



कर्मचारी राज्य बीमा निगम अस्पताल ,पीन्या
EMPLOYEES' STATE INSURANCE CORPORATION HOSPITAL PEENYA
(श्रम एवं रोजगार मंत्रालय ,भारत सरकार के अधीन((Under Ministry of Labour & Employment, Govt. of India)
सर्वे सं ,1-55-11.पलॉट सं5 ,1.वां मेन रोड़) एफ.टी.आई .कैंपस ,(यशवंतपुर सबर्ब,
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यशवंतपुर पो.ऑ .बेंगलुरु.022 560- /Yeshwanthapur P.O., BENGALURU-560 022.
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492/W/17/11/2016-17/STP-ETP

05.05.2017

**E-TENDER FOR REJUVENATING, REPAIR, OPERATION & MAINTENANCE OF STP & ETP AT ESIC HOSPITAL,
PEENYA, BENGALURU- 560 022**

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492/W/17/11/2016-17/STP-ETP

05.05.2017

क.रा.बी.नि. अस्पताल, पीन्या, बेंगलूर -560 022 में सीवेज उपचार संयंत्र (एसटीपी -45 केएलडी) और
ईफ्लुएंट उपचार संयंत्र (ईटीपी -10 केएलडी) की मरम्मत, संचालन और रखरखाव के लिए ई-टेंडर नोटिस
**E-TENDER NOTICE FOR REPAIR, OPERATION AND MAINTENANCE OF SEWAGE TREATMENT PLANT (STP-45
KLD) & EFFLUENT TREATMENT PLANT (ETP-10 KLD) AT ESIC HOSPITAL, PEENYA, BENGALURU-560 022**

कराबीनि अस्पताल-पीन्या, बेंगलूर में सीवेज उपचार संयंत्र (एसटीपी -45 केएलडी) और एफ्लुएंट उपचार संयंत्र (ईटीपी -10 केएलडी) के जीर्णोद्धार, मरम्मत, संचालन और रखरखाव के लिए दो-बोली के तहत "ई" खरीद समाधान के माध्यम से ई-निविदाएं आमंत्रित की जाती हैं।

E-tenders under two-bid system are invited from eligible Contractors for rejuvenating, repair, operation and maintenance of Sewage Treatment Plant (STP-45 KLD) and Effluent Treatment Plant (ETP-10 KLD) at ESIC Hospital-Peenya, Bengaluru through "e" procurement solutions.

1. ई-निविदा अपलोड करने की अंतिम तिथि/Last date for Uploading of e-Tenders: 05.06.2017 (by 4.00 p.m.)
2. पूर्व-बोली बैठक/Pre-bid Meeting: 15.05.2017 (10.30 a.m.)
3. तकनीकी बोली खोलने की तिथि/Date of opening of Technical Bids: 06.06.2017 (10.00a.m.)
4. कार्य की अनुमानित लागत/Estimated cost of work: Rs.16,00,000/-(Approx.)

इच्छुक निविदाकारों को क्लास-III बी डिजिटल हस्ताक्षर प्रमाण-पत्र प्राप्त करना चाहिए और स्वयं को <https://esictenders.eproc.in> पर पंजीकृत करना चाहिए। ई-निविदा प्रक्रिया के लिए संबंधित निर्देशों और हेल्पडेस्क संपर्क नंबरों के साथ निविदा दस्तावेज, कर्मचारी राज्य बीमा निगम की वेबसाइट www.esic.nic.in, www.esickar.gov.in, और www.esichospitals.gov.in/Bengaluru/peenya/home पर देखने के लिए उपलब्ध हैं।

The interested tenderers should obtain Class-III B Digital Signature Certificates and register themselves at <https://esictenders.eproc.in>. Tender documents with related instructions and Helpdesk Contact numbers for the e-tender process are available for viewing on the website of Employees' State Insurance Corporation i.e., www.esic.nic.in, www.esickar.gov.in, and www.esichospitals.gov.in/Bengaluru/peenya/home.

हस्ता/- Sd/-

चिकित्सा अधीक्षक

Medical Superintendent

स्थान/Place: Bengaluru

दिनांक/Date: 05-05-2017.

INTRODUCTION:

E-Tenders are invited from experienced Firms/Agency/Contractors in the prescribed format for Rejuvenating, Repair, Operation & Maintenance of Sewage Treatment Plant(STP-45 KLD) and Effluent Treatment Plant (ETP-10 KLD) at ESIC Hospital, Peenya, Bengaluru 560 022. The ESIC Hospital, Peenya is a hundred bedded hospital run by the Employees State Insurance Corporation which is a statutory body under the Ministry of Labour and Employment, Government of India.

The work under tender relates to repair and rejuvenation of the Sewage Treatment Plant and the Effluent treatment plant of the hospital and also the operation and maintenance of the Plant for a period of one(1) year renewable for another one year. The operation and maintenance includes deployment of manpower for three(3) shifts and also the services of maintenance of the various parameters and tests for the STP and ETP, Generators(2× 1000 KW) and Laundry Boilers including the disposal of wastes generated by these Plants and equipment as specified by the Karnataka State Pollution Control Board(KSPCB) either through a tie-up certified Laboratory or by setting up of the facilities for such tests and disposal under the supervision of a certified and qualified professional in the field of Pollution Control.

Name of the Work	Rejuvenating, Repair, operation and maintenance of Sewage Treatment Plant (45-KLD) and Effluent Treatment Plant (ETP-10 KLD) at ESIC Hospital-Peenya, Bengaluru-22.
Duration of Work	One Year (extendable by another one year)
Bid Processing Fee	Rs.2495/- (to be paid in the form of Demand Draft to M/s C1 India Pvt Ltd payable at New Delhi)
Value of Tender	Rs.16,00,000/- (Approx.) (Rupees Sixteen Lakhs only)
Earnest Money Deposit(EMD)	Rs.50,000(Rupees Fifty Thousand only)
Date of issue of e-tender applications	05.05.2017 (online)
Last date for uploading of completely filled tender applications	05.06.2017, 1600 Hours
Date and Time of opening of Tender(Technical Bid)	* 06.06.2017, 1000 hours (online)
Date and Time of opening of Tender(Financial Bid)	* Will be communicated through suitable media after completion of Technical bid analysis.

Note: *In case the said date/s, happen to be a holiday for any reason, the activity will be held on the immediate next working day at the same time & place & as a consequence any change/s in the date/s of the subsequent activities will be informed through suitable media to all concerned.

Selection of the agency will be at the sole discretion of the competent authority of the ESIC who reserves its right to accept or reject any or all the proposals.

The tender documents for the above work can be downloaded from www.esictenders.eproc.in and can also be viewed at www.esickar.gov.in or www.esic.nic.in or <http://www.esichospitals.gov.in/bengaluru-peenya-home>.

CHAPTER-1: INSTRUCTION TO BIDDERS

1. E-Tenders are invited from experienced Firms/Agency/Contractors in the prescribed format for Rejuvenating, Repair, Operation & Maintenance of Sewage Treatment Plant(STP-45 KLD) and Effluent Treatment Plant (ETP-10 KLD) at ESIC Hospital, Peenya, Bengaluru 560 022. The work is to be completed within two(2) months from the date of issue of the work order. The work of operation and maintenance of the STP and ETP will commence from the date of issue of completion certificate of the repair work by the appropriate authority of ESIC Hospital, Peenya.
2. **Bids for the tender will be accepted only online** through www.esictenders.eproc.in and no manual tender applications will be accepted. Any manual application received will be summarily rejected.
3. **Eligibility Criteria:**
 - (a) The Tenderer should have a Registered Office/Registered Branch Office in Bengaluru.
 - (b) The tenderer should have a minimum of three years' experience. Medical Superintendent reserves the right to modify or relax the eligibility criteria in case sufficient numbers of the Bidders are unable to fulfill the required criteria. No relaxation will be given as far as statutory requirements are concerned.
 - (c) The Bidder should be at least a B-Class contractor certified by the Govt of Karnataka or any other Central Govt authority for Civil works and should have carried out similar **three or more works** amounting to at least Rs.10,00,000/-(Rupees Ten lakhs only) during the past three years.
 - (d) The bidder should also have an establishment licence for deployment of manpower from the appropriate Labour Department or obtain such licence before commencement of the work.
 - (e) The annual turnover of the Contractor should be at least Rs.50,00,000/-(Rupees Fifty Lakhs only) during each of the past three financial years and supported by the audited Balance sheet and Income tax return.
 - (f) The Contractor should fulfil the various statutory criteria and fill up the information as specified in the Technical Bid under Chapter-4 along with supporting documents specified therein.
4. **Bid Security/Earnest Money Deposit(EMD)**
 - (a) The **last date for receipt of EMD** at ESIC Hospital Peenya is 05.06.2017 (The EMD of Rs.50,000/- in the form of Demand Draft(of any Scheduled Bank) drawn in favour of "ESI Fund A/c No.1" payable at Bengaluru should be dropped in the box placed at PMD Branch, ESIC Hospital, Peenya or sent to "The Deputy Director, PMD Branch, ESIC Hospital-Peenya, Plot No.1, 5th Main Road, Behind FTI Campus, Yeshwanthpur Industrial Suburb, Bengaluru-560022" in a closed cover superscribed as "EMD- Tender Repair, Operation and Maintenance of STP & ETP at ESIC Hospital-Peenya").
 - (b) EMD shall remain valid for of 30 days beyond the final validity period of bids (90 days).
 - (c) A bid received without Bid security (EMD) shall be rejected at the bid opening stage.
 - (d) The earnest money deposit (EMD) shall be refunded to the unsuccessful Tenderers after finalization of the Tender process.

- (e) It shall be refunded to the successful Tenderer on receipt of Security deposit or shall be allowed to be adjusted towards Security Deposit.
- (f) No interest is payable on the EMD.
- (g) The bid security may be forfeited:
 - (i) If a bidder withdraws his bid during the specified period of bid validity specified in the bid document.
 - (ii) In the case of successful bidder, if the bidder fails to:
 - Accept the offer of contract
 - Submit the surety bond after awarding of the contract.
 - Furnish the performance security within the time specified in the document.

5. E-tender Procedures and helpdesk: All bidders are to submit their bids and documents through online. The instructions relating to **e-tender procedures and the Helpdesk** for inquiries are given below.

- i) All bidders/contractors are required to procure Class-IIIB Digital Signature Certificate (DSC) with both DSC components i.e., signing & encryption to participate in the E-Tenders.
- ii) Bidder should get Registered at <https://esictenders.eproc.in>
- iii) Bidder needs to submit Bid Processing Fee charges of Rs.2,495/- (non-refundable) in the form of Demand Draft from any scheduled bank, in favour of M/s. C1 India Private Limited payable at New Delhi for participating in the tender.
- iv) Along with the Demand Draft, Bidder needs to send a covering letter mentioning about the payment details, company Name, Address, Payment towards ESIC Bid Processing Fees (Mention the Tender ID and Tender Title).
- v) The payment should reach at the below mentioned address, one day before the due date and time of Bid submission:

Kind Attn: Mr.Mohit Chauhan,
C1 India Private Limited,
301, Gulf Petro Chem Building, 1st Floor,
Udyog Vihar, Phase-2,
Gurgaon, Haryana – 122015.

Note: Payment will be approved only after physical receipt of Demand Draft.

HELP DESK NUMBERS

**HELPDESK NUMBERS ARE OPEN BETWEEN 09:30 HRS TO 18:00HRS IST
MONDAY TO FRIDAY (Exclusions:HOLIDAYS)**

Please email your issues at esichelpdesk@c1india.com before you call helpdesk.

Contact Nos. and email IDs of helpdesk officers

Name	E-mail ID	Phone Number
1. Mr. Elavarasan Raghunathan	elavarasan.raghunathan@c1india.com	022-66865600/10/11/ +91-8655995550
2. Ms. Anjali Thombare	anjali.thombare@c1india.com	+91-022-66865600/10/ 11
3. Mr. Ashish Kumar	ashish.kumar@c1india.com	+91-0124-4302035/ +91-9971556555
4. Mr. Vijay Kalra	vijay.kalra@c1india.com	+91-0124-4302034/ +91-9711770455
5. Mr. Saurav Gautam	saurav.gautam@c1india.com	+91-124-4302037/ +91-9911874555
6. Mr. Partha Ghosh	Partha.ghosh@c1india.com	+91-8811093299
7. Mr. Mohit Chauhan (payment related queries only)	Mohit.chauhan@c1india.com	+91-124-4302033

For Escalations contact

Sl. No.	Name	E-Mail
1	Mr. Ashish Goel	ashish.goel@c1india.com
2	Mr. Nimesh Bhardwaj	nimesh.bhardwaj@c1india.com
3	Mr. Achal Garg	achal.garg@c1india.com

6. Submission of Bids: All bidders are to upload their bids online at <https://esictenders.eproc.in>. The

documents to be uploaded and instructions in this regard are as below:

(a) **Technical Bid** (as per Form in Chapter-4) duly filled and signed. The technical bid should be supported by all **documents marked “*”** (asterisk sign) in the Technical bid Form and serially numbered as per the Serial numbers in the Bid form.

(b) **Financial Bid** (as per Form in Chapter-5) duly filled and signed. The Financial Bid should be accompanied by the **declaration in Annexure-A** duly filled and signed.

(c) All the pages of the Bid Forms and supporting documents should be self-attested.

7. All the entries/documents submitted in the bid must be legible and filled clearly and self-attested along with the seal of the firm. Any overwriting which is unavoidable shall be attested by the Authorized Signatory failing which the bid will to be liable to be rejected.

8. Deadline for submission of bids:

(a) The last date for online submission of tender is 05-06-2017 (1600 Hours).

(b) The **last date for receipt of EMD** at ESIC Hospital Peenya is 06-06-2017.

(c) The Medical Superintendent, ESIC Hospital, Peenya, Bengaluru - 22, may, at his/her discretion, extend the deadline for submission of bids or call for re-tender in case sufficient bids are not received. In such case, the financial bids for the valid Technical bids received will be considered for the re-tender.

9 Bid Opening and Evaluation

(a) The bid shall be opened online by the Officers authorized by the Medical Superintendent at **1000 Hrs on 06-06-2017** in the Conference Hall, 1st Floor, ESIC Hospital Peenya, in the presence of the bidders or their representatives duly authorized by the bidder who wish to be present.

(b) All the bids will be scrutinized, relevant documents will be checked for their eligibility.

(c) The tenderers whose technical bids are accepted will be informed about the date of the opening of financial bids.

