

TERMINOLOGY

White Water: (Also called as *Potable Water*)
Water from underground or surface sources that is fit for consumption.

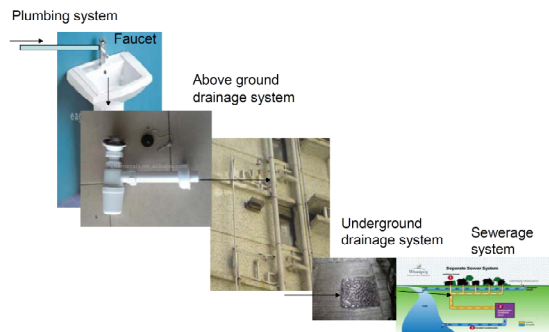
Black Water: (Also called as *Sewage*)
Wastewater containing fecal matter and urine.

Grey Water:
Water coming from domestic equipment other than toilets (e.g. bathtubs, showers, sinks, washing machines etc.)

Grey water gets its name from its cloudy appearance and from its status as being in between fresh water (White) and foul water (Black).

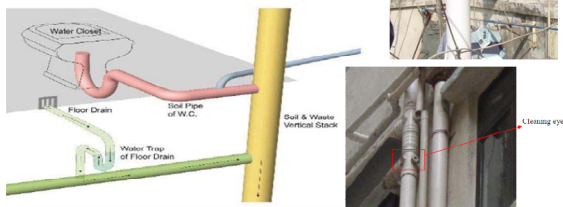
Storm Water:
Water that originates during precipitation events.

Drainage Connections



VENT PIPE:

- preventing loss of water seals in traps.
- is up to a height > 1m above roof
- Covered with a wire cage



Types of Vertical Drainage Stacks:

Waste pipe (WP)	-	Grey water.
Soil pipe (SP)	-	Black water.
Vent pipe (VP)	-	Anti - syphonage.
Rainwater pipe (RWP)	-	Storm water.

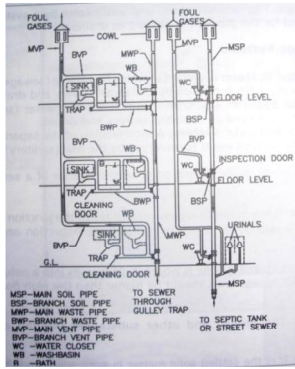
SYSTEMS OF DRAINAGE

- Two Pipe System
- One Pipe system
- Single Stack System
- Single Stack (partially ventilated) system

Two Pipe System

This is the best and most improved system of plumbing. The system has four pipes:

- One waste pipe
- One soil pipe
- One each for ventilation pipe
- Soil & waste pipes are separate
- Soil pipe connects directly with main sewer
- Waste pipe connected to main via Gully trap
- Ventilation by connecting line with ventilation pipe
- Used where sullage is to be treated separately
- More expensive

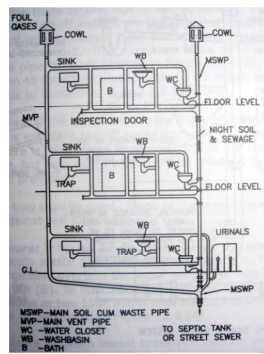


2-pipe system

- Soil stack
- Vent pipe for soil stack
- Waste stack

One Pipe system

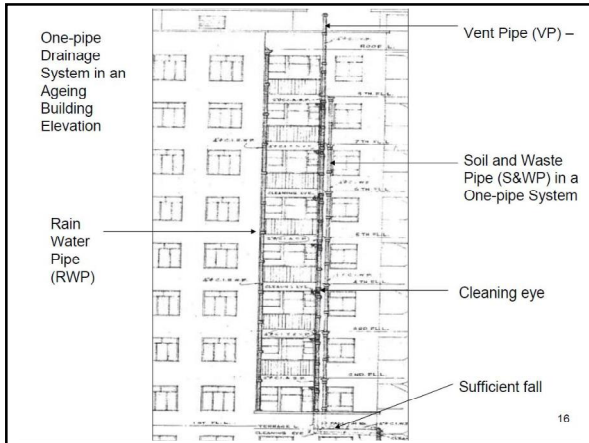
- One main pipe for soil as well as waste water conveyance
- It has two stacks
 - One soil cum waste pipe
 - One Vent stack
- No Gully trap provided
- Trap provided for each fixture, water seal must not fail in any case.
 - 40 mm for waste water
 - 50 mm for soil fixtures



One-pipe Sys

- WC
- Vent pipe
- S&W Stack
- Floor drain (toilet)
- Basin
- Bath
- sink





Single Stack System

- Only one pipe: Soil cum waste pipe
- Same as one pipe but without trap ventilation pipe
- All soil & waste fittings discharge into a single pipe
- No separate ventilation pipe, stack itself acts as ventilation pipe
- Dia of stack
 - 100 mm upto 4 storey
 - 150 mm upto 15 storey
- Commonly used if fixtures are closely grouped

Safeguards for design of Single stack

- Air pressure fluctuations:
 - Induced syphonage
 - Self-syphonage
 - Back pressure
- Single stack (Partial Ventilated)
 - Only soil traps are ventilated

Single Stack (partially ventilated) system

- This is an improved form of single stack system, where the traps of the water closets are ventilated, by a separate vent pipe, called relief vent pipe.
- This system uses two pipes as in single pipe system.
- The single soil and waste pipe is connected to vent pipe and thus cost is reduced

