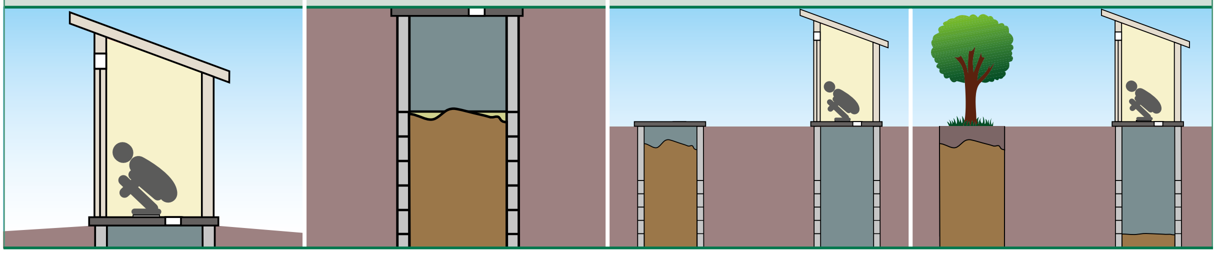
World Health Organization

Fact sheet 1

Dry or flush toilet with onsite disposal

Toilet	Containment	End use / disposal
Dry or pour flush toilet	Single pit or VIP	Onsite disposal: Fill and cover / Arborloo



Summary

This system is based on the use of a single pit technology to collect and store excreta. The system can be used with or without flushwater, depending on the toilet. Inputs to the system can include urine, faeces, cleansing water, flushwater and dry cleansing materials. The use of flushwater, cleansing water and cleaning agents will depend on water availability and local habit. The toilet for this system can either be a dry toilet or a pour flush toilet. A urinal could additionally be used. The toilet is directly connected to a single pit or a single ventilated improved pit (VIP) for containment. As the pit fills up, leachate permeates from the pit into the surrounding soil.

When the pit is full, it can be backfilled with soil and a fruit or ornamental tree can be planted. The sludge acts as a soil conditioner with the increase in organic matter resulting in improved water holding capacity and providing additional nutrients, which are slowly reduced over time. A new pit has to be dug and this is generally only possible when the existing superstructure is mobile.

Applicability

Suitability: This system should be chosen only where there is enough space to continuously dig new pits. In dense urban settlements, there is not sufficient space to continuously dig new pits.

Therefore, the system is best suited to rural and peri-urban areas where the soil is appropriate for digging pits and absorbing the leachate; where hard, rocky ground is found, or locations where groundwater level is high or the soil is saturated are not suitable. It is also not suited to areas that are prone to heavy rains or flooding, which may cause pits to overflow into users' houses or to the local community [2, 3].

When it is not possible to dig a deep pit or the groundwater level is too high, a shallow, raised pit can be a viable alternative: the shallow pit can be extended by building the pit upwards with the use of concrete rings or blocks. A raised pit can also be constructed in an area where flooding is frequent in order to keep water from flowing into the pit during heavy rain [4].

Cost: This system is one of the least expensive to construct in terms of capital cost and maintenance cost, especially if the superstructure is mobile and can be reused [2, 3].

Design considerations

Toilet: The toilet should be made from concrete, fibreglass, porcelain or stainless steel for ease of cleaning and designed to prevent stormwater from infiltrating or entering the pit [2, 3].

Containment: On average, solids accumulate at a rate of 40 to 60L per person/year and up to 90L per person/year if dry cleansing materials such as leaves or paper are used. In many emergency situations, toilets with infiltrating pits are subjected to heavy use, and consequently excreta and anal-cleansing materials are added much faster than the decomposition rate; the 'normal' accumulation rates can therefore increase by 50% [4].

The volume of the pit should be designed to contain at least 1,000L. Typically, the pit is at least 3m deep and 1m in diameter. If the pit diameter exceeds 1.5m, there is an increased risk of collapse. Depending on how deep they are dug, some pits may last 20 or more years without emptying, but a shallow pit may fill up within 6 to 12 months. As a general rule, a pit 3m deep and 1.5m square will last a family of six about 15 years [3].

