bridge**

The clarifier scraper bridge structure shall be made of welded and bolted structural M.S. It will be a lattice girder bridge pivoted at the center and trolley fitted with pneumatic solid rubber tired wheel and resting on clarifier wall.

The bridge shall be 1.2m wide made of welded and bolted R.S. section of suitable size.

The scraper arm with scraper blade of suitable size fitted with rubber squeezer shall be suspended from the top of bridge having M.S. grill walkway 8mm thick M.S. chequered plate walkway ground flocculator drive gear. The scraper arm shall spread across the radius of the clarifier zone and to the dia. of flocculator zone. The bridge shall be so designed that it should also act as a hand railing or otherwise additional double row 32mm G.I. pipe railing light duty shall be provided. The driving mechanism for the bridge shall rotate over the steel fabricated track located over peripheral wall or directly over wall by rubber tyre wheel and comprise of GEC/ Kirloskar/ Crompton/ Jyoti make A.C. motor of suitable rating, 4 pole horizontal foot mounted class 'B' insulation T.E.F.C. squirrel cage motor having degree of protection as IP 55 suitable for 415 + 10 V-3 phase 50Hz having flexible coupling single speed worm reduction gear, duplex chain sprocket drive, plumber block with bearing M.S. ideal and driving shaft. The central bearing shall comprise of combined radial and thrust bearing housed in high grade CI housing with G.M. bush for rigidity.

The bridge shall be designed to take its own dead weight with uniformly distributed loading of 400kg/sqm. The bridge should be so braced that deflection at mid span is less than 80mm. The central bearing assembly shall be adequately infraction in all respect catch trays shall be provided to prevent slippage into water.

Five rings special current Collector shall be provided for each clariflocculator for transmission of electric power through pipe laid under floor from outside to the sub distribution board located over rotating board.

300 mm dia RCC NP2 pipe and specials as required shall be provided for each clarifier under the floor slab between sludge outlet channel around inlet well to sludge outlet chamber at periphery.

300 mm dia D/F PN-1 manually operated D.I. Non rising spindle sluice valve confirming to B.I.S. standards and bearing ISI mark is to be provided for each clariflocculator.

One M.S. steel operating shaft with 25mm dia extension complete with C.I. head stock, 200 mm dia hand wheel and brass indicator plate for operation of sluice valve for each clarifloculator is to be provided.

For each clarifier bridge 2 No. 450mm wide rung ladder made out of M.S. black medium class pipe to IS 1239 painted with primer and paint, fixed to clarifier bridge structure for access inside the clarifier zone/ flocculation zone be provided.

11.3.11. Filtration

Traces of suspended matter in the clarified water shall be removed by filtration. Filter designs shall be down-flow open rapid gravity units type or Single dual media filters of the divided bed type and shall operate on declining rate principle.

Each filter shall be hydraulically designed for an overload of 20%. Filters shall be capable of giving a run time of at least 24 hours. The number of filters shall be in even numbers with stand by units. All filters shall be of identical shape and size. Each filter shall have 2 halves. In the case of vertical flow rapid gravity sand filters; the average rate of filtration shall be 80 to 100 lpm/sqm. The filters will be served by an adjacent filter control block where the air scour and motive power plant for valve operation and other apparatus shall be housed. The main clarified water channel shall connect to the two filter inlet channels if necessary via a chamber. All filters shall be identical in internal dimensions and shall be designed for washing using filtered water and air scour. The air scour may precede or be concurrent with the wash water. The filters shall be designed so that when receiving clarified water of the standards given in clause 2.2 the minimum period between washes is not less than 24 hours.

11.3.11.1. **Number of Filter**

The filters should be in even numbers and designed for economy to provide treated water as per requirement specified in Annexure-F along with about 2.0 to 3.0 times of quantity of back wash water.

11.3.11.2. **Rate Of Filtration**

The rate of filtration shall be taken as 4.8 to 6m/hr (80 to 100 lpm/m2). The inlet and outlet arrangements shall be designed to permit 100% overload for emergency conditions.

11.3.11.3. **Capacity Of Filter Units**

The capacity of filter should be such that the number of unit can take care of the total quantity of water to be filtered and with optimum efficiency to keep the filters working without undue overloading at any time.

11.3.11.4. **Size Of Filter Unit**

Where the filters are located on both sides of pipe gallery the ratio of length to width of a filter box shall be about 1.25 to 1.33. A minimum 2m depth of water shall be provided above filter media. The filters shall be constructed in R.C.C. of minimum grade M-30.

11.3.11.5. **Filter Media**

Filter media will consist of sand gravel. The Specification of media shall be as per CPHEEO manual Para 7.6.3.6 to 7.6.3.10.

11.3.11.6. **Under Drainage System**

The design parameters in under drainage system shall be as given in Para 7.6.3.9 of CPHEEO manual. The under drain system with central manifold or laterals either perforated in the bottom or having umbrella type strainers on top shall be provided. The central manifold and laterals shall be of cast iron, concrete or other suitable materials.

11.3.11.7. **Wash Water Gutter (Troughs)**

It shall be of RCC with M-30 grade it shall be designed in such a way that the Horizontal travel of dirty water over surface of filter shall be kept in between 0.6 to 1.00 m before reaching the Gutter. The upper edge of wash water gutter should be placed sufficiently near to the surface of sand so that large quantity of dirty water is not left in the filter after the completion of washing. At the same time the top of the wash water gutter should be placed at sufficient height above the surface of the sand so that the sand will not be washed into the gutter. The height should be considered by considering the expansion of sand.

11.3.11.8. **Filter Back Wash**

The backwash shall be arranged at such a pressure that the sand should expand to about 130 to 150% of its undisturbed volume. The backwash shall be of air water type. The air shall be introduced at a rate of 36 to 45m/h and pressure of 0.35 kg/Sqcm for a duration of 5 minutes and then the wash water shall be introduced through the same under drains at a rate of 24 to 36 to “cubic meter per hour” (cum/h) for 10 minutes. For introducing air and water the piping may be same or separate. it shall be worked out by the firm with due consideration to the economy.

11.3.11.9. **Wash Water Tank**

It is advisable and economical also if wash water tank is constructed above the clear water control chamber. Its capacity will depend on the total loss of head due to expansion of sand, loss in under drainage system, loss in incoming pipe and height of wash water gutter with respect to under drainage system. The bottom of wash water tank shall be at a height of about 9.00 m to 11.00 m, the capacity of wash water should be varied from 2 to 6% of filtered water and should be sufficient for at least 10 minutes wash of one filter or 5 to 6 minutes wash of two filters. The minimum capacity of tank should be designed for washing two filters at a time. It shall be of RCC with minimum grade M-30. The most preferable shape is Rectangular. The corners of tank shall be rounded off. The top slab of tank shall be of RCC minimum grade M-30 with sufficient number of manholes and ventilators of 100mm diameter C.I. with cowls and aluminium ladder of 0.45m wide from top to bottom of tank.

A float operated mechanical gauge shall be provided. The arrangement should be fixed in such a way that during excessive wind flow it should not be disturbed. It shall have meter scale painted with enamel paint with black and red colour on white colour background. A RCC

staircase from ground to top of tank shall be provided by contractor. It shall have the railing either on both sides or on one side as per site conditions.

11.3.12. Appurtenances

11.3.12.1. Rate Of Flow Controllers

In this case filter influent shall be entered below the low water level of filters so relatively large influent header pipe or channel will serve all the filters. It shall be provided with influent valve for each individual filter.

11.3.12.2. Filter Gauges

It shall be provided to measure accurately the rate or flow through each filter box and to determine the loss of head occurring at any time during the filter run. It must be simple in operation and easy in handling by the maintenance staff.

11.3.12.3. Walkway

Walkway all-round the filters minimum 1.50m width shall be provided. it shall be fitted with railing of 0.75m height.

11.3.12.4. Pipe Gallery

Effluent wash and wastewater pipes all together with the sluice valves are placed in the pipe gallery should be well designed with minimum 2.00m width provided with a ladder or steel rungs to make it for the maintenance staff easily accessible to the bottom. It should be well ventilated. It should have a sufficient slope to drain out the wash water or other leakage water. The two pipe galleries shall be provided one gallery for effluent pipe Air and wash water pipes and other Gallery specially for draining out the wastewater of filters. It shall be designed by contractor and preferably of RCC pipe. It shall be connected with wastewater sump. The system will avoid the unnecessary congestion of the pipes and avoid the hindrances in cleaning of pipe galleries.

One shall be towards the module chambers side and other towards the influent header pipe side it should be constructed with minimum RCC grade M-30.

11.3.12.5. Effluent And Wash Water Pipe

The effluent pipe shall be designed for a velocity of 0.9 to 1.8m/s and wash water pipe for a velocity of 1.5m/s. These shall be D.I. double-flanged pipes confirming to I.S.8329 - 2000 and D. I. specials shall be confirming to I.S.1538-1976. The sluice valve provided shall be confirming to I.S. 14846-2000.

11.3.12.6. Module Chamber of Clear Water Control Chamber

It shall shave sufficient space to accommodate sluice valves of effluent pipes, effluent discharge weir and clear water effluent pipe feeding to clear water sumps. It shall have sufficient circulation space minimum 2.00m of ground floor where the module chambers shall be minimum ceiling height of floor shall be 4.00m. The ground floor shall be easily accessible by providing aluminium ladders.

Arrangement for effluent sluice valves, air blowers piping, wash water tank etc. It shall be framed structure of minimum RCC M-30 grade concrete at a height of minimum 10.00m. The wash water tank shall be provided for storing the water for washing the filters. The capacity of wash water tank is given in Para 6.6. The panels of framed structure shall be constructed of chimney brick masonry with cement mortar 1:5 and plastered with 1:5 mortar. The ground floor as well as first floor shall have sufficient ventilation of about 30% of floor area. As far as possible natural ventilation shall be provided, and the window shall be of M.S. Z-section provided with 4mm thick transparent glass. The gate shall be provided on all the four sides. The main gate shall be made of aluminium automatically closing type fitted with glass and the other gates one towards filter sides and other towards chlorine room side and open area side shall be made of Z section angle iron of size 1.20 x 2.10m fitted with glass. The windows shall be opened outside and fitted with mosquito net with all arrangements of opening and closing the window stoppers etc. complete. These shall be primed and painted as approved by the Engineer-In-charge. The flooring in chamber shall be mosaic with good finish up to 30cm height. The ground floor shall have drainage arrangement to easily drain out water in case of cleaning the water from module chamber.

11.3.12.7. **Air Blower**

The Air blowers shall be designed for a free flow of air at the rate of 36 to 45 Cum/hr at a pressure of 0.35 kg/sqcm for a duration of 5 minutes. Two air blowers including100% standby arrangements shall be provided. The material used for the pipe and specials should be anticorrosive, preferably DI class k-7 or C.I. Class LA double flanged and D.I. Sluice valves confirming to I.S. 14846. These shall be mounted in clear water control chambers at about 1.00m depressed floor from operating floor of effluent sluice valves.

11.3.12.8. **Back Wash Water Pump**

It shall be designed for 2.00 Hr. i.e. pump shall be in position to fill wash water tank in 2 Hr.

There shall be two pumps where one will act as stand by unit. These pumps shall be provided on the air blower floor. The pump shall be of centrifugal type with a suitable motor to operate on 415+10% volt, 50 Hz. B class of insulation and degree of protection at IP-56 with suitable Auto Transformer Starter panel, Cable, suitable rating capacitors and Stabilizer. These pumps shall be provided and fixed by the contractor. The pump shall be provided suitably with a NRV and sluice valve of PN 1.0. The size of the pipe to fill the wash water tank shall be designed by the contractor. The pipe shall be C.I. double-flanged class A with bell mouth at the top. The delivery pipe in wash water tank connecting to different filter to sluice valve shall be designed by contractor and made of C.I. double-flanged class A confirming to I.S. code in practice. The scour and overflow pipe also be designed and provided by the contractor. The overflow pipe shall be connected with the clear water sump pipeline or clear water sump whichever in nearer. Scour pipe shall be connected with the wastewater line of filter going to waste water sump of chamber with necessary D.I. sluice valves.

11.3.12.9. **Modules**

The module chamber shall be R.C.C. constructed for each filter bed separately. It shall have two compartments. In one compartment it shall have clear water effluent pipe with sluice valve. It shall be operated from the operating platform. The second compartment will be used for collecting the clear water spill over the weir; the height of weir shall be kept in order to avoid the negative head. It shall be line with tiles of standard make, preferably in sky blue colour. The top of the module chamber shall be covered with M.S. framed cover divided in two parts, fixed with glass of minimum 4mm thick the cover shall be so fixed that it should be easily opened at the time of maintenance. The module chamber shall also have arrangement for draining out the dirty water (at the time of maintenance). The minimum 600mm. R.C.C. Class NP2 pipe with sluice valves should be provided. The entire module chamber shall be connected with the one wastewater line & finally disposed of either in drain constructed in front of this block or in wastewater collection sump Sufficient head room above the module chamber shall be provided a M.S. ladder from floor to the top of the module chamber shall be provided.

11.3.12.10. **Filter Control**

Filters shall be of the declining rate type with filtration rates varying by +20% of the average over a filter run length. At the start of the filter run, when the bed is clear the filtration rate shall be 20% above the average value whilst at the end of the filter run the filtration rate shall be of 20% below the average value.

Clarified water shall be fed to each filter from the inlet channel through a submerged penstock opening.

At the outlet of each filter the filtered water shall flow through an adjustable valve or 'setting valve', which shall limit the maximum flow to 20% above average flow. The valve setting shall be adjusted during commissioning in order to achieve the required range of filtration rates between clean bed and dirty bed conditions to within + 20% of the average flow though the filters.

A separate valve drain shall be provided to drain the underflow chamber. Emergency access to the underside of the filter floor shall be provided.

Filter valves and penstocks shall be fitted with electric actuators with facility for manual operation.

Each filter shall be equipped with instruments for measurement of the differential head across the filter bed. Measurement accuracy shall be +2% of the measured value. Each measurement instrument shall be equipped with stainless steel needle isolating and drain valves.

A control console for each filter shall be installed in the gallery. These consoles shall be equipped such that the operator can initiate the backwashing operation manually.

The control consoles for each filter shall include the following facilities and indications as a minimum:

a) Start filter wash cycle -key operated push-button;

b) Manual/automatic key operated selector switch;
c) Filter water holding tank full-lamp;
d) Open/close push buttons for each actuated valve and penstock;
e) Open/close indication for each valve and penstock-lamp;
f) Filter ready for wash-lamp;
g) Filter washing - lamp;
h) Filter in service - lamp;
i) Filter out of service
j) Wash water pump tripped - lamp;
k) Air scour blower tripped - lamp

Filters shall be washed in sequence automatically under the control of a preset timer, adjustable from 12 to 36 hours. Filter backwashing shall be inhibited to prevent two filters washing simultaneously and also to prevent wash initiation when the filtered water holding tank has insufficient water in storage.

Programmable Logic Controllers (PLCs) may be used for filter washing controls, with each filter being controlled by a dedicated PLC with the initiation controlled by a central PLC. PLCs shall be arranged so that failure of one unit does not disable the automatic washing of more than one filter.

Lamps in the monitoring room shall indicate the state of each filter, i.e. filter in service, filter washing, and filter wash overdue.

Filter washing time cycles shall be manually adjusted to suit the monitored turbidity levels.

11.3.12.11. **Filter Valves and Motive Power System**

a) Butterfly valves shall be used for the filters in preference to penstocks or sluice valves unless the proposed penstocks or sluice valves are of a size which can be operated easily by one man.

b) Filter valves which require to be operated as part of the washing cycle shall be operated by pneumatic / electric power. The system shall be capable of operation in the event of electric power failure and details shall be provided by contractor, as to how this will be done. The time taken to open or close any valve shall generally be between 10-30 seconds.

c) Compressors for valve/ penstocks operation duties shall be in duplicate with duty/ standby units including receivers, provided to serve only the filters. The standby unit shall be so arranged to automatically operate if the duty unit fails and also initiate an alarm state on the filter block control room annunciator. The rating/ capacity of each compressor shall be designed to serve a total of 3 filters, and to enable valves on at least three filters to be operated simultaneously.

d) The compressor installation shall be designed to satisfy conditions for maximum air demand and shall ensure the duty compressor does not start more than six times in any hour and the running time of the duty compressor shall not exceed 35 minutes in any one hour. The standby compressor unit and receiver shall be identical in size.

e) To avoid overheating, an integral cooling system shall be provided for each compressor unit.

11.3.12.12. **Piezometer Tapings**

a) In two filters (to be selected by the Engineer-in-Charge's Representative), six piezometer tapings shall be provided for each filter to determine the head loss gradient across the media.

b) The Contractor shall provide and fix on the two filter front walls in an accessible position (with standing platform if necessary) all the necessary puddle pipes, strainers, manometers, tubes, calibrated scales, mounting boards and fixing brackets, interconnecting small bore tubing, cocks and fittings.

11.3.12.13. **Paving**

A paving in front of clear water control chamber 4.0m wide shall be provided by contractor. The paving shall be in grooved vitrified tiles good in appearance and colour, laid over M-25 cement concrete.

11.3.12.14. **Staircase**

The stairs made of brick masonry in cement mortar 1:4 with anti-skid tiles shall be provided. The staircase shall be provided to connect ground level to the floor of control room and wash water pump or air blower floor to the operating plate from of control room.

11.3.12.15. **Chemical House**

The chemicals to be added to raw water for coagulation and flocculation will be filter alum, hydraulic lime and other coagulant aid if necessary. Looking to the characteristics of the water only filter alum shall be sufficient. But in certain conditions where the raw water becomes acidic in nature then hydraulic lime shall be mixed.

The minimum storage shall be for 3 months for filter alum and 3 months for hydraulic lime and other chemicals. Store for the chemicals shall be provided below chemical dosing room. The minimum ceiling height shall be 4m. In order to avoid moisture the minimum plinth height shall be 0.90 m. The floor should be made damp proof and it should be filled about 0.6 0m with sand and bituminous coating shall be provided over it in order to avoid the moisture. The flooring shall be of concrete with acid resistance tiles cladding on the floor & in the sides up to 2.0 m height. The building shall be constructed in R.C.C. framed structure in M-25 grade concrete and panels shall be of second class brick masonry in cement mortar 1:6 and plaster in cement mortar 1:4. The specification of brick shall be as given in the specifications. The roof of this storage room shall have an opening of 2x2 m to facilitate lifting of chemicals. The arrangement for lifting and weighting of chemicals shall be provided by contractor from first

floor of chemical house. Adequate ventilation and lighting will be provided. It should be easily accessible to the trucks for unloading the chemicals. The main entrance shall be 3.00m wide and 3.50 m height with rolling shutter. The height of alum stack should not be kept more than 2.0 m with suitable open space for passage.

11.3.12.16. **Equipment For Handling Chemicals**

The Platform type-weighting machine 'Avery make' or equivalent of capacity 2.00 tonne for weighing the chemicals shall be provided. For transportation of chemicals from storeroom to the solution tank, an electric operated hoist of 2.00 tonne capacity of approved make shall be provided. The chemical should be loaded in the steel tray attached to wire rope.

11.3.12.17. **Solution Tank**

A Platform for construction of solution tank at a height of about 2.00m from first floor level shall be provided. The solution tank will be designed for the worst condition of turbidity for alum dosing to the designed flow. The minimum number of solution tank shall be two so that one will be standby unit. The capacity of tank shall be designed for 8 Hrs. capacity with 0.30m free board. The feeding arrangement shall be automatic based on flow. It shall be designed for 10% strength of solution. The solution tank shall be constructed in R.C.C. minimum M-30 grade and inside surface shall be lined with acid resistance material like F.R.P. or epoxy resin. The lime solution tank shall be designed for a dose of 5% strength of lime solution using 87% pure hydrated lime for the design flow for the period of 8 hrs. Each tank shall have platform at least 0.75m wide to allow the worker to stand for handling the chemicals and preparation of solution the platform shall have railing up to a minimum height of 0.75m. The height of the solution tank shall not be more than 1.50m from the first floor to the platform. A M.S. ladder 0.60m wide shall be provided and it shall be provided from solution tank platform to top of solution tank.

11.3.12.18. **Dissolving Trays**

The weighted chemical shall be placed into the tray. These trays shall be made up of cement

concrete with perforations both at sides and at the bottom. The weight of these trays shall be such so as to handle easily by the workers.

11.3.12.19. **Chemical Feed Devices**

The solution feed device will depend upon the point of application. The pump type of feeder shall be preferred, chemical feeder in which the solution from the chemical solution tank shall be flown by pump through a strainer and through the float valve into the orifice box. It shall include the necessary piping arrangement with G.M. valve for drains, overflow, and delivery pipe as per I.S. standard. It shall also have necessary agitating arrangement coupled with motor as per standard. It shall also have the provision to return the excess flow to solution tank.

11.3.12.20. **Chlorination**

The chlorinator shall be designed for a dosing of 5mg/l. It shall be designed for designed water flow. The chlorinator shall be vacuum type chlorinator with 100% standby. If any change in requirement of chlorine comes the firm may suggest and quote the rate accordingly, the liquid chlorine shall be supplied in toners. The contractor shall have to make arrangement for Brand new chlorine toners with a nominal capacity of holding one MT of liquid chlorine for minimum three months requirement. The toners should be as per relevant IS standard specifications. The contractor should also submit the required test certificate and other certificate to enable these cylinders to be put into the use. These toners shall be taken over by the department only after these have worked up to the satisfaction of the department after the O&M period. The chlorinator shall be fixed up by the firm with all required accessories. Due to corrosive nature of chlorine it should be conveyed through either heavy wrought or steel pipe on flexible annealed copper to be tested for 35kg/cm2 working pressure. The long pipeline shall be avoided. The chlorine gas lines shall be used. The gasket used shall be made of Antimony Lead (with 2 to 3% Antimony) or asbestos sheet. Screwed fitting shall be forged steel construction. Pressure indicators shall have Teflon diaphragms or silver foil protectors. Pressure reducing valves shall be of bronze or metal with a Teflon diaphragm.

- The dosing rate shall be manually set, and each chlorinator shall be equipped with a 0 to 5 mg/l scale and a manual dose setter over the complete range.
- Mal-operation of the duty chlorination system shall be indicated in the chlorination room and the monitoring room in order that manual changeover to the standby system can be initiated.
- Chlorinator shall be fitted with a pressure switch to provide an alarm in the event of bursting disc or pressure relief to atmosphere.

11.3.12.21. **Chlorine House**

It shall be situated in an isolated place and near to the chlorine feeding place in order to avoid the long piping. It should have at least two doors. The ventilation shall be provided at the bottom of the floor. It shall be well lighted. In the proposed chlorinator an auxiliary water system shall be provided. The suitable capacity of tank and a pump shall be provided, capable of filling it with in 30 to 60 minutes. The structure shall be R.C.C. framed with masonry panels in cement mortar 1:6 and plastered in cement mortar 1:4. The flooring of room shall have acid resistance tiles laid over cement concrete 1:2:4. An exhaust at sufficient height from bottom of 300mm diameter shall also be provided. The ventilator shall be of aluminium Z section fixed with 4 mm thick glass in order to avoid the corrosion; it shall be opened outside, a ramp on the main door of 2.0m wide to connect the G.L. to the plinth level of chlorine house shall be provided.

11.3.12.22. **Room To Store Chlorine Containers**

The capacity of the room shall be to store the minimum chlorine toners for three months looking to the requirement of 5mg/l average dose. The minimum space of room shall be provided with rails and trolley as per requirement. It shall be constructed at an isolated place near to the chlorine house for the chlorinator. It shall be constructed in R.C.C. M-25 concrete framed structure and shall have same specification as for chlorine room. Suitable number of exhaust fans of 450mm dia of G.E.C. or Khaitan or equivalent standard make painted with anticorrosive paint shall be provided.

11.3.12.23. **Tank For Neutralisation Of Chlorine**

A solution tank of minimum size 3.0 x 3.0 x 2.0m shall be provided. It shall be of R.C.C. with cladding of acid resistant tiles on all sidewalls and floor. It should be very near to the chlorine and storage room and shall have easy access without obstruction. It may be constructed below G.L. so it shall have a drainpipe 150mm dia R.C.C. class NP2 or PE 100 pipeline with sluice valve up to the nearest wastewater line or up to sump.

11.3.12.24. **Emergency Kit**

It shall consist of various tools appliances like gasket, Yokes Studs. Tie rods, hoods, clamps, spanners, mild steel channel kits, screws pins etc. complete. It shall cover the total precautionary arrangement parts, which shall be required at the time of chlorine leakage. All the Gadgets shall be designed for using in controlling or stopping the leakages from valves, fusible plugs, and sidewalls of cylinder used for handling chlorine.

11.3.12.25. **Residual Chlorine Monitoring**

a) One residual chlorine sampling and transmitting unit for settled water shall be provided at outlet of clarifiers. Residual chlorine monitoring shall be arranged by collecting water from the clear water reservoir.

b) The residual chlorine monitoring system shall be designed to measure free available chlorine. The signal from the measuring cell transmitter shall be indicated on the panel in the chlorine house with repeat indication and recording in the Control Block monitoring room.

c) A chlorine residual recorder shall be installed as a floor mounted unit in the chlorination room and actuated by a 4 to 20mA signal from a residual chlorination measurement cell mounted above ground level in the clear water reservoir outlet chamber.

d) This cell shall be fed with a continuous supply of treated water from the outlet main of the clear water reservoir. A suitable sampling pump shall be supplied to feed the water to the measuring cell.

e) A signal shall be transmitted to the monitoring room and shall be used to activate a chlorine residual indicator to be mounted in the monitoring room panel.

f) High and low chlorine residual level alarms shall be announced in the monitoring room and in the chlorination room.

g) All necessary sampling pumps, pipe work and isolation valves, for delivering clear water to the cell shall be provided.

11.3.12.26. **Fire Extinguishing - Arrangement**

An automated firefighting mechanism complete with piping arrangement, control and alarm system shall be provided to initiate firefighting automatically as soon as fire is detected. This automated system shall cover all buildings, pump houses, etc. Additionally suitable fire extinguishers in sufficient number shall be provided and placed at different position in pump house and chlorine storage room besides buckets filled with sand and placed at different places in clear water control chamber, chlorine room pump house shall also be provided. Additionally

11.3.12.27. **Water Sampling**

Continuous comparison of water samples is required, and the equipment provided shall include a suitable drained bench containing two clarity bowls complete with all interconnecting pipe work, automatic sampling pumps and drainage facilities for samples drawn from:

a) Raw water at the inlet works;

b) Clear water reservoir outlet.

The bench shall be sited in the reception area of the administration building. In addition a suitable sampling arrangement shall be included in the laboratory to enable samples to be obtained as follows :

a) Raw water at the inlet works;

b) Clarifier inlet;

c) Rapid gravity filter inlet;

d) Clear water reservoir outlet;

e) Supernatant

The sampling arrangement shall include all interconnecting pipe work, automatic sampling pumps and taps, adequate sink and drainage, all incorporated into a satisfactory sample bench.

In addition, convenient means shall be provided to obtain samples manually from each filter bed outlet and sample cocks shall be provided locally at the clear water reservoir outlet.

11.3.13. Sludge Drying Beds

Sludge from the wastewater recovery tank shall be discharged by open impeller type sludge pumps to the drying beds. The sludge from clarifiers, flocculators and sedimentation tanks etc., shall be pumped to the sludge drying beds directly through a suitable designed, pumping main. The sludge drying beds shall be with RCC M25 floor, supported by CC bed concrete of not less than 1:3:6 proportion, and with side walls of RCC M25 with proper granular material filled up over suitable drainage system designed and laid for collecting the filtrate and to discharge

the same to the inlet chamber and arrangement to discharge it into nearby natural drain shall also be provided.

i. The drying beds shall be so sized that each can contain the average daily production of sludge from the wastewater recovery tanks as well as from the sludge produced from plain sedimentation tank, clarifiers / flocculators, etc. The beds shall be designed for a cycle period of 5 to 7 days.

OR

ii. Any other proposal based on latest technology may be adopted subject to approval by MPJN.

Filtrate from the drying bed under drains shall be discharged into the inlet chamber. The discharge shall meet the standards for discharge into inland surface waters. When a drying bed is full to a depth of 200mm with dried sludge, the sludge shall be dug out and used for landfill wherever required.

11.3.14. Safety Equipment

1) Self-contained air-breathing apparatus with gas mask 6 numbers.

2) Gas leakage detector orthotolodine impregnated paper type leak detection system eight numbers.

Four chlorine gas leak detectors shall be supplied and installed, each with a single, detector cell, two for the drum room, one for the evaporator room and one for the chlorination room to alarm in the event of a chlorine leak.

The chlorine leak detectors in the drum room shall be mounted at each end of the drum room. The chlorine leak detectors shall have two adjustable alarm levels sensitive to chlorine concentrations above 1ml/m³, and the range of adjustment of alarms shall facilitate selection of the following alarms:

- low level - 2ml/m³
- high level - 4ml/m³

The low level alarm shall initiate local audible and visual alarms. The high level alarm shall initiate local audible and visual alarms, audible and visual alarms outside the buildings, alarms in the monitoring room, it shall shut down the chlorination systems, isolate chlorine drums and stop all the extract fans./ Warning signs shall be provided in English and Hindi.

3) Compressed air cylinder recharging facilities comprising of 40 litres capacity cylinder with recharging kit to refill service cylinder or breathing apparatus - 2No.

4) Protective Clothing - Rubber & P.V.C. clothing 2 No.

5) First Aid Facility - Emergency Oxygen Kit 5 No. complete for artificial respiration to neutralize Inhaled chlorine effect - 4 No. First Aid printed chart. It shall be mounted on a glass framed wooden board in chlorine room.

6) Weighing Machine - The weighing machine of standard make of two tonne capacity shall be provided to record the weight of cylinder.

7) Emergency safety showers & eye wash- the contractor shall provide two safety showers and eye bath units. These units shall be installed at location approved by Engineer-in-charge.

11.3.15. Unloading Arrangement

An arrangement with chain pulley block of 2 tonne capacity at a height of minimum 5.00m supported on M.S. beam section. It shall be provided at the entrance of chlorine storage room to unload the toners.

11.3.16. Clear Water Sump

The clear water from the module chamber shall be conveyed to the clear water sumps either through pipe or channel designed for a velocity 0.9 to 1.8m/s. The selection of pipe or channel shall be made on the basis of economy. The pipe if openly laid according to level shall be D.I. class K-7 Tyton joints and if covered then RCC. If the channel is provided, then it should be of RCC M-30 grade and covered with the RCC cover slab and it shall be in horseshoe shape as far as possible. The levels shall be so fixed up so that the tank up to water depth shall be totally underground. The tank shall be designed for a capacity for a minimum detention period of 60 minutes. A minimum free board of 0.5m should be provided below the roof beam. The floor of sump shall be designed in such way that it shall have a slope of 1:20 towards the inlet end. The shape of tank may be circular or rectangular as per design and economy consideration, preferably sump should have two compartments connected with each other by sluice valves in order to facilitate the cleaning of sump. It should be constructed in RCC with a minimum M-30 grade concrete and shall be provided with pressure release system to relieve the uplift pressure. The sump should be covered at top with RCC slab. The top slab shall have adequate number of manhole chambers of size 0.9 x 1.20m in each compartment fixed with M.S. cover and frame painted with primer & anticorrosive paint and locking arrangement. There should be 100mm diameter C.I. or M.S. ventilators painted with primer and anticorrosive paint with C.I. cowls in each quadrant of beams on the roof shall be provided. The top of roof shall be sloped outward to drain rainwater easily. An aluminium ladder 0.45m wide in one manhole of both chambers shall be provided by contractor. The inlet and outlet pipes shall be located at diagonally opposite end in order to minimize the short-circuiting and turbulence effect. An overflow pipe designed to maintain level shall be provided. The scour pipe shall be laid from bottom of clear water sump to wastewater sump.

All the pipes shall be fitted with sluice valve as per I.S. standard and wherever necessary provided with inspection chambers.

A locally mounted dial type float operated level indicator to indicate the water level shall be provided along with automatic level indication in control room.

11.3.17. Clear Water Pump House

It shall have sufficient space to accommodate required numbers of pumps for conveying water

to OHTs and IPS. There shall be one pump house of suitable size and the minimum height shall be provided in order to accommodate the function of Gantry. The elevation of building should be such as to give an architectural view. It shall have one additional storeroom of size 6.00 x 5.00m, L.T. switch gear room of size 3.00 x 6.00m and one office room of size 5.00 x 4.00m and attached toilet block. Additional space shall be provided for one pump set and also for generator set for use in emergency. Sufficient minimum space between the two pumps shall be provided for circulation and the distance of pump from the sidewall should also be minimum 2.00m. The distance of pumps from rear wall shall be decided to accommodate the suction pipe, NRV, sluice valve to each pump individually. The level of pump floor may be depressed as compared to the general floor level in pump house to avoid the negative head or negative suction. Space for LT/ HT ACB/ OCB shall also be provided for generator set if used in emergency. The ducts for laying of electric cable from substation shall be provided. It shall be of R.C.C. covered with chequered M.S. Plate and will have minimum size 0.6 x 0.9m of designed M-20 grade and chimney brick masonry in cement mortar 1:6 and plastered with C.M. 1:4. The capacity of the gantry crane to be provided under this contract shall be electrically hoisting and manually moving mounted on the rails or girders to move pumps & motors for lifting at the time of maintenance. The floor of pump house and all other units shall be mosaic/ ironite laid over 1:2:4 cement concrete 40mm thick. The main gate shall be of size 3.00 x 3.50m rolling shutter. Office room, L.T. switch gear room and storeroom shall be with salwood chaukhat and 40mm thick flush doors as per I.S. specification including door stoppers, tower bolts etc. complete. The door of the W.C. block shall be either M.S. Fabricated or flush doors. The window in pump house shall be about 20% of total area provided in each panel (except where doors are provided). The window shall also be the Z-Section fitted with 4mm thick glass, tower bolts and all other necessary arrangements as per I.S. specification. Minimum 12 number of exhaust fan of 450mm diameter shall be provided. The exhaust fan shall be of the make specified in Clause 24 – Approved List of Manufacturers. A ramp shall be provided to connect the ground level to the floor of pump house in main room only and in other doors and in depressed floor of pump house wherever necessary steps shall be provided. The minimum plinth height of pump house shall be 0.60m. It shall provide easy loading and unloading of pumps / motors from trucks by gantry.

11.3.18. Laboratory Block, Office And Control Room

The laboratory block may be isolated or connected with the other units. The tentative area of laboratory block shall be 60sqm or as per recommendation of CPHEEO Manual on Water Supply and Treatment, whichever is more to accommodate Control Room (Air Conditioned

Room), office room, chemical room or laboratory room for testing and attached toilet block. It shall have the same specifications as the pump house.

The contractor has to develop facility for online monitoring of water level in each individual overhead tank/ reservoir, and quantities as well as quality of water being supplied to each overhead tank/ reservoir. Contractor has to provide online control facility for integrating the individual data received from individual OHT/ reservoir and optimize the operation of water

distribution systems control room or any other specified remote location.

The door of laboratory room & A.C. room shall be of Aluminium of size 1.20 x 2.00m self-closing type fixed with 4mm thick glass and over with rolling shutter shall be provided (only in the laboratory room). The A.C. room shall have thermocouple ceiling with steel beeding and PVC sheet over the mosaic flooring. The A.C. shall also be provided by contractor. The capacity of A.C. shall be decided by contractor based on room size and sun orientation and shall be of Voltas/ LG/ Samsung or equivalent standard make with 5 star BEE rating. All around the laboratory room a platform of 1.00m wide shall be provided to put up the instruments and in two corners of wall wash basins as per I.S. Specification shall be fitted with water supply connection. It shall have two number exhaust fan of 300 mm diameter of the make specified in Clause 24 – Approved List of Manufacturers. Below the platform an almirah for storing the chemicals, fitted with wooden frames and door shall be provided. If the laboratory block is provided isolated to the module chamber in other building than a water sampling table, for visual examination and collection of raw, settled filtered and chlorinated water shall be provided in laboratory room. The testing platform and stands shall be cladded with acid resistance tiles. The following instruments shall be provided as per I.S. Specification for laboratory by contractor.

Requirement of Equipment for Water Testing Laboratory

S. No.	Name of Equipment	Required quantity
1	Refrigerator (310 Litres)	1 No.
2	Incubator 37°C±05°C (Bacteriological) 220 Volt A.C.	1 No.
3	pH Meter (Digital with 0-14 pH range)	1 No.
4	Nephelometer direct reading (Range 0-1000)	1 No.
5	Spectrophotometer visible range 220 to 850mm	1 No.
6	Jar test apparatus with variable speed control - 10 to 1000 RPM	2 No.
7	Conductivity meter (systronics)	1 No.
8	Water distillation plant (15L/day)	1 No.
9	Autoclave (Cabinet 15 Atm pressure)	1 No.
10	Hot Air Oven 30 lit. cap 100° to 180°C	1 No.
11	Water bath 6 to 8 concentric - 0 to 50°C	1 No.
12	Dissolve Oxygen Analyser (Digital)	1 No.
13	Chlorine comparator	2 No.
14	Heating metal (Capacity 1 Litre)	1 No.
15	Magnetic stirrer (1 Litre capacity speed control)	1 No.
16	Laboratory Balance 0 to 200 gm	1 No.

