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An approach paper for adoption of "Bona" tank type Latrine

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SUMMARY.

In this paper alternative to water seal pit latrine has been discussed. Certain advantages in adopting new proposal have been mentioned and a plea has been made for its inclusion in the 'DECADE'S PROGRAMME' which may go along with the water seal pit latrine with synergistic action.

INTRODUCTION.

In the developing countries, no doubt, rapid strides are being made on drinking water supplies in this international water supply and sanitation decade (1981-90). However, the sanitation component could not still get its due place. It has been universally accepted that water-seal pit privies where water is used for ablution would serve as a magic wand. This may or may not be true in all the cases. Many things may come in conflict-cultural differences among the people on one hand and the techno-economic aspects on the other. In India both for rural and urban areas alike, water-seal pit latrines have been considered as the only low cost solution. But there could be many alternatives now. In fact search for alternatives was started nearly fifteen years back with experiments at PRAI (India). A low cost dwarf (Bona) septic tank resembling acqua privy was subsequently evolved for the needs of individual families of 5 to 10 person from theoretical aspects to extensive field work taken up during this period, Refer fig. 1.

Dwarf (bona) septic tank.

While developing the design a reference was made to Indian standard specifications. Although typical in design the construction is simple as it can be made with $4\frac{1}{2}$ " thick brick/conc. block wall.

Desludging can be done periodically (12 months) under hydrostatic pressure of one foot only. The size of tank is much reduced and quality of effluent improved for flushing is possible with 10 to 15 pint of water due to small water-seal ($4\frac{1}{2}$ "). In fact a bath cum toilet can be made within the small space. The effluent can be disposed of in many ways such as (i) evapo-transpiration system, (ii) dilution with sullage water by discharging the contents into the drain (iii) into a soakage pit, (iv) treating with anaerobic filter and utilising the effluent in kitchen garden.

The cost wise design is quite economical and may be termed as low cost.

Extension of this approach.

With the initial success, further designs have been developed up to 500 persons with or without community latrines which are economical both in initial and maintenance cost. Where this is away from latrine enclosure, circular shape of dwarf septic tank is preferred for greater structural strength. Designs for biogas plant with latrines around have also been worked out recently, and a pilot plant is under construction at Gopeshwar (India). Our experience with evolving basic designs and the pilot study after field investigations have been well documented in more than two dozens of published technical papers.

COMPARISON OF DWARF SEPTIC TANK LATRINE.

Comparison of this design with two pit water-seal latrine has been shown in table. 1.

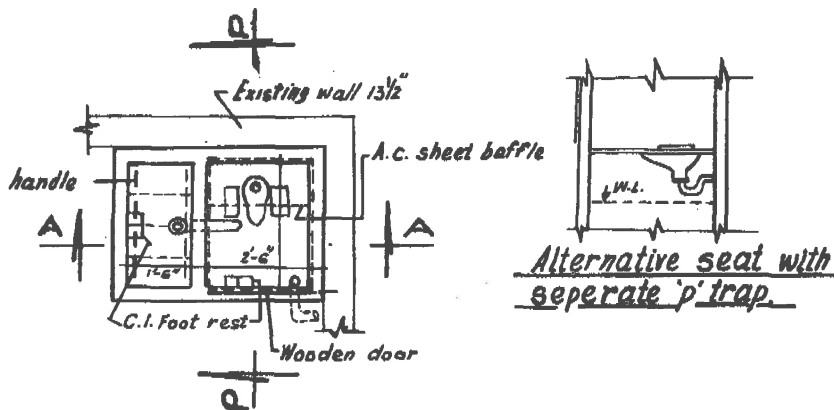
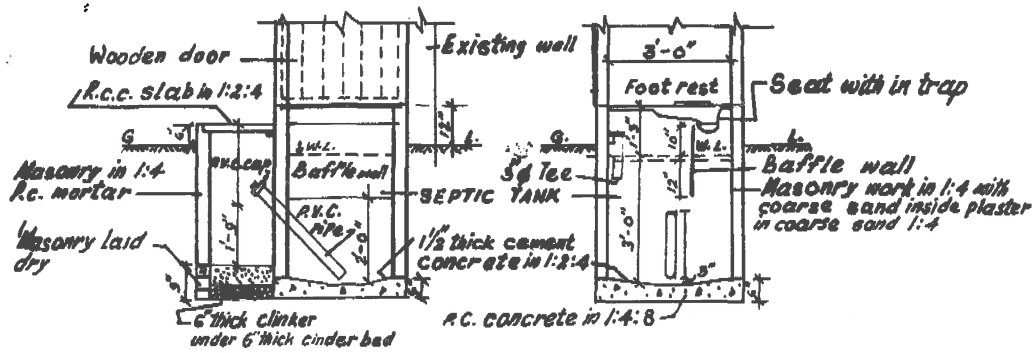


FIG. 1-DRAWING OF DWARF SEPTIC TANK FOR 5 USERS

CONCLUSION.

