WEDC Developing knowledge and capacity in water and sanitation

GUIDE 29

Pit latrines for special circumstances

Whilst pit latrines are often the most suitable form of sanitation in low-income communities, there are some situations which present particular challenges for designers and builders. These situations include locations where rock is close to the surface, so preventing the excavation of a deep pit, or in cold climates where solids do not decompose as readily as in warmer environments.

This guide examines the problems these circumstances present and suggests ways in which some of the difficulties can be overcome.

Contents

Refer to other guides in this series for information about other types of pit latrines which are suitable for most low-income communities.

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When rock is close to the surface

If there is only a thin layer of soil covering rocky ground it will not be possible to dig a conventional pit. The volume of the pit can be increased by extending the pit walls above the ground.

If it is possible for the pit to extend some depth below the ground then the lining above ground should be sealed so that all percolation takes place below ground-level (see Figure 1).

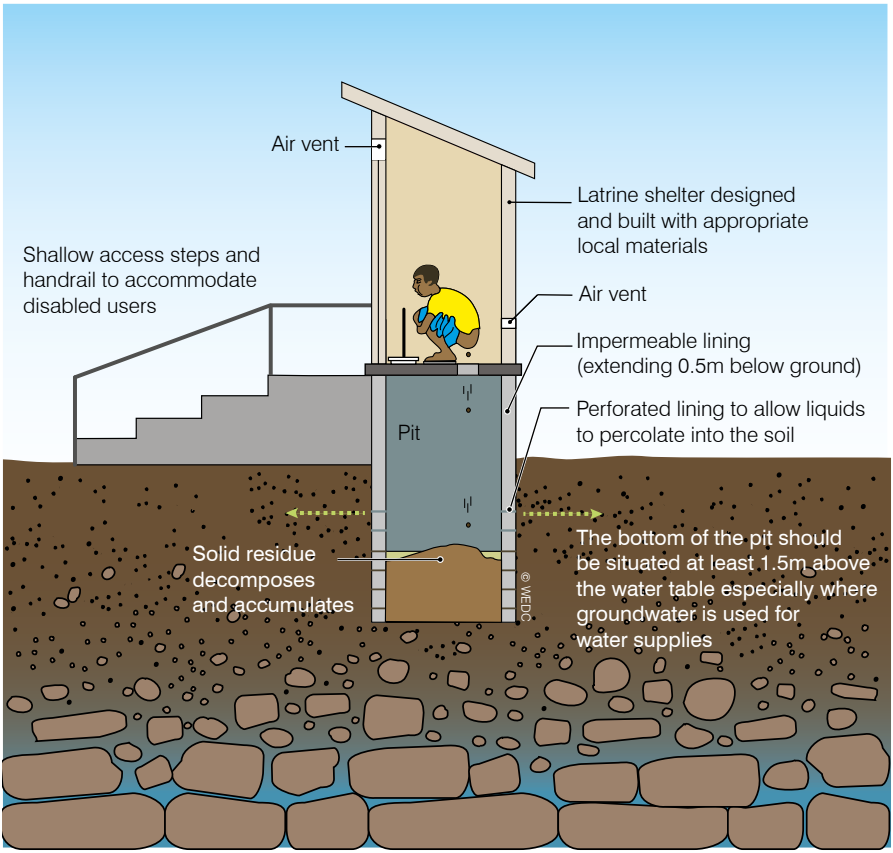

Figure 1. A raised latrine with the pit partially situated below ground level

If most of the pit must be constructed above ground then it is better to surround the pit lining with a soil mound. Part of the lining can then be left porous so that liquids can percolate into the mound.

Planting small shrubs on the mound will encourage the removal of the liquids from the mound by evapotranspiration of the liquids.

There is no maximum height for a raised latrine but users may become self-conscious if the top of the superstructure is more than about 1.5m above the roofs of surrounding buildings where they could be observed going to and returning from the latrine.

Access steps and a handrail must be provided to accommodate disabled users.

