Technical Note on

SHALLOW and DEEP TRENCHES

for Faecal Sludge / Septage

by
Water, Sanitation and Hygiene Institute

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Content

Definition

Statutory Town[1]

All places with a Municipality, Corporation, Cantonment Board or notified area committee etc.

Census Town[2]

Places that satisfy the following criteria are termed as Census Town a) A minimum population of 5000, b) At least 75% male main working population engaged in non-agricultural pursuits, c) A density of population of at least 400 per sq.km.

Out Growth[3]

Out Growth should be a viable unit such as a village or part of a village contiguous to a statutory town and possess the urban features in terms of infrastructure and amenities such as pucca roads, electricity, taps, drainage system, education institutions, post offices, medical facilities, banks, etc. Examples of Out-Growth are Railway colonies, University campuses, Port areas, that may come up near a city or statutory towns outside its statutory limits but within the revenue limit of a village or villages contiguous to the town or city.

Rural Area[4]

All areas other than urban are rural. The basic unit of rural areas is the revenue village.

Faecal Sludge

"Faecal Sludge" is raw or partially digested, in a slurry or semisolid form, the collection, storage or treatment of combinations of excreta and black water, with or without grey water. It is the solid or settled contents of pit latrines and septic tanks. The physical, chemical and biological qualities of faecal sludge are influenced by the duration of storage, temperature, soil condition, and intrusion of groundwater or surface water in septic tanks or pits, performance of septic tanks, and tank emptying technology and pattern.

1, 2, 3, 4 - Census 2011

Faecal sludge is the solid or settled contents of pit latrines and septic tanks. Faecal sludge (FS) comes from onsite sanitation technologies, and has not been transported through a sewer. Examples of onsite technologies include pit latrines, non-sewered public ablution blocks, septic tanks, aqua privies, and dry toilets.

Septage

"Septage" is the liquid and solid material that is pumped from a septic tank, cesspool, or another treatment facility after it has accumulated over a period of time. Usually, septic tank retains 60% - 70% of the solids, oil, and grease that enter it. The scum accumulates on the top and the sludge settles to the bottom comprising 20% - 50% of the total septic tank volume when pumped. Offensive odour and appearance are the most prominent characteristics of Septage. It is a host of many disease-causing organisms because of the contamination of significant level of grease, grit, hair, and debris.

Septage is the combination of scum, sludge, and liquid that accumulates in septic tanks.

The effluent from the septic tank can be collected in a network of drains and/or sewers and treated in a treatment plant designed appropriately. The accumulating sludge at the bottom of the septic tank however, has to be also removed and treated once it has reached the designed depth or at the end of the designed desludging period whichever occurs earlier. Such a removal is possible only mechanically. While sucking out the sludge, the liquid in the septic tank will also be sucked out. Such a mixture is referred to as septage.

Septic tank

A Septic tank is a special form of primary sedimentation tank with a longer detention tank in which digestion of settled sludge also takes place. In other words, a septic tank is a combined sedimentation cum digestion tank.

Sewage

Sewage or wastewater is a dilute mixture of various waste from residential, commercial, industrial and other public places.

Sewerage System

The underground conduit for the collection of sewage is called Sewer. A network of sewer appurtenances intended for the collection and conveyance of sewage generated from each of the properties to a sewage pumping station for pumping to sewage treatment plant for further treatment and disposal is called sewerage system.

Sewage Treatment Plant (STP)

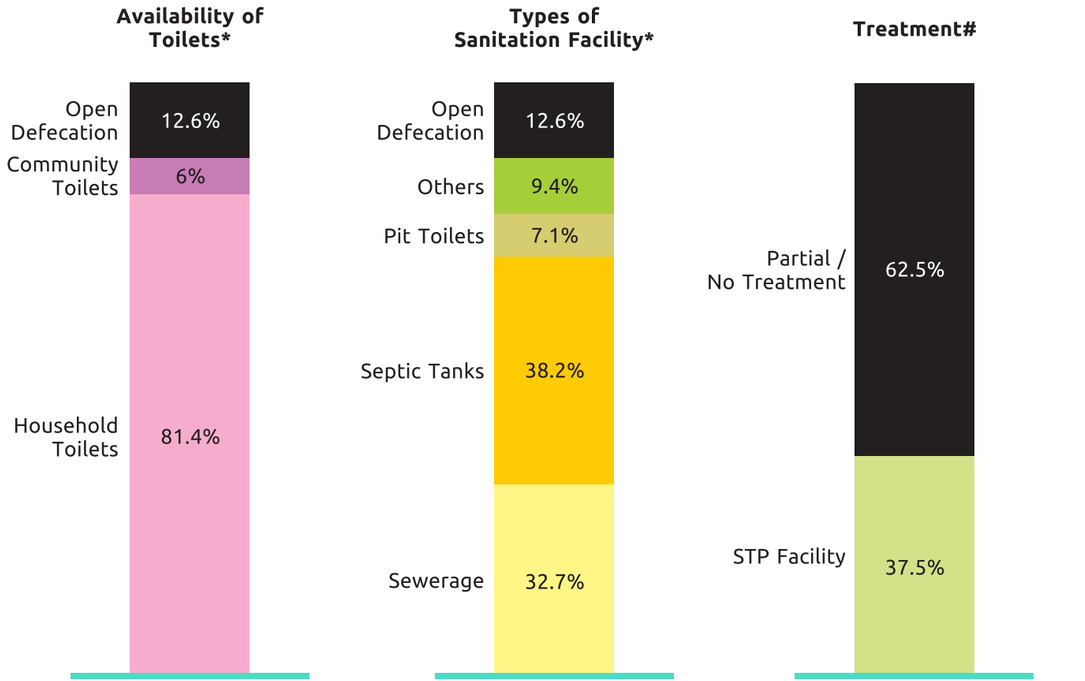
Sewage Treatment Plant is the place where contaminants from wastewater removed, primarily from household sewage. Physical, chemical and biological processes are used to remove contaminants and produce treated wastewater (or treated effluent) and Bio Solids that is safer for the environment.

