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Government of Gujarat

महात्मा गांधी स्वच्छता मिशन

# Guidelines for 'Open Defecation Free Gujarat'

## Mahatma Gandhi Swachhata Mission

**Urban Development and Urban Housing Department**
**Government of Gujarat**


**Mahatma Gandhi Swachhata Mission**

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Government of Gujarat

Urban Development and Urban Housing Department

Mission Directorate, Mahatma Gandhi Swachchhta Mission

Sachivalaya Gandhinagar

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## Preamble:

The Government of Gujarat has announced the Mahatma Gandhi Swachhata Mission with a view of achieving "**Open defecation free cities and villages"**. Government of India has launched the Swachh Bharat Mission (SBM) with a similar vision. The objective is to realise the dream of Mahatma Gandhi that all cities, towns and villages should become clean, have fully functional sewerage system leading to improved health. The people living in cities, towns and villages should get clean living environment.

Similarly, the Swachh Bharat Mission was launched at the national level on Oct 02, 2014 by the Government of India. The Swachh Bharat Mission (SBM), a joint mission of the Ministry of Urban Development (MoUD) and the Ministry of Drinking Water and Sanitation (MDWSS), emanates from the vision of the Government articulated in the President's address to the Joint Session of the Parliament on 9th June 2014

> *"We must not tolerate the indignity of homes without toilets and public spaces littered with garbage. For ensuring hygiene, waste management and sanitation across the nation a "Swachh Bharat Mission" will be launched. This will be our tribute to Mahatma Gandhi on his 150th birth anniversary to be celebrated in the year 2019."*

The Sub-Mission - Swachh Bharat Mission (SBM) for urban areas is to be implemented by the MoUD. It aims to achieve the objective of providing sanitation and household toilet facilities for all 4041 statutory towns in the country.

Leveraging such a national level thrust towards making Indian cities and villages free of open defecation, the Government of Gujarat (GoG) aims at making cities and villages from the state free of open defecation (OD). The strategies for achieving OD free settlements include but are not limited to:

1. Ensuring adequacy of toilets –individual and public toilets and Effective operations and maintenance of public toilets
2. Ensure regulatory frameworks and public health bye-laws
3. To effect behaviour change regarding health and hygiene and generate awareness and build capacity of respective departments.
4. Creation of an enabling environment to encourage participation of private sector

**Resolution:**

After careful consideration, the Government of Gujarat has resolved to issue the following guidelines for 'Open Defecation Free Towns' under the Mahatma Gandhi Swachhata Mission.

The following sections detail out each strategy and present the existing schemes and regulations and financial support available through state and central support.

# 1. Ensuring adequacy of toilets for households, public spaces and government buildings

This section details the norms for Urban Local Bodies (ULB) to provide sanitation facilities for households, public areas and labour.

The components include:

- Provision of individual and shared toilets for households
- Provision of public toilets in public spaces
- Provision of temporary toilets at construction sites for construction labour and for special events such as exhibitions /fairs/special events etc. and for migrants and homeless in urban areas.

**Individual toilet** means a toilet which is available within the premises of a household. Operation and maintenance of individual toilet rests with the beneficiary.

**Shared community toilets** means a toilet seat used by 3-4 households which are known to each other. Operation and maintenance of shared toilets rests with the beneficiaries (3-4 households).

**These also mean** a shared common facilities and on-site waste water treatment provided by and for a group of residents or an entire settlement. Community toilet blocks are used primarily in low-income and/or informal settlements/slums where space and/ or land are constraints in providing a household toilet. These are for more or less fixed user group. Operation and maintenance of shared community toilet block ideally should rest with the beneficiary users under over all supervision of the concerned ULBs.

**Public Toilet** means toilets meant for floating population/ general public in places such as markets/ transit nodes/ tourist places/ office complexes and other public areas with a high number of footfalls. Operation and maintenance of public toilets rests with the ULB or its appointed contractor.

**Temporary Toilet** means a toilet which is simple portable enclosures and is typically used for construction sites or large gatherings because of their durability and convenience. Operation and maintenance of temporary toilets rests with the construction company (in case of construction sites) or the ULB/ its appointed contractor.

All toilets constructed under MGSM must have two main structures- the toilet super structure (including the pan and water closet) and the sub-structure (either on-site treatment system or a connection to existing underground sewerage system).

## 1.1. Strategies for individual toilets for households

The Government of Gujarat recognises the importance of individual toilets at the household level and improved access to functional toilets in all public areas as well as government departments and premises. The Government also recognises the importance of safe disposal of waste water through sewered or on-site waste water treatment systems (OSS) such as septic tanks-soak pits or twin pit system.

As far as possible, the urban local bodies will strive to provide individual toilets to households that currently do not have access. Only in special cases where there are constraints of space availability, shared toilets will be provided. Shared toilets would be provided in lieu of community toilet blocks.

This section covers construction of new individual toilets and conversion of insanitary toilets including pit latrines to sanitary latrines.

### 1.1.1. Eligibility for incentive

All urban households residing in slums, slum-like areas, authorised/ un-authorised colonies and urban villages (*gamtals*) and who either do not have an individual toilet or have an insanitary toilet are eligible to receive incentive under MGSM irrespective of their land tenure status.

All eligible households will be provided with an individual toilet or in exceptional cases, a shared community toilet with either underground sewer connection or an OSS.

i. Beneficiaries who have a functional sewerage system within 30 metres from the settlement are eligible for construction of only the toilet super-structure. Such beneficiaries are also eligible for connection to the existing sewerage system.
ii. Beneficiaries who do not have a functional sewerage system within 30 meters from the settlement are eligible for construction of the toilet super-structure and an on-site treatment system (such as twin-pits, septic tanks-soak pits, bio-digesters, bio-tanks) for collection, treatment and disposal of waste water.

### 1.1.2. Operation and maintenance of individual toilets

Beneficiaries are responsible for maintenance of their respective individual toilets and OSS, if applicable. ULBs are responsible for operation and maintenance of sewerage system.

i. All individual toilets provided under MGSM must ensure running water supply or adequate water storage.
ii. All OSS units should be maintained and cleaned as per the regime and procedures defined in the Advisory Note on Septage Management in Indian Cities prepared by the Ministry of Urban Development, GoI (Ministry of Urban Development, 2014a). In addition to the advisory, the guidelines on design and construction of septic tanks issued by the Bureau of Indian Standards[1] and the CPHEEO[2] and Guidelines for Swachh Bharat Mission should be followed for operation and maintenance of OSS. 'Standard operating procedure (SOP) for septage management, 2014' (ISBN 978-81-900120-8-2) published under the Performance Assessment System (PAS) – the Service Level Benchmarking initiative by Government of Gujarat may be referred as model SOP.

Septage must be removed from septic tanks at least once every 2 or 3 years and transported off-site for treatment prior to disposal. Municipal utility or private contractors are required for mechanically desludging septic tanks and to ensure safe disposal of septage at a treatment plant. ULBs should also explore reuse of treated sludge and treated effluent.

[1](Bureau of Indian Standards, 1986)
[2](Central Public Health and Environmental Engineering Organisation and Japan International Cooperation Agency, 2013)

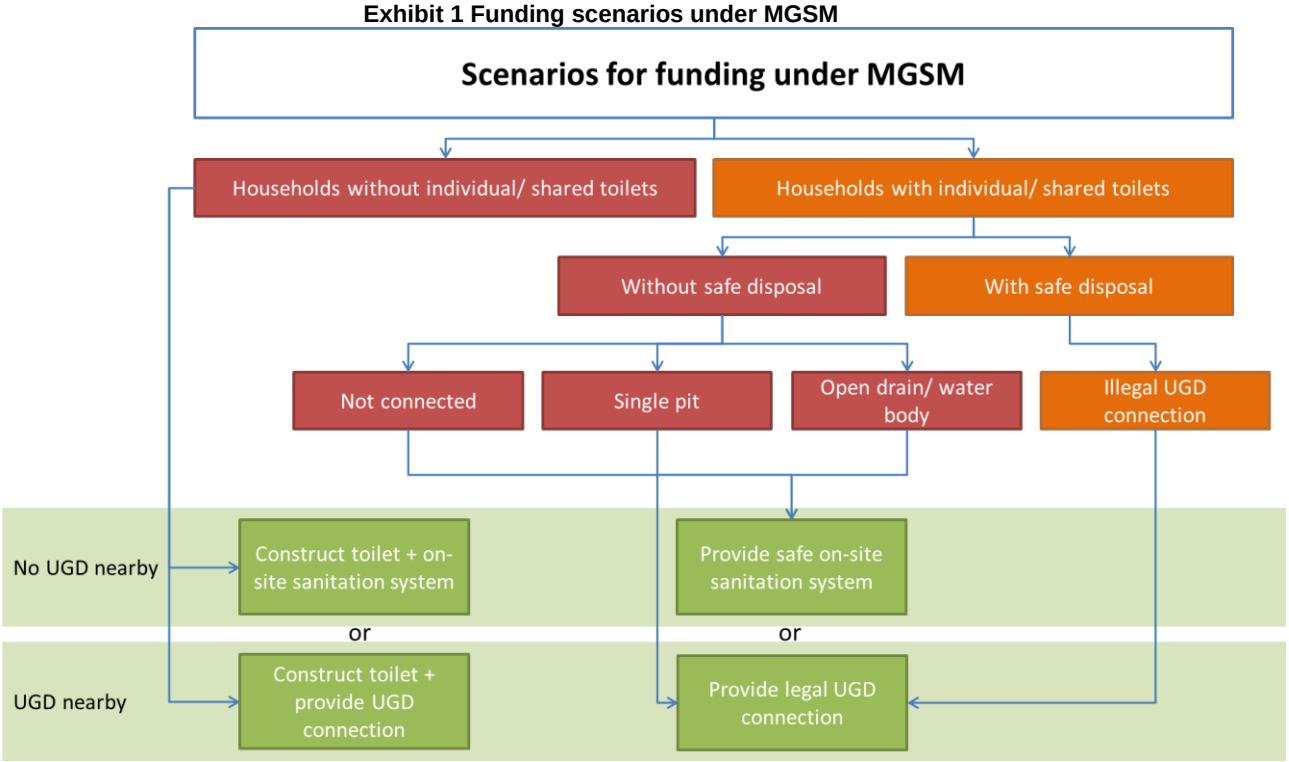
iii. Each ULB will adapt a model SOP for septage management prepared by the MGSM, GoG. The SOP will provide a set of written instructions on septic tank construction, cleaning and maintenance and disposal of sludge in a concise format. The SOP will contain a set of recording formats to help ULBs to document the number of septic tanks and frequency of cleaning for regular monitoring. A typical SOP would include detailed guidelines regarding the following:
   - Design and construction guidelines for soak pits and septic tanks
   - Septic tank cleaning procedure
   - Safe transportation of septage
   - Septage treatment and disposal
   - Appropriate use of treated septage

iv. All ULBs should prepare a septage management plan as per the Advisory on Septage Management by MoUD

### 1.1.3. Funding for individual toilets

Funding for individual toilets under the MGSM is applicable to the following situations of sanitation provisions.

**Exhibit 1 Funding scenarios under MGSM**




To achieve the objective of 'zero open defecation', MGSM will provide assistance for

a. Construction of toilets
b. Construction of on-site sanitation or providing connection to existing underground drainage (UGD)
c. Both 'a' and 'b'.

In many cities of Gujarat, UGD projects are in various stages of planning, approval and implementation. Until such projects become fully operational including operational treatment facilities, OSS will be funded.

Under all scenarios, financial incentive from Government of India (GoI) will be INR 4,000/- per household toilet as per the Guidelines for Swachh Bharat Mission (SBM)[3]. Contribution from GoG has been provided below for each scenario. Contribution from both GoI and GoG will be provided to the beneficiary only if the toilet is constructed with safe waste water disposal system. Any amount in addition to the contribution from GoI and GoG is to be borne by the beneficiary.

**Exhibit 2 Funding scenarios and contribution of GoI and GoG**

| Scenarios | Existing individual Toilet (Yes/ No) | Waste water disposal mechanism | Maximum contribution or actual cost, whichever is less (INR) | |
|---|---|---|---|---|
| | | | GoI | GoG |
| Scenario 1 | No | No UGD nearby | 4,000 | 8,000 |
| Scenario 2 | No | UGD nearby | 4,000 | 8,000 |
| Scenario 3 | Yes | No UGD nearby | 4,000 | 2,000 |
| Scenario 4 | Yes | UGD nearby | 4,000 | 2,000 |

*Note: In Scenarios 4, road cutting cost will be borne by the respective ULB.*

### 1.1.4. Operationalizing construction of individual toilets

ULBs should carry out required IEC activities to create awareness on the scheme to create demand amongst citizens.

Beneficiaries will apply to their respective ULBs to receive incentive under MGSM. ULBs should verify their eligibility within 7 working days and inform the beneficiary.

The identification of beneficiaries could be on an application basis or be based on a survey. ULBs should carry out a house-to-house survey to identify beneficiaries or wherever available, use existing data from surveys conducted under other programs such as RAY/ Mission Mangalam etc. Surveys conducted before 2011 should be updated. ULBs may involve CBOs/ CSOs/ NGOs or other agencies engaged by the State Government.

Based on the surveys and baseline data, ULBs should approve

a. either construction of a new individual toilet or upgradation of insanitary to sanitary toilet
b. connection to an existing sewerage system or construction of an on-site treatment unit. In case of on-site treatment unit, recommend technically appropriate options '**Various onsite technology options**'.

Eligible beneficiaries may choose to construct individual or shared toilets through any of the following mechanisms:

1. Constructed by the beneficiary directly
2. Constructed by ULB directly or through a ULB appointed private contractor/ NGO
3. Constructed by GoG appointed private contractor/ NGO

[3](Ministry of Urban Development, 2014b)

In all three mechanisms, the incentive from GoI and GoG will be released at the following stages:

**Exhibit 3 Funding stages for individual toilets**

| Stage | Criteria | Incentive to be released | | |
|---|---|---|---|---|
| | | Govt. of India | Govt. of Gujarat | Total |
| Stage 1 | 1st instalment on approval of application by the ULB | 2,000 | 3,000 | **5,000** |
| Stage 2 | 2nd instalment on verification of physical progress of construction by ULB (to ensure completion of waste water disposal mechanism) | 2,000 | 3,000 | **5,000** |
| Stage 3 | Final verification by ULB for construction and use of toilet with self-attested geo-tagged photographs of the toilet with applicant | - | 2,000 | **2,000** |
| | | | **Total** | **12,000** |

*All figures in INR.*

Final verification must ensure construction and functionality of sub-structurei.e. OSS or UGD connection. It should also ensure an enclosure that ensures minimum level of privacy, water supply / storage and sanitary ware.

### 1.1.5. Pooled infrastructure and community mobilisation

In case of *gamtals* and slums/ slum-like areas with no UGD nearby, and where it is possible or otherwise preferred by the beneficiaries, pooled on-site waste water treatment systems can be constructed. Each household is eligible to receive the incentive as described in 1.1.4. In such cases, ULBs may guide and facilitate joint application by the group of beneficiaries. ULBs directly, or through community mobilisers should identify areas where such pooled OSS may be constructed and encourage such pooled OSS as a preferred mode and on priority basis.

### 1.1.6 Assistance for Rural APL bebeficiaries

Mukhya Mantri Shri Swachhta Nidhi has been created for depositing and utilizing donations for providing and strengthening sanitation facilities in Gujarat State wide GR NML/102013/3521/PT-1/DH Dated: 1-10-2014. APL households in rural areas that do not a toilet will be eligible to get assistance of INR 4,000 from the Nidhi and budgetary support of INR 4,000 through Panchayat, Rural Development and Rural Housing Department. Beneficiary house hold will bear remaining INR 4,000/-. There is already an ongoing scheme for BPL beneficiaries of the rural area.

## 1.2. Strategies for community level shared toilets for households

As far as possible, the ULBs will strive to provide individual toilets to households that currently do not have access. Only in special cases where there are constraints of space availability, community level shared toilets will be provided. Community level shared toilets means a toilet

seat used by 3-4 households which are known to each other. Operation and maintenance of community level shared toilets rests with designated 3-4 households. ULBs should encouraged pooled OSS among such shared community toilets located at viable distances.

This section covers construction of community level shared toilets and conversion of any existing insanitary community level shared latrines to sanitary latrines.

### 1.2.1. Planning of community level shared toilets

ULBs should provide community level shared toilet in case individual toilets are not possible due to space constraints. These can be provided for urban households residing in slums, slum-like areas, authorised/ un-authorised colonies and urban villages (*gamtals*) and who either do not have an individual toilet or have an insanitary toilet.

All shared toilet will have either an underground sewer connection or an OSS (preferably pooled OSS), irrespective of the tenure status of the land on which such households are situated. Community level shared toilets may be provided in a cluster of upto 3-4 seats. Each seat will be provided to designated 3-4 households known to each other, who would maintain the toilet.

### 1.2.2 Design principles for community level shared toilets

Community level shared toilets should be constructed in a cluster of 3-4 toilet seats with either a back-to-back or side-to-side layout. All community level shared toilets will also have atleast one bathing unit and a common washbasin. Community level shared toilets should also have overhead water storage for running water supply in toilets, bathing unit and washbasin.

### 1.2.3 Maintenance of community level shared toilets

Beneficiaries are responsible for maintenance of their respective community level shared toilets and OSS, if applicable. ULBs are responsible for operation and maintenance of sewerage system. All operation and maintenance parameters remain the same as defined in section 1.1.2 and will apply here.

### 1.2.4 Funding for community level shared toilets

MGSM funding for community level shared toilets is applicable only in exceptional cases where individual toilets are not possible due to space constraints. A maximum assistance of INR 30,000/- or actual cost, whichever is less is available for construction of a new community level shared toilet. GoI will fund 40 percent as viability gap funding (VGF) for such seat and MGSM will fund the remaining 60 percent. The ownership of such community level shared toilets will remain with the concerned authorities. However, user and operations & maintenance ri1.2.6ghts will be given to the beneficiary families.

### 1.2.5 Operationalizing construction of community level shared toilets

ULBs should carry out a survey and create awareness on the scheme to identify areas where community level shared toilets will be provided.
Based on the surveys and baseline data, ULBs will assess whether the community level shared toilet requires a connection to an existing sewerage system (wherever available) or construction of an on-site treatment unit. In case of on-site treatment unit, recommend technically appropriate options '**Various onsite technology options**'.

### 1.2.6 Pooled infrastructure and community mobilisation

Pooled infrastructure and community mobilisation section remains the same as 1.1.5.

## 1.3 Strategies for community toilets

MGSM will provide financial assistance to ULBs for repair and retrofitting of existing community toilets until provision of individual or community level shared toilets in the identified areas. This would include conversion of insanitary community toilets to sanitary community toilets as well. MGSM will provide a maximum support of INR 15,000/- per community toilet seat or actual costs, whichever is less, of which 40% i.e. INR 6,000/- may be provided by GOI.

## 1.4 Strategies for public toilets in public spaces (free/ pay & use)

All Urban Local Bodies (ULBs) should ensure adequate public toilets in all public places that attract floating population including but not limited to gardens, play grounds, exhibition grounds, *chowks*, markets, transit nodes, streets, highways with appropriate gender considerations (number of seats, design and operations). Based on guidelines of the Swachh Bharat Mission, floating population is assumed at 5 percent of the total urban population.

### 1.4.2 Implementation strategies and funding pattern

ULBs and other concerned departments should converge funds available under MGSM, other Central Government Grants, Corporate Social Responsibility (CSR), contributions from NGOs etc. ULBs should identify land for public toilets, leverage this land and advertisements and other rights to encourage the private sector to construct and manage to encourage the private sector to construct and manage public toilets through a PPP agreement as a preferred mode. ULBs could also mobilise additional revenues by use of roof tops etc.

Wherever possibility of engaging PPP mode for construction of public toilets is not adequate, maximum assistance for repair of public toilets to the extent of INR 25,000/- per seat and for construction to the extent of INR 50,000/- per seat or actual cost, whichever is less will be provided to the concerned ULBs/ authorities.

### 1.4.3 Adequacy and planning

ULBs and concerned departments should undertake micro-planning exercise to locate new public toilets or relocate existing public toilets. Public toilets should be located at each major transit node where there is a heavy footfall and near identified permanent markets/ *haats*. Mobile toilets should be provided near weekly/ seasonal markets/ *haats* and at sites where festivities/ rallies/ celebrations occur.

There should be way-finding signage to direct users to public toilets. ULBs and all concerned departments need to provide users with clear directions as to the location of the toilet and where it is not obvious, the distance to the toilet. The signage should be integrated with the existing signage put up by the city/ village for directions and transit nodes.

The operating hours for each public toilet should be based on the field requirements. For example, a public toilet near a commercial street should be open for minimum twelve hours while one near an inter-city bus station or railway station should be open for 24 hours.

All ULBs and concerned departments should ensure provision of temporary toilets for construction labour at all sites where they are undertaking construction or maintenance works.

Such clauses should also be reflected in contracts if these construction/maintenance works have been outsourced. The role of monitoring for provision of such temporary toilets under such contracts should be done by these agencies.

All ULBs should maintain a proper and updated database of public toilets with maps and should make it public. A map showing all public toilets with other details of toilet facilities such as opening hours, operating agency, user charges, toilet cleaning schedule, accessibility for people with disabilities and the details of other nearby toilets should be made available online as well as displayed at prominent public spaces.

Feasible and proven technological options for waste to energy measures and reuse and recycling of treated waste water locally for flushing and/ or gardening should be adopted in public toilets.

### 1.4.4 Design principles

ULBs should strictly adopt applicable toilet design norms and standards. Good design will typically include considerations for gender specific needs, block layout configurations, use of materials, adequate day-lighting, good natural ventilation, child-friendly and disabled-friendly provisions and good signage.

A typical toilet block should ideally include the following and may be adapted based on contextual requirements

- Men's toilet with one urinal, one water closet and a wash basin
- Women's toilet with two water closets and a wash basin
- One common child friendly water closet and a wash basin
- One common disabled friendly water closet and a wash basin

All toilets must have running water supply and safe disposal of waste water (either UGD or OSS). All facilities that have OSS should be cleaned as per the regime and procedures of the Advisory Note on Septage Management prepared by the Ministry of Urban Development, Government of India. In addition to the advisory, the guidelines on design and construction of septic tanks issued by the Bureau of Indian Standards and the Central Public Health and Environmental Engineering Organization (CPHEEO) and draft guidelines of the Swachh Bharat Mission are also a good reference on technical design and maintenance of septic tanks.