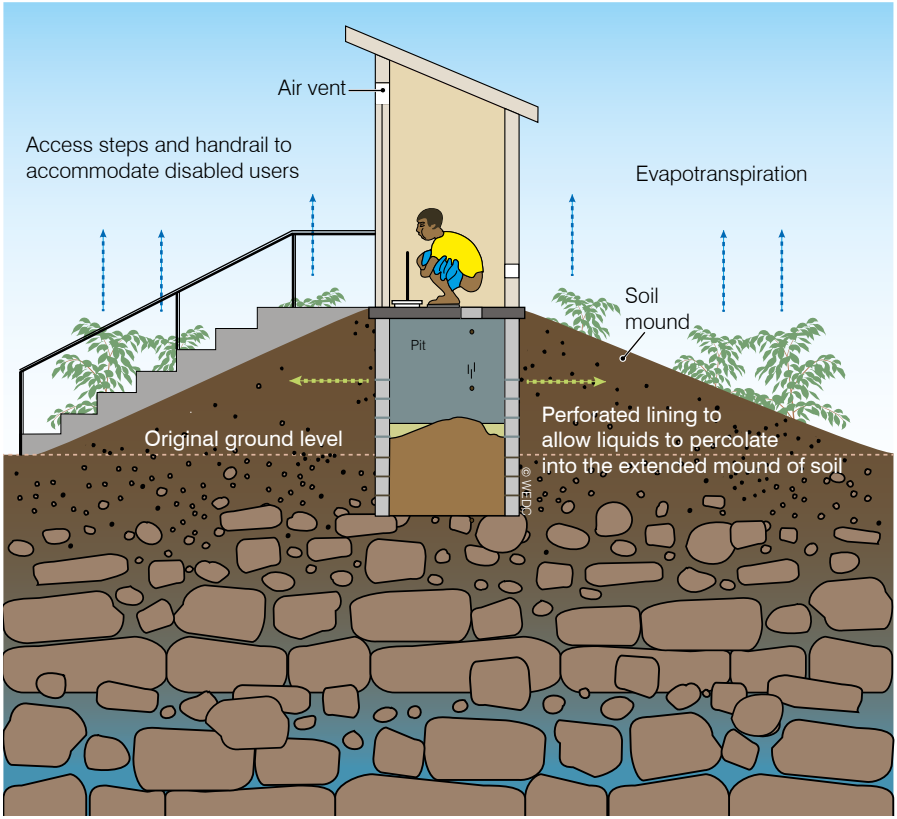

Figure 2. A raised latrine with the pit mainly above ground

Figure 3. Consider what is wrong with this design

High water table

The same solution can be used where the groundwater is very close to the surface. However, care must be taken when designing the pit lining as very wet soils are much weaker than dry ones.

Elevated houses

In societies where families live in houses built on stilts it is often necessary to construct the latrine superstructure at the same level as the floor of the living area. This is especially true if the area below the house floods. There are two options:

- The pit can be connected to the superstructure by a solid, watertight cylinder (see Figure 4). The cylinder will both carry the weight of the superstructure and store the excreta.

Ken Chatterton © WEDC Loughborough University

Figure 4. An elevated latrine

- Only a shallow pit is required for this design as most of the waste is contained in the raised cylinder, but strong foundations are necessary.

- If water is used for anal cleansing and it is possible to dig a deep pit then the latrine floor can be fitted with a water seal pan and connected to the pit with a long pipe (see Figure 5). With this design an alternative method must be found for supporting the superstructure.

