Sewage

Sew Gn 3

Des	Con	O & M
✓		✓

New build/ Refurbishment

Quantity of treated water that can be disposed and safe disposal methods

1. The maximum permissible quantity of treated waste water that can be disposed outside the site limits is as follows
   - 25% where a waste water treatment system is installed
   - 20% where a grey water treatment system is installed
2. Treated unused waste water should not be disposed on to the road. It has to be disposed directly into one of the following
   A. On ground for ground water recharge
   B. For irrigating nearby community parks or agricultural areas.
   C. Construction activities where required water quality is achieved
   D. A sewer line
   E. A storm water drain
   F. A lake, stream, pond or other surface water bodies
3. Treated waste water that is disposed had to meet the appropriate water quality requirement as defined by the CPCB.
4. All large developments (>50 acre site area) must adhere to 'Zero discharge' of treated wastewater outside site limits (Details provided in Guidance Notes of Sew Gn 1 Guideline)

Checklist / Special Points of Interest

1. 25% of treated water can be disposed outside site if WW treatment undertaken ☐
2. 20% of treated water can be disposed outside site if GW treatment undertaken ☐
3. Adopt safe disposal options as per CPCB norms ☐
4. Treated wastewater should meet prescribed CPCB standards ☐
5. Zero discharge of wastewater outside site for all large developments ☐

Why is this required?

In existing residential buildings, due to lack of finances or plumbing design, the house owners are unable to use the treated waste water. The non-residential buildings also are installed with STPs for compliance purpose but all the treated waste water is not reused and is getting discharged out of the site. As regards this, there is a need to outline options at individual and neighbourhood level for the safe disposal of treated wastewater to improve local ground water recharge potential and its reuse for other non-household purposes.

In new buildings also due to lack of awareness, it is observed that the STPs are installed but treated sewage is not effectively reused, rather it is disposed off into nearby drains etc. The different reuse options using appropriate grey water and wastewater systems are outlined in Sew Gn 1 Guideline, but however, in case of further available treated wastewater, options for its safe disposal have to be outlined.

Under the present scenario in Hyderabad, the unused treated wastewater is either directly discharged into open nallas or left on to the vacant sites in the vicinity, which again gets mixed with untreated

wastewater. It is noted that the sewerage network coverage on old MCH area is about 70% and other areas is about 20%. Hence, this is leading to contamination of lakes/water bodies, effecting ground water quality and also leading to severe health issues.

In many circumstances, even if all the generated grey water and wastewater is treated, its effective reuse for different purposes is not possible due to the lack of enough landscape areas, building level complexities etc. The current scenario in Hyderabad clearly shows that only the MCH area, Uppal Municipality, L.B. nagar municipality have greater than 50% sewerage network coverage. The other municipalities like Qutubullaur, Kukatpalli, Alwal, Malkajgiri and Kapra in the north while Rajendranagar municipality in the south have a network coverage between 10 and 50% while rest of the HMDA area has no sewerage at all and depend either on septic tanks or openly discharge waste. Henceforth, there is a need for outlining different ways of its safe disposal or reuse for out of site irrigation activities, construction purposes by meeting the quality limits and any other purposes.

How is it beneficial?

- Recycling and reuse of maximum quantity of treated wastewater on-site will help in reducing the use of 'potable water (water supplied by HMWSSB or bore well water)' for various non-potable water uses like landscaping, external cleaning, vehicle washing, WC flushing, AC cooling towers etc.
- Effective micro level disposal of treated wastewater vide application on land for irrigation would help in enhancing plant growth and also local ground water recharge potential.
- Safe disposal of the treated wastewater into lakes/ponds in the local vicinity would increase its water levels, enhance the recharge potential, nutrient water for growth of aquatic flora & fauna in water bodies, etc.
- By treating the wastewater upto the required standards, can be effectively used during building construction activity, thereby reducing the withdrawal of ground water for the same.
- By disposing the treated wastewater in the above-outlined options would avoid the discharge into open nallas, which as observed is chocked due to various developmental activities.
- Would avoid in accumulation of discharged wastewater in low lying areas, thereby leading to mosquito breeding and various water borne diseases like diarrhea, dysentery, cholera, typhoid, etc.