10 Contacting Officials:

(a) No bidder shall try to influence the Hospital administration on any matter relating to its bid, from the time of the bid opening till the time contract is awarded.

(b) Any effort by the bidder to influence the Hospital administration in the bid evaluation, bid comparison or contract award decision shall result in the rejection of the bid.

(c) Any doubts on the tender may be placed for clarification during the Pre-bid meeting.

11 No Tenderer will be allowed to withdraw after submission of the tenders within the bid validity period otherwise the EMD submitted by the tendering firm would stand forfeited.

12 Tenders received and found deficient on account of registrations, documents or any required information are liable to be summarily rejected.

13 The Tenders from Individual/Firm/Organization including its Partners/ Shareholders/ Directors who have been blacklisted/prosecuted by any departments/statutory bodies in any State or by any Court of Law, shall not be entertained.

- 14** Each bidder shall submit only one tender either by himself or as a partner in joint venture or as a member of consortium. If a bidder or if any of the partners in a joint venture or any one of the members of the consortium participate in more than one bid, their bids are liable to be rejected.
- 15** The bidder shall submit full details of his Agency / firm or, if the bidder is proprietor / partnership or a Private Limited Company, full details of ownership and name of the Directors. If the bidder is a Registered Company / partnership of two or more persons, all such persons shall be jointly and severally liable to the Hospital for the fulfilment of the terms of the contract. Such persons shall designate one of them to act as authorized signatory with authority to sign. The Company / partnership shall not be altered without the approval of the Hospital authority.
- 16** The bidder is expected to examine all instructions, Forms, Terms and conditions in the tender document. Failure to furnish all information required by the tender document or submission of a tender not substantially responsive to the tender document in every respect will be at the bidder's risk and may result in rejection of his bid.
- 17** All the information as required in the tender document should be filled up in the relevant part and no column should be left unfilled. An incomplete tender document or tender document submitted without tender fee (if applicable) and earnest money deposit (EMD) will be summarily rejected.
- 18** Tenderer signing the tender must clearly specify whether he is signing as sole proprietor, partner, under power of attorney or as Director/Manager/Secretary etc., as the case may be.
- 19** Non transferability : This tender is non transferable
- 20** Any conditional acceptance is liable for rejection of tender.
- 21** The Medical Superintendent, ESIC Hospital, Peenya, Bengaluru – 22 reserves the right to accept or reject any bid including the lowest and to annul the bidding process and reject all bids, at any time prior to award of contract, without thereby incurring any liability to the affected bidder or bidders or any obligation to inform the affected bidder or bidders of the grounds for the said action
- 22** The Medical Superintendent, ESIC Hospital, Peenya, Bengaluru – 22 reserves the right to accept or reject any bid including the lowest and to annul the bidding process and reject all bids, at any time prior to award of contract, without thereby incurring any liability to the affected bidder or bidders or any obligation to inform the affected bidder or bidders of the grounds for the said action.
- 23** The Medical Superintendent, ESIC Hospital, Peenya, Bengaluru-22 will award the contract to the successful evaluated bidder whose bid found to be responsive and who is eligible and qualified to perform the contract satisfactorily as per the terms and conditions incorporated in the bidding document.
- 24** The Medical Superintendent, ESIC Hospital, Peenya, Bengaluru will award the contract to the successful evaluated bidder whose bid found to be responsive and who is eligible and qualified to perform the contract satisfactorily as per the terms and conditions incorporated in the bidding document.
- 25** The Contractor who has quoted the least Grand total in the Financial bid shall be considered as the

lowest tenderer. The rates for each and every item shall be quoted in figure and words. In case of any discrepancy in rates, the rates written in words shall prevail and stand valid. The rates quoted shall be firm and fixed and are inclusive of cost of manpower, material, tools and plants, etc, all taxes (including service tax), duties and levies, insurance, etc. No escalation of whatsoever nature shall be payable thereafter.

- 26 In case more than one bid quoting the same rates are received, the award of the contract will be decided on the basis of evaluation by committee constituted by the Medical Superintendent, ESIC Hospital, Peenya, Bengaluru. The committee shall decide after verifying the premises, infrastructure, facility and years of experience etc.
- 27 The successful bidder will be informed by Registered post/e-Mail that his bid has been accepted.
- 28 The successful bidder will be required to execute an agreement within a period of 15 days from the date of issue of Letter of Award until extended by the Medical Superintendent, ESIC Hospital, Peenya, Bengaluru up to a maximum of another two weeks in a non-judicial stamp paper and all the expenditure in this regard should be borne by the bidder.
- 29 The successful bidder shall be required to furnish a Performance Security within 15 days of receipt of "Letter of Award" for an amount of **Rs. 1,00,000 (Rs One lakh only)** in the form of Demand Draft from a Scheduled / commercial bank drawn in favour of "**ESIC Fund A/c No -1**", payable at Bengaluru or in the form of an unconditional Bank Guarantee from a Scheduled bank in the format approved by ESIC. The successful bidder can also apportion the Earnest Money towards the security deposit subject to payment of the balance amount. The Performance Security / Security Deposit shall be returned within two months after the expiry of contract and completion of all contractual obligations. In case the contract period is extended further, the validity of Performance Security shall stand automatically extended.
- 30 This Security deposit will not bear any interest whatsoever.
- 31 Each page of the Tender document should be signed and stamped by authorized representative of Tenderer in acceptance of the terms and conditions laid down by ESIC.
- 32 Tender containing false, misleading information will be rejected and may also be liable for consequences for submitting false information.
33. The Medical Superintendent, ESIC Hospital, Peenya, Bengaluru does not bind himself to accept the lowest or any tender and reserves the right to accept or reject any or all the tenders, either in whole or in part, without assigning any reasons for doing so.
34. Medical Superintendent may at his discretion, amend/modify the tender and/or extends the deadline for submission of tenders at any time prior to the last date for submission of Tenders. Medical Superintendent may for any reason at his own initiative modify the Tender documents by amendment and information thereof will be uploaded on Corporation's website and shall be binding on all concerned.
- 35.

The Financial bid will be scrutinized and comparison for lowest bid made on the basis of weightage accorded to the various types of service at **Column "E"** in order to arrive at a reasonable basis as different categories of services are sought to be compared.

- 36.** The competent authority reserves the right to withdraw/relax any of the terms and conditions mentioned above.
 - 37.** The Medical Superintendent, ESIC Hospital, Bangalore -22 is the Competent Authority to renew the contract or to terminate the contract.
 - 38.** All disputes relating to this tender can be legally resolved through Courts in Bangalore only.
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CHAPTER-2: GENERAL CONDITIONS OF CONTRACT

1. Definitions and interpretations:

- a) In the Contract (as hereinafter defined) the following words and expressions shall have the meanings hereby assigned to them except where the context otherwise requires.
- (i) “Employer”, means the ESIC Hospital, Peenya, Bengaluru and the legal successors in title to ESIC Hospital, Peenya, Bengaluru
 - (ii) “Engineer”, means the person appointed by ESIC as Engineer for the purposes of the contract.
 - (iii) “Contractor”, means an individual or firms (proprietary or partnership) whether incorporated or not, that has entered into contract (with the employer) and shall include his/its heirs, legal representatives, successors and assigns. Changes in the constitution of the firm, if any shall be immediately notified to the employer, in writing and approval obtained for continued performance of the contract.
- (b) (i) “Contract” means these conditions, the Specification, the Bill of Quantities, the Tender, the Letter of Acceptance, the Contract Agreement (if completed) and such further documents as may be expressly incorporation in the letter of Acceptance or Contract Agreement (if completed).
- (ii) “Specification”, means the specification of the works included in the Contract and any modification thereof.
 - (iii) “Drawings” means all the completion drawings, calculations and technical information of alike nature provided by the Engineer to be Contractor under the Contract and all drawings, calculations, samples, patterns, models, Repair and Repair and Maintenance manuals and other technical information of alike nature submitted by the Contractor and approved by the Engineer.
 - (iv) “Tender”, means the Contractor’s priced offer to the Employer for the execution and completion of the works and the remedying of any defects therein in accordance with the provisions of the Contract, as accepted by the Letter of Acceptance. The work Tender is synonymous with “Bid” and the words “Tender Documents”, with “Bidding Documents”.
 - (v) “Letter of Acceptance”, means the formal acceptance of the tender by Medical Superintendent.
 - (vi) “Contract Agreement”, means the contract agreement (if any) referred to in Sub Clause 6.
- (c) (i) “Commencement Date”, means the date upon which the Contractor receives the notice to commence the works.
- (ii) “Time for completion”, means the time period for which the contract of Rejuvenating, repairing, servicing and O & M of STP/ETP in ESIC Hospital, Peenya, Bengaluru.
- (d) “Taking over Certificate”, means a certificate issued by employer evidencing successful completion of the awarded work.
- (e) (i) “Contract Price”, means the sum stated in the Letter of Acceptance as payable to the Contractor for the execution and completion of the works and the remedying of any defects therein in accordance with the provisions of the Contract.

- (ii) "Retention Money" means the aggregate of all monies retained by the Employer.
- (f) (i) "Works" means the Permanent works and the Temporary Works or either of them to be executed in accordance with the contract.
- (ii) "Site", means the places provided by the Employer for repair and re-carpeting of roads at ESIC Hospital, Peenya, Bengaluru.
- (iii) "Cost", means all expenditure properly incurred or to be incurred, whether on or off the site, including overhead and other charges but does not include any allowances for profit.
2. Duties and Authority of the Engineer: The Engineer shall carry out the duties specified in the Contract and he has the full right to carry out the Laboratory test of material used in the work and the contractor has to carry out such test at his own cost (contractor cost) for which no claim shall be admissible by the ESIC Hospital, Peenya, Bengaluru.
3. Custody and Supply of Drawings and Documents: The Drawings shall remain in the sole custody of the employer/engineer, but copies as required thereof as per availability in the record shall be provided to the Contractor free solely for the purpose of this contract.
4. Sufficiency of Tender: The Contractor shall be deemed to have based his Tender on the data made available by the employer and on his own inspection and examination of the site conditions.
5. Engineer at Liberty to object: The Engineer shall be at liberty to object and require the contractor to remove forthwith from the Works any person provided by the Contractor who, in the opinion of the Engineer, misconducts himself, or is incompetent or negligent in the proper performance of his duties, or whose presence on site is otherwise considered by the Engineer to be undesirable, and such person shall not be again allowed upon the works without the consent of the Engineer. Any person so removed from the works shall be replaced as soon as possible by a qualified person approved by the Engineer in-charge.
6. Safety, Security and Protection for the Environment: The Contractor shall, throughout the execution and completion of the works and the remedying of any defects therein:
- (i) Have full regard for the safety of all persons entitled to be upon the Site and keep the Site (so far as the same is under his control) and the Works (so far as the same are not completed or occupied by the Employer) in an orderly state appropriate to the avoidance of danger to such persons, and
- (ii) Provide and maintain at his cost all lights, guards, fencing, warning signs and watching, when and where necessary or required, by the Engineer or by any duly constituted authority for the protection of the works or for the safety and convenience of the public or others, and
- (iii) Take all reasonable steps to protect the environment on and off the Site and to avoid damage or nuisance to persons or to property of the public or others resulting from pollution, noise or other causes arising as a consequent of his methods or Repair.
7. Insurance of work by the Contractor for his liability:
- (i) During the Repair and Maintenance period for loss or damage to property and life arising from a cause for which contractor is responsible.

- (ii) For loss or damage occasioned by the Contractor in the course of any repairs carried out by him for the purpose of complying with his obligations. It shall be the responsibility of the contractor to notify the Insurance Company of any change in the nature and extent of the works and to ensure the adequacy of the Insurance cover at all times during the period of contract.
8. Damage to Persons and Property: The contractor shall, except if and so far as the contract provides otherwise, indemnify the employer against all losses and claims in respect of:
- (a) Death of or injury to any person, or,
- (b) Loss or damage to any property (other than the works); which may arise out of or in consequence of the Repair and Maintenance of the works and the remedying of any defects therein, and against all claims, proceedings, damages costs, charges and expenses whatsoever in respect thereof.
9. Accident or injury to workmen: The employer shall not be liable for or in respect of any damages or compensation payable to any workman for death or injury resulting from any act or default of the contractor. The Contractor shall indemnify and keep indemnified the Employer against all such damages, compensation and expenses whatsoever in respect thereof or in relation thereto. The Contractor shall register all workers engaged in the work under the ESI Scheme and provide each worker with a valid ESIC Card before deployment.
10. Evidence and Terms of Insurance: The Contractor shall take out appropriate insurance to cover his work and workers and staff employed by him fully. The contractor shall provide evidence to the Engineer/Employer as soon as practicable after the respective insurance have been taken out but in any case prior to the start of work at the Site that insurance required under the Contract have been effected.
11. Compliance with Statutes, Regulations: The Contractor shall conform in all respects, including the filing of all notices and the paying of all fees, with the provision of:
- a. Any national or State Statute, ordinance, or other law, or any regulation, or bye-law of any local or other duly constituted authority in relation to the execution and completion of the works and the remedying of any defects therein, and
- b. The rules and regulations of all public bodies and companies whose property or rights are affected or may be affected in any way by the works, and the Contractor shall keep the Employer indemnified against all penalties and liability of every kind for breach of any such provision.
- c. It is mandatory for contractor to pay minimum wages as notified by appropriate government from time to time while submitting the bid the vendors are advised to take into consideration that the minimum wages are revised in every six months no escalation in the tender bid submitted by vendor will be accepted later on this account.
12. Time for completion: The time for completion of the above said work is two months from the issue of work order in respect of Part-A: Rejuvenation and repair of the STP and ETP. For Part-B: Operation and Maintenance of the STP and ETP, the period of Contract will be for a period of one(1) year from the date of issue of Completion certificate and extendable for another one year based satisfactory performance.

