

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



TENDER DOCUMENTON
FORM- 'F' FOR
LUMP- SUM CONTRACT
FOR

Engineering, procurement, construction, testing, commissioning, trial run and operation & maintenance of various components of "MOHANPURA MULTI VILLAGE RURAL WATER SUPPLY SCHEME, DISTT. RAJGARH" for ultimate capacity of bringing 26.15 mld treated water (23 hours of pumping) from the Dam on river Newaj to 400 villages of Rajgarh, Khilchipur & Biaora Blocks of Rajgarh District in Single Package on 'Turn-key job basis' including trial run and running & maintenance of the entire scheme for 10 years. (Cost of running & maintenance shall be paid separately)

NIT No. 25/PROC/NDB/MPJNM/2018-19, Dated: 17/05/2018

Probable Amount of Contract: INR 25409.70 Lac

Earnest Money Deposit: INR 50.00 Lac

Date of Pre-Bid Meeting: 01/06/2018

MANAGING DIRECTOR
MADHYAPRADESH JAL NIGAM MARYADIT
2nd FLOOR, D-WING, VINDHYACHAL BHAWAN
BHOPAL-462004 (M.P)

MADHYA PRADESH JAL NIGAM MARYADIT
(A GOVT. OF M.P. UNDERTAKING)
OFFICE OF THE MANAGING DIRECTOR
M.P. JAL NIGAM MARYADIT, BHOPAL
TENDER DOCUMENT
FOR LUMP-SUM CONTRACT

1.	N.I.T. No. and Date:	:	NIT No. 25/PROC/NDB/MPJNM/2018-19, Dated: 17/12/2017
2.	Tender Invited from:	:	A/Firms of repute/Joint Venture of firms
3.	Due date of tender:	:	As per key dates
4.	Name of Work:	:	Engineering, procurement, construction, testing, commissioning, trial run and operation & maintenance of various components of "MOHANPURA MULTI VILLAGE RURAL WATER SUPPLY SCHEME, DISTT. RAJGARH" for ultimate capacity of bringing 26.15 mld treated water (23 hours of pumping) from the Dam on river Newaj to 400 villages of Rajgarh, Khilchipur & Biaora Blocks of Rajgarh District in Single Package on 'Turn-key job basis' including trial run and running & maintenance of the entire scheme for 10 years. (Cost of running & maintenance shall be paid separately)
5.	Probable Amount of Contract		INR 25409.70 lacs
6.	Amount of Earnest Money		INR 50.00 lacs
7.	Cost of Tender Document	:	INR 50000/-
8.	Time allowed for completion order	:	24 months (including rainy season) from the 21 st day from date of LOA
9.	Name of contractor	:	M/s
10.	Agreement Number and Date	:	No. Date

Managing Director

**MADHYA PRADESH JAL NIGAM MARYADIT
(A GOVT. OF M.P. UNDERTAKING)
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PART – I

Essential and Nonnegotiable Instructions for the Tenderers

1. No conditional tender shall be accepted under any circumstances whatsoever.
2. Price escalation shall be payable as per formula given in this Notice Inviting Tender (*hereinafter*, NIT).
3. The tenderers shall ensure that their tenders are in conformity with the conditions and clauses of this N.I.T. 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's & water tightness, tests, structure stability etc. for entire Civil works in particular.
4. This tender is on turnkey job basis, hence no advance payment towards the mechanical & electrical equipment's, items will be considered and no advance mobilization will be allowed for any purpose.
5. 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 N. I. T.
6. The tenderer/contractor shall get the gradient/ reduced levels verified on his own at his own expenditure and responsibility. The Madhya Pradesh Jal Nigam Maryadit (*hereinafter*, MPJNM) shall not be responsible for any variations in reduced levels. The tenderer/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 this periphery.
7. No payment shall be made on submission of drawing and design for civil work and general arrangement drawing for mechanical and electrical equipments. All the processes, drawings and designs shall be duly checked and verified by any Indian Institute of Technology (IIT)/National Institute of Technology (NIT). Contractor shall start work only after due approval, of their designs and drawings, by the competent authority.
8. Tenderers shall keep their offer open for acceptance for a period as prescribed in this N.I.T. i.e. 180 days from the date of opening of financial bid. The validity of the bid can be extended by mutual consent in writing.
9. As a matter of abundant caution, the tenderers are advised to carefully read the tender document, review the DPR in the Employer's office or through CD and visit the site

before submitting the tender.

10. 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.
11. Variations will be permitted only in length and size of pipeline and electrical line. Valuation for **Addition/Deductions** in sizes and lengths of pipelines shall be made as per ISSR Volume 1 to 4 published by Urban Administrative and Development Department, Govt. of M.P. enforced from 10th May 2012 with amendments up to the date of bid submission. **The valves and specials in pipeline will not be paid/deducted separately instead they will be measured in length of pipeline.** The **Addition/Deductions** in capacity and lengths of electrical power lines shall be made as per MPKVVCL SOR 2016 with amendments up to the date of bid submission. 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. The decision of Managing Director shall be final.
12. The tenderers, who are not registered with centralized system of registration in Govt. of M.P. Public Works Department, will have to get themselves registered therewith, before the drawl of the agreement, if their tender is accepted. In case of Joint Venture or Consortium of Firms, this condition shall be applicable to the Lead Partner only. JV shall be as per Annexure-I of this NIT.
13. The tenderer shall calculate and online submit in **Envelope - B** his **Bid Capacity** as given in **Schedule- G** of Pre - qualification documents. The financial bids shall be opened in the descending order according to PAC of the bids due for opening on the scheduled date. The financial offer of the bidder shall not be opened, whose bid capacity is exhausted or is lower than the probable amount of contract given in the NIT.
14. **(a)** A Variations Approval Committee consisting of the following members of the Madhya Pradesh Jal Nigam Maryadit shall finalize the variations in technical and financial matters, under this contract: -

i.	Project Director	Chairman
ii.	Chief General Manager	Member
iii.	Chief Finance Officer	Member

iv.	General Manager D&M	Member
v.	General Manager Procurement	Member Secretary

On the recommendation of above- mentioned committee, the variation up to 10% of total cost may be approved by Managing Director (MD) and above 10% variations may be approved by TAC (Tender Approval Committee).

(b) Madhya Pradesh Jal Nigam Maryadit may appoint the Supervision and Quality Control Consultant and authorize the Consultant to act as Engineer-in-Charge representative.

15.0 Most Important - The tenderer shall give energy efficient electrical equipments, because the tenders shall be evaluated with respect to the capitalized cost of energy charges as per Para 26 and Table -1 under Chapter 1.7. Accordingly, Table -1 under Chapter 1.7 shall be submitted by the Tenderer in Envelop B. Tendered cost of each bidder shall be evaluated according to Para 9 – Bid Evaluation in Part – III Detailed Notice Inviting Tender.

16. **Definitions.** -In this NIT, the following words shall mean–

- (a) BIS means Bureau of Indian Standard.
- (b) Completion means completion of the work, as certified by the Engineer-in-Charge, in accordance with the provisions of the agreement.
- (c) 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.
- (d) Contract Data means all the documents and other information which forms part of the Contract or are annexed to the NIT and contract.
- (e) Contractor: means a person or legal entity whose bid to carry out the work has been accepted by the Employer.
- (f) Contractor's bid: means the completed bid document submitted by the Contractor to the Employer.
- (g) Contract amount: means the amount of contract worked out in Indian Rupees Only (INR) on the basis of accepted bid.
- (h) 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.

- (i) Day: means the calendar day.
- (j) Defect: means any part of the work not completed in accordance with the specification included in the contract.
- (k) Deputy Manager: means Deputy Manager of Madhya Pradesh Jal Nigam Maryadit of concerned PIU.
- (l) Drawings: means duly approved drawings including calculation and other information provided and approved by the Engineer-in-Charge.
- (m) Employer: means the party as defined in the Contract Data, who employs the Contractor to carry out the work. The Employer may delegate any or all functions to a person of body nominated by him for specified function. The word Employer/ Government/ Department wherever used denote the Employer.
- (n) Engineer: means the person named in the Contract Data.
- (o) Engineer in charge: means the person named in the Contract Data.
- (p) Equipment: means the Contractor's machinery and vehicles brought temporarily to the site for execution of work.
- (q) KYC: means fulfilling criteria under Know Your Client.
- (r) GM: means General Manager of Madhya Pradesh Jal Nigam Maryadit of concerned PIU.
- (s) Government: means Government of Madhya Pradesh.
- (t) In Writing: means communicated in written form, signed by the authorized signatory, and delivered against receipt.
- (u) Material: means all supplies, including consumables, used by the Contractor for incorporation in the work.
- (v) MD: means Managing Director of Madhya Pradesh Jal Nigam Maryadit.
- (w) Manager: means Manager of Madhya Pradesh Jal Nigam Maryadit of concerned PIU.
- (x) NIT: means Notice Inviting Tender
- (y) PIU: means Project Implementation Unit of Madhya Pradesh Jal Nigam Maryadit of the area, under whose jurisdiction the work falls.
- (z) Stipulated date of completion: means the date on which the contractor is required to complete the work. The stipulated date is specified in the Contract Data.
- (aa) Specification: means the specification of the work included in the contract and any modification of addition made or approved by the Engineer-in-Charge.

- (bb) Start Date: means the date specified in the Letter of Intent/Work Order after the signing of agreement for the work.
- (cc) 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.
- (dd) Substantial Completion: means the completion of substantial works given in the scope of works and start of water supply in all the villages and only minor works such as painting, boundary wall are not fully complete.
- (ee) Temporary Work: means work designed, constructed, installed, and removed by the contractor that are needed for construction of installation of the work.
- (ff) Tender/Bid, Tenderer/Bidder: are the synonyms and carry the same meaning wherever used.
- (gg) Variation: means any variation in the work as approved by the competent authority under this contract.
- (hh) Work: means the work by virtue of contract, contracted to be executed, whether temporary or permanent and whether original, altered, substituted or additional.
17. Amendments to NIT, if any, shall be published on web site only and not in the newspapers.
18. Site Visit and examination of works:
The bidder shall visit and inspect the Site of Works and its surroundings and obtain for itself on its own responsibility all information that may be necessary for preparing the bid and entering into the contract All costs in this respect shall have to be borne by the bidder.
19. Land Acquisition,
The contractor shall not be responsible for any acquisition of land, which shall be done by Madhya Pradesh Jal Nigam Maryadit. However, the responsibility of taking the permission to lay pipeline along the road, shall be that of the contractor. Madhya Pradesh Jal Nigam Maryadit shall assist the contractor on receipt of such request, by issuing such letters, if so desired by the contractor.
20. All railway crossings, canal crossings, national high way crossings and state highway crossings shall be done with trench less technology by the Contractor and all related cost of work shall be borne by the contractor.
21. All protection work like plinth protection, slope protection etc. for stability of structure

as per site condition must be done by the contractor.

22. Pre-Bid Meeting:

The pre-bid meeting shall be held on the date and time as given in key dates, in the MPJNM office Bhopal.

- i. Any change in the schedule of pre-bid meeting will be communicated on the website only, and no intimation to bidders will be given separately.
- ii. 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.
- iii. 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.
- iv. All bidders are requested to visit the site and understand the scheme prior to pre-bid meeting.

23. 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.

**Managing Director
Madhya Pradesh Jal Nigam Maryadit,
Vindhyachal Bhawan, Bhopal**

PART II (SUMMARY OF PART III)

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

**OFFICE OF THE
MANAGING DIRECTOR
M.P. JAL NIGAM MARYADIT,
BHOPAL**

NOTICE INVITING TENDER

Online digitally sealed tenders are invited on behalf of Madhya Pradesh Jal Nigam Maryadit for the following work on "TURN KEY JOB BASIS" in Form - F for lump sum contract in the office of undersigned within the time mentioned in the key dates from the contractors, who are registered with the Centralized Registration System of Public Works Department, Govt. of Madhya Pradesh or any other State / Central Govt. department registered in equal capacity or firms of repute or Joint Venture of Firms, 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 a versa*.

The bidders registered with other departments of Govt. of M.P./Central Government or firms of repute or Joint Venture of Firms are also eligible to participate in tenders processed by Madhya Pradesh Jal Nigam Maryadit. The bidders intending to participate in this tender are required to get enrolled/ registered on the e procurement web site <https://www.mpeproc.gov.in> and the bidder would be required to have valid registration at the time of signing the agreement.

Name of the Work	Probable amount of contract (INR in Lacs)	Earnest Money (INR in Lacs)	Cost of tender document (in INR)	Time allowed for completion
Engineering, procurement, construction, testing, commissioning, trial run and operation & maintenance of various components of "MOHANPURA MULTI VILLAGE RURAL WATER SUPPLY SCHEME, DISTT. RAJGARH" for ultimate capacity of bringing 26.15 mld treated water (23 hours of pumping) from the Dam on river Newaj to 400 villages of Rajgarh, Khilchipur & Biaora Blocks of Rajgarh District in Single Package on 'Turn-key job basis' including trial run and running & maintenance of the entire scheme for 10 years. (Cost of running & maintenance shall be paid separately)	25409.70	50.00	50000.00	24 months including rainy season

1. GENERAL

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

Lump Sum tender shall be inclusive of all the items of works. The brief details are as under –

S. No.	Main Works
1.1	Construction of minimum 7.0 m diameter and 55.00 m deep R.C.C Intake well, 33.35 Million liter of capacity in 23 hours flow & 7.0 m dia & 6 m High Pump house including provision for automation and construction of R.C.C Approach Bridge minimum 3.5 m wide.
1.2	Raw water pumping main of 600 mm internal dia. DI K-9 with in-lining and out-coating of length 4100 m as per IS 8329 i/c flow meters, valves, sluice valves, air valves, scour valves, valve chambers, thrust blocks, crossings, specials & accessories etc. complete.
1.3	Water treatment plant to provide 26.15 million liter treated clear water in 23 hours i/c automation, with clear water sump having a storage capacity of 2 hours and pump house of suitable size complete near Village Rampuria, District Rajgarh i/c automation, construction of boundary wall, internal roads, approach road etc. complete.
1.4	Providing, laying & jointing of Clear water pumping main DI class K-9 pipe with in-lining and out-coating as per IS 8329 i/c flow meters, valves, sluice valves, air valves, scour valves, valve chambers, thrust blocks, crossings, specials & accessories etc. complete. 250 mm to 600 mm internal dia. of length 113.00 Km as detailed below: a. 250 mm dia DI Class K9 - 42000 m b. 300 mm dia DI Class K9 - 24173 m c. 350 mm dia DI Class K9 - 35827 m d. 400 mm dia DI Class K9 - 293 m e. 450 mm dia DI Class K9 - 3000 m f. 500 mm dia DI Class K9 - 7500 m g. 600 mm dia DI Class K9 - 209 m
1.5	Providing, laying & jointing of Clear water feeder/gravity main, DI class K-7 and K-9 pipe as per IS 8329 i/c flow meters, valves, sluice valves, air valves, scour valves, valve chambers, thrust block, crossings (rail and road), specials & accessories etc. complete. 100 to 400 mm internal dia of length 414.43 Km as detailed below: a. 100 mm dia DI Class K9 - 21200 m b. 150 mm dia DI Class K9 - 4048 m c. 200 mm dia DI Class K9 - 2158 m a. 100 mm dia DI Class K7 - 524 m b. 150 mm dia DI Class K7 - 210923 m c. 200 mm dia DI Class K7 - 57963 m d. 250 mm dia DI Class K7 - 52701 m e. 300 mm dia DI Class K7 - 21510 m f. 350 mm dia DI Class K7- 39681 m

	g. 400 mm dia DI Class K9 - 3724 m																																																																							
1.6	<p>a. 97 Overhead service reservoirs at different blocks of following capacity and approximate staging:- Rajgarh Block :- 61 Nos., Khilchipur Block :- 31 Nos. Biaora Block :- 5 Nos.</p> <table border="1"> <thead> <tr> <th>S. No.</th> <th>Tank Capacity</th> <th>Staging</th> <th>Nos.</th> </tr> </thead> <tbody> <tr><td>1</td><td>100 KI</td><td rowspan="16">As per design</td><td>21</td></tr> <tr><td>2</td><td>110 KI</td><td>15</td></tr> <tr><td>3</td><td>120 KI</td><td>8</td></tr> <tr><td>4</td><td>130 KI</td><td>9</td></tr> <tr><td>5</td><td>140 KI</td><td>6</td></tr> <tr><td>6</td><td>150 KI</td><td>5</td></tr> <tr><td>7</td><td>160 KI</td><td>9</td></tr> <tr><td>8</td><td>170 KI</td><td>8</td></tr> <tr><td>9</td><td>180 KI</td><td>4</td></tr> <tr><td>10</td><td>190 KI</td><td>4</td></tr> <tr><td>11</td><td>200 KI</td><td>2</td></tr> <tr><td>12</td><td>220 KI</td><td>1</td></tr> <tr><td>13</td><td>230 KI</td><td>1</td></tr> <tr><td>14</td><td>260 KI</td><td>2</td></tr> <tr><td>15</td><td>270 KI</td><td>1</td></tr> <tr><td>16</td><td>340 KI</td><td>1</td></tr> </tbody> </table> <p>Five Master Balancing Reservoir (MBR) near following villages ;</p> <table border="1"> <thead> <tr> <th>S. No.</th> <th>Name of MBR</th> <th>Capacity</th> </tr> </thead> <tbody> <tr><td>1</td><td>Amba</td><td>310 KI or Suitable Capacity</td></tr> <tr><td>2</td><td>Datagram</td><td>260 KI or Suitable Capacity</td></tr> <tr><td>3</td><td>Jwalapur</td><td>190 KI or Suitable Capacity</td></tr> <tr><td>4</td><td>Odpur</td><td>100 KI or Suitable Capacity</td></tr> <tr><td>5</td><td>Udiya pura</td><td>220 KI or Suitable Capacity</td></tr> </tbody> </table> <p>Note :- All the tanks/reservoirs/clear water sump cum pump house/MBR will have 2 m high Boundary Wall with gate, one Room set of area 25 sqm size with toilet, automation system and single-phase electrification with area lighting etc. complete.</p>	S. No.	Tank Capacity	Staging	Nos.	1	100 KI	As per design	21	2	110 KI	15	3	120 KI	8	4	130 KI	9	5	140 KI	6	6	150 KI	5	7	160 KI	9	8	170 KI	8	9	180 KI	4	10	190 KI	4	11	200 KI	2	12	220 KI	1	13	230 KI	1	14	260 KI	2	15	270 KI	1	16	340 KI	1	S. No.	Name of MBR	Capacity	1	Amba	310 KI or Suitable Capacity	2	Datagram	260 KI or Suitable Capacity	3	Jwalapur	190 KI or Suitable Capacity	4	Odpur	100 KI or Suitable Capacity	5	Udiya pura	220 KI or Suitable Capacity
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1.7	<p>Pumping equipment including suitable motors, protection equipment for following:-</p> <p>(i) Providing and installation of 4 Nos. suitable energy efficient deep well vertical turbine pumps for raw water at Intake well cum pump house as under:-</p> <p>(a) Each pump of 70 lps discharge, approx. 89±10 m head: 2 Nos. (Working)</p> <p>(b) Each pump of 35 lps discharge, approx. 89±10 m head: 2 Nos. (Standby)</p> <p>(ii) Providing and installation of 6 Nos. suitable energy efficient Centrifugal pumps, HSC type, for Clear water at pump house.</p> <p>(a) Each pump of 65 lps discharge, approx. 110±10 m head: 4 Nos. (working)</p> <p>(b) Each pump of 33 lps discharge, approx. 110±10 m head: 2 Nos. (standby)</p>																																																																							

1.8	<p>Provision for a total of 12.1 Km long dedicated 33/11KV power supply from nearby Sub-station to WTP and Intake well cum pump house including erection of suitable capacity transformers at Intake and WTP inclusive of all allied works complete.</p> <p>The work includes construction of sub-stations and stretching of power lines and internal and external electrification etc. complete.</p> <p>100 % Standby transformers to be provided.</p>
1.9	<p>Distribution network for a total length of 909.83 km comprising of:-</p> <p>HDPE, PE100 PN6 (minimum) pipelines including valves, specials, bulk water meters for all villages and other allied works of following diameters;</p> <ol style="list-style-type: none"> 90 mm dia. minimum 6 kg/cm² pressure- 413633 m 110 mm dia. minimum 6 kg/cm² pressure- 151861 m 140 mm dia. minimum 6 kg/cm² pressure- 134053 m 160 mm dia. minimum 6 kg/cm² pressure- 97984 m 180 mm dia. minimum 6 kg/cm² pressure- 57567 m 200 mm dia. minimum 6 kg/cm² pressure- 33410 m 250 mm dia. minimum 6 kg/cm² pressure- 19429 m 280 mm dia. minimum 6 kg/cm² pressure- 1893 m <p>HDPE Pipe line i/c valves, sluice valves, air valves, scour valves, valve chambers, thrust block, bulk water meters for all villages, specials & accessories etc. complete.</p>
1.10	<p>Provision for construction of complaint center with Boundary wall at OHT locations (5 m x 5m).</p>
1.11	<p>House service connections - No. of House service connections are 38,240</p>
1.12	<p>Operation & Maintenance of the Whole Scheme for the first year</p>
1.13	<p>The Operation and Maintenance cost for the first year, in terms of percentage of contract Amount is given in Annexure H, For every next year the first-year percentage rates will be increased/decreased according to the percentage change in consumer price index issued by Labor Bureau, GOI (All IW) 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.</p> <p>NOTE:-</p> <ol style="list-style-type: none"> The operation & maintenance period is 10 years from the date of completion of three months of trial run after successful commissioning of the project. The cost of energy charges (excluding penalties) shall be paid by MPJNM on reimbursement basis. 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 above components of the project are to be completed, tested and whole project to be commissioned within 24 months including rainy season from the date of start of work which is 21st day from the date of issue of LOA.

2. ISSUE OF TENDER DOCUMENTS

Tender documents can be purchased only through online from <https://www.mpeproc.gov.in> by making online payment. The last date of purchase of tender document shall be as mentioned in key dates.

The bid data shall be filled and the documents which are to be uploaded by the bidders shall be submitted online as per time schedule (Key dates).

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

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://www.mpeproc.gov.in>. This NIT shall form part of the agreement.

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

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

Madhya Pradesh Jal Nigam Maryadit 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 submission of tender must be accompanied with the following documents; otherwise tender shall be rejected-

- **Certificate for average turnover:** Average turnover of the firm in the last three years, i.e., 2014, 2015 and 2016 shall be at-least 50% of the estimated cost at current Price level. The previous years to 2016-17 shall be given weight-age of 10% per year to bring them to current price level of 2016-17, which shall be assessed on the basis of duly certified copy of Audit Report / balance sheet certified by the Chartered Accountant or its equivalent in the concerned BRICS country which is recognized in India indicating the average turnover during the period 2014, 2015 and 2016. In case of Joint Venture, the combined strength for the average turnover of all the partners should meet the qualifying criteria. However, for a Joint Venture to qualify, the lead partner should meet at least 51% of qualifying amount and the other partners should meet the remaining 49% of the qualifying amount, but the individual partner should not meet less than 26% of qualifying amount.
- **Certificate for Working Capital** - The firm / contractors shall demonstrate confirmed credit line from a schedule commercial bank recognized by the Reserve Bank of India (RBI) (other than a co-operative bank) not less than 15 % of the estimated cost. For which a certificate from officer not below the rank of branch manager shall be furnished to the Employer. In case of Joint Venture, the combined strength for the working capital of all the partners should meet the qualifying criteria. However, for a Joint Venture to qualify, the lead partner should meet at least 51% of qualifying amount and the other partners should meet the remaining 49% of the qualifying amount, but the individual partner should not meet less than 26% of qualifying amount.
- **Certificate for Net worth:** During the last three financial years, i.e., 2014-15, 2015-2016 and 2016-17, the net worth must be positive as certified by the

Chartered Accountant or its equivalent in the concerned BRICS country which is recognized in India. In case of Joint Venture, all the partners of the JV should have positive net-worth.

- **Experience certificate** - The Firms / Contractors / JV / any partner of the Joint Venture must have completed within the last 10 years design, manufacturing, construction, installation and successful commissioning of each of the following— Additionally in case of Joint Venture the lead partner should have completed at least three of the following-
 - River intake works under water supply projects or similar civil engineering infrastructure projects of at least 33% of the desired capacity in a single contract.
 - Providing/laying water supply pipelines of diameter 80mm or above of any material for minimum 33% of the total length given in this contract.
 - Water treatment plant of at least 33% of the desired capacity in a single contract.
 - Clear water reservoir (any drinking water storage RCC structure) of at least 50% of the desired maximum capacity in a single contract.
 - Pump – motor works of at least 33% of the pumping capacity for the largest pumping unit in the desired project including all civil, mechanical and electrical works in a single contract.
 - Firms / Contractors / JV / any partner of the Joint Venture, who are executing the works of similar nature and of capacity at par or above of this minimum requirement and have completed more than 75 % of job can also be considered, provided they produce certificates from the officer not below the rank of Executive Engineer or its equivalent in the concerned BRICS country. Such certificate must describe that the work was/is being executed for the extended period without penalty.
 - Experience of works with reputed private firm shall also be considered.
 - Experience of similar nature of works may also be considered, which includes works with its similarity in quantitative infrastructural works, its functional fulfillment, methodology and complexity such as construction of bridge pier with well sinking type foundation will be considered for intake well experience.
- 4. Income tax clearance certificate from the competent authority of the respective BRICS member countries or PAN Card and a copy each of Income Tax Return filed, for the financial years 2014-15, 2015-16 and 2016-17.
- 5. Valid registration certificate in case of registered contractors and previous year's (2016-17) balance sheet in case of firm of repute/ all partners of Joint Venture.
- 6. **Firms incorporated in any of the BRICS member countries (Brazil, Russia, India, China, and South Africa) of New Development Bank (NDB) are only eligible to apply.**
- 7. The applicants shall get the above documents verified from the originals, at least a day before **Financial bid (Envelope-C) Opening Date**; else their tender will not be entertained.

This tender notice can also be seen on the Madhya Pradesh Jal Nigam's web site www.mpjalnigam.co.in.

Managing Director
Madhya Pradesh Jal Nigam Maryadit
Vindhyachal Bhawan, Bhopal

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

OFFICE OF THE MANAGING DIRECTOR
M.P. JAL NIGAM MARYADIT, BHOPAL

DETAILED NOTICE INVITING TENDER

Online digitally sealed tenders are invited on behalf of Madhya Pradesh Jal Nigam Maryadit for the following work on "TURN KEY JOB BASIS" in Form – F for lump sum contract in the office of undersigned within the time mentioned in the key dates from the contractors, who are registered with the Centralized Registration System of Public Works Department, Govt. of Madhya Pradesh or any other State / Central Govt. department registered in equal capacity or firms of repute or Joint Venture of Firms, who fulfil the conditions mentioned in Para 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 a versa*.

The bidders registered with other departments of Govt. of M.P./Central Government or firms of repute or Joint Venture of Firms are also eligible to participate in tenders processed by Madhya Pradesh Jal Nigam Maryadit. The bidders intending to participate in this tender are required to get enrolled/ registered on the e procurement web site <https://www.mpeproc.gov.in>, the bidder would be required to have valid registration at the time of signing the agreement.

Name of the Work	Probable amount of contract (INR in Lacs)	Earnest Money (INR in Lacs)	Cost of tender document (in INR)	Time allowed for completion
Engineering, procurement, construction, testing, commissioning, trial run and operation & maintenance of various components of "MOHANPURA MULTI VILLAGE RURAL WATER SUPPLY SCHEME, DISTT. RAJGARH" for ultimate capacity of bringing 26.15 mld treated water (23 hours of pumping) from the Dam on river Newaj to 400 villages of Rajgarh, Khilchipur & Biaora Blocks of Rajgarh District in Single Package on 'Turn-key job basis' including trial run and running & maintenance of the entire scheme for 10 years. (Cost of running & maintenance shall be paid separately)	25409.70	50.00	50000.00	24 months including rainy season

1. GENERAL

1.1 Duly filled in and digitally signed Tender must be submitted only in online form for “Lump Sum Contract” as per instruction contained in this tender notice and in the guideline which are attached to this NIT.

Lump Sum tender shall be inclusive of all the items of works. The brief details are as under –

S. No.	Main Works
1.1	Construction of minimum 7.0 m diameter and 55.00 m deep R.C.C Intake well, 33.35 Million liter of capacity in 23 hours flow & 7.0 m dia & 6 m High Pump house including provision for automation and construction of R.C.C Approach Bridge minimum 3.5 m wide.
1.2	Raw water pumping main of 600 mm internal dia. DI K-9 with in-lining and out-coating of length 4100 m as per IS 8329 i/c flow meters, valves, sluice valves, air valves, scour valves, valve chambers, thrust blocks, crossings, specials & accessories etc. complete.
1.3	Water treatment plant to provide 26.15 million liter treated clear water in 23 hours i/c automation, with clear water sump having a storage capacity of 2 hours and pump house of suitable size complete near Village Rampuria, District Rajgarh i/c automation, construction of boundary wall, internal roads, approach road etc. complete.
1.4	Providing, laying & jointing of Clear water pumping main DI class K-9 pipe with in-lining and out-coating as per IS 8329 i/c flow meters, valves, sluice valves, air valves, scour valves, valve chambers, thrust blocks, crossings, specials & accessories etc. complete. 250 mm to 600 mm internal dia. of length 113.00 Km as detailed below: a. 250 mm dia DI Class K9 - 42000 m b. 300 mm dia DI Class K9 - 24173 m c. 350 mm dia DI Class K9 - 35827 m d. 400 mm dia DI Class K9 - 293 m e. 450 mm dia DI Class K9 - 3000 m f. 500 mm dia DI Class K9 - 7500 m g. 600 mm dia DI Class K9 - 209 m
1.5	Providing, laying & jointing of Clear water feeder/gravity main, DI class K-7 and K-9 pipe as per IS 8329 i/c flow meters, valves, sluice valves, air valves, scour valves, valve chambers, thrust block, crossings (rail and road), specials & accessories etc. complete. 100 to 400 mm internal dia of length 414.43 Km as detailed below: a. 100 mm dia DI Class K9 - 21200 m b. 150 mm dia DI Class K9 - 4048 m c. 200 mm dia DI Class K9 - 2158 m a. 100 mm dia DI Class K7 - 524 m b. 150 mm dia DI Class K7 - 210923 m c. 200 mm dia DI Class K7 - 57963 m d. 250 mm dia DI Class K7 - 52701 m e. 300 mm dia DI Class K7 - 21510 m f. 350 mm dia DI Class K7- 39681 m

	g. 400 mm dia DI Class K7 - 3724 m																																																																							
1.6	<p>a. 97 Overhead service reservoirs at different blocks of following capacity and approximate staging:- Rajgarh Block :- 61 Nos., Khilchipur Block :- 31 Nos. Biaora Block :- 5 Nos.</p> <table border="1"> <thead> <tr> <th>S. No.</th> <th>Tank Capacity</th> <th>Staging</th> <th>Nos.</th> </tr> </thead> <tbody> <tr><td>1</td><td>100 KI</td><td rowspan="16">12 mtr or As per design</td><td>21</td></tr> <tr><td>2</td><td>110 KI</td><td>15</td></tr> <tr><td>3</td><td>120 KI</td><td>8</td></tr> <tr><td>4</td><td>130 KI</td><td>9</td></tr> <tr><td>5</td><td>140 KI</td><td>6</td></tr> <tr><td>6</td><td>150 KI</td><td>5</td></tr> <tr><td>7</td><td>160 KI</td><td>9</td></tr> <tr><td>8</td><td>170 KI</td><td>8</td></tr> <tr><td>9</td><td>180 KI</td><td>4</td></tr> <tr><td>10</td><td>190 KI</td><td>4</td></tr> <tr><td>11</td><td>200 KI</td><td>2</td></tr> <tr><td>12</td><td>220 KI</td><td>1</td></tr> <tr><td>13</td><td>230 KI</td><td>1</td></tr> <tr><td>14</td><td>260 KI</td><td>2</td></tr> <tr><td>15</td><td>270 KI</td><td>1</td></tr> <tr><td>16</td><td>340 KI</td><td>1</td></tr> </tbody> </table> <p>Five Master Balancing Reservoir (MBR) near following villages ;</p> <table border="1"> <thead> <tr> <th>S. No.</th> <th>Name of MBR</th> <th>Capacity</th> </tr> </thead> <tbody> <tr><td>1</td><td>Amba</td><td>310 KI or Suitable Capacity</td></tr> <tr><td>2</td><td>Datagram</td><td>260 KI or Suitable Capacity</td></tr> <tr><td>3</td><td>Jwalapur</td><td>190 KI or Suitable Capacity</td></tr> <tr><td>4</td><td>Odpur</td><td>100 KI or Suitable Capacity</td></tr> <tr><td>5</td><td>Udiya pura</td><td>220 KI or Suitable Capacity</td></tr> </tbody> </table> <p>Note :- All the tanks/reservoirs/clear water sump cum pump house/MBR will have 2 m high Boundary Wall with gate, one Room set of area 25 sqm size with toilet, automation system and single-phase electrification with area lighting etc. complete.</p>	S. No.	Tank Capacity	Staging	Nos.	1	100 KI	12 mtr or As per design	21	2	110 KI	15	3	120 KI	8	4	130 KI	9	5	140 KI	6	6	150 KI	5	7	160 KI	9	8	170 KI	8	9	180 KI	4	10	190 KI	4	11	200 KI	2	12	220 KI	1	13	230 KI	1	14	260 KI	2	15	270 KI	1	16	340 KI	1	S. No.	Name of MBR	Capacity	1	Amba	310 KI or Suitable Capacity	2	Datagram	260 KI or Suitable Capacity	3	Jwalapur	190 KI or Suitable Capacity	4	Odpur	100 KI or Suitable Capacity	5	Udiya pura	220 KI or Suitable Capacity
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1.7	<p>Pumping equipment including suitable motors, protection equipment for following:-</p> <p>(i) Providing and installation of 4 Nos. suitable energy efficient deep well vertical turbine pumps for raw water at Intake well cum pump house as under:-</p> <p>(a) Each pump of 70 lps discharge, approx. 89±10 m head: 2 Nos. (Working)</p> <p>(b) Each pump of 35 lps discharge, approx. 89±10 m head: 2 Nos. (Standby)</p> <p>(ii) Providing and installation of 6 Nos. suitable energy efficient Centrifugal pumps, HSC type, for Clear water at pump house.</p> <p>(a) Each pump of 65 lps discharge, approx. 110±10 m head: 4 Nos. (working)</p> <p>(b) Each pump of 33 lps discharge, approx. 110±10 m head: 2 Nos. (standby)</p>																																																																							

1.8	<p>Provision for a total of 12.1 Km long dedicated 33/11KV power supply from nearby Sub-station to WTP and Intake well cum pump house including erection of suitable capacity transformers at Intake and WTP inclusive of all allied works complete.</p> <p>The work includes construction of sub-stations and stretching of power lines and internal and external electrification etc. complete.</p> <p>100 % Standby transformers to be provided.</p>
1.9	<p>Distribution network for a total length of 909.83 km comprising of:-</p> <p>HDPE, PE100 PN6 (minimum) pipelines including valves, specials, bulk water meters for all villages and other allied works of following diameters;</p> <p>i. 90 mm dia. minimum 6 kg/cm² pressure- 413633 m</p> <p>j. 110 mm dia. minimum 6 kg/cm² pressure- 151861 m</p> <p>k. 140 mm dia. minimum 6 kg/cm² pressure- 134053 m</p> <p>l. 160 mm dia. minimum 6 kg/cm² pressure- 97984 m</p> <p>m. 180 mm dia. minimum 6 kg/cm² pressure- 57567 m</p> <p>n. 200 mm dia. minimum 6 kg/cm² pressure- 33410 m</p> <p>o. 250 mm dia. minimum 6 kg/cm² pressure- 19429 m</p> <p>p. 280 mm dia. minimum 6 kg/cm² pressure- 1893 m</p> <p>HDPE Pipe line i/c valves, sluice valves, air valves, scour valves, valve chambers, thrust block, bulk water meters for all villages, specials & accessories etc. complete.</p>
1.10	Provision for construction of complaint center with Boundary wall at OHT locations (5 m x 5m).
1.11	House service connections - No. of House service connections are 38,240
1.12	Operation & Maintenance of the Whole Scheme for the first year
1.13	<p>The Operation and Maintenance cost for the first year, in terms of percentage of contract Amount is given in Annexure H, For every next year the first-year percentage rates will be increased/decreased according to the percentage change in consumer price index issued by Labor Bureau, GOI (All IW) 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.</p> <p>NOTE:-</p> <p>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.</p> <p>b) The cost of energy charges (excluding penalties) shall be paid by MPJNM on reimbursement basis.</p> <p>c) 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.</p>

*The above components of the project are to be completed, tested and whole project to be commissioned within 24 months including rainy season from the date of start of work which is 21st day from the date of issue of LOA.

