



KERALASTATE POLLUTION CONTROL BOARD
കേരളസംസ്ഥാന മലിനീകരണ നിയന്ത്രണ ബോർഡ്

Pattom P.O., Thiruvananthapuram – 695 004
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PCB/HO/SEE-2/BOARD Guidelines /2019

Date: 23/12/2019

From

The Chairman

To

The Chief Environmental Engineer
Regional Office-TVPM/EKM/KKD

The Environmental Engineer
TVM/KLM/PTA/ALP/KTM/IDK/EKM-1/EKM-2/ESC/TSR/
PLKD/MLPM/KKD/WYD/KNR/KSGD

Sub: Standards and condition of service for Solid Waste Management

Sir,

The standards and condition of service for street sweeping, solid waste collection and transfer from households / establishments and its treatment is enclosed for necessary action and this may be communicated to all local bodies under your jurisdiction. Also the compliance progress report should be submitted.

Yours faithfully

Ajit Handas

CHAIRMAN

KERALA STATE POLLUTION CONTROL BOARD

STANDARDS AND CONDITIONS OF SERVICE FOR STREET SWEEPING, SOLID WASTE COLLECTION AND TRANSFER FROM HOUSEHOLDS/ESTABLISHMENTS AND ITS TREATMENT

No.	Item	Specification
1.COLLECTION AND TRANSFER OF SOLID WASTE		
1.1	Manpower and vehicle for collection and transfer of solid wastes to transfer station	For 750 houses/establishments, One Tipper Auto (0.5 to 0.7T) – Electric vehicle is preferred Two Collectors and One Driver
1.2	Vehicle at transfer stations	One 5T truck for 10 autos One 10T truck for 20 autos
1.3	User Fee (Covering collection / transportation/treatment/disposal)	Rs.10 to 15 per collection visit
2.STREET SWEEPING		
2.1	Street Sweeping Norms	
	Small Town Staff requirement based on road density	<ul style="list-style-type: none">•High density roads: 1 person per 300– 350 running metre of road length •Medium density roads: 1 person per 500 running metre of road length •Low density roads: 1 person per 750– 1,000metre of road length

		Equipment	<ul style="list-style-type: none"> •Long handled broom •Metal tray and metal plate •Containerised handcart or tricycle •Tractor with covered trolley •Container lifting device
	Medium City	Staff requirement based on road density	<ul style="list-style-type: none"> •High density roads: 1 person per 300– 350 running metre of road length •Medium density roads: 1 person per 500 running metre of road length •Low density roads: 1 person per 750– 1,000metres of road length
		Equipment	<ul style="list-style-type: none"> •Long handled broom •Metal tray and metal plate •Containerised handcart or tricycle •Secondary storage bin •Dumper placer or compactor •Mechanical street sweeper – 1 mechanical sweeper can cover 40 km length per day . All curb sides are to be swept •Container lifting device
	Mega City	Staff requirement based on road density	<ul style="list-style-type: none"> •High density roads: 1 person per 300– 350 running metre of road length •Medium density roads: 1 person per 500 running metre of road length •Low density roads: 1 person

		per 750– 1,000metres of road length
	Equipment	<ul style="list-style-type: none"> •Long handled broom •Metal tray and metal plate •Containerised handcart or tricycle •Secondary storage bins •Dumper placer or compactor •Container lifting device •Mechanical street sweeper Narrow vacuum sweeper for sidewalks

Typical Classification of Streets and Frequency of Sweeping

Class	Character of Street	Frequency of Sweeping
A	City centre – shopping areas	Twice, depending on need
B	Market areas	Daily
C	Minor streets	Daily
D	Sub-urban shopping streets	Daily
E	Residential streets	Daily
F	Roads and streets having no households or establishments on either sides	Once in a week
G	Highways	Rarely necessary to sweep highways as motor traffic creates turbulence
H	Suburban main streets	Twice a week
I	Open spaces	Occasionally, when required (minimum once in 2 weeks)