13. Extension of Time for Completion: The contract may be extended upon the consent of both the party (ESIC and Contractor firm), but the final decision will be taken by Medical Superintendent after evaluating the actual condition and the feedback received from the Engineer in-charge of work.
14. Defect identification and its rectifications: Agency shall immediately attend the defects and complaints noticed at site. Defect Liability period shall be 12 months from the date of completion of work under BOQ measurable works. The contractor shall rectify at his own expenses any defect in the work carried out by him during this period. On failure of the contractor to do so, the same shall be completed by the employer at the risk and cost of the contractor.
15. Liquidated damages for delay: If the Contractor fails to attend any complaint or defect in due course of time and if in the opinion of engineer delay is on the part of Contractor firm/agency, the employer can impose liquidated damages on the contractor as detailed in the particular conditions.
16. Contractor's Failure to carry out instruction: In case of default on the part of the Contractor in carrying out defect rectification works, the Medical Superintendent, ESIC Hospital, Peenya, Bengaluru shall be entitled to employ and pay other persons to carry out the same and if such work, in the opinion of the Engineer, the Contractor was liable to do at his own cost under the contract, then all costs including penalty for delay in attending to the complaint consequent thereon or incidental thereto shall be determined by the Engineer and shall be recoverable from the Contractor by the Employer, and may be deducted by the employer from any money due or become due to the contractor.
17. Instructions for Variations:
 - (a)Quantities given in the Scope of work are indicative only: The quantity of any particular item may vary to any extent. Variation in quantity in particular items or total exclusion of certain items of Scope of work/quantity would be considered for payment subject to be verified by engineer in-charge as per regulating norms which does not entitle to claim any extra cost.
 - (b) Notice to be given by the contractor for execution of planned works: It shall be the duty of the contractor to give notice of at least three working days for execution of planned civil works so as to check the quality of materials to be used. If no notice is given, the work executed will not be considered for payment.
18. Works to be measured: The Engineer shall determine by the measurement of the value of actual work done in accordance with the Contract and the Contractor shall be paid proportionately. Part rate shall be made for any part of BOQ items not fully executed. Engineer shall be at liberty to decide the breakup of lump sum items and to decide the part rate for any particular item.
19. Method of Measurement: The works shall be measured net, notwithstanding any general or local custom, except where otherwise provided in the contract.
20. The tenderers are advised to visit the site and other documents pertaining to the work and samples of materials by making prior appointment with the accepting officer giving sufficient time, tenderers shall be deemed to have full knowledge of all relevant documents, samples, site, etc., whether he/they have inspected them or not.
21. The Contractor shall visit the site to acquaint himself/ themselves with site/working conditions in detail prior to tendering and no claim will be entertained on the ground of ignorance or otherwise of the conditions under which the work shall have to be executed.

22. Submission of Bills: The Contractor shall submit a bill in 3 copies to the PMD Branch of ESIC Hospital, Peenya, Bengaluru on completion of the work and verification of the work by the Engineer. The bill should clearly indicate the expenditure incurred towards replacement of the parts/ spares and the amount incurred towards labour and other professional and supervisory charges.
23. Deduction of Income Tax: The amount to be deducted towards the advance income tax shall be at the rate applicable.
24. Bill Payments: After submission of bill complete in all respects by the Contractor, shall check the bill with the help of contractor and certify for payment within 15 days after the verification done by the Engineer In-charge of ESIC Hospital, Peenya, Bengaluru.
25. Performance Guarantee: Within two weeks of award of work, the Contractor shall submit the Performance Security money for proper performance of the contract in the format enclosed in Enclosure-III for an amount of 5% of the total estimated amount. The performance guarantee/security money shall be valid for the duration of the contract period plus 365 days (12 months) i.e., till completion of defect liability period plus sixty days. The performance security can be encashed by the Employer to recover any amount which is payable by the Contractor to the Employer on any account for a cause arising out of the contract.
26. Final Certificates: Within 28 days after receipt of the Final Statement, and the written discharge, the Engineer shall issue to the employer (with a copy to the Contractor). The work completion certificate will be issued by Engineer In-charge (authorised by the Medical Superintendent, ESIC Hospital, Peenya, Bengaluru) for the above stated work.
27. Default of Contractor: If the performance of the contract and is not satisfactory and not corrected within 15 days of receiving notice, then THE MEDICAL SUPERINTENDENT, ESIC HOSPITAL, PEENYA, BENGALURU shall be at liberty to terminate the contract and get the work executed through other means at the risk and cost of the Contractor.
28. Payment on Termination: In the event of termination of the contract, employer shall be at liberty to get balance work done at the risk and cost of the contractor and due payment of the contractor, if any, shall be released after the completion of whole of the works.
29. Amicable Settlement of Dispute: The party shall use their best efforts amicably all disputes arising out of or in connection this contract or the interpretation thereof.
30. Arbitration: Any dispute and differences relating to the meaning of the specifications, designs, drawings and instructions herein before mentioned and as to the quality of workmanship of materials used in the work or as to any other question, claim, right, matter or thing whatsoever in any way arising out of or relating to the contract, designs, drawings, specifications, estimates, instructions or these conditions or otherwise concerning the works or the execution or failure to execute the same whether arising during the progress of the work or after the completion or abandonment thereof in respect of which:-Amicable settlement has not been reached shall be referred to the Sole Arbitration of the Medical Superintendent, ESIC Hospital, Peenya, Bengaluru who shall proceed as per the Arbitration Act.
31. The work under the contract shall continue, during the Arbitration proceedings.
32. The award of the Arbitrator shall be final, conclusive and binding on both the parties.

33. JURISDICTION OF COURT: The courts at Bengaluru shall have the exclusive jurisdiction to try all disputes, if any, arising out of this agreement between the parties.
34. Particular conditions of contract: CPWD specifications shall be followed, where not available, BIS/Engineering practice as directed by the Engineer shall be followed.
35. As the work will have to be carried out in around the Hospital complex building and area in use the contractor shall ensure:-
- a. That the normal functioning of ESI Hospital Sec-8 is not effected as far as possible.
 - b. That the work is carried out in an orderly manner without noise and obstruction to flow of traffic.
 - c. That all waste, etc., is disposed off at the earliest and the place is left clean and orderly at the end of each day's work.
36. The Contractor shall ensure that his staff is qualified for their part of work. He shall be responsible for their conduct. The staff should behave in a courteous manner. The contractor is held responsible for any loss or damage to ESICH Section 8 property.
37. The contractor shall ensure safety of his workers and others at site of work and shall be responsible for any consequence arising out of execution of the rejuvenating, repairing, servicing and O & M of STP/ETP.
38. When instructed to do so, the contractor shall ensure proper record keeping and storing of irreparable/dismantled material.
39. Subletting the contract will not be permitted.
40. The tenders are required to take into account while quoting their rate, all factors including any fluctuation in the market rates, additional items that may be required for complete functioning of the plant not mentioned in the Price schedule or any additional labour input. No claim will be entertained on this account after acceptance of the tender or during the currency of the contract.
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CHAPTER-3: SCOPE OF WORK

PART-A: SCOPE OF WORK FOR REPAIR AND REJUVENATION OF STP AND ETP

1. The scope of work shall be subject to the General Conditions of Contract as mentioned in Chapter-2 of the Tender document and fulfilment of the parameters provided in Annexure-B.
2. The Sewage Treatment Plant(STP) and Effluent Treatment Plant(ETP) repair and rejuvenation under tender refers to the Plant located and functioning in the premises of ESIC Hospital, Peenya, Bengaluru. The objective is to repair the Plant in all respects and hand over the same in a condition that will fulfil the norms of the Karnataka State Pollution Control Board and any other statutory provisions in treatment of all Sewage and Effluent generated by the ESIC Hospital. The Contractor will be required to ensure and guarantee the running of the Plant as specified for at least one year and undertake further repairs immediately during the warranty period without affecting the normal functioning of the Plant.
3. The capacity and other technical details of the plant are as mentioned in Annexure-B.
4. Mode of measurements for all items of work shall be as per IS 1200 – Method of Measurement for Building and Civil Engineering Work and work to be carried out as per CPWD specification.
5. The contractor shall arrange all required materials, tools tackles, labour, transportation etc., at his own cost.
6. The contractors should supervise the working of personnel provided by him. The rate quoted should include element of supervision, etc. and no extra claim on this account whatsoever will be entertained at a later date.
7. Electricity & Construction water: Shall be made available to the contractor on the basis of availability of supply received and it's surplus.
8. Materials: ESIC shall reserve the right to reject any materials if it is found not in conformity with specification and terms and conditions of the order in all respect. The materials should be as per BIC specification.
9. Recovery & Rectification of work: In case contractor fails to attend the work within a week from the date of intimation, it shall be got rectified by the owner through another agency and money spent thus shall be recovered from the contractor.
10. Clean Up of Site Work: During service contract, the Contractor shall without any additional payment at all times keep the working and storage areas used by him, free from accumulation of waste materials or rubbish. Before completion of erection, he shall remove or dispose of in a satisfactory manner all excess materials, temporary structures, waste and debris and leave the premises in a condition satisfactory to ESIC.
11. Discharge of treated or untreated sewage or effluent outside the premises of the Hospital is not permissible and should be disposed as per KSPCB norms and supported by records to prove the same.
12. STP and ETP shall be fully revamped, serviced, recommissioned and handed over to the ESIC on delivering the treated water parameters with the tested sample of third party laboratory report from Government approved/ reputed laboratories.
13. The bid amount in Part-A of Financial Bid is inclusive of all listed replacements as well as unforeseen items arising during the execution of work for full functionality of the STP and ETP as per the required parameters and for which no additional claim will be entertained. The bidders will be permitted to conduct physical verification of the STP and ETP Plants between 9.00 am to 4.00 p.m. to facilitate fair assessment of the requirement of the work.
14. The repair and rejuvenation of the STP and ETP Plants are to be treated as "One Job" and **no escalation in cost or claim will be permitted over and above the amount quoted in Part-A of Chapter-4: Financial**

Bid. The bid amount will be inclusive of all major and minor replacements, repairs, servicing (inclusive of spares and parts), installation and commissioning; and labour charges for the STP & ETP Plants. The major replacements, repairs, servicing and installations to be carried out within the amount quoted under Part-A of the Financial Bid in Chapter-4 is as follows:

I. For Sewage Treatment Plant (STP-45 KLD):

a) Supply & installation of Raw Sewage Submersible pump of CRI make, Capacity 2.5 M3/Hr @ 10m head- 1(one) No.
b) Repair & Servicing of the existing pump, UPVC piping connection to the new pump as per the site condition.
c) Supply & installation of coarse bubble diffusers (5 Nos, size-80mm Diameter, Disc Type) and S & L Pipeline for collection tank.
d) Supply & installation of diffusers 8 Nos size 90mm x 1000mm long (Tube Type) & S & L of pipelines for aeration tanks 1&2.
e) Supplying & filling of sand: 425 kg sand for filter MOC:FRP Size:2472, Qty:1 No.
f) Supply & filling of Carbon-160kgs for Carbon Filter (Qty:1No., MOC:FRP, Size:2472)
g) Supply & application of Resin-425 litres and supply & installation of UPVC pipeline suited to the existing inlet for softener (MOC:FRP Size:3072, Qty:1 No.) and inlet and outlet UPVC Pipelines to be provided.
h) Servicing(inclusive of material) of filter feed pumps- 2 Nos. of Kirloskar Make Model: GMC 1.3
i) Servicing of Final pumps of Kirloskar Make (Qty: 4 Nos.)
j) Supplying of filter cloth of approved quality for filter press (Qty: 16 Nos.)
k) Servicing of Screw pumps of capacity: 1 M3/hr(2-Nos.); grooves and coils to be replaced.
l) Supply and installation of digital flow meter for analysing incoming/outgoing waste water at STP/ETP entry & exit (4-Nos.) with all fittings, fixtures, strainers and connections.
m) Disposal of raw sewage/sludge as per KSPCB norms during the period of work.
n) Replacement of damaged bar screen- 1 No.
o) FAB reactor with Chlorine contact tank, tube settler tank- entire assembly to be replaced with FAB medias. Tube settler media, with heavy Grade MS/GI Pipe inlet and out let connection, erecting and commission with necessary grouting, bolts and nuts complete- 1 Set
p) S & F 200 ltrs capacity heavy duty tank for chlorine dosage including suitable piping connection & Non return valve to ACF/SF and fixing the Pump with proper bedding- 1 No.
q) Out let Connection from chlorinated Tank to SF/ACF Medias by replacing the PVC pipe to MS Pipe-1No.
r) Recirculation Pipe of MS 50 MM dia to filter press with all fittings and fixtures- 1 No.
s) Softener to Final Tank 50 mm dia pipe to be provided with all fittings and fixtures, cleaning and servicing-1 No.
t) Brine tank to Softener suitable pipe connection to be provided and salt stirrer to be serviced including cleaning /servicing of brine tank -1 no.
u) Replacement of worn-out Pressure gauges seven Nos of standard quality and makes to be replaced-1 no.
v) Suction pipe line to final pumps one no with suitable length to be laid with foot valves, flanges, gaskets etc. and connecting to pumps-1 No.
w) Air Blowers 2 Nos to be serviced and replace the damaged existing valves-1 no.
x) Butter Fly valves 4 Nos to be repaired or replaced

II. For Effluent Treatment Plant (ETP-10 KLD):

Sl. No	Description of items	Nature of works to be carried out.	Qty
1	Effluent transfer pump	Motor Coil rewinding, servicing Required.	2 Nos
2	Transfer pump	Servicing including any spares.	2 Nos
3	Filter feeder press pump	Servicing including any spares.	2 Nos
4	Alum Dosing system	Servicing including any spares, dosage tank of 200 capacity with suitable pipe connection to pump.	1 No.
5	Polymer dosing system	Servicing including any spares, dosage tank 200 ltrs capacity of capacity With suitable pipe connection to pump.	1 No.
6	Enzyme dosing system	Servicing including any spares, dosage tank of 200 ltrs capacity with suitable type pipe connections to pump.	1 No.
7	Flash Mixer	Servicing including any spares and S& F PVC pipeline for inlet and out let to effluent Tank.	1 No.
8	Tilted plate separator	Servicing including any spares.	1 No.
9	Filter press	Servicing including any spares and epoxy painting Two coats	1 No.
10	Air blowers	Servicing including any spares	2 Nos.
11	Disposal of effluent/Sludge as per KSPCB Norms	One time during the period of contract	-
12	Bifurcation of STP and ETP feeder pipe	Providing and laying of 100 metres (19 approx.) length and 110 mm diameter heavy duty PVC pipes with all fittings and fixtures, with 2 (two) intermediate inspection chambers connected to ETP collection tank. This includes cutting of concrete road and excavation, making good the excavated road with concrete and testing of pipeline. Servicing of existing pumps(4-Nos) feeding the ETP with spares.	1 No.
13	Filter press inlet connection to ETP	S&F Pipe line (63 MM dia UPVC) to the existing Filter press inlet water connection to ETP tank with all fittings and fixtures complete	1 No.