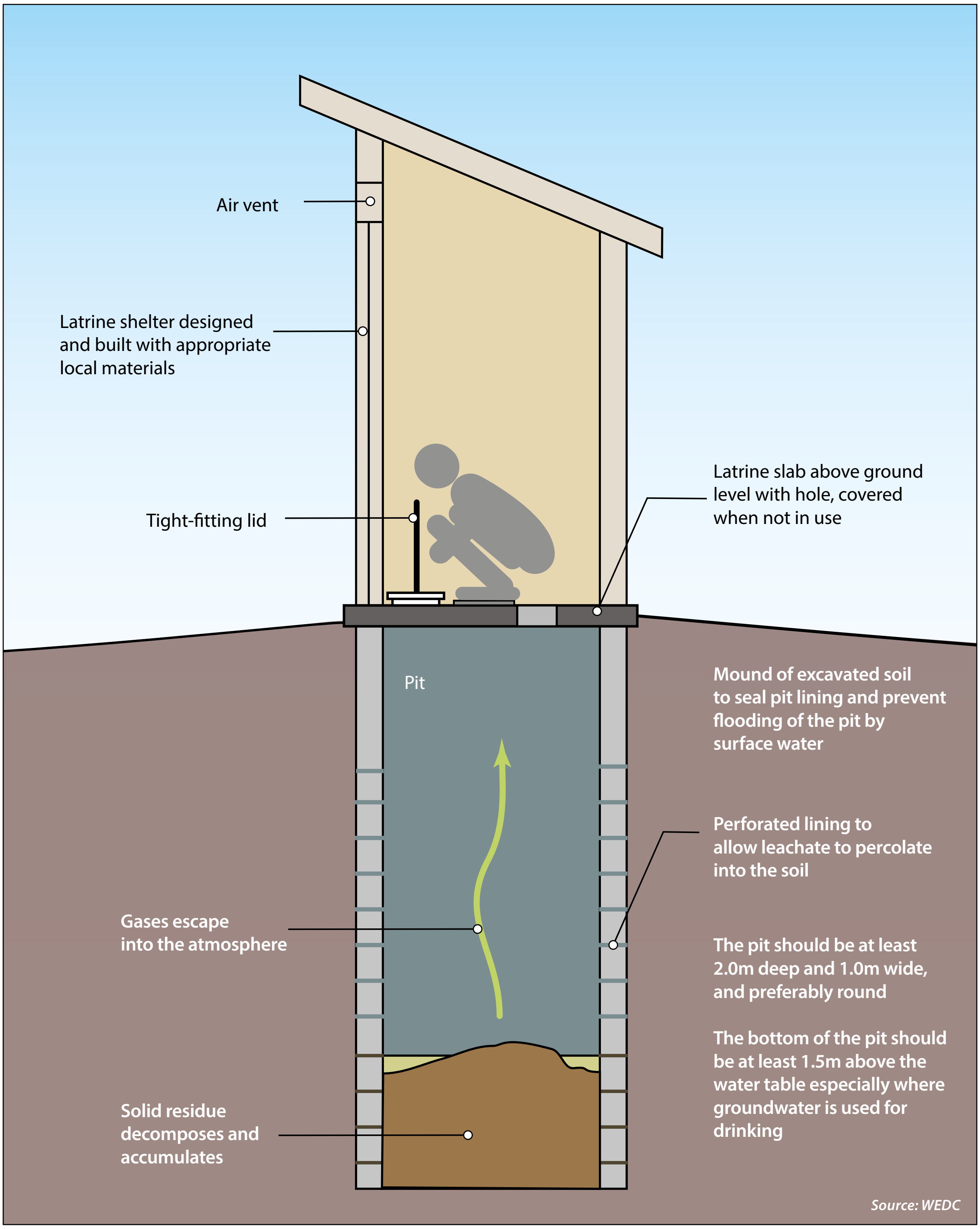


Figure 1. A single pit latrine

The water table level, and groundwater use should be taken into consideration in order to avoid contaminating drinking water. If groundwater is not used for drinking or alternative cost effective sources can be used, then these options should be explored before assuming that groundwater contamination by pit latrines is a problem. Where groundwater is used for drinking and to prevent its contamination, the bottom of the pit should be at least 1.5m above the water table [3]. In addition, the pit should be installed in areas located down gradient of drinking water sources, and at a minimum horizontal distance of 15m [5].

Excreta, cleansing water, flushwater and dry cleansing materials should be the only inputs to this system; other inputs such as menstrual hygiene products and other solid wastes are common and may contribute significantly to pit contents. As this will result in pits filling up more rapidly and make it more difficult to empty, an appropriate container for disposal of these wastes should be provided in the toilet cubicle. (Some greywater in the pit may help degradation, but excessive amounts of greywater may lead to quick filling of the pit and/or excessive leaching.)

End use/disposal: If the user plans to plant a tree in the covered pit, then space and site conditions for the tree when fully grown need to be taken into account. The tree should not be planted in raw excreta but into the soil filling on top of the pit contents [2].

Operation and maintenance considerations

Toilet and containment: The user is commonly responsible for the construction of the toilet and pit, although they may pay a mason to carry out the work. The user will be responsible for cleaning and repairs to the toilet, including the slab, seat/squat hole, drop-hole, cover/lid and superstructure [2].

To reduce smells and insect breeding, a cup of soil, ash or sawdust is added to the pit after each defecation, while periodically adding leaves will improve porosity [2].

End use/disposal: As no emptying and transport is required, once the pit is full the user is responsible for digging a new pit and transferring the toilet and superstructure, and then covering and filling the old pit and, if required, planting a tree on top [2].