3. CENTRALISED PLANT FOR ORGANIC WASTE

3.1.	Municipal Anaerobic Digester Plant for organic waste	Agitated digester with volume so as to provide minimum 30 day solids retention time
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**4. BIODEGRADABLE WASTE IN DECENTRALISED UNITS-
Conditions**

De-centralized treatment system

- 4.1 Source level treatment of biodegradable waste is permitted only where adequate land for installation of biogas / composting facilities available in waste generator premises.
- 4.2 Source level disposal of biogas plant slurry or compost is permitted only where adequate land and garden is available waste generator premises (140m² lawn/house (4 to 5 person) is estimated for application of nitrogen content in biogas slurry). Local body has responsibility to remove biogas slurry/ compost/garden waste from waste generator premises.
- 4.3 No waste generator shall throw, burn or burry the solid waste generated by him, on streets, open public spaces outside his premises or in the drain or water bodies
- 4.4 Segregated biodegradable wastes shall be treated at source in decentralized treatment
- 4.5 The operation and maintenance of decentralized treatment units shall be as per the Technical Manual
- 4.6 Local body shall have responsibility to ensure hygienic conditions at decentralized units

Apit Kumar
20/12/2019

SITING GUIDELINES FOR SOLID WASTE
PROCESSING FACILITY

KERALA STATE POLLUTION CONTROL BOARD



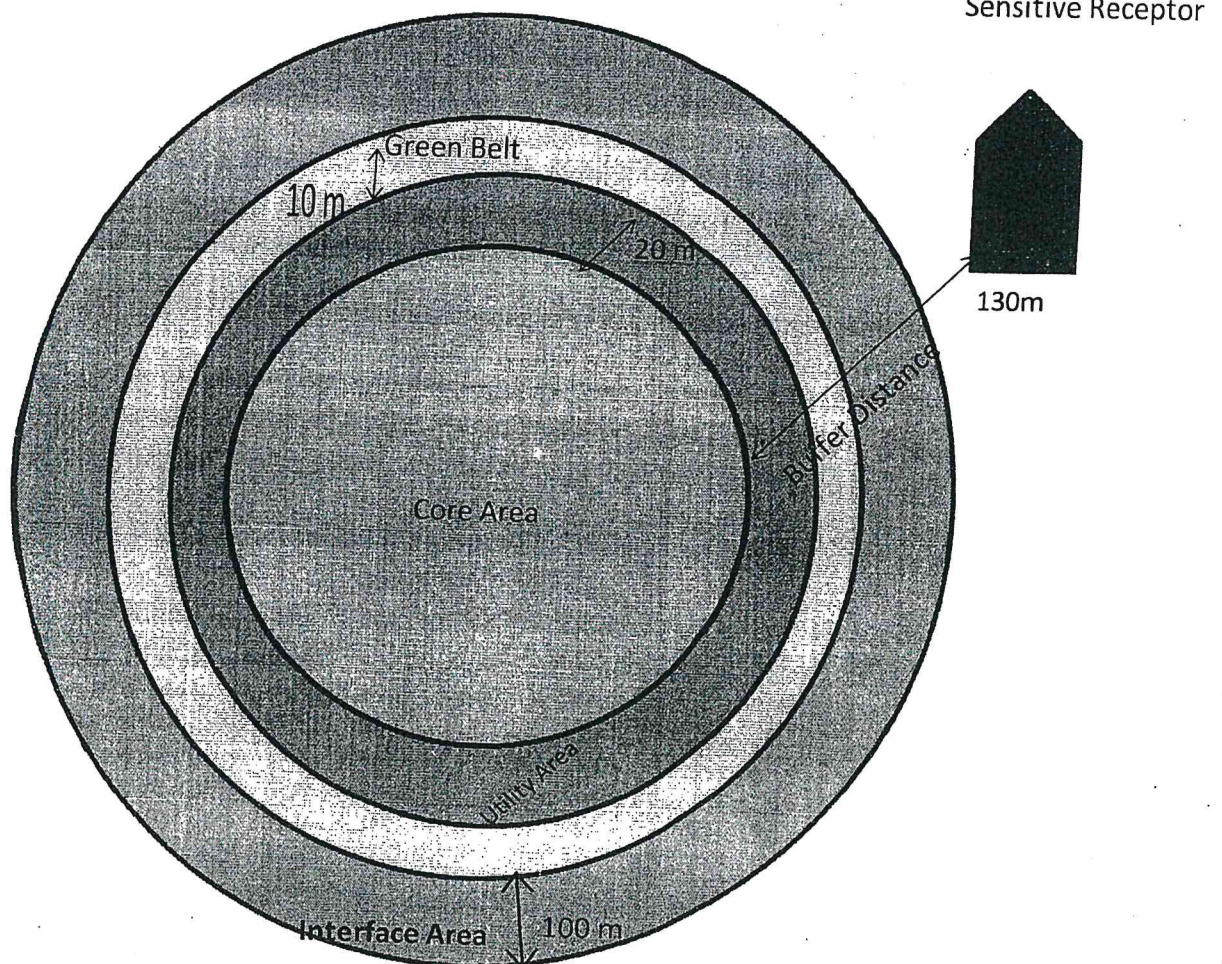
SITING GUIDELINES FOR SOLID WASTE PROCESSING FACILITY

Sl. No.	Activity	Area/Distance
1	Core Activity Area	The area required for Core Activity depends on the Technology adopted for Solid Waste processing
2	Utility Area	Width of 20 m around the source of emission- boundary of core activity
3	Green belt	Width of 10 m around the utility Area
4	Interface Area	Width of 100m around the utility area
5	Buffer Distance	Minimum 130m from the source of emission to the boundary of the property of the Sensitive Receptor

The land to be acquired for processing plant shall include the Core Waste Processing Area, Utility area and Green belt.

Interface Land Use: The permissible activities in the interface land use are limited to the following viz, vehicle showrooms, service stations, warehouses, display homes, emergency services facilities, funeral, veterinary clinic, playground, markets, Industrial Parks, Shopping Centres, Lorry Parking Area etc. If any residences/Public Buildings falls within the Interface area , the same shall be removed.

Waste Processing Plant Area Distribution



Land requirement for 300 TPD of segregated /pre-sorted MSW

Criteria	Integrated System (Composting + RDF)	RDF Incineration