1.2 ISSUE OF TENDER DOCUMENTS

Tender documents can be purchased only through online from <https://www.mpeproc.gov.in> by making online payment. The last date of purchase of tender document is as mentioned in key dates.

The bid data shall be filled and the documents which are to be uploaded by the bidders shall be submitted online as per time schedule (Key dates).

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

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://www.mpeproc.gov.in>. This NIT shall form the part of the agreement.

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The Bidders, if training is needed, are advised to get in touch with the Service Provider of the e-Procurement System M/s TCS-ANTARES for confirming the time and date for their training session.

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

Madhya Pradesh Jal Nigam Maryadit 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.

1.3 Eligible Bidder

1.3.1 This Invitation of Tender is open only to all Tenderers/ Firms incorporated in any of the BRICS member countries (Brazil, Russia, India, China, and South Africa) of New Development Bank (NDB), who are registered in centralized Registration system of P.W.D., Bhopal, M.P. or unregistered firms of repute are eligible to apply.

- (a) Individual Person/Proprietor
- (b) Proprietary firm
- (c) Partnership firm
- (d) Limited company or limited corporation
- (e) Government Undertaking / Enterprises
- (f) Joint Venture or consortium of two or more (**but not more than three**) firms / companies from (a) to (e) registered with registrar of firms / companies with appropriate authority under Companies Act / Firms and Society Registration Act.

A tenderer (including all members of a joint venture and all sub-contractors of a tenderer) 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.**

1.3.2 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:

- a) have controlling shareholders in common; or
- b) receive or have received any direct or indirect subsidy from any one of them: or
- c) 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.

1.3.3 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 such evidence of their continued eligibility up to the satisfaction of the MPJNM.

1.4 **Eligibility Criteria:** The submission of tender documents shall be accompanied with the following documents; otherwise tender documents shall be rejected-

1.4.1 **Certificate for average turnover:** Average turnover of the firm in last three consecutive years shall be at-least 50% of the estimated cost at current Price level. The previous years, 2014-15 to 2016-17 shall be given weight-age of 10% per year to bring them to current price level which shall be assessed on the basis of copy of Audit Report / certified balance sheet and summary of balance sheet certified by the Chartered Accountant or its equivalent in the concerned BRICS country which is recognized in India indicating the minimum average turnover during the period. In case of Joint Venture the combined strength for the average turnover of all the partners should meet the qualifying criteria. However, for a Joint Venture to qualify, the lead partner should meet at least 51% of qualifying amount and the other partners should meet the remaining 49% of the qualifying amount, but the individual partner should not meet less than 26% of qualifying amount.

1.4.2 **Certificate for Working Capital** - The firm / contractors shall demonstrate confirmed credit line from a scheduled bank recognized by RBI (other than a co-operative bank) not less than 15% of the estimated cost. For which a certificate from officer not below the rank of branch manager shall be produced. In case of Joint Venture the combined strength for the working capital of all the partners should meet the qualifying criteria. However, for a Joint Venture to qualify, the lead partner should meet at least 51% of qualifying amount and the other partners should meet the remaining 49% of the qualifying amount, but the individual partner should not meet less than 26% of qualifying amount.

1.4.3 **Certificate for Net worth:** During the last three financial years, i.e., 2014-15, 2015-16, and 2016-17, the net worth shall be positive as certified by the Chartered Accountant or its equivalent in the concerned BRICS country which is recognized in India. In case of Joint Venture, all the partners of the JV shall have positive net-worth.

1.4.4 **Experience certificate - The Firms / Contractors / JV / any partner of the Joint Venture should have completed within last 10 years design, manufacturing, construction, installation and successful commissioning EACH of the following--** - Additionally in case of Joint Venture the lead partner should have completed at least three of the following -

- River intake works under water supply projects or similar civil engineering infrastructure projects of at least 33% of the desired capacity in a single contract.
- Providing/laying water supply pipelines of diameter 80mm or above of any material for minimum 33% of the total length given in this

contract.

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 - Pump – motor works of at least 33% of the pumping capacity for the largest pumping unit in the desired project including all civil, mechanical and electrical works in a single contract.
- Firms / Contractors / JV / any partner of the Joint Venture, who are executing the works of similar nature and of capacity at par or above of this minimum requirement and have completed more than 75% of job can also be considered, provided they produce certificates from the officer not below the rank of Executive Engineer or equivalent in the concerned BRICS country. Such certificate should also describe that the work was/is being executed for the extended period without penalty.
- Experience of works with reputed private firms shall also be considered.
- Experience of similar nature of works may also be considered, which includes works with its similarity in quantitative infrastructural works, its functional fulfillment, methodology and complexity such as construction of bridge pier with well sinking type foundation will be considered for intake well experience such as construction of bridge pier with well sinking type foundation will be considered for intake well experience.

1.4.5 Income tax clearance certificate from the competent authority of the respective BRICS member countries and copy of PAN Card and copy of Income Tax Returns filed, for the financial years 2014-15, 2015-16 and 2016-17

1.4.6 Valid registration certificate in case of registered contractors and previous year's (2016-17) balance sheet in case of firm of repute/ all partners of Joint Venture.

1.5 The applicants shall get the above documents verified from the originals, at least a day before **Financial bid (Envelope-C) Open Date**; else their tender will not be entertained.

1.6 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.

1.7 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.

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

1.9 Not more than one tender shall be submitted by a contractor or by a firm of contractors.

2.0 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, taxes, testing and commissioning of all works, as a whole and all of its components individually as well. Rates shall be quoted in INR only. If the rates are quoted in any currency other than INR, the said Tender shall be rejected without assigning any reason whatsoever.

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

2.3 Tenderers shall have to keep their offer open for acceptance for a period as prescribed

- in the N.I.T. 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-** The contractor shall make his 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 foundation water, river water and rain water 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 tenderer 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 8.8.4 of Detailed Notice Inviting Tender.
- 3.0 **Submission of tenders:** - The Tenderer shall fill/upload the Bids online and the Bid Hashes of three envelopes shall be digitally signed and submitted online only in pdf. Format as per mentioned key dates. The Bidders shall also have to submit Bids online (decrypt the bids using their Digital Certificate and encrypt the bids) as per mentioned key dates. There shall be three separate Online envelopes as under:-.

Envelope "A" Earnest money, Registration certificate and Affidavit-

First sealed envelope shall contain earnest money in proper form, Registration certificate and Affidavit (Please see Annexure-2) on Non-Judicial Stamp of INR 1000/- and it should clearly be written on the envelopes as envelope "A" "Earnest Money, Registration certificate and Affidavit".

Envelope 'B' Technical Bid

The second online envelope shall contain Pre-qualification document, self-certified sheet duly supported by documents to demonstrate fulfillment of pre-qualification conditions (Please refer PQ document as attached Online).

Technical specifications, including PQ documents etc. shall be submitted as Hard Copy in Envelope '**B**' **one day before the Technical Bid (Envelope – B) Open Date.** On the front side of the envelope it should be clearly mentioned as envelope "B" "Technical Bid" The lump-sum offer in no case shall be put into this envelope.

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 his 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 his discretion forfeit his performance security/ guarantee, security deposit, enlistment deposit and take any other suitable action. This envelope 'B' shall not contain any condition. Conditional Technical Bid shall be summarily rejected without assigning any reason.

The following documents shall also be submitted in this envelope B-

- i. List of staff with the tenderer
- ii. List of Plants and Equipment's owned and available for use with the tenderer
- iii. List of works in progress as per Para 3.9 of Detailed NIT
- iv. List of works executed by the tenderer during last 10 years along with the due date of completion and actual date of completion.
- v. History of litigation and criminal record.

Envelope "C" Financial Bid (Online Only): This Envelope shall contain only the Lump-sum offer in INR only. The tenderer shall have to duly fill in their Lump-sum offer in appropriate online form meant for it.

This envelope shall not contain any condition. Any condition stipulated in envelope "C" shall render the Financial Bid *non responsive* and will be rejected without assigning any reason. The tenderer 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 accepted by a bidder, and a person who is a member of a bidding JV consortium, can neither bid separately nor is a part of another bidding consortium, whether directly or indirectly.*

3.1 Earnest Money- No tender shall be entertained without a deposit of Earnest Money., Subject to the provisions of clause 3.0, earnest money deposit may be returned to the unsuccessful tenderer on the rejection of their tender or earlier as may be decided by competent authority. The earnest money from the successful tenderer will be replaced by an unconditional and irrevocable bank guarantee as part of the security deposit valid upto the end of one year after the due date of completion of project.

3.2 Form of Earnest Money

The amount of Earnest Money to be deposited is in the form of Demand Draft/Fixed Deposit Receipt of a scheduled commercial bank recognized by RBI issued in favor of **Managing Director, Madhya Pradesh Jal Nigam Maryadit, Bhopal.**

3.3 Bid not accompanied by EMD shall be liable for rejection as non-responsive.

3.4 Refund of Earnest Money:-

Subject to the provisions of clause 3.0, EMD of bidders whose bids are not accepted will be returned within ten working days of the decision on the bid.

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.

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.

3.5 Security Deposit - The security to be taken from the successful tenderer for due performance of the contract under the terms and conditions printed in the tender form will be equal to 10% (Ten percent) of the amount of contract plus cost of the O&M payable to the contractor for 10 years (at base year payment), in the form of an unconditional and irrevocable bank guarantee executed in favor of the employer (MPJNM) of a Nationalized/ Scheduled commercial bank recognized by RBI (other than a Co-Operative Bank) situated in India. The unconditional and irrevocable bank guarantee shall be furnished by the tenderer on the date of signing and execution of the agreement. The employer (MPJNM) shall be the sole judge to decide the time and manner of encashment of bank guarantee. The contractor can either submit Bank Guarantee of 10% amount as described above or may submit Bank Guarantee for 5%

amount and remaining 5% will be deducted from Running Bill to make the sum equal to 10%.The amount deducted from RA bills will be replaceable by BG/FDR of equal amount. The security deposit furnished by way of bank guarantee will be released as follows: 33% (Thirty-three Percent) of Bank Guarantee one year after completion of project 33% (Thirty-three Percent) Bank Guarantee after 5 years of O&M period and remaining part of Bank Guarantee after 10 years of successful O&M. The contractor shall submit a fresh/ renewed Bank Guarantee at least 30 days before the expiry of the existing Bank Guarantee, otherwise the MPJNM shall have the right to encase the existing Bank Guarantee.

3.6 Implication of Submission of Tender:

Tenderers are advised to visit the site sufficiently in advance of the date fixed for submission of the tender. A tenderer 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.

3.7 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. 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.

3.8 Income Tax Clearance Certificate: -

An income tax clearance certificate in the form printed as Annexure "D" (Appendix 2.10 to PWD Manual Vol. - II Part-I) from the Income Tax Officer concerned or a certificate from the Income Tax authority that the assessment is under consideration at the time of submission of tender shall have to be submitted by the contractor/firm before tender documents can be issued to him. In later case the I.T. Clearance certificate for previous financial year will have to be submitted. In absence of I.T.C.C. the tenderer has to submit copies of PAN and Income Tax Return filed, for the financial years 2014-15, 2015-16, and 2016-17. This condition shall be applicable for each partner, in case the tenderer is participating as Joint Venture.

3.9 List of works in progress - The tender must be accompanied by a list of all the ongoing contracts held by the tenderer at the time of submitting the tender in the department and elsewhere showing therein.

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

3.10 Prohibited Relationship: The contractor shall not be permitted to submit his tender for works in the Project Implementation Unit responsible for forward and execution of this contract in which his near relatives are posted. He shall intimate names of his near relatives working in the Government of Madhya Pradesh Mantralaya, PHE Department and Madhya Pradesh Jal Nigam Maryadit, Bhopal. He shall also intimate the names of persons working with him in any capacity of subsequently employed by him and are near relatives of any gazetted officer in the M.P. Government, Mantralaya, Public Health Engineering Department.

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 wife, husband, parents, sons, daughters, grandsons, grand daughters, brothers and sisters, brothers in law, sisters in law, father in law and mother in law.

3.11 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.

3.12 The tender must be signed by the owner/partner of the firm or their authorized signatory. Each tenderer shall mention the full name, residence and place of business of the person signing the tender and this information shall be signed by the tenderer 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 in such a case. In case of Joint venture the Lead partner having the authority to sign the Agreement shall place his/her signature. Tender by corporation shall be signed with the legal name of Corporation followed by the full name and State of incorporation, and signature followed with designation of the President/Secretary or other persons authorized to sign it .

3.13 Deleted.

3.14 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.

3.15 Detailed specification and leaflets giving make etc. for all the components shall be submitted with the tender.

3.16 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 MPJNM in this regard is liable to be rejected.

3.17 Pre-Bid Meeting - The tenderer or his official representative, duly authorized by him by letter is advised to attend the pre-bid meeting which will be convened by Managing Director, Madhya Pradesh Jal Nigam Maryadit, Bhopal M.P. on the date and time as given in Key dates in MPJNM office Bhopal.

i. Any change in the schedule of pre-bid meeting would be communicated on the MPJNM website only, and no intimation to bidders in this regard shall not 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.

ii. 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.

4.0 Opening & Acceptance of Tenders:

4.1 Place and time of opening
Date and time of opening as per Key dates
Place of opening:

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

- 4.1.1 Envelope "A" shall be opened first, and its contents shall be checked. In cases where Envelop "A" does not contain all requisite documents, such bid shall be treated as non-responsive, and Envelop B and/or C of such bid shall not be opened.
- 4.1.2 Envelop "B" (Technical Bid) shall be opened online at the time and date notified in the Key Dates. The bidder shall have the freedom to witness opening of the Envelop "B". If any or all the conditions of Envelop 'B' is not fulfilled Envelop "C" (Financial Bid) of bidders shall not be opened.
- 4.1.3 Envelope "C" (Financial Bid) shall be opened online at the time and date notified. The bidder shall have freedom to witness opening of the Envelop "C".
- 4.1.4 After opening Envelop "C" all responsive bids shall be compared to determine the lowest evaluated bid.
- 4.1.5 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.
- 4.1.6 The Employer reserves the right of accepting the bid for the whole work or for a distinct part of it.
- 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 **Deleted.**
- 4.3 **Conditional Tender:**
Any condition, additions, deletion, alternations, variation, or modification in Envelope "A", or Envelope "B", or Envelope-C, is liable to be rejected without assigning any reason whatsoever.
- 4.4 **No Canvassing:**
Canvassing for support or opposition in any form for the acceptance/rejection of any tender is strictly prohibited. Any tenderer 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.
- 4.5 **Unsealed Tenders:**
The unsealed tenders shall be rejected, if not properly digitally sealed.
- 4.6 **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.
- 4.7 **Validity of Offer:**
Tender shall remain valid initially up to 180 days from the date of opening of envelope 'C' and in the event of the tenderers withdrawing the offer before the aforesaid date for any reason what-so-ever his Earnest Money deposited with the tender shall be forfeited by the Madhya Pradesh Jal Nigam Maryadit. 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.
- 4.8 **Legal address - Notices** - Tenderer 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 Maryadit, 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 personally.

4.9 History of litigation and criminal record -

The tenderer 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 10 years. A history of arbitration awards against the applicant or any partner of the Joint venture/Consortium must be furnished.

In case the tenderer has not provided such information and it comes to the notice of the authority, 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 tenderer/contractor and he will not have any defense.

Even though the tenderer meets the criteria, he shall be disqualified, if he 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.

- 4.10 Contractor's mistri or agent and contractors staff -** The contractor shall, in his own absence, constantly and continuously keep on the works a competent mistri or agent, and any direction, instruction or explanations given by the Superintending Engineer or his staff (representative) to such mistri or agent 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.

5.0 Specifications:

- 5.1** The general specifications for the work have been given in the enclosed Annexure 'E'. However, the following order or priority regarding specifications shall be followed by the contractor -

5.1.1 Specifications given in the Annexure 'E' enclosed.

5.1.2 IS Specification for R.C.C. works and other civil works, pipes, valves, specials and other materials shall be governed by relevant latest B.I.S. codes, specifications and I.R.C. specifications with their amendments.

5.1.3 National Building Code of India, latest edition.

5.1.4 Specification for civil engineering works shall be according to CPWD specifications

5.1.5 Latest guidelines published by Ministry of Drinking Water and Sanitation for Rural water supply schemes and Manual on water supply & treatment (latest edition) published by CPHEEO, Govt. of India, New Delhi.

5.1.6. Any other specifications, not covered under the above said standards, shall be fixed by the Engineer-in-Charge.

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 he considers it 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 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 C P.W.D. specification and B.I.S. specification issued up-to the last date of submission of Bid 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 referred to hereinafter and according to sound engineering practice. The structure should have even and smooth finish. The decision of the Engineer-in-Charge in respect of workmanship shall be final.

5.4 **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.

5.5 **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 Maryadit shall not supply any quantity of steel under any circumstances, whatsoever. Steel for reinforcement shall conform to B.I.S. 1786 (with up-to date revision). 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 Maryadit however reserves the right to get the received/supplied steel tested at the cost of the contractor. The grade of steel etc. shall be as specified in Annexure-E of this Detailed NIT.

5.6 **Cement:**

In accordance to 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 conforming to B.I.S. 8112 or 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: 1498.

5.7 **Pipes Specials and Valves:**

All the pipes, specials and valves etc. to be used in this work shall conform to specifications as given in Annexure-E.

5.8 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.

5.9 **Structural appearance:** The structure should necessarily have acceptable architectural appearance. In this respect the opinion of the Madhya Pradesh Jal Nigam Maryadit will be final and binding upon the tenderer. The tenderer shall have to modify and improve the appearance of the structure if desired by the Madhya Pradesh Jal Nigam Maryadit

without any extra payment.

5.10 Tests of Material & Structure:

5.10.1 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.

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

5.10.3 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.

6.0 Supply of material -

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

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

7.0 Other Essential Conditions:

7.1 Subletting:-

The contractor shall not, without the prior approval of the competent authority, in writing, sublet or assign to any other party or parties the whole or any portion of work, subject to maximum 25% of work under the contract. Where such approval is granted, the contractor shall not be relieved of any obligation or duty or responsibility, which he undertakes under the contract and the sub-contractor shall be registered with appropriate class of contractor in MP, PWD. Also the contractor shall not sublet any specialized nature of work under this contract. If it is found at any stage of work that the contractor has sublet any part of work, without proper approval in writing, this act will be considered as breach of contract.

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. in any form shall be payable by the contractor and the Employer shall not liable to make any payment in this regard.

7.3 The royalty charges for extracting minor minerals for Govt. work will be paid by the contractor to the Collector or mining authorities as per rules. Employer shall not 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 Maryadit 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 Maryadit.

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 or higher rates for additions and alterations upto 25% of an individual item of Annexure F, beyond this limit if increase is necessary, consent of the contractor will be required and for this additional quantity new rate as per the current ISSR shall be arrived at.

7.12 Time Schedule and Interim Progress

(a) 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.

(b) Execution of work according to Time Schedule:

The Bidder shall include in his bid, a detailed construction program of executing the project, describing broadly the technology and construction methodology of major components of the project including survey, investigation, soil exploration, design and

S. No.	Period	Financial Progress	Physical Progress
1	By the end of 2 nd time span	20%	Completion of approval of all design and drawing.
2	By the end of 3 rd time span	40%	Completion of approval of all design and drawing.
3	By the end of 4 th time span	60%	Completion of approval of all design and drawing.
4	By the end of 5 th time span	80%	Completion of approval of all design and drawing including completion of all ESRs & pipe line works.
5	By the end of 6 th time span	100%	Completion of approval of all design and drawing include completion of all ESRs & pipe line works.

tion, testing, trial run, commissioning of total project. The employer reserves the right to direct for change in detailed construction program after discussions with the successful bidder. The bidder may annex the construction program with the bid, such that the following progress is achieved-

Note :-(i) The progress shall be reckoned on the basis of financial progress at the end of each Time span . Mutually agreed detailed construction program shall form part of the Contract.

(ii) Time span = 4 months, the progress here is financial progress at the end of each time span .

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 i.e. 24 months (including rainy season BUT EXCLUDING TRIAL-RUN PERIOD OF 3 MONTH) by the contractor. The completion time 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.

7.14 **COMPENSATION FOR DELAY**

Without prejudice to the provisions of clause 7.14, if the contractor fails to achieve the milestones, 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 –

Slippage in financial/physical target during the milestone under consideration –10% of the financial target that remained unachieved/value of the corresponding component of the work to which the physical target concerns, that remained unaccomplished.

Note: For arriving at the dates of completion of time span related to different milestones, delays which are not attributable to the Contractor shall be considered. The slippage on any milestone (time span)if made good in subsequent milestones or at the time of

stipulated period of completion, the amount retained as above shall be refunded. In the event of contractor failing to make good the delay until completion of the stipulated contract period (including extension of time) the sum so retained will be adjusted / refunded after final completion of the project. In addition to the above, Liquidated Damage shall be levied on the contractor at the rate of 0.05% per day of delay, limited to maximum of 10% of contract price, for the delayed period beyond the stipulated period of completion

The decision of CGM MPJNM 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 MPJNM.

7.16 Transport of Material:

1 The contractor shall make his own arrangement for transport, handling and storage of all materials. The Madhya Pradesh Jal Nigam Maryadit 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 in-effective 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 labor laws for the time being in force India, including, enactments and rules made thereunder, regulations, notifications and bye laws of the State or Central Government or local authority and any other labor law (including rules), regulations, bye laws that may be passed or notification that may be issued under any labor law in future either by the State or the Central Government or the local authority. Salient features of some of the major labor 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 their 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 Engineer/Employer shall have the right to deduct from any money due to the Contractor. The Employer/Engineer shall also have right to recover from the Contractor any sum required or estimated to be required for making good the loss or damage suffered by the Employer. The employees of the Contractor and the Sub-Contractor in no case shall be treated as the employees of the Employer at any point of time.

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:

- (a) 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.
- (b) It shall be the contractor's sole responsibility to protect - the public and his employees against accident from any cause and he shall indemnify Madhya Pradesh Jal Nigam Maryadit against any claims for damages for injury to a n y person or a n y 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.
- (c) 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 Maryadit and Police about the facts of such accident. The contractor shall indemnity Jal Nigam against all loses or damage sustained by 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 Maryadit as consequence of failure to give notice under the Workmen's Compensation Act.
- (d) 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.
- (e) Insurance: - Copies of Work compensation policies of labor 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.

7.21 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 Maryadit 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 Maryadit 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.

7.22 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 Managing Director 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.

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 Para 1.4 of Detailed NIT. However, the application to purchase the tender document can be given by the lead partner of the Joint Venture / Consortium.

The joint venture must satisfy collectively the criteria mentioned in Para 1.4 of Detailed Notice Inviting Tender. 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. Such approval shall be denied if-

- (i) partners withdraw from a joint venture and the remaining partners do not meet the qualifying requirements
- (ii) the new partners to a joint venture are not qualified, individually or as another joint venture, or
- (iii) in the opinion of the Managing Director, a substantial reduction in competition may result.

Also that –

- (a) Any change in composition of the JV Consortium, 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) Similar restrictions should also apply to change in constitution of the corporate bodies who are members of the consortium.
- (c) In no event, shall the lead member of JV consortium be allowed to exit the JV consortium or dilute its membership below 51%, until completion of the Operation and Maintenance period.
- (d) A KYC 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 Maryadit 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 Maryadit 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.

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 Maryadit 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 General Manager who is In-Charge of the Project Implementation Unit (PIU) of Madhya Pradesh Jal Nigam Maryadit 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 N.I.T. 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 tenderer whose tender has been accepted shall have to execute the agreement within Twenty days from the date of issue of information of his 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 contractor's end) and shall execute the unconditional and irrevocable bank guarantee in favor of the Employer and will execute the agreement in prescribed form. Failure to do so will result in the earnest money being forfeited by the Madhya Pradesh Jal Nigam Maryadit and 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.

8.3.2 Technical Staff:-

The contractor shall employ the technical staff as given below during the execution of work, such that no site is left without the supervision of experienced engineer, accordingly following minimum technical personals shall be deployed-

Technical Personnel

Position	Minimum Qualification	Number	
		For work costing upto 100 Cr.	For work costing above 100 Cr.
Project Engineer	BE (Civil)	01	01
Graduate Site Engineer	BE	03	One per 40 Cr work or part thereof
Laboratory Technician	Diploma in civil Engg	01	02
Diploma Engineer	Diploma (Civil Engineer)	One per 20 Cr work	One per 20 Cr 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 anyone engineer is a must at the time of execution of work at that site.

Diploma Engineer- A diploma engineer, having minimum 3 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 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 Maryadit, 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.

8.4 DELETED

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 initial intended completion date or extensions granted for reasons attributed to the Employer by the Engineer.
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 the Force Majeure clause.

8.5.2 Procedure

The formula for adjustment of prices are :

$$R = \text{Value of work as defined in Clause 31.1 of Conditions of Contract}$$

Adjustment for Labour Component

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

$$VL = 0.85 \times P1 / 100 \times R (Li - Lo) / Lo$$

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 on 28 days preceding the date of opening of Technical Bids as published by Labour Bureau, Ministry of Labour, Government of India.

Li = the consumer price index for industrial workers for the State for the month under consideration as published by Labour Bureau, Ministry of Labour component of the work.

$$P1 = \text{Percentage of Labour component of the work.}$$

Adjustment for Cement Component

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

$$VC = 0.85 \times PC / 100 \times R \times (C1 - C0) / C0$$

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 Pozzolana Cement on 28 days preceding the date of opening of Technical Bids, as published by the Economic Advisor, DIPP, Ministry of Commerce & Industry Government of India, New Delhi.

C1 = The all India average wholesale price index for cement for the month under consideration as published by the Economic Advisor, DIPP, Ministry of Commerce & Industry Government of India, New Delhi.

$$Pc = \text{Percentage of cement component of the work}$$

Adjustment of Steel Component

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

$$Vs = 0.85 \times PS \times R / 100 \times (S1 - S0) / S0$$

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

S0 = The all India wholesale price index for mild steel long products / flats on 28 days preceding the date of opening of Technical Bids, as published by the Economic Advisor, DIPP, Ministry of Commerce & Industry Government of India, New Delhi.

Si = The all India average wholesale price index for mild steel long products / flats for the month under consideration as published by the Economic Advisor, DIPP, 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 / flats has been Chosen to represent steel group. In any work only one of the indices i.e. either for long products or for flats shall be used as decided by the Employer/ Executing Agency.

Adjustment of Bitumen Component

(iv) Price Adjustment for increase or decrease in the cost of bitumen shall be paid in accordance with the following formula:

$$V_b = 0.85 \times P_b / 100 \times R \times (B_i - B_o) / B_o$$

V_b = Increase or decrease in the cost of work during the month under consideration due to changes in rates for bitumen.

B_o = The official retail price of bitumen at the IOC depot nearest to the work site on the day 28 days prior to the date of opening of Technical Bids.

B_i = The official retail price of bitumen at the IOC depot nearest to the work site for the 15th day of the month under consideration.

P_b = Percentage of bitumen component of the work.

Adjustment of POL (Fuel and Lubricant) Component

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

$$V_f = 0.85 \times P_f / 100 \times R \times (F_i - F_o) / F_o$$

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

F_o = The official retail price of High Speed Diesel (HSD) at the existing consumer pumps of IOC nearest to the work site on the day 28 days prior to the date of opening of Technical Bids.

F_i = The official retail price of HSD at the existing consumer pumps of IOC nearest to the work site for the 15th day of month under consideration.

P_f = Percentage of fuel and lubricants component of the work.

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

Adjustment for Plant and Machinery Spares component

(Vi) 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:

$$V_p = 0.85 \times P_p / 100 \times R \times (P_i - P_o) / P_o$$

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

P_o = The all India wholesale price index for manufacturer of machines for mining / quarrying and construction on 28 days preceding the date of opening of Technical Bids, as published by the Economic Advisor, DIPP, Ministry of Commerce & Industry Government of India, New Delhi.

P_i = 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, DIPP, Ministry of Commerce & Industry Government of India, New Delhi.

P_p = 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.

Adjustment of Other Materials Component.

(Vii) 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:

$$V_m = 0.85 \times P_m / 100 \times R \times (M_i - M_o) / M_o$$

V_m = 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.

M_o = The all India wholesale price index (all commodities) on 28 days preceding the date of opening of Technical Bids, as published by the Economic Advisor, DIPP, Ministry of Commerce & Industry Government of India, New Delhi.

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

P_m = 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
1	2	3
1	Labour component-P1	10
2	Cement component -Pc	5
3	Steel component -Ps	15
4	Bitumen/HDPE component-Pb	40
5	POL component -Pf	10
6	Plant & Machinery Spares component -Pp	5
7	Other Materials component-Pm	15

Note: Ordinarily the 7 components shown above are components of the civil works. However for specific works in which some components not included in the aforementioned 7 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 The index relevant to any quarter, for which such compensation is paid, shall be

the arithmetical average of the indices relevant of the calendar month.

