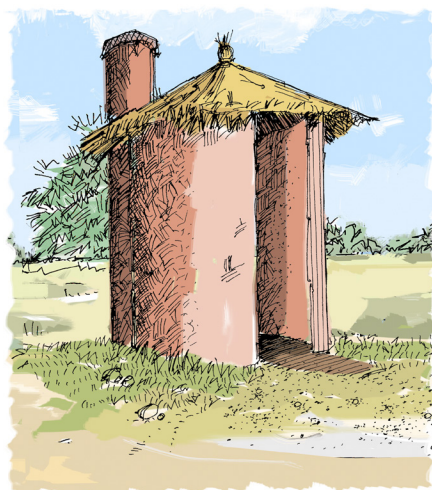


Ventilated improved pit (VIP) latrines

The addition of a vent pipe to a simple pit latrine is one way of reducing the nuisance of flies in the cubicle if the cubicle is kept clean and dark. This type of latrine is called a ventilated improved pit (VIP) latrine. There are a number of designs to suit different situations but they all work in much the same way. This guide describes how they work and presents various designs and design details.

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Although the main focus of this guide is on the use of ventilated improved pit latrines, many of its recommendations will be relevant to other types of latrines too.

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Why build a VIP latrine?

VIP latrines effectively control odour and flies while still allowing users to clean themselves with hard materials such as newspaper and leaves which may not be suitable for use with a pour-flush latrine. A squatting plate or a pedestal can be installed. (See Figure 1 and inset.)

How a VIP latrine works

Wind blowing over the top of the ventilation pipe causes air in the pipe to rise. Replacement fresh air is drawn into the pit through the superstructure and down the toilet hole. This flow of fresh air keeps the superstructure free of odours. When there is no wind, air in the vent pipe will continue to move upwards, if the pipe is being heated by the sun.

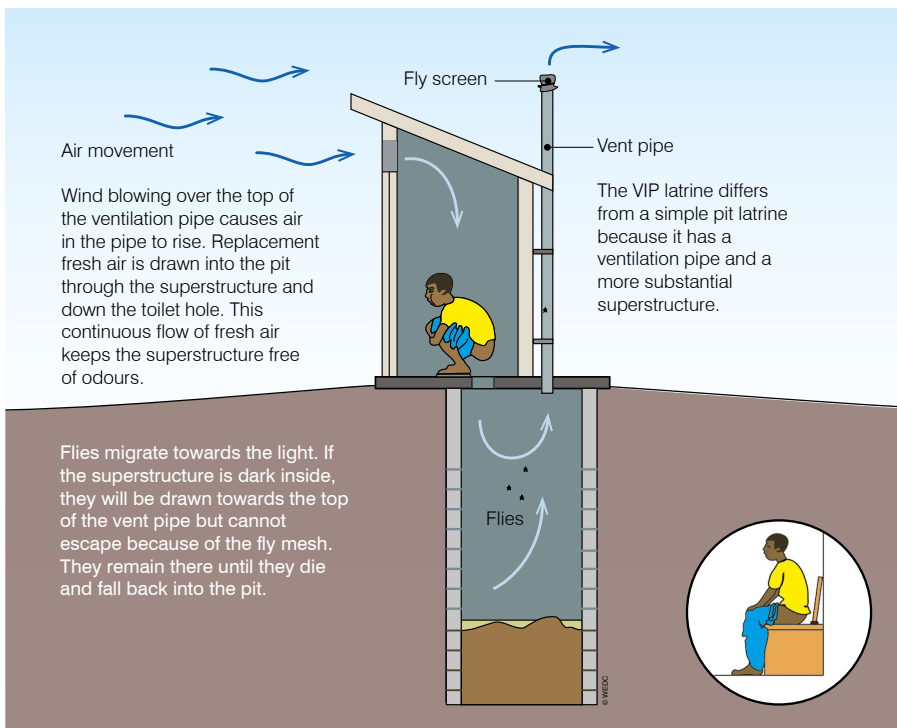


Figure 1. A ventilated improved pit latrine

Controlling flies

As well as odours, flies are also controlled by the vent pipe when:

- the top of the ventilation pipe is covered with fly screen preventing flies entering or leaving the pit via the pipe;
- the superstructure is kept dark at all times; and
- the ventilation pipe is straight.

