About WEDC

The Water, Engineering and Development Centre is one of the world’s leading education and research institutes for developing knowledge and capacity in water and sanitation for sustainable development and emergency relief.

We are committed to the provision of effective, evidence-based and appropriate solutions for the improvement of basic infrastructure and essential services for people living in low- and middle-income countries. With over 45 years of experience, we offer expert advice and quality learning opportunities for sector professionals.

Founded in 1971, WEDC is based in the School of Civil and Building Engineering at Loughborough University, one of the top UK universities. Being a part of a leading university gives us a recognised platform of independence and quality.

What makes us stand out from the crowd is our outreach to practitioners. We use our knowledge base and our applied research work to develop the capacity of individuals and organizations throughout the world, promoting the integration of social, technical, economic, institutional and environmental activities as foundations for sustainable development.

Visit our website to find out more about our postgraduate and professional development programmes (MSc, Diplomas and postgraduate certificates available at the University or by distance learning); our research; our advisory services; our international conferences; and our extensive range of information resources which are free to download from our knowledge base.

http://wedc.lboro.ac.uk

---

Simple pit latrines

Pit latrines are one of the oldest forms of formal sanitation in the world and for many they are still the best. Pit latrines are simple to build and can be constructed using local materials and technologies. Compared with other forms of sanitation they are relatively cheap, easy to operate and maintain and, if properly used, help prevent the spread of excreta-related diseases. For most low-income communities in the developing world, the pit latrine in one form or another will be the most appropriate means of excreta disposal.

Contents

How do pit latrines work? .........................1
Simple pit latrines ...............................1
Components ......................................3
The mound .....................................5
The toilet building .............................5
Problems with simple pit latrines ..........6

This guide describes how pit latrines work and the components of pit latrines. It also examines some of the main problems that can arise with this simple form of sanitation.

http://wedc.lboro.ac.uk/knowledge
Learn with WEDC

Learn with one of the top, award-winning universities of excellence in the UK and partake in a quality learning experience.

Gain a recognised, respected, independent and validated qualification.

WEDC offers you a wide variety of learning opportunities in all aspects of water and environmental management, water and waste engineering and infrastructure in emergencies.

You can learn in different ways and at different levels. Come to WEDC or study at home or at your place of work.

Choose from one of our postgraduate programmes and study towards a Postgraduate Certificate, Diploma or Master of Science (MSc). Study by research towards a PhD.

Alternatively, tailor-make a programme from our wide range of stand-alone modules to suit your particular professional development requirements.

Or you may prefer to invite us to collaborate with you to devise a programme especially for your staff.

Go straight to details about one of our learning opportunities.

Postgraduate programmes

- Infrastructure in Emergencies
- Water and Environmental Management
- Water and Waste Engineering

Other courses and programmes

- Special courses for groups
- Professional development
- PhDs
- Online courses

Learn with WEDC

Learn with one of the top, award-winning universities of excellence in the UK and partake in a quality learning experience.

Gain a recognised, respected, independent and validated qualification.

WEDC offers you a wide variety of learning opportunities in all aspects of water and environmental management, water and waste engineering and infrastructure in emergencies.

You can learn in different ways and at different levels. Come to WEDC or study at home or at your place of work.

Choose from one of our postgraduate programmes and study towards a Postgraduate Certificate, Diploma or Master of Science (MSc). Study by research towards a PhD.

Alternatively, tailor-make a programme from our wide range of stand-alone modules to suit your particular professional development requirements.

Or you may prefer to invite us to collaborate with you to devise a programme especially for your staff.

Go straight to details about one of our learning opportunities.
How do pit latrines work?
There are a number of different designs of pit latrine (sometimes called pit privies) but they all work in a similar way. Excreta, anal cleansing material and sometimes sullage, and/or refuse fall into a hole in the ground where:

- faeces and other organic material decompose through bacterial action, fungal attack and consumption by other organisms. The decomposition process may take place in the presence of oxygen (aerobic) or without oxygen (anaerobic). In most pits fresh excreta is initially decomposed aerobically but as it is covered by new layers of excreta conditions rapidly turn anaerobic;

- gases such as ammonia, methane, carbon dioxide and nitrogen are produced and released into the atmosphere where they either escape through the top of the pit or are absorbed into the surrounding soil;

- urine, other liquids and soluble material leach into the surrounding soil;

- pathogens (organisms that may cause disease) are destroyed because conditions in the pit are not suitable for their survival; and

- the residual material is compressed and compacted and slowly fills the pit.

Simple pit latrines
The simple pit latrine is the most basic type which is essentially a large hole in the ground covered by a platform in which there is a hole through which the user excretes. The platform is surrounded by a screen to provide privacy and, shelter from the weather.
Figure 2. A simple pit latrine

Pit
Latrine slab of wood or concrete at least 150mm above ground level, with a hole which is covered when not in use

Mound of excavated soil to seal pit lining and prevent flooding of the pit by surface water

Foot rest

Tight-fitting lid

Air vent

Perforated lining to allow liquids to percolate into the soil

Gases escape into the atmosphere

Solid residue accumulates and decomposes

The pit should be at least 2.0m deep and 1.0 to 1.5m in diameter

The bottom of the pit should be at least 1.5m above the water table especially where groundwater is used for water supplies

Figure 7. A simple pit latrine superstructure situated over a concrete slab

Cleanliness and health

Even a well-constructed latrine can spread disease unless it is kept clean.

