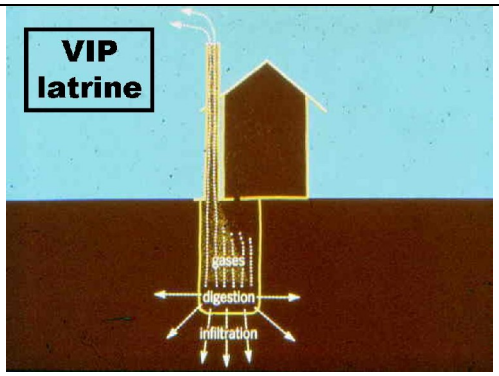
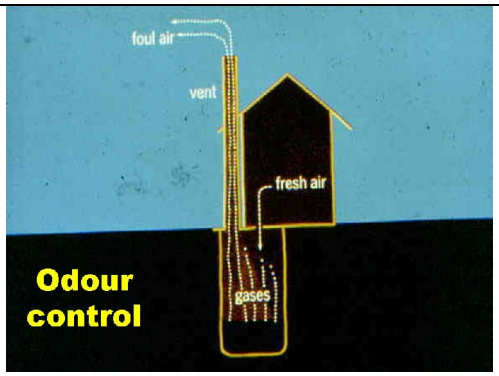
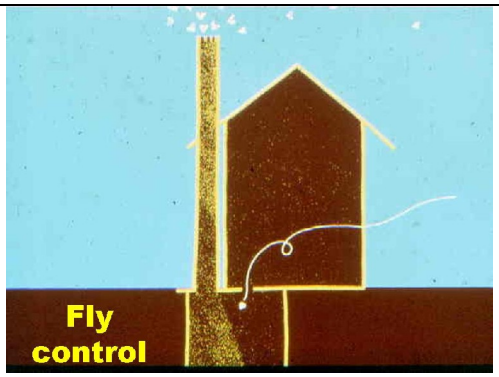
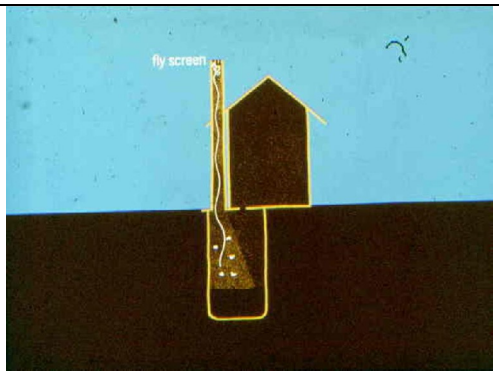
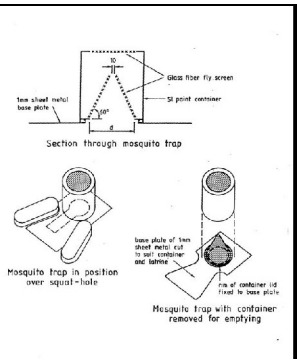
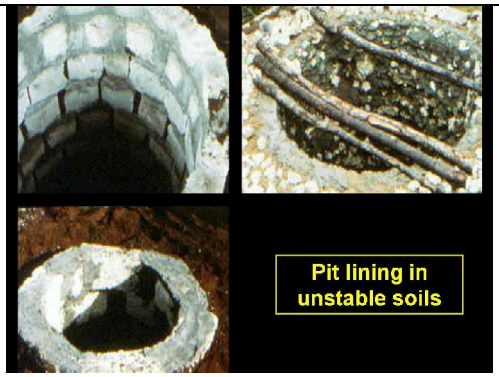
Single-pit VIP latrines