The last two factors work together to prevent any flies that may have entered the pit from leaving through the superstructure. Flies tend to migrate towards the light so any in the pit will

only see light at the top of the ventilation pipe if the superstructure is in darkness. They will be drawn towards the top of the pipe but cannot escape because of the fly screen. They remain there until they die and fall back into the pit.

Spiral VIP latrines

VIP latrines work in part because they are dark inside. Keeping a conventional latrine superstructure permanently dark can be very difficult, particularly if it is used by children.

Children and casual users may be unaware of the need for darkness inside

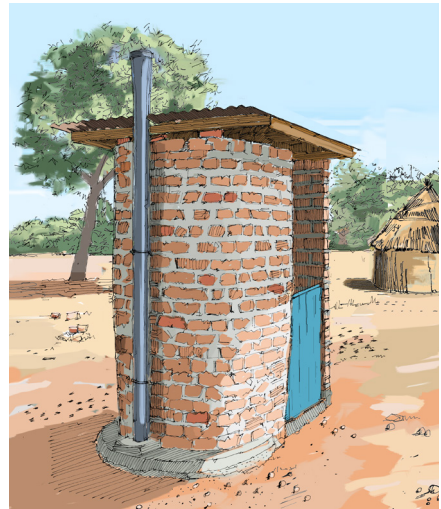


Figure 2. Original spiral designs had no door to maximise the air flow throughout the latrine (a). However, many users were concerned about privacy and safety so half doors have been added still allowing a sufficient flow of air whilst controlling access to other users and animals (b). Figure 3 shows the internal layouts of typical spiral designs.

and may leave the door open. One way of overcoming this is to build the superstructure in the form of a spiral (Figures 2a and 2b).

Where users are concerned about privacy or safety, a half-height door can be added to the spiral (Figure 2b). This allows air and light to enter the superstructure. Although the interior has to be dark, there needs to be sufficient light reflected around the walls of the spiral to allow users to see what they are doing.

Disadvantages of VIP latrines

Besides the higher cost, the complex design and construction of a VIP latrine can also be a disadvantage. It is essential that a VIP latrine is installed correctly for proper operation. This is not always obvious to potential users who may wish to cut costs and so compromise the design. VIP latrines have to be dark to work effectively, yet children (and some adults) may be afraid – not only because of the darkness – but because they may not be able to see if vectors such as rats, snakes or scorpions are hiding in the latrine. This can lead to a tendency amongst users to make the latrine more user-friendly by allowing additional light into the superstructure. This may mean that the latrine will not function correctly.

Although VIP latrines can control flies, they do not control the breeding of mosquitoes which is also a disadvantage.

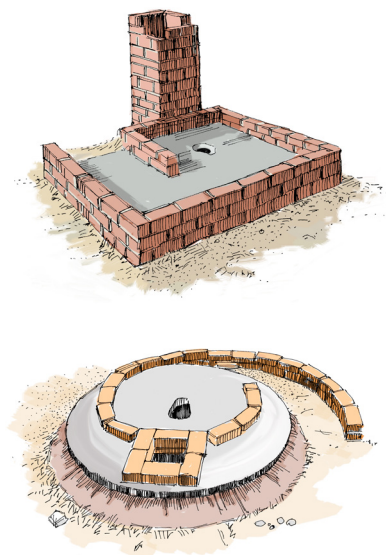


Figure 3. Spiral latrines under construction showing internal layouts

Maintaining the flow of air

The flow of air can only be maintained if:

- the toilet hole is kept permanently open so that the air flow is continuous;
- the superstructure has ventilation holes to let in fresh air;
- the ventilation pipe is of a large enough diameter to allow the free passage of the air (at least 150mm diameter if the inside of the pipe is smooth or else 200-250mm diameter); and
- the top of the ventilation pipe is unobstructed and at least 0.5m higher than any of the surrounding buildings.

Warning!