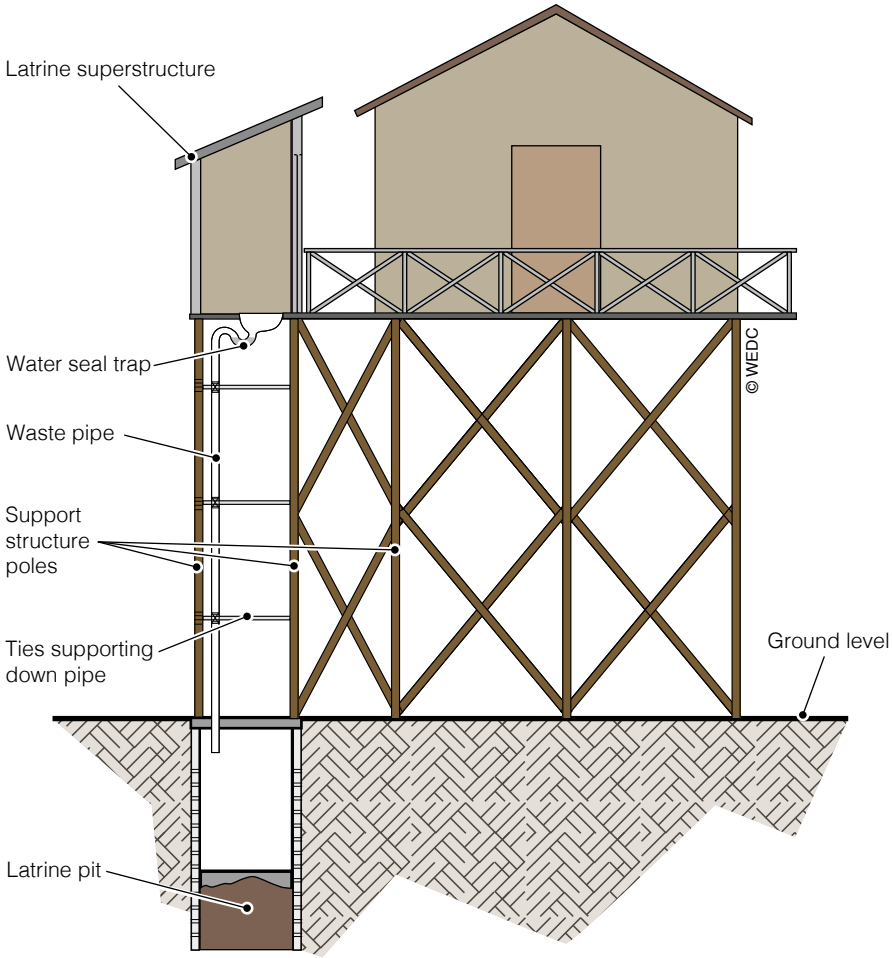

Figure 5. An elevated pour-flush latrine

Cost

Elevated latrines are not cheap. The cost of the latrine may turn out to be more than the cost of the house it serves.

There is no easy answer to this. Sometimes providing sanitation is expensive and even the cheapest options may be beyond the affordability of individual families.

Subsidies may be required to help families attain good sanitation facilities. The alternative is to encourage them to move to where construction costs are lower.

It is possible to build an elevated, pour-flush pit latrine provided there is a period during the year when the ground below the house is dry and the water table is low enough to allow the excavation of the pit.

Construction

While both these approaches can work, construction must be closely supervised to ensure there is no leakage of excreta into the environment.

Cold climates

Sanitation in cold regions poses two problems:

1. People may not wish to visit the latrine if it is some way from the house and is very cold inside.
2. The latrine and its contents may freeze, making it unusable.

A number of solutions to both problems could be considered.

Insulation

Insulating the superstructure so that it retains heat may help. Decomposing excreta gives off a small quantity of heat which may be enough to prevent the latrine from freezing.

Ventilated improved pit latrines VIP latrines are not suitable for use during very cold months as they will circulate cold air which will dissipate heat rising from the pit. (See Guide 27.)

Where VIP latrines are used in warmer months, the pipe should be sealed as cold weather sets in.

Pour flush latrines are best built inside the home as the heat from the rest of the house will prevent the waterseal from freezing. (See Guide 26.)

Keep the connecting pipe as short as possible and make sure there is plenty of distance between the pit contents and the inlet pipe at the start of the winter.

As the contents freeze the raw materials will form a pyramid before the inlet pipe which could become high enough to block the pipe.

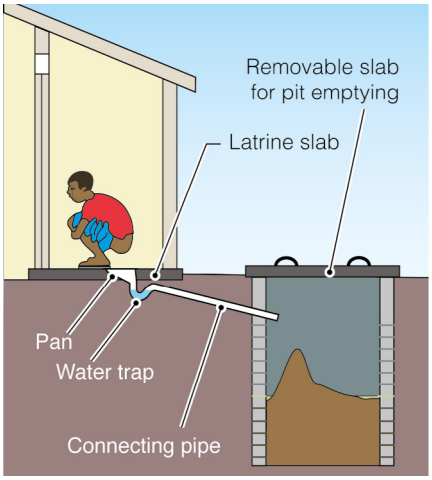

Figure 6. A pour-flush latrine

Non-insulation

If the area has very cold nights but warm days then lightweight superstructures may be better. The latrine will be very cold at night but warm up quickly during the day (Figure 7).

Raised floor slab

Raising the floor slab is particularly important for simple pits. If the temperature drops low enough for long enough, the contents of the pit will freeze. Decomposition will stop and the wastes deposited in the pit will tend to form a pyramid (see Figure 8). Increasing the gap between the pit contents and the floor slab will provide room for the pyramid to grow without causing offence to the user. When the temperature rises the pyramid will defreeze and the contents slump to a more level position.

Sometimes the squatting hole is replaced by a long slot so that the users can change their defecating position as the pyramid grows.

