

Simple pit latrines

The simple pit latrine is the cheapest and most basic form of improved sanitation available. It consists of a square, rectangular or circular pit dug into the ground, covered by a hygienic cover slab or floor, with a hole through which excreta fall into the pit. Depending on user preference, a seat or squat hole with footrests can be installed, and a lid supplied to cover the hole. The latrine is covered with a shelter and fitted with a door, and is situated well away from water sources and some distance from the house. The simple pit latrine is most appropriate when water is not used for anal cleansing. An example of a simple pit latrine is shown in Figure 1.

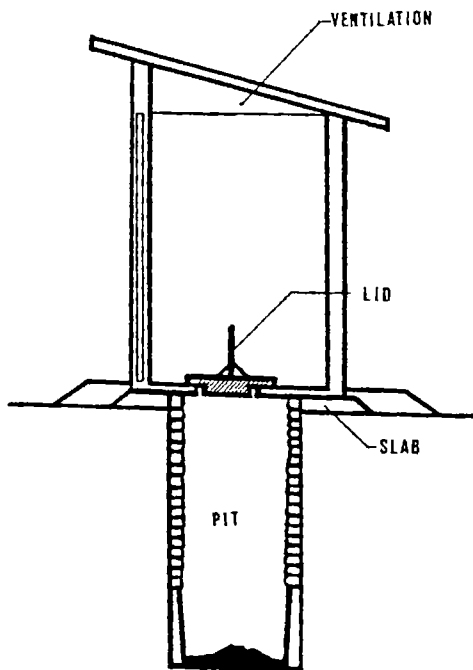


Figure 1. Simple pit latrine

The simple pit latrine has the advantage of being easy and cheap to construct, the slab and shelter can be re-used, and the excreta are isolated. Simple pit latrines can, however, produce unpleasant odours and allow flies to breed easily.

Where to build a pit latrine

It is important to locate a latrine downhill from water sources wherever possible. Pit latrines should not be built uphill of a well, particularly in areas of fissured rock such as limestone, since faecal pollution may be carried directly through cracks and joints in the rock to the well. The latrine pit should not penetrate groundwater and should be at least two metres above the water table. The site should be well drained and above flood level.

Latrines should also be an established minimum safe distance from the nearest water source. This is site specific and should be determined for each water source on the basis of local hydrological and hydrogeological conditions. A distance of 30 metres has been suggested by some workers as standard practice. It is recommended that this figure is taken as a guide to establishing a minimum safe distance in the absence of local information.

The latrine should be a minimum distance of six metres from the house, so that it is easy to reach during bad weather but will not cause problems of odour in the house.

An example of where to locate a simple pit latrine is shown in Figure 2.

