

**NORTHEAST MEGA FOOD PARK PVT LTD
AT
GUWAHATI, ASSAM**

**TENDER DOCUMENT FOR
WASTE WATER TREATMENT PLANT
FOR THE PROPOSED MEGA FOOD PARK
AT NALBARI, TIHU, GUWAHATI, ASSAM**

CONTRACT NO. : TPK/15010

FOR NORTH EAST MEGA FOOD PARK LTD.

DH/RANS/ :

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NOTICE INVITING TENDER FOR WASTE WATER TREATMENT PLANT

The NEMFPL is being planned under the Mega Food Park Scheme of Ministry of Food Processing Industries (MFPI), Government of India and setting up a park at North East, Guwahati, Assam Sealed tenders are invited under two bid system from approved and eligible contractors/ manufacturers/ suppliers of repute, well established in line and experienced in the execution of similar works of comparable magnitude, who fulfill the terms and condition of the tender for the following work at our unit.

Name of the work	Cost of Tender Form (Rs)	Time Allowed For completion
Design/detailed engineering, supply, delivery, unloading storage, installation testing and commissioning of Waste Water Treatment Plant complete in all respects, for proposed Mega food park at Assam	Rs 5,000/-	22 - 24 weeks as per tender with completion in all respects from the date of LOI

1. The Techno-commercial bid should be submitted in a sealed envelope superscribed on top as "Bid for Supply of Waste Water Treatment Plant".
2. At first, the tenders will be evaluated on Technical Parameters prescribed in the Tender Documents. The financial bids will refer of prescribed in the Tender Documents. The financial bids will refer of only parties who qualifying technically.
3. The estimated cost of the project (Complete in all respect) shall be Rs. 230 Lacs.
4. The parties who qualify the following pre-bid qualifications can purchase tender documents.
 - a. The turnover of the Company should not be less than Rs.3.0 Crores per annum for last 3 years.
 - b. The company should have experience of execution similar works; design/ detailed engineering, supply, delivery, unloading storage, installation testing and commissioning of wastewater treatment plant complete in all respects capacity - 1000 m³/day and above, at least 3 nos. in last 3 years.
 - c. The company should have at least one Site Engineer (Electrical, Mechanical or Environmental) to make available at site.

1. PREFACE

- 1.1 **M/s. NORTH EAST MEGA FOOD PARK LTD.** hereinafter referred to as "Employer", "Client" or "Owner" has decided to install Waste Water Treatment Plant for the Proposed Mega Food project at Tihu, Dist. Nalbari, Assam.
- 1.2 **M/s Technopak Advisors (P) Ltd**, DLF Cyber City, Building no.8, Gurgaon, NCR Delhi hereinafter referred as "Consultant" for the project who has been appointed as Project Management Consultant.

- 1.3** The scope of work covered under this turnkey tender document includes:
Supply, delivery, unloading, storage, installation, testing, commissioning and handing over of (detailed scope mentioned in Scope of Supply:-
- Design/ Detailed engineering, supply, delivery, unloading, storage, of the Waste Water Treatment Plant
 - Electrical Works in the Waste Water Treatment Plant such as paneling, Cabling, Lighting, Earthing etc.
 - Preparation of detailed working drawings and final As-Built drawings.
 - Approval from Statutory Authorities related to above, complete in all respects
- 1.4** The one who is awarded the contract will be the “Contractor”.
- 1.5** Brief Project Profile
- Location of the Project is at Tihu, Dist. Nalbari, Assam.
- Infrastructure
- Electricity & Water for completion of works will not be provided to the Contractor and contractor has to arrange the same without compromising the quality of the utility services like Electricity & Water.
- 1.6** The Contractor has to carry out his work according to General Conditions of Contract, Special Condition of Contract, Technical Specifications, Bill of Quantities and working drawings, as applicable issued by the client.
- 1.7** The privilege of authorship and ownership of drawings and designs of the structures remain with The Client. The drawings and designs prepared by The Client shall be used only for the purpose specified in this contract and all the drawings issued shall be returned to The Client on completion of work.
- 1.8** The Engineer authorized by Client to represent at Site-of-work is authorized to ask the Contractor to discontinue any work which does not meet the expected and /or specified requirements and /or work already executed, may be rejected and asked to be removed for the same reason and to construct with contractors cost, risk and responsibility.

1.A. Qualifying Criteria :

The tender documents will be issued to only those who meet the following criteria:

- a) Must be reputed organization registered under the Company Act 1956 or registered Partnership / Proprietorship firm.
- b) The Organization should have at least 5 years of experience in the installation of Waste Water Treatment Plants & Water treatment Plants.
- c) The organization should be Original Equipment Manufacturer and should have handled at least 2 similar assignments during last 5 years with similar types of projects. The company should have experience of execution similar works like design, detailed engineering, supply, delivery, unloading, storage, installation, testing and commissioning of waste water treatment plant complete in all aspects capacity 1000 m3/day and above at least 3 nos in last 3 years.
- d) Annual turnover of the organization should not be less than Rs.5 crore in the last three financial years (FY 2010-12, 2012-13 and 2013-14) and should be in profit for at least in the last three financial years .
- e) The organization should have sector specific experience and in house capabilities to manage the assignments to avoid outsourcing of the jobs. In case of outsourcing, the new agreement would not be allowed and should have done similar work jointly at least twice for similar volume of work.
- f) Subletting of the jobs assigned would not be allowed.
- g) There should not be any pending litigation against bidder with any central Govt./State Govt/statutory bodies.

BID EVALUATION CRITERIA:

Based on the NIT, Pre bid meeting and further communication, the Tender Committee (T.C.) will follow the following procedure for opening of the BID:

STEP – I

After receiving the BID, on the same day the Tender Committee will open the Envelope and check the receipt of the three separate covers inside the same duly mentioned with Cover – I, Cover – II and Cover –III as mentioned in the Tender.

The T.C. will open first the Cover – I to check the EMD in the absence or default of which the Tender may be rejected.

STEP – II

On the date of opening of the tender, the committee will open the Cover – II based on the cover – I as opened earlier on the same day.

T.C. will check the documents submitted with Cover – II like Technical bid and overall credential and keep for scrutiny and evaluation by SPV and PMC.

After Technical evaluation as mentioned above, the PMC will submit the report to the T.C. and T.C. will decide the date of opening of Cover – III, Commercial Bid based on the evaluation Report.

After opening of the Commercial Bid, the PMC will evaluate the same and submit the report to the T.C. to take the final decision on the same.

Cover II should contain:

- a) Proof of mandatory letter evidencing the similar work executed for the design, detailed engineering, supply, delivery, unloading, storage, installation, testing and commissioning of waste water treatment plant in last three years balance sheet.
- b) Company Profile, experience and resources of key personnel of the company dealing in waste water treatment, financial and legal expertise.
- c) Any other information that may be considered relevant.

The rates / prices quoted shall remain firm throughout the contract period.

The evaluation matrix have attached with the Tender as guide line to the Bidders as follows:

EVALUATION MATRIX

Sl. No.	Particular	Details	Max. Marks	Score	Remarks
1	Commercial Criteria				
a)	Annual turnover (Last three financial years)				
	2010-2011		10		
	2011-2012				
	2012-2013				
b)	Experience of the bidder in execution of work similar in nature and magnitude		10		
c)	Existing commitments and running Projects		5		
d)	Legal Status of the bidder		5		
e)	Evidence of access to Financial Resources (Cash Credit)		5		
f)	Company Status		10		
g)	Solvency Certificate		5		
h)	Audited Statement of Account		5		
2	Technical Criteria				
a)	Plant & Machinery, equipment and testing laboratory which the contractor intends to deploy.		15		
b)	Proposed key personnel, staff & their qualification		10		
c)	Proposed workers strength with details		5		
d)	Method of erection and commissioning safety at site and quality control/service center		10		
e)	Detailed schedule based on completion period		5		
	Total Marks		100		

The assessment will be done on above basis. Hence Bidder must submit authenticated information as above.

Validity of BID :

Bids submitted by the bidders shall remain valid for a minimum period of 180 days from the date of opening of bid (PART II)

Earnest Money Deposit:

The bidders is required to submit along with offer an earnest money deposit **(EMD) of Rupees Five Lacs only**(in the form of the Bank Guarantee from any nationalized Bank as per prescribed format as enclosed with the tender document or Demand draft drawn in favour of NORTH EAST MEGA FOOD PARK LTD." valid for 180 days. The bids submitted without EMD would be rejected. No interest shall be payable on EMD. The EMD would be refunded after allotment of works and on mobilization of man & material at the site.

Performance Security

Within 21 days of receipt of Letter of Intent, the successful bidder shall deliver to the Employer a Performance Security by Demand Draft in favour of "NORTH EAST MEGA FOOD PARK LTD.", payable at "Guwahati". for an amount of Rs. 12,00,000/- (Twelve Lac Rupees only) or equivalent to 5.0 % of Contract Price whichever is more performance security deposit will be interest free.

2. PREFACE

2.2. The scope of work covered under this tender document includes:

Design/ detailed engineering, supply, delivery, unloading storage, installation testing and commissioning of Waste Water Treatment Plant complete in all respects.

2.1 M/s. NORTH EAST MEGA FOOD PARK LTD. hereinafter referred to as "Employer", "Client" or "Owner" has decided to install Waste Water Treatment Plant for the North East Mega Food Park Limited, Tihu, Dist- Nalbari in Assam.

2.3. Infrastructure

Electricity & Water for completion of works will be provided to the Contractor at one point.

2.4. The one who is awarded the contract will be the "Contractor".

2.5. The Contractor has to carry out his work according to General Conditions of Contract, Special Condition of Contract, Technical Specifications, Bill of Quantities Contract, Special Condition of Contract, Technical Specifications, Bill of Quantities and working drawings, as applicable issued by the client/ PMC.

2.6 The privilege of authorship and ownership of drawings and designs of the structures remain with The Client. The drawings and designs prepared by The Client shall be used only for the purpose specified in this contract and all the drawings issued shall be returned to The Client on completion of work.

2.7. The Engineer authorized by Client to represent at Site-of-work is authorized to ask the Contractor to discontinue any work which does not meet the expected and or specified requirements and /or work already executed, may be rejected and asked to be removed for the same reason and to construct with contractor's cost, risk and responsibility.

3. GENERAL CONDITIONS OF CONTRACT

(See APPENDIX to this Section for specific stipulations).

3.1 Scope of Work

The scope of work is broadly defined in the Appendix.

3.2 Commencement of Work

The date of receipt of the Employer's written acceptance, by the Contractor shall be reckoned as the Date of Commencement of the work unless stated otherwise.

3.3 Completion Period

The work shall be completed within the period stipulated in the Appendix from the date of commencement.

3.4 Compliance with Statutes, Regulations etc.

The Contractor shall abide by and comply with the statutory provisions; regulations etc. of the statutory authorities applicable to his work, and shall help the client in getting their approvals as and when required as directed. Any statutory fee required for such approvals shall be paid by the Employer.

All licenses required by the Contractor to carry out his work at the Employer's work site shall be obtained by the Contractor.

3.5 Price Basis

Contractor to quote rates excluding all the VAT & taxes and . The same is to be mentioned separately for evaluation. However the taxes applicable to be paid at actual. Any Statutory variation &/or imposition of new taxes, levies by way of legislation or Govt. ordinance that shall become applicable to this contract, shall be reimbursed to the contractor as per actual on submission of documentary proof of such variation. This however shall not be applicable during the extended time required by contractor due to his fault.

Items which are not specifically mentioned but which logically belong to the work shall be deemed to have included in the prices.

3.6 Price Escalation

Subject to Clause on Taxes and Duties, the rates and prices set out in the contract shall remain firm and free of escalation for the entire duration of the contract, and no extra claim by the contractor in this respect shall be entertained. No price escalation during the contract shall be allowed on any account even for the extended period on any reasonable ground.

3.7 Terms of Payment

1. Shall be as stipulated in the Appendix.
2. All final payments of R.A. Bills will be made within 21 days from the date of the Consultant's certification; however 70% of the bill value can be released within 15 days of submission of bill.
3. Income tax as per prevailing rules and regulations shall be deducted at source from the Contractor's Bills and a certificate to that extent shall be given to him, unless the contractor produces a certificate from the concerned authorities against such deductions.

4. Final Bill shall be paid within 90 days from the date of its presentation and upon Certification of our Consultants provided all documents, rate analysis for extra items, photographs of work (if asked for) etc. are furnished along with Final Bill.
5. The Contractor's Final Bill shall be presented in the format acceptable to the Consultants.
6. Final Payment will be made after successful completion of the job after deducting the retention money (i.e. 5% of the Bill value) and taxes & duties as applicable, any other deduction as per company rules.

3.8 Retention Money

The Employer shall be retaining 5% from each payment due to the contractor, until completion of the whole of the works.

On completion of the whole of the works the retention amount will be released on submission of irrevocable Bank Guarantee equivalent to 5.0 % of contract price. The validity of Bank Guarantee shall be 365 days (Defect Liability Period) from the date of handing over of work

3.9 Liquidated damages for Delay

0.5 % of contract price per week or part thereof subject to a maximum of 10% of the total contract Value.

3.10 Bonus for Early Completion

0.5 % of contract price per week or part thereof subject to a maximum of 5% of the total contract value.

3.11 Co-ordination with other Agencies

The Contractor shall carry out the work at site under instruction and to the satisfaction of the Consultants and in co-ordination with other agencies working at site.

The Contractor shall not endanger/damage/remove/ alter the work of other contractors save with the written consent of the Consultants.

3.12 Contractor's Superintendence

The Contractor shall provide all necessary superintendence during the execution of the work and the period of maintenance.

3.13 Schedule of Work

The contractor shall work out and submit to the Consultants a stage-wise schedule within 4 days from the date of commencement incorporating:

- Submission of drawings and documents for approval
- Delivery of all materials.
- Installation
- Testing, Commissioning and Handing over.