VENTILATION

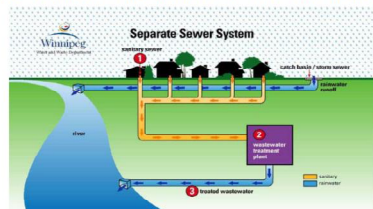
- The ventilation is usually achieved by providing a fresh air inlet connected to the lower-most manhole or inspection chamber.
- Fresh air from the atmosphere will enter through this inlet into the manhole, and finally goes out at top through the vent pipe.
- The air along with foul gases will finally escape out from the cowl provided at the top.
- A flap valve is provided at the inlet of fresh air into the inspection chamber, to avoid the escape of foul gases in the street or courtyard.

ANTI-SIPHONAGE PIPES

- Water seals of traps in multi storied building may some times get broken due to siphonic action.
- When wastewater is suddenly discharged from a sanitary fixture on the upper floor, it moves rapidly through the soil (waste) pipe, it may suck some air from the lateral pipe connecting the soil pipe with fixtures at lower floor.
- This sucked air causes siphonic action, resulting in the flow of water from the trap of the fixture to the soil pipe and thus breaking its water seal.
- To overcome this difficulty, a separate pipe of smaller diameter is attached to the traps, which connects the trap to the vent pipe. This pipe is known as anti-siphonage pipe and it supplies air to the short branch pipe of the lower fixture, at the time of suction, otherwise it acts as a vent pipe of the lower fixtures.
- This pipe normally serve as vent pipe and as anti-siphonage pipe in case suction takes place.

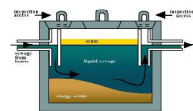
Systems of Underground Drainage

- Separate system:
 - Foul water (soil and waste water) -> foul sewer
 - Rainwater/surface water -> storm water sewer
- Combined system:
 - Foul water and rainwater are drained to the foul sewer



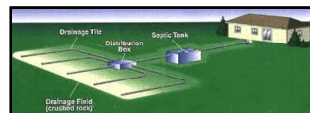
SEPTIC TANK

In rural areas where houses are spaced so far apart that a sewer system would be too expensive to install, people install their own, private sewage treatment plants. These are called septic tanks.



It is basically an underground hollow structure that facilitates the decomposition of waste matter in the discharged water.

The term "septic" refers to the anaerobic bacterial environment that develops in the tank and which decomposes or mineralizes the waste discharged into the tank.



Septic tanks can be coupled with other on-site wastewater treatment units such as biofilters or aerobic systems involving artificial forced aeration.

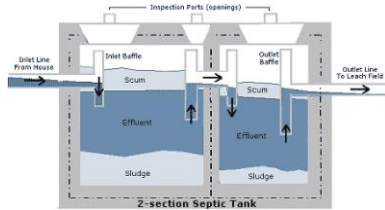
WORKING:

The septic system uses natural processes to treat and dispose off wastewater generated from the home.

Generally made of concrete, plastic or fiberglass. The size is at least twice the maximum daily discharge.

The material going into the septic tank is divided into three general categories:

1. **Sludge** - sinks to the bottom of the septic tank .
2. **Scum** (lighter in weight than water) - floats near the top of the septic tank .
3. **Effluent** (Liquid Waste) - fills the septic tank and flows into the drainfield.



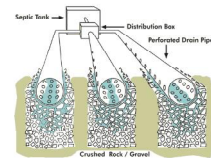
FATE OF THE SEWAGE:

The solid waste in the septic tank is decomposed by bacteria and is broken down into gas and liquids.

•The **gas** is released through the vent system.

•The **liquids** ordinarily flow by gravity into the drainfield.

•Sludge and **solids** are to remain in the septic tank.



The septic tank provides some biological treatment of the sludge and scum layers but the majority of treatment occurs in the drainfield.

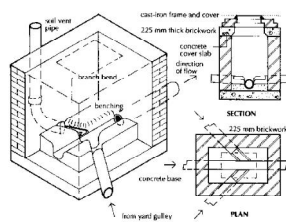
0.82 sqm tank area for every 10 persons has been assumed.



Drainfield.

INSPECTION CHAMBER

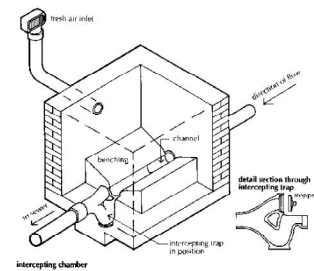
- It is a masonry chamber, constructed on a house drain, to provide access for cleaning, inspection and repair of the drain.
- The steepness of the floor does not allow deposition of sewage soil when channels over flow.
- Chambers are covered from the top by means of air tight C.I covers.



- The size of the chamber depends on the depth underground and number of branch connections.
- They should be provided at all junctions, bends.

INTERCEPTING CHAMBER

- Intercepting chambers are provided at the intercepting points of two or more pipes.
- They are installed at points where there is a chance of blockage.
- Its provides a space for inspection and clearance of the blockage



RAIN WATER DISPOSAL

- The rain water disposal in case of pitched roof is easier as the slope provides a natural runoff.
- The water is directed to rain water pipes through the gully and outlets.

RAIN WATER DRAINAGE IN CASE OF FLAT ROOF