PART-B: SCOPE OF WORK FOR OPERATION AND MAINTENANCE OF STP, ETP AT ESIC HOSPITAL, PEENYA

1. Operating Sewage pumping station and treatment Plant to maintain the quality of treated sewage within the standards prescribed in the tender, operate electrical equipment, centrifugal sludge drying and treat incoming sewage at prescribed standards through optimal dosing.
2. Carrying out daily cleaning of grit channels and removal of screenings and disposal of floating matter in grit dewatered sludge out of premises.
3. Carrying out continuous flow measurements of treated & untreated sewage and recording the same
4. Collecting samples of influent and effluent and analysing them daily to determine the quality of sewage and performance of the treatment plant.
5. Dewatering and de-silting of sludge sump, chlorination tank, chemical dosing tanks at least once in a year and disposal of silts.

6. Daily report of operation of the diffusers, agitators and other equipment at the STP Plants providing information on the quantity of treated, hours of operation equipment consumption of chemicals.
7. A daily report monitoring the quality of raw and treated sewage through the analysis of samples.
8. The contractor shall maintain all assets/work facilities/system of the authority throughout the contract period and shall handover the same in good working condition at the end of the contract. The contractor shall be fully responsible for making good the damages so caused by him entirely at his own cost.
9. The work involves operation in all the three shifts including operation of all connected pumps, valves etc., cleaning of all chambers,. Collection of cake from sludge chamber beds, stacking, etc.,
10. For testing of PH value, COD, BOD, TSS, TDS every day together with all chemicals required for various test, maintaining necessary registers, obtaining KSPCB certificate for the effluent, Aeration chamber, and treated water to be in conformity to the standards prescribed by KSPCB.
11. The pumps and motors required for operating STP/ETP requires periodical maintenance with consumables like grease, oil, pacing material, bearing etc..
12. The contractor shall also maintain the plants/lawn including watering etc. with the same man power surrounding the STP/ETP.
13. Process parameters like MLSS, etc are to be maintained as per the standard.
14. The contractor shall provide hand gloves, mask for safety of all the staffs.
15. Carryout routine, annual & breakdown maintenance of the equipment in the system.
16. Maintain record book, log book etc.
17. ESI & PF registration and record keeping.
18. Maintain the log sheet for various equipment and systems.
19. Draw samples and get analysed for the parameters required and make the necessary process correction
20. Housekeeping of the entire plant allocated area.
21. The manpower deployed will operate and maintain the STP and ETP for 24*7 days, ensuring effective flow of effluents including running of all the connected pumps, valves etc., located within the premises, cleaning of inlet chambers, grit chamber, coarse screen chamber, secondary clarifier Lander, Collection sump, raw sewage sumps, aeration tank etc., depositing of waste, collection of cake from sludge drying etc., loading, stacking of the same, keeping the premises clean etc, including all labor charges (per shift one operator must be engaged), transportation of tools, complete as directed by the Engineer and safeguarding the equipment, elements of supervision charges, etc.
22. Submit report in the form and frequency required by the ESIC authorities and as per the requirement of KSPCB and other statutory bodies for operation of the plant and deployment of labour.
23. Senior chemist shall visit at least once in a week for monitoring of plant operation and lab test.
24. All tools, equipment and testing devices required to maintain the STP/ETP is to be provided by the contractor.
25. The contractor shall be responsible for the updating records of documents for equipment and maintaining daily log book relating to running of machinery, consumption of consumables, etc. and various analysis performed as per statutory requirements of KSPCB.
26. The contractor will determine operating parameter, chemical dosages and generally optimized the process and working of the treatment plants.
27. All pipes and bends shall be checked regularly for chocking and cleaned if required.
28. Lubrication of all the moving parts of equipment/gates/valves regularly as per instruction of manufacturer shall be done.
29. Electrical connection to all equipment shall be checked/ repaired regularly.
30. Level switches shall be checked and maintained regularly for their proper functioning.

31. No spares or any other items will be supplied by the ESIC. All spares, tools required for the plant to be arranged by the contractor without any extra cost.
32. Quality of treated sewage shall be within the standard limit prescribed by the KSPCB.
33. To ensure the uninterrupted functioning of the STP/ETP during 24/7 hours.
34. To rectify all defects/repairs and to upkeep the system.
35. It is proposed to utilize the entire treated effluent for horticulture/Air conditioning purpose. Therefore the system components have to be provided accordingly.
36. For proper sludge handling, the existing sludge handling network/centrifuge shall be repaired as per the requirement and it is recommended to collect the dewatered compressed sludge into HDPE bags for disposal to the final destination as per the approval of the pollution authorities. No additional payments will be made for disposal of the sludge or any other waste.
37. Disposal of all solid waste including from sludge handling network as generated from STP after repair and renovation, O&M shall be responsibility of the contractor. The solid waste shall be disposed off in accordance with the KSPCB norms to the site to be identified by the contractor, loading and unloading transportation of solid waste shall be the contractors account.
38. The contractor shall ensure no foul smell or noise is emitted during operation and maintenance of the plant.
39. Execution of work includes all electrical mechanical plumbing processing equipment etc., any other allied work required for functioning of the treatment plant conforming to the statutory acts, rules, standards etc..
40. Power and water for repair and renovation, O & M shall be provided at one point near the plant the contractor shall extend the lines as required to his site work at his cost.
41. Maintenance of proper records of sampling as per approved proforma of KSPCB/ESIC/EPFO or any other statutory authority.
42. The records maintained by the contractor shall be produced periodically to the employer's representative for proper monitoring.
43. The employer's representative's remarks shall be attended to on next submission, consolidated summary reports shall be furnished to the employer by monthly, quarterly, half yearly containing salient features.
44. All consumables, polyelectrolyte and spare required operating and maintaining the contractor shall provide the plant in good condition. The grit, screening, wet sludge and other garbage generated in the plant shall be removed from the site on daily basis. No accumulation of such residues shall be permitted within the plant campus without express application by contractor giving adequate reasons as well as permission of employer's representative. The contractor shall such residues in conformity to environment regulations/rules in force. The employer's representative may, if required, decide the mode and timing of disposal of such residues in consultation with concerned environmental and civic authorities. Such directions shall be followed by the contractor promptly, both in letter and spirit, without any reservation and without any increase in O&M/other costs. The loading, unloading and transportation cost of these shall be borne by the contractor and shall be included in the price quoted by the contractor for O&M.
45. The contractor at his own expense shall provide all tools, cleaning and housekeeping equipment, security and safety equipment.
46. The contractor shall be responsible for instruction and training of all his personnel in all aspects of plant operation and maintenance till the end of the operation and maintenance period. The contractor shall also be responsible for training personnel designed by the Employer who will operate the plant at the expiry of the contract.

47. The contractor will make available for this purpose competent staff and as well as propose schedule information that may be necessary for effective execution of the training programs.
48. For operation and maintenance phase, complete laboratory setup, consumables for testing of influent and effluent with respect to its characteristics and quantity etc, O & M of laboratory including manpower for testing would be within the scope of the contractor.
49. The agency shall be responsible, in case the result of treated effluent is not found within the prescribed parameters of the Pollution control Board, in any case. The damage, if any paid by the corporation on account of not achieving the desired parameters of treated effluent shall be deducted /recovered from the agency in addition to the liquidated damages.
50. The agency shall allow any of the corporation's officer/officials to inspect the working of ESIC Hospital Peenya at any time and also allow the staff of Pollution Control Board/Central Pollution Control Board as and when they desired to take the sample of treated effluent. Except the above officer, no other persons will be allowed to visit the ESIC Hospital Peenya without prior permission of this office.
51. The contractor will be required to maintain on site one set of sampling and testing kit for testing of T.E. samples.
52. The contractor shall make his own arrangements for the engagement of all staff and labour, local or otherwise, and for their payment, housing, feeding and transport.
53. The contractor shall perform all tests, sampling and analyses regularly as approved by the Employer's requirement and as per the O & M Standards
54. No extra work charges of any kind shall be entertained by the contractor during O & M contract period.
55. Liaising with KSPCB officials including submission of required documents on timely basis, submission of renewal application for the consent for plants located inside the hospital, clarifying the queries raised by the KSPCB officials etc. However the consent fee would be paid by ESIC Hospital, Peenya.
- 56. Acceptance of tests to be carried out once in 3 months or as per KSPCB rules (Air quality, stack, emission, noise).**
57. The contractor should have required infrastructure such as lab facility, equipment for testing ambient Air quality, stack emission testing and analysing the waste water. In case lab facilities not available, contractor has to test the water and air through outside agencies periodically as per KSPCB norms ad cost of the testing charges to be included in the financial bid, no extra payment will be made separately at any circumstances and the offer is liable for rejection in the absence of the supportive documents for above mentioned criteria.
58. Treated water characteristics should meet the standard prescribed by KSPCB.
59. The conducting of test analysis should include lists by chemist/experienced personnel at least once in week
60. Monitoring of the status of pollution control in respect of emission and discharges and ensure adequacy of measures taken in respect of the following:
 - (a) Storage of hazardous materials.
 - (b) Handling and management of hazardous waste.
61. The contractor will depute twice a week and more number of times if required, a senior person totally conversant with design & operation of STP/ETP as per KSPCB norms and other statutory requirement. The contractor person will oversee the entire operation, review the sample analysis results & advice on steps to be taken for mitigating problem & interact with ESIC officials, so as to enable ESIC to obtain & retain KSPCB consent for operation of the units.
62. The contractor should bear the responsibility for achieving the prescribed standards of regulatory authorities such as KSPCB etc for the emission and discharges.
63. The operation and other processes to be fulfilled for efficient functioning of the STP and ETP Plant are provided in Annexure-II.

64. SCOPE CLASSIFICATION CHART: A brief classification of the scope of work is given below for guidance of the Contractor.

Sl.No.	Activity / Facility	Contractor's Scope
1	Manpower for Operation and Maintenance	√
2	Operation and Maintenance of facilities	√
3	Regular record keeping & log maintenance	√
4	Uniform & other requirements of O&M staff	√
5	Routine & experts visits from contractor experts	√
6	ESI, PF & Labour License	√
7	Spares for various equipment	√
8	Chemicals and Consumables	√
9	POL	√
10	Tools & Tackles	√
11	Statutory clearances	√
12	Telephone, fax & E-mail for staff	√
13	Workshop repairs if required	√
14	Canteen and Transport facility for O&M staff	√
15	Sample collection and testing charges from any outside lab	√
16	Sludge Transportation its treatment & disposal to Disposal facility	√
17	Training of Personnel for plant operation and maintenance of STP, ETP, WTP & RO	√
18	Setting up of Lab and Lab equipment/ Testing of quality	√
19	Testing of sewage water/ treated water periodically from a certified laboratory or through own laboratory arrangements under supervision of a qualified person.	√
20	Charges for testing effluent once in a month, cost of tools supplying of chemicals required for treatment of water pertaining to STP & ETP. Ensuring currency of all licences from KSPCB.	√
21	Disposing of sludge from the premises including transportation loading, unloading etc., as per KSPCB norms	√

65. Related records to be compiled by the contractor for KSPCB approval periodically for Sl.No.3 of Part-B of Chapter-5 (Financial Bid)

- (a) Parameter for conducting the treated sewage water analysis as per KSPCB Norms like:
- | | |
|------------------------|-----------------------|
| (i) P.H Value | (ii) BOD |
| (iii) COD | (iv) TSS |
| (v) TDS | (vi) Suspended Solids |
| (vii) Fical-coli forms | (viii) Color |
| (ix) Toxicants | (x) Fluorides |
| (xi) Oil & Grease | (xii) Bacteriology |
| (xiii) Fluorides | (xiv) Turbidity |
- (b) For Air: Suspended particulate matters, SOX, NOX, HCL, C12 Ammonia, RSPM etc.
- (c) Obtaining Hazardous waste authorization.
- (d) Scientifically operation of sewage Treatment plant and utilization of treated water with proper records like log book, water meter readings and consumables.
- (e) Submission of Water Balance Chart.
- (f) Submission of water cess Returns in appropriate Forms.
- (g) Stack monitoring, ambient Air quality monitoring, Noise level measurement etc of Generators(2

- (h) Submission of hazardous waste manifest in form No.13.
 - (i) Annual returns in Form-4.
 - (j) Submission of biomedical waste annual returns.
 - (k) Submission of solid waste generation, storage and disposal system.
 - (l) Following new biomedical waste rules 2016 and segregation of waste in color coded container with the coordination of ESIC Matron.
 - (m) Disinfection of OT and Lab washings waste water.
 - (n) Submission of environmental statement in form-4.
 - (o) Ascertain the quantity of water consumption and generation of waste water and furnish the water balance chart.
 - (p) Monitor the quality of effluent quarterly for the stipulated parameters and furnish the reports.
 - (q) Obtain the authorization under hazardous and other wastes (Management, Handling & Trans boundary movements) Rules 2016 for collection, Storage, generation of waste oil from DG set and other hazardous waste.
 - (r) The contractor will supply the required chemicals for treatment of sewage water at STP and chemist in order to obtain the quality as per KSPCB norms and disposal of sludge. The elements of material cost, manpower, transportation, lead, lift etc to be included in the respective items. No additional payment will be made at any circumstances.
 - (s) For testing of sewage water, contractor has to make their own arrangements of lab or testing the water analysis from outside sources is left to the contractor.
 - (t) Any other reports demanded by KSPCB in future.
-

CHAPTER-4: TECHNICAL BID

TENDER FOR FOR REJUVENATING, REPAIR, OPERATION & MAINTENANCE OF STP & ETP AT ESIC HOSPITAL, PEENYA

Particulars of the Contractor				
1	Name of the Contractor/Agency			
2	*Ownership Status (Proprietorship/ Partnership/ Pvt. Ltd. Company, etc) <i>Note: Provide copy of Voter ID/Partnership Deed/RoC respectively</i>			
3	Name of the Proprietor/ Managing Partner/ Managing Director			
4	*Address:			
	a. *Office Address:			
	b. *Residential address of Proprietor/ Managing Partner/ Managing Director:			
5	Contact Details:			
	a. *Office Phone Number			
	b. *Mobile number			
	c. Email ID			
	d. Fax Number			
6	Registration Details of Contractor (<i>Attach self-attested copy of each registration/ card</i>):			
	a. *PAN Number			
	b. *Labour Licence No.			
	c. *Service Tax Registration Number			
	d. *ESI Registration Number(<i>17 digit code No.</i>)			
	e. *EPF Registration Number			
	f. *Civil Works Contractor Licence Number			
7	*Experience Particulars – for past three(3) years (<i>with copies of Experience/Work completion certificates</i>):			
		Period	Organization/ Works	Amount (Rs & Lakh)
	a.	2016-17		
	b.	2015-16		
	c.	2014-15		

8	*Particulars of work carried out in the field of STP and ETP Repair/Rejuvenation/Erection (Enclose copies of work completion certificates):		
	Name of work/ Client / Specific area of work	Amount	Period
a.	*		
b.	*		
c.	*		
d.	*		
	TOTAL		
9	*Profit/ Loss for the last three(3) years (attach self-attested copies of audited Balance Sheet/ P&L Account & Income Tax Returns)		
	Financial Year	Turn-over(Rs.)	Profit(Rs.)
	2015-16		
	2014-15		
	2013-14		
	<i>Note: In case accounts are not finalized for 2015-16, preceding three(3) years details may be furnished.</i>		
10	Details of Application Fee (enclose Demand Draft):		
	Amount (Rs.)	Name of Bank & Branch	Demand Draft No. & Date
11	Details of EMD (enclose Demand Draft):		
	Amount (Rs.)	Name of Bank & Branch	Demand Draft No. & Date
12	*Details of Banker to the Contractor (Copy of Pass-book)		
	Name of Bank & Branch	Account Number	Saving/ Current/ Loan Account

Note: (1) The above format may be used to provide requisite details.