3.14 Drawings

Following drawings (4 sets) should be submitted within 2 weeks from the date of issue of work order.

- (a) Dimensional general arrangement drawings for civil tanks. Dimensional general arrangement drawings for all mechanical and electrical equipment with associated accessories.

(b) Dimensional foundation detail drawings and foundation design data.

Based on contractor's drawing, structural design and drawings will be prepared by the consultant. The Contractor shall submit 4 sets of system drawings, manuals, foundation drawings etc. as stipulated in the Appendix.

The requirement of submission of 'As Built' drawings shall be as stipulated in the Appendix.

3.15 Quality of Materials, Workmanship etc.

The Contractor binds himself to execute the work as per the relevant IS Code revised up to date and the Consultants specifications/instructions/directions and shall undertake to produce any test certificate from the accredited agencies/bodies, statutory authorities etc. as required by the Consultants without any extra charge to the Employer.

3.16 Rejection of Work

The Contractor shall remove all rejected material, equipment etc. immediately from the site, and no payment shall be made against the same.

3.17 Alteration, Additions and Omissions

The quantities set out in the Bill of Quantities are the estimated quantities of the work and are not to be taken as the actual and correct quantities to be executed by the Contractor. Payment shall be made as per the actual quantities executed and at the unit rates and prices set out in the Contract.

The Consultants and/or the Employer reserve the right to increase/decrease any of the quantities or totally omit any item of work and the Contractor shall not claim any extras or damages on these grounds. Additions to or deletion from the scope of work of any item shall not affect the prices of other items though the overall value of the contract gets revised accordingly.

All extra or additional work done or work omitted by the written order of the Consultants shall be valued at the rates and prices set out in the contract, if in the opinion of the Consultant, the same shall become applicable. If the Contract does not contain any rates or prices applicable to such extra or additional work then suitable rate analysis based on the rates/prices set out in the contract shall be submitted by the contractor for the Consultant's approval, prior to executing the work. The decision of the Consultants in such matters shall be final and binding on the contractor.

All extra work shall be carried out with prior approval from the Consultants.

4.18 Extra Items and Claims

The Contractor shall do any item of extra work with written order of the Consultants that may be required for the completion of the work under this contract. If the rates for the extra items cannot be derived from the rates already quoted in the annexed bill of quantities, the contractor shall furnish the rate analysis of such items based on actual cost of materials and labour for them items at site plus following percentage to cover the cost of plant and machinery, supervision, overheads and profits etc.

- a. Items requiring supply of materials, labour and machinery M + L + 20%
- b. Items requiring supply of materials M + 15%
- c. Items requiring labour and supervision only L + 25%
- d. It shall be the Contractor's responsibility to file and pursue with the insurance Company and/or statutory authorities for the settlement of any claims.

3.19 Labour

The Contractor shall make his own arrangements for labour. He shall conform to all applicable statutory provisions, revised up to date, of the concerned authorities and shall keep the Employer indemnified from all claims that may arise due to the Contractor's operations. In case of default, the contractor shall be liable to pay for the damages & shall thus become recoverable from him. (Also See Appendix).

3.20 Clearance of Site

The Contractor shall keep the work and the site clean at all times. All the temporary works, debris, excess materials, tools and tackles etc. shall be removed from site before handing over the works.

3.21 Settlement of Disputes and Arbitration

All disputes and difference arising out of or in connection with the contract whether during the progress of work or after completion, shall be referred to and settled by Arbitration, by two Arbitrators, one to be nominated by the Employer and the other by the Contractor. In the event of the Arbitrators disagreeing, it shall be referred to an Umpire to be nominated by the two Arbitrators before proceeding with the Arbitration. The decision of the Umpire shall however be final and binding on both the parties. For the purpose of this clause, the provisions of the Indian Arbitration Act 1996 with relevant amendments shall be applicable.

3.22 After Sales Service

After the initial guarantee period is over, the Contractor should be in a position to offer Annual Maintenance Contract (AMC), if so applicable for his work.

The Contractor should indicate following:

- Rates for AMC
- Address of his nearest service stations.

3.23 Bidder has to consider above points & succeeding Appendix as final and any other details (in tender document) regarding the same to be considered Null & Void.

APPENDIX

Sr. No.	Particulars	Required	Concurrence/ Variations to be indicated by Bidder
1.	Scope of work	Design/detailed engineering, supply, delivery, unloading storage, installation testing and commissioning of package type Waste Water Treatment Plant complete in all respects.	
2.	Battery Limits	<p>The Bidder shall assist the client in obtaining all approvals from the State Pollution Control Board and any other statutory authorities.</p> <p>Raw waste will be brought up to the receiving sump. From thereon all equipment, piping etc. up to the outlet of the Final Treated Wastewater Point/Drain is included in the scope of supply.</p> <p>To maintain the plant for a period Six (Six) month after satisfactory commissioning and handing over with supply of all essential spare parts as may be required.</p> <p>The Bidders are requested to quote exactly as per the tendered technical specifications and scheme. Makes/models of all components incorporated to be clearly mentioned in the offer</p> <p>The employer will have option to execute civil construction work through other agency based on dimensional layout drawings furnished by contractor.</p> <p>The following utilities shall be supplied by the clients at one point. <i>The provision of power for execution work shall be in the scope of</i></p> <ul style="list-style-type: none"> - Industrial Water - Raw Effluent - Power <p>Bidder to specify their requirement while quoting.</p>	
3.	Price Basis	Firm prices till handing over of the plant. Prices to be all exclusive from the taxes and duties. Loading, unloading, testing & commissioning.	
Technopak Advisors Pvt. Ltd.		15010	Waste Water Treatment Plant

Sr. No.	Particulars	Required	Concurrence/ Variations to be indicated by Bidder
4.	Terms of Payment	10% Advance against submission of an on Demand Bank Guarantee valid up to planned &/or extended date of completion, as per format supplied by Client / Consultant	
5.	Painting & Protection	<p>10% on approval of drawings & technical submittals by contractor.</p> <p>40% on delivery of materials to site.</p> <p>20% on pro rata erection.</p> <p>15% on testing & commissioning & handing over</p> <p>5% retention after handing over along with various statutory permissions but can be released against Approved Bank Guarantee valid for 12 months from date of successful commissioning & handing over.</p> <p>Painting with anticorrosive paint wherever required and final painting of the plant of the shade desired by client / consultant. A suitable weatherproof covering for all pumps, motor drives etc. shall be provided.</p>	
6.	Commencement of work	Date of issue of Letter of Intent/ Work Order / Written acceptance by Client whichever is earlier.	
7.	Completion Period	22 -24 weeks from date of LOI. A detailed time schedule shall be prepared by the bidder and submitted with his offer.	
8.	Defects Liability Period	12 months from the date of successful commissioning & handing over.	
9.	Insurance	<p>The contractor shall take out following policies :</p> <ul style="list-style-type: none"> - Transit insurance for material under Transportation. - Contractor all risk policy(CAR). - Third party insurance. - Workmen, compensation at 1 lakh per incident, no. of incidents min. 3 Nos. 	
10.	Validity of the Offer	90 days from the date of submission of the offer.	
Technopak Advisors Pvt. Ltd.		15010	Waste Water Treatment Plant

Sr. No.	Particulars	Required	Concurrence/ Variations to be indicated by Bidder
11.	Drawings, Catalogues, Erection &	Drawings like P & I diagram, Layout with the Hydraulic and Single Line diagram for MCC panel with offer.	
	Operation and Instruction Manuals	Detailed Engineering drawings shall be submitted after receipt of order.	
12.	As Built Drawing	Operation and instruction manuals to be submitted during start of commissioning. 4 copies of "As Built" and approved drawings to be given within 2 weeks after successful commissioning and handing over.	
13.	Indemnity Bond	The contractor to furnish indemnity bond indemnifying the client against any liability.	Not Applicable
14.	Codes / Standards	Works to be carried out and material used etc. should be as per relevant IS codes / standards wherever possible.	
15.	Plant operation and maintenance	<p>The contractor shall operate the plant, maintain the same as required on a regular basis and achieve the required treated waste results for a period of 6 month (Max.) from the date of commissioning and handing over at his own responsibility. The waste water treatment Plant (WWTP) will operate for 24 hours.</p> <p>During this period the contractor shall also train client's personnel in operation and maintaining of the plant.</p> <p>The bidder shall furnish a list of essential spares for 1 year operation as recommended by him.</p> <p>The Bidder should include with his offer a list of consumables including first fill of chemicals, lubricants etc. indicating quantities thereof. Cost of first fill is to be included in the price for supply, delivery, installation, testing, commissioning and handing over of the plant. Subsequent requirement of chemicals and any other indispensable consumables will be included in operation and maintenance charges for plant operation</p>	

Sr. No. Particulars Required Concurrence/ Variations to be indicated by Bidder

Electricity will be supplied free of cost by client.

Sr. No.	Particulars	Required	Concurrence/ Variations to be indicated by Bidder
		Bidders should indicate expected monthly consumption of electrical power and all consumables which are to be Guaranteed within $\pm 10\%$ variation.	
		The Bidder during the operation under his responsibility shall affect the necessary systematic analyses and shall register every extra ordinary event or action which has taken place (repairs, maintenance of equipment, etc.)	
		Laboratory facilities The Bidder shall maintain the record of analyses carried out per statutory requirements. Expenses for testing kits & equipment, supply of chemical reagent, maintaining of equipments etc, supply of chemical reagents for laboratory tests and any other indispensable consumable material is to be borne by the contractor/Owner as mutually agreed.	
		Chart for manpower to be deployed for operation and maintenance should be enclosed with the offer.	
16.	Tools and Tackles	All tools, tackles, scaffoldings required for successful commissioning of the plant to be included in the price.	
17.	Labour Housing	No place will be made available to house labour for erection of the equipments. Contractor to make his own arrangements for this purpose.	
18.	Safety Requirement	The contractor to make all safety requirement / norms in the event of any mishap or accident it will be the bidder's responsibility to tackle and sort out the entire matter with concerned authorities. Under no circumstances client will be responsible or brought into picture.	
19.	Clearance of Site on completion	The contractor will be required to clear the site within 1 week on completion of works.	
Technopak Advisors Pvt. Ltd.		15010	Waste Water Treatment Plant

BANK GUARANTEE FOR RELEASE OF EMD / RETENTION MONEY

THIS GUARANTEE is made on the ----- date of ----- by (Name of Bank) having its registered office or branch office at (address of bank) _____ (hereinafter referred to as the "Guarantor" which expression unless repugnant to the context shall include its successors, assigns etc.) in favour of M/S_____ a company formed under the Indian Companies Act 1913 and having a Registered office at _____ (hereinafter referred to as the CLIENT) which expression, unless

WHEREAS the CLIENT has entered into a contract vide their Purchase Order/ Contract No..... Dated (which expression unless repugnant to the context shall include any amendments thereto) with (Name of the Contractor) having its registered address at _____ (hereinafter referred to as the "CONTRACTORS" which expression unless repugnant to the context shall include its successors and assigns etc.) for (brief description of scope of contract) for CLIENT,s factory at

AND WHEREAS to secure due performance of the contract, CLIENT is entitled in terms of the said contract to retain a sum of Rs. _____ (_____) as retention money to be released after

AND WHEREAS the contractors have requested for release of the amount of retention money to them on their furnishing a bank guarantee for the said amount.

NOW in consideration of CLIENT making the advance payment of Rs. _____ (_____) to _____ we (name of the Bank), the Guarantor, agree as follows:

- a. We hereby unconditionally and irrevocably guarantee the refund to CLIENT any sum or sums upto Rs. _____ (_____) on _____ first demand in writing, stating that the sum or sums claimed is/are due to CLIENT by reasons of contractors failure to fulfill any of its obligations under the contract. under this guarantee and the amount stated by CLIENT to be so due shall be final and binding on the
- c. Neglect or forbearance on the part of ___CLIENT___ in enforcement of payment of any monies the payment whereof is intended to be hereby secured or giving of time by ___CLIENT___ for repayment thereof shall not in any way relieve me/us, the guarantor of my/their liability under this guarantee.

NOTWITHSTANDING ANYTHING CONTAINED HEREINBEFORE, the liability of the Guarantor under this guarantee is restricted to Rs._____ (_____) The Guarantee shall remain in force until (date)_____ in case no claim is lodged by _CLIENT_ upon the Guarantor within six months from (date)_____ that is on or before _(date)_____ all the rights of CLIENT_____ under the said guarantee shall be forfeited and the Guarantor shall be relived and discharged from all liabilities there

- e. We, the said Guarantor hereby further agree and undertaken that in the event of invocation of this Guarantee by __CLIENT_____. We shall make the payment of the guaranteed sum immediately on demand within a period not exceeding _7_ days from the date of such demand, failing which we further under undertake to pay interest @ 18% p.a. for the intervening period of delay commencing from expiry of such period of 7 days till the date of final payment of the guaranteed sum.

SIGNATURE OF GUARANTOR

4. GENERAL TECHNICAL SPECIFICATIONS

4.1. Source

The source of wastewater to the WWTP majorly from the food processing waste and toilet blocks, canteen & welfare facilities. All effluent / sewage will be generated over a 24 hours period.

4.2. Quantity

The expected raw wastewater quantity is 1000 m³/day. In which 700 m³/day of industrial effluent generates from fruit & vegetables processing. However, 300 m³/day of sewage generates from toilet blocks and canteen waste.

