UNHCR

PUBLIC HEALTH AND HIV SECTION, DIVISION OF OPERATIONAL SERVICES

NEPAL

Report on "Enhancing Protection Capacity through Improved Field Support in Technical Sectors (Water and Sanitation)"

25 August 2008 - 10 October 2008

TAKO GANAI
WATER AND SANITATION CONSULTANT

PHHS, DOS MISSION REPORT 08/NEP

Given the limited mission period, coverage area wide and varied and the unpredictable change in the demographic trend of the refugee population, much remains to be covered beyond the scope of the mission. However, I thank all the colleagues at UNHCR BO Kathmandu and in the field for the support in achieving whatever little I could within the short span. My due thanks are to the Senior Water and Sanitation Officer, PHHS HQ Geneva and the Representative, UNHCR BO Kathmandu for their suggestions and guidance.

It is hoped that the technical inputs and suggestion made through the technical documents, reports and drawings would be of some qualitative assistance in developing and addressing the response plan need in the water and sanitation sector by the refugee population and host communities in Jhapa and Morang districts of Nepal

ABSTRACT

Under the overall guidance of the Public Health and HIV Section/DOS in UNHCR HQ and supervision of UNHCR Representation in Nepal, the Consultant was assigned to undertake an evaluation of human waste disposal system (VIP Latrines) that has been successfully implemented in Bhutanese Refugee Program (BRP) in Nepal, as well as support UNHCR Sub Office Damak in reviewing the current sanitation services in the camps and in the surrounding communities taking into account eventual consolidation of residual caseload (or integration in the local community). In the pursuit of the said assignment the consultant has been asked to carry out the following tasks:

- Review the historical perspective on the selection of particular human waste disposal system in the context of BRP through existing literature, records maintained in the Office and with IPs and the personal interviews. This shall include a brief outline on refugees' initial reaction/support to the implementation of this activity taking into account their specific socio-cultural background as well as institutional barriers put up by the agencies involved and how the issues were addressed.

- Document original technical designs (including drawings, bill of quantity and cost estimate) and the variations adopted in the subsequent stages of implementation with explanation as to why such variations were introduced.

- Record/compile in chronological order all historical data reflecting number of VIP latrines constructed and maintained each year for each camp, and the expenditure thus incurred for the activity. Also include level and nature of participation of refugees in construction and maintenance of these facilities and estimated in-kind contribution in proportion to the expenditure made by the agencies.

- Review historical trend of WatSan related mortality and morbidity with the support of medical coordinator and the health IPs.

- Conduct focused group discussions, particularly among women, to record their overall assessment of the VIP latrine and how it has impacted them in their health, wellbeing and dignity.

- Analyze and prepare a report documenting the success story of VIP latrines in BRP from social, health, technical, economic and environmental perspectives.

Table of Content

LIST OF ANNEXES

EXECUTIVE SUMMARY

This report presents the summary of accomplishments, findings and limitations and issues that needs following up in particular reference to the VIP Latrines as a human waste disposal system in the context of Bhutanese Refugee Programme (BRP) in Nepal**.** The report reviews and documents the choice and selection of the VIP latrine as the human waste disposal system from social, health, technical and environmental perspective. For the evaluation of the human waste disposal system in place, sample survey and focussed group discussion in particular with the Bhutanese Refugee Women's Forum, discussions with respective partners, host communities, local government authorities and review of the past studies were carried out. The report has been divided into three segments; Description of the initial situations during the emergency phase which lead to the selection of the VIP latrine as the choice of human waste disposal system for the 70,000 plus refugee population then; analysis of the technical designs, drawings and cost estimates of the VIP latrine; analysis of the operation and maintenance of the system during the Care and Maintenance phase and recommendation for futures trends to be adopted during the third country resettlement and consolidation of the residual caseload phase.

Also a tentative proposal for methodologies that can be adopted for the amalgamation of the operation and maintenance of the system with the local communities in the direction of the so called "Reach Out" strategy has been suggested with a short list of requests from the host communities for complimentary implementation.

Given the importance of formulating a strategic framework with an optimum WatSan development plan in conjunction with the camp consolidation strategy and /or potential local integration, presently in a transitory phase, need of the hour was to give special emphasis to this activity. Hence, due to the time constraints a detailed final report on each and every aspects of the excreta disposal system could not be covered. However, utilising the time and resources available in the best possible manner, relevant technical inputs were provided for future planning, and design of the service facilities in a most cost effective manner.

1. INTRODUCTION

Diarrhoeal diseases, transmitted via the faeco-oral route, account for 17 % of all deaths of children under five worldwide according to (WHO, 2006). In refugee camp in Ethiopia in 1989, diarrhoeal disease was shown to account for 40% of all childhood deaths (Davis and Lambert, 2002). Among the Rwandan refugees in Goma (Zaire) in 1994, more than 85% of all deaths in the initial emergency phase were associated with diarrhoeal diseases such as cholera and shigellosis (Medicines Sans Frontieres, 1997). Studies (Fewtrell et al., 2005; Esrey, 1996) have shown that whilst improvements in water quality and quantity can produce limited reduction in childhood diarrhoea by 15 to 20 % greater reductions can be produced through safer excreta disposal (36%) and hand washing (35-42%). As per Dr. Chet/Nepal, more than 80% of Nepalese are suffering from water borne, highly infectious and dangerous diseases such as cholera, dysentery, typhoid, jaundice, hepatitis etc. almost in every year which are of epidemic character

On 20 December 2006, the UN General Assembly declared 2008 as the International Year of Sanitation (IYS), which has aimed to put the global community on track to achieve the sanitation Millennium Development Goal (MDG) through commitments and collaboration of multi stakeholders' platform. Keeping in view the specific objectives of IYS, it is hoped that the technical inputs and suggestion made through the technical documents, reports and drawings would be of some qualitative assistance in developing and disseminating the response plan need of a low cost and user friendly (child-friendly, gender friendly, ecosan etc.) human waste disposal system at household and institution levels by involving the concerned.

At the initiative of the UNHCR PHHS and DOS, review of the current sanitation services and analysis of the human waste disposal system (VIP Latrines) in place in the seven Bhutanese refugee camps and the host community in Eastern Nepal from social, health, technical, economic and environmental perspective has been carried out taking into account the recent trend in third country resettlement of the refugees and the eventual need for the consolidation of residual caseload. The documentation of the review and analysis in the form of report has been compiled based on existing literature, records

maintained in the offices, personal interviews with the implementing partners, focussed group discussions, historical trends of WatSan related mortality and morbidity, survey of the beneficiaries and onsite observation of the existing situation. Based on the analysis of the findings, lessons learnt, an immediate and long term strategy has been proposed. It is also hoped that the limited technical inputs in the report would contribute to the efforts of sanitation workers in the forefront and the practitioner engineers and that the knowledge is widely shared and applied in the field , both in the realm of humanitarian as well as development programmes.

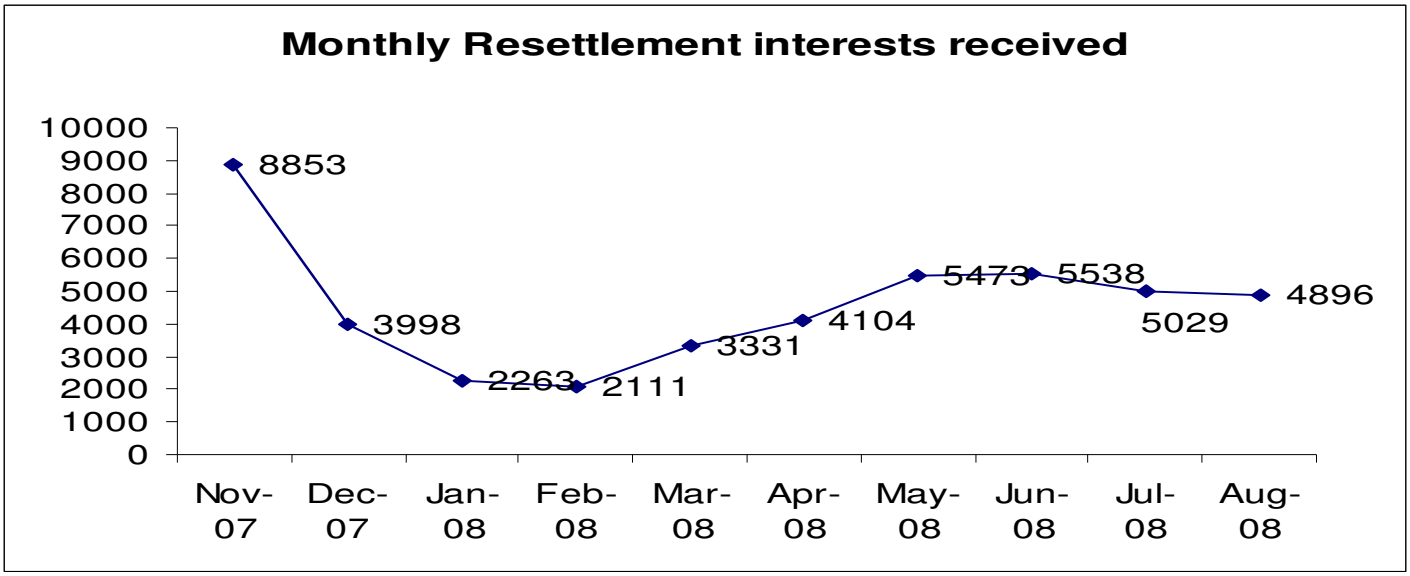
2. CAMP PROFILE

Recent events have witnessed regression in population of the camps due to the agreed durable solution for third country resettlement of the Bhutanese refugees between the Government of Nepal and the United States of America, Canada, Norway, Denmark and the Netherlands in October 2007. The registration exercise indicates a fall in the total population by 50% as reported by the UNHCR Census/ Registration Centre Damak as of August 2008.

In less than one year since the commencement of large-scale resettlement, over 40,000 Bhutanese refugees have expressed their interest and over 5,000 refugees have already departed from the camps by end of September 2008 (please refer graph and bar charts below). The graph and the bar chart below are a projection by the Census/Registration Centre UNHCR Damak as of August 2008. UNHCR is devising a reach-out strategy to prepare a ground for future coexistence and share services between refugees and host communities.

Table 1. Bhutanese Refugees Population as of January 2008:

Camps	Female	Male	Total	No. of Households
Beldangi - I	9,036	9,336	18,372	2,481
Beldangi - II	11,141	11,473	22,614	3,296
Beldangi – II Ext.	5,719	5,954	11,673	1,661
Sanischare	10,404	10,696	21,100	2,793
Goldhap	4,642	4,911	9,553	1,322
Khudunabari	6,600	6,666	13,266	1,942
Timai	5,135	5,340	10 ,475	1,398
TOTAL	52,677	54,376	107,053	14,893



Graph 1. Showing the monthly trend in resettlement interests received as of August 2008

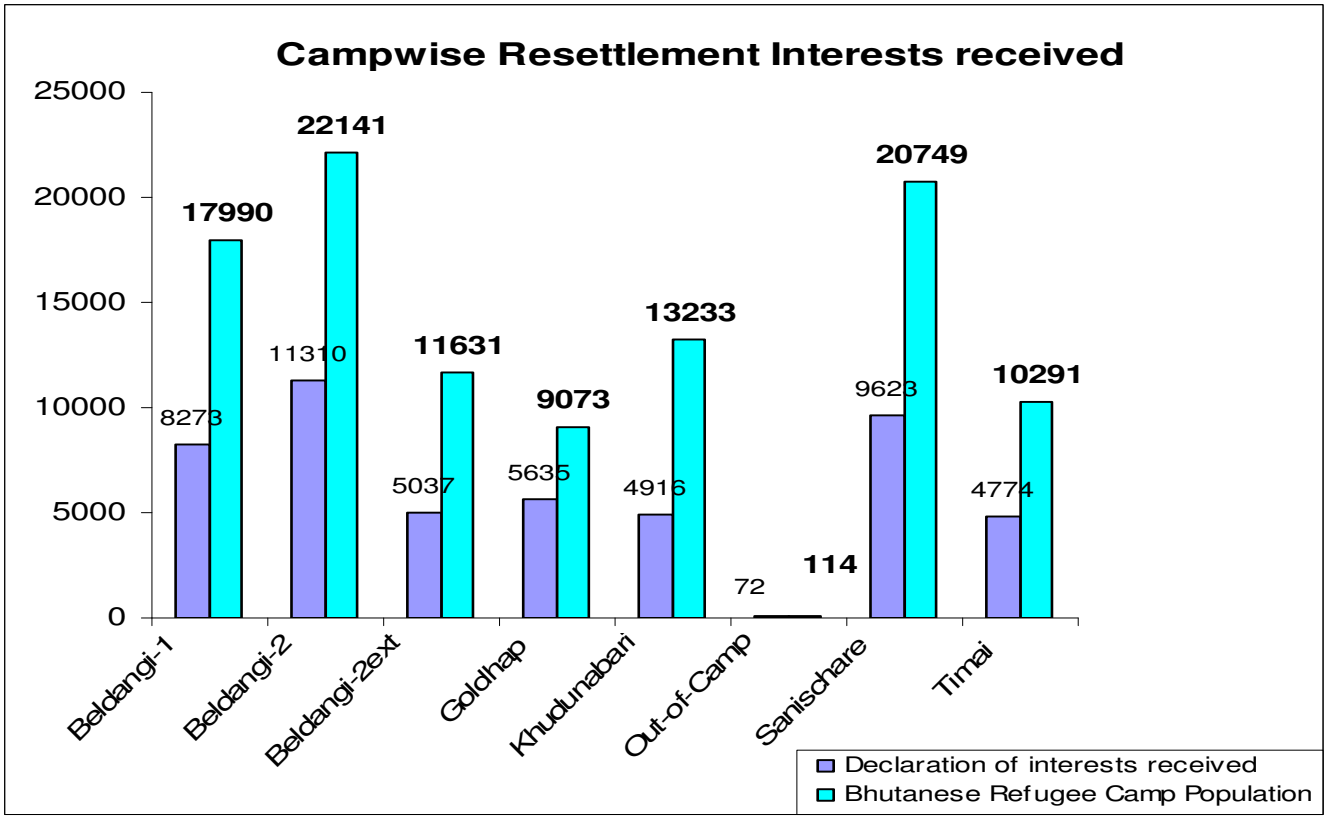


Fig. 12. Comparative Bar Chart depicting the camp population against the resettlement interests received (as of August.2008)

It is expected that by the end of 2009, and at the current rate of submissions of refugee families interested in resettlement, the camp population will decrease to about 76,000. This is based on the assumption that 15,000 refugees will have left by the end of 2008, and a further 16,000 will leave in the course of 2009. In the following years (2010-2013), it is anticipated that resettlement departures will continue at a rate of 10,000 per annum. When the resettlement process may eventually slow down, UNHCR expects that 70-60% of the camp population will have departed leaving some estimated 30,000 refugees behind.

The challenge ahead for UNHCR is to manage the process of reduction of the refugee population, and to be well prepared with a durable solution plan for the remaining refugee caseload. Taking into account current observations of the departure of small and partial family units, the composition of the remaining population may pose a number of challenges. In the light of the departure of mostly skilled refugees, however, the likely high degree of vulnerabilities and special needs among the remaining camp population will be a constraint in sustaining camp services. Since refugees departing on resettlement are drawn from all camps, planning for maintaining in-camp services becomes more unpredictable. There are *two possible scenarios* determining UNHCR future approach and course of action to implement a durable solution for the residual refugee population:

Camp consolidation:

Relocation of remaining refugees to some selected camps, e.g. to the Beldangi camps (Beldangi I, Beldangi II, Beldangi Extension) as the camps are nearest to the Urban service centre of Damak Municipality. Other camps, e.g. the Eastern camps and Sanichare would be closed, and the land be returned to the government. Sanichare camp has a high potential of conflicts between the local and the refugee population, and it would therefore be foreseen for closure; Disadvantage of this strategy is that the remaining camps retain the character of 'camps' with its known problems of overcrowding, lack of space for housing and sanitation , lack of land for gardening and farming. The refugee population in such a camp situation would largely remain dependent on external assistance. Only some percentage, most likely younger refugees, would find employment in rural centres to sustain their livelihoods without humanitarian assistance; Water and Sanitation and other essential services will have to be continued in the remaining camps, supported by external assistance;

A factor to be considered will be remittances sent by resettled refugees to their remaining relatives, which will mitigate the depletion of household resources by the departure of skilled and educated family members.

Development into Villages:

In the course of the coming five years of resettling refugees from all camps, the camps are emptying as huts of departing refugees are being demolished, creating more space for remaining refugee households. The camps would gradually decrease in population and loose their character of camps, gradually transform into villages. Provided that the government is willing to transfer landownership of that land currently used for the camp settlements to refugees, as long-term lease or as property, they would be able to start farming, produce vegetables for sale or keep animals. Options for the refugee to become self reliant are good. Farming combined with employment would provide options for self reliance of the remaining refugee households; Community services within the camps could be either handed over to the government (health, education, disability centers) or closed, and existing services in the vicinity of the camps or settlements would be shared with the local population. Economic self reliance of the Bhutanese refugees and the sharing of local government services would allow the gradual withdrawal of external assistance provided by the international donor community. The scenario of 'development into villages' requires thorough planning.

'Reach-Out' Strategy: A Phased Approach towards Local Integration

A second likely durable solution, i.e. *local integration*, in the current fragile political situation is not a realistic option in the coming 3-5 years and will meet with some resistance by the Government of Nepal. Therefore, UNHCR needs to carefully prepare the ground for local integration by building partnerships with government institutions in the Eastern Region providing community services in, or in the vicinity of the camps. UNHCR Nepal proposes a phased strategy of local integration as a durable solution for the residual caseload of Bhutanese refugees. During a first phase, the *'reach-out strategy'*, UNHCR will undertake a mapping of public facilities in the vicinity of refugee camps to assess their capacity and need for support to foster

sharing of public services between refugees and the local population. During this early stage, mapping data and an estimation of needs to upgrade public services to minimum international standards should also raise timely donor interest and support in a durable solution for this residual caseload.

3. VIP latrine Historical perspective:

By December 1992, over 70,000 Bhutanese refugees were located in four camps in the Jhapa and Morang Districts in Southeastern Nepal. From an initial population of 450 in early 1990, the number of Bhutanese refugees had reached 9,504 by the end of 1991. Dramatic increases were seen during mid 1992, with the arrival of an estimated 250 to 400 refugees per day. As of 15 December 1992, there were 71,450 refugees in camps in Nepal.

Throughout 1992, the leading causes of morbidity were environmentally associated illnesses. A Reuters news report of 21 April 1992, reported over 400 deaths, due to diarrheal diseases, in the Bhutanese Refugee Camps. The report emphasized the poor hygienic and sanitary conditions among these refugees. Subsequent missions and surveys identified poor water supplies, inadequate sanitation, overcrowding and lack of hygiene in the camps as leading causes for the deaths. A major concern noted during this period was the slow response in providing adequate and effective water and sanitation services to mitigate these illnesses. The causes for the slow response have been:

- The uncertainty as to how long the refugee population will remain in a location and require assistance in the provision of excreta disposal facilities.
- A lack of political and organizational will that prevents development of excreta disposal facilities suitable for the longer term.
- Budgets that exclude investment in anything other than basic services sufficient for the first few weeks.
- Lack of knowledge about the communities' needs and preferences as to what they would consider acceptable.
- the redundant and contradictory advices of consultants, failure to adopt a consistent and appropriate plan for services early in the development of the camps and the slow installation of agreed-upon environmental health services.

The implementing agencies, LWS and SCF, concentrated efforts to mitigate these adverse environmental health constraints. In order to develop a concise strategy to deal with the water and sanitation issues, LWS invited OXFAM to assist in their programme. Three sanitary engineers from OXFAM provided assistance to them from 2 August through 3 November 1992. At the time the health agency were pointing to major problems with water quality from shallow tube wells and a large problem with open defecation with many of the communal latrines recently constructed not being used. These facilities had been installed to satisfy the urgent needs of refugees settled in an area with no services, but the limitations of these systems were becoming apparent. Previously (in Bhutan), 87% of the refugees did not use any type of latrine at all, instead they went for open defecation in fields or river banks. In order to avoid exposing the population to continuing major health risks a different approach was required. While the drilling of deep boreholes, coupled with piped distribution systems would deal with many of the water quality problems, the excreta disposal problems were more complex to solve. With ground water at 1m depth in the northern camps of Beldangi I and II, digging latrines deep enough to hold excreta for more than 6 – 12 months would not be possible, which would necessitate continual redigging of pits if the refugees remained for a long time.

Within a couple of days of the assessment it became necessary to take stock of the limiting factors outlined above. Evidently communal latrines were not proving to be very effective with widespread evidence of open defecation, thought to be mostly from women and children. All indications at the time were that the refugee issue would not be resolved very soon and the people would remain for many years. Investments in camp infrastructure were being allowed by the government and made accordingly. There weren't any objection from the government for the construction of facilities that were more permanent in nature. Budgets were being made available and allowed planning for a longer time frame than would normally be expected. Despite agency staff opinion about what the community would or would not accept, limited discussion with the community was held and enabled a level of confidence to be placed in initial planning recommendations.