8.5.5 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

Except otherwise provided, in case of any dispute or difference between the parties to the contract either during the progress or after the completion of the works or after the determination abandonment, or breach of the contract, as to the interpretation of the contract, or as to any matter or thing arising thereunder, then either party shall forthwith give to the other, notice of such dispute or difference and the matter shall be referred within a period of thirty days of such occurrence to the Managing Director for his opinion / decision. The decision of the Managing Director, for the time being in respect of all questions and disputes relating to the meaning of the specifications, designs, drawings, and instruction herein before mentioned and as to the quality of the workmanship or materials used on the work or as to any other question, claim, right, matter or thing whatsoever, in any way arising out of, relating to the contract, designs, drawings, specifications estimates, instruction, orders or these conditions or otherwise concerning the work of execution or failure to execute the same whether arising during the progress of the work or after the completion or abandonment thereof, shall be final. The Managing Director shall before giving his decision in writing in the matter shall give an opportunity of being heard to the parties to the contract. If any party to the contract is dissatisfied with the final decision of the Managing Director, in respect of any matter, following steps shall be taken by the parties. *First*, parties shall endeavor to resolve the dispute by negotiation within the framework of the contract. If the negotiation is successful, the outcome thereof shall be recorded in writing and be signed by all the parties to the dispute which shall be final and binding on them. *Second*, if the negotiation fails, the parties to the dispute will appoint an independent mediator in whom they have full faith and confidence. If the mediation is successful, the outcome thereof shall be recorded in writing and be signed by all the parties to the dispute which shall be final and binding on them. *Third*, if the mediation fails, the aggrieved party may refer such dispute to the Arbitration Tribunal constituted under the Madhya Pradesh Madhyastham Adhikaran Adhiniyam 1982 (no.2 of 1983) within sixty days after receiving notice of failure of mediation. The Arbitration Tribunal constituted under the Madhya Pradesh Madhyastham Adhikaran Adhiniyam shall resolve the dispute only in accordance with the law for the time being in force in India. The law whether substantive or procedural of any other legal system or country, other than those of India, shall not be applicable at any stage and in any manner to the dispute.

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 notwithstanding 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 proper 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).

8.8.1 Force Majeure –

8.8.1. 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.

8.8.2. 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 radio-activity, except as may be attributable to the Contractor's use of such munitions, explosives, radiation or radio-activity, and
- v. natural catastrophes such as earthquake, hurricane, typhoon or volcanic activity.

8.8.3. 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.

8.8.4 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.

P_{fm} = 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 date of opening of Financial Bid.

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 19, 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.

8.8.5 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.

8.9 **Extension of Time:**

If the contractor shall desire an extension of the time for completion of the work on the grounds of his having been unavoidably hindered in its execution or any other ground, he shall apply in writing to the Engineer-in-Charge of PIU 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, are shown therefore, may authorize such extension for such period as is reasonably necessary under the circumstances. Any further extension of time 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-motto 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)

8.10 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 upto the end of Operation and Maintenance period after successful completion of work in all respects and its testing & commissioning

Contractor liable for damage done and for imperfection for the period upto the end of Operation and Maintenance after completion certificate:

If the contractor or his 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 curbs, 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 times thereafter may become due to the contractor or from his security deposit or the proceed of sale thereof or of sufficient portion thereof.

8.11 Action when the work is left Incomplete, Abandoned or Delayed beyond the Permitted Limit allowed by the Engineer-in-Charge:

If the Contractor fails to carry out any obligation under the Contract, the Engineer in Charge may by notice require the Contractor to make good the failure and to remedy it within a specified reasonable time.

8.11.1 The Engineer in Charge shall be entitled to terminate the Contract if the Contractor

- a) abandons the Works or otherwise plainly or otherwise demonstrates the intention not to continue performance of his obligations under the Contract;
- b) the Contractor is declared as bankrupt or goes into liquidation other than for approved reconstruction or amalgamation;
- c) without reasonable excuse fails to comply with the notice to correct a particular defect within a reasonable period of time;
- d) the Contractor does not maintain a valid instrument of bank guarantee and financial security as prescribed;
- e) the Contractor has delayed the completion of the Works by such duration for which the maximum amount of liquidated damages is recoverable;
- f) If the Contractor fails to deploy machinery and equipment or personnel or set up a

field laboratory as specified in the Contract Data;

g) If the contractor, in the judgment of the Engineer in charge has engaged in corrupt or fraudulent practices in competing for or in executing the contract;

h) Any other act amounting to breach of contract including fundamental breaches, and breach of fundamental terms.

In any of these events or circumstances, the Engineer in Charge may, upon giving 14 days' notice to the Contractor, terminate the Contract and expel the Contractor from the Site. However, in the case of sub-paragraph (b) or (g) of clause 8.11, the Engineer in Charge may terminate the Contract immediately.

8.11.2 Notwithstanding anything contained in the above clause, the Engineer-in-Charge may terminate the Contract for convenience by giving notice to the Contractor.

8.11.3 Payment upon Termination:

If the contract is terminated under clause 8.11.1, the Engineer shall issue a certificate for value of the work done less advance payments received upto the date of issue of the certificate, less other recoveries due in terms of the contract, less taxes due to be deducted at source as per applicable law and less the percentage to apply to the value of work not completed (10%). In the event of contract being terminated (during execution or during O&M period), under clause 8.11.1, the amount of security deposit (remaining at that point) of the contractor will be forfeited.

8.11.4 Payment on termination under clause 8.11.2 above

If the Contract is terminated under clause 8.11.1 above, the Engineer shall issue a certificate for the value of the work done, the reasonable cost of removal of Equipment, repatriation of the Contractor's personnel employed solely on the Works, and the Contractor's costs of protecting and securing the Works and less advance payments received up to the date of the certificate, less other recoveries due in terms of the contract and less taxes due to be deducted at source as per applicable law. If the total amount due to the Employer exceeds any payment due to the Contractor, the difference shall be recovered as per clause 8.11 above.

8.12 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. .

8.13 Conditions applicable for contract:

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

9. Bid Evaluation-

The tendered cost of each bidder shall be evaluated as below-

Effective Lump Sum Offer of the bidder = L + {CCB - CCL}

Where-

- L = Lump sum Cost offered by the bidder
CCB = Capitalized cost of energy charges Cc of the bidder
CCL = Capitalized cost of energy charges Cc of the lowest technically responsive bidder.

10. Following documents annexed with this N.I.T. shall form part of the contract.

- | | | |
|--------------|---|---|
| ANNEXURE – 1 | : | Joint Venture |
| ANNEXURE – 2 | : | Affidavit |
| ANNEXURE 'A' | : | Model rules, relating to labor water supply sanitation etc. |
| ANNEXURE 'B' | : | Contractor's labor regulations. |
| ANNEXURE 'D' | : | Form of Income Tax Clearance Certificate. |
| ANNEXURE 'E' | : | Specifications |
| ANNEXURE 'F' | : | Schedule of main items of work & leading details |
| APPENDIX-1 | : | List of Villages and Water Demand |
| ANNEXURE 'H' | : | Break-up schedule of payment. |
| ANNEXURE 'I' | : | Drawings. |

**Managing Director
Madhya Pradesh Jal Nigam Maryadit
Vindhyachal Bhawan, Bhopal**

MADHYA PRADESH JAL NIGAM MARYADIT
(A GOVT. OF M.P. UNDERTAKING)
TENDER FOR A 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 fulfill all the conditions annexed to the said specification or in default thereof to forfeit and pay to the Madhya Pradesh Jal Nigam Maryadit the penalties of sums of money mentioned in the said conditions.

Dated Tenderer's Signature.....

Address.....

Witness..... Address.....

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

The2018.....

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 favor of the Employer (Managing Director, Madhya Pradesh Jal Nigam Maryadit) for a sum equal to the percent of the sum specified in the clause 3.5 of Detailed Notice Inviting Tender, for a period on the basis of condition for refund of Security Deposit (Para 3.5). All damages to be borne, or other sums of money payable by the contractor(s) to the Madhya Pradesh Jal Nigam Maryadit 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 Maryadit 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 several 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 General Manager of PIU, (hereinafter called the 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 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, labor 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.
- 2(A) In respect of all bearings, hinges or similar parts intended for use in the superstructure of any bridge, the contractor shall, whenever required, in the course of manufacture, arrange and afford all the necessary and adequate facilities for the purpose of inspections and tests of all or any of these parts and the material used therein to any officer of the Directorate of Inspection of the Ministry of Works, Production and supply of the Government of India and such bearings, hinges or similar parts shall not be used in the superstructure of any bridge except on production of a certificate of acceptance thereof from the Directorate of Inspection. All inspection charges will be payable by the contractor.
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's shall not to 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) 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 labor 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 Latest Schedule of Rates of Urban Administration and Development Department/P.H.E. Department, as specified. In such cases in which rates do not exist, 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 Maryadit 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 the Madhya Pradesh Jal Nigam Maryadit 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 Maryadit 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 contractor(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 Maryadit 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 exceeded 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 within 30 months including rainy season from the date of issue of the aforesaid order and if from any cause whatever other than willful 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 Maryadit from his/their bills, and/or encash the bank guarantee, and/or recover liquidated damages for each default @ 0.05 % 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 **ten percent** 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 contractor(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 Managing Director by the Contractor(s). The Managing Director 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 that in case of any question/dispute of difference arising 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 of requisitions of the Engineer-in-Charge involving increased cost of the contractor(s) beyond the cost properly attending the carrying out of the contract according to the true intent and meaning of the signed drawings and specifications 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 No. 1,4,8 & 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 of in case he shall withhold 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 of 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 8.6.

18. If at any time before or after the commencement of the work, Madhya Pradesh Jal Nigam Maryadit 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 being 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	Managing Director Madhya Pradesh Jal Nigam Maryadit Vindhyaachal Bhawan, Bhopal
Dated.....	Dated.....

Joint Venture (JV) Annexure -1

If a J.V. 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 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 registered, so as to be legally valid and binding on all partners; and
 - g. a copy of the Joint Venture Agreement entered into by the partners shall be submitted with the bid.
 - h. The lead partner and the other partners shall have minimum 51% and 20% stake respectively in the Joint Venture. 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. Each partner of the joint venture shall be individually registered in the appropriate class required for participation in the tender or if eligible for registration, can also participate after having applied for registration in appropriate class.
 - j. If the bidder have 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 NEITHER party 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 The Employer derives 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 Bidder's compliance with the minimum qualifying criteria required for the bid. All the partners collectively and individually must meet the

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**/joint venture.
4. The JV shall attach the power of attorney of the signatory[ies] of the bid authorizing signature of the bid on behalf of the joint venture
5. The JV shall attach the agreement among all partners of the joint venture [and which is legally binding on all partners], which shows the requirements as indicated in the Instructions to Bidders".
- 6 . JV shall furnish details of participation proposed in the joint venture as below:

7. DETAILS OF PARTICIPATION IN THE JOINT VENTURE

<i>PARTICIPATION DETAILS</i>	<i>FIRM 'A'</i> <i>(Lead Partner)</i>	<i>FIRM 'B'</i>	<i>FIRM 'C'</i>
Financial			
Name of the Banker(s)			
Planning			
Construction Equipment			
Key Personnel			
Execution of Work (Give details on contribution of each)			

AFFIDAVIT

(On Non-Judicial Stamp of INR 1000) Annexure -2

I/we _____ who is/ are _____ (status in the firm/ company) and competent for submission of the affidavit on behalf of M/S _____ (contractor) do solemnly affirm an oath and state that:

I/we am/are fully satisfied for the correctness of the certificates/records submitted in support of the following information in bid documents which are being submitted in response to notice inviting e-tender No. _____ for _____ (name of work) dated _____ issued by the _____ (name of the department).

I/we am/ are fully responsible for the correctness of following self-certified information/ documents and certificates:

1. Fixed the self-certified information given in the bid document is fully true and authentic.
2. That:
 - a. Fixed deposit receipt deposited as earnest money, demand draft for cost of bid document and other relevant documents provided by the Bank are authentic.
 - b. Information regarding financial qualification and annual turnover is correct.
 - c. Information regarding various technical qualifications is correct.
3. No close relative of the undersigned and our firm/company is working in the department.

OR

Following close relatives are working in the department:

Name _____ Post _____ Present Posting _____

Signature with Seal of the Deponent (bidder)

I/ We, _____ above deponent do hereby certify that the facts mentioned in above paras 1 to 4 are correct to the best of my/our knowledge and belief.

Verified today _____ (dated) at _____ (place).

Signature with Seal of the Deponent (bidder)

Note: Affidavit duly notarized in original shall reach at least one calendar day before opening of the bid.

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. Lay out:** Labor huts shall be constructed for one family of 5 persons each. The lay out 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. If practicable filtered and chlorinated supplies shall be arranged. When supplies are from intermittent sources a covered storage tank shall be provided with a capacity for five liters per persons 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 waste water 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 whole time doctor and a dispensary. If there are women in the camp a whole-time 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 out 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 the 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 Equipments:

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

ANNEXURE –‘B’

Contractor’s Labor 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 or making good the loss suffered by a worker or workers by reason of non-fulfillment 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 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 fulfill 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 – ‘D’

Form of Certificate on Income Tax to be submitted by

Contractor Tendering for Works Costing INR 50,000/- or more

- (i) Name and Style (of the Company, firm, H.U.F. or individual) in which the applicant assessed to income tax and address for purposes of assessment.
- (ii) The Income Tax Circle/Ward/District in which the applicant is assessed to income tax.
- (iii) Following portion concerning the last income tax assessment made:
 - (a) Reference No. (or G.I.R. No.) of the assessment
 - (b) Assessment year and accounting year.
 - (c) Amount of total income assessed.
 - (d) Amount of tax assessed I.T., S.T., E.P.T., B.P.T.
 - (e) Amount of tax paid I.T., S.T., E.P.T., B.P.T.
 - (f) Balance being tax not yet paid and reasons for such arrears.
 - (g) Whether any attachment or certificate proceeding pending in respect of the arrears.
 - (h) Whether the company or firm or H.U.F. on which the assessment was made has been or is being liquidated, wound up, dissolved, partitioned or being declared insolvent, as the case may be.
- (iv) The position about later assessments namely, whether returns submitted under Section 22(1) or (2) of the Income-Tax act and whether tax paid under section 18-A of the act and the amount of tax so paid or in arrears.
- (iv) In case there has been no income tax assessment at all in the past, whether returns submitted under section 148(1) or (2) and 140 (3) and if so, the amount of income tax returned or tax paid and the income tax circle/ward/District concerned.
- (v) The name and address of the branch (is) verified the particulars set out above and found correct subject to the following remarks.

Date.....

Signature of I.T.O.

Seal.....

Circle/Ward/District

ANNEXURE – ‘E’
GENERAL SPECIFICATIONS
CHAPTER – 1

GENERAL BRIEF SPECIFICATIONS:

1.0 SPECIFICATION REFER TO:

- 1.1 Manual on Water Supply and Treatment by CPHEEO, Ministry of Urban Development, New Delhi and Guidelines (Latest) published by Ministry of Drinking Water and Sanitation, Govt. of India for Rural water supply.
- 1.2 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.
- 1.3 National building code of India latest edition.
- 1.4 Code of practice for earth quack resistance designs IS-1893
- 1.5 Specification for civil Engineering works shall be governed by "Standard Specification Published" by CPWD Govt of India with up to date amendments.
- 1.6 Government specification for electric works in Govt. Deptt. in Madhya Pradesh in force from 1972 with up to date amendments.
- 1.7 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.

2. Production, Submission and approval of engineering documents-

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

2.1 Meaning:

The following meanings shall apply:

- (i) Engineer-in-Charge means head of Project Implementation Unit of Madhya Pradesh Jal Nigam Maryadit normally General Manager.
- (ii) "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".
- (iii) "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.
- (iv) "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".

2.2 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.

2.3 Knowledge of work:

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

2.4 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 Engineer's 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.

2.5 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 by the Engineer for review until the program for their submission has been approved by him.
- (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). Five copies of all approved design and documents shall also be submitted along with CDs.

2.6 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.

2.7 Manufacture's and Contractor's Certificate:

- a) 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.
- b) Certificates shall be clearly identified by serial or reference number where ever possible to the material being certified and shall include information required by the relevant Reference Standard or Specification Clause.
- c) 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.
- d) 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.
- e) A section dealing with procedures for ordering spares shall also be included in the instruction.
- f) 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.
- h) All the electrical and mechanical equipment's shall be subjected to approval by third party inspection at place of manufacture, at contractor's cost.
- i) Transit insurance of all equipment's shall be the contractor's responsibility.
- j) Contractor shall have to take the certificate from the electrical inspector for

- regarding all electrical equipment's before commissioning of plant.
- k) Important instructions charts shall be framed and fixed at appropriate and prominent places.

3.0 Maintenance Instructions:

A maintenance manual shall be provided as supporting documents to the equipment manufacturer's instructions.

(i) Maintenance Manual

A 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.

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

C. A complete list of recommended lubricants, oils and their charts.

D. A spares schedule, which shall consist of a complete list of item wise spares for all electrical and mechanical plant items with ordering references and part numbers.

E. A 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.

F. Preventive maintenance details.

4. Record Drawings:

The Contractor shall provide record drawings including those drawings submitted by the Contractor to show the whole of the plant as installed and all civil works as built. 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 or Record Drawings shall be pre-requisite for the last taking over certificate. All the Record Drawings shall be of A2 size, in five copies, out of which 3 sets shall be plastic laminated for long-life. In addition, one set of Microfilm of all the Record Drawings shall also be furnished. The text of all the reports shall be prepared on a widely used IBM compatible MS Word / MS Excel, and all the Drawings shall be prepared using AutoCAD Software and in pdf form. When reports, drawings are furnished to Jal Nigam, two 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 Jal Nigam on CDs, Pen drive, data base preferable on MS office and AutoCAD latest versions and in .pdf form.

5.1 Program of Work:

- a) 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.
- b) The contractor shall include with his tender 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 Schedule.

- (i) activity duration in months and event times should be in months from the first event on the network and event numbers:
 - (ii) 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:
 - (iii) the timing of events shown in the program of work to be adhered to and shown in the network;
 - (iv) 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;
 - (v) 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 in (iv) above; and
 - (vi) program for submission of Instruction Manuals and Record Drawings;
- c) As soon as practicable, and in any case not later than four weeks, after acceptance of his tender the Contractor shall submit to the Engineer-in-Charge for his approval a program showing the order of procedure in which he proposes to carry out the works.
- d) Particulars to be shown on the program shall include:
- (i) Submission of drawings;
 - (ii) Placing of work orders;
 - (iii) Stages of manufacture;
 - (iv) Tests at place(s) of manufacture;
 - (v) Deliveries to Site;
 - (vi) Construction of Civil works ready for erection of Plant;
 - (vii) Mechanical completion of erection at site;
 - (viii) Tests at site;
 - (ix) Finishing and completion of civil and electrical works.
- e) 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.
- f) 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.
- g) 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 entered in the Tender.
- h) Contractor shall submit the quarterly financial planning along with the work program. This financial planning shall be according to physical planning.

5.2 PROGRESS:

- a) 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.

- b) The progress report shall also include status report on the following approved individual formats:
 - i) Drawings;
 - ii) Supplies of Plant Items;
 - iii) Construction program;
 - iv) Construction Progress;
 - v) Overall Progress Curve;
- c) From time to time the Managing Director or Engineer-in-Charge shall 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.
- d) 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.

6. GENERAL SPECIFICATION:

6.1 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.

6.2 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 with same specifications as per applicable IS code may also be used.

6.3 SAND:

The sand shall be as per IS 383/1970. The preferable sand shall be Narmada river sand. The sand for plaster shall be confirming IS 1542.

6.4 METAL:

Metals shall be confirming to IS 383/1970.

6.5 STEEL FOR REINFORCEMENT:

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. The steel is being used for 6 mm dia 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 in any circumstances. The Engineer-in-Charge, however reserves the rights to get the steel tested at the cost of contractor. The preferable makes of steel are TATA, RINL, SAIL or equivalent make of approved prime manufacturer

6.6 CEMENT :

The cement to be used in the work shall be 43/53 grade Ordinary Portland Cement conforming to B.I.S. 8112 or 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: 1498. Ordinary Portland cement shall be of ACC, Ultra Tech, JP, Diamond, Prism, Birla or TATA or equivalent makes. 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 I.S. 3536-1966	One test for 10 Tons or part thereof.
b)	Test for determination of Compressive strength of cement as per IS 3536/1966.	One test for 50 tones or part thereof.
c)	Specific Gravity	As per Specification
d)	Soundness	As per Specification

6.7 CONCRETE :

In general concrete shall be designed as per IS 456:2000 latest addition and concrete for water-retaining structures shall be designed as per IS: 3370-Part-II latest editions. 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 456:2000 latest addition.

In general, the clear cover to reinforcement shall be as per IS 456:2000 latest addition, but additional cover, for corrosive water of 12 mm shall be provided on all water retaining faces of the structural members as per the provisions of IS: 3370 (Part II) latest addition.

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 set-up a laboratory for testing of metal, concrete, cement on the site. Slump test shall be carried- out by contractor at his own cost. During concreting, sample test cube shall be prepared as per the frequency prescribed in IS 456:2000 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 his own cost. If the result of this comes again un-satisfactory 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.

6.8 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 1893-2002 'Criteria for earthquake resistance design of structures'.

6.9 RAILING:

The railing, wherever provided shall consist of 1.2 M high medium class G.I pipe posts at

1.5 M c/c embedded welded with reinforcement in cement concrete with 3 rows of 32 mm Medium class G.I pipes railing, duly painted in two or three coats, so as to give smooth and even finish, with synthetic enamel paint over prime coat.

6.10 PAINTING & FINISHING:

Two coats of Weather Shield Apex painting on the entire exterior 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.

7.0 ELECTRICAL WORKS:

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. On the outside campus also, sodium vapour lamps 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.

7.1 ELECTRIFICATION :-

7.1.1 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 10mm minimum. GI strip shall be buried at a minimum depth of 600mm.

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 labeled 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.

7.1.2 Colors :

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

7.1.3 Conductors

Copper conductors shall be used for power cables and copper conductors for control and instrumentation throughout. Cores of cross-sectional area greater than 4 mm². Small power and control cables shall be of a minimum cross section of 2.5 mm². Internal wiring of control panels shall be of a minimum cross-section 1.5mm² flexible and standard.

Instrumentation and control cabling shall be of a minimum cross-section 1.5mm² for external use and 1.0mm² for internal use.

7.1.4 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.

7.1.5 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.

7.1.6 Marketing 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.

7.1.7 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 energise a relay in each section of the assembly in order to light each lamp and enunciator. The lamp test circuit shall pass through auxiliary contacts 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.

7.1.8 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.

7.1.9 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, store room, 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.

The general requirements for lighting fixtures and wiring is given below. The tenderer 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 4064 & 4047 - 1967. Approved make fluorescent tube fittings rust resistant, stove enameled type with copper wound choke, capacitor, starter, holder etc. complete with tubes 2 x 40 watts or equivalent LED arrangement shall be provided. Approved make and accepted standard H.P. sodium vapour lamp, street lighting luminaries, consisting of metallic housing, highly polished aluminum mirrors, clean acrylic covers, gasket and equipped with accessories such as ballast. Condenser igniter skirted ceramic lamp holder suitable for 250 watt HPSV lamp complete with sun lamp or equivalent LED arrangement 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.

- Approved make ceiling fans of 1200 mm. sweep and pedestal fan 380 mm. size shall be provided by the contractor.

- The tender shall also include 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.

- Approved make means, Phillips, Compton, G.E.C. or equivalent makes approved by the competent authority only,

- 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 7.00 M. 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.

7.2 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's under the contract. A distribution board 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 weather proof distribution board to energize flash mixer, clariflocculator 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.D.B. for control of street light shall also be mounted in the pump house.

7.3 STARTER / PUSH BUTTON :-

For motors up to 5 H.P. D.O.L. push button starters shall be used. Motors above 5 H.P. shall have air break manually / electrically operated star delta starters.

7.4 CABLES: -

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

7.5 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 lightning Arrestor shall be provided at two distant location of buildings.

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

7.6 LIGHTENING CONDUCTOR :-

Lightening conductor of 25mm dia 300mm long copper tube having single prong at top with 85mm. dia thick copper base plate including holes shall be provided. It shall have 20x 3mm thick copper strip with necessary support to connect the strip to surface up to earthing plate. It shall be provided at the top of wash water tank.

7.7 ELECTRIC CONNECTION CHARGES

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

7.8 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.

8.0 VALVES & SPECIALS:-

Specification for Valves and specials and other materials shall be governed by relevant latest BIS specifications with their amendments, the material of these valves and specials **should be DI with IS Mark**, where DI pipeline and HDPE pipelines have been laid. The valves, which are not available conforming to BIS specification its face to face dimensions and flanges, shall be conforming to IS 14846-2000. The make of valves and specials have been given in Chapter 1.9B. 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.

9.0 Units of Water Treatment Plant:- All units and components of Water Treatment Plant shall be designed as per recommendations of Manual on Water Supply and Treatment, published by CPHEEO, Ministry of Urban Development, Govt. of India.

10.0 Minimum size of D.I. pipelines:- The minimum size of D.I. K-7 or K-9 pipes shall be of 100 mm.

11.0 MS pipe of 600 mm and above dia.:- Wherever the size of pipeline is designed as 600 mm dia. or above, it shall 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.

12.0 Boundary wall:- All the sites of structures e.g. intake well, pump houses, ESRs, MBRs and/or B.P. Tanks, WTP etc. shall be provided with boundary wall of minimum 2.0 m height from GL. The Boundary wall shall be of min. 20 cm thick brick masonry suitably constructed on RCC beams connected with RCC columns and having MS fabricated gate of minimum 3.5 m width. Para 6 General Specification of works shall be applicable as given in Chapter-1 of Annexure-‘É’.

13.0 Approach roads:- Wherever the specifications for approach roads are not given in NIT, it shall be WBM and overlaying Bituminous layers as per MOST specifications applicable for such roads. The width of roads shall be minimum 3.5 m. 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 B seal coats.

**Managing Director
Madhya Pradesh Jal Nigam Maryadit
Vindhyachal Bhawan, Bhopal**

CHAPTER – 1.1

BRIEF SPECIFICATIONS OF INTAKE WELL-CUM- PUMP-HOUSE

Scope of work:

The tenderer shall be required to complete the following works including the planning, design, construction, testing, commissioning and O&M;

- i) Intake Well Cum Pump House** at the bank of Mohanpura Dam on river Newaj near village Banpur District Rajgarh side at the selected site to draw raw water from top most layers in different seasons and also from the lowest level of water as below-
- a) 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.
 - b) The size of the intake well should be such that it has adequate capacity to draw 33.35 **Million** litre raw water in 23 hours having minimum 7.0 meter internal diameter.
 - c) The size of the Intake well should have adequate capacity for installation & maintenance of the pumps/motors with minimum 7.0 meter internal diameter, to house the pumping equipment's, as per specifications capable to supply 33.35 Million litres water in 23 hours.
 - d) 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.
 - e) Suitable sluice valves/gates at the entrance of Intake well have to be provided to control the flow with manual as well electrical operated arrangement.
 - f) Proper arrangement for fresh air circulation should be there so that suffocation does not occur during the maintenance of the well.
 - g) A RCC staircase to Intake well with proper railing up-to bottom, with landing at intermittent points has to be provided.
 - h) A separate gantry of suitable capacity is to be provided for maintenance purposes.
 - i) Proper ventilation/lighting arrangement as per the BIS requirements for the pumps and motors are to be provided.
 - j) Proper lightening arrester arrangement as per BIS standards are to be made for Intake well.
 - k) The internal diameter of the Intake well shall be minimum 7.0 m.
 - l) The intake well shall have inlet port arrangements at different levels, screens, racks, sluice valve arrangement with both manual and electrically operated arrangement.

ii) Approach bridge

A suitable approach bridge, having clear width of minimum 3.5 m 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.

- iii)** 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 have been included in the quoted rates.

The Specifications for construction of Intake well cum pump house and electrical

mechanical equipments for the Water supply scheme are given in the following paras:

1 General

- 1.1 The job means 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.
- 1.2 The tenderer's offer shall be technically sound and economically viable.
- 1.3 The tenderer shall be 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 Jal Nigam staff authorized by the M.D/ Engineer-in-Charge. Testing shall be carried out at contractor's cost and it shall be the duty and responsibility of the contractor to ensure that respective standards are achieved.
- 1.4 The Intake well shall be required to house vertical turbine pumps and other accessories, therefore coordination with the pump suppliers and hydraulic model studies shall be essential for deciding arrangements of pump installations. The contractor shall carry out any modification, addition and alteration, with the written approval of the Engineer-in-Charge, to the design and structure to meet the desired and necessary requirements without causing any extra liabilities on the MP Jal Nigam. The Contractor shall 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 shall be suitable for ultimate capacity of this project to draw 85.16 Million liters in 23 hours through different ports at same level. In the Intake well cum pump house total 4 numbers of vertical turbine pumps (2 Working + 2 Standby) which may be replaced in future after O&M period, for ultimate capacity. These pumps shall operate individually or in all possible combinations. The Civil structure shall 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 shall also be considered.

2 Detailed investigation

It shall be necessary for the tenderer to depute technical personnel to visit the site of construction to get them acquainted with the prevailing site conditions and for any additional information 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 RL of HFL shall be worked out by the contractor for planning water supply head works at the Intake well site on bank.

The tenderer shall confirm in writing that the above topographical and hydrological investigations have been done and satisfy themselves before submission of their tender as these details are just for guidance. No claims on variation of above data shall be admissible & considered for payment.

2.1 Preparation of technical report

The tenderer shall prepare a technical report for design and construction of the said work incorporating complete information, specifications and data for submission along with his tender.

2.2 Detail Designs and Drawings-

2.2.1 On acceptance of the tender, the contractor shall submit structural details, designs and drawings of the entire structure including allied works within 30 days from the date of acceptance of his offer. Besides this a general layout drawing showing the arrangement of installations of vertical turbine pumping sets, piping arrangement at discharge floor, location of their starters control panels, main switch board, cable laying etc. shall also be supplied by the contractor. Entire civil works related to these items viz. foundations for pump, motor, cable trenches ducts and opening in staining wall of Intake, opening in slabs for pump opening pumps, gantry cables and pipes etc. in all respects shall provided by the contractor and shall be a part of this contract.

2.2.2 The responsibility for design, construction, structural stability and water tightness shall rest solely with the contractor. The contractor shall submit four sets of completion drawings immediately after completion of work.

2.2.3 Detailed design shall include all the required calculations for all the components including, but not limited to, 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 work 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

2.2.4 At the time of submitting tender, the contractor shall have to submit an outline plan and section of the proposed work showing different components and scope of the work.

3.0 Foundation of Intake well-

3.1 The foundation of Intake well shall be designed and constructed considering the strata met in foundation, 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, shall also be taken into consideration for the design.

3.2 The drawings showing location of proposed work enclosed herewith are for guidance only. The work of foundation also includes the work of dewatering of water, shoring of sides of excavation, scaffoldings, de-silting of foundation, construction of coffer dam etc. for which no extra payment shall be made to contractor. The tenderers are therefore advised to inspect the site of construction before tendering their offer to ascertain the quantum of such works. The tenderer shall be deemed to have full knowledge of all the

relevant documents, proposed site of construction, soil samples or strata at site. The concrete mix for foundation RCC work should not be weaker than M30 and the stresses in concrete shall be taken as per IS 3370 and other relevant BIS codes/specifications.

- 3.3 Blasting in foundation shall be permitted only by the competent authority if the contractor guarantees that such operation shall not pose any threat of damage or injury.
- 3.4 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 1.5 metres for adequate anchorage purpose. In case of foundation resting on rock, the minimum embedment in the rock shall be 1.5 metres. However minimum depth below the scour line has to be ensured considering the sufficient factor of safety as per prevailing IS and IRC norms. The minimum bottom floor level of intake well shall be such, so that the water can be drawn up-to 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.
- 3.5 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.

3.6 Construction of trash rack structure, Intake well cum pump house

The R.C.C trash rack structure shall have the minimum suitable floor area, and for summer and fair weather & monsoon season three inlet ports shall be provided at suitable levels.

Control sluices for lower most and monsoon level ports shall be above HFL at Intake floor level where as all upper sluices shall be provided in the staining 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 shall be able to draw designed flow from the river at each of the ports. The top level of trash rack structure shall be connected to Intake well with an approach. Rose pieces shall be designed for 50% clogging.

- 3.7 The R.C.C Intake well with RCC framed structure pump house structure shall be having a dia of 7.00 m internal with a minimum discharge floor area for 4 numbers of vertical turbine pumping sets with all its appliances and appurtenances and minimum 6.00 m height. These shall be placed such as to have a clear space of 1.5 m in between the pumps/ motors, and the minimum distance of the pump/motor from the wall shall not be less than 1.5 m, and shall be designed to carry the static load, dynamic and impact load each excluding dead load of floor. The motor floor shall have a minimum floor area to accommodate starters and capacitors for motor floor level; motor floor slab has to be designed accordingly. The arrangement of beams for slab shall be given in such a way that these do not obstruct motor foundation and column assembly of pumps, valves, pipelines. The head room on discharge floor shall not be less than 3.0 M below the bottom of the beams of motor floor. Sufficient sand filling in sunk wells are to be made as per IRC clause 1207.

3.8 Staircase:

A R.C.C. staircase of minimum 1.0m width with railing for a suitable live load of discharge floor level to the bottom of the Intake well shall 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 shall be provided at about 4.0 M vertical intervals. The stairs shall be provided with railing as per specifications.

3.9 Inlet ports:

The well staining shall be provided with 3 Nos. inlet ports with suitable thimble plates, gates, operating rods manual/electrical operated 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 if desired 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.