The ventilation system usually works well if the ventilation pipe is unobstructed. However, under certain climatic conditions such as cold mornings when there is no wind, it is possible for the air to flow in the opposite direction drawing odours into the superstructure!

This last requirement makes the latrine more suited to low density areas rather than urban areas.

Offset latrines

The pit can be emptied more easily when the superstructure is offset from the pit. With the vent pipe removed, the hose of a suction tanker can be lowered through the hole provided for the pipe.

Materials for vent pipes

PVC and uPVC pipes

PVC and uPVC pipes should preferably have a stabilizer to prevent damage by ultraviolet light. The minimum recommended internal diameter is 150mm.

Brickwork or blockwork

Vent pipes can also be constructed using brickwork or blockwork (see right).

The vent can be built as an extension of the superstructure (Figure 4a) or it can be built internally (Figure 4b). Internal vents must be designed so as not to obstruct the user. The minimum internal size is 200mm square or diameter.

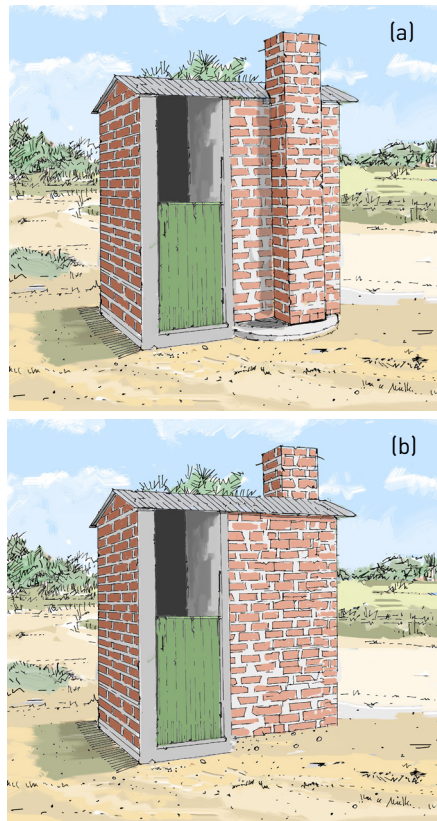


Figure 4. External and internal vent pipes built as part of a spiral VIP design

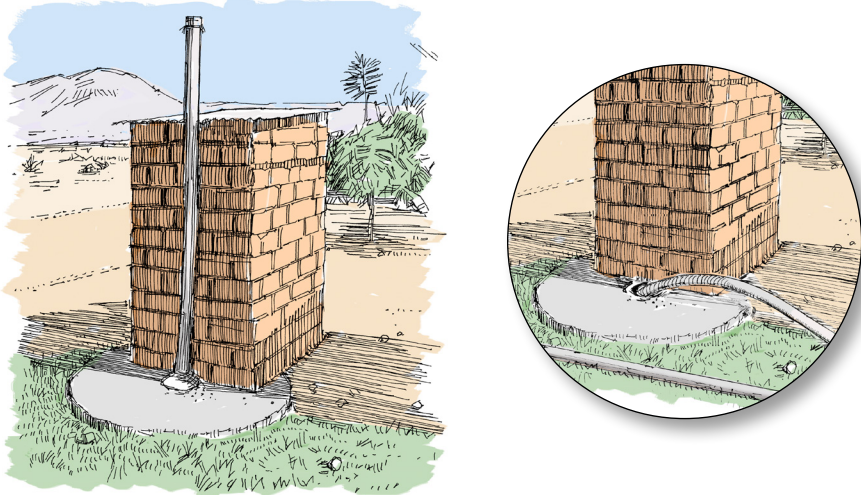


Figure 5. An offset VIP latrine (left) with the vent pipe removed to provide easy access to the pit (right). A suction hose attached to a tanker can be used to empty the pit contents.



Figure 6. A VIP latrine under construction

Locally-made vent pipes

Vent pipes can be made using materials that are available locally, such as plastered sackcloth on steel mesh, plastered matting and even anthill soil.

Their minimum internal diameter should be 200mm.