Submittals

For all the building types installed with grey water treatment systems or wastewater treatment systems, the following documents are to be provided by developer/ builder/ owner etc for seeking water connection from HMWSSB/ULB

- Documentary proof on the total quantity of treated wastewater output
- Documents/ details showing the type of reuse options adopted for the treated wastewater
- Indicate the quantity of treated wastewater that is disposed outside site and details of the disposal method.
- Copy of the compliance certificate issued by the certified inspector as regards safe disposal of treated wastewater.
- All existing buildings installed with treatment systems must display the monthly quality reports of the discharged wastewater prepared by certified agencies on common notice boards
- All existing buildings installed with treatment systems must submit the annual quality reports of the discharged wastewater prepared by certified agencies to HMWSSB

Guidance Notes

Calculating the quantity of treated waste water that is disposed

- Using the 'EBGH Water Calculator', arrive upon the total quantity of grey water and black water generated.
- Based on the composition of grey and black water, select appropriate grey water/ wastewater treatment system (details outlined in Sew Gn 1 Guideline)
- As per the selected option, calculate the total quantity of treated wastewater for possible uses viz., landscaping, external uses, toilet flushing and other internal uses using the 'EBGH Water Calculator'.
- Calculate the total water requirement for the above-outlined uses using the 'Water conservation calculator' and 'Landscape water requirement calculator'
- The excess treated wastewater after being used for all the possible uses as outlined above is the quantity of treated wastewater that is to be disposed.
- Ensure that the quantity of treated waste water that is disposed is not greater than 25% (if wastewater systems installed) and not greater than 20% (if grey water systems installed).

Options for safe disposal of treated wastewater

Treated wastewater, if handled properly, can be of high value as it contains several nutrients and is a vital source of fertiliser. The different sustainable ways of disposing the treated wastewater are discussed below.

- **Application on land for ground water recharge** - Recharge of groundwater is one of the way of reusing wastewater particularly since the groundwater table tends to lower almost all parts of Hyderabad. A crack-free, 3m thick soil layer above groundwater is sufficient to prevent organic pollution. Pollution by mineral deposition is far more frequent, as salts like nitrate and phosphate being soluble in water cannot be removed by physical filtration when passing through soil or sand layers. However, this option cannot be applicable in all parts of Hyderabad as about 40% of its jurisdiction is covered by hilly terrain and other physical barriers. Hence, other disposal options have to be adopted in these areas.
- **Application on land for irrigation** - Treated domestic wastewater is ideal for irrigating community parks, flower beds in gardens and other farm lands/agricultural areas. For an irrigation rate of 2m per year (20,000 cum/ha) which is commonly required for Hyderabad (semi-arid areas), even well-treated wastewater with concentrations as 15 mg/l of total nitrogen and 3 mg/l total phosphorous provides 300 kg N and 60 kg/hectare via irrigation without additional cost; at the same time the same amount of groundwater is saved.
- **Discharge into lakes/ponds/water bodies** - Wastewater is full of nutrients, which can directly be used by algae, water plants and lower animals, which then could become fish feed. Hyderabad is famous for its beautiful lakes. In all, there were more than 150 lakes in Hyderabad Metropolitan Area. But due to the development most of the lakes disappeared. In the Draft Master Plan for 2020, it is proposed to increase the area of water bodies to 95.44 sq. km. from the existing 84.3 sq. km. One way of achieving this is by channeling all our treated water, storm water etc into the closest lake in the vicinity.
- **Use of treated waste water for construction activities** - Water if treated upto the required standards can effectively be used for construction purposes. However, it is the general perception noticed among the architects, builders, engineers and other construction companies that the recycled water cannot be used for construction activities viz., mixing, curing, etc due to its hardness and recommend only fresh (soft) water for these purposes. (Cement is mainly composed of tri-calcium silicate, di-calcium silicate, tri-calcium aluminate and tetra-calcium alumina-ferrite formed at a very high temperature in rotary kiln. Some additives such as calcium sulphate are added to impart special properties to it. Hence water with hardness in tune of 400 mg/L can be used as calcium carbonate is used for curing the cement). Hence all construction activities use bore water (ground water) for this purpose, which is causing severe stress on ground water levels. Bureau of Indian Standards (BIS) have outlined a code for construction water quality (IS 456:2000).

Permissible water quality standards for disposal of treated waste water

The CPCB has developed National Standards for Effluent under the statutory powers of the Water (Prevention and Control of Pollution) Act, 1947. These standards have been approved and notified by the government of India, Union ministry of environment and forests (MoEF), under section 25 of the Environment (Protection) Act, 1986. Effluent standards for 29 parameters have been evolved and notified and are listed in the table below. These standards are for disposing effluent on land (irrigation, water recharge), in water bodies and public sewers.