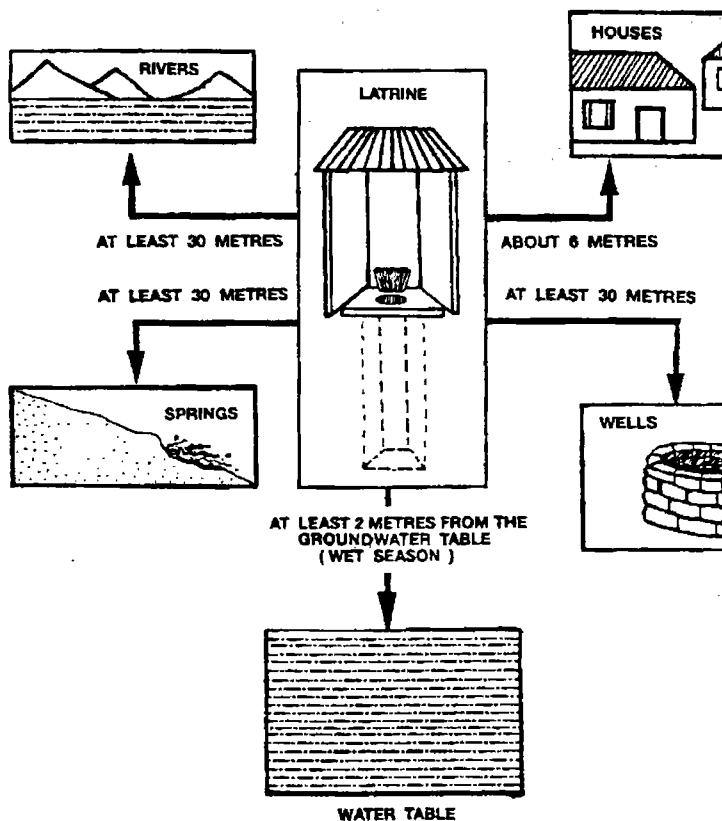


Figure 2. Location of a simple pit latrine

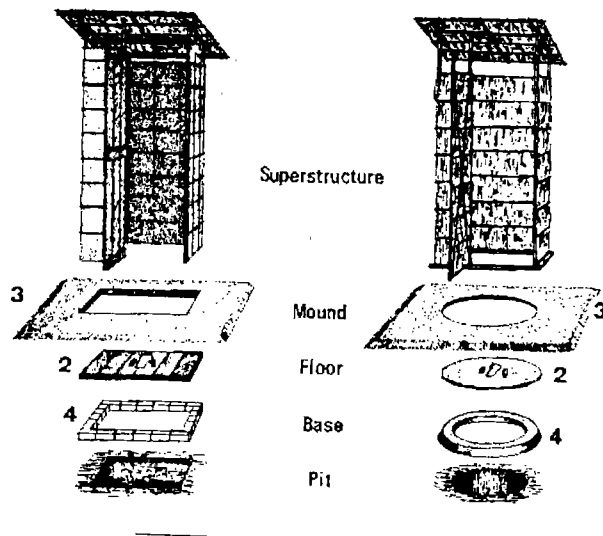
Problems with flies

Flies should be prevented from breeding in the latrine where possible, as they can carry disease from the latrine to food. The common housefly lays its eggs in excreta and also crawls and feeds on the excreta, picking up germs on its body and legs. The germs are then deposited on human food when the fly comes into contact with it. In this way, diarrhoeal diseases may easily be spread from human excreta to food. Once on the food, some germs can grow. In a few hours, one germ can produce many thousands of germs.

Flies are attracted by light and odour, and avoid darkness and dark surfaces. All openings leading to the excreta, including the seat or squat-hole, must be kept clean and closed when not in actual use.

Components of a simple pit latrine

The simple pit latrine has five main components, as shown in Figure 3.



Reproduced from Wagner & Lanoix (1958).

Figure 3. Pit latrine components

Size of the pit

The pit should be as deep as possible, at least 1.5 metres, with vertical sides and 1 to 1.2 metres in diameter. Circular pits have stronger walls than square ones, although they are more difficult to construct. A volume of at least 0.06 cubic metres per person for every year of anticipated life of the latrine is needed. This should not include the top 0.5 metres which will be filled with earth when the pit is full and a new latrine is built.

A greater volume, for example 0.1 cubic metres per person per year, should be allowed where bulky anal cleansing materials such as corn cobs or stones are used. An example illustrating how to calculate the required size of the pit is given in the box below.

Example: A family of six, two adults and four children who build a latrine to last for five years:

Assuming that 0.06 cubic metres is needed per person per year, the volume required will be 5 years \times 0.06 cubic metres \times 6 people
= 1.8 cubic metres.

If the pit is 1 metre wide \times 1 metre long, then a depth of 1.8 metres will be needed to provide this volume.

Adding 0.5 metres to the depth to allow for covering with soil when the pit is full means that the pit will have to be 2.3 metres deep.

Provided that the soil is sufficiently permeable, urine and the liquid part of excreta will seep into the ground through the walls and floor of the pit.

The pit should not be dug down into groundwater, and should be at least two metres above the water table, particularly where groundwater is used for drinking, for instance from wells or springs. This is because of the danger of contamination. If the water table is very high, then the latrine can be built on a mound, as described below.