Figure 7. A lightweight structure will warm up quickly during the day

Sludge in cold climates

In cold regions sludge builds up in pit latrines, quicker than in warmer climates:

- Biological processes, which normally reduce the volume of sludge, effectively come to a stop in sub-zero temperatures; restarting in the warmer months.
- Frozen ground is largely impermeable, so liquid from the sludge in the pit is unlikely to soak away in the colder months.
- In very cold conditions, with temperatures less than -10°C, excreta falling into the pit may freeze

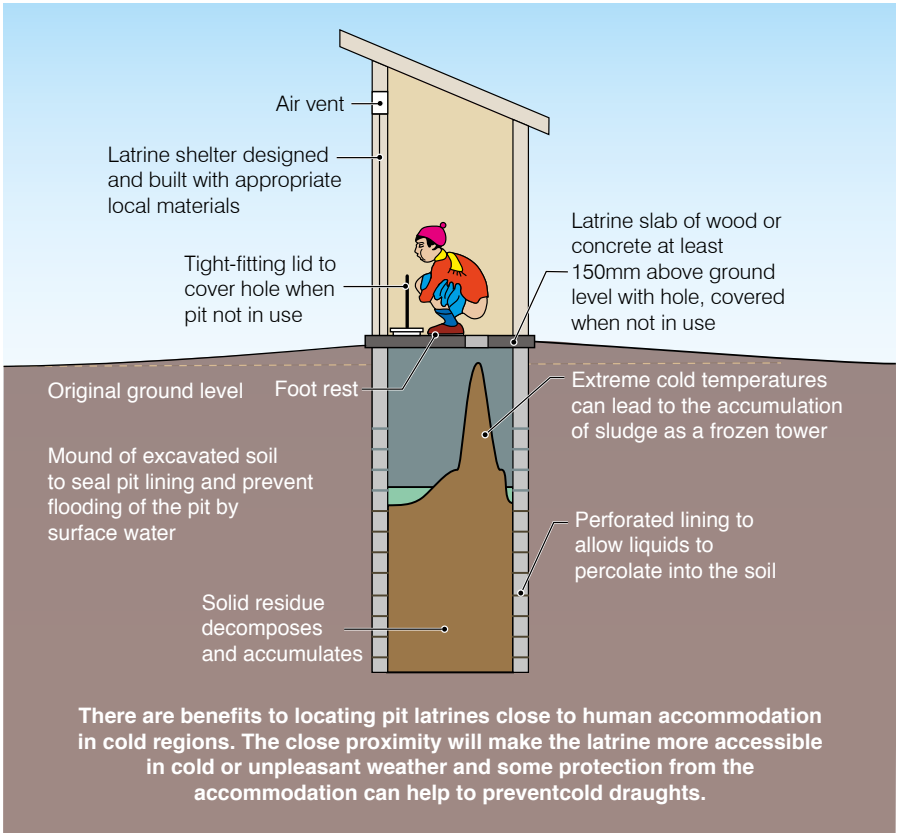

Figure 8. The effect of extreme cold on sludge accumulation

before the pile has time to slump (as noted above). The pit will not be filled efficiently, instead containing a frozen mound of excreta and void spaces.

There are benefits to locating pit latrines close to human accommodation in cold regions. The close proximity will make the latrine more accessible in cold or unpleasant weather and some protection from the accommodation can help to prevent cold draughts.

Building latrines in cold climates

General construction techniques in cold climates can vary significantly from those

used in warmer climates. For example, if concrete is not properly cured at rates suited to cold regions then it can be structurally weak and liable to collapse.

Soil that is hard and structurally sound when cold may go soft as it warms up, causing collapse of latrine pits excavated when the ground was firmer.

If a latrine pit is dug in frozen ground that is likely to thaw, steps should be taken to prevent the latrine slab from falling in. Extra support can be provided for latrine slabs by embedding two parallel sections of iron pipe, planks or poles into the surrounding soil, making sure they protrude at least 1m on either side of the hole. This spreads the load from the latrine slab over a wider area of soil, including more stable ground than that which is close to the pit sides. Better still, ensure the pit is properly lined and the slab fits on top of the lining. Where the soil has been frozen and covered with snow, some aid agencies have successfully used digging machines mounted on the back of snow vehicles to excavate pits. Otherwise normal diggers for construction may be the only option.

For detailed construction details refer to the WEDC publication here:

Out in the Cold: Emergency water supply and sanitation for cold regions

In very cold climates construction work stops during the coldest months.

Hand-washing facilities

If people (especially children) experience discomfort when hand-washing after defecation because the water is very cold, they will be tempted not to wash their hands at all.

Attempts should be made to make hand-washing as pleasant as possible, by:

- periodically pouring hot water into the containers that store water for hand-washing and taking steps to insulate the containers; and
- providing material for people to dry their hands on. Water evaporating from wet hands causes them to feel colder. Disposable paper is the most hygienic method, although a place to dispose of used paper should be provided.

Further information

BUTTLE, M.A. and SMITH, M.D. 2004. *Out in the Cold: Emergency water supply and sanitation for cold regions*. Loughborough, UK: WEDC, Loughborough University.

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