(2) * Mark means Copies of supporting documents to be enclosed serially numbered as per the Serial numbers at Column Nos 1 & 2

Name of the Applicant:

Designation:

Signature & Seal of the Applicant

DECLARATION

1. I, _____ Son/Daughter of Shri _____

Proprietor/Partner/Director/Authorised Signatory of _____ am
competent to sign this declaration and execute this tender document.

2. I have carefully read and understood all the terms and conditions of the tender and hereby convey my
acceptance of the same.

3. The information/documents furnished along with the above application are true and authentic to the best
of my knowledge and belief. I/We, am/are well aware of the fact that furnishing of any false
information/fabricated document would lead to rejection of my tender at any stage besides liabilities
towards prosecution under appropriate law.

Signature of Authorised Person

Date:

Full name:

Place:

Company's seal:

Contractor's Signature with seal

**NOTE: *The above declaration, duly signed and sealed by the authorized signatory of the company, should
be enclosed with Technical tender.***

CHAPTER-5: FINANCIAL BID

Sl. No. (A)	Description of Work/Service (B)	(C)	(D)	Amount (in Rs.) (E)
	PART-A			
1.	Repairing, Renovating, Servicing of STP(45-KLD) as per the Scope of Work in Chapter-3	-N.A.-		
2.	Repairing, Renovating, Servicing of ETP(ETP-10 KLD as per the Scope of Work in Chapter-3	-N.A.-		
	(Quote in lump sum as one Job inclusive of all material, labour, taxes, transportation, etc.)			
	TOTAL (PART-A: 1+2)	-		
Sl. No.	PART-B: Operation & Maintenance of STP-45 and ETP-10 KLD capacity	Quantity	Rate (in Rs.)	Amount (in Rs.)
1.	Manpower for Operation & Maintenance of STP-45 KLD and ETP-10 KLD capacity in all 3 shifts (Total shift of 1095 for 365 days). Regular Labour charges will comprise of 3 persons + 1 reliever at the minimum wages fixed by CLC for Semi-skilled labour. <i>Note: (a) Rate quoted should not be less than Rs.579/- which is the minimum wages for semi-skilled labour as fixed by CLC. (b) Statutory payments like ESI, EPF, Service tax, bonus and leave wages will be reimbursed on production of challans or proof of payment.</i>	1095 shifts (One Semi-skilled labour per shift for 365 days)		
2.	Service Charge for Supply of Manpower (per shift per person in Rs.). This should include Supervision charge for the manpower deployed for Operation and Maintenance.	1095		
3.	Testing charges inclusive of manpower, chemicals, tools, equipment, glass wares and Professional supervision for compliance with laws for prevention of Air, Water and Noise Pollution under KSPCB. Maintenance of data/log books, assisting in preparation and submission of reports/returns and ensure compliance with KSPCB norms (as listed in Part-B of Chapter 3). Disposal of sludge from STP & ETP; Waste engine oil (approx. 100 litres per month) to an approved location with all incidental costs.	12 months		
4.	Providing and applying epoxy painting of approved quality over settling tank, collection tank, aeration tank; all pumps, valves, related to STP/ETP of any description or any size including complete scrapping, priming, cleaning as directed.	Once in a year		
	Total (Part-B: 1+2+3+4)			
	GRAND TOTAL (PART-A + PART-B)			

Date:

Place:

(Seal & Signature of Bidder)

Operation Guidelines and Technical Details:

The primary aim of operation of Effluent Treatment Plant is to ensure that the effluent from the plants meet the prescribed standards in terms of BOD/COD/SS/pH etc., laid down by the local body or any other statutory body while discharging the effluent safely in public sewer, on land or in the water body. The standards required to be met are listed in Table1-1. A good ETP must achieve this most efficiently and economically.

UNIT WISE OPERATIONAL PROCEDURE:

A. Effluent Lifting Pump:

The Effluent collected in this tank is pumped continuously to the Collection Tank. The 2HP Pump has a discharge capacity of 1.5 lps i.e 5400 liters/Hour. The suction side valve should be regulated such that the Effluent generated per day is pumped out at a constant rate. While regulating the discharge it should be ensured that the collection tank neither overflows nor dries in a full day's operation.

This constant feeding of Effluent is essential

- To ensure good Biological Activity in CT tank.
- To prevent cross flow across the Aeration tank inlet & outlet.

For 50 M3/day Effluent generated the Pump should constantly discharge at a rate of 0.6 liters per second.

B. Preparation of Chemical Solution:

For the rapid growth of bacterial in the process, the ration of BOD:N:P should be 100:5:1. So the essential nutrients(Nitrogen & Phosphorous) are added in the aeration tank to maintain this ratio.

1. Urea: Make solution of urea of 10% by adding 10 kg of urea in a urea dosing tank(100 ltr capacity). Open the tap of the tank in the aeration tank so that the solution shall fall drop by drop.
2. DAP Tank: Make solution of DAP(Di-Ammonium Phosphate) of 10% by adding 10 kgs of DAP in a DAP dosing tank(100 ltr capacity). Open the tap of the tank in the aeration tank so that the solution shall fall drop by drop.

C. Control of the STP:

The operational variables in an activated sludge plant include rate of flow of Effluent, air supply, MLSS, aeration period, DO in aeration and settling tanks rate of sludge return and sludge condition.

Since the activated sludge treatment is biochemical in nature, conditions in the aeration tank should be kept uniform at all times. As the aeration tank will receive the pumped Effluent, the flow will remain uniform at all times. Flash loading of EAT should never be attempted. Frequent checks of DO at various points in the Aeration tank and at the outlet, which should not be less than 1.5 mg/l will help in determining the adequacy of the air supply. DO values above 4.0 mg/lit do not improve the operations significantly, but increases the aeration costs considerably. Control of the concentration of solids in the mixed liquor of the aeration tank is an important operating factor. It is most desirable to hold the MLSS constant at 5000 mg/l. The test for MLSS should be done at least once a week.

Foaming or frothing is generally found to occur in ETP. Because of the detergents used in washing. The foam covers the EAT preventing effective O₂ transfer. To do away with the foam spraying screened effluent or clear water, increasing MLSS conc., addition of anti-foam agents can be carried out.

D. Clarifier:

Sludge Removal Operation from Clarifier:

For removing Sludge from Clarifier bottom to Sludge sump the following procedures should be followed in the same order:

- Empty the Sump to minimum possible level by keeping the sludge valve (installed in a dry pit) closed.
- Open the Sluice Valve full. Due to difference in water level, the large hydrostatic pressure could ensure complete flushing of Clarifier bottom.
- Again close the Valve full. Pump out the Sludge from sump.

Repeat the cycle if more sludge is to remove. Sludge removal should be frequent to avoid development of anaerobic conditions. Excess Sludge removal would result in watery sludge. This watery sludge removal should be avoided. Excess Sludge should be pumped to the filter press. A good operation calls for prompt removal of excess sludge from the settling tank to ensure that the sludge is fully aerobic. Sludge cakes should be removed daily for disposal.

Sludge Recycle rate:

As illustrated in Article 2-1, the MLSS concentration in Sewage Treatment is maintained by returning Activated Sludge from the Clarifier. Generally for Activated Sludge Process with Extended Aeration type the ratio between RAS(Return Activated Sludge) and effluent inflow is 0.5-1.0

E. MAINTENANCE REQUIREMENT:

Maintenance operations can be classified into two categories viz. i) Preventive maintenance ii) Corrective maintenance. Preventive maintenance is more economical and provides uninterrupted service which is essential to achieve the basic objectives of treatment.

Maintenance of the wastewater treatment plant includes building and other structures, electrical and mechanical equipment's. Electrical maintenance includes checking of the ampere taken by each motor used in treatment plant intermittently. The Control Panel installed in the Plant should be periodically checked by a qualified electrician. If there is any short circuit or if the Star-Delta starter doesn't get tripped, the fault should be immediately rectified.

Building and other structures:

Panel room building and other treatment units should be well ventilated and illuminated. They should be maintained in good repair, white or color washed, metallic parts painted annually. The effect of corrosive gases like Hydrogen Sulphide can be minimized by proper ventilation. Dampness inside the building should be checked as there might be tank leakages underground.

PUMP INSTALLATIONS

Pumps are installed in the Plant are of Grundfos make. We reproduce some important maintenance details of these Pumps from Grundfos O&M manual. For further details the original manual can be referred.

- Do not run the Pump dry for long time.
- If the Pump is used to handle water containing solids and silt, it is necessary to wash out the same with clean water before restarting. Restarting of the pump should be done after filling the casing with clean water.
- The bearing should be lubricated once in a month. Grundfos recommends Servo Gem-2, Indian Oil make grease for that purpose.
- If the Pump is idle for some time, it may get stuck or locked in one place. The free end of the shaft should be given a little jerk to ensure free rotation.
- Turn the lantern ring 2 to 3 turns. This should be repeated weekly or as per need.

- The following maintenance Time table should be followed to get optimum performance from the pumps.

Monthly:

Check the Priming time(Priming time for the Pumps installed are listed in Table4.1), Pump noise if any, Pipe connections and Valves installed in the line for blockages.

Six Monthly:

Open the Pump to check and clean interior parts.

Yearly:

Replace shaft sleeve, Gland Packing, Impeller Vanes and other worn out parts.

Safety in the Plant:

The work of an Operator in a STP Presents many hazards that must be guarded against. Common types of accidents are injuries from falls, deaths from drowning and asphyxiation. Narrow walks, steps and platforms over tanks should be used carefully particularly in darkness, rains and wind.

F. OPERATION AND MAINTENANCE OF STP

Introduction:

Maintenance comprises those operations, which are well-planned systematic program of maintaining the machinery by taking appropriate steps to prevent breakdown well in advance before it causes major damage. This prevents wastage of time, production loss and prolongs the life of machines. It can be classified as (a) preventive maintenance, which constitutes works and precautions to be taken to prevent breakdown and (b) corrective maintenance, which involves carrying out repairs after breakdown. Preventive maintenance is more economical than corrective maintenance and provides uninterrupted service, which is essential to achieve the basic objectives of treatment, viz. protection of health of the community and prevention of nuisance.

The primary aim of sewage treatment plant operation is the running and maintenance of the plant, efficiently and economically so that the effluent from the plant meet the prescribed standards in terms of BOD/COD/SS/pH etc. laid down by the local body or any other statutory body while discharging the effluent safely in public sewer, on land or in the water body.

The basic requirements of successful operation and maintenance of Effluent Treatment Plants are:

1. A thorough knowledge of plant and machinery and equipment's provided in the treatment plant and their functions.
2. A thorough knowledge of the processes.
3. Proper and adequate tools.
4. Adequate stock of spare parts and chemicals.
5. Assignment of specific maintenance responsibilities to operating staff.
6. Systematic and periodic inspection and strict adherence to servicing schedule.
7. Training of all operating staff in proper operating procedures and maintenance practices.
8. Overall supervision of operation and maintenance schedules.
9. Good housekeeping.
10. Proper logging of all operation / maintenance activities.
11. Observation of safety precautions & procedures.
12. Provision for water supply for drinking and other uses.

Better plant operation is possible only when the operating maintenance and laboratory staff are fully conversant with the characteristics and composition of Effluent handled and the results achieved during each state or unit of the treatment process.

Operation and preventive maintenance of several treatment units and the frequency of cleaning, lubrication of mechanical equipment's etc., are to be strictly adhered to if optimum results are to be expected.

G. Problem rectification:

Bulking and Rising of Sludge:

The quick settle ability of sludge is an important factor in the efficient performance of the activated sludge plant. The SVI serves also as an index of sludge settle ability. SVI values of 80-150 are considered satisfactory in plants operating with MLSS of 800-3500 mg/l. Sludge with poor settling characteristics is termed bulking sludge. Sludge bulking results in poor effluent due to the presence of excessive suspended solids and also in rapid loss of MLSS from aeration tank. Sludge bulking is generally due to inadequate air supply, low pH or septicity and also due to growth of filamentous organisms consequent to the presence of industrial wasters containing high concentration of carbohydrates in Effluent. Sludge bulking is controlled by eliminating the causes and by application of chlorine either to the Effluent or to the return sludge to control filamentous growths. Chlorine requirements are 0.2 to 1.0 percent of dry solids weight in return sludge.

When sludge bulking occurs, the suggested remedies are: (i) reduction in rate of Effluent flow into aeration tanks; (ii) reduction in ration of return sludge; (iii) increase in air supply or (iv) dilution of incoming Effluent. Chemicals that may be used to reduce bulking include chlorine, lime (raising pH to 8.6 to 8.8) or chlorinated coppers etc. These are added to the return sludge in small doses to ensure that they do not become toxic to micro-organisms.

Structures & Mechanical Equipment:

The side walls of the settling tanks should be so finished as to minimize the collection of solids, grease, oil and aquatic growths. Collections, if any should be removed periodically by brushing and hosing them down without disturbing the tank contents. Dark floating matter and rising bubbles on the surface indicate improper cleaning and inadequate sludge removal.

Inlet and outlet channels should be kept clean and hosed at least once a week. All baffles should be cleaned of any sticky materials and stringy growths on the surface and edges.

The bearings, transmission gears, traction rollers, etc., should all be properly lubricated as per the lubricating schedule suggested by the manufacturer.