After further consultation with the community, government and UNHCR staff, the decision was taken to undertake detailed design work on the latrines and get costing for these in order to be able to generate budgets for the work (see annex 1). Of course the immediate open defecation problem remained and a sense of urgency was developing because of the health problems being reported from the health clinics. Therefore excreta clean up campaign was conducted to reduce risks, alongside a health promotion campaign /dialogue to understand the community's needs and views and to raise widespread awareness about the proposed twin pit composting latrine design. Some shared family latrines were constructed under OXFAM direction, but land constraints prevent additional latrine construction. OXFAM proposed a dual pit, shared family pit latrine system for all camps on 11 August 1992. By December, 1992 only 40 of the required 5,800 latrines had been constructed.

The situations in the seven camps then in existence in 1992 were:

Beldangi
Field defecation was the major form of sewage disposal. The area most heavily used was along the river to the east. Forested area was otherwise preferred. OXFAM had proposed dual pit shared family latrines, at a cost of $39 per latrine for 2 families, for the site. Construction began in September and the first units were turned over to refugees on 30 November 1992. High groundwater made excavation to any depth difficult and pit vault diameters was increased to prevent constructing vaults into groundwater. Shared family dual pit latrines were installed in Beldangi II, with similar latrines scheduled for Beldangi I and I1 Extension in 1993.

Goldhap
The only form of sewage disposal was field defecation. LWS had constructed family trench latrines, with direct-drop squat plates, but lack of maintenance has caused these to be bypassed as people went to the forest. A strategy to provide more permanent, shared family latrines was agreed upon on 4 December 1992, and construction works were initiated towards the end December 1992.

Maidhar
Maidhar was the second camp established and reached a population of over 24,000. The lower edge of the camp extended to the bed of the Mai River and there was significant concern over the potential for flooding. The major environmental concern at Maidhar was the extremely high density of refugees resulting in overcrowding and unhygienic conditions. Due to the high visibility of refugees (the camp was located on the East West Highway) and the poor sanitary subsequently reduced in population, with occupants being moved to Beldangi and Pathari. The camp was officially closed on 20 September 1992.

Sanischare
Established in April 1992, the camp occupies a cleared area in a forest near the Pathari Bazaar in Morang District. Initially, only new arrivals were placed in this camp, but as the pressure to relocate refugees on Maidhar increased, about 5,000 people from the latter camp were moved to Pathari. Some communal latrines were constructed in Pathari and serviced by Indian sweepers. These latrines were most frequently by-passed as people went to the field for defecation. A plan to provide interim communal toilets and more permanent shared family latrines was agreed upon on 4 December 1992.

Timai
Field defecation was still a major form of sewage disposal. The Riverbank was the site most often used. Sufficient latrines were constructed to provide 1 for every 24 to 48 person depending on camp sector. An estimated 55% of the refugees had access to latrines of some form. However, many traditional shallow pit latrines were full and were unusable. Land restrictions and the sheer density of dwellings prevent additional latrine construction.

The first latrines were finally turned over to refugees on 30 November 1992, 3. 5 months after first proposed. As of 13 December 1992, 43 (3%) of the needed 1440 latrines for Beldangi II were completed. Original cost estimates of the OXFAM latrine were $39 per unit. However, by the time the first latrines were completed, LWS and OXFAM estimated costs at $83 to $125 per unit. Concern over these high costs resulted in the development of a Facility Plan by the UNHCR and LWS Water and Sanitation Engineers. On 4 December 1992, following presentation of that plan to administrators and technical staff of LWS,

SCF and UNHCR, a decision was made on the definitive systems to be provided in the camps. The Facility Plan and its Record of Decision are shown at Annex 4 and ANNEX-E Figures1-11.

Shared family pit latrines were retained as the systems of choice for the camps. Five designs were selected to be used at each latrine site, based on the groundwater elevation and soil stability of the site. The modified latrines provide for significant soil area in contact with accumulated sewage. That should aid in sewage mass dewatering. The more intimate soil contact will enhance decomposition of pit contents by soil organisms and oxygen, providing safer compost after one year's rest. The latrine was more cost effective than the OXFAM design and was within UNHCR and LWS budgets for sanitation.

After receiving the green signal the construction of the VIP latrines went ahead at a war footing. Decision to adopt the right design was made based on the prevailing site conditions. By the end of 1992, 417 VIP latrines were constructed with a surge of 5,538 in 1993 and finally by 1995 the required total 8079 of VIP latrines in all the seven camps were complete. Simultaneously a health promotion campaign /dialogue to understand the community's needs and views and to raise widespread awareness about the proposed twin pit composting latrine design was launched. As a move towards self reliance a refugee sub-committee for the construction, operation and maintenance of the system was established in each of the camps by 1995 (refer ANNEX 15). To date the sub-committee has been actively involved in all the water and sanitation related activities in the camp. The immediate impacts of this decision included:

- Moving from communal latrines to shared family latrines initially reduced and, subsequently, virtually eliminated open defection;
- In conjunction with improvements in water supply and hygiene promotion, health problems related to excreta-related diseases started to decrease to manageable levels.

Longer-term impacts included:

- Health improved to an acceptable level for the area;
- Over a sixteen -year period, latrine costs were kept to an affordable level as investments are only required for maintenance;
- Local government and other agencies were very satisfied with the latrine design-which was subsequently introduced to local communities in villages surrounding the camps;
- The refugee community is very satisfied with the latrine design and most participated in the pit emptying on a voluntary basis.
- The refugee contribution in terms of unskilled labour for the construction of the latrine to date amounts to approximately
  USD276, 550.

With the adoption of the right choice of the humane waste disposal systems in the seven different camps, the crude mortality rate of children under five saw a sharp drop from 70 per 1000 in 1992 to 11 per 1000 in 1995. Similarly the over all crude mortality rate dropped from 30/1000 in 1992 to 4/1000 in 1995 (Please refer graphs 3&4 – SCF UK). Also during the period a sharp decline in water-borne disease was observed. Incidence rate of watery and bloody diarrhea crude for the year 2007-2008 (refer graph 2.) is < 2% and < 0.5% respectively. The mortality rate due to watery and bloody diarrhea is zero during this reporting period. Indicating the fact that the waterborne diseases is almost under control ever since the introduction of the integrated approach to the health and the right choice of humane waste disposal system.

Now in all the camps whether it is for residential purpose, school or agency offices the choice of latrine in all the camps for the last 14 years has been self composting VIP latrine. It is to be noted that the system has gone through tough decision making and finally it has been time tested and proven from all aspect of review be it social**,** health, technical, economic and environmental perspectives.The VIP latrine has proven to be a typical example of successful On-site Sanitation – collection and treatment/recycling of humane waste.

Composting latrines were introduced to communities with no previous knowledge of such systems, initially for technical reasons, but with results that were not expected by many people. These latrines have proved to be popular with the users over many years without major change or problems occurring. In this regard the decision to choose this design early on was the right one.

PTSS Senior Sanitary Engineer, Mr. C Rakotomalala in his mission report in 1995 says quote" All camps have been found to be quite a satisfactory state of cleanliness……The twin pit toilets which have been constructed on the basis of one toilet for every two shelters are obviously being used and are well maintained by their users" unquote. He further goes on to say quote "In camps with population densities such as those mentioned above, one would have expected to be disturbed by unpleasant smells, flies, and other nuisance. On the contrary, visiting refugee dwelling areas including family houses was a pleasant exercise ……These positive points show a lot about the capabilities/willingness of the refugee community to solve its daily problems by itself, in particular those relating to the disposal of liquid and solid wastes" unquote

4. Design of the VIP Latrine

The latrine can be divided into 2 parts, the substructure and super structure. The super structure consists of the bamboo constructed walls and roof of the latrine consisted of sandwich panel, designed to last for 3 years. The sub structure consists of the concrete rings and covers, squat plate, chute pipes and vent pipes. These items were designed with a life of ten years. The fly screens on top of the vent pipes are the most exposed plastic part to ultra violet radiation and is the first plastic part to fail.

4.1 Theory of VIP Latrine operation.

The theory of VIP latrines is well known and widely reported and can be summarized as:

Smells corning from the pit are drawn up through the vent pipe due to wind action across the top of the pipe. It is recommended that the pipe is 150 mm in Dia. and protrudes at least 0.5 m above the roof of the 'latrine. Smells are

prevented from entering the latrine super structure, since air is drawn down the chute pipe.

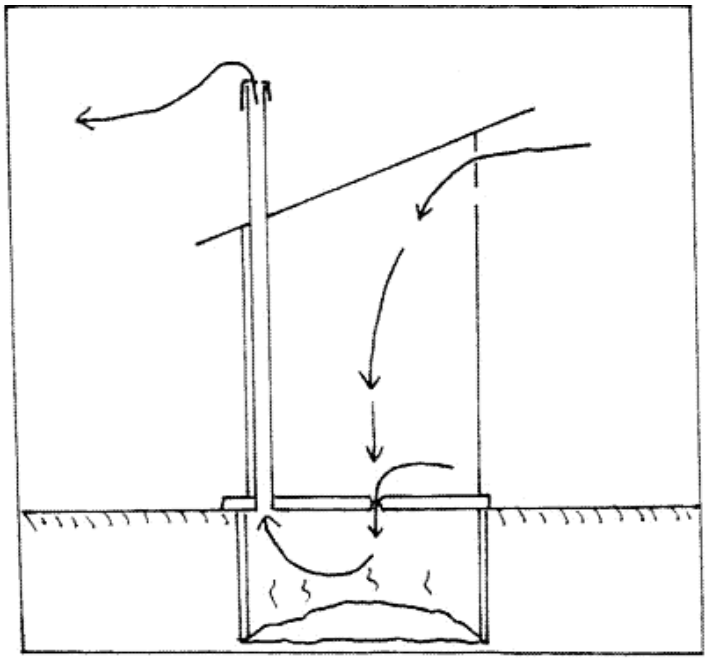


Figure 13. Showing the air circulation through the Latrine.

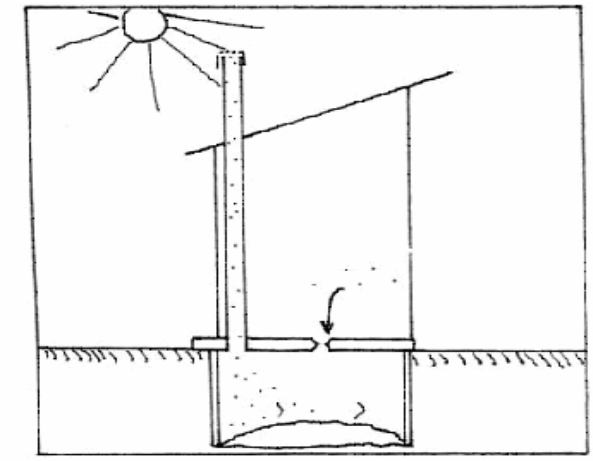


Figure 14 Shows the darkness in the superstructure prevents the flies from entering the toilet and lighting through the vent pipe attracts and traps the flies

Both the pits have at least unlined bases (if not sides). Water, used in anal cleansing, drains from the pits into the surrounding earth. Each pit would take a year to fill (being used by an average of 12 people). When the pit became full, it would then be covered with a layer of earth, the operating chute pipe blocked off and the vent pipe is switched over to the new pit.

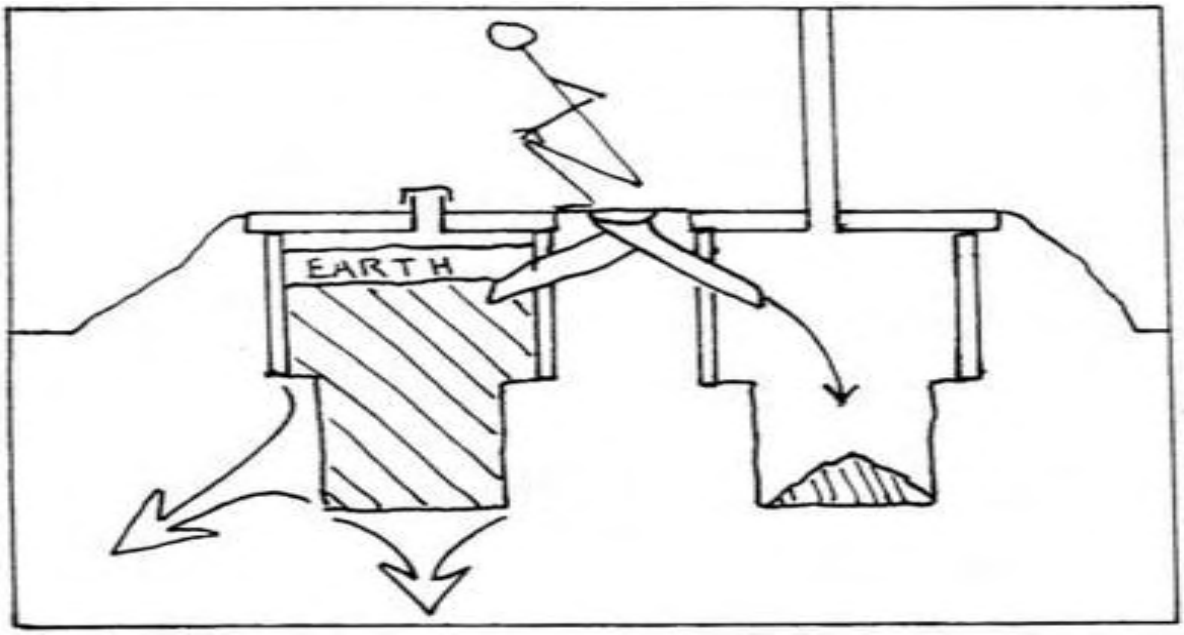


Figure. 15. Shows the Pit shifting process. The full pit is then allowed to decompose for 1 year, after which it is emptied ready for re-use. The second pit, now full, is closed off and allowed to decompose for a year, and the vent pipe is shifted back to the first pit.

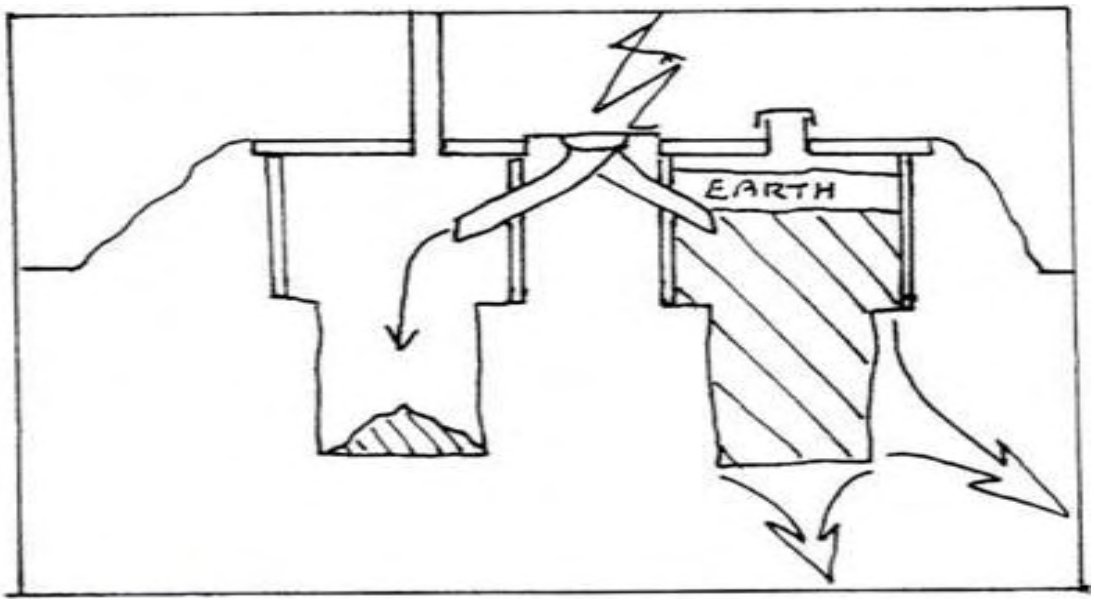


Figure.16 shows the process of decomposition and evacuation of the pit

4.2 Sub structure.

Annex 2 shows details of the chosen basic design. There were variations in the design to accommodate to the soil and water table conditions in the different camps accordingly. . Some camps (Sanischare) have more stable soils, where there was no need to line the pit to its full depth. Others (Timai) demand a fully lined pit, since the soil (sandy gravel type) is not so stable. Please refer to Annex 3 for a textural analysis of soils. The pit lining ring is one of the most expensive parts of the latrine and reducing its depth reduces the total cost considerably, important when building large numbers of latrines. The result was that there were 3 sizes of lining which were manufactured, the full size ring 1.2 m dia. with a depth of 1.2 m, the smaller ring of 1.2 m dia with a depth of 0.6 m and the smallest 0.9 m dia lining with a depth of 0.36 m. In the case of shorter 0.6 rn and 0.36 m rings, the refugees were instructed to dig a pit about 1 m. deep below the ring, so that the final volume would be the same as the 1.2m. fully lined pit. In practice however, refugees dug the pit to a depth they were happy with, which varied considerably from camp to camp and latrine to latrine.

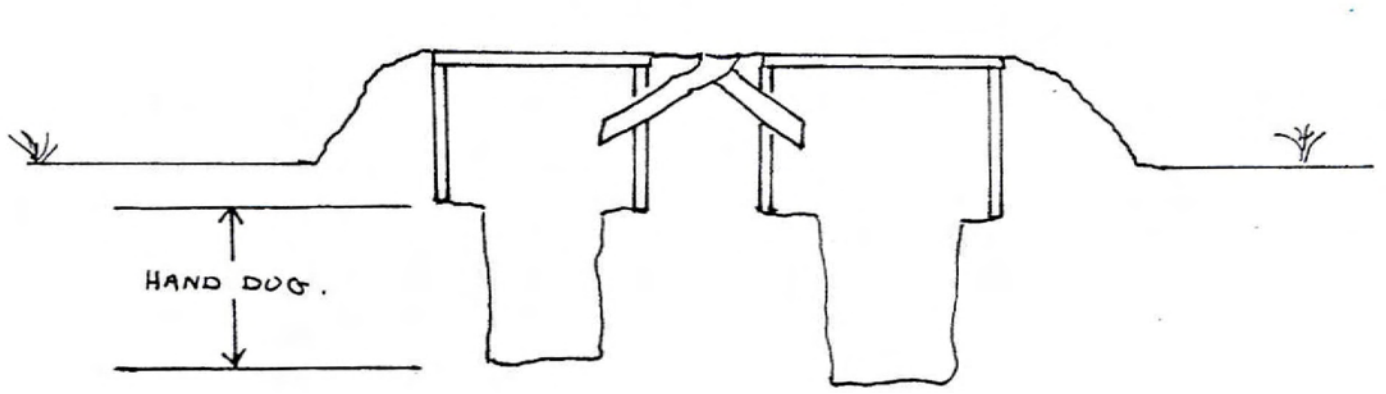


Figure.17 showing hand dug portion of pits

Goldhap camp was the only camp where the smallest ring size (0.9 m X 0.36 m) was used. Where conditions dictated (wet, unstable soil), up to 3 rings were placed on top of each other, to fully line the pit. Where the soil was stable enough, 2 were used.

Latrine design type	Diameter of ring lining (m.)	Effective depth of ring lining (m.)	Diameter of unlined section (m.)	Depth of unlined section (m.)	Total fill Volume m^3.
Fully lined 1.2 X 1.2m.	1.2	0.9	0	0	1.018
Partially lined 1.2 X a.6m.	1.2	0.6	0.9	1	1.315
Fully lined 0.9 X O.36m	0.9	0.78	0.7	1	0.881

Table 2. Showing pit design volumes from various latrine types.

(*Effective depth* refers to the distance from the chute pipe to the bottom of the ring. When the excreta level reaches the chute pipe it cannot be used any more and is effectively full, despite some freeboard above.)

The latrine pit design calculations allowed for an average of 12 people using the latrine, each producing 0.06m^3 of excreta per year. Each latrine pit was expected to fill in one year, and have 0.5m soil put on the top, to help in the anaerobic decomposition process.

4.3 Super structure

The super structure consists of 4 bamboo corner posts, door post bamboo lattice walls and sandwich panel roof, together with a bamboo door and bracing between the posts. The super structure is held together with wire coconut rope and sutlee (thin slivers of bamboo). Early models of the latrine had a black plastic roof (1,000 gauge), but this degraded completely in 1 year. Thatch and tile (oil based material) roofs were also tried, but were complicated in comparison to 1 piece of sandwich panel, which could easily be made in mass production. The sandwich panel roof was adopted in all latrine construction after 1993 and a programme was begun of replacing earlier, degraded plastic roofs.