While designing public toilets, following good design principles should be followed:

**Exhibit 4 Design principles for public toilets**

| | | Must | Desirable |
|---|---|---|---|
| **Access to the facility** | | | |
| Approach | Approach to the facility should be through a paved road or footpath and should be clear of any obstructions | ✓ | |
| Parking space | Adequate parking space to be provided especially in facilities located near taxi/ auto stands, public places and major roads | | ✓ |
| Access for disabled | Design guidelines for disabled-friendly toilets should be followed | ✓ | |
| **Building Exterior** | | | |

| | | Must | Desirable |
|---|---|---|---|
| Lighting | Immediate surroundings of the facility should be adequately lit during the night | ✓ | |
| | Energy saving measures and use of solar lighting should be explored. Use of energy efficient lighting such as LED lights should be explored. | | ✓ |
| | Colour of the exterior walls of the toilet blocks should be consistent across the city. | ✓ | |
| Signage about facility information and charges | Facilities should be easily visible through design, colour and appropriate signage | ✓ | |
| | Signboard showing names of O&M agencies, user charges, male-female sections, timings, directions should be placed at the entrance of the toilet and be clearly visible | ✓ | |
| **Toilet Interiors** | | | |
| General layout & Arrangement | After a common entrance to the public toilet, there should be separate entries to men's and women's sections | ✓ | |
| Signage | Signage with clearly written and appropriate symbols denoting the separate sections for men and women and physically disabled should be displayed | ✓ | |
| | Each cubicle should have instructions for proper use of facility behind the door | ✓ | |
| | Messages for hand washing after using the toilets should be displayed on the walls near the washbasins | ✓ | |
| | The design and colour of signage should be constant across all public toilets in a city | ✓ | |
| Internal walls, ceiling and floors | Flooring of the facility should be anti-skid and designed with appropriate slope to avoid water stagnation | ✓ | |
| | Light coloured tiled walls are easy to clean, reflect light and offer a sense of space. | | ✓ |
| Doors, windows & ventilators for cubicles | There should be adequate day-light and ventilation in the facility | ✓ | |
| | Doors, windows and ventilators should be designed to provide privacy | ✓ | |
| | Door should open outside the cubicles | ✓ | |
| | Latches on the doors of the buildings should be at a height that could be accessed by a child | ✓ | |
| | Should allow maximum daylight inside the toilet blocks. | | ✓ |
| Roof | Skylights and other passive design features to maximise daylight should be incorporated | | ✓ |
| Lighting arrangement | Energy-efficient lighting should be explored and installed | | ✓ |
| **Infrastructure** | | | |

| | | Must | Desirable |
|---|---|---|---|
| Water supply | Running water should be made available in all toilet and bathing cubicles | ✓ | |
| Water storage facility | All facilities should have adequate underground and /or overhead storage. Water storage should be cleaned at least once a month. | ✓ | |
| Waste Water disposal | All facilities should have waste-water disposal either in municipal sewer line or OSS constructed as per the CPHEEO norms | ✓ | |
| Waste bins | Appropriate number of waste bins should be placed in cubicles as well as common areas, especially near wash basins | ✓ | |
| | A waste bin should be placed in each cubicle in the women's section | ✓ | |
| | Women sections could include feasible and proven technologies for incineration of sanitary pads | | ✓ |
| Storage | A separate storage cabinet/ janitor's room for storing all cleaning equipment should be provided | ✓ | |
| Vending | Sanitary pads vending machines in women's section | | ✓ |
| **Sanitary & Plumbing fixtures** | | | |
| Urinals and Water Closets | Urinals<br>▪ All Urinals should be fitted with a flush valve and a flushing device, unless waterless urinals with proven effectiveness are installed in the facility<br>▪ Urinals should be separated by modesty boards<br>▪ Urinals should have a drain pipe below to avoid splashes<br>▪ If two or more urinals are installed, one should be installed at child's height. | ✓ | |
| | Water Closets<br>▪ Each public toilets should have a combination of Indian or western seats | ✓ | |
| | ▪ All WCs should have a flush valve | ✓ | |
| | ▪ Automatic flushing devices could be explored. | | ✓ |
| | ▪ An ablution tap should be installed in all cubicles.<br>▪ A floor trap should be provided within the cubicle with western seat<br>▪ The flooring of the cubicle should be properly graded towards the floor trap or the Indian seat so as to keep the floor dry<br>▪ Hooks should be affixed behind cubicle doors<br>▪ One water closet in each male and female section should be child friendly | ✓ | |
| Wash basin, Taps, | The water pressure and tap/wash basin position should not cause water to splash onto user's body during activation | ✓ | |
| | Where there are 2 or more basins, one should be installed at child's height. | ✓ | |

| | | Must | Desirable |
|---|---|---|---|
| | All wash basins should have soap dispensers or soap dishes for hand washing | ✓ | |
| | Water saving taps, dual flush knobs (half flush and full flush knobs) and motion sensor taps could be explored for water conservation. | | ✓ |
| Special Needs | Diaper changing station in the women's section | ✓ | |
| | Toilets for handicapped should be designed and constructed in accordance with Barrier Free and Accessibility Handbook published by CPWD[4]. | ✓ | |
| Mirrors | Separate mirrors should be provided for male and female sections | | ✓ |
| **Electricals** | | | |
| Electricity connection & meter | All facilities should have a separate metered electricity connection | | ✓ |
| | Electricity meters should be placed so that it is not prone to vandalism | | ✓ |
| Switch boards | Switch boards should be installed at heights so that it could be comfortably reached by users | ✓ | |

The above recommendations are based on a study of public conveniences in Ahmedabad. These recommendations maybe suitably adapted to suit the local requirements.

### 1.4.5 Operations and maintenance

All ULBs should adopt model standard operating procedures (SOP) including cleanliness benchmarks for operation and maintenances of public toilets. Benchmarks should be made available to the public so that citizens are aware of the expected level of cleanliness. Model SOPs are annexed to the GR. The model SOP will have detailed guidelines for the general maintenance of the toilets including daily cleaning and maintaining physical infrastructure.

The general guidelines of the SOP include regular cleaning of toilets, urinals, floors, walls and ceilings of the interior as well as exterior of the facility. Periodic physical infrastructure maintenance schedule includes sanitary, plumbing, electrical and civil fixtures mostly maintained by engineering departments of respective ULBs.

ULBs may operate and maintain public toilets themselves or may outsource to private agencies. If outsourced, contracts of the agencies should be for duration of atleast 5 years. Payment to the contractors should be based on their performance (as per the benchmarks set by each ULB) and contractor's adherence to the SOP.

All ULBs should set up a monitoring plan for maintenance and cleanliness of public toilets. In addition to monitoring by ULBs, citizens' feedback through complaints registration should be used to track performance of private agencies contracted for operation and maintenance of toilets. Payments of private operators should be linked to this performance measurement. All public toilets should either have one of the following systems for grievances recording and ensuring timely redressal.

- clearly displayed phone numbers of the toilet management
- a manual register for registering complaints
- On-line grievance registration & redressal

[4](CPWD, 2014)

## 1.5 Strategies for temporary toilets at construction sites, special events and for homeless in urban areas

Strategies for temporary toilets at construction sites for construction labour and for special events such as exhibitions /fairs/special events etc. and for migrants and homeless in urban areas

The Government " Building and Other Construction workers Act 1996" gives focus on the working conditions of the labourers and their basic requirements. The term "building and construction Work" , includes, construction, alteration, repairs, maintenance or demolition, of or, in relation to, buildings, streets, roads, railways, tramways, airfields, irrigation, drainage, embankment and navigation works, flood control works (including storm water drainage works), generation, transmission and distribution of power, water works (including channels for distribution of water), oil and gas installations, electric lines, wireless, radio, television, telephone, telegraph and overseas communications, dams, canals, reservoirs, watercourses, tunnels, bridges, viaducts, aqueducts, pipelines, towers, cooling towers, transmission towers and such other work.

All ULBs should ensure that there are adequate number of temporary toilets constructed at all construction sites where

- the ULB is undertaking any construction
- Construction is being undertaken by other government organisation, private or non-government organisation within its jurisdiction. The ULB should monitor provision of such toilets as part of the building plan permission process.

All temporary accommodation (such as night shelters)for migrants and the homeless should have adequate provision for toilets either on the premises or have access to a public toilet nearby.

## 1.6 Strategy for government departments of the state

Adequate number of seats for all residents/ occupants as well as visitors to a government building is vital. Relevant Indian Standard (IS) Codes and other applicable benchmarks for provision on facilities such as toilet seats, urinals, and wash basins should be followed as indicated in the "guideline for Sanitation Index". Toilets should comply with regulations for provision of facilities for disabled persons and children. Adequacy is to be checked for current usage and density even if the building was designed as per earlier standards.

1. All government departments should ensure adequate toilets for all occupants and visitors. These are applicable for all buildings/ premises owned or occupied by the 'eligible organisations' – any organisation/ board/ corporation/ company of the Government of Gujarat as well as all buildings/ premises commissioned by eligible organisations on public private partnership (PPP).
2. Over and above these recommended standards, provisions for child-friendly as per the technical note containing norms and options for school and *anganwadi* toilet designs published by the Ministry of Rural Development[5] have to be adhered to. Similarly, provisions should be made for the disabled in each toilet block as per the "Barrier Free Built Environment Guidelines" by the Central Public Works Department[6].
3. Any labour/ construction workers engaged by any government body, either directly or through private contractors, shall be provided individual toilets at their residences and

[5](Department of Drinking Water Supply, 2004)
[6](Central Public Works Department, 1998)

toilets at their workplace as per the Building and Other Construction Workers' Act, 1996[7].

All government departments should allocate required budget for providing adequate toilets within their premises and its upkeep.

**Operations and Maintenance of toilets**

All government departments should adopt model standard operating procedures (SOP) including cleanliness benchmarks for operation and maintenances of toilets. Toilets could be operated and maintained by the concerned government departments or could be outsourced to private agencies. If outsourced, then the SOPs and benchmarks should be included in the contracts.

By order and in the name of the Governor of Gujarat.

(Manish Modi)
Under Secretary
Urban Development and Urban Housing Department

Encles. :

1. Annexure I – Guidelines for adopting supporting measures.
2. Annexure II – Various technology options for toilets.
3. Annexure III – Technological options for onsite sanitation systems under Swachh Bharat Mission.
5. Annexure IV- Draft IEC messages for toilet usages.
6. Annexure V – Standard operating procedures for cleaning of toilets.
7. Annexure VI - Standard operating procedures for faecal sludge management.
8. Glossary
9. List of abbreviations.
10. Bibliography.

[7](Chief Labour Commissioner, 1996)

To,

Principal Secretary to Hon'ble Governor of Gujarat

Principal Secretary to Hon'ble Chief Minister,

All Personal Secretaries to Hon'ble Ministers / Hon'ble Ministers of State / Hon'ble Parliament Secretaries,

All A.C.S./ P.S./ Secretaries of the Secretariat Departments,

All HODs,

All Board Corporations,

All Collectors,

All DDOs,

All Municipal Commissioners,

Director of Municipalities, Gujarat State Gandhinagar,

Managing Director, GUDC, Gandhinagar,

Additional Chief Executive Officer, GUDM, Gandhinagar,

Chief Executive Officer, GMFB, Gandhinagar,

All Chief Officers (Through DOM),

Select file.

# Annexure 1: Guidelines for adopting supporting measures

## Annexure 1A: Regulatory framework: fines and public health bye-laws

Along with infrastructure creation and efficient operations, there is a need to put in place an adequate legislative framework which empowers ULBs to ensure strict enforcement of SWM rules & regulations and other sanitation guidelines.

GoG is preparing model public health bye-laws. All ULBs should adapt the model public health bye-laws for regulating all matters related to sanitation. The bye-laws will be applicable to every public and private space, commercial centres, residences and all public areas within the ULB limits. The bye-laws should spell out obligatory responsibilities of ULBs and penalties for the contravention of the bye-laws. Typically, Public Health Byelaws should include detailed regulations on:

- Classification of solid and liquid waste into different categories, waste generators
- Segregation, storage, collection, processing and disposal of solid and liquid waste
- Liquid Waste Management
- Prevention of Waterborne, Vector borne and Food borne diseases
- Offences under the bye-laws
- General offenses which is applicable to all the citizens within city limit
- Enforcement of the provisions
- Schedule of Fines

## Annexure 1B: Effect behaviour change regarding health and hygiene

A key strategy to ensure that toilets are used and that cities become free of open defecation is to change behaviour of users and to generate awareness on the linkages of sanitation and health.

All urban local bodies should conduct information, education and communication (IEC) campaign on WASH (water, sanitation for health).

A good communication strategy should at a minimum include:

- Importance of using a toilet for the family and for the community at large
- hand washing with soap after defecation and before having food
- importance of cleanliness and hygiene, solid waste management

The IEC strategy should clearly define the target audience, content of the information, methods to be used to convey the information and approaches to promote action for change. IEC can be achieved through advocacy, interpersonal communication and community mobilisation with multi-media support including mass media, digital media and social media. Clear actionable messages should be designed to reach out to the target audience and should be in sync with the State Action Plan for IEC. Some sample draft messages for IEC related to use of toilets has been provided in **Error! Reference source not found.**.

ULBs should converge such communication with other ongoing programs and outreach activities being undertaken.

ULBs should nominate relevant officials for training programs that will be conducted at the state level.

## Annexure 1C: Eradicating manual scavenging practices

On September 18, 2013,'The Prohibition of Employment as Manual Scavengers and their Rehabilitation Act, 2013', of the Parliament referred to The Act hereon, received assent from the President of India. The act was prepared to provide for prohibition of employment as manual scavengers, rehabilitation of manual scavengers and their families and for matters connected there with of incidental thereto. The act recognises that

> "… The dehumanising practice of manual scavenging arising from the continuing existence of insanitary latrines and a highly iniquitous caste system still persists in various parts of the country, and the existing laws have not proved adequate in eliminating the twin evils of insanitary latrines and manual scavenging."
> (Ministry of Law and Justice, 2013, p. 1)

In ULBs, incidences of the manual scavenging may occur in any of the following instances:

- manual clearing of waste from insanitary latrines,
- manual cleaning of open defecation spots,
- manual cleaning of sewer lines,
- manual cleaning of septic tanks, and
- manual cleaning of railway tracks. While cleaning of railway tracks is done by the Indian Railway, all other locations of manual scavenging come under the municipal purview.

All ULBs should initiate activities as prescribed by, 'The Prohibition of Employment as Manual Scavengers and their Rehabilitation Act, 2013'.

## Annexure 1D: Monitoring under the Mahatma Gandhi Swachhata Mission

In order to promote the tenets of "sanitation" across the state, the Government of Gujarat has initiated a regular monitoring system for all departments of the state. MGSM will monitor sanitation in the state including government owned buildings, and initiatives in cities and villages. Refer Sanitation Index guidelines by Urban Development and Urban Housing Department, GoG which detail the monitoring framework.

The results of the sanitation index will be placed in public domain for enhanced citizen participation and to create a demand for improved sanitation facilities.

All ULBs should establish monitoring systems to report PAS / SLB indicators, systems for reporting OD free status.

## Annexure 2: Various technology options for toilets

The following technological options of OSS are recommended under Swachh Bharat Mission (SM) Urban for construction of Individual Household latrines (IHL)/ household toilets, group/shared latrines and community and public toilets

| S. No. | OSS option | Application | | | |
|---|---|---|---|---|---|
| | | IHL | Shared Latrine | Public Toilets | |
| 1. | Twin-pit latrines / Leach Pits | ✓ | | | • In low- to medium-density areas, particularly peri-urban areas, where there is space to install pits and where the digested sludge can be applied to local fields and/or gardens as a fertilizer and soil conditioner<br>• Where water use is in the range 30– 50 litres per capita per day depending upon the characteristics of the soil or groundwater level. |
| 2. | Septic Tank System with soak pit | ✓ | ✓ | ✓ | • Septic tanks are widely used to provide partial treatment of wastewater from individual homes, household clusters or institutional buildings where there is no sewerage network.<br>• For soak pits to function, soil conditions must be suitable for infiltration of effluent from septic tanks |
| 3. | Bio-digester toilets (Anaerobic – developed by DRDO) | ✓ | ✓ | ✓ | • Widely used to provide 80% treatment of wastewater from IHL, household clusters or institutional buildings where there is no sewerage network.<br>• The effluent should be passed through a reed bed or soak pit before discharge.<br>• For soak pits to function, soil conditions must be suitable for infiltration of effluent from septic tanks |
| 4. | Aerobic Bio Tank | ✓ | ✓ | ✓ | • Widely used to provide 100% treatment of wastewater from IHL, clusters of houses or institutional building where there is no sewerage network. The effluent can be directly discharged since it is completely safe;<br>• Chlorination needs to be followed after treatment |

# Annexure 3: Technological options for on-site sanitation systems under Swachh Bharat Mission

This note explains the technical options for On-Site Sanitation (OSS) that are recommended under the Swachh Bharat Mission (SBM).

## *Features of On-Site Sanitation (OSS) Systems*:

When sewage is collected, treated and/or disposed off at, or near the point of generation, without the use of an underground sewerage system, the system is called "on-site sanitation" (OSS) system. OSSsystems are sanitation facilities provided for the use of individual households, community and the floating population. There are a number of situations when an underground sewerage system may not be feasible or desirable. For example, for smaller cities where construction of sewerage infrastructure may be expensive, or those cities that are in hilly areas or in undulating terrain where it may not be practical to construct a sewer network, or even in many cities that have grown organically and where not all households are connected to the existing sewerage network.

OSSsystems consist of two main structures, the toilet (superstructure, including the pan and water closet) and the treatment unit. OSS retains waste in the vicinity of the toilet either in a pit, tank or vault. The treatment ranges from a basic sanitary facility such as twin-pit latrines, to a simple type of treatment system by combining a septic tank and a soak pit, or a bio-digester toilet (aerobic and anaerobic).

## *OSS technology options recommended under SBM:*

The following technological options for OSS are recommended under Swachh Bharat Mission (SBM) for construction of Individual Household Latrines (IHL), group / shared latrines, and,community and public toilets:

| S. No. | OSS Option | Kind of Latrines | | | | Application |
|---|---|---|---|---|---|---|
| | | IHL | Shared Latrines/ Group Toilets | Community Toilets | Public Toilets | |
| 1. | Twin-pit latrines / Leach Pits | □ | | | | • In low- to medium-density areas, particularly peri-urban areas, where there is space to install pits and where the digested sludge can be applied to local fields and/or gardens as a fertilizer and soil conditioner<br>• Where water use is in the range 30–50 liters per capita per day depending upon the characteristics of the soil or groundwater level. |
| 2. | Septic Tank System with soak pit | □ | □ | □ | □ | • Septic tanks are widely used to provide partial treatment of wastewater from individual homes, household clusters or institutional buildings where there is no sewerage network. |

| S. No. | OSS Option | Kind of Latrines | | | | Application |
|---|---|---|---|---|---|---|
| | | IHL | Shared Latrines/ Group Toilets | Community Toilets | Public Toilets | |
| | | | | | | • For soak pits to function, soil conditions must be suitable for infiltration of effluent from septic tanks |
| 3. | Bio-digester toilets (Anaerobic – developed by DRDO) | □ | □ | □ | □ | • Claims to provide 80% treatment of wastewater from IHL, household clusters or institutional buildings where there is no sewerage network.<br>• The effluent should be passed through a reed bed or soak pit before discharge.<br>• For soak pits to function, soil conditions must be suitable for infiltration of effluent from septic tanks |
| 4. | Aerobic BioTank | □ | □ | □ | □ | • It claims to provide 100% treatment of wastewater from IHL, clusters of houses or institutional building where there is no sewerage networks. It claims that the effluent can be directly discharged since it is completely safe;<br>• Chlorination needs to be followed after treatment |

***OSS vs. underground sewerage***: Wherever a sewerage system is **feasible within 30m from the proposed individual household,** community or public toilets, only the superstructure (i.e. toilets) may be constructed under SBM and connected to the existing sewerage system. No construction of treatment units such as twin pits, septic tank, bio-digester or bio- tank shall be allowed.

## *Technical features & specification for OSS Options under SBM*

The details of technical features and specifications are given as under. The costs are simply estimates at this point of time and should be verified at the time of selection and installation of the technology.

### *I. Twin Pit Latrine*

| | |
|---|---|
| **Description** | It consists of superstructure (Toilet) and treatment units (two chambers). The two underground chambers (pits) are provided to hold fecal sludge. These are normally offset from the toilet and should be at least 1 meter apart. A single pipe leads from the toilet to a small diversion chamber, from which separate pipes lead to the two underground chambers. The pits should be lined with open-jointed brickwork. Each pit should be designed to hold at least 12 months accumulation of fecal sludge.<br><br>Wastewater is discharged to one chamber until it is full of fecal sludge. Discharge is then switched to the second chamber. Just before the second chamber is full of fecal sludge, the contents of the first pit are dug out. During the time of storage, digestion should ensure that it is odorless and free of pathogens. |
| **O&M Requirements** | The pits must be used alternately and the diversion chamber must be accessible so that flow can be diverted between chambers. Wastewater should never be diverted back to the first chamber before digested sludge has been removed from it.<br><br>Responsibility for O&M of the twin-pit latrine rests primarily with the householder, who needs to ensure that the pits are used in the correct sequence and are emptied at the appropriate time. However, ULB utility or private contractors are required for emptying and to ensure safe disposal of septage at a treatment plant. |
| **Additional Infrastructure / treatment requirements** | If digested material cannot be used in local fields and gardens, provision will have to be made for transportation to areas outside the city for reuse on agricultural land. |
| **Limitations** | • Households may not understand the system and as a result may not use the pits alternately, or may omit to rest the filled pit at least for one year so that the contents degrade and become harmless.<br>• Explanation of the operation and maintenance requirements is therefore essential at the time of installation.<br>• Water may percolate through the soil surrounding the pit and pollute groundwater, which is a potential problem if water is used for drinking. |
| **Specifications** | (a) **Size options for Toilet/ Super Structure** (as shown in Fig.1): Any one of the sizes given below may be adopted depending upon the space availability and affordability of the individual.<br>a. 750 mm x 900 mm x 1900mm; or<br>b. 800 mm x 1000 mm x 1900 mm ;<br>c. 900 mm x 1050 mm x 1900 mm<br>(b) **Material** – Brick work (as per Fig. 1) / FRP/ Pre-cast Cylindrical Unit |

| | |
|---|---|
| | (c) **Minimum Land Requirement** – 40 Sq. ft. -60 Sq. ft. (depending upon the location of superstructure and distance between two pits)<br><br>(d) **Size of Pits** is shown in Table -1 below |

| | 5 users* | | 10 users** | | 15 users*** | |
|---|---|---|---|---|---|---|
| | Dia | Depth (A) | Dia | Depth (A) | Dia | Depth (A) |
| Pit size | 900 | 1000 | 1100 | 1300 | 1300 | 1400 |

*- *only for IHL*

**- *Group household toilets*

The specification for pits given at Fig 2 may be referred to.

| | |
|---|---|
| **Cost (for 5 users)** | Tentative cost varies from Rs. 15,000/- to Rs. 20,000/- depending upon the construction material. |

| **DESIGN OF PITS UNDER DIFFERENT CONDITIONS** | |
|---|---|
| **Normal conditions** | A typical pour flush latrine with circular pits for normal conditions is shown in **Figure 2**. In rocky strata with a soil layer in between, the leach pits can be designed on the same principle as those for low subsoil water level and taking the long-term infiltrative capacity as 20 l/m$^2$/d. However, in rocks with fissures, chalk formations, or old root channels, pollution can flow for very long distances; hence these conditions demand careful investigation and adoption of adequate pollution safeguards. Pits in black cotton soil should be designed taking infiltrative rate of 10 l/m$^2$/d.<br><br>A vertical fill (envelope) of 300 mm in width with sand, gravel or ballast of small sizes should be provided all round the pit outside the pit lining in rocky strata with fissures and in black cotton soil. |
| **In water-logged areas** | The pit top should be raised by 300 mm above the likely level of water above ground level at the time of water logging. Earth should then be filled well compacted all-round the pits up to 1.0 m distance from the pit and up to its top. The raising of the pit will necessitate the raising of latrine floor also. A typical pour flush latrine in water-logged areas is shown in **Figure 3**. |
| **In high subsoil water level** | Where the subsoil water level rises to less than 300 mm below ground level, the top of the pits should be raised by 300 mm above the likely subsoil water level and earth should be filled all round the pits and latrine floor raised as stated above. A typical pour flush latrine with leach pits in high subsoil water level is shown in Figure 4. |
| **Where space is a constraint** | Where circular pits of standard sizes cannot be constructed due to space constraints, deeper pit with small diameter (not less than 750 mm), or combined oval, square or rectangular pits divided into two equal compartments by a partition wall may be provided. In case of combined pits and the partition wall should not have holes. The partition wall should go 225 mm deeper than the pit lining and plastered on both sides with cement mortar. A typical pour flush latrine with combined pits is shown in Figure 5. |