Land Requirement	6 ha. of land + 0.2 ha of land for providing odour control facilities	1.5 ha. land area is required for RDF incinerator in addition to the area required for Composting + RDF facility.

General information:

The Solid Waste Processing Facility requires the following specifically demarked areas for various activities.

- **Core Waste Processing Area** typically requires space for receiving storing and segregation of waste along with treatment units within the facility.
- **Utility Area** within the facility is the designated area for the facility operations other than the core activities like. Weigh bridge, parking, vehicle cleaning, laboratory, emergency services etc.
- **Green Belt** for the purpose of these guidelines shall refer to an area that is kept in reserve within the allotted land for setting up facility, around the core SWM processing area, for the purpose of plantation and landscaping to reduce the adverse effects from air, noise and Ground Water pollution soil erosion etc. Vegetation, shrubs, trees, and berms with high density greenery can be incorporated into green belt within facility limits to serve as visual barriers and to reduce noise levels. Depending on the monitoring of level of pollutants in ambient air after the boundary of facility, on case to case basis, suitable technological measures/ barriers to check pollutants need to be resorted. It also works as a natural shield to protect people around the facility from these pollution.
- **Interface Land Use:** The buffer zone could be further augmented with interface land use area, where this area can be beneficially and feasibly used as an additional optional measure, after due approval of the concerned authorities.
The activities in the interface land use are limited to the following viz, vehicle showrooms, service stations, warehouses, display homes, emergency services facilities, funeral, veterinary clinic and playground, markets, Industrial Parks, Shopping Centres, Lorry Parking Area etc. If any residences/Public Buildings falls within the Interface area, the same shall be acquired
- **Buffer Distance or Separation distance** is measured as the areal distance between the source of emission and sensitive receptors. For the purpose of these guidelines and addressing the required protection from adverse impacts, separation distance is measured from the tip of core SWM facility processing boundary, as the source of emission, to the nearest boundary of the property of sensitive receptors. (**Sensitive receptors** are people or other organisms that may have a significantly increased

sensitivity or exposure to contaminants by virtue of their age and health. Eg: Schools, day care centres, hospitals, nursing homes, elderly housing etc)