Faecal Sludge and Septage Management (FSSM)

Faecal Sludge and Septage Management (FSSM) is the management of safe containment, transportation, treatment, disposal and reuse of faecal sludge and septage.

Under Ground Drainage (UGD) with Sewage Treatment Plant (STP)

Flush and forget through “Under Ground Drainage (UGD) with Sewage Treatment Plant (STP)” is a high end solution and every city / Urban Local Bodies (ULBs) are dreaming to implement this high end solution. But in reality, implementing this high end solution is not that simple and there are several limitations.



Access to toilets for HH in Urban India

Types of Sanitation Facility by HH in Urban India

Status of waste water treatment in Urban India (MLD)

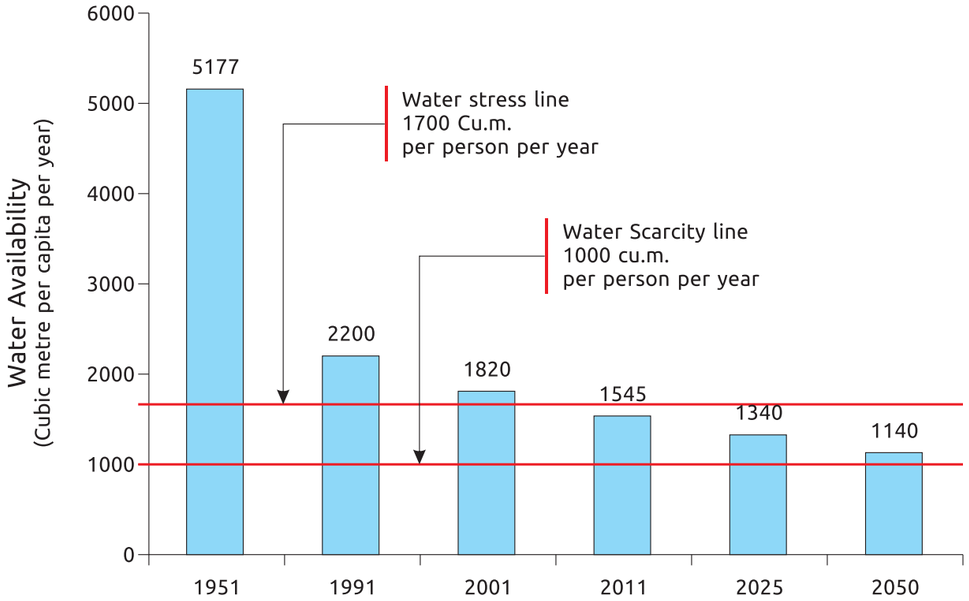
Source:
* Census of India 2011; # CPCB; Inventoriazation of STPs (2015)

Even after 70+ years of independence, the Country could achieve only 32.70% sewage coverage[5]. There are 4041 Statutory Towns and around 3000+ Census Towns in the country. Moving from 32.70% to 100% to coverage across all towns in the country by adopting this high end solution is not a simple task. The limitations of this high end solution are listed below:

- Under Ground Drainage with Sewage Treatment Plant is highly Capital intensive. Need huge investment for the infrastructural creation. The current Capital investment for the network based solution indicates that on an average per capita investment is Rs.20,000/-. (approx.)
- Even UGD with STP implemented in a town, it is always a challenge to go for 100% connection of all houses/offices/establishments in the city due to topography and various other reasons.
- Apart from huge investment, longer time of 3-5 years (depending on the city size) is required to implement the network based solution.
- Another major challenge is that operation, maintenance and management cost of the network based solution is also very high. Most of network based solutions have failed in low income countries due to high Operation & Maintenance cost.
- As the cities are expanding due to fast urbanization, the conventional network based solution are not likely keep pace with growing demand.
- Even Statutory Towns in the country have only 32.70% network based solution coverage and there are less chances for rural areas to get this high solution in near future.
- The existing centralized is a water carriage system. Sufficient quantity of water is required to be mixed with the faecal sludge so that the mixture flows down to the Treatment Unit smoothly. Since the fresh water availability in the country is drastically going down (refer to the chart on the next page[6]), using water to carry sludge to the treatment unit through sewer line is not going to be a viable and sustainable solution in long run.