### *II. Septic Tank*

<table>
<tr><td>Description</td><td>A septic tank is a buried chamber that collects, stores and treats the wastewater under anaerobic conditions. Effluent from septic tanks should be discharged into a soak pit. A well-managed septic tank will remove about 50 to 60 % of the biological load in the wastewater</td></tr>
<tr><td>Mode of operation</td><td>Solids settle in the tank and digest anaerobically. This reduces sludge volume and enables wastewater to infiltrate into the ground without clogging the leaching system. Sludge settles in the tank and digests anaerobically over time, releasing methane and other gases.</td></tr>
<tr><td>O&M Requirements</td><td>Septage must be removed from septic tanks at least once every 2 or 3 years and transported off-site for treatment prior to disposal. Municipal utility or private contractors are required for desludging of septic tanks and to ensure safe disposal of septage at a treatment plant. However the responsibility for O&M of the septic tank itself lies with the owner of the property</td></tr>
<tr><td>Limitations</td><td>• Cost and space requirements for the soak pit.<br>• Though septic tanks are designed for receiving black water, they often receive both black and grey water. As a result, the retention time in the septic tank is insufficient and the soak pit becomes hydraulically overloaded. This means that the septic tanks need to be de-sludged regularly</td></tr>
<tr><td>Specifications</td><td>(a) Size options for Toilet/ Super Structure (as shown in Fig.1): Any one of the sizes given below may be adopted depending upon the space availability and affordability of the individual.<br>a. 750 mm x 900 mm x1900mm; or<br>b. 800 mm x 1000 mm x1900 mm ;<br>c. 900 mm x 1050 mm x1900 mm<br><br>(a) Material – Brick work (as per Fig. 1) / FRP / Pre-cast Cylindrical Unit<br><br>(b) Minimum Land requirement - 40 Sq. ft. to 50 Sq. ft. (depending upon the location of superstructure)<br><br>(c) Soak-pit size - The seepage pit may be of any suitable shape with the least cross-sectional dimension of 0.90 m and not less than 1 m in depth below the invert level of the inlet pipe. The construction shall be of perforated brickwork<br><br>(d) Recommended sizes of septic tanks for households (up to 20 users – group / shared toilets) is given in Table 2 below.<br><br>
<table>
<tr><th rowspan="2">No. of users</th><th rowspan="2">Length (m)</th><th rowspan="2">Breadth (m)</th><th colspan="2">Liquid depth (m) (Cleaning interval of)</th></tr>
<tr><th>2 years</th><th>3 years</th></tr>
<tr><td>5*</td><td>1.5</td><td>0.75</td><td>1.0</td><td>1.05</td></tr>
<tr><td>10**</td><td>2.0</td><td>0.90</td><td>1.0</td><td>1.4</td></tr>
<tr><td>15**</td><td>2.0</td><td>0.90</td><td>1.3</td><td>2.00</td></tr>
<tr><td>20**</td><td>2.3</td><td>1.10</td><td>1.3</td><td>1.80</td></tr>
</table>
*- only for IHL<br>
**Shared/Group household toilets<br><br>
Note 1: The capacities are recommended on the assumption that discharge from only WC will be treated in the septic tank</td></tr>
</table>

| | |
|---|---|
| | ***Note 2:*** *A provision of 300 mm should be made for free broad.*<br>***Note 3:*** *The sizes of septic tank are based on certain assumption on peak discharges, as estimated in IS: 2470 (part 1) and while choosing the size of septic tank exact calculations shall be made.* |
| **Cost (for 5 users)** | • Tentative cost varies from Rs. 25,000/- to Rs. 30,000/- depending upon the construction material (toilet and septic tank).<br>• Pre fabricated septic tanks are available at lower cost in the market, which also may be explored to speed up the implementation. |

### *III Bio-digester Toilet (Developed by DRDO)*

| | |
|---|---|
| **Description** | A bio-digester toiletis an anaerobic multi-compartment tank with inoculum (anaerobic bacteria) which digests organic material biologically. The details of bio-digester toiletsare shown in Figure 7. This system converts faecal waste into usable water and gases in an eco-friendly manner.<br><br>It can be connected to the toilet or a series of toilets. The toilet can be a superstructure fixed on the bio-digester tank or a separate unit. Bio-digester tank has an inlet, an outlet and a gas pipe.<br><br>The tank has two components, namely, anaerobic microbial inoculum (seed bacteria) and specially designed fermentation tank. The tank can be made out of stainless steel, mild steel, FRP or concrete or brick and mortar.<br><br>**The effluent from bio-digester tank is needed to be further disposed into a soak pit or a reed bed arrangement for its treatment to acceptable levels for reuse.** |
| **Advantages** | • **It is claimed that there is no sludge formation,** consequently there is no need for de-sludging and treatment and hence it is more economical in the long-term as it conserves water and has minimum O&M<br>• Night soil degradation occurs through microbial reaction which converts it into bio gas and odorless water.<br>• Technology is environmental friendly, maintenance free and efficient without depending on conventional energy sources.<br>• Permits use of toilet cleansing agents.<br>• Suitable for mobile and stationary platforms.<br>• Lifelong usage bio-digester tank does not need recharging, re-shifting or maintenance.<br>• Costs lesser than the conventional toilets.<br>• Easy to transport and install.<br>• One-third to one-fourth capacity of septic tank<br>• Space requirement is less. |
| **Limitation** | • If the digester is not in use for more than 4-5 months continuously, a small portion of inoculum to be fed for reactivation of Bacteria. |
| **Specifications** | **Toilet Superstructure**<br>(a) **Size options for Toilet/ Super Structure** (as shown in Fig.1): Any one of the sizes given below may be adopted depending upon the space availability and affordability of the individual. |

a. 750 mm x 900 mm x1900mm; or
b. 800 mm x 1000 mm x1900 mm ;
c. 900 mm x 1050 mm x1900 mm

(b) **Material** – Brick work (as per Fig. 1) / FRP / Pre cast Cylindricalor Square

**Bio tank**

(a) Land requirement
a. 20-25 sq. ft.(superstructure above Bio Tank ,reedbedor soak pit)
b. 9-10 sqft (superstructure above Bio Tank)
(b) Tank internal dimensions – .715 mm x1000 mm x 1000 mm
(c) Diagonal partition wall of 2.5-3mm thickness (adequately stiffened by ribs)
(d) Tank is buried 600mm deep and anchored by 300mm long stainless steel (SS316) anchor bolts at corners(Not required)
(e) FRP tanks of average3mm(2.5-6mm depending on the volume) thickness
(f) Provision of water sealed outlet from the tank
(g) For 5-6 users:
a. Total capacity: 700 litres (1000 mmX700 mm and 1000 mm depth). Where space is a constraint the depth of the tank can be increased to 1.5 m
b. Volume of anaerobic Compartment (30% of capacity): 210 litres
c. Tank may be constructed with masonry also.

**Table 3** - Volume of bio-digester tank for various user groups:

| No. of users | Size of bio-digester / bio-toilet | Remarks |
|---|---|---|
| 4-7 (Single family) | 0.7$m^3$ (FRP / RCC material/ Brick and Mortar/ precast) | Individual |
| 8-15 (two families) | 1 $m^3$ (FRP / RCC material/ Brick and Mortar/ precast) | Group / shared |
| 30-50 | 3 $m^3$ (FRP / RCC material/ Brick and Mortar/ precast) | Community |
| 100-120 | 6.0 $m^3$ (FRP / RCC material/ Brick and Mortar/ precast*) | |
| 200-220 | 10.0 $m^3$ (RCC material/ Pre cast/Brick and Mortar/) | |
| 500-600 | 30.0 $m^3$ (RCC material/ Precast/Brick and Mortar) | |

* It is not recommended to use FRP tank for volume of more than 5-6.0 $m^3$ as logistics will be difficult and transportation cost is high.

**Cost Estimates**

- **Toilet cost (super Structure)**- between Rs. 15,000 and Rs. 20,000depending on material of construction;
- **Bio-digester tank Cost** - as per Table 4 below

| Bio-digester tank -> | Material of construction | | |
|---|---|---|---|
| **No. of users / Capacity** | **Masonry** | **Precast Cylindrical Unit** | **Fiber reinforced plastic** |
| 5 to 7 users (700 Litre) | 17,100 | 13,000 | 22,000 |
| 10 to 12 users (1000 Litre)** | 19,000 | 15,000 | 24,000 |

**Group / Shared toilets

| | |
|---|---|
| | **Notes on Bio- Digester based Toilets**<br><br>1. Cost of construction will depend on the schedule rates of each state.<br><br>2. The Claims made by Biodigester providers that "No sludge shall be produced" consequent to wastewater treatment,by addition of certain patented inoculums and processes in the bio tank ". It has been stated that use of phenyl and other chemical toilet cleansing agents will not unduly affect treatment efficiency, have not been independently verified by CPHEEO/MoUD.<br><br>As such, while drafting contracts, the firms/ ToT holders engaged to construct toilets using this technology should be held to be financially and legally responsible for tenability of their claims. |

## *IV Aerobic Bio Tank/ Bio Toilets (Patented by a private operator and approved by Department of Science and Technology)*[@]

| | |
|---|---|
| **Description** | This technology differs from that of the bio-digester toilets developed by DRDO since the process adopted is aerobic- which involves a different multi-strain of bacteria which breaks down the waste matter through oxidization. Bio-toilets consist of a purpose built multi-chambered bio-tank in which the waste is stored as shown in **Figure 8**. The movement of the waste is slowed down as the waste flows from one chamber to another by a special process in the Bio-tank such that the multi-strain bio-media present in the tank can digest the waste and convert it fully into non-toxic, neutral water. This water then passes through the last chamber for disinfection. Here water is treated with Chlorine where the majority of the germs are killed. The resultant water is free from all sorts of E-coli and fecal coliforms.<br><br>The bricks and mortar Bio-tank is described in the last diagram of Figure 8.The superstructure is made of bricks and mortar. These are available in both flush and non-flush models. |
| **Advantages** | • Aerobic bacteria are very efficient in breaking down organic waste and the waste is decomposed into water by the bacteria within 24 hours.The end products of aerobic degradation are carbon dioxide ($CO_2$) and water ($H_2O$).<br>• The aerobic pathway also releases a substantial amount of energy.<br>• The Bio-toilet is available in both, portable as well as fixed models. The advantage of the portable model is that it can be shifted from one location to another as and when required, and the module can be assembled and disassembled easily.<br>• **The Bio-toilet eliminates the need for any periodic sludge removal.** |
| **Limitations** | • The bacteria functions best in temperatures between 4 and 55 degrees centigrade<br>• Bio-toilets need proper bacteria inoculation periodically depending on the usage at particular sites. **An in-depth understanding of the operation and use of toilets in a given area must be undertaken BEFORE choosing bio-toilets as a solution.**<br>• Attention must be given to O&M, especially in dense urban settlements where chances of blockage of bio-toilets increase, making it dysfunctional |

| | |
|---|---|
| | over a period of time if the inoculation is not done in time.<br>• Phenyl/ Harpic or any strong detergent/acid and bleaching powder should not be used to clean the pan. Only herbal / ayurvedic cleaning agents should be used.<br>• Chlorine dose is necessary for disinfection. |
| **O&M** | Responsibility of cleaning the toilet / superstructure is with the owner of the household in the case of IHLs / shared latrines and with the ULB in the case of community / public toilets. |
| **Specifications** | (e) **Size options for Toilet/ Super Structure** (as shown in Fig.1): Any one of the sizes given below may be adopted depending upon the space availability and affordability of the individual.<br>a. 750 mm x 900 mm x 1900mm; or<br>b. 800 mm x 1000 mm x 1900 mm ;<br>c. 900 mm x 1050 mm x 1900 mm<br>(a) **Material** – Bricks and Mortar walls of Bio Digester tank and Superstructure, PCC tank floor, RCC toilet floor, PVC Door and Frame, RCC/PVC/GI sheet Toilet Roof.<br>(b) **The Bio-toilet system consists of:**<br>• Bio digester Tank(Bricks & Mortar/FRP/Steel),<br>• Superstructure(Bricks & Mortar/FRP)<br>• Indian Pan/WC<br>• Size: 4 feet x 4 feet tank base, 4 feet tank height, 6 feet superstructure height.<br>• Maximum usage recommended**:** 30 defecations/ day/ bio-toilet (no limit on urination)<br>(c) **Land requirement** - 16 Sq. ft. |
| **Cost Estimates** | The tentative cost of bio-toilet including super structure is approximately Rs.20,000/–depending upon material of construction. The bio-toilets should be supplied by the manufacturers, and the O&M for at least 5 years (including the feeding of inoculum in the periodicity needed) along with IEC (to train users for O&M) by the manufacturer / supplier also should be built into the undertaking. |

**Note-**

The manufacturers of **Aerobic Bio-tank/ Bio-Toilet** have claimed that aerobic conditions shall be created in the bio-tank/ bio toilet solely through natural aeration and that no sludge production would take place. These claims have not been independently verified by the CPHEEO/MoUD. As such, while drafting contracts, the firms/ ToT holders engaged to construct toilets using this technology should be held to be financially and legally responsible for tenability of their claims.

They have also stated that inoculum shall have to be fed at least once in a quarter (3 months) for proper functioning of the treatment unit. It is also suggested to use herbal/ Ayurvedic cleaning agents as chemical agents such as phenyl may harm the inoculums. How and by whom shall the inoculums be administered and what are the consequent O&M charges due to these requirement is a function of remoteness of the toilet from major urban areas. The same may also be accounted for in the cost of toilet.

## *Norms and Specifications for Community and Public Toilets*

<table>
<tr><td>Description</td><td>A community toilet block is a shared facility provided for a group of residents or an entire settlement. Community toilet blocks are used primarily in low-income informal settlements where space and/or land are constraints. Pour flush option is generally used in this kind of OSS systems. It is also advisable to provide facilities like washing, bathing, and a small incinerator in this block for the use of the community<br><br>Public toilets are provided for the floating population / general public in places such as markets, train stations or other public areas, where there is a considerable number of people passing by.</td></tr>
<tr><td>Septic tanks for public / community toilets</td><td>Recommended sizes of septic tanks for community/ public toilets (up to 300 users) is given below in Table 5.
<table>
<tr><th rowspan="2">No. of users</th><th rowspan="2">Length (m)</th><th rowspan="2">Breadth (m)</th><th colspan="2">Liquid depth (cleaning interval of)</th></tr>
<tr><th>2 years</th><th>3 years</th></tr>
<tr><td>50</td><td>5.0</td><td>2.00</td><td>1.0</td><td>1.24</td></tr>
<tr><td>100</td><td>7.5</td><td>2.65</td><td>1.0</td><td>1.24</td></tr>
<tr><td>150</td><td>10.0</td><td>3.00</td><td>1.0</td><td>1.24</td></tr>
<tr><td>200</td><td>12.0</td><td>3.30</td><td>1.0</td><td>1.24</td></tr>
<tr><td>300</td><td>15.0</td><td>4.00</td><td>1.0</td><td>1.24</td></tr>
</table>
Source: Manual on Sewerage and Sewage Treatment Systems, 2013 Part A Engineering<br>Note 1: A provision of 300 mm should be made for free board.<br>Note 2: The sizes of septic tanks are based on certain assumptions on peak discharges, as estimated in IS: 2470 (Part 1) and while choosing the size of septic tank exact calculations shall be made.<br>Note 3: For population over 100, the tank may be divided into independent parallel chambers of maintenance and cleaning</td></tr>
<tr><td>Community Toilet - Norms for toilet seats</td><td>• One seat for 35 men;<br>• One seat for 25 women</td></tr>
<tr><td>Public Toilets - Norms for toilet seats</td><td>Norms for toilet sets for public toilets are given in Table 6 below:
<table>
<tr><th>S. No.</th><th>Sanitary Unit</th><th>For Male</th><th>For Female (*)</th></tr>
<tr><td>i.</td><td>Water Closet</td><td>One per 100 persons up to 400 persons; For over 400 persons, add at the rate of one per 250 persons or part thereof</td><td>Two for 100 persons up to 200 persons; over 200 persons, add at the rate of one per 100 persons or part thereof</td></tr>
<tr><td>ii.</td><td>Ablution Taps</td><td>One in each W.C.</td><td>One in each W. C.</td></tr>
<tr><td>iii.</td><td>Urinals</td><td>One for 50 persons or part thereof</td><td>Nil</td></tr>
<tr><td>iv.</td><td>Wash basins</td><td>One per W. C. and urinal provided</td><td>One per W. C. provided</td></tr>
</table>
Source: Manual on Sewerage and Sewage Treatment Systems, 2013 Part A Engineering</td></tr>
</table>

<table>
<tr><td></td><td>Note:<br>i) It may be assumed that two-thirds of the number are males and one- third females<br>ii) One water tap with drainage arrangements shall be provided for every 50 persons or part thereof in the vicinity of water closet and urinals.<br>* At least 50% of female WCs may be Indian pan and 50% EWC<br>iii) Separate seat may also be provided for trans-genders<br>iv) Special arrangements may be made for physically challenged.</td></tr>
<tr><td>Treatment units</td><td>1. Bio Digester with reed bed systems/ soak pits<br>2. Aerobic Bio Tank<br>3. Septic Tank with Soak Pits</td></tr>
<tr><td>Cost</td><td>Tentative basic cost for community toilets is Rs. 65,000/- per seat and public toilets isRs. 75,000/- per seat. However, the cost per seat would vary depending upon the construction material, quality of construction, type of treatment technology adopted and O&M for specified period etc. However the cost of toilet in bio-digester given by NBCC are as under.
<table>
<tr><td colspan="3">Superstructure 5 Cubicle for 200 users</td></tr>
<tr><td>Pre Painted galvanized Sheets</td><td>Masonry</td><td>Cement Board</td></tr>
<tr><td>Rs. 1,63,000.00/-</td><td>Rs.95,000.00/-</td><td>Rs. 80,000.00/-</td></tr>
<tr><td colspan="3">Superstructure 10 Cubicle for 400 users</td></tr>
<tr><td>Pre Painted galvanized Sheets</td><td>Masonry</td><td>Cement Board</td></tr>
<tr><td>Rs.3,26,000.00/-</td><td>Rs. 1,80,000.00/-</td><td>Rs. 1,60,000.00/-</td></tr>
<tr><td colspan="3">Bio Digester Tank 10 KLD for every 200 users</td></tr>
<tr><td>Masonry</td><td></td><td></td></tr>
<tr><td>Rs. 1,74,000.00/- per 200 user</td><td></td><td></td></tr>
</table></td></tr>
<tr><td>Additional Infrastructure</td><td>It must be ensured that adequate water supply arrangement shall be made for proper functioning and upkeep of toilets. Wherever possible, ULBs should ensure that public and community toilets are outfitted with solar panels for the generation of electricity to ensure uninterrupted power supply and bring down O&M costs.</td></tr>
<tr><td>Implementation Mode</td><td>All toilets shall be constructed through PPP mode with inbuilt provision of O&M for at least a period of 5 years.</td></tr>
</table>

For additional details, the guidelines developed by NBCC can be downloaded. (www.nbccindia.gov.in)

**Figure 1: Detailed layout of toilet**

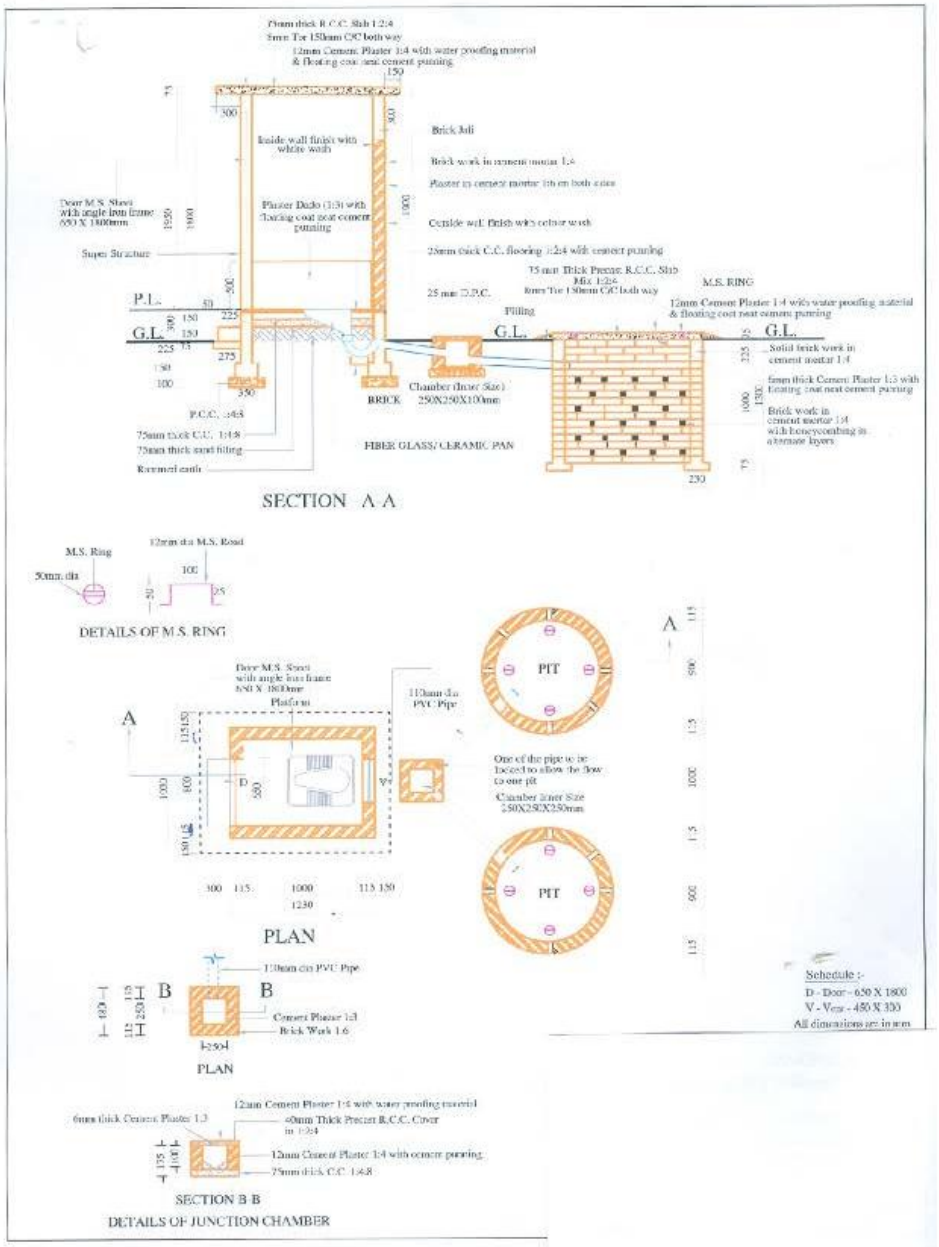
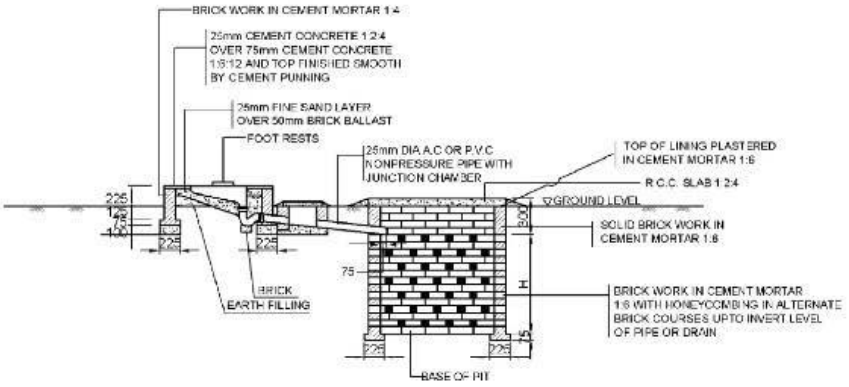
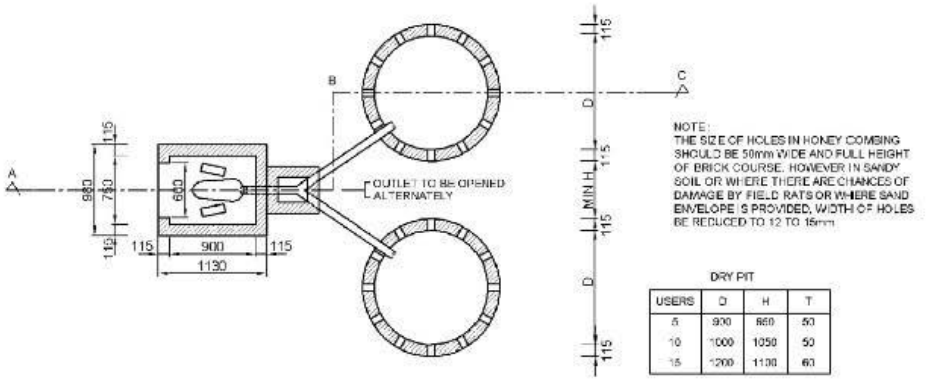


**Figure 2: Pour-flush latrine with circular pits**

(Source: Manual on Sewerage and Sewage Treatment Systems, 2013, Part A: Engineering)




SECTION A B C




DRY PIT

| USERS | D | H | T |
|---|---|---|---|
| 5 | 900 | 860 | 50 |
| 10 | 1000 | 1050 | 50 |
| 15 | 1200 | 1100 | 60 |

PLAN

**Figure 3: Pour-flush latrine in water-logged areas**

(Source: Manual on Sewerage and Sewage Treatment Systems, 2013, Part A: Engineering)