- The Coastal Zone Regulation notified by Ministry of Environment Forest and Climate Change also prohibits setting up and expansion of units or mechanism for disposal of wastes in High Tide Line (hereinafter referred to as the HTL) to 500 m on the landward side along the sea front. Also dumping of city or town wastes including construction debris, industrial solid wastes, fly ash for the purpose of land filling and the like with high tide line shall be regulated by the concerned authority, where shall implement schemes for phasing out any existing practice, if any.

Locational Criteria

Sl.No.	Location	Distance
1	Lake or Pond	>200m
2	Navigable River or Stream	>100m
3.	Flood Plain	No facility should be constructed within a 100 year flood plain
4	Highway	>200 m of the right of way of any state or national highway
5	Habitation	>130 m from a notified habited area
6	Wetlands	No facility should be constructed within wetlands
7	Ground Water Table	Facility should not be constructed in areas where table is less than 2 m below ground water surface
8	Airport	As per the limits prescribed by regulatory agencies (MoEF/CPCB/Aviation Authorities)
9	Water Supply Well	No facility should be constructed within 500 m of any water supply well
10	Coastal regulation Zone	Facility should not be sited in a CRZ
11	Unstable Zone	Facility should not be located in potentially unstable zones such as landslide prone areas, fault zone etc.
12	Public parks	>300 m
13	Earthquake zone	>500m from fault line fracture (urban local bodies in seismic zone 4 &5 consult seismic map)

The siting criteria shall further be reviewed based on the technology adopted in the treatment process viz, Composting (Mechanical Biological Treatment/Vermi Composting), Anaerobic Digestion, Waste to Energy process etc.

SULLAGE AND SEWAGE TREATMENT OPTIONS FOR MODEL PANCHAYATS AND MUNICIPALITIES

The method of Sewage and Sullage treatment from household depends on the nature of the terrain, population density, depth of water table, availability of space requirement, one time cost and operation and maintenance costs of the system. It is high time to develop Centralized managed sanitation systems focusing on scientific Solid & Liquid Waste Management systems for overall cleanliness in the State.

Ministry of Drinking water and Sanitation has also recommended Soakpits as an onsite treatment option for sullage from house holds.

WASTEWATER GENERATION & CHARACTERIZATION

The wastewater from various household activities can be classified into;

1. Grey water:- Wastewater generated from bathing, kitchen and other household activities except toilet.
2. Blackwater:- Wastewater generated from toilets.
3. Combined wastewater: It can be either mix of grey water and effluent of septic tank treating black water or effluent of septic tank treating black and grey water.
4. Sewage:- Combined grey and black water generated from household in the absence or presence of septic tank.

The characteristics of the above mentioned types of wastewater depends on water supply and per capita pollution load. The level of water supply plays a major role in deciding the concentration of pollutants. Other significant factors are settlement and decomposition in drains, sewers under warm weather conditions, partially treated sewage from septic tanks, lifestyle of the population. The best way to ascertain the characteristics is to conduct the sampling and analysis of various water quality parameters of the outfall or drain.

Parameters	Grey water	Black water	Septic Tank Effluent*	Septic Tank Effluent**	Mixed Wastewater***	Sewage
BOD (mg/L)	100-300	600-1000	300-600	80-160	150-400	250-400
COD (mg/L)	200-500	1000-2000	600-1000	200-400	300-600	500-800
TSS (mg/L)	100-300	800-1200	300-500	200-400	150-350	600-1000
Fecal Coliforms (MPN/100 ml)	10^2-10^3	10^6-10^7	10^5-10^6	10^3-10^5	10^4-10^5	10^5-10^7
Total Coliforms (MPN/100 ml)	10^2-10^3	10^7-10^8	10^6-10^7	10^4-10^6	10^5-10^6	10^5-10^7