Requirement of Chemicals for Water Testing Laboratory

S. No.	Name of Equipment	Required quantity
1	Phenolphthalein Indicator	1 Lit.
2	Methyl orange indicator	1 Lit.
3	Sulphuric acid N/50	2 Lit.
4	Potassium Chromate 5%	1 Lit.
5	Silver Nitrate	200 gms.
6	Manganese Sulphate	1 Kg.
7	Sodium Thiosulphate	1 Kg.
8	1-10 Phenolphthalein	200 gms.
9	Hydroxylamine Hydrochloride	200 gms.
10	Eriochrome black 'T'	100 gms.
11	Murexide	20 gms.
12	EDTAN/ 50	5 Lit.

Requirement of Glassware for Water Testing Laboratory

S. No.	Name of Equipment	Required quantity
1	Graduated pipette of capacity 1 ml - do - 2 ml - do - 10ml Ordinary pipette of capacity 10 ml - do - 25 ml	5 No. 5 No. 5 No. 5 No. 5 No.
2	Graduated Measuring Cylinder Capacity 10 ml - do - 50ml - do - 250ml - do - 1000 ml	5 No. 5 No. 5 No. 5 No.
3	Reagent Bottles of Capacity 250 ml. - do - 500ml	10 No. 10 No.
4	Nester's tube of capacity 50 ml - do - 100ml	5 No. 5 No.
5	Conical flask of capacity 100ml - do - 250ml - do - 500ml - do - 1000ml	5 No. 5 No. 5 No. 5 No.
6	Beakers of capacity 100ml - do - 250ml - do - 500ml - do - 1000ml	5 No. 5 No. 5 No. 5 No.

S. No.	Name of Equipment	Required quantity
7	Test tube with rim of size 25 x 250 - do - 15 x 150	100 No. 100 No.
8	BOD Bottle 300 ml.	15 No.
9	Funnel 4	15 No.
10	Filter paper (Whatman's) No.1 - do - No. 40 - do - No. 42	4 Pkt. 4 Pkt. 4 Pkt.
12	Desiccator	1 No.

Requirement of Accessories & Material for Laboratory

S. No.	Name of Equipment	Required quantity
1	Water Sampler (Steel) of capacity 2 Litre - do - 5 Litre	2 No. 2 No.
2	Gas Cylinder	2 No.
3	Burners (Bunsen Marks) ½" Pipe with tuner tone	4 No.
4	Wire basket 5 x 5 x 5	2 No.
5	Burette Clamps (Nickle plated)	4 No.
6	Tongs stainless steel 13"	2 No.
7	Spatula steel 8"	10 No.
8	Test tube stand (Iron)	10 No.
9	Rubber cork various sizes	50 No.
10	ICE Box (thirmocal)	3 No.
11	Iron Box with clamp	6 No.
12	Blotting paper	10 Sheets
13	Wire gage 6 x 6"	6 No.
14	Stopwatch	1 No.
15	Nesseler's tube stand	5 No.
16	Sample Box	2 No.
17	Brown Paper	5 Sheets
18	Pipette Stand	3 No.
19	Non-absorbent cotton	1 Kg.
20	Test tube brush (Nylon)	10 No.
21	Burette brush	10 No.

Requirement of Chemical for Bacteriological Test

S. No.	Name of Equipment	Required quantity
1	MacConkey Broth (D S)	1 Kg.
2	MacConkey Broth (S S)	1 Kg.
3	Peptone	1 Kg.

S. No.	Name of Equipment	Required quantity
4	Lactose	1 Kg.
5	Sod Chloride	1 Kg.
6	Bile Salt	0.5 Kg.
7	Natural Red	100 Gms.
8	Brilliant green bile lactose Broth (BGIB)	4 Kg.
9	Tryptohe broth	4 Kg.
10	Sprit	10 Lit.

11.3.19. Site Roads

Internal site roads shall be of minimum 3.5m width with a 1m wide shoulder on either side. The carriageway shall have camber of 1 in 40 to drain water from its surface. A concrete gutter shall be provided at either side of the road. The inner radius of bends shall allow the easy passage of large lorries. Parking for at least 8 Vehicles shall be provided at the administration building.

The sub-base shall be 150mm of hard granite cubes. The base shall be two layers each of minimum 75mm thick, the top layer shall be 40mm downgraded metal of 100mm as placed thickness, compacted to 75 mm, the bottom layer is 65mm downgraded metal of 100mm as placed thickness, compacted to 75mm. The wearing coat shall be asphalt concrete 20mm thick or the contractor may choose to construct CC road.

11.3.20. Site Drainage

The site drainage system shall be designed to dispose of overflow from tanks and rainwater in a manner to prevent damage to any structure. The drainage may use pipelines, culverts, conduits or open channels to carry the water to a safe disposal site leading to nearby water body. Open channels shall be lined, and pipelines shall be of RCC-NP2, DI-K7 grades.

11.3.21. Boundary Wall

Water Treatment Plant will be protected by a 2m high boundary wall of brick work with RCC columns at suitable intervals and ‘Y’ shape angle iron with 2 x 3 rows of barbed wire fencing at top of boundary wall and will have a minimum 4m wide M.S. fabricated iron gate.

11.3.22. Telephone System

A telephone system shall be provided. The system shall originate in the administration building and shall be controlled by a receptionist. Telephone instruments shall be installed in the offices in the chemical building, the workshops, the filter monitoring room and the main offices of the administration building. The connection of an outside line to the system will be provided by others.

11.3.23. Process Control

The Contractor shall monitor summary status of all the treatment work as follows:

- water level at raw water and clear water reservoirs
- process flows and totalized quantities
- water quality values
- status of each process
- reservoir high and low level alarms
- power outage present
- power consumed per day
- individual power consumption
- power factor
- water treated in the last complete 24 hour period (midnight to midnight, time selectable)
- total power outage house per day

11.3.24. Emergency Lighting

Emergency luminaries shall be provided in all areas and so arranged to provide sufficient illumination to allow safe evacuation from all buildings under power failure conditions. Emergency luminaries shall be of the type utilizing fluorescent lamps and provided with self-contained rechargeable batteries of the sealed type to give a three-hour illumination period with the batteries fully charged. A visual indication that the charger is operational shall be provided.

Where considered appropriate the emergency luminary can be incorporated as part of the normal luminaries where they utilize the main lamp at a reduced output for three hours.

Emergency luminaries shall be so arranged that they are illuminated by the failure of the local lighting current. Key switches shall be provided as required to facilitate testing of the emergency luminaries.

As a minimum emergency luminaries shall be positioned at or near (within 2 metres) the following points:

- each exit door
- near each staircase so each flight of stairs receives direct light
- near changes of direction
- near firefighting equipment
- at each change of floor
- near each intersection
- outside each final exit and close to it.

11.3.25. Landscaping

The campus of WTP shall be designed keeping a green belt on the periphery of the WTP preferable with trees (of local species) planted inside the boundary/ compound wall. Other open

areas within the WTP campus shall be maintained with green grass, shrubs and plantation of plants (flowers, herbs, etc.) to maintain a pleasing appearance. The green area shall be maintained in prime condition and failure to do so may invoke penalty as decided by Engineer-in-Charge.

11.3.26. External Lighting

External lighting shall be employed throughout the site to illuminate all site roads, turning areas, car parks, paths, tanks and building perimeters.

The following average levels of illumination are required :

- Car Parking area: 5 lux
- Access Roads, Pedestrian Walkways: 10 lux
- Lorry Loading and turning Areas: 20 lux
- Top of Tanks: 50 lux
- Building Perimeters: 50 lux

The access road lighting scheme shall be designed in accordance with the requirements of BS 5489: Part 3: 1989 (group B5/6). Column heights shall be 5 meters and each lantern shall incorporate a photocell for control. At each position where a section of road lighting columns is fed a selector switch shall be provided having the following functions:

- ON - Access road lighting permanently
- ON/ OFF - Access road lighting permanently
- OFF AUTO - Access road lighting under photocell control

Some flexibility in positioning of road lighting units is allowed but generally units shall be positioned at intersections and junctions with spacing not exceeding 30 metres + 10%.

12. Reservoirs

This section is applicable to any type of reservoir such as Over Head Service reservoir (OHSR), Ground Level Service Reservoir (GLSR), Master Balancing Reservoir (MBR), Elevated Service Reservoir (ESR), Sumps, etc. that are to be executed under this contract.

Construction of these RCC reservoirs that consists of central ventilation shall be of following specifications:-

The reservoir shape should be circular with central dome and central ventilation lantern so as to incorporate architectural effect to give an impressive view. Any other shape which gives architectural impressive view better than the above may be considered as per the decision of Engineer-in-Charge.

Free board of minimum 50cm should be provided below lowest part of roof beam slab structure. The minimum 50cm free board should be everywhere below bottom of straight beam, ring beam, and roof slab etc.

The floor level of MBR shall be so fixed, so as to provide desired water by gravity through gravity pipelines to proposed ESR/ SUMP.

The contractor should assess the bearing capacity of strata at the proposed site by conducting the required tests. It is responsibility of contractor to conduct bearing capacity test if required and bear financial charges towards it. MPJN will not make any payment towards it.

12.1. Design Criteria

(a) Foundation shall be designed as per ascertained S.B.C. of soil as given in next section and other soil parameter.

(b) The following load and forces should be considered:
   i. Dead Load
   ii. Live Load – static and dynamic load due to flow and falling of water
   iii. Load due to water/Wind pressure as per IS: 875-1969
   iv. Pressure due to Earthquake i.e. seismic force

(c) The sump shall be designed as per IS: 456-2000 revised up to date and IS: 3370-1976 (part I to IV) with up to date amendment and other standard code in practice besides the stipulations made in the code.

(d) Construction Joints: It should be as per clause No. 13.4 of IS 456.2000. Previously laid concrete layer should be first cleaned by water jet and then 10mm thick layer of cement mortar of same proportion should be laid before casting of next layer of concrete. Formwork should be 100mm below the previously laid concrete layer.

(e) **Steel:** The minimum steel for design purpose shall be as per relevant code, but minimum steel shall be as follows:-
   i. Exposed RCC surface:- If thickness is 150mm or more both face reinforcement shall be provided
   ii. Steel in container:- It shall be as per IS: 3370 but minimum shall be as per (i) mentioned above.
   iii. Maximum spacing of reinforcement:- The maximum spacing of main reinforcement in slab or wall should not be more than 150mm c/c. The spacing of secondary bars i.e. distribution steel shall not be more than 300mm c/c.

(f) The contractor shall have to make the reservoirs chlorine resistant by painting surface with suitable Epoxy or any other material because chlorination is done in water.

12.2. General specification

12.2.1. Depth of Excavation

The depth of excavation shall generally be guided by the underground strata and safe bearing capacity of the soil. The foundation/ mat concrete shall be laid minimum 1.50m below G.L. Safe bearing capacity & other soil test shall be conducted by the contractor at his own cost through any NIT/ Govt. Engineering College/ NABL Laboratory and any accrediting institution as per ISO/ IEC 17011 or laboratory accredited as per ISO/ IEC 17025. The result of SBC shall be submitted before start of work along with the detailed structural design. The design of foundation shall not be permitted for SBC more than 15 tonne/m2 in strata containing

any type of soil, even if the reported SBC is more than 15 tonne/m2 however, in case of rocky strata it may be considered maximum 25 tonne/m2. No payment shall be made to the contractor for carrying out these tests or on account of change in design due to strata. No dewatering in any condition shall be payable.

It shall be the responsibility of the contractor to test and check the bearing capacity of soil and submit it with the design. This bearing capacity shall be tested by plate load bearing test method at WTP and plate load test/any other method applicable as per IS code at other structures like Intake/ OHT/ MBR/ GLR/ Buildings etc., by any NIT/ Govt. Engg. College/ NABL Laboratory and any accrediting institution as per ISO/ IEC: 17011 or laboratory accredited as per ISO/ IEC: 17025. No dewatering in any condition shall be payable. The foundation shall be filled with minimum 150mm thick levelling course in cement concrete grade M-15 with 20 mm metal.
All other general & common specifications shall be as per Chapter -1.

12.2.2. RCC Staircase

Suitable RCC Staircase of grade M-25 concrete from ground level to top of roof of the Reservoir along circumference with G.I. railing as mentioned in the specification here. The riser should be around 175±25 mm and tread should be around 275±25 mm. The width of stair shall not be less than 1000 mm. The landing of minimum 1000 mm wide should be provided after 12 to 15 steps. The separate frame structure i.e. columns and beams should be provided for staircase for the overhead tanks of capacity 500KL or more, there shall be staircase with suitable gate shall be provided to prevent unauthorized entry to the tank. For RCC tank capacity less than 500KL staircase from ground to bottom of container tank and from bottom of container to top of the container MS ladder of angle 65x65x6 with 20mm double rods, width of staircase 600mm, shall be provided shall be provided by contractor. It shall have the railing on both sides.

12.2.3. Valve Chambers

The valve chambers for each valve of grade M-20 concrete/ Brick Masonry should be constructed. Size of valve chamber shall be as per the size of valves with enough working space in the chamber.

12.2.4. Pipeline Arrangement

12.2.4.1. **Pipes**

Each compartment shall be provided with Inlet pipe, Outlet pipe, Overflow pipe and scour pipe. Thus there will be one Inlet, one Outlet, one Overflow and one scour pipe in each compartment of the reservoir.

The diameter of different type of pipes are given below.

S. No.	Particulars	Type of Pipe	Internal Nominal Diameter in mm.
1.	Inlet pipelines	C.I., D/F, IS 7181 Class A/ B or D.I. D/F Class K-9/K12	As per Diameter of Incoming pipe.
2.	Outlet pipelines	-do-	Next higher Diameter than inlet or size of main pipe of distribution network, whichever is higher
3.	Overflow pipe	-do-	Next higher Diameter than inlet
4.	Scour pipe	-do-	100 mm

The inlet pipe shall be as far away from the outlet pipe as possible and outlet should be sufficiently above the floor level so as to keep it above deposited sediment at bottom of reservoir.

The scour pipe shall be provided at the bottom. The top of bell mouth on inlet shall be at FTL and overflow about 5cm above the FTL. The overflow in any case shall not be connected to the outlet pipe.

The cast iron or stainless steel grates of 20 mm x 20 mm on enlarge diameter of bell mouth of outlet and scour pipes shall be provided in order to avoid the accident during maintenance.

The D.I. Double Flanged pipe should be conforming to IS: 8329-2000 and while double flanged cast iron pipe should confirm to IS: 7181 latest.

12.2.4.2.**Specials**

All specials required for this work of pipeline arrangement, such as duck foot bends, puddle collars, bell mouths, bends, tees and end caps etc. shall be provided and fixed in position as per relevant I.S.
The bell mouth required to be embedded in the concrete should be specially manufactured with their collars as per requirement. The duck foot bend of all the pipe shall be grouted minimum sufficiently below ground level.

12.2.4.3.**Valves and Gates**

The contractor should provide and fix in desired position the DI valves and gates for easy and effective working.
All valves should be I.S. mark and inspection and testing certificate should produce to engineer in charge.
The double-faced sluice gate has been provided to pass water flow from one compartment to other compartment. In close position gate face should be capable of resisting water pressure

force. There should be no leakage in closed position when water pressure of full depth on one side and other side being empty.
For convenience in operation and maintenance of scheme, the flow controller i.e. valves shall be of remote operation type to facilitate their operation from centralized control room at WTP or any other specified remote location.

12.2.4.4.**Flow Measurement**

The arrangement for measurement of water quantity reaching to the tanks by providing & installing in position electromagnetic flow meter of suitable diameter in inlet pipe should be made by the contractor.
Contractor should provide arrangement such that the flow meters be installed before each OHT and at other place as per design and shall give its reading on screen at central control room or any other specified remote location. In addition to the above, arrangements are also to be made for measurement of Quality Parameter – only Residual Chlorine at the outlet of the OHT and display the same at the control room or any other specified remote location.

12.2.4.5.**Ancillary Works**

a) Lightening conductor: The arrangement for lightening protective system for protection of service reservoir should be made as per IS: 2309 revised up to date. The Lightening protective system should be designed, installed and tested as per this code and all components of the system should also be provided as per specification mentioned in this code.

b) Water Level Indicator: In addition to Ultrasonic Water level for monitoring, each tank should be provided with float type water level indicators. Thus sufficient water level indicators shall be provided in reservoir. Water level indicator shall comprise of PVC float which should be 10cm more in diameter than outlet pipe. The plate shall have turned edged to accommodate and to make easy movement of counterweight made of iron pointer fixed with guide pulley provided with white enamel paint write up with radium blue or black colour letters. It shall be fixed on container wall. Contractor should provide arrangement such that the water level in OHT shall be displayed on screen at central control room and any other specified remote location.

c) Aluminium / Stainless Steel Ladder: The aluminium / stainless steel ladder from top of roof to the inside bottom of container shall be provided. It shall comprise of not less than 600 mm long double round bar @ 250mm c/c. The ladder shall be rigidly fixed.

d) Railing: Railing should be provided up to manhole at top of roof and at balcony along the whole circumference and the sides of staircase as per specifications given in relevant chapter.

e) Manhole covers: Manholes of minimum size 60cm x 75cm shall be provided. The covers shall comprise of suitable angle iron frame and 10 gauge thick M.S. sheet, crossed by suitable flat inside, with locking arrangement.

f) Ventilators: The suitable air vent shall be provided as directed by Engineer-in-Charge.

12.3. Electrification

The electrification on top slab, staircase, walkways and in the campus should be done in such a manner that standard level of illumination is obtained inside the reservoir and in the campus. All electrical fixtures, wires etc. shall be ISI marked. The specifications shall be as given in relevant chapter. In case electric supply is not available at the site of OHT / MBR / BPT, the Contractor shall make arrangement for power supply from respective distribution company / MP Urja Vikas Nigam through electric line or solar respectively as directed by MPJN. The cost incurred for electric connection / solar as actual will be reimbursed to the contractor by MPJNM.

12.4. Protection Works and Finishing

a) Protection work around sump: Protection work all around the sump shall be provided. It shall be circular in shape and minimum 2.0 m in width around the outer edge of wall. It shall have 1:60 slope from center and a drain be constructed all around the tank. The protection work shall be with M-15 grade concrete.
b) Weather Shield Apex painting: Two and more coats suitable colour Weather Shield Apex as directed by Engineer-in- Charge shall be done after the testing of water tightness.
c) Colour enamel painting: All iron work, railing and pipes etc. shall be painted with two or more coats of black Japan or suitable colour enamel paint over primer as directed by Engineer-in-Charge.
d) Finishing: Although concrete shall be off shutter finish means no plaster shall be applied over concrete to make it smooth finish, but in unavoidable circumstances if plaster is done, then no extra payment shall be made.

12.5. Inspection & testing of concrete structure

In order to ensure that the construction complies with the design and all the structural requirement, clause No. 17 of IS 456-2000 shall be followed. It should also be noticed that during construction the settlement of sump due to self-weight during construction should be noticed by proper procedure.

12.5.1. Water Tightness Test

a) After the completion of structure it shall be tested for water tightness. Initially the sump shall be filled gradually to ensure uniform settlement all over the area. The full supply should reach in a period of not less than 72 hours. At the time of testing, verticality of sump should be checked by theodolite as per IS: 3370 (part I general requirement) code of practice for concrete structures for the storage of liquids specifies water tightness test at full supply level.
b) After seven days period for observation after filling with water the external face of sump should not show any sign of leakage and remain apparently dry.

c) The water for testing and pump for lifting water shall be arranged by the contractor at his own cost.
d) The contractor shall give the test for water tightness to the entire satisfaction of the department. The responsibility of structural stability shall solely be rest on the contractor.

12.6. Additional Requirements

a) All the tanks will have a room set of area 25 sqm with toilet, etc.
b) All the MBR/BPT/IPS will have boundary wall of 2.00 m high and one iron gate and all ESR/GSR will have G.I. chain link fabric fencing with MS Gate as specified in Annexure F & H.
c) All the tank will have area lighting with electrification of room and for electromagnetic flow meter in campus.

All the tanks & IPS will be provided with automation system as per Clause 19 Brief Scope of SCADA. Basic aim is to check the quantity and quality of water by automation. For IPSs sumps, suitable pump houses will be designed over sumps or nearby these sumps to accommodate required nos. of pumps with all other allied arrangements.

12.7. Scope of Work

The contractor is required to complete the following works.

a) Overhead service reservoirs at different villages of capacity and approximate staging as specified in Annexure F.
b) Construction of MBR cum pump houses of capacity as specified in Annexure F.
c) Construction of Sumps having capacity as specified in Annexure F, including all works complete.

Note: Minimum Height of Staging should be 12 m, Maximum height of staging shall be as per actual design and site condition to ensure the minimum required terminal pressure in the distribution network.

1. Location, capacity & staging of ESR/GLR/Sump/pump house may change as per the design requirements.
2. If due to any reasons, whatsoever, it is desired to increase or reduce the number or capacity of tanks/ reservoirs/ clear water sump, this will be done on per KL cost and/or on prorata basis. Variation in staging height will be addressed in accordance with Annexure H6a.
    a. Construction of Ground level reservoir (sump) shall consist of two equal compartment, all others may be with single compartment. All tanks will have central ventilation lantern.
    b. R.C.C. Staircase and Valve chambers

c. Pipeline arrangement including providing and laying pipes and specials of required diameter, length as per Annexure "F".
d. Providing and fixing required Valves and Sluice gates.
e. Providing and fixing of Lightening Conductor, Water Level Indicator, Aluminium Ladder, Railing, Manholes with locking arrangement and Ventilation hole arrangements, internal lighting arrangement and external campus electrification etc.
f. Protection work all around the Reservoir, Weather Shield Apex painting, suitable colour enamel painting, cleaning, finishing and handing over finished work to the department.

The contractor will further be required to submit detailed design, drawing, approximate quantities of cement, steel, pipes, valves, gates and specials, etc. and calculation in five copies within one month from the date of acceptance of their tender duly checked from any IIT / NIT, as directed by the General Manager for scrutiny and approval from competent authority. The responsibility for design construction/ structural stability and water tightness will however rest solely with the contractor.

13. HDPE Pipes

This specification covers the requirements for successfully designing, manufacturing, supplying, laying, jointing and testing at works and site of High Density Polyethylene Pipes used for water supply. The HDPE Pipes shall be of pressure class as per design requirement, but minimum class of pipe should be 6 kg/cm2 of PE 100.

13.1. Applicable Codes

The manufacturing, testing, supplying, laying, jointing and testing at work sites of HDPE pipes shall comply with IS: 4984 all currently applicable statutes, regulations, standards and amendments and others as follows:-

Code no.	Title/ Specification
IS 4984	High Density Polyethylene Pipes for Water Supply
IS 2530	Methods of test for polyethylene moulding materials and polyethylene compounds GRP Pipes, Joints and Fittings for use for Potable Water Supply
IS 5382	Rubber sealing rings for gas mains, water mains and sewers.
IS 4905	Methods for random sampling
IS 7328	High density polyethylene materials for moulding and extrusion
IS 7634	Laying & Jointing of Polyethylene (PE) Pipes

Code no.	Title/ Specification
IS 9845	Method of analysis for the determination of specific and/ or overall migration of constituents of plastics material and articles intended to come into contact with foodstuffs
IS 10141	Positive list of constituents of polyethylene in contact with food stuffs, pharmaceuticals and drinking water.
IS 10146	Polyethylene for its safe use in contact with foodstuff, Pharmaceuticals and drinking water.

13.2. Colour

The colour of the pipe shall be black.

13.3. Materials

The material used for the manufacturer of pipes should not constitute toxicity hazard, should not support microbial growth, should not give rise to unpleasant taste or odour, cloudiness or discoloration of water. Pipe manufacturers shall obtain a certificate to this effect from the manufacturers of raw material by any internationally reputed organization as per the satisfaction of the Engineer-in-Charge in charge.

13.3.1. Raw Material

Raw material for manufacture of HDPE Pipes – Both the raw materials – 100% virgin pre-compound black resin and 100% virgin natural PE resin shall be used for manufacture of HDPE Pipes.

It should confirm to IS: 4984, IS: 7328 and ISO: 4427- 2007 (latest version).

The resin should also have been certified by an independent laboratory of international repute like Bodycote/ Slevan/ Advantica for having passed 10,000 hour long term hydrostatic strength (LTHS) test extrapolated to 50 years to show that the resin has a minimum MRS of over 10MPa. There should not be any brittle knee at 80°C before 5000 hours. Internal certificate of any resin manufacturer will not be acceptable.

Certificate from reputed organization OR Raw material supplier for having passed the full scale rapid crack propagation test as per ISO: 13478. High density Polyethylene (HDPE) used for the manufacture of pipes shall conform to designation PEEWA-50-T-003 of IS: 7328. HDPE conforming to designation PEEWA-50-T-003 of IS:7328 may also be used with the exception that melt flow rate (MFR) shall not exceed 1.10 g/10 min. In addition the material shall also conform to clause 5.6.2 of IS: 7328.

The specified base density shall be between 940 kg/m³ and 958 kg/m³ (both inclusive) when determined at 27°C according to procedure prescribed in IS: 7328. The value of the density shall also not differ from the nominal value by more than 3 kg/m³ as per 5.2.1.1 of IS 7328. The MFR of the material shall be between 0.20 and 1.10 (both inclusive) when tested at 190°C with nominal load of 5 kgf as determined by method prescribed in IS: 2530. The MFR of the

material shall also be within ± 20 percent of the value declared by the manufacturer.

The resin shall be compounded with carbon black. The carbon black content in the material shall be within 2.5 ±0.5% and the dispersion of carbon black shall be satisfactory when tested as per IS:2530.

13.3.2. Anti-oxidant

The percentage of anti-oxidant used shall not be more than 0.3 percent by mass of finished resin. The anti-oxidant used shall be physiologically harm less and shall be selected from the list given in IS:10141.

13.3.3. Reworked Material

No addition of Reworked/ Recycled Material from the manufacturer's own rework material resulting from the manufacture of pipes is permissible and the vendor is required to use only 100% virgin resin compound.

13.4. Maximum Ovality of Pipe

The outside diameter of pipes, tolerance on the same and ovality of pipe shall be as given in table 2 of IS: 4984. Ovality shall be measured as the difference between maximum outside diameter and minimum outside diameter measured at the same cross section of the pipe at 300 mm away from the cut end. For pipes to be coiled the ovality shall be measured prior to coiling. For coiled pipes, however, re- rounding of pipes shall be carried out prior to the measurement of ovality.

13.5. Detectability

HDPE Pipes shall be detectable when buried underground, by providing an insulated copper wire having minimum diameter of 1.20mm, firmly attached along the entire length of pipe.

To avoid theft or dislocation during handling/ laying or earth refilling in trench, the insulated Copper wire shall be firmly fixed on the outer surface of HDPE pipe at Pipe manufacturer's works through external adhesion or co-extrusion or any other appropriate method. The Contractor shall supply 5 sets of Ultrasonic Metal detection instruments, suitable for on-site detection of under-ground buried HDPE pipelines, without any extra cost and will also arrange for training of the department's personnel.

13.6. Length of Straight Pipe

The length of straight pipe used shall be more than 6 m or as agreed by Engineer-in-Charge.

13.7. Coiling

The pipes supplied in coils shall be coiled on drums of minimum diameter of 25 times the nominal diameter of the pipe ensuring that kinking of pipe is prevented. Pipe beyond 110mm dia shall be supplied in straight length not less than 6m.

13.8. Workmanship/ Appearance

Pipes shall be free from all defect including indentations, delaminating, bubbles, pinholes, cracks, pits, blisters, foreign inclusions that due to their nature degree or extent detrimentally

affect the strength and serviceability of the pipe. The pipe shall be as uniform as commercially practicable in colour opacity, density and other physical properties as per relevant IS Code or equivalent International Code. The inside surface of each pipe shall be free of scouring, cavities, bulges, dents, ridges and other defects that result in a variation of inside diameter from that obtained on adjacent unaffected portions of the surface. The pipe ends shall be cut clearly and square to the axis of the pipe. IS: 4984 will be followed for visual appearance.

13.9. Handling, Transportation, Storage and Lowering of pipes

During handling, transportation, storage and lowering, all sections shall be handled by such means and in such a manner that no distortion or damage is done to the section or to the pipes as a whole.

The following procedures should be followed so as to eliminate potential damage to pipes and fittings and to maintain maximum safety during unloading, lifting and lowering.

1. Pipes must not be stored or transported where they are exposed to heat sources likely to exceed 60°C.
2. Pipes shall be stored such that they are not in contact with direct sunlight, lubricating or hydraulic oils, petrol, solvents and other aggressive materials.
3. Scores or scratches to a depth of greater than 10% or more of wall thickness are not permissible; any pipes having such defects should be strictly rejected.
4. PE pipes should not be subjected to rough handling during loading and unloading operations. Rollers shall be used to move, drag the pipes across any surface.
5. Only polyester webbing slings should be used to lift heavy PE (>315mm) pipes by crane. Under no circumstances, chains, wire ropes and hooks be used on PE pipes.
6. Pipes shall not be dropped to avoid impact or bump. If any time during handling or during installation, any damage, such as gouge, crack or fracture occurs, the pipe shall be repaired if so permitted by the competent authority before installation.
7. During coiling care should be taken to maintain the coil diameter at or above the specified minimum to prevent kinks. Coiling shall be done when the pipe attains the ambient temperature from the extruder. In uncoiling or recoiling care should be taken that sharp objects do not scour the pipe.
8. When releasing coils, it must be remembered that the coil is under tension and must be released in a controlled manner. The end of the coil should be retained at all times, then the straps released steadily, one at a time. If the coil has bands at different layers of the coil, then they should be released sequentially starting from the outer layers. The amount of the energy locked up in the coil will depend on the size of the pipe, the SDR of the pipe,

and the size of the coil.

9. Straight lengths should be stored on horizontal racks giving continuous support to prevent the pipe taking on a permanent setback
10. Bare coils shall be wrapped with hessian cloth for long distance (> 300Kms) transportation. The truck used for transportation of the PE pipes shall be exclusively used for PE pipes only with no other material loaded – especially metallic, glass and wooden items. The truck shall not have sharp edges that can damage the Pipe.
11. Pipes manufactured at factory are to be carried to the site of work directly or stacked suitably and neatly along the alignment/roadside/elsewhere near by the work site or as directed by the Engineer-in-Charge.
12. Damages during transit, handling, storage will be to the Contractor's account and replacement for such pipes has to be made by the Contractor without any extra cost as directed by the Engineer-in-Charge.

13.10. Lowering, Laying of Pipes

1. Each pipe shall be thoroughly checked for any damages before laying and only the pipes which are approved by the Engineer-in-Charge shall be laid.
2. While installing the pipes in trenches, the bed of the trench should be level and free from sharp edged stones. In most cases, the bedding is not required, as long as the sharp and protruding stones are removed, by sieving the dug earth, before using the same a backfill material. While laying in rocky areas suitable bed of sand or gravel should be provided. The fill to about 10 to 15 cm above the pipe should be fine sand or screened excavated material. Where hard rock is met with, bed concrete M15, 15 cm or 20cm thick sand bed as approved by the Engineer-in-Charge may be provided
3. As PE pipes are flexible, long lengths of fusion-jointed pipes having joints made above ground can be rolled or snaked into narrow trenches. Such trenches can be excavated by narrow buckets.
4. During the pipe laying of continuous fusion jointed systems, due care and allowance should be made for the movements likely to occur due to the thermal expansion/ contraction of the material. This effect is most pronounced at end connections to fixed positions (such as valves etc) and at branch connections. Care should be taken in fixing by finishing the connections at a time the length of the pipe is minimal (lower temperature times of the day.)
5. For summertime installations with two fixed connection points, a slightly longer length of PE pipe may be required to compensate for contraction of the pipe in the cooler trench bottom.
6. The final tie-in connections should be deferred until the thermal stability of the pipeline is achieved.

7. The flexibility of polyethylene pipes allows the pipe to be cold bend. The fusion jointed PE pipe is also flexible as the plain Pipe. Thus the total system enables directional changes within the trench without recourse to the provision of special bends or anchor blocks. However, the pipe should not be cold bend to a radius less than 25 times the OD of the pipe.
8. The Installation of flanged fittings such as connections to sluice/air/gate valves and hydrant tees etc., requires the use of stub ends (collars/flange adaptors complete with backing rings and gaskets. Care should be taken when tightening these flanges to provide even and balance torque.
9. Provision should be made at all heavy fittings installation points for supports (such as anchoring of the flange in the soil) for the flange joint to avoid the transfer of valve wheel turning torque on to the PE flange joint.
10. PE pipe is lighter than water. Hence care should be taken for normal installations where there could be a possibility of flooding of the trench thus the trench shall be kept free of water till the jointing has been properly done
11. When flooded, some soils may lose cohesiveness, which may allow the PE pipe to float out of the ground. Several design checks are necessary to see if groundwater flotation may be a concern. Obviously, if the pipeline typically runs full or nearly full of liquid, or if groundwater is always below the pipe, flotation may not be a significant concern.
12. However, weights by way of concrete blocks (anchors) are to be provided so that the PE pipe does not float when suddenly the trench is flooded and the soil surrounding the pipe is washed away. Thus site conditions study is necessary to ensure the avoidance of flotation.

    - Pipe embedment backfill shall be stone-free excavated material placed and compacted to the 95% maximum dry density.
    - Anchoring of the pipeline

Thrust blocks shall be provided at each bend, tee, taper, end piece to prevent undue movements of the pipeline under pressure. They shall be constructed as per design approved by the Engineer according to the highest pressure during operation or testing of the pipes, the safe bearing pressure of the surrounding soil and the friction coefficient of the soil.

13.11. Measurement and payment

The net length of pipes as laid or fixed shall be measured in running meters correct to a cm. Specials shall be included and measured in the total length. The portion of the pipe at the joints (inside the joints) shall not be included in the length of pipe work.

13.12. Excavation and preparation of trenches for laying U/G pipeline

The trench shall be so dug that the pipe may be laid to the required alignment and at required depth. When the pipeline is under a roadway, a minimum cover of 1.2 m shall be provided, in other cases the minimum cover of 1 m above the top surface of the pipe shall be provided. The

trench shall be shored, wherever necessary and kept dry so that the workman may work therein safely and efficiently. Under roadway and places where it is not possible to lay pipes up to required depth or laid open on ground, pipes should be incased all-round with the 1:2:4 (M15) cement concrete.

13.13. Recovery of other serviceable material

All serviceable materials such as woodwork, bricks, masonry etc. recovered during the operation of cleaning or excavations, which, in the opinion of the Engineer-in-Charge are suitable for reuse in restoring the surface, shall be separately stacked and disposed-of as directed by Engineer-in-Charge.

13.14. Dewatering

Dewatering shall be carried out by the contractor, wherever necessary. The discharge of the trench dewatering pumps shall be conveyed either to drainage channels or to natural drains and shall not be allowed to spread over in the vicinity of workplace.

13.15. Trenching

The trench shall be so dug that the pipe may be laid to the required alignment and at required depth. For road cutting and restoration of concrete/ BT roads, estimates are based on conventional method. However, as directed by the Engineer-in-Charge, the contactor is required to complete this work either (i) with concrete cutter/ trenching machine, or (ii) using trenchless technology. When the pipeline is under a roadway, a minimum cover of 1.2m under major roads shall be provided, in other cases the minimum cover of 0.9m above the crown of the pipe shall be provided, if due to the any condition the pipe are not laid at prescribed depth, deduction will be made as per UADD ISSR May 2012 with amendments up to 31.12.2020. The trench shall be shored, wherever necessary and kept dry so that the workman may work therein safely and efficiently. Under roadway and places where it is not possible to lay pipes up to required depth or laid open on ground shall be encased all round with the 1:2:4 (M20) cement concrete.

13.16. Jointing of Pipes

The pipe shall have Electro-fusion with coupler jointing system that shall provide for fluid tightness for the intended service conditions.

13.17. Bedding, Backfilling and Compaction Bedding

In case of sandy strata no separate bedding is required. However the bottom face / trench bed where pipe shall be placed shall be compacted to provide a minimum compaction corresponding to 95% of maximum dry density. The pipe bedding should be placed so as to give complete contact between the bottom of the trench and the pipe. The minimum cover over buried pipe should be 1m.

13.18. Back Filling

Backfilling should be placed in layers not exceeding 15cm thickness per layer, and should be compacted to a minimum of 95% maximum dry density. The refilling should be done on both sides of pipe together & height difference in earth fill on each side should not be more to cause lateral movement of pipe.

Most coarse grained soil are acceptable. This may comprise of gravel or sand. However silty sand, clayey sand, silty and clayey gravel shall not be used unless proposed to be used in conjunction with gravel or clean sand.

It is very important that the pipe zone backfill material does not wash away or migrate into the native soil. Likewise, potential migration of the native soil into the pipe zone backfill must also be prevented.

Heavy earth moving equipment used for backfilling should not be brought until the minimum cover over the pipe is 90cm in the case of wide tracked bulldozers or 120cm in the case of wheeled roaders or roller compactors.

13.19. Compaction

Vibratory methods should be used for compaction. Compaction within distances of 15 cm to 45 cm from the pipe should be usually done with hand tempers. The backfill material should be compacted not less than 95% of maximum dry density.

13.20. Thrust Block

RCC thrust block should be suitably designed & provided at bends and at places of reduction in cross section to take care of thrust.