In addition, it is good practice to dewater each clarifier at least once a year to inspect the submerged portions of the mechanism such as flight scrapers, squeezes etc., and repair or replace the worn-out parts, check all nuts and bolts for tightness and repaint all metallic parts. Motors should be checked periodically for overload conditions and electric wiring for proper insulation. Where cathodic protection devices using impressed current are provided, the strength of protective current should be checked.

H. Records: The daily operation records should show frequency and method of cleaning, flow, flow through time, volume of sludge and scum removed and percentage moisture in sludge, settleable solids both in Effluent and in Effluent from sedimentation tanks. The Suspended solids. BOD of both influent and effluent should be recorded as per Appendix.

I. Aeration Tanks: The operational variables in an activated sludge plant include rate of flow of Effluent, air supply, MLSS, aeration period. DO in aeration and setting tanks, rate of sludge return and sludge condition. The operator should possess thorough knowledge of the type of system adopted viz. conventional, high rate, extended aeration or contact stabilization so that effective control of the variables can be exercised to

achieve the desired efficiency of the plant. Inspection of mechanical aerators should be done for bearings, bushes, and transmission gears and they should be lubricated as per the schedule suggested by the manufacturers. The whole unit should be thoroughly inspected once in a year including replacement of worn out parts and painting with anti-corrosive paint to achieve desired efficiency of the plant. The record of operation should be maintained.

J. Air supply: Frequent checks of DO at various points in the tank and at the outlet end, which should not be less than 1 mg/l will help in determining the adequacy of the air, supply. Mechanical or surface aerators should be kept free from fungus or algae growths by cleaning them periodically.

K. Mixed Liqueur suspended Solids: Control of the concentration of solids in the mixed liquor of the aeration tank is an important operating factor. It is most desirable to hold the MLSS constant, at the suggested rates. The test of MLSS should be done at least once a week preferably during peak flow. As the MLSS will be minimum when the peak flow starts coming in and will be maximum in the night hours when the flow drops, operating MLSS value would be the average hourly value in a day which should be verified at least once a month. In case of very large plants regular daily check is desirable.

L. Return Sludge: The return sludge pumps provided in multiple units should be operated according to the increase or decrease in return sludge rate of flow required to maintain the necessary MLSS in aeration unit, based on the sludge volume index. The sludge volume index should be determined daily to know the condition of the sludge. A value of over 200 definitely indicates sludge bulking.

A good operation calls for prompt removal of excess sludge from the secondary tanks to ensure that the sludge is fully aerobic. This should be measured daily and recorded. The excess sludge is taken to digester directly or through primary settling tank.

M. Foaming: Foaming or frothing is sometimes encountered in activated sludge plants when the Effluent contains materials which reduce the surface tension, the synthetic detergents being the major offender. Froth, besides being unsightly, is easily blown away by wind and contaminates all the surface it comes into contact with. It is a hazard to workmen because it creates a slippery surface even after it collapses. Foam problems can be overcome by the application of a spray of screened effluent to clear water, increasing MLSS concentration, decreasing air supply or addition of other special anti-foam agents. The presence of synthetic anionic detergents in Effluent also interferes with the oxygen transfer and hence reduces aeration efficiency.

N. Records: Activated sludge operation should include recording of flow rates of Effluent and return sludge, DO, MLSS, BOD, COD and nitrates in both influent and effluent.

O. Building and other Equipment: Office building and other structures should be well ventilated and illuminated. They should be maintained in good repair, white or color washed, metallic parts painted annually. The effect of corrosive gases like Hydrogen Sulphide can be minimized by proper ventilation, proper collection and disposal of corrosive gases and painting the structures which are prone to be attacked by the gas, with anti-corrosive plants. Dampness inside the building could be reduced by proper ventilation. Wherever necessary, exhaust fans and forced ventilation should be adopted.

P. Equipment: The operator should maintain a book of catalogues supplied by manufacturers containing instruction sheets of all equipments. In addition, printed or written operating and maintenance schedules should be displayed near each equipment in the language understood by all operating staff.

Lubricating schedules cleaning and painting schedules, checks for efficiency, leaks and wear and tear and testing of safety devices, should be followed strictly according to manufacture instructions.

All measuring devices such as weirs and float gauges should be maintained in proper working condition including calibration. Charts should be changed at the same hour every day. Records maintained should show total maximum and minimum rates of flow.

Operating, lubricating and maintenance instructions for all pumps and other mechanical equipment should be strictly followed. Special attention should be given to maintaining pumps in an efficient operating

condition, free from clogging, excessive friction or entrance losses and abnormal power consumption due to wear and tear.

Water level in the wet wells should not be lower than the minimum designed level and all accumulations of grease and other deposits removed promptly.

Floats and sequence switches controlling the pumping cycle should be examined at the beginning of each shift. All pumps including standby pumps should be operated in rotation so that the wear and tear is distributed evenly.

All bearings, motors and electrical control equipment should be inspected daily for any overheating. The manufacture directions for operation and lubrication should be strictly followed. Packing glands should be checked for over-tightening.

When pumps may have to be operated manually time interval between start and stop, should not be less than 5 minutes.

Valves and piping should be regularly checked for leaks. Leaks should be attended to as per the instruction in the manufacturers' catalogues.

Q. Safety in Plant: The work of an operator in an Effluent treatment plant presents many hazards that must be guarded against. Common types of accident are injuries from falls, deaths from drowning and asphyxiation. Narrow walks or steps over tanks(particularly in darkness, rains and wind), ladder and spiral staircases are potential danger spots where the operator should be alert; overexertion during operation of valves, moving weights and performing other arduous tasks should be avoided. All open tanks should be provided with guardrails to prevent accidental falls. Screen or guards should protect Glass parts as well as moving parts. Adequate lighting within the plant and around the plant should be provided which gives better working facility reducing accidents on account of slipping etc. Honeycomb grating be provided on open channels to avoid accidents on account of falling down or drowning.

All workers should be compelled to observe personal hygiene such as washing with soap after work as well as washing before taking food. The use of antiseptics along with washing should be emphasized.

R. Training of Personnel: All operating staff engaged in technical and skilled work should be trained. The person who would be looking after the maintenance and operation of the plant should be preferable involved in the activities at the time of design, procurement and installation including inspection of equipment at manufacturers' place and their test and trails on completion of system.

S. Recording and Reporting: All operating records of the various treatment units in a plant should be properly compiled on a day-to-day basis and daily, monthly and yearly reports prepared, maintained and periodically reviewed. These reports will form a valuable guide to better operation and serve as an important document in the event of a legal suit resulting from nuisance or danger attributed to the plant or for meeting the statutory requirements about the satisfactory performance of the plant.

RUNNING OF STP:

Step – 1:

The operator of the Effluent Treatment Plant must check the various equipment and their components for any faults. He should check whether all the parts that need oiling are properly oiled and ready.

Step – 2:

The operator should start the pump that feed to the aeration tank.

Step – 3:

The operator should now check the level of Effluent in the aeration tank and start the Floating Aerator in the aeration tank only when the aerator is in contact with Effluent

Step – 4:

The Effluent from aeration tank flows to the Secondary Clarifier. He should start the sludge recirculation pump. The sludge during commissioning should be pumped only to the aeration tank. After the commissioning is complete, the sludge can be partly pumped to the aeration tank and partly to the filter press.

Step – 5:

The operator shall now use the filter press to carry out sludge concentration. He should then start the filtrate return pump as soon as the filtrate return tank starts filling.

Trouble Shooting:-Operation Problems in Effluent Treatment Plant

(1) Signs & Symptoms	(2) Possible Causes	(3) Suggested Action
CLARIFIER 1. Floating Sludge in all tanks.	Accumulated sludge decomposing in the tank and buoyed to the surface	Remove sludge more completely and more often
2. Floating sludge not in all tanks	Affected tanks receiving too much Effluent	Reduce flow to affected tanks
3. Bubbles rising in tanks	Septic conditions	Report and empty tank completely as soon as possible
4. Contents black and odorous	Septic Effluent or strong digester supernatant	Take action to eliminate septicity by improving hydraulics of sewer system Pre aeration of organic industrial wastes admitted to the system etc. or improve digester operations as to have improved quality supernatant: or reduce flow into setting tank or bypass completely supernatant to lagoons etc. till situation improves.
5. Excessive setting in inlet channels	Velocity too low	Reduce cross sectional area by installing inner wall of suitable material along one wall of channel: or agitate with air, water or otherwise to prevent deposition.
6. Excessive suspended matter effluent – all tanks	Accumulated sludge Flow through tanks too fast (over loading) Humus sludge or under drainage returned too fast.	Clean tanks more often. Report and get the loading reduced pumping rate.
7. Excessive suspended matter in effluent – not in all tanks	Some tanks receiving too much effluent	Reduce flow to affected tanks
8. Excessive floating matter in the effluent	Defective scum boards or none	Repair Scum boards or Install new ones
9. Sludge pipes choke	Sludge too thick	Clean more often
10. Intermittent surging of flow	High intermittent pumping rates	Adjust pumping rates to keep close to rates of flow of install or adjust baffling to reduce inlet velocity and to have effective flow distribution across the width of tank.
11. Sludge hard to remove from hopper	High content of grit and/or clay Low velocity in withdrawal line	Reduce grit content: or reduce clay content: or rod the clogged lines Pump sludge more often: or change sludge piping.

Sl. No.	Name of section or part to be attended	Maintenance to be carried out	Frequency/time interval at which inspection and maintenance to be done	Remarks
1	Bearings	Checking of Temp. with thermometer	Two Months	Hot ball or roller bearings point to too much oil or grease. Hot sleeve bearings need more oil or heavier lubricant. If does not correct, disassemble and inspect the bearing alignment of pump and driver.
2	Glands	Changing of Gland packing	Two Months	
3	Bearings	Lubrication (greasing)	Two Months	Check for saponification resulting in whitish color. Washout with kerosene
4	Gauges	Checking of pressure and vacuum gauges	Three Months	
5	Valves	Changing of gland packing in delivery sluice valve, suction valves, bye pass valve. Reflux valve	Six Months	
6	Exhaust pump and its auxiliaries	Checking of gland packing and its auxiliaries etc.	Six Months	
7	Impeller	Checking of impeller blades. Sleeves efficiency rings, bearings necking impeller nut etc.	One Year	

Test recommended to be carried out in Effluent Treatment Plant:

Treatment Stage/ Unit	Total Suspended Solids	Dissolved Solids	Mixed Liquor Suspended Solids (MLSS)	SVI for ML	pH	BOD	COD	DO
Effluent of Secondary setting tank	X					X	X	X

TECHNICAL DETAILS OF THE STP PLANT:

Sl.No.	ELECTRO MECHANICAL ITEMS	QUANTITY
1	BAR SCREEN: Size : 0.4m wide x 0.8m long x 0.4m depth MOC: MSEP Make: Repl	1 Nos.
2	SEWAGE LIFT PUMPS: Type: Submersible, Centrifugal Capacity: 2 M3/hr, Head: 10-12 mtr., MOC: CI Make: Grundfos Qty: 1W + 1S Model: FEKA VS 1000 TNA	2 Nos.
3	FAB Reactors	2 Nos.

	MOC: MSEP Size: 1.2m x 1.0m x 0.4m Make: REPL	
4	AIR BLOWER & MOTORS: Type: Twin Lobe Compressor Consist of V-belt, Drive and Driven Pulleys Capacity: 75 CUM/HR at 0.4kg/cm ² , MOC: CI Drive: Belt Driven Type Accessories: Base Frames, Air filter for suction line and silencer for discharge, safety valve & Pr.Guage, V.belt guard, Make: Everest Blowers, Model: 44 MOTOR: Type: Horizontal Foot Mounted Motor Make: ABB	2 Nos. (1W + 1S) 2 Nos.
5	FINE BUBBLE DIFUSSERS: Type: Fine Bubble Type, Size: 90 dia x 1000mm Air Distribution Capacity: 6-8 CUM/Hr MOC: EPDM membrane Make: Techpro	7 Nos.
6	COLLECTION TANK: Size: 3 Mtr x 2.5 Mtr x 3.5 Mtr MOC: Internal MSEP, External MSFRP Make: REPL	1 Nos.
7	AERATION TANK: Size: 3 Mtr x 2.5 Mtr x 3.5 Mtr MOC: Internal MSEP, External MSFRP Make: REPL	2 Nos.
8	TUBE SETTLER TANK: Size: 2.5 Mtr x 1.5 Mtr x 3.5 Mtr MOC: Internal MSEP, External MSFRP Make: REPL	1 Nos.
9	CLARIFIED WATER TANK: Size: 2.5 Mtr x 1.5 Mtr x 3.5 Mtr MOC: Internal MSEP, External MSFRP Make: REPL	1 Nos.
10	SLUDGE HOLDING TANK: Size: 3 Mtr x 0.5 Mtr x 3.5 Mtr MOC: Internal MSEP, External MSFRP Make: REPL	1 Nos.
11	TREATED WATER TANK: Size: 2.5 Mtr x 3 Mtr x 3.5 Mtr MOC: Internal MSEP, External MSFRP Make: REPL	1 Nos.
12	SECONDARY CLARIFIER TANK: Capacity: 2 Mtr x 1 Mtr x 4 Mtr MOC: MSEP Make: REPL	1 Nos.
13	CHLORINE CONTACT TANK: MOC: MSEP Size: 2 mtr x 1 mtr x 4 mtr	1 Nos.
14	COARSE BUBBLE DIFFUSERS: Size: 80 mm dia, Type: Disc Type	9 Nos.

	Air Distribution Capacity: 8-10 CUM/Hr MOC: PVC Make: Techpro	
15	TUBE SETTLER MEDIA: Capacity: 2 M3 Type of Media: Honey Comb MOC of Media: PVC Make: Cool Deck	1 Set
16	SLUDGE TRANSFER PUMPS: Type: Submersible, Centrifugal Capacity: 1 M3/hr, Head: 10 mtr MOC: CI Power Rating: 1.0 kw Make: Grundfos Qty: 1W + 1S Model: FEKA VS 1000 TNA	2 Nos.
17	DOSING SYSTEM: Capacity: 0-4 lph with manual adjustment Type: Electronic Diaphragm MOC: PP Make: E dose Dosing tank: 100 ltrs MOC of tank: HDPE	1 Set
18	FILTER FEED PUMP: Type: Centrifugal Monoblock Capacity: 2 M3/hr, Head: 30 mtr Power Rating: 1 kw Make: Kirloskar Model: KDS 134	2 Nos.
19	DUAL MEDIA FILTER: Type: Vertical Cylindrical FRP Capacity: 2 M3/hr Size: 24" x 72" Type of Media: Graded Sand and Pebbles, Various sizes Media: 435 kgs Make: PENTAIR Accessories: UPVC Piping	1 Nos.
20	ACTIVE CARBON FILTER: Type: Vertical Cylindrical FRP Capacity: 2 M3/hr Size: 24" x 72" Type of Media: Activated Carbon Media: 165 kgs Make: PENTAIR Accessories: UPVC Piping	1 Nos.
21	SLUDGE DWATERING SYSTEM: SCREW PUMP Capacity: 1 M3/hr Head: 35-40 Make: Alfa Helical	1 Nos.
22	FILTER PRESS	1 Nos.

