

# Pour-flush latrines

Simple latrine pits offer a basic level of service to the user. Pour-flush latrines provide an improved option in terms of use, maintenance and construction. They are a cross between a pit latrine and a septic tank or sewer. A small amount of water is used to flush excreta out of a collection pan, down a short pipe and into a pit. A water trap, if fitted, fills with water to form a seal and isolates the pit from the user – an effective way of controlling smells and flies.

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Pour-flush latrines are an on-site 'wet' option; they require a regular supply of water for flushing, but considerably less than a flush toilet discharging to a sewer or septic tank.

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## Improvements on a basic pit latrine

The flushing action of a pour-flush latrine enables the toilet cubicle to be offset from the pit if space allows. This provides several advantages.

### User experience

The flushing action means that:

- access to the pit is concealed, making users, particularly children and old people, feel more secure when using the latrine;
- a large pan can be used for defecation; pit latrines have smaller drop holes which are harder to defecate into, so the slab can be fouled more frequently; and
- users cannot see into the pit, making using the latrine more pleasant.

Offsetting the pit means the toilet can be located inside the house. Normally, pit latrines must be located outside the house because of the smell and difficulty with emptying.

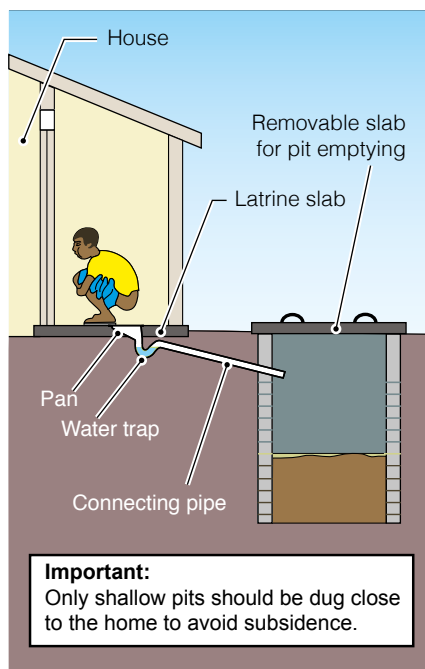
In this design, shown in Figure 1, the pit is still outside the house but the toilet is inside, with the two connected by a short pipe.

People can visit the toilet in complete privacy. This is particularly important for people who cannot leave the house and for women in some communities as it makes their use easier and safer at night.

Adding a water trap ensures:

- odours produced in the pit cannot escape into the toilet cubicle so there is no problem with smell – the gases seep into the surrounding soil; and
- flies and mosquitoes cannot get into or out of the pit.

Controlling smells and flies means that light and ventilation does not have to be as carefully managed as it does for latrines ventilated with vent pipes (VIP latrines), so the cubicles of pour-flush latrines can be well lit.



**Figure 1.** An offset pour-flush latrine

## Maintenance

The pit of an offset pour-flush latrine is easier to access for emptying because the cubicle does not need to be disturbed. As the floor does not have to be broken open periodically to empty the pit, families feel encouraged to use a higher standard of fittings and materials. This increases the prestige value attached to this type of latrine.

## Construction

For offset latrines, the latrine slab does not have to be as strong as that of a latrine with direct access to the pit and so can be thinner. The pit still needs to

### Limitations of pour-flush latrines

The latrine will only function where water or soft toilet tissue is used for anal cleansing. Hard material will block the water trap and attempts to remove the blockage usually causes damage.

Users need to be educated so they don't dispose of solid wastes down the pan. Specific provision may have to be made for the disposal of menstrual hygiene materials.

A regular supply of water is required. A nearby standpipe should be adequate so a house connection is not essential.

Note that offset latrines require more space than direct systems.

be covered but could be fenced off and a lighter removable slab used. This also reduces the load on the pit walls.

## Pans

Pour-flush latrines have a collection pan inset into the floor slab. Pans can be cheap and can be manufactured locally. A good surface finish is important to enable them to be kept clean. The pans can be made of plastic, porcelain or concrete with a smooth finish.

