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SCHOOL HEALTH AND SANITATION PACKAGE.

APPROPRIATE TECHNOLOGY IN DESIGN AND CONSTRUCTION OF LATRINES.

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The main of objective of the HESAWA programme is the improvement of the welfare of the rural population through improved health education, sanitation, and water supply so as to create better prospects for social and economic development.
In order that improved sanitation is acquired it is necessary to use appropriate technology which will ensure that the Latrine constructed, is an acceptable design, of durable building materials, stable, affordable, and reliable.

The Appropriate technology therefore includes the following parameters and as illustrated in figs. 1-5.

Siting of the Latrine:

The location of the site for the latrine shall be at such a point that, its distance will be greater than or equal to 10m from a residential building, 40m or more from a water source. This will ensure that the flies from the latrine have a long way to travel before they can contaminate the food and also smell from the latrine will not be distinct at the house. It will also ensure that pollution of the water source will not take place as the water will travel through a long filtration soil media thus safe water being obtained at that distance.

The Pit.

The latrine will have various depths depending upon the soil characteristics existing in that area. However for various soil characteristics experienced, it is appropriate to use the following approximate depths,

Soil characteristics	Depth
Sandy soils	3m or less
clay soils	4m or more
rocky clay soils	4m or more
silt soils	4m or more
high ground water level	less than 3m
high rock level	excavate to rock level

Excavation through soils requires that a wider pit is used to achieve the required final size of the latrine. In areas with high ground water table dewatering is necessary and normally, the excavation are carried out during the dry season when the ground water level is at its lowest level. The excavation of the pit is done using locally available equipment eg. holes, picks, spades and buckets for dewatering. The pit shape should be square rectangular or circular depending upon which shape is traditionally used.

Pit lining.

After excavation the pit has to be lined so that it is prevented from collapsing due to the loose soil or water movement in the soil layers contained. The lining material should be strong, durable, easily produced, cheap and locally available and easily worked with. The lining is normally done by using burnt bricks, stones, concrete blocks and soil cement stabilised blocks.

In firm soils (clay, rocky and silt) the lining is normally stopped at a distance of not more than 2m, below ground level. A colar is provided at the top to prevent the development of a top weak layer. In areas with high water and rock level the lining is done from the bottom to a distance not more than 2m. from the ground level. In loose soils (sandy and silty) the lining is done the whole depth up to a height of not less than 600m above ground level. Openings staggered up to a height of 1m from the bottom of pit is allowed to ensure proper movement of the water from the pit and into the surrounding soil.
The pit depth thus acquired should always be not less than 3.0m for pit latrines and 1.2m for compost latrines.

The cover slab

The slab shall have to be strong enough to carry more than ten people safely without collapsing. This property requires that it is produced by using strong and durable materials like ferrocement, reinforced concrete, special grade poles with sand cement and normal concrete but arched. Another important property that the slab must have is the ease to keep it clean. In order to acquire this, the surface should be smooth finished and sloped towards the drophole such that no water stagnates on it. The cover slab should be easily placed on the pit.

The cover slab is provided with a central big opening to facilitate emptying when full in which case a further squatting slab is placed on top. In case no emptying is to be done through the slab then this technology can be avoided. For compost latrines two strong, durable and light weight slabs are used, as the pits have to be alternated when one is full. One slab is provided with foot rests and a drophole, while another slab is cast same size as the pit, without foot rests or drophole. This slab is used to cover the filled pit and allow it to continue composting while the new pit is being used. The cover slab is provided with two holes one being at the centre to save as a drophole and the other at the rear corner to save for venting. The drophole is key hole shaped to provide for the easy draining in of urine. The expanded circular part is normally bevelled with a minimum bottom diameter of 150mm. and top diameter of 170mm. The total length of the drophole is 450mm. This length facilitates easy urining without fouling the slab. The second hole is located at the rear centre incase of compost latrines and at left hand side corner of the slab for pit latrines. This second hole saves as a vent hole upon which a vent pipe is erected. The size of the vent hole shall always be bigger than the drophole, so that more light passes through it.