	Capacity: with Manual Ratchet Size: 210mm x 210mm Make: Precision	
23	TREATED WATER PUMP: Capacity: 5 M3/hr Head: 30 mtrs Type: Monoblock Centrifugal Make: Kirloskar Model: KDS 1540	2 Nos.
24	SOFTNER FEED PUMP: Capacity: 252 Imp Head: 24 mtrs Type: Monoblock Centrifugal Make: Kirloskar Model: KDS 335 ++	
25	WATER SOFTNER: Capacity: 12 M3/hr Type: Vertical Cylindrical FRP Hardness: 600 ppm OBR: 72 M3 Size: 36" x 72" Make: PENTAIR Resin: Sodium based cation resin Qty: 612 ltrs	
26	BRINE TANK WITH STIRRER: Type: Vertical Cylindrical MSRL Capacity: 2.25 M3/hr Size: 900 mm dia x 1500mm ht Make: Reputed Media: Salt Accessories: UPVC Piping	
27	PIPING & VALVES: All interconnecting piping (PB) with plant room including valves and accessories	1 Nos.
28	CONTROL PANEL & WIRING: Make: REPL	1 Set

TECHNICAL DETAILS OF ETP

A. Tertiary Treatment:

This stage is provides a final stage to raise the effluent quality to the standard required before it is discharged to the receiving environment (sea, river, lake, ground etc.) More than one Tertiary treatment process may be used at any treatment plant.

B. Treated Water Tank:

It collects clear water from the Clarifier launder from where it is disposed off into the overhead tank by gravity.

C. Treatment Units & other facilities – Salient Features

Sl.No.	Description	Quantity
1	BAR SCREEN: MOC: MSEP Size: 0.5m wide x 2.8m long Make: REPL	01 No.
2	EFFLUENT TRANSFER PUMPS: Flow: 0.75 M3/hr Head: 10 Mts Model: AP 12.40.04.A3 Make: GRUNDFOS	02 Nos. (1W + 1S)
3	ALUM DOSING SYSTEM: Capacity: 0-2 lph Make: Positive Metering Pump Tank: 50 lts MOC: HDPE	01 Set
4	POLYMERS DOSING SUSTEM: Capacity: 0-2 lph Make: Positive Metering Pump Tank: 50 lts MOC: HDPE	01 Set
5	FLASH MIXER: Liquid Volume: 7.5 M3/hr Size of Tank: 600 mm dia x 1000 mm ht MOC of Tank: SS 304 Make: REPL STIRRER Power Required: 1.5 HP	01 Nos. 01 Nos.
6	TILTED PLATE SAPARATOR Capacity: 0.75 M3/hr No. of Plates: 07 Nos. Plates MOC: FRP MOC: MSEP	01 Nos.
7	AIR BLOWERS WITH MOTORS Capacity: 10 M3/hr MOC: CI Head: 0.35 Kg/Cm2	02 Nos.

	Make: Everest Motor Make: Crompton R Motor: 1.5 HP	
8	CBD Size: 80 mm dia Base: PVC Air Handling: 8-10 M3 Hr Type: Disc Type Make: Techpro	01 Lot
9	EMZIME DOSING SYSTEM: Capacity: 0-2 lph Make: Positive Metering Pump Tank: 50 lts MOC: HDPE	01 Nos.
10	TRANSFER PUMPS Capacity: 0.75 M3/Hr Head: 10 Mtrs MOC: CI Make: Kirloskar/Eq Type: Centrifugal Monoblock	02 Nos. (1W + 1S)
11	INTERCONNECTING PIPING: UPVC/ MS as required	1 lot.
12	ELECTRICAL CONTROL PANEL WITH INTERNAL CABLING	1 lot.
13	Instruments a) Pressure Gauge b) Level Switch	1 lot.
14	FILTER PRESS FEED PUMPS Capacity: 1 M3/Hr Head: 40-45 Mtr MOC: CI Motor Capacity: 2 HP Make: ABB/Eq	2 Nos. (1W + 1S)
15	FILTER PRESS Size: 310 x 310 mm No. of Plates: 11 Nos. No. of Chambers: 1 Nos. Make: Welcome Enviro	1 Nos.

D. Operation Guidelines

The primary aim of operation of Effluent treatment plant is to ensure that the effluent from the plants meet the prescribed standards in terms of BOD/COD/SS/pH etc., laid down by the local body or any other statutory body while discharging the effluent safely in public sewer, on land or in the water body. The standards required to be met are listed in Table 1-1. A good Effluent Treatment Plant must achieve this most efficiently and economically.

E. Unit Wise Operational Procedure

(i) Effluent lifting pump

The Effluent collected in this tank is pumped continuously to EAT. The 2 HP Pump has a discharge capacity of 1.5 lps i.e 5400 liters/ Hour. The suction side valve should be regulated such that the Effluent generated per day is pumped out at a constant rate. While regulating the discharge it should be ensured that collection tank neither overflows nor dries in a full day's operation. This constant feeding of Effluent is essential

- To ensure good Biological Activity in EAT tank.
- To prevent cross flow across the Aeration tank inlet & outlet.

For 50 m³/day Effluent generated the Pump should constantly discharge at rate of 0.6 liters per second.

(ii) Extended Aeration Tank (EAT)

This is an important unit in the Activated Sludge Treatment Process. Any mis operation of this unit would considerably affect the treated water quality for a long time span even after the operation is rectified. The Operator would do well to understand the basic definitions, Operational Parameters explained under article 2-1.

F. Preparation of Chemical Solution

For the rapid growth of bacteria in the process, the ration of BOD:N:P should be 100:5:1. So the essential nutrients (Nitrogen & Phosphorous) are added in the aeration tank to maintain this ratio.

1. Urea: Make solution of urea of 10% by adding 10 kg of urea in urea dosing tank(100 ltr capacity). Open the tap of the tank in the aeration tank so that the solution shall fall drop by drop.
2. DAP Tank: Make solution of DAP(Di-Ammonium Phosphate) of 10% by adding 10 kgs of DAP in the DAP dosing tank(100 ltr. Capacity). Open the tap of the tank in the aeration tank so that the solution shall fall drop by drop.

G. Control of ETP:

The operational variables in an activated sludge plant include rate of flow of Effluent, air supply, MLSS, aeration period, DO in aeration and settling tanks, rate of sludge return and sludge condition.

Since the activated sludge treatment (extended aeration process) is biochemical in nature, conditions in the aeration tank should be kept uniform at all times. As the aeration tank will receive the pumped Effluent, the flow will remain uniform at all times. Flash loading of EAT should never be attempted. Frequent checks of DO at various points in the Aeration tank and at the outlet, which should not be less than 1.5 mg/l will help in determining the adequacy of the air supply. DO values above 4.0 mg/lit do not improve the operations significantly, but increase the aeration costs considerably. Control of the concentration of solids in the mixed liquor of the aeration tank is an important operating factor. It is most desirable to hold the MLSS constant at 5000 mg/l. The test for MLSS should be done atleast once in a week.

Foaming or frothing is generally found to occur in ETP. Because of the detergents used in washing. The foam covers the EAT preventing effective O₂ transfer. To do away with the foam, spraying screened effluent or clear water, increasing MLSS concentration, addition of anti-foam agents can be carried out.

H. Tilted Plate Separator:

The corrugated plate pack in a TPI/CPI separator, used in Oily water treatment for removal of free oil, is the heart of our various purification systems consisting of number of parallel corrugated plates. A Plate pack is a housing of flat plastic plates (strengthened by resins) and stiffened by a frame made from plastic material (strengthened by resins) and/or stainless steel.

The number of plates in a Plate pack is determined by in-house developed calculations, based on the long experience acquired by supply of the separators to various industrial applications. The number of plates per Plate pack is also factored to certain extent on economy of size of the separator. The number of Plate packs per TPI/CPI separator is calculated based on the effluent flow and its characteristics to the unit.

The liquid to be treated flows through the spaces between the Corrugated Plates in each Plate pack. Ideal condition for separation is achieved in the TPI(Tilted Plate Interceptor)/ CPI(Corrugated Plate Interceptor) separator by simulating a laminar flow condition through the plate pack. Much attention is also being given on the profile of the corrugated plates in the Paramount(PL) designed TPI/CPI separator. The specific profile has

been chosen by Paramount(PL) so that a smooth transfer and compaction of the separated particles is effected in the

I. TPI/CPI separator:

In order to reduce the frictional resistance between the separated material and the corrugated plates to a minimum, particular attention is paid to the smoothness and hardness of the plate surface. The Corrugated Plates as well as the casing of the Plate Pack of TPI/CPI separator are made from glass fiber reinforced polyester resin. This material is resistant to the most frequently used chemical additives and temperature.

Paramount has specialized in design of TPI/CPI separator installation in both RCC(Reinforced cement concrete) and steel basins. The selection of the basin of the TPI/CPI separator is advised to client based on the basic requirement, adaptability, time and economy criteria envisaged in the Oily water treatment process installed.

J. Sludge Recycle rate:

As illustrated in Article 2.1 the MLSS concentration in EAT is maintained by returning Activated Sludge from the Clarifier. Generally for Activated Sludge Process with Extended Aeration type the ration between RAS(Return Activated Sludge) and effluent inflow is 0.5 to 1.0.

K. Maintenance Requirement:

Maintenance operations can be classified into two categories viz. i) Preventive Maintenance ii) Corrective Maintenance. Preventive maintenance is more economical and provides uninterrupted service which is essential to achieve the basic objectives of treatment.

Maintenance of the wastewater treatment plant includes building and other structures, electrical and mechanical equipment's. Electrical maintenance includes checking of the ampere taken by each motor used in treatment plant intermittently. The Control Panel installed in the Plant should be periodically checked by a qualified electrician. If there is any short circuit or if the Star-Delta starter doesn't get tripped, the fault should be immediately rectified.

(a) Building and other Structures:

Panel room building and other treatment units should be well ventilated and illuminated. They should be maintained in good repair, white or color washed, metallic parts painted annually. The effect of corrosive gases like Hydrogen Sulphide can be minimized by proper ventilation. Dampness inside the building should be checked as there might be tank leakages underground.

(b) Pump Installations:

Pumps installed in the Plant are Groundfos Kirloskar make. We reproduce some important maintenance details of these Pumps from Groundfos Kirloskar's O & M manual. For further details the original manual can be referred.

- Do not run the Pump dry for long time
- If the Pump is used to handle water containing solids and silt, it is necessary to wash out the same with clean water before restarting. Restarting of the pump should be done after filling the casing with clean water.
- The Bearing should be lubricated once in a month. Kirloskar Brother's recommend Servo Gem-2, Indian Oil make grease for that purpose.
- If the Pump is idle for some time, it may get stuck or locked in one place. The free end of the shaft should be given a little jerk to ensure free rotation.
- Turn the lantern ring 2-3 turns. This should be repeated weekly or as per need.
- The following maintenance Time table should be followed to get optimum Performance from the Pumps.

(c) Monthly:

Check the Priming time (Priming time for the pumps installed are listed in Table 4-1), Pump noise if any, Pipe connections and Valves installed in the line for blockages.

(d) Six Monthly:

Open the Pump to check and clean interior parts.

(e) Yearly:

Replace shaft sleeve, Gland Packing, Impeller Vanes and other worn out parts.

Priming Time for various Pumps in the Plant:

Sl.No.	Pump Identification	Priming Time in Seconds
1	Effluent Pump(Near Final Manhole)	75-168
2	Sludge Pump(Near Sludge Sump)	75-168
3	Final Pump (Near Final Tank)	50-100

L. Safety in the Plant

The work of an Operator in ETP presents many hazards that must be guarded against. Common types of accidents are injuries from falls, deaths from drowning and asphyxiation. Narrow walks, steps and platforms over tanks should be used carefully particularly in darkness, rains and wind.

M. Operation and Maintenance of ETP

Maintenance comprises those operations, which are well-planned systematic program of maintaining the machinery by taking appropriate steps to prevent breakdown well in advance before it causes major damage. This prevents wastage of time, production loss and prolongs the life of machines. It can be classified as (a) preventive maintenance, which constitutes works and precautions to be taken to prevent breakdown and (b) corrective maintenance, which involves carrying out repairs after breakdown. Preventive maintenance is more economical than corrective maintenance and provides uninterrupted service, which is essential to achieve the basic objectives of treatment, viz., protection of health of the community and prevention of nuisance.

The primary aim of sewage treatment plant operation is the running and maintenance of the plant, efficiently and economically so that the effluent from the plant meet the prescribed standards in terms of BOD/COD/SS/pH etc. laid down by the local body or any other statutory body while discharging the effluent safely in public sewer, on land or in the water body.

The basic requirements of successful operation and maintenance of Effluent Treatment Plants are:

1. A thorough knowledge of Plant and Machinery and Equipment's provided in the treatment plant and their functions.
2. A thorough knowledge of the processes
3. Proper and adequate tools
4. Adequate stock of spare parts and chemicals
5. Assignment of specific maintenance responsibilities to operating staff
6. Systematic and periodic inspection and strict adherence to servicing schedule.
7. Training of all operating staff in proper operating procedures and maintenance particles
8. Overall supervision of operation and maintenance schedules
9. Good Housekeeping
10. Proper logging of all operation/maintenance activities
11. Observation of safety precautions & procedures.
12. Provision of water supply for drinking and other uses.

Better plant operation is possible only when the operating maintenance and laboratory staff are fully conversant with the characteristics and composition of Effluent handled and the results achieved during each state or unit of the treatment process.

Operation and preventive maintenance of several treatment units and the frequency of cleaning, lubrication of mechanical equipment's etc., are to be strictly adhered to if optimum results are to be expected.