4.0 Pipe floor or Discharge floor:

Pipe floor shall be provided to house all discharge pipes, valves and manifold for all the vertical turbine pumping sets as per requirement. The floor slab shall be designed for a uniformly distributed expected live load and moving loads, suitably designed openings shall be provided for passing column pipes through the slab. The suitable provision for concrete bedding and thrust blocks for all discharge pipes shall also be provided. A door entrance opening with steel collapsible gate shall be provided in the well staining above pump discharge floor level towards the approach road/ramp. An opening towards the approach ramp shall be provided at motor floor just above the entrance of discharge floor. The arrangement shall be such that easy handling of motors/pumps is possible with the help of gantry crane. A minimum 1.0 M 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, 5.0 MT capacity and tilting bucket shall be provided for lifting silt from the bottom of Intake.

4.1 Motor floor and Pump house:

A floor slab at motor floor with minimum 1.0 m cantilever projection as balcony all around on the outer side of wall steining shall 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 ironite 1.50%, an opening 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 shall be provided all around. Good architectural appearance shall be provided to balcony and chhajja to the satisfaction of department. A main entrance of 2.4m x 1.5 m shall be provided facing towards the staircase. The staircase shall be connected with the balcony to facilitate approach to the motor floor from discharge floor Approach road/ramp. G.I pipe railing shall be provided all around the balcony. Sufficient doors, ventilator and windows of Z- section steel or aluminum 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.

4.2 The roof of pump house shall be of R.C.C and the live load over the roof shall not be less than 150 Kg/Sqm.

4.3 Sufficient space for storage of spare parts and tools and plants shall 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 looking arrangement.

4.4 **Arrangement of Gantry Girder:**

Cantilever projection not less than 0.3 m shall 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 shall be provided all around this projection over which the gantry girder will move along the circumference. The gantry girder shall 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 shall also be made.

5.0 **Approach bridge:**

A R.C.C approach bridge of suitable length from Intake well to nearest GL above HFL shall be constructed. The width of the bridge shall be minimum 3.5 m excluding the 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 R.C.C., Full drainage arrangement from slab of the bridge shall be provided. The scope of this work includes the detailed geo technical investigation, design drawing, construction, and load testing etc. for this work.

Managing Director

CHAPTER - 1.2

BRIEF SPECIFICATIONS RAW WATER PUMPING MAIN WORK

1. BRIEF SCOPE OF WORK:

The raw water pumping main shall be provided for conveying 33.35 MLD in 23 hours water from Raw Water Intake well-cum-Pump House near village Banpur, Block Rajgarh, District Rajgarh to Water Treatment Plant near village Rampuria, Block Rajgarh, District Rajgarh, which shall comprise main section as per details below-

Raw water pumping main shall start from Raw Water Intake well-cum-Pump House at Mohanpura Dam near village Banpur and terminate at the inlet of Water Treatment Plant near village Rampuria is having a total length of 4100 m approximately. Raw water shall be taken from the Mohanpura Dam by intake well. This main shall be of 600 mm dia DI K-9 pipe having cement mortar in-lining and out-coating as per IS:8329-2000.

2. Allied Works: All works necessary for providing, laying, jointing, testing, commissioning and O&M of above pumping mains shall fall under the scope of works including surge protection works, if any.

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.

3. LAYOUT DRAWINGS OF PUMPING MAINS:-

The contractor shall 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 30 m 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 before or even after the acceptance of the tender or during the course of execution of work and the contractor shall not claim for compensation in any way on this account.

3. Supply and laying, jointing of Ductile Iron pipes and Specials

3.1. 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

3.2 Specifications for Ductile Iron Pipes:

3.2.1. Casting

The pipes shall be centrifugally cast (spun) Ductile Iron pipes for Water, confirming to the IS 8329. The pipes used shall be with push on joints (Rubber Gasket Joints). The class of pipe to be used shall be of the class K-9.

3.2.2. Surface coating

The pipes shall be coated with Metallic Zinc 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.

3.2.3. Standard length

The pipes shall 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 shall also be supplied with a rubber EPDM gasket, confirming to the IS: 5382. Any change in the stipulated lengths shall require prior written approval of the Engineer – in charge.

3.2.4. Manufacture of Gaskets

The gaskets shall also be supplied by the manufacturer of the pipes. They shall preferably be manufactured by the manufacturer of the pipes. In case they are not, it shall be the responsibility of the contractor to see that the manufacturer of the pipes get 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 shall however be responsible for the compatibility and quality of the products.

3.2.5. Flanged joints

The flanged joints shall confirm to the Clause 6.2 of IS 8329. The pipe supply shall also include one rubber gaskets for each flange.

3.2.6. 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 shall be applied before the hydrostatic test.

3.2.7. Test for Gaskets

The test reports for the rubber gaskets shall be as per acceptance tests of the IS 5832 and shall be in accordance to 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.

3.2.8. 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:

- 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.
- Mechanical Tests as per Clause 10 of IS 8329 for tensile strength and Brinell hardness test.
- 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.

3.2.9. 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.

3.2.10. Marking

- All pipes shall be marked as per Clause 18 of IS 8329 and show as below:
- Manufacturer name/ stamp
- Nominal diameter
- Class reference
- A white ring line showing length of insertion at spigot end

3.2.11. Packing and Transport:

The pipes shall be preferably transported by road from the factory and stored as per the manufacturer specifications to protect damage.

3.3. Specifications for Ductile Iron Fittings (Specials)

3.3.1. General

The Ductile Iron (DI) fittings shall be D.I. fittings, ISI marked as per IS : 9523-2000, suitable for Tyton joints to be used with Ductile Iron pipes with flanged and Tyton jointing system.

3.3.2. Types of specials

The following types of DI fittings shall be manufactured and tested in accordance with IS: 9523 or BS: 4772

- flanged socket
- flanged spigot
- double socket bends (90° , 45° , $22\frac{1}{2}^{\circ}$, $11\frac{1}{4}^{\circ}$)
- double socket branch flanged tee
- all socket tee
- double socket taper
- All the fittings shall be of PN 16 pressure rating

3.3.3. 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.

3.3.4. 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 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 get them manufactured from a suitable manufacturer under its own supervision and have it tested at his/sub-contractors premises as per the contract. The pipe manufacturer will however be responsible for the compatibility and quality of the products.

3.4. Lubricant for ductile iron pipes and specials

3.4.1. 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.

3.4.2. Specification

The lubricant has to have the following characteristics:

- must have a paste like consistency and be ready for use
- has to adhere to wet and dry surfaces of DI pipes and rubber rings
- to be applied in hot and cold weather; ambient temperature 0 - 50°C, temperature of exposed pipes up to 70°C
- must be non-toxic
- must be water soluble
- must not affect the properties of the drinking water carried in the pipes
- must not have an objectionable odour
- has to inhibit bacterial growth
- must not be harmful to the skin
- must have a shelf life not less than 2 years

3.4.3. Acceptance tests

Acceptance Test shall be conducted in accordance with the provisions of the IS 9523.

3.4.4. 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.

3.5. Laying and jointing of DI pipes and specials

3.5.1. Use of tackle

Pipes shall 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.

3.5.2. Cleaning

All construction debris shall 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 shall vacate any section of trench into which the pipe is being lowered

3.5.3. Laying on steep slopes

On gradients of 1:15 or steeper, precautions shall 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 shall 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.

3.5.4. 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 shall 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

3.5.5. 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.

3.5.6. 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.

3.6 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.

4 **Excavation and preparation of trenches for laying underground pipeline**

4.1 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 contractor 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 1.2 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. 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.

4.2 **Recovery of other serviceable material:-**

All serviceable materials such as wood work, 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.

4.3 **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 work place.

Trenching:-

The excavation of trenches shall be carried out by hand or machines. The width of trench shall be kept to a minimum consistent with the working space required. At the bottom, between the faces, it shall be minimum 200 mm clearance on either side of the pipe. However this is for the safety of the trench, the method of laying and jointing the pipe and the need to avoid damage to pipe coating.

4.4 **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 shall 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.

4.5 **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.

4.6 **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.

4.7 **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.

4.8 **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.

4.9 **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, equipments 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.

4.10 **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.

4.11 **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.

4.12 **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.

4.13 **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.

- 4.14 **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.
- 4.15 **Preparation of Formation for Sections of pipe line to be laid above Ground:-** Formation shall be prepared by cutting high grounds and filling in low areas. Care shall 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 shall also be taken to ensure that pipe rests fully either on cutting or on bank.
- 4.16 **Disposal of surplus material:** Excavated material in excess than required for backfilling the trenches, shall be disposed off 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.
- 4.17 **Extra material required for back filling:** If in any case, it is required to bring the soil for back filling from outside, it shall be of good quality and shall not have chemicals e.g. sulphates, chlorides & conductivity etc., which may cause corrosion to pipes, specials and other structures, beyond the permissible limits.
- 4.18 **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 all such crossings except fee charged by the concerned department for granting permission shall be included in the rates and no extra payment shall be made on that account. Liaisoning with the concerned authorities shall be under the scope of the contractor any road or shoulder damaged for laying of pipeline, should be restored and made good to the satisfaction of concerned agency.

Managing Director
Madhya Pradesh Jal Nigam Maryadit
Vindhyachal Bhawan, Bhopal

CHAPTER - 1.3

BRIEF SPECIFICATIONS CLEAR WATER GRAVITY/PUMPING MAIN WORK

1. BRIEF SCOPE OF WORK:

(A) The Clear Water Pumping Main shall be provided for conveying water from Clear Water Sump of Treatment Plant to MBR and from MBR to OHTs.

DI class K-9/K-7 pipe as per IS 8329 i/c valves, electromagnetic flow meters, sluice valves, air valves, scour valves, air valves, chambers, thrust block specials & accessories etc. complete.

250 mm to 600 mm internal dia. of length 113 Km as detailed below:

- a. 250 mm dia DI Class K9 - 42000 m
- b. 300 mm dia DI Class K9 - 24173 m
- c. 350 mm dia DI Class K9 - 35827 m
- d. 400 mm dia DI Class K9 - 293 m
- e. 450 mm dia DI Class K9 - 3000 m
- f. 500 mm dia DI Class K9 - 7500 m
- g. 600 mm dia DI Class K9 - 209 m

(B) The Clear Water Gravity mains shall be provided for conveying water from MBR to various Over Head Tanks.

DI class K-7 and K-9 pipe, as per IS 8329 i/c valves, electromagnetic flow meters, sluice valves, air valves, scour valves, air valves, chambers, thrust block specials & accessories etc. complete.

DI class K-7 and K-9 pipe, as per IS 8329 i/c valves, electromagnetic flow meters, sluice valves, air valves, scour valves, air valves, chambers, thrust block specials & accessories etc. complete.

100 to 400 mm internal dia of length 414.43 Km as detailed below:

- a. 100 mm dia DI Class K9 - 21200 m
- b. 150 mm dia DI Class K9 - 4048 m
- c. 200 mm dia DI Class K9 - 2158 m

- a. 100 mm dia DI Class K7 - 524 m
- b. 150 mm dia DI Class K7 - 210923 m
- c. 200 mm dia DI Class K7 - 57963 m
- d. 250 mm dia DI Class K7 - 52701 m
- e. 300 mm dia DI Class K7 - 21510 m
- f. 350 mm dia DI Class K7 - 39681 m
- g. 400 mm dia DI Class K7 - 3724 m

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.

2.0 LAYOUT DRAWINGS OF PUMPING MAINS:-

The contractor shall 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 30 m 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 before or even after the acceptance of the tender or during the course of execution of work and the contractor shall not claim any compensation in any way on this account.

3.0 Supply and laying, jointing of Ductile Iron pipes and Specials

3.1. 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

3.2 Specifications for Ductile Iron Pipes:

3.2.1. Casting

The pipes shall be centrifugally cast (spun) Ductile Iron pipes for Water, confirming to the IS 8329. The pipes used shall be with push on joints (Rubber Gasket Joints). The class of pipe to be used shall be of the class K-9.

3.2.2. 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.

3.2.3. Standard length

The pipes shall 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 shall also be supplied with a rubber EPDM gasket, confirming to the IS: 5382. Any change in the stipulated lengths shall be required to be approved in writing by the Engineer – in charge.

3.2.4. Manufacture of Gaskets

The gaskets shall also be supplied by the manufacturer of the pipes. They shall preferably be manufactured by the manufacturer of the pipes. In case they are not, it shall be the responsibility of the contractor to see that the manufacturer of the pipes get 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 shall however be responsible for the compatibility and quality of the products.

3.2.5. Flanged joints

The flanged joints shall confirm to the Clause 6.2 of IS 8329. The pipe supply shall also include one rubber gaskets for each flange.

3.2.6. 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.

3.2.7. Test for Gaskets

The test reports for the rubber gaskets shall be as per acceptance tests of the IS 5832 and shall be in accordance to 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.

3.2.8. 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:

- 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.
- Mechanical Tests as per Clause 10 of IS 8329 for tensile strength and Brinell hardness test.
- Hydrostatic Test as per Clause 11 of IS: 8329.

The sampling for the above tests shall be as per the provisions of 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.

3.2.9. 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 as a whole shall be deemed as not complying the required standards and shall be rejected.

3.2.10. Marking

- All pipes shall be marked as per Clause 18 of IS 8329 and show as below:
- Manufacturer name/ stamp
- Nominal diameter
- Class reference

- A white ring line showing length of insertion at spigot end

3.2.11. Packing and Transport:

The pipes shall be preferably transported by road from the factory and stored as per the manufacturer specifications to protect damage.

3.3. Specifications for Ductile Iron Fittings (Specials)

3.3.1. General

The Ductile Iron (DI) fittings shall be D.I. 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.

3.3.2. Types of specials

The following types of DI fittings shall be manufactured and tested in accordance with IS: 9523 or BS: 4772

- flanged socket
- flanged spigot
- double socket bends (90^0 , 45^0 , $22\frac{1}{2}^0$, $11\frac{1}{4}^0$)
- double socket branch flanged tee
- all socket tee
- double socket taper
- All the fittings shall be of PN 16 pressure rating

3.3.3. 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.

3.3.4. 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 shall also be supplied by the manufacturer of the pipes. They shall 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 get them manufactured from a suitable manufacturer under its own supervision and have it tested at his/sub-contractors premises as per the contract. The pipe manufacturer shall however be responsible for the compatibility and quality of the products.

3.4. Lubricant for ductile iron pipes and specials

3.4.1. 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.

3.4.2. Specification

The lubricant shall have the following characteristics:

- must have a paste like consistency and be ready for use
- has to adhere to wet and dry surfaces of DI pipes and rubber rings
- to be applied in hot and cold weather; ambient temperature 0 - 50°C, temperature of exposed pipes up to 70°C
- must be non-toxic
- must be water soluble
- must not affect the properties of the drinking water carried in the pipes
- must not have an objectionable odour
- has to inhibit bacterial growth
- must not be harmful to the skin
- must have a shelf life not less than 2 years

3.4.3. Acceptance tests

Acceptance Test shall be conducted in accordance with the provisions of the IS 9523.

3.4.4. 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.

3.5. Laying and jointing of DI pipes and specials

3.5.1. Use of tackle

Pipes shall 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.

3.5.2. Cleaning

All construction debris shall 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 shall vacate any section of trench into which the pipe is being lowered

3.5.3. Laying on steep slopes

On gradients of 1:15 or steeper, all precautions shall 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 shall 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.

3.5.4. 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 shall be inserted up to the insertion mark on the pipe spigot. After insertion, the correct position of the socket shall be tested with a feeler blade

3.5.5. 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.

3.5.6. 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-in-Charge 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.

3.5.7 Strainer Valve

Contractor shall provide strainer valve in pipeline before it enters in a village. These valves shall be provided for each and every village. The strainer valve shall be able to restrict the entry of large particles/debris from entering into the pipeline which otherwise may take a lot of efforts. It shall be easy to maintain the strainer valve and clean it whenever pressure drop is observed in the system.

3.6 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.

3.7 **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. For road cutting and restoration of concrete/ BT roads, estimates are based on conventional method. However, as directed by the Engineer in Charge, the contractor 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 1.2 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 workmen 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 (M15) cement concrete.

3.08 Recovery of other serviceable material:-

All serviceable materials such as wood work, 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.

3.09 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 work place.

Trenching:-

The excavation of trenches shall be carried out by hand or machines. The width of trench shall be kept to a minimum consistent with the working space

required. At the bottom, between the faces, it shall be minimum 200 mm clearance on either side of the pipe. However this is for the safety of the trench, the method of laying and jointing the pipe and the need to avoid damage to pipe coating.

3.010 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 shall 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.

3.011 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.

3.012 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.

3.013 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.

3.014 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.

3.015 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, equipments 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.

3.016 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.

3.017 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.

3.018 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.

3.019 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.

3.020 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.

3.021 Preparation of Formation for Sections of pipe line to be laid above Ground:-

Formation shall be prepared by cutting high grounds and filling in low areas. Care shall 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 shall also be taken to ensure that pipe rests fully either on cutting or on bank.

3.022 Disposal of surplus material:

Excavated material in excess than required for backfilling the trenches, shall be disposed off 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.

3.023 Extra material required for back filling:

If in any case, it is required to bring the soil for back filling from outside, it shall be of good quality and shall not have chemicals e.g. sulphates, chlorides & conductivity etc., which may cause corrosion to pipes, specials and other structures, beyond the permissible limits.

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 all such crossings except fee charged by the concerned department for granting permission shall be included in the rates and no extra payment shall be made on that account. Liaisoning with the concerned authorities will be under the scope of the contractor, any road or shoulder damaged for laying of pipeline, should be restored and made good to the satisfaction of concerned agency.

CHAPTER – 1.4

BREIF SPECIFICATIONS FOR WATER TREATMENT PLANT HAVING CAPACITY TO PROVIDE 26.15 MILLION LITRES OF TREATED WATER IN 23 HOURS

All units and components of Water Treatment Plant shall be designed as per recommendations of Manual on Water Supply and Treatment, published by CPHEEO, Ministry of Urban Development, Govt. of India.

A- SCOPE OF WORK:

This Contract is on turnkey basis. It 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 to provide 26.15 million liters of treated water in 23 hours including all associated mechanical and electrical plants, equipment's 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 shall represent a pleasing appearance with aesthetic features forming a balance between function and form. Architectural style representing the area/state should be given to the structure. 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 shall 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.

1. The scope of work includes but shall not be limited to the provision of the following :-
 - 1.1 Study of available data with department and if required collection of additional field data's and site investigations.
 - 1.2 Planning and design of most economical type of treatment plant to generate 26.15 Million liter filtered water in 23 hours, with due consideration of future expansion (Requirement for the year 2047).
 - 1.3 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's, electrical equipment's, 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.
 - 1.4 Design & Construction of Cascade Aerator or any other suitable system, for removal of iron in incoming Raw water if required.
 - 1.5 Design & Construction of sedimentation tank if required.
 - 1.6 Supply and erection of Dosing equipment's of coagulants, including chemicals with facilities to store Alum and chemicals for 3 months.
 - 1.7 Design and construction of Flash mixers.
 - 1.8 Design & Construction of Distribution chamber for clarifiers / flocculators.

- 1.9 Design & Construction of Clarifiers and flocculators.
- 1.10 Design & Construction of Rapid gravity sand filters, filter galleries, wash water tank, filter back wash system and filter control block.
- 1.11 Design and construction of clear water sump to store treated water.
- 1.12 Design and construction of clear water Pump House to accommodate the clear water pumps, electrical panels, control room etc.
- 1.13 Design & Construction of chlorination plant building, facilities for post and/or pre chlorination and storage of chlorine cylinders for 90 days requirement.
- 1.14 The sludge, from plain sedimentation tank, clarifier and flocculators shall 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, raw water inlet channel. The overflow from various units shall be connected to the storm water drains for safe disposal to the nearby water bodies with environmental acceptance.
- 1.15 Monitoring and instrumentation with their housing.
- 1.16 Electrical works including incoming cable from substation to main control panel, motor control centers, local control and panels compatible PLC, interfacing, power and control cabling, plant ventilation and lighting etc.
- 1.17 Pipe lines, valve chambers, service water installation, sampling and water quality monitoring, instrumentation and other miscellaneous works associated with the plant.
- 1.18 Levelling the treatment plant site and landscaping.
- 1.19 Storm water drain and sewers with appurtenances.
- 1.20 Administrative building, laboratory, store, and for control arrangements housing building, i/c 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.)
- 1.21 Guard Room - with not less than 6.0 sqmt floor area with toilet facilities and Building services.
- 1.22 A Conference room – of size 6 x 12 m with sitting capacity of 30 persons with toilet facilities and Building services.
- 1.23 Internal roads with storm water drains, landscaping and area lighting etc.
- 1.24 Training of PHE / Jal Nigam personnel in operation and maintenance of the plant during the last three months of O&M period.
- 1.25 **BY PASS CHANNEL**
 - (i) Raw water channel to flocculators by passing primary sedimentation tank.
 - (ii) Raw water channel to filters by passing flocculation and sedimentation unit.

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% over load.
- 1.26 Cascade Aerator - shall be designed in circular shape with circular Gullet to collect water.
- 1.27 Primary Sedimentation Tank. - Designed for the distension time as per the provisions in CPHHEO Manual, it shall have properly designed inlet and out let arrangement with due consideration to the better efficiency of settling, mechanical sludge cleaning arrangement with sludge effluent pipe etc. complete.
- 1.28 **CLARIFLOCCULATORS :** Designed with properly designed inlet and outlet arrangement with due consideration to the better efficiency of settling, mechanical sludge cleaning arrangement with sludge effluent pipe etc. complete. Clariflocculator shall be designed for 25% overloading including inlet and outlet.
- 1.29 **FILTRATION:**
Designed rapid gravity sand filters in even numbers.
- 1.30 **WALK WAY AND PIPE GALLERY:**
The minimum walk way near the filter should be 1.5 mt. wide and pipe gallery shall be

minimum 2.00 mt. or more wide to accommodate all the pipes and valves and have a proper slope to drain out the wash water through wash water pipe.

1.31 **MODULE CHAMBER ROOM OR CLEAR WATER CONTROL CHAMBER ROOM:**

It shall be designed to accommodate module chambers of all filters including weir, wash water tank pump and air blowers. The height shall be sufficient so that the wash water tank may be constructed above it.

1.32 **CHLORINE HOUSE AND CHLORINE CYLINDER STORE ROOM:**

It shall have sufficient space to accommodate liquid or gaseous feed chlorinator with weighing machine of 2 ton capacity. The cylinder storing room should have the sufficient capacity to accommodate cylinder/toner for at least 90 days storage. It shall be forced ventilated, easily accessible from at least two sides. It shall have arrangement near the ramp to unload the truck by providing chain pulley arrangement at a height of minimum 5.00 mt.

1.33 **STORAGE TANK FOR NEUTRALIZATION OF CHLORINE:**

Solution storage tank of minimum dimension 3.00x3.00x2.00 mt. size shall be provided with fire resisting tiles cladding. It shall be easily accessible from chlorine house or storage room.

1.34 **CLEAR WATER STORAGE TANK/SUMP :**

1.35 Designed for 2 hours detention period capacity and this capacity shall be divided in 2 compartments capable for isolation provided with scouring arrangement overflow arrangement, manholes, air ventilation cowels, ladders etc.

CLEAR WATER PUMP HOUSE :

It shall have sufficient space to accommodate required number of pump and arrangement to pump treated / clear water to OHTs and IPS.

Pumping arrangement shall, at least, have minimum numbers of centrifugal pumps as specified including cable ducts, surge protection (If so required), NRV, suction pipe etc. complete. It shall have sufficient height to accommodate the gantry crane of suitable capacity. It shall have additional store room of minimum size 5.00x4.00x4mt. Switch Board room of size 3.00x6.00mt and office room minimum 4.00x6.00mt. in size and toilet units.

1.36 **LABORATORY BLOCK :**

There shall be one laboratory block of 60 sqm minimum 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, toilet. WC block shall be attached with laboratory.

1.37 **WASTE WATER COLLECTING SUMP AND WASTE WATER LINE :**

The waste water or sludge water from flocculator, clarifier and filter plant and other units shall be collected in waste water collecting tank of at least suitable detention time and depth according to the levels. It shall have such level that the waste clear water tank can be cleaned easily. The overflow of waste water from tank shall be directly discharged by gravity away from treatment plant to the natural Drain. The chambers shall be provided at maximum 60.00 mt. Internal and at turning and where ever necessary. The diameter of the pipe shall be as per approved design and minimum class of pipe shall be RCC NP2.

1.38 **WASTE WATER PIPE FROM FLOCCULATOR, FILTER, CLEAR WATER SUMP:**

The waste water line from all the units R.C.C. class NP2 up to the waste water sump shall be provided.

1.39 **SLUDGE DRYING BEDS:**

Sludge drying beds shall be designed for 5 to 7 days cycle, the settled sludge from waste water sumps shall be taken to drying beds and filtrate will again be carried to flash mixer for

reuse.

1.40 INTERNAL AND EXTERNAL ELECTRIFICATION:

It shall be done as per details given and as per IS S/B.I.S./I.E. Rules

COMMISSIONING AND TESTING OF PLANT :

2. BASIC INFORMATION :

2.1 The source of water shall be proposed Mohanpura Dam on river Newaj near Banpur village.

2.2 The quality of raw water is appended in Annexure F. The quality of Raw water for design purpose may be taken as following:

Raw Water Quality Standards: -

S. No.	Parameters	Unit	Acceptable Limit	Permissible Limit in absence of alternate source	Result
Physical Test					
1	Turbidity	NTU	1	5	6
2	Colour	Hazen	5	15	-
Chemical Test					
3	pH value	Mg/L	6.5-8.5	6.5-8.5	8.4
4	TDS	Mg/L	500	2000	208
5	Total Hardness	Mg/L	200	600	-
6	Alkalinity	Mg/L	200	600	-
7	Chloride	Mg/L	250	1000	59
8	Fluoride	Mg/L	1.0	1.5	-
9	Iron	Mg/L	0.3	0.3	-
10	Nitrate	Mg/L	45	45	-
11	Sulphate	Mg/L	200	400	-
Bacteriological Test					
12	Tharmotolerent Coliform	/100 ml	NIL	NIL	-

However the firm or the contractors are advised to assess the water quality themselves before designing the plant and its performance.

2.3 LOCATION OF TREATMENT PLANT:

The location of the WTP is near village Rampuria, Rajgarh Block, District Rajgarh.

2.4 SITE TOPOGRAPHY & GEOLOGY:

The site is slight flat with average ground level 425 m.

3. BEARING CAPACITY OF SOIL:

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 by any Govt. Engg. College.

4. TREATED WATER QUALITY:

The plant as a whole and the units individually shall 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.

5. 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..

Clarified water quality shall meet the following standards

Turbidity	-	Not more than 15 NTU
Suspended solids	-	Not more than 15 mg/lit
Residual Aluminium	-	Not more than 0.5 mg/lit

Treated water quality after filtration and chlorination shall meet the following standards :

Colour	-	Should be free from colour with 3 or less on Cobalt scale. Turbidity -
		Not more than 1 NTU or less.
Suspended Solids	-	Not more than 2.5 mg/l
Taste & Odour	-	Unobjectionable
Residual Chlorine-		Not less than 0.2 mg/l
Coliform Organism-		Nil (MPN/100/ml)

6 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.

6.1 INLET CHAMBER :

It shall be provided to collect the raw water from cascade aerator. It shall be designed for designed Capacity. It shall be in R.C.C. 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 emergent loading condition. The residual head at the end of pumping main shall be 2 m, which may be kept, in consideration during the design.

6.2 INLET CHANNEL:

It shall be designed for designed capacity with flow measuring arrangement parallel flume type with dial type flow indicator. The raw water channel shall be constructed in minimum grade R.C.C. M-30 concrete supported on columns at minimum 2.00 mts, center to center in R.C.C. minimum grade M-25. A puddle collar shall be provided to receive water.

6.2.1. FLOW MEASURING ARRANGEMENT:

The flume shall be designed for a designed flow (with a provision of 50% over loading) with free board of not less than 30 cm. The measuring flume shall have a side chamber for float. The flume shall be open channel type. The entire construction shall be in R.C.C. and shall be perfectly water tight and suitably supported in R.C.C. columns. The walkway of 1.0-meter width with G.I. pipe railing as per specification 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 a maximum flow of 26.15 million liter water in 23 hours including 50% overloading. The weir plate will have brass edges which shall be graduated to read in liters 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.

6.2.2. BY PASS CHANNEL

In order to provide the flexibility in operation the bypass channels shall be provided. The bypass channel shall be designed for designed capacity. It shall connect the following units :-

- (i) From raw water channel to flocculate by passing primary settling tank.
- (ii) From raw water channel to filters by passing the flocculates and primary settling.
- (iii) From flocculate to sump by passing filters.

The necessary penstock with simple operating arrangement shall be provided as per I.S. 3042-1965 or some alternative arrangement, which suits to the proposal. It shall be constructed in minimum M-30 grade concrete and columns shall be minimum M- 25 grade concrete.

6.3 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.

6.3.1. 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 dia to tank diameter 0.20 to 0.40 and the shaft speed of propeller to impart tangential velocity greater than 3mt/Sec. 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 for 300 per second.

The power requirement of flash mixer shall be as per recommendation given in I.S. 7090.

The paddles made of structural steel conforming to I.S. 226. The agitator shall be mechanically driven and shall consist of electric motor with continuous duty operating through a reduction gear. To achieve good and efficient results the chemical should be added just near the tip of blade. The design shall be such that there shall be no possibility of short circuiting in the tank. It shall be designed for a full flow of designed capacity. A desludging pipe of R.C.C. NP2 with sluice valve conforming to B.I.S. shall be provided. The length of pipe shall be as per requirement of layout plan, it shall be connected to waste water sump. Hand railing along operating platform (1.0m diameter all around) of 0.75mt. height shall be provided. The M.S. ladder of 0.75 mt. wide shall also be provided. The specification of ladder and railing are given separately. It shall be constructed in R.C.C minimum M-25 grade concrete. Protective cover of G.I Sheet of 8 gauge shall be provided for motor.

6.4 CLARIFLOCULATOR-

Combined units of flocculation and sedimentation shall be provided immediately after flash mixer but it shall be designed on concept of tap erring velocity gradient and settling velocity with suitable motor operated mechanical cleaning device.

6.4.1. NUMBER OF UNITS:

Clarifloculator (s) shall be provided for the total designed flow with provision for 25% overloading under emergent condition as per CPHEEO manual. The inlet and outlet arrangement shall also be designed for 25% overloading.

6.4.2. INFLOW ARRANGEMENT -

Coagulated water from flash mixer shall be conveyed to the inlet of clarifloculator through precast R.C.C. pressure pipe or CI or DI D/F of suitable dia. It shall 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 0.45 mps.

6.4.3 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 shall be admitted through the central hollow shaft near the water surface and then shall 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 shall be mounted on a vertical shaft, which shall be rotated by A.C. motor 3 phase 415 v. The partition wall and the floor slab of flocculator shall be of R.C.C. Area of opening at the bottom of partition wall should be large enough to maintain sufficiently low velocity of flocculated water.

6.4.4. 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 m³ /m² /day at design flow. The outlet shall comprise of V-notches and effluent launder or rectangular weir and outlet flume. A baffle shall be provided in front of the weir to stop floating matter. A weir loading of 300 to 600 m³/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 walk way 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.

6.4.4.1 Sludge Removal in Plain Sedimentation Tanks and Clarifiers / Flocculators and Clariflocculator

- a) The withdrawal of sludge from plain sedimentation tanks and clarifier / flocculator / clariflocculator shall be carried out into a terminal sludge collection tank for disposal into the sludge drying beds by pumping. Suitable pump sets and pump house shall be provided at the sludge collection tank.
- b) 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.
- c) 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.
- d) 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.

6.4.4.2 Desludging Control and Plant

Plant for the desludging system and control shall be located in the central control house as appropriate.

Control

- (i) The system shall be designed to carry out the following operations:
 - A) intermittent desludging alone
 - B) continuous desludging alone
 - C) intermittent and continuous desludging simultaneously.
 - D) Pumping of sludge from sludge receiving tank into the sludge drying beds.
- a) 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 clariflocculator 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 device, under fail-safe conditions; alternative facilities such as compressed air bottles (one for

each sedimentation tank or clarifiers / Flocculators / clarifloculator) 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 shall be 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.
- b) Hydraulic design: The total hydraulic design capacity of the sludge withdrawal and discharge system shall not be less than 10% by volume of the Max. Water Flow.
- c) Sludge disposal pipework: The pipe work for the plain sedimentation tanks and clarifiers / flocculators / clarifloculator 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.

6.4.4.3 Sedimentation Tank and Clarifiers / Flocculators / Clarifloculator 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 clarifloculator. 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.

6.4.4.4 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 clarifloculator.
- 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.

6.4.4.5 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.

6.4.5 ROTATING BRIDGE-

The clarifier scraper bridge structure shall be made of welded and bolted M.S. structural. It shall 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 1.2 mt. 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 walk way 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 \pm 10 V-3 phase 50 Hz. 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 shall 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 clarifloculator for transmission of electric power through pipe laid under floor from outside to the sub distribution board located over rotating board.

300 mm dia R.C.C. NP2 pipe and specials as required shall be provided for each clarifier under the floor slab between sludge out let channel around inlet well to sludge outlet chamber at periphery.

