CONCERN-BANGLADESH

Sanitation Study
Khaliajuri

Donna Mooney

December 1995

STUDY ON SANITATION IN KHALIAJURI

Introduction

CONCERN operate a water and sanitation component in their Rural Development Programme

The objectives of the water and sanitation component are -

- To provide access to low cost latrines and tubewells
- To create an awareness among group members about the relationship between health and the environment

To achieve these objectives CONCERN set up production centres in the areas to produce low cost sanitary latrines. During the monsoon in some areas the sanitary latrines which were installed overflowed.

A study was undertaken to assess the problem. The study deals with the performance of simple water seal pit latrines with particular reference to how well they work when rains flood Khaliajuri during the monsoon.

The purpose of this report is to explain how the study was carried out, record findings and make recommendations.

Khaliajuri

The study on pit latrines was carried out in Khaliajuri thana which is situated in the North-East region of Bangladesh in the district of Netrakona. Khaliajuri is a haor area. This is an area in the flood plain of a river, which is very fertile agricultural land for 4 months of the year and under water for the other 8 months. The people in this area live in tiny villages built on artificial islands made of banked up mud. During the dry season these villages are the centres for intense agricultural activity, and in the wet season the people live on rice they have stored in the village and some fishing. CONCERNs Rural Development Programme began in Khaliajuri in 1992 and is designed to be a rolling programme, which means it moves into an area works in that area for 3 to 5 years, and then moves on.

Present Conditions

In the Khaliajuri area traditionally defecated material is deposited on the open ground or into surface waters. In 1993 a water and sanitation component was introduced into the area as part of CONCERN's Rural Development Programme. The use of a simple water seal pit latrine (1 ring, 1 slab) was encouraged in Khaliajuri as part of CONCERN's sanitation component to improve sanitation in the area.

This type of latrine was chosen as it is cheap, can be locally constructed and takes up the minimum amount of space. The target set by the programme for the installation of 200 latrines in a year was exceeded. In a number of villages all hanging latrines were replaced and in others up to 80% hanging latrines were replaced by sanitary latrines.

The function of a pit latrine is to isolate and store human excreta in such a way that no harmful bacteria can be carried to a new host. Disposal of the effluent occurs by seeping into the surrounding soil i.e. urine and flushing water flow into the pit, the solid matter (faeces) is stored in the pit where it undergoes decomposition while the liquid (water and urine) seeps away into the surrounding soil. The excreta accumulates inside the pit until it comes to within about 1 or 2 ft of the top of the pit at which point the pit is filled in and a new pit dug.

A water seal pit latrine consists of a pit with a reinforced concrete lining, a reinforced squatting plate (with flush pan) and a bamboo matting shelter. The water seal provides a barrier between the interior of the pit and the outside, preventing flies, mosquitoes or odours passing.

One of the most important aspects of any pit latrine is its useful life. The longer the pit latrine will serve a family without being moved or rebuilt, the more certain is the health protection it can give and therefore the more value it has to the family and community. The life of a latrine depends on the care with which it is built, the material used in its construction and the time required for the pit to fill.

Another aspect of pit latrines which may be important is the survival of pathogenic organisms in the pit. Most pit latrines are filled in when almost full and are either never dug up or only dug up many years later. If the pit has been left for a minimum of 1 year, there will be no viable pathogens surviving except for the possibility of a few Ascaris ova. However, the risk involved in reusing material that has been buried for at least 1 year is very small and may be ignored.

Maintenance

Maintenance is the most important and also the simplest requirement of pit latrines. It consists principally of keeping the squatting plate and superstructure clean. Squatting plates easily become fouled up. Fouled and unhygienic pit latrines are found all over the world because they have been constructed in communities that previously used open ground for defecation and the absence of adequate community involvement on education. Fouled pit latrines became a focus for disease transmission and may make matters worse than before.

Difficulties encountered

The principle difficulty with this type of pit latrine is that in Khaliajuri the water table is high and in the wet season the pit often floods with water causing the latrines to overflow. To try to overcome this problem a number of experimental latrines were constructed before the monsoon and monitored throughout the monsoon to establish which types work best.

Experiment

In order to try to find a solution to the sanitation problem that is so cheap that the people can afford to continue to build after the withdrawal of the project a series of experimental latrines was designed and built and were monitored during the monsoon. (see attached figures 1-6).

Type of latrines

One of the latrines has a built up pit with a 0.6 metre deep ring used instead of the normal 0.3 metre deep ring. The idea behind this is that when the pit fills with water there is still enough space above the water level to prevent the latrine from overflowing. This latrine is 0.45m above ground level. A second latrine uses 5 rings lining the pit to see if this would make a difference to the workings of the latrine. This is compared

with a latrine made up of 6 rings all of which are 0.3 m deep. This latrine is 0.23m above ground level as opposed to 0.45m.