13.21. Fittings & Specials

All HDPE fittings / specials shall be of minimum PN 10 or above Pressure class, fabricated in accordance with IS: 8360 (Part I & III). PE Injection moulded fittings shall be as per IS: 8008 (Part I to IX). All fittings/ specials shall be fabricated or moulded at factory only. No fabrication or moulding will be allowed at site, unless specifically permitted by the Engineer-in-Charge. Fittings will be welded on to the pipes or other fittings by use of Electro- fusion process.

13.22. Bends

HDPE bends shall be plain square ended conforming to IS: 8360 Part I & III Specifications. Bends shall be moulded.

13.23. Tees

HDPE Tees shall be plain square ended conforming to IS: 8360 Part I & II Specifications. Tees may be equal tees or reduced take off tees. Tees shall be moulded.

13.24. Reducers

HDPE Reducers shall be plain square ended conforming to IS: 8008 Part I & VII Specifications. Reducer must be moulded.

13.25. Flanged HDPE Pipe Ends

HDPE Stub ends shall be square ended conforming to IS: 8008 Part I & VI Specifications. Stub ends will be welded on the pipe. Flange will be of slip on flange type as described below.

13.26. Slip-On Flanges

Slip-on flanges shall be metallic flanges covered by epoxy coating or plastic powder coating. Slip-on-flanges shall be conforming to standard mating relevant flange of valves, pipes etc. Nominal pressure rating of flanges will be PN10.

13.27. Electro Fusion Tapping Saddle, Branch Saddle & Fittings

i. All the Electro fusion fittings should be manufactured with top quality virgin pre-compounded PE 100 resin which should be compatible with the distribution mains.

ii. The products shall comply with the requirements of EN 12201-3, EN 1555- 3 or ISO 8085-3.

iii. All the fittings shall be of PN 10 rating.

iv. The fittings shall have the approval from any one of the following agencies: KIWA, DVGW, WRC-NSF, U.K., CIPET etc.

v. All the products shall be manufactured by injection moulding using virgin compounded PE 100 polymer having a melt flow rate between 0.2-1.4 grams/10 minutes and shall be compatible for fusing on PE 100 distribution mains manufactured according to the relevant national or international standards. The polymer used should comply with the requirements of EN 12201 -1.

vi. Process voltage of all saddles must not exceed a maximum of 40 volts.

vii. The heating elements should be designed for fusion at any ambient temperatures between -5 to +40 degree centigrade.

viii. The heating coils contained in each individual saddle should be so designed that only one complete process cycle is necessary to fully electrofuse the fitting to the adjoining pipe or pipeline component as applicable. The heating coils shall be terminated at terminal pins of 4.0 or 4.7 millimetre diameter.

ix. No heating element shall be exposed, and all coils are to be integral part of the body of the fitting.

x. The EF tapping/ branch saddles should be fixed by fixation device and shall be achieved by external or integral clamping device.

xi. The cutter should be designed in such a way that the cut coupon is not allowed to fall into the pipeline and is retained inside the body of the cutter.

xii. A limited path style fusion indicator acting for each fusion zone as visual recognition of completed fusion cycle should be incorporated into the body of each fitting near the terminals. The fusion indicators should not allow the escape of the

molten polymer through them during or after the fusion process.

xiii. All the sockets in the electro fusion fittings should include a method of tapping controlling the pipe penetration (pipe positioner /stopper).

xiv. All the electro fusion products should be individually packed in transparent protective bags to allow easy identification without opening the bag and must clearly indicate its contents

xv. The brand name, size, raw material grade, SDR rating and batch identification are to be embedded as part of the injection moulding process. Each fitting should also be supplied with a Data Card or stickers with appropriate barcode as well as manual setting information for data transfer purpose.

xvi. Installation and Fusion Jointing: The fusion jointing process is to be carried out is as per the procedure outlined in the DVS2202 standard, if not available equivalent standards acceptable to employer.

A protocol for each fusion joint to be printed to ensure the joint process carried out is error free. The electro fusion machine shall have the facility to record & make print for each joint.

The precautions & measures as mentioned by electro fusion fittings/ machine manufacturer should be taken up rigorously while making the joints in the field.

The jointing procedures shall be performed with required accessories and tools as recommended by the fittings manufacturer.

The related pipe jointing accessories such as rotary pipe cutter, Universal clamping tools, Pipe cleaners, Pipe peelers supplied by the same electro fusion fitting/ machine supplier shall be used to ensure perfect jointing.

The usage of tapping tools such as taping keys, supplied by the same electro fusion fitting/ machine supplier must be used to ensure perfect tapping of main lines.

The piping system will be tested as per the guidelines given by ISO standard. The guideline shall be furnished by the supplier of electro fusion fittings, tools and machines.

13.28. Hydraulic Testing

Pipes shall be given different hydraulic tests for ensuring quality of manufacturing as per relevant clauses of IS specifications or prevalent standards as decided by the engineer.

13.29. Manuals

Technical Manual on PE pipes including precautions to be taken during operation of the pipeline.

13.30. Flanges

All flanges employed in the project must be compatible whatever material used.

13.31. Marking

All pipes shall be marked as per Clause 10 of IS 4984-2016.

13.32. Packing & Transport

The pipes should be preferably transported by road from the factory and stored as per the manufacturer specifications to protect damage.

13.33. Summary of Quality Tests

i.	**Quality Mark**	**:**	ISI marked (IS: 4984-2016) PE pipes shall be used
ii.	**Material**	**:**	As per IS 4984. However only virgin resin is allowed, reworked material is not allowed.
iii.	**Grade of Material**	**:**	PE 100 as per IS 4984 (Certificate from raw material manufacturer is required).
iv.	**Pressure Rating**	**:**	Minimum PN 6 or above as per requirement
v.	**Colour**	**:**	as per IS 4984
vi.	**Dimensions of Pipe:**		
	Diameter	**:**	The nominal diameter (outside)
	Wall thickness	**:**	As per IS 4984
	Length	**:**	

a) For diameter 90 mm and 110 mm : 100 meter (if pipes are supplied in length less than 100 m than the cost of extra joints will be borne by the contractor.)

b) For diameter more than 110 mm : minimum 6 meter (Tolerance as per IS 4984)

vii.	**Visual Appearance**	**:**	as per IS 4984
viii.	**Test and sampling**	**:**	as per IS 4984
ix.	**Special Test**	**:**	Notch hydraulic Test for the HDPE pipe made from PE-100 grade raw material as per ASTM 1474 OR ISO 13479 at manufacturer's laboratory or independent laboratory and should pass the Hydraulic test as per IS:4984:2016 for a minimum 165 Hours. The test reports shall not be more than three months old. Pipe shall convey water under variable temperature conditions ranging from 4°C to 45°C.
x.	**Jointing of pipes (pipe end):**		
	All diameters	**:**	Electro-fusion Process
xi.	**Quality Assurance**	**:**	Quality Assurance Plan shall be got approved from the employer before production start.

Note: All remaining parameters/ specifications are as per respective BIS specifications.

13.34. Inspection & Testing

i. The inspection and testing of the sample pipes shall be carried out as per relevant IS and/ or ISO standards (latest version) by the CEIL (Certification Engineers International Ltd.) or CIPET (Central Institute of Plastic engineering & Technology) or any other agency approved by the MPJN, in the manufacture's works before dispatch and / or picking random samples of pipe from work site.

ii. To ascertain the quality of HDPE Pipes, MPJN may get the quality of HDPE Pipes cross checked by another TPI Agency approved by MPJN at any time even after laying. The cost of such testing shall be borne by MPJN.

iii. If the pipe quality is found to be substandard, then the entire batch shall be rejected, and the contractor will be required to re-lay the rejected stretch at its own cost. If the contractor fails to re-lay the rejected stretch, MPJN will undertake the relaying of the rejected stretch at contractor's cost and risk.

iv. The pipe supplier for the rejected pipes will be removed from the empanelment list and debarred from supply of pipes.

13.35. Field Hydraulic Testing

13.35.1. Sectional Tests

After laying and jointing the pipeline shall be tested for tightness of barrels and joints, and stability of thrust blocks in sections approved by the Engineer-in-Charge in Charge. The length of the sections depends on the topographical conditions. Preferably the pipeline stretches to be tested shall be between two chambers (air valve, scour valve, bifurcation, other chamber). At the beginning, the Contractor shall test stretches not exceeding 1 km. After successful organization and execution of tests the length may be extended to more than 1 km after approval of the Engineer-in-Charge. The hydraulic testing shall have to be commenced immediately after laying and jointing of 1 km reach is completed.

The water required for testing shall be arranged by the contractor himself. The Contractor shall fill the pipe and compensate the leakage during testing. The Contractor shall provide and maintain all requisite facilities, instruments, etc. for the field testing of the pipelines. The testing of the pipelines generally consists in three phases: preparation, pre-test/saturation and test, immediately following the pre-test. Generally, the following steps are required which shall be monitored and recorded in a test protocol.

a) Complete setting of the thrust blocks.

b) Partial backfilling and compaction to hold the pipes in position while leaving the joints exposed for leakage control

c) Opening of all intermediate valves (if any)

d) Fixing the end pieces for tests and after temporarily anchoring them against the soil (not against the preceding pipe stretch) at the lower end with a precision pressure

gauge and the connection to the reciprocating pump for establishing the test pressure at the higher end with a valve for air outlet

e) If the pressure gauge cannot be installed at the lowest point of the pipeline, an allowance in the test pressure to be read at the position of the gauge has to be made accordingly

f) Slowly filling the pipe from the lowest point(s). The water for this purpose shall be reasonably clear and free of solids and suspended matter

g) Complete removal of air through air valves along the line.

h) Closing all air valves and scour valves.

i) Slowly raising the pressure to the test pressure while inspecting the thrust blocks and the temporary anchoring.

j) Keeping the pipeline under pressure for the duration of the pre-test / saturation of the lining by adding make-up water to maintain the pressure at the desired test level. Make up water to be arranged by Contractor himself at his own cost.

k) Start the test by maintaining the test pressure at the desired level by adding more make-up water; record the water added carefully and the pressure in intervals of 15 minutes at the beginning and 30 minutes at the end of the test period.

The pipeline stretch will pass the test if the water added during the test period is not exceeding the admissible limits. No section of the pipe work shall be accepted by the Engineer-in-Charge until all requirements of the test have been obtained. Water used for testing should not be carelessly disposed of on land which would ultimately find its way to trenches.

13.35.2. Back filling

On completion of a satisfactory test any temporary anchor blocks shall be broken out and stop ends removed. Backfilling of the pipeline shall be completed.

13.35.3. Flushing and disinfecting of pipelines

After testing and commissioning the contractor shall flush the pipes with a velocity not less than 1 m/s or as approved by the Engineer-in-Charge. Disinfection of drinking water pipelines should be done by Contractor.

13.36. House Service Connections on HDPE pipes

These specifications are for MDPE Blue/ Black PE 80/100 Pipes for House Service Connections of Dia 20 mm to 32 mm OD. HDPE Pipes (PN12.5 for 25 to 50mm diameter and PN16 for 16 to 20 mm diameter as per ISO: 4427)

13.36.1. Performance requirements

The Pipe supplied should have passed the acceptance test as per ISO: 4427. The manufacturer should provide the test certificates for the following tests:

1. Melt Flow Rate

2. Density,
3. Oxidation and Induction test,
4. Hydrostatic Test ,
5. Pigment dispersion Test,
6. Longitudinal Reversion Test.

13.37. Sluice Valves on Branches/ Scour valves/ Air Valves

Suitable numbers of DI sluice valves shall be provided conforming to IS: 14846 at different locations to regulate or isolate the flow in the network with locking chambers. Scour Valves of

DI sluice valves shall be provided conforming to IS: 14846 at different locations for emptying the pipeline for cleaning purposes with locking chambers.

ISI marked Air valves of DI shall be provided, wherever necessary with locking chambers.

13.38. Flow Control Valves

Flow control valves should be used with following specifications:

- 4.5 LPM to 7 LPM,
- Flow Control Valve (FCV) using food grade materials SS 316 ball / (1/2" (15 mm),
- The FCV nominal design is for 5 LPM,
- Discharges at 0.5 bar pressure loss and should not exceed the flow the range of 7 LPM.
- Grade stainless steel SS-316.
- Material of Construction of ball stainless steel-316.
- Flow direction arrow embossed on its outside surface.
- The valve should act as flow control valve and non-return valve.
- Minimum operating pressure: 0.1 kg (10 cm head).
- Design pressure: 1 meter to 50 meters.
- Accuracy of valves: +20% of average flow rate.
- Orifice size: not be less than 12 mm.
- Ball size: not less than 12 mm.
- Weight of FCV : not less than 125 gms.
- Length not less than 65 mm.

The FCV is with internal arrangements of very simple passage in line such that the valve would pass the small floating particles if any entered in the valve to avoid chocking.

13.39. Compression Fittings

Compression fittings used for House service connection should comply as per ISO: 14236 with Threaded metal inserts –SS 304 with BSP Threads.

13.39.1. Pressure Testing

The pressure rating of compression fittings should be as per clause 8 of ISO 14236 which shall be PN16.

13.39.2. Dimensions

The Dimension of compression fittings shall be as per clause 7.1 of ISO: 14236

13.39.3. Performance Requirements

The compression fittings shall be tested as per ISO: 14236. Following Test methods shall be performed.

a) Leak tightness under internal pressure.

b) Leak tightness under Internal Vacuum.

c) Long term Pressure Test for Leak tightness for assembled joint

d) MRS Value as per ISO 9080

e) Resistance to Internal pressure.

13.39.4. Effects on Quality of Water

The Compression fittings for intended for conveyance of Potable water for Human consumption to be tested to comply with BS 6920 specifications in any of the laboratories like DVGW/ KIWA/ SPGN/ WRC –NSF and certificate of compliance to be produced for the following parameters:

a. Odour & Flavour of Water.

b. Appearance of Water.

c. Growth of Micro Organism

d. Extraction of substances that may be of concern to Public Health (Cyto Toxicity)

e. Extraction of Metals.

All fittings with threaded ends should be with BSP threads.

13.40. House Service Connections on Metallic pipes

13.40.1. Specifications for Clamp Saddle Service Connections for other pipes

Clamp saddles for service connection from water distribution mains shall be of wrap around design, wide skirt and wide straps support, which shall reinforce the pipe while providing excellent stability to the saddle. Clamp Saddles for service connections shall be of fastened strap type with threaded outlet for service connection. The service connection threading sizes shall be conforming to IS: 554 Clamp saddles shall be suitable for DI pipes of nominal size 3" (NB to 12" (NB 300) with nominal service connection size from ½" (NB 15), ¾" (NB 20), 1" (NB 25), 1¼" (NB 32), 1½" (NB 40) and 2"(NB 50). The straps shall be elastomer coated (insulated) type for firm grip on pipe as well as to protect the coating on the pipe and to insulate the un-identical metals.

The saddles shall be single strap type up-to pipe sizes of NB 600 and service outlet of ½", ¾" and 1". The saddles shall be double strap type for pipe sizes above NB 600 or when the service outlet is 1 ¼", 1 ½" or 2". Fasteners shall be of threaded nut-bolt-washer type. Nut-bolts of size ½" (M12) shall be used for saddles of size up to 4" (NB 100) and Nut-bolts of size 5/8" (M16) shall be used for saddles of size 6" (NB 150) and above.

The sealing between the saddle and mains shall be obtained by using a profiled elastomer seal matching to the curvature of the pipe. The seal shall be of elastomer type, suitable for all potable water applications. The Material of construction of the body, straps, fasteners etc. shall be of a non-corrosive material such as engineering plastic (PE/PP) or stainless steel or a combination of both or DI with epoxy coating. The design of the saddle body should be such that, the service connection outlet metal insert shall project out towards pipe side and align with the hole drilled on the pipe to ensure positive locking against rocking or creeping on the pipe, as might be caused by vibration, pressure or excessive external loading. The clamp saddles shall be suitable for maximum working pressures up-to 10 bars.

13.40.2. Material and Design Specifications

Saddle Body: Noncorrosive Engineering Plastic body moulded with Stainless steel/DI with epoxy coating threaded metal insert for tapping outlet. Also, the stirrup metal plate shall be duly embedded in the plastic body, except at the place of nut-bolt lugs. Threading size and dimensions shall conform to IS:554. The body shall have retaining cavity housing for internal and external retention of the elastomeric seal. Sealing shall be achieved by pressure exerted by the body while fastening the saddle straps & body on the pipe.

Saddle Strap: Saddle straps shall be made of stainless steel 304 grade / plastic strap to prevent corrosion over the long service life.

Strap Insulation: Elastomeric (rubber) insulation / lining shall be such that none of the Stainless Steel Strap is in direct contact with the pipe. It shall ensure a firm nonslip grip mounting on the pipe to prevent the saddle from rocking or creeping on the pipe, as might be caused by vibration, pressure or excessive external loading.

Saddle Seal: It shall be virgin rubber SBR Grade 30/ NBR (NSF 61 approved). It shall be of type pressure activated hydro-mechanical design. It shall be contoured gasket to provide a positive initial seal which increases with increase in the line pressure. Gasket shall be gridded mat, with tapered ends, with the outlet section having O-ring contacting the saddle body multiple O-rings contacting the pipe, preferably with a Stainless steel reinforcing ring insert moulded to prevent expansion under pressure.

Nuts- Bolts- Washer: Stainless Steel Type 304, NC rolled thread, Tightening torque for ½" (M12) nut-bolt: 14-15 kg.m and for 5/8" (M 16) nut-bolt: 21-23 kg.m

14. Pumps, Motors and Ancillaries

14.1. Scope of Work

14.1.1. Pumps

Vertical turbine pumps and centrifugal pumps as per designed requirements complete with base plate, sub floor discharge head, motor stool, Bowel assembly, pressure gauges, etc. as per the specifications.

14.1.2. Motors

440 V, 3 phase, 50 cycle A.C. Solid shaft vertical motors to drive the above mentioned vertical turbine pumps with space heaters and all other accessories as per the specifications.

14.1.3. Capacitors

Capacitor banks for each of above motor to improve the power factor up to at least 0.95 with accessories as per specifications attached- as per requirement

14.1.4. Starters

Motor starter shall be as mentioned below.

i. Motors up to 5 HP - DOL starter
ii. Motors above 5 HP up to 100 HP - Star-delta starters
iii. Motors above 100 HP - soft starter

14.1.5. Delivery pipes and specials for pumps:

i. Suitable diameter M.S. Pipe and specials, epoxy coated for delivery piping of each turbine pump in the required length as per specification attached.
ii. Suitable size M.S. epoxy coated pipe for common manifold of required length.
iii. Dismantle joint as per diameter of delivery pipe.

14.1.6. Valves for delivery piping:

i. Suitable diameter swing type reflux valve (non-return valve) as per the specifications.
ii. Suitable dia. Butterfly / Sluice valves as per specifications Suitable dia. butterfly valve to be installed in the manifold as per the specifications.
iii. Suitable dia. Butterfly / Sluice valve to be installed in the manifold as per the specifications.

14.1.7. Flow Measuring Device:

Electromagnetic full bore type flow measuring device to be installed at junction point of pumping main and manifold outside the pump house with remote flow indication panel to be fixed inside the pump house- one no.

14.1.8. Electronic Pressure Transducers:

For indication of delivery pressure of each pump electronic pressure transducers with indication panel.

14.1.9. Crane: 4 tonne capacity overhead gantry traveling crane

14.1.10. H.T. and L.T. switchgear as per specifications.

14.1.11. Temperature scanner panels as per specifications.

14.1.12. Earthing of electrical equipment's inside pump house and electrical substation as per I.E. rules- as required.

14.1.13. Power and control cables

Power and control cables of suitable rating including cable trays, conduits cable trenches, supporting materials etc. for inter connection of various electrical units in every pumps house- as required:

i) Street lighting M.S. tubular poles for yard and street lighting with complete fitting suitable to carry three- phase line with necessary foundation,

ii) Suitable cable conductors of suitable size from lighting distribution panel of pump house.

iii) Distribution board for indoor/outdoor lighting.

iv) Complete watertight 250 watt mercury vapour lamp fitting on each pole to provide illumination as desired.

v) Lightening protection of pump house building complete with earthling stations, earthing conductors and accessories as required,

vi) Hand gloves and shock treatment charts in English and Hindi,

vii) Rubber mats in suitable sections to be provided in front of all switch boards for their entire length,

viii) Danger/caution notice boards in English and Hindi as per I.E. rules.

14.1.14. Civil Works

Necessary civil work required for erection with supply of building materials, all foundation bolts, washers, bolts of special design and special embedment as required for erection including all other miscellaneous articles, e.g. lubricants and oils required for installation, testing, commissioning, trial run and O&M.

Contractors shall carryout the actual site survey for determination of electrical soil resistively.

All the equipment shall be designed for operation in tropical humid climate subject to heavy rainfall and frequent thunderstorms with ambient air temperature of 50°C a maximum and 45°C average over 24 hours. The design of indoor equipment shall be done for an ambient temperature of 50°C. However, equipment and apparatus to be installed outdoor subject to direct incidence of sunrays shall be designed for operation at maximum ambient temperature of 55°C. Maximum monthly mean relative humidity is 80% and shall be taken into consideration for design of equipment.

All the materials to be used in this work must be strictly in accordance with relevant B.I.S.

The work shall be carried out by a licentiate class A contractor authorized under I.E. rules 1956 framed to in accordance with I.E. Rules of 1910. The contractor will have to obtain the license from the M.P. inspector of electrical safety department permitting to carry out the work.

The work shall be carried out strictly in accordance with latest I.E. Rules in vogue and relevant Indian standards. (B.I.S.)

The pumping sets shall be installed over the properly designed foundation so as to satisfy true alignment and vibration free installation, dynamically and statically balanced. The installation should conform to the modern technique and should be capable to give performances singly of with all units running in parallel in reference to system curve. The contractor shall test the installation of pumping sets for vibration and submit the vibration signature of pumping set for approval of the Engineer-in-Charge of the work before commissioning of the plant.

The responsibility of commissioning and satisfactory working of all the equipment will be that of contractor. Any defects due to faulty design, defective material of parts used in manufacture, noticed during the entire O&M period shall be made good by the contractor free of cost, without interruption of the plant. The replacement shall be done within a week of such break down, free of all charges inclusive of all cost of transportation, handling and fixing the same.

The contractor shall submit the technical particulars of the equipment.

The contractor shall submit the detailed description of each item provided for along with dimensioned drawing for the lay out and connections proposed.

The contractor shall also furnish an undertaking from the manufactures of equipment that before going out of production of spare parts, for the equipment offered the manufacturer shall give at least 12 months advance notice to the Madhya Pradesh Jal Nigam.

The contractor shall furnish the system efficiency curve indicating the overall system efficiency along with the submission of design of pump after confirmatory survey, for following situations:-

i. Only one pump is operated.

ii. Two pumps are operated in parallel.

The combined discharge head curve shall also be furnished for all above conditions.

The contractor shall indicate the overall kilowatt input at duty point without any tolerance.

The overall efficiency of each pumping unit and KW input should be quoted without any tolerance on negative side. The efficiency and kilowatt input of motor once quoted should be firm and shall not be allowed to be altered.

On completion of work, contractor shall submit the completed drawing circuit diagrams, detailed mechanical drawings of equipment and the maintenance manual in form as desired by the Engineer-in-Charge of work.

All the equipment shall be provided with rating plate and nameplate as per the specifications.

14.2. Specifications For Pumps

14.2.1. Raw Water Pumps

The pumps shall be Vertical Turbine wet pit type non-pull out design with multistage bowl assembly, directly coupled through flexible pin coupling with vertical motor without speed reduction gear. These pumps are to be installed in the intake well cum pump house at raw water pumping station to pump the turbid water. The rotating elements of pumps shall be dynamically balanced and over stressing shall not occur due to sudden failure of power. Reverse rotation shall not damage the pumps. Suitable Energy Efficient Submersible Vertical Turbine Pumps may also be allowed at Intake Well

The design data for pumps is as given in Annexure F.

14.2.2. Clear Water Pumps

The number of centrifugal pumps to be supplied and installed are mentioned in Annexure-F. For the pumps supplied and installed following specifications needs to be fulfilled:

i. Overall efficiency of each pump shall be 70% minimum for pumps of 50 KW or more and 60% minimum for pumps of less than 50 KW.
ii. Pump speed - 1500 RPM (Max).
iii. Characteristic of liquid to be handled - Clear water
iv. Method of lubrication - Auto lubrication with clear water
v. Pressure head - As per L- section including other losses of each case.

14.2.3. Specifications

i. Pumps shall be designed so as to have a maximum flow capacity of not less than 110% of the rated flow capacity.

ii. Pumps shall be designed so as for continuous operation at any point head capacity curve between 50% and 110% of pumps rates flow without undue vibration or overheating.

iii. The pumps shall be designed so as to have a stable non overloading characteristic. Capacity head curve shall be continuously dropping from shut off point to operating point and shall be suitable for parallel operation of pumps without any haunting possibility. The shut off head should not exceed 360% of duty point head.

iv. The impeller adjustment shall be designed in such a way that impellers run free in any installed condition in spite of the extension of line shaft caused by hydraulic down- thrust the weight of shafting and impellers.

The pumps shall be complete with bowel assembly, column pipe, line shaft, foundation plate, sole plate basket strainer, motor footstool and all other necessary accessories. The pumps should generally comply with the requirements of following standards.

i. I.S. 1710- Submersible pumps for clear, cold and fresh water.

ii. I.S. 5360- technical requirement of rot dynamic special purpose pumps.

iii. Any other relevant I.S. specifications.

Impeller shaft: The impeller shaft shall be of stainless steel with renewable stainless steel sleeves at bearing portion. The impeller shaft shall be guided by Bearings provided in each bowel. The butting faces of the shaft shall be machined square to the axis and the shaft and shall be chamfered on the edges. The shaft shall have a surface finish of 0.75- micron Ra max as per IS: 3073-1967.

Impellers: The impeller may be of closed type of semi open type made of S.S. CF8M, statically and dynamically balanced. The impeller shall be free of any carting defect and shall be properly machined all the water passage shall be smooth finished. The impellers shall be fastened with shaft thrust collar and keys.

Bowels: The bowels shall be made of 1.5% to 2% Nickels cast iron I.S. 2010 Gr FG260 smoothly finished and free from any casting defects. The bowels shall be capable of withstanding hydrostatic pressure equal to twice the pressure at rated capacity of 1.5 times of the shut off head whichever is greater. The bowels shall be equipped with replaceable seal rings on the suction side of impellers in case of closed impellers. The water passage in the bowels shall be smooth and shall have the stainless steel bushes to serve as bearing for the impeller shaft.

Line shafts: The line shaft shall be made of stainless steels the shafts shall be furnished with interchangeable sections having length of 1.5m, 2.5m of 3m. The butting faces of shafts shall be machined square to shaft axis and the shaft ends shall be chamfered on the edges. To ensure the correct alignments of shafts, they shall be straight within 0.365mm for 3m length total dial indicator reading.

The shaft shall not have the surface roughness more than 0.75 micron as per I.S. 3073-1967. The shaft coupling shall be designed with a minimum factor of safety for shafts and shall have left hand of right hand threads depending on the direction of rotation of pump to tighten during the pump operation. The outside diameter of the coupling shall be concentric with the bore and with a small transverse hole in the middle. The shaft shall have the adequate strength to withstand all the forces at the (±10% of the critical speed of shaft). The minimum dia of line shaft shall not be less than 60mm.

Column Pipe: The columns pipe shall be manufactured from the heavy series of mild steel tube confirming to relevant India standard specifications. The column pipes shall be flanged and bolted and shall be complete with nuts and bolts the length of column section shall depend upon the design of intake well cum pump house and the installation however for the ease of handling. The length of each column pipe shall not exceed 3 meters.

Line Shaft Bearings: Lubrication from filtered water tapped from V.T. pump deliver line and then passed through a small basket type filter unit. The filter unit shall have two sets of filter elements and booster pump to provide 100% standby system.

Thrust Bearing: The trust bearing shall be of angular contact spherical roller and shall be lubricated by oil. The thrust bearing shall be designed on the basis of 30000 working hour minimum for the load corresponding to the duty point. The thrust bearing shall be capable of taking entire pump thrust arising from all probable conditions of continuous operation throughout its range of operation and also at shut off conditions.

Discharge Head: The discharge head should be sufficiently strong to support the weight of the pump. It shall be fitted with a tube tension plate to tighten up the shaft tubes for the purpose of aligning the shafts. The discharge elbow shall be of fabricated mild steel.

Stuffing Box: A packing gland shall be provided at the top of stuffing box. Shaft sleeves shall be provided on the top shaft. The stuffing box shall be of sufficient depth to permit adequate packing. The space between the pump motor main coupling and the stuffing box shall be sufficient to permit removal of packing glands and insertion of new packing without dismantling the pumps.

Motors Foot Stool: The motor footstool shall be of fabricated mild steel and shall be designed to take care of all the static and dynamic loads on it.

Sole Plate: Each pump shall be provided with a heavy structural steel sole plate. Sole plate shall be provided and grouted with foundation. The sole plate shall be designed to permit removal of entire pump without disturbing sole plate.

Suction Bell and Basket Strainer: Each pump shall be provided with a suction bell and basket type removable, strainer. The strainer shall be of galvanized mild steel. The open area of strainer should be such that there is a minimum head loss in the strainer.

Pressure Gauges: Each pump shall be provided with a pressure gauge fibbing of best bell make to give the indication of delivery pressure. The pressure gauges shall be of Bourdon type fitted with glycerine outside the Burdon tube and connected to atmosphere for damping the mechanical vibrations. The connection size shall be 36 mm BSP.

Bolts, Nuts and Washers: All bolts, nuts and washers shall be of superior quality conforming to relevant Indian standard specifications.

14.2.4. Material of construction

The material of construction of the pumps and columns and bowel assembly shall be such as to resist erosion and corrosion, the material of construction for various components shall be as under:-

(i)	Suction bell and bowels:	1.5-2%Nickel C.I. I.S.210 Gr FG260
(ii)	Impellers:	S.S. CF8M
(iii)	Columns pipes:	Fabricated Mild Steel conforming I.S. 2062
(iv)	Pumps shaft:	Stainless steel AISI 410
(v)	Line shaft:	Stainless steel AISI 410.
(vi)	Shaft sleeve:	Stainless steel AISI 410.
(vii)	Line shaft bearing:	Cut less rubber
(viii)	Sole plate:	Mild steel as per IS 2062
(ix)	Pumps motor flexible coupling:	Semi steel.
(x)	Gland:	Bronze as per IS 318 Gr. 2.
(xi)	Packing for gland:	Braided impregnated Teflon.
(xii)	Bowel wearing rings:	Bronze.
(xiii)	Stuffing box:	C.I to I.S. 2010 gr. 25.
(xiv)	Thrust bearing housing:	C.I. to I.S. 2010gr 25.
(xv)	Motor foot stool:	Fabricated mil steel to I.S. 2062
(xvi)	Nuts, bolts and washers:	High tensile (Conforming to Relevant B.I.S.)

All the inspection, examination and testing shall be carried out in accordance with relevant Indian standard specifications. Details of test to be carried out are as follows:-

(i) **Laboratory Test:** Laboratory pump test shall be carried out as per I.S. 5360 for each pump to access the pump discharge v/s head, horsepower & Efficiency figures. The pump bowel shall be subjected to a test pressure of 1.5 times of the shut off pressure of twice the working (Rated) pressure whichever is higher.

(ii) **Field test:** The field test shall be carried out as per I.S. 1710 and 5360.

14.2.5. Technical particulars

The contractor shall submit the details of technical particulars along with the preliminary outline drawings indicating the principal dimensions and weight of pumping equipment, and cross section drawings indicating the assembly of pumps and major parts thereof with material of construction and special features, complete descriptive and illustrated literature on the equipment and accessories offered.

14.2.6. Energy Consumption

The MPJN's estimation for yearly consumption of energy for design period is specified in Annexure – 'F'. For reimbursement of energy charges, calculation shall be done on prorata basis from 1st year to design period. The energy charges will be rebased according to the population projections every financial year i.e. on 1st April of every year. The energy charges

will be based on the projected population for the entire financial year. If energy consumption is more than derived as above, then excess energy charges shall be paid by the firm.

If any change in scheme components or water demand increases due to any reason & approved by MPJN, then reimbursement of payment for energy consumption excluding penalties, shall be made accordingly.

14.2.7. Excess Energy Consumption

If energy consumption is more than the units as derived in the above clause, then excess energy charges shall be paid by the firm.

15. Electric Power Line

Design, Supply, erection and Construction of dedicated 33 KV/ 11KV power supply to Intake well cum pump house and IPS including construction of suitable capacity substation and transformers including standby and stretching of power. Campus lighting and allied internal and external electrical works for the entire project for all components including all allied civil works, etc. complete.

Liaison with MPPKVVCL for new power supply agreement for getting Electricity connection, Necessary arrangement for getting MPPKVVCL/ Electrical inspectors clearance and approval for the same or with any agency/ department as required, shall be in Contractor's scope. The work shall be done with latest MPPKVVCL's specifications and IS specifications.

i. Supply, installation, testing and commissioning of two pole structure along with lightning arrestor, disconnector, AAAC conductor, clamp and connectors, insulators, hardware, CT- PT metering set, H.T. meter with enclosure, etc for taking tapping from incoming overhead line.

ii. Supply, installation, testing and commissioning of suitable transformer with Off-circuit Tap Changer, necessary foundation and earthing.

iii. Supply, installation, testing and commissioning of the complete electrical distribution system with Main LV switchboards, process equipment panels etc.

iv. Supply, installation, testing and commissioning of the complete cabling system with terminations (scope includes supply of gland, lug, etc.) as per approved drawing.

v. Supply, installation, testing and commissioning of the illumination system including new lighting panels, lighting fixtures, cables, cable terminations, wires, GI conduits, switches, receptacles, street lighting poles with Junction box and overhang etc. including all the necessary accessories as per approved lighting layout drawings and technical specification.

vi. Supply, installation, testing and commissioning of earthing and lightning protection system with earthing pits and connecting the pits to the earth grid and forming earth grid and equipment connection to the grid including necessary clamps, nuts, bolts, etc all including welding, bolting and associated civil works for two pole structure,

overhead line, for all equipment inside and outside plant as per approved layout diagram and technical specification.

vii. Civil works associated with the electrical works is also included in the Contractors scope of works. Preparation of supports and structures for erection of transformers, switchgear, poles, cable trays and other accessories are included in the scope of works of the contractor. The work also includes testing at the place of manufacture by a third party as nominated by the Employer, as required at the contractor's cost.

15.1. Item & specification of the work

15.1.1. 33 KV Line Work

1. Supplying & drawing 100 mm sq. DOG, AAAC conductor, complete with binding at existing insulator, jointing teeing of connection etc. As required and cleaning of obstacle (if any) complete in all respect. As per latest BIS version (Make ISI make or Equivalent)
2. Supply and erection of angel/channel, flats iron fitting for over headlines such as cross arms, clams, V cross arms, brackets, back clamps, top clamps etc including nut bolts of required size welding fabricating painting with two coat of red oxide paint and two coat of aluminium paint as required as per specification, complete in all respects. Make: ISI Marked/ Tested (Make: Tata, SAIL or Equivalent)
3. Supply erection testing, commissioning of 33/ 11 KV disc insulator/ Polymer insulator and its hardware with galvanized insulator fitting, ball and socket type with galvanized insulator fitting wall and socket type with galvanized string camp, bolt, nut washer, etc suitable for 100 sq mm (AAAC conductor as required) as per specification complete in all respect as per BIS version.
4. Supply, erection, testing, commissioning of 33/ 11 KV Pin insulator and with GI Pin clamp, bolt, nut washer. etc suitable for 100 sq mm (AAAC conductor as required as per specification complete in all respects. As per latest BIS version.
5. Carpet guarding of 33 KV/ 11KV lines with 8 Swg GI wires along with binding wires etc complete in all respect including earthling of guarding as per BIS standard and specifications.
6. Supplying, installing, testing and commissioning of transformer, outdoor, oil filled copper wound distribution transformer along with all accessories conforming to latest edition of IS: 1180 specification with Neutral Solidly earth, HV Bushing shall be provided with home gaps, as per latest BIS version.
7. Supplying, Positioning, fixing & Erection at desired site of ISHB-beam/ Rail pole 11m long (min: 37.10 Kg/m) for electrical lines/ sub stations including aligning and keeping it truly in vertical position including excavation of poles pits in hard rock, with concrete of Grade M15 with 20mm graded black metal. The job includes plastering the exposed concreting with 1:4 (cement : sand) cement mortar including white cement painting. It

also including painting on MS pole with primer coat of red oxide, and two coat of aluminium paint inclusive of painting materials, labor etc complete as required as per specification. ISI Marked/ Tested (Make: Tata, SAIL or Equivalent)

8. Supply and erection of angel. Channel, flats iron fitting for over headlines such as cross arms, Clamps, V cross arms, brackets, black clamps, top clamps, stay clamps, stay set etc. including nut bolts of required size welding fabrication painting with two coat if red oxide paint/ Zinc chromed and two coats of aluminium paint as required as per specifications, complete in all respects. Make: ISI Marked/ Tested (Make: Tata, SAIL of Equivalent)
9. Supply, Erection, Testing and Commissioning of 33 KV disk insulator and its hardware with galvanized insulator fitting, ball and socket type with galvanized insulator fitting ball and socket type with galvanized string clamp, bolt, nut washer, etc suitable for 100 Sq. mm. (AAAC conductor as required as per specification complete in all respects (set of 3 disk of 33 KV) As per latest BIS revision.
10. Supply Erection, Testing & commissioning of 33 KV double stage insulator channel type drop outside complete as per specification duly installed on existing structure (Set of three complete in all respect). (DO Fuse) As per latest BIS version.
11. 33 KV Danger Boards as per MPPKVVCL specifications.
12. Providing and installing GI pipe earth electrode: earthling with GI pipe 40 mm dia. Including accessories and providing masonry enclosure with cover plate having locking arrangement and GI watering pipe. Earthling strips to be traced on electrode and brought out. Electrode to be covered by alternate layer of salt and charcoal powder. Complete in all respect, as per latest BIS revision.
13. Supplying /fixing of GI strips 25x5 mm size including riveting, welding clamping brazing and connection from earth plate to transformer body LA, Do fuse, ABS, & earth grid connection etc. complete in all respects, as per latest BIS version.
14. Winding of GI Barbed wire (Anti climbing device) up to height of 3m around of pole As per MPPKVVCL standards.
15. Supplying erection, testing of lighting arrester cap type single piece nonlinear resister type (set of 3 nos.) suitable for three wire 33 KV line with galvanized clamping arrangement, G.I. Bolt, nuts washer etc and mounting on existing structure to complete job as per specification complete in all respect (LA) as per latest BIS version.
16. Transformer Distribution Box – Supplying, installation, testing and commissioning of cubical type totally enclosed free standing type, dust, damp free and vermin proof, distribution board made of MS sheet 14G, complete with stove enamel paint, etc. with bus bar MV danger notice plate, ammeter and voltmeter with suitable aluminium leads and connection of incoming and outgoing cable with thimble and cable clamps having following incoming and outgoing with HRC fuses.

