Draft Operative Guidelines

Septage and Faecal Sludge Management

2015 for Urban Local Bodies in Karnataka

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Current Scenario in Urban Areas of Karnataka

Karnataka is the fifth-most urbanized state in the country as per the Census 2011 findings. Of the 61.13 million residents of the state 23.6 million residents (about 38% of the state's population) live in urban areas spread across 213 municipalities, or Urban Local Bodies (ULBs).

At present there are eight Municipal Corporations, 43 City Municipal Councils, 94 Town Municipal Councils and 68 Town Panchayats in the State. Also for specified areas like industrial areas where municipal services are required to be provided, the government has created 6 Notified Area Committees (NAC) (Urban Development Department, Government of Karnataka).

Table 1. The increase as the number of towns in the Karnataka have increased drastically in the last decade

Particulars	As per Census 2001	As per Census 2011	Decadal change
No. of Towns	270	347	347
No. of Census	44	127	127
No. of Villages	29406	29340	29340

This increase in the number of urban areasbrings with it demands for providing a well-functioning sanitation system, addressing the sanitation requirements of every citizen. Such a system must ensure that its processes do not adversely impact the environment or public health. Currently the state government prioritizes the implementation of a centralized piped sewer network connected to every household as the most appropriate sanitation system to meet the sanitation requirements of these urban areas. The actualization of this system to meet the needs of every household has not materialized as expected.

Data available with the Karnataka Urban Water Supply and Drainage Board (KUWS&DB) indicates that only 29% of the total urban areas have access to a sewered network. This includes areas which were declared to be urban areas before 2001, indicating that the lack of coverage of the centralized sewer networks has been a chronic problem with the increase in urban areas only compounding the problem. Consequently many individual households have taken it upon themselves to meet their sanitation needs by putting in place on-site sanitation systems like septic tanks and pit latrines (mostly single-pit latrines).

The figures from the 2011 Census for Karnataka reveal, that of the households which have a latrine facility on their household premises 17% have a septic tank and 12% have a pit latrine. The Directorate of Municipal Administration has taken cognizance of these numbers and attempted to facilitate the desludging of these systems by commissioning vacuum trucks, utilized in desludging of such on-site systems, for each of the 213 ULBs in the State. These vacuum trucks will add to the privately-owned vacuum trucks that have been carrying out the desludging and transportation of septage/faecal sludge for on-site sanitation systems.

In the present scenario, Sewage Treatment Plants (STPs) and solid waste treatment facilities exist as treatment options for septage/faecal sludge. Of these, the use of solid waste treatment facilities is more feasible and therefore recommended based on the accessibility of these facilities and the superior quality of treatment. Currently STPs are not in place in every urban area in Karnataka. In contrast there are solid waste treatment facilities available in the jurisdiction of every Town Municipal Council in the state except for the four Town Municipal Councils of Badami, Wadi, Devadurga and Shikaripura.

The ready accessibility of solid waste treatment facilities enables the complete implementation of all the processes in septage/faecal sludge management. The treatment of faecal sludge/septage along with the organic components of municipal solid waste is advantageous because the two materials complement each other in terms of their physical characteristics and chemical composition.

Human excreta are relatively high in phosphorous (P) and potassium (K) content and moisture, and the municipal solid waste is relatively high in organic carbon (OC) content and has good bulking quality. High temperatures attained in the co-composting process are effective in deactivating excreted pathogens in the faecal sludge and will convert both wastes into a hygienically safe soil conditioner-cum-fertilizer.

The presence of a high quantity of phosphorus and potassium has a significant impact on improving agricultural yield. The content of organic matter in faeces also increases the water-holding and ion-buffering capacities of soils, which is of importance for improving the soil structure and stimulates the microbial activity. (WHO Guidelines for the safe reuse of wastewater, excreta and greywater,2006)

The Need for Guidelines on Decentralised Septage/Faecal Sludge Management System in Karnataka

According to the figures of the Census 2011 for the state of Karnataka, there are 906,083 households in urban areas which have septic tanks and 636,644 households in urban areas which have pit latrines.

Currently these on-site sanitation systems are being serviced for their emptying and septage/faecal sludge transportation requirements by government-owned and privately-owned vacuum trucks, colloquially known as 'honeysuckers'. There exists a need to formalize the functioning of these vacuum trucks.

However this is only part of the larger need to put in place a set of operative guidelines which will formalize the entire sanitation value chain. These guidelines propose the recognition of the good practices in disposing and treating septage/faecal sludge and efficient regulation of the sanitation value chain where necessary.

The operative guidelines thus intend to improve access to design and construction standards for on-site sanitation systems, regulate the emptying and transportation of septage/faecal sludge and recommend procedures for the disposal, treatment and re-use of the septage/faecal sludge. Presently the design and construction of on-site sanitation systems like septic tanks and pit latrines are undertaken on a private basis by house owners.

The Central Public Health &Environmental Engineering Organization (CPHEEO) Manuals 2013, National Building Code, 2005 and the Bureau of Indian Standards, 2011 all provide recommendatory design and construction specifications for these on-site sanitation systems. However, there is little awareness among house owners of these prescribed standards for design and construction. Consequently most septic tanks and pit latrines do not meet these recommended standards. The operative guidelines seek to remedy this lack of awareness by providing a consolidated version of these recommended standards.

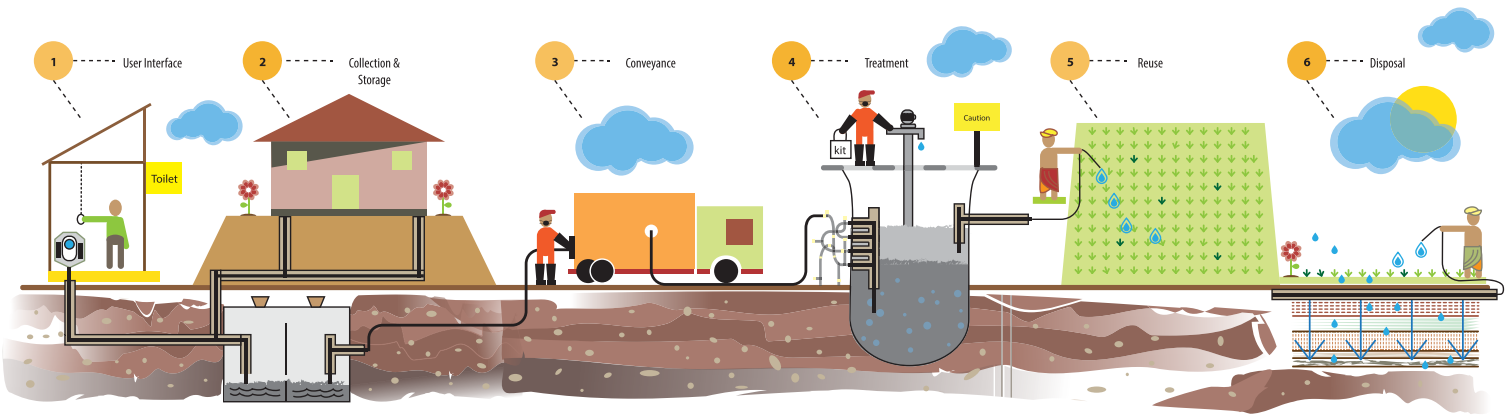


Figure 01 : Sanitation Value Chain

The Directorate of Municipal Administration has sought to provide its own services for emptying and transportation of septage/faecal sludge by commissioning vacuum trucks for each one of the 213 ULBs in the state. These vacuum trucks will function along with those owned by private service providers. The increase in the number of vacuum trucks is a welcome initiative as it introduces a mechanized method of desludging doing away with manual scavenging. However there needs to be more effective regulation of the disposal points utilized by these vacuum trucks. Many of these vacuum trucks sometimes haphazardly dump the septage/faecal sludge in lakes or other public water bodies, adversely impacting the environment and increasing the risk of epidemics. The private service providers often indulge in such illegal dumping practices because the government authorities require them to pay a fee for disposing of the septage/faecal sludge at Sewage Treatment Plants (wherever such facilities are present).