There is some debate about whether the water filling the latrines is caused by water entering the latrine from the top, or seeping in through the sides as a result of a rise in the water table. To investigate, a latrine with 6 rings and the top closed was constructed. In addition, a number of sample pipes were bored to monitor the level of the water throughout the monsoon. The latrines are usually sited away from the houses at the edges of the villages in soil that has been built up by the villagers to protect them from erosion. This soil has different characteristics to the more compacted soil of the villages themselves. To see if the compaction of the soil has an effect, the test latrines have been constructed in both compacted and loose soil.

Location

Experimental latrines were installed in 3 villages Nayapara, Krishtapur and Ballabpur as follows:

Name of village	House/latrine holder name	Type of latrine				Total beneficiaries	Date of installation
		6 ring (1ft) 1 slab	1 ring (2ft) 1 slab	1 ring (1ft) 1 slab	6 ring (top 2 ft.) 1 slab		
Nayapara	Gita Rani Chaia Rani	1 set				12	
	Nisha Rani Lani Rani		1 set			7	
	Dipali Rani Nisha Rani			1 set		6	
Kristapur	Sorashi Das	1set				12	
	Fulan Rani Shikha Rani		1 set			10	
	Chaia Rani			1 set		8	
Ballabpur	Sawragha	1set				14	
	Fultara Rani		1 set			7	
	Shefali Rani			1 set		6	

Monitoring

The experimental latrines were monitored every 2 weeks by the CONCERN engineer from 1 July 1995 upto the 15 October. In addition the water level at a distance of 3ft from each latrine was recorded when monitoring commenced to ascertain the difference between surface water level and depth of water in the pit.

During the monitoring period some of the villagers moved their sanitary latrines from the low ground level where they were sited during the dry season and stored them beside their homes. They built hanging latrines into haor and used those instead during the rainy season. Evidence of defecation in open spaces at the edges of the embankments of the villages was also found.

It was also observed that in the sanitary latrines used by the villagers that there was no roof on the superstructure thus allowing rain water to enter into the pan of the latrine.

Findings

In Nayapara none of the latrines worked effectively during the monsoon. The soil in Nayapara is clay thus percolation through the pit latrines was slow causing latrines to overflow and render them unusable.

In Kristapur the 6 ring latrine worked throughout the monsoon. The 1 ring (1ft) had to be reinstalled after damage caused by rats filling up the latrine with soil. The remaining latrine 1 ring (2ft) collapsed due to wave erosion. In Kristapur soil conditions are mostly sandy rendering percolation through the soil good.

In Ballapur only the 6 ring latrine remained working throughout the monsoon season. The other 2 latrines overflowed and collapsed. Soil conditions in this area are sandy/soil.

The findings were recorded in tables (see attached sheets).

There are many reasons for the collapse of latrines.

(1) Soil has been built up in the earth work programme and thus is loosely bound and has not the same strength as normal soil.

(2) Rain water in the monsoon contributes to soil erosion and this problem is confounded by the burrowing of rats seeking shelter on higher ground during the monsoon. In latrines where there is only one ring there is not enough surface area at the base to transfer the load of the ring and slab and users into the ground. This along with a minimum of friction support due to the small depth of the ring in the soil contributes to sinking and collapse of the latrines.

(3) In latrines with 6 rings the base of rings is situated in deeper and more compacted soil. The base is flat at the bottom thus there is no scope for soil eroding as with only one ring. The rings creates greater surface area thus providing greater friction surrounding the lining (rings) which protects the latrine from sinking and collapsing. The linings provide protection from rats in the pit during the rainy season when rats are borrowing into the soil.

The results of the experiments show no latrine worked continuously throughout the monsoon under all soil conditions. Most latrine users abandoned pit latrines during the monsoon and reverted back to building hanging latrines into the haor.

During the period of the study a meeting between group members and CONCERN's Development Organisers was called to discuss the use of latrines during the monsoon and to find a short term solution to the problem. At the meeting it was decided that when the monsoon rains were heavy and pit latrines were unusable, due to collapse and overflowing, that families could install and use hanging latrines. It was also agreed that after the monsoon that pit latrines should be installed again. However, this situation is undesirable because at the end of the monsoon, families may be reluctant to install pit latrines again.

The 6 ring latrine worked throughout the monsoon in sandy soil and sandy/clay soil only. This latrine is expensive to install but, it is recommended that this design be used in sandy or sandy/clay soil areas in Khaliajuri. The present 30% subsidy available to help group members install latrines should be increased to provide the greater financial assistance necessary to help group members install the recommended 6 ring latrine.

There is clearly a need to find a cost effective solution to the problem as without proper sanitation the conditions in the haor can not be effectively improved in preventing the spread of disease.

Recommendations

The findings of this report were circulated to similar organisations who operate water and sanitation programmes. UNICEF was the only organisation to reply and they agreed with the findings.

The ideal latrine is a 6 ring (top ring 2ft) type which would allow for an extra 1ft above ground thus decreasing the chances of the latrine overflowing. However there are handling and transport problems with this type of latrine because of its size and shape.

The best option is to install the 6 ring latrine (all rings 1ft) in Khailajuri.

In specific cases where the 6 ring latrine is not suitable the manager with help from the Development Organisers and engineer, should decide on varying the number of rings as appropriate.