There is little maintenance associated with a closed pit other than taking care of the tree. Trees planted in abandoned pits require regular watering and a small fence of sticks constructed around the sapling will protect it from animals.

Mechanisms for protecting public health

Toilet and containment: The toilet separates users from excreta while the pit isolates the excreta and pathogens within it from physical human contact.

During rains, the toilet and the pit contain the fresh excreta and prevent it from being washed away into surface water bodies[2, 3].

End use/disposal: Users do not come in contact with the faecal material and, thus, there is a very low risk of pathogen transmission. The main mechanism for pathogen reduction is through long storage time in the pit. The conditions in the pit are not favourable for pathogen survival, so over time, generally around one to two years, the pathogens die off and the excreta becomes safer. The die off period can be reduced by adding lime or other alkaline material to raise the pH, raising the temperature or reducing the moisture content. Ascaris (roundworm) eggs are the most persistent pathogen to die off [6].

Any leachate safely permeates into the surrounding soil and pathogens contained in the liquid are filtered out, adsorbed onto particles, or die off during their slow travel through soil [2, 3].

References

The text for this fact sheet is based on Tilley, et al. [1] unless otherwise stated.

1. Tilley E, Ulrich L, Lüthi C, Reymond P, Schertenleib R, and Zurbrügg C (2014). *Compendium of Sanitation Systems and Technologies. 2nd Revised Edition.* Swiss Federal Institute of Aquatic Science and Technology (Eawag).
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3. Reed R A, Scott R E, and Shaw R J (2014). *WEDC Guide No. 25: Simple Pit Latrines.* WEDC, Loughborough University, UK.
4. Harvey P (2007). Excreta Disposal in Emergencies: A Field Manual, WEDC, Loughborough University, UK.
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6. Stenström T A, Seidu R, Ekane N and Zurbrügg C (2011). Microbial exposure and health assessments in sanitation technologies and systems. Stockholm Environment Institute (SEI).