On the other hand some private service providers also engage in positive dumping practices, like dumping septage/faecal sludge on the fields of consenting farmers where such septage/sludge serves as a soil conditioner. There is a need for the government to appreciate the contributions made to servicing these sanitation systems by the private sector while discouraging the illegal or harmful practices they may engage in. These operative guidelines seek to address this need by encouraging the presence of private service providers and introducing measures to ensure the disposal of septage/faecal sludge in a manner most conducive to public health and the environment. One of the most prominent disposal points that need formal recognition is the dumping of septage/faecal sludge in agricultural fields. These guidelines lay down mechanisms for recognizing such disposal as well as improving the agriculturist's capabilities in receiving septage/faecal sludge as a soil conditioner.

It is recommended that the treatment of septage/faecal sludge be made a part of the solid waste treatment process wherever feasible. The operative guidelines formalize this inclusion of septage/faecal sludge in the solid waste management process and detail the different methods by which septage/faecal sludge can be treated as part of the solid waste management process. The treatment of septage/faecal sludge as a part of the solid waste management process is more conducive to enabling its re-use as a soil conditioner, as directed by the Advisory Note on Septage Management circulated by the Ministry of Urban Development.

Purpose and Objective of the Operative Guidelines

These Guidelines intends

To be a step in the regularization of all processes pertaining to the creation of a robust decentralized sanitation value chain.

To ensure the adherence to proper design, collection, treatment and disposal standards in managing faecal sludge/septage with the existing infrastructural capabilities of the ULBs.

To further strengthen the framework focused on implementing the provisions of the Prohibition of Employment as Manual Scavengers and their Rehabilitation Act, 2013 in the state of Karnataka.

To secure reuse of faecal sludge/septage as environmentally safe, organic fertilizers and soil conditioners.

Definitions

The partially treated sewage that is stored in a septic tank is commonly called as septage. It includes the liquids, solids (sludge), as well as the fats, oils and grease (scum) that accumulate in septic tanks over time.
Faecal Sludge comes from on-site sanitation technologies like pit latrines and dry toilets. It is raw or partially digested, a semisolid and results from the collection, storage or treatment of combinations of excreta and blackwater, with or without greywater.
Decentralised sanitation solutions includes managed individual on-site septic systems and pit latrine systems which are used to collect and partially treat septage/faecal sludge from individual dwellings, businesses or small communities.
Septage/Faecal Sludge Management includes the entire process of design, collection, safe treatment and re-use/disposal of septage/faecal sludge
Urban Areas include all cities and towns falling under the purview of the Urban Development Department, Government of Karnataka.

Operative Guidelines for Urban Local Bodies for effective implementation of Septage/Faecal Sludge Management.

Septage/Faecal Sludge Management for the local bodies includes both residential and non-residential /commercial waste (excluding industrial waste). These operative guidelines seek to empower the local bodies with knowledge, procedure and facilities.

Key elements of Septage Management

I.	Survey and Inventory of sanitation systems
II.	Design and Construction of Septic Tanks and Pit Latrines
III.	De-sludging
IV.	Septage Transportation
V.	Treatment & Septage Disposal
VI.	De-watered septage/sludge reuse
VII.	Fees/Charges for Collection, Transportation and Treatment
VIII.	Information, Education and Communication

The Operative Guidelines for each of these key elements is as follows.

Survey and Inventory of sanitation systems

Conduct a household survey on the formal nature of the toilet in all urban areas of Karnataka. The survey may make use of the form as given in Annexure 6.

Based on the data collected from the survey, records of the information related to septage/faecal sludge generation from individual households, commercial establishments, community toilets and public toilets; household level details of insanitary latrines, identification of septic tank/pit latrine location in individual households, commercial establishments, community toilets and public toilets; physical condition and functioning of the toilets and frequency of desludging the septic tanks/pit latrines.

Such records must be updated on an annual basis.

Design and Construction of Septic Tanks and Pit Latrines

All building approval plans must submit proper designs of the on-site sanitation systems that are proposed to be constructed.

Issue notices in those cases where the on-site sanitation system is the cause of public nuisance by way of overflows, leakage, and stench under the provisions of The Karnataka Municipalities Act, 1964.

Identify insanitary latrines and convert them to sanitary latrines for safe collection and disposal of waste.

Desludging

Wherever septage/faecal sludge is currently discharged into fresh water or storm water drains, Urban Local Bodies must ensure a proper collection (transportation) system, treatment of septage/faecal sludge at the solid waste treatment unit and its safe reuse.

Wherever septage/faecal sludge is collected in a decentralized sanitation system and a private service operator is engaged for the mechanical collection and transport of the septage/faecal sludge, the private service operator will acquire the necessary permits and adhere to hygiene and environmental standards while collecting and disposing off the faecal sludge/septage.

Septage/ Faecal Sludge Transportation

All vacuum trucks must be required to transport septage/faecal sludge to recognized composting facility in agricultural fields or a solid waste management facility or a sewage treatment plant within the jurisdiction of the ULB.

Only certified vacuum truck ownerswith permits, to desludge and transport waste to the Solid Waste treatment unit in the urban centre. The transporters should be selected in compliance with the requirements of Annexures 3 and 4.

The vacuum truck operators involved in the process of collection, treatment and disposal of sewage should be well trained and equipped with protective safety gear, tools to ensure safe handling of faecal sludge/septage. The rules under the Prohibition of Employment as Manual Scavengers and their Rehabilitation Act, 2013 provide for a comprehensive list of safety gear to be used and the same must be adhered to.

The ULBs must maintain a record of all the registered private vacuum truck operators. These records must include the operators available in each location and the details for each vacuum truck.

Treatment and Final Disposal

The final disposal point for septage/faecal sludge must be either a solid waste management facility or a recognized composting facility in an agricultural field or a sewage treatment plant.

Annexure3 lists the various methods of treatment that can be used for treating septage/faecal sludge to procure its re-use as a soil conditioner.

The septage/faecal sludge receiving facility should be operational during working hours only and a responsible official should be tasked with ensuring that no commercial or industrial waste,other than septage/faecal sludge from such sources is unloaded into these facilities.

Septage/sludge reuse as agricultural fertilizer

In order to produce soil conditioner as a result of the treatment of septage/faecal sludge as a part of the solid waste management process,the 'Bangalore Model' of sludge/septage treatment is recommended.

The compost must meet the recommended quality standards as prescribed in the Municipal Solid Waste Management Rules, 2000.

The sludge must be reused in accordance with the WHO Guidelines on the Reuse of human excreta, wastewater and grey water, 2006.

Information, Education and Communication

The information, education and communication aspects pertaining to septage/faecal sludge management must be addressed in a three step process:

1. Public Awareness:

Members of Resident Welfare Associations, community-organizers, self-help groups and the general public should be sensitized periodically regarding the need for a sound septage/faecal sludge management system. The health hazards associated with the improper collection and treatment of waste, and the ill-effects of unhygienic disposal of septage/faecal sludge must be explained to the residents. Such public awareness initiatives must bring to the notice of the residents all the available options for septage/faecal sludge collection, transport and treatment present in the jurisdiction of the ULB. This must include disseminating details of all the government-owned and privately-owned vacuum trucks in the location.

2. IEC for Municipal Staff:

Municipal Commissioners, Engineers, Sanitation Inspectors, Health Officers, and Sanitation Workers should be well-trained in septage/faecal sludge management and its best practices. This involves regular training sessions on safe collection, treatment and disposal. Information regarding standard septic tank/pit latrine designs, the need for periodic inspection and desludging of septage/faecal sludge, details for granting permits to private service providers, details for formally recognizing composting facilities on agricultural fields. Training should also be provided on safety standards. These awareness and training initiatives for the municipal staff may be conducted by the Directorate of Municipal Administration.

3. IEC for septage/faecal sludge transporters and other private service providers:

The Directorate of Municipal Administration is recommended to prepare training modules and conduct periodic training programmes for all septage/faecal sludge transporters. These training programmes must include safety precautions to be taken during the handling of septage/faecal sludge. The ULBs must also undertake knowledge dissemination programmes to augment composting facilities on agricultural fields for farmers.

Fees/Charges for Desludging, Transportation and Treatment

a) Fees for Desludging to be collected from residents by certified and registered tanker operators.
b) All government tanker operators must notify the rates at which the desludging and disposal of the faecal sludge/septage will be carried out.

Periodic revisions for the charges to be effected based on the revisions in the costs involved.