17. Specification: A incoming : 1 nos. 400/200/100 Amp MCCB with over current, earth fault over voltage, under voltage protection B: Bus bar, a set of 600 mps aluminium bus bar duly colour coated, C: outgoing: 12 nos. 200 Amps HRC base with fuse. As per latest BIS version (make MCCB: Havel's or ISI approved equivalent).
18. Supply, laying, placing, positioning, following PVC cables of 1.1 MN grade PVC insulated aluminium conductor armoured cables with inner and outer sheath mid laying vertically or horizontally including excavation in rock, trenching with cables covered with sand and brick protection etc. complete in all respects. (Offer should include termination of cables covered with proper lugs and connection to the equipment's complete in all respects) As per latest BIS revision.
19. Supplying erection and commissioning of ging operated pin insulator type air break switch Outdoor type 33 kv, 3 phase 50 HZ 200 Amp normal current on existing structure I including operating handle with guide and locking arrangement with earthling. 1 no. & 1 NC limit switch with its mounting etc as per specification (one set of three nos.) complete in all respect (AB switch as per latest BIS revision).
20. Providing & fixing fencing consisting of GI wire, MS angle iron post 40 x 40x 6 mm, (confirming to IS 225), 1.2 Mt. height above GL and 0.3 Mt. below GL. C/C spacing of each post shall not exceed 2.25 Mt. with diagonal strut to hold the fencing in line and level. Angle of size 40x40x6 mm length 1 Mt. at every forth post fixed with nuts bolts including applying a priming coat of steel printer and painting with black paint to post and struts etc, complete including screwing with GI tying wire, GI stipples, GI un-ails or steel pins, etc. complete with cost of excavation and filling cement concrete M15 grade for fixing posts and struts to the pit of size 0.3 x 0.3 x0.3 Mt for each post and struts etc. complete for covering transformer & other electrical utility with welded mesh 50x25 mm as per latest BIS version.
21. Supplying Positioning fixing & erection at desired site of ISHB –beam/ Rail pole 13m long (min: 37.10 Kg/m) for electrical lines/ sub stations including aligning and keeping it truly in vertical position including excavation of pole pits in hard rock, with concrete of grade M15 with 20mm graded black metal. The job includes plastering the exposed concreting with 1:4 (cement and sand) cement mortar including white cement plastering. It also including painting MS pole with primer coat of red oxide, and two coat of aluminium paint inclusive of painting materials, labour etc. complete as required as per specification ISI marked/ tested (Make: Tata, SAIL or approved equivalent).
22. Supplying and fixing of earthling set coil made out of 8 swg GI wire complete as MPPKVVCL specification.
23. Supply and winding of GI Barbed wire (Anti climbing device) up to height of 3m around of pole as per MPEB standards.
24. Supply and installation of danger board 33 KV rating: The job includes concreting, suitable HBEAM pole of mm 11m height to house all mentioned fittings, including

excavation, making pedestal, M20 concreting, reinforcement as per drawings & design. As per latest BIS version.

25. Supply and fixing of stay set 20 mm complete with stay rod, stay wire and base plate, excavation of pole pits in hard rock, with concrete of grade M15 with 20 mm graded black metal. The job includes plastering the exposed concreting with 1:6 (cement and sand) cement mortar including white cement painting. It also including painting materials, labour etc complete as required as per specification.
26. Supply erection testing commissioning of 33 KV disk insulator and its hardware with galvanized insulator fitting, ball and socket type with galvanized insulator fitting ball arid socket type with galvanized string clamp, bolt, nut washer, etc suitable for 100 sq.mm (AAAC conductor as required as per specification complete in all respect) As per latest BIS revision.
27. Supply and erection of Angel/ Channel, flats iron fittings for over headlines such as cross arms, clamps, V cross arms, brackets, back clamps. top clamps etc including nuts bolts of required size welding fabricating painting with two coat of red/ oxide paint/ zinc chromed paint and two coats of aluminium paint as required as per specifications, complete in all respects. Make: ISI Marked/ Tested (Make: Tata, SAIL or approved equivalent).
28. Supply erection testing commissioning of 33 KV Pin insulators and its hardware with Insulator and GI Pin as per latest BIS version.
29. Supply. Testing, Commissioning of 110 Volts/ 5 Amps KWH meter with TTB. Make: secure meters Ltd.
30. Supply, Testing and Installation of 33 KV oil immersed 3 phase CT PT unit of rating 50/5 Amps as per design and specifications of MPEB.
31. Supply and Installation or HT meter box double door with glass window. Made of MS sheet duly painted with locking arrangements etc.
32. Supply and installation of cooper control cable 2.5 sq min 12 cores complete with glands connectors etc.
33. Supplying laying placing positioning following PVC cables of 1.1 KV grade PVC insulated aluminium conductor armoured cables with inner and outer sheath and laying vertically or horizontally including excavation in rock, trenching and refilling and making it as original in GI pipe/Hume pipe/ GI cable trays/ earth/ RCC trenches with cables covered with sand and brick protection etc complete in all respects (offer should include termination of cables with proper tugs and connecting to the equipment's complete in all respects). As per latest BIS version (Make Havells, Finolex, Paragon or IS approved equivalent).
34. Supplying fixing and installation of RS JOIST 175x85 mm of 9 inch ht., its excavation, concreting M20, Primer & enamel painting etc junction box required in all respects

with accessories, The job includes supplying erection in positioning, RSJ pole of min 9 mt height to house all mentioned fittings, including excavation, making pedestal, M20 concreting, reinforcement as per drawing and design, as per latest BIS version including junction box, fixed with clamps with simple fuse fitted also providing street light operating as per MPPKVVCL norms (Make: Bajaj, Crompton, Philips or IS equivalent approved)

35. The job included concreting in position, suitable MS tubular pole of min 9 Mt and section feeder panels height to house all mentioned fittings, including excavation, making pedestal, M20 concreting, reinforcement as per drawings & design as per latest BIS version.
36. Supply and testing of sired light operating switch suitable for Street lights (Three phase supply)
37. Supply and testing limit switch with copper armoured cables from AB switch to the breaker.

15.1.2. 11 KV Electric power line (if required)

1. Scope of work includes supply, erection, testing and commissioning of 11 KV electric line using H-Beam as poles and using Raccoon Conductor having max span 70 Mtrs with following items using following items including labour, transportation etc. complete.

S. No.	Particulars
1	H-Beams 152 X 152mm, 37.1 Kg/m, 11m Long
2	11 KV 'V' cross-arms angle type (65x65x6 mm angle)
3	Back clamps (65x6 mm flat) for 140kg PCC Pole
4	11 KV Top clamps angle type 65x65x6 mm
5	Earthing Coil (coil of 115 turns of 50 mm. dia. and 2.5m lead of 4.0 mm. G.I wire)
6	11 KV (5 KN) polymer Pin insulator
7	AAAC Conductor Raccoon with 3% Sag
8	Jointing Sleeves suitable for 80 Sq mm Al. Eq. AAAC conductor
9	Stay set 16 mm. complete with back clamps, stay wire 7/3.15 mm. (5.5 kg. stay wire per stay set) and turn buckles for H beam
10	Concreting (1:2:4) of H-beam @0.65 cum per pole (Base pedding + Muffing)
11	Concreting (1:2:4) of stay @ 0.2 cum per stay
12	Painting with Red oxide paint
13	Final 2 coat of Aluminium paint

S. No.	Particulars
14	Fixing of Anti climbing devices
15	Fixing of Danger Boards Enamelled Type 11KV

15.1.3. Specifications for 11 KV/ 0.4 KV outdoor substation on RSJ using following items including labour, transportation, etc. complete

Transformer 11/ 0.4 KV 3 Star rated of designed capacity including standby
RS Joist 175x85, 19.6kg/m, 11m Long
D. C. cross-arm of 100 X50X 6 mm 8' centre with 2 pair of clamp suitable for RSJ
11 KV (45 KN) Polymer disc insulator
11KV Strain hardware fitting
11 KV D.O. fuse & Lightening Arrestor mounting channel (75X 40 X 6 mm) with 2 back clamp suitable for RSJ
11 KV D.O. fuse unit
9 KV Gapless type (5 KA) polymer lightning Arrestors for DTR
Transformer mounting DC cross-arm 100X50X6 mm channel
Transformer clamping set 50X50 X6 mm angle
Transformer belting with 50X50X6 mm angle with two cross fixing channels
Stay set 16 mm complete with back clamps, stay wire 7/3 15 mm (5.5 kg stay wire per stay set) and turn buckles
Concreting (1:2:4) of RS Joist @ 0.5 cum per pole
Concreting (1:2:4) of Stay @ 0.2 cum per stay
AAA Conductor Rabbit for Jumper
Danger Boards Enamelled Type 11KV
Earthing set
Anti-climbing devices (Barbed wire 2.24 mm Dia (14 SWG) (3.5 Kg. wire per pole)
Red oxide paint
Aluminium paint
M.S.Nuts and Bolts
Distribution Box mounting channel (75x40x6 mm.)

The work include supplying and fixing of all accessories complete whether included or not as per latest MPPKVVCL's specifications and charging the line including taking permission from any other government department if necessary. Standby transformers (100% standby) should be installed such that the same is ready to use in case of failure of working transformer.

16. Internal and Approach Roads

16.1. WBM and overlaying Bituminous layer

Construction of Embankment/ Subgrade/ earth shoulders as per clause 305 of MoRTH Specifications & its sub-clauses, where required but with approved materials/ soil like morrum and CBR value not less than 7% including all lead & lifts, excavation, cost of watering, compaction and maintenance of surface during construction to ensure shedding & prevent ponding of water (clause 305.3.6) shaping & dressing (clause 305.3.7) finishing etc. complete but excluding scarifying existing granular/ bituminous road surface vide clause 305.6.

Granular Sub-Base with Coarse Graded Material (Table:-400-2): Construction of granular sub-base by providing coarse graded material, spreading in uniform layers with motor grader on prepared surface, mixing by mix in place method with rotator at OMC, and compacting with vibratory roller to achieve the desired density, complete as per clause 401 of MoRTH Specifications.

For grading-III Material: Providing, laying, spreading and compacting stone aggregates of specific sizes to water bound macadam specification including spreading in uniform thickness, hand packing, rolling with vibratory roller 8-10 tonnes in stages to proper grade and camber, applying and brooming requisite type of screening/ binding Materials to fill up the interstices of coarse aggregate, watering and compacting to the required density.

By Manual Means Grading-I using screening of Type-A (13.2mm Agg.): Providing, laying, spreading and compacting stone aggregates of specific sizes to water bound macadam specification including spreading in uniform thickness, hand packing, rolling with vibratory roller 8-10 tonnes in stages to proper grade and camber, applying and brooming requisite type of screening/ binding Materials to fill up the interstices of coarse aggregate, watering and compacting to the required density.

By Manual Means Grading- II using screening Type-A (13.2mm Agg.): Providing, laying, spreading and compacting stone aggregates of specific sizes to water bound macadam specification including spreading in uniform thickness, hand packing, rolling with vibratory roller 8-10 tonnes in stages to proper grade and camber, applying and brooming requisite type of screening/ binding Materials to fill up the interstices of coarse aggregate, watering and compacting to the required density).

By Manual Means Grading- III using screening Type-B (11.2mm Agg.): Providing and applying primer coat with bitumen emulsion on prepared surface of granular Base including clearing of road surface and spraying primer at the rate of 0.60 kg/sqm using mechanical means.

Providing and applying tack coat with bitumen emulsion using emulsion pressure distributor on the prepared bituminous/granular surface cleaned with mechanical broom and as per relevant clauses of section-503 of MoRTH Specifications @ 0.30 kg per sqm (dry & hungry bituminous surfaces/granular surfaces treated with primer)

Open - Graded Premix Surfacing (Providing, laying and rolling of open - graded premix surfacing of 20 mm thickness composed of 13.2 mm to 5.6 mm aggregates either using penetration grade bitumen or cut-back or emulsion to required line, grade and level to serve as wearing course on a previously prepared base, including mixing in a suitable plant, laying and rolling with a smooth wheeled roller 8-10 tonne capacity, finished to required level and grades.)

Case - II: Open-Graded Premix: Surfacing using cationic Bitumen Emulsion Seal Coat (Providing and laying seal coat sealing the voids in a bituminous surface laid to the specified levels, grade and cross fall using Type A and B seal coats)

Case - I : Type A: Construction of unlined surface drains of average cross sectional area 0.40 sqm in soil to specified lines, grades, levels and dimensions to the requirement of clause 301 and 309.

Excavated material to be used in embankment within a lead of 50 meters.

17. Cross Drainage Works

Providing and Laying Reinforced cement concrete pipe NP4/ prestressed concrete pipe 1000 mm dia. for culverts on first class bedding of granular material (cost of bedding included) in single row including fixing collar with cement mortar 1:2 but excluding excavation, protection works, backfilling, concrete and masonry works in head walls and parapets.

Notes:

1. Clauses and tables mentioned in specifications above refer to MORTH specifications.
2. Excavation, disposal of surplus earth, construction of shoulders with approved material, Plain Cement Concrete for drains and other required works which will facilitate full functionality shall also form part of the work.
3. Until and unless specified otherwise in this document the road width shall be 3.5 m with 1 m shoulder on either side.

18. Boundary/ Compound wall

The boundary wall or compound wall as the case may be shall be constructed as per specifications below:

i. Type of foundation shall be as per approved design and drawing.

ii. Plain cement concrete used for foundation shall be minimum of M15 grade.

iii. RCC used for plinth beam foundation and columns shall be of M20 grade.

iv. Brick work with well burnt chimney bricks having crushing strength not less than 25 kg/cm^2 and water absorption not more than 20% using 1:4 cement mortar.

v. Internal and external plastering shall be 12 mm thick using 1:3 cement mortar.

vi. Finishing walls with Acrylic smooth exterior paint of required shade (two or more coat applied @1.67 litres/ 10 sqm over and including base coat of water proofing cement paint applied @2.0 kg/ 10sqm).

vii. Providing and fixing of gate built with structural steel as per approved drawing and specifications at every location.

viii. The height of boundary wall above ground level shall be minimum 2m.

19. Office Building and Staff Quarters

Office building and staff quarters as specified in Annexure F are to be designed and constructed at WTP campus or as decided by MPJN officials.

19.1. General Specifications of Staff Quarters

All the staff quarters/ Office shall be RCC framed brick masonry structures. The columns, Beams, Lintels, Chhajjas, Slabs shall be constructed in RCC M25 grade of concrete and walls shall be constructed in brick masonry with 1:6 cement mortar duly plastered with 1:5 cement mortar. The specifications of all the materials have already given earlier, however brief description of different components of quarters are as under:

19.1.1. Foundation

The foundation shall be of RCC footing or raft as per safe bearing capacity of foundation strata.

19.1.2. Plinth

The minimum height of plinth shall be 0.60m above from highest nearby ground level. The plinth shall be filled with hard moorum or stone crusher dust duly compacted. An RCC floor slab shall be laid at plinth level with minimum reinforcement. The minimum thickness of slab shall not be less than 0.15m.

19.1.3. Flooring

Kota stone flooring shall be done in I and H type of quarters and in G and F type of quarters flooring of Vitrified tiles shall be provided.

19.1.4. Walls

The brick masonry walls shall be constructed as per specifications given earlier. The minimum thickness of the outer walls shall be 0.20 m and partition wall may be of half brick wall.

19.1.5. Doors

All the door frames shall be constructed by sal/malesia sal wood and panels shall be constructed by flush door panels except outer doors. The outer door shutters shall be constructed by teak wood panels. All the doors have one additional panel having mosquito net. The doors of washrooms may be constructed in aluminium frame with PVC shutters. All the doors shall also be provided with interlock arrangement.

19.1.6. Windows

30% of floor area shall be provided for door and windows. All the windows shall be constructed of aluminium framed with 4 mm thick glass panes and mosquito net. MS grill shall also be provided in each window.

19.1.7. Electrification

Concealed electric fitting shall be done as per standard IE rules. Each room shall be provided with sufficient number of points for lights, fans, power points, sockets and etc. Separate line for inverter shall also be laid. All fixtures like energy efficient tube lights, CFL, Night lamps, Fans, Exhaust Fans, Geyser etc as required of ISI mark and of standard make shall be provided.

19.1.8. Water Supply

Concealed water supply fitting shall be provided. GI class medium/ CPVC pipes can be used. A water storage tank of minimum 2000 lts capacity shall also be constructed over roof. Sufficient number of points for fresh as well as for stored water shall be provided for Kitchen, Dining room, Toilet, Courtyard and etc. Provision for geyser connection, mixers shall also be provided.

19.1.9. Sanitary

Provision of attached toilets for bedrooms shall be provided. A common toilet shall also be provided. Glazed tiles shall be provided on inner walls of the toilet up to full height. Toilet block should have Indian type WC with flushing arrangement, shower, fresh and stored water outlets, Geyser point, and wash basin. A septic tank of sufficient capacity shall be constructed. Internal drainage lines may be of UPVC and external line may be of UPVC/RCC and should be laid up to local drain/ sewer. Roof water harvesting arrangement shall also be provided.

19.1.10. General

All the bedrooms will have the facility of wooden almirah, Dining room should be provided with wash basin, Kitchen should have the facilities of Kitchen stand, Sink, sufficient almirah/cupboard, exhaust fan and etc. All the fixtures shall be of standard make and shall be ISI mark as approved by MPJN Officials. H and I type quarter may be duplex type and G & F type may be constructed as row houses or separately. The office building should have sufficient number of rooms to accommodate all the staff. The flooring of the office building shall be of Vitrified tiles. Minimum two toilet blocks one for ladies and another for gents with all facilities as mentioned earlier shall be provided along with one attach toilet with main room. Roof water harvesting arrangement for office building/ quarters shall also be provided.

20. Pipe Appurtenances

Air Valves

The air valve shall be conforming to IS-14845. The material for construction where specified as Ductile Iron EN1563 EN-r cGJS-500/7 should be read as Ductile Iron EN1563 EN-GJS-500/7 or Ductile Iron GGG 40.

Scope

Automatic air release valves shall be provided at locations given in the project specifications. These valves shall conform to BS EN 1074:2000 part 4. Air valves shall be constructed so that internal working parts, which may need repairs, shall be readily accessible, removable, and replaceable without use of special tools and removing the valve from the line. Standard air valves shall be designed so that the floats seat against orifices without leakage at all pressures between 0.1bars and the maximum field test pressure. The design for the floats and seats shall be such that the risk of adhesion is a minimum and shall be of a type proved by experience to be suitable for the duties required. All valves shall be suitable for operation under working pressures conforming to standards and Table1 of BSEN 1074-1:2000, Valves shall be so designed that the floats cannot be held or blown shut against the orifices by air pressure or turbulence due to escaping air. Standard air valves shall have a minimum pressure rating of 16 bar and in all cases shall be supplied with PN16 (i.e.16bars) flanges, complying with BSEN 1092-1: 2007.

Construction

Double orifice valves shall comprise one large orifice air valve and one small orifice air valve integrated into a single unit assembly and having a single pipeline connection. It shall have ductile iron body and double float actuated air valves with flanged ends. Double orifice air valves shall be provided with a separate isolating valve. Isolating valves must be so arranged that they can be closed from the ground surface above, with a tee key even when the air valve chamber is flooded. Where required, a short length of double-flanged pipe could be supplied to increase the height above the main to suit the operational requirements depending on the depth of installation of Air valve. Air valves shall be insect proof at the outlet vents leading to the atmosphere. Tests shall be carried out on all types of air valves, as specified in BSEN 1074-4:2000 and BSEN 1074-1:2000 and the contractor shall submit the manufacturer's certificates certifying that such tests have been conducted satisfactorily.

Material of construction

Component	Material of construction
Body, Cowl, side chamber	Ductile Iron EN1563EN-GJS-500/7
Guide bottom, guide top	GP-22 ABS
Seat ring, guide ring	GP-22 ABS
Large & small orifice	GP-22 ABS
Splash Cover	Ductile Iron EN1563EN-GJS-500/7
Orifice bracket /cover	Nylon
Grooved pin, plug	St. Steel EN 10088 No.1.4401
Gasket, seal ring, O ring	EPDM
Isolating Sluice Valve	As per BS EN 1074 part 1&2
Fasteners	St. Steel EN 10088 No.1.4401

All ABS components to be WRAS (Water Regulations Advisory Scheme) approved.

Process Liquid	Treated drinking water											
Service	Isolation											
Type of Valve	Sluice Valve											
Size	150 NB											
Valve Description	Operating Conditions		Design Conditions		Material of Construction (as indicated below or its equivalent)				Nominal size NB (mm)	End Connection	Operator	Qty
	T (°C)	P (bar)	T (°C)	P (bar)	Body Material	Disc	Stem	Seals/ gaskets				
Suction isolation valve		1	50	2.5	D.I.	D.I.	St. steel	EPDM	150 NB	Flanged	Hand wheel	3
Pump Discharge isolation valve		3.5	50	2.5	D.I.	D.I.	St. steel	EPDM	150 NB	Flanged	Electric Actuator	3

Process Liquid	Treated drinking water											
Service	Isolation											
Type of Valve	Non-return Valve											
Valve Description	Operating Conditions		Design Conditions		Material of Construction (as indicated below or its equivalent)				Nominal size NB (mm)	End Connection	Operator	Qty
	T (°C)	P (bar)	T (°C)	P (bar)	Body Material	Disc	Seat	Seals/ gaskets				
Pump Discharge vertical non-return valve(floating ball type)		3.5	50	2.5	D.I.	N.A.	Bronze	EPDM	150 NB	Flanged	EPDM Vulcan issued steel ball	3
Pump rising main horizontal non-return valve with dashpot/counter weight		3.5+ max surge pressure	50	2.5+ max surge pressure	D.I.	D.I.	Bronze	EPDM	300 NB	Flanged	Disc	1

Process Liquid			Treated drinking water								
Service			Protection								
Type of Valve			Air Valve								
Valve Description	Operating Conditions		Design Conditions		Material of Construction (as indicated below or its equivalent)				Nominal size NB (mm)	End Connection	Qty
	T (°C)	P (bar)	T (°C)	P (bar)	Body Material	Guide Bottom & Top	Orifice Bracket & Cover	O rings & gaskets			
Double orifice air valve		3.5	50	4.5	D.I.	GP-22 ABS	Nylon	EPDM	150 NB	Flanged	1

Sluice Valves

Scope

The sluice valves for pipeline installation shall comply with the BSEN 1074:1-2000 and BSEN 1074 : 2 – 2000 or BS 5163-1:2004 for diameters up to and including 600 mm and BSEN 1171:2002 for diameters above 600 mm and shall be of PN 16 pressure rating, for potable water applications.

The valves shall be suitable for the maximum pressure (including water hammer pressure, where applicable) at the maximum liquid temperature encountered by the valve during operation

Construction

Sluice valves shall be standard Non-rising spindle (inside screw), wedge gate valves.

Seating arrangement

The valve shall be provided with solid taper wedge seat, with precision machined seat rings and body rings of materials as per project specifications. For sizes up to 300 mm resilient seated (EPDM lined seat) valves will be provided. For sizes above 300 mm, metallic seats shall be provided.

Operating mechanism

As a basic requirement the valves shall be provided with hand wheels made of cast iron and shall have arrows and words ‘open’ and ‘close’ cast on to indicate direction of rotation for opening and closing the valve Directions of closure of the valves shall be ‘clockwise”. Valves above 300 mm size, or when the operating torque more than 130 Nm, shall be provided with gear drive the gear drive shall be provided with suitably designed thrust bearing for ease of operation. The gear mechanism shall be spur/bevel/worm gearing as per recommendations of the valve manufacturer to suit the site conditions.

All Tee-Key operated valves shall be provided with valve cap as per BS5163: 2004. Bypass arrangement shall be provided for valves of DN 300 and above. The valves shall be provided with optional operating mechanism like extended shaft with head stock if asked for in tender specifications.

Actuators

When specified in the project specifications, the valves shall be provided with electric or pneumatic actuators, selected considering the torque required, the closing/opening time. The actuator shall be provided as per the specifications for the actuator given in the project specifications. Manufacturer to furnish data viz. torque, operating time and supporting calculation for review / approval.

Body and bonnet:

The valve body shall be ductile iron. Cast iron body will be acceptable up to and including DN150 complying with BS5163-1:2004 and BSEN1563:2004 if specified in tender data sheets. For diameters above 150 mm, the valve body shall be ductile iron complying with BSEN 1563:2004.

Spindle

Valves shall have stainless steel spindle, machined bronze mating faces securely fixed to the valve body. The Spindle shall have precision threading for ease of operation, and to prevent slip. Standard rotation shall be clockwise to close.

Materials of Construction

Standard sluice valves (350 mm and above)

Component	Material of construction
Body / Bonnet /Gland flange	DuctileIronEN1563EN-GJS-500/7
Stem	St. Steel EN 10088 No.1.4401
Wedged gate	DuctileIronEN1563EN-GJS-500/7
Bushing	Nylon
Wedge Nut	Aluminium bronze EN 1982 CC331G(AB1)
Stem seal, Gasket	EPDM
Fasteners	St. Steel grade A4
Flange Drilling	BS EN 1092-2
PN rating	10 / 16

Resilient seated sluice valves (up to 300 mm)

The sluice valves shall generally conform to BS EN 1074 part 1 & 2, with length over flanges as per BS EN – 558 series 3

Component	Material of construction
Body / Bonnet	DuctileIronEN1563EN-GJS-500/7

Component	Material of construction
Wedge (fully rubber encapsulated)	Ductile Iron EN1563EN-GJS-500/7integrally lined with EPDM rubber
Stem	St. Steel EN 10088 No.1.4401
Wedge Nut	Aluminium bronze EN 1982 CC331G(AB1)
Stem seal, O ring, Gasket	EPDM rubber
Fasteners	St. Steel grade A4
Flange Drilling	BS EN 1092-2
PN rating	10 / 16

Accessories

Typical Accessories	
Back Seat Bush	Hallprene on bronze
Thrust bearings (400 ø and above)	SKF or equivalent
Enclosed spur / worm gear box (400 ø and above)	CI with IP 54 protection;
Shoe & Channel (400 ø and above)	Gun metal BS EN 1982 CC491K

Flanges

The valves shall be double flanged, with flange-to-flange distance strictly as per BS EN 558:2008. The flange thickness and drilling table shall be based on the maximum pressure (including water hammer pressure, where applicable) specified in the project specifications.

Pressure Reducing Valve

Scope

This specification covers the requirements regarding material, construction and workmanship, performance and marking of pressure reducing valves of different size. for domestic water supply system suitable for maximum inlet pressure of 1·72 to 5 MPa.
The valves covered by this specification are self-contained, direct acting, single seat, and diaphragms type. Valves with integral or separate strainers connected to the valve inlet are included.

General

Pressure reducing valves shall be suitable for application in water distribution systems. The valve shall be able to reduces a higher variable inlet pressure to a constant predetermined lower outlet pressure, independent of the flow rate or inlet pressure fluctuations. **The PRV should be Hydraulically operated and of needle type only.**
It shall be possible to set the outlet pressure to a value ranging from 7 to 20 mH2O. At the same time, the PRV shall be selected in order to ensure the lowest possible pressure drop in case the upstream pressure is lower than the downstream setting pressure. It shall be possible

to regulate the PRV without external energy supply. The valve shall be made of wear-resistant, corrosion-resistant, and penetration-proof metallic material conforming to standards for drinking water up to 50 °C. Not all parts in contact with the water shall create any hazard to human health. The body and bonnet shall be of either ductile or cast iron or carbon steel. The body of the valve shall have epoxy coating to prevent corrosion. The valve shall have flange ends on both sides according to EN 1092-2 PN 1.6. It shall be leak-proof, and it shall include a stopcock for manual purging. All internal parts shall be accessible from the top for maintenance without disassembling the valve from the pipeline. The maximum downstream pressure to which the valve is to be set is specified in the drawings, according to the outcome of the hydraulic model.

Applicable codes

IS: 1363	Hexagon head bolts, screws and nuts of product grade C
IS: 1364	Hexagon Head Bolts, Screws and Nuts of product grades A and B
IS: 1367	Technical Supply conditions for Threaded Steel Fasteners
IS: 5382	Rubber sealing rings for gas mains, water mains and sewers
IS: 9739	Specification for Pressure Reducing Valves for Domestic Water Supply Systems
IS: 12820	Dimensional requirements for rubber gaskets for mechanical joints and push on joint for use with cast iron pipes and fittings for carrying water, gas and sewage.

Material

The different components or pressure reducing valves shall be made of the materials as given in Table below.

S No.	Component	Specifications
1	Body, Disc holder, Bottom cover, drain plug, Diaphragm retaining disc, Spring disc and check nut.	Leaded-tin bronze Conforming to Grade 2 of IS: 318-196
2	Diaphragm cover and spring chamber	Cast iron Conforming to IS 210-1978 Grade FG 200
3	Body seat ring (when replaceable), adjusting screw and valve stem.	Chromium steel confirming to grade 12 CR 13 of IS 1570 (part V)-1972
4	Tommy Bar	Mild steel
5	Diaphragm valve disc,	Synthetic Rubber
6	Fasteners	Steel confirming to IS: 1363-1967
7	Springs	Carbon steel confirming to IS: 4454 (Part-1)-1975
8	Gaskets	Compressed asbestos fibre confirming to Grade C of IS 2712-1979.

9	Strainer screen	Stainless steel Conforming to Designation 04Cr18 Ni10, 07Crl8 Ni9. 10Crl7 Ni7, 10Crl7 Mn6 Ni4 N20 of IS: 6911-1972

Construction and Workmanship

All castings shall be sound, free from laps, blow hole and other surface defects.
Body and component shall be so designed as to provide ample resistance to distortion under maximum working pressure.
The valves shall have screwed female ends threaded to IS: 554-1975 for connection to the pipeline. The ends shall be made hexagonal or of any other suitable design to facilitate wrenching.
The pressure adjusting shall be affected by a diaphragm loaded with a spring.
The seat may be integral with the body or it may have replaceable ring·
The design of the valve shall be such that in case of failure of any part or the valve, it shall be capable of maintaining a continuous flow of water to the System.
All valves shall be so constructed and installed as to permit repair or removal of parts without breaking a pipeline or removing the valve from the pipeline.
Valves shall be so constructed that in normal service they will not chatter, pulsate, hum or be otherwise noisy.
The screen of the strainer shall have a minimum unobstructed open flow area (total area of holes) equal to or greater than twice the nominal pipe flow area. The maximum hole dimension of the screen shall not exceed 1/12 of the valve's orifice escape diameter.

Testing

The pressure reducing valve shall satisfy all the tests as stated in IS: 9739-1981

Instructions

Every pressure reducing valve shall be accompanied with instruction for installation, adjustment and maintenance.

Marking

Every pressure reducing valve shall be permanently marked with the manufacturer's name or trademark and nominal size.
Each pressure reducing valve may also be marked with the lSI Certification Mark.
CO2 type fire extinguishers trolley mounted, capacity 22.5 kg as per IS 2878:2004

Non-Return Valves

Scope

Unless otherwise specified, check valves shall be swing type conforming to BS EN 12334:2001with a pressure rating of PN16 (i.e.16 bars).

Construction

Horizontally mounted Check valves shall be constructed so that disc, seat, seat rings and other internal working parts, which may become necessary for repairs, shall be readily accessible, removable and replaceable without use of special tools and removing the valve from the line. Vertically mounted check valves shall be only floating ball type or tilting disc type. The valve body and the disc shall be of ductile iron complying with BSEN 1563:1997 and having smooth operating stainless steel hinge pins with gun metal bushes, EPDM encapsulated discs. They shall possess high speed closing characteristics with minimum shock on closing. All valves shall be tested to BS EN12334:2001 and as specified in BS EN 12266-1:2003 and the test certificates issued by the manufacturer shall be submitted. The flange drilling shall comply with BS EN1092-1:2007, BS EN1092-2:2007 or BS EN 1092-3: 2007.The swing check valve shall be suitable for mounting on a horizontal pipeline .

The swing check valve shall be conforming to IS-5312 part-I for valve up to 600mmsize and for sizes more than 600mm check valve shall conforming to IS-5312 part-I conform to IS-5312-2.

Flow direction shall be clearly embossed on the valve body. Valves shall have in built quick closing non-slam characteristics achieved by suitable disposition of weight on door and the hydraulic passage when specified in the tender. Multi-door type check valves shall be additionally provided with a supporting foot. The door shall be integral with the hinge and shall have a flat seating face. Minimum suspension lugs shall be cast integrally and shall be of adequate strength. Pressure rating of the valve shall be based on the maximum pressure (including the water hammer pressure where applicable), at the maximum liquid temperature encountered by the valve.

Closing mechanism

For sizes up to 600 NB, single door pattern shall be used. For sizes above 600 NB, multi-door pattern or tilting disc pattern valves shall be used. The hinge shall be made from stainless steel. precision machined seat rings and body rings of materials as per project specifications shall be provided. For sizes up to 300 NB Non-return valves with rubber coated floating ball with Gun metal seat ring will be preferred. Spring loaded wafer flap / lifting disc check valves shall be employed only where there is space limitation. These valves shall be used in vertical lines only.

By-pass arrangement

By-pass arrangement with regulating globe valve shall be provided for 200 NB and higher valves. Smaller valves shall be provided with by-pass connection if asked for in project specifications

Anti-slam mechanism

For valves fitted on pump discharge and rising main pipelines, suitable anti-slam mechanism like counterweight or hydraulic dash-pot shall be provided if asked for in the project specifications. The design of the anti-slam mechanism shall be submitted for pre-approval to client or their consultant.

Materials of Construction

Horizontally mounted valves

Component	Material of construction
Body / Door	DuctileIronEN1563EN-GJS-500/7
Hinge pin (single door) / Stub pin (multi-door type)	St. Steel EN 10088 No.1.4401
Disc	Steel BS 4360:1979 43B fully encapsulated with EPDM rubber or faces with bronze to BS EN 1982 CC491K
Bushing	Brass BS EN 12164 CW 602N
Fasteners	St. Steel grade A4
Flange Drilling	BS EN 1092-2
PN	10 / 16
By – pass arrangement	Required with isolating valve

Vertically mounted valves

Floating ball type valves	
Body/dome	DuctileIronEN1563EN-GJS-500/7
Ball	EPDM vulcanized on St. steel
Tilting disc type valves	
Body/disc	DuctileIronEN1563EN-GJS-500/7
Body seat	St. Steel EN 10088 No.1.4401
Disc seat, O rings	EPDM
Shaft	St. Steel EN 10088 No.1.4401
Front & back bushing	Brass BS EN 12164 CW 602N
Fasteners	St. Steel grade A4

Flanges

The valves shall be double flanged, with flange-to-flange distance strictly as per BSEN 558:2008. The flange thickness and drilling table shall be based on the maximum pressure (including water hammer pressure, where applicable) specified in the project specifications.