The sandwich panel roof a technology widely used in Bangladesh and India, is made up from a layer of plastic sheet sandwiched between a layer of inter woven flattened bamboo, which forms the upper side and a layer of more openly woven bamboo on the lower side. The plastic provides protection from rain, whilst the upper layer of bamboo provides protects the plastic from the sun. The bottom layer keeps the plastic in place.

4.4 Construction Costs.

The cost of the latrine is around $117.82 (depending on current cement and reinforcement bar prices).For a detailed break down of costs, please see Annex 8.

Within Nepal, these costs are similar to those experienced by other agencies building latrines in the same area. of recent the cost has gone up due to the rise in the construction materials such as cement and iron rod almost doubled..

4.5 Design process.

When considering a suitable sanitation option, there were various factors which had to be taken into account, in order to produce a satisfactory result. Most important at the time were;

- The life of the latrine system;
- How to ensure the latrines were used an looked after properly,
- How to allow for a high water table in some places,

Life of the system.

It was decided to design a latrine system which gives some flexibility on the investment required. The sub structure was built to last 10 years, and the super structure to last 3 years. However, experiences over the past 14 years have shown that the super structure required maintenance almost every year with the exception of the roof which lasted for 3 years. A double pit system was deemed necessary, since this allows rotation between operating pits, without having to move the whole latrine" (there is a shortage of space in the camps).

***Proper use and care of the latrines*.**

There were two options on where to put the latrines - within the living area of the camp or outside it. Having latrines outside of the living area, in clusters, confines any smell to one particular area. However, experience with the trench latrines, which were in clusters, suggested people preferred to avoid them as much as possible. Without daily cleaning and a constant eye to watch for pilferage of wood from the super structure, the latrines soon degraded as described above. The alternative chosen was to bring latrines into the refugee living area. Latrines were built in rows between the refugee shelters (see Photo 1). They stand right outside the shelter front door and cannot be ignored. Any smelliness is immediately noticeable. Any misuse is also immediately noticeable. To make sure each latrine was looked after, it was decided that latrines would be shared by two families (average 12 persons total for each latrine), living next to each other. They would be responsible for keeping their own latrine as clean as they wanted it. It is noticeable that today, many latrines in all camps now have locks on them, put there by the user families, preventing unauthorized use. This undoubtedly reinforces the feeling of ownership of the latrines to the refugee family using it. Bringing the latrines into the midst of the refugee community has undoubtedly played a crucial part in making sure they are looked after properly.

Photograph.1 VIP Latrines in a row between the refugee huts in Beldangi-II Extension

4.6 Ground conditions

There was an additional constraint in some areas of a very high water table. Deep pits would flood and probably collapse in the rainy season, unless they were fully lined. It was decided that the pits would have to be raised up, partially above ground to both prevent ground water pollution and pit collapse. The system chosen, after trials with various options, was a raised, Ventilated Improved Double Pit latrine {VIP)- (see photo 2 below)

Photograph.2 Raised VIP latrine in low land area of Sanischare Bhutanese refugee camp

•
Flies, attracted by smell into the latrine, lay their eggs in the excreta. However, escape for them and their offspring is prevented by the fly screen at the top of the vent pipe. Flies are attracted by light and do not think to go out the way they come in, since the superstructure around the squat plate keeps the area dark.

5. PERFORMANCE CHARACTERISTICS

In order to assess the essential of functioning of the latrines as to whether this differs from what was expected a survey of 127 individuals from all the 7 camps were conducted besides the focussed group discussions and personal interviews.

A questionnaire was prepared (please see Anex.1)to assess the use of the latrine as well as how the latrine performed in

terms of fill time, maintenance needs, smelliness etc under what conditions decomposition was happening and whether it was different between the lined and unlined pits.

5.1 User survey.

A survey of 127 randomly chosen households was taken across all camps, in proportion to the number of latrines in each camp. Annex 1shows the questionnaire and Annex 2 shows a breakdown of the responses for each question.

The results show a mixed picture. The ages of the latrines varies from brand new to 14 years and this with the short design life of the super structure leads to a wide variation in maintenance and replacement needs between and within camps. There are also large variations in the number of people using each latrine, the time taken to fill one pit and the type of problems encountered in its upkeep. The substructure (with a design life of ten years) has not been a serious problem so far, but the superstructures show signs of rapid deterioration within one year.

Use of latrines is very high, and refugees show they have understood and accepted complimentary health and hygiene messages given to them by AMDA.

5.2 Use of the latrine - what the survey showed.

Before coming to the camps, 85 % of the respondents did not use a latrine and mostly used open fields. Majority of the refugees have been using the latrines for the last 12 years and to date virtually all the users have expressed satisfaction with them (97%).

The latrines are used by all the respondents, who now almost never go for open defecation. 98 % said they never go for open defecation, 2% said they rarely do. In support of these very high figures, it is rare when walking through the camps to see faeces on the ground, although in the adjacent forest there is some evidence of open defecation. The introduction of VIP Latrines together with software of community health message has virtually eliminated exposed faeces in the camps.

Some health messages promoted by AMDA concern hand feet washing which have become common practice after defecation. 87 % of respondents wash at least their hands afterwards, and 59 % wash their feet as well.

5.3 Cleaning the latrine - what the survey showed.

Nearly all (at least 92 %) latrines are being cleaned (i.e. the squat plate washed down) on a weekly basis, and 75 % are cleaned every day. This voluntary job is not culturally the responsibility of a particular person, although it is never done by children. 36 % of respondents say it is either the job of the mother / sister of the family, whilst 27 % said it is the job of the father / brother.

However, nearly half the people (48 %) said it was a job shared between men and women. (The responses to this question from men and women were similar).

The picture of shared responsibility for cleaning the latrine was confirmed when it was found that 54 % of respondents stated that different people clean the latrine rather than the same person.

84.5% of the latrines are shared between 2 families, 4.5% of the latrines are shared between 4 huts, 3% of the latrines are shared between 3 huts and 8% of latrines are shared by single hut. Most families (71 %) feel the latrine is important enough that they contribute either fully or partly to the maintenance work done on them. All materials are provided by the agencies however, and when asked why they didn't try to improve the latrine design 37 % said they had either no money or materials (63 % had no response)

5.4 Performance of the latrine - what the survey showed.

Pit fill up time	Percentage of pits filled up
In 6 months to less than <6 months	52%
In 10 months to 1year	28%
In 2-13 years	20%

Table. 3 Effects of change in specification of the base structure

The high percentage of pits getting filled up in 6month to less than 6 month has been due to:

Primarily since last few years it has been the practice to replace any sunken or broken down pit with fully lined (P.C.C rings) to a depth of 1.2 metres regardless of the ground condition whether the infiltration rate is low or the ground water table is high. In the process of stabilising the pit walls the chances for filling up of the pit within short period of time was disregarded. With the result 32% of the respondents have indicated that their pits are filled up in less than six month period. Reflecting the fact that within a year the respondent had to desludge the undicomposed sewage more than twice. This repeated exposure to raw sewage though not reported so far, may pose a health threat. Besides the space around the toilets is limited and frequent digging of pits to fill the raw sewage is going to destabilise the ground around the toilet.

Secondly some areas in Beldangi-II Ext., Beldangi-II and Goldhap in particular has high water table. The solution would have been as decided in the early stages of 1992 to provide raised pit latrines in these areas.

Where the infiltration rate is low and the surrounding soil conditions are firm like in Sanischare and Khudunabari, the half ring i.e. P.C.C ring up to a depth of 0.6 metre and the rest up to a depth of 1metre hand dug should continue so that there is enough area for direct infiltration of the liquid sewage into the surrounding soils and the pit fill time increased.

Of respondents whose pits had been emptied, 100 % said they had emptied their own pit. They had to borrow tools from their friends to do so. When those who had not emptied their own latrines were asked why not, the major reasons given were; I don't know how to / I don't have the tools (42 %) followed by fears about health risks (39 %). A variety of other reasons followed.

5.5 Maintenance of the latrines - what the survey showed.

When the respondents were asked what sort of maintenance was done to the latrine it was seen that the superstructure accounts for major maintenance requirements followed by pit emptying and sunken toilets. As expected, the amount of repair done depends on age, but also very much on site too. High water table is a main problem in Goldhap and Beldangi and certain areas of Sanischare. Timai seems to be the ideal location for VIP latrines because of the high infiltration rates and long pit fill time (ranging from 2-13 years).

VIP Latrines

		1991	1992	1993	1994	1995	1996
1	Number of toilets existed	20	2464	6530	7804	8376	8376
2	Number of new toilets built	20	2464	4066	1274	572	0
3	Number of toilets repaired annually	0	0	0	0	5608	8151
4	Number of sunken toilets	0	0	0	0	0	364
5	No of pits emptied mannually	0	0	0	0	5406	3524

		1997	1998	1999	2000	2001	2002
1	Number of toilets existed	8310	8063	8442	8876	8896	8900
2	Number of new toilets built	0	0	477	20	4	0
3	Number of toilets repaired annually	8310	8063	7559	8327	6364	6848
4	Number of sunken toilets	177	454	317	0	802	893
5	No of pits emptied mannually	4150	4510	3491	4614	4794	5343

		2003	**2004**	**2005**	**2006**	**2007**	**Total Quantity**	**Rate/unit**	**Amount**
1	Number of toilets existed	8900	8939	8940	8959	8959	8959		
2	Number of new toilets built	0	18	10	9	0	8934	6500	58,071,000
3	Number of toilets repaired annually	8753	8569	1650	3501	2893	84596	1200	101,515,200
4	Number of sunken toilets	956	383	466	757	373	5942	800	4,753,600
5	No of pits emptied manually	5186	4250	4705	4748	4154	58875	50	2,943,750
									167,283,550

Table 4. Statistics on VIP Latrine

From 1995 to 2004 the maintenance routine was that of a blanket assistance of almost 86% of the total number of toilets in each camp i.e approximately 7655 toilets each year in all the camps were repaired. From 1997 onwards due to lack of funding the facility to repair and maintenance of the toilets were provided on a need basis i.e. on an average of 2681 toilets per year were provisioned for repair and maintenance. Because of the cut in the provision of repair and maintenance most of the respondents expressed their dissatisfaction and have reasoned as one of the main cause for toilet collapsing due to roof leaks and superstructure failure.

5.6 Performance of the vent pipe - what the survey showed.

Theory suggests the orientation of the latrine is important to maximize the air drawn up through the vent pipe. Latrines are recommended to have the air inlets facing the prevailing wind. However, orientation of the refugee latrines was determined by space available and not by wind direction. Also, the HDP vent pipe used in the VIP is only 110 mm. dia as opposed to the recommended 150 mm but it does not seem to have impaired the performance of the vent pipe.

83 % of people said there was little or no smell in the latrine. and only 4 % said it was very smelly. 92 % understood the smell ridding qualities of the vent pipe.

Asked about flies in the latrine, *only* 4 % said there were a lot of flies in their latrine and 64 % said there were very few or no flies present.

5.7 Adoption of VIP - What the survey showed.

98 % of respondents said they were satisfied with their latrine. When the refugees move away from the camp, 98 % said they would try and build a VIP at their new (or old) home. Since there was a high level of involvement by them in

construction, they do have practical experience of how to build one.

5.8 Conclusions from the survey.

1. Frequency of pit shifting and emptying in more than 50% of the cases has been twice per year contrary to the assumption that it takes longer than1 year for the pits to fill.

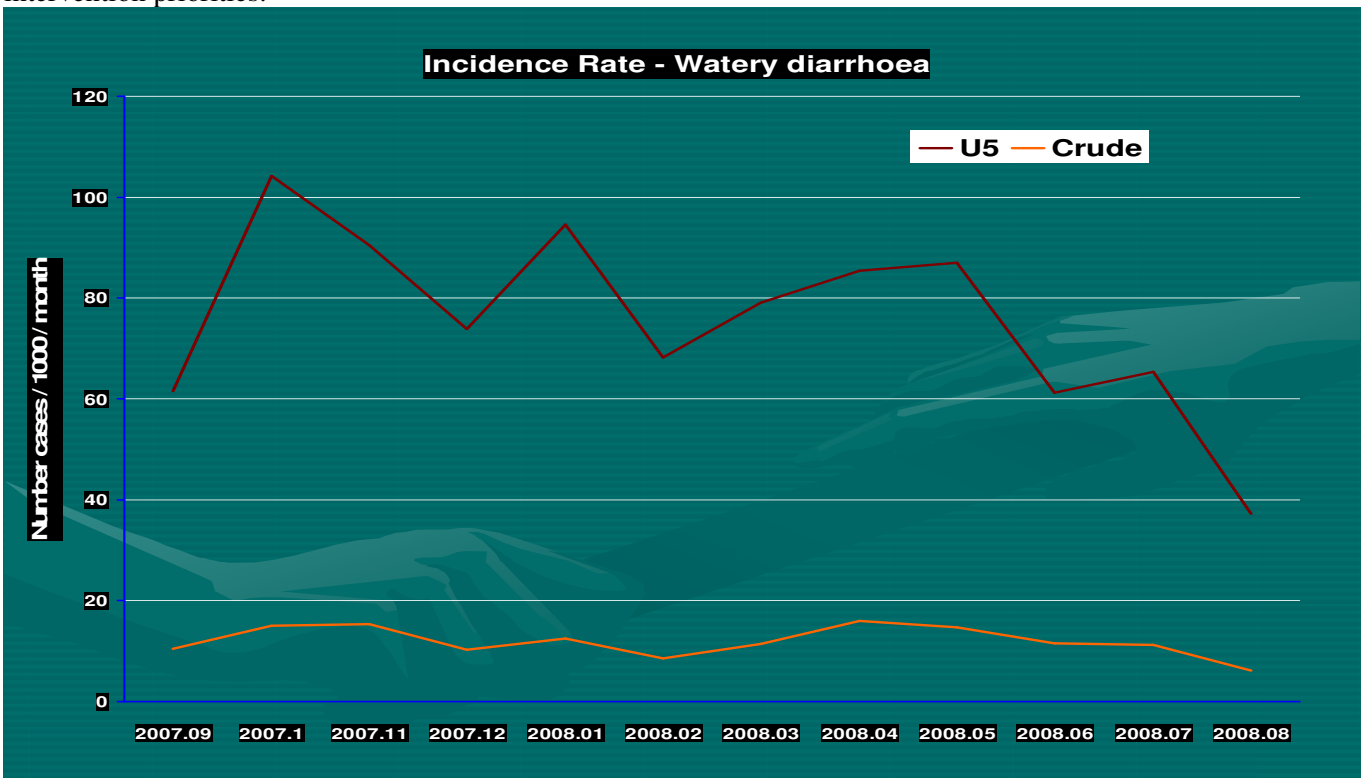
2. The super structures have started to fall over due to lack of provision for repair and maintenance. Given they have no materials, the refugees take care of the latrines and have absorbed the health and hygiene messages given by AMDA.

3. To achieve maximum latrine performance in terms of pit fill time and life of the superstructure, there is a need for reinstating the provision of repair and maintenance assistance and a detail survey of the soil texture, ground infiltration rate and areas with high water table.

4. Based on the survey results the areas with high tables and low infiltration rates should be demarcated and an appropriate design options needs to be adopted to accommodate the soil and water table conditions in the different camps accordingly. Sanischare have more stable soils, where there was no need to line the pit to its full depth. On the other hand (Timai) demand a fully lined pit, since the soil (sandy gravel type)is not so stable. Please refer to Annex 6.for a textural analysis of soils.

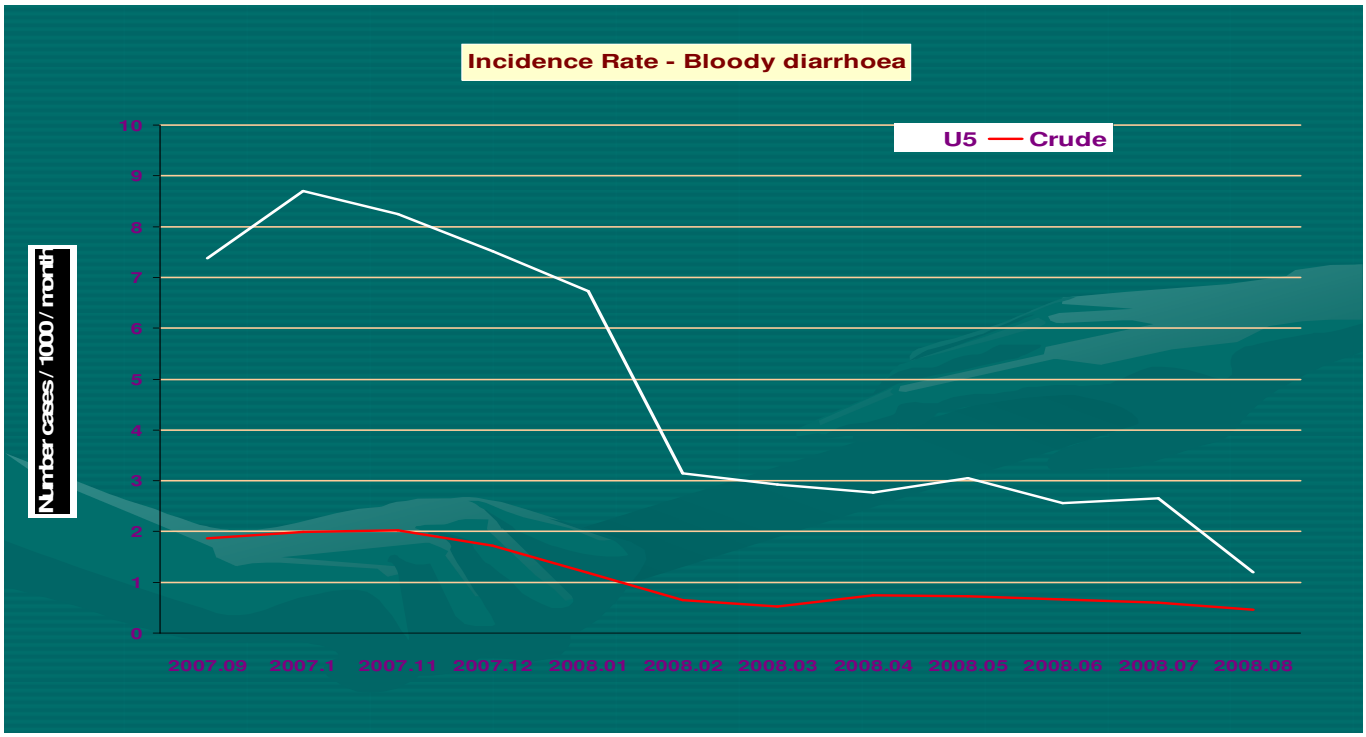
6. Impact of VIP latrine construction on the Health and Hygiene.

The primary purpose of an excreta disposal programme is to sustain or improve health by minimizing the transmission of disease causing pathogens. Health and hygiene issues, therefore have particular relevance when conducting any assessment. These are especially important in order to determine the key risks to the refugee population and consequently to identify intervention priorities.



Graph 2. Depicting the trend in Watery Diarrhoea

The current health status of the refugee population and potential threats to health as per the key assessment indicators and as reported by the medical coordinator and the agency involved in the health sector viz. AMDA is that the mortality rate due to excreta –related disease is nil. The crude incidence rate of watery and bloody diarrhoea (pleas refer Graph 2. above….) is well within the recommended figures shown in Table 5.The survey results also indicate that almost 87% of the respondent wash their hands after defecation.