5 - Census 2011
6 - Central Water Commission Presentation on 22nd Jan, 2014

Per Capita Water Availability
(National Average)

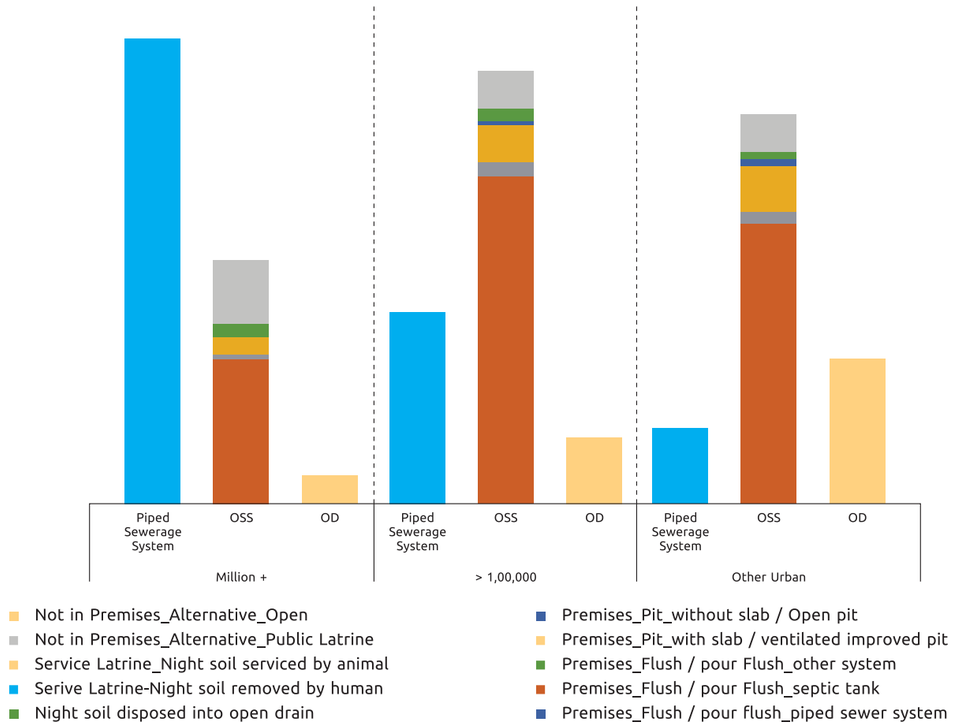


Faecal Sludge Treatment Plant (FSTP)

Over 60% households in India is connected to On-Site Sanitation (OSS) system. Globally, around 2.7 billion people are served by OSS technologies and it is expected that the number is going to be doubled by 2030.

Piped Sewerage Systems vs. OSS

(All-India, Statutory Towns)



Source: Census 2011

From the graph, it is clear that when the population size of the cities goes down, increased usage of OSS.

Decentralized option such as FSTP along with proper emptying, safe transportation and reuse of treated waste is an easy as well as practical and reliable solution to address the faecal sludge and septage waste management. When compared with STPs, FSTP is simpler option and cost effective. Approximately, the FSTP based solution costs 1/4th of the network based solution(approx.). There is no doubt that in future, safe disposal of faecal sludge is going to be purely depended on the Faecal Sludge and Septage Management (FSSM) i.e safe containment, safe emptying, safe transportation, safe treatment and disposal or reuse of treated wastewater and sludge.

Though, as of now, FSTPs are the best solution, there are still certain limitations that needs to be addressed to scale up this option. The current limitations are:

- Very fewer number of FSTPs across the country, which limit the city officials / Engineers gaining experience / exposure to these robust technologies.
- NIMBY Syndrome: Though the FSTPs are user friendly and they release no or less foul smell, people acceptance level is still low due to lack of awareness to establish FSTPs within the community setting. Need more promotional campaigns to create awareness among the people.
- Scheduled desludging is not in practice. As a result, emptying of septic tank/OSS is based on will and wish of the respective household than the environmental pollution consideration. Economical value in operating the FSTPs depend on the amount of sludge coming to the plant. Hence regular/scheduled desludging to be promoted.
- Majority of the cases, the cesspool / septic tank emptying services are handled by the private players. When there is no regulatory framework on these private players, they often dump the faecal waste indiscriminately. Ensuring every player in the FSSM value chain adopts right steps is critical for the success and sustainable functions of FSTPs.
- Small scale FSTPs could be a better option for rural areas, especially bigger Panchayats. FSTPs service viability as well as cost effective technological options have to be explored.

