18th WEDC Conference KATHMANDU, Nepal 1992

WATER, ENVIRONMENT AND MANAGEMENT

Shallow sewers for low income settlements

A D D Disna Pathirage and Priyani Thantirige

SHALLOW SEWERS

A Promising Option for Urban Low-Income Settlements

INTRODUCTION

This paper will attempt to discuss one of the sewerage disposal systems implemented by National Housing Development Authority in order to dispose the sewage collected from urban low income settlements.

The informal settlements of the urban low income groups are called gardens and the people who live in these gardens are migrants who had moved in to cities from various places many decades ago.

They are the people with worst houses in Sri Lanka. Even though the rural poor also suffer the housing problem they can put up a house with mud walls and a that roof without any cost. But in the city things are expensive and putting up a shelter without ready cash is not an easy task.

Unfortunately since 1984 these communities had never been received the attention of city planners. Even though they consist of one half of the city population they were not conventionally recognised as a part of the city.

But in 1984 with the introduction of the Million Houses Programme the doors of the urban development were opened for the slum and shanty dwellers as well.

The NHDA which was formed in 1978 as a semi government organisation to provide better housing conditions for the majority of the country, identified these peoples initiatives and creativity and recognised the need to support them in constrained areas.

Under the Urban low income housing programme these deserving people were provided with land, infrastructure and services, assistance for house construction and training for skill development. They were given a buildable plot of land within the city and Roads, Drainage facilities, Water Supply, Electricity and Excreta disposal systems were provided by the government.

The extent of the land is around 50 square metres and in practice there is surprisingly little room to fit in all the services and this had made the job of engineers involved in the programme and extremely difficult one.

Authors had been closely involved in the programme from the beginning and obnserved that the most difficult service to provide under the space constraint is the excreta disposal. The conventional systems for this had been tried in many places and found unsuccessful and it has been proved that the shallow sewer system is the best answer for the sewage disposal in urban low income housing communities.

Shallow Sewer Among Other Excreta Disposal Methods

During the initial stages of the above described development exercise given the technical constraints and very high congestion most convenient excreta disposal solution available was communal toilets. Those toilets were either connected to the municipal sewer network where the same was available or in the absence of it to septic tanks. Although this solution offered some relief to the problem communal toilets being a public property, the question of upkeeping and maintenance existed without unanswered. Efforts made to maintain them either by municipal council or through various community organisation had never become successful. As a result of this, most of the communal toilets appear as untidy, unhygienic leaving the sanitation problem at a some what near condition to what was prevailing orginally.

With the bad experience on communal toilets and with sense of privacy and independence created among residents, as a result of improved social status acquired by them through housing programmes demand for individual toilet facilities commenced to increase.

Although over 60 per cent of Colombo City areas is covered by the municipal sewer network, providing conventional sewer system to upgraded squatter settlements, even if they were located close to the network was not possible due to technical constraints. Deep excavations needed for laying conventional sewer lines within narrow alleys among the houses and large spaces required for conventional manholes, interceptors etc. were among such constraints. Also some of the settlements being situated near the shallow lines maintaining high slopes required by the conventional sewer design was not feasible. It was further limited by high cost of providing such sewer lines.

In response to the individual household toilet facilities, the following systems are to be considered.

i. Ventilated improved pit latrines with leach pits (VIP latrines)

ii. Individual septic tanks with soakage pits.

iii. Double pit latrines.

i. Ventilated Improved Pit Latrines

Although providing many pit latrines with leach pits so closely in a low income settlement would create severe ground water contamination, considering the already contaminated state of ground water and ground water being not used drinking or working purposes, this system was considered as an acceptable solution.

ii. Individual Septic Tanks with Soakage Pits

Large space required for two pits, unfavourable soakability conditions and high cost often create limitations to the applications of this system in Low Income Urban Settlements.

iii. Double Pit Latrines

Having observed success of double pit latrines in similar situations in some other countries, double pit latrines were introduced in some projects in Colombo. The system has two independent chambers to be used alternatively for depositing excreta. While the second chamber in operating, properly digested harmless remains of the first pit to be emptied manually by the users. Despite the technically feasibility of the system, phycological or cultural behaviors of residents have created limitations in acceptability of the system.

In the light of the above mentioned limitations in the other options and in view of the ultimate solution as perceived by the residents, being a sewer system similar to that possessed by affluent citizens, shallow sewer was indicated promising characters, when it was first introduced to the NHDA Engineers by Gihan Sinnathambi of UNCHS in 1987.

Subsequent experience drawn from Orangi Pilot Project, and some refinements done by NHDA had further improved the system.

Shallow Sewer System which required much less excavations and space with it's simplicity in construction, operation and maintenance offered a much better quality solution among other solutions already described.

Limitations in the three solutions described above, such as ground water contamination, soakability problems, problems encountered in digging pits, smelling manual handling of remains etc are not found in Shallow Sewer Systems.

Also it does not require sophisticated rodding equipments etc in clearing a blockage. As the mainfold pits are located closely and depth is small, even residents themselves can handle a clearing operation.

However, it requires a linear formation of a layout of houses with a narrow alley for laying the lines and a generally flat or gradually sloping land profile. Also it requires a municipal sewer line at it's outlet or a natural water cause to discharge the filtered effluent.

With the other low cost excreta disposal options showing limitations, technically and socially acceptability on the given situation, Shallow Sewer Systems becoming increasingly popular as a human excreta disposal solution among Low Income Settlements in Urban Areas.

SHALLOW SEWER TECHNOLOGY AND SYSTEMS

i. Phenomenon

Conventional sewer systems are designed such that flow velocity of flushing water in the system is high enough to flush away the sewage through the network. In order to keep the velocity high enough to carry sewage forward, pipes are laid at fairly steep slopes. In order to provide free flow of water diameters used are fairly large.

However recent observations made on the deteriorated old sewer system still functioning satisfactorily and those indicate that the above self flushing velocity is not a necessary requirement. Solids get deposited in the pipes causing the subsequent flush water to collect behind to build up a back pressure. This back pressure causes the solids to move forward.

Therefore, shallow sewers do not require such steep slopes or large diameters to function.

ii. Design

Flow velocity not being very critical design of Shallow Sewer Systems does not require tedious calculations except in the very large networks.

In general 100mm pipes laid at gradients not less that 1:300 slopes could be used for 100 houses. However, if sewers are laid on marshy or newly filled lands slopes less than 1:200 are not recommended in order to prevent errors which could be caused due to subsequent settlement of pipes and many fold structures.

Houses can be connected to the sewer network either through manholes or even without manholes depending on the situation.

CONCLUSION

On concluding authors wish to mention that the shallow sewer system had proved itself a significant achievement in many ways.

The technology is simple and no foreign exchange required. The investment is minimal compared with the conventional systems.

This design as well as the construction can be handled by the community with a little guidance from NHDA.

Despite the appropriateness of the system the replicability may largely depend on the assistance given to the Urban Low Income Programme by the government as well as by various donor agencies. Therefore, it is the responsibility of the government and the donor agencies to provide necessary funds and assistance for the implementation of Shallow Sewer Systems in low income settlements in order to achieve the objectives of a clean environment.

REFEREES :

1 Ganepola, Piyal and Nilaweera R. (1990) Shallow Sewers (a paper)

2 Cotton Andrew and Franceys Richard (1980) Engineering Services for Urban Low Income Housing in Sri Lanka (a book)

3 Pathirage A D D D (1990) Site and Service Programme in Sri Lanka (a paper)