300 mm dia D/F PN-1 manually operated C.I. Non rising spindle sluice valve conforming to B.I.S. standards and bearing ISI mark shall be provided for each clarifloculator. 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 Nos. 450mm wide made out of M.S. black medium class pipe to IS 1239 rung ladder painted primer and paint, fixed to clarifier bridge structure for access inside the clarifier zone/ flocculation zone be provided.

6.5.1 FILTRATION -

Traces of suspended matter in the clarified water shall be removed by filtration. Filter designs shall be based on the use of rapid gravity single media sand filters using quartz sand, type being declining rate filters.

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 in which shall be housed the air scour and motive power plant for valve operation and other apparatus. The main clarified water channel shall connect to the two filter inlet channels if necessary via a chamber. The filters shall be down-flow open rapid gravity units type or dual media filters of the divided bed type and shall operate on declining rate principle. 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.

6.5.2 NUMBER OF FILTERS -

The filters shall be in even numbers and designed for economy to provide 26.15 million litre treated water (in 23 hours working) plus about 2.0 to 3.0 times of quantity of back wash water.

6.5.3 RATE OF FILTRATION -

The rate of filtration shall be taken as 4.8 to 6 m/hr (80 to 100 lpm/m²). The inlet and outlet arrangements shall be designed to permit 100% overload for emergency conditions.

6.5.4 CAPACITY OF FILTER UNITS-

The capacity of filter shall 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.

6.5.5 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 2 mt depth of water shall be provided above filter media. The filters shall be constructed in R.C.C. of minimum grade M-30.

6.5.6 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

6.5.7 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.

6.5.8 WASH WATER GUTTER (TROUGH)-

It shall be of R.C.C. 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 mt before reaching the Gutter. The upper edge of wash water gutter shall 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 shall be placed at sufficient height above the surface of the sand so that the sand will not be washed into the gutter. The height shall be considered by considering the expansion of sand.

6.5.9 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 45 Mt/Hr and pressure of 0.35 kg/Sq.cm 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 cmt/hr 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.

6.6 WASH WATER TANK -

Wash water tank shall be constructed above the clear water control chamber. Its capacity shall 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 mt to 11.00 m, the capacity of wash water should be varied from 2 to 6% of filtered water and shall 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 shall be designed for washing two filters at a time. It shall be of R.C.C. 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 R.C.C. minimum grade M-30 with sufficient number of manholes and ventilators of 100mm dia C.I. with Cowels and the aluminium ladder of 0.45 mt wide from top to bottom of tank.

A float operated mechanical gauge shall be provided. The arrangement shall be fixed in such a way that during excessive wind flow it shall not be disturbed. It shall have meter scale painted with enamel paint with black and red colour on white colour back ground. 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.

6.7 APPURTENANCES -

6.7.1 RATE OF FLOW CONTROLLERS -

Since it is proposed to provide declining rate filtration hence one rate of flow controller shall be provided. 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.

6.7.2. 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 shall be simple in operation and easy in handling by the maintenance staff.

6.7.3 WALK WAY -

Walk way all-round the filters minimum 1.50M width shall be provided. it shall be fitted with railing of 0.75 M height.

6.7.4 PIPE GALLERY-

Effluent wash and waste water pipes all together with the sluice valves placed in the pipe gallery shall be well designed with minimum 2.00mt width provided with a ladder or steel rungs to make it for the maintenance staff easily accessible to the bottom. It shall be well ventilated. It shall 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 R.C.C. pipe. It shall be connected with wastewater sump. The system shall 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 shall be constructed with minimum R.C.C. grade M-30.

6.7.5 EFFLUENT AND WASH WATER PIPE -

The effluent pipe shall be designed for a velocity of 0.9 to 1.8 mt./second and wash water pipe for a velocity of 1.5 mt/second. These shall be C.I. double-flanged class .Pipes conforming to I.S. 7181 - 1984 and C. I. specials shall be confirming to I.S. 1538-1976. The sluice valve provided shall be confirming to I.S. 14846-2000.

6.8 MODULE CHAMBER OF CLEAR WATER CONTROL CHAMBER

It shall have 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 2.00 mt of ground floor where the module chambers shall be minimum ceiling height of floor shall be 4.00 Mt. 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 R.C.C. M-30 grade concrete. At a height of minimum 10.00 Mt. the wash water tank shall be provided for storing the water for washing the filters. The capacity of wash water tank shall be as given in Para 6.6 The panels of framed structure shall be constructed of chimney brick masonry with cement mortal 1:5 and plastered with mortar 1:5 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 the window shall be of M.S. Z-section provided with 4 mm 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 1.20mt x 2.10 fitted with glass. The windows shall be opened outside 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 30-cm. height. The ground floor shall have drainage arrangement to easily drain out water in case of cleaning the water from module chamber.

6.9 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 including 100 % standby arrangements shall be provided. The material used for the pipe and specials shall be anticorrosive preferably DI, class k-7 or C.I. Class LA double flanged and C.I. Sluice valves confirming to I.S. 14846. These shall be mounted in clear water control chambers at about 1.00 mt depressed floor from operating floor of effluent sluice valves.

6.10 BACK WASH WATER PUMP:-

It shall be designed for 1.00 Hr. i.e. pump shall be in position to fill wash water tank in 1 Hr. There shall be two pumps in which 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 $415 \pm 10\%$ volt, 50 Hz. B class of insulation and degree of protection at IP-56, the 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 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 conforming to I.S. code in practice. The scour and over flow 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 is nearer. Scour pipe shall be connected with the waste water line of filter going to waste water sump of chamber with necessary C.I. sluice valves.

6.11 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 shall 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 lined 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 shall be provided. The entire module chamber shall be connected with the one waste water line & finally disposed of either in drain constructed in front of this block or in waste water 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.

6.11.1 FILTER CONTROL

Filters shall be of the declining rate type with filtration rates varying by $\pm 20\%$ 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 $\pm 20\%$ of the average flow through 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 $\pm 2\%$ 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 pre-set 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.

6.11.2 Filter Valves and Motive Power System

- a) Butterfly valves shall be used for the filters in preference to penstocks or sluice valves unless the penstocks or sluice valves proposed 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 power. The system shall be capable of operation in the event of electric power failure and details shall be provided by tenderers, 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.

6.11.3 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.

6.12 PAVING :-

A paving in front of clear water control chamber 4.0 mt. 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.

6.13 STAIR CASE:-

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 platform of control room.

6.14 CHEMICAL HOUSE:

The chemicals to be added to raw water for coagulation and flocculation shall 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 4 mt. In order to avoid moisture the minimum plinth height shall be 0.90 mt. The floor should be made damp proof and it should be filled about 0.60 mt. 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 mt. 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 mt. 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 shall be easily accessible to the trucks for unloading the chemicals. The main entrance shall be 3.00 mt. wide and 3.50 mt. height with rolling shutter. The height of alum stack shall not be taken more than 2.0m with 30% open space for passage.

6.14.1. EQUIPMENT'S 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-ton capacity of approved make shall be provided. The chemical shall be loaded in the steel tray attached to wire rope.

6.14.2. SOLUTION TANK:

A Platform for construction of solution tank at a height of about 2.00 mt. from first floor level shall be provided. The solution tank shall 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 stand by unit. The capacity of tank shall be designed for 8 Hrs. capacity with 0.30 mt. 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 0.75 mt. 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 0.75 mt. The height of the solution tank shall not be more than 1.50 mt. from the first floor to the platform M.S. ladder 0.60 mt. wide shall be provided and it shall also be provided from solution tank platform to top of solution tank.

6.14.3 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.

6.14.4 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.

6.15 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% stand by. If any change in requirement of chlorine comes the firm may suggest and quote the rate accordingly, the liquid chlorine shall be supplied in tonners. The contractor shall have to make arrangement for Brand new chlorine tonners with a nominal capacity of holding one MT of liquid chlorine for minimum three months requirement. The tonners 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 tonners shall be taken over by the department only after these have worked up to the satisfaction of the department, after O&M. 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 or 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.

6.15.1 a) 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.

- a) 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.
- b) Chlorinator shall be fitted with a pressure switch to provide an alarm in the event of bursting disc or pressure relief to atmosphere.

6.15.2 CHLORINE HOUSE: -

It shall be situated in an isolated place and near to the feeding place in order to avoid the long tubing. It shall 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 be have acid resistance tiles laid over cement concrete 1:2:4. An exhaust at sufficient height from bottom, of 300 mm dia 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 2.0mt. wide to connect the G.L. to the plinth level of chlorine house shall be provided.

6.15.3 ROOM TO STORE CHLORINE CONTAINERS:-

The capacity of the room shall be to store the minimum chlorine tonners 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 numbers of exhaust fan of 450 mm dia of G.E.C. or Khetan make or equivalent standard make painted with Anticorrosive paint shall be provided.

6.15.4. TANK FOR NUTRALISATION OF CHLORINE:-

A solution tank of minimum size 3.0 x 3.0 x 2.0 mt shall be provided. It shall be of R.C.C. with cladding of acid resistance tiles on all sidewalls and bottom. It shall be very near to the chlorine room and storage room and shall have easy access without obstruction. It shall be constructed below

G.L. so it shall have a drain pipe 150mm dia R.C.C. class NP-2or PE 100 pipeline with sluice valve up to the nearest waste water line or up to sump.

6.15.5 EMERGENCY KIT: -

It shall consist of various tools appliances like gasket, Yokes Studs. Tie rods, hoods, clamps, spanners, mild steel channels 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.

6.15.6 Chlorine Residual Monitoring

- a) One chlorine residual 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 chlorine residual 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 20 mA 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 annunciated 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.

6.16 FIRE EXTINGUISHING - ARRANGEMENT:-

Suitable fire extinguishers shall be provided and placed in 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.

6.17 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 beds outlets and sample cocks shall be provided locally at the clear water reservoir outlet. Sludge Drying Beds

Sludge from the waste water 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) prop., 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.

The drying beds shall be so sized that each can contain four times the average daily production of sludge from the waste water recovery tanks as well as from the sludge produced from plain sedimentation tank, clarifiers / Flocculators etc they shall be designed for a cycle period of 5 to 7 days.

Filtrate from the drying bed under drains shall be discharged in to 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.

6.18 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 1 ml/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 both in English and Hindi.

- 3) Compressed air cylinder recharging facilities comprising of 40 liters capacity cylinder with recharging kit to refill service cylinder or breathing apparatus - 2No.
- 4) Protective Clothing - Rubber & P.V.C. clothing 2 numbers.
- 5) First Aid Facility - Emergency Oxygen Kit 5 No. First Aid Box 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 locations approved by Engineer-in-charge.

6.19 UNLOADING ARRANGEMENT: -

An arrangement with chain pulley block of 2 tons capacity at a height of minimum 5.00 m supported on M.S. beam section. It shall be provided at the entrance of chlorine storage room to unload the toners.

7. 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 1.8 m/sec. 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 R.C.C. if the channel is provided, then it should be of R.C.C. M-30 grade and covered with the R.C.C. cover slab it shall be in horse shoe 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 120 minutes. A minimum free board of 0.5 m 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 shall be constructed in R.C.C. with a minimum grade M-30 concrete and shall be provided with pressure release system to relieve the uplift pressure. The sump shall be covered at top with R.C.C. slab. The top slab shall have adequate number of manhole chambers of size 0.9 x 1.20 m in each compartment fixed with M.S. cover and frame painted with primer & anticorrosive paint and locking arrangement. There shall be 100 mm. dia 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 out ward to drain out rain water easily. An aluminium ladder 0.45 mt. wide in one-man hole of both chambers shall be provided by contractor. The inlet and outlet pipes shall be located at a 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 waste water 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.

8. 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 shall be such as to give an architectural view. It shall have one additional store room of size 6.00 x 5.00 mt. L.T. switch gear room of size 3.00 x 6.00 mt. and one office room of size 5.00 x 4.00 and attached toilet block. Additional space shall be provided for one pump set and also for generator set if used in emergency. Sufficient minimum space between the two pumps shall be provided for circulation and the distance of pump from the sidewall shall also be minimum 2.00 mt. 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 0.9Mt. or 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 on 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 3.50mt. shall be rolling shutter, Office room, L.T. switch gear room and store room shall be with salwood chaukhat and 40mm. thick flush doors as per I.S. specification including doors stoppers, tower bolts etc. complete. The door or 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 or provided in each panel (except where doors are provided). The window shall also be the Z-Section fitted with 4 mm thick glass, tower bolts and all other necessary arrangements as per I.S. specification. Minimum 12 numbers of exhaust fan 450 mm. dia shall be provided. The exhaust fan may be G.E.C. Crompton, Khetan or

equivalent make. A ramp shall be provided to connect the Ground level to the floor of pump house in main 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 0.60 M. It shall provide easy loading and unloading of pumps / motors from trucks by gantry.

9. 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 60 sqm or as per recommendation of CPHEEO Manual on Water Supply and Treatment, whichever is more to accommodate one A.C. Room as Control 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 shall 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 shall 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 or laboratory room & A.C. room shall be of Aluminum of size 1.20 x 2.00 Mt. 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 bedding 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 and of Voltas, LG, Samsung or equivalent standard make. All around the laboratory room a platform of 1.00 Mt. wide shall be provided to put up the instruments and in two corners of wall wash basin as per I.S. Specification fitted with water supply shall be provided. It shall have two numbers of exhaust Fan of 300mm dia Crompton, G.E.C., Bajaj, Khetan or equivalent make. Below the platform the Almirah for storing the chemicals fitted with wooden frames with door shall be provided. If the laboratory block is provided isolated to the module chamber in other building then 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 EQUIPMENTS FOR WATER TESTING LABORATORY

S.No.	Name of Equipment's	Required quantity
1	Refrigerator (310 Liters)	1 No.
2	Incubator $37^{\circ} \text{C} \pm 0.5^{\circ} \text{C}$ (Bacteriological) 220 Volt A.C.	1 No.
3	pH Meter (Digital) (0-14 pH range)	1 No.
4	Nephelometer direct reading (Range 0-1000)	1 No.
5	Spectrophotometer visible range 220 to 850 nm	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	Auto calve (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 ⁰ 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 Liter capacity speed control)	1 No.
17	Laboratory Balance 0 to 200 gm	1 No.

REQUIREMENT OF CHEMICALS FOR WATER TESTING LABORATORY

S.No.	Name of Equipment's	Required quantity
1	Phenolphthaline Indicator	1 Lit.
2	Mehayal orange indicator	1 Lit.
3	Sulphuric acid N/50	2 Lit.
4	Potassium Chromate 5%	1 Lit.
5	Silver nitrate	200 gms.
6	Manganese Soleplate	1 Kg.
7	Sodium thisulphate	1 Kg.
8	1-10 Phenepitheline	200 gms.
9	Hydroxylamine Hydrochloride	200 gms.
10	Eriochrome black 'T'	100 gms.
11	Murexide	20 gms.
12	E D T A N/50	5 Lit.

REQUIREMENT OF GLASSWARE FOR WATER TESTING LABORATORY

S. No.	Name of Equipment's	Required quantity
1	Graduated pipette of capacity 1 ml. - do - 2 ml. - do - 10ml. Ordinary pipette of capacity 10 ml. - do - 25 ml.	5No. 5No. 5No. 5No. 5No.
2	Graduated Measuring Cylinder Capacity 10 ml. - do - 50ml. - do - 250ml. - do - 1000 ml.	5No. 5No. 5No. 5No.
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.
7	Test tube with rim of size 25 x 250 - do - 15 x 150	100 No. 100 No.
8	B O D 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's	Required quantity
1	Water Sampler (Steel) of capacity 2 Lit. - do - 5 Lit.	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	Stop Watch	1 No.
15	Nessler'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's	Required quantity
1	Mac conkey Broth (D S)	1 Kg.
2	Mac conkey Broth (S S)	1 Kg.
3	Peptone	1 Kg.
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.

10. SITE ROADS :-

Internal site roads shall be a minimum of 3.5 m wide with a 1 m shoulder on either side. The carriageway shall have camber of 1 in 40 to drain rain 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 150 mm of hard granite cubes. The base shall be two layers each a minimum of 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 20 mm thick or the contractor may choose to construct CC road.

10.1 SITE DRAINAGE: -

The site drainage system shall be designed to dispose of overflows from tanks and rain water in a manner to prevent damage to any structures. The drainage may use pipelines, culverts, conduits or open channels to convey the water to a safe disposal site leading to nearby water body. Open channels shall be lined.

11.0 BOUNDARY WALL

Water treatment Plant shall be protected by a 2 m high boundary wall of brick work with RCC columns at suitable intervals and shall have a minimum 4 m wide MS fabricated iron gate.

12.0 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 to others.

13.0 PROCESS CONTROL:

(i) General

The Contractor shall monitor summary status of all the treatment works as follows: water level 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.
- ❖

13.1 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 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.

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 areas	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 $\pm 10\%$.

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CHAPTER - 1.5

BRIEF SPECIFICATIONS FOR OHT (ESR)/GLR/SUMP CUM PUMP HOUSE

Scope of Work:-

The tenderer shall complete the following works.

1. OHSR's - 97 Nos.
2. MBRs - 5 Nos.

b)97 Overhead service reservoirs and 05 MBRs at different villages of following capacity and approximate staging :-

- c)1. Rajgarh Block :- 61 Nos.
- d)2. Khilchipur Block :- 31 Nos.
- e)3. Biaora Block :- 5 Nos.

S. No.	Tank Capacity	Staging	Nos.
1	100 Kl	As per design	21
2	110 Kl		15
3	120 Kl		8
4	130 Kl		9
5	140 Kl		6
6	150 Kl		5
7	160 Kl		9
8	170 Kl		8
9	180 Kl		4
10	190 Kl		4
11	200 Kl		2
12	220 Kl		1
13	230 Kl		1
14	260 Kl		2
15	270 Kl		1
16	340 Kl		1

f)

g)Five Master Balancing Reservoir (MBR) near various villages;

h)

S. No.	Name of MBR	Capacity
1	Amba	310 Kl or Suitable Capacity
2	Datagram	260 Kl or Suitable Capacity
3	Jwalapur	190 Kl or Suitable Capacity
4	Odpur	100 Kl or Suitable Capacity
5	Udiya pura	220 Kl or Suitable Capacity

- Note:-**
1. Minimum Height of Staging should be 12 m, Maximum height of staging shall be as per actual design and site condition.
 2. Location, capacity & staging of ESR/GLR/Sump/pump house may change as per the design requirements.

3. If due to any reasons, whatsoever it is desired to increase or reduce the number or capacity of tanks/reservoirs, payment/deduction will be done on per KL cost on prorata basis only. There shall be no payment due to change in staging of the tanks.

[I] Construction of Ground level reservoir (sump), shall consist of two equal compartment, all others may be with single compartment. All tanks shall have central ventilation lantern.

[II] R.C.C. Stair case and Valve chambers

[III] Pipe line arrangement including providing and laying pipes and specials of required diameter, length.

[IV] Providing and fixing required Valves and Sluice gates.

[VI] Providing and fixing of Lightening Conductor, Water Level Indicator, Aluminum Ladder, Railing, Manholes with locking arrangement and Ventilation hole arrangements, internal lighting arrangement and external campus electrification etc.

[VII] Protection work all around the Reservoir, Weather Shield Apex painting, suitable colour enamel painting, cleaning, finishing and handing over finished work to the department.

They shall further be required to submit detailed design, drawing, approximated 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 the approved Engineering College, as directed by the General Manager for scrutiny and approval from competent authority. The responsibility for design construction/structural stability and water tightness shall however rest solely with the contractor.

[I] Construction of these RCC - ESR/GLR/Sump which consists of central ventilation shall be as under: -

1. The reservoir shape shall 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.
2. Free board of minimum 50cm shall be provided below lowest part of roof beam slab structure. The minimum 50cm free board shall be everywhere below bottom of straight beam, ring beam, and roof slab etc.
3. The floor level of MBR shall be so fixed, so as to provide desired water by gravity through gravity pipelines, to proposed ESR/SUMP
4. The tenderer shall assess the bearing capacity of strata at the proposed site by conducting the required tests. It shall be responsibility of contractor to conduct bearing capacity test if required and bear financial charges towards it. The department shall not make any payment towards it.

5. **Design criteria**

- (a) Foundation shall be designed as per ascertained S.B.C. of soil as given above and other soil parameter.
- (b) The following load and forces shall be considered
 - (i) Dead Load
 - (iv) 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
 - (v) 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 shall be as per clause No. 13.4 of IS 456:2000. Previously laid concrete layer shall be first cleaned by water jet and then 10mm thick layer of cement mortar of same proportion shall be laid before casting of next layer of concrete. Formwork shall be 100mm below the previously laid concrete layer.

(e) **Steel**

Minimum 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.

6. The contractor shall make the reservoirs chlorine resistant by painting surface with suitable Epoxy or any other material because heavy dose of chlorination is expected to be given in water.

7. General specification

7.1 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 min. 1.50m below GL. Safe bearing capacity & other soil test shall be conducted by the contractor at his own cost. The result of SBC shall be submitted before start of work along with the detailed structural design.

The design of foundation for OHTs, OHBRs 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. The foundation shall be filled with minimum

150mm thick levelling course in cement concrete grade M-15 with 20mm metal.

7.2 **All other general & common specifications shall be as per Chapter -1.**

[II] R.C.C. STAIR CASE & VALVE CHAMBERS: -

[A] R.C.C STAIR CASE:-

Suitable R.C.C. Staircase of grade M-25 concrete from First Flight level to top of roof Reservoir along circumference with G.I. railing as mentioned in the specification in Chapter -1. Contractor shall provide an Aluminium Ladder to reach upto first flight which shall be kept at Watchman room when not in use. 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 shall be provided after 12 to 15 steps. The separate frame structure i.e. columns and beams shall be provided

for staircase for the overhead tanks of capacity 1000 kL or more. There shall be staircase with suitable gate shall be provided to prevent unauthorized entry to the tank.

[B] VALVE CHAMBERS:---The valve chambers for each valve of grade M-20 concrete/Brick Masonry shall be constructed.

[III] PIPELINE ARRANGEMENT:----

[A] PIPES:-

[1] Each compartment shall be provided with Inlet pipe, Outlet pipe, Overflow pipe and scour pipe . Thus, there shall 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.
01	Inlet pipe lines	C.I. Class LA or D.I. D/F Class K-7/ K-9	As per Dia. of Incoming pipe.
02	Outlet pipe lines	-----do-----	Next higher Dia. than inlet or size of main pipe of distribution network, whichever is higher
03	Overflow pipe	-----do-----	Next higher Dia. than inlet
04	Scour pipe	-----do-----	100 mm

The inlet pipe shall be as far away from the outlet pipe as possible and outlet shall 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 5 cms. 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.

Specifications:-

The D.I. Double Flanged pipe shall be conforming to IS:8329-2000 and while double flanged cast iron pipe should confirm to IS:7181 latest.

(B) Specials:-

All specials required for this work of pipe line 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 shall 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.

(IV) Valves and Gates:-

The contractor should provide and fix in desired position the CI/DI valves and gates for easy and effective working.

All valves shall be I.S. mark and inspection and testing certificate should produce to engineer in charge.

The double-faced sluice gate shall be provided to pass water flow from one compartment to other compartment. In close position gate face shall be capable of resisting water pressure force. There shall 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

(V) Flow Measurement:-

The arrangement for water quantity reaching to the tanks by providing & installing in position electromagnetic flow meter of suitable diameter in inlet pipe shall be made by the contractor.

Contractor shall provide arrangement such that the flow meters to be installed before each OHT and at other place as per design shall give their reading on screen at central control room or any other specified remote location. In addition to the above, arrangements shall also be made for measuring of two quality parameters- residual chlorine and turbidity at the out let of tanks and display of the same on screen at control room or any other specified remote location.

(VI) Lightning conductor, Water level indicator, Aluminum ladder, Railing, Manholes, ventilation holes arrangement, Internal lighting arrangement and external campus lighting arrangements etc.

(1) Lightning conductor:-

The arrangement for lightening protective system for protection of service reservoir shall be made as per I.S. 2309 – 1969 C revised up to date.

The Lightening protective system shall be designed, installed and tested as per this code and all components of the system shall also be provided as per specification mentioned in this code .

(2) Water Level Indicator: -

Each tank shall be provided with water level indicator. Thus sufficient water level indicators shall be provided in reservoir. Water level indicator shall comprise of PVC float which should be 10 cm. more in diameter than outlet pipe. The plate shall have turned edged to accommodate and to make easy movement of counter weight 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 shall provide arrangement such that the water level indicator shall display the level of

water in OHT tank on screen at central control room or any other specified remote location.

(3) Aluminium Ladder:-

The aluminium 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 @ 250- mm. c/c. ladder shall be rigidly fixed.

(4) Railing:-

Railing shall be provided on the top of roof slab along the whole circumference and the sides of staircase as per specifications given in relevant chapter.

(5) Manhole covers:-

Manholes of minimum size 60 cms x 75 cms shall be provided. The covers shall comprise of suitable angle iron frame and 10 gauge thick MS sheet, crossed by suitable flat inside, with locking arrangement.

(6) Ventilators:-

The suitable air vent shall be provided as directed by Engineer-in-Charge.

(7) Electrification: -

The electrification inside and outside shall 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.

(7) Float Type Valve – There shall be a float type valve for each OHSR which are fed by gravity system.

(VII) Protection work all around the Reservoir, Weather Shield Apex painting & colour enamel painting of approved colour, cleaning, finishing and handing over finished work to the department :-

1.0 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.

2.0 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.

3.0 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.

4.0 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.

5.0 Inspection & testing of concrete structure:-

- 5.1 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
- 5.2 **Water Tightness Test**
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 shall reach in a period of not less than 72 hours. At the time of testing verticality of sump shall 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.
After seven days period for observation after filling with water the external face of sump shall not show any sign of leakage and remain apparently dry.
- 5.3 The water for testing and pump for lifting water shall be arranged by the contractor at his own cost.
- 5.4 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.
- 5.5 All the tanks shall have a room set of area 25 sq. m with toilet etc.
- 5.6 All the tanks shall have boundary wall of 2.00 m high and one iron gate.
- 5.7 All the tank shall have area lighting with electrification of room and for Electromagnetic flow meter in campus.
- 5.8 All the tanks & IPS shall be provided with automation system as instructed by the engineer in charge. Basic aim is to check the quantity and quality of water by automation.
- 5.9 For IPSs sumps, suitable pump houses shall be designed over sumps or nearby these sumps to accommodate required nos. of pumps with all other allied arrangements.

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CHAPTER - 1.6
BRIEF SPECIFICATIONS FOR HDPE & DI DISTRIBUTION NETWORK

1. BRIEF SCOPE OF WORK:

1.The scope of work shall be as given in point 1- General- Part II - brief details of work, of this tender document.

2.House service connection should be provided just inside the boundary of the consumer's house with the suitable MDPE pipes and ending with GI pipes and steel taps, the height of tap must be 60 cms over ground with 15 cms nipple with rigid standing support as approved by MPJNM.

3.An RCC platform of clear size 60 cm x 60 cm in M-20 grade concrete for each house service connection with suitable foundation should be constructed by the contractor as approved by MPJNM

(4)Bulk water meter: - Suitable Mechanical Jet type Bulk Water Meters shall be provided at the entry level of each village to ascertain the quantity of clear water supplied to that particular village.

Specifications for 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 and Ductile Iron Class K7 pipes used for water supply. Use of HDPE Pipes shall be of pressure class of as per design requirement but minimum class of pipe should be 6 kg/cm² of PE 100.

Applicable Codes

The manufacturing, testing, supplying, laying, jointing and testing at work sites of HDPE pipes shall comply with IS: 4984-1995 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 molding 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 molding and extrusion
IS 7634	Laying & Jointing of Polyethylene (PE) Pipes
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.

- **Colour of Pipes**

The colour of the pipes shall be black.

- **Materials**

The material used for the manufacturer of pipes shall not constitute toxicity hazard, shall not support microbial growth, shall 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.

Raw Material

- (a) Resin used to manufacture the HDPE pipes shall be 100% virgin PE Black pre-compounded confirming to IS: 4984, IS: 7328 and ISO: 4427-2007 (latest version). The resin proposed to be used for manufacturing of the pipes shall also comply with the following norms as per ISO 9080-2003 (latest version).
- (b) The resin shall 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 shall not be any brittle knee at 80^OC before 5000 hours. Internal certificate of any resin manufacturer will not be acceptable.
- (c) 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.
- (d) 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.
- (e) 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.

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

Reworked Material

No addition of Reworked/ Recycled Material from the manufacturer's own rework material resulting from the manufacture of pipes shall be permissible and the vendor shall use only 100% virgin resin compound.

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.

Detectability

HDPE Pipes shall be detectable when buried underground, by providing an insulated copper wire having minimum diameter of 1.20 mm, 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.

Length of Straight Pipe

The length of straight pipe used shall be more than 6 m or as agreed by Engineer-in- Charge.

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.

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 :1995 shall be followed for visual appearance.

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 shall be followed so as to eliminate potential damage to pipes and fittings and to maintain maximum safety during unloading, lifting and lowering.

- Pipes must not be stored or transported where they are exposed to heat sources likely to exceed 60°C.
- Pipes shall be stored such that they are not in contact with direct sunlight, lubricating or hydraulic oils, petrol, solvents and other aggressive materials.

- Scores or scratches to a depth of greater than 10% or more of wall thickness are not permissible; any pipes having such defects shall be rejected without assigning any reason.
- PE pipes shall not be subjected to rough handling during loading and unloading operations. Rollers shall be used to move, drag the pipes across any surface.
- Only polyester webbing slings shall be used to lift heavy PE (>315mm) pipes by crane. Under no circumstances, chains, wire ropes and hooks be used on PE pipes.
- Pipes shall not be dropped to avoid impact or bump. If at any time during handling or during installation, any damage, such as gouge, crack or fracture occurs, the pipe shall be repaired if so permitted in writing by the competent authority before installation.
- 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 shall be taken that sharp objects do not scour the pipe.
- When releasing coils, it shall be ensured that the coil is under tension and has been released in a controlled manner. The end of the coil shall 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 shall 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.
- Straight lengths shall be stored on horizontal racks giving continuous support to prevent the pipe taking on a permanent set
- 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 of PE pipes only but with no other material loaded. The truck shall not have sharp edges that can damage the Pipe.
- Pipes manufactured at factory shall be carried to the site of work directly or stacked suitably and neatly along the alignment/road side/elsewhere near by the work site or as directed by the Engineer-in-Charge.
- Damage during transit, handling, storage shall be to the Contractor's account and replacement for such pipes shall be made by the Contractor without any extra cost as directed by the Engineer-in-Charge.

Lowering, Laying of Pipes

- Each pipe shall be thoroughly checked for any damage before laying and only the pipes which are approved by the Engineer-in-Charge shall be laid.
- While installing the pipes in trenches, the bed of the trench should be levelled and be 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 shall be provided. The fill to about 10 to 15 cm above the pipe shall 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.
- 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.
- During the pipe laying of continuous fusion jointed systems, due care and allowance shall

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. All Due Care shall be taken in fixing by finishing the connections at a time the length of the pipe is minimal (lower temperature times of the day.)

- For summer time 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.
- The final tie-in connections shall be deferred until the thermal stability of the pipeline is achieved.
- The flexibility of polyethylene pipes allows the pipe shall be cold bend. The fusion jointed PE pipe shall 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 shall not be cold bend to a radius less than 25 times the OD of the pipe.
- 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. All Due Care shall be taken when tightening these flanges to provide even and balance torque.
- Provisions shall 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.
- PE pipe is lighter than water. Hence care shall 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
- When flooded, some soils may lose cohesiveness, which may allow the PE pipe to float out of the ground. Several design checks shall be 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.
- However, weights by way of concrete blocks (anchors) shall 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 shall be 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-in-Charge 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.

• **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.

- **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. For road cutting and restoration of concrete/ BT roads, estimates are based on conventional method. However, as directed by the Engineer in Charge, the contractor 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 1.2 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 shall be encased all-round with the 1:2:4 (M15) cement concrete.

- **Recovery of other serviceable material:-**

All serviceable materials such as wood work, 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.

- **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 work place.

- **Trenching:-**

The excavation of trenches shall be carried out by hand or machines. The width of trench shall be kept to a minimum consistent with the working space required. At the bottom, between the faces, it shall be 150 mm clearance on either side of the pipe or as required at site . However this is for the safety of the trench, the method of laying and jointing the pipe and the need to avoid damage to pipes.

Jointing of Pipes

The pipe shall have Electro-fusion jointing system that shall provide for fluid tightness for the intended service conditions.

Bedding, Backfilling and Compaction Bedding

In case of sandy strata no separate bedding shall be 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 shall be placed so as to give complete contact between the bottom of the trench and the pipe. The minimum cover over buried pipe shall be 1 m.

Back Filling

Backfilling shall be placed in layers not exceeding 15cm thickness per layer, and shall be compacted to a minimum of 95% maximum dry density. The refilling shall be done on both sides of pipe together & height difference in earth fill on each side shall 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 shall be mandatory that the pipe zone backfill material does not wash away or migrate in to the native soil. Likewise, potential migration of the native soil in to the pipe zone backfill

shall be prevented.

Heavy earth moving equipment used for backfilling shall not be brought until the minimum cover over the pipe is 90 cm in the case of wide tracked bulldozers or 120 cm in the case of wheeled roaders or roller compactors, any road or shoulder damaged for laying of pipeline, should be restored and made good to the satisfaction of concerned agency.