It may be necessary to provide support to prevent the pit walls from caving in. This is particularly important where latrines are dug in loose, sandy soil or clay soils prone to shrinkage. In stable soil, the top 0.5 metres of the pit should be lined, to support the squatting plate or floor.

Mound-built latrines

The presence of solid rock or a high water table near the ground surface generally prevents the construction of pit latrines. In such circumstances, the latrine can be built on a mound, as shown in Figure 4.

The pit walls need to be built up at least 1.2 metres before the mound is constructed. The pit should be fully lined with stone, brick or concrete masonry and this lining continued above the ground to the top of the mound. Steps should be built up the outside of the mound using cement mortar.

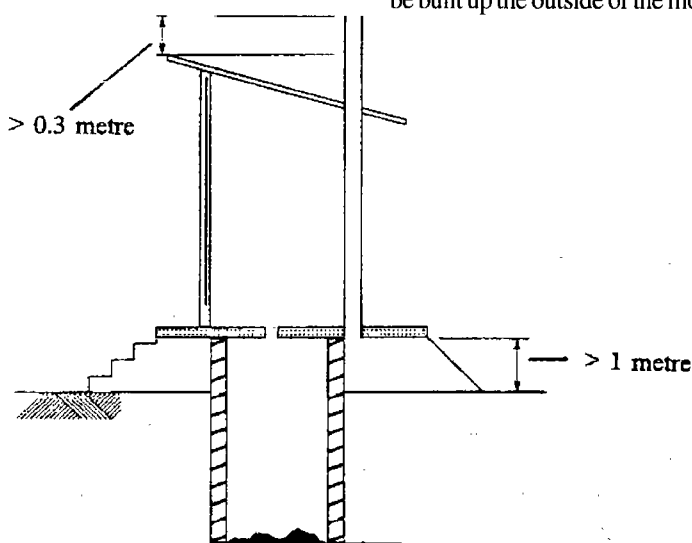


Figure 4. Mound-built latrine

Lining the pit

A wide variety of materials can be used to line the pit, as shown in Figure 5. Examples include concrete blocks, bricks, cement-stabilized soil blocks, masonry, stone rubble, perforated oil drums, and rot-resistant timber. Where blocks, bricks, masonry or stones are used, the lining joints should be fully mortared in the top 0.5 metres of the pit. Below this, the vertical joints should be left unmortared to allow the liquid part of the excreta to infiltrate into the soil.

