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Karnataka State Pollution Control Board
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No.KSPCB/SEO-INFRA/STP-GUIDELINES/2020-21/ 5446 Date: 01 MAR 2021

OFFICE MEMORANDUM ON STPs

Sub: Guidelines for Design and location of Sewage Treatment Plants (STPs)- Reg

Ref: 1. Proceedings of the Technical Committee meeting held on 19/09/2020.
2. IISc letter dated 12/10/2020
3. The Government of Karnataka Notification No FEE 316 EPC 2015 on STPs dt. 19/01/2016

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The Responsibility prescribed under the Section 24 and Section 25 of Water (Prevention and Control of Pollution) Act, 1974, indicates the wholesomeness water to be maintained in all the water bodies like River, Well, Lake, etc. Therefore, regulatory agency viz. Karnataka State Pollution Control Board (KSPCB), in exercise of its power has specified the mandatory condition to provide the Sewage Treatment Plants (STP) for a) Apartments with 20 Units and above or having a total built up area of 2,000 square meter including basement, b) Commercial constructions Projects (Commercials Complexes, office, IT related activities etc.) with total built up area of 2000 Square meter and above, c) Educational Institutions with or without Hostel facility having total built up area of 5.000 square meter and above and d) Townships and Area Development Projects with an area of 10 acres and above shall install STP.

The location of these STPs is equally important besides its Operation & Maintenance. It is observed that majority of STP'smainly of the Residential apartments are either not provided in the proper location leading to the frequent complaints by the residents about noise and odor nuisance. Also in many cases, the unit operations are not properly designed and the treatment technology is not properly adopted leading to non conformity to the standards prescribed by the Board. The Plant operators may not be aware of the functioning of various unit operations and this may result in discharge of untreated sewage which ultimately joins the water bodies and may also lead to seepage of water from the tanks thereby contaminating the ground water.

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The violations observed in many instances indicated improper location leading to Noise, Smell, unapproachable passage entry etc. and attracted neighboring complaints, spillages/ illegal Cross connection of such sewage entering intothe Groundwater.

In view of the above, general guidelines are framed considering various Environmental aspects and field conditions and are enclosed as Annexure-1. However, it is to be made clear that the guidelines are general in nature & may require certain modifications/ stringent practices to be adopted depending on the specific field conditions.

Hence ROs are hereby directed to advice the Project Proponents and also insist for best appropriate available technologies for implementation.

I. Sewage Treatment Plant Technologies

The approved Technologies are:

A) Activated Sludge Process(ASP) only in the case where the Sewage generated is 500 KL and above. (why??)
B) Sequential Batch Reactor(SBR) (Not good!)
C) Membrane Bio Reactor (MBR)
D) Moving Bed Bio Reactor (MBBR) / Fluidized Aerobic Bed rector (FAB) (Not good!)

Note: As and when new technologies are brought to the notice of the Board, the Technical committee review and decide if it can be adopted.

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The secondary settling tank is missing!

II. Unit operation details for the above Technologies

Call for an oversized Eq tank will result in huge cost overrun, and degrade sewage quality because aeration becomes poorer

No.	Unit	Activated Sludge Process(ASP)	Sequential Batch Reactor(SBR)	Membrane Bio Reactor (MBR)	Moving Bed Bio Reactor (MBBR) / Fluidized Aerobic Bed rector (FAB)
1	Equalization Tank	Shall have a Minimum Holding Period of 8 hours	Shall have a Minimum Holding Period of 8 hours	Shall have a Minimum Holding Period of 8 hours	Shall have a Minimum Holding Period of 8 hours
2	Anoxic Tank - To Achieve De-Nitrification	Return Activated sludge shall be pumped into the Anoxic Tank to achieve De-Nitrification	Sludge Recirculation Not required, however if the same is done by pumping the contents of the SBR Reactor back to the Pre-Aeration Tank, a better control on De-Nitrification can be achieved	Return Activated sludge shall be pumped into the Anoxic Tank to achieve De-Nitrification	Return Activated sludge shall be pumped into the Anoxic Tank to achieve De-Nitrification
3	Aeration Tank	Adequate care to be taken to ensure that higher DO is maintained in the Aeration Tank in excess of 4 mg/L	Adequate care to be taken to ensure that higher DO is maintained in the Aeration Tank in excess of 4 mg/L	Adequate care to be taken to ensure that higher DO is maintained in the Aeration Tank in excess of 4 mg/L	Adequate care to be taken to ensure that higher DO is maintained in the Aeration Tank in excess of 4 mg/L
4	Membrane Tank	Not Required	Not Required	The Membranes shall be replaced periodically as per the Manufacturers specifications	Not Required
5	Sludge Holding Tank	This tank shall be mandatorily provided, to hold the excess sludge prior to dewatering			
6	Final Treated Water Holding Tank	A minimum of 2 days capacity (Design Capacity of STP) shall be provided to store and use the water in case of rainy seasons.			
7	Sludge Drying	The sludge drying beds and filter press shall not be used due to the operational issues. Horizontal centrifuge system shall be used for the STP of more than 500 KLD and Vertical centrifuge / Belt Press / Screw Press system shall be used for the STP of less than 500 KLD			