4.3. Expected characteristics of Raw Wastewater

Parameters	Units	Industrial effluent	Sewage
Flow	m ³ /day	700	300
pH		6.5 – 7.0	6.5 – 7.0
TSS	ppm	600 – 800	300 – 450
BOD	ppm	2000 – 2500	250 – 300
COD	ppm	3000 - 4000	400 – 500

4.4. Expected characteristics of Treated Wastewater

Parameters	Units	Treated wastewater
Flow	m ³ /day	1000
pH		6.5 – 8.5
TSS	ppm	< 100
BOD	ppm	< 30
COD	ppm	< 250

4.5. Concept

A compact and easy to operate Waste Water Treatment Plant is recommended, consisting of anaerobic treatment followed by aerobic treatment. The polishing of the effluent and disinfection to be done by tertiary treatment to meet the treated wastewater characteristics specified. The treated water should be suitable for Toilet flushing purpose. Excess will be used for gardening/ green area development. The ease of maintenance and operation is of utmost importance in the design of Waste Water Treatment Plant.

4.6. Scope of work for Contractor

The scope of work shall include design, supply, testing, erection and commissioning of the wastewater treatment plant as per scheme envisaged

The treatment plant shall consist broadly of the following units:-

- a. Effluent Lift Pumps
- b. Bar screen cum Oil & Grease Trap
- c. UASB reactor & Buffer Tank
- d. Aerobic Bio-Reactor MBBR Based with diffused aeration
- e. Secondary Clarifier and sludge recycle pumps
- f. Intermediate holding tank with feed pumps
- g. Pressure Sand Filter
- h. Activated Carbon Filter
- i. Sludge Holding tank
- j. Filter Press with feed pumps & provision of Sludge Drying Beds to be considered.
- k. Sludge Drying Beds
- l. Dosing systems – Chlorine, any other required
- m. Treated Water Tank & Disposal Pumps

Interconnecting pipe work complete with valves fittings, etc., interconnections between pumps, tanks, and chemical dosing systems as per battery limits specified in schematic flow diagram. Instruments such as pressure gauges, Electro-magnetic Flow meter (non-contact type), ORP meter for automised chlorination, auto level controllers, flow indicators as required. Motor control panel complete with starters, push buttons, indicating lamps, isolating switches, fuses, internal and external power and control cabling / wiring from panel to motors and auto level controllers. Painting of equipment and piping. Any additional requirement for treatment deemed fit by the bidder should be clearly indicated giving the equipment details. Bidder should work-out the design of the plant in details and give the required flow diagram, size of each equipment along with the plant hydraulics and layout. The offer without these details may not be considered. Bidder to also indicate the technology & price separately if automatic remotely operated PLC controlled plant with manual operation option can be incorporated in the scheme.

4.7. Process Description

The Contractor can propose suitable effluent treatment methods like standard extended aeration Waste Water Treatment Plant, differential flow-floating sludge system, etc. The allocated space and shall be subject to the approval of the Project manager / Consultants.

The HRT of Equalisation Tank, UASB & Aeration Tank are fixed in this tender tender i.e. as 18, 15 & 24 hrs.not clear

4.7.1 Inlet Screen Chamber

Raw effluent shall flow into the inlet screen chamber by gravity. Large solids particles shall be intercepted by a fine step screen. A manual screen shall be installed in parallel with the screw screen as a standby screen when the step screen is under maintenance. Floatable Oil & Grease shall be removed manually from Oil & Grease trap which having a baffle wall arrangement.

Separate Inlet screen chamber shall be providing for sewage. Overflow of which feed to Equalization tank.

4.7.2 Equalization Tank

The equalization tank shall be designed to provide a minimum storage of 18 hours at peak flow while pumping. Two submersible pumps as per schedule shall be provided with level switch control and automatic cut-in of the standby unit.

4.7.3 UASB reactor

In the UASB process, the whole waste is passed through the anaerobic reactor in an up flow mode, with a hydraulic retention time (HRT) of only about 12-15 hours at average flow. No prior sedimentation is required. The contractor may take the provision of attached growth anaerobic digester. The upflowing mixed effluent (Trade & Domestic) itself forms millions of small "granules" or particles of sludge which are held in suspension and provide a large surface area on which organic matter can attach and undergo biodegradation. A high solid retention time (SRT) of 30-50 or more days occurs within the unit. No mixers or aerators are required as required mixing is achieved by the turbulence of upward rising effluent. The gas produced can be collected and used if desired. Anaerobic systems function satisfactorily when temperatures inside the reactor are above 18-20°. Excess sludge is removed from time to time through a separate pipe and sent to a simple sand bed for drying.

4.7.4 MBBR Reactors

An aeration system similar to MBBR aeration tank or compact attached growth reactor shall be provided for aerobic degradation of remaining organic content, mixing and aerating the effluent.

Effluent shall be retained in the aeration tank for optimum duration and subjected to biochemical oxidation by fine bubbles aeration.

4.7.5 Clarifier Tank

The effluent after bio-oxidation shall enter the rectangular/cylindrical hopper bottom sedimentation tank where the sludge effectively settles to the tank bottom. The clear effluent shall weir into the chlorination chamber.

The activated sludge collected in the sludge tank shall be returned to the aeration tank for further oxidation of the incoming organic matter by means of automatic siphoning .

Any sludge settled on the surface of the clarifier tanks shall be returned to the aeration tank by automatic siphoning /pumping.

4.7.6 Chlorination System

A chlorine contact tank with a capacity of not less than 30 min average flow detention shall be furnished. It shall be attached to the settling tank. Construction shall be similar to the other tanks and panels comprising the treatment plant, and shall include flow diversion baffles and outlet of the chlorine contact chamber for measuring the waste flow. A chlorine feed system shall be furnished as a complete package assembly for installation in the plant room. Assembly shall include baseplate, electronic positive displacement type chemical feed pump, HDPE chemical grade solution tank, suction and discharge tubing and fittings.

Each chlorine solution dosing pump shall perform to achieve a residue not more than 1mg/l in the treated effluent. Solution feed pump shall have a minimum capacity of 1l/hr chemical pump will operate on 50 Hz supply. HDPE - Chemical grade solution tank shall be of no less than 200 litre capacity and include suction line fitted with strainer. Control shall be by means of compound loop (i.e. flow proportional and residual measuring).

The feed pump shall be of variable speed positive displacement, solenoid-driven diaphragm metering type.

4.7.7 Treated Water Tank

All treated water will collect in this tank from thereon will pump to the flushing tanks. Excess will be reused for gardening purposes.

4.7.8 Sludge Thickening / Holding Tank

Excessive sludge shall be stored in the sludge holding tank for dewatering, after it is fed to the dewatering equipment before disposal.

4.7.9 Tertiary Treatment

This tertiary treatment shall be provided for the effluent used for Toilet flushing and may be used for cooling tower make-up water tank system.

The tertiary treatment plant shall comprise of the pressure sand filters and activated carbon filters. This shall be sized to accommodate 100% of the effluent discharge flow rate and shall achieve the performance as outlined and described in Design Criteria.

Details of the equipment layout proposal shall be submitted for review by the Project Manager with tender documents.

4.8. General requirement of Mechanical works Piping and Instrumentation

The following give the minimum requirements of the different components of the system. The figures indicated are for contractor's references. It shall be the contractor's responsibility to select equipment for the plant proposed by them so that the capacities and performance of the Waste Water Treatment Plant meet with the criteria set out in this specification.

All equipment and components of the system shall be of top quality construction and shall be corrosion resistant.

4.8.1 Coarse Screening Equipment

Bar screen shall be of 304 stainless steel construction. Drip trays shall be provided for holding and drainage of the screenings. A manual by-pass screen of 30mm opening with stainless steel drip tray shall be provided. An isolation valve shall be provided to divert the flow to the by pass screen when the screen requires service.

4.8.2 Effluent Pumps

Working and standby effluent pumps shall be provided. Each shall be of submersible type c/w guide base to facilitate ease of removal, lift chain and automatic discharge connection. Pump casing and impeller shall be of cast iron material. Shaft shall be of

stainless steel material. The BOQ identifies quote rate for alternate MOC. Contractor to ensure submission of quote for same.

4.8.3 Pumps

- a. Pumps shall be selected to have the best efficiency at the specified duty point. The pumps shall be suitable for continuous operation at any point within the range of operation as stipulated in the data/specification sheets.
- b. Pumps shall have a continuously rising head-capacity characteristics from the specified duty points towards shut off point, the maximum being at shut off point to enable parallel operation. The pump head at shut off point shall be approximately 110 % but shall not exceed 120 % of the head at the specified capacity point. Under all circumstances, the range of operation of the pumps shall exclude any unstable operating zone of the head-capacity curve.
- c. The pump set along with the drive motor shall run smooth without undue noise and vibration. Acceptable peak to peak vibration limits shall be generally guided by the Hydraulic Institute standards of USA. Acceptable limit of sound pressure level is 80 dB (A) at 1 m distance.
- d. The pumps shall be single stage with impellers of radial flow design.
- e. The impeller shall be dynamically balanced.
- f. The pump shaft shall be guided by bearings in the casing assembly of approved make.
- g. The thrust bearing shall be of adequate size to withstand the weight of all rotating parts as well as the imposed hydraulic thrust.
- h. Shaft: Shaft size shall be selected considering that the critical speed shall be above the operating speed as recommended in applicable code / standards. The critical speed shall also be at least 10% above the running speed.
- i. Shaft sleeves: renewable type fine finished shaft sleeves shall be provided between the shaft & stuffing box. Shaft sleeves shall be properly fastened to the shaft to prevent any leakage or loosening. Shaft and shaft sleeve assembly should ensure concentric rotation. O' ring shall be provided of suitable material between shaft and shaft sleeve.
- j. Stuffing boxes: stuffing box design shall permit replacement of packing without removing any part other than the gland. Stuffing boxes shall be sealed / cooled by the fluid being pumped / external clear water, as indicated in the data sheets.
- k. Gland packing: The pump supplier shall supply suitable gland packing according to the service conditions as mentioned in the data sheets.
- l. The impeller size selected for the specified duty shall be at least 5% smaller than the maximum impeller diameter of the pump.
- m. Margin on NPSH (i.e. NPSH available - NPSH required) shall not be less than 1.0 m. If it is less than 1 m, NPSH test shall be conducted.
- n. Wearing ring: replaceable type wearing rings shall be furnished to prevent damage to impeller and casing.
- o. Painting: all equipment shall be supplied duly painted with 2 no coats of zinc oxide primer and 2 no coats of finish paint suitable for intended service.
- p. A heavy duty coupling along with coupling guard to be provided between the pump and drive unit.

- q. All the suction and discharge shall be suitable for ANSI 150#.
- r. Pump and motor shall be mounted on a common base plate, duly assembly and aligned by the contractor.
- s. All the suction and discharge nozzle of centrifugal pump to be fitted with flexible joints.
- t. The power rating of the motor shall not be less than the larger of the following:
 - i. The maximum power required from zero discharge to zero head.
 - ii. 120% of the power required at the design point.

Sludge pumps

The pumps shall meet the requirements of IS: 5120. The pump should be capable of handling sludge of about 1.25% solid contents, specific gravity of sludge being 1.01. The pumps shall be suitable for single as well as parallel

Filter Feed Pumps

Pump shall meet the requirements of IS: 5120.

The pump should be capable of handling clarified water with solid content. The pumps shall be suitable for single as well as parallel operation and shall run smooth without undue noise and vibration. The pumps shall be capable of developing the required total head at rated capacity.

4.8.4 Tanks and vessels of CS construction

- a. Only the approved and tested material should be used.
- b. Contractor shall carryout root run by TIG wherever back chipping is not possible. All butt weld joints would be full penetration weld.
- c. Welding shall be carried out conforming to AWS E 6013.
- d. Spot (10%) radiography on the equipment shall be carried out. If any two subsequent, radiography on any weld seam fails then contractor has to carry out 100% radiography on that weld seam.
- e. Sharp edges are to be rounded off to 3R.

Tanks with dished ends shall conform to requirements as per IS: 2825/ ASME Sec. VIII

- g. Painting: all equipment shall be supplied duly painted with 2 no coats of zinc oxide primer and 2 no coats of finish paint suitable for intended service.

4.8.5 Tanks of HDPE construction

Use only the approved makes and tested materials.

4.8.6 Agitator

- a. The agitators shall conform to IS: 7090 – 1985.
- b. Material used for shaft, blade and bush etc. shall be SS 304 (tested quality).
- c. Contractor shall use only approved and tested material.
- d. Contractor shall carryout welding conforming to AWS E 308-16.
- e. Sharp edges are to be rounded off to 3R.
- f. Contractor shall carryout static and dynamic balance of agitator assembly.
- g. Contractor shall carryout no load and full load test of agitator assembly for 4 hours in water.

4.8.7 Air Blowers and Diffused Air Piping

- a. The air blower shall be rotary twin-lobe compressor type. The blower shall be designed for continuous running. The speed of the blower will be adjusted for designed for continuous running. The speed of the blower will be adjusted for 100% of air volume requirement. The motor rating also shall be designed 100% air volume requirement. The speed of the blowers should not exceed 1200 r.p.m.
- b. The blowers shall be air-cooled. The blowers shall be complete with set of pulleys, belt guard, motor, common base frame, vibration isolators, inlet filter, inlet silencer, isolating valve, non return valve and foundation bolts. The casing rotor shall be of discharge silencer, pressure relief valve, 6 " pressure gauge with cast iron construction. Bearings and gears shall be grease lubricated. Motor speed shall be 1500 rpm.
- c. The air inlet and outlet for blowers shall be from top and bottom respectively.
- d. The motor shall be TEFC and suitable for operation on 3-phase, 415 V, 50 c/s A.C. supply.
- e. A suitable grid of diffusers shall be provided at the bottom of the tank for efficient mixing. The entry pipes shall be taken from the top of the tank. The fixing arrangement for diffusers shall retrievable type for easy maintenance.
- f. The diffusers shall be porous, membrane type. Each diffuser shall be fully supported over the length. The membrane shall be made of EPDM/ Polyurethane material. Spacing of the diffusers shall be designed for the efficient mixing.
- g. The size and performance of the air blower shall be so selected that it can provide a minimum air flow rate 0.5 l /sec / diffuser to 1l/sec/diffuser maximum, and to maintain a minimum of 2.0mg/l dissolved oxygen in the aeration tanks in operation.