<u>The vent Pipe:</u>

The pipe is erected on the vent hole provided on the slab to a height more than 300mm above the highest point of the roof. The vent pipe top is covered with a flyproof screen. The flyproof screen traps the flies as follows;

- Flies which are into the pit will leave by flying following a stronger source of light which is the vent pipe, at the top of which the flyproof screen fixed will prevent it from going out. It will remain there till it dies.
- Flies outside will be attracted by the smell of faeces emitted from the pit via the vent pipe. They will land and remain on the top of flyproof screen till they die.

The vent pipe can be constructed using ferrocement, sand cement, burnt bricks, plastic pipes, concrete blocks and stabilised soil cement blocks and mud with reeds. The flyproof screen can be of stainless steel or fibreglass.

The superstructure.

The main and most important function of the superstructure is to provide privacy to the user. The minimum size of the superstructure should be 1.2m x 1.2m. The superstructure is provided with door opening such that one can enter and leave easily. Depending upon the design, the door opening is provided with a shutter or not to minimize the amount of light into the pit. The height of the walls should not be less than 2.0m and should be hipped or sloped to drain away rainwater safely. The superstructure walls can be constructed of burnt bricks, mud blocks, soil cement stabilised blocks, concrete blocks, mud and pole, sawn timber, and bamboo poles. The roofing materials used can be; thatch, sisal rainforced sand cement sheets, G.C.I. sheets, burnt clay tiles, bamboo and asbestos cement sheets.
The types of roofing material to be used will depend upon that which is locally available and affordable by the user.

Construction

The technology used in the construction of pit latrines ie. walling or pit lining is the same as that for house construction.
The casting of slabs using timber moulds is easily done with rectangular shapes. The dome and circular slabs are complicated hence not easily produced by local fundis available in the villages. Training in the production of such slabs is required and it thus will take a long time to be adopted by most villagers. For a remarkable adoptability, the construction techniques for the improved latrine should easily be known by the village fundis and the villagers. Hence the Improved latrine construction technology is similar to that of the traditional latrine but with only easily practised improvements in the use of durable materials and provision of slabs and vent pipes. The cost of construction is expected to be affordable as local building materials will be used and local fundi or Householder himself can easily construct it.

Durability of the latrine.

The durability of the latrine depends upon the quality of building materials and measures taken to cater for the various problems originating from ground conditions.

The appropriate technology as outlined before ensures that all the factors affecting durability of the latrine components are taken care of by the design.

The other important factor is the time it takes for the pit to get filled. If it fills up within a short time after use then the pit latrine is not durable. The rate of filling the latrine depends upon the size, number of users and duration of use. Assuming that the waste production per year per person is 0.06m^3 a pit of 1.20m by 1.20m with a depth of 3m. at a total volume of 4.32m. The pit can be closed when the depth is 2.5m full, with a volume of 3.6m. Hence this size of pit when used by a family of 10 people will last for a period of $\frac{3.6}{(0.06 \times 10)}$ years = 6 years.

The design lifespan of pit latrines can be calculated using this simple formula. If this period is known it is easy to plan for the maintenance of the latrine.