Pressure Reducing Valve Needle (Plunger) Type

Manufacture supply and delivery of DI D/F Plunger type (control valve) with body of ductile cast iron grade GGG 40/SG400/12 or equivalent grade as per IS 3896-part 2-1985 and subsequent revisions all internal parts of stainless steel piston guides of bronze welded overlay and bearing bushes pf bronze Rotationally symmetric flow path with annular flow across section in any position. Axial movement of the plunger by means of crank shaft drive and with irreversible worm gear box including position indicator face to face dimensions as per DIN 3202 F5 and flange connections as per DIN 2501-1 or IS 1538 with surface protection having Epoxy coating min.250 microns

Material of Construction:

Body	Ductile iron to EN-JS 1030 (GGG-40)
Crank Gear	Stainless Steel 304
Plunger	Stainless Steel 304
Control Cylinder	Stainless Steel 304
Shaft	Stainless Steel 420 (1.4021)
Bearing Bush	Zinc free Bronze
Piston Guides	Bronze overlay welded and micro-finished
Surface Protection	Epoxy coating min. 150 microns, colour RAL 5005 Blue.
Gearbox Housing	Ductile iron to EN-JS 1030 (GGG-40)

Butterfly Valves

Scope

Standard butterfly valves shall conform to BSEN 593:2004

Construction

Except where otherwise specified, all butterfly valves shall be equipped with manual operators with hand wheels and shall give tight closure against unbalanced water pressure in either direction. The unbalanced water pressure shall be the design pressure rating of the valve. The valve body shall be ductile iron complying with BSEN 1563:2004 and shall be designed to withstand the maximum working pressure specified. The manufacturer's preferred direction of flow for the valve shall be clearly marked on the valve. The valve seat shall be replaceable and be formed of EPDM or other approved resilient material. Seats shall be of a design that permits removal and replacements at the site of installation. The valve seat shall be securely clamped into a machined groove in the valve body or to the edge of the disc by seat retention members or other equivalent retention device, in such a manner as to prevent leakage of water under the seats and to hold the seat securely in position during opening and closing of the valve disc. The seat retention members shall be of stainless steel and shall be securely fastened to the body or disc with stainless steel fasteners. The valve disc shall be made of ductile iron. Disc edges shall be machined with rounded corners and shall be polished to a smooth finish. The valve disc shall rotate through an angle of 90 degrees from the fully opened to the fully closed position and the seat shall be of such design as to allow the valve disc to seat at an angle normal to the axis of the pipe when the disc is in the fully closed position. Adjustable mechanical stops shall be provided in the valve body to be capable of absorbing full operating torque with necessary safety factor. The valve disc shall be double eccentric construction. The disc seal ring shall be made from EPDM, Hypalon or nitrile rubber, based on the pressure-temperature rating given in the project specifications. The seal retaining ring shall be made from DI or SS of suitable grade. The shaft seal shall be made from EPDM, Hypalon or nitrile rubber, based on the pressure-temperature rating given in the project specifications. The shaft and nuts and bolts

shall be fabricated of stainless-steel complying with relevant provisions of BS 970:1996. The shaft and disc fixing shall be capable of absorbing the full operating torque with necessary safety factor. Shaft seals, when used, shall be EPDM rubber O-ring type. Packing shall be either rubber O-ring or self-adjusting chevron type. When all the seat retention members are in place, the finished edges shall fit closely, and the surface shall be smooth with all fastenings set flush in the water passage so as to offer the least resistance possible to the flow of water through the valve. Valve seats which extend over the face of the flanges to secure the seat in place, or which require surface grinding and/ or hand fitting of the disc; or designs which require the adjoining pipe flange to retain the seat in place and resist line pressure, shall not be supplied. Operating gear for butterfly valves shall be of the fully enclosed type. Valves shall be suitable for operation by one man at all working pressure conditions that can apply. All butterfly valves shall be tested at the manufacturer's works in accordance with BS EN 593:2004 as specified and under 'open-end' conditions. The seat test shall be for tight closure under maximum unbalanced water test pressure in either direction. The maximum permissible leakage for each valve shall be 0.05 litres per hour per 100 mm nominal diameter of the valve. The word “CLOSE” or its abbreviation and the arrow mark indicating the direction of rotation to close the valve shall also be cast on the cover of the body. Pressure rating of the valve shall be based on the maximum pressure (including the water hammer pressure where applicable), at the maximum liquid temperature encountered by the valve.

End connections

Valves up to 200NB shall be of wafer type constriction, sandwiched between two pipe flanges. (Wafer type butterfly valves)

Wafer type butterfly valves

Wafer type butterfly valves shall have following features

- Acceptable standards – BS EN 593
- Bi – directional shut off
- Pressure rating – PN 10 & 16
- For manual operation: Hand-lever up to 200 ø; Worm Gear box for higher sizes
- Suitable for easy installation between pipe flanges as per BS 1092-2

Flanged butterfly valves

Valves of sizes 250 NB and above shall be double flanges construction.
The face-to-face dimensions shall be as specified in BSEN 58:2008, Table 4. The flange thickness and drilling table shall be based on the maximum pressure (including water hammer pressure, where applicable) specified in the project specifications. For Valves designed as per BS: EN: 593 the flanges shall conform to BS EN 1092-2

Fabricated valves

Fabricated butterfly valves instead of cast body valves are acceptable for larger size (600 mm and above) provided testing features and face to face dimension of the valve are as per the

relevant design standard BS: EN: 93. In such a case the valve supplier should submit the design calculations for selection of major dimensions such as body, shaft diameter, disc thickness etc. for client/consultant's approval.

Shaft bearings

Shaft bearing shall be sleeve type and shall be made from bearing bronze or PTFE Valves of size 350 NB and above shall be provided with one or two thrust bearings to hold the disc securely in the centre of valve seat without hydraulic or external axial shaft loads. Sleeve and other bearings fitted into the valves body shall be of self-lubricated materials that do not have any effect on the fluid handled and other components of the valves.

Operators

Wafer type valves shall be provided with hand-lever with graded position indicator. All the valves shall be equipped with adjustable mechanical stop-limiting devices to prevent over travel of the valve disc in the open and closed positions. Flanged valves shall be provided with hand wheel and quarter-turn gear box. When specified in the project specifications, the valves shall be provided with electric or pneumatic actuators, selected considering the torque required, the closing/opening time. The actuator shall be provided as per the specifications for the actuator given in the project specifications. Manual hand wheel shall be provided for valves with actuator.

Materials of Construction

Wafer type butterfly valve

Component	Material of construction
Body	Ductile Iron EN1563EN-GJS-500/7integrally lined with EPDM rubber
Disc	Ductile Iron EN1563EN-GJS-500/7
Bearings	PTFE
Shaft	St. Steel EN 10088 No.1.4401
Hand lever	Steel

Flanged butterfly valves

Component	Material of construction
Body / Disc	Ductile Iron EN1563EN-GJS-500/7
Stub Shafts	St. Steel EN 10088 No.1.4401
Bearings	Steel backed PTFE
Body seat	Integral (Monel 60) Ni – Cu alloy weld deposited, micro finished
Disc seal	EPDM
Disc seal retaining ring	Ductile Iron EN1563EN-GJS-500/7
Shaft seal	Hallprene
Internal Fasteners	St. Steel EN 10088 No.1.4401

Flange Drilling	BS EN 1092 - 2
PN	10 / 16

Mandatory accessories

Enclosed worm gear box with additional spur gear boxes, when specified	DI with IP 54 protection;
Mechanical Position Indicator	Yes
Limit stops	Yes

CI Dismantling Joints

The items refer to supply of Cast Iron dismantling joint suitable for main flanged connections with the plain barrel of CI pipes (as per IS: 1536), and DI pipes (as per IS: 8329).
The item includes inspection, factory-testing, freight, insurance, loading, transport to stores/site, unloading, installation, and field-testing. All necessary material and tools for installation such as nuts, bolts, etc. shall also be included in the supply.

Applicable Codes

IS: 1363	Hexagon head bolts, screws and nuts of product grade C
IS: 1364	Hexagon Head Bolts, Screws and Nuts of product grades A and B
IS: 1367	Technical Supply conditions for Threaded Steel Fasteners
IS: 1536	Centrifugally cast (spun) iron pressure pipes for water, gas and sewage - Specification
IS:1538	Cast Iron fittings for Pressure pipes for Water, Gas and Sewage - Specification
IS: 5382	Rubber sealing rings for gas mains, water mains and sewers
IS: 6418	Specification for Cast Iron and Malleable Cast Iron flanges for general Engineering purposes
IS: 8329	Centrifugally cast (spun) ductile iron pressure pipes for water, gas and sewage
IS: 12820	Dimensional requirements for rubber gaskets for mechanical joints and push on joint for use with cast iron pipes and fittings for carrying water, gas and sewage.

Valve Actuators

Scope

The item refers to design, providing and erecting IP67 valve electric actuators with integral starter, to be installed on sluice valves or butterfly valves. The item includes inspection, testing, freight, insurance, loading, transport to stores/site, unloading, installation, testing and commissioning. The supply of all necessary fittings including bolts, nuts, jointing material, etc. as well as the necessary labour work shall also be included.

Applicable Codes

IS: 325	Three-phase Induction Motors
IS: 9334	Electric Motor Operated Actuators
IS/IEC 60034	Rotating electrical machines
IS/IEC 60947	Low-Voltage Switchgear and Control gear
IS/IEC: 60079-1	Explosive Atmospheres. Part 1 – Equipment Protection by flameproof enclosures "d"

- In case of imported equipment, the standards of the country of origin shall be applicable if these standards are equivalent or more stringent than the applicable Indian standards.
- The equipment shall also conform to the provisions of Indian Electricity Rules and other statutory regulations currently in force in the country.
- In case Indian standards are not available for any equipment, standards issued by IEC/BS/VDE/IEEE/NEMA or equivalent agency shall be applicable.

Specifications

General

The electric actuators shall be installed on sluice valves for open/close operation, and on butterfly valves for regulating the flowrate. The actuators installed on butterfly valves should develop a torque sufficient to completely close the valve, starting from 70°-open position, within a time lower than 5 minutes for valves installed on SR inlets, and equal to 20 seconds for valves installed on BPT inlets and Pump Station inlets.

All actuators shall be connected to the SCADA for Transmission System/Distribution system Operation and Control (SCADA is covered under separate Item).

This specification, along with the relevant data sheet(s), and any other specifications/attachments to the inquiry/order defines the MINIMUM REQUIREMENTS for electric actuators covering the design, material, construction features, manufacture, quality assurance, testing of the performance at the Vendor's/Sub-Vendor's Works and delivery to site.

If any deviations are considered essential by the vendor (after exhausting all possible efforts to meet the specifications), these shall be separately listed in the vendor's proposal, under 'List of deviations' Each deviation shall be linked giving specific clause number, with technical reason for deviation asked for. In case of claim of superior technology/ construction/ metallurgy, the onus of proving the same shall be with the vendor. The justification for any equipment shall be given by manufacturer. Justifications given by Contractor/Trader shall not be accepted. No financial leverage will be given for any such deviation claiming superiority

Compliance to this specification shall not relieve the vendor of the responsibility of furnishing equipment and accessories/auxiliaries of proper design, materials and workmanship for proper installation, erection, commissioning, and smooth working of the equipment.

In case the vendor considers requirement of any additional instrumentation, controls, safety devices or any other accessories/auxiliaries essential for satisfactory and safe operation of the

equipment, he shall recommend the same along with reasons with his proposals and include the same in his offer.

Equipment Qualifying Criteria

The offered actuator model shall be from regular production range of the manufacturer. The mechanical as well as electric performance must have been established in full type test carried out at manufacturer's test lab.

At least 5 actuators of the same model should be in operation for more than one year. Manufacturer shall provide customer details and purchase order details to the buyer, if asked for. The buyer shall be at liberty to contact the existing users for cross-verification.

Power supply

- 415V, 3 phase, 3 wire power supply shall be given to the actuator from the contractor's switch board as applicable, through a switch-fuse unit.
- Control voltage of the motor starter shall be 230 V AC /24 V DC, derived suitably from 415V power supply.
- The actuators shall have integral starters along with overload relays.
- The SPP (Single Phasing Preventer) shall be provided for 3 phase actuators.

Sizing

- For Open / Close at rated speed against designed differential pressure at 90% - of rated voltage.
- For isolating service - three successive open-close operations or 15 minutes, whichever is higher.
- For regulating service - 150 starts per hour or required cycles, whichever is higher.
- The torque selected for breaking open, run and the seating torque shall exceed the corresponding rated torque figures of the valve by sufficient margin to ensure trouble free operation

Construction

Motor

- The motor shall be 3-phase squirrel cage induction type unless specified otherwise in the data sheet. It shall have totally enclosed non-ventilated construction.
- The motor shall be designed for valve actuator service with high starting torque and shall be suitable for Direct online starting. It shall be rated for S2-15 minute duty and shall conform to IS 325 or equivalent international standards.
- The motor shall be provided with thermostat(s)/thermistor(s) embedded in the hot spots of motor winding for protecting the motor.
- The motor shall be able to operate the actuator at 75 % of rated voltage.
- The motor shall have class 'F' insulation with temperature rise limited to class 'B' limits. Motor winding shall be treated to resist corrosive agents and moisture.
- Motor rotor shall preferably be of die-cast aluminium

Motor Construction

- Type: Squirrel cage induction motor suitable for Direct Online (DOL) starting.
- Enclosure: Totally enclosed, self-ventilated IP-67 degree of protection
- Insulation Class B or better. - Temperature rise 70 Deg Cover 50Deg C ambient I
- Bearings: Double shielded, grease lubricated antifriction.
- Earth Terminals: Two
- Protection: Single Phasing Protection, over heating protection through Thermostat and wrong phase sequence protection shall be provided over and above other standard protection features. Suitable means shall be provided to diagnose the type of fault locally.
- Gear Train: Metal gears, self-locking to prevent drift under torque switch (wherever applicable) spring pressure when motor is de-energized.
- Hand wheel – Shall disengage automatically during motor operation

Integral Starter and Control Transformer

- The reversing starter, control transformer and local controls shall be integral with the valve actuator, unless specified otherwise in the data sheet.
- Solid state control of valve actuator and electrically isolated interface for remote control requirement shall be provided, wherever these features exist in manufacturer's design.
- The integral starter shall be supplied with the following devices:

a) Electrically and mechanically interlocked reversing contactors for opening and closing operations.
b) Control transformer with necessary tapings and protected with suitable easily replaceable fuses.
c) Terminal block for external cable connection fully prewired for internal devices of valve actuator.

Local Control Devices

Actuators operating with AC power supply shall be provided with Integral Push Button, Selector switches, Indications and Control devices.
The following local control devices shall be provided integral with the actuator:

a) Push buttons for 'Opening/Closing/Stop' or alternatively 'Open/stop/Close' selector switch.
b) 'Local/Off/Remote' selector switch, pad-lockable in each position
c) Local continuous position indication from 'Valve fully opens' to 'Valve fully closed' position, which may be of analogue or digital type using mechanical indication/Indicating lamps/LEDs.

Torque and Travel Limit Switches

a) Four nos. (2 each in open and close position) position limit switches and two (one in open and other in close direction) torque switches, each having two NO and two NC contacts shall be provided. A single shaft shall actuate all contact of limit switches at each position.

b) The limit switches shall be pre-set. However, it shall be possible to set the value of maximum torque during closing from 50% to 100% of rated torque of actuators.
c) Travel limit switch shall be provided to cut-off the power supply to the motor at the end of pre-set limit of valve travel. The switches shall be provided with requisite number of potential-free contacts for valve actuator operation and for indication on remote panels as specified in data sheet. Instead of mechanical torque limit switches, magnetic pulse counter to measure and control the stroke of actuator may be provided, wherever this feature exists in manufacturer's design.

Control Facilities

a) The internal controls and monitoring circuits shall be incorporated within the integral starter along with transformer and control unit of valve actuator.
b) Remote control facility shall be provided, if specified in the data sheet. The remote-control circuits shall be powered from internally derived control supply voltage unless the use of external supply for remote control is specified in data sheet.
c) In order to cater to remote control and indication requirements for 'Position of Remote/Local/Off selector switch', if specified in the data sheet, an additional Monitoring relay/auxiliary relays shall be provided as a part of the valve actuator.
d) As an alternative, a common status contact indicating the availability of the actuator for remote control may be provided by monitoring the following:
    - Loss of one or more phases of power supply
    - Loss of control circuit supply
    - Selector switch in local mode
    - Local stop push button set to 'Off'
    - Motor thermostat tripped
    - Any other local fault/abnormal condition.
e) Where applicable, one number hand-held infrared remote programming device required for site commissioning and reconfiguring (without the need of removal of the MOV cover) shall be supplied for each group of 10 valve actuators (subject to minimum one infrared remote setting device, even if number of valve actuators are less than ten).

Hand Operation

A hand wheel with hand/auto lockable lever shall be provided for emergency operation of the MOV. The energization of the motor shall automatically re-engage power operation.

Two-Wire Control System

a) Where specified in the data sheet, the actuators shall be suitable for 2-wire control system using HART
b) Each field unit / MOV actuator shall be addressable from the Control Room through a unique address code. Unless specified otherwise in the data sheet, all the field settable / adjustable parameters of the MOV actuator shall be settable from the Control Room.

c) All the indications available on the MOV actuator shall be available at the Control Room. Full diagnostic features for the MOV actuators shall be available from the Control Room as well.
d) In case of a fault at any location in the cable loop, the field units shall still have accessibility to/from the Control Room through the other section of the cable loop.
e) All diagnostic information shall be available through HART communication

Remote Position Indicator

A 4-20 mA remote position transmitter shall be provided in the valve actuator for remote indication.

Wiring and Terminals

a) Suitable voltage grade copper wire shall be used
b) All devices provided in the actuator shall be wired up to the terminal block. The contacts for remote operation and indication shall also be wired up to the terminal block.
c) Minimum 10% spare terminals shall be provided for future interlocks.
d) Internal wiring for power and control circuits shall be appropriately sized for MOV actuator rating.
e) Each wire shall be identified at both ends using PVC ferrules.
f) The terminal compartment shall be separated from the inner electrical components of the actuator by means of a watertight seal so that the actuator electrical components are FFRPFRP protected from the ingress of moisture and foreign materials when the terminal cover is removed during installation and maintenance.

Vendor shall be solely responsible for the compatibility of the actuator with the valve and for the selection and sizing of various electrical devices and components in the actuator.
The actuator shall be provided with minimum three adequately sized cable entries viz., one for power cable and two for control cables.
Suitable double compression cable glands shall be provided with each actuator for all cable entries and sealing plugs for all control cable entries. The cable glands and plugs shall be made of Nickel-plated brass.

Interfaces

Open/Close command termination logic with position & torque Limit Switches, positioned circuit shall be suitably built in the PCB inside the actuator.

a) For Binary Drive: - Open/ Close command & status thereof and disturbance monitoring signal (common contact for Overload; Thermostat control supply failure, LIR selector switch at local & other protections operated) shall be provided. Interface with the-control system shall be through hardware signal only. Interposing relays provided (with coil burden 2.5 VA) in the actuator shall be de-energized to initiate opening and closing, by 24V DC signal from the external control system.
b) For Modulating Drive: - the command to actuator shall be in form of 4-20mA signal. The necessary positioning circuit and motor protection shall be provided.

c) Open / close command termination logic shall be suitably built inside actuator.

Position transmitter (for modulating/inching type):

As required. Suitable for stabilized 4-20 mA signal, 2 wire inductive type, 24 volts DC operated

Enclosures

All enclosures shall be rated IP 67 as a minimum.

Nameplate

Each motorized valve actuator shall be provided with a stainless-steel nameplate furnishing the following details, attached firmly to it at a place convenient for reading:

- Actuator tag number as per data sheet
- Motor kW rating, motor time rating, motor supply voltage, nominal motor phase current, auxiliary switch rating
- Maximum torque setting
- Actuator enclosure type, lubricant type
- Actuator type, wiring diagram number/catalogue number, actuator serial number

Inspection, Testing and Acceptance & Scope of third-party Inspection

a) The equipment shall be subject to inspection by Owner & by third party agency.
b) Manufacturer shall furnish all necessary information concerning the supply to Owner's inspector & third-party inspector
c) During manufacturing, the purchaser or his authorized representative shall be free to visit the works and assess the progress of work and the manufacturer shall render him all possible assistance to do so.
d) Routine and acceptance tests shall be carried out at the manufacturers' works under His & third-party inspector's supervision and at his own cost.
e) Two weeks' notice shall be given to Owner for witnessing the final testing of the complete assembly along with third party inspector to ensure satisfactory operation of the actuators.
f) Type test certificates shall be furnished with bids.
g) Final acceptance of MOVs at site shall be subject to successful testing of the MOV actuators with the valves.
h) Type test certificates, original drawings referred in certificates and statutory approval certificates and BIS license, where applicable, shall be vetted by inspection agency & thereby to be approved by employer along with the Quality Assurance Program.
i) The certificates and BIS license must be valid at the time of dispatch.
j) Test certificates of bought-out components shall be duly signed and stamped by third party inspector

Packing and Dispatch

a) All the equipment shall be divided into multiple sections for protection and ease of handling during transportation. The equipment shall be properly packed for the selected mode of transportation, i.e. by ship, rail, or trailer.
b) The equipment shall be wrapped in polythene sheets before being placed in crates/cases to prevent damage to finish.
c) The equipment may be stored outdoors for long periods before installation. The packing shall be completely suitable for outdoor storage in areas with heavy rains and high ambient temperature unless otherwise agreed. In order to prevent movement of equipment/components within the crates, proper packing supports shall be provided.
d) A set of instruction manuals for erection, testing and commissioning, a set of operation and maintenance manuals and a set of final drawings shall be enclosed in a waterproof cover along with the shipment.

21. Brief Scope of PLC SCADA

Component	Parameters to be Covered Under PLC SCADA		Instruments to be installed, monitored and reported
	Monitoring	Regulation	
Intake Well	Electricity parameter - Current, Voltage, Power Factor, Energy Other Parameters - Level, Flow & totalized flow, Discharge Pressure, Pressure at delivery end	On/ Off Operation of Pumps	Electromagnetic Flow Meter (recalibration), Pressure Sensor, level sensor, multi-function meter (MFM) & minimum 8 CCTV Camera with local / centralized monitoring system

Component	Parameters to be Covered Under PLC SCADA		Instruments to be installed, monitored and reported
	Monitoring	Regulation	
WTP	Raw Water Parameters - Flow of totalised value at inlet, pH, Turbidity Clear Water Parameters - pH, Turbidity, Residual Chlorine	Complete Regulation of Filtration process including Backwash Arrangement, Clarifier Drain with actuator enabled	Electromagnetic Flow Meter (recalibration), Level Sensor (Filter Bed & Backwash), ROF (Raw & Clear Water), Turbidity, Chlorine & pH analyser (Raw & Clear Water) & minimum 32 CCTV Camera with local / centralized monitoring system
Clear Water Sump cum Pump House & IPS	Electricity parameter - Current, Voltage, Power Factor, Energy Other Parameters -Flow, Pressure, Residual Chlorine	On/ Off Operation of Pumps	Electromagnetic Flow Meter, Pressure Sensor (individual pumps & common header), Level Sensor & minimum 8 CCTV Camera with local / centralized monitoring system
MBR / BPT / OHT / GSR	Flow at inlet with Totalizer, Water Level at container, residual chlorine	–	Electromagnetic Flow Meter, Level Sensor, Chlorine analyser
Note: Remaining specification of PLC SCADA shall remain same as detailed in the bid document.			

21.1. General Specifications of PLC SCADA

The automatic process control of the plant shall typically be based on the use of a number of programmable logic controllers (PLCs). These shall be located within control panels.

Monitoring and Operative system of SCADA to be provided at Intake and WTP and Monitoring SCADA system to be provided at other component like MBR, OHTs etc. and control room to be constructed at WTP site.

The supervisory monitoring of the entire treatment plant shall be implemented by a site system provided in the administrative building control room by the contractor. The contractor shall also provide a static mimic panel of minimum 2m x 1m size within the administration building control room with the main processes engraved on mosaic tales and with edgewise instruments displaying all main flows and levels (local raw water and clear water tank levels, residual values, number of filters in service etc.), together with indicator lamps for combined faults for each process/area of the works. It is intended that the operator will investigate each local area for the individual faults displayed.

The control system shall be provided and located in the administrative building at the water treatment works.

21.2. SCADA Components

An industrial grade latest personnel computer (PC). This shall be provided to the latest industry standard conducive to the efficient and effective operation of the selected SCADA software package. It shall be provided with latest drivers. The fixed drive shall be sized to permit the operation of the system and the storage of the following:

i. In excess of 2000 historic alarms data;
ii. Not less than 7 months archive data.
iii. Plus not less than 50% spare capacity.
iv. One latest industry standard 20" colour monitor;

The PC hall also be supplied with important accessories and peripherals such as:

i. Mouse
ii. 132 column alarm/ event latest dot matrix printer with fan fold paper attachment;
iii. Colour inkjet screen duplex printer with multiple single sheet feeder (the printer shall be suitable for use at the local SCADA system)

A metal computer desk with vinyl work surface and one pedestal draw unit and one cupboard unit, the desk shall accommodate the PC and alarm/event printer and permit two operators to sit side by side. The desk shall be purpose built, attractive, durable and ergonomic and it shall be sized to have not less than 50% spare work surface when accommodating the PC and printer. The desk shall incorporate an integral power distribution system to supply equipment mounted on desk;

i. full height two door metal storage cupboard with three shelves;
ii. 2 Nos upholstered swivel chairs;
iii. Printer trolley/s to accommodate the report and screen dump printer.

The Contractor shall provide proprietary SCADA software for the central SCADA systems. The SCADA software shall be windows compatible. It shall have a proven track record for similar applications in the water industry and shall be supported within India.

The SCADA system shall be the same as that used for the local SCADA systems. The software package selected shall provide facilities for the provision of the following :

i. Colour graphic screen representation of each plant area including system overviews;

ii. Alarm annunciation and historic logging of alarms;
iii. Historic event logging;
iv. Real time and historic trending of analogue variables;
v. Preparation of simple reports;
vi. Archiving of system variables for retrieval on to third party machines operating industry standard spreadsheet and database software and onto machines using the SCADA software, which shall permit trend graphs of the archived data to be recreated.

The Contractor shall configure the SCADA system to provide facilities to: display status,

i. values and totals in a graphical and tabular format (see note 1)
ii. annunciate alarms including details of the time the alarm occurred (see note 3)
iii. provide facilities for the operator to:

- acknowledge alarms
- view a journal of unacknowledged alarms;
- view a journal of the last 200 alarms acknowledged and unacknowledged;
- carry out real time (see note 4) and historic trending of analogue values (see note 3)
- carry out data archiving of all analogue values to optical disk (see note 5)
- prepare daily, weekly, monthly and annual reports (see note 6)

The SCADA system shall be configured by the Contractor to carry out any additional requirements needed to assist in the effective and efficient operation and monitoring of the water transmission system.

Notes:

1. Graphic screens shall be provided to display:
   - overview of the treatment works;
   - active colour graphic flow diagrams for each process and section of the works sufficient to convey to the operations staff and management the status of the plant including the power supply and control system at all times;
2. A comprehensive screen navigation system shall be provided giving access to all screens via a system of menus and short cuts (i.e. it shall be possible to follow from one screen to another by clicking the mouse cursor on screen 'hotspots' to effect the move from one screen to another and back against).
3. The software chosen shall have a comprehensive alarm handling capability with the ability to annunciate, acknowledge, sort and maintain a historic record of current and past alarms including details of when the alarm occurred, when it was acknowledged and when it returned to normal.
4. The system shall be capable of storing real time data for one day and historic data for 7 months.

5. The sample rates for archiving shall be the same as for trending. The archives shall be stored in daily files. The system shall provide separate storage capacity to store archives for one year. A warning alarm shall be provided to the operator to advise that archiving to disk should take place or archived data will be overwritten. Additionally it shall be possible to;

    - Reintroduced the data derived from archiving and view the archived data facility;
    - Display the data using industry standard spread sheet or database software in tabular format on a third party machine;

6. The SCADA system shall manipulate the data it receives in order to prepare reports in order to provide the Employer with a schedule of throughput and power consumption for the period concerned. The reports shall be generated on demand and automatically as required.

The Contractor shall monitor summary status of all the treatment works as follows:

a) water level in raw water and clear water reservoirs;
b) process flows and totalized quantities;
c) water quality values
d) status of each process;
e) reservoir high and low level alarms;
f) power outage present;
g) power consumed per day;
h) individual power consumption;
i) power factor;
j) water treated in the last complete 24 hour period (midnight to midnight, time selectable);
k) total power outage house per day.

The SCADA system and its ancillary equipment shall be powered via an uninterruptible power supply with a hold up time at full output of the UPS for 30 minutes. The full output of the UPS shall correspond to the maximum imposed load plus 20%. All measuring instruments under SCADA shall be calibrated in the last month of Defect Liability Period and at least annually thereafter.

22. Trial Run For 3 Months And Operation & Maintenance For 10 Years

General: The scope of work under this contract includes trial run and maintenance of the scheme as a whole and its parts as an individual component as well. Under this trial run period of 3 months after the completion of works in all respects, the contractor has to run the scheme completely and will have to prove performance of each component individually and of whole scheme as per the standards laid down in contract. After completion of three months trial run, the whole scheme shall be operated and maintained for 10 (ten) years and then shall be handed over to Madhya Pradesh Jal Nigam.

During this period the contractor shall have to appoint necessary staff for running and maintenance of scheme. The candidature of the staff being engaged by contractor shall have to be approved by the Engineer-In-charge. During this period, the staff engaged for running and maintenance of scheme will be paid by the contractor as per the wages rules and all the responsibilities of employees regarding safety/ insurance, etc. will be of the contractor.

During the last three months period of O&M, Madhya Pradesh Jal Nigam will appoint staff to get hands on training to run and maintain the scheme. Contractor and his staff will arrange training for the staff to the satisfaction of Engineer-In-charge.

The period of trial run shall be three calendar months from the date of actual commissioning of scheme as certified by the Engineer-In-charge. The period of 10 years O&M shall be from the date of actual completion of trial run of the scheme as certified by the Engineer-In-charge.

Intake Well cum pump house: The contractor will provide the staff to run and maintain and keep records of the machinery and equipment, installed in intake well. The electricity charges (excluding penalties) will be borne by MPJN, inventory of the consumables like oil, Grease, Gland packing; all type of fuses, T&P etc. will be provided by the contractor at his own cost and expenses. The contractor shall have to maintain consumption and stock of the inventory so as not to interrupt the water supply. The contractor shall have to arrange for security, watch and maintain the premises of intake well and approach bridge & road during this period.

Raw and Clear water pumping Mains: The contractor will have to arrange and provide for regular surveillance of pumping mains from Intake well cum pump house structure to treatment plant and up to MBRs and OHTs, and will have to arrange for any repairs and maintenance during the trial run and O&M period. All necessary T&P, consumables, pipes etc. will be provided by the contractor at his own cost and expenses.

Treatment Plant and Pump House: The contractor will provide necessary staff to run and maintain the treatment plant,chlorine, alum, lime, and other chemicals used in laboratory. The electricity charges (excluding penalties) consumed / used during the treatment process and cost of consumable chemicals excluding laboratory chemeical used for water testing will be borne by the MPJN on reimbursement basis.

The contractor will maintain the record of consumption of chemicals and inventory of stock and will apprise the Engineer in charge of shortcomings. The contractor will bring in the notice of Engineer in charge all repairs and maintenance works done during the day and will generate and submit reports on each important parameter being monitored and an alarm enunciated during the day.

The contractor shall arrange for the training of the staff as nominated by the Engineer in charge to run and maintain the plant and pump house three months prior to completion of 10 years O&M period- up to the satisfaction of Engineer in charge.

The contractor shall have to arrange and provide for watch and ward, security and upkeep of premises of the plant during trial run period and O&M period. He will maintain/replace the furniture/ equipment, etc. if damaged during this period.

Master Balancing Reservoirs/ GLR/ ESR: The contractor will provide necessary staff for watch and ward and maintenance of break pressure tanks and all over head tanks under this project and will upkeep the premises of the tanks to the satisfaction of Engineer in Charge. The contractor's staff will maintain the record of water level in tanks and stock of inventory if any at these tanks.

Gravity Feeder Mains: The contractor will have to arrange and provide for regular surveillance of gravity feeder mains from Master Balancing Reservoir /Break Pressure Tanks to all Overhead tanks of the villages and will have to arrange for any repairs and maintenance during the trial run and O&M period. All necessary T&P, consumables, pipes etc. will be provided by the contractor at his own cost and expenses.

Electrical Substations and Electric Supply Line: The contractor will provide necessary staff and arrange for the maintenance/ repairs of electrical substations and systems developed/ constructed under this contract at intake well, treatment plant and in the other premises. All expenses to operate and maintain shall be borne by the contractor, except the energy charges excluding penalties etc.

After successful completion of trial run and O&M period (to be certified by the Engineer-in-Charge) the scheme as a whole and its components individually will be handed over to MPJN for further running and maintenance.

Operation & Maintenance of distribution system: The contractor is liable and responsible for all the works which have been executed under the contract. The O&M of ESRs of the villages and distribution systems are also in the scope of contractor. Daily operation of valves, beyond the ESRs, within the village for distribution shall also be done by the contractor . Please also refer Chapter on ‘Service Level Benchmarks during Operation & Maintenance’.

All SCADA Instruments shall be calibrated yearly in NABL accredited Laboratory.

Handing Over after O&M period: Before handing over the components to MPJN, all the structures shall be finished by painting as per specifications given in the agreement and all the Electrical & Mechanical equipment shall be finished by painting as per specifications and these must be in good running conditions.

It will be the responsibility of the contractor to show that all stipulated Service Level Standards have been fulfilled and are up to the mark on the date of handing over the works to MPJN.

The MPJN will not take any responsibility of the employees engaged by the contractor to run the scheme during trial run and O&M period. The scheme and all its components individually shall be handed over to MPJN in a very good maintained condition. (Decision of Engineer-in-Charge will be final in this regard).

23. O&M Period specification

23.1. General

The contractor shall be responsible to maintain service level standards during the 10 years of operation and maintenance period and these standards shall be effective till the date of handing over the project to Madhya Pradesh Jal Nigam.

The contractor shall operate and maintain whole works for 10 years including distribution system after OHT. The Scope of operation and maintenance of works executed under this Contract including Jackwell, Raw water Transmission mains, Water treatment plant, Pure water transmission mains, Pipelines, Pumping Stations and ESR (Source to OHT), Distribution system, including operation & maintenance of SCADA system, metering, instrumentation, redressing complaints, for ten years after completion of all system components specified in the Contract.

During O&M, the contractor shall paint all structures (internally and externally) after completion of first three years of O&M, then after Seven Year of O&M and before handing over the site to MPJNM in the 10^{th} Year of O&M.

23.2. Service Level Standards

The following standards shall be maintained by the contractor-

23.2.1. Supply of safe & potable drinking water

The safe and potable drinking water having characteristics of water as per IS: 10500 (latest) shall be supplied to each consumer. The testing of samples shall be done by contractor as per IS: 1622 (latest).

To achieve the above, the contractor shall submit the test results, including details of test results of residual chlorine at the farthest consumer's end, taken periodically as per the norms for each village, during the submission of bills. The contractor shall ensure that the chlorine content at the consumer end shall be as per standard requirements and for this inline chlorination shall be done.

Penalty- If the contractor fails to perform as above, a sum of 15% of the amount payable on account of O&M for that village, for the period under default shall be deducted from the bill.

23.2.2. Per capita supply of water-

The contactor is liable to ensure supply of potable water for domestic use to each consumer at the rate of 55 lpcd minimum at consumer end.

To achieve the above, the contractor shall submit the details of bulk water meter reading installed for each village, during the submission of bills.

Penalty - If the contractor fails to perform as above; a proportionate amount as mentioned below payable on account of supply of water for that village during the period under consideration shall be deducted from the bill -

- For 55 lpcd and above: No deduction
- Between 55 to 40 lpcd supply: proportionately reduced payment.
- For 40 lpcd supply: 25% of payable amount
- Between 40 to 10 lpcd supply: proportionately reduced payment.
- Below 10 lpcd supply: 100% of payable amount

Note: If due to certain reasons such as shortage of storage in source or river flow the employer orders reduction in supply above penalty will not be applicable up to that modified rate of supply.

23.2.3. Pressure at consumer end

The contactor is liable to ensure supply of potable water for domestic use at service point of each consumer not less than 7.0m.

Penalty- If the contractor fails to perform as above, an amount in proportion to the number of connections of that village not getting prescribed pressure shall be deducted from the bill, for the period under consideration and/or until the contractor makes alternative arrangement.

23.2.4. Unaccounted for Water

The contactor is liable to ensure that the losses in the production of treated water and water supplied to villages shall be within 5% of water produced (from Intake well to ESRs).

Penalty- If the wastages on account of UFW is more than 5%, then a proportionate amount of wastages above 5% shall be deducted from the bill as follows-

Example: If UFW is 20% then excess wastage is 20-5=15%, so 15% of the total billed amount will be deducted as penalty.

23.2.5. Complaint redressal

The contactor is responsible to attend the complaints of the consumers within 48 hours of information received. In case of failure of system due to any technical breakdown, the contractor has to supply water through alternative means, but the normal supply should be restored within 48 hours of its occurrence.

Penalty- If the contractor fails to perform as above, a sum of 5% of the amount payable on account of O&M for that village shall be deducted from the bill for that period for each occurrence of 48 hours as above or part thereof.

23.2.6. Increase in demand during O&M period

If due to any reason demand is increased then it will be made available by the contractor by adjustment of flow or by increasing the pumping hours and no extra payment shall be made on that account.

23.2.7. Road cutting and restoration

If required, it shall be the responsibility of the contractor during maintenance period but in case of line shifting or repairing due to road widening, etc. the cost as per prevailing ISSR shall be paid.

23.2.8. Additional Areas

Other habitations not covered in the scheme may also be included during maintenance period. The contractor shall have to supply water to these habitations by increasing pumping hours or up to permissible overloading as directed by Engineer-in-charge. No separate payment shall be made on this account except electric bills and chemicals.