Action Plan for the Urban Local Bodies

Key elements of septage/ faecal sludge	Objectives and Outcomes	Activity to be undertaken by Urban Local Bodies	Timeframe	Means of Verification
1. Survey and Inventory of sanitation systems	To ensure that thorough records on the formal nature of the toilet on a household, community toilet and public toilet level are	The ULBs to conduct a survey using the sample form provided in Annexure 6 to collect data on the toilet and its allied sanitation systems for the household, community toilets and public toilets. The data collected by such surveys must be systematically entered into records which will be maintained by the ULBs.	1 year	Records and Registers of the ULBs.
2. Desludging	Safe collection of all septage/faecal sludge generated in the jurisdiction of the Urban Local Body by residential and commercial establishments.	The point of disposal must be decided. Dedicated and trained staff for desludging. No use of manual scavenging. Protective safety gear to be used for desludging.	6 months	The service providers' manifest as provided in Annexure 4 must be filled.
3. Septage Transportation	Safe transportation of septage/faecal sludge by licensed septage/faecal sludge transporters in vacuum trucks and safety gear for all staff.	Call for Expression of Interest. Grant permits (valid for a year) for transporting sewage on rate contract basisbased on permits given in the Annexure 3 & 4. Certificate of fitness for the vehicles (to be checked every year). Trucks to prominently display their registration with the ULBs Payments to be made directly to the Transporter. The ULBs must maintain a record of vacuum truck Ensure proper vacuum trucks are transporting septage/faecal sludge with staff adequately equipped with safety gear and other protective equipment required to safely collect and transport septage/faecal sludge.	1 month	Tender details, details of selected septage /faecal sludge transporters to be maintained. Vehicle details to be kept with the ULBs.
4. Treatment and Final Disposal	Ensure safe treatment of septage/sludge.	As a first preference the septage/faecal sludge must be dumped on agricultural/ horticultural fields of farmers having recognized composting facilities.	3 months	The service providers' manifest as provided in Annexure 4 will give the details of the location of dumping of the septage/faecal sludge.

Key elements of septage/ faecal sludge	Objectives and Outcomes	Activity to be undertaken by Urban Local Bodies	Timeframe	Means of Verification
5. Septage/sludge reuse	To ensure that all dewatered septage /sludge must be reused as soil	The ULBs must engage with agricultural science universities to conduct routine checks on thequality of compost produced as an end-product of the septage/sludge treatment process.	1 month	Records of compost quality to be maintained at agricultural science universities and
6. IEC Activity	All stakeholders in the septage/faecal sludge management system including residents, civic bodies, personnel handling sewage, municipal officials to be given periodical training on safe and best practices in septage/faecal sludge management. The importance of safe collection, treatment and disposal of sewage and the health hazards resulting from improper sewage treatment should explained clearly to all.	Ensure one training session every 3 months for Urban Local Body staff on safe collection, treatment and disposal. Information regarding standard septic tank/pit latrine design, tender details for engaging licensed septage/faecal sludge transporters etc. should be disseminated widely to achieve a safe septage/faecal sludge management system. The Directorate of Municipal Administration to prepare the training modules and conduct the training. Ensure monthly engagement with Residents including Resident Welfare Associations, community organizers, self-help groups. The general public should be sensitized regarding the need for a sound septage/faecal sludge management system. The health hazards should be clearly explained to the residents. Residents should also be informed about the standard designs for septic tanks/pit latrines. Urban Local Bodies to organize orientation session for Septage Transporters/private vendors: Urban local bodies should ensure all safety norms are clearly explained to the transporters. Private and Government	1 year	Certification by the Directorate of Municipal Administration. Photographs and Videos of the campaign. Photographs and Videos of the orientation sessions. Directorate of Municipal Administration may perform this activity. Standard templates/Videos may be produced for this activity.

Annexure 1: Septic Tank/Pit Latrine Design

Design of septic tank

The inlet and outlet should not be located at such levels where the sludge or scum is formed as otherwise; the force of water entering or leaving the tank will unduly disturb the sludge or scum and cause clogging of the inlet/outlet pipes. Further, to avoid short-circuiting, the inlet and outlet should be located as far away as possible from each other and at different levels. Baffles are generally provided at both inlet and outlet and should dip 25 cm to 30 cm into and project 15 cm above the liquid. The baffles should be placed at a distance of one-fifth of the tank length from the mouth of the straight inlet pipe. The invert of the outlet pipe should be placed at a level 5 to 7 cm below the invert level of inlet pipe.

Baffled inlet will distribute the flow more evenly along the width of the tank and similarly a baffled outlet pipe will serve better than a tee-pipe. For larger capacities, a two-compartment tank constructed with the partition wall at a distance of about two-thirds the length from the inlet gives a better performance than a single compartment tank. The two compartments should be interconnected above the sludge storage level by means of pipes or square openings of diameter or side length respectively of not less than 75 mm.

Every septic tank should be provided with ventilation pipes, the top being covered with a suitable mosquito proof wire mesh. The height of the pipe should extend at least 2 m above the top of the highest building within a radius of 20 m. Septic tanks may either be constructed in brick work, stone masonry or concrete cast in situ or pre-cast materials. Pre-cast household tank made of materials such as asbestos cement / HDPE could also be used, provided they are watertight and possess adequate strength in handling and installing and bear the static earth and superimposed loads.

All septic tanks shall be provided with watertight covers of adequate strength. Access manholes (minimum two numbers one on opposite ends in the longer direction) of adequate size shall also be provided for purposes of inspection and desludging of tanks. The floor of the tank should be of cement concrete and sloped towards the sludge outlet. Both the floor and side wall shall be plastered with cement mortar to render the surfaces smooth and to make them water tight.

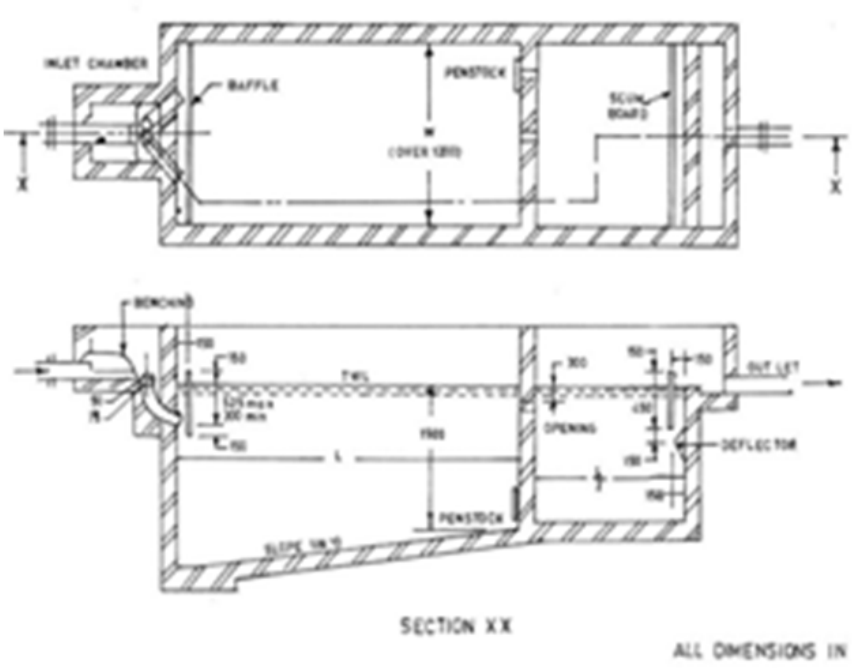
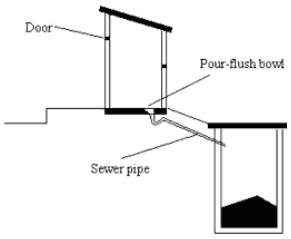


Figure 1: Typical section of septic tank (Source: CPHEEO Manual, 2013).