The excreta of small children should be cleared up and put in a pit latrine until they can use the latrine properly themselves. Children’s excreta are very infectious.

Everyone should wash their hands thoroughly with soap after using the latrine.
Problems with simple pit latrines

Pit latrines are still used widely around the world despite the fact that many politicians and engineers disapprove of them, preferring more expensive high technology options such as sewers. For many of the world’s rural and urban poor they will remain the most appropriate sanitation option for many years to come. In some places, however, simple pits have a bad reputation due to:

- poor design and construction and inappropriate materials causing pits to collapse before they are full;
- bad odours;
- nuisance from flies and mosquitoes (and sometimes cockroaches);
- lack of privacy, especially for women, because simple pits have to be constructed away from the house;
- difficulty in digging large pits because of poor ground conditions; and
- difficulty with emptying pits once they are full.

Often these problems can be overcome with good design, construction and operation but sometimes they cannot. For situations such as these and where the community no longer has the confidence to use simple pits, other solutions must be sought.

Other types of pit latrines such as borehole latrines, pour-flush latrines and ventilated latrines are discussed in subsequent guides.

Components

The pit

The larger the pit, the longer it will take to fill up. The size of pits varies widely around the world. In some areas the pits are only a metre deep. These tend to fill very quickly and are usually only of a temporary nature. In other places the pit may be 10 to 15m deep and take a long time to fill. The plan size of the pit (the size looking down on the hole from above) also varies. Some are less than 0.5m wide whilst others are 2 to 3m wide. Typically pits are 2.5 to 4m deep and 1 to 1.5m wide.

There are a number of factors affecting the time taken to fill a pit. As a general rule, a pit 3m deep and 1.5m square will last a family of six about 15 years. A pit is considered full when the contents are within 0.5m of the surface. The shape of the pit is not too important. Normally they are rectangular, square or circular.

The lining

The sides of holes in the ground may collapse if not supported. Soils close to the surface are particularly vulnerable because they are much looser than deeper soils. In fact, one of the main causes of pit latrine failure is the collapse of the soil close to the surface causing the platform to fall into the pit. It is important, therefore, that soils liable to collapse are supported by a lining. The top metre of a pit must always be lined, but the decision as to whether to line the rest will depend on local soil conditions.

The cover slab

A slab is necessary to cover the pit and to provide a place for the user to excrete. For the user, this is probably the most important part of the pit latrine and therefore great care should be taken over its design and construction. The slab is placed directly on top of the pit lining about 15cm above the surrounding ground level. It is elevated above the surrounding ground to prevent surface water from entering the pit.

If surface water entered the pit it could erode its walls and fill the pit with water. Should this happen, it would overflow, carrying the pit contents to surrounding areas.

The slab is commonly flat with a hole near the centre. The hole is provided with a lid for safety (to stop young children accidentally falling into the pit), to reduce odour and to help prevent flies from breeding in the pit. Flies and smell tend to be more of a problem in shallow pits containing water than deep ones that are dry. If a household cannot afford a cover slab, a smaller, concrete sanitary platform (a SanPlat) can be used over a platform made from logs and compacted mud. This will offer some of the benefits of a concrete slab covering the entire hole.

Sometimes a seat (or pedestal) is provided.

The design of a simple reinforced concrete slab is a basic structural problem for an engineer, but when that slab forms a critical part of a latrine, the design criteria

Figure 6. Four men test the strength of a latrine slab

Hole covers

Covers for the hole in the slab when the latrine is not in use helps to reduce odour and keeps flies away from the latrine.
widen to include issues of economics, maintenance, sustainability, health, gender, culture, and user preference as well as construction factors. Size, shape and surface finish need to be considered alongside strength. Defecation is often a private activity and subject to cultural constraints. Being able to go to the toilet in a pleasant, private and clean location is valued by many societies and so the slab needs to meet the user’s needs and preferences. It should be strong and offer a secure platform over the vault. The strength of a slab can be tested by four people standing on it (see Figure 5). If it holds steady, it can be put in place.

People will want to be able to use the latrine without getting their feet wet or their clothes dirty, so the slab should be able to be cleaned easily.

People will want to be sure that the slab will not break or tip, causing them to fall into the vault. They should also be able to use the latrine without tripping or slipping. Discouraging snakes, spiders and scorpions is another health and safety issue.

**The mound**

The cover slab is surrounded by a mound of soil. This is to seal the space between the lining, the cover slab and the ground. It can also prevent any rainwater from the roof of the toilet building entering the pit.

The mound is usually made from the soil excavated from the pit.

**The toilet building**

The toilet building (or ‘superstructure’) is primarily constructed to provide privacy for the users. It could be made of bricks and mortar with a solid roof and a window or just a few pieces of cloth fastened to a few sticks of wood. In some communities buildings are not constructed at all. The design of the building can be adapted to suit the requirements of the user.