## Policy w.r.t. water sources, demand types and treatment options

Water is required for various purposes in a development, which can be grouped in 4 key usage categories:

1. *Drinking (all activities which have direct human touch or where water enters into the human body e.g. basin, shower, kitchen, swimming pool)*
2. *Limited human touch (e.g. water bodies, water walls, fountains, open landscaping)*
3. *Flushing (activities which are unlikely to have any human touch e.g. flushing, dense landscaping)*
4. *Mechanical Cooling e.g. Cooling towers etc. for commercial towers*

Depending of which of these 4 categories the usage is meant for, the water can have different permissible thresholds of various chemical and biological matter:

Table 1.1

| **Maximum limits/Type of Water usage** | **Unit** | **Drinking As per IS 10500/CPHEEO** | **Limited Human Touch As per CPHEEO** | **Flushing As per CPCB MOEF /CPHEEO** | **Mechanical cooling As per CPHEEO** |
|---|---|---|---|---|---|
| Colour | | 5 | Acceptable | Acceptable | Acceptable |
| Total Hardness | Mg/lit | <200 | <500 | <500 | <200 |
| BoD | Mg/lit | <3 | <10 | <10 | <5 |
| CoD | Mg/lit | <10 | <30 | <50 | <30 |
| TDS | Mg/lit | <500 | <1000 | <2100 | <1500 |
| Residual Chlorine | Mg/lit | 0.2 | <1 | <-1 | <-1 |
| Fecal Col. form | MPN/100ml | 0 | <1.8 | <100- | NA |
| Turbidity | NTU | <1 | <10 | <2 | NA |
| pH | | 6.5 – 8.5 | 6-9 | 6.5 – 9 | 6 – 9 |
| TSS | Mg/lit | NA | <20 | <20 | <5 |
| $NH_4$-N | Mg/lit | NIL | <2 | <- 5 | NA |
| N- Total | Mg/lit | 0.5 | <5 | <10 | - |
| Chloride | Mg/lit | 200 | - | - | <175 |

Water is available from following 5 primary sources:

1. Municipal Water
2. Ground water (bore well, open well etc.)

3. Tanker
4. Recycled water (post first usage within the development)
5. Rain water from non-landscaped areas (limited source)

Some of the commonly known treatment methods and their key functionality are as follows:

Table 1.2

| Treatment Method | General Input water type/characteristics (mg/lit) | General Output water characteristics (mg/lit) | Capex Range / drivers (Rs./KLD) | Opex Range (Rs/KLD) | Suitable For |
|---|---|---|---|---|---|
| STP with secondary treatment (Type of STP: Conventional / SAFF) | Suspended Solids: 250<br>BOD: 250-300<br>COD: 450 – 600<br>pH: 6.5 – 8.5 | SS: 10 – 20<br>BOD: 10 – 30<br>COD: <100<br>pH: 7 – 8<br>oil & Grease <5 | 10,000/- to 12,000/- | 8/- | Flushing |
| STP with tertiary treatment (Type of STP: MBBR/MBR) | Suspended Solids: 250<br>BOD: 250-300<br>COD: 450 – 600<br>pH: 6.5 – 8.5 | SS<5<br>BOD<5<br>COD<30<br>pH: 7 – 8<br>oil & Grease <5 | 15,000/- to 22,000/- | 10/- | Limited human touch, Flushing, Mechanical Cooling |
| Reverse Osmosis (RO) | TDS <= 5000 mg/l | TDS <150<br>Ph : 7 – 8 | 10000/- | 15/- to 20/- | Domestic |
| UV (Usually combined with RO or STP with tertiary treatment) | UV treatment kills bacteria hence these parameters are not applicable to the same. However UV treatment is required where STP treated water is expected to be used for 'limited human touch' usage. | | 800 - 1000/- | 1/- | As per applicable used for RO or STP with tertiary treatment |

It is essential to map out a water balance which takes into account the quantity available from the various sources, their input characteristics, the demand based on the aforesaid 4 categories and how to match the sources and the demand using various treatment methods. The treatment methods need to be determined taking into account both their capital cost and their operational costs. The goal is to ensure that all facilities in the development (inside the unit and outside) can operate over the long-term within the limits of CAM that has been set (with normal inflation).

The multi-source, different demand water balance needs to be finalized prior to the closure of concept design for the MEP Services.