Where the 6 ring latrine (all rings 1 ft) are installed, it will involve extra cost and therefore it is important that group members receive an increase in financial assistance

unicef

United Nations Children's Fund
জাতিসংঘ শিশু তহবিল (ইউনিসেফ)

RWS/513/1538
December 19, 1995

Donna Mooney
Technical Advisor for Environmental Health
CONCERN
House 63, Road 15A
Dhanmondi, Dhaka

Dear Ms Mooney,

Subject: Sanitation Study in Khaliajuri Thana, Netrakona District

I refer to you letter of 13 December to Mr. Deepak Bajracharya, Chief, WESS together with a report of the above study. Thank you for sharing with us the report. It is a commendable effort for you to look into the problem of using waterseal latrines in the above rural area. Please find our observations/suggestions as below:-

1. The study indicates that the 6 rings and 1 slab waterseal latrines work well throughout the monsoon season in sandy soil and sandy/clay soil formation. For sustainability of low cost technology and the people's sanitary habit formation, the 6 rings structural sound sanitary latrine should be promoted. The project can work out a loan or credit scheme to provide financial assistance to the economic weak families. In such a way, community members can be involved to manage their own sanitation scheme and the villagers do not have to go back to the open field and hanging latrines.

2. Your report mentions that the excreta left in the pit for one year and there will be no pathogens except a few ascaris ova. Do these conclusions draw from research studies by your project or by others ? We appreciate to receive copy of these studies.

With best regards.

Sincerely yours,

T.V. Luong
Sanitation Coordinator,
WES Section

CONCERN:TVL-XL :/ 12.95

House [illegible] Road [illegible] Dhanmondi R/A, Dhaka [illegible] GPO Box [illegible], Dhaka 1000, Bangladesh [illegible] DHAKA [illegible] Phone [illegible]