Problem rectification:

Bulking and Rising of Sludge

The quick settle ability of sludge is an important factor in the efficient performance of the activated sludge plant. The SVI serves also as an index of sludge settle ability. SVI values of 80-150 are considered satisfactory in plants operating with MLSS of 800-3500 mg/l. Sludge with poor settling characteristics is termed bulking sludge. Sludge bulking results in poor effluent due to the presence of excessive suspended solids and also in rapid loss of MLSS from aeration tank. Sludge bulking is generally due to inadequate air supply, low pH or simplicity and also due to growth of filamentous organisms' consequent to the presence of industrial wastes containing high concentration of carbohydrates in Effluent. Sludge bulking is controlled by eliminating the causes and by application of chlorine either to the Effluent or to the return sludge to control filamentous growths. Chlorine requirements are 0.2 to 1.0 percent of dry solids weight in return sludge.

When sludge bulking occurs, the suggested remedies are: (i) reduction in rate of Effluent flow into aeration tanks; (ii) reduction in ratio of return sludge; (iii) increase in air supply or (iv) dilution of incoming Effluent. Chemicals that may be used to reduce bulking include chlorine, lime (raising pH to 8.6 to 8.8) or chlorinated coppers etc. these are added to the return sludge in small doses to ensure that they do not become toxic to microorganisms.

Structures & Mechanical Equipment

The side walls of the settling tanks should be so finished as to minimize the collection of solids, grease, oil and aquatic growths. Collections, if any should be removed periodically by brushing and hosing them down without disturbing the tank contents. Dark floating matter and rising bubbles on the surface indicate improper cleaning and inadequate sludge removal.

Inlet and outlet channels should be kept clean and hosed at least once a week. All baffles should be cleaned of any sticky materials and stringy growths on the surface and edges.

The bearings, transmission gears, traction rollers, etc., should all be properly lubricated as per the lubricating schedule suggested by the manufacturer.

In addition, it is good practice to dewater each clarifier at least once a year to inspect the submerged portions of the mechanism such as flight scrapers, squeezes etc., repair or replace the worn-out parts, check all nuts and bolts for tightness and repaint all metallic parts. Motors should be checked periodically for overload conditions and electric wiring for proper insulation. Where cathodic protection devices using impressed current are provided, the strength of protective current should be checked.

Records: The daily operation records should show frequency and method of cleaning, flow, flow through time, volume of sludge and scum removed and percentage moisture in sludge, settleable solids both in Effluent and in Effluent from sedimentation tanks. The suspended solids/BOD of both influent and effluent should be recorded as per Appendix.

Aeration Tanks: The operational variables in an activated sludge plant include rate of flow of Effluent, air supply, MLSS, aeration period. DO in aeration and settling tanks, rate of sludge return and sludge condition. The operator should possess a thorough knowledge of the type of system adopted viz. conventional, high rate, extended aeration or contact stabilization so that effective control of the variables can be exercised to achieve the desired efficiency of the plant. Inspection of mechanical aerators should be done for bearings, bushes and transmission gears and they should be lubricated as per the schedule suggested by the manufacturers. The whole unit should be thoroughly inspected once in a year including replacement of worn out parts and painting

with anti-corrosive paint to achieve desired efficiency of the plant. The record of operation should be maintained.

Air Supply

Frequent checks of DO at various points in the tank and at the outlet end, which should not be less than 1 mg/l, will help in determining the adequacy of the air, supply. Mechanical or surface aerators should be kept free from fungus or algae growths by cleaning them periodically.

Mixed Liqueur suspended Solids: Control of the concentration of solids in the mixed liquor of the aeration tank is an important operating factor. It is most desirable to hold the MLSS constant, at the suggested rates. The test of MLSS should be done at least once a week, preferably during peak flow. As the MLSS will be minimum when the peak flow starts coming in and will be maximum in the night hours when the flow drops, operating MLSS value would be the average hourly value in a day which should be verified at least once a month. In case of very large plants regular daily check is desirable.

Return Sludge: The return sludge pumps provided in multiple units should be operated according to the increase or decrease in return sludge rate of flow required to maintain the necessary MLSS in aeration unit, based on the sludge volume index. The sludge volume index should be determined daily to know the condition of the sludge. A value of over 200 definitely indicates sludge bulking.

Foaming: Foaming or frothing is sometimes encountered in activated sludge plants when the Effluent contains materials which reduce the surface tension, the synthetic detergents being the major offender. Froth, besides being unsightly, is easily blown away by wind and contaminates entire surface it comes into contact with. It is a hazard to workmen because it creates a slippery surface even after it collapses. Foam problems can be overcome by the application of a spray of screened effluent or clear water, increasing MLSS concentration, decreasing air supply or addition of other special anti-foam agents. The presence of synthetic anionic detergents in Effluent also interferes with the oxygen transfer and hence reduces aeration efficiency.

Records: Activated sludge operation should include recording of flow rates of Effluent and return sludge, DO, MLSS, BOD, COD and nitrates in both influent and effluent.

Building & Other Equipment: Office building and structures should be well ventilated and illuminated. They should be maintained and kept in good repair, white or color washed, metallic parts being painted annually. The effect of corrosive gases like H₂S could be minimized by proper ventilation, proper collection and disposal of corrosive gases and painting the structures which are prone to be attacked by the gas, with anti corrosive plants. Dampness inside buildings could be reduced by proper ventilation. Wherever necessary, exhaust fans and forced ventilation should be adopted.

Equipment: The operator should maintain a book of catalogues supplied by manufacturers containing instruction sheets of all equipments. In addition, printed or written operating and maintenance schedules should be displayed near each equipment in the language understood by all operating staff.

Lubricating schedules cleaning and painting schedules, checks for efficiency, leaks and wear and tear and testing of safety devices, should be followed strictly according to manufacture instructions.

All measuring devices such as weirs and float gauges should be maintained in proper working condition including calibration. Carts should be changed at the same hour every day. Records maintained should show total maximum and minimum rates of flow.

Operating, lubrication and maintenance instructions for all pumps and other mechanical equipment should be strictly followed. Special attention should be given to maintaining pumps in an efficient operating condition, free from clogging, excessive friction or entrance losses and abnormal power consumption due to wear and tear.

Water level in the wet wells should not be lower than the minimum designed level and all accumulations of grease and other deposits removed promptly.

Floats and sequence switches controlling the pumping cycles should be examined at the beginning of each shift. All pumps including standby pumps should be operated in rotation so that the wear and tear is distributed evenly.

All bearings, motors and electrical control equipment should be inspected daily for any overheating. The manufacture directions for operation and lubrication should be strictly followed. Packing glands should be checked for over-tightening.

When pumps may have to be operated manually time interval between start & stop, should not be less than 5 minutes.

Valves and piping should be regularly checked for leaks. Leaks should be attended to as per the instruction in the manufacturers catalogues.

Safety in Plant

The work of an operator in a effluent treatment plant presents many hazards that must be guarded against. Common types of accident are injuries from falls, deaths from drowning and asphyxiation. Narrow walks or steps open tanks(particularly in darkness, rains and wind), ladder and spiral staircases are potential danger spots where the operator should be alert; over exertion during operation of valves, moving weights and performing other arduous tasks should be avoided. All open tasks should be provided with guardrails to prevent accidental falls. Screen or guards should protect Glass parts as well as moving parts. Adequate lighting within the plant and around the plant should be provided which gives better working facility reducing accidents on account of slipping etc. Honeycomb grating be provided on open channels to avoid accidents on account of falling down or drowning.

All workers should be compelled to observe personal, hygiene such as washing with soap after work as well as washing before taking food. The use of antiseptics along with washing should be emphasized.

Training of Personnel

All operating staff engaged in technical and skilled work should be trained. The person who would be looking after the maintenance and operation of the plant should be preferably involved in the activities at the time of design, procurement and installation including inspection of equipment at manufacturers place and their test and trials on completion of system.

Recording & Reporting

All operating records of the various treatment units in a plant should be properly compiled on a day-to-day basis and daily, monthly and yearly reports prepared, maintained and periodically reviewed. These reports will form a valuable guide to better operation and serve as an important document in the event of a legal suit resulting from nuisance or danger attributed to the plant or for meeting the statutory requirements about the satisfactory performance of the plant.

Running of ETP

Step-1

The operator of the Effluent Treatment Plant must check the various equipments and their components for any faults. He should check whether all the parts that need oiling are properly oiled and ready.

Step-2

The operator should start the pump that feed to the aeration tank.

Step-3

The operator should now check the level of Effluent in the aeration tank and start the Floating Aerator in the aeration tank only when the aerator is in contact with Effluent.

Step-4

The Effluent from aeration tank flows to the Secondary Clarifier. He should start the sludge recirculation pump. The Sludge during commissioning should be pumped only to the aeration tank. After the commissioning is complete, the sludge can be partly pumped to the aeration tank and partly to the filter press.

Step-5

The operator shall now use the filter press to carry out sludge concentration. E should then start the filtrate return pump as soon as the filtrate return tank starts filling.

Trouble Shooting:- Operation Problems in Effluent Treatment Plant

(1) Signs & Symptoms	(2) Possible Causes	(3) Suggested Action
<u>Tilted Plate Separator</u> 1. Floating Sludge in all tanks.	Accumulated sludge decomposing in the tank and buoyed to the surface	Remove sludge more completely and more often
2. Floating sludge not in all tanks	Affected tanks receiving too much Effluent	Reduce flow to affected tanks
3. Bubbles rising in tanks	Septic conditions	Report and empty tank completely as soon as possible
4. Contents black and odorous	Septic Effluent or strong digester supernatant	Take action to eliminate septicity by improving hydraulics of sewer system Pre aeration of organic industrial wastes admitted to the system etc. or improve digester operations as to have improved quality supernatant: or reduce flow into setting tank or bypass completely supernatant to lagoons etc. till situation improves.
5. Excessive setting in inlet channels	Velocity too low	Reduce cross sectional area by installing inner wall of suitable material along one wall of channel: or agitate with air, water or otherwise to prevent deposition.
6. Excessive suspended matter effluent – all tanks	Accumulated sludge Flow through tanks too fast (over loading) Humus sludge or under drainage returned too fast.	Clean tanks more often. Report and get the loading reduced pumping rate.
7. Excessive suspended matter in effluent – not in all tanks	Some tanks receiving too much effluent	Reduce flow to affected tanks
8. Excessive floating matter in the effluent	Defective scum boards or none	Repair Scum boards or Install new ones
9. Sludge pipes choke	Sludge too thick	Clean more often
10. Intermittent surging of flow	High intermittent pumping rates	Adjust pumping rates to keep close to rates of flow of install or adjust baffling to reduce inlet velocity and to have effective flow distribution across the width of tank.

11. Sludge hard to remove from hopper	High content of grit and/or clay Low velocity in withdrawal line	Reduce grit content: or reduce clay content: or rod the clogged lines Pump sludge more often: or change sludge piping.
ACTIVATED SLUDGE		
1. Change in Sludge Volume index	High soluble organic loads in Effluent	Decrease aeration liquor suspended solids: or bulking of activated sludge may be controlled by proper application of chlorine to return sludge: or control sludge index by converting deposited sludge to activated sludge
2. Rising sludge (in setting tanks)	Due to excessive nitrification	Increase the rate of return activated sludge from the final setting tank: or decrease the rate of flow of aeration liquor into the tank. Or increase the speed of sludge collecting mechanism in the final setting tank to increase rate of removal of sludge or decrease nitrification by reducing aeration or lowering the detention period.
3. Frothing	Synthetic detergents cause, frothing. The froth increases with decrease in aeration liquor suspended solids or increase in aeration. Or increase in degree of purification of Effluent or increase in atmospheric temperature	Use water effluent or clarified Effluent sprays in the frothing areas. Or apply deferments in small quantities to tank surface(repeated dosing is necessary) or increase aeration liquor SS concentration

Sl.No.	Name of section or part to be attended	Maintenance to be carried out	Frequency/time interval at which inspection and maintenance to be done	Remarks
1	Bearings	Checking of Temp. with thermometer	Two Months	Hot ball or roller bearings point to too much oil or grease. Hot sleeve bearings need more oil or heavier lubricant. If does not correct, disassemble and inspect the bearing alignment of pump and driver.
2	Glands	Changing of Gland packing	Two Months	
3	Bearings	Lubrication (greasing)	Two Months	Check for saponification resulting in whitish color. Washout with kerosene
4	Gauges	Checking of pressure and vaccum gauges	Three Months	
5	Valves	Changing of gland packing in delivery sluice valve, suction	Six Months	

		valves, bye pass valve. Reflux valve		
6	Exhaust pump and its auxiliaries	Checking of gland packing and its auxiliaries etc.	Six Months	
7	Impeller	Checking of impeller blades. Sleeves efficiency rings, bearings necking impeller nut etc.	One Year	

Electrical Motors:

Sl.No.	Name of section of part to be attended	Maintenance to be carried out	Frequency/ time interval at which inspection and maintenance to be done	Remarks
1	Introduction Motor stator and Rotor	Open of end covers dust blowing and checking of air gap	One Month	Depending on the working conditions & Maintenance staff available
2	Slip ring device	Cleaning of slip rings and adjustment of carbon brushes short circuiting jaws, oiling of cloth etc.,	One Month	
3	Bearings	Proper lubrication	Two Months	
4	Windings	Checking of motor after taking out its Rotor. Dust blowing, checking of end connections of stator, Rotor and taking insulation test no load rest before putting the motor on load	Two years	

Test recommended to be carried out in Effluent Treatment Plant:

Treatment Stage/ Unit	Total Suspend ed Solids	Dissolved Solids	Mixed Liquor Suspended Solids (ML.SS)	SVI for ML	pH	BOD	COD	DO
1.Activated sludge Aeration tank Influent & Effluent						X	X	X
2.Effluent of Secondary setting tank	X					X	X	X

List of Indian Standards on Sewerage and Sewage System:

1	IS:5600-1970	Indian Standard Code: Specification for Sewage and Drainage Building Elements
2	IS 6279:1971	Indian Standard Code: Equipment for grit removal devices
3	IS 6280:1971	Sewage Screens
4	IS 7784: Part 1 & 2: Sec 1 to 5	Indian Standard Code: Code of practice for design of cross drainage work Part 1 General features
5	IS 9110:1979	Indian Standard Code: Hand operated augers for cleaning water closet pipe and sewer
6	IS 9213:1979	Indian Standard Code: BOD Bottle
7	IS 10037: PT1 To 3: 1981	Indian Standard Code: Requirements for sludge dewatering equipment. Part 1 sludge drying beds-sand, gravel and under drains
8	IS 10261:1982	Indian Standard Code: Requirement for sewing tank(clarifier equipment) for waste water
9	IS 10552:1983	Indian Standard Code: Buckets to be used in power driven buckets type sewer cleaning machine
10	IS: 4733-1972	Method of sampling test sewage effluent