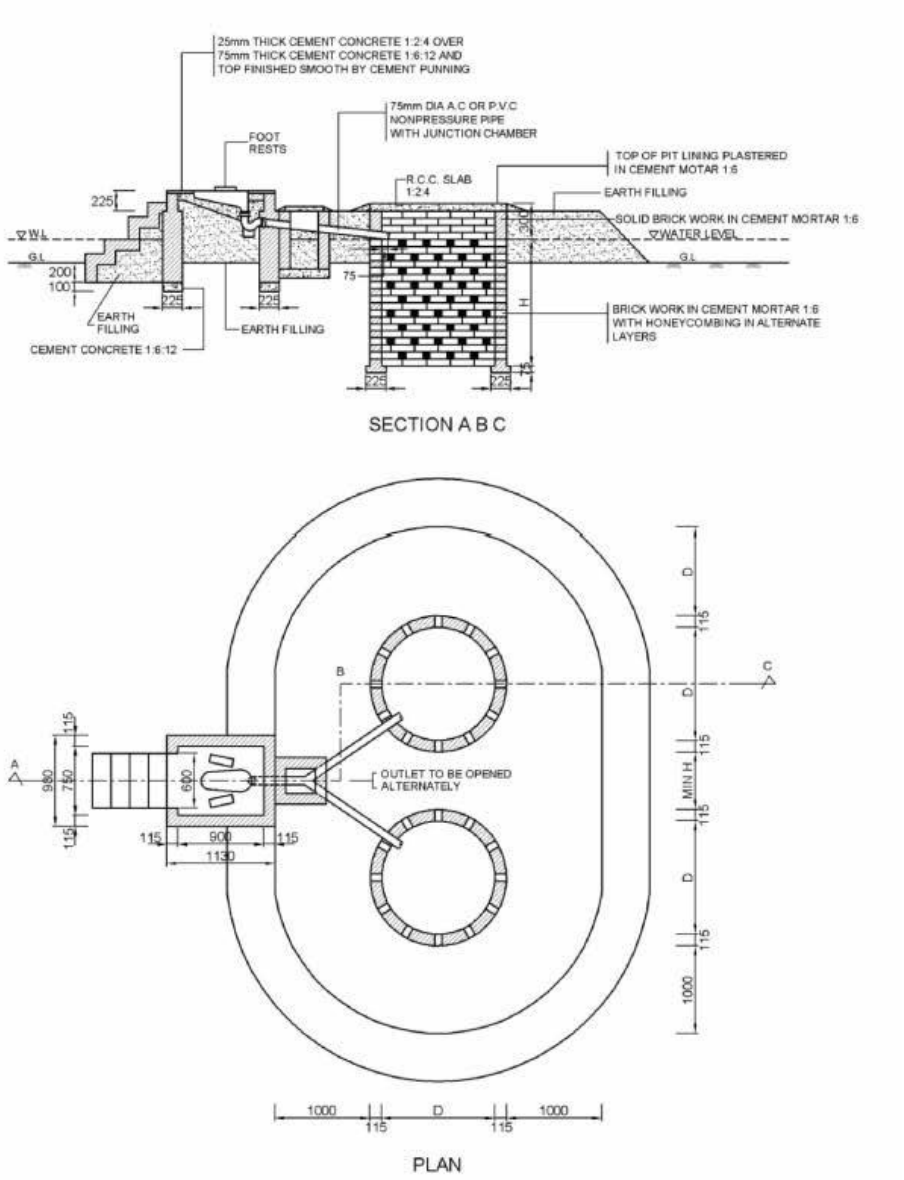
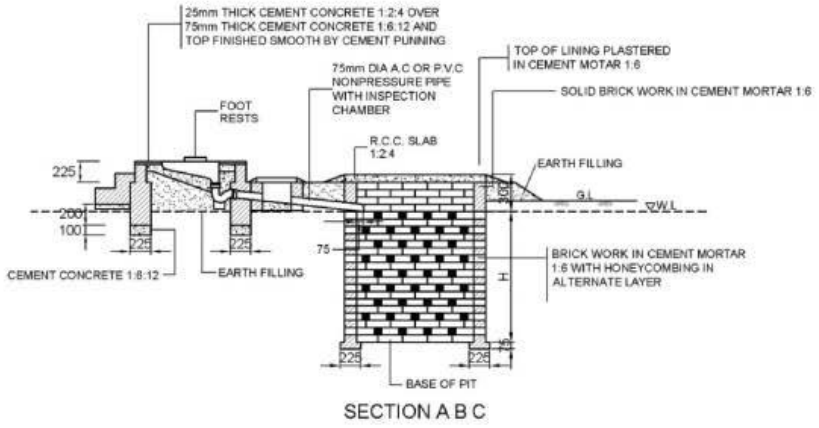
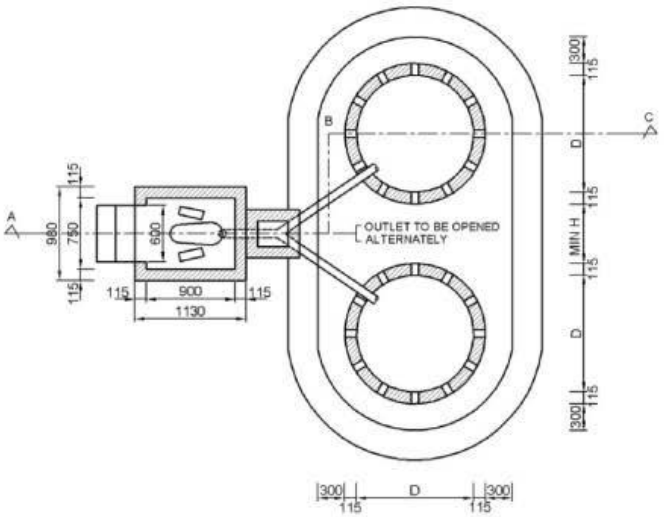


**Figure 4: Leach pits in high subsoil water level**

(Source: Manual on Sewerage and Sewage Treatment Systems, 2013, Part A: Engineering)




SECTION A B C




PLAN

**Figure 5: Pour-flush latrine with combined pits**

(Source: Manual on Sewerage and Sewage Treatment Systems, 2013, Part A: Engineering)

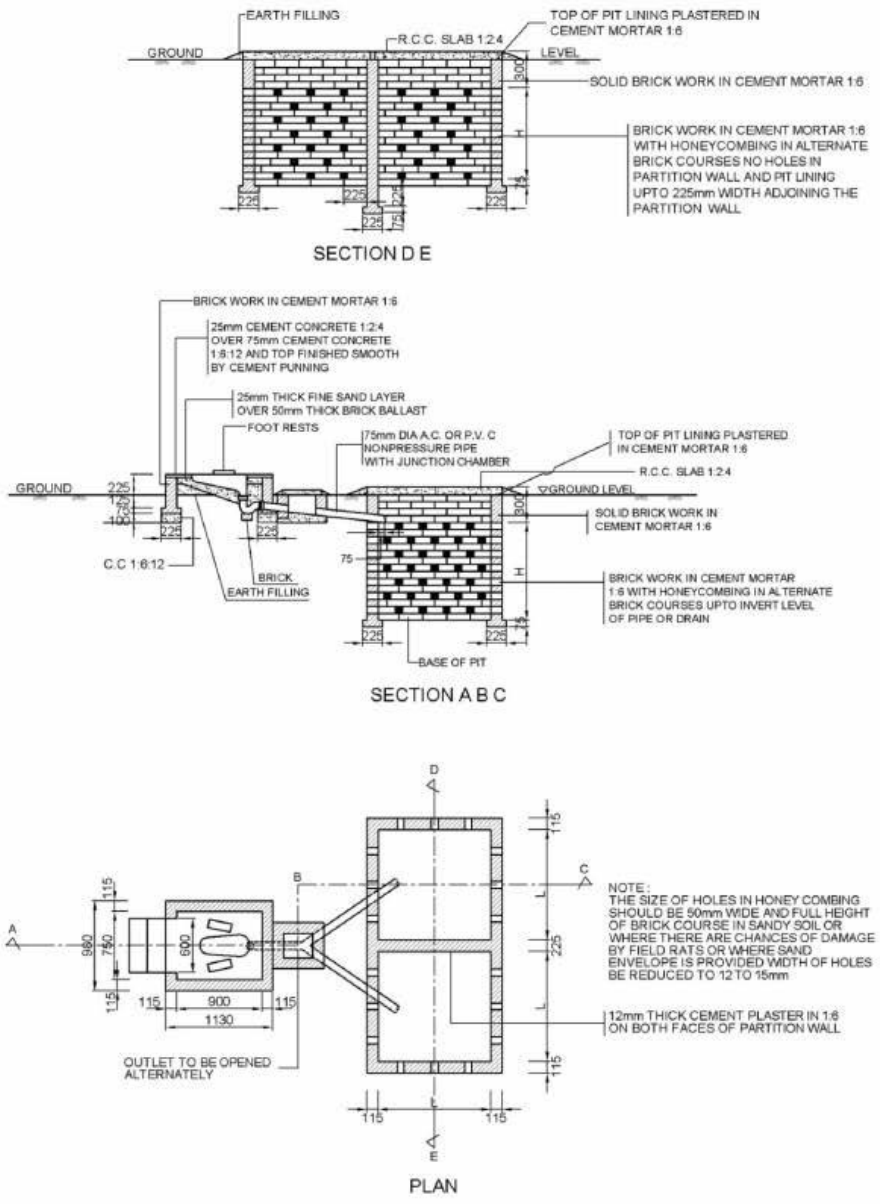


**Figure 6: Typical sketch of Two-compartment Septic Tank for 5 users** (Source: Manual on Sewerage and Sewage Treatment Systems, 2013, Part A: Engineering)

(Dimensions in mm)

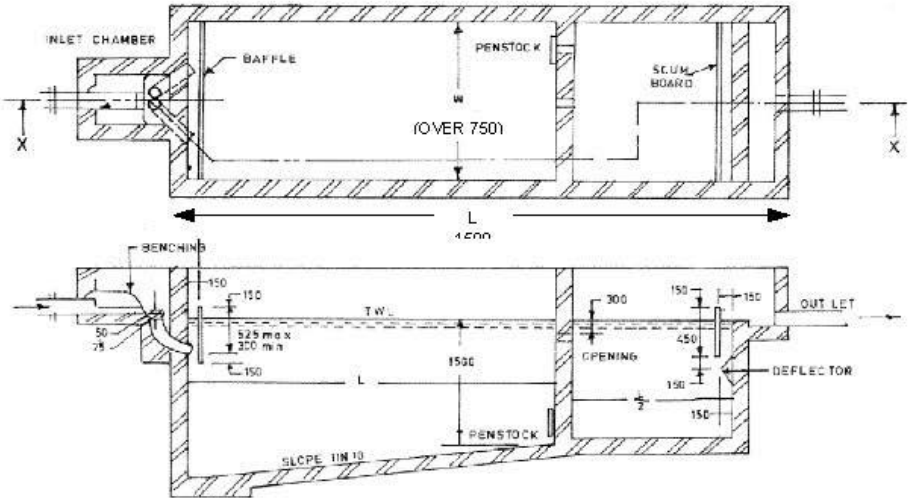
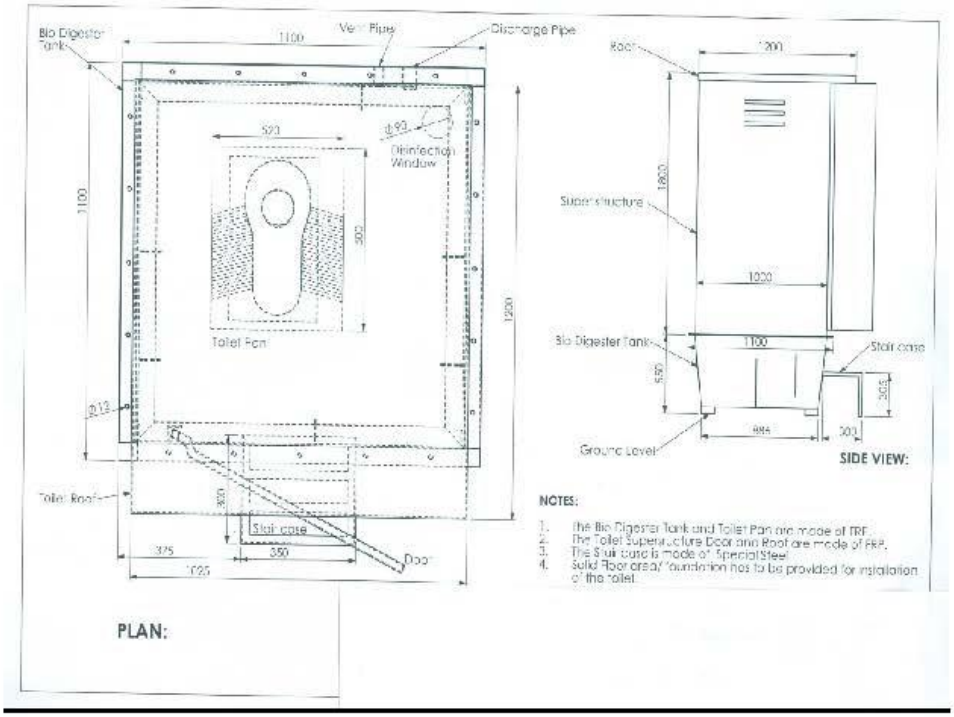
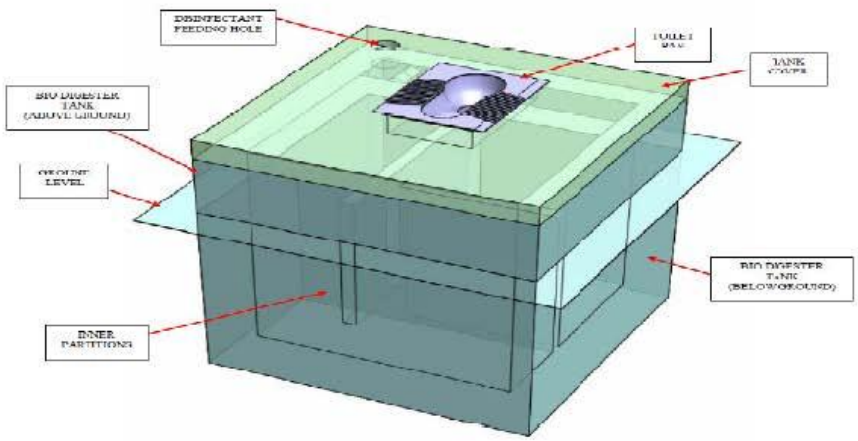


**Figure 7: Details of bio-digester with reed bed**(Source: DRDO)

**Figure 8: Details of Bio-Toilet**(Source: Private Agency)



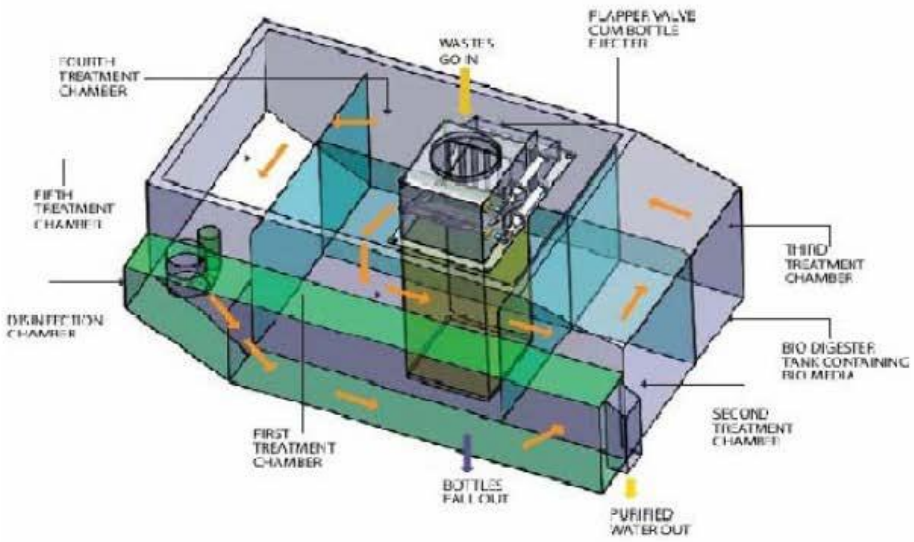

WASTES GO IN
FOURTH TREATMENT CHAMBER
FIFTH TREATMENT CHAMBER
THIRD TREATMENT CHAMBER
BIO DIGESTER TANK CONTAINING
SECOND TREATMENT CHAMBER
FIRST TREATMENT CHAMBER
BOTTLES FALL OUT
PURIFIED WATER OUT

**Figure 9: Self-cleaning electronic toilet (E-toilet)**

**Self-cleaning electronic toilet (E-toilet)**

E-toilet is addressing public sanitation by developing toilets that are portable, hygienically maintained, and eco-friendly. The insertion of a coin opens the door of the e-toilet for the user, switches on a light and provides audio commands to guide users. E-toilets are programmed to flush 1.5 litres of water after 3 minutes of usage or 4.5 litres if usage is longer. It can also be programmed to clean the platform with a complete wash down after every 5 or 10 persons use the toilet.

Key features of E-Toilets include

- Mild steel and stainless steel body for low maintenance
- User-friendly access, sensitive to the needs of the elderly and the differently abled
- Hygienic and easy to maintain components and accessories
- Durable and vandal-resistant enclosure
- Easy to erect and relocate if required.
- User guides, display boards and audio instructions
- Sensor based resource conservation and automated access control
- Waste processing through STP
- Online mapping, GPRS enabled units for real-time updation

There are provisions to customize the designs as per the usage and needs by adding optional items such as stainless steel wash basin, Napkin vending machine, mirror and STP.

**Figure 10: Namma Toilets**

**Namma Toilets**

Namma toilets are modular toilets made with fibre reinforced polymer. These are the latest state of the art toilets which are modern replacements for the conventional Pay and use toilets. The aim of Namma toilets is to make people use the toilet to control open defecation. The initiative started by Chennai Municipal Corporation.

Key features of the Namma toilets are:

- Namma toilets are designed to suit the needs of men, women , children, elderly and the differently abled in an eco-friendly manner
- Sensor based automated LED lights (3W) with solar power
- Adequate ventilation
- Durable and Vandal-Resistant model
- Privacy for ladies and provision of hygienic disposal of Sanitary napkins
- Human waste will be converted to useful materials like bio gas and fertilizers
- No User Charges

Functionalities:

- Universal design – privacy & safety.
- Easy maintenance - easy to clean due to composite material .
- Modules to fit varying site size, user requirement and shapes.
- Signage for easy entry – Common logo
- Easy to install - Accessible 24 x 7 .
- Concealed plumbing.
- Provision for overhead tank (200 L capacity).
- Provision for Flush Cistern (9 L capacity).

Figure 11: Waterless Urinals

**Waterless Urinals**

Waterless urinals do not require water for flushing and can be promoted at homes, institutions and public places to save water, energy and to harvest urine as a resource. Reduction in infrastructure required for water supply and waste water treatment is also spinoff arising from installing waterless urinals.

Waterless urinals do not need water and expensive plumbing accessories usually required for flushing. Also, the dry operation of waterless urinals and touch free operations reduce spreading of communicable diseases.

**Advantages of Waterless Urinals and Reuse of Urine**

- Save enormous quantities of freshwater
- Enhance efficiencies of sewer lines and wastewater treatment plants
- Optimize cost of plumbing accessories at supply & consumption ends
- Conserve electricity used for pumping water & treating wastewater
- Replace chemical fertilizers with urine to grow crops
- Produce fertiliser & other chemicals from urine (industrial feedstock)
- Recover hydrogen for producing energy and fuel
- Reduce emission of green house gases and pollution of water bodies

Waterless urinals are good options to be considered while promoting public urinals because they overcome the need for water as well as infrastructure required for conventional urinals.

**Figure 12: Waterless Public Urinal Kiosk**

### Waterless Public Urinal Kiosk

Waterless public urinal kiosk is a stand-alone concrete reinforced pre-fabricated urinal kiosk which can be installed in public places and institutions. Although pre-fabricated urinal kiosks made of steel and FRP have existed in the past, the kiosks made of concrete can be cheaper and robust. Urine collected can be diverted to a storage tank of the urinal kiosk covered with a planted hedge to offer privacy to the users. In place of the planted hedge, billboards can be erected at public places to generate revenue for maintenance of the urinals.

**Waterless Public Urinal Kiosk**

### Green Waterless Urinal

A green waterless urinal is low cost onsite urine application model suitable for sites where adequate space is available and the number of users is limited. Urine collected is diverted to a plant bed of Canna Indica and Ficus planted around the urinal. For enabling uniform distribution of urine to the plant bed, a perforated pipe connected to the urinal is laid along the plant bed. As urine contains essential plant nutrients such as nitrogen, phosphate and potassium, these are utilized by the plants for their growth. The plantation also doubles as a hedge around the urinal offering privacy to the users.


During The bed must be surrounded by the earthen bunds to prevent flow of the urine to nearby areas during rainy seasons. At periodic intervals, watering and emptying of the phosphate deposits is carried out to maintain the system. Treatment for reducing salinity of the soil must be taken up at regular intervals. This model of onsite utilization of the urine through GWUs can be adopted in public places, gardens and institutions where there is open space. The initial and maintenance cost of GWUs is also very low compared to the normal urinals. GWUs can be established at a cost of INR 500/- to INR 10,000 based on the design adopted.

**Figure 13: Urine diverting toilets**

### Urine Diverting Toilets

Like waterless urinals, urine diverting toilets can also be employed to harvest urine for reuse in agriculture. Urine diverting toilets facilitate separation of urine from faeces and wash-water. A variant in which urine, faeces and wash-water are separated are called Urine Diverting Dry Toilets. In many parts of the world, including India, such toilets are being promoted to recover resources present in urine and faeces for productive purposes, mainly agriculture.

**Urine diverting toilets facilitate**

- Harvesting of nutrients present in urine and faeces.
- saving of water used for flushing
- Saving of energy required for water and wastewater treatment
- To minimise ground water pollution. (Chariar & Sakthivel, nd)

Urine Diverting Toilets

*Source: http://web.iitd.ac.in/~chariarv/WLUResourceBookFinal.pdf*

**Figure 14: Decentralised Wastewater Treatment Systems (DEWATS)**

DEWATS treatment methodology will provide a treatment efficiency that allows for reuse of the treated wastewater for gardening or irrigation as well as for safe disposal in to a water body or natural drain.

The decentralised wastewater treatment system is a simple design, non-dependent on energy, reliable, long-lasting, tolerant towards inflow fluctuation and low in costs. It can treat organic wastewater from domestic and industrial sources.

DEWATS is based on different natural water treatment techniques which are combined according to requirements such as the characteristics of wastewater, desired effluent quality and technical specifications.