4.8.8 Air Diffusers for Extended Aeration Tanks

- a. Air diffusers shall be made to provide a uniform distribution of fine bubble air release performance in the system. The air diffuser shall be either made of elastomeric rubber membranes or composed of crystalline fused aluminium oxide with a suitable ceramic bonding material.
- b. Membrane endurance shall be more than 180,000 expansion/contraction cycles.
- c. Diffuser shall be of self-cleaning, non-clog disc or dome-shaped type. Oxygen transfer efficiency shall not be less than 20% at 3.5m submergence in clear water. Alternatives may be offered for consideration.
- d. Diffuser hold down assemblies shall consist of a retainer bolt, a matching washer and gasket. Sealing gasket shall be composed of solid neoprene rubber and shall be conform to ASTM D-2000 and shall be suitable for withstanding the effects of wastewater high temperature up to 120° C.
- e. The Contractor shall submit calculation to justify the diffuser selection and air requirement during the detailed design.

4.8.9 Clarifier

- a. All the materials for the construction of different components of clarifiers shall confirm to the requirements of IS: 10261 – 1982.
- b. The clarifier shall be provided with central drive head with tip speed of 1.5 m/min and overload alarm. The influent will enter into clarifier through center with an entry velocity of 0.6 to 0.8 mps.
- c. At the central inlet of the clarifier a feed well shall be provided to eliminate disturbances of tank contents and reduce short circulating. The diameter of the feed well shall not be less than 15% of the tank diameter and shall extend at least 1200 mm below water level and 150 mm above water level.

- d. The outlet weir shall consist of 900 V-notches. For uniform draw off at low flows adjustable weir plates formed of FRP plates fixed in an adjustable and renewable manner extending around the entire periphery of the tank shall be provided. The floor of the clarifier shall have a 40mm minimum thickness of screed coarse swept into place by the rotating sludge scraper mechanism.
- e. The motor should have at least 25% over rating capacity required at duty point. Motor shall be covered with FRP canopy.
- f. The central bearing assembly shall be adequately lubricated in all respects and all grease points shall be extended to a battery place mounted at a convenient point above the walkway. Oil fill and points, where applicable, shall be extended to provide convenient access for filling and draining system.
- g. The driver mechanism shall be of the totally enclosed type to permit all weather operation.
- h. A fixed type steel bridge (running full diameter of the tank) shall be provided with chequered walkway and suitable height hand railing.
- i. All underwater nuts, bolts, washers, etc., shall be of SS 316 only. Bottom of scraper shall be provided with rubber padding.
- j. The Projected "effective" surface area shall be no more than 80% of the total projected surface area for the lamella clarifier. The lamella clarifier shall be designed for unattended continuous operation.
- k. The lamella clarifier shall be designed for unattended continuous operation.
- l. Plates shall be continuously self supporting, and installed at an angle of 55 degrees to the horizontal plane. The plates shall include grips or hand holes to facilitate handling and shall be individually removable. Plate spacing shall be 50 mm perpendicular to the plate surface.
- m. The clarified water shall travel up the plates and be collected from both sides through orifice holes. Each plate spacing shall be served by two orifices holes, sized to accept a wide range of flow rates to provide hydraulic surge capacity. The orifice weir plate shall be removable and adjustable for leveling to maintain optimum flow collection over the entire length of the unit.
- n. The lamella clarifier shall be supported on structural steel legs designed to withstand all anticipated loadings and shall be of sufficient length to provide a minimum of 300mm of clearance below the sludge discharge nozzle.
- o. The lamella clarifier shall have lifting eye bolts for ease of field handling.
- p. Sludge shall drop into an integral inverted pyramid sludge hopper sloping to a common bottom outlet connection. The sludge hopper walls should be sloped a minimum of 55 degrees on all sides toward a flanged outlet nozzle.
- q. Sample taps to monitor liquid sludge level should be provided.
- r. The lamella clarifier shall be designed for outdoor installation, for wind loading of 6 – 6.5 m.p.h
- s. The top of the unit shall be open to provide easy access for inspection and maintenance. Ladders and platforms as necessary for easy operation and maintenance shall be provided.
- t. The equipment, wherever necessary, shall be complete with flash mixing and flocculation arrangement.
- u. The motors provided should have at least 25% over rating capacity required at duty point. Motor shall be covered with FRP canopy.
- v. All the Mild Steel parts shall be sand blasted and phosphatised and given one coat of epoxy primer and two coat of epoxy paint.

4.8.1 Electrical Control

The operation of the treatment process shall be fully automatic.

A completely assembled and prewired control panel with mimic diagram consisting of weatherproof cabinet shall be furnished. The control panel shall contain all metering and status indicators, motor starters, program timers, on-off-auto changeover switches and duty selectors for equipment.

Proper control sequence shall be designed according to system requirement and manufacturer standards.

4.8.2 Other Equipment

Any other necessary accessories, such as buffer, riser, scum removal devices, partition, control panel, collection devices, etc. for all the tanks and pumps (where necessary) shall be provided in order to provide a fully working systems.

Pipe lines

- a. Contractor shall carryout root run by TIG when back chipping is not possible. All butt weld joints would be full penetration weld.
- b. Contractor shall use pipe line flange and fittings suitable for ANSI 150#.
- c. On completion of work, the contractor shall flush the pipe lines with water and then test hydraulically at 1.5 times at design pressure.
- d. Underground pipes shall be of Cast Iron and shall conform to class LA of IS: 1536 and IS: 1537. The pipe fittings shall conform to IS: 1538. In case of flanged pipes, flanges shall be flat faced and drilled as per IS: 1537 and fitted at right angle.
- e. All pipes above ground shall be flanged while all under ground piping shall be spigot and socket type.
- f. All piping is to be permanently identified with directional arrows for flow, identification of contents, and source & destination labels.
- g. All piping shall be adequately supported. For thermoplastic piping, 50 mm or less in diameter, the support shall be continuous. For thermoplastic piping above 50 mm, the location of supports shall be sufficient to prevent sagging with the line in service.
- h. The piping support provided shall be based on manufacturer's recommended spacing based on material, temperature and service for all piping. These recommendations are to be followed as a minimum.
- i. All CS pipelines and supports shall be coated with an approved anticorrosion paint. HDPE piping shall be manufactured from 100% virgin material.

Piping Materials

SS304 - Submerged air piping

MS epoxy - Air piping and pumped effluent riser (Non submerged)

PVC piping - Pumped effluent (submerged) & tank overflow pipe line.

GI (Heavy) - Interconnecting pipe line after delivery header of pump / filter.

Valves

The Contractor shall supply and install all isolating valves and control valves as required for the proper and efficient operation and maintenance of the entire systems.

Check valve shall be of single door type. The body and door of the valve shall conform to IS:210. Flanged ends of the valve shall be flat faced. Body ring shall be of leaded Gunmetal. Valves shall be free from sharp projections, which are likely to catch and hold stringy materials.

The gate valve body, bonnet and wedge shall be of Cast Iron conforming to IS: 210. Valves shall be designed for a pressure of 10kg/cm^2 . Valves shall have a non-rising spindle and stuffing box gland shall be of bolted type. Flanged end of the valves shall be flat faced. Face to face dimensions shall be as per IS: 780. The spindle shall be of forged SS 410. The valves shall be free from sharp projections, which are likely to catch and hold stringy materials.

All valves shall be rated for a minimum 8kg/cm^2 at 20°C .

All valves supplied shall be suitable for the working pressure and test pressure of the system as specified elsewhere in this specification.

Regulating valves shall be of similar materials as that specified for cast iron gate valves.

All regulating valves shall be lockshield type.

All valves shall be full line size.

Each valve shall have a purpose made reference number plate for label engraved or stamped indicating the manufacturer's catalogue number, pressure and temperature ratings. Valves shall be arranged so that clockwise rotation of the spindle will close the valve.

Furnish all valves and accessory materials necessary in the piping whether or not shown on drawings as flows.

All valves shall be packed with an approved packing and threads shall be coated with oil and graphite. Packings should be replaced when found deteriorated on site.

Where possible locate all valves at convenient positions of operation from the floor with valve stems upright.

Valves that are flanged shall have flanges to the table specified for the pipework.

Plastic or metal plates (rust less) shall be provided to indicate the open / close status as well as the use of each valve in the pump and tank rooms. Intrudence clause of pipe support here.

4.9. PIPE SUPPORTS

4.9.1 General Support

The Contractor, on the award of the work, shall prepare detailed working drawings, showing the cross-sections, longitudinal sections, details of fittings, locations of isolating and control valves, drain and air valves, and all pipe supports. He must keep in view the specific openings in buildings and other structure through which pipes are designed to pass.

Piping shall be properly supported on, or suspended from, on stands, clamps, hangers as specified and as required. The Contractor shall adequately design all the brackets, saddles, anchor, clamps and hangers, and be responsible for their structural stability.

Pipe work and fittings shall be supported by hangers or brackets so as to permit free expansion and contraction. Risers shall be supported at each floor with Galvanized steel clamps. To permit free movement of common piping support shall be from a common hanger bar fabricated from Galvanized steel sections.

Piping shall be supported from the building structure, which shall support the sum of the load of a water-filled pipe and a minimum of 120 kg applied at the point of hanging.

All piping brackets shall be constructed as shown on the standard detail drawings.

Vertical pipework shall be supported at intervals of at least one per floor level.

Horizontal pipework shall also be supported by adjustable flat iron or clevis type hangers hung by hot rolled steel rods of the following diameters and spacing subject to the Client's/ Consultant's approval:

Nominal Pipe Size	Distance between supports	Diameter of Rod
25 mm	1.8 m	10
32 mm	2.4 m	10
40 mm	2.7 m	10
50 mm	2.7 m	10
65 – 80 mm	3.0 m	12
100 mm	3.0 m	16
150 – 200 mm	3.6 m	18

The end of the steel rods shall be threaded and not welded to threaded bolt.

Hangers shall be supported by means of approved fasteners. Wood plugs shall not be used. Unless allowed by the structural engineer, power fixings may be used for pipe work of diameter less than 50 mm. Expansion fasteners may be used for vertical pipe work under 100 mm diameter.

All pipe work shall be carried out in a proper workman like manner, causing minimum disturbance to the existing services, buildings, roads and structure. The entire piping work shall be organized in consultation with other agencies work, so that area can be carried out in one stretch.

Requirement of Cut-outs in the structural slab or wall for installing the various pipes shall be clearly identified in the detailed shop drawing to be prepared by the ETP contractor.

Pipe sleeves, larger diameter than pipes, shall be provided wherever pipes pass through walls and slab and annular space filled with fibreglass and finished with retainer rings.

The contractor shall make sure that the clamps, brackets, saddles and hangers provided for pipe supports are adequate or as specified / approved by Consultants. Piping layout shall take due care for expansion and contraction in pipes and include expansion joints where required.

All pipes shall be accurately cut to the required sizes in accordance with relevant BIS codes and burrs removed before laying. Open ends of the piping shall be closed as the pipe is installed to avoid entrance of foreign matter. Where reducers are to be made in horizontal runs, eccentric reduces shall be used for the piping to drain freely. In other locations, concentric reduces may be used.

Automatic air valves shall be provided at all high points in the piping system for venting. All valves shall be of 15mm pipe size and shall be associated with an equal size gate valves.

Discharge from the air valves shall be piped through a pipe to the nearest drain or sump. All pipes shall be pitched towards drain points.

Pressure gauges shall be provided as shown on the approved drawings. Care shall be taken to protect pressure gauges during pressure testing.

4.10. General requirement of Electrical works

All equipment and components to be supplied for the project shall be designed/ rated for following climatic conditions based on manufacturer's recommendation. Later on no additional cost will be granted for requiring to use higher rated component on account of derating due to ambient temperature:

Maximum ambient temperature = 43 °C

Minimum ambient temperature = 15 °C

Design ambient temperature = 35 °C

Relative humidity (average over a month) = 85 %

(Maximum temperature and maximum RH do not occur at the same time)

Average rain fall per year = 200mm

Standards

The latest edition of following standards and rules shall be applicable: -

- | | |
|------------------------|--|
| 1. IS: 13947 | - (part II) Specification for A.C. Circuit breakers. |
| 2. IS: 4047 | - Specification for Heavy Duty Air Break Switches and fuses for voltages not exceeding 1000V. |
| 3. IS: 1818 | - Specification for A.C. Isolators and earthing switches. |
| 4. IS: 13947 | - Moulded case circuit breaker |
| 5. IS: 2208 | - HRC cartridge fuse links upto 650V. |
| 6. IS: 3072 | - Code of practice for installation and maintenance of switchgear. |
| 7. IS: 3106 | - Code of practice for selection, installation and maintenance of fuses (voltages not exceeding 650V). |
| 8. IS: 4237 | - General requirements for switchgear and control gear for voltages not exceeding 1000V. |
| 9. IS: 5578 | - Marking and arrangement for switchgear bus bars, main connection & auxiliary wiring. |
| 10. IS: 2705 | - Current Transformers |
| 11. IS: 1248 | - Direct acting electrical indicating instruments. |
| 12. IS: 2419 | - Dimensions of electrical indicating instruments. |
| 13. IS: 3231 | - Electrical relays for power system protection. |
| 14. IS: 2147 | - Degree of protection provided by enclosures for low voltage switchgear and control gear. |
| 15. IS: 8623 | - Low voltage switchgears and control gear assemblies. |

16. IS: 10118 – Code of practice for selection, installation and maintenance of switchgear and control gear.
17. IS: 513 – Cold rolled low carbon steel sheets and strips.
18. IS: 5082 – Aluminium alloy bars, rods, tube sections for electrical application.