Census Town and Rural Area

In India, even majority of statuary towns lack network-based solution, hence there is no way the census towns are going to get this high-end solution in the distant future.

OSS is prevalent in all the census towns, especially Septic Tanks. There are no treatment facilities in any of these census towns and hence the Faecal Sludge is disposed of indiscriminately.

As of now, the Faecal Sludge Management in rural setting is largely non-existent and unknown. Though, popular belief is that rural sanitation is largely dominated with twin pit toilets, which require no Faecal Sludge and Septage Management, however, recent study on Rural Sanitation Technology indicates that in the rural setting around 21% of households are connected with Septic Tank and 22% households connected with single pit[7]. Therefore, the households connected with Septic Tanks and Single Pit need proper FSSM services.

7 - Quality and Sustainability of Toilets Study By WaterAid India, October 2017

Intermediate Solutions

Decentralized FSSM may be a better option for Statutory towns, Census Towns, Rural Areas and water logging related problematic zones. By looking at the aspects such as capital investment, land acquisition and mobilizing other resources/permission needed to establish FSTPs, a step by step or intermediate approach might be a better solution to arrest the indiscriminate disposal of faecal sludge in the environment by adopting safe and low cost solutions and move forward to FSTPs.

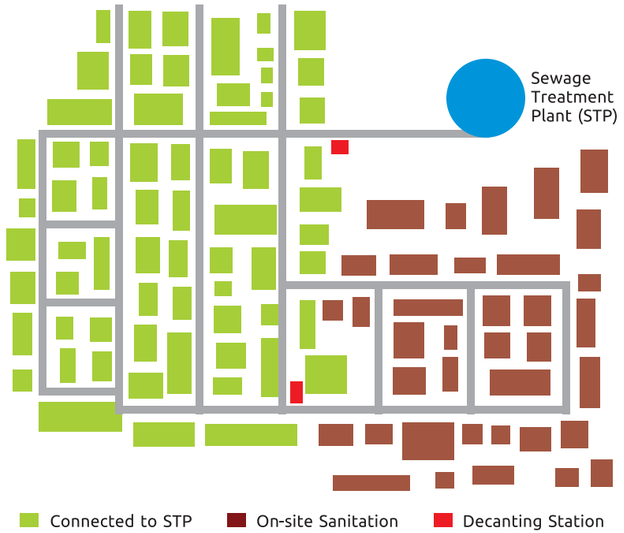
The following low hanging better options can be considered as immediate and intermediate solutions to tackle Faecal Sludge and Septage issues in the urban and rural areas:

- Co-treatment to cater the needs of unserved section of the communities in towns where STP exist already
- Co-treatment to bring Urban and Rural connect
- Decentralized low cost FSSM services in Census town by including neighboring Gram Panchayats as service area
- Shallow and Deep trenching method
- All new upcoming STPs should have option for co-treatment

The above-mentioned options are elaborated in the following pages.

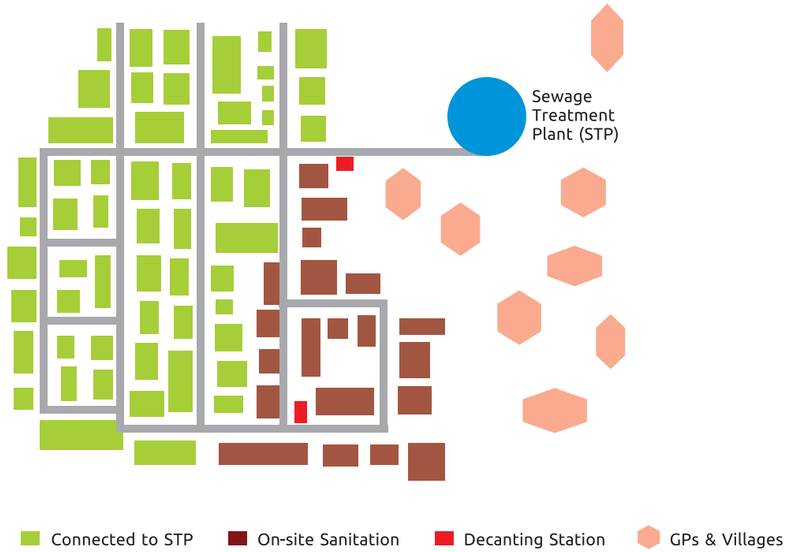
Co-treatment to cater the needs of unserved section of the communities in towns where STP exist

The available data on existing STPs across the country indicates that over 50% of them are underutilized due to various reasons such as longer design period, not all the household connected to the STP etc., These underutilized STPs can be effectively used by allowing the cesspool operators to decant the septage waste collected from the Septic Tanks located at unserved pockets of the city. This can be an immediate step and it would prevent the cesspool operators from dumping the faecal waste indiscriminately. This would help to utilize the existing STP optimally.