Figure - 1

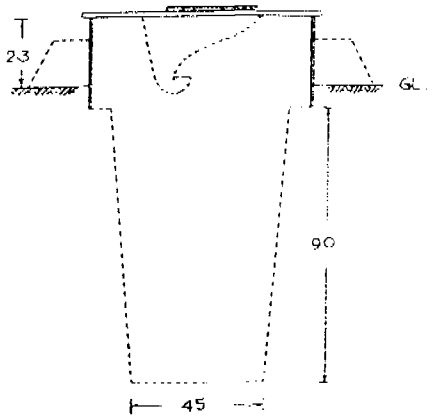


Figure - 2

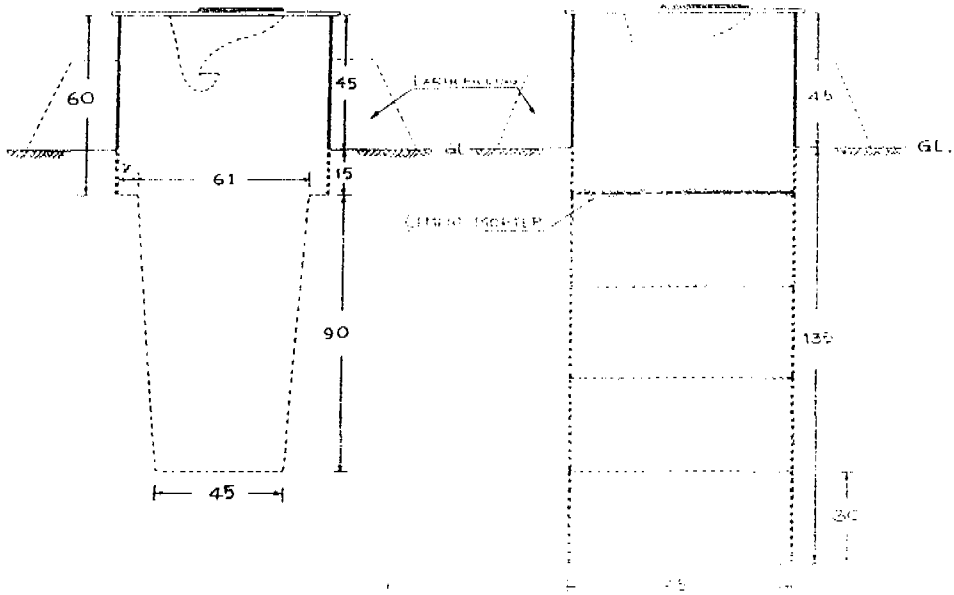


Figure - 4

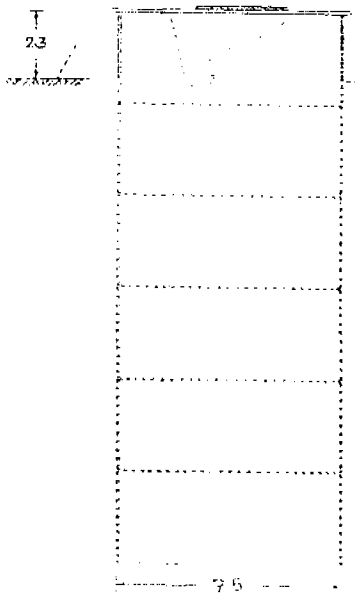


Figure - 5

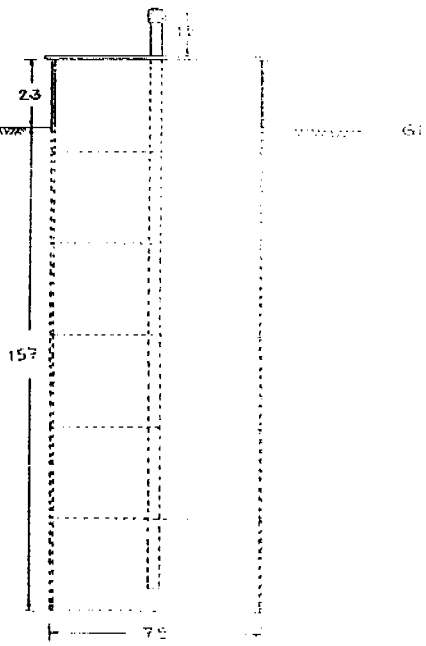
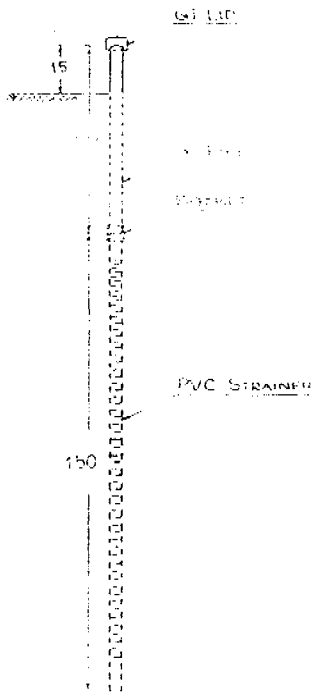
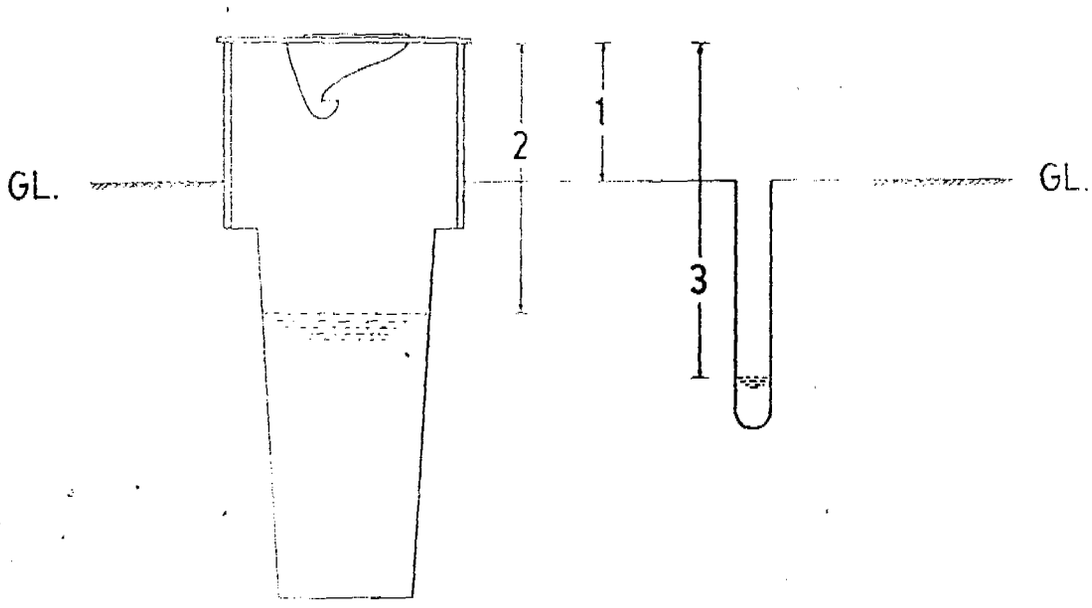


Figure - 6





1. Height of latrine above ground level.
2. Depth of water in pit.
3. Depth of water in surface pit at 3′ distance from latrine.

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Name of Owner: Gita Rani and Chaya Rani

Name of Village: Nayapara (Khaliajuri)

Type of Latrine: 6 Ring (1'-0" height) + 1 Slab.

Monitoring Date	Ht. of latrine above G.L.	Depth of water in pit	Depth of surface water (3' distance)	Staff observation and comments	Users comments
01.07.95	0'-9"	1'-4"	3'-1"	* Good condition for use * Soak is not good because soil is clay type	* This type of latrine is good for use in all seasons but it is too expensive
02.07.95	0'-9"	0'-3"	2'-6"	Latrine not being used because it was overflowing.	Cannot use because pit is overflowing
02.8.95	0'-7"	0-6"	2'-6"	Latrine not being used because it was overflowing	Cannot use because pit is overflowing
6.8.95	—	—	—	Latrine is being used by a few persons only	Latrine only used by a few persons. Pit quickly fills up.
15.08.95	0'-7"	0'-6"	2'-8"	Not using - not working	Not using
20.08.95	"	"	—	Not working Overflowing	"
15.09.95	"	"	—	"	"
20.09.95	0-6"	0'-10"	2'-11"	Good condition using	Reinstalled and using
15.10.95	0-6"	0'-11"	3'-3"	Good condition	"

11.1.95 Not using - door broken. Well resides on low lying ja

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Name of Owner: Nisha Rani and Lani Rani

Name of Village: Nayapara (Khaliajuri)

Type of Latrine: 1 Ring (2'-0" ht) + 1 Slab.