Design of Pits

Single pit-latrine:

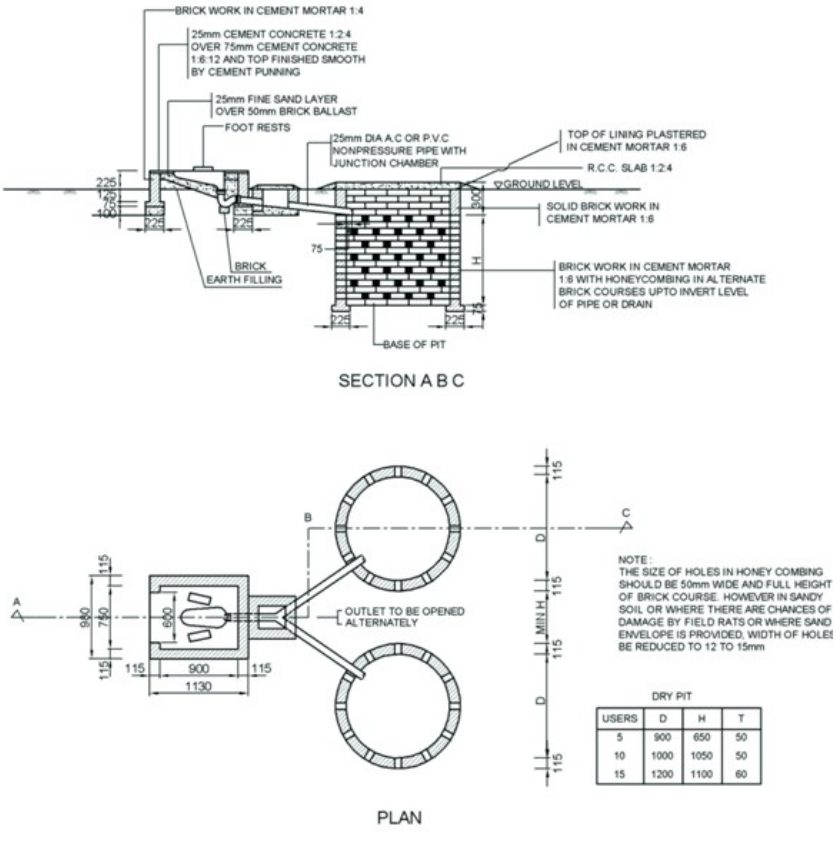


For single pit latrines the following must be adhered to:

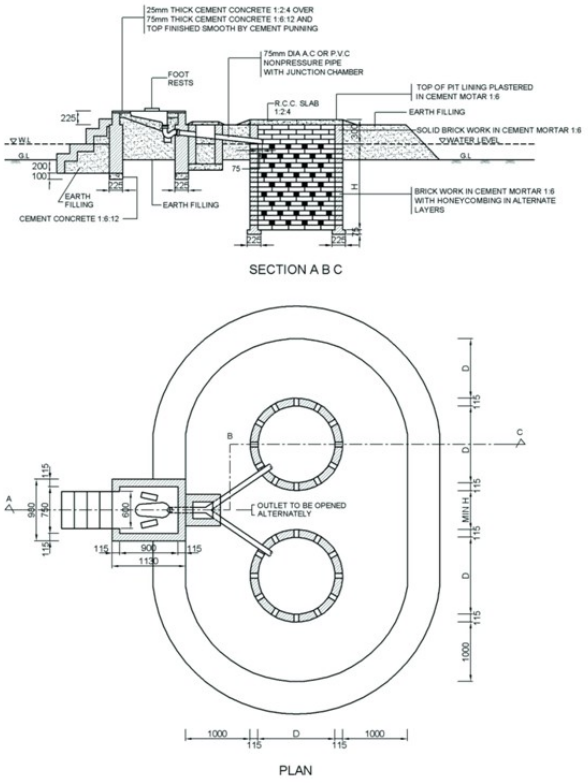
1. The pit must be a maximum of 6 feet in depth
2. The pit must be emptied once every 2 years
3. The groundwater table must be at least 2m below the pit
4. The pit must be at least 18 m away from any source of water (National Building Code, 2005).

Twin pit-latrine:

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.

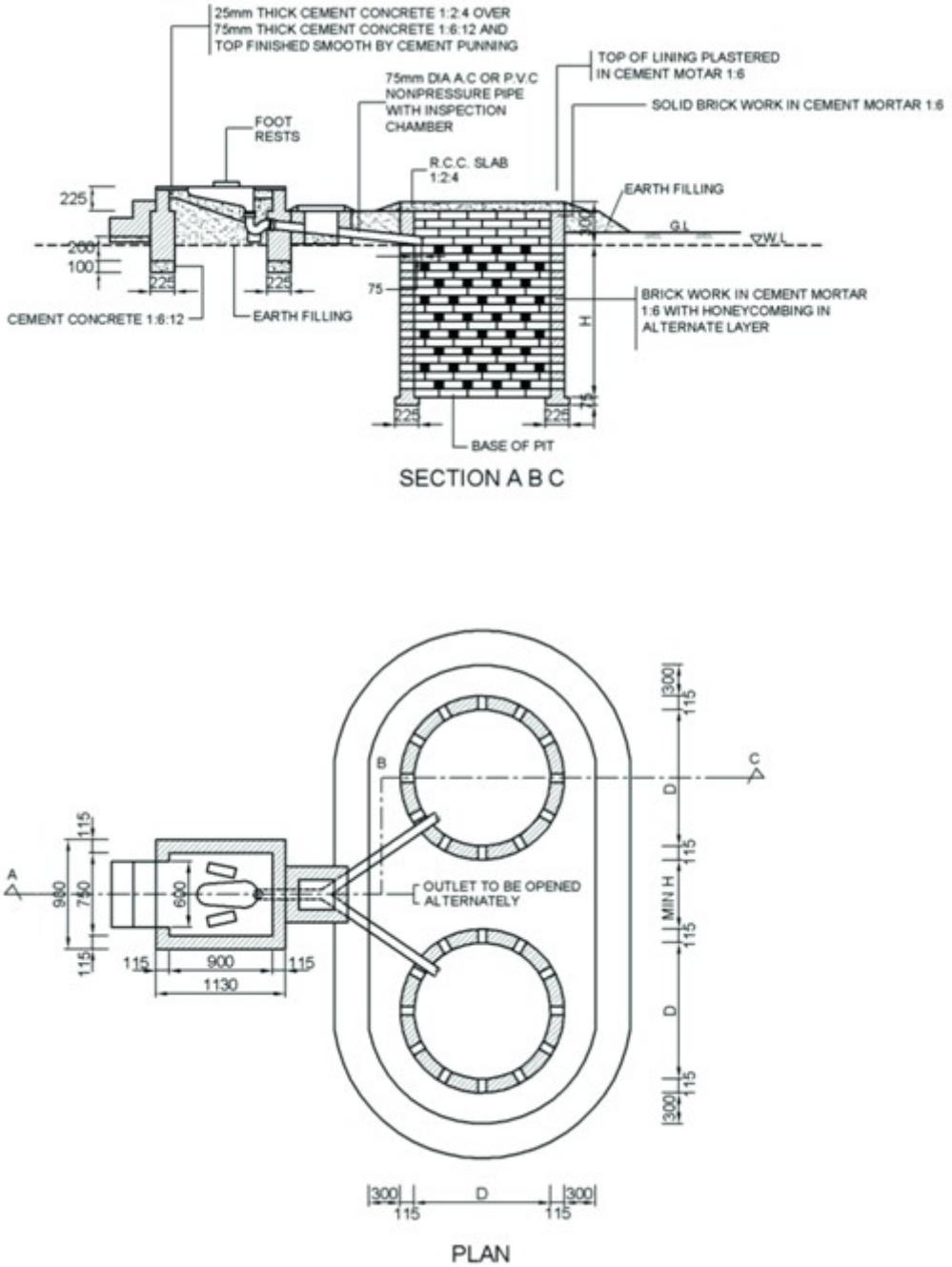


A typical pour-flush latrine with circular pits (Source: CPHEEO, 2013).



A typical pour-flush latrine in water logged areas (Source: CPHEEO, 2013).