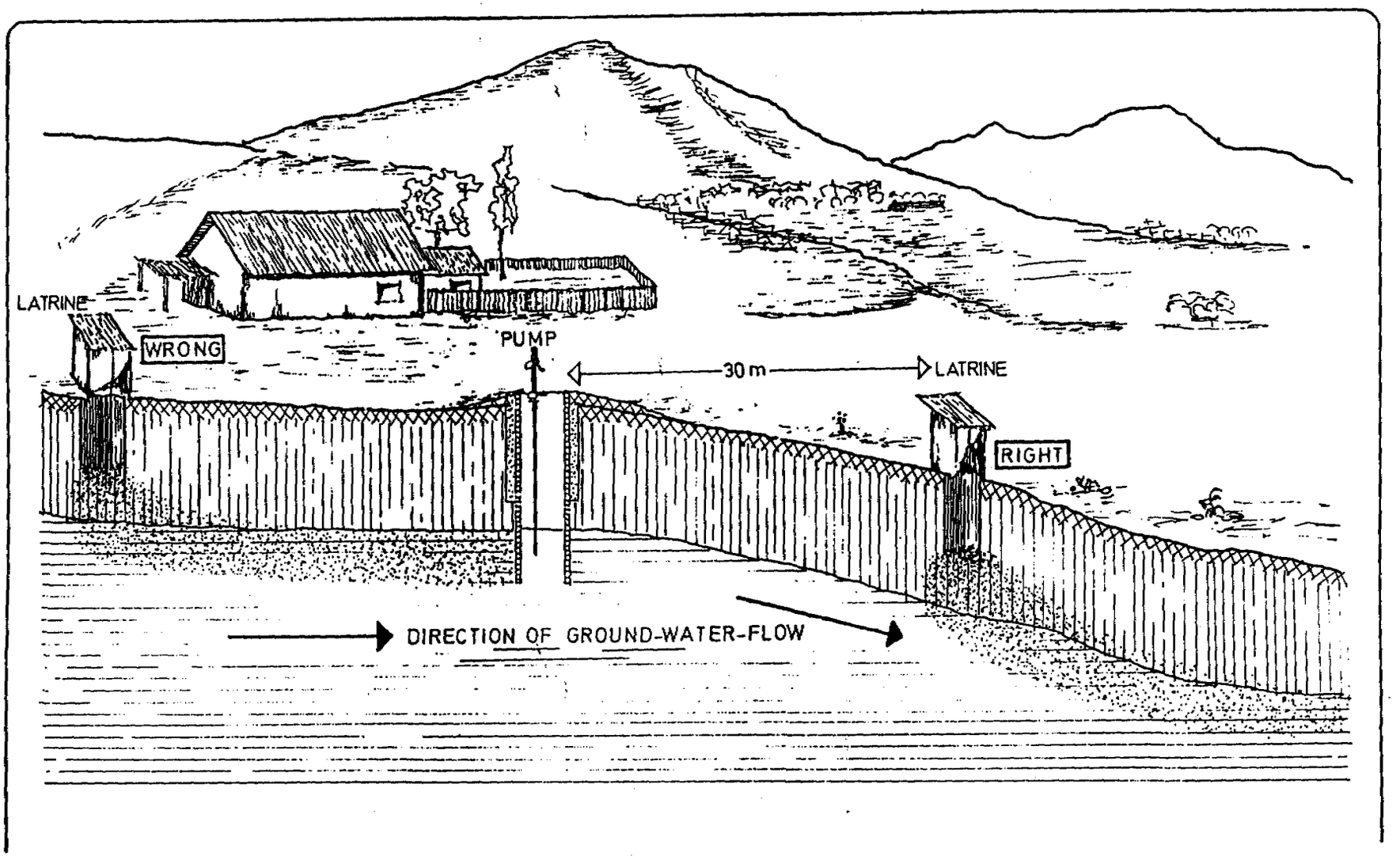


Figure I. SITING OF THE PIT LATRINE.