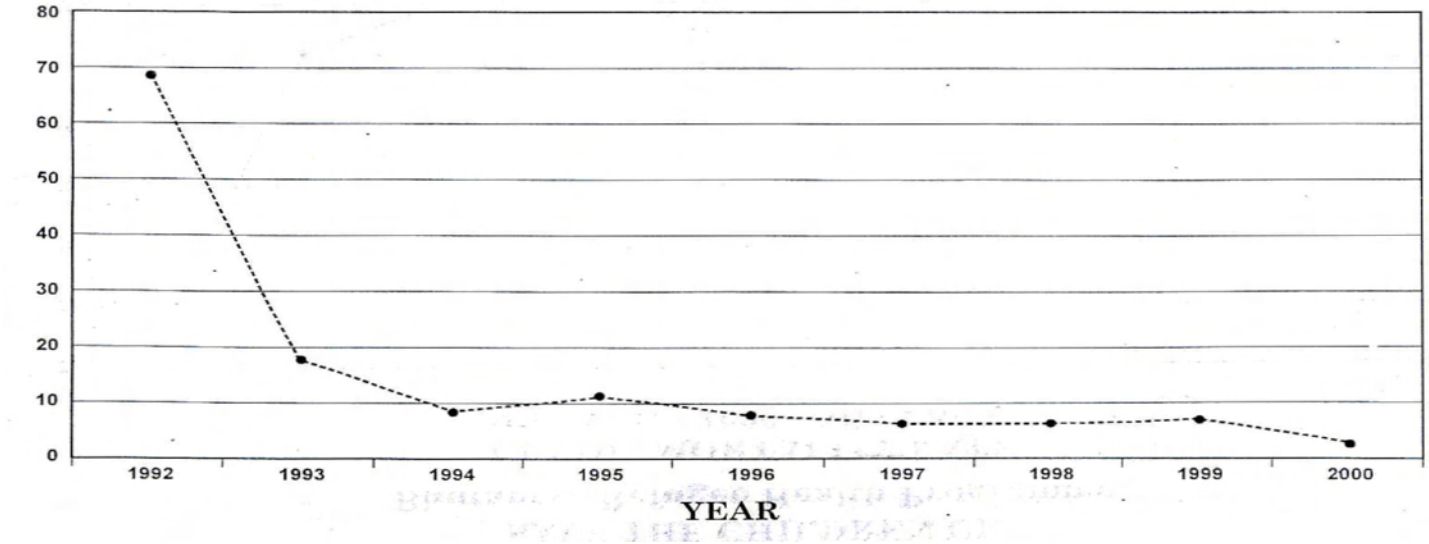
Graph 2.1 Showing the trend in Bloody Diarrhoea from Sept. 2007 to August 2008

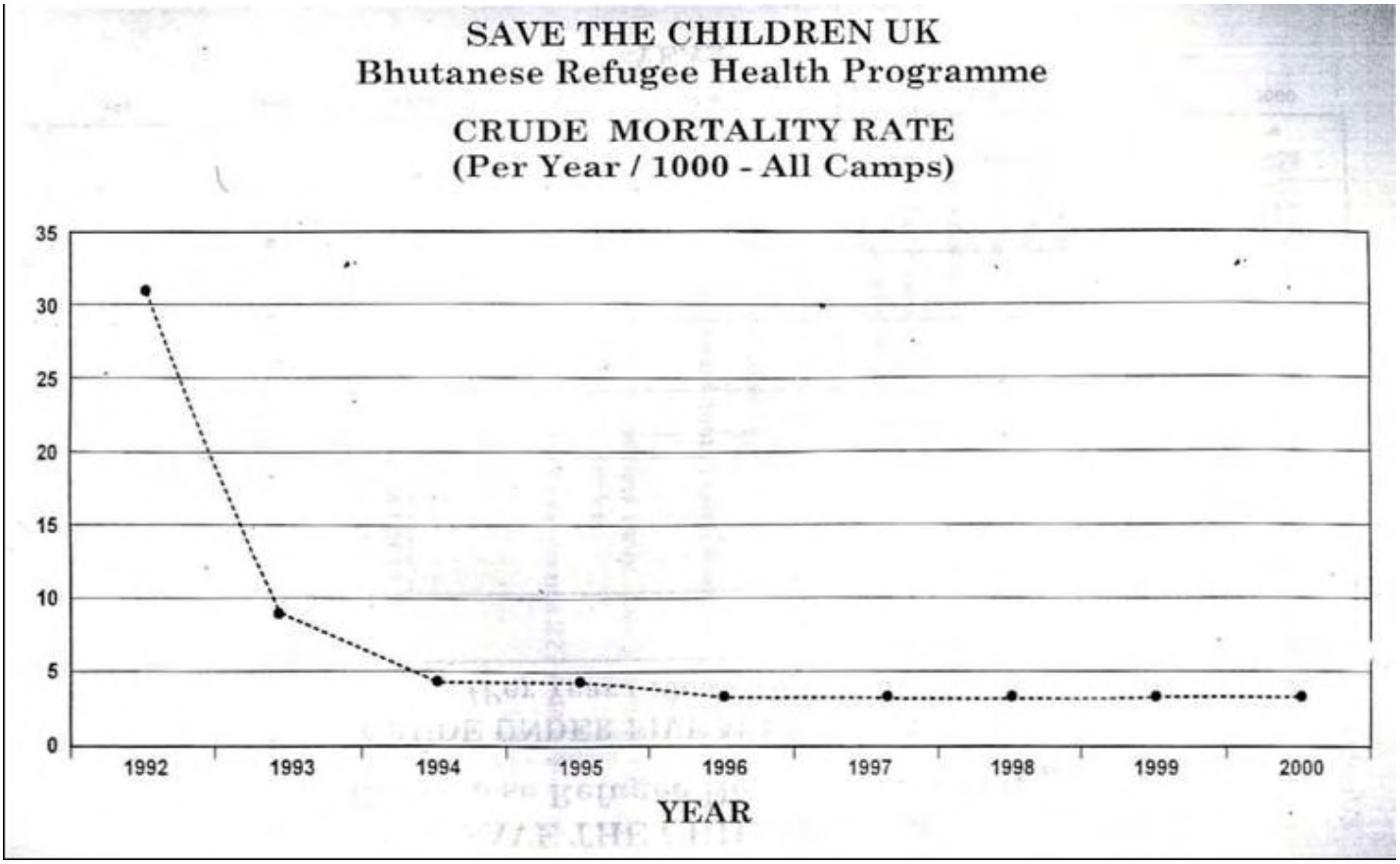
Table 5. Indicative acceptable incidence rates in camps for displaced persons or refugees (after de Veer,1998)

Disease	Incidence rate(incases/10,000/week)
Diarrhoea total	60
Acute watery diarrhoea	50
Bloody diarrhoea	20
Cholera	Every suspected case must be acted upon

The graph prepared by SCF (UK) then, further endorses the fact that prior to the introduction of VIP latrines in 1992 the crude mortality rate was 31/1000 per year which dropped significantly to <5/1000 per year in 1995 by the time when the construction of VIP latrines were almost complete in all the camps. Evidently it shows that the introduction of the VIP latrines complemented by the health and hygiene programme had a positive impact on the overall health situation of the refugee population.

Graph 3. SAVE THE CHILDREN UK Bhutanese Refugee Health Programme
CRUDE UNDER FIVE MORTALITY RATE (PerYear/1000–All Camps)





Graph 4. Crude Mortality Rate

Jonathan Puddifoot in 1995 has made comparison of the reported cases of diarrhoea in each camp from July 1992 to December 1994, against the construction of latrines, it can be seen that latrines have a strong impact in reducing diarrhoea (Please refer Graph 6. below).

The rates of reported diarrhoea per 100 people and the rates of VIP latrines per 100 people were compared to

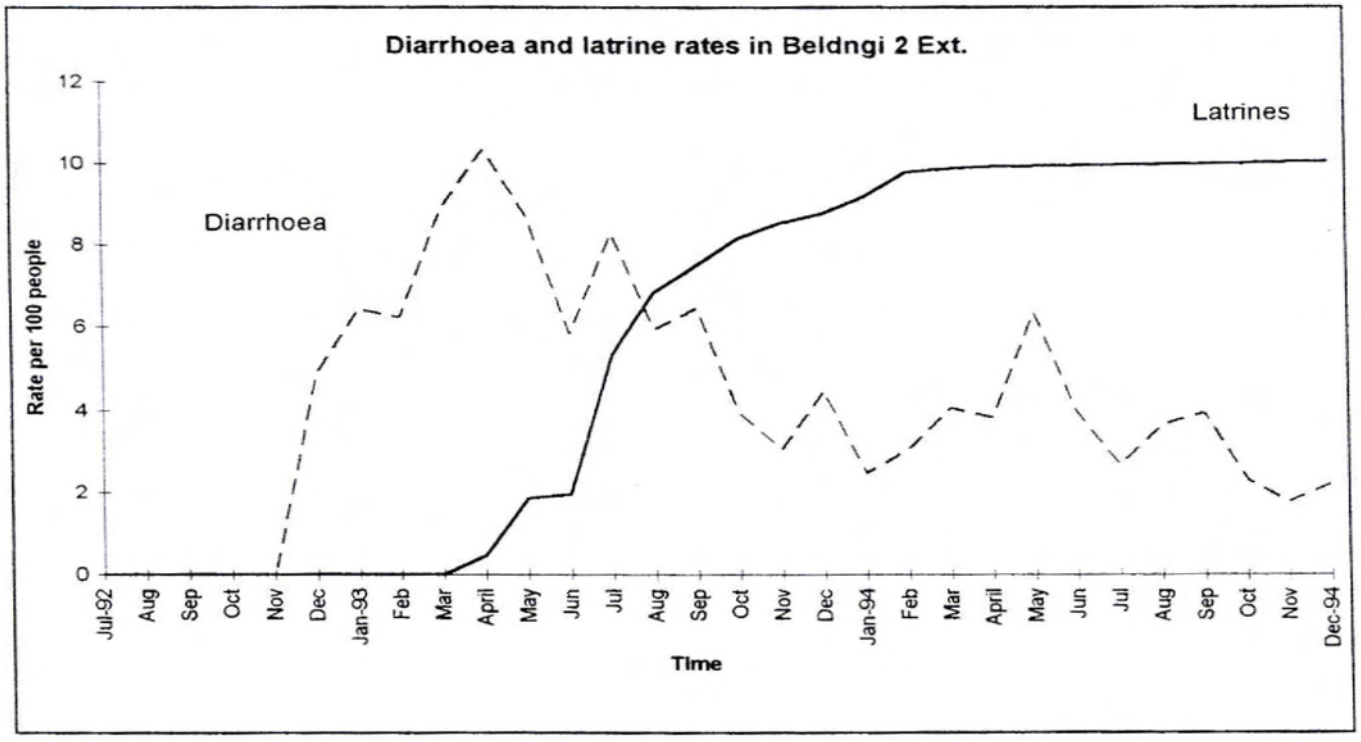
find the correlation between them, giving the figures as shown in table 10 below:

Camp	Correlation of latrine rate with diarrhoea rate
Timai	-27.77%
Sanischere	-76.65%
Goldhap	-63.38%
Beldangi 1	-25.60%
Betdangi 2.	-11.64%
Betdangi 2 Ext.	-82.94%
Khudunaban	-77.13%

Table 10.Showing the correlation between increasing latrine rate and reducing diarrhoea.

It can be seen that in all camps the relationship is -negative. VIP latrines help to reduce diarrhoea! In some camps there is a very strong relationship (Beldangi 2 Ext., Khudunabari and Sanischere) especially considering the seasonal nature of reported diarrhoea infection, whilst in others it is weaker. As latrine construction goes on, diarrhoea is reduced.

It can be seen from Graph 6. below however, that an increasing trend of reported diarrhoea prior to the construction of latrines in Beldangi 2 Ext., having an average rate per month (December 1992-March 1993) of 6.61 per hundred people was reduced to 3.52 for the same period the following year, after construction was nearly complete.



Graph 6. Impact of VIP Latrine Construction on Diarrhoeal Rates

7. FUTURE LATRINE TRENDS.

The previous sections have dealt primarily with the latrines themselves or the habits of the users. The characteristics of the latrines will have a big impact on the future management decisions facing both the agencies and refugees. This section sets out some of the factors which will need to be addressed. Most importantly, management of repair and maintenance of the toilets during the transition period of resettlement exercise, salvaging of the reusable materials when the refugee leaves and more durable solution to the toilet structures taking into account eventual consolidation of residual caseload (or integration in the local community) and setting up of refugee/local community self management system, which will look after the maintenance, pit shifting, emptying and replacement of latrines.

The biggest challenge to the agencies and UNHCR is how to protect their stock of latrines, so that they give optimum performance in terms of safeguarding public health and minimizing the number of pit shifts that need to be carried out.

Important factors about the latrines in the refugee camps are as follows;

- There are a lot of them. (over 8,959 by the end of 2007)
- The superstructures have a short life of around 1 year.
- They have a pit fill time of less than 6 months, which could be increased with adoption of appropriate design options suitable to the surrounding ground condition.
- Taking into account current observations of the departure of small and partial family units, the composition of the remaining population may pose a number of challenges. In the light of the departure of mostly skilled refugees, however, the likely high degree of vulnerabilities and special needs among the remaining camp population will be a constraint in sustaining camp services.

Tasks that need to be carried out on the latrines are:

1. Repairs and maintenance to the superstructure.
2. Emptying the decomposed material from the pits.
3. Changing the operating pit from one to another (vent pipe / chute pipe changing)
4. Replacing the superstructure.

.

Whilst LWF found constructing nearly 8,959 latrines a challenge, they already know that maintaining them to their maximum performance with a centralised management system is virtually impossible. The data base required (8,959 latrines X 4 tasks = 35,836 bits of data per year) is much too big in the context of alternative management options.

It is the stated objective of UNHCR and LWF that refugee self managed systems take care, as far as is possible, of the running of camps. Already, for the management of the infrastructure such as water supply and sanitation there exists the Sanitation Volunteers and refugee Infrastructure Services Sub Committee (please refer organisational chart ANNEX 15)). But in the wake of the departure of mostly skilled refugees, however, the likely hood of remaining of high degree of vulnerable and special needs camp population may pose a serious constraint in sustaining camp services. A decentralised, trained refugee/ Local community self managed system, catering to the needs of each latrine will be the most efficient, provided the level of management is good enough. A good level of management is also necessary to safe guard public health.

Such a management system will not automatically produce itself, but needs careful and long term guidance and support from all those involved (LWF, UNHCR, AMDA, Refugees and the surrounding Local Communities). It is not enough to appoint voluntary sanitation persons and provide them with tools.

At the moment, LWF Camp Management Officer have most experience in organising latrine related activities. Their

experience is a valuable asset to be used in the development of a refugee/Local Community managed system.

The development of the latrine management system will encounter similar problems and opportunities to those faced in a development project situation. Experience from development situations suggests that a successful system;

- Should be developed by the refugees/Local Communities and operated with the guidance and support of agencies over at least 2 cycles (i.e. pit shifts & emptying). This suggests (steadily decreasing) support for 2 years.

- It is best started on a small scale (i.e. one camp) and then the success repeated throughout the rest of the camps.

- The refugees/Local Communities involved in managing the system need to understand why they are doing it. They need to understand the basic principles of VIP latrines, disease control and record keeping systems. This implies a well thought out series of training sessions with them.

- The people involved in managing the system must be motivated to do so. There is a real opportunity cost for refugees/Local Communities to spend their time in latrine management.

- The system will be have to be decentralised, at least to a camp and one of local community in the vicinity of the refugee camp. This means responsibility and authority will also have to be decentralised away from the agencies and UNHCR This will always be difficult whilst the refugees depend exclusively on UNHCR for money.

Decentralised systems will vary from one camp to another in their effectiveness and method of operation. The quality of management will vary, as will the quality of reporting. It will become more difficult to maintain an equal balance of latrine condition in all camps and surrounding communities.

7.1 Setting up the system.

Since successful systems need to be developed by and with each camp/local community, it is not sensible to layout a plan for a management system here. However, the following guidelines for each area are suggested.

UNHCR, LWF and AMDA have the same overall goal in the refugee managed system. The expectations, roles and responsibilities of each agency need to be made clear and agreed upon by all. This will minimise any future communication gaps.

- LWF can take their current role further, developing a training programme with the Refugee Project Services Sub Committee (PSSC) and the User's Committee from the local community, who will be the enactors of most latrine activities. LWF can provide the support necessary for the first 2 years of its activities. The skills needed by staff to carry out such a programme are different from those used by LWF up until now. Some readjustment / retraining of LWF staff may be necessary.

- LWF staffs do however; have invaluable experience of running bamboo yards, distribution points, latrine pit shifting and emptying etc. This experience will greatly enhance the chances of success of the PSSC/Local User's Committee (LUC), if it can be channelled into a positive programme of support.

- The support needs to be structured into a logical set of objectives and activities, designed to reach the goal (self

managed systems) agreed by agencies and PSSC/LUC, needs to be developed on a camp wise and immediate local neighbourhood basis.

- There are several well established methods to do this (Objective Oriented Planning, Logical Framework etc.). The objectives and activities can then be expanded with a time frame and success indicators.

In short a definite, complimentary programme of events designed by all parties to achieve a commonly agreed development goal will increase the chances of success. Spasmodic actions by different agencies reacting to current events, may serve to divide the PSSC/LUC. The refugee/local community self managed system has one major difference from a development project situation in that the target group are both the refugees as well as the host community.

7.2 Repairs and maintenance in the future.

As time goes on, donor fatigue will lead to a general reduction in funds available for the camps. It will become necessary to be more efficient in the allocation of scarce resources such as repair and maintenance money. Greater efficiency in the allocation of materials for the latrines will be brought about when refugees and the local communities give this aspect of camp/community infrastructure high importance.

Training input to PSSC/LUC from both AMDA (on continued hygiene) and LWF(operation of the VIP latrine, importance of proper maintenance etc.) will raise awareness and define training needs in other areas.

The super structure is an essential part of the latrine. Low light levels in the latrine prevent flies escaping from the chute pipe. Blocking the chute pipe stops the vent pipe working and is not a good alternative. The roof must prevent water getting into the pit and flooding it. Repairs and maintenance, together with systematic replacement are necessary to achieve these factors.

The repair and maintenance of the super structure must continue on the scale and methods as of prior to 2005 in proportion to the statistics of the refugee huts in existence until a clear picture of the third country resettlement and of the consolidation of the residual caseload is visualised.

In the meanwhile some sort of coordination must be developed between the local communities and the refugees in tandem with the development of similar type of Human waste disposal system in the local communities (if implemented under the "Reach Out" strategy).

As suggested earlier a management committee consisting of a combination of refugee PSSC and Local User's Committee could be established to jointly overtake the future repair/ maintenance responsibility in due course of time.

Further in the event of realization of a clear picture regarding the consolidation at the end of the third country resettlement exercise, the break even point for this technology would be if the life of the super structure is prolonged, which it probably would. It is suggested trials are carried out again in this area to find out the practicality of developing a 5 year super structure, as a way of reducing repair and maintenance costs. In this regard a more durable requiring less of maintenance is proposed for the residual caseload (please refer drawings and estimates ANNEXES 11&12).

The main necessary improvement made in order to enhance the durability of the latrine is:

Base

- Dry brick walls of 254 mm thick and 470 mm deep at the base with a capping of brick masonry in 1:5CM 130mm in depth are suggested to support the 1.2m dia. PCC rings on top for the pits. The dry brick wall is expected to strengthen the pit walls and at the same time allow enough space for infiltration of the raw sewage liquid through it (facilitates dewatering).

- The dimensions of the pit cover slabs are increase by 50 mm. so that the self load of the cover slab is transferred to the surrounding ground instead of directly on the PCC rings.

Superstructure

- Instead of bamboo poles, RCC poles are proposed which according to the experience of the stakeholders in the field can last for many years.

- The base of the superstructure is proposed to be of 5' thick brick masonry wall 1m depth all around to support the remaining height of ekra bamboo wall.

- The roof is proposed to be of CGI Sheets which can last for more than ten years.

8. Impact on sustainable development

It is obvious that the twin-pit VIP latrine tackles the sustainability issue. The reuse of the latrines economizes the resources needed for construction and the occupation of land. This is particularly important in crowded areas where flexibility is needed as the environment already suffers from the density of the refugee population. The two pits give more flexibility since a pit fills up in two to three years and should then stand for one year. Therefore, the twin-pit latrine is an innovation that addresses the environmental dimension of sustainable development.

If one compares the investment required for the construction, operation and maintenance of sewage disposal system of a population of the size of a municipality (100,00 plus) and that of the 8,959 VIP toilets constructed, successfully operated and maintained over the last 14 years in the seven Bhutanese Refugee camps it quite but evident that the VIP Latrine system of human waste disposal is much simple and more economical. Thus, the twin-pit VIP latrine economizes real money and makes economically a difference that can be read as the economic dimension of sustainable development.

Lastly the dignity of the refugees is better preserved, as they do not have to change their sanitation habits all the time. Also, the environmental sustainability increases the acceptance of the refugees by the host community. This makes a direct social impact that can be considered as the social dimension of sustainable development. In summary, the twin-pit VIP latrine makes an impact on sustainable development in the refugee camps, in all dimensions of the Brundtland notion, but especially in an environmental.