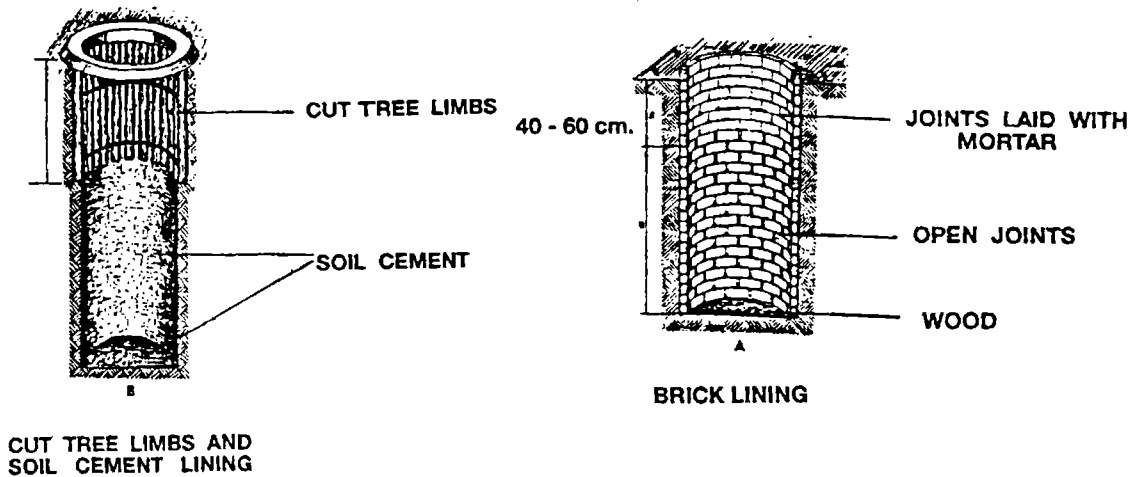


Figure 5. Types of pit linings

The base or foundation

The base or foundation serves as a solid, impervious foundation upon which the floor (or squatting plate) can rest. It prevents the flooding of the pit by surface water and also helps to prevent the escape of hook worm larvae (which climb up the pit walls) and the entrance of burrowing rodents into the pit. The base should be high enough to raise the floor at least 100 to 150 millimetres above the level of the surrounding ground to protect the pit from flooding (see Figure 6). The base or collar may be circular or square.

The following materials may be used to construct the base or collar, depending upon local availability and cost :

- Plain or reinforced pre-cast concrete using a mix of cement : sand : gravel of 1 :2 :4 or 1 :3 :6.
- Brick - dried mud, burned mud, adobe, and so on.
- Rough-cut logs - hardwood and termite resistant.

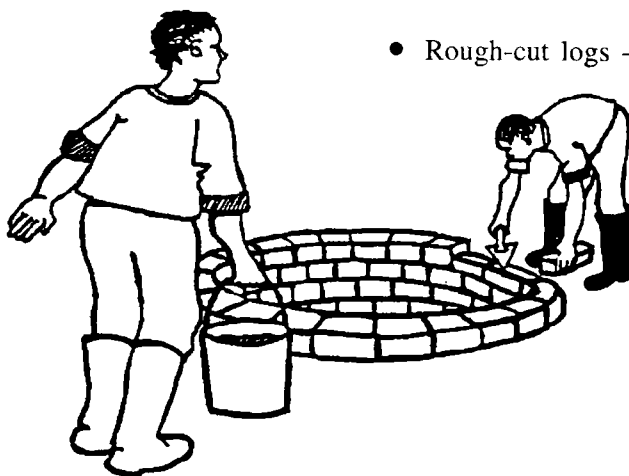


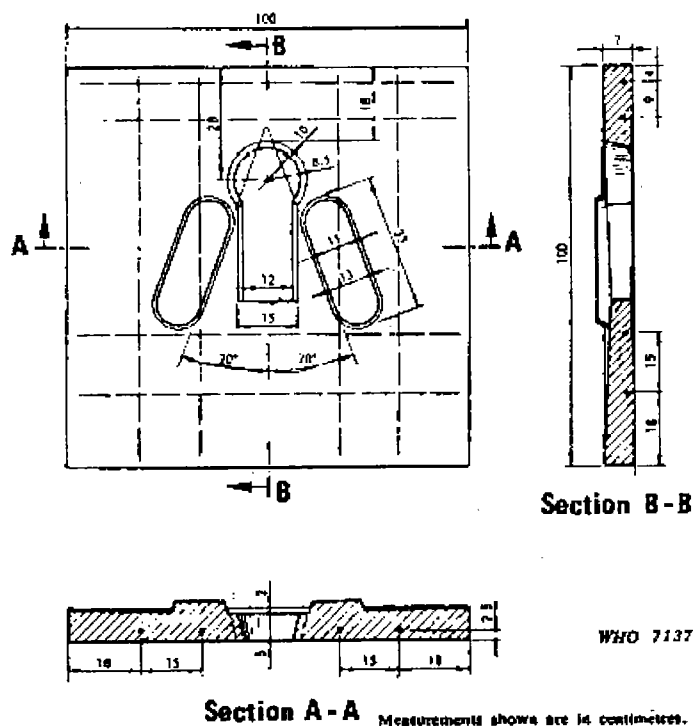
Figure 6. Latrine base or collar

The floor or slab

The floor or slab supports the user and covers the pit. It should fit tightly and be flush with the outer edge of the base. The slab must be larger than the pit and rest firmly on the foundation or base to avoid the danger of collapse.