Monitoring Date	Ht. of latrine above G.L.	Depth of water in pit	Depth of surface water (3' distance)	Staff observation and comments	Users comments
01.07.95	0'-8"	0'-9"	3'-1"	Bad condition for use because depth of water level in pit very high - Clay soil	Can not use this latrine because pit is overflowing
17.07.95	0'-8"	0'-8"	2'-5"	Bad condition because depth of water level in pit is very high.	"
02.08.95	0'-6"	0-6"	2'-7"	"	"
06.08.95	—	—	—	overflowing - not being used.	"
15.08.95	0'-5"	0-6"	2'-6"	"	"
30.08.95	0'-5"	0-6"	—	"	"
15.9.95	"	"	—	"	"
30.9.95	0-6"	0-6"			
11.11.95				not using - flooded. top off - clean pit.	not using

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CONCERN-Bangladesh

Name of Owner: Dipali Rani and Nisha Rani

Name of Village: Nayapara (Khatiajuri)

Type of Latrine: 1 Ring (1'-0" ht) + Slab.

Monitoring Date	Ht. of latrine above G.L.	Depth of water in pit	Depth of surface water (3' distance)	Staff observation and comments	Users comments
01.07.95	0'-7"	0'-9"	3'-1"	Bad condition Pit is not holding water during overflowing clay soil	We cannot use this type of latrine in the Rainy Season
17.07.95	0'-7"	0'-8"	2'-6"	overflowing	"
02.8.95	0-6"	0-6"	2'-8"	"	"
06.8.95	—	—	—	overflowing - not being used.	
15.08.95	0'-6"	0-3"	2'-6"	" overflowing	not using
30.08.95	"	"	—	"	"
15.9.95	"	"	—	"	"
11.11.95				flooded - not using	not using

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CONCERN-Banglaudesh

Name of Owner: Kultara Rani

Name of Village: Ballabpur (Nagar Union)

Type of Latrine: 1 Ring (2'-0" ht) + 1 Slab

Monitoring Date	Ht. of latrine above G.L.	Depth of water in pit	Depth of surface water (3' distance)	Staff observation and comments	Users comments
01.07.95	0'-7"	3'-0"	2'-9"	Good condition - working well. Sandy/clay soil	Can use properly
17.7.95	0'-7"	2'-3"	2'-7"	"	"
02.08.95	0'-4"	1'-8"	2'-4"	"	"
06.08.95	—	—	—	Was working but can't be used too often as quickly fills up.	"
13.08.95	0'-4"	1'-1"	2'-3"	Was working but cannot be used often because quickly fills up.	"
30.08.95	0'-4"	1'-2"	2'-5"	"	"
15.09.95	0-4"	1'-3"	2'-6"	"	"
30.09.95	0-4"	1'-6"	2'-10"	"	"
05.10.95	0'-4"	1'-9"	3'-0"	Not working	Not using.
3.11.95				Collapsed and destroyed - not using	

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CONCERN-Bangladesh

Name of Owner: Subaggha Rani

Name of Village: Ballabpur (Nagar Union)

Type of Latrine: 6 Ring (1'-0" ht) + 1 Slab.

Monitoring Date	Ht. of latrine above G.L.	Depth of water in pit	Depth of surface water (3' distance)	Staff observation and comments	Users comments
01-07-95	0'-8"	2'-1"	3'2"	Good condition. Water level is low in pit. Sandy/Clay Soil	Can use properly
17-07-95	0'-8"	1'-11"	2'-9"	"	"
02-08-95	0'-6"	1'-6"	2'-6"	"	"
16-08-95	—	—	—	Working well good condition.	using properly
15-09-95	0'-5"	1'-4"	2'-3"	Good Condition	using properly
1-08-95	0'-6"	1'-6"	2'-6"	Good Condition	
14-09-95	0'-5"	1'-4"	2'-6"	Good Condition	"
2-10-95	0'-5"	1'-9"	2'8"	Good Condition	"
16-10-95	0'-5"	2'-0"	3'-0"	Good Condition	

1-11-95

Working - during Monsoon
Worked. Door broken

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Name of Owner: Safali Rani

Name of Village: Ballabpur (Nagar Union).

Type of Latrine: Ring (1 Pit nil) + Slab.