The World Health Organization (WHO) recommends that treated wastewater for unrestricted irrigation should contain less than 1,000/100 ml faecal coliform and less than one helminth egg per litre. This limit should be observed strictly since the risk of transmitting parasites is relatively high.

Table 1: Disposal Standards of CPCB for Quality of Treated Wastewater

Parameter	On land for irrigation Indian Standards: 3307 (1974)	Into inland surface waters Indian Standards: 2490 (1974)	Into public sewers Indian Standards: 3306 (1974)
pH	5.5 - 9.0	5.5 - 9.0	5.5 - 9.0
BOD (for five days at 20^0C)	100	30	350
COD	-	250	-
Suspended solids	200	100	600
Total dissolved solids (inorganic)	2100	2100	2100
Temperature (^{0}C)	-	40	45
Oil and grease	10	10	20
Phenolic compounds	-	1	5
Cyanides	0.2	0.2	2
Sulphides	-	2	-
Fluorides	-	2	15
Total residual chlorine	-	1	-
Pesticides	-	-	-
Arsenic	0.2	0.2	0.2
Cadmium	-	2	1
Chromium (hexavalent)	-	0.1	2
Copper	-	3	3
Lead	-	0.1	1
Mercury	-	0.01	0.01
Nickel	-	3	3
Selenium	-	0.05	0.05
Zinc	-	5	15
Chlorides	600	1000	1000
Boron	2	2	2
Sulphates	1000	1000	1000
Sodium (9%)	60	-	60
Ammoniacal nitrogen	-	50	50
Radioactive materials			
• Alpha emitters (milli-curie/ml)	10^{-8}	10^{-7}	10^{-7}
• Beta emitters (micro-curie/ml)	10^{-7}	10^{-6}	10^{-6}

Permissible water quality standards for construction activities

Water used for construction purposes shall be clean and reasonably free from injurious quantities of deleterious materials such as oils, acids, alkalis, salts and microbial growth. In practice it is observed that potable water is used for construction activities. However, it is recommended that if 'treatment options as outlined in WR Sys 3 of the Guideline Sew Gn 1' are installed on-site, then the treated water can be used for construction purposes if it meets the Bureau of Indian Standards (BIS) standards. Required water softeners will have to be used if the treated water using WR Sys 3 does not meet the BIS standards.

Table 2: Water Quality Standards of BIS for Construction Purposes

Parameter	Construction Activity Indian Standards: 456 (2000)
Hardness	440 mg/l
Total Dissolved Solids (TDS) General	3200 mg/l
TDS - Organic	200 mg/l
TDS - Inorganic	3000 mg/l
Sulphate	400 mg/l
Chloride (for PCC)	2000 mg/l
Chloride (for RCC)	500 mg/l
pH	Not less than 6

Permissible water quality standards for AC Cooling Towers

In all sites, if treatment options as outlined under 'WR Sys 3' are installed for treating the waste water, then the output treated waste water can be used for the purpose of AC cooling towers by further undertaking some treatment like water softeners etc. The permissible water quality standards for AC cooling towers as per NBC 2005 is discussed below.

- Water with hardness less then 50 ppm of CaCO3 is recommended for air-conditioning applications. Untreated water if used in air – conditioning system can lead to scale formation, corrosion and organic growth. Hence, it is essential to analyse the supply source for various constituents including dissolved solids.

- Hardness in water is represented by calcium and magnesium salts, which may also include aluminium, iron, manganese, zinc etc. Temporary hardness is attributed to carbonates and bicarbonates of calcium and / or magnesium expressed in parts per million (ppm) as CaCO3. The permanent hardness is due to sulphates, chloride, nitrites of calcium and / or magnesium expressed in ppm as CaCO3.

- Temporary hardness is primarily responsible for scale formation, which results in poor heat transfer resulting in increased cost of energy for refrigeration and air conditioning. Permanent hardness (non-carbonate) is not a critical factor in water conditioning due to its solubility. In many cases, water may contain as much as 1 200 ppm of non-carbonate hardness and not deposit a calcium sulphate scale.

- A chemical analysis of water sample should provide number of total dissolved solids (TDS) in parts per million (ppm) as also composition of each of the salts in parts per million. Also, water with pH less than 5 is quite acidic and corrosive to ordinary metals and needs to be treated.

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