9. "Reach Out" strategy - Sanitation in the host community:

Since past many decades, Nepal continues to suffer high mortality and morbidity rate which tolls about 28,000 deaths of children and the nation bears the damage of almost Rs. 10 billion annually mainly due to lack of awareness about cleanliness and sanitation among publics. The population is still largely ignorant about the relationship between sanitation and health. UNICEF gives a figure of 15% sanitation coverage for Nepal up to 1995. In the pursuit of addressing the socioeconomic and negative environmental impacts provoked by the long presence of the refugees, UNHCR under the Refugee Affected Areas had launched in the past from 1994-2000 a considerable number of health and sanitation programme in the neighbouring communities. Following are list of activities implemented under the sanitation programmes in tabular form

Sanitation

S.N.	Activity	Year	VDC	Qty.	Beneficiaries (persons)	LWF Cont.	Comm. Cont.	Total
1	Family Latrine Construction	1994	Shantinagar	100	600	222,954	148,584	371,538
2	Family Latrine Construction	1995	Shantinagar	112	700	249,710	166,416	416,126
3	Family Latrine Construction	1996	Arjundhara	29		42,368	43,732	86,100
4	Family Latrine Construction	1997	Damak	98		182,161	147,784	329,945
5	Family Latrine Construction	1997	Garamuni	86		139,147	129,688	268,835
6	Family Latrine Construction	1997	Khudunabari	87		155,681	131,196	286,877
7	Family Latrine Construction	1998	Banjho	30	166	54,403	40,152	94,555
8	Family Latrine Construction	1998	Damak	14	78	25,368	18,676	44,044
9	Family Latrine	1998	Damak	15	83	27,180	20,010	47,190

	Construction							
10	Family Latrine Construction	1998	Damak	15	83	27,180	20,010	47,190
11	Family Latrine Construction	1998	Damak	19	103	34,428	25,346	59,774
12	Family Latrine Construction	1998	Garamuni	20	111	36,240	26,680	62,920
13	Family Latrine Construction	1998	Khudunabari	10	55	18,120	13,340	31,460
14	Family Latrine Construction	1998	Madhumalla	40	221	72,480	53,360	125,840
15	Family Latrine construction	1998	Damak	55	311	100,816	144,100	244,916
16	Family Latrine construction	1998	Chulachuli	25	142	45,825	65,500	111,325
17	Family Latrine construction	1998	Garamuni	20	113	36,660	52,400	89,060
18	Family Latrine construction	1998	Khudunabari	75	450	143,081	97,500	240,581
19	Family Latrine construction	1998	Pathari	25	150	47,694	32,500	80,194
20	Family Latrine construction	1998	Sanischare(M)	50	300	95,387	65,000	160,387
21	Public Toilet construction	1998	Damak	1	5000	371,188	74,500	445,688
22	Public Toilet construction	1998	Anarmani	1	5000	365,533	85,751	451,284
23	Family Latrine Construction	1999	Damak	50		100,826	159,741	260,567
24	Family Latrine Construction	1999	Sanischare(M)	15		30248	47922	78,170
25	Family Latrine Construction	1999	Khudunabari	10		20165	31948	52,113
26	Family Latrine Construction	1999	Garamuni	15		30248	47922	78,170
27	Family Latrine Construction	1999	Shantinagar	25		50413	79870	130,283
28	Family Latrine Construction	1999	Chulachuli	21		42347	67091	109,438
29	Public Latrine Construction	1999	Duwagadi	1	1200	451,563	171,342	622,905
30	Family latrine construction	2000	Damak	57		113,187	190,470	303,657
31	Family latrine construction	2000	Sanischare(M)	15		29,786	50,124	79,910
32	Family latrine construction	2000	Garamuni	10		19,857	33,416	53,273
33	Family latrine construction	2000	Khudunabari	19		37,729	63,490	101,219
34	Family latrine construction	2000	Arjundhara	35		69,501	116,955	186,456
35	Family latrine construction	2000	Shantinagar	15		29,786	50,124	79,910
36	Family latrine construction	2000	Pathari	15		29,786	50,124	79,910
37	Family latrine construction	2000	Chulachuli	35		69,501	116,955	186,456
38	Construction of	2000	Chandragadi	1	2000	450,000	121,465	571,465

	community latrine							
39	Family Latrine Construction	2000	Chulachuli	20	110	31,126	51,877	83,004
40	Family Latrine Construction	2000	Madhumalla	20	110	31,126	51,877	83,003
41	Family Latrine Construction	2000	Arjundhara	10	55	15,563	25,939	41,502
42	Sunakhari Primary School	2004	Pathari	1		125,000	37,433	162,433
43	Durga Primary School	2004	Sanischare	1		125,000	31,689	156,689
44	Rastriya Bijaya Primary School	2004	Shantinagar	1		125,000	41,084	166,084
45	Sishusudhar Primary School	2004	Budhabare	1		125,000	41,259	166,259
46	Sarswoti Secondary School	2004	Lakhanpur	1		125,000	82,194	207,194
47	Toilet construction-Damak Campus	2004	Damak	1		150,000	89,001	239,001

Table 11. List of Projects implemented in Sanitation under RARP (1994-2004)

Training		Year	Location	Beneficiaries	Amount
1	4 Days Public Health Awareness training	2004	Damak	32	12,139
2	4 Days Public Health Awareness training	2004	Damak	29	11,751
3	4 Days Public Health Awareness training	2004	Damak	29	11,751
4	4 Days Public Health Awareness training	2004	Dharampur	27	11,493
5	4 Days Public Health Awareness training	2004	Lakhanpur	28	11,622
6	4 Days Public Health Awareness training	2004	Lakhanpur	29	11,751
7	4 Days Public Health Awareness training	2004	Lakhanpur	33	12,269
8	4 Days Public Health Awareness training	2004	Sanischare	29	11,751
9	5 Days Public Health Awareness training	2004	Topgachhi	29	11,751

Table 12. List of Health Awareness programmes launched in the host community

The Refugee Affected Areas Rehabilitation Programme (RARP) in effect came to an end in 2001 with the break of the funding from the German Government BMZ. Although there has been persistent request from the local communities for the continuation of the assistance programme no initiative has been taken to revive the programme since then.

During the visits to the neighbouring host communities, in the process of gathering the necessary information with regards to the eventual consolidation of the residual caseload, the local community leaders had expressed their willingness to take over the responsibilities for some of the infrastructures services inside the refugee camps such as water supply and sanitation programmes. For materialisation of the proposition much depends on the third country resettlement pattern of the refugees and would need further dialogues with the neighbouring communities and the local authorities at the appropriate time. The local Community representatives had requested for continuation of the assistance programme in the host communities. Some of the request from the Village Development Committee secretaries and Representatives of the respective municipalities for sanitation programmes in their respective VDC and municipalities are:

Garamuni VDC

- Public toilet one number
- School Latrine for Durga Secondary High school one number
- VIP latrines 1500 numbers

Khudunabari VDC

- Public Toilet one number
- VIP latrines 1300 numbers

Humse Dumse Forest User's Committee
- School toilet for Adarsha Namuna Samudayak Vidyala one number
- VIP Toilets 650 numbers

Madhumalla VDC
- Public Toilet one number
- School latrine for Jaleshwari school one number
- VIP toilets in Sisauli Bagar tole 100 numbers

Pathari VDC
- VIP Latrines 300 numbers

Mechi Nagar Palika
- VIP Latrines 300 numbers

Budhabare VDC
- VIP Latrines 500 numbers

For detail cost analysis and estimates for the above activities please refer ANNEXES 7, 8 and 9.

10. Conclusion and Recommendation

On the whole it is to be said that the system of Human Waste Disposal through 8959VIP latrine, with a population producing minimum of 6,423 m^3 raw/decomposed sewage annually, over the past two decades, has demonstrated fact that the system can be simulated without any hesitation in a refugee influx situation elsewhere subject to the ground condition (soil texture, water table and infiltration rates).

Groundwater elevation and soil stability dictate specific latrine design at each site. Two options, 7 and 8, were selected as the latrine designs of choice. Each offers alternative designs based on site - specific soil stability.(Appended as Figures, 5, 6,7and 8). LWF needs to determine which of these four alternatives to construct at each specific facility site, based on the foregoing site characteristics instead of the present tendency of bluntly applying the option 6 (Appended as Figures4 and 18) in all the camps.

For the selection of the right type and site-specific design LWF needs to carry out a detailed site investigation for ground water tables, infiltration rates and soil textures and demarcate the areas accordingly.

Budgetary provision needs to made for the repair and maintenance of the super structure and needs to be continued on the scale and methods as of prior to 2005 in proportion to the statistics of the refugee huts in existence until a clear picture of the third country resettlement and of the consolidation of the residual caseload is visualised.

Further in the event of realization of a clear picture regarding the consolidation at the end of the third country resettlement exercise, the break even point for this technology would be if the life of the super structure is prolonged, which it probably would. It is suggested trials are carried out again by LWF in this area to find out the practicality of developing a 5 year super structure, as a way of reducing repair and maintenance costs. In this regard a more durable requiring less of maintenance is proposed for the residual caseload (please refer for drawings and estimates ANNEXES 11&12)

For the achievement of the goals of the "Reach Out" strategy there is need to revive the complementary assistance programme in the host community at the earliest. Due to the time constraints a detailed study in this regard could not be

carried out. A detailed study with further technical elaboration is needed in the sector of the infrastructure services delivery in the host community such as watsan, health, education, roads and soil conservation and flood protection works.

ANNEX 1

Social survey on use of family latrine.

1. When did you start using the latrine?

2. Where did you go for defecation before you had the family latrine?

a) Open field
b) River
c) Own latrine
d) Other e)=a)+b)

3. Are you happy with your latrine?

a) Yes
b) No
c) Half & half.

4. If not, why not?

a) Too close to the house
b) Sharing with another family
c) Too many people are using it
d) Smell / fly problem
e) Cultural practices

5. When did your latrine fill up? Pit1 Month *I* year
Pit 2 Month / year

6. What do you do when your latrine pit fills up?

a) Empty it myself. (GO TO Q. 7)
b) Go for open defecation (GO TO Q.9)
c) Inform camp committee *I* agencies / sector head etc. (GO TO Q.IO)

7. If 6 a), then is it safe to empty latrines?

a) Yes
b) No

8. If yes, do you have the equipment to empty the latrine?

a) Yes
b) No

9. If 6 b), is it good practice for your health?

a) Yes
b) No

10. If 6 c), why?

a) Cultural reasons
b) Health risk h) = b) + c)
c) I don't know how to do it i) = c) + d)
d) lack of equipment j) = b) + d)
e) Its not my job to do it k) = a) + b)
f) There is a bad smell
g) Other l) = b) + f)

11. What do you do after defecation?

a) Wash anus only (GO TO Q. 13)
b) Wash hands only (GO TO Q. 13)
c) Wash anus & hands (GO TO Q10 Q. 12)
d) Wash anus hands & feet (GO TO Q. 12)
e) Use wood, stones, leaves or other solid material (GO TO Q. 13)
f) Nothing

12. If 11 c) or d) what do you use for hand washing?

a) Soap / ash with water
b) Soil / mud with water
c) Water only
d) Nothing

13. Does someone clean your latrine?
a) Yes
b) No

14. If yes, who does it?
a) Mother / sister
b) Father / brother
c) Children
d) Other. e)=a)+b) f)=a)+b)+c)

15. If yes, why?

a) For hygiene
b) To protect the latrine
c) Pressure form the CHV / VHW
d) Don't know e)=b)+c) t)=a)+b)

16. If yes, how often?

a) Daily, after use
b) Weekly
c) Monthly
d) Three monthly
e) Never

17. How many people using the latrine are less than 10 years old?

18. Did you take part in building the latrine? If so what did you do?

a) Digging the hole
b) Mixing & laying cement
c) Building super structure
d) All parts
e) = a) + c) f)=a) +b)

19. How did you learn to build it properly?

a) A supervisor gave advice
b) I watched what my neighbours were doing
c) I have built one before
d) A mixture of the above.
e) Don't know
f) = a) + c)
g) = a) + b)

20. Have you shifted over the pit? When?

21. Did you do that on your own or with the help of agency staff?

a) On my own
b) With agency staff

22. How well did they respond to your request for help in shifting the pit?

a) Within 2 days
b) Within a week
c) More than a week

23. When the pit was shifted, did anyone put earth on the top of the pit or not?

a) Yes
b) No
c) Don't know

24. Does one person usually clean the latrine or do different people do it?

a) Same person
b) Different people

25. Do you share the cleaning & maintenance work of the latrine with your neighbour, or not?

a) One family does all the work
b) One family does most of the work
c) The work is shared equally

26. What maintenance is done on your latrine?

a) Repairs to the door
b) Repairs to the wall
c) Repairs to the roof
d) Repairs to the squat plate
e) None
g) = b) + c)
h) = a) + b) + c)
i) = a) + c)

27. How often do you go for open defecation?
a) Never
b) Rarely (1 time per month)
c) Not often (1 time per week)
d) Often (3 times per week)

28. When you move away from the camp, Will you try & build a VIP latrine at your home?

a) Yes
b) No

29. What is the purpose of the vent pipe in your latrine?

a) Not sure
b) To get rid of smells
c) To keep the pit cool
d) To let sunlight into the pit.

30. Do you find a problem with flies in the latrine?

a) No flies
b) Very few flies
c) Some flies'
d) A lot of flies

31. Do you find it smelly in the latrine?

a) No smell
b) A little smell
c) Moderate amount of smell
d) Very smelly

32. Does your family' use the latrine for other purposes?

a) Washing / showering
b) Washing baby clothes
c) Washing dishes
d) No other use

33. Do you face problems with the latrine in the rainy season, if so what?

a) No problem,
b) Roof leaks
c) Pit fills with water
d) Super structure starts to fall over

34. Does the latrine ever get blocked (except when it is full?)

a) Never
b) Rarely
c) Sometimes
d) Often

35. Do you put things in the latrine?
a) Household sweepings
b) Bones, old food, paper etc.
c) Bottles, sticks, plastic
d) Nothing.

36. If you do what will happen?
a) It will affect the decomposition of the material
b) It may cause injury to the person emptying the pit
c) The latrine will fill up too quickly

37. What is the best thing about the VIP latrine for you?
a) Health / hygiene aspects
b) Convenience
c) Lack of smell
d) Other

38. What is the worst thing about the VIP latrine for you?
a) Nothing
b) The pit fills up
c) Smell
d) Fly problem

39. How would you make the design of the latrine better?
a) Improve the super structure
b) Make the pit deeper
c) Other

40. Why don't you do it?
a) Lack of money
b) Lack of materials
c) Lack of advice / supervision

ANNEX 2

RESULT OF LATRINE USE SURVEY

Question no	0	a	b	c	d	e	f	g	h	i	j	k	l	month	year	Total
Q1.															1990=3 1992=3 1993=68 1994=26 1995=26 1997=1	127
Q2.		72	20	18	8	12										
Q3.		123	1													
Q4.	31		1													
Q5.														11m-1 10m-1 6m-28 5m-14 4m-14 3m-14 2m-4	13yr-1 12yrs-1 11yrs-3 10yrs-1 3yrs-4 2yrs-19 1yr-38	
Q6.		119	1	49	1											
Q7.		78	43													
Q8.		15	86													
Q9.	1	70	40				2									
Q10.		6	55	1	45	1	9									
Q11.		20	15	32	98											
Q12.		118	24	1	1											
Q13.		69	49		7		1									
Q14.	10	78	56	21	18	10	26									
Q15.	9	97	20	2			7									
Q16.	7	91	31													
Q17.																
Q18.		20	10	6	90		12									
Q19.		56	43	11	17	7		8								
Q20.														10=1 8=1 6=11 4=2 3=5 2=4 1=13	1993=4 1995=1 1996=2 1997=2 1998=1 2000=2 2001=1 2003=2 2004=1 2005=2 2006=2 2007=36	
Q21.	11	73	50													
Q22.		66	58	21	1											
Q23.		104	13	9	1											
Q24.		16	122													
Q25.	4	9	8	106	1											
Q26.		67	62	58	25	1			53							

Q27.		12 3	1	2												
Q28.	1	96	23													
Q29.	6	30	82	4	2											
Q30.		23	49	46	6	29		1								
Q31.		12	48	17	3											
Q32.					83											
Q33.		9	34	46	22	3										
Q34.		75	5	3	2	2										
Q35.					83											
Q36.	2	40	41	32	2											
Q37.		74	13	14	7											
Q38.		37	49	45	32	28										
Q39.		11 2	50	7	1											
Q40.		96	93	30												

Q.17	1 CHILD	17 HUTS
	2 CHILDREN	22 HUTS
	3 CHILDREN	19 HUTS
	4 CHILDREN	5 HUTS
	5 CHILDREN	3 HUTS
	6 CHILDREN	1 HUT
	7 CHILDREN	3 HUTS
	8 CHILDREN	1 HUT
	9 CHILDREN	2 HUTS
	10 CHILDREN	1 HUT
	14 CHILDREN	2 HUTS
	22 CHILDREN	1 HUT

ANNEX 3

Camp	1992	1993	1994	1995	1995 - 1999	Present Total
Timai	0	116	0	722	-29	809
Sanischare	0	327	912	0	490	1729
Goldhap	0	726	0	0	40	766
Beldangi 1	0	1,426	0	0	107	1,533
Bendangi 2	417	1,418	0	0	101	1,936
Bendangi 2 Ext.	0	825	103	0	59	987
Khudunabari	0	700	387	0	51	1,138
TOTAL	**417**	**5,538**	**1402**	**722**	**819**	**8,898**

Table 13. Number of Latrines constructed (1991-2008)

Latrines and Urinals

Camps	No of latrine used by one hut	No latrine used by two huts	No latrine used by three huts	No latrine used by four huts	Total latrines	Agency latrine	Public latrine (CMC,RWF,BRVE)	School latrine		
								VIP	Trench	Urinal
Beldangi 1	64.00	1,391.00	76.00	3.00	1,534.00	12	3	34		4
Beldangi 2	132.00	1,756.00	18.00	3.00	1,909.00	13	6	39	11	
Beldangi 2 ext.	65.00	877.00	48.00	1.00	991.00	4	3	15	20	1
Sanischare	159.00	1,153.00	32.00	393.00	1,737.00	5	15	30		5
Goldhap	39.00	713.00	16.00	-	768.00	4	6	2	3	4
Timai	184.00	563.00	58.00		805.00	13	3	11	3	4
Kudunabari	68.00	999.00	10.00		1,077.00	5	4	27		4
Total	**711**	**7452**	**258**	**400**	**8,821.00**	**56**	**40**	**158**	**37**	**22**

Table 14. Stock of Latrines and Urinals in each Camp

ANNEX 4

Annex E
PTSS Mission Report
92/67

Annex E

FACILITY PLAN FOR SEWAGE DISPOSAL

IN THE BHUTANESE REFUGEE CAMPS,

JHAPA AND MORANG DISTRICTS, NEPAL

December 1992

INTRODUCTION

Approximately 70,000 Bhutanese refugees now reside in 6 camps in Southeastern Nepal. That population generates from 8,000 to 18,000 cubic metres of sewage, including feces, urine, cleansing and flushing water, each year. To assure that the refugees and the local Nepali communities are not exposed to the potential pathogens of raw sewage, provisions must be made for its effective treatment and disposal. This Facility Plan identifies several alternatives for that disposal and is intended to be used for selecting the system or systems most appropriate, within available funding, for each camp.

Cost estimates have been provided by LWS. Where total costs are listed, they are for a population of 70,000 refugees. To show actual cost comparison, cost per refugee is used.

FACILITIES

1. Unmanaged Field Defecation (Do-Nothing Option)
   Description: Continued use of forests, river banks and fjelds for the indescriminate disposal of feces. This is currently the major form of disposal for the majority of Bhutanese refugees and is the method of disposal practiced by most in Bhutan. Feces are left unprotected as deposited. Refugees use water, leaves, stones for anal cleansing.
   Advantages: No immediate cost to relief agencies.
   No training needed.
   Disadvantages: Sewage immediately accessible to vector and human contact.
   High stream and surface water pollution potential.
   Odors and nuisance to users and nearby residents.
   Estimated Cost: None
   System Longevity: Indeterminate (years)

2. Managed Field Defecation
   Description: Fields are delineated expressly for defecation. Stategies for management may include small portable shelters in which shallow pits are dug, use of shovels to bury feces or ashes to cover feces to make them less attractive to flies.
   Advantages: Very inexpensive.
   Refugees manage the systems themselves.
   Reduced pollution potential from unmanaged defection.
   Disadvantages: May require intensive health education and monitoring.
   Difficult to manage during rainy season.
   Requires refugee cooperation and incentive.
   Estimated Cost: 0 to 0.42 Rupees/refugee.
   System Longevity: Indeterminate (years)

Facility Plan

3. Individual Family Latrine (UNHCR Design-FIGURE 1)
Description: Individual or shared family pit latrine. Circular Squat plate with direct - drop slot placed on concrete o r wooden beams over 0.8 to 1 m diameter pit 1.5 t o 4 meters deep. Standard Bamboo / thatch shelter. Latrine is used until pit fills. Concrete Fixtures and structures are moved and pit is covered with soil.
Advantages: Inexpensive.
Refugees can construct with little guidance.
Simple wooden forms required for concrete structure.
Low water usage (only needed for anal cleansing).
Concrete beams and squat plate usable in replacement latrine

Disadvantages: Will require replacement in 1 t o 3 years
Requires adequate land for replacement pit.
Not suitable for high groundwater situations (<2 rn)

Estimated Cost: 90 to 188 Rupees/refugee.
System longevity: 1 t o 3 years, depending on pit depth and use.

4. Shared Family Latrine (UNHCR design-FIGURE 2)
Description: Cylindrical pits with concrete direct drop squat plates. Bamboo framework used for soil stabilization of pit. For cost comparison, half of the structure is shown (2 pits). One pit is used for one year and then closed with second pit in operation second year. At end o f one year's resting, sludge is removed from first pit.
Advantages: Optimizes soil contact of sewage mass for dewatering and composting by soil organisms and oxygen.
Low water usage; anal cleansing water only.