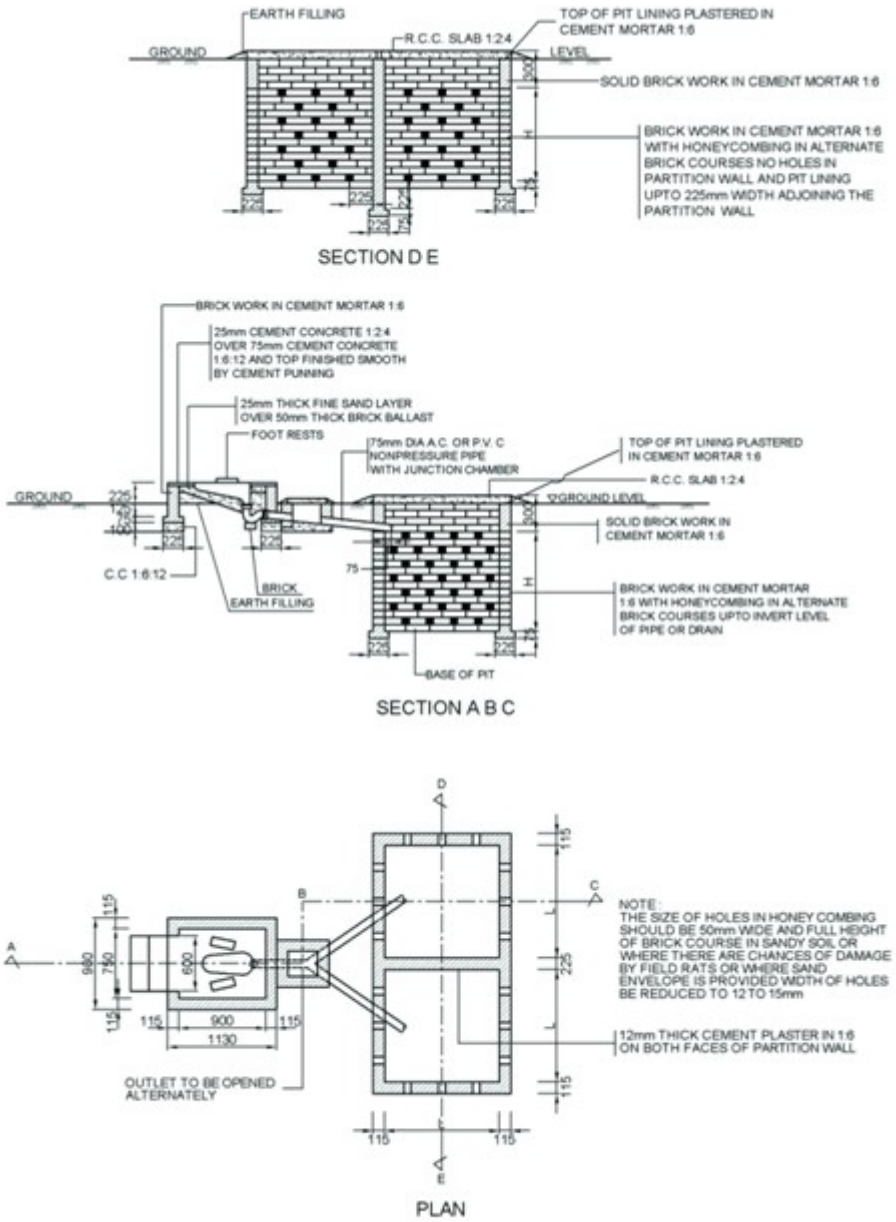
In high subsoil water level: Where the subsoil water level rises to less than 300 mm below ground level, the top of the pits should be raised by 300 mm above the likely subsoil water level and earth should be filled all-round the pits and latrine floor raised as stated above.



A typical pour flush latrine with leach pits in high subsoil water level (Source: CPHEEO, 2013).

In black cotton soil: Pits in black cotton soil should be designed taking infiltrative rate of 10 l/m/d. However a vertical fill (envelope) 300 mm in width with sand, gravel or ballast of small sizes shouldbe 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 (Source: CPHEEO, 2013).

Annexure 2: List of Solid Waste Treatment

Sl.No	District Name	ULB Name	MSW Available
1	Bagalkote	Terdal TMC	Yes
2	Bagalkote	Guledgudda - TMC	Yes
3	Bagalkote	Mudhol -TMC	Yes
4	Bagalkote	Mahalingapura TMC	Yes
5	Bagalkote	Badami TMC	No
6	Bangalore Rural	Vijayapura, TMC	Yes
7	Bangalore Rural	Devanahalli, TMC	Yes
8	Bangalore Rural	Hosakote, TMC	Yes
9	Bangalore Rural	Nelamangala, TMC	Yes
10	Bangalore Urban	Anekal, TMC	Yes
11	Belagum	Chikkodi TMC	Yes
12	Belagum	Saundatti TMC	Yes
13	Belagum	Mudalagi TMC	Yes
14	Belagum	Sankeshwar-TMC	Yes
15	Belagum	Bailhongal TMC	Yes
16	Belagum	Athani-TMC	Yes
17	Belagum	Ramdurg,TMC	Yes
18	Bellary	Siruguppa,TMC	Yes
19	Bellary	Sandur,TMC	Yes
20	Bellary	Hoovina Hadagali,TMC	Yes
21	Bellary	Kampli TMC	Yes
22	Bidar	Chittaguppa TMC	Yes
23	Bidar	Bhalki TMC	Yes
24	Bidar	Humnabad,TMC	Yes
25	Bijapur	Sindagi TMC	Yes
26	Bijapur	Talikote TMC	Yes
27	Bijapur	INDI TMC	Yes
28	Bijapur	Muddebihal	Yes
29	Bijapur	Basavana BagewadiTMC	Yes
30	Chamarajanagar	Gundlupete TMC	Yes
31	Chickballapur	Bagepalli -TMC	Yes
32	Chickballapur	Gowribidanur TMC	Yes

Sl.No	District Name	ULB Name	MSW Available
33	Chickmagalur	Birur - TMC	Yes
34	Chickmagalur	Kadur - TMC	Yes
35	Chickmagalur	Tarikere- TMC	Yes
36	Chitradurga	Hiriyur - TMC	Yes
37	Chitradurga	Challakere-TMC	Yes
38	Chitradurga	Hosadurga-TMC	Yes
39	Dakshina kannada	Moodbidri, TMC	Yes
40	Dakshina Kannada	Puttur TMC	Yes
41	Dakshina Kannada	Ullal TMC	Yes
42	Dakshina Kannada	Bantwal-TMC	Yes
43	Davanagere	Harapanahalli TMC	Yes
44	Dharwad	Navalgund TMC	Yes
45	Dharwad	Annigeri - TMC	Yes
46	Gadag	Naragund - TMC	Yes
47	Gadag	Gajendragad - TMC	Yes
48	Gadag	Ron TMC	Yes
49	Gadag	MUNDARGI TMC	Yes
50	Gadag	Laxmeshwar TMC	Yes
51	Gulbarga	Wadi TMC	No
52	Gulbarga	Chittapur TMC	Yes
53	Gulbarga	Aland-TMC	Yes
54	Gulbarga	Shahabad - CMC	Yes
55	Gulbarga	Sedam TMC	Yes
56	Hassan	Holenarasipura TMC	Yes
57	Hassan	Belur TMC	Yes
58	Hassan	Channarayapatna- TMC	Yes
59	Hassan	Sakleshpura - TMC	Yes
60	Hassan	Arasikere TMC	Yes
61	Haveri	Byadgi-TMC	Yes
62	Haveri	Hanagal TMC	Yes
63	Haveri	Savanur TMC	Yes
64	Haveri	Shiggaon TMC	Yes

Sl.No	District Name	ULB Name	MSW Available
65	Haveri	Bankapur TMC	Yes
66	Kolar	Bangarpet TMC	Yes
67	Kolar	Malur, TMC	Yes
68	Kolar	Srinivasapura TMC	Yes
69	Kolar	Mulbagal-TMC	Yes
70	Koppal	Kushtagi TMC	Yes
71	Mandya	K.R.Pet - TMC	Yes
72	Mandya	Srirangapatna TMC	Yes
73	Mandya	Maddur-TMC	Yes
74	Mandya	Malavalli TMC	Yes
75	Mysore	Hunsur TMC	Yes
76	Mysore	BANNUR TMC	Yes
77	Mysore	Nanjangud TMC	Yes
78	Mysore	K.R.Nagar T.M.C.	Yes
79	Raichur	Lingasugur-TMC	Yes
80	Raichur	Devadurga TMC	No
81	Raichur	Manvi TMC	Yes
82	Ramanagara	MAGADI,TMC	Yes
83	Ramanagara	Kanakapura TMC	Yes
84	Shimoga	Shikaripura-TMC	No
85	Tumkur	Chikkanayakanahalli,TMC	Yes
86	Tumkur	Kunigal TMC	Yes
87	Tumkur	PAVAGADA TMC	Yes
88	Tumkur	Madhugiri TMC	Yes
89	Udupi	Karkala TMC	Yes
90	Udupi	Kundapur- TMC	Yes
91	Uttara Kannada	Bhatkal-TMC	Yes
92	Uttara Kannada	Kumta,TMC	Yes
93	Yadgiri	Shorpur TMC	Yes
94	Yadgiri	Shahapur TMC	Yes