Pour-flush latrines are generally designed for squatting, but there are some pans that can be fitted to a pedestal (Figure 2d). People may prefer to have the steep side of the pan either facing them or behind them, as some designs cause urine to splash out of the pan.

## Water traps

The collection pan may be fitted with a water trap filled with about 0.5 litres of water. After use, a litre of water as a minimum is thrown into the pan. This flushes the waste products out of the pan, through the water trap and into the pit. A small amount of water is retained in the trap to provide a physical water seal between the pit and the toilet cubicle (Figure 2b,c,d).

The depth of the water seal in a conventional toilet is about 50mm but this requires several litres of flush water to displace the water already in the trap. A shallower depth reduces the amount of flush water but evaporation could break

the seal if the toilet is not used often and the weather is hot. A 20 to 30mm depth is a good compromise.

The water trap can be formed by:

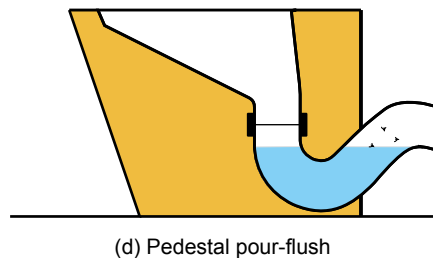
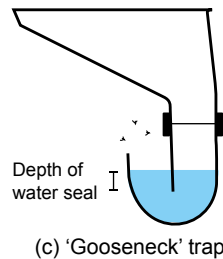
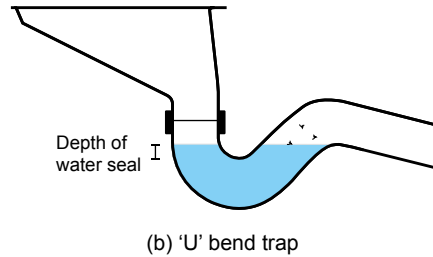
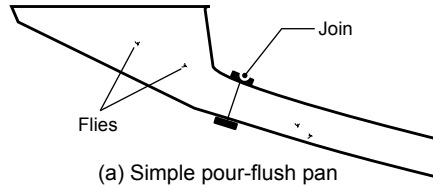
- a 'U' bend in the pipe (Figure 2b)
- a so-called 'gooseneck' trap (Figure 2c).

A water trap is not always used, however (Figure 2a). A length of pipe still provides some of the benefits (such as the visual separation of the pit from the cubicle and the physical separation of an offset pit). Odour and fly control may not be as effective, but capital cost and maintenance needs can be reduced.

The trap and pan can be made separately; this allows the direction of the pan and the direction of the connecting pipe to be aligned according to local needs, but acute bends reduce the flushing efficiency. The trap does need to be securely fixed to the pan or it will become dislodged when the pan is cleaned.

## Connecting pipe

Where the pit is offset from the pan, a 50 to 75mm diameter smooth concrete, clay or plastic pipe connects the pan to the pit. A small diameter reduces the volume of flush water needed but if the pipe is too small, it will be prone to blockages. Covered concrete channels could be used; they are easier to inspect and unblock but require larger volumes of flush water.



**Figure 2.** Pan configurations

The connecting pipe should slope down at a minimum gradient of about 1:40, but this will depend on the material and size of the pipe. Too steep a slope reduces the flushing power of the water, leaving solids behind in the pipe. Too shallow a slope means the pipe can block. The connection pipe should project at least 100mm into the pit, to prevent fouling and damage from the flush water to the inside of the pit wall.

The section where the connecting pipe passes through the wall needs to be designed to prevent the pipe being damaged due to the ground or building foundations moving relative to the pit.

## Using pour-flush latrines

The pan should be wetted before defecation to prevent faeces sticking to it. Depending on the design, about 1 to 4 litres of water is deposited into the pan after each use to flush excreta through the trap and/ or along the pipe and into the pit.

Factors affecting the amount of water needed include:

- pipe roughness;
- the diameter and length of the pipe;
- the slope of the pipe;
- changes in direction in the pipe; and
- the size and shape of the trap (if fitted).

The water used for flushing does not need to be clean. Most families prefer to use clean water but if it is in short supply,

wastewater from the kitchen, bathroom or laundry could be used. Water with a high grease content may cause fat to settle on the pan making it difficult to clean.