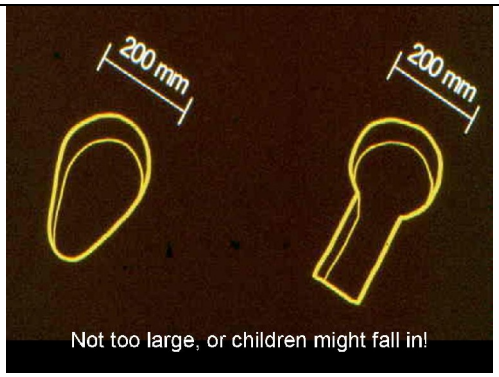
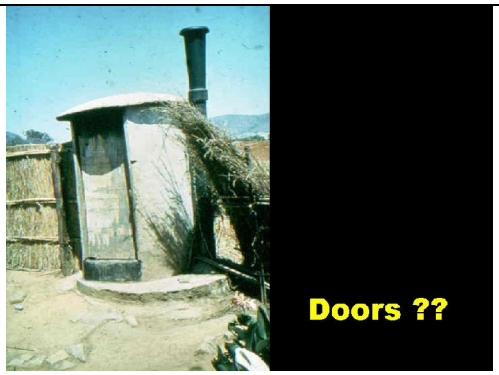
1.		This presentation is on single-pit ventilated improved pit latrines, or VIP latrines. Single-pit VIPs are suitable for use in rural areas and also in periurban areas if they can be emptied mechanically (which we'll come to later).
2.		VIP latrines avoid the two main drawbacks of traditional − that is to say, unimproved and unventilated − pit latrines: odour and fly nuisance. The main difference between VIPs and traditional latrines is that the superstructure of a VIP latrine is slightly offset from the pit, so that a vertical vent pipe can be installed; and, as we will see, the vent pipe is the key to controlling both flies and odours. Otherwise the VIP latrine functions like any other pit latrine: the excreta are deposited into the pit via the squat-hole, the liquid (mainly urine) infiltrates into the surrounding soil, and the solids are digested anaerobically.
3.		Odour control works like this: the wind blowing across the top of the vent pipe sucks out some of the air at the top of the vent pipe and this is replaced by air from below; so this sets up an airflow pattern in which fresh air enters the pit through the squat-hole; this air and the malodorous gases generated in the pit are then sucked up and out of the vent pipe, so leaving the superstructure totally odour-free.

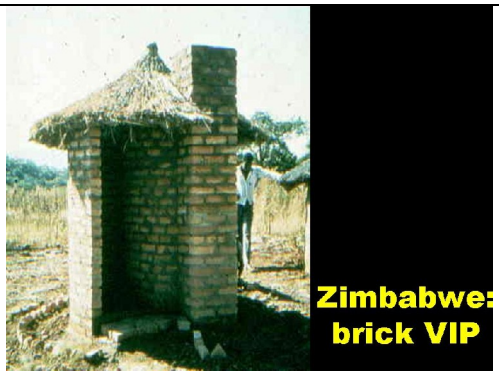
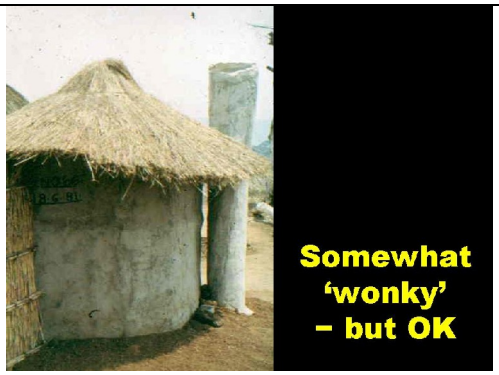
4.		And fly control works like this: gravid female flies know that human faeces are a good place to lay their eggs, so they're attracted to latrines by their faecal odour; but with VIP latrines all the odour comes out of the vent pipe, so this is where the gravid flies fly to. To prevent the flies entering the pit, a fly screen is placed over the top of the vent pipe. However, a few flies will enter the pit via the squat-hole and lay their eggs.
5.		Eventually these become newly emergent adult flies, and newly emergent flies always fly in the direction of the strongest light they can see. If the superstructure is reasonably well shaded, then the strongest light these newly emergent flies see is the shaft of light coming down the vent pipe, so they fly up the vent pipe, but they can't get out because of the fly screen and they shortly die because they can't get any food.
6.		It's not uncommon to see cobwebs at the top of the vent pipe as spiders soon learn that this is a good place to catch their food.
7.		And we should remember that fly control *is* important, very important.