Disadvantages: Refugees may open stand-by toilet and use both before first pit is full.
Requires compost be removed after one years resting; land for disposal required.
Not suitable for high groundwater areas (<2 m).

Estimated Cost: 282 to 286 Rupees/refugee
System Longevity: 5 t o 10 years.

5. Shared Family Latrine (LWS design: Brick Pit-FIGURE 3)
Description: Single pour-f lush squat p l a t e toilet connected t o a dual brick- lined pit (Nepali Sulabah shauchalaya). Pit rotation as in Option 4.

Advantages: Brick pit facilitates sewage mass dewatering.
Single squat p l a t e. Easy to clean.

Disadvantages: Requires extra water for flushing. Requires land f o r disposal o f sludge.
Requires source o f soil to cover sludge when pit is filled within 0.5 m of capacity.
Requires health education t o keep squat plate clean.

Estimated Cost: 325 t o 329.Rupees/refugee
System Longevity: 10 t o 20 years.

6. Shared Family Latrine (O XFAM design: FIGURE 4)
Description: Dual concrete ring pits with a shared chute-type squat plate. Resting schedule as for Option 4.
Advantages: Durable construction of squat plate and pit. Easy to clean. Good for high groundwater sites.

Disadvantages: Requires extra water for chute cleansing. Contents may be anaerobic after one-year's resting. Requires disposal of sludge. Requires soil t o cover sludge when pit is full

Estimated Cost: 301 t o 329 Rupees/refugee
System Longevity: Basic structure 5 t o 10 years.

7. Shared Family Latrine (LWS High Groundwater design-FIGURE 5,6)
Description: Modification of OXFAM design, utilizing more soil interface and less structural support of pit. Cleaning schedule as in Option 4. Two designs are offered: one for stable soil, another for unstable soil.
Advantages: Better sewage mass dewatering than OXFAM design. Otherwise, as Option 6.

Disadvantages: Requires extra water to clean chute. Requires disposal of sludge. Requires soil to cover sludge when pit is full.

Estimated Cost: Option A: 321 t o 340 Rupees/refugee.
Option B: 259 t o 274 Rupees/refugee.
System longevity: Basic structure: 5 t o 10 years.

8. Shared Family Latrine, (LWS Moderate Groundwater design-FIGURE 7, 8)
Description: Similar to Option 7 except for moderate groundwater areas. Otherwise as Option 7.
Advantages: Good for moderate groundwater areas. Otherwise same as Option 7.

Disadvantages: Same as Option 7.

Estimated Cost: Option A: 200 to 215 Rupees/refugee.
Option B: 196 to 208 Rupees/refugee.
System Longevity: Basic structure: 5 t o 10 years.

9. Shared Family Latrine, (LWS Deep Groundwater design-FIGURE 9, 10)
Description: Options for deep ground waters. Option A is the OXFAM design, except that some additional soil contact is achieved by excavating an unlined pit below the main pit. Sewage mass dewatering is, therefore, better. Option B is a modification of the UNICEF latrine and creates essentially a concrete vault in which sewage is stored. This later option may be quite anaerobic and require sludge pumping, rather than compost removal.
Advantages: Easy t o clean.
Disadvantages: Option B may be anaerobic and require desludging.
Both options will require periodic pit cleaning.
Cost Estimate: Option A: 302 t o 331 Rupees/ latrine.
Option B: 263 t o 286 Rupees / latrine.
System Longevity: Basic structure: 5 t o 10 years.

10. Communal Toilet (UNHCR Design Figure 11)
Description: Eight to ten shared family pour -flush squat-type
Toilets draining to a storage tank that is periodically pumped with a vacuum pumper. Final disposal of Sludge/sewage by land spreading on agricultural or forest land or by treatment through stabilization pond, with discharge to a stream.
Advantages: Easy to maintain.
Disadvantages: .Requires refugee education on use. Uses water for flushing.
Requires pumping and off – site disposal of sewage.
Requires tractor/pumper maintenance.
Estimated Cost: With ag / forest disposal: 128 Rupees/refugee. With pond disposal: 154 Rupees/refugee
System Longevity: 5 t o 10 years

ANNEX 5.

RECORD OF DECISION

In order to select the most appropriate systems for sewage disposal in the - Bhutanese refugee camps in Nepal, a facility Plan was prepared by LWS and UNHCR technical staff. That Plan identified multiple options for the disposal of sewage in the camps that included the Option "Do Nothing" (continued uncontrolled field defecation) , managed field defecation, simple family pit latrines, dual pit shared family latrines , and centralized sewage collection through shared toilets, with off - site treatment and disposal . Advantages and disadvantages of each option were offered along ' with a cost comparison of all choices. The Plan was presented on **4** December 1992, at a joint meeting of the LWS, SCF and UNHCR technical and administrative staff. After an overview and discussion of the Plan, the following decisions were made:

1. The dual pit shared family pit latrine remains the disposal method of choice for all camps. The chute-type squat plate toilet, with water cleansing to clean the chute, is adopted as the toilet of choice. Once completed with a bamboo, thatch and mud plaster shelter, the latrines will provide consistent facilities in all camps that are socially and culturally-acceptable to the refugees.

2. Groundwater elevation and soil stability dictate specific latrine design at each site. Two options, 7 and 8, were selected as the latrine designs of choice. Each offers alternative designs based on site - specific soil stability. A third alternative design, 7C, was also determined as an acceptable alternative (Appended as Figure12). LWS will determine which of these five alternatives to construct at each specific facility site, based on the foregoing site characteristics.

3. It was desired that sewage be safe after one year's resting cycle, once pits become full. Both selected options provide significant soil infiltrative area for sewage mass dewatering and for intimate contact of that mass with soil organisms and oxygen to render it harmless. Options using closed vault or complete concrete ring lining were not considered as adequate for successful sewage mass decomposition. Both options are also much more cost - effective and are with in budget limitations of the UNHCR and implementing agencies.

4 In order to facilitate completion of latrines in Beldangi 11, the current latrine design, Option 6, will be completed in that camp in its entirety.

RESPONSIBILITIES IN THE AREAS OF WATER AND SANITATION, ENVIRONMENTAL HEALTH AND HEALTH EDUCATION
INTRODUCTION **12 December 1992**

All involved agencies have the mutual goal of providing the Bhutanese refugees in Nepal with maximized services in these areas. The purpose of this paper is to clarify the division of functional responsibilities in the areas and, although not a complete list of each agency's or entity's functions do this in an efficient way.

GENERAL
UNHCR, LWS, SCF and the refugees shall cooperate with HMG in protecting, preserving and improving the environment around and in the camps. To enhance water, sanitation, environmental health and health education activities, the following specific tasks are agreed to:
UNHCR: - will, with LWS and the Government of Nepal (HMG), establish technical standards and guidelines for design, construction and management of systems
- specifies the level of services, including type and quantity, in close consultation with LWS, HMG, SCF and related entities

LWS:
- installs, manages and maintains all water and sanitation systems and services.
- will, in coordination with UNHCR, develop a data bank system for the archiving of relevant information , such as plans, quantities and specifications on water- and sanitation - related project activities.
- will set up a Technical Project Management system that will secure the required involvement of related agencies and refugees throughout the - process of water and sanitation system involvement.

SCF:
- undertakes community health education.
- monitors and analyzes the incidence and causes of diseases associated with water and sanitation and advises on appropriate preventive and corrective strategies.

Refugees:
- will receive health education training from SCF, and communicate health messages to the general refugee population.
- will provide feedback to the agencies on acceptable sanitation practices, training and implementation of water and sanitation practices.
- will participate fully in those aspects of water and sanitation activities appropriate for them.

HMG:
- will be involved in establishing technical standards and guide lines, in cooperation with LWS, SCF and UNHCR.
- contributes to maintenance of environmental health standards in and around camps.
- provides access to existing infrastructure and governmental services.
- DPHO/MOH assumes responsibilities for standards of food and water hygiene, including animal slaughter, and for food products sold in markets adjacent to or in the refugee camps.

WATER SUPPLY

UNHCR
- to monitor design, construction , operation and maintenance activities in water supply.
- coordinate where necessary with local authorities.

LWS
- is responsible for design, installation, operation and maintenance of all water supply systems. This will be accomplished in close cooperation with refugees and related agencies and will including relevant training of refugees.
- continue regular bacteriological testing of all water supplies, with test results routinely shared with SCF and UNHCR.
- establishes maintenance systems for protective zones around water supplies and supervise water points and tap stands, as necessary, to ensure equitable and efficient utilization.
- provide for and maintenance of a back-up/emergency water supply arrangement. Such system shall come into operation immediately in the event of water shortages, lack of water sufficient quality or new influxes of refugees.

SCF:
- shall monitor and analyze rates of water-borne or associated disease- rates and other health effects traceable to water supplies and provide UNHCR and LWS with recommendations for preventive or corrective action.
- through Health Education will promote better hygienic practices in the camp.

HMG:
- will be involved in setting technical standards, with LWS and UNHCR
- the Department of Water Supply and Sanitation (DWSS) to be involved in the evaluation , monitoring and long – term maintenance of water supply

Refugees:
- shall, through the appropriate committees and with training by SCF and LWS, assist in maintenance of tap stands, hand pumps, drainage and household storage containers.

SEWAGE DISPOSAL

UNHCR
- monitor LWS and SCF activities and refugee involvement related to sewage disposal.
- coordinate negotiations with HMG for securing necessary land for on- and off - site disposal.

LWS:

- design and construct latrines, assisting and training refugees in setting up refugee level latrine repair systems.
- maintain shared latrines.
- construct and assist refugees in management and maintenance of latrines .
- will promote appropriate latrine use and maintenance
- educate refugees on use of temporary sanitation facilities.

Refugees:
-actively operate and maintain all sewage systems, with support of LWS and SCF.

HMG:
- to provide the necessary land for construction of latrines and for subsequent safe disposal of latrine contents.
- to provide support assistance to meet mutually agreed upon technical standards.

SOLID WASTE DISPOSAL

UNHCR:
- to monitor the effectiveness of the solid waste disposal system.

LWS:
- will provide necessary technical support on solid waste Management, along with SCF, to the Refugee Sanitation Committees.
- will provide solid waste containers, construction of disposal pits and trenches.
- will develop a scheme dealing waste, i.e. more pits to be dug or

SCF:
-with LWS, will promote household and community level solid waste collection and disposal practices.
- will assist LWS in training of refugee committees.
- with LWS, will monitor the functioning of solid waste disposal system.

Refugees:
- t o be responsible for a system of transferring waste in household containers, out of camp, to a designated site (and for maintenance and care of the disposal site)
- through the Refugee Sanitation Committee to be responsible for the general cleanliness of common areas.
- through the Camp Committees are to ensure adequate protection at disposal sites

HMG
- will provide adequate land for pits and trenches for solid waste disposal

VECTOR CONTROL
UNHCR - will monitor the effectiveness of vector control related activities.
- procure required insecticides on behalf of **LWS** and **HMG.**
-to provide technical advice and assistance as needed in all aspects of vector control .

LWS:
- will maintain sprayers in working order, keep sufficient stocks of insecticides and train refugees in their use and application - to coordinate spraying with the Camp Committee
- will direct refugees in maintenance of good drainage in the camps and adjacent areas
- Will distribute bed nets.

SCF:
- will conduct campaigns to inform refugees of the purpose of spraying and precautions to take during spraying.
-to promote and monitor bed net use and care
- will notify UNHCR and **LWS** on vector-borne disease rates and advise on control strategies.

Refugees:
- must provide voluntary participation through labour contribution for spraying, fogging and drainage maintenance activities
-to participate in the promotion and use of bed nets

HMG:
- DPHO to provide annual residual spraying, if so advised.
- will provide vector control in areas adjacent to the refugee camps.
- to conduct on-going supervision and training of camp microscopists
- to provide anti - malarial drugs, as necessary

ANNEX 6.

Jonathan Puddifoot June 1995 - Results and Analysis of Infiltration, Moisture Content and Soil Texture Tests

Drainage from the pits - Infiltration tests.

When inspecting the 176 latrines described above, it was also obvious that decomposition had taken place, at least for part of the time, under water. Since the pit linings were mostly made without drainage holes in the sides, water from anal cleansing must have infiltrated through the bottom of the pit.

Some authors have found the soil in the base of the pits becomes quickly clogged with decomposing material. They have recommended the lining of the pit must therefore be made porous to allow seepage of water side ways. Since the linings of these latrines were not porous, the pit bases must allow at least some water to escape.

14 Infiltration tests were carried out in various sites in Beldangi and other camps, to asses how well water can drain from the latrines compared to the surrounding soil. A pit was chosen at random, which had been through 1 cycle of filling and decomposing for a year.

An infiltration ring, 0.4 m Dia. was hammered into the bottom of the evacuated pit, by at least 0.2 m. Water was put into the ring to a depth of 0.25 m, and the rate of infiltration was measured over 2 hours, or less if constant readings were obtained first.

At the same time a similar test was carried out in soil adjacent to the latrine. A hole was dug next to the latrine, to a similar depth as the pit base. An identical infiltration ring was hammered into the soil and the same procedure of measuring infiltration rates was carried out. The results are shown in Annex 8, and summarised below in table 9.

Camp	Soil type	Pit infiltration rate mm/hr	Soil infiltration rate mmlhr
Beldangi 1	Sandy loam	36	282
Beldangi 1	Sandy loam	12	57
Betdangi 1	Sandy loam	63	*150*
Beldangi 2	Sandy loam	60	*240*
Sanischere	Sandy loam	99	108
Timai	Sandy gravel	147	*480*
Goldhap	Sandy loam	36	33

Table 9. Comparison of infiltration rates between soil & pit.

The results show that whilst infiltration rates are significantly reduced through the bottom of the pits due to the clogging up of soil pores, it is not stopped, as has been found in some other countries. In these soils (please see Annex 3 for a textural analysis) there is no need to make the pit lining porous, a solid wall is acceptable.

The results also show the tremendous variation of infiltration rates in Beldangi. The camp is situated on alluvial deposits, containing many lenses of both clay and sands. One latrine may still have water in the pit after 3 months of being sealed, the next is *dry,* depending on soil type in the pit base. This again reflects the enormous variation found in the performance of individual latrines, and emphasizes that for maximum performance, attention must be paid to each latrine on an individual basis.

3.4 Moisture content of decomposing material.

To assess the moisture content of the decomposing material, 23 samples were taken from latrines being emptied in

Beldangi 1 (sector E3). The results, shown in Annex 9, once again depict large variation between adjacent latrines. The average moisture content of the decomposing material was 89.82 %. (5 of the samples were not measured since the material was still under water.)

The age of the samples (i.e. how long they had been decomposing) was also calculated from latrine records. There is no correlation between the age of the sample & the moisture content. The pit contents do not dry *out* with time in Beldangi.

Given the high moisture content, decomposition of the material must be fully anaerobic and there is no need therefore, to place soil on the top of the excreta when sealing the pit.

From examination of many pits in all camps it is clear that the earth topping practice is only carried out sporadically anyway. Since it does not show a marked improvement in the decomposition rate of the excreta, it is suggested this practice is stopped. Not opening the cover to put earth in will also save on wear & tear to the substructure.

Thick as …..

Dry bulk density measurements of decomposing material in Beldangi (6 samples) gave an average of 5,680 Kg / m', compared to 12,670 Kg / m^3 from the surrounding soil. There was no significant difference in the density of material coming from fully lined (1.2 m) pits and partially lined (0.6 m) pits.

Series No.	weight gms	weight gms	Content %	of sample	closure	
1	37.72	54.75	62.27	54.36	699	Jun-93
2	42.71	59.17	72.70	58.76	304	JUI-94
3	38.48	66.92	80.24	66.40	304	Jul-94
4	42.71	78.54	77.01	78.09	61	Mar-95
5	37.63	81.02	89.26	80.44	?	?
6	41.44	84.10	100.62	83.51	395	Apr-94
7	58.68	85.14	97.50	84.74	?	?
8	44.61	85.81	92.09	85.29	304	Jul-94
9	40.50	85.76	70.43	85.34	304	Jul-94
10	45.47	90.42	88.78	89.93	?	?
11	38.52	91.24	96.38	90.64	395	Apr-94
12	38.75	92.76	91.79	92.18	304	Jul-94
13	47.47	97.20	89.54	96.73	304	Jul-94
14	47.50	103.99	90.87	103.51	395	Apr-94
15	37.72	107.23	123.85	106.53	304	Jul-94
16	45.48	108.43	118.44	107.81	395	Apr-94
17	55.93	109.96	138.81	109.36	395	Apr-94
18	49.89	143.82	178.99	143.10	242	Sep-94
19	Sample not taken as pit contents were liquid				61	Mar-95
20	Sample not taken as pit contents were liquid				61	Mar-9S
21	Sample not taken as pit contents were liquid				61	Mar-95
22	Sample not taken as pit contents were liquid				304	JUI-94
23	Sample not taken as pit contents were semi liquid					Apr-94

MOISTURE CONTENT OF DECOMPOSING MATERIAL, BELDANGl1 E 3.

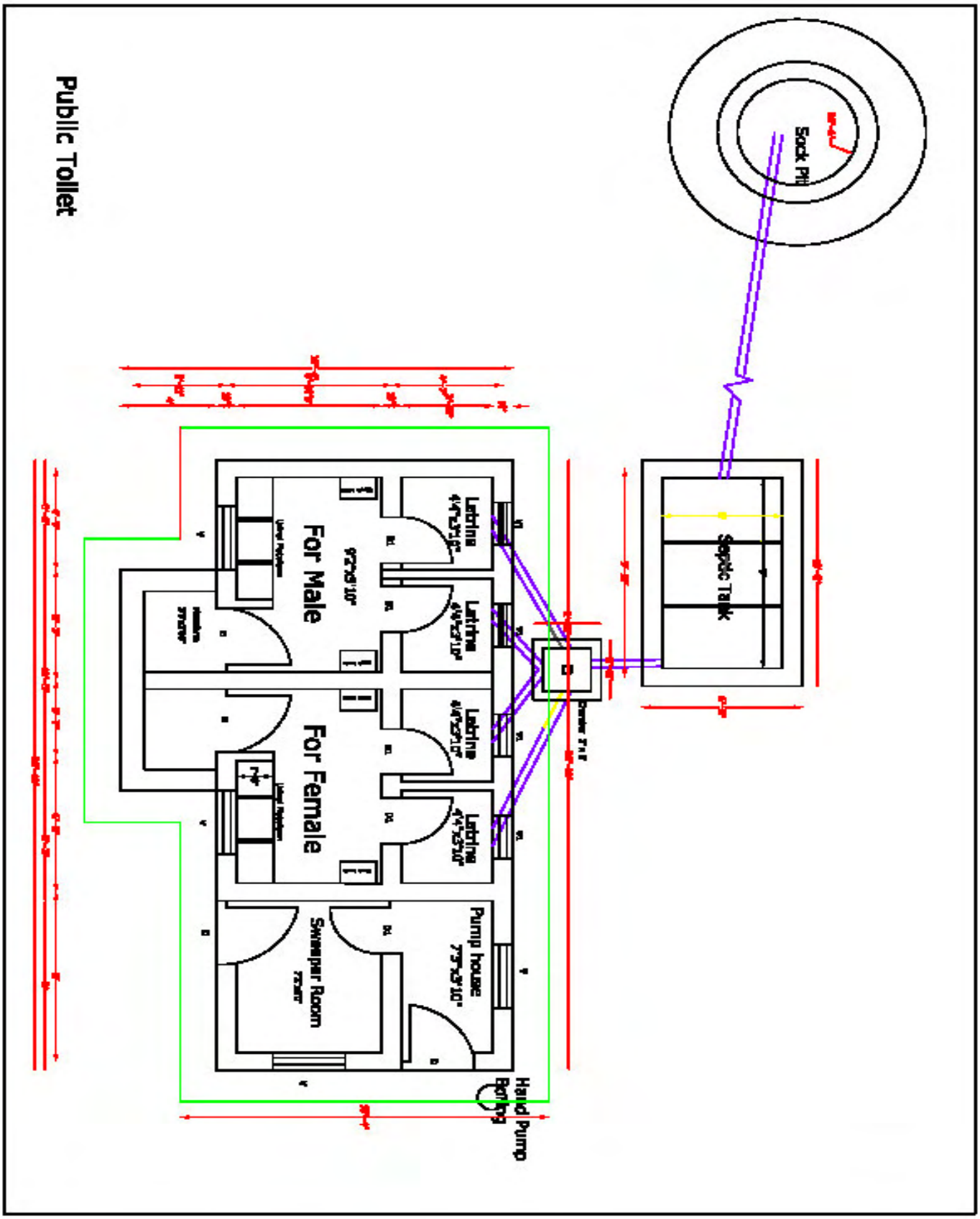
3.5 Rats

There have been reports of rats burrowing into latrines, filling them with earth and making them unusable. It was thought this might be a design weakness with the shallow, 0.6 m linings and that rats were finding easy access into the pit. During emptying of 176 pits in Beldangi camps, the incidence of rats burrowing in and filling them with earth was less than had been previously expected, at around 5 % incidence. It was also noticed that whilst most rats came under the lining of the 0.6 m ring, some burrowed down & entered the 1.2 m pits, whilst others found their way in around the chute pipe. It was also noticed that there was a significant frog presence in the pits, presumably eating the cockroaches that infest them.