**Advantages of DEWATS**

- Treat organic wastewater from domestic sources
- Deep sewer line construction not required
- Comply to statutory discharge standards
- Wastewater can be treated on site
- Tolerant to inflow fluctuation (unknown peak flow)
- No external energy is required to run the system
- Reliable, durable and requires minimal maintenance
- Treat wastewater flows from 1–1000m3 per day

*Source: http://www.cddindia.org/dewats.html*

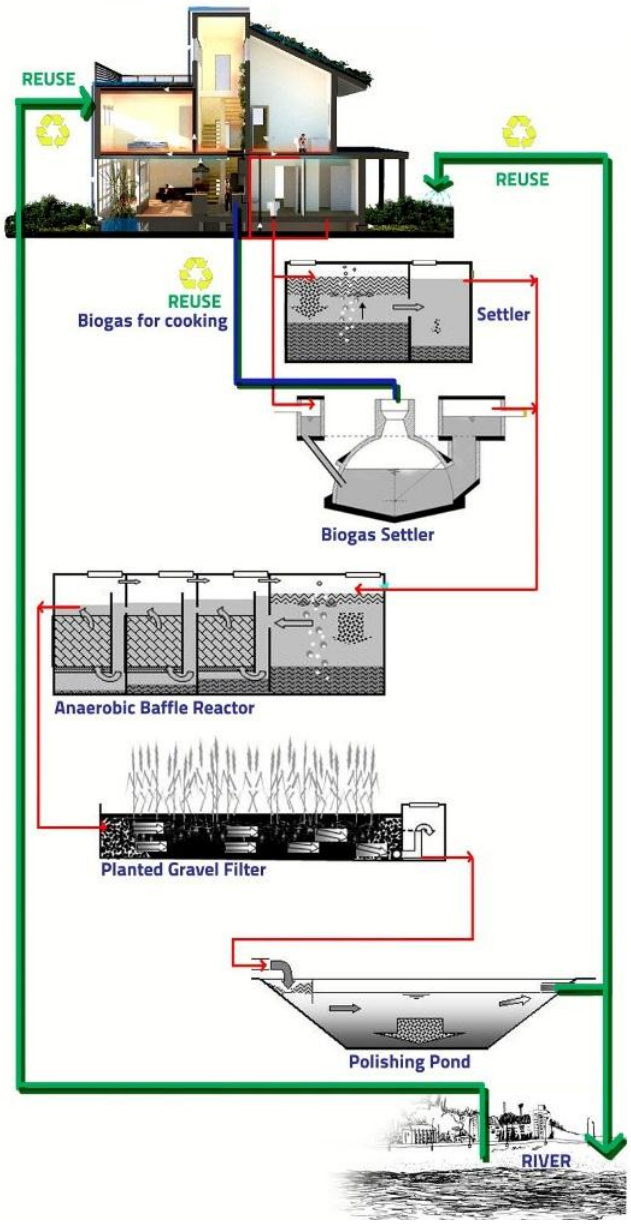


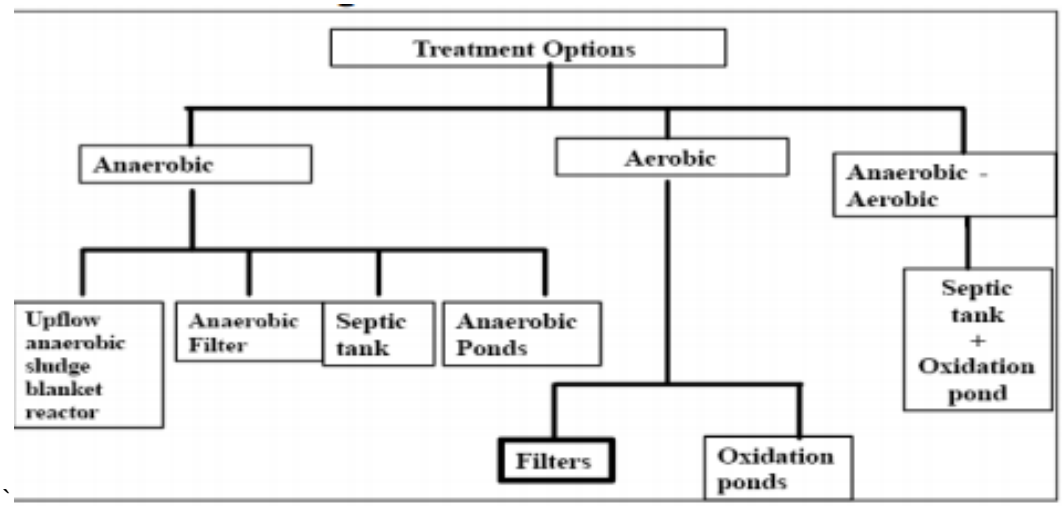
**Figure 15: Low Cost Treatment Technologies for Reuse/Recycle by NEERI**

The amount spent on pollution control should be optimum. The general approaches available for pollution control are waste minimization (low-waste technology), wastewater conservation and development of low cost treatment options. Grey water and black water from a building which is connected to a municipal sewerage system are disposed of into municipal sewers directly and treatment is given in a centralized facility.

In the areas where sewerage system is non-existent the black water is treated primarily in a septic tank and effluent from septic tank and grey water are disposed of into ground though soak pit. In some cases untreated grey water is used for gardening. There is a need to develop appropriate technology for green building constructed in sewered and non-sewered areas especially from the operation and maintenance viewpoint. There should be more inclination towards the development of sustainable treatment plants. The natural systems of waste treatment are the obvious choice for sustainability. This is will extract the desirable features such as benefit from warmer temperatures, use of little mechanization, utilization of minimum electric power and reuse for non-domestic purposes. Further the systems to be adopted for sustainable treatment should need less land, are easier to construct and can generate some income. All these aspects ensure sustainability of the treatment plants and will keep them acceptable, affordable, and manageable for a long time.

**Methodology**

The reuse and recycle of grey water as well as black water requires series of treatments similar to the conventional treatment plants which comprises of Primary, Secondary & sometimes tertiary treatments. The simulation can be carried out on economical basis with low cost treatment technologies available in the wastewater field.




**Primary Treatments**

- Fine/Coarse Screening,
- Oil & Grease Traps,
- Settling Tanks.

**Secondary Treatments**

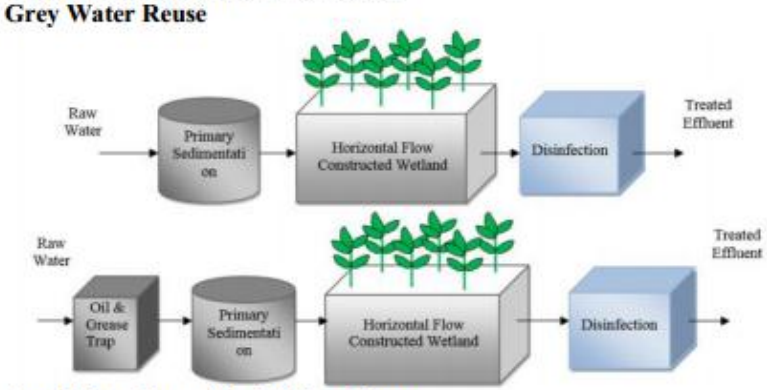
- Chemical Methods,
- Biological Treatments-Aerobic & Anaerobic,
- Secondary Settling & Sludge Treatment.

**Tertiary Treatments**

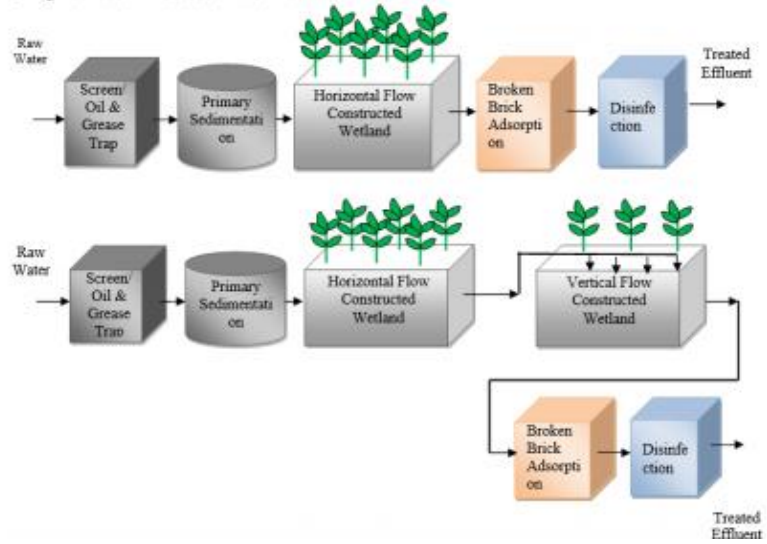
- Charcoal Filtration
- Broken Bricks Adsorption for polishing the treated water.

**Treatment options available:**

**Grey Water Reuse**




**Grey Water Reuse/Black Water Reuse:**




*Source:* http://urpjournals.com/tocjnls/34_14v4i4_2.pdf

## Annexure 4: Draft IEC messages for toilet usage

ટોઇલેટ-**પાશ્ચાત્ય શૈલી (મહિલા)**

http://japanory.typepad.co.uk/japanory/2010/08/spending-a-yen-in-japan-toilets.html *(Source of Image)*

*તમને ચોખ્ખું* ટોઇલેટ *વાપરવું ગમે છે ને, તો બીજા માટે પણ* ટોઇલેટ *ચોખ્ખું રાખો.*

ઉભડક પગે ન બેસો.
બહાર નીકળતાં પહેલાં ફ્લશનો ઉપયોગ અચૂક કરો.
બહાર નીકળતાં પહેલાં પ્લાસ્ટિકની સીટ ઉપર કરો, અથવા બરાબર સાફ કરો.
ઉપયોગ કર્યા પછી, નળ, ફ્લશ વગેરે બરાબર બંધ કરો.
બિનજરૂરી પાણી ઢોળશો નહીં
હાથ ધોવા સાબુનો ઉપયોગ કરો અને હાથ ધોયા પછી સાબુ તેની જગ્યા પર જ રાખો.
કચરો ફક્ત કચરાપેટીમાં જ નાંખો.
પાન, તમાકુ,સોપારી,ગુટકા થુંકસો નહિ.
સેનીટરી નેપકીન કાગળમાં લપેટી કચરાપેટીમાં નાખો.
"ચોખ્ખાં ટોઇલેટ ચોખ્ખાં *હાથ, તંદુરસ્તી હમેશા સાથ."*

## ટોઇલેટ-**પાશ્ચાત્ય શૈલી (પુરૂષ)**

http://japanory.typepad.co.uk/japanory/2010/08/spending-a-yen-in-japan-toilets.html *(Source of Image)*

*તમને ચોખ્ખું* ટોઇલેટ *વાપરવું ગમે છે, બીજા માટે પણ* ટોઇલેટ *ચોખ્ખું રાખો.*

ઉભડક પગે ન બેસો.

બહાર નીકળતાં પહેલાં ફ્લશનો ઉપયોગ અચૂક કરો.

બહાર નીકળતાં પહેલાં પ્લાસ્ટિકની સીટ ઉપર કરો, અથવા બરાબર સાફ કરો.

ઉપયોગ કર્યા પછી ફ્લશ , નળ વગેરે બરાબર બંધ કરો

બિનજરૂરી પાણી ઢોળશો નહીં

હાથ ધોવા સાબુનો ઉપયોગ કરો અને હાથ ધોયા પછી સાબુ તેની જગ્યા પર જ રાખો.

પાન,તમાકુ,સોપારી,ગુટકા થુંકસો નહિ.

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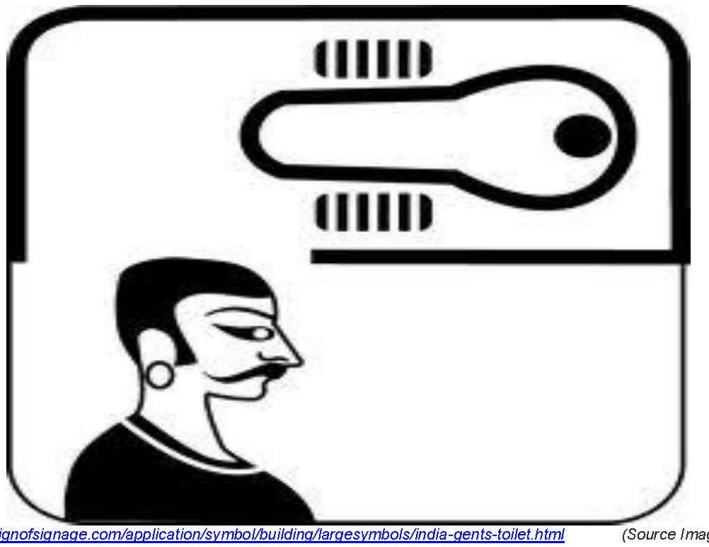
"ચોખ્ખાં ટોઇલેટ, ચોખ્ખાં *હાથ, તંદુરસ્તી હમેશા સાથ."*

## ટોઇલેટ-ભારતીય શૈલી (પુરુષ)



http://www.designofsignage.com/application/symbol/building/largesymbols/india-gents-toilet.html (Source Image)

*તમને ચોખ્ખું વાપરવું ગમે છે ને, તો બીજા માટે પણ ટોઇલેટ ચોખ્ખું રાખો.*

બહાર નીકળતાં પહેલાં ફ્લશનો ઉપયોગ અચૂક કરો..

ઉપયોગ કર્યા પછી ફ્લશ , નળ વગેરે બરાબર બંધ કરો

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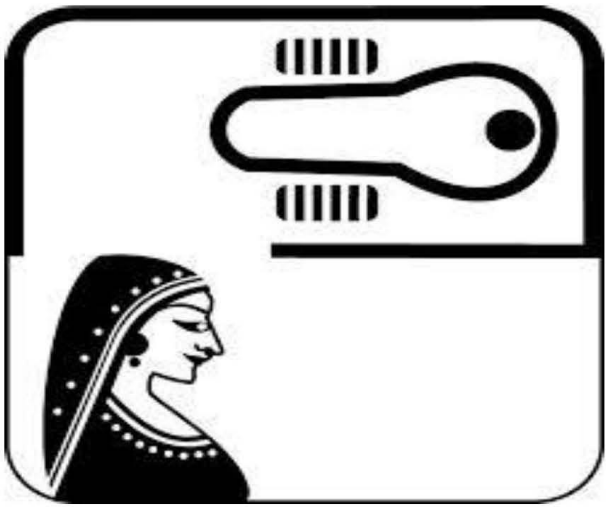
ટોઇલેટ - **ભારતીય શૈલી (મહિલા)**



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## Annexure 5: Standard operating procedures for cleaning toilets

Different equipment for different joints and corners, as well as different cleaning agents and sanitizers, should be used in the cleaning of different sanitary wares and fittings. To carry out proper toilet maintenance the following equipment-supplies are required:

**Equipment and consumables/ supplies required for cleaning**

| Cleaner safety gear | Cleaning equipment | Consumables | Other equipment |
|---|---|---|---|
| - Rubber Gloves<br>- Face mask<br>- Boots<br>- Uniform/ Apron/ Overall | - Brush for cleaning toilet seats/ bowls<br>- Brush for cleaning wash basins<br>- Brush/ scouring paper for cleaning tiles<br>- Brooms for wet areas<br>- Brooms for dry areas<br>- Cloths/ mops for cleaning floor<br>- Floor Wipers<br>- Sponge/ cloths for scrubbing plumbing fixtures and other general purposes<br>- Bucket for mixing floor cleaning agent with water<br>- Mug for pouring floor cleaning agent mix<br>- Sponges/ soft cloth for cleaning mirrors<br>- Dust collector/ dust colleting pan<br>- Dustbins | - Liquid sanitary ware cleaning agent<br>- Liquid/ powdered tiles cleaning agent<br>- Liquid/ powdered floor cleaning agent<br>- Liquids/ powdered plumbing fixtures cleaning agent<br>- Soap/ non-abrasive cleaning liquid/ powder (non-acidic)<br>- Disposable garbage bags<br>- Hand washing soap<br>- Naphthalene balls | - Sign boards/ Warning Signs<br>- Trolley/ tray for carrying cleaning equipment<br>- Room freshener<br>- Plumbing snakes<br>- Plunger<br>- |

**Suggested instructions for cleaning of bathrooms**

| Frequency – minimum once a day | Materials |
|---|---|
| 1. Wash hands and wear gloves, face mask, protective uniform/ apron/ overall and boots | Gloves, face mask, protective uniform/ apron/ overall and boots |
| 2. Place the signboard to caution users of the toilet | Signboards |
| 3. Assemble items to be used for cleaning in a trolley/ tray | Trolley/ tray |

| | |
|---|---|
| 4. Apply liquid/ powdered tiles cleaning agent on the tiled walls of the bathroom and leave it for 15 minutes | Liquid/ powdered cleaning agent for tiles |
| 5. Apply liquid/ powdered plumbing fixtures cleaning agent on taps, faucet, and other plumbing fixtures and scrub using sponge. | Sponge |
| 6. Apply liquid/ powdered floor cleaning agent on the floor of the bathroom and then leave 15 minutes or more. | Liquid/ powdered floor cleaning agent |
| 7. Scrub the wall tiles using a brush/ scouring paper and pour water on the wall tiles. Use a dry cloth to wipe the tiles and plumbing fixtures | Brush/ scouring paper, dry cloth |
| 8. Use a brush/ wet broom to scrub floor and rinse floor with water | Brush/ wet broom |
| 9. Drain excess water from the floor using a wiper and mop the floor using a clean dry cloth. | Wiper, dry cloth/ mop |
| 10. Clean and rinse all brushes, cloths, sponges and brooms used in the process and store them in the janitor's area. | |
| 11. Remove gloves and wash hands with soap thoroughly. | Hand washing soap |
| 12. Conduct final inspection and update work records. | |
| **Frequency- Weekly** | |
| 1. Clean cobwebs and dust on ceiling and ventilators using a long handle broom/ brush | Dry broom |
| 2. Repeat all the steps mentioned in daily cleaning | |

**Suggested instructions for cleaning of water closets and urinals (Indian and Western)**

| **Frequency – minimum once a day** | **Materials** |
|---|---|
| 1. Wash hands and wear gloves, face mask, protective uniform/ apron/ overall and boots | Gloves, face mask, protective uniform/ apron/ overall and boots |
| 2. Place the signboard to caution users of the toilet | Signboards |
| 3. Assemble items to be used for cleaning in a trolley/ tray | Trolley/ tray |
| 4. Remove garbage bags from all dustbins and place the dustbin outside the WC cubicle | |
| 5. Apply liquid/ powdered tiles cleaning agent on the tiled walls of the WC cubicle and leave it for 15 minutes | Liquid/ powdered cleaning agent for tiles |
| 6. Apply liquid/ powdered plumbing fixtures cleaning agent on taps, faucet, and other plumbing fixtures and scrub using sponge. | Sponge |
| 7. Flush once and then apply liquid sanitary ware cleaning agent inside the WC bowls/ seats. Leave it for 10 minutes. | liquid sanitary ware cleaning agent |

| | |
|---|---|
| 8. Clean the inside of the WC bowl/ seat using a brush ensuring all stains are removed. | Brush for cleaning toilet seats/ bowls |
| 9. Flush or pour water to rinse the inside of the WC bowl/ seat | |
| 10. Apply liquid/ powdered floor cleaning agent on the floor of the WC cubicle and then leave 15 minutes or more. | Liquid/ powdered floor cleaning agent |
| 11. Scrub the wall tiles using a brush/ scouring paper and pour water on the wall tiles. Use a dry cloth to wipe the tiles and plumbing fixtures | Brush/ scouring paper, dry cloth |
| 12. Use a brush/ wet broom to scrub floor and rinse floor with water | Brush/ wet broom |
| 13. For western WC seats, apply soap/ non-abrasive cleaning liquid/ powder on the seat rim and seat cover and clean it using sponge/ cloth. Pour water over the rim and the cover and wipe it using a dry cloth. | Soap/ non-abrasive cleaning liquid/ powder (non-acidic) |
| 14. Drain excess water from the floor using a wiper and mop the floor using a clean dry cloth. | Wiper, dry cloth/ mop |
| 15. Place a fresh garbage bag in the dustbins and place them in the WC cubicles | Garbage bags |
| 16. Clean and rinse all brushes, cloths, sponges and brooms used in the process and store them in the janitor's area. | |
| 17. Remove gloves and wash hands with soap thoroughly. | Hand washing soap |
| 18. Conduct final inspection and update work records. | |

# Annexure 6: Standard operating procedures for faecal sludge management

## 1. Background

Proper treatment and management of fecal sludge is integral to safe sanitation practices which ensure health and well being of citizens. According to the Census 2011 data on sanitation, around 30 million urban households, or more than one thirds of all urban India depends on on-site sanitation solutions for safe waste water disposal. In Gujarat too, the reliance on on-site sanitation systems is very high. 105 out of the 167 cities in the state do not have any underground drainage system and are dependent on technologies such as single pits, twin pits and septic tanks for waste water disposal.

Also in cities that have underground drainage network, the coverage of the underground network is limited. With rapid development, more and more properties especially in peripheral urban areas are making their own arrangements of waste water disposal. A rapid assessment of septage management in Asia carried out by USAID in 2010 revealed that about 148 million people in urban areas will have septic tanks by the year 2017. Though the National Urban Sanitation Policy (NUSP) emphasizes the need for proper collection, treatment and disposal of sludge from such on-site installations, very limited attention has been paid to the construction, management, maintenance and safe disposal of fecal sludge from these systems.

Most urban local bodies (ULBs) in India are not able to effectively monitor the regular cleaning and maintenance of septic tanks and pits. Some ULBs provide septic tank and pit cleaning as a municipal service but the supply of such desludging services is far from adequate. In many cities private players have filled this gap by providing these services for a fee. The private contractors also sometimes sell the nutrient rich sludge to farmers in the vicinity of cities. However the disposal of waste water is often not regulated. The sludge is dumped in storm water drains and open areas posing considerable health and environmental risks.

Recognizing the growing importance of safe fecal sludge management practices, the Ministry of Urban Development (MoUD) has recently released an advisory to provide guidance to states and cities on policy, technical, regulatory and monitoring aspects of fecal sludge management. The advisory is a useful resource on fecal sludge management for cities in India. In addition to the advisory, the guidelines on design and construction of septic tanks issued by the Bureau of Indian Standards (BIS) and the Central Public Health and Environmental Engineering Organization (CPHEEO) are also a good reference on technical design and maintenance of septic tanks. These standard operating procedures (SOP) borrows from these two resources as well as the team's extensive experience of working with cities in Gujarat to establish a uniform procedure for fecal sludge management in Gujarat and present the information in a handy, comprehensive and easily accessible format.

### 1.1. Existing fecal sludge management practices in Gujarat

Like in other cities of India, fecal sludge management has been a neglected area in ULBs of Gujarat as well. The sector has not received any attention because of poor understanding of O&M requirements, lack of guidance, inadequate resources and skills, shortage of manpower and finance. Currently out of the 167 ULBs, only 62 have a partial sewer system. Most cities from the Saurashtra region do not have any underground drainage system and are dependent on on-site sanitation systems. The toilets are connected to septic tanks/ pits and the sullage/effluent is often discharged into road side storm water drains which are covered or

open. Fecal sludge generated in small cities often ends up in garbage dumps, storm water drains, water bodies or is used for agriculture. In cities that have sewerage network and functional STPs, sludge is emptied in manholes or transported to STPs and treated along with the sewage conveyed through the underground network.

### Prevalent on-site sanitation systems (OSS) in cities in Gujarat

Most existing toilets in urban Gujarat use pour flush latrine interface. Insanitary latrines such as dry latrines and service latrines have been phased out. The pour flush latrines are either connected to single pit, twin pits or septic tanks.

**Single pit system**: It is observed that single pit system is one of the most widely used systems to dispose wastewater. These single pits are completely lined or partially lined at the top and then left un-lined. Lining materials include brick, concrete or mortar plastered onto the soil. These pits are constructed very deep (6-12m) and hence last for15 or more years without emptying. Because of their depths, the pits cannot be completely cleaned using suction machines. The sludge at the bottom hence hardens and the capacity of these pits to treat waste water keeps reducing over the years. As the pits are not cleaned often, they pose a risk of ground water contamination.

**Septic Tanks**: Septic tanks are the second most commonly used OSS after single pits. They are designed as watertight chambers which provide primary treatment for blackwater and greywater. The liquid flows through the tank and heavy particles (sludge) sink to the bottom, while scum (mostly oil and grease) floats to the top. The septic tanks should be appropriately sized and the accumulated sludge and scum must be removed every 2-3 years. However in Gujarat, most septic tanks are constructed oversized and are not cleaned for 5-10 years. The effluent of the septic tank must be dispersed by using a soak pit or transported to another treatment technology. Soak pits are common in Gujarat. Many of these soak pits located in dense areas have lost their absorption capacity due to sludge entering into the pits because of lack of cleaning and maintenance of septic tanks. Hence soak pits also need to be emptied and cleaned frequently.

**Twin pit system**: The Twin pit system consists of a pour flush toilet connected to two alternating pits. Only one of the two pits is used at any time and accommodates waste generated over one or two years. Then the second pit is used. This allows the contents of the first pit to transform into Pit Humus (a sanitized soil-like material) which is safe and can be manually excavated. The twin pit system is not a commonly found system in Gujarat. Where present, the system is often not used appropriately and effectively functions as a latrine connected to two single pits.

Box 1Prevalent on-site sanitation systems in Gujarat

Cities in Gujarat also do not have any reliable data on number of households dependent on each of these above mentioned systems. Anecdotal evidence suggests that cities are moderately aware of the functioning and difference between these systems.