Huge increase in cost

Huge increase in cost

separate mixer needed

1.5-2 mg/L recommended

1.5-2 mg/L recommended

1.5-2 mg/L recommended

Huge cost! Change only when the membrane performance drops

8-14 hours max storage. BTW rains only results in excess water storage

Too costly!

The SBR and MBBR have thinner sludge. Will stress the dewatering stage.

Also, they need larger sludge-holding tank.

III) Mechanical EquipmentSpecifications Guidelines(These equipment / Units shall be part of the STP)

No.	Unit	Activated Sludge Process(ASP)	Sequential Batch Reactor(SBR)	Membrane Bio Reactor (MBR)	Moving Bed Bio Reactor (MBBR) / Fluidized Aerobic Bed rector (FAB)
1	Bar Screen Chamber	To screen the incoming sewage of rags and floating solids			
2	Fine Screen	To screen the incoming sewage of fine particles. The filtration diameter shall be < 5mm			
3	Oil and Grease Trap	To trap and remove the oils from the sewage			
	Pumps	Raw sewage pumps shall be submersible type with CI body and CI impeller. Other pumps like sludge transfer and filter feed pumps shall be Centrifugal surface mounted pumps /submersiblewith CI body and CI impeller			
4	Air Blowers	These form the heart of the treatment. Adequate air volume to compensate for the pipelines losses etc to be taken care off. Recommended to have 2.5 kg of oxygen per kg of BOD of removal			
5	Noise Control from Air Blower	Acoustic Enclosures shall be provided to ensure the noise from the Air Blower should be less than the permissible limits, a below			
		Area	**Day**	**Night**	
		Industrial	75 dB	70 dB	
		Commercial	65 dB	55 dB	
		Residential	55 dB	45 dB	
6	Ultra filtration System	Shall mandatorily be provided for the treated sewage reuse for toilet flush and also to avoid recontamination at the final holding tank	Not Required for MBR	Shall mandatorily be provided for the treated sewage reuse for toilet flush and also to avoid recontamination at the final holding tank	
7	Membranes	The filtration efficiency of the membrane shall be to filter out virus and bacteria also in the range of ten to the power of minus 6 log reduction, The system shall be fully PLC based automatic plant for both filtration and backwash cycles. The membrane life shall be guaranteed for a period of 5 years of operation			
8	Faecal Coliform Control	A dual approach of having UV Stabilizer to disinfect the treated sewage followed by chlorinator to maintain a residual chlorine level of 2ppm in the treated sewage shall be adopted to achieve Faecal Coliform < 100 MPN / 100ml. Ozonation may also be considered with ozone dosage at 4 ~ 5 ppm.			

Needed only in case of MBR

Needed in kitchen outlet; not in combined inlet of STP

Not recommended: poor maintenability

The noise should be measured at the periphery of the residential area; not inside STP

Huge increase in cost

PSF+ACF are sufficient!

Only for MBR!

Too high: burns grass. 1 ppm acc to EPA (US)

Stable plants are not available!

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III (A) Mechanical Equipment's

1. Bar Screen Chamber and Oil & Grease Chamber shall have clear and easy access.
2. To avoid sound and vibration issues, as far as possible the equipment shall be submersible type with provision of easy removal when maintenance is required without the need to empty the tanks.
3. Air Blowers should be away from residential units to mitigate its effect of vibration and noise. Air blowers shall be provided with anti- Vibration mounts and acoustic Enclosures

Main cause is that the blowers are mounted on tanks, which amplifies the sound.

IV. Location of the STP

- STP shall be located, preferably under drive way, clubhouses, play area and as far as away from apartment complexes.
- Never locate the STP in the basement of any flats of apartment towers.
- The access from the lowestbasement is not permitted for the reason of flooding of rain water, smell and sound nuisance.
- The access to the STP should be from the ground level / Upper Basement, all tanks should be open, and access shall be through well designed walkways and head room
- Mechanical Ventilation shall be provided to ensure adequate ventilation with a minimum of 25 air changes per hour shall be provided inline of para(1) along with the guidelines of NBC, in case if the STP is in the basement.