A review of the data produced here would lead to a valid question that with obvious advantages why the extension of dwarf (Bona) septic tank latrine has been deferred for long. It is perhaps due to the belief that the design and construction of water-seal pit latrine is very simple. At this juncture, it may be mentioned that the design in question is also very simple in construction and can be adopted as a valid alternative with the technical expertise already available with in the developing countries including India.

Implementation strategy.

U.P. Jal Nigam like many other organisations have adequate technical expertise for handling innovative programmes confidently. The authors feel that in order to make a dent, an interaction is desirable with in ourselves to harnessing the best possible talent available and thereafter with support agencies such as HUDCO, WORLD BANK, UNICEF etc. with an open mind. Perhaps then, it would be possible to achieve the DECADE targets for minimum sanitation services in the developing countries.

Table .1. COMPARISION OF DWARF (BONA) SEPTIC TANK TYPE LATRINES WITH WATER SEAL PIT LATRINE.

<u>DWARF SEPTIC TANK LATRINE</u> -----	<u>WATER SEAL PIT LATRINE</u> -----
1. NATURE OF INSTALATION.	1. NATURE OF INSTALATION.
<p>A. It is a permanent type of installation. This is an extension of acqua privy/septic tank concept. (Page 40 Wagner -ref .1)</p>	<p>A. The life span of a pit privy will vary from 5 to 15 years depending upon the capacity of the pit and porosity of the soil. (p.40, Wagner -ref.1)</p>
<p>and its removal <u>Reasons.</u> /</p>	<p><u>Reasons.</u></p>
<p>1. Sludge can be removed hydrostatically without any difficulty at one year interval into the manure pit. Here it gets converted into the sludge cakes/ is easy. As far effluent nearly 85% of suspended solids and 90% of B.O.D. are removed .As per test data B.O.D. of the effluent is around 450ppm. The effluent contains some impurities in finely divided & colloidal form and can be disposed of in:-</p>	<p>(1) If the soil through which the pit has been dug is not sufficiently porous, the effluent will slowly accumulate and will ultimately overflow. Even in porous soils such a situation is common as the earthen walls become choked by the deposit of the finely divided matter carried by the effluent and the solid built up by the life activity of the zoological organisms thriving on the grains of the soil in contact with the effluent. (p.125, Wagner)</p>
<p>(a) A specially designed soak pit where the porosity of the soil is reasonable .The pit will last for about 5 years. This pit can be used after cleaning and washing its contents. In this design soak pit wall does not choke and porosity remains intact.</p>	<p>(11) It has been reported that an average pit of 3ft dia and 8 ft deep, fills up in 2½ to 3 years (PRAI pub.No 340 p.35 ref-2 & also as per design criteria mentioned on page 48 Wagner) This pit will be filled up in 3 years (2cuft per capita per year). This pit shall however, be filled up much quicker for aforesaid reason on subsequent filling. (AnnWal report PRAI 1968-69 -ref.3)</p>
<p>(b) In non absorbtive soils anaerobic filter can be provided and the effluent can be utilised for kitchen gardening, also the effluent could be utilized for growing of fruit trees without any further treatment. (Evepo -Transpiration system).</p>	
<p>(c) The effluent from dwarf septic tank be diluted with drain water in area of good water supply. To mentain cleanliness about 10-15 pints per capita per day will be sufficient for the latrine. When mixed with 100 to 150 pints per capita per day of sullage the over all B.O.D. and suspended solid will reduce to much lower limit, generally permissible for surface waters and the waste stablization shall be taken care of by the self purification power of the surface water itself. (Practice adopted by CMDA Calcutta (India) & also Wagner Page 122)</p>	

2. WATER POLLUTION DUE TO HIGH SUB SOIL WATER LEVEL:-

A. A dwarf (bona) septic tank will not be affected in areas of high sub soil water level as they are shallow and can be constructed partly above or below the ground without any problem. They are also water tight. Also instead of soak pit, a soak trench could be provided to avoid any pollution of ground water or the effluent may be discharged above ground level as mentioned earlier; also Wagner p. 79)

Fissured rock

B. No such difficulty in case of dwarf septic tank.

3. IMPERVIOUS SOILS.

No such problem as for the pit privy.