The fly screen

Size of the mesh

The best size of mesh is 1.5 mm x 1.2 mm. Larger holes allow flies to get through. Smaller holes restrict the airflow (Figure 7).

The best material for fly netting is PVC-coated glass fibre, which lasts more than five years.

Cheaper material may fail because of corrosion or attacks by birds and small animals. Stainless steel lasts longer but is very expensive.

Fixing fly screens

For brick or block pipes, either build the fly screen into the brickwork or blockwork (Figure 8) or attach with pieces of wood.

For PVC pipes, sandpaper the top of the pipe so there are no sharp edges that will cut the netting. Fix the flyproof netting to the pipe with glue or tie around with galvanized wire or nylon string (Figure 9a). An alternative is to make a 'collar' from a cut section of pipe and 'snap' this over the mesh (Figure 9b).

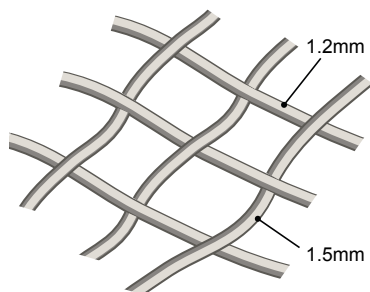


Figure 7. Size of the mesh

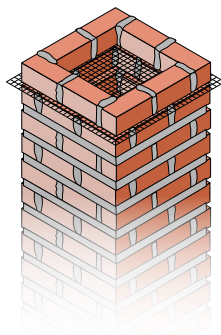


Figure 8. Fly screen netting with vent pipe made of brickwork

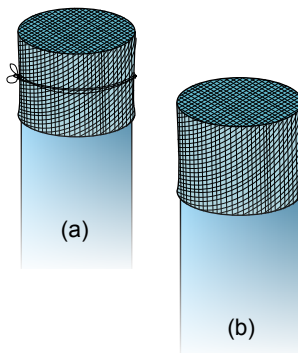
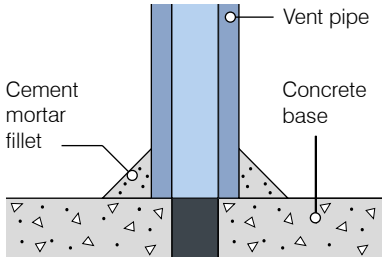


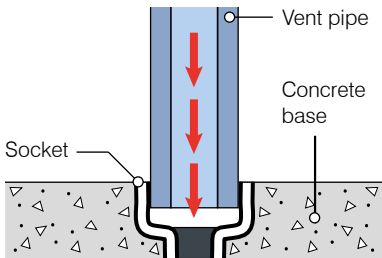
Figure 9. Fly screen netting on a PVC pipe

Fitting vent pipes

The bottom of the vent pipe should be securely fixed into a hole in the pit cover slab.



A PVC cement pipe can be sealed into the pit cover slab.



The pipe should be attached to the wall of the superstructure with steel straps or galvanised steel wire.

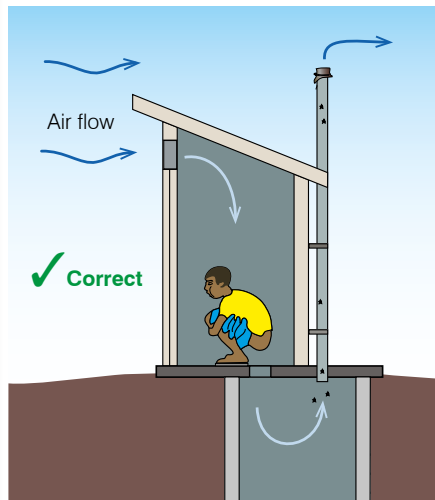
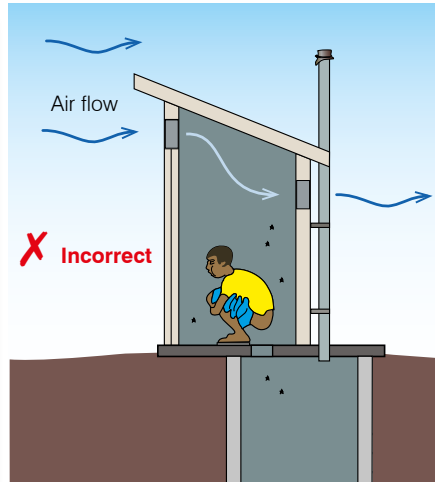
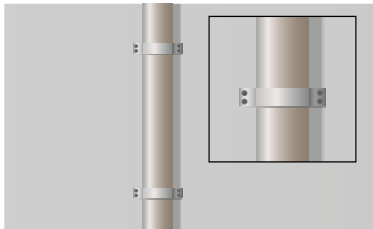