*(Treated Black water only)

** (Treated Grey water + Black water)

***Septic Tank Effluent & Grey water

Note: *These concentrations are analysed on-site, the values could be 20-40 % lower at the STP site due to settling, biodegradation etc., process in the wastewater collection system depending on the climatic conditions, type and length of the collection system etc.,*

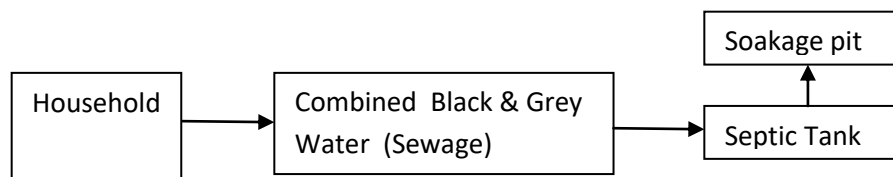
WASTEWATER COLLECTION & TREATMENT SYSTEM

As per the prevailing conditions, different options are suggested for safe wastewater (Grey water, Black water, combined wastewater & sewage) collection, treatment and disposal/reuse as per the end user requirement. These options are either on-site solutions, or decentralised or mixed solutions. Most suitable option should be elaborated in a thorough feasibility study that takes into account the above mentioned criteria for technology selection. The configurations could be any one of the following options depending on the standard of living, water availability, fund constraints, soil and topographical conditions, density of population etc.,

The Ministry of Drinking Water and Sanitation has recommended some combination of treatment technologies depending on nature of soil, water supply, ground water level and population.

Option 1. Sanitation System using Soak pits (Sandy soil and deep groundwater table, piped water supply sparse population)

This system can be adopted in Panchayat/ Village areas having the above characteristics.



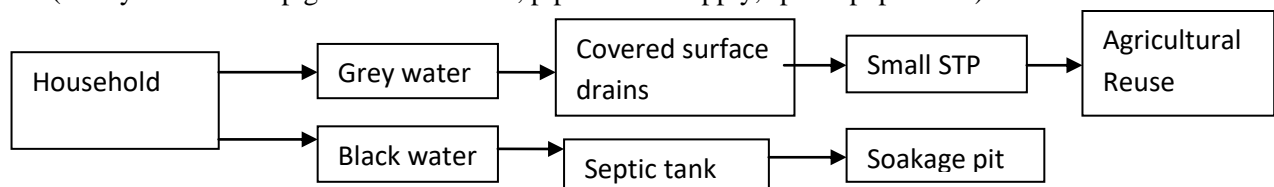
Option 2. Sanitation System with different methods.

All the Municipalities shall adopt one or the other following option for comprehensive management of Sullage and Sewage and shall take effective steps for providing and maintaining covered surface drains and STP for the treatment of Sullage/ Sewage.

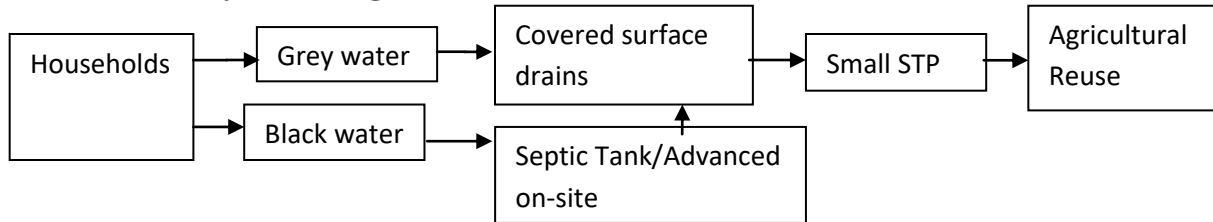
This system can be adopted in municipal areas having the above characteristics.