SOIL TEXTURE ANALYSIS

Camp	Very coarse sand %	Medium sand %	Fine sand %	Silt %	Clay %	Textural class
Sanischere	1.6	13.2	44.8	27.9	12.5	Sandy loam
Khudunabari	0.4	7.6	43.6	31.9	16.5	Loam
Goldhap	4.8	27.8	39.0	23.9	4.5	Sandy loam
Betdangi 1	2.0	8.6	61.0	21.9	6.5	Sandy loam
Beldangi 2	1.8	7.0	64.8	23.9	2.5	Sandy loam
Timai	22.4	46.6	35.0	0.0	0.0	Sand

ANNEX 7


Public Toilet
Sock Pit
Septic Tank
For Male
For Female
Latrine
Latrine
Latrine
Latrine
Swaeper Room
Pump house
Hand Pump

ANNEX 8.

COST ANALYSIS

Project:-VIP Latrine Construction Project
(Cost for one Latrine)

SN	*DESCRIPTION*	*TOTAL QTY*	*UNIT*	*RATE*	*AMOUNT*
1.	*E/W in excavation*	*2.06*	*m^3*	*150*	*309.00*
2.	*E/W in filling*	*1.17*	*m^3*	*120*	*140.40*
3.	*PCC Work 1:2:4 Ratio*	*0.62*	*m^3*	*4524*	*2804.88*
4.	*6mm Reinforcement Bar*	*6.97*	*Kg*	*100*	*697*
5.	*Boulder Pitching Work*	*0.128*	*m^3*	*738.92*	*94.58*
6.	*HDPE Pipe 110mm 2.5kg/cm^2*	*4.5*	*m*	*300*	*1350*
7.	*Cost of superstructure*				*2878.12*
Total					*8273.98*
5%Contingencies					*413.70*
Grand Total					*8687.68*

Note: The community contribution would be for the earthwork excavation and filling and boulder pitching works = Rs. 543.98
Therefore , the total project cost= 8143.7 i.e. USD 110.5 @ 1$ =Rs. 73.7

ANNEX 9.

Tentative Cost Estimate for the Sanitation Projects to be implemented in the Bhutanese Refugee Host Communities

S.N.	*Particulars*	*Quantity*	*Unit*	*Rate*	*Amount*	*Remarks*
1.	*Construction of VIP family Latrines*	*4650*	*Nos.*	*8687.68*	*40,397,712*	
2.	*Construction of school latrines*	*3*	*Nos.*	*750,000*	*2,250,000*	
3.	*Construction of Public Toilets*	*3*	*Nos.*	*11,44,700*	*3,434,100*	
TOTAL in NPR					***46,081,812***	
TOTAL IN USD					***625,262.00***	

TOTAL Project Cost in Nepalese Rupees 46,081,812.00
TOTAL Project Cost in US Dollars* 625,262.00

***Exchange Rate: USD 1 = NPR 73.7.30 (1 October, 2008 Exchange Rate)**

ANNEX 10.

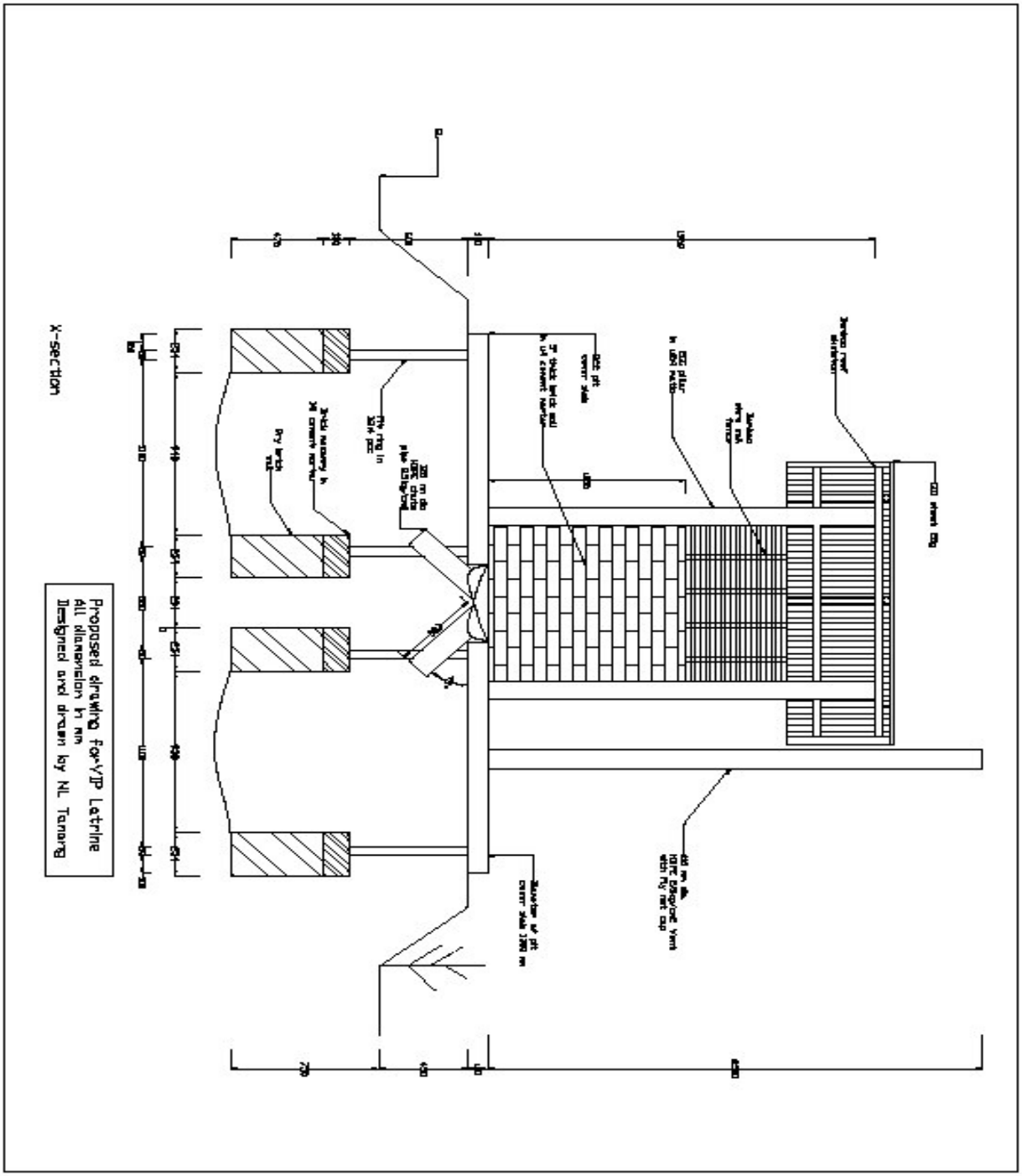
Cost Estimate for the refugee contribution towards each of the VIP latrine construction in terms of unskilled labour

Sl. No.	Particulars	Quantity	Unit	Rate in Rupees	Amount in Rupees.	Remarks
1.	Earthwork Excavation	3.17	MD	150	475.5	Pit Excavation
2.	Back fill	2	MD	150	300.00	
3.	Transportation of the materials	2	MD	150	300.00	Cement bags, aggregates, sand and bamboos
4.	Unskilled labour contribution for the construction	8	MD	150	1,200.00	Concrete mixing and erection of the superstructure
Total					2,275.00	

Therefore, refugee contribution in terms of unskilled labour towards latrine construction to date would amount to 8959 X @2,275.00 = Rs. 20,381,725 i.e. USD 276,549.86@ 1$ = Rs. 73.7

Besides, the refugees carry out the routine exercise of emptying of pit and digging for burying the waste on an average of 4,500 latrines annually at Rs. 150 per latrine which amounts to Rs.675,000 i.e. USD9,158.75/ year

ANNEX 11



.

Proposed design drawing for the more Durable VIP Latrine

ANNEX 12.

Detailed Cost estimates for the Construction of Semi-Permanent VIP Latrine									
Sn.	**Particulars of Items**	**No**	**L**	**B**	**D**	**QTY.**	**Unit**	**RATE**	**Amt.NPR.**
1	Earth work excavation in foundation/site clearance	2				2.71	M3		
	Unskilled labour					3.17	PD	150	475.75
									475.75
2	Dry brick wall in pit ring	2				0.92	M3		
2.1	1st class bricks					458.87	No	10	4,588.74
2.2	Unskilled labour					2.29	PD	150	344.16
2.3	Skilled labour					0.92	PD	250	229.44
	Sub total dry wall								5,162.34
3	Brick masonry in 1:4 cement mortar					0.24	M3		
	1st class bricks					119.31	No	10	1,193.07
	Cement					0.48	Bg	509	242.91
	Sand					0.06	M3	285	17.68
	Unskilled labour					0.60	PD	150	89.48
	Skilled labour					0.24	PD	250	59.65
									1,602.80
4	PCC pit ring in 1:2:4 ratio	2				0.22	M3		
	Cement					1.39	Bg	509	706.22
	Sand					0.10	M3	285	27.19
	Agregates					0.19	M3	435	82.99
	Unskilled labour					0.65	PD	150	97.56
	Skilled labour					0.33	PD	250	81.30
									995.24
5	Pit cover RCC slab in 1:2:4 ratio	2			0.1	0.27	M3		
	Cement					1.70	Bg	509	864.86
	Sand					0.12	M3	285	33.29
	Agregates					0.23	M3	435	101.63
	6 mm dia. Iron rod					7.00	Kg	100	700.00
	22g black wire					2.00	Kg	125	250.00
	Unskilled labour					0.80	PD	150	119.47
	Skilled labour					0.40	PD	250	99.56
									2,168.81
6	RCC pillar in 1:2:4 ratio	3	0.1	0.10	2.58	0.08			
		2	0.1	0.10	2.28	0.05			
	Total work					0.12	M3		
	Cement					0.79	Bg	509	400.68
	Sand					0.05	M3	285	15.42
	Agregates					0.11	M3	435	47.08
	8 mm dia. Iron rod					20.00	Kg	100	2,000.00
	4.75 mm dia. Iron wire					7.00	Kg	100	700.00
	22g black wire					2.00	Kg	125	250.00
	Unskilled labour					0.37	PD	150	55.35
	Skilled labour					0.18	PD	250	46.13
									3,514.67

7	5" thick brick wall in 1:4 CM	1	4	0.13	1	0.51	M3		
	1st class brick					254.07	No		
	Cement					1.02	Bg	509	517.28
	Sand					0.13	M3	285	37.65
	Unskilled labour					1.52	PD	150	228.66
	Skilled labour					0.76	PD	250	190.55
									974.14
8	Bamboo ekra wall	1	1		1.98	1.98			
		1	2.04		0.68	1.39			
		2	1		0.3	0.30			
	Total work					3.67	M2		
	Bamboo 8" girth 8 m long					5.00	No	50	250.00
	16g GI wire					1.00	Kg	125	125.00
	Unskilled labour					0.73	PD	150	110.02
	Skilled labour					2.00	PD	250	500.00
									985.02
9	Roof								
	6' long CGI sheet 28g					2.00	No	840	1,680.00
	J-hook with washer					8.00	No	20	160.00
	6" girth 8 m long bamboo					2.00	No	50	100.00
	16g GI wire					1.00	Kg	125	125.00
									2,065.00
10	Squatting plate	1	1	1.00	0.1	0.10	M3		
	Cement					0.64	Bg	509	325.76
	Sand					0.04	M3	285	12.54
	Agregates					0.09	M3	435	38.28
	Unskilled labour					0.30	PD	150	45.00
	Skilled labour					0.15	PD	250	37.50
									459.08
11	110 mm dia HDPE 2.5kg/cm2 pipe					2.75	M	300	825.00
	125 mm dia. HDPE 2.5kg/cm2 pipe					1.00	M	300	300.00
	Net loan					1.00	No	50	50.00
	End cap					1.00	No	200	200.00
	Total								**1,375.00**
12	RBM filling work					3.11	M3	277	861.60
	Unskilled labour					6.22	PD	150	933.14
									1,794.75
	Grand total								**21,572.60**
	Total in USD @$1=Rs.73.7								**USD 292.71**

ANNEX 13.

Quantity and Cost estimate of VIP Twin pit Latrine

Item No.	Particulars	No.	L	B	H	Qty.	Unit	Rate	Amount
1	Earhtwork excavation in Foundation	2	3.143	1.28^2/4	0.8	2.06	m^3	72.1	148.39
2	RBM filling base of squating plate	1	1	0.55	0.2	0.11	m^3	350	38.5
3	Backfilling	1	3.61	1.75	0.4	2.54			
	Deduction	2	3.143	1.28^2/4	0.4	1.03			
	Net filling work					1.51	m^3	350	528.5
4	P.C.C.(1:2:4) for RCC ring	2	3.14			0.44			
	P.C.C.(1:2:4) for RCC slab cover	2	3.143	1.2^2/4	0.08	0.15			
	Subtotal					0.62	m^3	4524	2805
5	6mm dia. bars @20 cm c/c	24	1.2	28.8		6.97	kg	100	697
6	Boulder soling and pitching work on base of the ring	2	3.14	1*1/4	0.2	0.31			
	On base of squatting plate	1	1	1	0.2	0.2			
	Subtotal					0.51	m^3	810	413.1
	110mm HDP pipe 2.5Kg/ cm2								
7	Vent pipe	1	2.5			2.5	m	198	494.1
8	Chute pipe 50cm long	2	1			2	m	198	395.28
9	HDP vent cap110mm	2				2	No.	60	120
10	Bamboo work for superstructure					0			
	Front post	2	2.25			4.5	m		
	Back post	2	2			4	m		
	For roofing	6	2			12	m		
	For covering s/panel	3	2			6	m		
	Subtotal					26.5	m	9.32	246.98
	Ekra wall fence	2	2		2.13	8.52	m^2		
	Ekra wall triangular portion	2	1		0.3	0.6	m^2		
	Subtotal					9.12	m^2	129	1173.74
11	Sandwich panel roofing work	1	1.8	1.8		3.24	m^2	119	384.17
12	12.5mm cement plaster1:4 CM					0			
	On squatting plate	1	1	1		1	m^2		
	Out and inside wall	4	2		1	8	m^2		
	Subtotal					9	m^2	75.5	679.05
13	3mm cement punning1:1 CM	1	1	1		1	m^2		
	On inside wall	2	2		1	4	m^2		
	On squatting plate	1	1	1		1	m^2		
	Sub total					6	m^2	55.7	334.44
14	Bamboo frame with bamboo mat door	1	0.75		1.95	1.46	m^2	154	225.23
						Grand Total			**8683.48**
	@ $1=Rs, 73.7 i.e. in USD117.82								

ANNEX 14

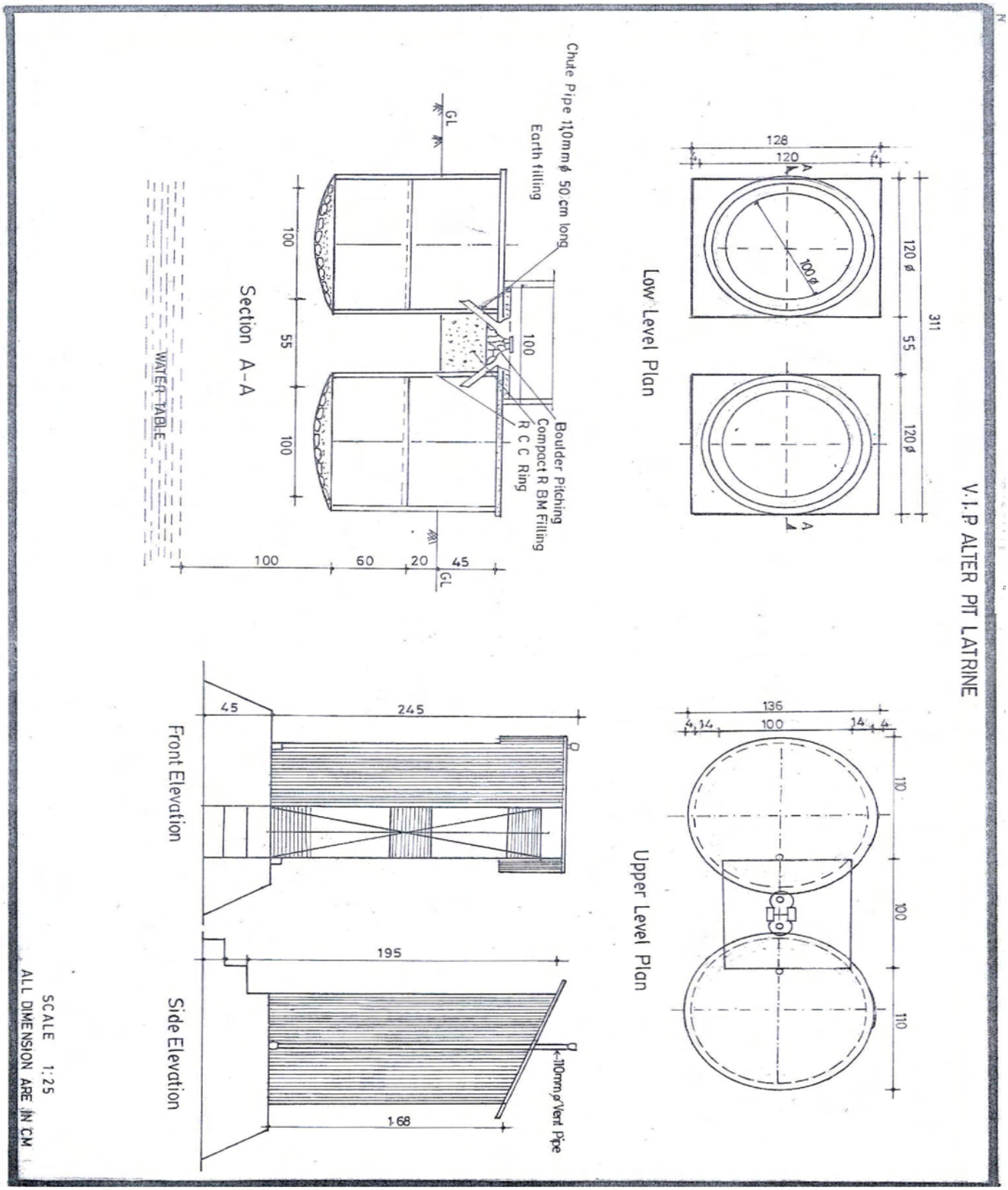
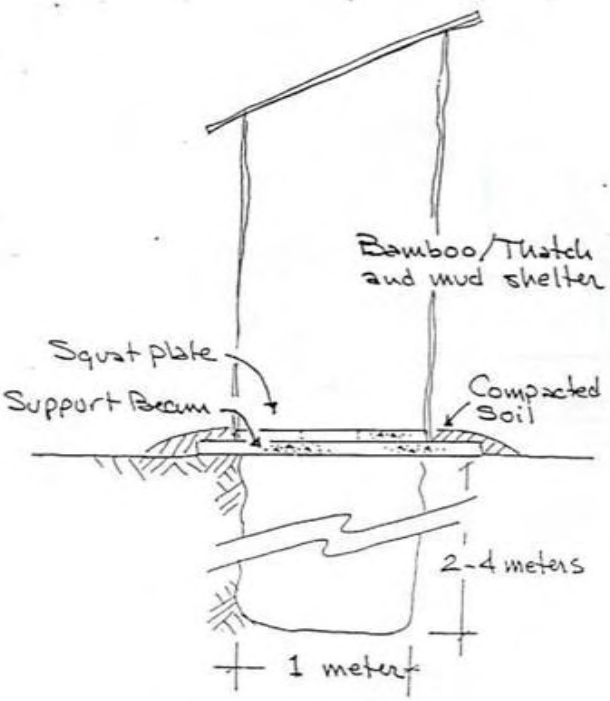


Figure-18

Annex E - Cont'd 5

FIGURE 1

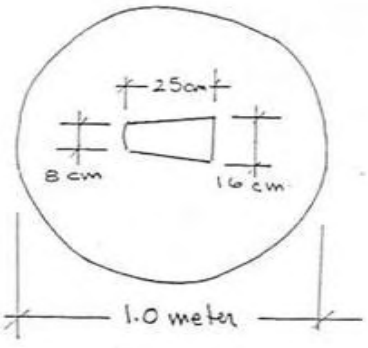


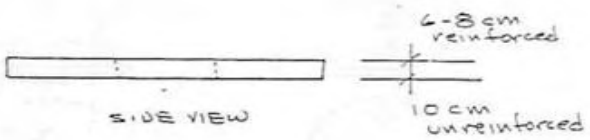
INDIVIDUAL/SHARED FAMILY PIT LATRINE

A direct-drop squat plate latrine which maximizes soil interface for sewage dehydration and decomposition. A wooden cover may be fitted over the slot. No vent is necessary. The support beams may be either wood or concrete.