The floor or slab can be made from reinforced concrete, rot-resistant wood or bamboo covered with a layer of mud and cement mortar. The slab should have a smooth surface and slope towards the squat hole to provide easy drainage for urine and water used for cleaning the floor. A concrete slab is heavy and will need several people to lift it onto the base.

The floor or slab may be of the squatting type or provided with a raised seat. The opening should be no bigger than 250 millimetres, so that it is too small for a young child to fall through. A keyhole shape with foot rests, as shown in Figure 7, is ideal.



• Reproduced from Wagner & Lanoix (1958).

Figure 7. Concrete floor or slab

Instructions for making a simple floor slab are presented below.

To construct a simple reinforced concrete covering slab :

- Dig a square, shallow pit, about 200 millimetres wider and longer than the pit and 50 millimetres deep. Be sure that the bottom of the pit is level and smooth (see Figure 8).

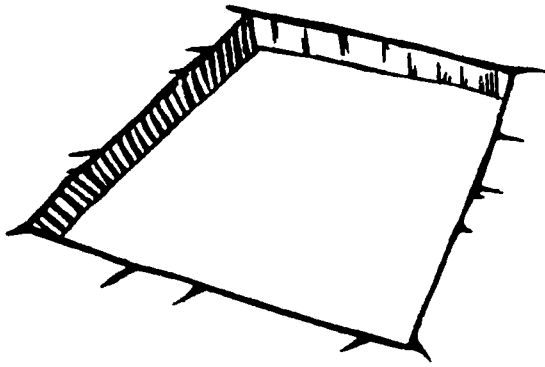


Figure 8. Preparing a pit for cover slab casting

- Make or cut a wire mesh or grid to lie inside the pit. The wires can be 6 to 9 millimetres thick and about 200 millimetres apart (see Figure 9). Cut a hole about 250 millimetres in diameter in the middle of the grid.

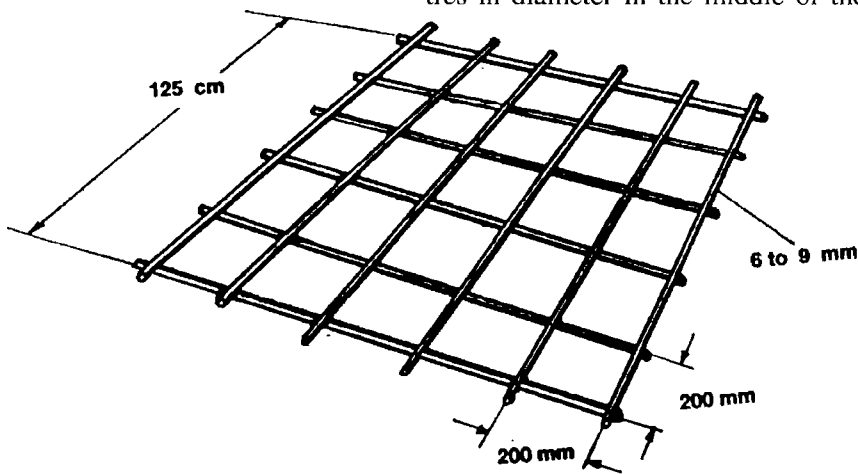


Figure 9. Reinforcement grid

- Put the grid in the pit. Bend the ends of the wires, or put a small stone at each corner, so that the grid stands about 20-30 millimetres off the bottom of the pit (see Figure 10).