23.2.9. Extension of Distribution Network or Mains

Any extension of pipeline network if required shall have to be done by the contractor during maintenance period, payment of which shall be made according to prevailing ISSR,

23.2.10. Additional Demands

Catering to additional short term demands (such as fair, mela, or public gathering, etc.) as directed by Engineer-in-charge will also be the responsibility of the contractor during operation and maintenance period. No separate payment shall be made on this account except electricity bills and chemicals.

23.2.11. Manpower Requirement:

Minimum manpower to be deployed by the contractor during the O&M phase is specified here:

No.	Personal	Minimum Deployment
1.	Project Manager	1 No
2.	WTP Maintenance Engineer	1 No
3.	Chemist & Laboratory Technician will be provided by MPJN, either on its own or through any third party agency.	
4.	Pump Operator	2 for each pumping station
5.	Helper / Assistant / Gardener / Housekeeping staff / Chowkidar / Maintenance staff	42 Nos
6.	Electrician	2 at WTP and 1 for each pumping station
7.	Watch man	3 for each pumping station
8.	Maintenance Gang comprising of minimum 6 persons	7 gangs
9.	SCADA Operator	3 at each operating unit

Penalty: If contractor fails to deploy the minimum number of persons as mentioned above, a penalty of up to Rs 1,000/- per day per head of manpower deficiency as decided by MPJN shall be deducted from the contractor's bill. This amount of deduction will also vary as per the change in O&M payment based on CPI.

23.2.12. Facilities to Manpower

The Contractor shall provide facilities as specified here to the above mentioned staff.

1	Inspection Vehicle / Equipment	Minimum Requirement
i)	Jeep or Equivalent	4 Nos
ii)	Loading Vehicle – 8 Ton Capacity	5 Nos
iii)	Small Canter or equivalent	4 Nos
iv)	JCB	4 Nos
v)	Portable Welding Arrangements	2 Nos
2	Mobile Phones to all staff	
3	Land Line Phone at each Pumping Station	

23.2.12.1. Penalty: Deductions for not providing above facilities shall be as follows from the payments for Operations and Maintenance if O&M suffers and complaint redressal is not done in timely manner –

- Inspection Vehicle –
  - Jeep or Equivalent – INR 50,000/- per month
  - Loading Vehicle – 8 Ton Capacity – INR 60,000/- per month
  - Small Canter or equivalent – INR 40,000 per Month.
  - JCB – INR 50,000/- per month
- Mobile Phones – INR 1,000/- for each.
- Land Line Phone - INR 1,000/- for each.

This amount of deduction shall also vary as per the change in O&M payment based on CPI.

24.Approved List of Manufacturers

The following manufacturers are recommended for manufacturing of the major items given below. Where more than one manufacturer is listed the Contractor is free to choose between them. For additional items, the Contractor is free to submit proposals for other manufacturers from time to time and the same shall be effective after approval by the Employer.

The Contractor may substitute alternative brand names for the major items given below provided that it demonstrates to the employer's satisfaction that substitution is inevitable in the interest of project and the alternative makes proposed by the Contractor are substantially equivalent or superior to the one recommended hereunder.

Note: The manufacturers empanelled in MPJN at any later stage shall also be eligible besides listed below.

24.1. MPJN Empanelled Manufacturers

No.	Item / Component	Recommended Makes
1.	VT and Centrifugal Pumps	Kirloskar / Jyoti / Mather+Platt /WPIL/Becon Weir/Flowmore Ltd., Gudgaon/ KSB Limited (Formerly Known as KSB Pumps Limited).
2.	Electric motors	Kirloskar / Jyoti / Crompton Grieves / ABB / Marathon/BHEL/Siemens/ Bharat Bijlee
3.	Power Transformers	ABB / Crompton Greaves/ Emco / Siemens/ Shriram Switchgears/ Vardhman Electro-Mech Pvt. Limited/ Star Delta Transformers Limited
4.	DI Pipes	Electrosteel / Jindal / Tata / Electrotherm/ Jai Balaji Industries/ Rashmi Metaliks/ Shrikalahasthi pipe/ ESL Steel Limited
5.	HDPE Pipes & specials	Reliance / Duraline / Jain Irrigation, Jalgaon/ Sangir/ Time Technoplast/ Signet Industries/ ORI-Plast, Kolkata/ Kataria Plastics/ Kriti Industries/ The Supreme Industries/ Makknow Industries/ Texmo Pipes and Products/ Kisan Irrigations and Infrastructure/ Tufropes Pvt. Ltd. / Apollo Pipes/ Vishal pipes/ Vectus Industries/ Parixit Irrigation, Ahmedabad / Nimbus Pipes/ Godavari Polymers/ Shree TNB Polymers Ltd/ VEEKAY PLAST/ Miraj Pipes and Fittings Pvt. Ltd/ Delight Enterprises Pvt. Ltd/ Kothari Agritech Pvt. Ltd/ Tijariya Polypipes Ltd/ Kisan Mouldings Limited, Silvassa/ Tirupati Structurals Limited/ Delta Irrigation LLP/ Mohit Polytech/ Hitech Polyplast/ Pragati Pipe / VIP Venkatesh Indigenous Pipes / Vinayak Polypipes/ Gautam Plastics/ Borana Industries/ Rupam Industries/ Wonder Agritech/ Bhagwati Plastric & Pipe/ Flexiflow Polymers LLP/ Falcon Pipe/ Konark Irrigation/ Crestia Polytech/ ASM Industries/ Elegant Polymers/ Rungta Irrigation Ltd./ Jai Pushpa Industries/ Kisan Mouldings Limited, Dewas/ Aditya Polytechnic Pvt. Ltd./ Kelvin Plastic Private Limited/ Parixit Irrigation Limited, Bhopal/ Creator Poly Extrusions LLP/ AVS Industries/ Dinesh Irrigation Pvt. Ltd./ Eonn Plast India Pvt. Ltd./ Shree Bhandari Plastic Pvt. Ltd./ Chamunda Plastic Pvt. Ltd./ Laxmi Engitech Pvt. Ltd./ Ashish Pipes/ Westwell Polytubes/ Avian Pipes Pvt. Ltd./ Aion Pipes Private Limited/ Newton Pipe Industry/ OMRF Pipe & Products/ Riyansh Polytech Pvt. Ltd./ Vijaya Polymers India Pvt. Ltd./ Tyagi Industries/ Rajasthan Engineers & Contractors Enterprises/ Annapurna Industries/ SRM Plastochem Pvt. Ltd./ Duke Pipes Pvt. Ltd./ B.R. Polyplast LLP/ Malpani Pipes & Fittings Pvt. Ltd./ Rainson Pipe Industries Pvt. Ltd./ Noble Green Agritech Pvt. Ltd./ Natraj Polyplast Pvt. Ltd./ Mohit

No.	Item / Component	Recommended Makes
		India/ Vasani Polymers Pvt. Ltd./ Vishakha Plastic Pipe Pvt. Ltd./ Varni Plast/ Parvati Agro Plast/ Ori Plast Limited, Behror/ Pawan Polytex Pvt. Ltd./ Jain Irrigation Systems Ltd., Alwar.
6.	MDPE Pipe	HI-TECH Polyplast Nagpur Pvt. Ltd./ Newton Pipe Industry/ Gautam Plastics & Industries/ Chamunda Plastic Pvt. Ltd./ Noble Green Agritech Pvt. Ltd./ Mohit India/ VIP Venkatesh Indigenous Pipes Pvt. Ltd./ Laxmi Engitech Pvt. Ltd./ Rainson Pipe Industries Pvt. Ltd./ Texmo Pipes and Products Limited/ Malpani Pipes & Fittings Pvt. Ltd./ Crestia Polytech 'P' Ltd./ Parixit Irrigation Limited, Ahmedabad/ Kisan Mouldings Limited, Silvassa/ Sangir Plastics Pvt. Ltd.
7.	Sluice Valves / Scour Valves/ Butterfly Valve/ Non-return Valves/ Kinetic Air Valve	Kirloskar / IVC / VAG /IVI/ Fouress/ Sachdeva Metal Works/ Jupiter Engineering Co/ G.M. Engineering Pvt. Ltd/ G.M. DALUI & SONS Pvt. Ltd/ R&D Multiples (Metal Cast) Pvt. Ltd/ Kartar Valves Pvt. Ltd/ Shiva Industries/ R S Valve & Products/ Durga Valves Pvt. Ltd/ AVK Valves India Private Limited/ McWane India Private Limited/Sigma Flow Control India Ltd./ Chopra Brothers/ Shree Krishna Industries/ Orbit Engineers, Ahmedabad/ Sondhi Industries/ Bikaner Engineering Works/ Aarko Manufacturing Company/ Kamla Valve Manufacturing Concern.
8.	Valve Actuators	Auma / Rotork / Limitork
9.	Hydraulically operated Flow cum Pressure control valves	VAG / Darling-Muesco / Singer
10.	Flow control valve remote operation type	Talis Valves India/ Mcwane India/ Orbit Engineers.
11.	Zero Velocity Valve	Vardhman Electromech/ Flownix Valves/ Shree Krishna Industries
12.	Single faced Sluice Gates	JASH / VAG / Kirloskar/ Hindustan Water Engineeing.
13.	Water Hammer Control Devices	Sureseal or equivalent
14.	Electro-magnetic Flow meters,	Emerson / Krohne Marshall / Yokogawa/ Siemens/ Endress+Hauser (India)/ Itron India/ Nivo Controls /SBEM Pvt. Ltd. Pune
15.	Electro-magnetic Flow meters, Water Meter, Items for Instrumentation/ Automation	Endress+Hauser (India)/ Itron India/ Nivo Controls.

No.	Item / Component	Recommended Makes
16.	Woltman type Bulk water meters	Zenner / Itron / Elster / Minol/ N. B. Industries (Meters) Pvt. Ltd./ Nbeson Engg./ Everest Sanitation India/ UPC Instruments Pvt. Ltd.
17.	WTP equipement : *Flash mixers, Clariflocculators, Flocculators, Rotating bridge, Blowers etc*.	Triveni / Shivpad / Dorr-Oliver / Voltas/ Adroit Associates/ Imac Engineering/ Reliable Equipments/ Hindustan Water Engineering Company /TMVT INDUSTRIES PVT.LTD (*Blowers* Only) / KPT. Industries Ltd (*Blowers* Only)/ Kay International (*Blowers* Only)/ Micro Transmission Systems/ Everest Blowers Pvt. Ltd.
18.	Single Faced Sluice Gate/ WTP equipment: (*Flash mixers, Clariflocculators, Flocculators, Rotating bridge & Chlorination Equipment's)*	GEO Miller/Kay International
19.	Chlorination equipment: Chlorinator, Chlorine leak detector, Residual Chlorine analyzer, Scrubber etc.	Pennwalt / W&T / Alldos/ ZION TECHNOLOGIES/ Toshcon Jesco/ Pristine Water/ Hindustan Water Engineeing/ Supreme Technology/ IEC Fabchem Limited/ Chloro Tech Equipments Pvt. Ltd.
20.	DI / CI Fittings & specials	Kiswok / Electrosteel/ Kejriwal./ R.G. Industries/ Kartar Valves Pvt. Ltd/ Jindal Saw Ltd/ Chandranchal Enterprise Pvt. Ltd/ Truform Techo Products Ltd
21.	Dismantling joints	Anup Engg. / LoneStar / Vedanta / Precise/ Shiva Industries / Bikaner Engineering Works.
22.	Expansion joints	Anup Engg. / LoneStar / Vedanta / Precise/ Shiva Industries
23.	HDPE Fittings (Compression fittings, Tapping Saddles, Electrofusion Couplers)	Kimplas /, George ficher / Glynwed / Frialen / Trustlene / GPS / Durafuse/ AL-Aziz Plastics/ AIVA Engineering Private Limited/ Lesso Buildtech Pvt. Ltd/ Bentlay Fittings Pvt. Ltd/ TEGA MUHENDISLIK SANAYi VE TiCARET A.S.Turkey/ Arihant Plast/ VIP Venkatesh Indigenous Pipes/ Rupam Industries/ Chamunda Plastic Pvt. Ltd./ Crestia Polytech 'P' Ltd./ Rainson Pipe Industries Pvt. Ltd./ Brothers Plastic Industries.
24.	Float valves to control the overflow from ESRs/GSRs	Shiva Industries/ Bikaner Engineering Works.
25.	Flow control valve for HSCs.	Platinum Technologies and Engineering Services/ Orbit Engineers
26.	D.I. Double Flanged Pipe	Sachdeva Metal works/ SRIKALAHASTHI PIPES/ Delight Enterprises Pvt. Ltd/ Chandranchal Enterprise/ tru-form engineers/ The Aarko Pipes Gram Udyog

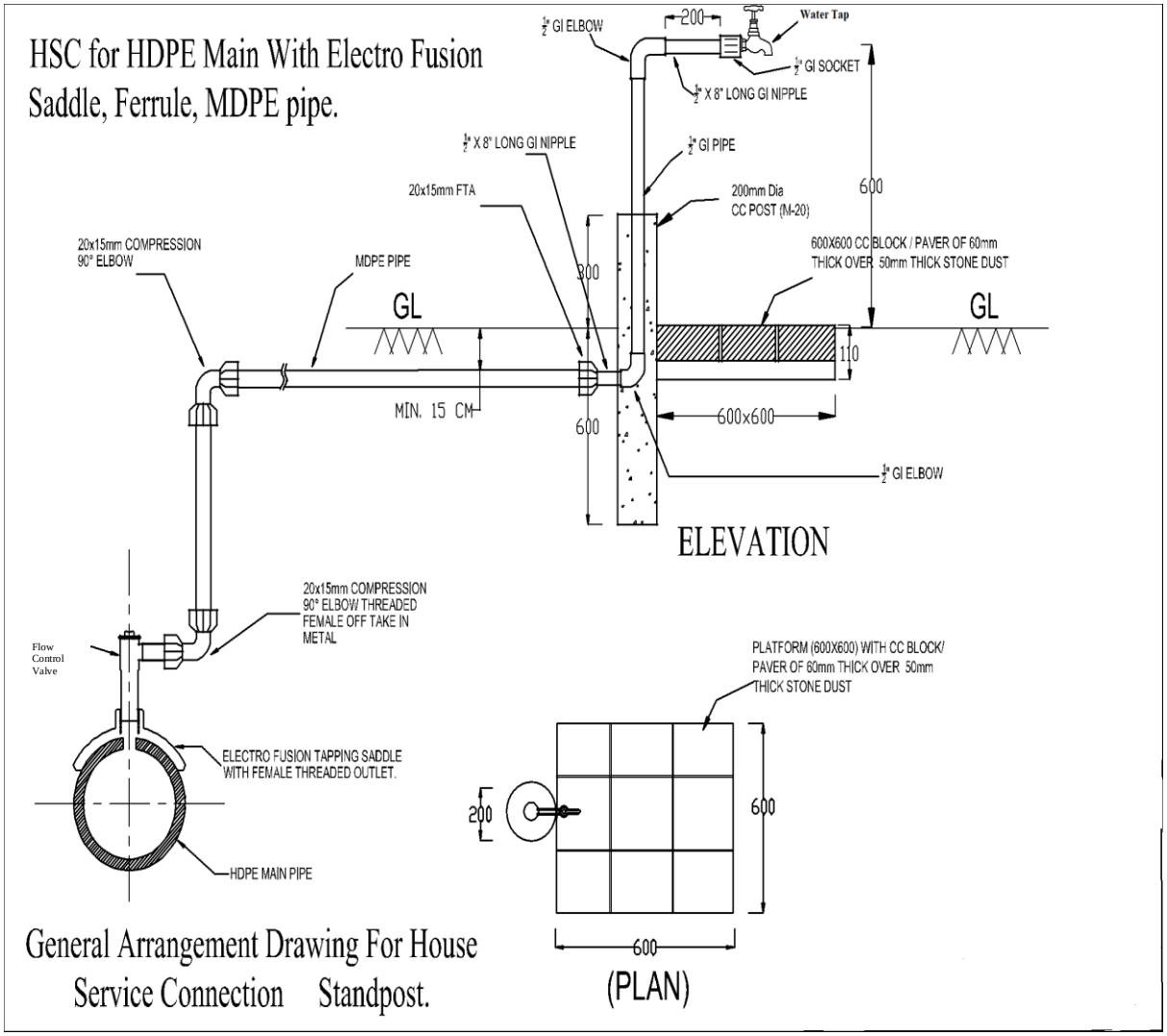
No.	Item / Component	Recommended Makes
27.	Steel For Reinforcement	TATA, RINL, SAIL/ Shri Bajrang Power and Ispat Limited.
28.	PE Water Storage Tank	Supremo India Private Limited/ Canvas Manufacturing Industries Pvt. Ltd./ Laxmi Engitech Pvt. Ltd./ Newton Pipe Industry/ Aditya Polytechnic Pvt. Ltd./ R.R. Roto Industries/ Prins Polytech Pvt. Ltd./ Konark Irrigation Pvt. Ltd./ Shakti Plastics Industries/ Ferrotech Engineers Pvt. Ltd.
29.	Submersible Pump Set.	Unnati Pumps Pvt. Ltd. / C.R.I. Pumps Private Limited/Pluga Pumps and Motors Pvt. Ltd. / Shakti Pumps (India) Ltd. / Wilo Mather and Platt Pumps Pvt. Ltd. / Oswal Pumps Ltd. / KSB Limited (Formerly Known as KSB Pumps (Limited)) / Duke Plasto Technique Private Limited / Calama Technologies Pvt. Ltd. / Silver Consumer Electricals Pvt. Ltd. / Falcon Pumps Pvt. Ltd. / Flotech Engineering Pvt. Ltd. / Unnati Pumps Enterprise / Unnati Industrial Corporation / Lubi Industries LLP.
30.	Open-Well Pump Set.	Unnati Pumps Pvt. Ltd., Falcon Pumps Pvt. Ltd.

Items for Instrumentation/ Automation

No	Item / Component	Recommended Makes
1.	Programmable Logic Controllers (PLC)	Rockwell *(Allen Bradly)* / Siemens / Honeywell
2.	Moulded Case Circuit Breaker (MCCB)	Siemens / Schneider M.G. / Jyoti / L&T
3.	Relay and Contactors	Siemens / Marathon / Jyoti / ABB / L&T
4.	Flat PVC and Armoured Cable	Tropodur / Finolex / Asian / Gloster / Incab / Universal / Polycab/ Cords Cable Indutries Ltd./ C.R.I. Pumps Private Limited/ Vishal Cables Pvt. Ltd.
5.	Panel Enclosures and Consoles	Rittal / President / Cutler Hammer/ Hira RR Ispat.
6.	Switch fuse Disconnector	L & T, FN Type, Siemens 3 KL Type, GEPC
7.	Multi-Function Energy Meters	Enercon, L & T, SOCOMEC
8.	Capacitor bank	Crompton Greaves, Khatau Junker, Malde, L&T
9.	Cable Termination kit	Raychem, Denson, M-Seal
10.	Battery	HBL NIFE, Exide, Amco
11.	Battery Charger	Chaabi Electrical, Masstech
12.	Ultrasonic Type Level Measurement Device	Endress+Hauser / Krohne Marshall / Hycontrol UK, Electronet
13.	Pressure switch	Indfoss, Switzer,Tag Process Instruments

No	Item / Component	Recommended Makes
14.	Pressure gauge	WAREE, WIKA, AN Instruments, Guru, Hitek, Electronet
15.	Flow switch	Switzer, General Instrument,Forbes Marshall
16.	Pressure Transmitter	Emerson, Foxbro, Druck, Endress – Hauser, ABB, Honeywell Automation, Electronet
17.	Engineering cum Operator work Station	IBM, Compaq, Dell
18.	Local Supervisory Station	IBM, Compaq, Dell
19.	HMI Software	Wincc, Rs View, Monitorpro, Intellution, Indusoft
20.	Alarm Annunciator	Minilec, Peacon, ICA, APLAB, Electronet
21.	Uninterruptible Power Supply	HI-Real, Pulse, Tata Libert, APC, APLAB
22.	Lightening Protection Unit	MH Inst, Crompton Greaves, MTL, Pepper & fuchs, Rittmeyer, Cirprotec
23.	Instruments & Control Cables	Delton, Asian, Servel, TCL, Thermopad
24.	Receiver Indicator/Digital panel meter	Masibus, Yokogawa, Lectrotek, NISHKO, SaiTech, MTL INSTS, Electronet
25.	Conductivity level switch	Pune techtrol, SBEM, Krohne Marshall, Endress+Hauser India, NIVO, Electronet
26.	SCADA System	Mitsubishi Electric/ Schneider Electric/ Cimcon Software (India) Pvt. Ltd./ Delta Electronics India Pvt. Ltd./ Desire Energy Solutions Pvt. Ltd./ Jumo India Pvt. Ltd.
27.	Computer (Servers & Workstation)	HP-Compaq / IBM / Dell
28.	Laptop	HP / Dell / Sony / Toshiba
29.	Printer	Samsung, HP, CANNON
30.	Multifunction power monitor	MASIBUS, L&T, ENERCON, SOCOMECH, SECURE, DAE
31.	Temperature Scanner	SaiTech, Masibus, Nishko, Lectrotek
32.	Analog Signal Multiplier	MASIBUS, Sai Tech, MTL INSTS, NISHKO
33.	Air conditioning	Voltas, Samsung, Carrier, Hitachi
34.	Furniture	Godrej, Ergo, Featherlite
35.	Exhaust Fan	Crompton / G.E.C. / Bajaj / Khaitan
36.	Lighting & Fixtures	Phillips / Crompton / G.E.C.
37.	Ordinary Portland Cement	ACC / Ultra Tech / Jaypee / Diamond / Prism / Birla / Tata

25.House Service Connection Design



Only Flow Control Value should be used in house service connection.

ANNEXURE F – MAIN ITEMS OF WORK (BRIEF SCOPE)

A. CONSTRUCTION PHASE

<table>
<tr><th>No</th><th colspan="4">Main Works</th></tr>
<tr><td>1</td><td colspan="4">Construction of intake well cum pump house having minimum diameter 12 m and approximately 32 m deep (including 6 m height Pump house), 54.75 million litres in 20 hours (65.70 MLD) with provision for automation, Electromagnetic Flow Meter, construction of RCC approach bridge of length approximately 150 metres, minimum 5 m wide (excluding space for pipeline, kerb, cable duct, railing, electric poles, etc.) & all other necessary/ ancillary structures required from Halon Dam near Village Karanjiya Mal, Block Bichhiya, District Mandla</td></tr>
<tr><td rowspan="2">2</td><td colspan="4">Providing, laying & jointing of raw water pumping main having length and diameter as indicated below with in-lining and out-coating as per relevant specification including valves, sluice valves, air valves, scour valves, valve chambers, thrust blocks, crossings, specials & accessories, etc. complete including road restoration</td></tr>
<tr><td><table>
<tr><th>Type of Pipe/ Class</th><th>Diameter in mm</th><th>Length in metre</th></tr>
<tr><td>DI K-9</td><td>800</td><td>10,300</td></tr>
</table></td></tr>
<tr><td>3</td><td colspan="4">Water treatment plant to provide 43.75 million litres treated clear water in 20 hours (52.50 MLD) near village Gwaradongri, District Mandla including automation, clear water sump cum pump house of one hour retention capacity, electromagnetic flow meter, boundary wall with MS gates, internal roads, electrification, laboratory, etc. complete and all other necessary/ ancillary structures required.</td></tr>
<tr><td rowspan="2">4</td><td colspan="4">Providing, laying & jointing of clear water pumping main having length and diameter as indicated below with in-lining and out-coating as per relevant specification including, valves, sluice valves, air valves, scour valves, valve chambers, thrust blocks, crossings, specials & accessories, etc. complete including road restoration</td></tr>
<tr><td><table>
<tr><th>Type of Pipe/ Class</th><th>Diameter in mm</th><th>Length in metre</th></tr>
<tr><td rowspan="4">DI K-9</td><td>100</td><td>29,020</td></tr>
<tr><td>150</td><td>12,687</td></tr>
<tr><td>200</td><td>1,544</td></tr>
<tr><td>250</td><td>1,734</td></tr>
<tr><td>800</td><td>1,500</td></tr>
<tr><td colspan="2">Total</td><td>46,485</td></tr>
</table></td></tr>
</table>

No	Main Works		
5	Providing, laying & jointing clear water feeder / gravity main as specified in specification including valves, sluice valves, air valves, scour valves, valve chambers, thrust block, crossings (rail and road), specials & accessories, etc. complete including road restoration of length and diameter as indicated below:		
	Type of Pipe/Class	**Diameter in MM**	**Length (metre)**
	DI K-7	100	3,76,176
		150	1,96,255
		200	70,166
		250	49,579
		300	18,675
		350	17,313
		400	17,177
		450	9,862
		500	16,379
		600	11,383
		700	22,379
	DI K-7 / MS	900	6,555
		1100	9,532
	DI K-9	100	1,09,155
		150	40,041
		200	14,286
		250	32,135
		300	13,184
		350	10,675
		400	22,259
		450	1,866
		500	25,175
		600	18,373
		700	6,682
	Total		**11,15,262**

No	Main Works		
6	a) Construction of RCC overhead service reservoirs (OHSR's) at different villages of following capacity and staging of minimum 12 m or as per design to maintain the required minimum residual pressure of 7 m at consumer end including G.I. chain link fabric fencing with MS gate & approach road, electrification, etc. complete with 25 sqm room.		
	S. No.	**Capacity (KL)**	**Quantity (Nos)**
	1	50	35
	2	60	14
	3	70	11
	4	80	13
	5	90	6
	6	100	8
	7	110	9
	8	120	6
	9	130	9
	10	140	5
	11	150	5
	12	160	5
	13	170	4
	14	180	3
	15	190	5
	16	200	2
	17	210	3
	18	220	1
	19	230	2
	20	240	1
	21	250	1
	22	260	1
	23	300	1
	24	310	1
	25	350	1
	Total		**152**

No	Main Works
	b) Construction of RCC Clear Water Sump cum pump houses having following capacity (with twin compartments if capacity is greater than 500 KL) including boundary wall with MS Gate & Approach road, electrification etc. complete with 25 Sqm room. i. GLMBR 1 Capacity 2200 KL ii. GLMBR 2 capacity 150 KL iii. GLMBR 3 capacity 100 KL iv. BPT 1 - Capacity 750 KL. v. BPT 2 – Capacity 600 KL. vi. BPT 3 – Capacity 500 KL. vii. Sump – Capacity 200 KL viii. Sump – Capacity 150 KL ix. Sump 100 KL- 3 Nos. x. Sump 50 KL – 13 Nos.
	c) Construction of RCC OHBR with following capacity and approx. staging including boundary wall with MS gate & approach road, electrification, etc. complete with 25 sqm room. ---Nil---
	Note: All MBR/ BPT/ IPS/ WTP shall have boundary wall as defined in bid document but all ESRs/ GSRs shall have G.I. chain link fabric fencing of mesh size 25x25mm made of G.I. wire of 3 mm diameter including strengthening with welding or nuts, bolt & washers etc. complete. It shall have ISA 50x50x5mm angle iron post at a spacing 2.5 m centre to centre of height 2m above ground level embedded in M20 cement concrete 30x30 cm pillar minimum 75cm below ground level. Every 7th post & corners shall be strutted with similar specification angle iron & grouting. The top & bottom of chain link as well as on angle a 25x3mm flat secured with either weld or rivets or bolts, to make fencing safer, shall be provided. It shall have angle iron gate of size 3.0m x 1.8m having ISA 50x50x5mm angle iron & 16mm diameter plain M.S. bar including AL drop, holdfast etc. and shall be fixed up in 45x45 cm wide R.C.C. pillars. An additional gate of size 0.6mx1.5m shall also be provided within the same gate, to avoid opening of bigger gate all the time & it shall be made of IS 40x40x5mm angle iron with AL drop, etc. The CW sump cum pump houses and GLBR/ MBR/ BPT will have 2m high boundary wall with 'Y' shape angle iron with 2*3 rows of wire bed, wire fencing at top of boundary wall and gate, one room set of area 25sqm size with W.C. & bathroom, automation system and electrification with area lighting, etc. complete. The size of fencing or boundary wall shall be 20x20m including gate for these structures & if it increases or decreases then accordingly variation shall be paid or deducted as per applicable SOR given in Part I – Essential Instructions for the Bidders, Clause 1. One room set of minimum area 25 sqm size with W.C. & bathroom and housing of automation system and solar/ single phase electrification with area lighting, landscaping, plantation, etc. complete. The approach road for the MBR, OHSR, etc. shall be of approx. 30 m for each location. Any alteration to the total length of approach roads considering all structures shall be paid or deducted as per the MPPWD SOR w.e.f. 29th August 2017 (with amendments up to last date of bid submission). The length of the approach road shall be finalized by the Engineer-in-Charge.

<table>
<tr><th>No</th><th colspan="5">Main Works</th></tr>
<tr><td rowspan="8">7</td><td colspan="5">Distribution network for length and diameter as indicated below comprising of HDPE, PE100 PN6 (minimum) & DI class K-7 pipelines including bulk water meters for every village, valves, specials, and other allied works etc. complete</td></tr>
<tr><td colspan="2">Type of Pipe/ Class</td><td colspan="2">Diameter in mm</td><td>Length in metre</td></tr>
<tr><td colspan="2" rowspan="4">HDPE, PE100 PN6</td><td colspan="2">90</td><td>18,04,811</td></tr>
<tr><td colspan="2">110</td><td>2,18,471</td></tr>
<tr><td colspan="2">160</td><td>2,77,923</td></tr>
<tr><td colspan="2">200</td><td>1,60,727</td></tr>
<tr><td colspan="2" rowspan="2">DI K-7</td><td colspan="2">200</td><td>32,883</td></tr>
<tr><td colspan="2">250</td><td>1,510</td></tr>
<tr><td colspan="3">Total</td><td>24,96,325</td></tr>
<tr><td colspan="5">HDPE & DI Pipeline including valves, sluice valves, air valves, scour valves, bulk water meters for all villages, with protection chambers, thrust block, specials & accessories etc. complete including road restoration.</td></tr>
<tr><td rowspan="15">8</td><td colspan="5">(a) Pumping equipment including suitable motors, protection equipment for following -
Providing and installation of suitable energy efficient deep well vertical turbine pumps for raw water at intake well cum pump house including automation as under:</td></tr>
<tr><td>Location</td><td>Type</td><td>Nos</td><td>Discharge (lpm)</td><td>Head (m)</td></tr>
<tr><td rowspan="2">Intake well cum pump house</td><td>Working</td><td>2</td><td>19,167</td><td>60</td></tr>
<tr><td>Standby</td><td>2</td><td>9,584</td><td>60</td></tr>
<tr><td colspan="5">The pumps given above are inclusive of standby pumps (50% standby)</td></tr>
<tr><td colspan="5">(b) Pumping equipment including suitable motors, protection equipment for following-
Providing and installation of suitable energy efficient Centrifugal pumps for Clear water including automation as under:</td></tr>
<tr><td>Location</td><td>Type</td><td>Nos</td><td>Discharge (lpm)</td><td>Head (m)</td></tr>
<tr><td rowspan="2">WTP to GLMBR 1</td><td>Working</td><td>2</td><td>18229</td><td>70</td></tr>
<tr><td>Standby</td><td>2</td><td>9115</td><td>70</td></tr>
<tr><td rowspan="2">Sump at Karela ryt to GLBR 2</td><td>Working</td><td>2</td><td>1101</td><td>95</td></tr>
<tr><td>Standby</td><td>1</td><td>1101</td><td>95</td></tr>
<tr><td rowspan="2">Sump at Jilwara to GLBR 3</td><td>Working</td><td>2</td><td>651</td><td>103</td></tr>
<tr><td>Standby</td><td>1</td><td>651</td><td>103</td></tr>
<tr><td rowspan="2">Localised Sump at 3 Places</td><td>Working</td><td>3</td><td colspan="2">35 HP</td></tr>
<tr><td>Standby</td><td>3</td><td colspan="2">35 HP</td></tr>
<tr><td rowspan="2">Localised Sump at 4 places</td><td>Working</td><td>4</td><td colspan="2">20 HP</td></tr>
<tr><td>Standby</td><td>4</td><td colspan="2">20 HP</td></tr>
<tr><td rowspan="2">Localised Sump at 9 Places</td><td>Working</td><td>9</td><td colspan="2">5 HP</td></tr>
<tr><td>Standby</td><td>9</td><td colspan="2">5 HP</td></tr>
<tr><td colspan="5">The pumps given above are inclusive of standby pumps (50% standby)</td></tr>
</table>

<table>
<tr><th>No</th><th>Main Works</th></tr>
<tr><td>9</td><td>Provision for a total of approx. 37.50 km long dedicated 33 KV / 11 KV power supply with suitable cable from nearby substation to required locations including erection of suitable capacity transformers at locations specified below inclusive of all allied works complete. Provision for power connection (High Tension Line i.e. 132/33/11 KVA as a separate feeder to ensure sustainable power supply, suitable transformers as per requirement of running of the pumps with Outdoor Type Substation).
<table>
<tr><th>Location</th><th>Capacity</th><th>Nos.</th></tr>
<tr><td>Intake well site</td><td>1000 KVA</td><td>1</td></tr>
<tr><td>WTP site</td><td>3.15 MVA</td><td>1</td></tr>
<tr><td>IPS 1 at Karela ryt</td><td>200 KVA</td><td>1</td></tr>
<tr><td>IPS 2 at Jilwara</td><td>100 KVA</td><td>1</td></tr>
</table>
Supply, installing, testing and commissioning of transformers (including 100% standby) at the required locations with transformer yards complete in all respects as per specifications. Provision of stretching suitable capacity electric line and taking connection for clear water sump cum pump houses. Any other work necessary to cater the power supply demand of the project (as variation).
The work includes construction of substations and stretching of power lines and internal and external electrification, etc. complete at all components. Quantity of transformers mentioned above is of only working transformers and 100% standby transformers with all necessary arrangements to be provided at all locations in addition to working transformers.</td></tr>
<tr><td>10</td><td>Design, Supply, Delivery, Erection, Testing, & Commissioning of Automation Components for Monitoring & Maintenance with GPRS Communication with all necessary accessories (SCADA)</td></tr>
<tr><td>11</td><td>House Service Connection (up to end of O&M Period) – 50,825 Nos.</td></tr>
<tr><td>12</td><td>Construction of Staff Quarter / Office Building:
<table>
<tr><th>Particulars</th><th>Area</th></tr>
<tr><td>Office Building/Admin block in WTP campus</td><td rowspan="3">700 sqm
Note: Area/Location of individual buildings will be decided by MPJN</td></tr>
<tr><td>Store Building</td></tr>
<tr><td>Office Building at a place directed by MPJN</td></tr>
</table>
i. F-type staff quarter with minimum plinth area 93.0 Sqm each – 1 No
ii. G-type staff quarter with minimum plinth area 65.0 Sqm each – 2 Nos
iii. H-type staff quarter with minimum plinth area 46.5 Sqm each – 4 Nos
iv. I-type staff quarter with minimum plinth area 32.5 Sqm each – 12 Nos</td></tr>
<tr><td></td><td>Total Construction Phase</td></tr>
</table>

B. OPERATION AND MAINTENANCE PHASE

No.	Main Works
13	**Operation & Maintenance of the Whole Scheme for first year** The Operation and Maintenance cost for the first year, in terms of percentage of contract Amount is given in Annexure H. For every subsequent year, the first-year percentage rates will be increased / decreased according to the percentage change in consumer price index issued by Labour Bureau, GOI (All Industrial Worker) for that period. The index on the date of completion of trial run period will be treated as base for calculation of percentage point increase/decrease in O&M cost of next year. Payment of O&M will be made quarterly. **Note:** a) The operation & maintenance period is 10 years from the date of completion of three months of trial run after successful commissioning of the project. b) The cost of chemical and energy charges (excluding penalties) shall be paid by MPJN on reimbursement basis. c) Energy Requirement: The estimation for yearly consumption of energy is 1,15,62,327 kwH (Unit) for design period of 15 years. The estimation will be finalized based on the equipment installed as per the approved design. For intermediate years, payment will be made on pro rata / calculation basis. d) If due to any reasons whatsoever, it is desired to supply water in some of the villages before final commissioning and trial run, then the pro-rata rates derived from the Annexure H shall be applicable for the part payment on the basis of duration and quantity supplied, but the date of commissioning of whole work shall be applicable from the dates as stipulated in this contract. The cost of chemical and energy charges (excluding penalties) shall be paid by MPJN on reimbursement basis.