Motor Control Center

System: 415 volts, 3 phase 4 wire system.

Earthing: Provision of double earthing to panel with separate earth bus

Control Supply: 230 Volts AC with centre tap transformer earth with necessary protection on both sides.

Switchgears: All the switchgears shall be Siemens / Schneider make.

Bus Bar: The Bus bar system is suitable for 415 volts 3 phase, 4 wire 50 Hz with fault withstand capacity of 35 KA for 1 sec with proper SMC supports. MCC should have separate control Bus/ Earth Bus.

Compartment: MCC should be compartmentalized and Non – Draw out type.

ELCB: Only from Schneider make with 100 MA test certificate.

Fabrication: MCC must be 14/16 Gauge steel frame

Painting: Epoxy powder coated Simens Gray colour

Wiring: The wiring shall be carried out with 650/1100 Grade PVC insulated stranded copper conductor.

Doors: Doors interlocking of isolator/ fuse switch units with the feeder door.

Starters: The starters for rotating machines as required in the MCC's shall be as per the type 2 coordination from Siemens as follows:-

- Up to 5 kW : Direct on Line.

- From 5 to 55 kW : Star / Delta

- The starters shall comply the following features: -

- Main and auxiliary contacts of required capacity with coils and 4 NC + 4 NO spare contacts each wired up to the terminals.

- Arrangements for the remote start stop function.

- Bimetallic over load relays with contact wired up to the terminal with SPP.

- Illuminated start stop push buttons with latch.

- Internal wiring and accessories including CT's wherever required.

Contactor: Motor starter contactor shall be suitable for Class AC 3 utilisation category and of the electromagnetic type rated for uninterrupted duty as defined in applicable standards. Main contacts of motor starter contactor shall be of silver plated copper. Each motor starter contactor shall be provided with two NO and two NC auxiliary contacts. Insulation class of operating coils shall be class B or better. Operating coils of contactor shall be suitable for operation from the specified control supply system. Contactor shall be of the double break, no gravity type. One number spare auxiliary contactor with 4 No./ 4NC contact along with its coil completely wired up to the terminal should be provided.

Reversing Starters:

(if required.) Reversing starters shall comprise forward and reverse contactor, electrically interlocked with each other. Reversing starters shall be suitable for Class AC 4 duty.

Thermal Overload Relays:

Starters shall be complete with three elements, positive acting, ambient temperature compensated, time lagged thermal overload relay with adjustable settings. The settings range shall be properly selected in accordance with the rating of the motor. Thermal overload relays shall be hand-reset type. 'Stop' push button of the starter and hand-reset device shall be separate from each other. Overload relay hand reset push button

shall be brought out on the front of the compartment door. Overload relay shall be provided with at least one 'NO' and one 'NC' or one changeover contact.

Instruments: Indicating instruments shall be of Digital type, 144 x 144 Sq.mm size, suitable for flush mounting. Watt-hour and Var-hour meters shall be suitable for 3 phase, 4 wire system, balanced as well as unbalanced load and suitable for semi-flush mounting.

Approved Make Of Switchgear Equipment / Components:

Unless approved in writing, equipment/components of following makes only shall be acceptable:

Air Circuit Breaker (ACB):	SIEMENS /SCHNEIDER
Moulded Case Circuit Breaker (MCCB):	SIEMENS /SCHNEIDER
Switch Disconnectors Fuse Units:	SIEMENS
Contactors and O/L Relays:	SIEMENS
Push Buttons:	SIEMENS / Teknik
Indicating lamps:	SIEMENS / Teknik
Load Manager:	Enercon/ Secure (Conzerv)
Digital Voltmeter:	Enercon
Digital Ammeter:	Enercon
KWH Meter:	Enercon
HRC Fuses & base	SIEMENS
Terminals:	Elmex
Timers:	SIEMENS
Selector switch:	KAYCEE
MCB:	MDS/SCHINEDER
ELCB 30 MA/30MS:	SIEMENS/MDS
Wires:	Polycab /RR.
Protective Relays:	SIEMENS

Panel fabrication drawings with single line diagram and control / wiring diagram should be got approved in writing before taking up the manufacturing.

4.11. INSTALLATION

The Contractor shall check the associated civil work prior to the installation of any item of machinery and advise the Project Manager, in writing, of any deviation of such work from the specified details.

The machinery shall be accurately installed to correct dimensions, alignments, levels, etc., all as indicated on the final drawings. The machinery shall be mounted on flat steel packing pieces of thickness suitable to take up variations in level of the concrete foundations. Suitable packing pieces shall be located adjacent to each holding down bolt and shall be properly bedded by grinding the concrete surface to a smooth, level finish. The machinery shall be aligned and levelled and the nuts of the holding down bolts tightened with a spanner of normal length. The base plates shall be packed with grout after the machinery has been run and checked by the Project Manager for stability and vibration.

Installation shall include the provision and fixing of all necessary holding down bolts, ashers, nuts etc.

The length of all bolts shall be such that when fitted with a nut and tightened the threaded portion of the bolts shall protrude from the top face of the nut by a distance not exceeding half the bolt diameter. Exposed bolt heads and nuts shall be hexagonal.

All equipment and materials of the same type shall be products of the same manufacturer. Locally made equipment will not be accepted unless otherwise specified.

All similar items of plant and their component part shall be completely interchangeable. Spare parts shall be manufactured from materials similar to the originals and shall fit all similar items of plant. Where machining may be needed before fitting renewable parts, the machining fits with their tolerance shall be shown on the drawings accompanying the instruction manuals.

All motors and/or revolving parts shall be truly balanced both statically and dynamically so that when running at normal speeds and any load up to the maximum there shall be no significant vibration due to lack of balance. All parts which can be worn or damaged by dust shall be totally enclosed in dust-proof housings.

4.12. PIPE PROTECTION (FOR COLD WATER PIPES BURIED IN TRENCHES/GROUND /EARTH)

All buried pipes shall be cleaned with zinc chromate primer and bitumen paint, wrapped with three layers of fibre glass tissue, each layer laid in bitumen and placed on concrete blocks with PUF saddles dipped in bitumen at every 2 meters. The pipes where laid under floor shall be encased with 100 mm thick river sand all around in addition to protective coating as described above.

4.13. MAINTENANCE FACILITIES

Permanent work platform and catwalk shall be designed by the Contractor and provided by the Contractor for access to elevated equipment. The catwalk and platform for access shall allow a minimum width of 750mm.

Catwalk to maintenance platform shall be provided with railings and guards designed for safe movement of personnel in a restricted space including provision for gaining access and to accommodate maintenance personnel.

Hand railing and guards shall be designed by the Contractor and provided by the Contractor for all concrete tanks to allow safe movement of personnel.

Permanent I-beams, lifting eyes, etc. shall be provided by the Contractor over major equipment which require lifting for overhaul and maintenance.

Waterproof power sockets required for servicing shall be provided by the Contractor. The number and locations shall be proposed by the Contractor and approved by the Project Manager / Consultant. Power supply to these sockets shall be taken from control panel of the effluent treatment system.

The design of all permanent work platform, hand rails, etc. shall be submitted to the Project Manager / Consultant for approval. The loading and fixing method of lifting facilitate shall also be submitted to the Project Manager / Consultant for approval and checking within 4 weeks on award of Contract or receipt of letter of intent.

4.14. TESTING

The performance of the system shall be demonstrated by taking hourly samples of the raw effluent and final effluent over a twelve hour period. The sample shall be taken at periods approximately the flow rates specified by the plant. The sample shall be combined and a 5-day BOD shall be run, the results of which must verify the capacity of the treatment plant prior to acceptance.

4.15. TRAINING

Provided training facilities courses to ensure that the employer's staff associated with the project may acquire full knowledge and appreciation of all aspects of the design, day-to-day operation, breakdown and routine maintenance, and fault diagnosis of all plant, equipment and systems. Training to the employer's staff shall be held as appropriate at the Contractor's or manufacturer's premises and on site. A detailed syllabus for each of the training courses specified or proposed and the timing of the courses shall be submitted for approval. The Contractor shall recommend the desirable qualifications and experience of the trainees to optimally benefit from the courses.

The Contractor shall be deemed to have include in his tender price the cost of providing training facilities as specified.

In addition to the above, the Contractor shall submit to the Project Manager a list describing such other spares and special tools, their number, price and where appropriate the anticipated frequency of replacement as soon as is practicable.

5. TECHNICAL SPECIFICATIONS

1. Medium Bar Screen & "V" Notch Plate

Description	Required as per Specifications	Concurrence/Variance by Tenderer
Tag number of tank	SC-1	
Quantity	1	
Screen Operation	Automated Self cleaning type	
Clear openings	mm 20 - 50	
Screen size	mm To fit into the screen chamber of size 500 mm wide x 300 mm SWD.	
Material of construction	MS galvanized	
Accessories	Mechanized raking system	
Standard "V" Notch Plates	To fit into the chamber of size 500 mm wide x 300 mm SWD.	
Quantity	Nos 2	
Material of construction	MS galvanized/ Granite tile	
Angle of the 'V' Notch	O 60	
2. Effluent Transfer pumps		
Description	Required as per Specifications	Concurrence/Variance by Tenderer

Tag Number SP1, SP2

Make _____ Kirloskar / KSB/ Grundfos

Number of stages		Single	
Type		Submersible, non-clog type	
Quantity	Nos.	3 (2 working + 1 standby)	
Liquid pumped		Raw Effluent	
Location		Submerged	
Capacity	m ³ /hr	21 (each)	
Effluent Handling capacity	mm	38	
Operating pressure			
- suction	mwc.	--	
- discharge	mwc.	10	
Working temperature	oC	Ambient	
Speed	Nos	2900 (max)	
Type of lubricator		Constant oil leveler	
Prime mover		Electric motor	
Motor			
- type		TEFC	
- speed	Rpm	Not to exceed 2900	
Technopak Advisors Pvt. Ltd.		15010	Waste Water Treatment Plant

Material of construction

- impeller CI FG 200 – IS 210
- pump shaft Grade 40C8 – IS 1570

- pump casing		CI FG 200 – IS 210	
Shaft sleeve		Bronze Gr. LTB 2 – IS 318	
Wear rings casing / impeller		CI FG 200 – IS 210	
3. Blower for Aeration Tank			
Description		Required as per Specifications	Concurrence/Variance by Tenderer

Tag Number _____ B1, B2, B3

Make		Everest, Kay, Beta	
Quantity	Nos.	3 (2 working+1 standby)	
Capacity	m ³ /hr	as required	
Type		Twin lobe type	
Service		Air supply to Eq. sump and Bio reactor tank	
Suction pressure	mm	Atmospheric	
Discharge pressure	mm	5500	
Duty		Continuous	
Installation		Outdoor	
Blower speed	Rpm	Not to exceed 2950	
Prime mover		Electric motor	
Motor			
- type		TEFC	
- power	kW	To include 20% margin	
- speed	Rpm	Not to exceed 2950	
Relief valve setting		7500	
Material of construction			
- Casing		CI Gr. 20125 IS 210	
- Lobes		CI Gr. 20125 IS 210	
- Shaft & grease		Alloy Steel	
- Gasket		PTFE	
4. Diffused aeration for Bio reactor Tank			
Description		Required as per Specifications	Concurrence/Variance by Tenderer

Tag number of tank _____ DF1

Make		Grindwell, Norton, Triveni, Ott-O2 konom, Rehau	
Tank dimensions			
Technopak Advisors Pvt. Ltd.		15010	Waste Water Treatment Plant

- quantity Nos 1
- length x breadth mm
- water depth mm

Type of diffuser		porous membrane type	
Fixing arrangement		retrievable type	
Material of construction			
Header		HDPE	
Diffuser		EPDM / Polyurethane / Eqv.	
5. Secondary Settling Tank / Clarifier			
Description		Required as per Specifications	Concurrence/Variance by Tenderer

Tank tag number SST1

Tank size

- Inside diameter	Mm	as required	
- Side water depth	Mm	2500 + hopper bottom (1 in 12 slope)	
Quantity	No	1	
Speed	Rpm	1.0 – 1.5	
Contents		wastewater with settleable bio-sludge	
Clarifier mechanism			
- type		Centrally driven, fixed bridge, scraper assembly	
- service		Separation of clarified water from sludge	
- duty		Continuous	
- installation		Outdoor	
Motor			
- type		TEFC flange mounted	
- quantity	nos.	1	
- speed	Rpm	Not to exceed 900	
Material of construction			
- shaft		IS – 226	
- scrapper		IS – 226	
- bush for shaft		AISI 304	
- packing material		PTFE	
- gland packing ring		PTFE	

6. Sludge Recirculation Pumps

Description Required as per Specifications Concurrency/Variance by Tenderer

Tag Number SRP1, SRP2

Number of stages _____ Single

Type		Horizontal, centrifugal, non-clog type	
Quantity	Nos.	2 (1 working + 1 standby)	
Liquid pumped		Bio- Sludge	
Location		Outdoor	
Capacity	m ³ /hr	21 (each) /as required	
Operating pressure			
- suction	mwc.	Positive	
- discharge	mwc.	15	
Working temperature	oC	Ambient	
Speed	Rpm	1500 (max)	
Coupling		Direct coupled	
- type		Metallic flexible	
- make		Fenner / Lovejoy	
Type of coupling guard		Non-sparking	
Type of base plate		MS fabricated	
Type of lubricator		Constant oil leveler	
Prime mover		Electric motor	
Motor			
- type		TEFC	
- speed		Not to exceed 1500	
Material of construction			
- impeller		CI FG 200 – IS 210	
- pump shaft		Grade 40C8 – IS 1570	
- pump casing		CI FG 200 – IS 210	
Shaft sleeve		Bronze Gr. LTB 2 – IS 318	
Wear rings casing / impeller		CI FG 200 – IS 210	
7. Filter Feed Pumps			
Description		Required as per Specifications	Concurrency/Variance by Tenderer