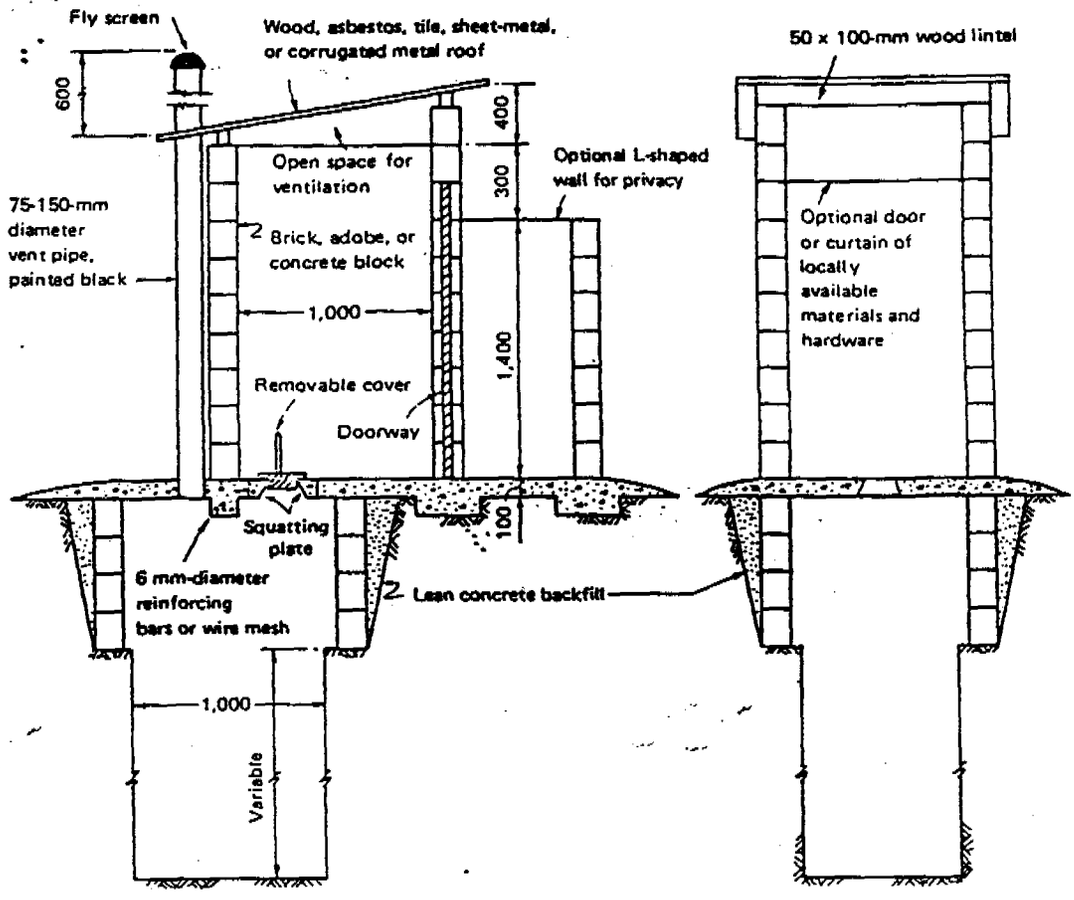
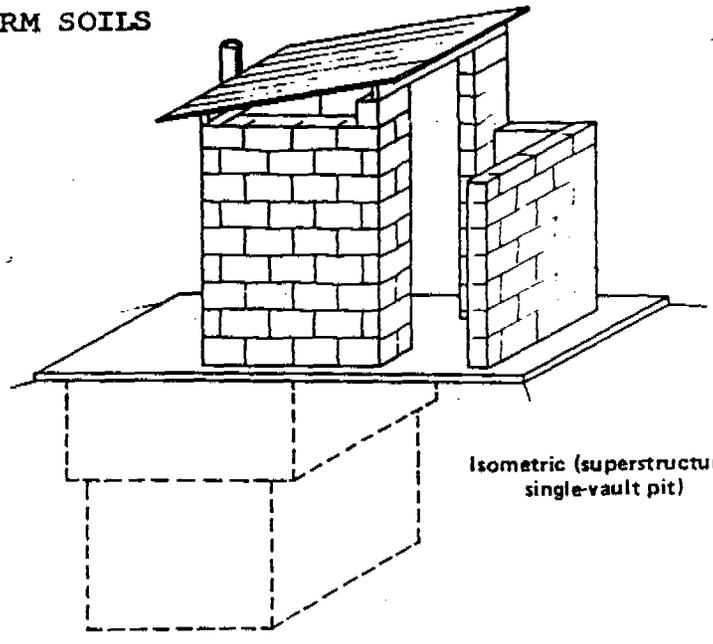