Monitoring Date	Ht. of latrine above G.L.	Depth of water in pit	Depth of surface water (3' distance)	Staff observation and comments	Users comments
[illegible] 04 95	0'-8"	2'-8"	3'-8"	Good condition - working well. Sandy/clay soil.	Can use properly.
01-04-95	0'-8"	2'-0"	2'-6"	"	"
02-05-95	0'-3"	0'-9"	2'-0"	"	"
06-08-95	—	—	—	Overflowing - not being used	Can not use because it is over flowing.
15-08-95	0'-3"	0'-7"	2'-0"	bad condition - not working	Not using.
30-08-95	0'-3"	0'-8"	2'-3"	not working	not using
[illegible] 04 95	0'-3"	0'-6"	2'-0	not working	"
30-01-95	0'-3"	0-9"	2-0"	Good condition	Reinstalled again and using
[illegible] 10 95	0-3"	0'-10"	2'-6"	Good condition	using properly
[illegible] 95			Not working. - filled with mud		not using.

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Name of Owner: Sarasati Das

Name of Village: Kristapur (Khaliajuri)

Type of Latrine: 6 Ring (1'-0" Dia) + 1 Slab.

Monitoring Date	Ht. of latrine above G.L.	Depth of water in pit	Depth of surface water (3' distance)	Staff observation and comments	Users comments
01·07·95	0'-9"	4'-0"	-	Good condition for use. Soil is sandy type so Sank already Good (Sandy/Clay Soil)	Can use Properly but it very expensive
17·07·95	0'-9"	3'-0"	3'-9"	"	"
02·08·95	0'-9"	2'-6"	4'-6"	"	"
6·8·95	-	-	-	Good condition for use.	"
15·8·95	0'-9"	2'-0"	4'-0"	Good Condition	"
30·8·95	0-9"	2'-3"	4'-3"	Good Condition	"
15·9·95	0-9"	2'-0"	4'-0"	Good Condition	"
30·9·95	0-9"	2'-3"	4'-3"	Good Condition	"
15·10·95	0'-9"	2'-6"	4'-6"	Good Condition	"

1·11·95 Working Using

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Name of Owner: Fulan Rani / Shikha Rani

Name of Village: KRISHNAPUR (Khaliajuri)

Type of Latrine: 1 Ring (2'-0" ht) + 1 Slab

Monitoring Date	Ht. of latrine above G.L.	Depth of water in pit	Depth of surface water (3' distance)	Staff observation and comments	Users comments
01.07.95	0'-9"	3'-6"	-	Good condition for use. Clay is sandy - good for soak away (Sandy/Clay Soil)	Can use properly but, Ring is difficult to carry
01.08.95	0'-9"	2'-6"	3'-5"	"	"
01.08.95	0'-9"	2'-0"	4'-0"	"	"
06.08.95	-	-	-	Good condition - working well.	
15.08.95	0-9"	1'-9"	3'-6"	Good condition	"
30.08.95	0-9"	1'-10"	3'-9"	Good condition	"
15.09.95	-	-	-	Damaged by earth erosion on 03.09.95	Not using because Ring / Slab eroded by wave on 03.09.95
30.09.95	0'-9"	-	-	"	"
15.10.95	-		-	"	"
01.11.95				removed - Slab reset in low lying ground. Zero ring not	

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Name of Owner: Chaia Rani

Name of Village: Leistapur (Khatiguri)

Type of Latrine: 1 Ring (1'-0" ht) + 1 Slab.

Monitoring Date	Ht. of latrine above G.L.	Depth of water in pit	Depth of surface water (3' distance)	Staff observation and comments	Users comments
01·07·95	0'-6"	0'-0"	–	Pit filled up by earth Caused by Rats. Sandy/clay	Common use because of Rats.
07·07·95	0'-9"	4'-0"	4'-3"	15·7·95 - Re-installed near by and usage started.	Now are using latrine
[illegible]	0'-9"	3'-9"	4'-3"	Working well.	"
06·08·95	–	–	–	Condition good - latrine working well.	
15·08·95	0'-9"	3'-3"	4'-0"	"	"
20·08·95	0'-8"	3'-2"	3'-9"	"	"
15·09·95	0'-8"	3'-0"	3'-6"	"	"
30·09·95	0'-8"	2'-9"	3'-9"	"	"
15·10·95	0-8"	2'-7"	3'-11"	"	"
11·11·95				Using - door broken	using.

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Name of Owner:

Name of Village: Krishapur (North West)

Type of Latrine: Sealing boring pipe

Monitoring Date	Ht. of latrine above G.L.	Depth of water in pit	Depth of surface water (3' distance)	Staff observation and comments	Users comments
01.07.95	0-6"	4' 6"			
02.05.95	0-6"	2' 1"			
15.08.95	0-6"	2'-0"			
30.08.95	0-6"	2'-2"			
15.09.95	0-6"	2'-0"			
30.09.95	0-6"	2'-10"			
15.10.95	0-6"	4'-10"			
11.11.95	0-6"	↓ 6 ft.			