ANNEXURE H – BREAK UP SCHEDULE FOR PAYMENT

A. CONSTRUCTION PHASE

<table>
<tr><th>No</th><th>Main Works</th><th>Pro rata share (% of Lump Sum Offer)</th></tr>
<tr><td>1</td><td>Construction of intake well cum pump house having minimum diameter 12 m and approximately 32 m deep (including 6 m height Pump house), 54.75 million litres in 20 hours (65.70 MLD) with provision for automation, Electromagnetic Flow Meter, construction of RCC approach bridge of length approximately 150 metres, minimum 5 m wide (excluding space for pipeline, kerb, cable duct, railing, electric poles, etc.) & all other necessary/ ancillary structures required from Halon Dam near Village Karanjiya Mal, Block Bichhiya, District Mandla</td><td>0.55 %</td></tr>
<tr><td>2</td><td>Providing, laying & jointing of raw water pumping main having length and diameter as indicated below with in-lining and out-coating as per relevant specification including valves, sluice valves, air valves, scour valves, valve chambers, thrust blocks, crossings, specials & accessories, etc. complete including road restoration
<table>
<tr><th>Type of Pipe/ Class</th><th>Diameter in mm</th><th>Length in metre</th></tr>
<tr><td>DI K-9</td><td>800</td><td>10,300</td></tr>
</table></td><td>3.00 %</td></tr>
<tr><td>3</td><td>Water treatment plant to provide 43.75 million litres treated clear water in 20 hours (52.50 MLD) near village Gwaradongri, District Mandla including automation, clear water sump cum pump house of one hour retention capacity, electromagnetic flow meter, boundary wall with MS gates, internal roads, electrification, laboratory, etc. complete and all other necessary/ ancillary structures required.</td><td>1.96 %</td></tr>
<tr><td>4</td><td>Providing, laying & jointing of clear water pumping main having length and diameter as indicated below with in-lining and out-coating as per relevant specification including, valves, sluice valves, air valves, scour valves, valve chambers, thrust blocks, crossings, specials & accessories, etc. complete including road restoration
<table>
<tr><th>Type of Pipe/ Class</th><th>Diameter in mm</th><th>Length in metre</th></tr>
<tr><td rowspan="5">DI K-9</td><td>100</td><td>29,020</td></tr>
<tr><td>150</td><td>12,687</td></tr>
<tr><td>200</td><td>1,544</td></tr>
<tr><td>250</td><td>1,734</td></tr>
<tr><td>800</td><td>1,500</td></tr>
<tr><td colspan="2">Total</td><td>46,485</td></tr>
</table></td><td>2.00 %</td></tr>
</table>

<table>
<tr><th>No</th><th colspan="3">Main Works</th><th>Pro rata share (% of Lump Sum Offer)</th></tr>
<tr><td rowspan="21">5</td><td colspan="3">Providing, laying & jointing clear water feeder / gravity main as specified in specification including valves, sluice valves, air valves, scour valves, valve chambers, thrust block, crossings (rail and road), specials & accessories, etc. complete including road restoration of length and diameter as indicated below:</td><td rowspan="21">53.34 %</td></tr>
<tr><td>Type of Pipe/Class</td><td>Diameter in MM</td><td>Length (metre)</td></tr>
<tr><td rowspan="11">DI K-7</td><td>100</td><td>3,76,176</td></tr>
<tr><td>150</td><td>1,96,255</td></tr>
<tr><td>200</td><td>70,166</td></tr>
<tr><td>250</td><td>49,579</td></tr>
<tr><td>300</td><td>18,675</td></tr>
<tr><td>350</td><td>17,313</td></tr>
<tr><td>400</td><td>17,177</td></tr>
<tr><td>450</td><td>9,862</td></tr>
<tr><td>500</td><td>16,379</td></tr>
<tr><td>600</td><td>11,383</td></tr>
<tr><td>700</td><td>22,379</td></tr>
<tr><td rowspan="2">DI K-7 / MS</td><td>900</td><td>6,555</td></tr>
<tr><td>1100</td><td>9,532</td></tr>
<tr><td rowspan="11">DI K-9</td><td>100</td><td>1,09,155</td></tr>
<tr><td>150</td><td>40,041</td></tr>
<tr><td>200</td><td>14,286</td></tr>
<tr><td>250</td><td>32,135</td></tr>
<tr><td>300</td><td>13,184</td></tr>
<tr><td>350</td><td>10,675</td></tr>
<tr><td>400</td><td>22,259</td></tr>
<tr><td>450</td><td>1,866</td></tr>
<tr><td>500</td><td>25,175</td></tr>
<tr><td>600</td><td>18,373</td></tr>
<tr><td>700</td><td>6,682</td></tr>
<tr><td colspan="2">Total</td><td>11,15,262</td></tr>
</table>

<table>
<tr><th>No</th><th>Main Works</th><th>Pro rata share (% of Lump Sum Offer)</th></tr>
<tr><td>6</td><td>a) Construction of RCC overhead service reservoirs (OHSR's) at different villages of following capacity and staging of minimum 12 m or as per design to maintain the required minimum residual pressure of 7 m at consumer end including G.I. chain link fabric fencing with MS gate & approach road, electrification, etc. complete with 25 sqm room.
<table>
<tr><th>S. No.</th><th>Capacity (KL)</th><th>Quantity (Nos)</th></tr>
<tr><td>1</td><td>50</td><td>35</td></tr>
<tr><td>2</td><td>60</td><td>14</td></tr>
<tr><td>3</td><td>70</td><td>11</td></tr>
<tr><td>4</td><td>80</td><td>13</td></tr>
<tr><td>5</td><td>90</td><td>6</td></tr>
<tr><td>6</td><td>100</td><td>8</td></tr>
<tr><td>7</td><td>110</td><td>9</td></tr>
<tr><td>8</td><td>120</td><td>6</td></tr>
<tr><td>9</td><td>130</td><td>9</td></tr>
<tr><td>10</td><td>140</td><td>5</td></tr>
<tr><td>11</td><td>150</td><td>5</td></tr>
<tr><td>12</td><td>160</td><td>5</td></tr>
<tr><td>13</td><td>170</td><td>4</td></tr>
<tr><td>14</td><td>180</td><td>3</td></tr>
<tr><td>15</td><td>190</td><td>5</td></tr>
<tr><td>16</td><td>200</td><td>2</td></tr>
<tr><td>17</td><td>210</td><td>3</td></tr>
<tr><td>18</td><td>220</td><td>1</td></tr>
<tr><td>19</td><td>230</td><td>2</td></tr>
<tr><td>20</td><td>240</td><td>1</td></tr>
<tr><td>21</td><td>250</td><td>1</td></tr>
<tr><td>22</td><td>260</td><td>1</td></tr>
<tr><td>23</td><td>300</td><td>1</td></tr>
<tr><td>24</td><td>310</td><td>1</td></tr>
<tr><td>25</td><td>350</td><td>1</td></tr>
<tr><td colspan="2">Total</td><td>152</td></tr>
</table></td><td>6.63 %</td></tr>
</table>

No	Main Works	Pro rata share (% of Lump Sum Offer)
	b) Construction of RCC Clear Water Sump cum pump houses having following capacity (with twin compartments if capacity is greater than 500 KL) including boundary wall with MS Gate & Approach road, electrification etc. complete with 25 Sqm room. i. GLMBR 1 Capacity 2200 KL ii. GLMBR 2 capacity 150 KL iii. GLMBR 3 capacity 100 KL iv. BPT 1 - Capacity 750 KL. v. BPT 2 – Capacity 600 KL. vi. BPT 3 – Capacity 500 KL. vii. Sump – Capacity 200 KL viii. Sump – Capacity 150 KL ix. Sump 100 KL- 3 Nos. x. Sump 50 KL – 13 Nos.	0.79 %
	c) Construction of RCC OHBR with following capacity and approx. staging including boundary wall with MS gate & approach road, electrification, etc. complete with 25 sqm room. ---Nil---	0.00 %
	Note: All MBR/ BPT/ IPS/ WTP shall have boundary wall as defined in bid document but all ESRs/ GSRs shall have G.I. chain link fabric fencing of mesh size 25x25mm made of G.I. wire of 3 mm diameter including strengthening with welding or nuts, bolt & washers etc. complete. It shall have ISA 50x50x5mm angle iron post at a spacing 2.5 m centre to centre of height 2m above ground level embedded in M20 cement concrete 30x30 cm pillar minimum 75cm below ground level. Every 7th post & corners shall be strutted with similar specification angle iron & grouting. The top & bottom of chain link as well as on angle a 25x3mm flat secured with either weld or rivets or bolts, to make fencing safer, shall be provided. It shall have angle iron gate of size 3.0m x 1.8m having ISA 50x50x5mm angle iron & 16mm diameter plain M.S. bar including AL drop, holdfast etc. and shall be fixed up in 45x45 cm wide R.C.C. pillars. An additional gate of size 0.6mx1.5m shall also be provided within the same gate, to avoid opening of bigger gate all the time & it shall be made of IS 40x40x5mm angle iron with AL drop, etc. The CW sump cum pump houses and GLBR/ MBR/ BPT will have 2m high boundary wall with 'Y' shape angle iron with 2*3 rows of wire bed, wire fencing at top of boundary wall and gate, one room set of area 25sqm size with W.C. & bathroom, automation system and electrification with area lighting, etc. complete.	

<table>
<tr><th>No</th><th>Main Works</th><th>Pro rata share (% of Lump Sum Offer)</th></tr>
<tr><td></td><td>The size of fencing or boundary wall shall be 20x20m including gate for these structures & if it increases or decreases then accordingly variation shall be paid or deducted as per applicable SOR given in Part I – Essential Instructions for the Bidders, Clause 1.

One room set of minimum area 25 sqm size with W.C. & bathroom and housing of automation system and solar/ single phase electrification with area lighting, landscaping, plantation, etc. complete.

The approach road for the MBR, OHSR, etc. shall be of approx. 30 m for each location. Any alteration to the total length of approach roads considering all structures shall be paid or deducted as per the MPPWD SOR w.e.f. 29th August 2017 (with amendments up to last date of bid submission). The length of the approach road shall be finalized by the Engineer-in-Charge.</td><td></td></tr>
<tr><td>7</td><td>Distribution network for length and diameter as indicated below comprising of HDPE, PE100 PN6 (minimum) & DI class K-7 pipelines including bulk water meters for every village, valves, specials, and other allied works etc. complete
<table>
<tr><th>Type of Pipe/ Class</th><th>Diameter in mm</th><th>Length in metre</th></tr>
<tr><td rowspan="4">HDPE, PE100 PN6</td><td>90</td><td>18,04,811</td></tr>
<tr><td>110</td><td>2,18,471</td></tr>
<tr><td>160</td><td>2,77,923</td></tr>
<tr><td>200</td><td>1,60,727</td></tr>
<tr><td rowspan="2">DI K-7</td><td>200</td><td>32,883</td></tr>
<tr><td>250</td><td>1,510</td></tr>
<tr><td colspan="2">Total</td><td>24,96,325</td></tr>
</table>
HDPE & DI Pipeline including valves, sluice valves, air valves, scour valves, bulk water meters for all villages, with protection chambers, thrust block, specials & accessories etc. complete including road restoration.</td><td>24.90 %</td></tr>
</table>

<table>
<tr><th>No</th><th>Main Works</th><th>Pro rata share (% of Lump Sum Offer)</th></tr>
<tr><td rowspan="4">8</td><td>(a) Pumping equipment including suitable motors, protection equipment for following -
Providing and installation of suitable energy efficient deep well vertical turbine pumps for raw water at intake well cum pump house including automation as under:
<table>
<tr><th>Location</th><th>Type</th><th>Nos</th><th>Discharge (lpm)</th><th>Head (m)</th></tr>
<tr><td rowspan="2">Intake well cum pump house</td><td>Working</td><td>2</td><td>19,167</td><td>60</td></tr>
<tr><td>Standby</td><td>2</td><td>9,584</td><td>60</td></tr>
<tr><td colspan="5">The pumps given above are inclusive of standby pumps (50% standby)</td></tr>
</table></td><td>0.40 %</td></tr>
<tr><td>(b) Pumping equipment including suitable motors, protection equipment for following-
Providing and installation of suitable energy efficient Centrifugal pumps for Clear water including automation as under:
<table>
<tr><th>Location</th><th>Type</th><th>Nos</th><th>Discharge (lpm)</th><th>Head (m)</th></tr>
<tr><td rowspan="2">WTP to GLMBR 1</td><td>Working</td><td>2</td><td>18229</td><td>70</td></tr>
<tr><td>Standby</td><td>2</td><td>9115</td><td>70</td></tr>
<tr><td rowspan="2">Sump at Karela ryt to GLBR 2</td><td>Working</td><td>2</td><td>1101</td><td>95</td></tr>
<tr><td>Standby</td><td>1</td><td>1101</td><td>95</td></tr>
<tr><td rowspan="2">Sump at Jilwara to GLBR 3</td><td>Working</td><td>2</td><td>651</td><td>103</td></tr>
<tr><td>Standby</td><td>1</td><td>651</td><td>103</td></tr>
<tr><td rowspan="2">Localised Sump at 3 Places</td><td>Working</td><td>3</td><td colspan="2">35 HP</td></tr>
<tr><td>Standby</td><td>3</td><td colspan="2">35 HP</td></tr>
<tr><td rowspan="2">Localised Sump at 4 places</td><td>Working</td><td>4</td><td colspan="2">20 HP</td></tr>
<tr><td>Standby</td><td>4</td><td colspan="2">20 HP</td></tr>
<tr><td rowspan="2">Localised Sump at 9 Places</td><td>Working</td><td>9</td><td colspan="2">5 HP</td></tr>
<tr><td>Standby</td><td>9</td><td colspan="2">5 HP</td></tr>
<tr><td colspan="5">The pumps given above are inclusive of standby pumps (50% standby)</td></tr>
</table></td><td>0.75 %</td></tr>
</table>

<table>
<tr><th>No</th><th>Main Works</th><th>Pro rata share (% of Lump Sum Offer)</th></tr>
<tr><td>9</td><td>Provision for a total of approx. 37.50 km long dedicated 33 KV / 11 KV power supply with suitable cable from nearby substation to required locations including erection of suitable capacity transformers at locations specified below inclusive of all allied works complete. Provision for power connection (High Tension Line i.e. 132/33/11 KVA as a separate feeder to ensure sustainable power supply, suitable transformers as per requirement of running of the pumps with Outdoor Type Substation).
<table>
<tr><th>Location</th><th>Capacity</th><th>Nos.</th></tr>
<tr><td>Intake well site</td><td>1000 KVA</td><td>1</td></tr>
<tr><td>WTP site</td><td>3.15 MVA</td><td>1</td></tr>
<tr><td>IPS 1 at Karela ryt</td><td>200 KVA</td><td>1</td></tr>
<tr><td>IPS 2 at Jilwara</td><td>100 KVA</td><td>1</td></tr>
</table>
Supply, installing, testing and commissioning of transformers (including 100% standby) at the required locations with transformer yards complete in all respects as per specifications. Provision of stretching suitable capacity electric line and taking connection for clear water sump cum pump houses. Any other work necessary to cater the power supply demand of the project (as variation).
The work includes construction of substations and stretching of power lines and internal and external electrification, etc. complete at all components. Quantity of transformers mentioned above is of only working transformers and 100% standby transformers with all necessary arrangements to be provided at all locations in addition to working transformers.</td><td>0.60 %</td></tr>
<tr><td>10</td><td>Design, Supply, Delivery, Erection, Testing, & Commissioning of Automation Components for Monitoring & Maintenance with GPRS Communication with all necessary accessories (SCADA)</td><td>2.50 %</td></tr>
<tr><td>11</td><td>House Service Connection (up to end of O&M Period) – 50,825 Nos.</td><td>2.18 %</td></tr>
<tr><td>12</td><td>Construction of Staff Quarter / Office Building:
<table>
<tr><th>Particulars</th><th>Area</th></tr>
<tr><td>Office Building/Admin block in WTP campus</td><td rowspan="3">700 sqm
Note: Area/Location of individual buildings will be decided by MPJN</td></tr>
<tr><td>Store Building</td></tr>
<tr><td>Office Building at a place directed by MPJN</td></tr>
</table>
i. F-type staff quarter with minimum plinth area 93.0 Sqm each – 1 No
ii. G-type staff quarter with minimum plinth area 65.0 Sqm each – 2 Nos
iii. H-type staff quarter with minimum plinth area 46.5 Sqm each – 4 Nos
iv. I-type staff quarter with minimum plinth area 32.5 Sqm each – 12 Nos</td><td>0.40 %</td></tr>
<tr><td></td><td>Total Construction Phase</td><td>100 %</td></tr>
</table>

B. OPERATION AND MAINTENANCE PHASE

No.	Main Works	Pro rata share (% of Lump Sum Offer)
13	**Operation & Maintenance of the Whole Scheme for first year** The Operation and Maintenance cost for the first year, in terms of percentage of contract Amount is given in Annexure H. For every subsequent year, the first-year percentage rates will be increased / decreased according to the percentage change in consumer price index issued by Labour Bureau, GOI (All Industrial Worker) for that period. The index on the date of completion of trial run period will be treated as base for calculation of percentage point increase/decrease in O&M cost of next year. Payment of O&M will be made quarterly. **Note:** a) The operation & maintenance period is 10 years from the date of completion of three months of trial run after successful commissioning of the project. b) The cost of chemical and energy charges (excluding penalties) shall be paid by MPJN on reimbursement basis. c) Energy Requirement: The estimation for yearly consumption of energy is 1,15,62,327 kwH (Unit) for design period of 15 years. The estimation will be finalized based on the equipment installed as per the approved design. For intermediate years, payment will be made on pro rata / calculation basis. d) If due to any reasons whatsoever, it is desired to supply water in some of the villages before final commissioning and trial run, then the pro-rata rates derived from the Annexure H shall be applicable for the part payment on the basis of duration and quantity supplied, but the date of commissioning of whole work shall be applicable from the dates as stipulated in this contract. The cost of chemical and energy charges (excluding penalties) shall be paid by MPJN on reimbursement basis.	**1.00 %**

Notes regarding Break up of Payment Schedule

1. Component wise cost for payment will be assessed based on the percentage in the above table, and the price quoted by Contractor in its Financial Proposal.
2. Operation and Maintenance expenditures of only first year (excluding energy charges) shall be calculated by the percentage as given in Sr. No. 13 from the Lump-sum offer given by the contractor. Energy requirement mentioned in the Annexure H is for reference only. Actual expected energy requirement will be calculated considering 70% efficiency for pumps of 50 KW or more and 60% efficiency for pumps of less than 50 KW as per actual working hours of the pumps/ equipment and 10% extra load for lighting and other internal usages. Based on the first year O&M charges, the percentage increase of further years shall be worked out as given above in Sr. No. 13.
3. Up to the quantities of MS / DI / HDPE (component wise i.e., Raw Water, Clear Water, Distribution pipeline) pipes mentioned in Annexure - F & H, for any change in pipe dia/class/length, there shall be no additional payment for excavation, refilling, laying jointing and restoration of road, etc. Only cost of providing, laying, and jointing of pipe shall be adjusted in the contract price according to the approved variation.
4. If overall length of pipes of MS / DI / HDPE (component wise i.e. Raw Water, Clear Water, Distribution pipe line) increases or decreases from the above mentioned quantities in Annexure – F & H, then the cost of complete works of providing, laying, jointing of the pipeline including excavation, refilling, restoration of road, civil works, etc. will be payable or recovered as the case may be as per valuation of work based on actual detailed item wise measurements of work done according to the approved variation.
5. It will be the responsibility of the contractor to provide safe and potable water at 55 lpcd as specified in the Appendix-I for each individual consumer of the village. However, it will be responsibility of the contractor to ensure that all the villages in the scheme area are covered, and the scheme is designed in accordance with the specifications after the confirmatory survey.
6. Percentage rates for boundary wall, approach roads required to be constructed are included in civil works of that respective sub head.
7. The Contractor shall paint (externally and internally) the existing water supply structures visible above ground (brownfield assets - OHT's, MBR's, GSR's, etc.) as per tender specifications and the same will be paid as extra as below.
    i) Structure with capacity up to 50 KL – Rs. 1,500 per KL
    ii) Structure with capacity above 50 KL up to 100 KL – Rs. 75,000/- + Rs. 1,000 per KL for additional capacity above 50 KL
    iii) Structure with capacity above 100 KL – Rs. 1,25,000/- + Rs. 750 per KL for additional capacity above 50 KL
8. Component wise break-up is given in the following Annexures.

ANNEXURE – H_1

Break up of schedule of payment for the

Intake well cum pump house and Approach Bridge

S. No.	On completion of item of work	Percentage payable of H_1	Cumulative percentage payable of H_1
1	After construction of coffer dam, excavation of foundation and casting of bed concrete.	5%	5%
2	After completing foundation and well staining up-to discharge floor level.	35%	40%
3	After construction of R.C.C. approach bridge, approach road and discharge floor.	15%	55%
4	After completing pump house up to roof slab with bridge connecting jack well with intake, R.C.C. Duct conduit etc.	20%	75%
5	After fixing of inlet ports, valves, specials, gantry girder.	15%	90%
6	After finishing, testing and successful trial run of work.	5%	95%
7	After Bank protection/land scaping as per site condition/Approach road	5%	100%

ANNEXURE – H_2

Break up of schedule of payment for the Raw Water Pumping Main

S. No.	On completion of item of work	Percentage payable	Cumulative percentage payable
1	On testing and supply at site actual quantities of in-lined and out-coated K-7, K-9 & MS pipes of specified diameters and lengths on pro-rata basis	70%	70%
2	On transportation of pipes, excavation of trenches and construction of supporting structures, laying, jointing and testing at site, backfilling of pipe trenches on pro-rata basis	10%	80%
3	After road restoration or making surface good as same before construction on pro-rata basis	10%	90%
4	After successful testing and disinfection of pipelines on pro-rata basis	5%	95%
5	After successful commissioning of pipelines on pro-rata basis	5%	100%

Notes:

1. It is to be noted by the bidder that at no point more than 50% total equivalent pipe length for the project shall remain unlaid) before new invoice for additional supply of pipe can be claimed.

2. To bring the pipes of different sizes at equal level, equivalent length is calculated as follows:

   Equivalent length= (Length of pipe in km) * (Nominal diameter in mm)

   For the purpose of assessing equivalent pipe length, all the pipe types/ classes will be considered the same.

ANNEXURE – H_3

Break up schedule for payment for Water Treatment Plant

I. Percentage wise break-up of cost of civil and mechanical/Electrical works. The cost of C.I./DI Pipes, valves, laboratory equipment and chemicals for water testing and furniture should be included as E/M work.

II. Percentage wise break-up of cost of individual units of civil work and items of E/M work.

Percentage cost at various stages of construction of individual units of civil work.

Based upon the above, payment shall be regulated as given hereunder:

For civil works - 0.8 **H_3**

For E&M works - 0.2 **H_3**

(The cost of wash water pumps, air blowers, alum agitators, pre-sedimentation (if included) and clarifloculator motors/agitators, C.I. pipes, valves, laboratory equipment and chemical and furniture should be included as E/M works)

III. Civil work:

Unit wise share of civil work shall be as under -

No	Units of Civil Work	Percentage payable	Cumulative percentage payable
1	Cascade aerator / Inlet chamber	0.5% of 0.8 H_3	0.5%
2	Flash Mixer with inlet channel	0.5% of 0.8 H_3	1.0%
3	Pre-Settling tank and/or Clariflocculator	22% of 0.8 H_3	23%
4	Filters	22% of 0.8 H_3	45%
5	Wash Water Tank	10% of 0.8 H_3	55%
6	Administrative Block	10% of 0.8 H_3	65%
7	Lab Building	3% of 0.8 H_3	68%
8	Store Building	4% of 0.8 H_3	72%
9	Clear Water Sump	15% of 0.8 H_3	87%
10	Recycling arrangement	2% of 0.8 H_3	89%
11	Pump house	5% of 0.8 H_3	94%
12	Boundary wall, roads	1% of 0.8 H_3	95%
13	Site development (land scaping and plantation), etc.	5% of 0.8 H_3	100%

Based upon the above, payment shall be regulated as given hereunder:

S. No.	Particulars	Percentage payable	Cumulative percentage payable
1.	Preliminary work, rooting out fallen trees and excavation, casting of levelling course/PCC of footing or raft.	10%	10%
2.	After casting of foundation and construction up to plinth level	20%	30%
3.	After casting up to half height of structure.	20%	50%
4.	After casting up to full height of structure.	30%	80%
5.	After completion of rest, works of structure and finishing and testing of the structure.	20%	100%

IV. Mechanical and Electrical works with Automation

S. No.	Particulars	Percentage payable	Cumulative percentage payable
1.	On delivery at site	80%	80%
2.	On installation	10%	90%
3.	On testing, trial run and commissioning	10%	100%

V. Boundary wall, approach road, fencing, etc. shall be included in the cost of civil works.

ANNEXURE – H_4

Break up of schedule of payment for Clear Water Pumping Main

S. No.	On completion of item of work	Percentage payable	Cumulative percentage payable
1	On testing and supply at site actual quantities of in-lined and out-coated K-7, K-9 & MS pipes of specified diameters and lengths on pro-rata basis	70%	70%
2	On transportation of pipes, excavation of trenches and construction of supporting structures, laying, jointing and testing at site, backfilling of pipe trenches on pro-rata basis	10%	80%
3	After road restoration or making surface good as same before construction on pro-rata basis	10%	90%
4	After successful testing and disinfection of pipelines on pro-rata basis	5%	95%
5	After successful commissioning of pipelines on pro-rata basis	5%	100%

Notes:

1. It is to be noted by the bidder that at no point more than 50% total equivalent pipe length for the project shall remain unlaid) before new invoice for additional supply of pipe can be claimed.

2. To bring the pipes of different sizes at equal level, equivalent length is calculated as follows:

   Equivalent length= (Length of pipe in km) * (Nominal diameter in mm)

   For the purpose of assessing equivalent pipe length, all the pipe types/ classes will be considered the same.

ANNEXURE – H_5

Break up of schedule of payment for the Clear Water Trunk Mains

S. No.	On completion of item of work	Percentage payable	Cumulative percentage payable
1	On testing and supply at site actual quantities of in-lined and out-coated K-7, K-9 & MS pipes of specified diameters and lengths on pro-rata basis	70%	70%
2	On transportation of pipes, excavation of trenches and construction of supporting structures, laying, jointing and testing at site, backfilling of pipe trenches on pro-rata basis	10%	80%
3	After road restoration or making surface good as same before construction on pro-rata basis	10%	90%
4	After successful testing and disinfection of pipelines on pro-rata basis	5%	95%
5	After successful commissioning of pipelines on pro-rata basis	5%	100%

Notes:

1. It is to be noted by the bidder that at no point more than 50% total equivalent pipe length for the project shall remain unlaid) before new invoice for additional supply of pipe can be claimed.

2. To bring the pipes of different sizes at equal level, equivalent length is calculated as follows:

   Equivalent length= (Length of pipe in km) * (Nominal diameter in mm)

   For the purpose of assessing equivalent pipe length, all the pipe types/ classes will be considered the same.

ANNEXURE – H_{6a}

CONSTRUCTION OF OVER HEAD TANKS (ESRs)

S. No.	Particulars	Percentage payable	Cumulative percentage payable
1.	Preliminary work, rooting out fallen trees and excavation, casting of levelling course/PCC of footing or raft	10%	10%
2.	After casting of foundation, columns up to and including ground bracing beams	10%	20%
3.	After casting of full staging and columns up to bottom ring beam and staircase	10%	30%
4.	After casting of bottom slab or dome including walkway slab or balcony	10%	40%
5.	After casting of full vertical wall and top slab or dome	20%	60%
6.	After providing, fixing pipes and specials for inlet, over flow scour, outlet, bell mouths, grating, puddle collars, duck foot bends, sluice valves, and their required chambers etc. complete.	10%	70%
7.	Providing arrangement for manhole covers, air vents & central ventilation, including railing for staircase and roof top & After finishing and testing of the structure, providing and fixing water level indicator, lightening conductors, protection work, and all other works as given in tender document. Painting as per specifications etc. all complete.	10%	80%
8.	After commissioning of the overhead tank	10%	90%
9.	Construction of 25 sqm. room set, electrification with area lighting, automation, and G.I. chain link fabric fencing with gate, etc. complete.	10%	100%

NOTE:

1. The value of pro rata share **H_{6a}** is for all the tanks to be constructed as part of the scheme. For individual overhead tank, weighted share can be worked out.
2. **Payment for variation in staging height of OHT/MBR/BPT**

   The rates are for staging height of 12 m to 16 m for OHT's. These rates shall be increased for per meter variation in the staging height beyond 16 m for OHT and beyond staging height mentioned in the bid document for MBR/BPT, as below:

- 12 m to 16 m staging – (no variation) the cost derived from the % allotted to the item in payment breakup.
- 16 m to 20 m staging - 3% of the cost derived from the % allotted to the item in payment breakup for each meter variation.
- 20 m and above staging - 4% of the cost derived from the % allotted to the item in payment breakup for each meter variation.

E.g. For 17 m staging height, percentage calculation will be as follows:

16 to 17 m --- 1 x 3% = 3%

Total = 3%

Hence, cost of 17 meter staging height OHT shall be 103% of the cost derived from the %age allotted to the item in payment breakup.

For 21 m staging height, percentage calculation will be as follows:

16 to 20 m --- 4 x 3% = 12%

20 to 21 m --- 1 x 4% = 4%

Total = 16%

Hence, cost of 21 meter staging height OHT shall be 116% of the cost derived from the %age allotted to the item in payment breakup.

Note: In case of increase in the staging height of MBR's/ BPT's beyond the staging as mentioned in the bid document, increase per meter staging will be paid as per applicable slab mentioned above on the cost derived from the % allotted to the item in payment breakup only for additional staging height.

ANNEXURE – H_{6b}

Clear Water sump cum pump house

S. No.	Particulars	Percentage payable	Cumulative percentage payable
1.	Preliminary work, rooting out fallen trees and excavation, casting of levelling course/PCC of footing & casting of base slab.	10%	10%
2.	After casting 50% tank wall and partition walls	15%	25%
3.	After casting of full tank walls and partition walls	15%	40%
4.	After casting top slab including arrangement for manhole covers, air vents & central ventilation, including casting of stair case, railing for staircase and roof and complete construction of pump house (wherever applicable).	20%	60%
5.	After providing, fixing pipes and specials for inlet, over flow scour, outlet, bell mouths, grating, puddle collars, duck foot bends, sluice valves, sluice gates, and their required chambers etc complete including installation of pumps and making all internal electric connection (wherever applicable)	10%	70%
6.	After finishing and testing of the structure, providing and fixing water level indicator, lightening conductors, air vent flow recorded, protection work, and all other works as given in tender document. Painting as per specifications etc. all complete.	10%	80%
7.	Construction of 25 sqm. room set, electrification with area lighting, Automation and Boundary wall with gate etc. complete.	20%	100%

NOTE: The value of pro rata share H_{6b} is for all the sump cum pump houses to be constructed as part of the scheme. For individual sump cum pump houses, weighted share can be worked out.

ANNEXURE – H_{6c}

CONSTRUCTION OF MBR

S. No.	Particulars	Percentage payable	Cumulative percentage payable
1.	Preliminary work, rooting out fallen trees and excavation, casting of levelling course/PCC of footing or raft	10%	10%
2.	After casting of foundation, columns up to and including ground bracing beams	10%	20%
3.	After casting of full staging and columns up to bottom ring beam and staircase	10%	30%
4.	After casting of bottom slab or dome including walkway slab or balcony	10%	40%
5.	After casting of full vertical wall and top slab or dome	20%	60%
6.	After providing, fixing pipes and specials for inlet, over flow scour, outlet, bell mouths, grating, puddle collars, duck foot bends, sluice valves, and their required chambers etc. complete.	10%	70%
7.	Providing arrangement for manhole covers, air vents & central ventilation, including railing for staircase and roof top & After finishing and testing of the structure, providing and fixing water level indicator, lightening conductors, protection work, and all other works as given in tender document. Painting as per specifications etc. all complete.	10%	80%
8.	After commissioning of the overhead tank	10%	90%
9.	Construction of 25 sqm. room set, electrification with area lighting, automation and boundary wall with gate etc. complete.	10%	100%

Note:

1. The value of pro rata share H_{6c} is for all the MBRs to be constructed as part of the scheme. For individual MBRs, weighted share can be worked out.
2. In case of increase in the staging height of MBR's/ BPT's beyond the staging as mentioned in the bid document, increase per meter staging will be paid as per methodology specified in Annexure H_{6a} on the cost derived from the % allotted to the item in payment breakup only for additional staging height.

ANNEXURE – H_7

DISTRIBUTION NETWORK

S. No.	On completion of item of work	Percentage payable	Cumulative percentage payable
1	On testing and supply at site actual quantities of in-lined and out-coated K-7 & HDPE pipes of specified diameters and lengths on pro-rata basis	60%	60%
2	On transportation of pipes, excavation of trenches and construction of supporting structures, laying, jointing and testing at site, backfilling of pipe trenches on pro-rata basis	15%	75%
3	After road restoration or making surface good as same before construction on pro-rata basis	15%	90%
4	After successful testing and disinfection of pipelines on pro-rata basis	5%	95%
5	After successful commissioning of pipelines on pro-rata basis	5%	100%

Notes:

1. It is to be noted by the bidder that at no point more than 50% total equivalent pipe length for the project shall remain unlaid) before new invoice for additional supply of pipe can be claimed.

2. To bring the pipes of different sizes at equal level, equivalent length is calculated as follows:

   Equivalent length = (Length of pipe in km) * (Nominal diameter in mm)

   For the purpose of assessing equivalent pipe length, all the pipe types / classes will be considered the same.

ANNEXURE – H_{8A}

RAW WATER PUMPS

S. No	On completion of item of work	Percentage payable	Cumulative percentage payable
1	i. On manufacturing, testing at factory and supply at site the pumping equipment	60%	60%
	ii. On installation of pumping equipment	10%	70%
2	i. On supply of valves, manifold, control panel, cables, gantry, and all other allied equipment	15%	85%
	ii. On installation of all above equipment	5%	90%
3	On testing and commissioning the pumping equipment	10%	100%

ANNEXURE – H_{8B}

CLEAR WATER PUMPS

S. No	On completion of item of work	Percentage payable	Cumulative percentage payable
1	i. On manufacturing, testing at factory and supply at site the pumping equipment	60%	60%
	ii. On installation of pumping equipment	10%	70%
2	i. On supply of valves, manifold, control panel, cables, gantry, and all other allied equipment	15%	85%
	ii. On installation of all above equipment	5%	90%
3	On testing and commissioning the pumping equipment	10 %	100%

ANNEXURE – H_9

33 KV/11 KV POWER LINE AND SUB STATION

S. No	On completion of item of work	Percentage payable	Cumulative percentage payable
1	i. On manufacturing, testing and supply at site the power cables, poles, wires, transformers, etc. all equipment	60%	60%
	ii. On installation of all above	20%	80%
2	On getting approval as per I.E. rules from Electrical Inspector	10%	90%
3	On testing and commissioning the electric sub station	10%	100%

Note:

1. The invoices for electrical line and transformers can be claimed on pro rata basis. The weightage shall be worked out on basis of transformer capacity / electrical line length.

ANNEXURE – H_{10}
Break up of schedule of payment for SCADA

S. No.	On completion of item of work	Percentage payable	Cumulative percentage payable
1.	On supply of required instruments	50%	50%
2.	On installation of required instruments	20%	70%
3.	On commissioning of instruments	20%	90%
4.	After trial run of the overall system	10%	100%

Note:

i. The component wise breakup will be as follows:

   a. Intake, WTP, Sumps & MBRs – 50%

   b. OHSRs – 50%

ii. Payment for SCADA component at OHSRs will be done on pro rata basis based on the number of OHSRs.

ANNEXURE – H_{11}

Break up of schedule of payment for the House Service Connection

S. No	On completion of item of work	Percentage payable	Cumulative percentage payable
1	On the completion of house service connection with fixing of tap.	65%	65%
2	Construction of Standpost and Platform as per detailed drawings.	15%	80%
3	After commissioning of HSC and temporary restoration i.e., proper refilling of the trench with excavated material and making surface level up to road / ground	20%	100%

Note:

1. The payment of house service connection will be made on pro rata basis based on the number of connection installed with respect to total connections.
2. Contractor is required to ensure 100% coverage of house service connections in the project area.
3. The number of house service connections may increase or decrease as per the actual demand in villages. The payment for actual number of house service connections will be calculated on pro rata basis.
4. Typical drawing of individual house hold service connection is enclosed as ANNEXURE E – GENERAL SPECIFICATIONS Clause 25.

ANNEXURE – H_{12}

Break up of schedule of payment for the Staff Quarters

S. No	On completion of item of work	Percentage payable	Cumulative percentage payable
1	On completion of foundation up to plinth beam level	20%	20%
2	On completion of Structures up to Roof Level	20%	40%
3	On completion of flooring and plastering works of the Structures	20%	60%
4	On completion of door windows, sanitary, electrical fittings, etc.	20%	80%
5	On completion of paintings, finishing and of balance entire works	20%	100%

NOTE: The value of pro rata share $\mathbf{H_{12}}$ is for all the staff quarters to be constructed in the scheme. For individual staff quarter weighted share can be worked out.

ANNEXURE – H_{13}

Break up of schedule of payment for the OPERATION & MAINTENANCE

S. No.	On completion of item of work	Percentage payable	Cumulative percentage payable
1	After three months of successful operation and maintenance of whole scheme after completion of trial run	25%	25%
2	After six months of successful operation and maintenance of whole scheme after completion of trial run	25%	50%
3	After nine months of successful operation and maintenance of whole scheme after completion of trial run	25%	75%
4	After one year of successful operation and maintenance of whole scheme after completion of trial run	25%	100%

NOTE:

a. The operation & maintenance period is 10 years from the date of completion of three months of trial run after successful commissioning of the project.

b. The cost of energy charges and consumable chemicals shall not be included in pro rata share. In case of partial commissioning and trial run of the system, cost of energy charges (excluding penalty) and consumable chemicals will be borne by MPJNM, subject to the proportion of treated water being supplied to consumers.

c. The value of H_{13} for subsequent years of O&M shall be assessed based on the methodology given in Annexure H.

d. If due to any reasons, whatsoever it is desired to supply water in some of the villages before final commissioning and trial run, then the pro-rata rates derived from the above table shall be applicable for the part payment on the basis of duration and quantity supplied, but the date of commissioning of whole work shall be applicable from the dates as stipulated in this contract.