The Prohibition of Employment as Manual Scavengers (and their rehabilitation) Act, 2013, prohibits manual cleaning of pit toilets and septic tanks. Adopting mechanical processes for

cleaning of septic tanks such as suction emptiers is seen as the only way to eliminate manual scavenging. Regrettably, part of septic tank / pit cleaning in some cities is carried out manually. Based on PAS-SLB data of 2013, 85cities in the state provide mechanized septic tank/ single pit cleaning as a municipal service. However, currently there is no infrastructure in any of the Municipalities in Gujarat for adequate fecal sludge treatment. GMFB has provided sludge sucking machines to the ULBs but sometimes these are inadequate and not functioning. Septic tank cleaning hence is often addressed by the private sector with little monitoring and regulation from the ULB. It is feared that the new Act may drive the already secretive business of fecal sludge emptying underground, and drive up the cost of emptying. Hence, it becomes essential that the ULBs recognize and register sludge emptying services as legitimate business, regulate their operations and enforce the use of mechanized suction machines. Simultaneously, ULBs need to augment their infrastructure and resources directly or through contracting out emptying, transport and treatment of sludge.

For improving the coverage of safe sanitation in the State, the Government of Gujarat is providing financial assistance for underground drainage projects and for establishing sewage treatment plants. This assistance is under the Swarnim Jayanti Mukhya Mantri Shaheri Vikas Yojana for all 159 Municipalities. GUDM, GUDC and GWSSB have been identified as implementing agencies. But to achieve well functional sewerage, cities need to reach water supply levels of135 lpcd, which is also going to take efforts and time. Till then fecal sludge management is of prime importance to ensure total sanitation. The septic tank combined with soak pit provides good sanitation and can work well with lesser (70-100 lpcd) level of water supply than that needed for conventional sewerage. Therefore it makes both economic and sanitation sense to manage sludge efficiently till sewerage becomes feasible and affordable.

Figure 1 and Figure 2 show the current sanitation value chain in two cities surveyed by the UMC team. The line weight depicts the percentage of connections. Higher the weight, higher is the percentage. The green color denotes safe sanitation while the red ones denote un-safe practices that need to be improved. The dependence of households on on-site sanitation is higher in Himmatnagar and Amreli Municipalities.

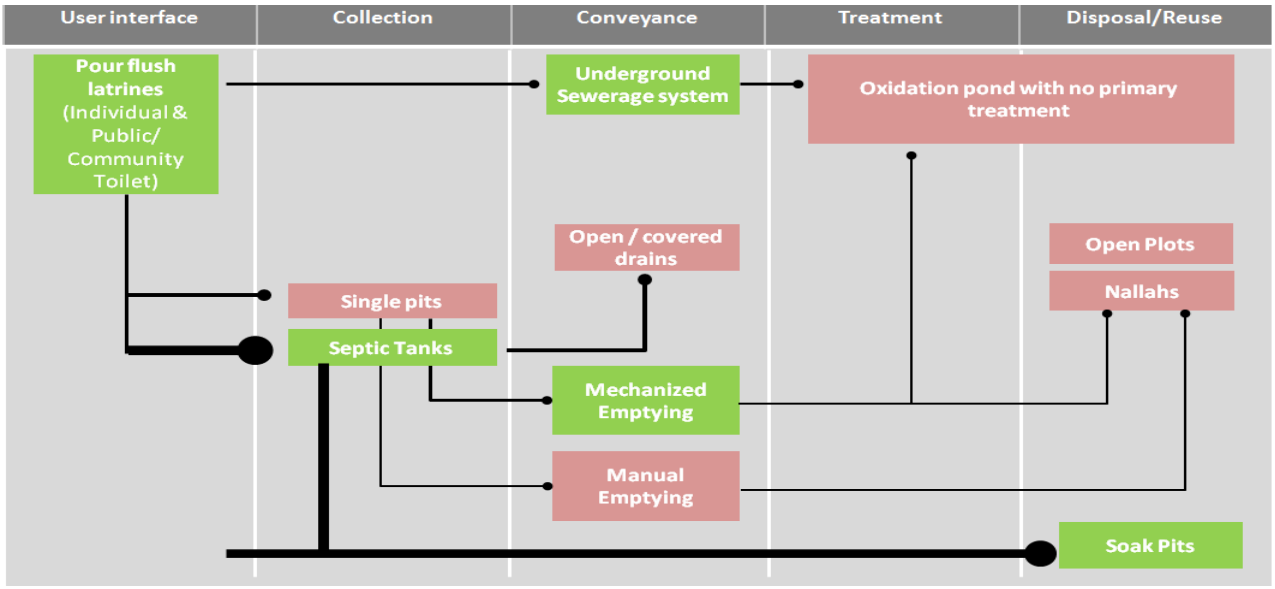
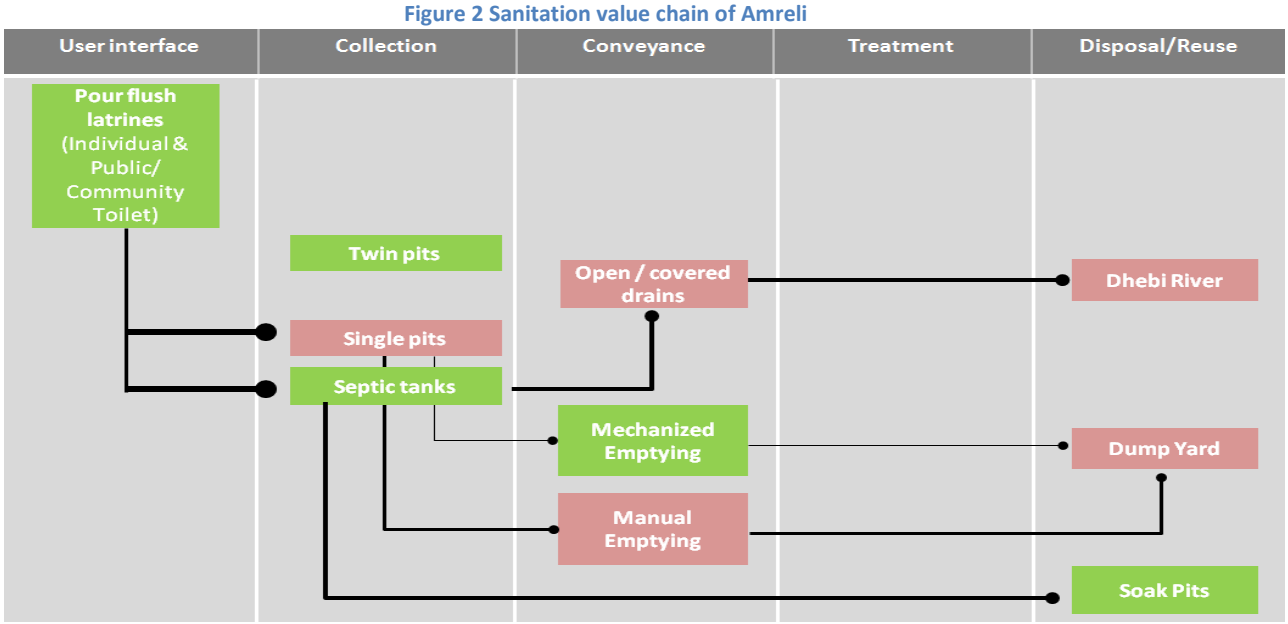



Figure 1 Sanitation value chain of Himmatnagar

Figure 2 Sanitation value chain of Amreli




# 2. About the SOP

This SOP is a step-by-step guide for ULBs to institute a framework for on-site sanitation system management. This SOP conforms to the advisory note on septage management released by MoUD and draws from UMC's experience of working with ULBs in Gujarat. It provides a set of written instructions on septic tank construction, cleaning and maintenance and disposal of sludge in a concise format. The SOP also contains a set of recording formats to help ULBs to document the number of septic tanks and frequency of cleaning for better decision making.

## 2.1. Scope and Applicability

The purpose of these guidelines and SOP is to establish a uniform procedure for construction, routine maintenance and regular cleaning and emptying of on-site waste water disposal systems. The procedures outlined in this SOP are applicable to all ULBs in Gujarat in which households are dependent on single pit, twin pit, septic tank system and other systems. This SOP covers the following areas:

- Design and construction guidelines for twin pits and septic tank system
- Cleaning procedure for pits and septic tanks
- Safe transportation of septage
- Septage treatment and disposal
- Appropriate re-use of treated septage

## 2.2. Methodology for Preparation of SOP

The SOP is prepared based on the Advisory Note on Septage Management in Urban India (January 2013), and the Guidelines for Swachh Bharat Mission (December 2014) by the Ministry of Urban Development, Government of India along with data and information collected from various cities regarding their current fecal sludge management procedures. The UMC team with guidance from Mr. K. V. Dinesh visited eight cities (Patan, Deesa, Anklav, Dhrangadhra, Khambhat, Himmatnagar, Amreli and Lathi) to understand the existing practices in the ULBs. The team obtained firsthand information through interaction with concerned officers in ULBs regarding existing sanitation systems, infrastructure and facilities, recording

and monitoring frameworks and institutional arrangements for fecal sludge management in the city. The team also studied leading practices from other cities and countries in similar context to inform the preparation of the SOP for integrated FSM.

## 2.3. Target Audience for SOP

This SOP is targeted to the Chief Officers, engineering staff and/ or staff in-charge of sewerage sanitation in ULBs of Gujarat state. This SOP intends to bridge the gap in understanding of O&M requirements of fecal sludge (also called septage) and provide handy guidance to ULBs through a step by step process for fecal sludge management

# 3. Standard operating procedure for integrated fecal sludge management

An integrated fecal sludge management plan would cover aspects across the value chain of on-site sanitation including safe collection, conveyance, treatment and disposal/reuse of the treated fecal sludge.

## 3.1. Conduct an audit of on-site sanitation systems technologies that collect and treat fecal sludge

A ULB should conduct a comprehensive audit of on-site sanitation systems that provides the city officials with a base line of the existing situation in the city. The audit should cover the following areas:

- Number of toilets connected to various types of on-site sanitation systems (single pits, twin pits septic tanks, others)
- Assessment of local construction standards, methods and technology
- Existing issues with on-site sanitation systems
- Routine O&M by property owners
- Cleaning and emptying frequency

## 3.2. Provide guidance to property owners on construction of accepted OSS

Toilet and septic tank construction are regulated by the National Building Code of India, 1983. The section on drainage and sewerage specifies sizing and design of toilet, septic tank and other sanitation infrastructure.

### 3.2.1. Conversion of single pit systems into on-site primary treatment system

The ULBs should take proactive steps towards encouraging households to convert their exiting single pit systems to more advanced systems that include collection and primary treatment. The addition of a septic tank or other treatment system before the single pit can enable households to convert the single pits into a soak pit (if the pit adheres to construction standards and has absorption capacity). The ULBs should also ensure that the disposal system of all existing public and community toilets in the city is improved to an on-site treatment system.

### 3.2.2. Construction of twin pits

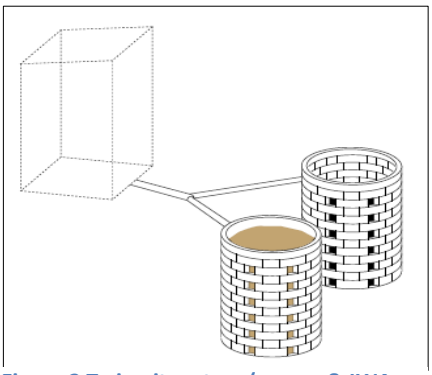


Figure 3 Twin pit system (eawag & IWA,

Twin pits system consists of two underground chambers (pits) to hold and treat fecal sludge. These are normally offset from the toilet and should be at least 1 meter apart. A single pipe leads from the toilet to a small diversion chamber, from which separate pipes lead to the two underground chambers. The pits should be lined with open-jointed brickwork. Each pit should be designed to hold at least 12 months accumulation of fecal sludge. Wastewater is discharged to one pit until it is full. Discharge is then switched to the second chamber. The filled up pit can be conveniently emptied after 1.5 to 2 years, when most of the pathogens die off. The sludge can safely be used as manure. Thus the two pits can be used alternately and perpetually. Refer Annexure A for details on construction specifications for the system for various soil types and contexts (Ministry of Urban Development & JICA, 2013).

### 3.2.3. Construction of septic tank based systems

CPHEEO prescribes septic tanks as double chambered with specified sizes. Septic tanks need to be watertight and are built of bricks, stones or concrete. The recommended sizes of septic tanks and soak pits (used in Gujarat cities to serve dual function of storage & digestion of solids and infiltration of liquids) are shown in Tables 21.1, 21.2 and 21.6 of CPHEEO manual on Sewerage and Sewage Treatment Systems Part A Engineering and are reproduced in Annexure B.Cities can adopt their own innovative techniques for septic tank construction by using locally available material and skills.

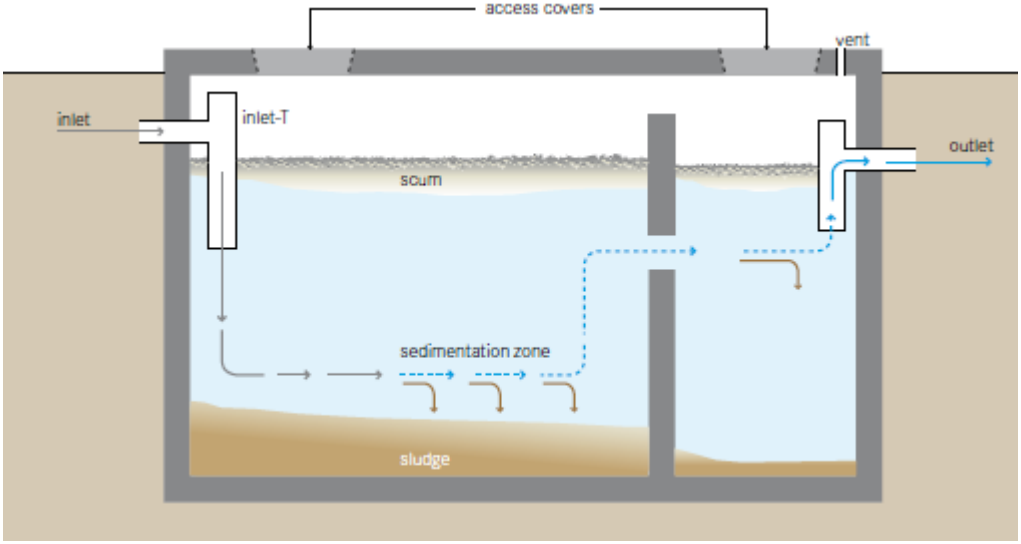



Figure 4 Double chambered septic tank

*Image source: Compendium of Sanitation Systems and Technologies - 2nd Revised Edition)*(eawag & IWA, 2014, p. 74)


Figure 5Local Innovation- Readymade Septic Tanks of RCC andPlastic used in Maharashtra & Jharkhand
*Image source: K.V Dinesh and Sintex* (Sintex)

The process of design and construction should be done very carefully; otherwise, problems may occur due to poor design and workmanship of septic tank and soak pit. A possible solution to this can be provision of standard designs of septic tanks to the citizens by the ULB and adoption of a simple process of construction, verification and approval which can be clubbed with the house completion report.

Effluent from the septic tanks should ideally be disposed using soak pits or leach fields which allow the absorption of liquids in the ground or should be conveyed using a solids-free/ settled sewer.

**Disposal of effluents using soak pits**
A soak pit is a porous-covered chamber that allows effluent from septic tanks to soak into the ground. It is also known as a soak-away or leach pit.The soak pit should be connected to the septic tank by an extension pipe with a T junction to receive the over flow from the tank. The diameter of soak pit is generally 900 mm with depth varying from 2400 to 4000 mm. The soak pit is filled with bricks or broken stones and is covered with stone or RCC slab. A vent pipe should be provided to release the gases produced in the soak pit. For detailed construction guidelines on septic tanks and soak pits, refer the Manual of Sewerage and Sewage Treatment Part A Engineering published by MoUD (Ministry of Urban Development & JICA, 2013, pp. 9-23).

**Conveyance of effluent to an off-site treatment facility**
In cities where discharging effluent into drains is a common practice, it is recommended that ULBs include alternative solutions in their long-term plans. ULBs can explore systems like settled or solids-free sewer system which is designed as a network of small-diameter pipes that transport pre-treated and solids-free wastewater (such as septic tank effluent). This system is economical than the conventional underground drainage system. It can be installed at a shallow depth and does not require a minimum wastewater flow or slope to function. For the detailed guidelines on settled or solids-free sewer system, refer Compendium of sanitation systems and technologies by Eawag and IWA (eawag & IWA, 2014, p. 92).

## 3.3. Provide guidance to property owners on routine O&M of OSS

Routine operations and maintenance of the complete on-site sanitation system is critical to ensuring safe and efficient sludge management practices. ULBs should educate and inform property owners about the proper functioning and maintenance requirements of these systems

and encourage them to clean them often. The on-site O&M responsibilities of sanitation infrastructure (private) for which property owners are responsible include:

- Repair and maintenance of toilets, septic tank, soak pit and piping
- Clearing pipe blocks
- Getting fecal sludgeemptied from private or municipal vacuum emptier at an interval of 2-3 years.


**Figure 6 ULBs can distribute flyers and carry out IEC campaigns about proper septic tank/ soak pit usage**

*Image source: United States Environmental Protection Agency (USEPA)*

## 3.4. Prepare a service plan for scheduled emptying of septic tanks

All ULBs should ensure safe emptying of on-site treatment units at regular intervals. Currently most households get their septic tanks cleaned once in 8-10 years. It is evident that there is not enough awareness among households to get their septic tanks cleaned at regular intervals of maximum 2-3 years. The ULB should initiate scheduled septic tank desludging services and carry out extensive awareness campaigns to ensure that the septic tanks are cleaned at least once in three years.

The scheduled emptying services should be provided on a rotating, three to five year cycle. In order to comply with The Prohibition of Employment as Manual Scavengers (and their rehabilitation) Act, 2013, ULBs need to ensure that all septic tanks and pit systems in the city are cleaned mechanically. The ULBs should either provide the emptying services themselves or enter into service contracts with private agencies. The contracts could also include construction and operation of treatment options like sludge drying beds. If the private players are providing the service, ULB should monitor their services. Suggestive criteria for selecting private emptiers should include:

- Provision of safety and protective gear to the cleaners
- Availability of mechanical cleaning equipment ( Vacuum emptiers)
- Availability of a doctor on call
- Adequate number of trained staff
- Agreement to follow procedures listed in SOP

Since the households will be unlikely to pay for the scheduled services, the ULBs can consider raising their local taxes or charge a fixed amount as user charges for sanitation every year. The private service providers could then be compensated by the ULB.

**Scheduled emptying of septic tank, Experience from Marikina city, Philippines**

Source: A Rapid Assessment of Septage Management in Asia, Policies and Practices in India, Indonesia, Malaysia, the Philippines, Sri Lanka, Thailand, and Vietnam, January 2010, USAID

To achieve its goal of desludging all septic tanks in the city by 2011, Marikina City is implementing the "OplanTodoSipsip" program with Manila Water Company, Inc. (MWCI). Developed with support from the ECO Asia program, the initiative mobilizes local barangay leaders to educate communities about desludging septic tanks. As a result, Marikina City has increased the percentage of households using desludging services from 40 to 55 percent. Cooperative actions include the following:

- Community meetings are held to explain the program in advance of the desludging;
- A sound truck and fliers advertise desludging in a community the day before it is done;
- Local barangay staff accompany MWCI desludging crews to encourage homeowners to cooperate and open inaccessible septic tanks;
- MWCI places stickers on houses that have been desludged, so a second visit can be made later to the homes without stickers; and
- Promotion campaigns are conducted that include distributing informative calendars, art contests, and hand washing events.

The project aims to desludge all 90,000 septic tanks in Marikina City on a rotating five-year cycle. At the time of writing, however, MWCI had only desludged 5,400 septic tanks.

Box 2Scheduled emptying of septic tank, experience from Marikina city, Philippines

## 3.5. Invest in capital infrastructure

### 3.5.1. Procure cleaning equipment.

Septic tank needs emptying in regular intervals of depending on its design capacity. The ULBs need enough vacuum emptiers to effectively service all septic tanks in a city. The ULB can buy these emptiers or can ensure adequate equipment through signing service contracts with private contractors. Indicative capacities and other details of sludge emptying equipment available in India are listed in the table below:

Table 1 Indicative details of fecal sludge emptying equipment

| Tank capacity (litres) | Gross Vehicle Weight (Tonnes) | Vacuum (%) | Displacement (litres per minute) | Positive pressure (bar) |
|---|---|---|---|---|
| 1000 & 1500 | 5 | 80 | 1500 – 4500 | 2.0 |
| 3000 | 10 | 80 | 1500 -4500 | 1.5 |

| | | | | |
|---|---|---|---|---|
| 6000 | 16 | 90 | 3200 – 9000 | 1.5 |
| 9000 | 25 | 90 | 4500 – 12000 | 2.5 |

ULBs can also procure dedicated small footprint (1500 – 3000 liter capacity) vacuum emptiers to service slums and other areas where access is narrow. For areas with wide roads (>9m), vacuum emptiers of capacity 5000-9000 liters can be deployed.
The following box shows indicative requirement of cleaning equipment for cities of Patan and Lathi (Ministry of Urban Development, 2013, p. 40).

**Patan**

| | |
|---|---|
| Number of septic tanks in the ULB (Census 2011) | 8692 |
| Existing number of emptiers | 1 |
| If septic tank needs to be cleaned once in three years ,then number of septic tanks need to be cleaned in a day | (8692/305*3)<br>= 9.5 (Appx. 10) |
| Assuming that present emptier cleans 5-6 septic tanks /day ,then additional number of septic tank emptiers needed | 1 |
| Cost of emptier @ Rs. 1,500,000 (incl. prime mover) | Rs. 15 lakh |
| Annual O&M cost per emptier | Rs. 2 lakh |
| Annual Salary of staff involved in septic tank emptying process | Rs. 2.5 lakh |
| Income earned per emptier per annum by emptying 500 septic tanks @service fee of Rs. 500-Rs 1500 / tank | Rs. 2.5 Lakh-Rs. 7.5 lakh |

**Lathi**

| | |
|---|---|
| Number of septic tanks in the ULB (Census 2011) | 2563 |
| Existing number of emptiers | 1 |
| If septic tank needs to be cleaned once in three years ,then number of septic tanks need to be cleaned in a day | (2563/305*3)<br>= 2.8 (Appx. ) |
| Assuming that present emptier cleans 3 septic tanks /day ,then number of septic tank emptiers needed | 1 |
| Cost of emptier @ Rs. 700000 (incl. prime mover) | Rs. 7 lakh |
| Annual O&M cost per emptier | Rs. 1 lakh |
| Annual Salary of staff involved in septic tank emptying process | Rs. 2.5 lakh |
| Income earned per emptier per annum by emptying 915 septic tanks @service fee of Rs. 500-Rs 1500 / tank | Rs. 4.5 lakh - 13.7 lakh |

Box 3Calculating requirement for vacuum emptiers for Patan and Lathi

### 3.5.2. Construction of sludge drying beds

The ULB needs to construct sludge drying beds to appropriately treat the fecal sludge. As the sludge is partially treated in the septic tank, it requires appropriate treatment before the usage. Drying of the sludge in the drying beds is considered as one of the septage treatment system.

The following table presents the area requirement for sludge drying beds if the quantum of sludge generated is 100 cum/day:

Table 2 Calculation of Sludge drying beds and area required

| | Sludge drying Beds | |
|---|---|---|
| **1** | Quantum of sludgeto be treated (cum/day) – HHs level | 100 |
| **2** | Single Drying Bed area (12m x 12 m) | 144 |
| **3** | Max. Sludgedepth (m) | 0.3 |
| **4** | Capacity per bed (cum) | 43 |
| **5** | Sludge drying cycle (days) | 10 |
| **6** | Total No. of sludge drying beds required (SDB) | 30 |
| **7** | Total site area (SD Bed area + 10% SD bed area + area of office and dried storage + area of ancillary units) (sqm) | 13,250 |

*Source:*(Ministry of Urban Development, 2013, p. 36)

## 3.6. Establish customer service protocols

Once the ULB has procured the vacuum emptiers or made required arrangements with private contractors, the ULB should establish customer service protocols and convey it to the citizens by publishing in the local newspaper, holding meetings and displaying the information at citizen service centers. The ULB should also establish a helpline number and publicize it widely.