Tag Number FFP1, FFP2

Make _____ Kirloskar / KSB/ Grundfos

Number of stages		Single	
Type		Self priming, Horizontal centrifugal non-clog type	
Technopak Advisors Pvt. Ltd.		15010	Waste Water Treatment Plant

Quantity nos. 3 (2 working + 1 standby)
 Liquid pumped Treated Clarified Effluent
 Location Outdoor

Capacity	m ³ /hr	21 (each)	
Operating pressure			
- suction	mwc.	--	
- discharge	mwc.	25	
Working temperature	oC	Ambient	
Speed	Rpm	2900 (max)	
Coupling		Direct coupled	
- type		Metallic flexible	
- make		Fenner / Lovejoy	
Type of coupling guard		Non-sparking	
Type of base plate		MS fabricated	
Type of lubricator		Constant oil leveler	
Prime mover		Electric motor	
Motor			
- type		TEFC	
- speed	Rpm	Not to exceed 2900	
Material of construction			
- impeller		CI FG 200 – IS 210	
- pump shaft		Grade 40C8 – IS 1570	
- pump casing		CI FG 200 – IS 210	
Shaft sleeve		Bronze Gr. LTB 2 – IS 318	
Wear rings casing / impeller		CI FG 200 – IS 210	
8. Pressure Sand Filter			
Description		Required as per Specifications	Concurrence/Variance by Tenderer

Tag Number PSF-1

Type		Vertical, down flow type	
Quantity	nos.	1	
Liquid pumped		Clarified waste water	
Location		Outdoor	
Capacity	m ³ /hr	42 (each)	
Filtration rate	m ³ /hr/m ²	8	
Filter media		Graded quartz, sand	
Vessel details			
- type		Vertical, cylindrical with dished ends and packed bed of media inside.	
Technopak Advisors Pvt. Ltd.		15010	Waste Water Treatment Plant

- contents		Graded quartz + water	
- design code		IS 2825 / ASME Sec. VIII, Div. I	
- Internal diameter	mm	as per design	
- design pressure	kg/cm ²	7	
- hydraulic test pressure	kg/cm ²	10.5	
Filter bed			
- type		Conventional, stratified	
- depth	Mm	1000	
Free board over bed	%	100	
Overall size			
- height of straight (HOS)	Mm	2000	
Type of support		Bracket type	
Accessories		Frontal pipework, level gauge, pressure gauge, pressure relief valve, set of internals etc.	
Material of construction			
- shell with ends		IS 2062	
- nozzle pipe		IS 1239 (Medium)	
- nozzle flange		ASTM A-105	
- gasket		PTFE	
- bolts and nuts		SS-316	
Corrosion protection			
- internal		Epoxy paint	
- frontal pipe		MS galvanized	
Guaranteed water quality		Output turbidity should be less than 2 ppm on silica scale.	
9. Activated Carbon Filter			
Description		Required as per Specifications	Concurrence/Variance by Tenderer
Tag number		ACF1	

Type _____ Vertical, down flow type

Quantity	nos.	1	
Liquid pumped		Filtered water	
Location		Outdoor	
Capacity	m ³ /hr	42 (each)	
Filtration rate	m ³ /hr/m ²	10	
Filter media		Dechlorination grade activated carbon.	
Vessel details			
- type		Vertical, cylindrical with dished ends and packed bed of media inside.	
Technopak Advisors Pvt. Ltd.		15010	Waste Water Treatment Plant

- contents		Activated carbon + water	
- design code		IS 2825 / ASME Sec. VIII, Div. I	
- Internal diameter	Mm	As per design	
- design pressure	kg/cm ²	7	
- hydraulic test pressure	kg/cm ²	10.5	
Bed depth of media	Mm	1000	
Free board over bed	%	100	
Overall size			
- height of straight (HOS)	Mm	2000	
Type of support		Bracket type	
Accessories		Frontal pipework, level gauge, pressure gauge, pressure relief valve, set of internals etc.	
Material of construction			
- shell with ends		IS 2062	
- nozzle pipe		IS 1239 (Medium)	
- nozzle flange		ASTM A-105	
- gasket		PTFE	
- bolts and nuts		SS-316	
Corrosion protection			
- internal		Epoxy paint	
- frontal pipe		MS galvanized	
10. Treated water Transfer pumps			
Description		Required as per Specifications	Concurrence/Variance by Tenderer

Tag Number

TWT1, TWT2

Make

Kirloskar / KSB/ Grundfos

Number of stages		Single	
Type		Horizontal centrifugal non-clog type	
Quantity	nos.	3 (2 working + 1 standby)	
Liquid pumped		Treated effluent water	
Location		Outdoor	
Capacity	m ³ /hr	21 (each)	
Operating pressure			
- suction	mwc.	Positive	
- discharge	mwc.	25	
Working temperature	oC	Ambient	
Speed	rpm	2900 (max)	
Coupling		Direct coupled	
Technopak Advisors Pvt. Ltd.		15010	Waste Water Treatment Plant

- type Metallic flexible
- make Fenner / Lovejoy
- Type of coupling guard Non-sparking

Type of base plate		MS fabricated	
Type of lubricator		Constant oil leveler	
Prime mover		Electric motor	
Motor			
type		TEFC	
speed	rpm	Not to exceed 2900	
Material of construction			
impeller		CI FG-200 – IS 210	
pump shaft		Grade 40C8 – IS 1570	
pump casing		CI FG-200 – IS 210	
Shaft sleeve		Bronze Gr. LTB 2 – IS 318	
Wear rings casing / impeller		CI FG-200 – IS 210	
11. Urea Dosing Systems			
Description		Required as per Specifications	Concurrence/Variance by Tenderer

Tag Number DS-1

Tank details

- Type		Cylindrical, flat end, top open with agitator	
- Location		Outdoor	
- Quantity	nos.	1	
- Capacity (working)	Lits.	500	
- Contents		Urea solution	
- Type of support		Bottom	
Material of construction			
- tank		HDPE – Chemical Grade	
- nozzle for solution		SS – 316	
- nozzle pipe		SS – 316	
- nozzle flange		ASTM A-105	
- gasket		PTFE	
- bolts and nuts		SS – 316	

12. DAP Dosing Systems

Description Required as per Specifications Concurrency/Variance by Tenderer

Tag Number DS-2

Tank details

- Type		Cylindrical, flat end, top open with agitator	
- Location		Outdoor	
- Quantity	nos.	1	
- Capacity (working)	Lits.	500	
- Contents		DAP solution	
- Type of support		Bottom	
Material of construction			
- tank		HDPE – Chemical Grade	
- nozzle for solution		SS – 316	
- nozzle pipe		SS – 316	
- nozzle flange		ASTM A-105	
- gasket		PTFE	
- bolts and nuts		SS – 316	
13. Hypochlorite dosing system			
Description		Required as per Specifications	Concurrency/Variance by Tenderer

Tag Number DS-3

Tank details

- Type		Cylindrical, flat end, top open with agitator	
- Location		Outdoor	
- Quantity	nos.	1	
- Capacity (working)	Lits.	500	
- Contents		Hypochlorite solution	
- Type of support		Bottom	
Material of construction			
- tank		HDPE – Chemical Grade	
- nozzle for solution		SS – 316	
- nozzle pipe		SS – 316	
- nozzle flange		ASTM A-105	
- gasket		PTFE	
- bolts and nuts		SS – 316	
Technopak Advisors Pvt. Ltd.		15010	Waste Water Treatment Plant

Dosing Pump details

Manufacturer – Model

Speed rpm

Safe minimum flow	m ³ /h		
Shut-off head	mWC		
Efficiency	%		
Bearing			
- type, make			
Absorbed power	kW		
Operating weight	Kg		
Overall dimensions (L x B x H)	mm		
Prime Mover (Motor)			
- manufacturer – model			
14. Sludge Tank Mixer			
Description		Required as per Specifications	Concurrence/Variance by Tenderer

Tag Number

AG-1

Tank size

As required or

- Length x breadth	mm	3000 x 3000	
- Side water depth	mm	1600	
Quantity	Nos.	1	
Speed	rpm	100 – 200	
Contents		wastewater with chemical sludge	settleable
Agitator			
- type		propeller type	
- service		Mixing of sludge	
- duty		Intermittent	
- installation		Outdoor	
Motor			
- type		TEFC flange mounted	
- quantity	nos.	1	
- speed	rpm	Not to exceed 900	
Material of construction			
- shaft		AISI 304	
- impeller		AISI 304	
- bush for shaft		AISI 304	
- packing material		PTFE	
- gland packing ring		PTFE	
Technopak Advisors Pvt. Ltd.		15010	Waste Water Treatment Plant

15. Sludge Feed Pump

Description Required as per Specifications Concurrence/Variance by Tenderer

Tag Number SFP1, SFP2

Number of stages _____ Single

Type		progressive cavity type	
Quantity	nos	2 (1 working + 1 standby)	
Liquid pumped		Chemical sludge to dewatering equipment	
Location		Outdoor	
Capacity	m ³ /hr	15.0 (each) / as per design	
Operating pressure			
- suction		Positive	
- discharge	mwc	As per equipment requirement	
Working temperature	°C	Ambient	
Speed	rpm	1200 (max)	
Coupling		Direct coupled	
Type of coupling guard		Non – sparking	
Type of base plate		MS fabricated	
Type of lubricator		Constant oil leveler	
Prime mover		Electric motor	
Motor			
- type		TEFC	
- speed	rpm	Not to exceed 1200	
Material of construction			
- impeller		CI FG 200 – IS 210	
- pump shaft		Grade 40C8 – IS 1570	
- pump casing		CI FG 200 – IS 210	
- shaft sleeve		Bronze Gr. LTB 2 – IS 318	
- wear rings casing / impeller		CI FG 200 – IS 210	
16. Sludge Dewatering Equipment			
Description		Required as per Specifications	Concurrence/Variance by Tenderer

Tag number SDE-1

Type _____ Filter Press

Design flow	15 m ³ /hr / as per design	
Inlet sludge consistency	2 – 3% solids	
Dewatered cake consistency	35 – 40% solids	
Operation	Batch type	
Total Filtration cycle	2 hrs. max.	
Technopak Advisors Pvt. Ltd.	15010	Waste Water Treatment Plant

Filtrate collection system closed via pipe
 Cake collection system On Tray / Bin, easily movable
 Material of construction

17. Sludge Drying Beds		
Description	Required as per Specifications	Concurrence/Variance by Tenderer

Tag number SDB
 Type _____ As per IS 10037

Quantity	nos.	As required	
Overall size			
length	mm		
width	mm		
18. Instrumentation			
i. Flow Meter			
Description		Required as per Specifications	Concurrence/Variance by Tenderer

Type _____ By-pass rotameter
 Service fluid Clarified water

Operating temperature	°C	40	
Operating maximum flow	m ³ /h	45	
Output signal		Analogous (4-20mA) / HART	
Wetted material		SST	
ii. Auto Level Control System			
Description		Required as per Specifications	Concurrence/Variance by Tenderer

Type _____ Float operated capacitance type

Duty	To start / stop pump at low / high level in the raw effluent sump.	
	To start / stop pump at low / high level in the Clarified water tank.	
	To start / stop pump at low / high level in the Treated water tank.	
iii. Pressure Gauges		
Description	Required as per Specifications	Concurrence/Variance by Tenderer

Type _____ Bourdon

Technopak Advisors Pvt. Ltd.		15010	Waste Water Treatment Plant

Service		Water, compressed air	
Range	psi	0÷8	
Mounting		Direct	
Protection class	IP	54	
Casing material		Die-cast Al.	
Dial		White Al with legible black marking	
Dial size	mm	150	
Zero adjustment		Micrometer on pointer	
Window		Non-glare glass (shatter proof)	
Ring (bezel)		Threaded	
Element		Bourdon	
Process connection	mm	15	
Connection location		Bottom	
Accuracy	%	± 0.5 of span	
Over range protection	%	125 of span	
Material of construction			
- element		SS-316	
- connection		SS-304	
- movement		SS-304	
Maximum temperature	°C	45	
Snubber material		SS-304	
17. Technical specifications for Pipes and Fittings			
a. Ball valve			

Description Required as per Specifications Concurrence/Variance by Tenderer

Construction features

- class _____ ANSI 150

- stem	Rising OS & Y	
- ends	Flanged R.F drilled to ANSI B	
	16.5	
- bonnet	Bolted	
- disc	Solid wedge	
- seat	Renewable	
- operation	Hand wheel	
Material of construction		
- body	CI FG 200 – IS 210	
- disc	CI FG 200 – IS 210	
- stem	CI FG 200 – IS 210	
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- seat CI FG 200 – IS 210
- gasket PTFE
- packing PTFE
- nuts & studs CS Class 4 IS 1363

b. Check valve: swing type (flanged)		
Description	Required as per Specifications	Concurrence/Variance by Tenderer
Construction features		

- class _____ ANSI 150

- type	Swing	
- ends	Flanged R.F drilled to BS-10	
- cover	Bolted	
- seat	Renewable	
Material of construction		
- body	CS FG 200 – IS 210	
- disc	CS FG 200 – IS 210	
- seat	CS FG 200 – IS 210	
- gasket	PTFE	
- nuts & studs	CS Class 4.6 IS.1363	
c. Butterfly valve: wafer type		
Description	Required as per Specifications	Concurrence/Variance by Tenderer
Construction features		

- class _____ ANSI 150

- stem	90° turn operating with detent position	
- ends	Wafer type	
- body	Wafer type	
- disc	Wafer type	
- seat	Renewable	
- operation	Lever	
Material of construction		
- body	CS FG 200 – IS 210	
- disc	CS FG 200 – IS 210	
- stem	SS	
- seat	CS FG 200 – IS 210	
- disc seat	PTFE	
- nuts	CS Class 4 IS.1363	
- studs	CS Class 4.6 IS.1363	
Technopak Advisors Pvt. Ltd.		
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Diaphragm valve: membrane type for dosing systems

d.