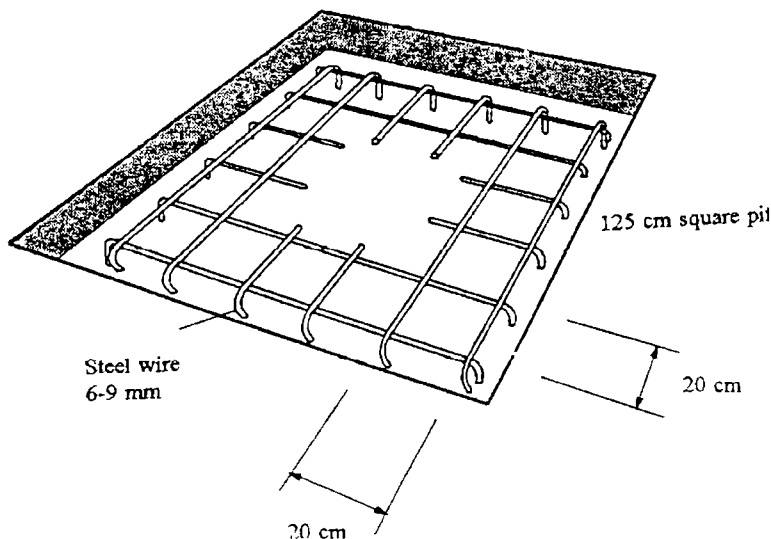


Figure 10. Place grid in pit

Fact Sheet 3.4

- Put an old bucket with a bottom about 200 millimetres across or a template in the shape of a keyhole in the hole in the grid (see Figure 11).

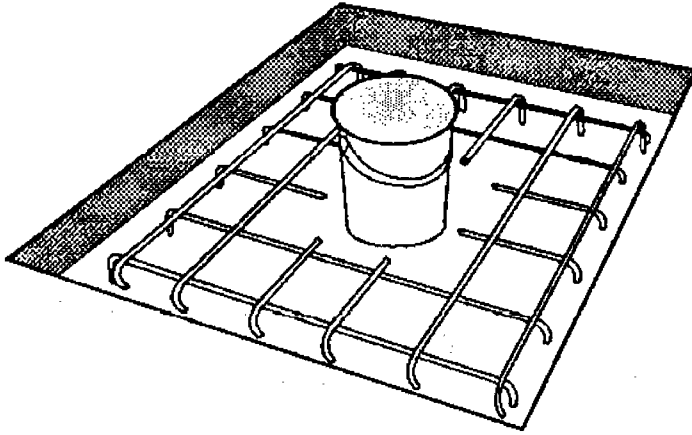


Figure 11. Making a squat hole

- Mix cement with sand, gravel and water (with each shovel of cement, mix 2 shovels of sand and 4 shovels of gravel) mix well and pour it into the pit until it is about 50 millimetres thick (see Figure 12).

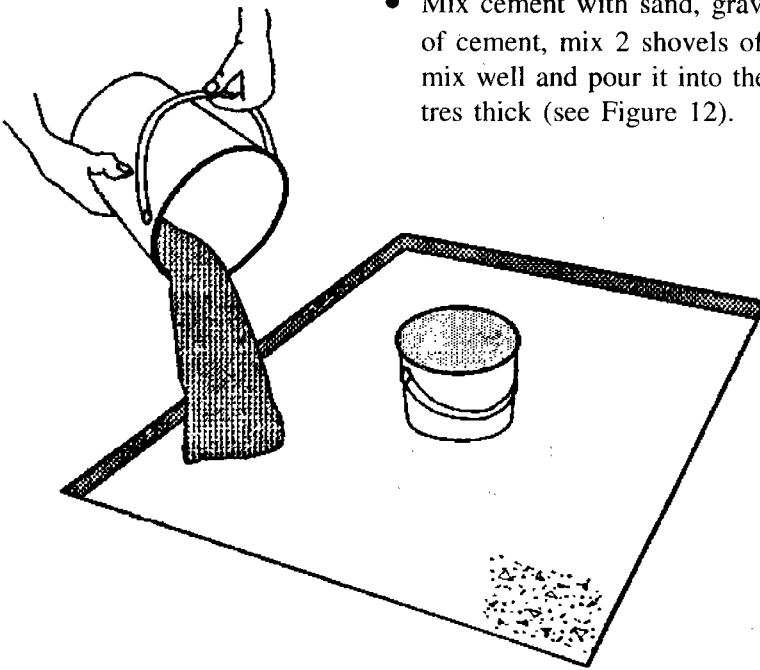


Figure 12. Laying the slab

- Remove the bucket when the cement is beginning to harden (after about three hours). Then cover the cement with damp cloths, cement bags, sand, hay or a sheet of plastic and keep it damp. It is important that the cement is kept damp for five days to reach its full strength. Remove the slab after five days.