## 3.7. Follow operating procedure for cleaning septic tank/ soak pit

### 3.7.1. Daily Preparation for the ULB / emptying and transport service

- Receive work orders for the day
- Check the functioning of vacuum emptier and equipment
- Check personal protective equipment – All employees shouldberesponsible for maintaining their own personal protective equipment (such as gloves, boots, hat, face mask, Davy's lamp) in good condition
- Check Disinfecting and spill control equipment – Operators should be trained on identifying spills and proper methods of disinfecting. Sprinkle lime over spilled area, wait 15 minutes, then wash with water
- Check Hoses – inspect hoses for cracks and wear– discard or repair worn and broken hoses. Connecting the Hose in the correct manner using the clamp style fitting ensures a tight and leak proof connection. Use of twine and plastic for making connections causes leaks and require cleanup.

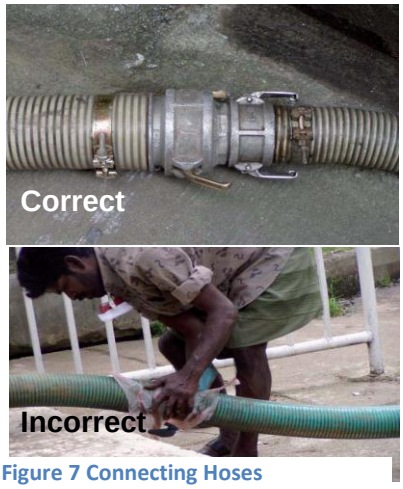



Figure 7 Connecting Hoses
*Image source: K.V Dinesh*


Figure 8 Protective Gear and Vacuum Emptier

### 3.7.2. Operating the vacuum emptier

Operators should become familiar with the proper operation of the equipment in use for each operation. This includes the physical operation of the truck, and all valves, piping, power take-offs and ancillary equipment for the vacuum emptier (including the tank, valves, hoses, and fittings). The following steps can be followed for operating the vacuum emptier:

Figure 9 Operating the vacuum emptier
*Image source: (Robbins, 2007)*

- Reach the first site and meet the building owner.
- Before pumping, check the tank to look for obvious damage to the structure and to verify proper piping is in place.
- Check the water level to get clues as to tank condition: high levels (above outlet level) indicate a clogged outlet; low levels (below outlet level) indicate a leaking tank (or tank not in use).
- Check for back flow into tank during pumping and when pumping is complete. Flow back may indicate a problem with plumbing in the house or clogged disposal.
- Open the access covers, inspect the interior and exterior of the tank. If more than one, locate and remove lids (for at least 2 hours) from all compartments.
- Each compartment will require pumping after ventilating. Probe the tank with the last length of hose. This will provide an indication on the volume of sludge to pump.
- Start the pump or vacuum equipment. The operator will make sure there is suction and that the pump is operating.
- Volume in the tank should start decreasing rapidly. Use hose to break up sludge and scum to the extent possible.

After pumping is complete, check the tank for remaining sludge. If there are accumulated solids remaining, initiate the pump-back procedure, which is to send the pumped fecal sludge under pressure back into the tank and direct this flow toward the sludge mass. This will break up the mass, making it possible to pump out. When pump-back is complete, pump out the tank again (suction). When pumping is complete, wash the hoses and replace the tank lids. Clean up any spills and disinfect with lime or bleach solution.

### 3.7.3. Cleaning and desludging on site systems

**Septic tank/Single pit emptying:** The process of septic tank emptying can be broken down into the following three simple steps:

| |
|---|
| From septic tanks firstly a small quantity of scum in the vicinity of the suction pipe is withdrawn. |
| Liquid septage is extracted until sludge at the bottom is reached. |
| Sludge comes off last and is fully sucked out only if there is bottom slope in the septic tank towards outlet. It is important to empty the tank completely including sludge. |

Figure 10 Septic tank emptying procedure

If tanks are emptied partially, they become more and more filled with hardened sludge, washout of solids occurs and quality of effluent deteriorates. Septic tanks must be emptied once in 2-3 years or even earlier intervals when they are overloaded. If the single pits are not dug very deep and cleaned regularly at an interval of 2 to 3 years the sludge from the pits can be emptied mechanically. If the hardened sludge is to be mechanically removed, the pit should be back washed and the sludge should be diluted and then emptied.

**Soak pit cleaning**

In most cities septic tanks are not cleaned regularly due to which sludge enters soak pits and gets accumulated resulting in diminishing the capacity of soil. In high water table or in stony, gravely soils where percolation capacity of soil is limited, the soak pits get filled and hence need to be cleaned. Soak pits up to 3.5m depth can be fully emptied by the vacuum emptier. Hence it is essential that ULBs and State do not permit soak pits deeper than 3m. Image 4 shows a typical example of soak pit emptying in Anklav city. For emptying typical soak pits in Gujarat cities the following steps can be followed:

| |
|---|
| Remove the Soil Cover (1-1.5m) and puncture the concrete cap to make a hole to insert the suction pipe |
| For soak pits till the depth of 3.5m vacuum emptier can be used to completely empty the pit |
| Pump water into the pit to make the pit contents dilute to enable smoother flow |

Figure 11 Soak pit cleaning procedure

However in the long term, it is recommend that in areas where the percolation capacity has reduced ULBs should consider alternate systems like settled sewerage system or connect to open drain system as an intermediate solution

**Cleaning twin pits**

Once a pit is full in a twin pit system, it should be closed and the wastewater should be channelized to the second pit. The full pit should be emptied only after one to two years after the contents of the pit have transformed into a partially sanitized, soil-like material called pit humus. Pit humus can be manually excavated.

## 3.8. Safely transport fecal sludge to sludge treatment site


Figure 12Septage emptying vehicle

*Image source: UMC*

If cities have an oxidation pond or a Sewage Treatment Plant, the emptier should dispose fecal sludge into STP inlet chamber or into the manhole on the outfall sewer or in the sludge drying beds. In case of partial sewerage, it is not advisable to dispose these in the sewers since it will end up as sludge in open drains and make the situation worse.

If the ULB do not have any provision of the treatment system, ULB can select the suitable treatment and the following actions at fecal sludge receiving site are summarized below.

- Plan the trip so as to arrive at the disposal site within the specified disposal site operating hours
- Report equipment malfunctions or required repairs immediately to supervisors.
- At the Disposal Facility position the truck so that the fecal sludge may be directed to the receiving chamber with only one length of hose
- Open the valve and allow the sludge to flow via gravity into the receiving chamber
- When the tank is empty, disconnect hose and clean tank and hose with water
- Use all safety precautions at disposal site and keep site clean

## 3.9 Treat and dispose fecal sludge

Sludge is the black water from toilets mixed with grey water from bathrooms whereas septic tank effluent is the liquid part which flows out from septic tank (since solids are trapped in septic tank). Sludge has a much higher concentration of pollutants than the septic tank effluent. Biological Oxygen Demand (BOD) and Total Suspended Solids (TSS) are two common measurements of the strength of wastewater. Sludge may have BOD concentrations between 440to78, 600 mg/l and TSS values in excess of 90,000 mg/l, where septic tank effluent has values averaging 200 mg/l BOD and 300 mg/l TSS. As septic tanks fill with sludge, the effluent begins to resemble fecal sludge with higher pollution values. Therefore, regular desludging provides dramatic improvements in effluent quality. Detailed sludge characterization (BOD, TSS &other microbial characteristics) as well as its dewatering characteristics (specific resistance etc.) should be done prior to the design of any fecal sludge management facility. Treatment of sludge can be of two types, treatment at sewage treatment plants and at independent septage treatment plants. The details of these two types of treatment are given in the section below:

### 3.8.1. Treatment of fecal sludge at Sewage Treatment Plants

Co-treatment of fecal sludge along with municipal sewage at a STP if available in the city is the most desirable option. Though sludge is more concentrated in its strength than domestic sewage, its constituents are similar to municipal wastewater. The sewage treatment plants should have adequate capacity to accept the sludge without hampering the functioning of the sewage treatment plant. Another possible way (needs checking for STP shock load or overload) is to dispose fecal sludge into easily accessible manholes at steep gradient sections on outfall sewers.

Sludge could be added to sewage immediately upstream of the screening and grit removal processes. Fecal sludge could be processed with the sludge processing units of STP. If fecal sludge is to be co-treated with sewage, it will be necessary to construct a fecal sludge receiving chamber. Chemicals such as lime or chlorine can also be added to the fecal sludge in the storage tank to neutralize it, to render it more treatable, or to reduce odors.

Figure 13 Sludge disposal into inlet chamber of STP

*Image Source: septage management guide for local governments, 2007, David M. Robbins*

### 3.8.2. Treatment at independent Fecal Sludge Treatment Plants

When a city does not have a sewage treatment plant, a treatment plant specially meant for sludge treatment becomes the option to consider. These include:

a) Lime stabilization – odor control, conditioning and stabilization of the sludge.
b) Dewatering – sludge drying beds or mechanical dewatering.
c) Anaerobic / aerobic wastewater treatment – liquid from the sludge drying beds and mechanical dewatering systems.
d) Co-composting with organic solid waste.

**Lime stabilization**

Lime stabilization is practiced to stabilize, control odor, vector and pathogen destruction. Lime stabilization involves adding and thoroughly mixing lime (lime powder slaked with water in 1:3 proportions, 15 litres of slaked lime for 4000 litres of septage) with each load of septage to ensure that the pH is raised to at least 12.

Lime addition could be done at any of these three points:

- In the septage emptier
- In a septage receiving tank where septage is discharged
- Spread septage in a pit and apply lime every time septage is dumped.

Figure 14 Lime stabilization

## Sludge drying bed

An unplanted drying bed is a simple, permeable bed that, when loaded with sludge, collects percolated leachate and allows the sludge to dry by evaporation. Approximately 50% to 80% of the sludge volume drains off as liquid or evaporates. The sludge, however, is not effectively stabilized or sanitized.

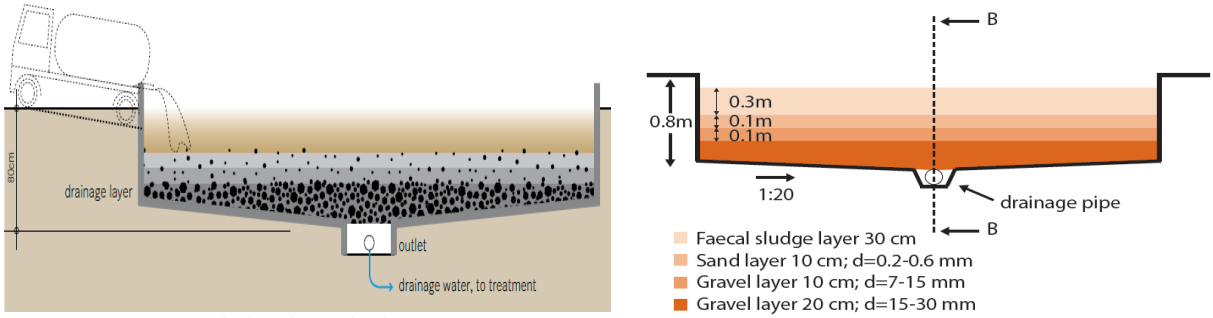



**Figure 15 Sludge drying beds**

*Image source: Compendium of Sanitation Systems and Technologies - 2nd Revised Edition and Advisory on septage management*

## Planted Sludge drying bed

A planted drying bed is similar to an Unplanted Drying Bed, but has the added benefit of transpiration and enhanced sludge treatment due to the plants. The key improvement of the planted bed over the unplanted bed is that the filters do not need to be desludged after each feeding/drying cycle. Fresh sludge can be directly applied onto the previous layer; the plants and their root systems maintain the porosity of the filter.

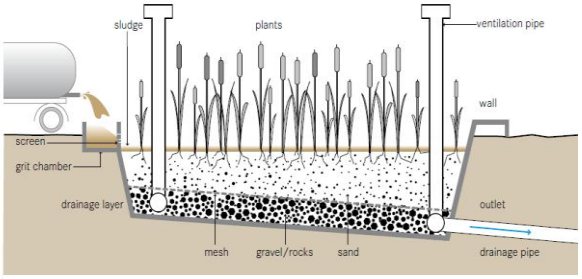



**Figure 16 Planted Sludge drying bed**

*Image source: Compendium of Sanitation Systems and Technologies - 2nd Revised Edition*

## Septage dewatering

The septage after lime dosing is pumped to screw press or any other mechanical dewatering machine. Polyelectrolyte (a chemical commercially available for use as a coagulant in water supply and sewage treatment) is added to improve the dewatering efficiency. The liquid residual/ /filtrate from dewatering machine needs to be further treated before disposal. The dewatered sludge needs to be dried or composted prior to reuse as soil conditioner / organic fertilizer. Instead of Screw Press the other options could be to use Centrifuge or Belt Press or a Filter Press. Many companies in India are manufacturing sludge dewatering machines.

**Figure 17 Septage dewatering**

## Composting of Septage

Composting is a popular method of treating septage. During the composting process organic material undergoes biological degradation to a stable end product. Approximately 20 percent to 30 percent of the organic solids are converted to carbon dioxide and water.

Figure 18 Septage composting

*Image Source: Cao Dzien co composting plant in Hanoi, Vietnam. Business Analysis of Fecal Sludge Management, Sept 2012, Gates Foundation*

As the organic material in the septage decomposes, the compost heats temperatures in the range of 50 to 70 degrees Centigrade and harmful pathogens are destroyed. The resulting humus-like material is suitable as a soil conditioner and source of nitrogen and phosphorus. The basic procedure for composting is as follows:

- Septage is mixed with a bulking agent (e.g. agricultural residue, cow dung, organic part of municipal solid waste) to decrease moisture content of the mixture, increase porosity, and assure aerobic conditions during composting.
- The mixture is aerated by mechanical turning ("agitated") for about 28 days. The most common "agitated" method is windrow composting: the mixture of septage or wastewater solids and bulking agent is pushed into long parallel rows called "windrows", about 1 to 2 meters high and about 2 to 4.5 meters at the base. The cross-section is either trapezoidal or triangular. Several times a week the mixture is turned over using a front-end loader to move, push, and turn the mixture. Factors affecting the composting process (USEPA 1984) include moisture content (40 percent to 60 percent); oxygen (5 percent to 15 percent); temperature (must reach 55 to $65^0$ C); pH (6 to 9); and carbon-to-nitrogen ratio (30:1).
- Pit composting is simple, does not need any equipment and has been practiced in Gujarat before. The process involves digging many pits (1.2m wide, 1.5m deep and 4m long) and covering with soil (2-3 inches) every time septage is dumped until it gets filled. Contents of the pit are emptied and can be used for soil enrichment after 6 months, by this time most pathogens die off and composting is complete. Treated septage is safe for agricultural use.

**Innovative Approach for Septage Management**

Source: Business Analysis of Fecal Sludge Management, Sept 2012, Gates Foundation

Recent innovative method of using a geo tube for septage storage and transfer has been introduced in Malaysia. The geo-tube material is made of a porous membrane with the sludge received through a hose from a truck. Discharge can be achieved by using a pump or gravity. Sludge in the geo-tube is gradually dewatered by leaching through a porous membrane and the leach ate is treated in the nearby STP while the solids are retained inside. Exposure to the outdoor heat further dries the sludge and the geo-tube is eventually transported to a landfill or recovery facility. Geo-tube before and after use in Malaysia

Box 4Innovative Approaches of Septage Management

Dewatered septage/sludge can be used as a fertilizer in agriculture application

- A fecal coli form density of less than 1000 MPN/g total dry solids
- Salmonella species density of less than 3 MPN per 4 g of total dry solids.
- WHO (2006) suggests helminth egg concentration of < 1/g total solids and E-coli of 1000/g total solids in treated septage for use in agriculture.

Properly treated sludge can be reused to reclaim parched land by application as soil conditioner, or as a fertilizer in agriculture. Deteriorated land areas, which cannot support the plant vegetation due to lack of nutrients, soil organic matter, low pH and low water holding capacity, can be reclaimed and improved by the application of treated septage.

Septage sludge, as a result of lime stabilization has pH buffering capacity that is beneficial for the reclamation of acidic soils. Treated septage is applied with agricultural manure spreaders. Liquid sludge, typically with solid content less than 6 percent are managed and handled by normal hydraulic equipment. Treated septage contains nutrients in considerable amounts, which supports the growth of a number of plants.

Drip irrigation is the preferred irrigation method for settled septage effluent when irrigation is feasible. Crops which could be safely grown are corn, fodder, cotton, trees including fruit trees, eucalyptus and poplar.

Aquaculture can be practiced for settled septage effluent when freshwater is available to achieve dilution to ensure dissolved oxygen is above 4 mg / l. Fish species of tilapia and carp are preferred since they tolerate low dissolved oxygen. Both drip irrigation and aquaculture need land and are feasible at city outskirts.

### 3.8.3. Full cost recovery

To be sustainable, the septage management programs should be funded from the users in the form of user fees. This fee can be added to either the property tax or it can also be used as a pay and use system. This fee should include cost of staff, transportation, treatment, disposal and operation and maintenance.
An example of cost recovery is Marikina City, Philippines. Manila Water Company, the service provider, will purchase eight new septage pumping trucks and fund a mechanized treatment facility in exchange for a 10% surcharge added to the monthly water bill. The program will fund septage pumping of 55,547 septic tanks every 5.25 years (Robbins, 2007).

### 3.8.4. Social marketing

This includes initiating programs for educating the citizens at large. Dedicated Information, Education and Communication (IEC) programs need to be undertaken to inculcate education on sanitation for school children, youth and women in the city.

The social marketing system has different steps, these can include surveying the existing perceptions, conducting meetings with stakeholders, developing technical committees and outreach tools for media outlets, pre testing the tools, performing final surveys and deploying the messages to gauge results.

In Muntinlupa, the city and the technical team developed a campaign plan with target audiences and messages and then developed a mascot, fliers, posters, newspaper ads and a video about the market treatment facility that was aired on a local cable TV station (Robbins, 2007).

## 3.9. Recording and Reporting

Keeping accurate records regarding tanks and volume pumped is important for billing and compliance. Recordkeeping is an integral part of a comprehensive septage management program.

The "manifest system" is a tracking and compliance tool. It helps ensure that all of the septage pumped arrives at the disposal site and minimizes the opportunity for illegal discharge. It is also a record that some septage programs may choose to use for paying septage hauling subcontractors.

Manifest forms are simple receipts that specify:

- the location or address of the pumped septic tank
- septage characteristics (residential or commercial)
- the name and address of the property owner or occupier
- the volume of septage pumped
- any notes regarding tank deficiencies, missing pipes or fittings, improper manholes or access ports, cracks or damage observed

All ULBs should keep a manifest form record for each septic tank / soak pit emptied (A sample manifest form is shown in **Annexure 6 D**). Once completed, a copy of the manifest is given to the property owner as a receipt. When the septage load is delivered to the disposal site, the disposal site operator:

- accepts the load
- verifies the volume
- takes a sample if needed
- signs the manifest proving receipt of the volume of septage disposed of

It may be advantageous for the operator (ULB or private) to pump out multiple tanks before going to the disposal site. In this case, a multiple-load manifest form should be completed as well as in addition to individual manifest/receipt forms. The completed document or documents should be given to the ULB for their records. Cities with more than one lakh population should maintain the records at ward level for on-site sanitation system cleaning.

## 3.10. Ensure safe practices

Never enter a septic tank / soak pit which has not been well ventilated. Check for gas levels before entering septic tanks, manholes and closed chambers. Following steps should be followed as safety measures for septage management:

- Always keep first aid kit, gas detection lamp and fire extinguisher in the septage emptier vehicle
- Provide training to workers handling septage on safety and hygiene practices
- Provide fencing or compound around septage treatment facility premises
- Train staff and compel them to wear helmets, gum boots and gloves while on work.
- Ventilate covered tanks/pits by keeping them open for sufficient period before entering
- Paste list of emergency numbers on septage emptier and at a prominent place in septage treatment / disposal unit

Annexure 6 A

## Specifications of twin pit system (From CPHEEO manual)

**In water logged area**: The pit top should be raised by 300 mm above the likely level of water above ground level at the time of water logging. Earth should then be filled well compacted all-round the pits up to 1.0 m distance from the pit and up to its top. The raising of the pit will necessitate rising of latrine floor also. A typical pour flush latrine in water logged areas is shown in Figure 19

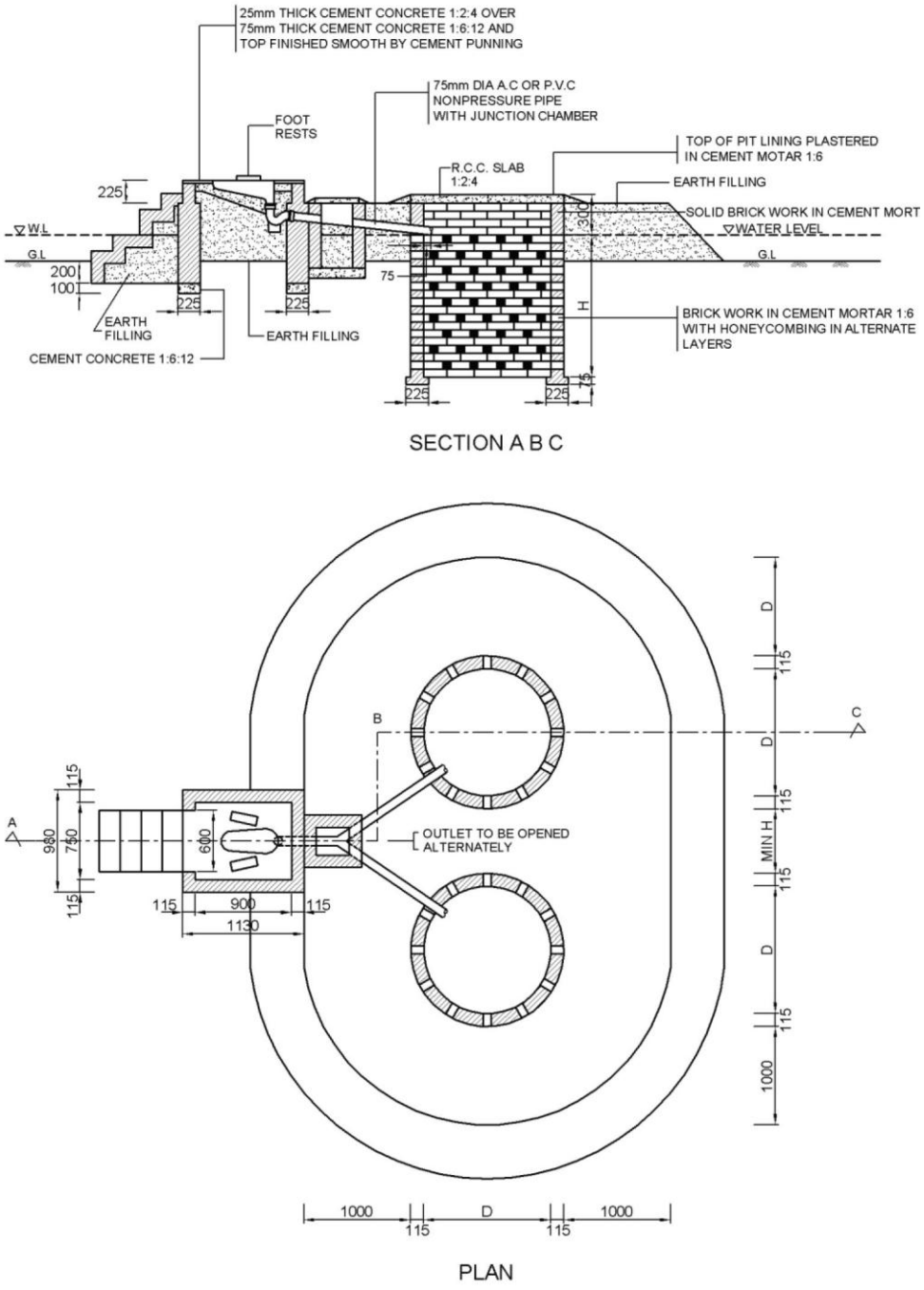



Figure 19 Twin pit for water logged area

**In high subsoil water level**: Where the subsoil water level rises to less than 300 mm below ground level, the top of the pits should be raised by 300 mm above the likely subsoil water level and earth should be filled all round the pits and latrine floor raised as stated above. A typical pour flush latrine with leach pits in high subsoil water level is shown in Figure 20