Compaction

Vibratory methods shall be used for compaction. Compaction within distances of 15 cm to 45 cm from the pipe shall be usually done with hand tempers. The backfill material shall be compacted not less than 95% of maximum dry density.

Thrust Block

RCC thrust block shall be suitably designed & provided at bends and at places of reduction in cross section to take care of thrust.

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 in writing by the Engineer-in-Charge. Fittings will be welded on to the pipes or other fittings by use of Electro- fusion process.

Bends

HDPE bends shall be plain square ended conforming to IS: 8360 Part I & III Specifications. Bends shall be moulded.

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.

Reducers

HDPE Reducers shall be plain square ended conforming to IS: 8008 Part I & VII Specifications. Reducer must be moulded.

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.

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.

Electro Fusion Tapping Saddle, Branch Saddle & Electro Fusion fittings:

- a. All the Electro fusion fittings shall be manufactured with top quality virgin pre-compounded PE 100 resin which should be compatible with the distribution mains.
- b. The products shall comply with the requirements of EN 12201-3, EN 1555- 3 or ISO 8085-3.
- c. All the fittings shall be of SDR 11 rating.
- d. The fittings shall have the approval from any one of the three agencies like KIWA, DVGW, WRC-NSF, U.K., CIPET etc.
- e. 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 shall comply with the requirements of EN 12201 -1.

- f. Process voltage of all saddles must not exceed a maximum of 40 volts.
- g. The heating elements shall be designed for fusion at any ambient temperatures between -5 to +40 degree centigrade.
- h. The heating coils contained in each individual saddle shall be so designed that only one complete process cycle is necessary to fully electro fuse 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 milli meter diameter.
- i. No heating element shall be exposed and all coils are to be integral part of the body of the fitting.
- j. The EF tapping / branch saddles shall be fixed by fixation device and shall be achieved by external or integral clamping device.
- k. The cutter shall 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.
- l. A limited path style fusion indicator acting for each fusion zone as visual recognition of completed fusion cycle shall be incorporated into the body of each fitting near the terminals. The fusion indicators shall not allow the escape of the molten polymer through them during or after the fusion process.
- m. All the sockets in the electro fusion fittings shall include a method of tapping controlling the pipe penetration (pipe positioner /stopper).
- n. All the electro fusion products shall be individually packed in transparent protective bags to allow easy identification without opening the bag and must clearly indicate its contents
- o. The brand name, size, raw material grade, SDR rating and batch identification shall be embedded as part of the injection moulding process. Each fitting shall also be supplied with a Data Card or stickers with appropriate barcode as well as manual setting information for data transfer purpose.
- p. Installation and Fusion Jointing

The fusion jointing process shall be carried out 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 shall be 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 shall 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 tapping keys, supplied by the same electro fusion fitting /machine supplier shall be used to ensure perfect tapping of main lines.

The piping system shall 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.

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.

Manuals

Technical Manual on PE pipes including precautions shall be taken during operation of the pipeline.

Flanges

All flanges employed in the project shall be compatible with whatever material used.

Marking

All pipes shall be marked as per Clause 10 of IS 4984-1995.

Packing & Transport

The pipes shall be preferably transported by road from the factory and stored as per the manufacturer specifications to protect damage.

Summary of quality Tests:

1. **Quality Mark** : Pipe: IS 4984
2. **Material** : As per IS 4984. However only virgin resin is allowed, reworked material is not allowed.
3. **Grade of Material** : PE 100 as per IS 4984 (Certificate from raw material manufacturer is required).
4. **Pressure Rating** : Minimum PN 6 or above as per requirement.
5. **Colour** : as per IS 4984
6. **Dimensions of Pipe** :
 - Diameter** : The nominal diameter (outside)
 - Wall thickness** : As per IS 4984.
 - Length** :
 - i. **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.)
 - ii. **For diameter more than 110 mm** : minimum 6 meter.
(Tolerance as per IS 4984)
7. **Visual Appearance** : as per IS 4984.
8. **Test and sampling** : as per IS 4984.
9. **Special Test** : Notch hydraulic Test for the HDPE pipe made from PE-100 grade raw material as per ASTM 1474 OR ISO 13479 at manufacturers laboratory or independent laboratory and shall pass the Hydraulic test as per IS:4984:1995 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 degree centigrade to 45 degree centigrade.
10. **Jointing of pipes (pipe end):**
 - All diameters** : Electro-fusion Process
11. **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.

Inspection & Testing:

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 MPJNM, in the manufacture's works before dispatch and / or picking random samples of pipe from the work site.

Field Hydraulic testing of the pipelines 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. 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 in Charge. The hydraulic testing shall 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.

- Complete setting of the thrust blocks.
- Partial backfilling and compaction to hold the pipes in position while leaving the joints exposed for leakage control
- Opening of all intermediate valves (if any)
- 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
- 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
- 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
- Complete removal of air through air valves along the line.
- Closing all air valves and scour valves.
- Slowly raising the pressure to the test pressure while inspecting the thrust blocks and the temporary anchoring.
- 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.
- 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 shall 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.

Back filling

Water used for testing shall not be carelessly disposed off on land which would ultimately find its way to trenches

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 any road or shoulder damaged for laying of pipeline, should be restored and made good to the satisfaction of concerned agency.

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 shall be done by Contractor.

House Service Connections on HDPE pipes--

MDPE Pipes (PN 12.5 for 25 to 50mm Dia. and PN 16 for 16 to 20 mm dia. As per ISO 4427 / 1996)

These specifications are for MDPE Blue/Black PE 80/100 Pipes for House Service Connections of Dia 20 mm to 32 mm OD.

Performance requirements

The Pipe supplied shall have passed the acceptance test as per ISO 4427. The manufacturer shall 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.

Sluice Valves on Branches/ Scour valves/ Air Valves-

Suitable numbers of CI/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 CI/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 CI/DI shall be provided, wherever necessary with locking chambers.

GM/ Brass Ferrules-

The ferrules for connection with HDPE shall generally conform to IS: 2692/1984 (Reaffirmed 2005). It shall be of nonferrous materials with a CI bell mouth cover and shall be fitted with a screw and plug or valve capable of completely shutting off the water supply to the communication pipe, if and when required.

The size of ferrule shall not exceed a quarter of the nominal diameter of the main and also be less than the size of the service pipe/connection pipe.

Compression Fittings-

Compression fittings used for House service connection shall comply as per ISO 14236 with

Threaded metal inserts –SS 304 with BSP Threads

Pressure Testing-

The pressure rating of compression fittings shall be as per clause 8 of ISO 14236 which shall be PN16

Dimensions-

The Dimension of compression fittings shall be as per clause 7.1 of ISO 14236

Performance Requirements-

The compression fittings shall be tested as per ISO 14236. Following Test methods shall be performed.

- -Leak tightness under internal pressure.
- Leak tightness under Internal Vacuum.
- Long term Pressure Test for Leak tightness for assembled joint
- MRS Value as per ISO 9080
- Resistance to Internal pressure.

Effects on Quality of Water-

The Compression fittings for intended for conveyance of Potable water for Human consumption to be tested shall comply with BS 6920 specifications in any of the laboratories like DVGW / KIWA / SPGN / WRC –NSF and certificate of compliance shall 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 shall be with BSP threads.

House Service Connections on Metallic pipes--

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 shall 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.

1.1. Material and Design Specifications: Saddle Body: Non corrosive 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 non slip 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 1/2" (M12) nut-bolt: 14-15 kg.m and for 5/8" (M 16) nut-bolt: 21-23 kg.m

Specifications for DI Class K7 pipes:

The pipes shall be centrifugally cast (spun) Ductile Iron pipes for Water confirming to the IS 8329: 2000 / ISO 2531-1998 /BS EN 545 (latest). The pipes used shall be either with push on joints (Rubber Gasket Joints) or Flanged joints. The class of pipe to be used shall be of the class K-7.

The pipes shall be coated with Metallic zinc with a finishing layer of Bituminous Paint as per IS: 8329.

The pipes shall be supplied in standard length of 4.00, 5.00, 5.50 and 6.00 meters length with suitably rounded or chamfered ends. Each pipe of the push on joint variety shall also be supplied with a rubber EPDM gasket. Any change in the stipulated lengths shall be approved in writing by the Engineer-in-Chief. The gaskets shall conform to the IS 5382:1985/ISO Standard.

The gaskets shall also be supplied by the manufacturer of the pipes. They shall preferably be manufactured by the manufacturer of the pipes. In case they are not, it shall be the responsibility of the manufacturer of the pipes to have them manufactured from a suitable manufacturer under its own supervision and have it tested at his/subcontractors premises as per the contract. The pipe manufacturer shall however be responsible for the compatibility and quality of the products.

The flanged joints shall conform to the Clause 6.2 of IS 8329/ISO Standard. Supply shall also include one rubber gaskets for each flange.

Inspection and Testing

The pipes shall be subjected to following tests for acceptance:

- Visual and dimensional check as per Clause 13 and 15 of IS 8329/ISO standard
- Mechanical Test as per Clause 10 of IS 8329/ ISO standard
- Hydrostatic Test as per Clause 11 of IS 8329/ ISO standard
- The test reports for the rubber gaskets shall be as per acceptance tests of the IS: 5832 . The sampling shall be as per the provisions of the IS: 8329/ISO standard Marking

All pipes shall be marked as per Clause 18 of IS 8329 and show as below:

- Manufacturer name/ stamp
- Nominal diameter
- Class reference
- A white ring line showing length of insertion at spigot

Packing and Transport

The pipes shall be preferably transported by road from the factory and stored as per the manufacturer specifications to protect damage

Hydraulic Testing

Factory test shall be as per IS:8329/ISO standard and field hydraulic test shall be carried out for the distribution network at pressure 12 kg/ sq. cm.

Specials for Ductile Iron Pipes General

This specification covers the general requirements for Ductile Iron (DI) fittings suitable for Tyton joints to be used with Ductile Iron pipes with flanged and Tyton jointing system.

Types of specials

The following types of DI fittings shall be manufactured and tested in accordance with IS: 9523 or BS: 4772/ ISO standard.

- flanged socket
- flanged spigot
- double socket bends (90^0 , 45^0 , $22\ 1/2^0$, $11\ 1/4^0$)
- double socket branch flanged tee
- all socket tee
- double socket taper
- restrained joints
- Collars

All the fittings shall be of class K-12

Supply

All the DI fittings shall be supplied with one rubber ring for each socket. The rubber ring shall conform to IS: 12820 and IS: 5382 as described in the preceding chapter.

Flanged fittings shall be supplied with one rubber gasket per flange and the required number of nuts and bolts.

Lubricant for ductile iron pipes and specials General

This section covers the requirements for lubricant for the assembly of Ductile Iron pipes and specials suitable for Tyton push-in rubber ring joints.

Specification

The lubricant shall have the following characteristics:

- must have a paste like consistency and be ready for use

- has to adhere to wet and dry surfaces of DI pipes and rubber rings
- to be applied in hot and cold weather; ambient temperature 0 to 50 °C, temperature of exposed pipes up to 70 °C
- must be non-toxic
- must be water soluble
- must not affect the properties of the drinking water carried in the pipes
- must not have an objectionable odour
- has to inhibit bacterial growth
- must not be harmful to the skin
- must have a shelf life not less than 2 years

Acceptance tests

- They shall be conducted in line with the provisions of the IS 9523

Packing

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.

The fittings shall also be supplied by the manufacturer of the pipes. They shall preferably be manufactured by the manufacturer of the pipes. In case they are not, it shall be the responsibility of the manufacturer of the pipes to have them manufactured from a suitable manufacturer under its own supervision and have it tested at his/sub-contractors premises as per the contract. The pipe manufacturer shall however be responsible for the compatibility and quality of the products.

Summary of Quality Tests

Scope:

Supply of Ductile Iron (DI) pipe with EPDM rubber gasket for Drinking water.

Specification Quality Standard

- Pipe : IS 8329/ ISO standard
- Jointing Material (EPDM rubber gasket) : IS 5382
- Classification of Pipe : Class – K- 7
- Joint : Push-on-Joint (as per IS 8329/ISO standard)
- Sampling: as per respective IS· Test: as per respective IS.
- **Dimensions of pipe**
- Length : standard length of 4.00, 5.00, 5.50 and 6.00 meters (tolerance as per IS 4984).
- Diameter : The nominal diameter (inside)
- Wall Thickness : as per IS 8329

Coating : Metallic Zinc with finishing layer of bituminous paint as per IS : 8329 Lining :

Cement Mortar as per IS : 8329

Type of Cement : Portland Cement or Sulphate Resisting Portland Cement (as Per IS : 8329)

Quality Assurance: Quality Assurance Plan shall be got approved from the Engineer in Charge before production start.

CHAPTER-1.7

BRIEF SPECIFICATIONS FOR RAW WATER/CLEAR WATER **PUMPING EQUIPMENTS**

Scope of work :-

1.0 Pumps:

Vertical turbine pumps and centrifugal pumps as above complete with base plate, sub floor discharge head, motor stool, Bowel assembly, pressure gauges etc. shall be as per the specifications.

2.0 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 shall be as per the specifications.

3.0 Capacitors:

Capacitor banks for each of above motor to improve the power factor up to at least 0.95 with accessories shall be as per specifications attached- as per requirement

4.0 Starters: Auto transformer type suitable for motors shall be installed.

5.0 Delivery pipes and specials for pumps:

- i) Suitable diameter M.S. Pipe and specials epoxy coated for delivery piping of each of turbine pumps in the required length shall be as per specification attached.
- ii) Suitable size M.S. epoxy coated pipe for common manifold of required length.
- iii) Dismantle joint as per dia. of delivery pipe.

5.1 Valves for delivery piping:

- i) Suitable diameter swing type reflux valve (non-return valve) shall be as per the specifications.
- ii) Suitable dia. butterfly valves shall be as per specifications
- iii) Suitable dia. butterfly valve to be installed in the manifold shall be as per the specifications.
- iv) Suitable dia. Swing type reflux valve (non-return valve) for manifold.

6.0 Flow Measuring Device:

Electromagnetic full bore type flow measuring device shall 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.

7.0 Electronic Pressure Transducers:

For indication of delivery pressure of each pump electronic pressure transducers with indication panel.

8.0 Crane:

5 Ton capacities overhead gantry traveling crane

- a) H.T. switchgear as per specifications.
- b) L.T. switchgear as per specifications.

8.1 Temperature scanner panels shall be as per specifications.

8.2 Earthing of electrical equipment's inside pump house and electrical substation shall be as per I.E. rules- as required.

9.0 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 water tight 250 watt mercury vapour lamp fitting on each pole to provide illumination as desired.
- v) Lightning protection of pump house building complete with earthing 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 both in English and Hindi as per I.E. rules.

10.0 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 resistivity.

11.0 All the equipment's 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%, which shall be taken into consideration for design of equipment.

12.0 All the materials to be used in this work shall be strictly in accordance with relevant B.I.S.

13.0 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 shall obtain the license from the M.P. inspector of electrical safety department permitting to carry out the work.

14.0 The work shall be carried out strictly in accordance with latest I.E. Rules in vogue and relevant Indian standards. (B.I.S.)

15.0 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 shall 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.

16.0 The responsibility of commissioning and satisfactory working of all the equipments shall 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.
- 17.0 The tenderer shall submit along with the tender the guaranteed performance and technical particulars of the equipments.
- 18.0 The tender shall submit the detailed description of each item provided for along with dimensioned drawing for the lay out and connections proposed.
- 19.0 The tender shall also furnish an unconditional undertaking from the manufactures of equipments that before going out of production of spare parts, for the equipment's offered the manufacturer shall give at least 18 months advance notice to the departments.
- 20.0 The tenderer shall furnish along with the tender the system efficiency curve clearly mentioning the overall system efficiency when-
- i) Only one pump is operated.
 - ii) Two pumps are operated in parallel. The combine discharge head curve shall also be furnished for all above Conditions.
- 21.0 The tender shall clearly mention the overall kilowatt input at duty point without any tolerance.
- 22.0 The overall efficiency of each pumping unit and KW input shall be quoted without any tolerance on negative side. The efficiency and kilowatt input of motor once quoted shall be firm and shall not be allowed to be altered.

22.1.1 On completion of work contractor shall submit the completion drawing circuit diagrams, detailed mechanical drawings of equipments and the maintenance manual in form as desired by the engineer-in-charge of work.

22.1.2 All the equipments shall be provided with rating plate and nameplate as per the specifications.

23.0 SPECIFICATIONS FOR PUMPS

(A) SPECIFICATIONS FOR RAW WATER VERTICAL TURBINE PUMPS

General design considerations:

The pumps shall be Vertical Turbine wet pit type non-pull out design with multi stage bowl assembly, directly coupled through flexible pin coupling with vertical motor without speed reduction gear. These pumps shall 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.

Providing and installation of 4 Nos. suitable energy efficient deep well turbine pumps for raw water at Intake well cum pump house as under:-

- (a) Each pump of 70 lps discharge, approx. 89±10 m head: 2 Nos. (Working)
- (b) Each pump of 35 lps discharge, approx. 89±10 m head: 2 Nos. (Standby)

The design data for pumps are given below:

- | | | |
|---|---|---|
| 1 | Total numbers of pumps: | 4 Nos. |
| 2 | Rated capacity of pumps: | 2 number pumps of 70 lps and 2 Nos. of 35 lps (23 hrs pumping). |
| 3 | Pressure head: | Approx. 89 m or as per L- section i/c other losses. |
| 4 | Overall efficiency of each pump: | 70% minimum |
| 5 | Number of pumps working in parallel: | 2 |
| 6 | Number of pumps standby: | 2 |
| 7 | Pump speed: | 1500 RPM (Max). |
| 8 | Characteristic of liquid to be handled: | Raw water |

9 Method of lubrication: Auto lubrication with Raw water.

(B) SPECIFICATIONS FOR CLEAR WATER CENTRIFUGAL PUMPS

General design considerations:

The pumps shall be centrifugal, high head, single /multi stage split casing horizontal spindle type, directly coupled to motor through flexible coupling and These pumps shall be installed in the Clear water pump house at water treatment plant campus if required and at IPS to pump the treated 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.

Providing and installation of 6 Nos. suitable energy efficient Centrifugal pumps for Clear water at CW sump cum pump house at WTP near Rampuria village i/c automation:-

- (a) Each pump of 65 lps discharge, approx. 110±10 m head: 4 Nos. (Working)
- (b) Each pump of 33 lps discharge, approx. 110±10 m head: 2 Nos. (Standby)

In Each Case:-

- 1. Overall efficiency of each pump 70% minimum
- 2. Pump speed 1500 RPM (Max).
- 3. Characteristic of liquid to be handled- Clear water
- 4. Method of lubrication: - Auto lubrication with clear water
- 5. Pressure head - As per L- section i/c other losses of each case.

- 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 over loading 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 shall 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.

24.0 General Specifications:

The pumps shall be complete with bowl assembly, column pipe, line shaft, foundation plate, sole plate basket strainer, motor footstool and all other necessary accessories. The pumps shall generally comply with the requirements of following standards.

- a) I.S. 1710- Submersible pumps for clear, cold and fresh water.
- b) I.S. 5360- technical requirement of rot dynamic special purpose pumps.
- c) Any other relevant I.S. specifications.

24.1 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 bowl. 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 I.S. 3073-1967.

24.1.1 Impellers:

The impeller may be of closed type or semi open type made of S.S. CF8M, statically and dynamically balanced. The impeller shall be free of any casting 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.

24.1.2 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.

24.1.3 Line shafts:

The line shaft shall be made of stainless steels the shafts shall be furnished with inter changeable sections having length of 1.5 M, 2.5 M or 3 M. 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 or 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 ($\pm 10\%$ of the critical speed of shaft). The minimum dia of line shaft shall not be less than 60mm.

24.1.4 Column pipe:

The column pipe shall be manufactured from the heavy series of mild steel tube conforming 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.

24.1.5 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.

24.1.6 Thrust Bearing:

The thrust 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.

24.1.7 Discharge Head:

The discharge head shall 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.

24.1.8 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.

24.1.9 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.

24.1.10 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.

24.1.11 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.

24.1.12 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 Bourdon tube and connected to atmosphere for damping the mechanical vibrations. The connection size shall be 36 mm. BSP.

24.1.13 Bolts, nuts and Washers:

All bolts, nuts and washers shall be of superior quality conforming to relevant Indian standard specifications.

25.0 Material of construction:

The material of construction of the pumps and columns and bowl 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% to 2% Nickel cast iron 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) | Bowl 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 |

- i) Nuts, bolts and washers High tensile mild steel (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:- 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 bowl 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.

Field test: The field test shall be carried out as per I.S. 1710 and 5360. **Guaranteed performance and technical particulars** :The contractor shall submit the details of guaranteed performance and technical particulars along with the preliminary out line drawings indicating the principal dimensions and weight of pumping equipments, 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.

26.0 GUARANTEE FOR ENERGY CONSUMPTION--

26.1 The tenderer shall guarantee for energy consumption against the various pumps-motors, blowers mentioned in following Para. Power consumption figure lowest among the technically responsive bidders will be treated as datum for comparison and subsequent energy loading.

The capitalized cost of energy charges $(C_c) = C_r \{1-(1+r)^{-n}\}/r \dots\dots\dots(1)$

where –

- Cost of energy charges of first year (C_r)
- No. of years (n) =10 years
- Rate of interest (r) = 10.5%

Accordingly –

Capitalized cost of energy charges shall be-

$$C_c = 6.01477274 C_r$$

**TABLE - 1
STATEMENT OF POWER CONSUMPTION (C_r) FOR FACILTIES**

SL. No.	Description	No. of Working	KW Rating	Operational KW	Hrs. of Operation/Day	Energy Consumption (KWh/Day)
	(1)	(2)	(3)	(4) = (2)x(3)	(5)	(6) = (5)x(4)
1	Flash Mixer				23	
2	Clarifier Bridge Drive				23	
3	Flocculator Drive				23	
4	Filter Back Wash Pumps				2	
5	Back Wash Blowers				2	
6	Sludge Pumps				2	
7	Chlorinator Booster Pumps				23	
8	Clear Water Centrifugal Pumps				23	
9	Raw Water VT Pumps				23	

Total (T)	
Total energy consumption per year in KWH (Pe) Pe = 365 x Total of Column (7) i.e., (T)	
Total cost of energy charges for first year (Cr) in INR Cr = Pe x 5.10	
The capitalized cost of energy charges (Cc) Cc = Cr x 6.01477274	

1. Above calculation are to be done for working pumps only; with 10 years capacity.
2. The Actual requirement of water for water supply in initial years may be less then installed capacity so the energy consumption will be calculated on proportional basis for deciding penalty on energy consumption.
3. The MPJNM's estimation for yearly consumption of energy is **KWH** (Unit), if any bidders quote lesser than this, then in the event of getting the contract, he will have to submit the difference in cost (between MPJNM estimates and his quoted) for 10 years before starting of O&M periods in the form of BG. This amount will be released only after successful completion of O&M period of 10 years.
4. The combined efficiency of Pumps shall not be less than 70%.
5. Energy charges shall be applicable @ Rs. 5.10/- per KWH.
6. The above information is relevant for Bid Evaluation.
7. Generate the above "**Statement of Power Consumption for Facilities**" from Web Form (Attached in Tender Documents) and submit it online in mandatory submission "Envelop B"

Seal & Signature of the Contractor (Authorized Signatory)
--

The above information of consumption of power provided by the bidder will have to be verified by the successful bidder during the trial run period at his own through the Madhya Pradesh Urja Vikas Nigam.

26.2 Penalty if Guaranteed Performance is not achieved –

If the guaranteed performance of installed equipments is not achieved, then the difference of capitalized cost payable extra by the Employer during the 3 months of trial run period and 10 years of O&M period shall be recoverable from the bills payable to the contractor during the period or from the deposits available with the Employer and the Employer shall also be entitled to encash the bank guarantee. In such case the capitalized cost shall be calculated on the basis of above formula (1), where –

Rate of interest (r) shall be the rate of interest of loan borrowed by the Employer from any agency for the Project or 10.5%, whichever is higher.

And the time period, **no. of years (n)** shall be 10 years O&M **plus** 3 months i.e. 10.25 years

The rates of Energy Charges in this case shall be the prevailing rates at the time of consideration, during the years of O&M.

Managing Director

CHAPTER - 1.8

SCOPE OF WORK FOR ELECTRIFICATION OF ELECTRIC POWER LINE CONNECTON AT INTAKE WELL, WTP SITE & IPS

Brief Scope of Work-

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.

The work includes total of 12 Km long dedicated 33/11KV power supply from nearby Sub-station to WTP and Intake well cum pump house including erection of suitable capacity transformers at Intake and WTP inclusive of all allied works complete.

Provision of stretching suitable capacity electric line and taking connection for CWS cum pump house near Mohanpura.

The work includes construction of sub-stations and stretching of power lines and internal and external electrification 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 of work. The work shall be done with latest MPPKVVCL's specifications and IS specifications.

- Supply, installation , testing and commissioning of two pole structure along with lightning arrester, disconnecter AAAC conductor, clamp and connectors, insulators, hardware, CT- PT metering set, H.T meter with enclosure etc for taking tapping from incoming overhead line.
- Supply, installation, testing and commissioning of suitable transformer with Off-circuit Tap Changer, necessary foundation and earthing.
- Supply, installation, testing and commissioning of the complete electrical distribution system with Main LV switchboards, process equipment panels etc.
- Supply, installation, testing and commissioning of the complete cabling system with terminations (scope includes supply of gland, lug, etc.) as per approved drawing.
- 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.
- 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 equipments inside and outside plant as per approved layout diagram and technical specification.
- 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.

Item & specification of the work-

33 KV Line Work

1. Supplying & drawing 100mm 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 aluminium wound distribution transformer along with all accessories conforming to latest edition of IS 10028 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:37.10Kg/Mt) for electrical lines/sub stations, i/c 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 and sand) cement mortar i/c white cement painting. It also i/c painting on MS pole with primer coat of red oxide, and two coat of aluminum 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 aluminum 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

out side complete as per specification duly installed on existing structure (Set of three nos, 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 i/c 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 3 Mt. around of pole As per MPPKVVCL standards.
15. Supplying erection, testing of lighting arrester cap type single piece nonlinear resistor 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 my cubical type totally enclosed free standing type, dust, damp free standing type dust, damp free and vermin proof, distribution board made of MS sheet 14 G, complete with stove enamel paint, etc. with bus bar MV danger notice plate, ammeter and voltmeter with suitable aluminum leads and connection of incoming and outgoing cable with thimble and cable clamps having following incoming and outgoing with HRC fuses.
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 aluminum bus bar duly color coated, C: outgoing: 12 nos. 200 Amps HRC base with fuse. As per latest BIS version (make MCCB: Havels or ISI approved equivalent)
17. Supply, laying, placing, positioning, following PVC cables of 1.1 MN grade PVC insulated aluminum conductor armored 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.
18. Supplying erection and commissioning of gong 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. I 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.)
19. 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 fourth post fixed with nuts bolts i/c applying a priming coat of steel primer and painting with black paint to post and struts etc., complete i/c screwing with GI tying wire, GI staples, GI un-nails 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 x 0.3 Mt for each post and struts etc. complete for covering transformer & other electrical utility with welded mesh 50x25 mm as per latest BIS version.

20. Supplying Positioning fixing & erection at desired site of ISHB –beam/Rail pole 13 m long(min: 37.10 Kg/Mt), for electrical lines/ sub stations, i/c aligning and keeping it truly in vertical position including 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 1:4 (cement and sand) cement mortar i/c white cement plastering. It also i/c painting MS pole with primer coat of red oxide, and two coat of aluminum paint inclusive of painting materials, labor etc. complete as required as per specification ISI marked/tested (Make: Tata, SAIL or approved equivalent)
21. Supplying and fixing of earthing set coil made out of 8 swg GI wire complete as MPPKVCL specification.
22. Supply and winding of GI Barbed wire (Anti climbing device) up to height of 3 Mt. around of pole as per MPEB standards.
23. Supply and installation of danger board 33 KV rating.
24. The job includes concreting, suitable HBEAM pole of mm 11 Mt. height to house all mentioned fittings, i/c 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 1:3:6 (cement and sand) cement mortar i/c white cement painting. It also i/c painting materials, labor 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 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 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 aluminum 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 0/5 Amps as per design and specifications of MPEB.
31. Supply and Installation of 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 aluminum conductor armored 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 Havel's, Finolex, Paragon or IS1 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, i/c 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 MPPKVCL norms (Make: Bajaj, Crompton, Philips or ISI equivalent)
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, i/c 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 armored cables from AB switch to the breaker.

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 labor, transportation etc. complete.:-

Sl.No	Particulars
1	H-Beams 152 X 152 mm., 37.1 Kg./mtr 11 Mtr. 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 2.5 Mtrs. 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 (1:3:6) of H-beam @0.65 cmt per pole (Base pedding + Muffing)
11	Concreting (1:3:6) of stay @ 0.2 cmt. per stay
12	Painting with Red oxide paint
13	Final 2 coat of Aluminum paint
14	Fixing of Anti climbing devices
15	Fixing of Danger Boards Enameled Type 11KV

specifications for 11 KV/0.4 KV outdoor substation on RSJ using following items

including labor, transportation etc. complete.:-

RS Joist 175x85, 19.6kg/mtr., 11mtr. Long
D.C.cross-arm of 100 X50X 6 mm. 8' center with 2 pair of clamp suitable for RSJ
11 KV (45 KN) Polymer disc insulator
11KV Strain hard ware fitting
11 KV D.O. fuse & Lightning 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 100 X 50 X6 mm. channel
Transformer clamping set 50X50 X6 mm Angle
Transformer belting with 50 X 50 X 6 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 (1:3:6) of RS Joist @ 0.5 cmt. per pole
Concreting (1:3:6) of Stay @ 0.2 cmt. per stay
AAA Conductor Rabbit for Jumper
Danger Boards Enameled Type 11KV
Earthing set
Anti climbing devices (Barbed wire 2.24 mm Dia (14 SWG) (3.5 Kg. wire per pole)
Red oxide paint
Aluminum paint
M.S. Nuts and Bolts
Distribution Box mounting channel (75x40x6 mm.)

The work includes supplying and fixing of all accessories complete whether included or not as per latest MPPKVVCL's specifications and charging the line i/c taking permission from any other government department if necessary. All the transformer shall have 100% standby arrangement.

Managing Director

CHAPTER – 1.09
BRIEF SPECIFICATIONS FOR APPROACH ROAD, BOUNDARY WALL AND
STAFF QUARTERS

The specifications of WBM and overlaying Bituminous layer shall be as detailed below:-

- a) Construction of Embankment/Subgrade/ earth shoulders, as per clause 305 & its sub-clauses, Where required but with approved materials/soil like morrum CBR value not less than 12% i/c all lead & lifts i/c excavation, cost of watering, compaction and maintenance of surface during construction to ensure shedding & preventing 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.
- b) 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)

(iii) for grading-III Material

- c) 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 i) Grading- I (a) Using Screening Type-A (13.2mm Agg.)

- d) 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 i) Grading- II (a) Using Screening Type-A (13.2mm Agg.)

- e) 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 (ii) Grading- III (a) Using Screening Type-B (11.2mm Agg.)

- f) 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.
- g) 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.

(ii) @ 0.30 kg per sqm (dry & hungry bituminous surfaces/granular surfaces treated with primer)

- h) 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.)

(ii) Case - II: Open-Graded Premix

- i) 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)

(i) Case - I : Type A

- j) 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.

- k) "Laying RCC Pipe NP4 / pre-stressed concrete pipe on first class bedding in single row for cross drainage purposes .

Providing and Laying Reinforced cement concrete pipe NP4 / pre-stressed 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 .

Note : 1. Clauses and tables mentioned in specifications above refer to MORTH specifications.

1. 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.
2. Until and unless specified otherwise in this document the road width shall be 3.5 m with 1 m shoulder on either side.

Specifications for Boundary/Compound wall

- a) Excavation for foundation and footing as required including refilling and disposal at the designated place.
- b) Type of foundation shall be as per approved drawing.
- c) Plain cement concrete used for foundation shall be minimum of M15 grade
- d) RCC used for plinth beam foundation and columns shall be of M 20 grade.
- e) Brick work with well burnt chimney bricks having crushing strength not less

than 25 kg/cm² and water absorption not more than 20% using 1:4 cement mortar.

- f) Internal and external plastering shall be 12 mm thick using 1:3 cement mortar.
- g) Finishing walls with Acrylic smooth exterior paint of required shade (two or more coat applied @ 1.67 liters /10 sqm over and including base coat of water proofing cement paint applied @2.0 kg/10sqm.
- h) Providing and fixing of gate built with structural steel as per approved drawing and specifications at every location.
- i) The height of boundary wall above ground level shall be minimum 2 m.

OFFICE BUILDING AND STAFF QUARTERS

The following office building, administrative building and staff quarters are to be designed and constructed at Intake /WTP campus and at Rajgarh town as decided and approved by Jal Nigam officials-

1. Office Building with minimum plinth area 225 .00 Sqm.
2. Admin block with minimum plinth area 225 .00 Sqm.
3. Store Building 75.00 Sqm
4. F - Type with minimum plinth area 93.0 Sqm each - 1 No.
5. G - Type with minimum plinth area 65.0 Sqm each - 2 Nos.
6. H - Type with minimum plinth area 46.5 Sqm each - 4 Nos.
7. I - Type with minimum plinth area 32.5 Sqm each - 4 Nos.