In some countries, a seat is more acceptable than a squatting plate. The seat can be made from concrete blocks or bricks, or wood.

The lid

For simple pit latrines it is important to use a lid to cover the squat-hole or seat of the latrine. The lid keeps light out of the pit and helps to stop flies and odours entering the latrine. The lid is usually made from wood, as shown in Figure 13.

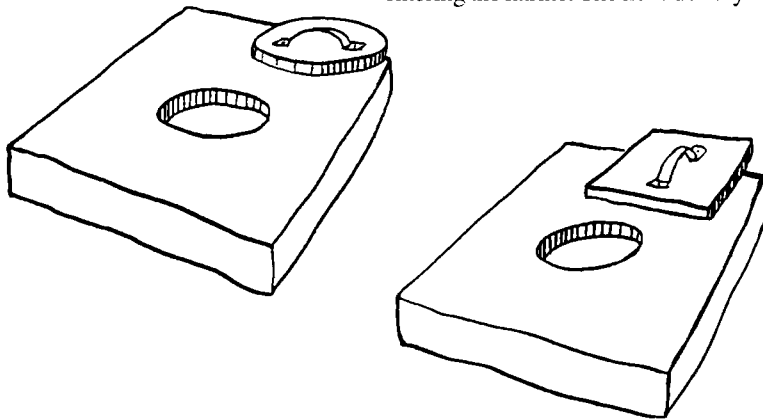


Figure 13. Latrine pit lids

The mound

The function of the mound is to protect the pit and base from surface water run-off which otherwise might enter and destroy the pit. It should be built up to the level of the floor and be well tamped. It should extend at least 0.5 metres beyond the base on all sides. In exceptional cases, the mound may be built up considerably above the ground for protection against tides and flood waters.

The mound will normally be built with the earth excavated from the pit or surrounding area, and may be consolidated with a stone facing to prevent it from being washed away by heavy rains. In front of the entrance door, it is a good idea to supplement the mound with a masonry or brick-built step to add extra protection against wear.

The shelter

The shelter is for privacy and protects the user and the latrine from the weather. The shelter can be made from any suitable materials. Figure 14 shows one type of shelter.

The shelter is placed on the base of the latrine. The shelter should be high enough for comfort. The height will depend on the users of the latrine. Openings of 100 to 150 millimetres width should be provided at the top of the shelter walls for constant ventilation.

The roof should cover the shelter completely and have a large overhang to protect the mound and the walls from rain or roof drainage.