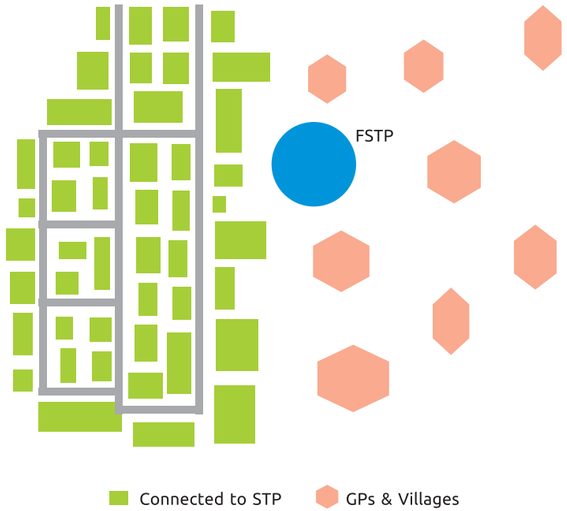
However, co-treatment must carefully consider the relative loads of Sewage / Faecal Sludge(FS) and the capacities of the STP. Unless the FS volumes are very low (less than 1% of STP capacity) there should be screening, grit/ grease removal and solid liquid separation of the FS before the liquid part is co treated with the sewage. Other issues which could upset the STP operation must be considered. These include strength of FS, possibility of contamination with industrial / toxic waste etc. Where decanting stations are used (for co-treatment) at least screening and grit removal and if possible solid/liquid separation should be performed before mixing with the sewage. Otherwise serious operational issues like solids deposition, equipment wear and tear, sewer and equipment clogging can occur. Long term damage to the sewerage system may also result.

Co-treatment: Urban and Rural connect



In most cases, the STPs in the Statutory Towns are located away from the city and mostly in the rural areas. In case, such STPs located in the rural area are bring underutilized currently, the Faecal sludge and Septage from the Gram Panchayats, out growth area of Statutory Towns and rural villages can be permitted to decant. The cesspool operators can be encouraged to expand their service area to incorporate these rural pockets. This would bring a good Septage management connectivity between urban and rural area and also better utilization of available STPs.

Decentralized low cost FSSM services in Census town



Decentralized low cost FSTPs can be promoted in the census towns. However, it is important to note that adequate faecal sludge loading is important for sustainable operations of the FSTP and making the system economically viable. This will also ensure FSSM Private player's survival who depend on quantum of sludge coming to FSTPs and also numbers of Septic Tank get emptied every day. Apart from sludge coming from census town to gain maximum load for the FSTPs, the neighbouring Gram Panchayats/villages can also be connected as service areas of the FSTPs, which would widen the service area and also it would make cost benefit ratio more viable to establish FSSM services in the Census Towns.

Trenching

"Shallow Row Entrenchment (SRE)" and "Deep Row Entrenchment1 (DRE)" are simple technologies used to dispose the waste removed from On-Site Sanitation Systems (OSS) in the absence of, or while awaiting more appropriate treatment facilities. DRE/SRE enables disposal of such waste in a controlled manner, while mitigating and minimizing odours, nuisances and risk of exposure to pathogens. It is a preferred method when offered as an alternative to disposing wastes in open environment or water bodies.

In general, disposal of untreated faecal sludge in trenches is not desirable as a long term strategy, because it may pollute the ground and surface water sources due to its leaching effects. Generally, the key/potential parameters to be monitored in the on-site sanitation waste disposal options are:

BOD_5	The Biochemical Oxygen Demand (BOD) is a measure of the dissolved oxygen required to stabilize the organic matter in five days.
TSS	Total Suspended Solids (TSS) are the organic and inorganic solids that are not dissolved and may be removed by coagulation or filtration.
N	Nitrogen is a valuable nutrient used for crop growth. It is present in several forms – Organic Nitrogen, ammonia, nitrite and nitrate. Though nitrogen is valuable for crop growth, in surface water, it can accelerate the growth of aquatic plants. In ground water, nitrate pose a health threat if it enters in drinking water supplies.
P	Phosphorous exists in both the organic and inorganic form. Phosphorus can cause eutrophication in surface water – a nutrient enrichment causing microbial and algae growth. It leads to water body unsuitable for aquatic life and also as a source of drinking water.
Bacteria	The concentration of bacteria is usually regulated through limits of E-coli, faecal coliform and total coliform Bactria. Presence of these bacteria indicates the potential presence of pathogenic organism.

The waste from the on-site sanitation system has to be tested for the above parameters. And potentially hazardous. ways of disposal including shallow or deep trench system might cause contamination in the surface and ground water, if care or proper disposal methods are not followed while disposing the waste. The potential risks may be from :

Bacteria: The majority of bacteria and viruses are small enough to pass through soil pores and if they are not destroyed, they may leach down to the water table, especially when the water table is high.