Description	Required as per Specifications	Concurrence/Variance by Tenderer																																																													
Construction features																																																															
- class	ANSI 150																																																														
- stem	90° turn operating with detent position																																																														
- ends & body	Wafer type																																																														
- seat	Renewable																																																														
- operation	Hand wheel																																																														
Material of construction																																																															
- body	CS FG 200 – IS 210																																																														
- diaphragm	EPDM/ Nitrile rubber/ Equiv.																																																														
- stem	SS																																																														
- seat	CS FG 200 – IS 210																																																														
- disc seat	PTFE																																																														
- nuts & studs	CS Class 4.6 IS 1363																																																														
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18. Technical specifications for Electrical Works

a. Panels

Description	Required as per Specifications	Concurrence/Variance by Tenderer
Type of Panel	For MCC Non Draw out type compartmentalized.	
Type of Mounting	Free standing Floor Mounted	
Fault kA	35 kA – 1 Sec for MCC	
Thickness of CRCA sheets		
Structural members	3 mm	
Covers and doors	2 mm	
Base channel	MCC – ISMC 75	
Gland plate	3 mm	
Painting / Process	Synthetic Enamel paint as per seven tank process oven backed	
Paint shade ;		
a. Inside	White	
b. Outside	RAL – 7032	
Details of bus bars	Electrolytic grade Aluminum of specified rating for details see constructional features mentioned in specifications	
Cable Entry	Top or Bottom depending upon location of panel.	
Enclosure Protection /Ventilation	IP-54 with louvers for ventilation	
Control Wiring / Power Wiring	Insulated 600 Volts Cu. Wire	
a. Voltage Circuit	1.5 sq.mm	
b. Current Circuit	2.5 sq.mm	
c. Minimum size of power wiring	4 sq.mm	
Cable lugs / Cable glands	Included in the scope.	
Operating height	Shall not be more than 1900 mm	
Mounting height of Relays / Meters Control Switches	Range 350 mm to 1900 mm	
Type of C.Ts	Cast Resin	
Reference Ambient Temp.	45 Deg. C	
Make of the components to be used	(Indicate the make on which your offer is based)	
a. Power Contractor		
b. Overload relays / SPP		
c. MCCB		

- d. Relays
 e. Meters
 f. Ammeter / Voltmeter selector switches

g. Wires		
h. C.Ts		
i. Control Fuses		
Construction Features for MCC		
Incoming and outgoing feeders	To be signed and given by bidder	
MCC		
Accessibility	Front accessible only	
Overall Depth	450 mm	
Overall Height	Up to 2300 mm	
Incoming compartment	Individually one module of 800 mm wide with direct entry of incoming cables with cable bus bars for terminating multiple incoming cable. Incoming metering units as per specs.	
Outgoing feeder compartment	Switch chamber + cable chamber = 800 mm	
Vertical Bulbar Chamber	300 mm wide	
Horizontal Bulbar Chamber	300 mm wide	
Compartment Height for outgoing feeders		
63 A	250 mm	
125 A	300 mm	
250 A	400 mm	
400 A	500 mm	
630 A	600 mm	
800 A	650 mm	
Current Density of Bus bars (Al)	1.5 sq.mm = 1 Amp	
Branch bus Rating	75% of aggregate switches connected. 1.5 sq.mm Al/1 Amp Density.	
Neutral Bus	Half of the size of phase bus	
Earth Bus	50 x 6 copper	

19. Technical specifications for Civil Works (Clients Scope)

a. Bar Screen cum 'V' Notch Chamber

Description Required as per Specifications

Tag number SC-1

Type Rectangular, top open

Quantity nos. 1

Overall size	
- tank length	Mm
- tank width	Mm
- tank height	Mm
- water depth	Mm
b. Collection Sump	
Description	Required as per Specifications

Tag number CS-1

Type Rectangular, top open

Quantity nos. 1

Capacity (working)	m ³
Overall size	
- tank length	Mm
- tank width	Mm
- tank height	Mm
- water depth	Mm
c. UASB reactor	
Description	Required as per Specifications

Tag number UASB -1

Type Rectangular or circular, top closed

Quantity nos. 1

Capacity (working)	m ³
Overall size	
- tank length	mm
- tank width	mm
- tank height	mm
- water depth	mm
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d. MBBR Reactors

Description Required as per Specifications
 Tag number MBBR -1 & 2
 Type Rectangular, top open

Quantity	nos.	2
Capacity (working)	m3	
Overall size		
- tank length	mm	
- tank width	mm	
- tank height	mm	
- water depth	mm	
e. Secondary Clarifier		
Description		Required as per Specifications
Tag number		SC -1

Type Cylindrical with hopper at bottom, top open

Quantity	nos.	1
Capacity (working)	m3	
Overall size		
- tank diameter	mm	
- tank height	mm	
- water depth	mm	
f. Chlorine Contact Tank		
Description		Required as per Specifications
Tag number		CCT-1

Type Rectangular, top open

Quantity	nos.	1
Capacity (working)	m3	
Overall size		
- tank length	mm	
- tank width	mm	
- tank height	mm	
- water depth	mm	
g. Clarified Water Tank		
Description		Required as per Specifications
Tag number		CWT-1

Type Rectangular, top open

Quantity	nos.	1
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Capacity (working) m3

Overall size

- tank length mm

- tank width mm

- tank height mm

- water depth mm

h. Treated Water Tank	
Description	Required as per Specifications
Tag number	TWT-1

Type Rectangular, top open

Quantity nos. 1

Capacity (working) m3

Overall size

- tank length mm

- tank width mm

- tank height mm

- water depth mm

i. Sludge Holding tank	
Description	Required as per Specifications
Tag number	SHT-1

Type Rectangular, top open

Quantity nos. 1

Capacity (working) m3

Overall size

- tank length mm

- tank width mm

- tank height mm

- water depth mm

j. Sludge Drying Beds	
Description	Required as per Specifications
Tag number	SDB

Type As per IS 10037

Quantity nos.

Overall size

- length mm

- width mm

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k. Chemical House (MCC + Chemical storage area + laboratory chemical dosing tank)

Description Required as per Specifications

Inside dimension

- area m²

- height mm

2500

Storied

Two

Roof

Truss with coated sheets

Floor finish

IPC + coat tar epoxy coating

6. LIST OF APPROVED MAKES

Filter Press.....	Sachin, Thorat / equivalent
Pressure gauge	Bells Controls, H-Guru , Precision
Agitators.....	Kunal, Mixrite, Remi
Auxiliary contactors, timers, similars	BCH, Omron, Siemens
Auto level control system.....	AN-Instruments, Bell Controls, Levcon
Ball valve	Audco, BDK, HAWA, Leader
Butterfly valve	Audco, BDK, HAWA, Leader, Keystone
Changeover switch	Havells/Equivalent
Check Valves	Audco, BDK, HAWA, Kirloskar, Leader
Air Blowers.....	Everest, Kay, Beta
CI pipes.....	Electrosteel, New Janta
Centrifuge	Pennvalt, Humbolt
Clarifier/ Clarifloculator/ Sludge thickener mechanism	Dorr-Oliver, HGE, Kunal, Voltas
Coupling.....	Fenner, Lovejoy
Flexible joints	Anup, J. Rosales, Mettalic Bellows Triveni, Ott-O2 konom, equivalent
Flow recorder	ABB
Flow transmitter	J N Marshall, Rosemount, Spirax
G.I. pipes.....	
. Tata, Jindal	
Gears	CPEC, Elicon, Radicon
HDPE tanks	Fusion, Patton, Sharp, Sintex
High rate reactivator clarifier mechanism	Ion Exchange / Equivalent
Level switch	S.B.electromech, S.J.Electrosystem,
Level Transmitter	Bela instruments, Fisher-Rosemount
Mechanical seal	Burgman, Dura, John Crane, Techtrol Sealol
Membrane diffusers	Grindwell Norton/Triveni/ Ott-O ₂ _Konom
Metering pumps	Asia LMI, Metachem
Motors	ABB, Crompton Greaves, Siemens, Kirloskar
MS pipe.....	Tata, Jindal, Tisco
Paints	Asian, Berger Paints, Goodlass Nerolac
Pressure safety valve	Chandra & Co., Vanaz Engg.
PTFE Gasket	IGP, MIL, Spiraseal, Spitmaan
PVC Pipes	Finolex/ Supreme / Prince
Screw Pump.....	Rota, Alfa Helical Greaves /
Wilo	
Surface Aerators	Batliboi-HGE, Dorr-Oliver, Voltas
Pumps.....	Kirloskar/KSB/Grundfos/Crompton
SAFF Media.....	Cooldeck, MM Aqua
Strainers	Dryton, HAWA, Spirax

7. TESTING, COMMISSIONING & HAND OVER

7.1

GENERAL

The entire works included in this Contract shall be fully tested in stages as the work proceeds and on completion of work as applicable.

The Contractor shall provide during normal working hours, all necessary labours, instruments, equipment, materials, fuel, power and maker's representatives, to carry out such tests as may be necessary to satisfy the Client that the installation meets the requirement and intent of the Specification as well as such tests required by Local Authorities.

All tests shall be made in the presence of the Client or his representative or any inspecting authority. At least seven working days notice in writing shall be given to the inspecting parties before performing any test.

Three copies of all test results shall be submitted to the Client in A4 size sheet paper within two weeks after completion of the tests.

Tests described hereinafter and including all tests prescribed by the Authority having jurisdiction shall be carried out. Any tests proved unsatisfactory shall be repeated to the satisfaction of the inspecting parties.

The Contractor shall provide skilled technicians/engineer to commission the plant and associated controls to the satisfaction of the Client. The technicians/ engineers will be required to demonstrate the correct procedures in starting and stopping the plant, running the various items of equipment under automatic and manual control and the correct Maintenance of the plant.

Water flow rates of all equipment shall be adjusted to design conditions. Complete results of adjustments shall be recorded and submitted.

7.2 FACTORY TESTS

Main Switchboard

The following tests shall be performed in the presence of the Client representative:

- Inspection of switchboard including wiring, electrical and mechanical connections;
Mechanical tests;
- Primary and secondary injection tests to commission and calibrate all measuring,
- Protection and control circuits and associated components;
- Continuity and dielectric tests;
- Power frequency and pressure test;
- Functional check of all control wiring.

Valves, Cocks and Fittings

`Type-Test' and approval certificate for pressure test and compliance with the regulations laid down by the local Water Authority/Project Manager.

7.3 ~~ON-SITE TESTING AND COMMISSIONING~~

Two months prior to completion of the Contract Works, the Contractor shall liaise with the Main Contractor and the Electrical Contractors and submit for the Client's approval a detailed programme for conducting on-site acceptance tests and commissioning.

The Contractor shall start up, operate, test and adjust the systems in accordance with the agreed programme. The setting shall be supervised by the manufacturer's representative, who shall remain on site until the equipment is operating satisfactorily and accepted by the Client. The Contractor shall advise and co-ordinate with the manufacturer's representatives so that all testing is carried out according to the agreed programme.

The whole installation shall be given the following tests to bring the systems into running order. The Client shall be given reasonable notice together with a copy of recorded test results, generally not less than seven (7) days, regarding the nature of tests, the time and location. Acceptance tests will only be witnessed by the Client when the submitted tests results are found satisfactorily.

All instruments, tools, material and labour required to perform these tests shall be provided by this Contractor.

Before the tests are carried out, the Contractor shall remove connected equipment and components which are liable to damage under test, and shall provide and fix all the necessary gauges, blanking flanges, etc.

Prior to the system start-up, the following inspection, tests and pre-commissioning treatment shall be carried out by the Contractor:

i. Tanks and Level Switches

Check sides and edges of sectional tanks for distortion. The tanks shall be thoroughly cleaned with water and drained before city mains supply will feed in. Also before city mains supply will feed in, the level switch shall be simulated for the various cut-in and cut-out settings.

ii. Pressure Switches

The testing equipment arrangement for pressure switches and pressure gauges shall be as shown on the drawings or of an approved equivalent.

The pressure gauges to be tested shall be connected as shown on the drawing in lieu of the pressure switch. The gauges to be tested shall be regarded acceptable when the pressure readings of all three gauges are the same throughout the jacking pressure range varied by applying the hand pump.

iii. Hydrostatic Tests

All parts of the water circuit shall be filled with water before hydrostatic pressure testing, and pump running tests for verification of pressure and flow rate, are conducted.

The hand jacking pump shall be applied to increase the system pressure to 2 times the working pressure or 1.5 times the working pressure plus 3.5 bar whichever is the lower but in any case not less than 7 bar. The pressure shall be maintained for a period not less than 24 hours.

Where any section of pipework or equipment is found to be unable to withstand the maximum pipework test pressure, it shall be isolated during the pipework test then that section of pipework or equipment shall be made good and re-tested at the appropriate test pressure.

The working pressure for various systems shall be as shown on the drawings.

iv. House drains shall be hydrostatically tested to a water head of 1.2 m at the high end and not more than 2.4 at the low end and shall show no appreciable loss of water after elapse of two hours.

In every test, water used shall be left in the pipes until they are covered with earth or other trench filling material to a depth of at least 1 m over the top of pipes and until permission is given by the Client for the water to be released. If after the Client has approved the sewer pipeline and has given permission for the trenches to be refilled the pipes become damaged and loses water from any cause and/or admit subsoil water, the Contractor shall uncover the pipes and make good the defect made good and the pipes retested as before and all at the Contractor's expense.

v. Cleaning, Flushing and Pre-Treatment

Prior to start-up and hydraulic testing, the Contractor shall clean the entire installation including all fitments and pipework and the like after installation and keep them in a new condition. All pumping systems shall be flushed and drained at least once through to get rid of contaminating materials. All pipes shall be rodded to ensure clearance of debris, cleaning and flushing shall be carried out in sections as the installation becomes completed _____

All strainers shall be inspected and cleaned out or replaced.