Annexure 3: List of solid waste treatment methods which can be used to treat septage/faecal sludge

The Indian Bangalore Method

The 'Indian Bangalore Method' is an on-farm composting method developed by Dr. L.N. Acharya at the Indian Institute of Science. It is recommended where night soil and refuse is being used for preparing compost. This method relies on the passive composting approach. It involves the stacking of the material in piles or pits to decompose over a long period of time with little agitation or management. This method is based on anaerobic decomposition for a large part of the operations and takes six to eight months for the completion of the process.

This method is mostly used to treat urban wastes. This method has many advantages over other indigenously developed composting methods like the Indore composting method as it accounts for problems like the heap protection from adverse weather, nutrient losses from high winds and strong sun, frequent turning requirements and fly nuisance.

Pit Preparation

Trenches or pits about 1m deep are dug; the breadth and length of the trenches can vary according to the availability of land and the type of material to be composted. The trenches should have sloping walls and a floor with a 90 cm slope to prevent waterlogging.

Filling the Pit

Organic residues and night soils are put in alternate layers. After filling the pit is covered with a layer of refuse of 15-20 cm. The materials are allowed to remain in the pit without turning and watering for three months. During this period the material settles owing to a reduction in biomass volume. Additionally refuse and night soil are placed on top in alternate layers and plastered or covered with mud or earth to prevent loss of moisture and breeding of flies. After the initial aerobic composting (about eight to ten days), the material undergoes anaerobic decomposition at a very slow rate. It takes about six to eight months to obtain the finished product (FAO Report on On-Farm Composting Methods, 1980).

Co-composting of Septage/faecal sludge.

The co-composting of septage/faecal sludge entails the biological degradation of the organic material into a stable end product. As the organic material in the septage/faecal sludge decomposes, the compost heats to temperatures in the range of 50 to 70 degrees centigrade and the harmful pathogens are destroyed. The resulting humus-like material is suitable for use as a soil conditioner. The basic procedure for co-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 650 C); pH (6 to 9); and carbon-to-nitrogen ratio (30:1) (Standard Operating Procedure for Septage Management in UMCs of Gujarat, 2013).

Lime Treatment Method

Lime stabilization is used to stabilize the organic mixture, control odour, vector and pathogen destruction. Lime stabilization involves adding and thoroughly mixing lime (lime powder slaked with water in 1:3 proportion, 15 liters of slaked lime for 4000 liters of septage/faecal sludge) with each load of septage/faecal sludge to ensure that the pH is raised to at least 12. Lime addition could be done at any of these three points:

a) In the septage/faecal sludge emptier

b) In a septage/faecal sludge receiving tank.

c) In a pit where septage/faecal sludge is dumped. Lime must be added after every dumping (Standard Operating Procedure for Septage Management in UMCs of Gujarat, 2013).

Decentralised Wastewater Treatment Systems (DEWATS™) for Septage/Faecal Sludge Treatment

The DEWATS™ technology allows for treatment of both the solid and liquid component of the septage/faecal sludge and the reuse of treated septage/faecal sludge and water for gardening or irrigation. The DEWATS is a decentralized wastewater treatment system with a simple design. It is not dependent on external sources of energy and is long-lasting. It is tolerant of inflow fluctuations and incurs low input costs.

The system is based on different natural water treatment techniques which are combined according to determining factors such as characteristics of the inflow, desired effluent quality and other technical specifications.

Treatment Concept:

Based on the characteristicsof septage/faecal sludge with high organics and solids content, its treatment is highly feasible through biological processes especially in anaerobic conditions i.e. biogas digester. The treatment modules implemented are Biogas digester, Anaerobic Baffle Reactor, Planted Gravel Filter and collection tank.

These modules are selected to achieve the maximum treatment efficiency so that treatment byproducts like treated water, biogas and sludge can reused safely. Septage/faecal sludge at the treatment plant is received through cesspool vehicles/vacuum trucks (honeysuckers).

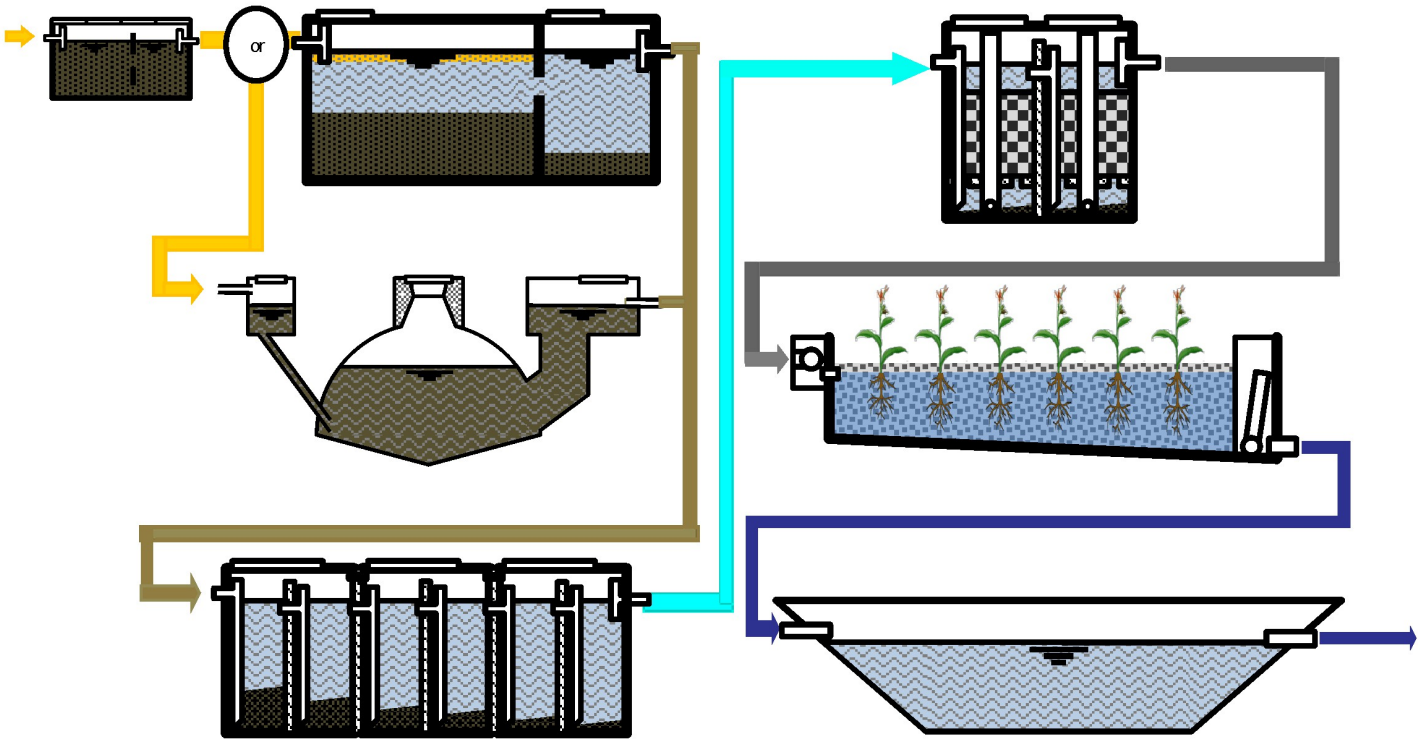
Description of Modules:

Initially a Feeding Tank (FT) is provided to separate the solids and liquid of septage/faecal sludge. With septage/faecal sludge different types of solid materials also enter the treatment system. These solid materials are screened at the inlet pipe in the feeding tank using screen chamber of pore size 15mm. This is to avoid solid waste from septage/faecal sludge entering into treatment system. When the septage/faecal sludge is received, it is allowed for settling at the feeding tank for separation of liquids and solids.