12-15 is enough

- The exhaust should be terminated at the terrace level. All ducting running inside the shaft shall be provided with acoustic insulation. This ducting and routing shall not be along with flats and shall be along the common utilities.
- STP Shall never is fully closed.
- Activated Sludge Process shall be avoided for all decentralized STPs less than 500 KLD.

??? Recommended till 5000 KLD!

- Preferably go for Sequential Batch Reactor (SBR) with Ultrafiltration Or Membrane Bio Reactor (MBR) or Moving Bed Bio Reactor (MBBR) with Ultrafiltration.

V)Treated Sewage Standards: The final treated sewage shall confirm to the following standards

No.	Parameter	Limits
1.	pH	6.5-8.5
2.	BOD(5^{th} day)	<10mg/l
3.	COD	<50 mg/l
4.	Suspended Solids	<10mg/l
5.	Ammonical Nitrogen	<5 mg/l
6.	Total Nitrogen	<10 mg/l
7.	Faecal Coliform	<100 MPN/100 ml

3-day BOD at 27 C

P limit??
(2 mg/L, acc to MoEF; but 1 mg/L acc to NGT)

Realtime measuring is overkill.
It makes sense only when the STPs are designed and fabricated using the right technology.

V.Installation of Sensors:

Huge increase in cost

The Sensors are made mandatory for all the STPs,(Including BWSSB, Municipalities, ULBs, Residential, Commercial, IT, Educational Institutions, Railway Stations, Airports etc.,) for the parameters listed below:

The online monitoring shall be strictly comply with the specifications by CPCB. The brief Guidelines are as shown below:

No	Parameter	Type of Measurement	Type of Sensor	Communication Protocol
1.	pH	Inline	Ion selective glass electrodes	RS 485 communication with Modbus
2.	Total Suspended Solids	Inline	Turbidity to TSS correlation with nephelometric technique	RS 485 communication with Modbus
3	BOD	Inline	UV-Vis Spectrophotometry & combustion(Double beam with entire spectrum scanning	RS 485 communication with Modbus
4	COD	Inline	UV-Vis Spectrophotometry & combustion(Double beam with entire spectrum scanning	RS 485 communication with Modbus
5.	Flow	Inline	Electromagnetic flow measurement	RS 485 communication with Modbus

1. The Concerned Regional Officers shall properly indicate the above Technical status in their Inspection Report at the time of CFE for all the new applicants and shall follow strictly during the CFO to ensure full compliance.

2. RSEOs shall monitor on the aspects during the Monitoring/ Inspection of these units and report the action proposed suitably.

This Circular shall come into effect for newly proposed STP's or modifications or upgradations to the existing STPs from the date of issue of this memorandum and all other Circulars/Office Memorandums/any directions issued in respect of STPs will become null and void.

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VI. Usage of Treated Sewage: 1) Mandatorily the treated sewage shall be used for the toilet flushing with dual plumbing system.

2) For gardening, lawn maintenance and land scape including vertical garden. The usage is considered at 5 Lt per every Square Meter of landscape area.

3) The treated water shall be used for the construction activity other than for the load bearing structures like curing, dust suppression, road consolidation, brick work etc., where the treated water does not come in contact with the steel either directly or indirectly (Until the Final study report from IISc obtained).

VII.Caution Board At STPs:

1) The STP owner shall provide '**DANGER**' sign board near the STP to maintain safety of the operational personnel and shall maintain operational safety protocol. Proper signages shall be displayed in both Kannada and English at the taps where treated sewage is flowing as "not fit for drinking".

2) Whenever there is a maintenance and staff get into STP, especially in the basements a display Board "Caution – Danger" shall be put up. The gases generated might choke & create breathlessness and may be fatal. During such activities the person entering shall do so with all protective equipment's including the Oxygen portable cylinder with a mask. Two more persons shall be watching from outside and shall immediately evacuate the person inside if such a situation arises. A minimum of two sets of such protective gear shall always be kept available in a working condition.

VIII. Adoption of Modular Based approach: It is found that in many large projects especially the layouts, the occupancy is minimal in the initial stages. The adequate quantities of sewage is not generated at the time of occupancy for the effective operation of STPs. Hence, the design and execution shall be on a modular basis so that the STP can be made operational during the lean occupancy also.

This is practicable only in multi-phase projects: In any apartment, population takes 6-9 months to build up. If the area is sparsely populated, people delay their arrival as much as possible.

IX. Plan Sanctions: The approved Plan sanction shall include the location of the STP as per the guidelines of KSPCB.

MEMBER SECRETARY

To

1) All CEOs,/SEOs/ZSEOs/ROs for information and to strictly follow above.
2) Website of KSPCB
3) Mobile App
4) Office Master file

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