Nitrate: Nitrate is a highly soluble compound and readily transported to ground water. Excessive amount of nitrate in drinking water leads to blue baby syndrome (methemoglobinemia).

Phosphate (a form Phosphorus): Most common problem with phosphate is eutrophication of lake water. Phosphate pollution from On-site sanitation system effluent is of much less concern in comparison to nitrate or bacteria and viruses. Phosphorus is adsorbed tightly by to soil minerals and its potential movement to ground water or surface water sources are limited

Types of Trenches

"DRE / SRE are methods of land application of faecal sludge or septage as a controlled disposal method. The site must be carefully selected as in the section below, and the facility designed and operated to mitigate and minimise impact on environment and safeguard health and safety of operators, and the public." . Appropriate trees (high nitrogen demand varieties) can be planted on the top of the filled trenches, the trees get benefit from organic matter and nutrients that are released from the faecal sludge(Sludge from the On-Site Sanitation (OSS) and from wastewater treatment plants contains valuable nutrients).Often the DRE is followed in an area where no drinking water tapped from the ground water. One of the site selection criteria should be that the site is sufficiently separated from drinking water sources to ensure there is no contamination. Adapting of DRE is purely depend on the local/state/country legal policies / guidelines and the implementing agency should obtain permission from the government authority to implement such DRE/SRE.

The advantages of using DRE/SRE are :

- Very simple and easy to construct
- Very low investment
- No expensive infrastructure and pumps are needed
- Very limited or low operation and maintenance Produces no visible or olfactory nuisance if proper planning, design, operation and monitoring procedures are adhered to
- Gain benefit from the planted trees or green cover (CO_2 fixation, control soil erosion and economic benefits from the produces)

The major disadvantages of DRE/SRE are:

- Required a lot of land area, which is limited in most places
- Leaching from the Trench might pollute the ground water and surface water bodies

Planning for Shallow and Deep Trench

To go for shallow and deep trenching, the following aspects should be considered as part of the planning process:

- Estimate the current and projected faecal sludge load to be disposed of and accordingly identify the trenching location.
- The sites should be selected based on suitability for this purpose which include the following:
  - Legal permissions & approval from relevant authorities
  - Should not be a shallow/waterlogged/flood prone area
  - Soil permeability should be good so that it allows easy leaching (e.g. Black cotton soil can be avoided)
  - The selected land should be reasonably flat for easy operations and also accessible by decanting vehicles
  - Sufficient buffer distance to habitable properties should be at least 200 meters
  - The site should not be close to surface/sub-surface/ground water sources, especially used for potable purposes
  - Leachate / filtrate / liquor treatment facility- if required to meet effluent discharge standards

Trench Design

The following critical design considerations should be kept in mind while designing Trenching :

- Trench dimensions should be majorly based on type of soil and quantum of sludge to be deposited
- The permissible horizontal distance between the trench and surface water sources and the vertical distance between bottom of the trench to the ground water should be maintained as illustrated in the later part of the document.
- Access roads to reach the trenching site and inner road between the trenches should be designed properly for easy movement of the trucks
- Fencing to protect the trenching area can be considered. Trees can be planted along the fencing to reduce the odour and give the site an aesthetic look
- Warning signage can be placed appropriately

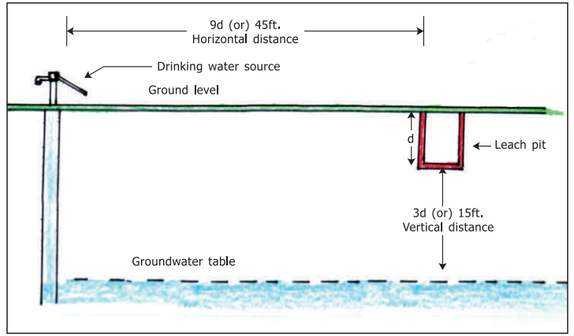
The trench design used to dispose the waste from the OSS is narrated in the following headings:

- Maintaining safe vertical and horizontal distance to avoid ground and surface water pollution
- Shallow Trenches for disposal of waste and also for tree plantation
- Deep trenches
  - Normal Deep Trench
  - Deep Trench with Sand Barrier
  - Deep Trench with Sand and Plastic/Agri-film cover

The technical specifications and other details of the above-mentioned aspects are narrated in the following pages in details.

Safe Vertical and Horizontal Distance

In the absence of any prescribed technical specifications on maintaining safe vertical and horizontal distances between the ground water & surface water sources and deep trenches, the normsadopted for leach pit latrine can be considered as minimum limit for trenches as well (refer picture given in the box for vertical and horizontal distance to be maintained to avoid any potential ground and surface water contamination due to leaching from the trenches). In general, this thumb rule can be applied, however there may be minor variation depending on the soil permeability in project site.



In cases where drinking water source is close to trenching sites, a more detailed study of the soils, ground water, aquifer, seasonal variations, topography and sub-terrain geology should be performed to ascertain the safe distance.