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CONCERN-Bangladesh

Name of Owner:

Name of Village: Kalapur (South-East)

Type of Latrine: Tank boring pipe

Monitoring Date	Ht. of latrine above G.L.	Depth of water in pit	Depth of surface water (3' distance)	Staff observation and comments	Users comments
01-09-95	6"	2' 6"			
02-09-95	6"	1' 6"			
07-09-95	6"	1'-7"			
30-08-95	6"	1'-6"			
04-09-95	6"	1'-7"			
30-8-95	6"	2'-0"			
[illegible]	6"	3' 0"			
[illegible]	6"	< 6"			

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CONCERN-Bangladesh

Name of Owner:

Name of Village: Nayapara (Southside)

Type of Latrine: Tesc (boring) pipe

Monitoring Date	Ht. of latrine above G.L.	Depth of water in pit	Depth of surface water (3' distance)	Staff observation and comments	Users comments
[illegible]	6" above G.L.	2' 11"			
02.08.95	6"	2'01"			
15.08.95	6"	2'0"			
30.08.95	6"	2'-3"			
15.09.95	6"	2-1"			
[illegible]	6"	2-9"			
[illegible]	6"	3'0"			
[illegible]	6"	<6 in			

Prepared by:_____

CONCERN-Bangladesh

Name of Owner:

Name of Village: Naikpara (North-West Side)

Type of Latrine: Tejc boring pipe

Monitoring Date	Ht. of ~~latrine~~ pipe above G.L.	Depth of water in ~~pit~~ pipe	Depth of surface water (3' distance)	Staff observation and comments	Users comments
01-07-95	0-6"	4' 3"			
[illegible] 05 95	6"	4' 0"			
[illegible] 08-95	6"	4'1"			
30-08-95	6"	4'-0"			
[illegible] 95	6"	3'-11"			
30-09-95	6"	4'-2"			
[illegible] 95	6"	4'-6"			
[illegible] 95	6"	<6in			

Prepared by:_____

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Name of Owner:

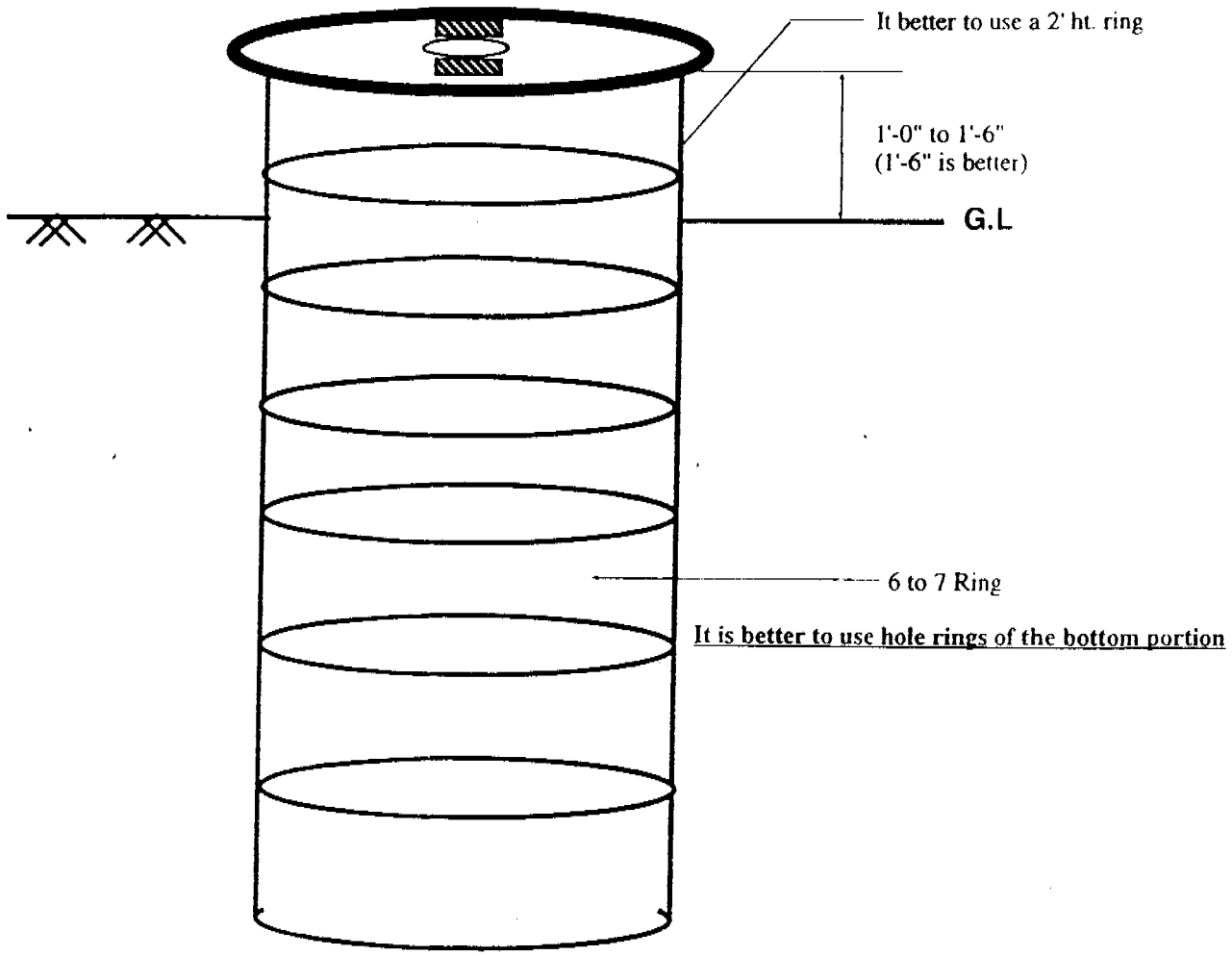
Name of Village: Digal hati (Khalleyuri) near - Dulip's house.