Figure 2. PIT LINING IN FIRM SOILS



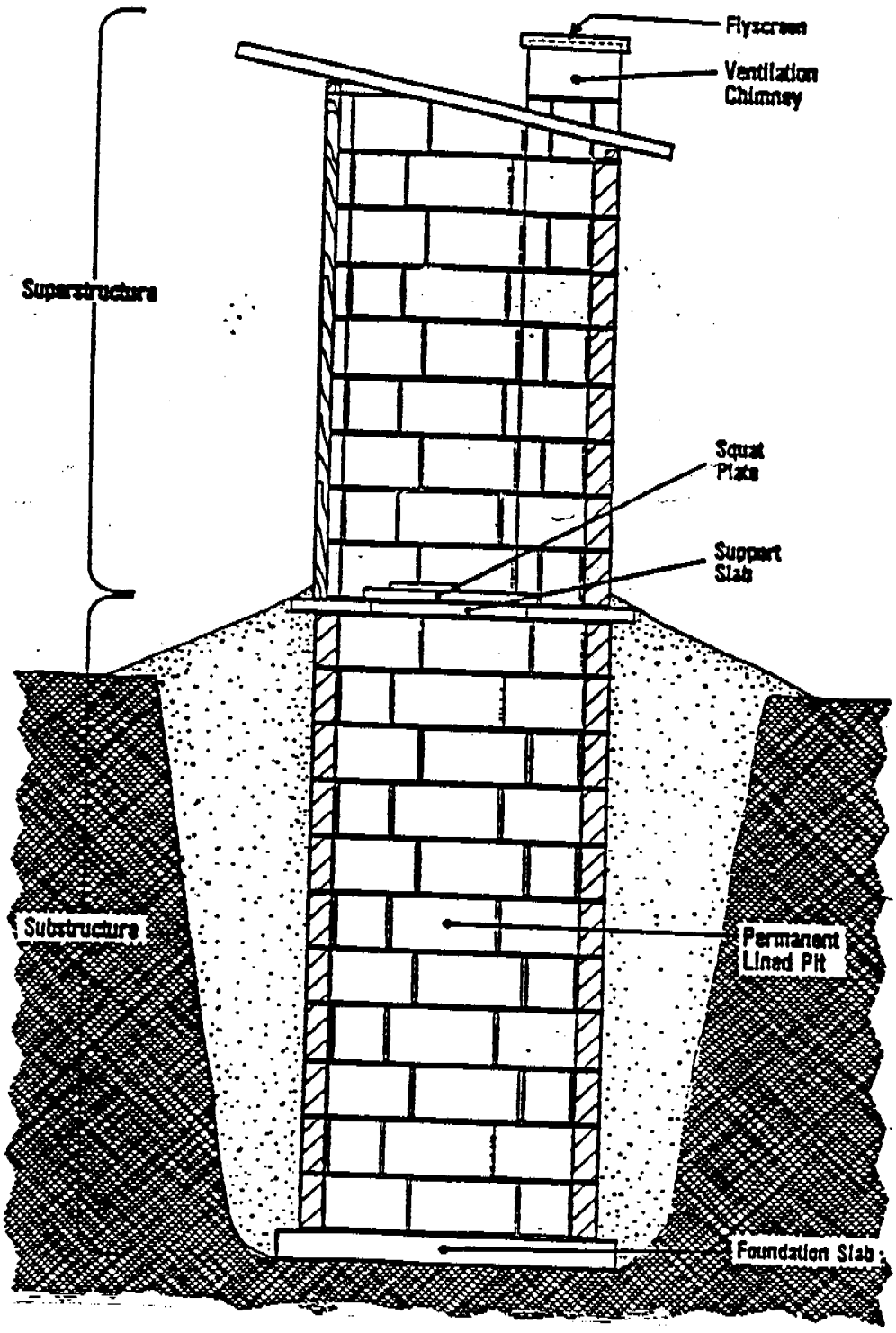


Figure 3. PIT LINING IN HIGH GROUND WATER TABLE AREAS WITH SANDY SOILS.