## Latrine configurations

### Simple pour-flush latrine

The simplest adaptation to a pit latrine is to set a pour-flush pan directly into the cover slab of a pit. This is sometimes called a direct pour-flush or an overhung pour-flush latrine. The pipe should be situated such that the discharge does not come into contact with the walls of the pit which over time could damage the lining. The pan is often designed so that it can



**Figure 3.** A direct pour-flush latrine

be removed from the surrounding slab, leaving a hole large enough to allow the pit to be emptied.

### Offset pour-flush latrines

An offset pour-flush latrine can separate the pit from a toilet building (Figure 1) or simply provide easier access to the pit cover. Whilst offset latrines provide more benefits, they require more water for flushing. The contents are not visible, so users may not be aware when a pit needs emptying. Offset latrines can be upgraded at a later stage, to discharge into a septic tank or a sewer.

### Twin pit pour-flush latrines

A latrine can have two pits rather than just one (Figure 4). Each pit is used alternately. It is often easier and cheaper to dig two shallow pits than one deep one, especially if:

- the water table is very close to the surface;
- there is hard rock close to the surface;
- the ground in which the pit is to be dug is so soft that it keeps collapsing before an adequate depth can be reached; and
- pits need to be lined to their full depth.

Shallow pits are also easier and safer to empty.

There is a relationship between the depth of the pit and the distance to both the

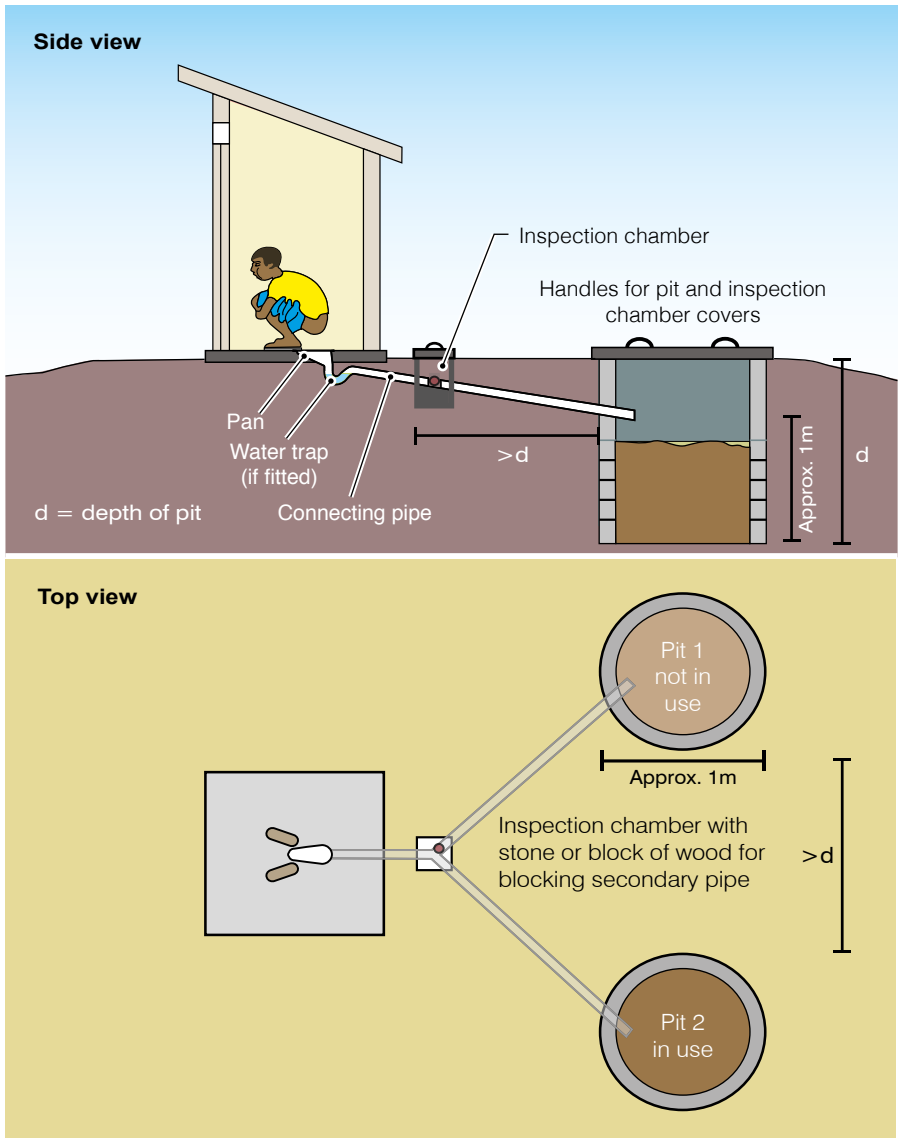
### Disposal of used anal cleansing material