The separated liquid from septage/faecal sludge is connected to an integrated Settler (ST) with Anaerobic Baffle Reactor (ABR) whereas the solids are fed into Biogas Settler (BGS) for anaerobic digestion.

The overflow of water from digested sludge from BGS is also connected to ABR for further treatment. The treated water from ABR is connected to Planted Gravel Filter (PGF) for aerobic and tertiary treatment for removal of excess nutrients, odour, and colour.

The treated wastewater is collected in a collection tank and reused for irrigation. The sludge from BGS is transferred into Sludge Drying Beds (SDB) and the dried sludge from the SDB may be used as a soil conditioner.



Modules of DEWATS™ (Source: CDD Society)

Sludge drying beds

Drying of faecal sludge/septage in drying beds is considered as one of the methods for treating the partially treated sludge/septage received from septic tanks. The following table presents the area requirement for sludge-drying beds if the quantum of sludge generated is 100 cum/day.

Sludge drying Beds	
Quantum of sludge to be treated (cum/day) - HHs level	100
Single Drying Bed area (12m * 12m)	144
Max. Sludge depth (m)	0.3
Capacity per bed (cum)	43
Sludge drying cycle (days)	10
Sludge drying cycle (days)	30
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

Annexure 4: Sample Service Providers' Manifest (to be modified by ULBs as per requirement)

Sample Form to be filled by Operator / Transporter of Septage

Date Time

Name of the City

Basic information to be filled by septage emptier (person)

I Identification of Waste

Volume (in litres)

Type Septic Tank Single Pit Twin Pit

Source Residential Commercial Restaurant Portable Toilet Others

II Details of Waste Generator

Name
Phone Number
Address
Pin

The undersigned being duly authorized does hereby certify to the accuracy of the source and type of wastewater collected and transported.

Date _____ Signature _____

II Details of Transporter / Operator

Company Name
Permit
Vehicle License
Pump out date

The above described wastewater was picked up and hauled by me to the disposal facility name below and was discharged. I certify that the foregoing is true and correct:

Signature of authorized agent _____

IV Acceptance by _____ Municipality's authorized

The above transporter delivered the described wastewater to this disposal facility and it was accepted.

Disposal date _____ Amount Collected from _____

Signature of authorized agent and title _____

Annexure 5: Sample Septage/Faecal Sludge Transporter Permit

In accordance with all the terms and conditions of the current .....Municipality's Rates, Rules and Regulations, the special permit conditions accompanying this permit, and all applicable rules, laws or regulations of Government of Karnataka, permission is hereby granted to:

Name of Permittee _____

Address _____

For the disposal of septage/faecal sludge from domestic septic tank or commercial holding tank at the..... STP/SWM site or agricultural field.

This Permit is based on information provided in the Septage/Faecal sludge Transporter Permit application which constitute the Septage/Faecal sludge Management Hauled Transporter Permit.

This Permit is effective for the period set forth below, may be suspended or revoked for Permit Condition Non-Compliance and is not transferable. The original permit shall be kept on file in the Permittee's office.

A copy of this Permit shall be carried in every registered vehicle used by the permittee.

Effective Date:

Expiration Date:

.....Check if Renewed Permit

Permit is liable to be cancelled in case of violations of any Acts, Rules and Regulations relating to the operation of Septage/Faecal sludge System or in cases of safety protocols not being adhered to or in case of non-permitted disposals.

Annexure 6: Sample Household/Community toilet/Public toilet Survey for Identifying Septic tanks/Pit Latrines, etc.

This is a sample form for a household survey that can be conducted for Septic Tanks/Pit latrines. This form may be considered by ULBs and may be expanded to add new fields.

Property Details [These details can be readily obtained from the Property Tax Register of the ULB]	
Does the Household have a toilet: Yes/No.	
No. of Toilets in the Household:	
Type of toilet	
Receptacle of the toilet: Single-pit/Twin-pit/Septic tank/drain.	
Physical condition of the toilet and receptacle:	
Cleaning Frequency: Every 6 months / Every Year / Every 2 Years / Never	
Who is contacted to Provide Septic Tank Cleaning Services:(Name of Agent / Tank	
Actual Number of People Living in the Household:	
Does the Household have a Water Connection:	
Septic Tank/pit latrine Details	
Capacity as Per Plan: [Can be gained from the ULB records]	
Actual Capacity	
Location of Septic Tank: Front of House Entrance / Back of House	
Can a Septic Tank Cleaning Truck easily reach the tank outlet	
Pit Latrine Details	
Location of the Pit Latrine: Front of House Entrance/Back of House	
Can a Cleaning Truck easily reach the pit outlet:	
Is grey water let out in the open? (Yes / No)	

Policy Document

Context

The Census of India 2011 has revealed that in Karnataka, there are 906,083 households in urban areas which have septic tanks and 636,644 households in urban areas which have pit latrines. These septic tanks and pit latrines form a part of the on-site sanitation systems which have been put in place on a private basis to address the sanitation needs of those households which are currently not a part of a centralized, piped sewer network. According to the Constitution of India, water supply and sanitation is a subject which falls under the State List and the states have been bestowed with the responsibility for the effective planning and implementation of sanitation systems.

Despite the constitutional mandate the state assistance to regulate the construction and facilitate the maintenance of these on-site sanitation systems has not kept up with their burgeoning numbers. While there are construction manuals for on-site sanitation systems in the form of the CPHEEO Manuals of 2013, the National Building Code, 2005 and the Bureau of Indian Standards, 2011 they have had little impact on the ground. This is firstly, because these on-site sanitation systems are constructed on a private basis by individual house owners who are largely unaware of the presence of such manuals and secondly because these manuals are only recommendatory in nature.

The faulty design and construction of on-site sanitation systems make them vulnerable to leakage, overflows and seepage as well as making the emptying of these systems very difficult. As far as the emptying and transportation services for such on-site systems is concerned, the Directorate of Municipal Administration has attempted to augment the existing capacities provided by privately-owned vacuum trucks by providing vacuum-trucks of its own for each of the 213 Urban Local Bodies in the state.

The use of such vacuum trucks is an encouraging step towards achieving the complete abolition of manual scavenging. However there is a need for the state to address every aspect of the sanitation value chain. Especially, regulating the disposal points for septage/faecal sludge since the indiscriminate dumping of septage/faecal sludge poses a grave threat to public health and the environment. Such illegal dumping also takes place on account of the state imposing fees for private service providers to dump septage/faecal sludge at state-run treatment facilities.

The state also does not adequately recognize and the positive contributions of such private service providers in terms of improving operations and maintenance capacities for on-site sanitation systems and engaging in positive dumping practices like dumping septage/faecal sludge on the agricultural fields of consenting farmers who make use of such septage/sludge as a soil conditioner. There is also scope for a lot more to be done to ensure that the reuse potential of septage/faecal sludge is fully exploited in a sustainable manner under the mandate of the state.

Any policy directions in this regard must be operationalized under the aegis of the Urban Local Bodies (ULBs). The ULBs have been identified as the appropriate authority to address sanitation-relate matters in urban areas by the National Urban Sanitation Policy, 2008. Also it is in keeping with the decentralization approach taken by the Jawaharlal Nehru National Urban Renewal Mission (JNNURM), which is based on The Constitution (74th Amendment) Act, 1992.

The initiatives recommended as a part of this policy fit within the mandate of the 'Model Municipal Law' as drafted by the Ministry of Urban Development to facilitate the implementation of the 74th Constitution Amendment provisions, under the head of 'Urban Environmental Infrastructure and Services'.

As mentioned under this head, the ULBs must make provisions to ensure compliance with the Municipal Solid Wastes (Management & Handling) Rules, 2000. Accordingly, the Karnataka State Policy on Integrated Solid Waste Management has been brought out by the state government, underlining the functions to be carried out by ULBs in this process. The present policy is proposed to be added as an appendix to the Karnataka State Policy on

Scope

The Policy seeks to be the touchstone of a new approach by all stakeholders in the area of septage/faecal sludge management in the state of Karnataka.