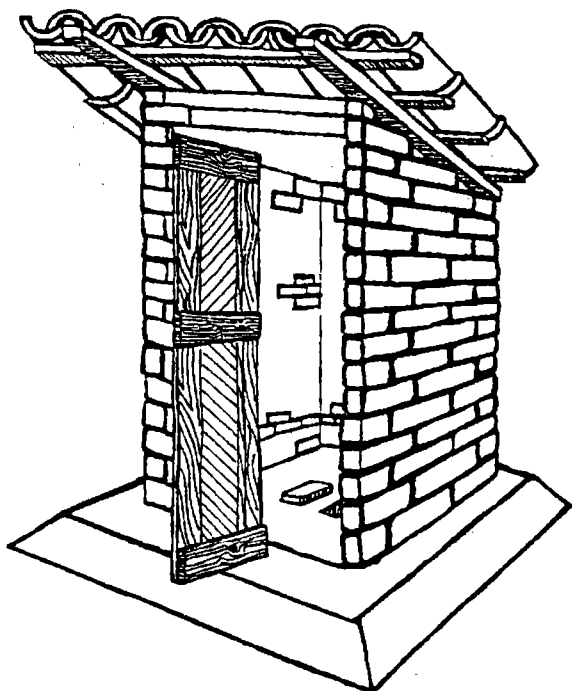


Figure 14. Example of shelter

Routine maintenance

- Any grass or plants growing around the latrine should be kept well cut.
- Make sure that the door is kept closed.
- Keep the latrine floor clean by cleaning daily using water or ashes.
- Do not deposit tins, glass or plastic inside the pit.
- Household waste, such as vegetable or fruit peel, and organic matter, such as sawdust and leaves, may be placed in the latrine and can help to reduce odours, but will decrease the life of the pit.
- When the contents reach a level of 0.5 metres from the surface, then the contents of the pit should be covered over with soil and a new pit should be dug.
- During an epidemic, the floor of the latrine should be cleaned daily with a disinfectant such as bleach (sodium hypochlorite).
- To stop mosquitoes breeding in pits, pits should be kept as dry as possible. If too much water enters, ashes or dry horse or cow dung thrown in helps to absorb water and odours.
- No disinfectant should be added to the pit.

Upgrading of existing simple pit latrines

The simple pit latrine is a common excreta disposal system used in many countries. Some are pleasant to use and contribute to the protection of public health. Others are less pleasant - particularly because of the odour - and may present a risk to public health, particularly if flies can enter and leave the pit. Upgrading simple pit latrines is straightforward and results in a more hygienic and pleasant latrine.

Common problems with simple pit latrines include the following :

- The pit is shallow and the shelter allows light into the pit, which attracts flies.
- The pit is unlined and built in unstable soils.
- The floor does not drain properly and is not smooth, so it does not facilitate cleaning.
- Lack of a lid or an ill-fitting lid which is not always immediately replaced after use.
- No ventilation pipe to carry odours away.

Important points to consider when deciding whether to upgrade a traditional pit latrine include the following :

- Relative cost compared to building a new latrine.
- Remaining useful life of the latrine pit.
- Structural soundness of the pit.
- User acceptability of upgraded design.

In general, a latrine should only be upgraded if it has at least three years of useful life left, otherwise a new latrine should be built.

Upgrading a simple pit latrine to a VIP latrine

For fly control and to improve odour problems, a ventilation pipe can be installed. This converts the simple pit latrine to a VIP latrine (see Fact Sheet 3.5).

The minimum diameter of the ventilation pipe is 100 millimetres and the most convenient pipe to use is PVC. Other materials may be used, such as bamboo, fibre-cement or a square chimney made from bricks (internal diameter of 225 millimetres / 225 millimetres).

It is important that the vent pipe extends at least 0.5 metres above the peak of the roof. This will draw air up the vent pipe and carry odours away. The latrine

should be well away from tall buildings and trees to ensure that ventilation works efficiently. Ideally, the door of the latrine will face into the prevailing wind. The VIP latrine should not have a lid over the squat hole, which must be left open to allow air to flow into the pit.

The end of the vent pipe above the shelter roof needs to be covered with a fly screen. This can be made from aluminium or stainless steel or PVC-coated fibreglass. Other materials will corrode quickly. Flies are controlled by ensuring that the interior of the latrine is semi-dark, thus the main light entering the pit comes from the vent pipe. Flies are attracted up the vent pipe and are caught on the fly-screen and die.

Earthen floors can be improved by plastering them with a thin layer of cement to make them harder and smoother. In some areas, clay is mixed with other materials, for instance cow dung, to make a hard plaster finish for the floor. Alternatively, earthen floors may be replaced by a new reinforced concrete slab which incorporates a hole for the ventilation pipe and has foot rests either side of the drop hole. This would require the complete dismantling of the latrine and in these circumstances it may be better to build a new latrine.