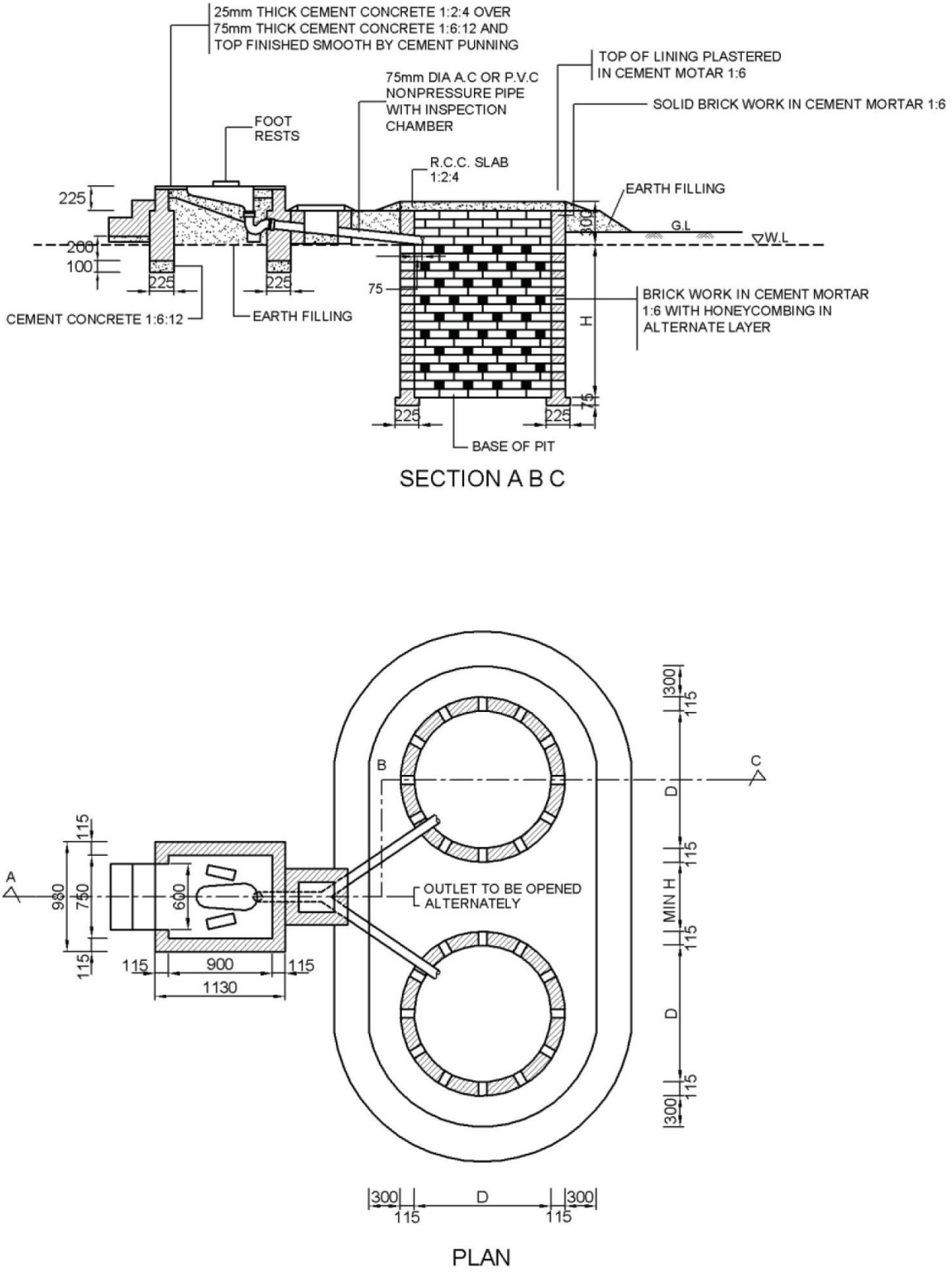



Figure 20 Twin pit in high subsoil water level

**In rocky strata**: In rocky strata with soil layer in between, the leach pits can be designed on the same principle as those for low subsoil water level and taking the long term infiltrative capacity as 20 l/m2/d. However, in rocks with fissures, chalk formations, old root channels, pollution can flow to very long distances; hence these conditions demand careful investigation and adoption of pollution safeguards as stated in paragraph below.

**In black cotton soil**: Pits in black cotton soil should be designed taking infiltrative rate of 10 l/m2/d. However a vertical fill (envelope) 300 mm in width with sand, gravel or ballast of small sizes should be provided all round the pit outside the pit lining.

**Where space is a constraint:** Where circular pits of standard sizes cannot be constructed due to space constraints, deeper pit with small diameter (not less than 750 mm), or combined oval, square or rectangular pits divided into two equal compartments by a partition wall may be provided. In case of combined pits and the partition wall should not have holes. The partition wall should go 225 mm deeper than the pit lining and plastered on both sides with cement mortar. A typical pour flush latrine with combined pits is shown in Figure 21

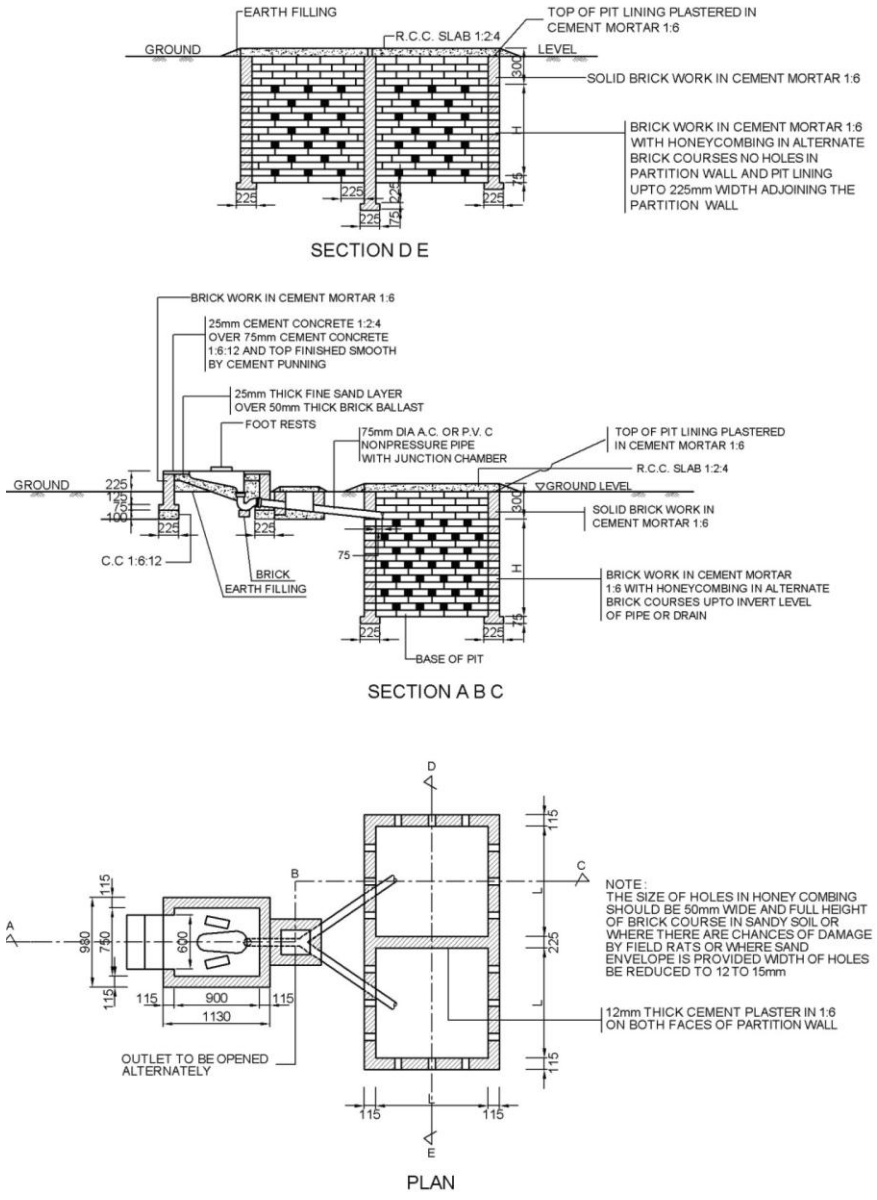



Figure 21 Twin pits in Space constrain location

Annexure 6 B

**Recommended sizes of septic tanks** (From CPHEEO manual)

| Sl. No. | Number of Users | Length (m) | Breadth (m) | Liquid depth for Cleaning once/2 years | Liquid depth for Cleaning once/3 years |
|---|---|---|---|---|---|
| 1 | 5 | 1.5 | 0.75 | 1.0 | 1.05 |
| 2 | 10 | 2.0 | 0.9 | 1.0 | 1.40 |
| 3 | 15 | 2.0 | 0.9 | 1.3 | 2.0 |
| 4 | 20 | 2.3 | 1.1 | 1.3 | 1.8 |
| 5 | 50 | 5.0 | 2.0 | 1.0 | 1.24 |
| 6 | 100 | 7.5 | 2.65 | 1.0 | 1.24 |
| 7 | 150 | 10 | 3.0 | 1.0 | 1.24 |
| 8 | 200 | 12 | 3.3 | 1.0 | 1.24 |
| 9 | 300 | 15 | 4.0 | 1.0 | 1.24 |

**Recommended sizes of twin pits**

| Pit type | 5 users | | 10 users | | 15 users | |
|---|---|---|---|---|---|---|
| | Diameter | depth in m | diameter | depth in m | diameter | depth in m |
| Dry pits | 0.9 | 1.0 | 1.1 | 1.3 | 1.3 | 1.4 |
| Wet pits | 1.0 | 1.3 | 1.4 | 1.4 | 1.6 | 1.5 |

Notes:

1. Depth from bottom of pit to invert level of incoming pipe or drain
2. When groundwater table is below the pit bottom it is a dry pit, when groundwater table is above the pit bottom it is a wet pit

Annexure 6 C

## MODEL CHECKLIST

The following checklist provides a ready reference of major considerations that apply for work in a confined space such us sewer, septic tank or soak pit.

### PRE-ENTRY

The pre-entry considerations should be at least as follows:

**a.** **Employee selection**, including evaluation of an employee's aptitude and fitness for task and confined space entry.

**b.** **Employee training should include the following:**

- Emergency entry and exit procedures.
- Use of respiratory protective devices.
- First aid including cardio-pulmonary resuscitation (CPR).
- Safety equipment use.
- Rescue drills.
- Fire protection.
- Communications.

**c.** **Actions required before execution are as follows:**

- Coordinate planning of work.
- Coordinate supervising of work.
- Implement emergency rescue plan.
- Initiate safe work practices.
- Signpost work area.
- Isolate confined space.
- Evaluate confined space environment.
- Comparison of initial test results with existing standards to determine
- Ventilation and/or personal protection requirements.
- Ventilate and/or provide personal protection.
- Provide for monitoring of confined space during work.
- Ensure that standby staff is available for rescue of workers and operation of essential equipment.
- Ensure rescue equipment is readily available and in order.
- Authorize entry by permit.
- Suspend work/evacuate space if conditions change to present real/
- Potential danger.

### DURING ENTRY AND RE-ENTRY

The minimum considerations prior to the entry and re-entry should be as below

- A comparison of initial test results with an existing standard to determine whether ventilation or personal protective equipment will be used.

- Continuous or periodic monitoring of confined space atmosphere.
- Ensure safe work practices followed.
- Reissue permit if conditions change.
- Confirmation that all persons and equipment are accounted for.

### AFTER EXIT

The consideration after exit should include the following:

- Ensure safe work practices followed.
- Review of operation - comment on any unsatisfactory aspects.
- Acceptance of completed job.
- Secure the entry point
- Clean the equipment and store it in safe place.

## Annexure 6 D

### Sample Septage Manifest Form (ULBs should modify this to fit their needs)

**Name of the City_____**

**Date _____ Time _____ am/pm**

**1. Basic Information (Must be completed by the septage emptier (person)**
a) What is the Volume of septage emptied (liters) _____
b) What is the type of container emptied? (Tick the correct option)
___ Holding Tank ___ Septic Tank ___ Soak Pit___ Other (specify) _____
c) Source: ___ Residential ___ Restaurant ___ Office/commercial ___ Industrial ___ other(__specify___)

**2. Generator of septage (Not to be filled in case of Oxidation Pond)**
a. Complete name: _____
b. Phone number: _____
c. Complete address with landmarks:
_____
_____
The undersigned being duly authorized hereby certifies to the accuracy of the source and type of collected septage identified above and subject to this manifest.

Date: _____ Signature: _____

**3. Information about the wastewater emptier (vehicle):**
a. Company Name: _____
b. Type of Vehicle: _____

c. Vehicle Number: _____

d. Where was the waste taken for treatment?
_____
e. Where was the waste dumped?
_____
f. Was the treated septage used for any other purpose?
_____

### 4. Acceptance by _____Municipal Council

FORM AT COMPOSTING SITE or SEWAGE TREATMENT PLANT
Emptier (Name) _____
Vehicle Number: _____
The above emptier delivered the described septage to this disposal facility and it was accepted.
Disposal date: _____
Signature of authorized official and title: _____

# Glossary

**Child-Friendly toilet:** Toilet designed keeping in view privacy, safety and dignity of children with suitable construction specifications (width of toilet pans, height of urinals, hand-washing facilities, door & latches). (*Source: Technical Note series, school and anganwadi toilet design, Norms and Option, 2004,- Dept. of Drinking Water and Sanitation, Govt. of India)*

**Community toilet:** Community toilets mean a shared facility provided by and for a group of residents or an entire settlement. Community toilet blocks are used primarily in low-income and/or informal settlements/slums where space and/or land are constraints in providing a household toile. These are for more or less fixed user group. *(Source: Guidelines for Swachh Bharat Mission, Dec 2014-Ministry of Urban Development, Govt. of India)*

**Disabled Friendly Toilet:** Toilet design which caters the need of physically challenged people with simple adaptation like low level of hand rail in toilet, ramps and a pipe attached to the tap for self-cleanings. (*Source: Technical Note series, school and anganwadi toilet design, Norms and Option, 2004,- Dept. of Drinking Water and Sanitation, Govt. of India)*

**Faecal sludge*:*** It is a mixture of solids and liquids, containing mostly Excreta and water, in combination with sand, grit, metals, trash and/or various chemical compounds. (*Source: Compendium of Sanitation Systems and Technologies, by the International Water Association.)*

**Flush / pour flush latrine connected other system**: If the pour or pour-flush latrine is connected to any system other than a piped sewer system or septic tank e.g. excreta and waste water gets flushed into the street, yard / plot, drainage ditch or any other location. *(Source: Census of India 2011)*

**Flush / pour flush latrine connected septic tank**: If a pour flush latrine is connected to a septic tank that collects both human excreta and wastewater and removes them from the household environment. *(Source: Census of India 2011)*

**Flush / pour flush latrine connected to piped sewer system:** If a pour flush latrine is connected to a system of sewer pipes that collect both human excreta and waste water and removed them from the household environment. *(Source: Census of India 2011)*

**Improved Sanitation as per the Joint Monitoring Program (JMP):** An improved sanitation facility is one that hygienically separates human excreta from human contact. For example-piped sewer system, septic tank, pit latrine, ventilated improved pit (VIP) latrine, Pit latrine with slab, composting toilet. (*Source: Progress on Sanitation and Drinking water- 2013 update, JMP- UNICEF and WHO)*

**Insanitary latrine** means a latrine which requires human excreta to be cleaned or otherwise handled manually, either in situ or an open drain or pit into which the excreta is discharged or flushed out, before the excreta fully decomposes in such manner as may be prescribed. *Source: (Chapter I Section 2(i)(e) The Prohibition of employment as manual scavengers & their Rehabilitation Act 2013)*

**On-site sanitation:** It is underground waste collection system which is used in the absence of piped sewer system. When the wastes are collected, treated and disposed of at the point of generation, it is called an on-site system like pit latrines and septic tank systems. (*Source: Manual on Sewerage and Sewage Treatment Systems Part A Engineering, CPHEEO)*

**Pit latrines**: defecation into pits dug into the ground for reception of night soil directly without flushing. *(Source: Census of India 2011)*

- **Pit latrine with slab**: A pit latrine with a squatting slab or platform or set firmly supported on all sides, and raised above the surrounding ground level to prevent surface water from entering the pit, and easy to clean.
- **Pit latrine with ventilated improved pit**: Pit latrines with slabs that are ventilated by a pipe extending above the latrine roof and the open end of the vent pipe is covered with mesh or fly-proof net
- **Pit latrine without slab / open pit**: Pit latrines without a squatting slab or platform or seat

Public toilet: Public toilets are to be provided for floating population/general public in places such as markets, train stations train stations, tourist places, near office complexes, or other public areas where there are considerable number of people passing by. (*Source: Guidelines for Swachh Bharat Mission, Dec 2014-Ministry of Urban Development, Govt. of India)*

Septage management: The systematic management and disposal of faecal sludge produced in septic tanks. *(Source: Septage management in Urban India, Water and sanitation Program, National Urban Sanitation Policy)*

Septic tank: It is an underground structure made up of bricks, cement or concrete. It has 3 or more chambers separated by baffle wall. In different chambers waste as settled and degraded anaerobically and the final effluent is discharged through outlet pipe of septic tank. *Source: Handbook on Technical options for onsite sanitation, Ministry of Drinking water and sanitation, Govt. of India, May 2012.*

Shared toilet: It is the common toilet which is shared and used by five or less households. (*Source: Progress on Sanitation and Drinking water- 2013 update, JMP- UNICEF and WHO)*

Soak pit: Porous-covered chamber that allows wastewater to soak into the ground. It is also known as a soak-away or leach pit. (*Source: Septage management in Urban India, Water and sanitation Program, National Urban Sanitation Policy)*

Standard operating procedure (SOP): are detailed written instructions to achieve uniformity of the performance of a specific function. Purpose of SOP is to carry out the operations correctly and always in the same manner. (*Source: http://sop-standard-operating-procedure.com)*

Temporary Toilet means toilets which are simple portable enclosures and are typically used for construction sites or large gatherings because of their durability and convenience.

Twin pit: In a twin pit system, the second pit is only used when the first pit is filled. The first pit is left sealed for a year or more before emptying during which time disease-causing organisms are destroyed by natural processes. After such storage, without the addition of fresh wastes, the contents become safe to handle, and may be used as compost. (*Source: http://water.worldbank.org/shw-resource-guide/infrastructure/menu-technical-options/pit-latrine)*

# List of abbreviations :

| | |
|---|---|
| CPHEEO | Central Public Health Engineering and Environmental Organisation |
| CPWD | Central Public Works Department |
| CSR | Corporate social responsibility |
| GoG | Government of Gujarat |
| GoI | Government of India |
| GR | Government Resolution |
| IEC | Information, education and communication |
| INR | Indian National Rupee |
| IS | Indian standards |
| JMP | Joint Monitoring Programme |
| LED | Light emitting diode |
| MDWSS | Ministry of Drinking Water Supply and Sewerage |
| MGSM | Mahatma Gandhi Swachhata Mission |
| MoUD | Ministry of Urban Development |
| NGO | Non-governmental organisation |
| O&M | Operation and maintenance |
| OD | Open defecation |
| OSS | On-site waste water treatment system |
| PPP | Public private partnership |
| SBM | Swachh Bharat Mission |
| SLB | Service Level Benchmarking |
| SOP | Standard operating procedure |
| SWM | Solid waste management |
| UGD | Under-ground drainage |
| ULB | Urban local body |
| UNICEF | United National International Children's Emergency Fund |
| WHO | World Health Organisation |

| | |
|---|---|
| BOD | Biochemical Oxygen Demand |
| COD | Chemical Oxygen Demand |
| CPCB | Central Pollution Control Board |
| FSM | Fecal Sludge Management |
| GPCB | Gujarat Pollution Control Board |
| GUDC | Gujarat Urban Development Company Ltd. |
| GUDM | Gujarat Urban Development Mission |
| GWSSB | Gujarat Water Supply and Sewerage Board |
| LPCD | Liters Per Capita Per Day |
| MPN | Most probable number of coliforms |
| NUSP | National Urban Sanitation Policy |
| PAS | Performance Assessment System |
| pH | Hydrogen ion concentration |
| RCC | Reinforced cement concrete |
| SS | Suspended Solids |
| STP | Sewage Treatment Plant |
| TSS | Total Suspended Solids |
| UASB | Up flow Anaerobic Sludge Blanket |
| UMC | Urban Management Centre |
| USAID | United States Agency for International Development |
| USEPA | United States Environmental Protection Agency |

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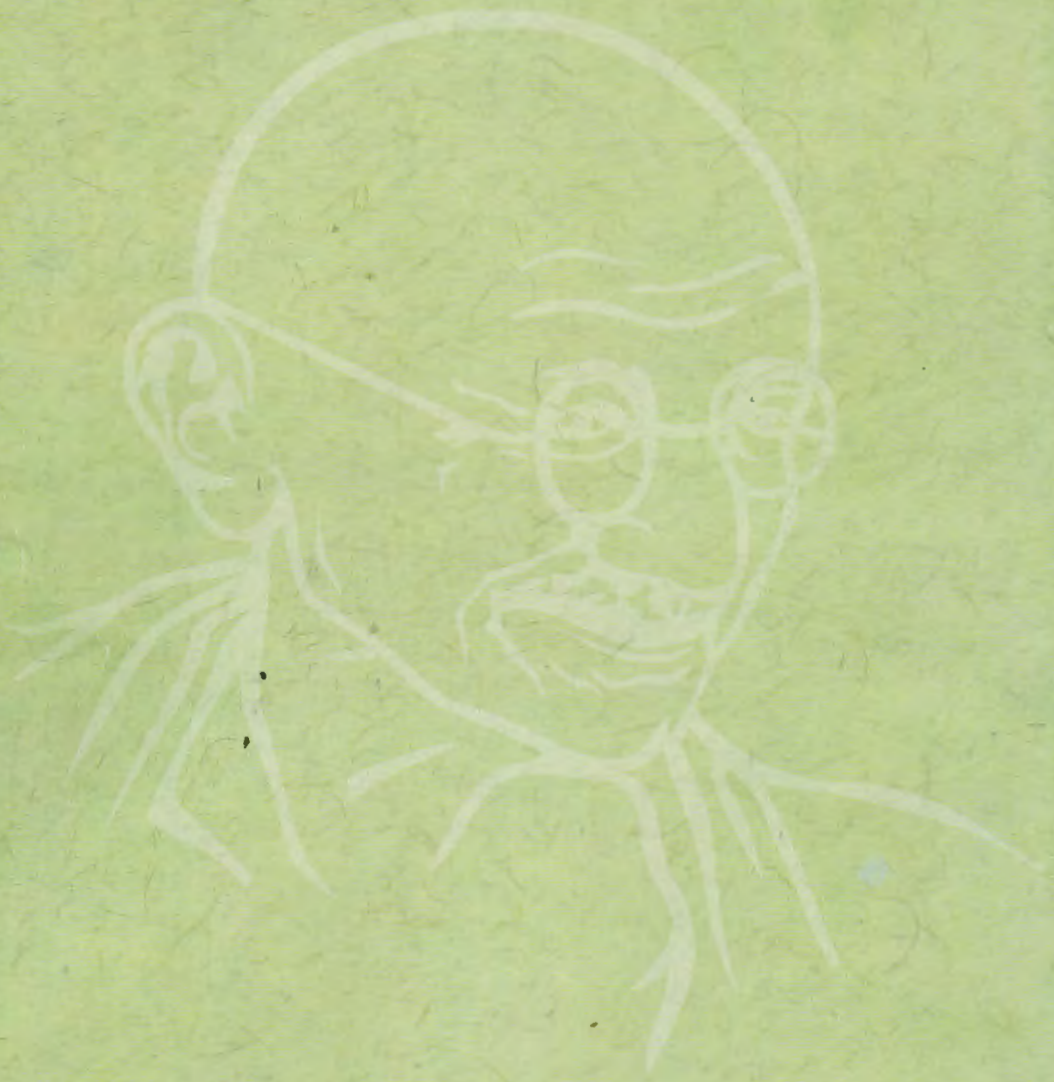

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