The general specifications of the staff quarters are as under -

All the staff quarters/Office shall be RCC framed brick masonry structures. The columns, Beams, Lintels, Chhajjas, Slabs shall be constructed in RCC M - 25 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 -

1. Foundation - The foundation shall be of RCC footing or raft as per safe bearing capacity of foundation strata.
2. Plinth - The minimum height of plinth shall be 0.60 m 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 0.15 m.
3. Flooring - Kota stone flooring shall be done in I to H type of quarters and in G and F type of quarters flooring of Vitrified tiles shall be provided.
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..
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 in 3 track system. The doors of wash rooms may be constructed in aluminum frame with PVC shutters. All the doors shall also be provided with interlock arrangement.
6. Windows - 30 % of floor area shall be provided for door and windows. All the windows shall be constructed of aluminum framed with 4 mm thick glass panes and mosquito net. MS grill shall also be provided in each window.

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- LED, Night lamps, Fans, Exhaust Fans, Geyser etc as required of ISI mark and of standard make shall be provided.
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, Court yard and etc. Provision for geyser connection, mixers shall also be provided.
9. Sanitary – Provision of attached toilets for bed rooms shall be provided. A common toilet shall also be provided. Glazed tiles shall be provided on inner walls of the toilet upto full height. Toilet block should have European/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 upto local drain/sewer. Roof water harvesting arrangement shall also be provided.
10. General - All the bed rooms 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. Preferably all the bed rooms should have attached toilet unit with European seats. All the fixtures shall be of standard make and shall be ISI mark as approved by Jal Nigam Officials. H and I type quarter may be duplex type and G & H type may be constructed as row houses and F type should be constructed separately.

11.0 Specifications for Administrative Building at WTP and Office Building at Maihar:-

The Administrative Building and office building should be fully furnished and air conditioned with office equipment and accessories necessary to discharge the official functions like furniture , telecommunication, conferencing and storage and should have sufficient number of rooms to accommodate 5 officers and 12 supporting staff. The flooring of the office building shall be of Vitrified tiles. Minimum two toilet blocks one for ladies and another for gents for supporting staff and attach toilet with room for officials.

Roof water harvesting arrangement for office building/quarters shall also be provided. The office and residential premises would be covered with boundary wall and entrance gates giving a pleasant environment of a campus fully lighted externally and internally with all safety supported with audio visual watch and ward and internal communication.

The Administrative/ Office Building/ Staff quarters should have covered parking sheds with sufficient parking facilities commensurate with requirement as estimated during time of construction by MPJNM.

Managing Director
Madhya Pradesh Jal Nigam Maryadit
Vindhyachal Bhawan, Bhopal

CHAPTER – 1.10
Automation at WTP, IPS, MBR's, and ESR's

(i) General

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.

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 tiles 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.

The SCADA system shall comprise the following ;

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 drives. The fixed drive shall be sized to permit the operation of the system and the storage of the following ;

- ❖ In excess of 2000 historic alarms data;
- ❖ Not less than 7 months archive data.
- ❖ Plus not less than 50% spare capacity.
- ❖ One latest industry standard 20" color monitor;
- ❖ Mouse;

- ❖ 132 column alarm/event latest dot matrix printer with fan fold paper attachment;

Color inkjet screen dup printer with multiple single sheet feeder (the printer shall be suitable for use at the local SCADA system);

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;

full height two door metal storage cupboard with three shelves;

2 Nos upholstered swivel chairs;

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 based. 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 :

- ❖ Color graphic screen representation of each plant area including system overviews;
- ❖ Alarm annunciation and historic logging of alarms;
- ❖ Historic event logging.
- ❖ Real time and historic trending of analogue variables;
- ❖ Preparation of simple reports;

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, values and totals in a graphical and tabular format (see note 1);

annunciate alarms including details of the time the alarm occurred (see note 3);

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 as follows :
overview of the treatment works;
active color 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 affect 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.

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:

water level 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.

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%. The scope of work includes providing power backup in the form of solar panel and battery (of atleast 150 watts capacity) at MBR/OHSR/OHT for operating flow meters uninterruptedly and providing illumination in the campus

CHAPTER – 1.11
SERVICE LEVEL BENCHMARKS DURING OPERATION & MAINTENANCE

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 Jal Nigam.

2. Service Level Standards: The following standards shall be maintained by the contractor-

i. 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.

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.

ii. Per capita supply of water- The contractor is liable to ensure supply of potable water for domestic use to each consumer @ 70 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 70 lpcd and above	No deduction
For 40 lpcd supply	75% of payable amount
Between 70 to 40 lpcd supply	proportionately reduced payment.
Below 40 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

iii. Pressure at consumer end- The contractor is liable to ensure supply of potable water for domestic use at service point of each consumer not less than 12.0 m.

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.

iv. Unaccounted for Water- The contractor 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 pumping to Overhead Service Reservoir)

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-

If UFW is 20% then excess wastage is $20-5=15\%$, so 15% of the total billed amount will be deducted as penalty.

v. Complaint redressal- The contractor is responsible to attend the complaints of the consumers within 24 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.

vi. 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.

vii. Road cutting and its restoration (if required) 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.

viii. 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.

ix. Any extension of pipe line network if required shall have to be done by the contractor during maintenance period, payment of which shall be made according to prevailing ISSR,

x. 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 under maintenance period. No separate payment shall be made on this account except Electric bills and chemicals.

Minimum manpower to be deployed by the contractor during the O&M phase is as given below-

Sr. No	Personal	Quantity
1	Project Manager	1
2	Maintenance Engineer	2
3	Chemist	2
4	Operator	16
5	Helper/Valveman	40
6	Electrician	2
7	Watch man	06
8	Line Man/Fitter	07

Penalty: In the event of contractor fails to deploy the minimum number of persons

the Amount shall be deducted for sr. no 1 Rs 1.00 lac per month and Rs 0.75 lacs for Sr.no.2 Rs 0.20 Sr.no 3,4,6 & 8 and Rs 0.10 lacs for Sr. no 5&7.This amount of deduction will also vary as per the change in O&M payment based on CPI.

xi) The Contractor shall provide following facilities to the above mentioned staff –

a) Inspection Vehicle –

- Jeep or Equivalent – 2 Nos
- Loading Vehicle – 8 Ton Capacity – 1Nos
- Small Canter or equivalent – 2 Nos.

b) Mobile Phones – Contractor shall provide Mobile Phones to all staff indicated in Sr. No. 1,2,4,4,6, and 8.

c) Land Line Phone - Contractor shall provide at each Pumping Station.

xii) Deductions for not providing above facilities shall be as follows from the payments for Operations and Maintenance –

- Inspection Vehicle –
 - Jeep or Equivalent – 50000.00 per month
 - Loading Vehicle – 8 Ton Capacity – 60000.00 per month
 - Small Canter or equivalent – 40000.00 per Month.
- Mobile Phones – INR 1000 for each.
- Land Line Phone - INR 1000 for each.

2This amount of deduction shall also vary as per the change in O&M payment based on CPI.

xi. The Managing Director reserves the right to terminate the contract without assigning any reason whatsoever by giving one month's notice to the contractor of this intent.

**Managing Director
Madhya Pradesh Jal Nigam
Maryadit Vindhyachal Bhawan, Bhopal**

CHAPTER – 1.12

List of Recommended makes of major items of Plant and Services.

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 MPJNM at any later stage shall also be eligible besides listed below-

S. No.	Item / Component	Recommended makes
1	VT and Centrifugal Pumps	Kirloskar / Jyoti / Mather+Platt /WPIL/Becon Weir/Flowmore Ltd., Gudgaon.
2	Pump motors	Kirloskar / Jyoti / Crompton Grieves / ABB / Alsthom /BHEL/Siemens/ Bharat Bijlee
3	Power Transformers	ABB / Crompton Greaves/ Emco / Siemens
4	DI Pipes	Electrosteel / Jindal / Tata / Electrotherm/ Jai Balaji Industries/ Rashmi Metaliks
5	HDPE Pipes & specials	Reliance / Duraline / Jain Irrigation/ Godavari/ Sangir/ Time Technoplast/ Signet Industries/ ORI-Plast/ Kataria Plastics
6	Sluice Valves / Scour Valves	Kirloskar / IVC / VAG /IVI/ Fouress
7	Butterfly Valve	Kirloskar / IVC / VAG /IVI/ Fouress
8	Non-return Valves	Kirloskar / IVC / VAG /IVI/ Fouress
9	Kinetic Air Valve	Kirloskar / IVC / VAG /IVI/ Fouress
10	Valve Actuators	Auma / Rotork / Limitork
11	Hydraulically operated Flow cum Pressure control valves	VAG / Darling-Muesco / Singer
12	Zero Velocity Valve	Vardhman Electromech/ Flownix Valves

13	Single faced Sluice Gates	JASH / VAG / Kirloskar
14	Water Hammer Control Devices	Sureseal or Equivalent
15	Electro-magnetic Flow meters,	Emerson / Krohne Marshall / Yokogawa/ Siemens/ Endress+Hauser (India)/ Itron India/ Nivo Controls
16	Electro-magnetic Flow meters, Water Meter, Items for Instumation/ Automation	Endress+Hauser (India)/ Itron India/ Nivo Controls
17	Woltman type Bulk water meters	Zenner / Itron / Elster / Minol
18	WTP equipement : <i>Flash mixers, Clariflocculators, Flocculators, Rotating bridge, Blowers etc.</i>	Triveni / Shivpad / Dorr-Oliver / Voltas
19	Single Faced Sluice Gate/ WTP equipement : (<i>Flash mixers, Clariflocculators, Flocculators, Rotating bridge & Chlorination Equipment's</i>)	GEO Miller/Kay International
20	Chlorination equipment : Chlorinator, Chlorine leak detector, Residual Chlorine analyzer, Scrubber etc.	Pennwalt / W&T / Alldos
21	DI / CI Fittings & specials	Kiswok / Electrosteel/ Kejriwal.
22	Dismantling / Expansion joints	Anup Engg. / LoneStar / Vedanta / Precise
23	Compression fittings, Tapping Saddles, Electrofusion Couplers	Kimplas /, George ficher / Glynwed / Frialen / Trustlene / GPS / Durafuse

Items for Instrumentation / Automation

S. No.	Item / Component	Recommended makes
1	Programmable Logic Controllers (PLC)	Rockwell (<i>Allen Bradley</i>) / Siemens / Honeywell
2	Moulded Case Circuit Breaker (MCCB)	Siemens / Schneider M.G. / Jyoti / L&T
3	Relay and Contactors	Siemens / Alstom / Jyoti / ABB / L&T
4	Cables	Tropodur / Finolex / Asian / Gloster / Incab / Universal / Polycab
5	Panel Enclosures and Consoles	Rittal / President / Cutler Hammer
6	Switch fuse Disconnecter	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
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, Serval, 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
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

Managing Director

CHAPTER – 1.13

TRIAL RUN FOR 3 MONTHS AND OPERATION & MAINTENANCE FOR 10 YEARS

1. **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** (Defect liability period is upto the end of Operation and Maintenance period which shall start after trial run of 3 months) 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 Maryadit.

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, the Nigam shall appoint staff to get hands on training to run and maintain the scheme. Contractor and his staff shall arrange training for the staff to the satisfaction of Engineer In-charge.

2. 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

3. **Intake Well cum pump house:** The contractor shall provide the staff to run and maintain and keep records of the machinery and equipments, installed in intake well. **The electricity charges (excluding penalties) will be borne by MPJNM**, initial inventory of the consumables like oil, Grease, Gland packing; all type of fuses, T & P etc. shall 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.
4. **Raw and Clear water pumping Mains:** The contractor shall 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 shall arrange for any repairs and maintenance during the trial run and O&M period, including damage done by human interference or by machinery or traffic, contractor however shall be free to claim compensation on such grounds from the party responsible for such damages as admissible. All necessary T&P, consumables, pipes etc. shall be provided by the contractor at his own cost and expenses.
5. **Treatment Plant and Pump House:** The contractor shall provide necessary staff to run and maintain the treatment plant the cost of chlorine, alum, lime and other chemicals used in laboratory. **The electricity charges (excluding penalties) consumed/used during the treatment process will be borne by the MPJNM.**

The contractor shall maintain the record of consumption of chemicals and inventory of stock and will apprise the Engineer in charge of shortcomings. The contractor shall bring in the notice of Engineer in charge all repairs and maintenance works done during the day and shall 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 arrange and provide for watch and ward, security and upkeep of premises of the plant during trial run period and O&M period. He shall maintain/replace the furniture/ equipment etc. if damaged during this period.

6. **Master Balancing Reservoirs/GLR/ESR:** The contractor shall provide necessary staff for watch and ward and maintenance of break pressure tanks and all over head tanks under this project and shall upkeep the premises of the tanks to the satisfaction of Engineer in Charge. The contractor's staff shall maintain the record of water level in tanks and stock of inventory if any at these tanks.
7. **Gravity Feeder Mains:** The contractor shall arrange and provide for regular surveillance of gravity feeder mains from Break Pressure Tanks to all Overhead tanks of the villages and shall arrange for any repairs and maintenance including damage done by human interference or by machinery or traffic, contractor however will be free to claim compensation on such grounds from the party responsible for such damages as admissible, the MPJNM shall help in certifying the quantum of such damage during the trial run and O&M period. All necessary T&P, consumables, pipes etc. shall be provided by the contractor at his own cost and expenses.
8. **Electrical Substations and Electric Supply Line:** The contractor shall 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 shall be handed over to MPJNM for further running and maintenance.

8. **Operation & Maintenance of distribution system:-** The contractor shall be solely and exclusively liable and responsible for all the works which have been executed under the contract including damage done by human interference or by machinery or traffic, contractor however will be free to claim compensation on such grounds from the party responsible for such damages as admissible, the MPJNM shall help in certifying the quantum of such damage. 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 be done by Gram Panchayat. Please also refer Chapter on ‘**Service Level Benchmarks during Operation & Maintenance**’.
9. **Handing Over after O&M period:** Before handing over the components to MPJNM all the structures shall be finished by painting as per specifications given in the agreement and all the Electrical & Mechanical equipments shall be finished by painting as per specifications and these must be in good running conditions.

It shall be sole and exclusive duty and 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 MPJNM.

The MPJNM shall 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

MPJNM in a very good maintained condition. (Decision of Engineer in Charge will be final in this regard).

Annexure –‘F’

S. No.	Main Works
1.1	Construction of 7.0 m diameter and 55.00 m deep R.C.C Intake well, 33.35 Million liter of capacity in 23 hours flow & 7.0 m dia & 6 m High Pump house including provision for automation and construction of R.C.C Approach Bridge minimum 3.5 m wide.
1.2	Raw water pumping main of 600 mm internal dia. DI K-9 with in-lining and out-coating of length 4100 m as per IS 8329 i/c flow meters, valves, sluice valves, air valves, scour valves, valve chambers, thrust blocks, crossings, specials & accessories etc. complete.
1.3	Water treatment plant to provide 26.15 million liter treated clear water in 23 hours i/c automation, with clear water sump having a storage capacity of 2 hours and pump house of suitable size complete near Village Rampuria, District Rajgarh i/c automation, construction of boundary wall, internal roads, approach road etc. complete.
1.4	<p>Providing, laying & jointing of Clear water pumping main DI class K-9 pipe with in-lining and out-coating as per IS 8329 i/c flow meters, valves, sluice valves, air valves, scour valves, valve chambers, thrust blocks, crossings, specials & accessories etc. complete.</p> <p>250 mm to 600 mm internal dia. of length 113 Km as detailed below:</p> <ul style="list-style-type: none"> a. 250 mm dia DI Class K9 - 42000 m b. 300 mm dia DI Class K9 - 24173 m c. 350 mm dia DI Class K9 - 35827 m d. 400 mm dia DI Class K9 - 293 m e. 450 mm dia DI Class K9 - 3000 m f. 500 mm dia DI Class K9 - 7500 m g. 600 mm dia DI Class K9 - 209 m
1.5	<p>Providing, laying & jointing of Clear water feeder/gravity main, DI class K-7 and K-9 pipe as per IS 8329 i/c flow meters, valves, sluice valves, air valves, scour valves, valve chambers, thrust block, crossings (rail and road), specials & accessories etc. complete.</p> <p>100 to 400 mm internal dia of length 414.43 Km as detailed below:</p> <ul style="list-style-type: none"> a. 100 mm dia DI Class K9 - 21200 m b. 150 mm dia DI Class K9 - 4048 m c. 200 mm dia DI Class K9 - 2158 m a. 100 mm dia DI Class K7 - 524 m b. 150 mm dia DI Class K7 - 210923 m c. 200 mm dia DI Class K7 - 57963 m d. 250 mm dia DI Class K7 - 52701 m e. 300 mm dia DI Class K7 - 21510 m f. 350 mm dia DI Class K7 - 39681 m g. 400 mm dia DI Class K7 - 3724 m
1.6	a. 97 Overhead service reservoirs at different blocks of following capacity and

approximate staging:-

S. No.	Tank Capacity	Staging	Nos.
1	100 KI	12 mtr - 22 mtr. (As per design)	21
2	110 KI		15
3	120 KI		8
4	130 KI		9
5	140 KI		6
6	150 KI		5
7	160 KI		9
8	170 KI		8
9	180 KI		4
10	190 KI		4
11	200 KI		2
12	220 KI		1
13	230 KI		1
14	260 KI		2
15	270 KI		1
16	340 KI		1

Five Master Balancing Reservoir (MBR) near various villages;

S. No.	Name of MBR	Capacity
1	Amba	310 KI or Suitable Capacity
2	Datagram	260 KI or Suitable Capacity
3	Jwalapur	190 KI or Suitable Capacity
4	Odpur	100 KI or Suitable Capacity
5	Udiya pura	220 KI or Suitable Capacity

Note :- All the tanks/reservoirs/clear water sump cum pump house/MBR will have 2 m high Boundary Wall with gate, one Room set of area 25 sqm size with toilet, automation system and single-phase electrification with area lighting etc. complete.

- 1.7 Pumping equipment including suitable motors, protection equipment for following:-
- (i) Providing and installation of 4 Nos. suitable energy efficient deep well vertical turbine pumps for raw water at Intake well cum pump house as under:-
 - (a) Each pump of 70 lps discharge, approx. 89±10 m head: 2 Nos. (Working)
 - (b) Each pump of 35 lps discharge, approx. 89±10 m head: 2 Nos. (Standby)
 - (ii) Providing and installation of 6 Nos. suitable energy efficient Centrifugal pumps, HSC type, for Clear water at pump house.
 - (a) Each pump of 65 lps discharge, approx. 110±10 m head: 4 Nos. (working)
 - (b) Each pump of 33 lps discharge, approx. 110±10 m head: 2 Nos. (standby)

1.8	<p>a) Provision for a total of 12.1 Km long dedicated 33/11KV power supply from nearby Sub-station to WTP and Intake well cum pump house including erection of suitable capacity transformers at Intake and WTP inclusive of all allied works complete.</p> <p>The work includes construction of sub-stations and stretching of power lines and internal and external electrification etc. complete.</p> <p>100 % Standby transformers to be provided.</p>
1.9	<p>Distribution network for a total length of 909.83 km comprising of:-</p> <p>HDPE, PE100 PN6 (minimum) pipelines including valves, specials, bulk water meters for all villages and other allied works of following diameters;</p> <ol style="list-style-type: none"> a. 90 mm dia. minimum 6 kg/cm² pressure- 413633 m b. 110 mm dia. minimum 6 kg/cm² pressure- 151861 m c. 140 mm dia. minimum 6 kg/cm² pressure- 134053 m d. 160 mm dia. minimum 6 kg/cm² pressure- 97984 m e. 180 mm dia. minimum 6 kg/cm² pressure- 57567 m f. 200 mm dia. minimum 6 kg/cm² pressure- 33410 m g. 250 mm dia. minimum 6 kg/cm² pressure- 19429 m h. 280 mm dia. minimum 6 kg/cm² pressure- 1893 m <p>HDPE Pipe line i/c valves, sluice valves, air valves, scour valves, valve chambers, thrust block, bulk water meters for all villages, specials & accessories etc. complete.</p>
1.10	<p>Provision for construction of complain center with Boundary wall at OHT locations (5 m x 5m).</p>
1.11	<p>House service connections - No. of House service connections are 38,240</p>
1.12	<p>Operation & Maintenance of the Whole Scheme for the first year</p>
1.13	<p>The Operation and Maintenance cost for the first year, in terms of percentage of contract Amount is given in Annexure H, For every next year the first-year percentage rates will be increased/decreased according to the percentage change in consumer price index issued by Labor Bureau, GOI (All IW) 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.</p> <p>NOTE:-</p> <ol style="list-style-type: none"> 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 (excluding penalties) shall be paid by MPJNM on reimbursement basis. c) 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.

**ANNEXURE – ‘H’
BREAK UP SCHEDULE FOR PAYMENTS**

Total lump sum offer of work shall be distributed work-wise as per the details below-

S. No.	Main Works	Prorata share (% of Lump Sum Offer)																		
1.1 H ₁	Construction of 7.0 m diameter and 55.00 m deep R.C.C Intake well, 33.35 Million liter of capacity in 23 hours flow & 7.0 m dia & 6 m High Pump house including provision for automation and construction of R.C.C Approach Bridge minimum 3.5 m wide.	0.98																		
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15	270 Kl		1																																																				
16	340 Kl		1																																																				
1.8 H ₈	<p>Pumping equipment including suitable motors, protection equipment for following:-</p> <p>(i) Providing and installation of 4 Nos. suitable energy efficient deep well vertical turbine pumps for raw water at Intake well cum pump house as under:-</p> <p>(a) Each pump of 70 lps discharge, approx. 89±10 m head: 2 Nos (1 working & 1 standby)</p> <p>(b) Each pump of 35 lps discharge, approx. 89±10 m head: 2 Nos. (1 working & 1 standby)</p>	0.38																																																					
1.9 H ₉	<p>(ii) Providing and installation of 6 Nos. suitable energy efficient Centrifugal pumps, HSC type, for Clear water at pump house.</p> <p>(a) Each pump of 65 lps discharge, approx. 110±10 m head: 4 Nos. (working)</p>	0.44																																																					

	(b) Each pump of 33 lps discharge, approx. 110±10 m head: 2 Nos. (standby)	
1.10 H ₁₀	a) Provision for a total of 12.1 Km long dedicated 33/11KV power supply from nearby Sub-station to WTP and Intake well cum pump house including erection of suitable capacity transformers at Intake and WTP inclusive of all allied works complete. The work includes construction of sub-stations and stretching of power lines and internal and external electrification etc. complete. 100 % Standby transformers to be provided.	0.57
1.11 H ₁₁	Distribution network for a total length of 909.83 km comprising of:- HDPE, PE100 PN6 (minimum) pipelines including valves, specials, bulk water meters for all villages and other allied works of following diameters; a. 90 mm dia. minimum 6 kg/cm ² pressure- 413633 m b. 110 mm dia. minimum 6 kg/cm ² pressure- 151861 m c. 140 mm dia. minimum 6 kg/cm ² pressure- 134053 m d. 160 mm dia. minimum 6 kg/cm ² pressure- 97984 m e. 180 mm dia. minimum 6 kg/cm ² pressure- 57567 m f. 200 mm dia. minimum 6 kg/cm ² pressure- 33410 m g. 250 mm dia. minimum 6 kg/cm ² pressure- 19429 m h. 280 mm dia. minimum 6 kg/cm ² pressure- 1893 m HDPE Pipe line i/c valves, sluice valves, air valves, scour valves, valve chambers, thrust block, bulk water meters for all villages, specials & accessories etc. complete.	31.2
1.12 H ₁₂	Provision for construction of complain center with Boundary wall at OHT locations (5 m x 5 m)	1.21
1.13 H ₁₃	House service connections - No. of House service connections are 38,240	2.33
1.14	Operation & Maintenance of the Whole Scheme for the first year	1.20
	The Operation and Maintenance cost for the first year, in terms of percentage of contract Amount is given in Annexure H, For every next year the first-year percentage rates will be increased/decreased according to the percentage change in consumer price index issued by Labor Bureau, GOI (All IW) 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 energy charges (excluding penalties) shall be paid by MPJNM on reimbursement basis. c) 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.	
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NOTE-

1. *Maintenance expenditures of only first year (excluding energy charges -as detailed) shall be paid as prorata % share mentioned above of the Lump-sum offer. On the basis of the pro-rata share above, the percentage share of further years shall be worked out.
2. The above respective share of sizes and lengths of DI K-9 and K-7 pipe lines shall be for the sizes and lengths specified in the tender, but if the actual length varies, then the variation shall be admissible as per latest and prevailing ISSR for Water Supply works published by UADD, MP. The lengths of valves and specials would be included in the total length.
3. The above respective share of sizes and lengths of HDPE distribution pipelines shall be for the sizes and lengths specified in the tender, but if the actual type, size and length varies, then the variation shall be admissible as per latest and prevailing ISSR for Water Supply works published by UADD, MP. The lengths of valves and specials would be included in the total length.
4. It will be the sole and exclusive responsibility of the contractor to provide safe and potable water @ 70 lpcd as specified in the Appendix-I for each individual consumer of the village. The total demand of the village in 2025 and 2035 are given in the Appendix-I.
5. Percentage Rates for fencing, approaches etc. required to be constructed are included in civil works of that respective sub head.

Annexure - H₁

**Break up of schedule of payment for the
Intake well cum pump house and Approach Bridge
Pro-rata Share (H₁): 0.98% of Lump sum offer**

S. No	On completion of item of work	Percentage payable of H₁	Cumulative percentage payable of H₁
1	After construction of coffer dam, excavation of foundation and casting of bed concrete.	5% of H ₁	5% of H ₁
2	After completing foundation and well staining up-to discharge floor level.	35% of H ₁	40% of H ₁
3	After construction of R.C.C. approach bridge, approach road and discharge floor.	15% of H ₁	55% of H ₁
4	After completing pump house up to roof slab with bridge connecting jack well with intake, R.C.C. Duct conduit etc.	20% of H ₁	75% of H ₁
5	After fixing of inlet ports, valves, specials, gantry girder.	20% of H ₁	95% of H ₁
6	After finishing, testing and successful trial run of work.	5% of H ₁	100% of H ₁

Annexure - H₂

Break up of schedule of payment for the DI Pumping Mains

Raw Water Pumping Main

Pro-rata Share (H₂): 1.67% of Lump sum offer

S. No	On completion of item of work	Percentage payable	Cumulative percentage payable
1	i. On testing and supply at site of 20% in-lined and out-coated K-7 D.I. pipes of specified diameters and lengths	13 % of H ₂	13% of H ₂
	ii. On transportation of pipes, excavation of trenches and construction of supporting structures, laying, jointing and testing at site of 20% of specified diameters and lengths.	2 % of H ₂	15% of H ₂
	iii. After proper refilling of trench including restoration of road i.e. making surface good as same before construction.	3 % of H ₂	18% of H ₂
2	i. On testing and supply at site of 40% in-lined and out-coated K-7 D.I. pipes of specified diameters and lengths	13 % of H ₂	31% of H ₂
	ii. On transportation of pipes, excavation of trenches and construction of supporting structures, laying, jointing and testing at site of 40% of specified diameters and lengths.	2 % of H ₂	33% of H ₂
	iii. After proper refilling of trench including restoration of road i.e. making surface good as same before construction.	3 % of H ₂	36% of H ₂

3	i. On testing and supply at site of 60% in-lined and out-coated K-7 D.I. pipes of specified diameters and lengths	13 % of H₂	49% of H₂
	ii. On transportation of pipes, excavation of trenches and construction of supporting structures, laying, jointing and testing at site of 60% of specified diameters and lengths.	2 % of H₂	51% of H₂
	iii. After proper refilling of trench including restoration of road i.e. making surface good as same before construction.	3 % of H₂	54% of H₂
4	i. On testing and supply at site of 80% in-lined and out-coated K-7 D.I. pipes of specified diameters and lengths	13% of H₂	67% of H₂
	ii. On transportation of pipes, excavation of trenches and construction of supporting structures, laying, jointing and testing at site of 80% of specified diameters and lengths.	2 % of H₂	69% of H₂
	iii. After proper refilling of trench including restoration of road i.e. making surface good as same before construction.	3 % of H₂	72% of H₂
5	i. On testing and supply at site of 100% in-lined and out-coated K-7 D.I. pipes of specified diameters and lengths	13 % of H₂	85% of H₂

	ii. On transportation of pipes, excavation of trenches and construction of supporting structures, laying, jointing and testing at site of 100% of specified diameters and lengths.	2% of H₂	87% of H₂
	iii. After proper refilling of trench including restoration of road i.e. making surface good as same before construction.	3 % of H₂	90 % of H₂
6	On disinfecting and commissioning the complete pipe lines	10 % of H₂	100% of H₂

NOTE- There are different sizes and lengths of K-9 D.I. pipes, the total value of pro rata share **H₂** is for all these pipelines. For supplied and laid pipelines weighted share can be worked out.

Annexure - H₃
Break up schedule for payment for
Water Treatment Plant

Pro-rata Share (H₃): 2.42% of Lump sum offer

- I. Percentage wise break-up of cost of civil and mechanical/Electrical works. The cost of C.I./DI Pipes, valves, laboratory equipment's and chemical 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.
- III. 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 H₃

For E&M works- 0.2 H₃

(The cost of wash water pumps, air blowers, alum agitators, pre sedimentation (if it is there) and clarifloculator motors/agitators, C.I. pipes, valves, laboratory equipment and chemical and furniture should be included as E/M works)

IV. Civil work:-

Unit wise share of civil work shall be as under -

Cascade aerator / Inlet chamber	0.5% of 0.8 H ₃
Flash Mixer with inlet channel	0.5% of 0.8 H ₃
Pre Settling tank and/or Clarifloculator	24% of 0.8 H ₃
Filters	24% of 0.8 H ₃
Wash Water Tank	5% of 0.8 H ₃
Administrative Block	10% of 0.8 H ₃
Lab Building	5% of 0.8 H ₃
Store Building	3% of 0.8 H ₃
Clear Water Sump	10% of 0.8 H ₃
Clear Water Pump House	2% of 0.8 H ₃

Recycling arrangement	1% of 0.8 H ₃
Complete Testing Commissioning of Plant	5% of 0.8 H ₃
Boundary wall	5% of 0.8 H ₃
Roads work of campus	3% of 0.8 H ₃
Site development and etc.	2% of 0.8 H ₃

Percentage cost at various stages of construction of individual units of civil work.

Based upon the above, payment shall be regulated as given hereunder: -

S.No.	Particulars	Cumulative percentage
1.	Preliminary work, rooting out fallen trees and excavation, casting of leveling course/PCC of footing or raft.	10%
2.	After casting of foundation and construction up to plinth level.	30%
3.	After casting up to half height of structure.	50%
4.	After casting up to full height of structure.	80%
5.	After completion of rest, works of structure and finishing and testing of the structure.	100%

V. Mechanical and Electrical works with Automation

- (a) 80% of the cost of items plus taxes on delivery at site.
- (b) 10% of the cost of items, on execution.
- (c) 10% of the remaining amount on testing, trial run and commissioning.

VI. Boundary wall approach road, fencing etc. shall be included in the cost of civil works.

Annexure - H₄

CONSTRUCTION OF MASTER BALANCING RESERVIOR

Pro-rata Share for Over Head Tanks (H₄): 0.30% of Lump sum offer

S. No.	Particulars	<u>Cumulative percentage</u>
1.	Preliminary work, rooting out fallen trees and excavation, casting of leveling course/PCC of footing or raft	10% of H ₄
2.	After casting of foundation, columns up to and including ground bracing beams	20% of H ₄
3.	After casting of up to bottom ring beam.	30% of H ₄
4.	After casting of bottom slab or dome including walkway slab or balcony	40% of H ₄
5.	After casting of full vertical wall and top slab or dome	60% of H ₄
6	After providing, fixing pipes and specials for inlet, over flow scour, outlet, bell mouths, grating, puddle collars, duck foot bends, sluice valves, Electromagnetic flow meter and their required chambers etc. complete.	70% of H ₄
7	Providing arrangement for manhole covers, air vents & central ventilation, including railing for staircase and roof top.	80% of H ₄
8.	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.	90% of H ₄
9.	After commissioning of MBR's.	100% of H ₄

NOTE- There are 5 MBR's to be constructed, the value of pro rata share H₄ is for all MBR's . For individual MBR weighted share can be worked out.