4. DISTANCE FROM BUILDING FOUNDATION

A. It can be placed very close to a dwelling.

Reasons.

(i) Dwarf septic tank is a shallow water tight container, no damage to building foundation is expected

(ii) Even in case of congested localities construction of dwarf septic tank is possible which could be accommodated with in existing dry latrine enclosure.

5. DISTANCE BETWEEN THE TWO PITS

No such problem exists in case of dwarf septic tank type privy and the soak pit may be constructed in close proximity.

6. PROBLEM WITH PAN FLUSHING AND KEEPING THE LATRINE CLEAN.

With this design more water can be used for keeping the latrine as clean as possible. In fact a tap can

2. WATER POLLUTION DUE TO HIGH SUB SOIL WATER LEVEL:-

A. It should have atleast 5 ft cushion (dry earth covering) above the highest subsoil water level. It is desirable to keep minimum 5 ft depth in which case the water table should be lower than atleast 10 ft from the ground level. By injecting excreta directly in to the subsoil water long distance travel of bacteria has been reported (PRAI pub. No 340 p.37; Wagner p-29 to 32)

Fissured rock

B. In fissured rock and lime stone formation, soak pit construction is difficult and risk of water pollution is high (Wagner p.32)

3. IMPERVIOUS SOILS.

In impervious soils pit privy has very little use as the contents overflow quickly.

4. DISTANCE FROM BUILDING FOUNDATION.

A. Pit privies should preferably be built at some distance about 20ft or more away from dwellings (Wagner p.68 and 103)

Reasons.

(i) Inleaching pit system, the foundation as well as superstructure may be adversely affected by the liquid containing salts rising up due to capillary action.

(ii) For very congested localities pit privies may not be feasible (Wagner p.125)

5. DISTANCE BETWEEN THE TWO PITS.

The minimum distance between the alternating pits should be (5-6ft) or more (Wagner p. 117)

6. PROBLEM WITH PAN FLUSHING AND KEEPING THE LATRINE CLEAN.

As a result of evaluation study (p.103 ref-4) it has been reported that out of the latrines which

be fitted inside where piped water supply facility exist. Instead of 4 to 5 pints of water per flush as recommended for pit privies we can conveniently use about 10 to 15 pints (Wagner p.82)

7. PROBLEM OF PIT EMPTYING.

Dwarf septic tank has been provided with a desludging pipe for removal of digested slurry once in a year. This sludge is dried on site and its removal is easy.

8. NON AVAILABILITY OF SPACE.

It requires small space as the latrine pan could be built right over the dwarf septic tank itself.

9. WHERE PEOPLE USE STONE GRASS PAPER FOR ANAL CLEANING.

Dwarf septic tank latrine can still be used with slight modification by replacing the water-seal with straight pipe projecting below the water level in tank (Old aqua privy concept)

10. MANURIAL VALUE.

The recovered dry digested sludge cakes have high manurial value and low cost of handling.

11. COST OF PRIVY.

Cost though higher because of supervision, it is quite comparable to pit privy. This may be adopted with advantage in lower to upper middle class housing where water supply facilities are available.

Reference:-

1. WAGNER, F.G. and LONIX, J.N. Excreta disposal for rural areas and small communities. WHO monogram series.
2. Planning research and action institute Lucknow U.P. (India) publication no. 340 WHO.
3. Annual report of the sanitary Engineering Programmes-Rural Health section.
4. P. RAI Publication 1967. Induced change in health behaviour. A evaluation study of the pilot environmental sanitation project in U.P. (India)

were used only about 50% were found to be clean.

Reason.

Water source can not be located inside a latrine enclosure for fear of filling of the pit early. Difficulty exist in water use if the source is located out side and therefore keeping the latrine clean

7. PROBLEM OF PIT EMPTYING.

Pit emptying is a major problem both in case of two pits and single pit. Top portions remain in liquid form whereas bottom sludge becomes too hard. This is difficult to handle with conventional means. (Annual report PRAI 1968-69)

8. NON AVAILABILITY OF SPACE.

It requires very large space which may not be generally available in big towns and cities.

9. WHERE PEOPLE USE STONE GRASS PAPER FOR ANAL CLEANING.

This type of latrine can not be used at all.

10. MANURIAL VALUE.

The sludge produce have high moisture contents in upper layers with loss in nitrogen. Sludge at the bottom is difficult to remove as it becomes harder with time. Cost of recovery is high whereas the manurial contents are low.

11. COST OF PRIVY.

Cost is quite low as it does not require much supervision. This may be adopted where ever feasible.