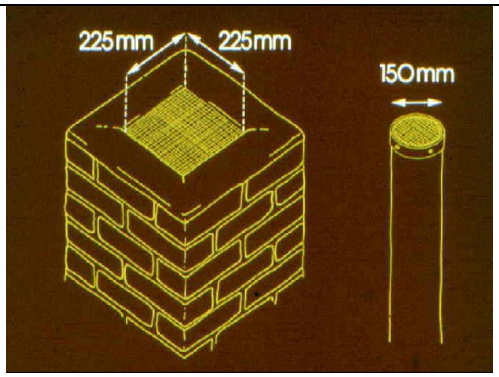
8.	 **Mosquito control** _____ **Note:** details given in *The Design of Ventilated Improved Pit Latrines* (listed in 'Supporting Material'.	Mosquitoes, not flies, breed in wet latrine pits (that is to say, pits which are deeper than the depth to the groundwater table), and newly emergent mosquitoes are not attracted to the light, as flies are. So they'll leave via the squat-hole, but they can be caught by the 'lobster pot'-type trap shown in the slide. The latrine users quickly become motivated to keep the trap over the squat-hole as they see the number of mosquitoes that have been trapped and, more importantly, as they realise that they're being bitten much less frequently.
9.	 **VIP latrines in rural Zimbabwe: 1. mud & wattle**	This slide shows a mud-and-wattle VIP latrine in rural Zimbabwe, with a vent pipe of cement-mortared reeds; and …
10.	 **2. Brick**	this slide shows a brick one, with a brick vent pipe.
11.		Operation and maintenance couldn't be simpler: the cover slab needs to be washed down a few times each week, and …

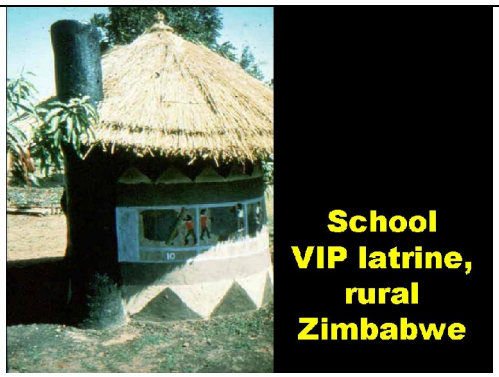
12.		the fly-screen at the top of the vent pipe needs checking every so often and anything that's landed on top of it, leaves for example, has to be removed.
13.		The superstructure can really be built in any style using almost any material. The slide shows a ferrocement superstructure (top left), a mortared mud-and-wattle one (top right), a brick one and a concrete-block one. In rural areas especially it's best to let the householders choose; they build their own houses, so they'd probably choose to build their latrine superstructure in more-or-less the same architectural style.
14.		This is a sequence of slides showing how a single-pit VIP latrine is constructed. So first, obviously, the pit is excavated. They're usually circular, 1−1.5 m in diameter, and they're up up to 3 m deep.
15.		In stable soils, that is to say soils with an undrained shear strength greater than ~20 kN/m^2, the pit sidewall surface is lined by plastering it with cement mortar.

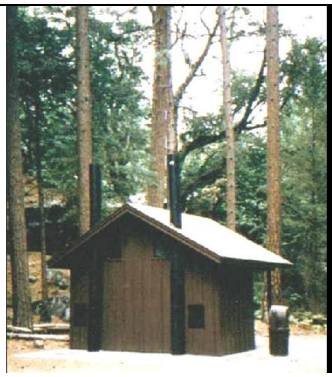
16.		In unstable soils with a lower undrained shear strength the pit is protected against collapse by lining it with a more substantial material. Bricks could be used; also concrete blocks, as shown in the top left of the slide; or rough coral stone (top right); or coral blocks (bottom left). As shown in the top left slide, the vertical joints are not mortared, to allow liquids to infiltrate away, but the top 2−3 courses are mortared.
17.		In high-groundwater areas it's difficult to line the pit with bricks or block, and these circular concrete units can be used instead. One is placed on the ground, the soil excavated, and the first unit sinks down; another is placed above it, more soil is excavated, and so the second one sinks down; and this is repeated until the pit is excavated to the required depth.
18.		This is a reinforced concrete cover slab, with two holes: one is the squat hole and the other (at the rear) is for the vent pipe. The cover slab has two footrests, and these are a good idea as they encourage depositional accuracy!
19.		This is one of the early cover slabs made in Zimbabwe from local timber − not as durable, of course, as reinforced concrete, but if it's protected against termite attack it'll last quite a few years.