In many parts of Central and South America, water seal toilets are installed and newspaper is used for anal cleaning. After use, the newspaper is deposited in a container (sometimes on the floor) and disposed of separately, usually by burning, burying or with domestic refuse. Whilst such an approach overcomes the problems of using hard anal cleaning materials in a water seal toilet, it can cause a serious health hazard if the materials are not securely contained and disposed of safely.

latrine superstructure wall and between the twin pits. This distance should be at least the depth of the pit. Deeper pits, therefore, need to be situated further away from the pan. This requires a longer pipe, more flushing water and an increase to the 'dead' space above the inlet to the pit.

If space does not allow the twin pits to be separated by at least their depth, then the linings of the sides of the pits that are closest to each other should be impermeable to prevent contamination passing between them.

The pits are connected to the pan by short pipes that converge at an inspection chamber, forming a 'Y'. The



**Figure 4.** A twin pit, offset pour-flush latrine



chamber must have an airtight cover to prevent flies and mosquitoes entering and odours escaping. The chamber needs to be accessible, so should be at least 250mm wide if situated at ground level, but if the pipes are deeper, then the chamber needs to be larger to allow for maintenance.

The chamber can accommodate changes in the direction of flow of the waste to suit the layout of the latrine.

### Operation of twin pits

The twin pits are used alternately. When one pit is full, the waste is diverted to the other pit. The contents of the first pit decompose while the second pit is used. Each pit should take at least two years to fill, during which time the pathogens in the closed pit will usually have died off, making the material safe to handle when the pit is emptied. Just before the second pit is full, the contents of the first pit are removed and the waste diverted back to the first pit again, which is now empty.

The amount of water required to flush twin pits is slightly more than for single

offset pits because the connecting pipe changes direction. However, two shallow pits may be built closer to the pan.

### Pit size

Twin pits for family latrines generally have a capacity below the inlet pipe of about one cubic metre. This is sufficient for the accumulation of solids from a single family over a period of about two years.

Twin pits may be popular because they can appear to last indefinitely due to the alternating nature of their use. However, they will need lining if they are to be repeatedly emptied. Some communities may be unwilling to accept them until they have seen pits emptied, so time is required to allow new users to adjust to the cycle of changing over pits and emptying.

### Pit contents

The contents of a pour-flush latrine pit will be wetter than the contents of a dry latrine.

The liquid nature of the excreta deposited with water helps a pour-flush latrine pit to fill evenly, resulting in more compact sludge. As a result, the rate at which a pit fills may be slightly reduced.

The quantity of water used for flushing is not excessive and should leach readily into most soils. Where bathing water is also flushed down the pan, then an overflow system may be required.

**The amount of water will vary, depending on the configuration and materials used, but as a rough guide a direct pit may use 1 litre per flush, an offset pit may use 2 litres, a twin pit may use 3 to 4 litres.**

## Ventilation

An offset pit does not need to be ventilated as any gas produced in the pit is absorbed by the surrounding soil.

Communal facilities may need the pit to be vented, as more gas will be generated. The superstructure will also need to be designed to ensure an adequate flow of fresh air.

## Further information

FRANCEYS, R.W.A, PICKFORD, J.A. and REED, R.A., 1992. *A Guide to the Development of On-site Sanitation*. Geneva: World Health Organization.

*Refer to other guides in this series to find out more about the various types of latrines commonly in use in low- and middle-income countries.*

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