Type of Latrine: Cast iron pipe.

Monitoring Date	Ht. of latrine above G.L.	Depth of water in pit	Depth of surface water (3' distance)	Staff observation and comments	Users comments
02.07.95	6"	1' 9"			
07.08.95	6"	1' 3"			
15.08.95	6"	1-3"			
30.09.95	6"	1-6"			
15.09.95	6"	1-4"			
30.9.95	6"	1-8"			
15.10.95	6"	2' 0"			
1.11.95	6"	<6ft			

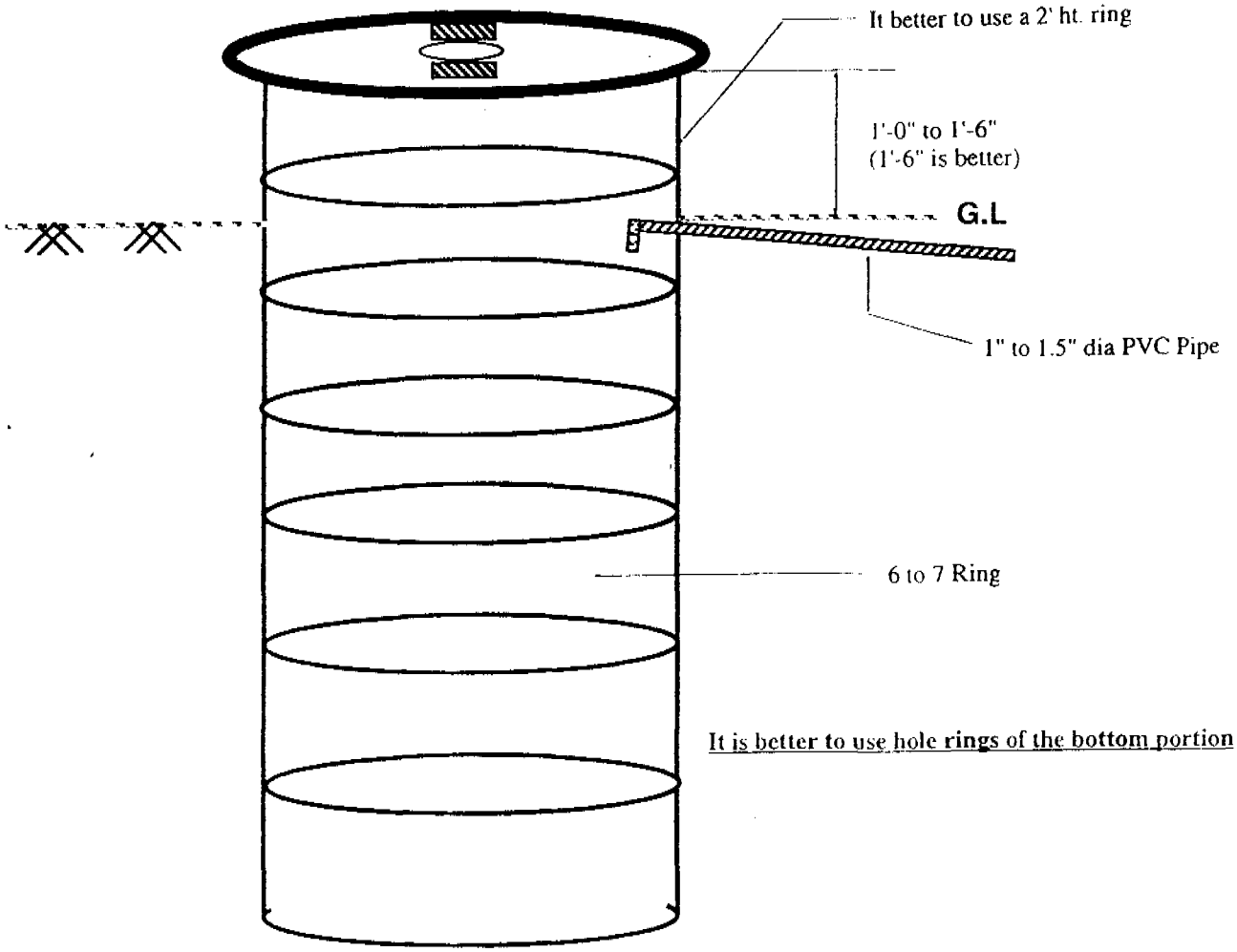
Prepared by:_____

Concern Bangladesh
Experimental Latrines (April 97)



Latrine without water disposal pipe

Concern Bangladesh
Experimental Latrines (April '97)



Latrine with water disposal pipe