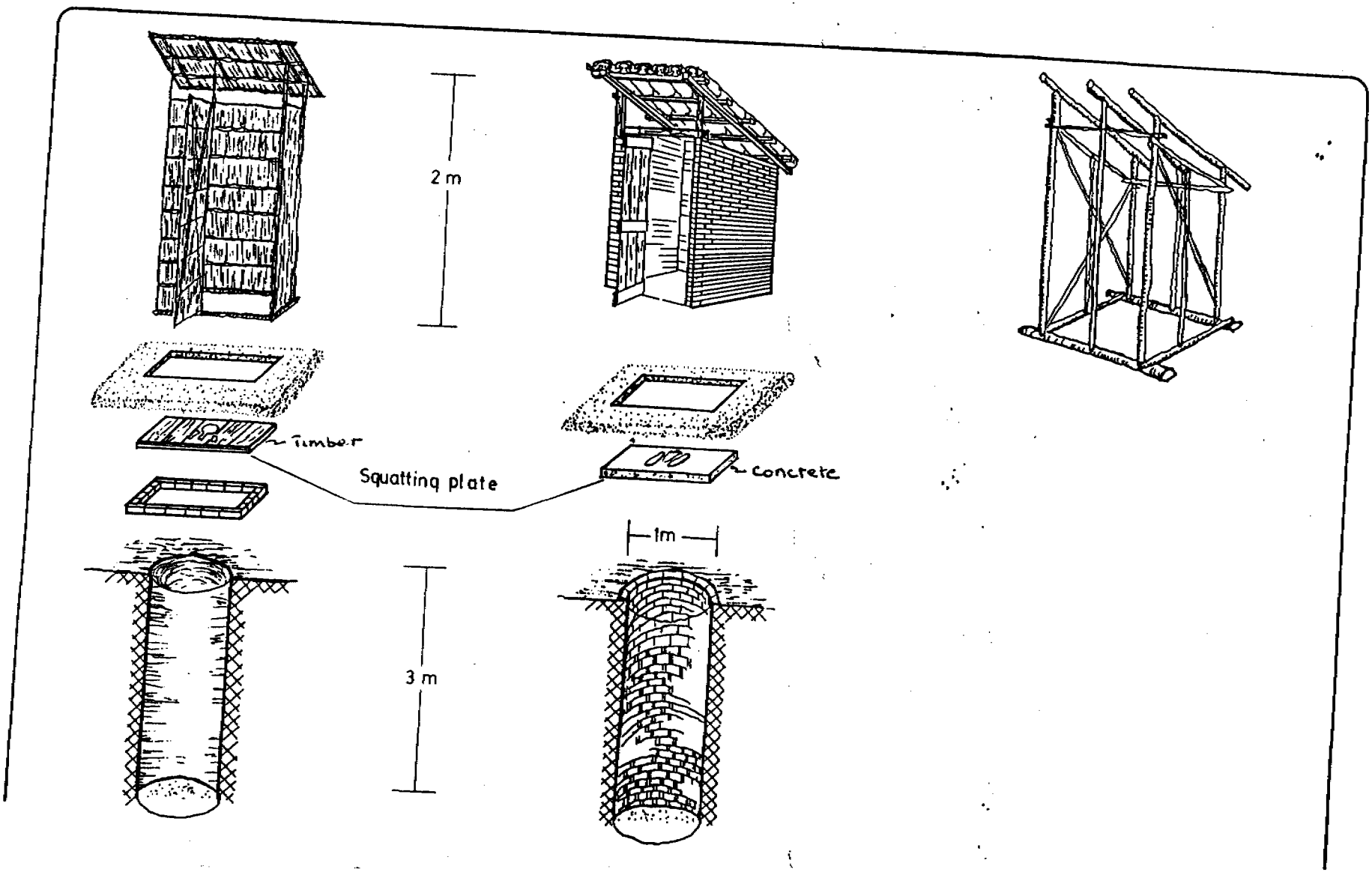


Figure 4. PIT LATRINE SLABS AND SUPERSTRUCTURE CONSTRUCTION.

