Good Practice 2

Ventilated Improved Pit Latrines

Ventilated improved pit (VIP) latrines are one of the simplest improved sanitation options for excreta (faeces and urine) management. When combined with good greywater management (see 'Good Practice 6') they form a sustainable sanitation system. VIP latrines can be either single-pit units or alternating twin-pit units.

Figure 1 shows a single-pit VIP latrine. The superstructure is slightly off-set from the pit to permit the installation of a vertical vent pipe which is fitted with a fly screen at its top. The vent pipe has two functions: odour control and fly control (in contrast traditional - i.e., unventilated - pit latrines generally have serious odour and fly problems). The wind blowing across the top of the vent pipe sucks air out of the vent pipe, so creating a flow of air from outside the superstructure, down through the squat hole (or pedestal seat unit), and up and out of the vent pipe, taking with it all the malodorous gases from the decomposing faeces in the pit, so leaving the superstructure completely odour-free. Gravid female flies are attracted to the top of the vent pipe by the faecal odours coming out of it, but the fly screen blocks their entry, so they cannot enter the pit to lay their eggs. A few flies will, however, enter the pit via the squat hole and lay their eggs in the pit; eventually these eggs become newly emergent adult flies, which always fly in the direction of the strongest light they can see. Provided the superstructure is kept reasonably dark, the strongest source of light they are able to see is the shaft of light coming down the vent pipe and so the newly emergent adult flies fly up the vent pipe, but the fly screen blocks their exit; due to a lack of food they quickly die and fall down into the pit. In all other respects VIP latrines function like any other pit latrine: the faeces slowly decompose in the pit and the urine and any water used to clean the squat slab or pedestal seat infiltrate into the surrounding soil. Design details are given in Mara (1984); typically the pit is 1- 1.5 m in diameter, with a depth of ~3 m, and the vent pipe diameter 100-150 mm (or ~225 mm square if the vent pipe is made of locally burnt bricks). The pit is lined with brickwork or blockwork (with the vertical joints unmortared) if the soil is unstable. The cover slab is raised 300 mm above ground level if the groundwater table is within 300 mm of ground level (either permanently or seasonally).

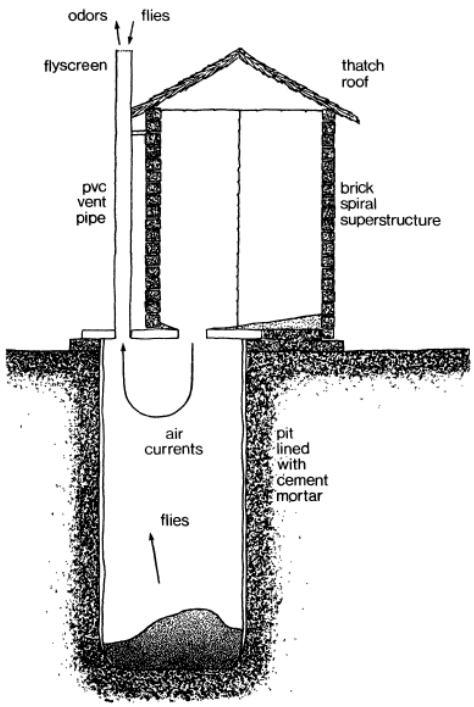

Figure 1. A single-pit VIP latrine, showing the superstructure off-set from the pit and the air flow down through the squat hole and up and out of the 100-mm diameter PVC vent pipe. The superstructure can be made out of any suitable local materials (generally the same materials as used for the construction of the users' house); the interior of the superstructure has to be reasonably dark for good fly control, so often a spiral superstructure is used:

Single-pit VIP latrines are commonly designed for a life of 10 years. When the pit is full (to within ~300 mm of the cover slab), the superstructure is dismantled and a new latrine built over an adjacent new pit, reusing as much as possible from the old pit (cover slab, vent pipe etc.). Thus single-pit VIPs are most suitable for use in rural areas where there is normally space for a second pit. They can also be used in periurban areas or small towns and large villages if the pit is emptied mechanically [by a high-powered vacuum tanker - such as the 'Vacutug' (UN Habitat, 2002); see also Pickford and Shaw (undated)].

If mechanically emptying is not possible, then in low-density periurban areas or small towns and large villages alternating twin-pit VIP latrines (also called 'ventilated improved double pits' or VIDPs) can be used. They are a permanent sanitation facility as they do not need to be relocated. Within the single permanent superstructure there are two squat-holes, each above their own pit which extends sideways beyond the superstructure; each pit has its own vent pipe (Figure 2). One squat-hole and its pit are in use at any one time for 1-2 years, and the other squat-hole is blocked off; after the 1- 2 years the second squat hole and pit are put into service, and towards the end of the second 1-2-year period the first pit is emptied – this can be done either mechanically or manually (manual emptying is not hazardous as all the excreted pathogens, with the exception of just a few *Ascaris* eggs, will have died during the 1- 2 years the pit was not in use). At the beginning of the third 1-2-year period the first squat-hole and pit are put back into service.

Figure 2. An alternating twin-pit VIP latrine. Each of the two pits has its own 100-mm diameter vent pipe with a fly screen at its top. The external pit cover slabs are only weakly mortared so they can be easily removed when the pit is to be emptied:

Solids accumulate in the pit at a rate of 0.02- 0.06 m^3 per user per year - lower in wet pits (those that penetrate the groundwater table) than in dry pits (those wholly above the groundwater table). The material removed from the pit is totally different from what went into the pit: it is odourless and much more like soil than faeces. It is either buried on-site if there is space for this, or carted away to landfill or used as a soil conditioner (in, for example, periurban agriculture).

Operation and maintenance are simple: regular cleaning of the squat-hole or pedestal seat and the cover slab, and visual inspection of the fly screen and removal of any material (e.g., fallen leaves) from it. Pit emptying (either manually or mechanically) is required every 1-2 years.

References

Mara, D. D. (1984). *The Design of Ventilated Improved Pit Latrines* (TAG Technical Note No. 13). Washington, DC: The World Bank; available at: http://go.worldbank.org/NYU395FV90.

Pickford, J. and Shaw, R. (undated). *Emptying Pit Latrines* (Technical Brief No. 54). Loughborough: WEDC; available at: http://www.lboro.ac.uk/well/resources/technical-briefs/54-emptying-latrine-pits.pdf.

UN Habitat (2002). *Operating and Maintenance Manual for the Mark II Vacutug Latrine Emptying Vehicle*. Nairobi: UN Habitat; available at: http://www.personal.leeds.ac.uk/~cen6ddm/PitEmptying/VacutugManual.pdf.

Further information (and links to other publications): On-site Sanitation (University of Leeds webpage at: http://www.personal.leeds.ac.uk/~cen6ddm/WatSan.html).

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