**Calculation of water requirement for project**

This is for internal purposes only – for municipal / environmental submissions, use government standards.

| **Type of Project**<br><br>**(ltrs per day)** | **Drinking** | **Limited Human Touch** | **Flushing** | **Mechanical Cooling** |
|---|---|---|---|---|
| Luxury Residential / Hi-end Residential | 165 ltrs / per occupant per day | Make up water for swimming pools and water bodies assuming evaporation rate of 8_mm of total water surface area___ + _5__ ltrs per sq. mtrs. of actual landscape (not hardscape) area | 75 ltrs / – occupant/ - day for toilets with flush valves<br><br>45 ltrs/occupant/day<br><br>For toilets with 3-6 ltr flush tanks | -<br><br>NA |
| Aspirational Residential / Casa Residential | 110 ltrs / per occupant per day | As above | 60 ltrs / – occupant/ - day for toilets with flush valves. | As above |

| | | | | |
|---|---|---|---|---|
| | | | 45 ltrs/occupant/day for toilets with flush tanks | |
| Excelus / Supremus Office | -20 ltrs / per occupant per day including Restaurants/Canteens | As above | -25 ltrs / per occupant per day (urinals should be set for half flush; if flushing water is short, one can consider waterless urinals and assume only 5 ltrs/per occupant per day) | - For central airconditioning system make up water @ 10 ltr/hr/Tr |
| iThink Office | As above | As above | As above | As above |
| Experia Retail | 25 ltrs / per full-time occupant per day (including requirement of food retailers in restaurants, food court, multiplex etc.) & 5ltrs per visitor. | As above | 20 ltrs / per full time occupant per day (urinals should be set for half flush; if flushing water is short, one can consider waterless urinals) & 10ltrs per visitor. | As above |
| Boulevard Retail & club | As above | As above | As above | As above |

| | | | | |
|---|---|---|---|---|
| house | | | | |
| Multiplex / concert hall | 5ltrs / seat | | 10ltrs / seat | |
| School | 25ltrs / head | | 20ltrs / head | |

To calculate no. of occupants, refer to 'Occupancy Factor norms'.

**Once the projects input, storage and treatment systems have been decided, it is necessary to commission some of these systems in the first 6-9 months from start of construction at the site to ensure that this capex investment can be used to generate construction water and allow quicker/smooth construction.**

**Notes:**

1. MBBR /MBR based STP shall be used for commercial towers and townships developments wherein treated water is planned to be reused for Mechanical Cooling/ Limited Human Touch/ Flushing. MBBR/MBR treated water can also be used for construction purposes.

2. Conventional system /SAFF based STP is cost effective but recommended for projects where there are no water bodies / huge landscape works and water is planned to be reused only for flushing. If UV sterilizer is added to such system, it can be used for Limited Human Touch usage. Further, if RO is added to convention / SAFF system, the output water can be used for construction usage.

3. Bore well / Open well water may be possible to use for Drinking usage with RO treatment – however, this is subject to chemical analysis of the water source and designing of treatment system to ensure that the required chemical characteristics specified in Table 1.1 above are fulfilled.

4. Rain water from non-landscaped areas (viz. which does not mix with fertilizer chemicals) may be possible to use for Drinking usage after Softener treatment - however, this is subject to chemical analysis of the water source and designing of treatment system to ensure that the required chemical characteristics specified in Table 1.1 above are fulfilled.

5. Drinking water tanker can be used for Drinking or Limited Human touch usage without any treatment.

6. Regular water tanker can be used for Flushing or Mechanical Cooling without any treatment. It may also be possible to use this water for Limited Human touch usage, but only after chemical analysis of the water source and designing of treatment system to ensure that the required chemical characteristics specified in Table 1.1 above are fulfilled.

7. It is recommended that any action w.r.t. to ground water utilization (including bore / open well) is done as soon as possible and definitely within the first 6-9 months after start of construction on site.

8. In the event that there is not sufficient usage possible of the treated water from STP (after accounting for permissible uses such as flushing, landscape etc.), then grey (non-sewage) water (, bathing, sink etc.) can be treated separately with lower level of treatment and used for appropriate usage permitted by regulation (eg. bathing, landscape or disposal to external sewage/storm water treatment, sale to 3rd party). If grey water is used for bathing, this will increase building down takes by 1 nos. but reduce the drinking (potable) water consumption.

9. Attached format to be used for summarizing the water system.

## Water Usage Synopsis

**Used within Development**

| Sr No | Input | Estimated Daily Quantity (Ltrs) | Pre-Treatment Storage Capacity (if any) (Ltrs) | Treatment Details | Usage | Estimated Daily Quantity (Ltrs) | Storage Capacity (Ltrs) |
|---|---|---|---|---|---|---|---|
| 1 | Municipal Water | | | | a. Drinking | | |
| 2 | Ground Water | | | | b. Limited Human Touch | | |
| 3 | Tanker | | | | c. Flushing | | |
| 4 | Recycled Water | | | | d. Mechanical Cooling (if applicable) | | |

| | | |
|---|---|---|
| 5 | Non-landscape Rain Water | e. Fire Fighting |

## Use Arrow (→) to link Input and Usage

**Discharged Outside Development**

| Sr No | Input | Discharge Quantity (Ltrs) | Discharge Point |
|---|---|---|---|
| 1 | Landscape Rainwater / Storm Water | | Storm Water Drain |
| 2 | Excess Recycled Water | | Sewage Drain |