a) Sanitation System using Soak pits and Covered surface drains

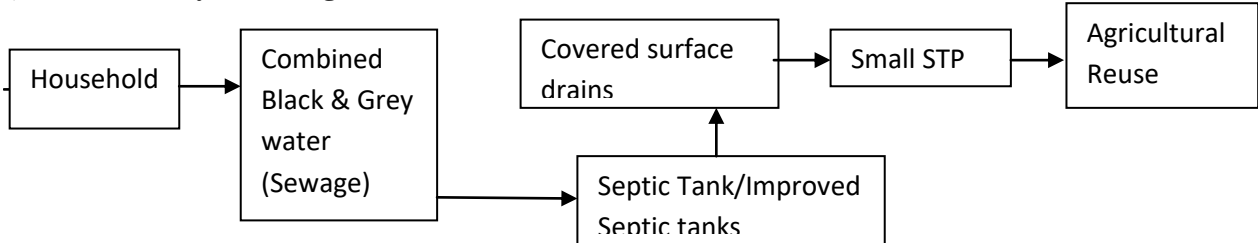
(Sandy soil and deep groundwater table, piped water supply, sparse population)



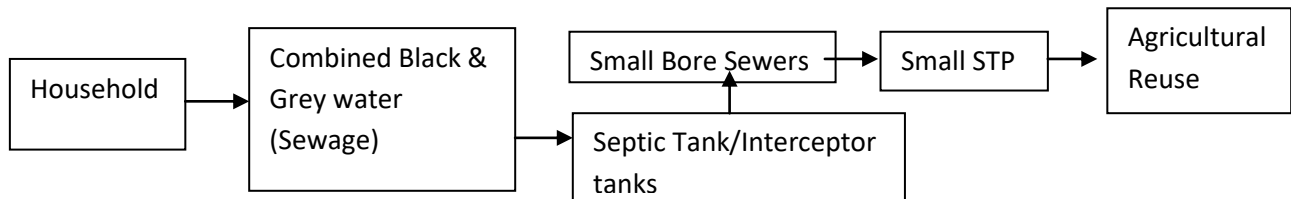
b). (Sanitation system using covered surface drains)



c). (Sanitation system using covered surface drains)



d). (Partly Sewered sanitation using small bore sewer)



Note:

- *The Septic tank mentioned here in shall be in accordance with the specifications and dimensions as per IS 2470 Part 1-1985 and the Soakage pit shall be in accordance with the specifications and dimensions as per IS 2470 Part 2-1985*
- *Small STP –The STP that is suggested for treatment of combined Black and Grey Water. This shall consist of the following treatment units viz, equalization tank (aerobic suspension), aeration tank(ASP, EA, MBBR , fixed film or any other advanced technology), secondary settling, pressure sand filter, disinfection tank, activated carbon filter. (Source: Guidelines of Kerala SPCB)*

WASTEWATER COLLECTION SYSTEM

Removing wastewater of any form i.e., greywater, combined grey water and septic tank effluent or sewage and storm water is an important environmental health intervention for reducing disease. Poorly drained wastewater and stormwater forms stagnant pools that provide breeding sites for disease vectors. Hence there should be proper systems for the collection of wastewater.

There are three common types of collection systems of wastewater;

- Covered surface drains
- Small bore sewers
- Conventional sewers

i. Covered Surface drains

One of the cheapest and interim options for disposal of grey water, grey water + septic tank effluent is the covered surface drains. Further, open channels often exist in rural areas and hence can be upgraded to covered drains with little efforts.

The objective of covered surface / storm water drain is to remove waste water/ rain water from the households/ premises in a controlled and hygienic manner in order to minimize public health and environmental risks, inconvenience to residents and the deterioration of other infrastructure.

This requires:

- a) Removal of grey water and/or septic tank effluent generated from various household activities
- b) Removal of storm water, that is, water which runs off the land and houses as a result of infall.

The recommended section of covered surface drain is shown in the figure (Fig 1). The half rounded central channel for the peak dry weather wastewater flow, while the outer channel facilitates storm water discharge. The outer channel floor should preferably gently down to the central channel. Since, open drain/channel have a higher friction than a pipe. In relatively flat areas, pipe flow could be better, an alternative option would be laying the pipe into the open channel and cover it.