Figure 10. Incorrect and correct ways of venting a VIP latrine fitted with a door

Inspection and maintenance

Inspect the fly screen regularly, at intervals of six months or less.

Clear any debris from the screen, for example by pouring a bucket of water down the pipe; this will also wash spiders and spiderwebs into the pit.

Check the fixtures of the vent pipe to the structure and repair or replace if damaged.

Make sure the vent pipe does not have any cracks, holes or other damage and is firmly fixed to the pit cover slab.

Placement of the latrine

Ventilation of a VIP latrine is most effective when the entry is facing the direction of the prevailing wind. A vent pipe painted in a dark colour will attract the heat from the sun more effectively than a white or light coloured pipe. Heat will encourage the flow of air through the vent.

Twin pit VIP latrines

In situations where it is not possible to dig a deep pit (i.e. close to the surface or a high water table) then two pits can be built (Figure 11).

Two pits, each about one cubic metre are dug side by side. All the walls are porous

below 0.5m except the dividing wall which is sealed. The pits are covered with four slabs. The outer two slabs have handles to help with their removal.

The other two each contain two holes; one for the toilet and the other for a vent pipe. The two centre slabs are enclosed in a superstructure.

Operation of a twin pit latrine

- The two holes over one of the pits are covered.
- The ventilation pipe and toilet pedestal (where covered) are attached to the other two holes.
- Use the latrine as normal.
- When the first pit is full, transfer the ventilation pipe and pedestal to the second pit and cover the holes to the first one.
- Use the latrine as normal.
- When the second pit is full, empty the first pit, transfer the ventilation pipe and pedestal and use the first pit again.

Experience has shown that communities are unwilling to accept the technology until they have seen for themselves how the pits are emptied and the condition of the decomposed pit contents as it is removed. In some circumstances, however, they are the only viable option.

