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Sanitation

in Developing Countries

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Sanitation in Developing Countries

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Housing Sanitation, Mozambique

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During colonial times little interest was paid to the sanitation situation of the majority of the Mozambican people. After gaining independence in 1975, however, the Ministry of Health started a national campaign for latrine construction. The campaign was launched with the support of the mass media and was in many areas very successful. In Maputo, for example, almost every family now has its own latrine.

The experiences from the latrine campaign were very positive, but it was apparent that technically, many problems were not yet solved. Special difficulties arose, for example, in areas with high groundwater tables or with loose or rocky ground. It was also found that latrine covers, constructed mainly of pieces of wood covered with soil, were unhygienic and often fell into the pit. A program for a sanitation development project, therefore, was jointly established by the National Directorate of Housing, the National Directorate of Water, and the National Directorate of Preventive Medicine.

Three Aspects of Sanitation

Sanitation has many aspects. In this project three were considered: the safety aspect; the ecological aspect; and the comfort aspect.

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The Safety Aspect

As mentioned earlier, the latrines that have been built by the people in the past have experienced hygienic and technical problems. The first task, therefore, was to develop a pit slab that was easy to keep clean and would not be destroyed by rotting and termites.

To meet these requirements, a round slab of nonreinforced concrete was developed (Fig. 1). By giving it a slightly conical form, the slab only required a thickness of a few centimetres. The fact that it was given a round form facilitated local transport by rolling and also inspired the builders to dig round pits, which are preferable for soil stability reasons. Different materials were considered for making the slab, but nonreinforced concrete was the most competitive. The possibility of industrial production using asbestos cement (lusalite) is also being considered.

The first slabs were made at a factory for prefabricated concrete products. In transporting the slabs from the factory to the sites where they were to be installed, however, many of them were broken. To solve this problem a workshop was set up to produce the slabs locally. Using simple moulds, a mason and two assistants can make eight slabs per day.

In order to prevent accidents, each slab is test loaded with 4–6 persons standing on top of it, depending upon the diameter. In spite of this, however, cracks have appeared in a few cases after the testing, due to carelessness in transporting the slabs. If reinforc-

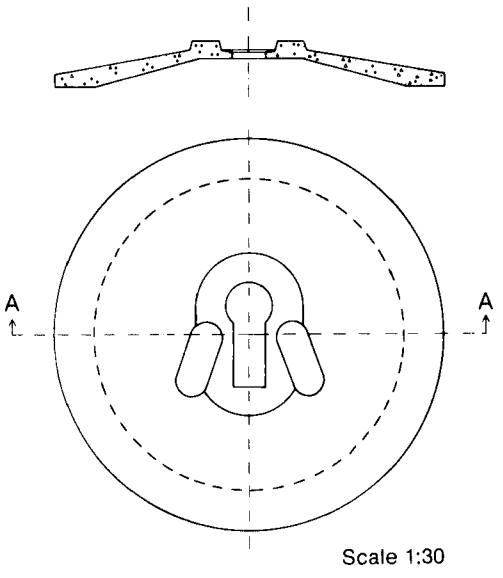

Fig. 1. Plan and cross-sectional views of slab of nonreinforced concrete used for conventional pit latrines. The ratio of cement : river sand : 1/4 in. stone used to make the cement mixture is 1:2: 1.5. When tested, the slab supported the weight of 9 people but failed with 10. Every slab is tested and must support the weight of six people before it can be put over a pit and used.

ing steel had been easily obtainable, a ring of reinforcement around the edge of the slab would have been useful for transportation purposes.

In order to get an idea of the appropriateness of the slabs, they were offered for sale to the general population for the price of producing them. So far, the sales have not been very sucessful and the reason is unknown because the inhabitants themselves had stressed the need for the slabs and nobody has yet said that they are too expensive.

The next step in the project was to design suitable types of latrines for special conditions. In this area, the new slabs have been very useful. For loose and unstable soils, different types of lining were used to hold up the wall of the pits. Good results have been achieved using cement blocks laid with open joints. The round form eliminates the need for mortar in the joints so that the lining is easy to erect. Experimental lining of only the upper part of the pit proved to be less sucessful unless executed with scrupulous control, which would be difficult to achieve in a large-scale project.

Lined pits also allowed for increased diameter. This has been used in areas with high groundwater tables to achieve a reasonable volume with a reduced depth. For these areas, the lining has also been used to raise the cover about 40 cm above ground level. In areas where groundwater is not used for household purposes, no effort has been made to ensure that the pits do not reach the water table.

Vietnamese double-vault compost latrines, built completely above ground, will also be tried. These are particularly appropriate for areas with high groundwater tables that are liable to flood conventional pits.

Another approach to limit the problem of covering the pit has been the introduction of borehole latrines. To compensate for the low capacity, due to the small pit diameter, they have been constructed to a depth of 8 m. Usually, two or three are constructed at the same time for the same family. Diameters of 30 cm are presently being used. Smaller diameters have been shown to fill up too quickly.

The Ecological Aspect

Enormous amounts of natural fertilizers are produced each day by people carrying out their bodily functions. In cities, these potential fertilizers are washed away by sewage systems into the sea or are otherwise made difficult or impossible to use. At the same time as this wastage of natural fertilizers is continuing, Mozambique is having difficulty in providing food for its urban population.

To meet this situation, a number of compost latrines have been constructed. These are mainly ordinary pit latrines with a reduced volume, constructed two and two, side by side, to be used alternately.

It is supposed that a compost period of 6 months would be sufficient to eliminate the risk of parasite transmission. From an agricultural point of view 12 months could also be considered. Medical tests are continually conducted as part of the project experiment. In accordance with results from other sanitation projects, ascaris egg viability is used as an indicator of pathogen neutralization.

It is hoped that the excavation of the compost or neutralized faecal matter will meet the agricultural difficulties, but the project has not yet advanced to the stage of a latrine being ready for emptying. In some cases, however, people have spontaneously emptied old latrines to use the contents as fertilizer.

Some of the borehole latrines have also been constructed so that after a period of neutralization they can be rebored for reuse of both the contents and the hole. For areas with sandy soil and low groundwater tables this seems to be a simple and cheap solution.

The Comfort Aspect

From the comfort point of view, few sanitary solutions can compete with the conventional flush toilet. For areas where water supply is a problem, as it is in most Mozambican cities, solutions with less water consumption are highly desirable. Also, the conventional flush toilet frequently causes hygienic difficulties because the effluent is voluminous and often highly polluting. For clay or fine sandy soils, infiltration can be difficult and can lead to surface streams of raw sewage. High groundwater tables and insufficient natural infiltration of the sewage can lead to serious pollution of wells.

Alternative sanitary solutions with corresponding comfort will be studied in the future stages of the project. This is particularly important because Mozambique, in the coming years, will have to build a considerable number of new houses all over the country for foreign technicians and other people involved in national development.