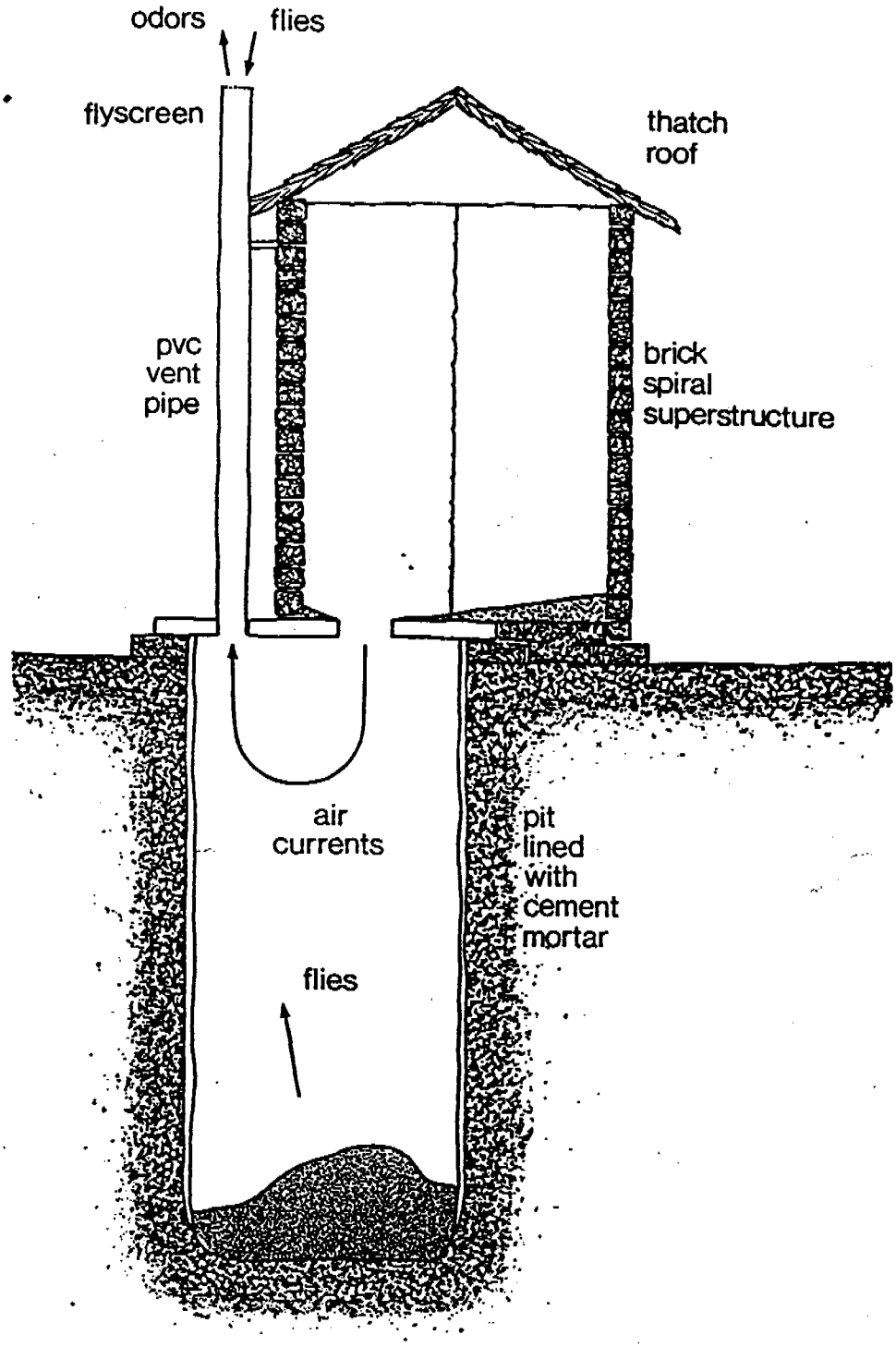


Figure 5. **VENT PIPE OPERATION IN ODOR AND FLY ELIMINATION.**