This approach relies on addressing each aspect of the sanitation value chain in order to make sanitation a well-functioning, environmentally sustainable and financially sustainable process. The focus of this policy lies in giving formal recognition to the existing service providers and their positive business practices and creating a more efficient regulatory framework. The National Urban Sanitation Policy has identified the city-level approach as the appropriate level for sanitation planning and implementation.

This policy seeks to reconcile this responsibility of the government towards decentralized sewerage systems with the city-level approach by providing directions for appropriate regulatory interventions by the urban local bodies in the septage/faecal sludge management sector. The idea is to encourage better regulation as opposed to increased regulation in the faecal sludge/septage management process.

The directions given in this policy seek to achieve the following objectives:

(a)	Introduce a robust FSM/Septage Management system in urban areas where no septage/faecal sludge treatment facilities exist.
(b)	Affect amendments to laws, as required for the formal recognition of on-site sanitation systems in the construction of buildings.
(c)	Improve the regulatory framework in order to address the concerns of all stakeholders on the health, environment and business aspects of septage/faecal sludge management.
(d)	Propose mechanisms for putting an end to manual scavenging.
(e)	Improve treatment capacities of septage/faecal sludge in terms of 'access' and 'quality of treatment'.
(f)	Produce soil conditioner as a result of treatment of septage/faecal sludge.

Principles

1. Sustainability & Resource Efficiency:

The policy must seek to create a framework within which environmentally and economically sustainable systems of faecal sludge/septage management can be put in place on a city-level. The sustainability of the system depends on the efficiency of the system in carrying out resource recovery of both, financial as well as biological.

2. Affordability & Universality:

The policy directions must be based on the principle that sanitation is a basic human right that must be accessible for every individual. Any attempts at implementing improved sanitation services must ensure the affordability of such services.

3. City-level approach:

The policy directions must create a decentralized sanitation system complementing the existing centralized system.

4. Private Sector Participation:

Involving the private sector in a productive manner is important for any faecal sludge/septage management system in the long run. While seeking to adequately incentivize private sector participation the policy must seek to nullify its negative impacts.

5. Awareness Generation:

The policy must seek to increase public awareness on the importance of community participation in operating and maintaining an integrated faecal sludge/septage management policy.

Definitions

The partially treated sewage that is stored in a septic tank is commonly called as septage. It includes the liquids, solids (sludge), as well as the fats, oils and grease (scum) that accumulate in septic tanks over time.
Faecal Sludge comes from on-site sanitation technologies like pit latrines and dry toilets. It is raw or partially digested, a semisolid and results from the collection, storage or treatment of combinations of excreta and
Decentralised sanitation solutions includes managed individual on-site septic systems and pit latrine systems which are used to collect and partially treat septage/faecal sludge from individual dwellings, businesses or small communities.
Septage/Faecal Sludge Management includes the entire process of design, collection, safe treatment and re-use/disposal of septage/faecal sludge
Urban Areas include all cities and towns falling under the purview of the Urban Development Department, Government of Karnataka.

Scope

Key institutional stakeholders and their roles:

1 The **Urban Development Department** is the authority responsible for the development of the policy and legislative framework for faecal sludge/septage management.

2 Functioning under the guidance of the UDD, the **Directorate of Municipal Administration** is responsible for supervising and facilitating the activities undertaken by ULBs in furtherance of this policy.

3 The policy envisages the Urban Local Bodies, which includes the **City Municipal corporations**, **Town Municipal councils** being responsible for practical implementation of the policy directions on the ground as part of the City-level approach.

4 **The Directorate of Town and Country Planning** is responsible for earmarking land in the Master Plan for faecal sludge/septage management. It is also responsible for proposing any amendment to the Karnataka Town and Country Planning Act, 1961 to facilitate on-site sanitation systems under the Building bye-laws.

5 **The Karnataka Urban Infrastructure Development Finance Corporation** is responsible for providing the technical and financial assistance to ULBs for implementing the policy initiatives.

6 **The Karnataka Urban Water Supply and Drainage Board** are required to provide access to Sewage Treatment Plants (STPs) for faecal sludge/septage treatment where necessary. The Board is the appropriate training and capacity-building authority in furtherance of all initiatives to increase awareness on faecal sludge/septage among all stakeholders.

7 **Service providers** offering sanitation-related services at every stage of the sanitation value chain. (Such as honeysuckers, infrastructure providers, O&M service providers, knowledge partners, NGO's and farmers).

Policy Directions

1. Ensure construction of septic tanks and pit latrines as per CPHEEO Manuals.

The policy recognizes the need for septic tanks and pit latrines to be constructed as per the standards mentioned in the CPHEEO Manuals. This is essential to avoid seepage, leakage and overflow of septage/faecal sludge from such on-site installations. The proper construction of such facilities is also important to facilitate their emptying. The lack of proper design can make desludging of such installations very difficult. In order to achieve complete adherence to the standards prescribed in the CPHEEO Manuals the policy recommends that the Urban Local Bodies carry out routine checks and issue notices to owners of on-site sanitation systems which are the cause of public nuisance owing to the seepage, leakage or overflow of septage/faecal sludge.

2. Management and Regulatory framework for handling and transportation of faecal sludge/septage.

Currently there is an absence of a formal framework within which the government and private service providers can be efficiently regulated. The policy recommends the creation of such a framework which will take into account the concerns of the private service providers as well. Especially concerns regarding the procurement of adequate credit facilities which are currently difficult to acquire due to the high collateral requirements such service providers are forced to fulfil. This can be addressed by mandating the financial institutions to recognize the private service providers as legitimate businesses and requiring them to lower the collateral requirements. Such a framework may seek to take forward the suggestions given in the action plan suggested by the Operative Guidelines on Septage and Faecal Sludge Management in Urban Areas of Karnataka. The focus of such a framework must be harness the maximum out of the collective capacities of the government and private service providers.

3. Ensure proper treatment of faecal sludge/septage.

The treatment of septage/faecal sludge must be made more efficient by improving the access to treatment facilities and the quality of septage/faecal sludge treatment. To achieve this end, the policy recommends the treatment of septage/faecal sludge at solid waste treatment facilities, wherever feasible. This is because the chemical characteristics of septage/faecal sludge and that of the organic part of the municipal solid waste complement each other and are conducive to the production of soil conditioners as a reuse material. The policy recommends that the methods for treatment of septage/faecal sludge as part of the solid waste management process as given in the Operative Guidelines on Septage and Faecal Sludge Management in Urban Areas of Karnataka must be implemented as far as possible. The use of solid waste treatment facilities is also recommended because of their presence in the jurisdiction of almost every Urban Local Body in the state, except for the four Town Municipal councils of Badami, Wadi, Devadurga and Shikaripura, which makes them the most accessible treatment facility in the state. Other treatment facilities like Sewage Treatment Plants may also be used wherever they are available.

4. Develop Information, education and communication for different stakeholders.

It is widely acknowledged that the sanitation infrastructure fails to effectively curb all the unhealthy and illegal practices in this sector because of the lack of adequate knowledge with all the stakeholders. The policy recognizes the need to increase access to information and provide proper training to the general public, the sanitation service providers and the staff of the Urban Local Bodies. Such a knowledge framework must be routinely revitalized by periodic meetings and exchange of best practices in the septage/ faecal sludge management sector. The ULBs must look to build on the suggestions given in the Operative Guidelines on Septage and Faecal Sludge Management in the Urban Areas of Karnataka by inviting community initiatives to build awareness on the importance proper septage/faecal sludge management.

Policy Outcomes

The directions given in this policy seek to achieve the following objectives:

(a)	Every house with a safe sanitation system
(b)	Every urban area with a safe and productive faecal sludge/septage management system
(c)	Increase in quantity of compost and soil-conditioner for agricultural use.
(d)	Complete abolition of all instances of manual scavenging.

Measurable Indicators

No.of towns with faecal sludge/septage treatment and use	
No. of towns with adequate vacuum trucks to satisfy all demands for de-sludging within a time period of forty-eight hours	
Percentage of households, community toilets and public toilets with appropriately designed and functional on-site sanitation systems	
Percentage of faecal sludge/septage generated, which has been safely treated or composted	
Percentage of soil conditioner/compost used	

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BORDA

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