APPENDIX I – VILLAGE LIST

PART A – TOTAL VILLAGES

Total Villages in the Scheme (including Bulk Supply Villages)

No	Name of Villages	Block	District	Population (2011 Census)
1	Ahmadpur	Bichhiya	Mandla	2,763
2	Amadongri	Bichhiya	Mandla	808
3	Anjaniya	Bichhiya	Mandla	5,444
4	Atariya	Bichhiya	Mandla	302
5	Aurai Mal.(Ourai Mal.)	Bichhiya	Mandla	251
6	Aurai Ryt.(Ourai Ryt.)	Bichhiya	Mandla	1,117
7	Baghraudi F.V	Bichhiya	Mandla	1,207
8	Bagli	Bichhiya	Mandla	537
9	Baheramal	Bichhiya	Mandla	469
10	Bamhani Ryt	Bichhiya	Mandla	741
11	Banji	Bichhiya	Mandla	877
12	Barbaspur	Bichhiya	Mandla	921
13	Bariha	Bichhiya	Mandla	1,031
14	Barkheda	Bichhiya	Mandla	365
15	Barkheda Ryt	Bichhiya	Mandla	1,230
16	Basaniya	Bichhiya	Mandla	801
17	Bhanpur Dodi	Bichhiya	Mandla	2,004
18	Bhapsa	Bichhiya	Mandla	658
19	Bhawa Jar	Bichhiya	Mandla	762
20	Bhawa Mal.	Bichhiya	Mandla	505
21	Bhawan	Bichhiya	Mandla	421
22	Bhima	Bichhiya	Mandla	1,284
23	Bhimpuri Ryt	Bichhiya	Mandla	654
24	Bhonda	Bichhiya	Mandla	634
25	Bijegaon	Bichhiya	Mandla	541
26	Birsa Mal	Bichhiya	Mandla	593
27	Bokar	Bichhiya	Mandla	2,057
28	Budhanwara	Bichhiya	Mandla	515
29	Budla	Bichhiya	Mandla	868
30	Bundelikhoh	Bichhiya	Mandla	76
31	Chandiya	Bichhiya	Mandla	708
32	Changariya	Bichhiya	Mandla	681
33	Chatuamal	Bichhiya	Mandla	526
34	Chhirpani Mal.	Bichhiya	Mandla	411

No	Name of Villages	Block	District	Population (2011 Census)
35	Chilphi	Bichhiya	Mandla	394
36	Chouranga	Bichhiya	Mandla	526
37	Chutti Pondi	Bichhiya	Mandla	243
38	Dadhi Ryt.	Bichhiya	Mandla	991
39	Daie	Bichhiya	Mandla	1,598
40	Danitola	Bichhiya	Mandla	2,575
41	Dariya Gondi	Bichhiya	Mandla	37
42	Devari Ryt	Bichhiya	Mandla	626
43	Dhamangaon	Bichhiya	Mandla	509
44	Dharampuri Mal	Bichhiya	Mandla	725
45	Dharampuri Ryt	Bichhiya	Mandla	118
46	Dhutka	Bichhiya	Mandla	477
47	Dilwara	Bichhiya	Mandla	233
48	Diwara	Bichhiya	Mandla	1,147
49	Dudhari	Bichhiya	Mandla	793
50	Dudka	Bichhiya	Mandla	676
51	Dungariya	Bichhiya	Mandla	431
52	Dungra Ryt	Bichhiya	Mandla	686
53	Fonk	Bichhiya	Mandla	1,617
54	Gadiya	Bichhiya	Mandla	351
55	Gangora	Bichhiya	Mandla	824
56	Ghatiya	Bichhiya	Mandla	599
57	Ghont	Bichhiya	Mandla	1,009
58	Gubari	Bichhiya	Mandla	374
59	Gudali	Bichhiya	Mandla	1,114
60	Gunehara	Bichhiya	Mandla	583
61	Gupangi	Bichhiya	Mandla	166
62	Gwaradongari	Bichhiya	Mandla	399
63	Harabhat	Bichhiya	Mandla	1,033
64	Harrabhat Jar	Bichhiya	Mandla	71
65	Harrabhat Mal.	Bichhiya	Mandla	719
66	Imaliya Mal.	Bichhiya	Mandla	845
67	Imaliya Ryt.	Bichhiya	Mandla	304
68	Jagnathar	Bichhiya	Mandla	1,054
69	Jailwara	Bichhiya	Mandla	561
70	Jamuniya	Bichhiya	Mandla	55
71	Jhigarghat	Bichhiya	Mandla	988
72	Jhulup	Bichhiya	Mandla	701

No	Name of Villages	Block	District	Population (2011 Census)
73	Jogi Sonda	Bichhiya	Mandla	388
74	Kakaiya	Bichhiya	Mandla	3,518
75	Kanhari Kalan	Bichhiya	Mandla	1,029
76	Kanhari Khurd	Bichhiya	Mandla	443
77	Kanskheda	Bichhiya	Mandla	929
78	Karanjiya Mal	Bichhiya	Mandla	1,161
79	Karanjiya Ryt	Bichhiya	Mandla	35
80	Kareli Ryt.	Bichhiya	Mandla	591
81	Kariyagaon	Bichhiya	Mandla	1,741
82	Kata Jar	Bichhiya	Mandla	1,030
83	Kata Mal.	Bichhiya	Mandla	875
84	Katanga Mal	Bichhiya	Mandla	166
85	Katanga Ryt	Bichhiya	Mandla	95
86	Katangi	Bichhiya	Mandla	516
87	Kewlari	Bichhiya	Mandla	450
88	Kewlari Ryt	Bichhiya	Mandla	846
89	Khalondi	Bichhiya	Mandla	1,328
90	Khamrauti	Bichhiya	Mandla	1,704
91	Khamtipur	Bichhiya	Mandla	624
92	Kharpariya	Bichhiya	Mandla	166
93	Kharrajhar	Bichhiya	Mandla	411
94	Khirhani	Bichhiya	Mandla	1,400
95	Kisali Ryt	Bichhiya	Mandla	780
96	Koko Ryt	Bichhiya	Mandla	1,065
97	Kosampani	Bichhiya	Mandla	895
98	Kudela	Bichhiya	Mandla	1,704
99	Kumhali Ryt.	Bichhiya	Mandla	1,500
100	Kumharra	Bichhiya	Mandla	232
101	Lafra	Bichhiya	Mandla	2,936
102	Lapti	Bichhiya	Mandla	1,533
103	Lohta	Bichhiya	Mandla	450
104	Lutiya	Bichhiya	Mandla	607
105	Madhopur	Bichhiya	Mandla	3,399
106	Majhipur	Bichhiya	Mandla	1,325
107	Mand	Bichhiya	Mandla	2,519
108	Manga	Bichhiya	Mandla	744
109	Mangaweli Mal	Bichhiya	Mandla	982
110	Mangaweli Ryt	Bichhiya	Mandla	292

No	Name of Villages	Block	District	Population (2011 Census)
111	Medhatal	Bichhiya	Mandla	730
112	Mohad	Bichhiya	Mandla	1,609
113	Mohgaon	Bichhiya	Mandla	320
114	Muhgaon (Mohgaon) Ryt.	Bichhiya	Mandla	904
115	Nakawal	Bichhiya	Mandla	1,478
116	Nara	Bichhiya	Mandla	955
117	Nareni Mal.	Bichhiya	Mandla	1,141
118	Narenijar	Bichhiya	Mandla	751
119	Nayagaon	Bichhiya	Mandla	831
120	Newsa	Bichhiya	Mandla	502
121	Newsamal	Bichhiya	Mandla	841
122	Orai	Bichhiya	Mandla	1,117
123	Padariya	Bichhiya	Mandla	1,380
124	Pondi	Bichhiya	Mandla	507
125	Rahgi	Bichhiya	Mandla	338
126	Rajo Mal	Bichhiya	Mandla	1,392
127	Rajo Ryt	Bichhiya	Mandla	162
128	Ramepur	Bichhiya	Mandla	324
129	Ramnagar	Bichhiya	Mandla	3,018
130	Ratanpur Ryt.	Bichhiya	Mandla	502
131	Rewtha	Bichhiya	Mandla	483
132	Samnapur	Bichhiya	Mandla	1,141
133	Sarasdoli Mal	Bichhiya	Mandla	653
134	Sarasdoli Ryt	Bichhiya	Mandla	117
135	Sarhi	Bichhiya	Mandla	665
136	Sijhora	Bichhiya	Mandla	3,293
137	Simariya Urf Rampur F.V.	Bichhiya	Mandla	725
138	Surehla	Bichhiya	Mandla	237
139	Taktauwa	Bichhiya	Mandla	470
140	Thonda	Bichhiya	Mandla	1,098
141	Tikariya	Bichhiya	Mandla	459
142	Umaria	Bichhiya	Mandla	759
143	Umarwara	Bichhiya	Mandla	919
144	Urdali Mal	Bichhiya	Mandla	386
145	Vishanpura Ryt.	Bichhiya	Mandla	309
146	Ahmadpur	Ghughari	Mandla	684
147	Airi (Aeri)	Ghughari	Mandla	528
148	Amjhar	Ghughari	Mandla	559

No	Name of Villages	Block	District	Population (2011 Census)
149	Andiya Alias Chhiwala Tola	Ghughari	Mandla	1,259
150	Andiya Mal.	Ghughari	Mandla	796
151	Andiya Ryt.	Ghughari	Mandla	784
152	Andiyadar Jar	Ghughari	Mandla	635
153	Bagli	Ghughari	Mandla	1,584
154	Bamhani	Ghughari	Mandla	1,780
155	Banehari	Ghughari	Mandla	1,808
156	Baniya	Ghughari	Mandla	1,264
157	Baniyatara	Ghughari	Mandla	797
158	Barwani	Ghughari	Mandla	1,067
159	Barwari	Ghughari	Mandla	134
160	Basaniya	Ghughari	Mandla	625
161	Bhainswahi	Ghughari	Mandla	1,641
162	Bhanpur	Ghughari	Mandla	474
163	Bhanpur Kalan	Ghughari	Mandla	543
164	Bhonkadeori	Ghughari	Mandla	690
165	Bhudkur	Ghughari	Mandla	1,334
166	Bijaura	Ghughari	Mandla	587
167	Bilai Khar (Bisandhar)	Ghughari	Mandla	510
168	Bilgaon	Ghughari	Mandla	1,758
169	Bilgaon	Ghughari	Mandla	514
170	Bilgarha Mal.	Ghughari	Mandla	764
171	Bilgarha Ryt.	Ghughari	Mandla	649
172	Binjhi	Ghughari	Mandla	503
173	Boda Silli Ryt.	Ghughari	Mandla	1,024
174	Chabi	Ghughari	Mandla	2,251
175	Chalni	Ghughari	Mandla	1,655
176	Chandwara	Ghughari	Mandla	1,542
177	Chauba	Ghughari	Mandla	1,614
178	Chaugaon Ryt.	Ghughari	Mandla	1,634
179	Chhata Mal.	Ghughari	Mandla	622
180	Chhatarpur	Ghughari	Mandla	1,871
181	Chhita Pakhana (Chitepakhana)	Ghughari	Mandla	335
182	Churiya	Ghughari	Mandla	1,234
183	Dadargaon	Ghughari	Mandla	615
184	Dalka Gopangi (Gupangi)	Ghughari	Mandla	1,018
185	Deogaon	Ghughari	Mandla	1,930
186	Deohara	Ghughari	Mandla	1,668

No	Name of Villages	Block	District	Population (2011 Census)
187	Deori	Ghughari	Mandla	862
188	Dhanauli	Ghughari	Mandla	644
189	Dhangaon	Ghughari	Mandla	830
190	Dhangaon-1	Ghughari	Mandla	691
191	Dhenko	Ghughari	Mandla	1,141
192	Dhobabor	Ghughari	Mandla	515
193	Dongar Mandla	Ghughari	Mandla	921
194	Dongargaon	Ghughari	Mandla	999
195	Duladar	Ghughari	Mandla	1,224
196	Dundadeh Ryt.	Ghughari	Mandla	984
197	Dundi	Ghughari	Mandla	900
198	Dupta	Ghughari	Mandla	576
199	Elahi	Ghughari	Mandla	715
200	Gajraj	Ghughari	Mandla	601
201	Ganwahi Alias Dhanwahi	Ghughari	Mandla	295
202	Garaiya Pand (Harriya Pand)	Ghughari	Mandla	1,106
203	Ghorewada Ryt.(Ghoreghat)	Ghughari	Mandla	719
204	Ghughari	Ghughari	Mandla	3,760
205	Ghurghuti F.V.	Ghughari	Mandla	411
206	Githar	Ghughari	Mandla	857
207	Githar Malpahri	Ghughari	Mandla	1,412
208	Gorakhpur	Ghughari	Mandla	833
209	Gorakhpur	Ghughari	Mandla	519
210	Guhdar	Ghughari	Mandla	392
211	Gullukhoh	Ghughari	Mandla	458
212	Guwara	Ghughari	Mandla	351
213	Harra Tikur	Ghughari	Mandla	1,106
214	Indra Mal.	Ghughari	Mandla	569
215	Indra Ryt.	Ghughari	Mandla	464
216	Ishwarpur	Ghughari	Mandla	750
217	Jarga F.V.	Ghughari	Mandla	293
218	Jhigar Ghata	Ghughari	Mandla	506
219	Jhina F.V.	Ghughari	Mandla	727
220	Jhunjhar Ryt.	Ghughari	Mandla	616
221	Jhurgi Ryt.	Ghughari	Mandla	1,077
222	Jogi Ludhiya	Ghughari	Mandla	780
223	Junwani	Ghughari	Mandla	1,121
224	Kachnari	Ghughari	Mandla	1,218

No	Name of Villages	Block	District	Population (2011 Census)
225	Kaknu	Ghughari	Mandla	699
226	Kanchangaon	Ghughari	Mandla	310
227	Kandra	Ghughari	Mandla	994
228	Karegaon	Ghughari	Mandla	1,206
229	Kasauta	Ghughari	Mandla	646
230	Katangi	Ghughari	Mandla	936
231	Kathaidih	Ghughari	Mandla	1,172
232	Kauwa Dongri	Ghughari	Mandla	1,014
233	Khairi Mal.	Ghughari	Mandla	1,274
234	Khairi Ryt.	Ghughari	Mandla	542
235	Khairi Ryt.	Ghughari	Mandla	341
236	Khajari	Ghughari	Mandla	1,641
237	Khalhe Githauri	Ghughari	Mandla	1,310
238	Khamhariya	Ghughari	Mandla	927
239	Khamhariya-1	Ghughari	Mandla	927
240	Khamtara	Ghughari	Mandla	757
241	Kharra Chhapar Mal.	Ghughari	Mandla	486
242	Kharra Chhapar Ryt.	Ghughari	Mandla	745
243	Khoda Khudra	Ghughari	Mandla	715
244	Khoda Khudra	Ghughari	Mandla	922
245	Khudia	Ghughari	Mandla	1,027
246	Kisli	Ghughari	Mandla	1,144
247	Kopariya F.V.	Ghughari	Mandla	504
248	Kudopani	Ghughari	Mandla	1,217
249	Kumharra	Ghughari	Mandla	689
250	Kumhi	Ghughari	Mandla	758
251	Kunti Dadargaon	Ghughari	Mandla	1,100
252	Kusmi	Ghughari	Mandla	804
253	Lafan	Ghughari	Mandla	988
254	Lato	Ghughari	Mandla	1,448
255	Lodha	Ghughari	Mandla	1,174
256	Ludhiya Alias Imlitola	Ghughari	Mandla	531
257	Machla	Ghughari	Mandla	1,148
258	Madanpur	Ghughari	Mandla	661
259	Mahli	Ghughari	Mandla	839
260	Malpahri	Ghughari	Mandla	600
261	Malwathar	Ghughari	Mandla	1,348
262	Manga	Ghughari	Mandla	987

No	Name of Villages	Block	District	Population (2011 Census)
263	Mirchakheda F.V.	Ghughari	Mandla	322
264	Mohgaon	Ghughari	Mandla	3,093
265	Mohgaon Ryt.	Ghughari	Mandla	1,021
266	Mungwani Ryt.	Ghughari	Mandla	2,393
267	Munu	Ghughari	Mandla	1,326
268	Naharbeli	Ghughari	Mandla	1,012
269	Naijher	Ghughari	Mandla	1,153
270	Nidhani	Ghughari	Mandla	912
271	Odhari	Ghughari	Mandla	1,037
272	Padariya Ryt.	Ghughari	Mandla	594
273	Paddikona	Ghughari	Mandla	737
274	Palehara	Ghughari	Mandla	1,173
275	Palki	Ghughari	Mandla	746
276	Panchhi Pani	Ghughari	Mandla	573
277	Pand Kalan	Ghughari	Mandla	1,128
278	Paraswah	Ghughari	Mandla	1,412
279	Patadei	Ghughari	Mandla	596
280	Patan	Ghughari	Mandla	1,866
281	Pipardarra	Ghughari	Mandla	1,003
282	Pipardaun	Ghughari	Mandla	1,118
283	Pipardhoun Alias Dukarghati	Ghughari	Mandla	789
284	Pipariya Kalan	Ghughari	Mandla	825
285	Pipariya Khurd	Ghughari	Mandla	776
286	Pipariya Ryt.	Ghughari	Mandla	1,167
287	Pondi	Ghughari	Mandla	441
288	Pondi Mal.	Ghughari	Mandla	1,405
289	Raigaon Jar	Ghughari	Mandla	651
290	Ramhepur	Ghughari	Mandla	824
291	Ramkhiriya Ryt.	Ghughari	Mandla	1,029
292	Rampuri	Ghughari	Mandla	544
293	Rehangi (Rihangi)	Ghughari	Mandla	797
294	Sahjar	Ghughari	Mandla	1,811
295	Sailwara	Ghughari	Mandla	1,114
296	Sakri	Ghughari	Mandla	345
297	Salheghori	Ghughari	Mandla	925
298	Saliwada	Ghughari	Mandla	859
299	Saliwada Mal.	Ghughari	Mandla	304
300	Saliwada Ryt.	Ghughari	Mandla	297

No	Name of Villages	Block	District	Population (2011 Census)
301	Salwah	Ghughari	Mandla	1,873
302	Sendwara	Ghughari	Mandla	432
303	Silghiti	Ghughari	Mandla	540
304	Simaiya F.V.	Ghughari	Mandla	230
305	Simariya	Ghughari	Mandla	489
306	Singanpuri	Ghughari	Mandla	595
307	Singarpur	Ghughari	Mandla	1,723
308	Sudgaon	Ghughari	Mandla	1,745
309	Suntikri	Ghughari	Mandla	477
310	Surehali(Surhali)	Ghughari	Mandla	1,969
311	Tabalpani	Ghughari	Mandla	1,661
312	Telandeh	Ghughari	Mandla	730
313	Thebha	Ghughari	Mandla	1,743
314	Tikariya	Ghughari	Mandla	1,186
315	Umardih	Ghughari	Mandla	1,065
316	Umariya	Ghughari	Mandla	1,131
317	Umariya Ryt.	Ghughari	Mandla	1,453
318	Urwahi	Ghughari	Mandla	593
319	Amgawan	Mandla	Mandla	910
320	Bakchhera Gondi	Mandla	Mandla	647
321	Bakora	Mandla	Mandla	420
322	Bakori	Mandla	Mandla	1,537
323	Bargawan	Mandla	Mandla	729
324	Bhapsa	Mandla	Mandla	2,565
325	Dalka Berpani F.V.	Mandla	Mandla	242
326	Deogaon	Mandla	Mandla	1,687
327	Dhangaon Ryt.	Mandla	Mandla	247
328	Dhauranala	Mandla	Mandla	1,133
329	Dungariya F.V.	Mandla	Mandla	284
330	Ghughra	Mandla	Mandla	992
331	Gonjhi Mal.	Mandla	Mandla	1,170
332	Gonjhi Ryt.	Mandla	Mandla	177
333	Guda Anjaniya	Mandla	Mandla	969
334	Gurarkheda	Mandla	Mandla	1,058
335	Harduwa	Mandla	Mandla	636
336	Hirdenagar	Mandla	Mandla	3,277
337	Jamkhar	Mandla	Mandla	37
338	Jhalpani	Mandla	Mandla	343

No	Name of Villages	Block	District	Population (2011 Census)
339	Jhalpani F.V.	Mandla	Mandla	273
340	Jujhari Mal.	Mandla	Mandla	572
341	Kanhari	Mandla	Mandla	880
342	Khaddeora	Mandla	Mandla	1,086
343	Khaddeori	Mandla	Mandla	335
344	Khaguwa	Mandla	Mandla	615
345	Khairi	Mandla	Mandla	618
346	Khairi	Mandla	Mandla	497
347	Khairi Mal.	Mandla	Mandla	459
348	Khalwara	Mandla	Mandla	335
349	Khalwara F.V.	Mandla	Mandla	353
350	Khari	Mandla	Mandla	899
351	Khuksar	Mandla	Mandla	791
352	Korgaon	Mandla	Mandla	1,671
353	Kosam Ghat	Mandla	Mandla	987
354	Kosamdongri	Mandla	Mandla	364
355	Kudwan	Mandla	Mandla	608
356	Lawar Mal.	Mandla	Mandla	686
357	Lawar Ryt.	Mandla	Mandla	44
358	Linga Mal.	Mandla	Mandla	1,362
359	Linga Ryt.	Mandla	Mandla	1,049
360	Madhapuri	Mandla	Mandla	2,276
361	Manot Jar	Mandla	Mandla	489
362	Mohgaon Chak	Mandla	Mandla	602
363	Mohgaon Ryt.	Mandla	Mandla	355
364	Mudadih Mal.	Mandla	Mandla	672
365	Mudadih Ryt.	Mandla	Mandla	243
366	Muhgaon (Mohgaon)	Mandla	Mandla	1,502
367	Mungli	Mandla	Mandla	824
368	Murram Khap	Mandla	Mandla	554
369	Murram Khap	Mandla	Mandla	329
370	Nayegaon	Mandla	Mandla	78
371	Newargaon (Niwargaon)	Mandla	Mandla	873
372	Oghat Khapri	Mandla	Mandla	1,073
373	Padmi	Mandla	Mandla	2,029
374	Patpara Mal.	Mandla	Mandla	273
375	Patpara Ryt.	Mandla	Mandla	560
376	Patpara Singarpur	Mandla	Mandla	672

No	Name of Villages	Block	District	Population (2011 Census)
377	Piparpani	Mandla	Mandla	1,249
378	Purwa	Mandla	Mandla	1,493
379	Rambag	Mandla	Mandla	1,243
380	Sakwah Khurd	Mandla	Mandla	1,524
381	Salaiya	Mandla	Mandla	679
382	Semarkhapa	Mandla	Mandla	536
383	Silgi	Mandla	Mandla	2,869
384	Silpuri	Mandla	Mandla	637
385	Silpuri Alias Chhapri Ryt.	Mandla	Mandla	723
386	Simariya Mal.	Mandla	Mandla	751
387	Singarpur	Mandla	Mandla	744
388	Suktara	Mandla	Mandla	639
389	Surajpura	Mandla	Mandla	720
390	Tikra Berpani	Mandla	Mandla	374
391	Tilaipani	Mandla	Mandla	685
392	Umardih	Mandla	Mandla	453
393	Umariya	Mandla	Mandla	836
394	Amagahan	Mawai	Mandla	167
395	Anjani Mal	Mawai	Mandla	1,324
396	Anjani Ryt	Mawai	Mandla	472
397	Aurai	Mawai	Mandla	569
398	Baghandi	Mawai	Mandla	336
399	Barrai	Mawai	Mandla	626
400	Bhada	Mawai	Mandla	875
401	Bhagdu	Mawai	Mandla	330
402	Bharki Ryt	Mawai	Mandla	752
403	Bharli	Mawai	Mandla	865
404	Bija	Mawai	Mandla	1,180
405	Bija Tola	Mawai	Mandla	732
406	Chandwara Mal	Mawai	Mandla	204
407	Chandwara Ryt	Mawai	Mandla	717
408	Chhapartala	Mawai	Mandla	1,023
409	Devri Dadar	Mawai	Mandla	702
410	Dhangaon	Mawai	Mandla	435
411	Duba	Mawai	Mandla	222
412	Gaitra	Mawai	Mandla	578
413	Ghota Ryt	Mawai	Mandla	1,013
414	Ghutas	Mawai	Mandla	1,526

No	Name of Villages	Block	District	Population (2011 Census)
415	Gopisani	Mawai	Mandla	353
416	Gorakhpur	Mawai	Mandla	649
417	Harratola	Mawai	Mandla	1,014
418	Karela Ryt	Mawai	Mandla	652
419	Katigahan	Mawai	Mandla	453
420	Kavlari Ryt	Mawai	Mandla	421
421	Kevlari Kalan	Mawai	Mandla	1,172
422	Kevlari Khurd	Mawai	Mandla	470
423	Khairi	Mawai	Mandla	392
424	Khamariya	Mawai	Mandla	771
425	Khamariya Ryt	Mawai	Mandla	486
426	Kolamgahan Ryt	Mawai	Mandla	1,013
427	Kumha	Mawai	Mandla	776
428	Kutarwani	Mawai	Mandla	892
429	Mainpuri	Mawai	Mandla	727
430	Mohgaon	Mawai	Mandla	1,083
431	Mohgaon	Mawai	Mandla	354
432	Mudiya Richka	Mawai	Mandla	1,056
433	Nandram	Mawai	Mandla	1,024
434	Nayagaon Mal	Mawai	Mandla	542
435	Nayagaon Ryt	Mawai	Mandla	304
436	Parsatola	Mawai	Mandla	1,725
437	Patpara	Mawai	Mandla	478
438	Piparimal	Mawai	Mandla	810
439	Pipri Ryt	Mawai	Mandla	1,021
440	Richkakalan	Mawai	Mandla	421
441	Rusha	Mawai	Mandla	851
442	Sakwa	Mawai	Mandla	1,025
443	Shahajpuri	Mawai	Mandla	939
444	Shermi	Mawai	Mandla	543
445	Sighouri	Mawai	Mandla	535
446	Tikariya	Mawai	Mandla	858
	Total			**3,98,911**

Note:

i. ‘Total Villages’ means villages covered under Appendix-I Part A, which form the periphery of the scheme coverage area. They include both Household Supply Villages and Bulk Supply Villages.

ii. Contractor should get the village wise present population and projected population from General Manager, PIU before designing the OHT and distribution system. There may be some change in present population individually in villages. But the overall capacity of following components of scheme should be kept constant i.e. as mentioned in NIT.

1. Intake Well
2. Water Treatment Plant

PART B – BULK SUPPLY VILLAGES

Bulk Supply Villages in the Scheme

No.	Name of Villages	Block	District
1	Ahmadpur	Bichhiya	Mandla
2	Aurai Ryt.(Ourai Ryt.)	Bichhiya	Mandla
3	Chouranga	Bichhiya	Mandla
4	Daie	Bichhiya	Mandla
5	Dilwara	Bichhiya	Mandla
6	Imaliya Ryt.	Bichhiya	Mandla
7	Jhigarghat	Bichhiya	Mandla
8	Khalaudi Ryt.	Bichhiya	Mandla
9	Sarasdoli Ryt	Bichhiya	Mandla
10	Anjaniya	Bichhiya	Mandla
11	Bagharaudi F.v>	Bichhiya	Mandla
12	Bamhani Ryt	Bichhiya	Mandla
13	Banji	Bichhiya	Mandla
14	Bariha	Bichhiya	Mandla
15	Barkheda	Bichhiya	Mandla
16	Basaniya	Bichhiya	Mandla
17	Bhapsa	Bichhiya	Mandla
18	Bhawa Jar	Bichhiya	Mandla
19	Bhawan	Bichhiya	Mandla
20	Bhima	Bichhiya	Mandla
21	Bhonda	Bichhiya	Mandla
22	Bokar	Bichhiya	Mandla
23	Chutti Pondi	Bichhiya	Mandla
24	Dhamangaon	Bichhiya	Mandla
25	Dharampuri Mal	Bichhiya	Mandla
26	Dharampuri Ryt.	Bichhiya	Mandla
27	Dhutka	Bichhiya	Mandla
28	Diwara	Bichhiya	Mandla
29	Dudka	Bichhiya	Mandla
30	Dungra Ryt	Bichhiya	Mandla
31	Fonk	Bichhiya	Mandla
32	Gadiya	Bichhiya	Mandla
33	Ghont	Bichhiya	Mandla
34	Gubri	Bichhiya	Mandla
35	Gudali	Bichhiya	Mandla
36	Gupangi	Bichhiya	Mandla
37	Harrabhat Mal.	Bichhiya	Mandla
38	Imaliya Mal.	Bichhiya	Mandla
39	Jagnathar	Bichhiya	Mandla

No.	Name of Villages	Block	District
40	Kakaiya	Bichhiya	Mandla
41	Kanhari kalan	Bichhiya	Mandla
42	Kanskheda	Bichhiya	Mandla
43	Karanjiya Mal	Bichhiya	Mandla
44	Kariyagaon	Bichhiya	Mandla
45	Kata Jar	Bichhiya	Mandla
46	Katanga Mal	Bichhiya	Mandla
47	Katanga Ryt	Bichhiya	Mandla
48	Kewlari	Bichhiya	Mandla
49	Khamrauti	Bichhiya	Mandla
50	Khamtipur	Bichhiya	Mandla
51	Kharpariya	Bichhiya	Mandla
52	Kharrajhar	Bichhiya	Mandla
53	Khirahani	Bichhiya	Mandla
54	Koko Ryt	Bichhiya	Mandla
55	Kudela	Bichhiya	Mandla
56	Kumharra	Bichhiya	Mandla
57	Lafra	Bichhiya	Mandla
58	Lutiya	Bichhiya	Mandla
59	Madhopur	Bichhiya	Mandla
60	Mand	Bichhiya	Mandla
61	Manga	Bichhiya	Mandla
62	Mangaveli Mal.	Bichhiya	Mandla
63	Medhatal	Bichhiya	Mandla
64	Mohad	Bichhiya	Mandla
65	Mohgaon	Bichhiya	Mandla
66	Nakawal	Bichhiya	Mandla
67	Nara	Bichhiya	Mandla
68	Nareni Mal.	Bichhiya	Mandla
69	Newsa	Bichhiya	Mandla
70	Newsamal	Bichhiya	Mandla
71	Padariya	Bichhiya	Mandla
72	Patpara	Bichhiya	Mandla
73	Pondi	Bichhiya	Mandla
74	Rajo Mal	Bichhiya	Mandla
75	Ramhepur	Bichhiya	Mandla
76	Ramnagar	Bichhiya	Mandla
77	Rewtha	Bichhiya	Mandla
78	Sijhora	Bichhiya	Mandla
79	Thonda	Bichhiya	Mandla
80	Umarwada	Bichhiya	Mandla
81	Urdali Mal	Bichhiya	Mandla

No.	Name of Villages	Block	District
82	Dhangaon	Ghughri	Mandla
83	Garaiya Pand	Ghughri	Mandla
84	Tikariya	Ghughri	Mandla
85	Airi (Aeri)	Ghughri	Mandla
86	Bamhani	Ghughri	Mandla
87	Banehari	Ghughri	Mandla
88	Baniya	Ghughri	Mandla
89	Barwani	Ghughri	Mandla
90	Bhainswahi	Ghughri	Mandla
91	Bhanpur	Ghughri	Mandla
92	Bhudkur	Ghughri	Mandla
93	Bijaura	Ghughri	Mandla
94	Bilai Khar (Bisandhar)	Ghughri	Mandla
95	Chalni	Ghughri	Mandla
96	Chhatarpur	Ghughri	Mandla
97	Chhita Pakhana (chitepa	Ghughri	Mandla
98	Binjhi	Mandla	Mandla
99	Dungariya	Mandla	Mandla
100	Harduwa	Mandla	Mandla
101	Jarga F.V.	Mandla	Mandla
102	Khairi	Mandla	Mandla
103	Ludhiya	Mandla	Mandla
104	Rambag	Mandla	Mandla
105	Silpuri	Mandla	Mandla
106	Simaiya F.V.	Mandla	Mandla
107	Suktara	Mandla	Mandla
108	Bakchhera Gondi	Mandla	Mandla
109	Bakori	Mandla	Mandla
110	Bargawan	Mandla	Mandla
111	Bhapsa	Mandla	Mandla
112	Deogaon	Mandla	Mandla
113	Dhauranala	Mandla	Mandla
114	Gonjhi Mal.	Mandla	Mandla
115	Gonjhi Ryt.	Mandla	Mandla
116	Guda Anjaniya	Mandla	Mandla
117	Hirdenagar	Mandla	Mandla
118	Jhalpani	Mandla	Mandla
119	Jujhari Mal.	Mandla	Mandla
120	Khaguwa	Mandla	Mandla
121	Lawar Mal.	Mandla	Mandla
122	LINGA MAL.	Mandla	Mandla
123	Linga Ryt.	Mandla	Mandla

No.	Name of Villages	Block	District
124	Madhapuri	Mandla	Mandla
125	Manot Jar	Mandla	Mandla
126	Mohgaon Chak	Mandla	Mandla
127	Mohgaon Ryt.	Mandla	Mandla
128	Mudadih Mal.	Mandla	Mandla
129	MUDADIH RYT.	Mandla	Mandla
130	Mungli	Mandla	Mandla
131	murram Khap	Mandla	Mandla
132	Oghat Khapri	Mandla	Mandla
133	Padmi	Mandla	Mandla
134	Patpara Singarpur	Mandla	Mandla
135	Piparpani	Mandla	Mandla
136	Purwa	Mandla	Mandla
137	Sakwah Khurd	Mandla	Mandla
138	Semarkhapa	Mandla	Mandla
139	Silgi	Mandla	Mandla
140	Singarpur	Mandla	Mandla
141	Tikariya	Mandla	Mandla
142	Bijatola	Mawai	Mandla
143	Dhangaon	Mawai	Mandla
144	Rahgi	Mawai	Mandla
145	Saliwada Ryt.	Mawai	Mandla
146	Barrai Ryt.	Mawai	Mandla
147	Bhanpur Dadi	Mawai	Mandla
148	Bija	Mawai	Mandla
149	Chandwara Mal.	Mawai	Mandla
150	Chhapartala	Mawai	Mandla
151	Dadhi Ryt.	Mawai	Mandla
152	Dhangaon Ryt.	Mawai	Mandla
153	Duba	Mawai	Mandla
154	Ghonta Ryt.	Mawai	Mandla
155	Ghutas	Mawai	Mandla
156	Gorakhpur	Mawai	Mandla
157	Harratola	Mawai	Mandla
158	Kewlari Kalan	Mawai	Mandla
159	Kolamgahan Ryt	Mawai	Mandla
160	Kutarwani	Mawai	Mandla
161	Mainpuri	Mawai	Mandla
162	Nandram Ryt.	Mawai	Mandla
163	Parsatola Alias Bhagdoo	Mawai	Mandla
164	Khairi Ryt.	Mohgaon	Mandla
165	Khamhariya	Mohgaon	Mandla

No.	Name of Villages	Block	District
166	Kumha	Mohgaon	Mandla
167	Amjhar	Mohgaon	Mandla
168	Andiya Mal.	Mohgaon	Mandla
169	Andiya Ryt.	Mohgaon	Mandla
170	Andiyadar Jar	Mohgaon	Mandla
171	Bagli	Mohgaon	Mandla
172	Bhanpur Kalan	Mohgaon	Mandla
173	Boda Silli Ryt.	Mohgaon	Mandla
174	Chabi	Mohgaon	Mandla
175	Chaugaon Ryt.	Mohgaon	Mandla
176	Ishwarpur	Nainpur	Mandla
177	Khamhariya-1	Nainpur	Mandla

Note:

i. 'Bulk Supply Villages' means villages covered under Appendix-I Part B, where the contractor needs to supply water in bulk at village inlet (sump / OHT) and does not cover the scope of survey, investigation, design, implementation of in-village infrastructure. Construction of sump / OHT and Operation and Maintenance of in-village infrastructure at village inlet is not in the scope of this contract.

ii. The Contractor will not be required to execute the in-village inftastruture for above villages i.e., service reservoir, distribution network & FHTCs.

iii. The Contractor will be required to design the system considering the water demand, location, elevation & full supply level (FSL) of the service reservoir of Bulk Supply Villages mentioned in Part B of Appendix I, i.e., pumps, MBR & clear water feeder (pumping / gravity) mains to ensure that the service reservoirs are filled as per the requirement.

iv. The list of Bulk Supply Villages will be confirmed prior to confirmatory survey by GM, PIU and EE, PHED.

v. Contractor shall design the system to meet the demand for the aforementioned bulk supply villages. Treated bulk water is to be supplied up to the periphery of the villages at a suitable location to be confirmed by General Manager, PIU before designing the treated water mains.