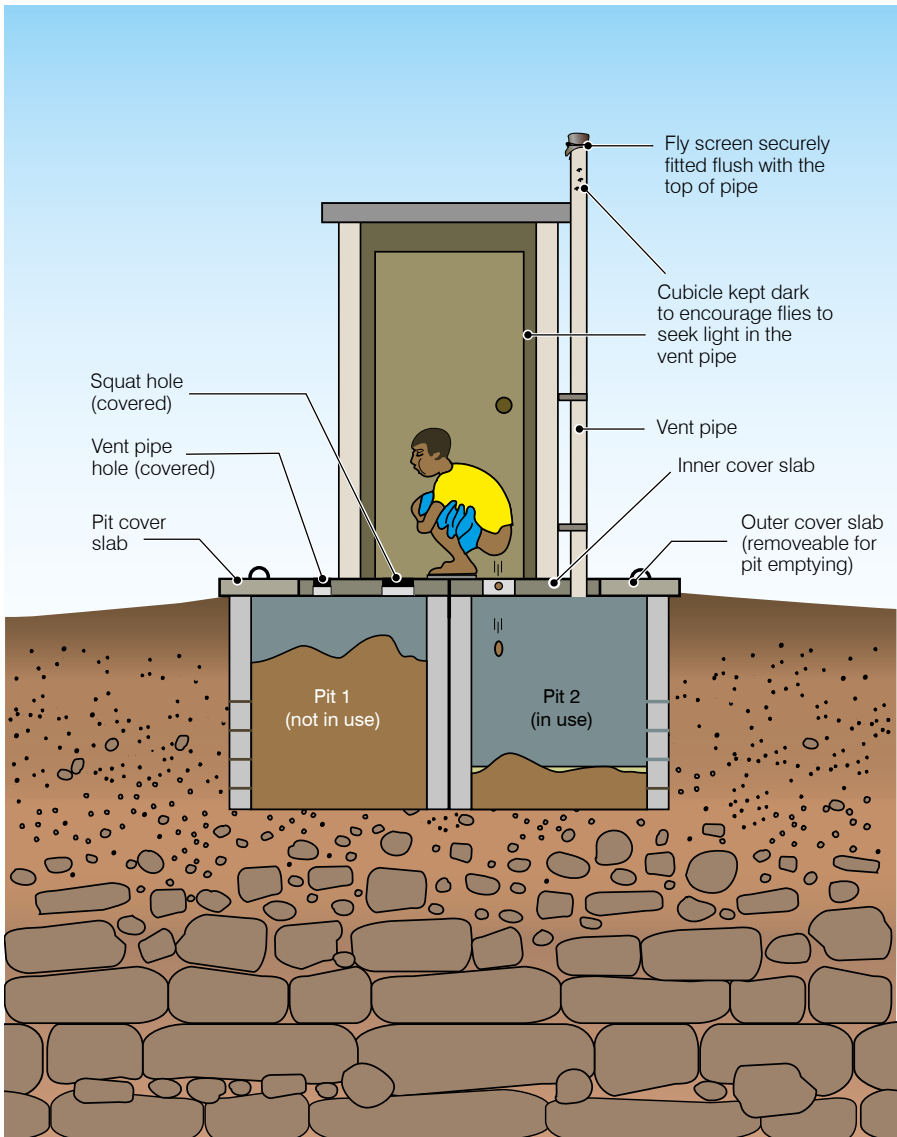
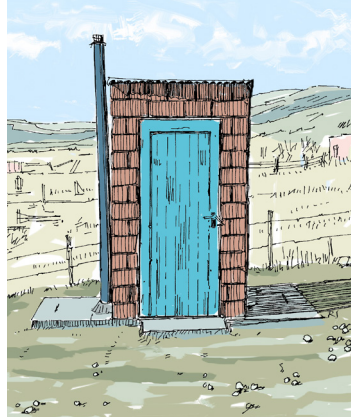


Figure 11. Design details of a twin pit VIP latrine

Advantages and disadvantages of twin pit latrines

Double pits can be cheaper to build than single deep pits as the cost of excavation increases with pit depth. The difference is even more pronounced if single pits are to be lined to their full depth.

The main disadvantage of double pits is the length of time taken to introduce them.



Summary note

The VIP latrine was developed to control flies and odours in pit latrines where direct entry to the pit for excreta is necessary. They are very effective provided they are built and used properly.

Unfortunately the way in which the latrine works is not immediately apparent and this leads to many latrines being incorrectly built.

It is important, therefore, that users and those involved in the construction of VIP latrines fully understand how they work.

Further information

FARMER, Simon. 2002. *Ventilated Improved Pit Latrines*. Rugby UK: Practical Action. <http://goo.gl/SiGKNd>

MARA, Duncan D. 1984. *The design of ventilated improved pit latrines*. Technical Advisory Group (TAG). Technical Note 13. Washington DC: The World Bank. <http://goo.gl/pLlg8H>

MORGAN, Peter R. and MARA, Duncan, D. 1982. *Ventilated improved pit latrines: recent developments in Zimbabwe*. Technical Advisory Group (TAG). Technical Note 2. Washington DC: The World Bank. <http://goo.gl/rYFWpf>

RYAN, Beverley A. and MARA, Duncan, D. 1983. *Pit latrine ventilation: field investigation methodology*. Technical Advisory Group (TAG). Technical Note 2. Washington DC: The World Bank. <http://goo.gl/W29xyg>

WORLD BANK. 2002. *VIP latrines in Zimbabwe: from local innovation to global sanitation solution*. UNDP Water and Sanitation Programm, Africa Region. Field Note 4. Washington DC: The World Bank. <http://goo.gl/eIFqqY>

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