Shallow Trench

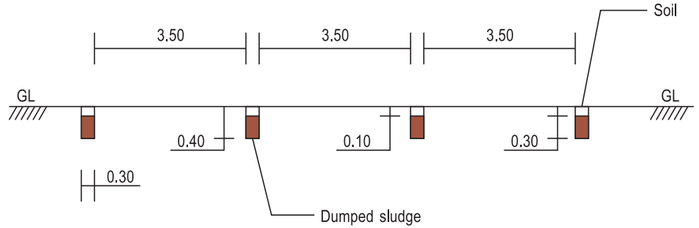
In order to gain the multiple benefits such as disposal of faecal waste safely and at the same time utilizing the nutrient present in the feacal sludge effectively for growth of plantation, the shallow trenches can be adopted.

In general, the shallow trenches used for the above mentioned twin purposes have the specifications as per the given table.

Details / Item	Measurement in Meters
Top width of trench	0.30 m
Bottom width of trench	0.30 m
Height/depth of trench	0.40 m
Length of trench	100.00 m
Distance between two trenches	3.50 m

100.00 m x 0.30 m x 0.40 size of trenches can be excavated at every 3.50 meters' interval. Maintaining 3.50 meters interval between the trenches will help an easy movement of desludging trucks to drain the waste in the trenches effectively. Out of 0.40 meters depth, it is advisable to fill the feacal sludge in the trenches only upto 0.30 meters height and top 0.10 meters should be covered with the local soil(refer the technical drawing given below). On the top of soil cover, high nitrogen demand tree saplings can be planted.

Model 4



Length of the trench 100 m

Dimensions are to be read in metre

Normal Deep Trench

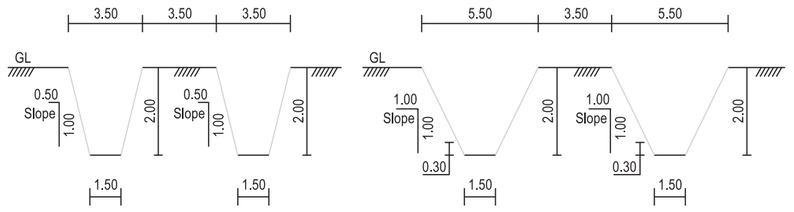
In case, the selected area for the disposal of faecal sludge by using deep trench has very deep ground water table and there are no surface water sources such as stream/river, open pond, open well, tube well etc., nearby, the normal deep trenches can be considered.

The dimensions of deep trench is given in the table.

Details / Item	Measurement in Meters
Top width of trench	3.50 m to 5.50 m
Bottom width of trench	1.50 m
Height/depth of trench	1.00 m to 2.00 m
Length of trench	10 m
Distance between two trenches	3.50 m
Side Slope	0.50:1 or 1:1

The normal deep trenches can be constructed with a bottom width as 1.50 m and depth as 2.00 m (note that the depth of the trench canbereduced, but do not go over 2 meters deep), the side slope can be maintained as 0.50:1 or 1:1 depending on the soil type in the project location, if the soil formation is hard, 0.50:1 can be adopted and in case of loose formation, the side slope of 1:1 can be followed. It is advisable to break the trench length at every 10 meters (refer technical drawing given below). Once the trenches are filled with sludge, the pit can be covered with local soil. Either high nitrogen demand tree saplings can be planted on the trench or buried sludge can be left for two years for complete decomposition. Though, most pathogen will die within 6 to 8 months' period, but helminth like ascariasis might survive for over two years, hence after two years of burial, it is better to test the manure quality to ensure that the manure is free from pathogen, before applying to agriculture field.

Model 1



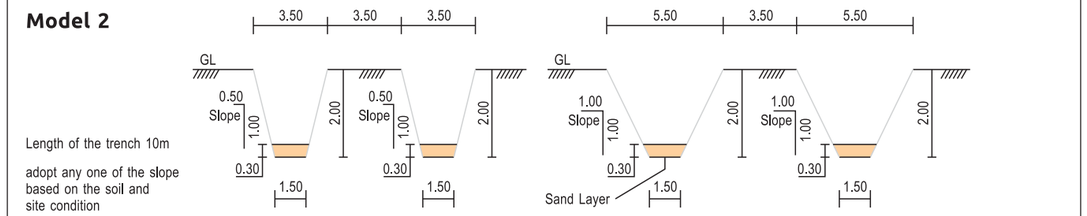
Deep Trench with Sand Barrier

In case there is no surface water sources such as stream/river, open pond, open well, tube well etc. nearer to the proposed trench location, whereas ground water depth is almost equal to the vertical permissible limit mentioned under the safe distance heading, then it is advisable to use the Deep trench with Sand barrier option.