20.		The squat-hole dimensions are shown here for the two common squat-hole shapes: egg-shaped and keyhole-shaped. The point is that they shouldn't be too large as young children might fall in, or be afraid of falling in.
21.		We tend to think that doors are mandatory in order to provide privacy. But is this really the case?
22.		The main problem with doors is that, while people close them when they're using the latrine, they're not so particular when they're not, so doors are often left open and …
23.		this means that fly control doesn't work as any newly emergent adult flies will just fly out through the squat-hole and the superstructure as the light coming through the squat-hole is stronger when the door's left open than the light coming down the vent pipe.

24.		This slide shows a spiral brick superstructure under construction, and …
25.		this is the finished latrine. No door, as the spiral superstructure ensures privacy and the superstructure is always dark enough inside to enable good fly control.
26.		People who live in round houses often prefer a round latrine superstructure, but those who live in rectangular houses generally prefer a rectangular one. If they do, then it's easy to 'square off' the spiral, as shown on the slide.
27.		This slide shows an owner-built mud & wattle VIP latrine in rural Zimbabwe with a homemade vent pipe – it's a bit 'wonky' but perfectly OK.

28.		The dimensions of the vent pipe are important as the airflow up it has to be big enough to carry away all the odours, but obviously not excessively big. For brick vent pipes the internal dimensions are a brick length square, typically 225 × 225 mm. For PVC vent pipes 150 mm diameter is ideal, but you get an almost sufficient airflow with 100 mm.
29.		We can divide people into two groups: sitters and squatters. Sitters prefer to sit while they defecate and squatters to squat. You can make a good physiological argument for squatting (better bowel evacuation), but really life's too short: it's easier to just give squatters a squat-hole and sitters a seat.
30.		This is the inside of a VIP latrine in a school in rural Botswana, where people are sitters, so they have a pedestal seat unit over the hole in the cover slab, …
31.		and this one's in northeast Brazil where people are also sitters. The seat unit's made from GRP, glass-fibre reinforced plastic, and it's shiny white, so it's easy to clean; and it's supported on a cylinder of sisal-reinforced cement mortar.

32.		Now pit emptying. With dry pits (that is to say, pits with their base above the groundwater table), you have to use a high-powered vacuum tanker, like the one shown on the slide. With wet pits we can simply use an ordinary vacuum tanker of the type used to desludge septic tanks.
33.	 More details at www.unhabitat.org	This slide shows the 'Vacu-tug', which is really a smaller version of the tanker shown in the last slide. It was developed by UN-Habitat in Nairobi as a solution to two problems with large tankers: high cost and difficulty in accessing pits in very-high-density periurban slum areas.
34.		School sanitation is very important, not only for obvious reasons, but also to keep girls in school as they generally don't like going to a latrine-less school when they're menstruating. The slide shows a VIP latrine in a school in rural Zimbabwe, and the kids have decorated the outside of the superstructure with a sequence of paintings showing how it was built.
35.		And here's another school latrine, also in Zimbabwe; it's really two VIP latrines built together − one for boys and one for girls.

36.	 VIP latrine in Yosemite National Park, CA	VIPs are good not only in developing countries. The slide shows a double VIP latrine, one compartment for women and one for men, in Yosemite National Park in California, and you can find them in many of the National Parks in the United States.

Note: VIP latrine design details are given in *The Design of Ventilated Improved Pit Latrines*, which is listed in 'Supporting material'.