Annexure - H₅
Break up of schedule of payment for the DI Pumping Mains
Clear Water Pumping Main
Pro-rata Share (H₅): 18.20% of Lump sum offer

S. No	On completion of item of work	Percentage payable	Cumulative percentage payable
1	i. On testing and supply at site of 20% in-lined and out-coated K-7 D.I. pipes of specified diameters and lengths	13 % of H ₅	13% of H ₅
	ii. On transportation of pipes, excavation of trenches and construction of supporting structures, laying, jointing and testing at site of 20% of specified diameters and lengths.	2 % of H ₅	15% of H ₅
	iii. After proper refilling of trench including restoration of road i.e. making surface good as same before construction.	3 % of H ₅	18% of H ₅
2	i. On testing and supply at site of 40% in-lined and out-coated K-7 D.I. pipes of specified diameters and lengths	13 % of H ₅	31% of H ₅
	ii. On transportation of pipes, excavation of trenches and construction of supporting structures, laying, jointing and testing at site of 40% of specified diameters and lengths.	2 % of H ₅	33% of H ₅
	iii. After proper refilling of trench including restoration of road i.e. making surface good as same before construction.	3 % of H ₅	36% of H ₅

3	i. On testing and supply at site of 60% in-lined and out-coated K-7 D.I. pipes of specified diameters and lengths	13 % of H ₅	49% of H ₅
	ii. On transportation of pipes, excavation of trenches and construction of supporting structures, laying, jointing and testing at site of 60% of specified diameters and lengths.	2 % of H ₅	51% of H ₅
	iii. After proper refilling of trench including restoration of road i.e. making surface good as same before construction.	3 % of H ₅	54% of H ₅
4	i. On testing and supply at site of 80% in-lined and out-coated K-7 D.I. pipes of specified diameters and lengths	13% of H ₅	67% of H ₅
	ii. On transportation of pipes, excavation of trenches and construction of supporting structures, laying, jointing and testing at site of 80% of specified diameters and lengths.	2 % of H ₅	69% of H ₅
	iii. After proper refilling of trench including restoration of road i.e. making surface good as same before construction.	3 % of H ₅	72% of H ₅
5	i. On testing and supply at site of 100% in-lined and out-coated K-7 D.I. pipes of specified diameters and lengths	13 % of H ₅	85% of H ₅

	ii. On transportation of pipes, excavation of trenches and construction of supporting structures, laying, jointing and testing at site of 100% of specified diameters and lengths.	2% of H₅	87% of H₅
	iii. After proper refilling of trench including restoration of road i.e. making surface good as same before construction.	3 % of H₅	90 % of H₅
6	On disinfecting and commissioning the complete pipe lines	10 % of H₅	100% of H₅

- NOTE-** 1. There are different sizes and lengths of K-7/K-9 D.I. pipes, the total value of pro rata share **H₅** is for all these pipelines. For supplied and laid pipelines weighted share can be worked out.
2. Percentage of payment is taken for valuation and not to be essentially followed in sequence.

Annexure - H₆

Clear Water GRAVITY MAINS

Pro-rata Share (H₆): 33.39% of Lump sum offer

S. No	On completion of item of work	Percentage payable	Cumulative percentage payable
1	i. On testing and supply at site of 20% in-lined and out-coated K-7 D.I. pipes of specified diameters and lengths	13 % of H ₆	13% of H ₆
	ii. On transportation of pipes, excavation of trenches and construction of supporting structures, laying, jointing and testing at site of 20% of specified diameters and lengths.	2 % of H ₆	15% of H ₆
	iii. After proper refilling of trench including restoration of road i.e. making surface good as same before construction.	3 % of H ₆	18% of H ₆
2	i. On testing and supply at site of 40% in-lined and out-coated K-7 D.I. pipes of specified diameters and lengths	13 % of H ₆	31% of H ₆
	ii. On transportation of pipes, excavation of trenches and construction of supporting structures, laying, jointing and testing at site of 40% of specified diameters and lengths.	2 % of H ₆	33% of H ₆
	iii. After proper refilling of trench including restoration of road i.e. making surface good as same before construction.	3 % of H ₆	36% of H ₆

3	i. On testing and supply at site of 60% in-lined and out-coated K-7 D.I. pipes of specified diameters and lengths	13 % of H₆	49% of H₆
	ii. On transportation of pipes, excavation of trenches and construction of supporting structures, laying, jointing and testing at site of 60% of specified diameters and lengths.	2 % of H₆	51% of H₆
	iii. After proper refilling of trench including restoration of road i.e. making surface good as same before construction.	3 % of H₆	54% of H₆
4	i. On testing and supply at site of 80% in-lined and out-coated K-7 D.I. pipes of specified diameters and lengths	13% of H₆	67% of H₆
	ii. On transportation of pipes, excavation of trenches and construction of supporting structures, laying, jointing and testing at site of 80% of specified diameters and lengths.	2 % of H₆	69% of H₆
	iii. After proper refilling of trench including restoration of road i.e. making surface good as same before construction.	3 % of H₆	72% of H₆
5	i. On testing and supply at site of 100% in-lined and out-coated K-7 D.I. pipes of specified diameters and lengths	13 % of H₆	85% of H₆

	ii. On transportation of pipes, excavation of trenches and construction of supporting structures, laying, jointing and testing at site of 100% of specified diameters and lengths.	2% of H₆	87% of H₆
	iii. After proper refilling of trench including restoration of road i.e. making surface good as same before construction.	3 % of H₆	90 % of H₆
6	On disinfecting and commissioning the complete pipe lines	10 % of H₆	100% of H₆

- NOTE-** 1. There are different sizes and lengths of K-7 D.I. pipes, the total value of pro rata share **H₆** is for all these pipelines. For supplied and laid pipelines weighted share can be worked out.
2. Percentage of payment is taken for valuation and not to be essentially followed in sequence.

Annexure - H₇

CONSTRUCTION OF OVERHEAD TANKS/ESR/OHSR

Pro-rata Share for Over Head Tanks (H₇): 6.91% of Lump sum offer

S. No.	Particulars	Cumulative percentage
1.	Preliminary work, rooting out fallen trees and excavation, casting of leveling course/PCC of footing or raft	10% of H ₇
2.	After casting of foundation, columns up to and including ground bracing beams	20% of H ₇
3.	After casting of full staging and columns up to bottom ring beam and staircase.	30% of H ₇
4.	After casting of bottom slab or dome including walkway slab or balcony	40% of H ₇
5.	After casting of full vertical wall and top slab or dome	60% of H ₇
6.	After providing, fixing pipes and specials for inlet, over flow scour, outlet, bell mouths, grating, puddle collars, duck foot bends, sluice valves, Electromagnetic flow meter and their required chambers etc. complete.	70% of H ₇
7.	Providing arrangement for manhole covers, air vents & central ventilation, including railing for staircase and roof top	80% of H ₇
8.	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.	90% of H ₇
9.	After commissioning the overhead tank	100% of H ₇

NOTE- There are 55 overhead tanks to be constructed, the value of pro rata share H₇ is for all these tanks. For individual overhead tank weighted share can be worked out.

Annexure - H₈

RAW WATER PUMPS

(Pro-rata share of pumping equipment H₈ = 0.38%)

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's	60 % of H₈	60% of H₈
	ii. On installation of pumping equipment's	10 % of H₈	70% of H₈
2	i. On supply of valves, manifold, control panel, cables, gantry, flow meters and all other allied equipment's	15% of H₈	85% of H₈
	ii. On installation of all above equipment's.	5 % of H₈	90% of H₈
3	On testing and commissioning the pumping equipment's	10 % of H₈	100% of H₈

Annexure - H₉

CLEAR WATER PUMPS

(Pro-rata share of pumping equipment H₉ = 0.44%)

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's	60 % of H ₉	60% of H ₉
	ii. On installation of pumping equipment's.	10 % of H ₉	70% of H ₉
2	i. On supply of valves, manifold, control panel, cables, gantry, flow meters and all other allied equipment's.	15% of H ₉	85% of H ₉
	ii. On installation of all above equipment's.	5 % of H ₉	90% of H ₉
3	On testing and commissioning the pumping equipment's.	10 % of H ₉	100% of H ₉

Annexure - H₁₀

33 KV/11 KV POWER LINE AND SUB STATION

Pro-rata Share (H₁₀): 0.57% of Lump sum offer

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's	60 % of H₁₀	60% of H₁₀
	ii. On installation of all above	20 % of H₁₀	80% of H₁₀
2	On getting approval as per I.E. rules from Electrical Inspector	10% of H₁₀	90% of H₁₀
3	On testing and commissioning the electric sub station	10 % of H₁₀	100% of H₁₀

Annexure - H₁₁

DISTRIBUTION NETWORK

Pro-rata Share (H₁₁): 31.20% of Lump sum offer

S. No	On completion of item of work	Percentage payable	Cumulative percentage payable
1	i. On testing and supply at site of 20% HDPE/DI pipes of specified diameters and lengths	12 % of H11	12% of H11
	ii. On transportation of pipes, excavation of trenches and construction of supporting structures, laying, jointing and testing at site of 20% of specified diameters and lengths.	2 % of H11	14% of H11
	iii. After proper refilling of trench including restoration of road i.e. making surface good as same before construction.	4 % of H11	18% of H11
2	i. On testing and supply at site of 40% HDPE/DI pipes of specified diameters and lengths	12 % of H11	30% of H11
	ii. On transportation of pipes, excavation of trenches and construction of supporting structures, laying, jointing and testing at site of 40% of specified diameters and lengths.	2 % of H11	32% of H11
	iii. After proper refilling of trench including restoration of road i.e. making surface good as same before construction.	4 % of H11	36% of H11
3	i. On testing and supply at site of 60% HDPE/DI pipes of specified diameters and lengths	12 % of H11	48% of H11

	ii. On transportation of pipes, excavation of trenches and construction of supporting structures, laying, jointing and testing at site of 60% of specified diameters and lengths.	2 % of H11	50% of H11
	iii. After proper refilling of trench including restoration of road i.e. making surface good as same before construction.	4 % of H11	54% of H11
4	i. On testing and supply at site of 80% HDPE/DI pipes of specified diameters and lengths	12 % of H11	66% of H11
	ii. On transportation of pipes, excavation of trenches and construction of supporting structures, laying, jointing and testing at site of 80% of specified diameters and lengths.	2 % of H11	68% of H11
	iii. After proper refilling of trench including restoration of road i.e. making surface good as same before construction.	4 % of H11	72% of H11
5	i. On testing and supply at site of 100% HDPE/DI pipes of specified diameters and lengths	12 % of H11	84% of H11
	ii. On transportation of pipes, excavation of trenches and construction of supporting structures, laying, jointing and testing at site of 100% of specified diameters and lengths.	2 % of H11	86% of H11
	iii. After proper refilling of trench including restoration of road i.e. making surface good as same before construction.	4 % of H11	90% of H11

7	On disinfecting and commissioning the complete pipe lines	10 % of H11	100% of H11
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- NOTE-**
1. There are different sizes and lengths of pipes, the total value of pro rata share **H₁₁** is for all these pipelines. For supplied and laid pipelines weighted share can be worked out.
 2. Percentage of payment is taken for valuation and not to be essentially followed in sequence.
 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 as above.

Annexure – H₁₂

**CONSTRUCTION OF COMPLAINT CENTER WITH BOUNDARY
WALL AT OHT LOCATIONS**

Pro-rata Share (H₁₂): 1.21 % of Lump sum offer

S. No	On completion of item of work	Percentage payable	Cumulative percentage payable
1	After excavation of foundation and casting of bed concrete	5% of H ₁₂	5% of H ₁₂
2	After completing foundation and construction of sub structure up-to plinth level	10% of H ₁₂	15% of H ₁₂
3	After construction of R.C.C. structure up to roof level	25% of H ₁₂	40% of H ₁₂
4	After completion of brick work, fixing of doors-windows, ventilators etc.	20% of H ₁₂	60% of H ₁₂
5	After plastering and completion of flooring	5% of H ₁₂	65% of H ₁₂
6	After completion plumbing pipelines, electrical work and internal and external finishing and painting	10% of H ₁₂	75% of H ₁₂
7	After fixing of water taps, wash basins, fixtures, fans, lighting work and completion of sanitary work	5% of H ₁₂	80% of H ₁₂
8	After completion of Approach Roads, boundary walls, site development, Internal/External Electrification complete in all respect.	15% of H ₁₂	95% of H ₁₂
9	After clearing of site and completion of quarters in all respects	5% of H ₁₂	100% of H ₁₂

Annexure – H₁₃

Break up of schedule of payment for the

HOUSE SERVICE CONNECTION

Pro-rata Share (H₁₃): 2.33% of Lump sum offer

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.	70% of H ₁₃	70% of H ₁₃
2	Restoration of road, construction of platform with testing and commissioning of service connection.	30% of H ₁₃	100% of H ₁₃

1. 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 as given above.

Mohanpura Multi Village Rural Water Supply Scheme, District Rajgarh**LIST OF VILLAGES AND ITS WATER DEMAND**

S. No.	Name of Villages	Block	Adopted Population (2037)	Water Demand @ 95 LPCD
1	Lalpura Jhala	Rajgarh	1070	101650
2	Padampura	Rajgarh	1780	169100
3	Ataikheda	Rajgarh	1380	131100
4	Badalkhedi	Rajgarh	1170	111150
5	Dupadia	Rajgarh	1060	100700
6	Sankhedi	Rajgarh	1860	176700
7	Dehari Baman	Rajgarh	3140	298300
8	Chhatri Rajgarh	Rajgarh	350	33250
9	Odpur	Rajgarh	2570	244150
10	Selapani	Rajgarh	1480	140600
11	Bhopalpura	Rajgarh	440	41800
12	Surajkhedi	Rajgarh	610	57950
13	Naiheda	Rajgarh	1760	167200
14	Jhoomka	Rajgarh	950	90250
15	Sameli	Rajgarh	1660	157700
16	Tandi	Rajgarh	530	50350
17	Karanwas	Rajgarh	3530	335350
18	Laxmanpura (4)	Rajgarh	160	15200
19	Gindor Bhatt	Rajgarh	290	27550
20	Kadiyakhichi	Rajgarh	590	56050
21	Bhadwakheda	Rajgarh	460	43700
22	Jaitpura	Rajgarh	310	29450
23	Sawan Kheda	Rajgarh	120	11400

24	Manjrikho	Rajgarh	440	41800
25	Manda Kheda	Rajgarh	1840	174800
26	Ladanpur	Rajgarh	870	82650
27	Surajpura	Rajgarh	360	34200
28	Nawalpura	Rajgarh	100	9500
29	Abhaypur	Rajgarh	790	75050
30	Chauki	Rajgarh	560	53200
31	Shikarpura	Rajgarh	510	48450
32	Banpura	Rajgarh	870	82650
33	Kalalpura	Rajgarh	450	42750
34	Chainpuriya (1)	Rajgarh	370	35150
35	Balwantpura	Rajgarh	430	40850
36	Bamlabey	Rajgarh	1810	171950
37	Mundla	Rajgarh	1110	105450
38	Hirankhedi	Rajgarh	1590	151050
39	Pipalbey Purohit	Rajgarh	930	88350
40	Lalgarh	Rajgarh	270	25650
41	Khajla	Rajgarh	930	88350
42	Bhamlya Pura	Rajgarh	450	42750
43	Bhojpuriya	Rajgarh	190	18050
44	Latadia	Rajgarh	550	52250
45	Amritpura	Rajgarh	320	30400
46	Baddala	Rajgarh	450	42750
47	Rawatpura (2)	Rajgarh	320	30400
48	Rampuriya (6)	Rajgarh	160	15200
49	Rajli Bey	Rajgarh	950	90250
50	Kalitalai	Rajgarh	2130	202350
51	Kishanpuria (3)	Rajgarh	440	41800

52	Ghoghadi Khurd	Rajgarh	890	84550
53	Ghogadia Kalan	Rajgarh	570	54150
54	Heerankheda	Rajgarh	990	94050
55	Kachri	Rajgarh	2940	279300
56	Bapchi	Rajgarh	480	45600
57	Naipuriya	Rajgarh	790	75050
58	Jogidata	Rajgarh	100	9500
59	Kasturipura	Rajgarh	190	18050
60	Kishanpuriya (4)	Rajgarh	110	10450
61	Jalalpura	Rajgarh	1100	104500
62	Kesharpura	Rajgarh	350	33250
63	Suwahedi	Rajgarh	890	84550
64	Chandarpura	Rajgarh	80	7600
65	Sawasda	Rajgarh	1830	173850
66	Pansara	Rajgarh	820	77900
67	Guradiya (2)	Rajgarh	570	54150
68	Bajtalai	Rajgarh	530	50350
69	Kalipeeth	Rajgarh	2800	266000
70	Devli Kalan	Rajgarh	950	90250
71	Goliyabey	Rajgarh	600	57000
72	Sinduriya	Rajgarh	2030	192850
73	Amba	Rajgarh	1090	103550
74	Khedi	Rajgarh	770	73150
75	Bajpura	Rajgarh	320	30400
76	Bhawanipura (2)	Rajgarh	780	74100
77	Mahua Bey	Rajgarh	720	68400
78	Kharparas	Rajgarh	530	50350
79	Kundibey	Rajgarh	610	57950

80	Jodkiya	Rajgarh	900	85500
81	Paraspura	Rajgarh	70	6650
82	Narayanghata	Rajgarh	1030	97850
83	Ajeetgarh	Rajgarh	130	12350
84	Madapura	Rajgarh	940	89300
85	Pipliya (3)	Rajgarh	1050	99750
86	Rampuria (1)	Rajgarh	500	47500
87	Mohanpura	Rajgarh	1070	101650
88	Bakhatawarpura (2)	Rajgarh	1190	113050
89	Magriabeh	Rajgarh	360	34200
90	Kharna	Rajgarh	1040	98800
91	Sultanpura	Rajgarh	1240	117800
92	Khandiya Pura	Rajgarh	570	54150
93	Leelbey	Rajgarh	160	15200
94	Kolu Khedi	Rajgarh	1010	95950
95	Mahabal	Rajgarh	1150	109250
96	Keelkheda	Rajgarh	3090	293550
97	Sandahedi	Rajgarh	1130	107350
98	Lasuldi Lodha	Rajgarh	1280	121600
99	Bananiya	Rajgarh	1580	150100
100	Laliyatalai	Rajgarh	700	66500
101	Padiya (1) (Rajgarh)	Rajgarh	1890	179550
102	Dalelpura (2)	Rajgarh	1430	135850
103	Dehra	Rajgarh	930	88350
104	Machalpur	Rajgarh	1480	140600
105	Balbadhurpura	Rajgarh	810	76950
106	Chhagoda	Rajgarh	470	44650
107	Pirthipura	Rajgarh	130	12350

108	Munjkheda	Rajgarh	230	21850
109	Bhawarpura	Rajgarh	150	14250
110	Munjkhedi	Rajgarh	430	40850
111	Karanpura	Rajgarh	220	20900
112	Pipliyakalan	Rajgarh	660	62700
113	Kawarpura	Rajgarh	240	22800
114	Zirapur	Rajgarh	410	38950
115	Bhainpura	Rajgarh	410	38950
116	Bhainpuri	Rajgarh	410	38950
117	Shobhapura (1)	Rajgarh	330	31350
118	Amargarh	Rajgarh	1370	130150
119	Killa	Rajgarh	260	24700
120	Baskho	Rajgarh	60	5700
121	Bhawanipura (1)	Rajgarh	570	54150
122	Piplodi	Rajgarh	660	62700
123	Bankiyapura	Rajgarh	500	47500
124	Awanpura	Rajgarh	570	54150
125	Madhaniya	Rajgarh	270	25650
126	Dehrinath	Rajgarh	1240	117800
127	Alwapura	Rajgarh	140	13300
128	Tulsipura	Rajgarh	340	32300
129	Ganeshpura (2)	Rajgarh	610	57950
130	Udapuriya (1)	Rajgarh	250	23750
131	Rasbhari	Rajgarh	150	14250
132	Bakana	Rajgarh	440	41800
133	Gangapath	Rajgarh	840	79800
134	Bahadurpura	Rajgarh	490	46550
135	Chhuwadaya	Rajgarh	890	84550

136	Kansi	Rajgarh	920	87400
137	Junapani Ka Kheda	Rajgarh	390	37050
138	Junapani	Rajgarh	1360	129200
139	Laxmanpura (5)	Rajgarh	470	44650
140	Dheergarh	Rajgarh	490	46550
141	Patna	Rajgarh	780	74100
142	Rampuriya (4)	Rajgarh	380	36100
143	Dehari	Rajgarh	640	60800
144	Mawadipura	Rajgarh	120	11400
145	Guradiya (3)	Rajgarh	560	53200
146	Fetapura (2)	Rajgarh	460	43700
147	Ratanpuria	Rajgarh	140	13300
148	Prempura	Rajgarh	1080	102600
149	Patdi Khurd	Rajgarh	270	25650
150	Kanbey	Rajgarh	170	16150
151	Bankpura	Rajgarh	1740	165300
152	Rakliya	Rajgarh	850	80750
153	Maniyapura (2)	Rajgarh	570	54150
154	Kishanpuriya (2)	Rajgarh	470	44650
155	Phoota Talab	Rajgarh	860	81700
156	Laharchi	Rajgarh	790	75050
157	Nogaon	Rajgarh	420	39900
158	Kanakapura	Rajgarh	320	30400
159	Padliya	Rajgarh	610	57950
160	Pura Padliya	Rajgarh	390	37050
161	Raghunathpura (2)	Rajgarh	410	38950
162	Devli Jagir	Rajgarh	600	57000
163	Dhanwas Khurd	Rajgarh	610	57950

164	Bakhtawarpura (1)	Rajgarh	520	49400
165	Dhanwas Kalan	Rajgarh	1760	167200
166	Uchakheda	Rajgarh	650	61750
167	Kalikheda	Rajgarh	690	65550
168	Rampuriya (5)	Rajgarh	710	67450
169	Dhand	Rajgarh	360	34200
170	Titodi	Rajgarh	570	54150
171	Daftari Ki Bawdi	Rajgarh	680	64600
172	Titodi Ka Anda	Rajgarh	40	3800
173	Ganeshpura Khurd	Rajgarh	350	33250
174	Hinotiya	Rajgarh	1000	95000
175	Hinoti	Rajgarh	1100	104500
176	Koyala	Rajgarh	630	59850
177	Mangniya Khedi	Rajgarh	510	48450
178	Pura Bharmal	Rajgarh	690	65550
179	Semlabey	Rajgarh	1110	105450
180	Dhedia	Rajgarh	400	38000
181	Tindoniya	Rajgarh	370	35150
182	Lawabey	Rajgarh	680	64600
183	Gadiya	Rajgarh	600	57000
184	Datagram	Rajgarh	210	19950
185	Hamir Pura	Rajgarh	400	38000
186	Motipura	Rajgarh	830	78850
187	Jamsheerpura	Rajgarh	900	85500
188	Laxmanpura (1)	Rajgarh	190	18050
189	Baldiya	Rajgarh	750	71250
190	Rawatpura (1)	Rajgarh	400	38000
191	Jhanjhadpur	Rajgarh	1790	170050

192	Paraspura	Rajgarh	460	43700
193	Padiya (2)	Rajgarh	460	43700
194	Karadiya	Rajgarh	510	48450
195	Tandi Khurd	Rajgarh	1040	98800
196	Tandikalan	Rajgarh	1750	166250
197	Semli	Rajgarh	770	73150
198	Rupakheda	Rajgarh	420	39900
199	Dholbey	Rajgarh	560	53200
200	Leherchi	Rajgarh	980	93100
201	Nipaniya	Rajgarh	570	54150
202	Patdi Kalan	Rajgarh	1300	123500
203	Bheya Pura	Rajgarh	1530	145350
204	Kelghata	Rajgarh	120	11400
205	Talawda	Rajgarh	760	72200
206	Jagniyapura (Rajgarh)	Rajgarh	350	33250
207	Jwalapura	Rajgarh	470	44650
208	Kotra	Rajgarh	50	4750
209	Sundarpura	Rajgarh	130	12350
210	Devjhiri	Rajgarh	260	24700
211	Kamalpur	Rajgarh	260	24700
212	Raghunathpura (1)	Rajgarh	670	63650
213	Jetpura	Rajgarh	330	31350
214	Motipura Khati	Rajgarh	810	76950
215	Heerapura	Rajgarh	570	54150
216	Bhatpura	Rajgarh	260	24700
217	Padli Khati	Rajgarh	690	65550
218	Tootipura	Rajgarh	150	14250
219	Gabakpura	Rajgarh	240	22800

220	Baga	Rajgarh	680	64600
221	Phattukhedi	Rajgarh	340	32300
222	Guradiya (1)	Rajgarh	30	2850
223	Gopalpura (1)	Rajgarh	1110	105450
224	Chamari	Rajgarh	720	68400
225	Dilwari	Rajgarh	460	43700
226	Golakheda	Rajgarh	810	76950
227	Vijaygarh	Rajgarh	410	38950
228	Dilawara	Rajgarh	900	85500
229	Maniyapura (1)	Rajgarh	810	76950
230	Dhobipura	Rajgarh	110	10450
231	Dehri Thakur	Rajgarh	710	67450
232	Barniyakhedi	Rajgarh	440	41800
233	Chandpura	Rajgarh	440	41800
234	Chhayan	Rajgarh	1000	95000
235	Laxmipura	Rajgarh	620	58900
236	Doulatpura	Rajgarh	200	19000
237	Guradkheda	Rajgarh	490	46550
238	Puragurad Kheda	Rajgarh	220	20900
239	Pipalbey	Biaora	1520	144400
240	Narsinghpura	Biaora	360	34200
241	Biniyakhedi	Biaora	510	48450
242	Shivpura	Biaora	120	11400
243	Chandarpura	Biaora	470	44650
244	Gujarkhedi	Biaora	210	19950
245	Badlawada	Biaora	340	32300
246	Jamoniya Ghata	Biaora	410	38950
247	Nayapura	Biaora	500	47500

248	Ummedpura	Biaora	320	30400
249	Khakra Sabla	Biaora	1110	105450
250	Moya	Biaora	1520	144400
251	Chamari	Biaora	1200	114000
252	Chatha	Biaora	2010	190950
253	Banjari	Biaora	810	76950
254	Dhamanda	Khilchipur	350	33250
255	Gordhanpura	Khilchipur	180	17100
256	Kalyanpura	Khilchipur	400	38000
257	Gadhiya Charn	Khilchipur	1030	97850
258	Borda Khurd	Khilchipur	310	29450
259	Karkara	Khilchipur	710	67450
260	Pithapura	Khilchipur	920	87400
261	Bawdi Beh	Khilchipur	430	40850
262	Semla Beh	Khilchipur	200	19000
263	Prempura	Khilchipur	1090	103550
264	Patdi Kheda	Khilchipur	510	48450
265	Rughnathpura (Manda Kheda)	Khilchipur	360	34200
266	Khokariya	Khilchipur	370	35150
267	Chhawani	Khilchipur	680	64600
268	Chandpura	Khilchipur	610	57950
269	Baghela	Khilchipur	1330	126350
270	Gopalpura	Khilchipur	360	34200
271	Limboda	Khilchipur	540	51300
272	Salari	Khilchipur	560	53200
273	Rajpura (1)	Khilchipur	500	47500
274	Ruppura	Khilchipur	580	55100

275	Bagheli	Khilchipur	310	29450
276	Nesh	Khilchipur	290	27550
277	Odpur	Khilchipur	160	15200
278	Rampuriya (Ruppura)	Khilchipur	430	40850
279	Manda Kheda	Khilchipur	690	65550
280	Dalupura	Khilchipur	1510	143450
281	Jagannathpura	Khilchipur	400	38000
282	Borda Najdik	Khilchipur	500	47500
283	Pura Jagannathpura	Khilchipur	450	42750
284	Mayapura	Khilchipur	370	35150
285	Negdiya	Khilchipur	230	21850
286	Kishan Puriya	Khilchipur	320	30400
287	Girdharpura	Khilchipur	380	36100
288	Parspura	Khilchipur	410	38950
289	Sadiya Kuwan	Khilchipur	1770	168150
290	Sedra (Dalupura)	Khilchipur	650	61750
291	Borkapani	Khilchipur	780	74100
292	Pipliya Pust	Khilchipur	200	19000
293	Talawada	Khilchipur	1030	97850
294	Puratalawda	Khilchipur	280	26600
295	Motipura (5)	Khilchipur	460	43700
296	Khandarbeh	Khilchipur	360	34200
297	Dobdikheda	Khilchipur	200	19000
298	Tilapura	Khilchipur	210	19950
299	Kherkhedi	Khilchipur	810	76950
300	Singanpur	Khilchipur	670	63650
301	Devakhedi (2)	Khilchipur	280	26600
302	Hirapuri	Khilchipur	320	30400

303	Semalkhedi	Khilchipur	410	38950
304	Lalpuriya	Khilchipur	410	38950
305	Jhandapatti	Khilchipur	420	39900
306	Khetiyakhedi	Khilchipur	170	16150
307	Chhipipura	Khilchipur	900	85500
308	Gadhiyaluhar	Khilchipur	1110	105450
309	Pura Chhipipura	Khilchipur	670	63650
310	Haripura Nazdik	Khilchipur	940	89300
311	Pura Kherkheda	Khilchipur	280	26600
312	Kherkheda	Khilchipur	490	46550
313	Manpura	Khilchipur	600	57000
314	Madanpura	Khilchipur	910	86450
315	Satan Khedi	Khilchipur	1150	109250
316	Surajpura	Khilchipur	240	22800
317	Bislai	Khilchipur	250	23750
318	Mannalpura	Khilchipur	280	26600
319	Badri	Khilchipur	500	47500
320	Bherugarh	Khilchipur	340	32300
321	Bijepur	Khilchipur	20	1900
322	Dob	Khilchipur	920	87400
323	Patdi	Khilchipur	380	36100
324	Koyala	Khilchipur	680	64600
325	Parspura (2)	Khilchipur	1690	160550
326	Timarni	Khilchipur	360	34200
327	Shivpuri	Khilchipur	20	1900
328	Barkheda	Khilchipur	820	77900
329	Rughnathpura	Khilchipur	620	58900
330	Kundi Kheda	Khilchipur	540	51300

331	Gopal Pura	Khilchipur	2420	229900
332	Khajla	Khilchipur	730	69350
333	Khajli	Khilchipur	1130	107350
334	Patlapani	Khilchipur	420	39900
335	Talawadi	Khilchipur	370	35150
336	Pura Kajla	Khilchipur	800	76000
337	Gundipura	Khilchipur	410	38950
338	Rampuriya (2)	Khilchipur	260	24700
339	Udiya Pura	Khilchipur	480	45600
340	Khemapura	Khilchipur	300	28500
341	Mohkapura	Khilchipur	400	38000
342	Durgpura	Khilchipur	1520	144400
343	Naiheda	Khilchipur	580	55100
344	Purasevani	Khilchipur	420	39900
345	Sevni	Khilchipur	310	29450
346	Pura Durgpura	Khilchipur	360	34200
347	Pura Sedra	Khilchipur	500	47500
348	Sedra	Khilchipur	1300	123500
349	Badiya	Khilchipur	160	15200
350	Bhawanipura	Khilchipur	880	83600
351	Hatepur	Khilchipur	70	6650
352	Piplya Khawas	Khilchipur	640	60800
353	Anchalpura	Khilchipur	520	49400
354	Antraliya	Khilchipur	390	37050
355	Doriya Khedi	Khilchipur	1170	111150
356	Kandi Kheda	Khilchipur	2870	272650
357	Richhariya	Khilchipur	710	67450
358	Binayakbey	Khilchipur	930	88350

359	Borda Shriji	Khilchipur	950	90250
360	Dhand	Khilchipur	1130	107350
361	Haripura Pust Dhand	Khilchipur	180	17100
362	Karan Pura	Khilchipur	80	7600
363	Bedar	Khilchipur	610	57950
364	Rampuriya	Khilchipur	1420	134900
365	Haripura	Khilchipur	1440	136800
366	Shampura	Khilchipur	160	15200
367	Bamniya Khedi	Khilchipur	520	49400
368	Chhatpura	Khilchipur	430	40850
369	Nayapura	Khilchipur	450	42750
370	Papdel	Khilchipur	1600	152000
371	Chhatarpura (2)	Khilchipur	70	6650
372	Mahuwa Kheda	Khilchipur	60	5700
373	Bhomariya	Khilchipur	2160	205200
374	Amarpura	Khilchipur	460	43700
375	Dabli Khurd (Bhawanipura)	Khilchipur	480	45600
376	Narayanganj	Khilchipur	220	20900
377	Gordhan	Khilchipur	1040	98800
378	Gordhan Pura	Khilchipur	710	67450
379	Laxmanpura (3)	Khilchipur	80	7600
380	Kherkhadi	Khilchipur	370	35150
381	Gokulpuriya	Khilchipur	440	41800
382	Dehara	Khilchipur	1030	97850
383	Khutiya Bay	Khilchipur	590	56050
384	Kotra	Khilchipur	960	91200
385	Raghopur	Khilchipur	350	33250

386	Parspura (1)	Khilchipur	100	9500
387	Pura Kulipura	Khilchipur	80	7600
388	Jharniya	Khilchipur	210	19950
389	Barol	Khilchipur	850	80750
390	Purbarol	Khilchipur	610	57950
391	Suwahedi	Khilchipur	950	90250
392	Lakhoni	Khilchipur	590	56050
393	Ghatakhedi	Khilchipur	380	36100
394	Bhawanipura Bedibey	Khilchipur	80	7600
395	Kulipura	Khilchipur	520	49400
396	Kushalpura	Khilchipur	1080	102600
397	Behdi Beh	Khilchipur	430	40850
398	Bhawanipura Kulipura	Khilchipur	350	33250
399	Rampuriya (Haripura Nazdik)	Khilchipur	490	46550
400	Pura Kherkhedi	Khilchipur	440	41800
Total			275310	26154450