When the entire systems are reasonably clean, a pre-treatment chemical shall be introduced and circulated for at least 8 hours. Warning signs shall be provided at all outlets during pre-treatment. The pre-treatment chemical shall:

- Remove oil, grease and foreign residue from the pipework and fittings;
- Pre-condition the metal surfaces to resist reaction with water or air;
- Establish an initial protective film;
- After pre-treatment, the system shall be drained and refilled with fresh water and left until the system is put into operation.
- Details and procedures of the pre-treatment shall be submitted to the Client for approval

vi. Electrical Tests

Electrical tests shall comply with the current edition of IEE regulations and requirements enforced by Local Authorities.

Electrical insulation tests earth electrode resistance test and cost amenity test shall apply to busbars, isolators and other equipment and wiring where applicable.

A 500V DC instrument shall be used to check the insulation resistance. The reading shall not be less than 1 mega-ohm in all instances.

Function simulation tests shall be performed to ensure that the systems have been installed to the control requirements as described in the Specification therein.

vii. Pump Drives

The direct coupling of the pump drives shall be dismantled before the pump motor control panel is energized.

The Contractor shall demonstrate to the Client of acceptable clearances of the coupling alignment for ensuring satisfactory power transmission.

The coupling shall not be re-mated again till the correct motor rotation has been demonstrated with power drawn from the energized pump motor control panel.

viii. Pump Operating Test

The Contractor shall ensure to the satisfaction of the Client that the installation or portion thereof which has been set to work complies with all requirements including the following:

That the plant and apparatus shall be of robust construction and of capacity for the duty specified.

That all valves, switches, controls and the like are properly regulated and capable of proper operation and in the case of valves are capable of being shut-off.

That all apparatus shall be silent.

That all instruments are correctly calibrated and read accurately. That all services are tested in accordance with the details of the relevant clauses of this Specification.

7.4 STATUTORY AUTHORITIES' TESTS AND INSPECTIONS

As and when notified in writing or instructed by the Client, the Contractor shall submit shop drawing and attend all tests and inspections carried out by Local Pollution Control Board Authorities, Water Authority and other Statutory Authorities, and shall forthwith execute free of charge any rectification work ordered by the Client as a result of such tests and inspections where these indicate non-compliance with Statutory Regulations. Some of these tests may take place after the issue of Practical Completion of the Main Contract and the Contractor shall make all allowances in this respect.

The Contractor shall be responsible for the submission of all necessary forms and shop drawings to the Statutory Authorities which shall conform in layout to the latest architectural plans submitted to and kept by these Authorities.

The submission shall comply with the requirements set forth in the current Codes of Practice and circular letters of the Statutory Authorities. The shop drawings to be submitted shall be forwarded to the Client for checking before submission. The Contractor shall allow for at least two submissions of complete sets of shop drawings to the Authorities, one to be made within six months after the award of the Contract but not less than six weeks before the inspection. The Client may at his discretion instruct the Contractor for additional submissions to the Local Authorities whenever necessary.

The Contractor shall notify the Client at least seven days in advance of his application for local Authority tests and inspections. On receipt of a confirmed date for test and inspection the Contractor shall inform the Client without delay.

7.5 PRELIMINARY COMMISSIONING CHECKS

Ensure that all equipment is thoroughly cleaned, lubricated and checked for serviceability before setting to work. Particular attention is drawn to the removal of building debris from the pipework systems.

Special attention is drawn to the need for thoroughly flushing out all pipework systems to ensure that all foreign matter is removed.

All automatic controls and safety devices shall be inspected and checked for service ability before the working fluid or electricity is applied to the system.

7.6 COMMISSIONING

When the various installations have been completed and the preliminary commissioning checks carried out, the Contractor shall set to work, regulate and calibrate all system in the entire installation. Special attention shall be paid to the following items:

That all valves, switches, controls, etc. are regulated and capable of proper operation and in the case of isolation valves that they are capable of tight shut off.

That all apparatus is silent in accordance with the requirements of this Specification.

That all instruments are correctly calibrated and read accurately.

That all services are tested in accordance with the details in the relevant clauses of this Specification.

Operate pumps, pressure reducing sets, etc. to ensure that all control systems are functioning correctly and are properly set, sequenced or interlocked.

7.7 FINAL ACCEPTANCE TESTS

Following commissioning and inspection of the entire installation, and prior to issue of the Completion Certificate, the Contractor shall carry out final acceptance tests in accordance with a programme to be agreed with the Client.

Should the results of the acceptance tests show that plant, systems and/or equipment fail to perform to the efficiencies or other performance figures as given in this Specification, the contractor shall adjust, modify and if necessary replace the equipment without further payment in order that the required performance is obtained.

Where acceptance tests are required by the relevant Authorities having jurisdiction, these tests shall be carried out by the Contractor prior to the issue of Completion Certificate to the acceptance of the Authorities.

7.8 REJECTION OF PLANT

Any item of plant or system or component which fails to comply with the requirements of this specification in any respect whatsoever at any stage of manufacture, test, erection or on completion at site may be rejected by the Client either in whole or in part as he considers necessary/appropriate. Adjustment and/or modification work as required by the Client so as to comply with the Authority's requirements and the intent of the Specification shall be carried out by the Contractor at his own expense and to the satisfaction of the Authority/Client.

After works have been accepted, the Contractor may be required to carry out assist in carrying out additional performance tests as reasonably required by the Client/Employer.

7.9 WARRANTY AND HANDOVER

The Contractor shall warrant that all plant, materials and equipment supplied and all workmanship performed by him to be free from defects of whatsoever nature before handover to the Employer.

7.10 HANDING OVER OF DOCUMENTS

All testing and commissioning shall be done by the Contractor to the entire satisfaction of the Project Manager and all testing and commissioning documents shall be handed over to the Project Manager. The Contractor shall also hand over all maintenance and operation manuals, all certificates and all other documentation as per the terms of the contract to the Project Manager.

8. PLANT OPERATION AND MAINTAINENCE

The contractor shall operate the plant, maintain the same as required on round the clock basis and achieve the required treated waste results for a period of 6 (Six) months from the date of commissioning and handing over at his own responsibility.

The contractor shall provide at least the following skilled and experienced staff
1 operator per shift
1 supervisor / Chemist

Chart for man power to be deployed for operation and maintenance should be enclosed with the offer.

During this period the contractor shall also train client's personnel in operation and maintaining the plant.

The bidder should include with his offer a list of consumables including first fill of chemicals, lubricants etc. indicating quantities thereof. Costs of first fill is to be included in the price for supply, delivery, installation, testing, commissioning and handing over of the plant. Subsequent requirement of chemicals and any other indispensable consumables will be included in operation and maintenance charges for plant operation.

The bidder shall furnish a list of essential spares for 2 years operation as recommended by him.

Bidders should indicate expected monthly consumption of electrical power and all consumables which are to be Guaranteed within $\pm 10\%$ variation.

Electricity for operation and maintenance will be supplied free of cost by client.

The bidder during the operation under his responsibility, shall effect the necessary systematic analyses and shall register every extra ordinary event or action which has taken place (repairs, maintenance of equipment, etc.)

Preparation of Monthly Analysis Report, which gives the comments on the overall performance of treatment plant and the quality of the treated effluent. Suggestions if any needed, regarding the remedial measures required to be taken for the efficient operation and maintenance of the plant shall be incorporated in these report.

Separate record shall be maintained of every extra ordinary event or action which has taken place (repairs, maintenance, replacements etc. of equipment).

9. APPROXIMATE CONSUMPTION / COSTS

a) Chemical Consumption

Sr. No	Chemical	Concentration % or PPM	Approx. Dosing Rate lph	Approx. Consumption Kgs/day	Approx. Unit Rate Rs.	Approx. Cost Per day Rs.
1.	Hypochlorite					
2.						
	Total					

Bidders are required to indicate cost of the chemicals based on current prices including all duties & taxes.

Performance tests of the plant will include but not be limited to carrying out such test as necessary to determine chemical consumption for the design effluent flow rate.

b) Electrical Energy Costs

Sr. No.	Equipment	KW/HP Connected	KW/HP Working	Working Hours Per day	KW/day
	Total				
	Total Cost/Day @ Rs. /kw.hr.				

10. DRAWINGS & DOCUMENTS TO BE INCLUDED WITH BIDDERS' OFFER

A) Drawings

1. Technical specifications of the units
2. P & I Diagram for scheme.
3. General Arrangement of Treatment Plant Layout, with hydraulic flow diagram.
4. General Arrangement drawing showing major dimensions and technical data for mechanical equipment.
5. Single Line Diagram & Control wiring drawing for control panel.
6. A list of essential spares for 1 year operation

B) Documents

1. Time schedule for completion of works.
2. Chart for man power to be deployed for operation and maintenance of plant.
3. List of similar works of similar magnitudes completed and operating satisfactorily.

11. REMARKS OF THE BIDDER (IF ANY)

12. BILL OF QUANTITIES

Item No.	Description	Qty.	Unit	Rate Rs/-	Amount Rs/-
A.	MECHANICAL EQUIPMENTS				
	Design, supply, delivery, testing, erection and commissioning of the following equipment conforming to technical specifications and technical data sheets attached herewith :				
1	Medium bar screen & 'V' notch plates as specified in technical specification and technical data sheets.	1	Set		
2	Air Blowers including all accessories, common base frame suction filter, suction silencer, safety valve V-Belt, V- Belt guard drive and driven pulley electric motors, interconnecting piping etc. complete (B1, B2) for Effluent sump and Bio reactor tank.	2	Nos.		
3	Coarse bubble aeration grid as specified in technical specifications and technical data sheets for tanks SW-1	2	Set		
4	Effluent Transfer pumps as specified in technical specifications and technical data sheets.	3	Nos.		
5	Diffused aeration grid as specified in technical specifications and technical data sheets AT-1	1	Set		
6	Secondary clarifier mechanism Top, Centre feed with fixed bridge. As specified in technical specifications and technical data sheets. SST-1	1	Nos.		
7	Sludge recirculation pumps as specified in technical specifications and technical data sheets (SRP1, SRP2)	3	Nos.		
8	Sludge Tank Mixer as specified in technical specifications and technical data sheets for sludge tank. AG-1	1	Nos.		

9	Sludge Feed pumps, as specified in technical specifications and technical data sheets (SFP1, SFP2)	2	Nos.		
10	Sludge Dewatering Equipment as specified in technical specifications and technical data sheets. SDE-1	1	Nos.		
11	Filter feed pumps. Horizontal, centrifugal, non-clog type as specified in technical specification and technical data	3	Nos.		
12	Pressure Sand Filter as specified in technical specifications and technical data sheets complete with frontal piping valves, instruments, etc. PSF – 1	1	No.		
13	Activated carbon filter as specified in technical specifications & technical data sheets with frontal piping valves, instruments, etc. ACF – 1	1	No.		
14	Urea Dosing System as specified in technical specifications & technical data sheets	1	No.		
15	DAP Dosing System as specified in technical specifications & technical data sheets	1	No.		
16	Hypochlorite Dosing System as specified in technical specifications & technical data sheets	1	No.		
17	Treated water transfer pumps, Horizontal, centrifugal, non-clog type as specified in technical specification and technical data	3	Nos.		
	TOTAL "A"				

Item No.	Description	Qty.	Unit	Rate Rs/-	Amount Rs/-
B.	INSTRUMENTATION WORK				
1.	Flow Meter	2	Nos.		
2.	Pressure gauges – as required	12	Nos.		
3.	Automatic level switch / controller including control cabling all complete as specified.	3	Sets		
	TOTAL "B"				

Item No.	Description	Qty.	Unit	Rate Rs/-	Amount Rs/-
C.	PIPING WORK				
	Interconnecting pipe work complete with all accessories including painting with 2 coats of antirust primer and 2 coats of enamel paint and touch up after installation as required, necessary arrow marks and description on pipes for direction of flow and pipe content, necessary intermediate supports, etc. complete as described in technical specifications	1	Lot		
	Mild Steel Pipes				
	15 NB	QRO			
	25 NB	QRO			
	40 NB	QRO			
	50 NB	QRO			
	80 NB	QRO			
	100 NB	QRO			
	150 NB	QRO			
	200 NB	QRO			
	CI Pipes				
	80 NB	QRO			
	100 NB	QRO			
	150 NB	QRO			
	200 NB	QRO			
	SS pipes				
	15 NB	QRO			
	20 NB	QRO			
	25 NB	QRO			

HDPE pipes				
20 mm OD	QRO			
25 mm OD	QRO			
32 mm OD	QRO			
40 mm OD	QRO			
50 mm OD	QRO			
90 mm OD	QRO			
125 mm OD	QRO			
PVC pipes				
90 mm OD	QRO			
125 mm OD	QRO			
230 mm OD	QRO			
300 mm OD	QRO			
Total : "C"				

Item No.	Description	Qty.	Unit	Rate Rs/-	Amount Rs/-
D.	ELECTRICAL WORK Motor Control Centre As per technical specifications, and single line diagram enclosed complete with all electrical fittings and cabling (power supply 1 & control cables) work, cable trays, earthing, etc. complete within battery lines.		Set		
	TOTAL "D"				

13. SUMMARY OF COSTS

Sr. No.	Description	Amount
1.	Total cost of mechanical equipments	Rs.
2.	Total cost of pipe work	Rs.
3.	Total cost of instrumentation	Rs.
4.	Total cost of electrical work	Rs.
A.	Total : (1 to 4)	Rs.

Figure in words Rs. _____

B.	Total estimated cost of civil works:	Rs.
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Figure in words Rs. _____

C.	Operation and maintenance of plant for Six (6) month after successful commissioning	Rs.
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Figure in words Rs. _____