Details / Item	Measurement in Meters
Top width of trench	3.50 m to 5.50 m
Bottom width of trench	1.50 m
Height/depth of trench	1.00 m to 2.00 m
Length of trench	10 m
Distance between two trenches	3.50 m
Side Slope	0.50:1 or 1:1
Depth of Sand Layer at the bottom of the trench	9 to 12 inches (0.30 m)

Construction of deep trench with sand barrier is similar to normal deep trench and the dimensions are same(bottom width as 1.50 m and depth as 2.00 m, the side slope can be maintained as 0.50:1 or 1:1 depending on the soil type in the project location, if it is a hard formation 0.50:1 can be adopted and in case of loose formation, the side slope of 1:1 can be followed). The only difference is that at the bottom of the trench, a sand layer with a thickness of 9 to 12 inches (0.30 m) to be provided to prevent the leaching of pathogen to an extent. It is advisable to break the trench length at every 10 meters (refer technical drawing given below). As like in the normal deep trench, once the trenches are filled with sludge, the pit can be covered with local soil. Either tree plantation can be adopted or leave the sludge for two years for complete decomposition. The decomposed materials can be used as manure after testing its content to detect present of any pathogen

Model 2

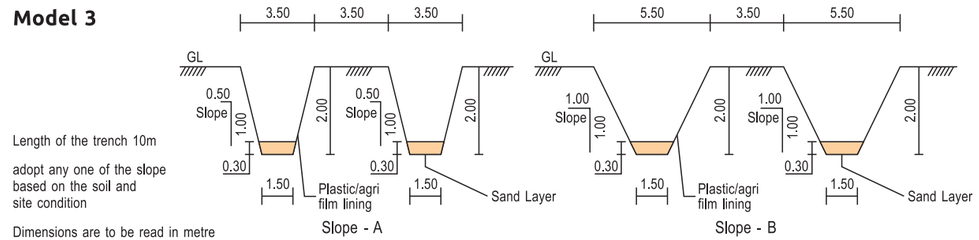


Deep Trench with Sand Barrier and plastic/agri-film cover

In case, both ground water as well as surface water sources are almost equal to permissible limited indicated earlier, it is necessary to take precaution to prevent potential contamination due to leaching from the trenches. In such cases, it is advisable to adopt deep trenches with Sand barrier and plastic/agri-film method, which means providing sand layer at the bottom of the trench and the sides of the trenches are protected with plastic /agri-film. Providing plastic/agri-film cover for all the four sides will prevent the seepage through the sides of the trench and it diverts the leaching of the content through the bottom sand layer.

Details / Item	Measurement in Meters
Top width of trench	3.50 m to 5.50 m
Bottom width of trench	1.50 m
Height/depth of trench	1.00 m to 2.00 m
Length of trench	10 m
Distance between two trenches	3.50 m
Side Slope	0.50:1 or 1:1
Depth of Sand Layer at the bottom of the trench	9 to 12 inches (0.30 m)
Trench sides	Layer of plastic/ agri-film

Model 3



Construction of deep trench with sand barrier and plastic/agri-film is similar to normal deep trench and the dimensions are same (bottom width as 1.50 m and depth as 2.00 m, the side slope can be maintained as 0.50:1 or 1:1 depending on the soil type in the project location, if it is a hard formation 0.50:1 can be adopted and in case of loose formation, the side slope of 1:1 can be followed). The difference is that at the bottom of the

trench, a sand layer with a thickness of 9 to 12 inches (0.30 m) to be provided and all the four sides of the trenches are provided with a layer of plastic/agri-film. It is advisable to break the trench length at every 10 meters (refer technical drawing given below). As like earlier cases, once the trenches are filled with sludge, the pit can be covered with local soil. Either tree plantation can be adopted or leave the buried sludge for two years for complete decomposition.Before using the decomposed materials as manure, it is advisable to test the quality of manure to ensure that there is no pathogen present.

Operations

- Ensure only faecal sludge from households are disposed in the trenches and no industrial, commercial or toxic sludges are disposed.
- Ensure the Tanker Operators follow procedures and maintain log & records (source, route taken, date/time of collection & deposit etc.
- Ensure proper log & records at the site (dates, no. of trucks entered, quantum of sludge deposited, days/time taken to fill each trench etc.)
- Monitor weather so that deposit of sludge in the trench is avoided during rainy season
- During rainy season the leaching effect may be low. The frequency of dumping in the same trench can be lowered down. Use more than one pit during rainy season.
- Personnel engaged in the decanting trucks and the trenching site should use adequate & proper safety gears and conduct regular health check-ups.

Monitoring

- Sampling of deposited sludge should be conducted once in 6 months to ensure that the applied sludge is only from Households with no significant presence organic chemicals or toxins such as Z, Cu, Ni, Cd, Pb, Hg, Cr, As, Mo and P.
- Test boreholes can be installed 100-150 ft away from the trenching site and periodically water samples can be collected and tested to ensure there is no contamination due to leaching.
- Once a year soil samples around the around the trenching site can be tested to ensure there is no contamination.

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Technical Note on

SHALLOW and DEEP TRENCHES

for FaecalSludge / Septage