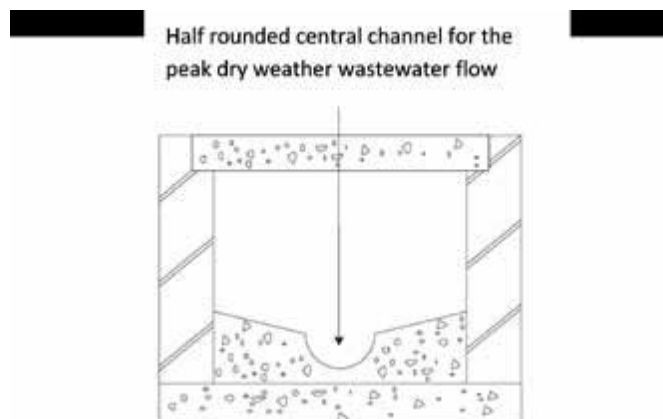
The important design considerations are as follows:

- The raising of road surfaces above the plinth level of nearby houses should always be avoided.
- In the absence of rainfall data, drainage schemes should normally be designed for a return period of 1 year or less. Rainfall intensity in the range of 50-100 mm per house can be assumed.
- Both opened and covered drains give rise to maintenance problem and their total length should be minimized.
- Covered drains should not be smaller than about 500 mm in square cross section

Applicability:

It is an interim and fast solution of wastewater collection and can be applied at reasonable cost. However, to prevent clogging, regular cleaning service for the removal of sludge is necessary. Further, if existing open channels (Nallas) are upgraded it has to be taken care of providing sufficient slope of the drains for dry weather flow as existing drains often lead to stagnant dry weather flow which causes unhygienic conditions and may infiltrate in the ground.

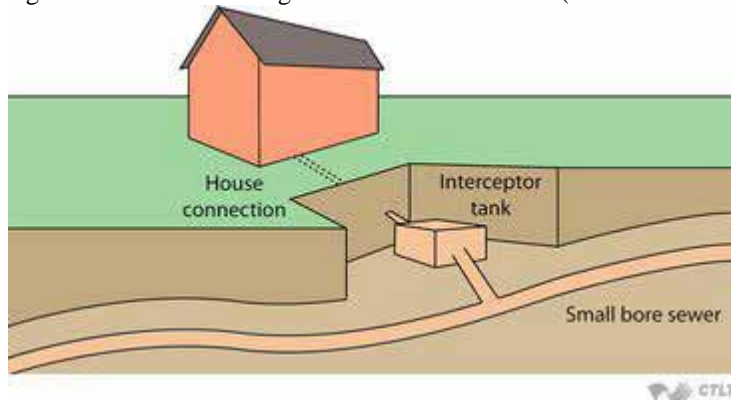
Fig.1. Half rounded central channel



Small Bore Sewers

For grey water, surface drain is the cheapest option for collecting such waste water. For black water, mixed with grey water, small bore / swallow sewer is the appropriate and sustainable options for collecting waste water in rural areas. Small bore sewer systems are designed to receive only the liquid portion of household wastewater for off-site treatment and disposal. Grit, grease and floating materials are separated from the waste flow in interceptor tanks similar to septic tanks. Such interceptor tanks are installed after each household or group of households as per the site conditions. Depending upon the size of interceptor tanks and inflow of waste water, settled solids should be removed periodically from the interceptor tanks. It is suitable where per capita waste water generation is very low. It is more suited in rural areas where per capita water supply is low, making conventional sewer system technically unfeasible.

Figure 2. A schematic diagram of Small bore sewer (Source: Website Jhsphopen Courseware, 2013)



- Ref:-
1. Technological Options for Solid and Liquid Waste Management in Rural Areas-MINISTRY OF DRINKING WATER AND SANITATION, SWACHH BHARAT MISSION (GRAMIN)
 2. Indian Standard Code of Practice for Installation of Septic tanks Part I and Part II (IS:2470- 1985)
 3. Siting Criteria and Consent Conditions Notification- Kerala State Pollution Control Board