CONCRETE REQUIREMENT

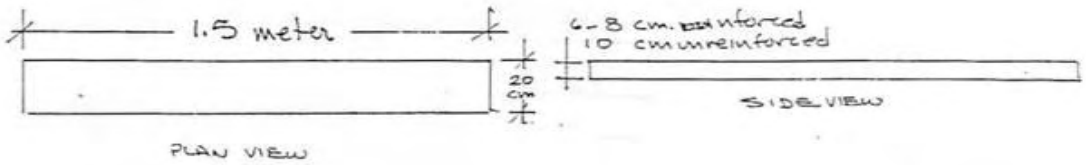
Squat Plate	0.08 m^3
2 Beams	0.06 m^3
	0.14 m^3/latrine





SQUAT PLATE (1 TYP)

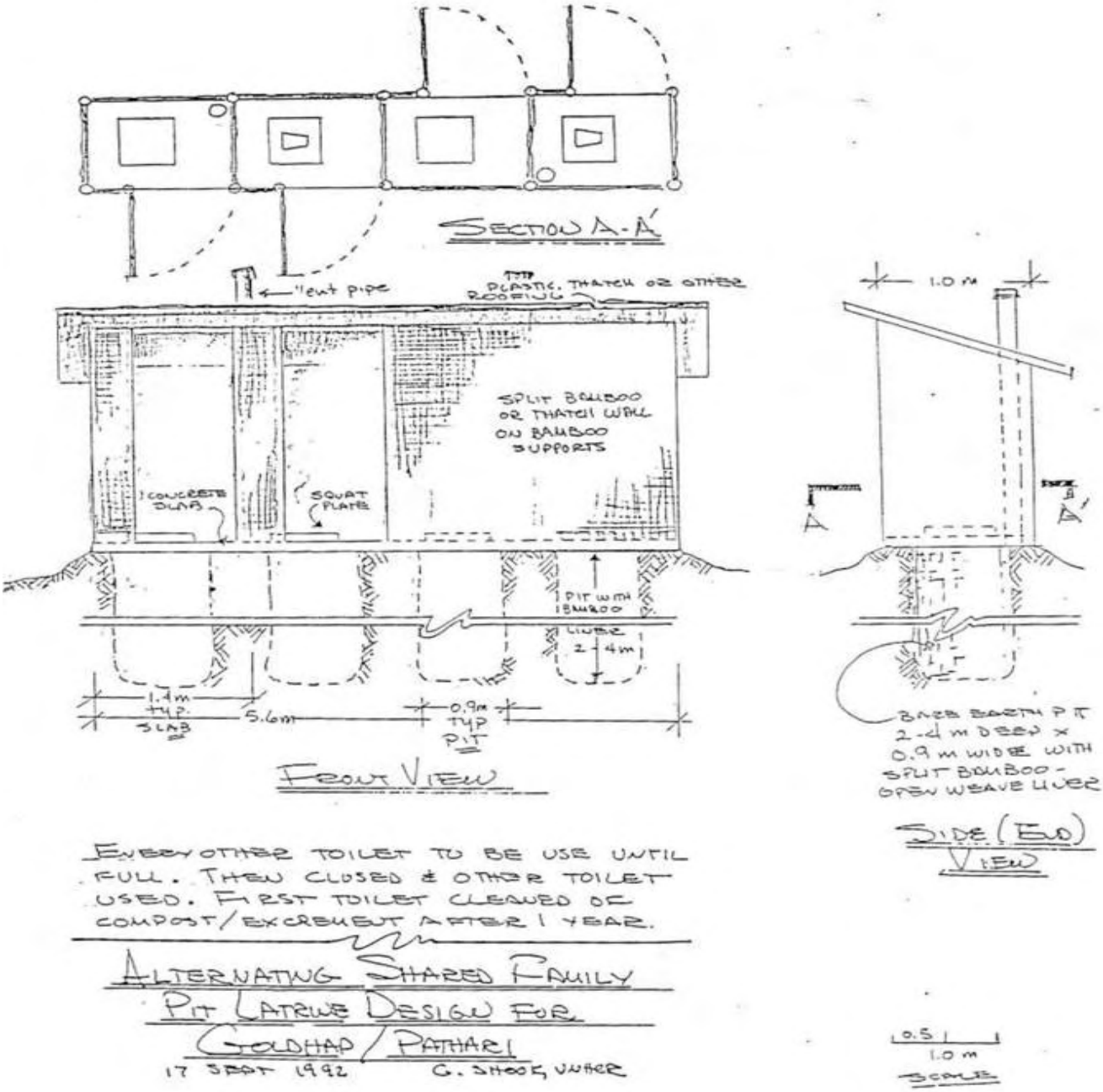
SUPPORT BEAM (2 TYP.)



DEC 1992

Annex E - Cont'd 6

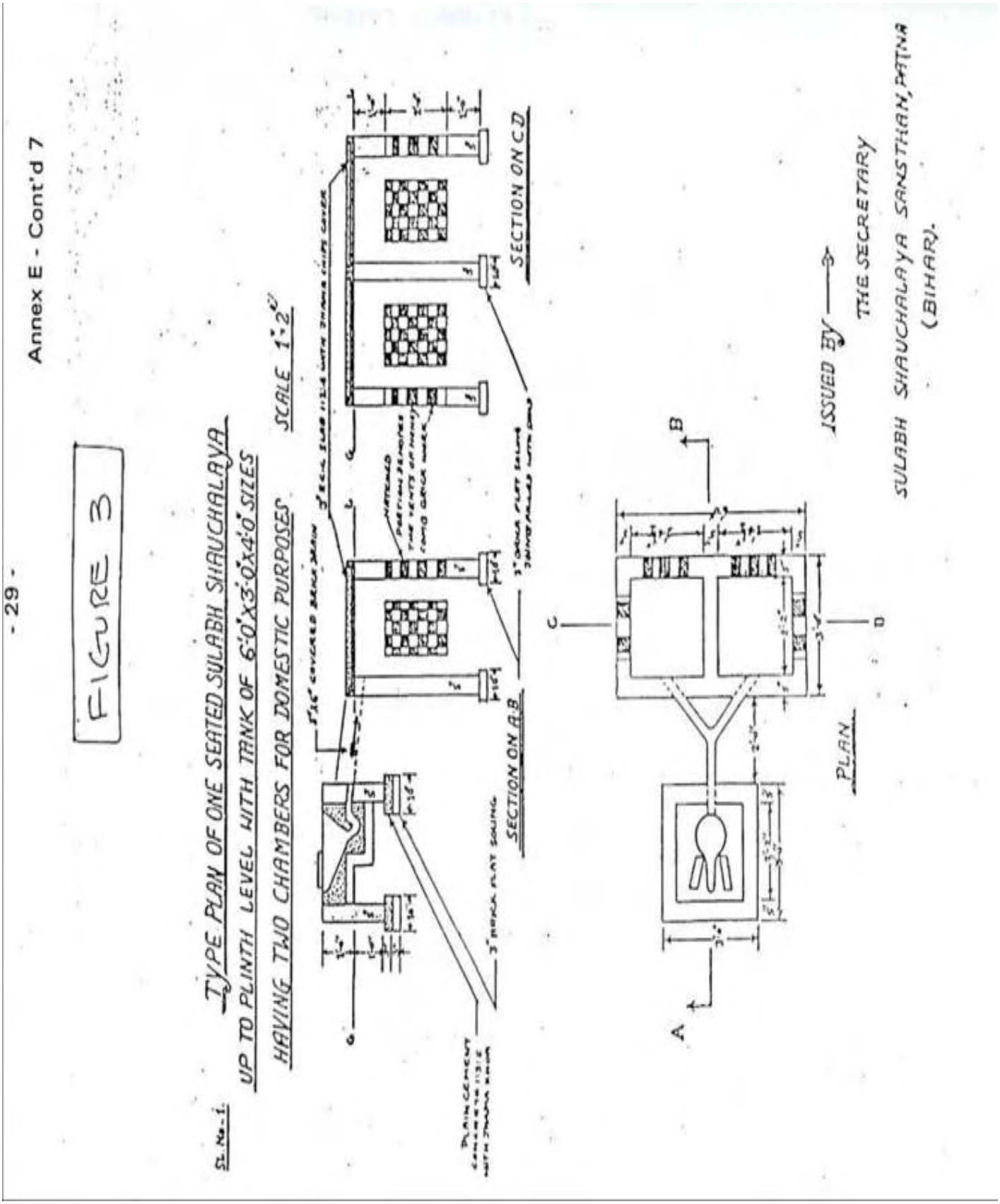
FIGURE 2



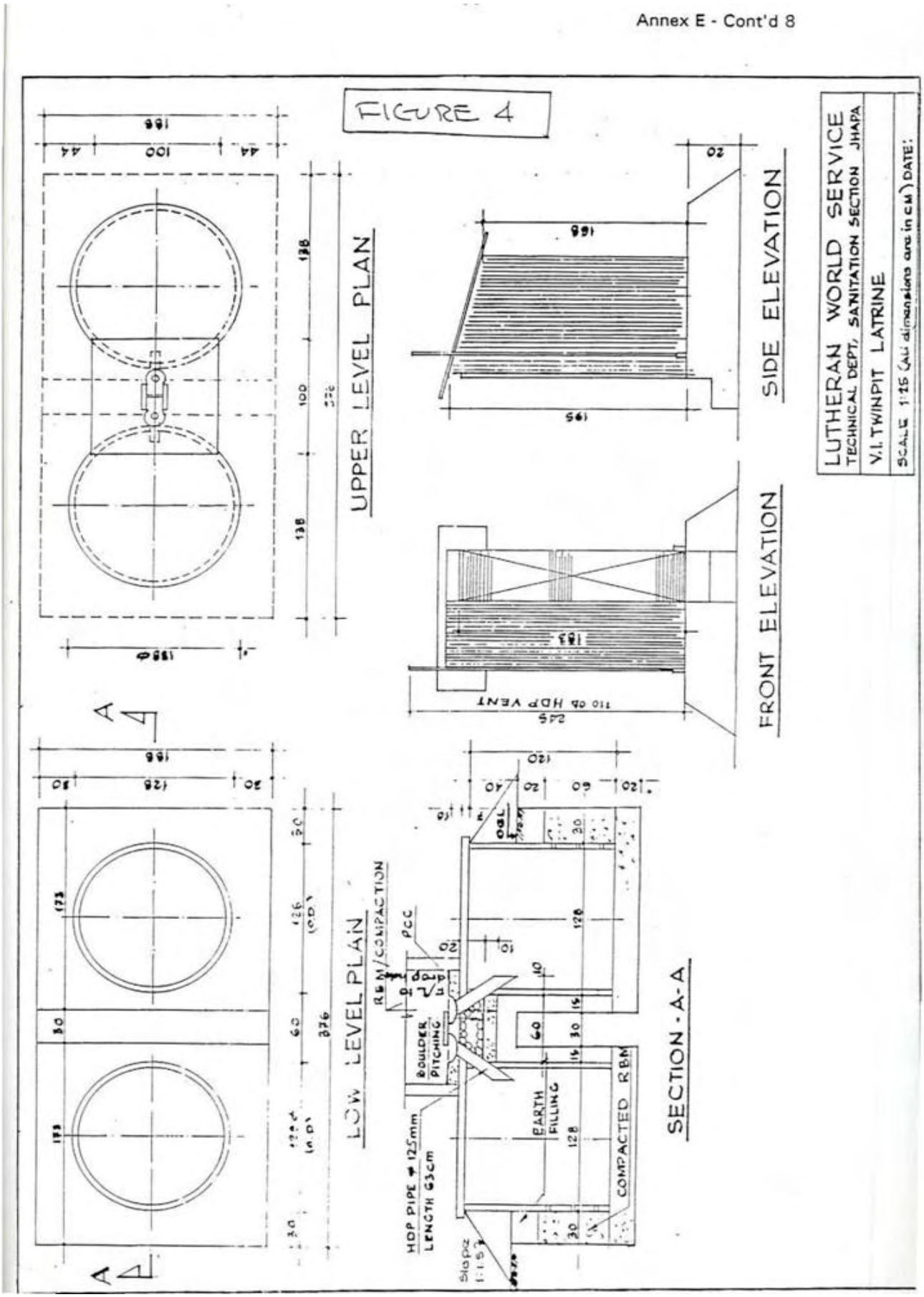
EVERY OTHER TOILET TO BE USE UNTIL FULL. THEN CLOSED & OTHER TOILET USED. FIRST TOILET CLEANED OF COMPOST/EXCREMENT AFTER 1 YEAR.

ALTERNATING SHARED FAMILY PIT LATRINE DESIGN FOR GOLDHAP / PATHARI

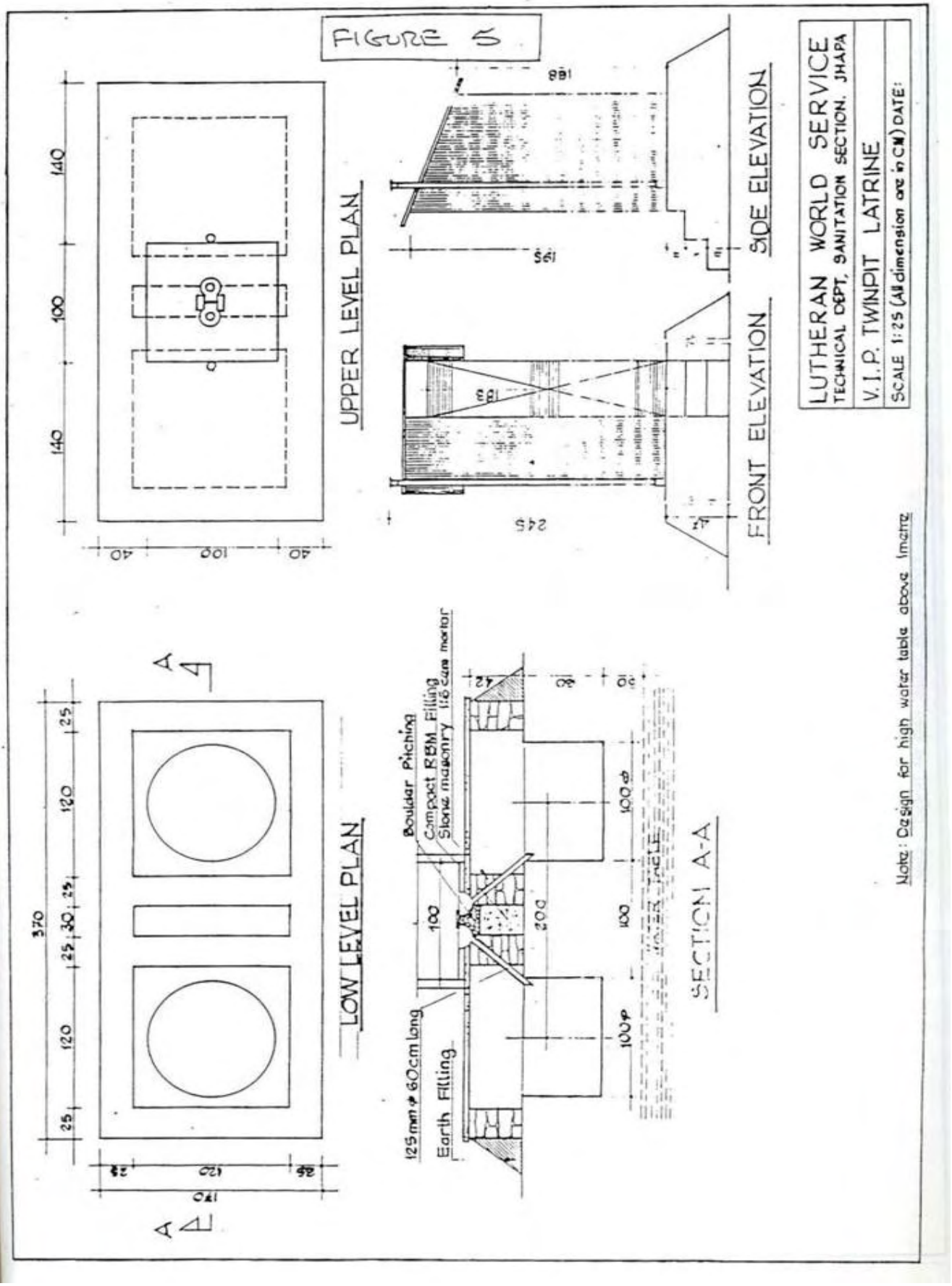
17 SEPT 1992 G. SHOOK, UNHCR


Annex E - Cont'd 7
- 29 -
FIGURE 3
TYPE PLAN OF ONE SEATED SULABH SHAUCHALAYA
UP TO PLINTH LEVEL WITH TANK OF 6'0"X3'0"X4'0" SIZES
HAVING TWO CHAMBERS FOR DOMESTIC PURPOSES
SCALE 1"=2"
Sl. No. 1.
SECTION ON C.D
SECTION ON A.B
PLAN
ISSUED BY
THE SECRETARY
SULABH SHAUCHALAYA SANSTHAN, PATNA
(BIHAR).

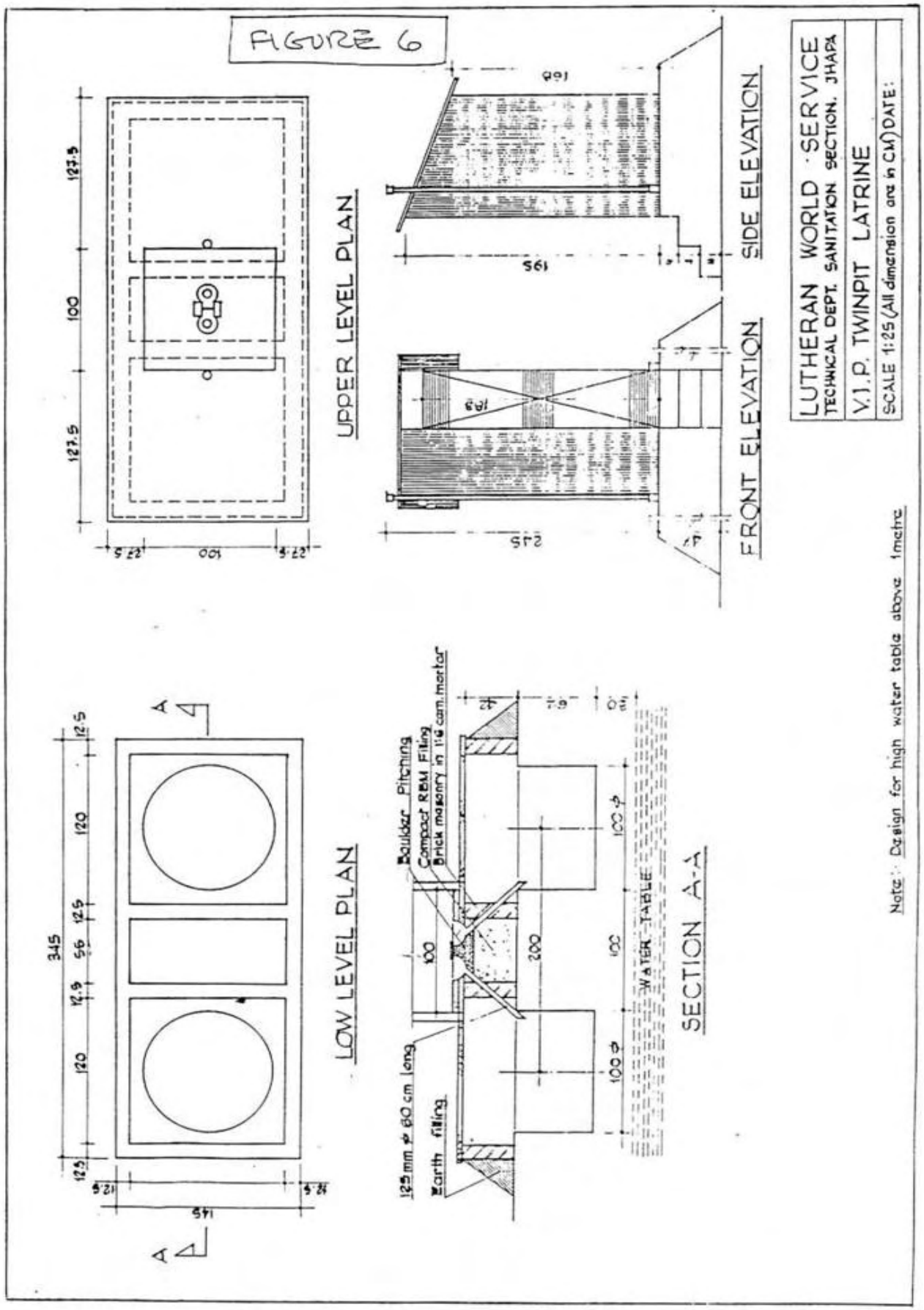
Annex E - Cont'd 8



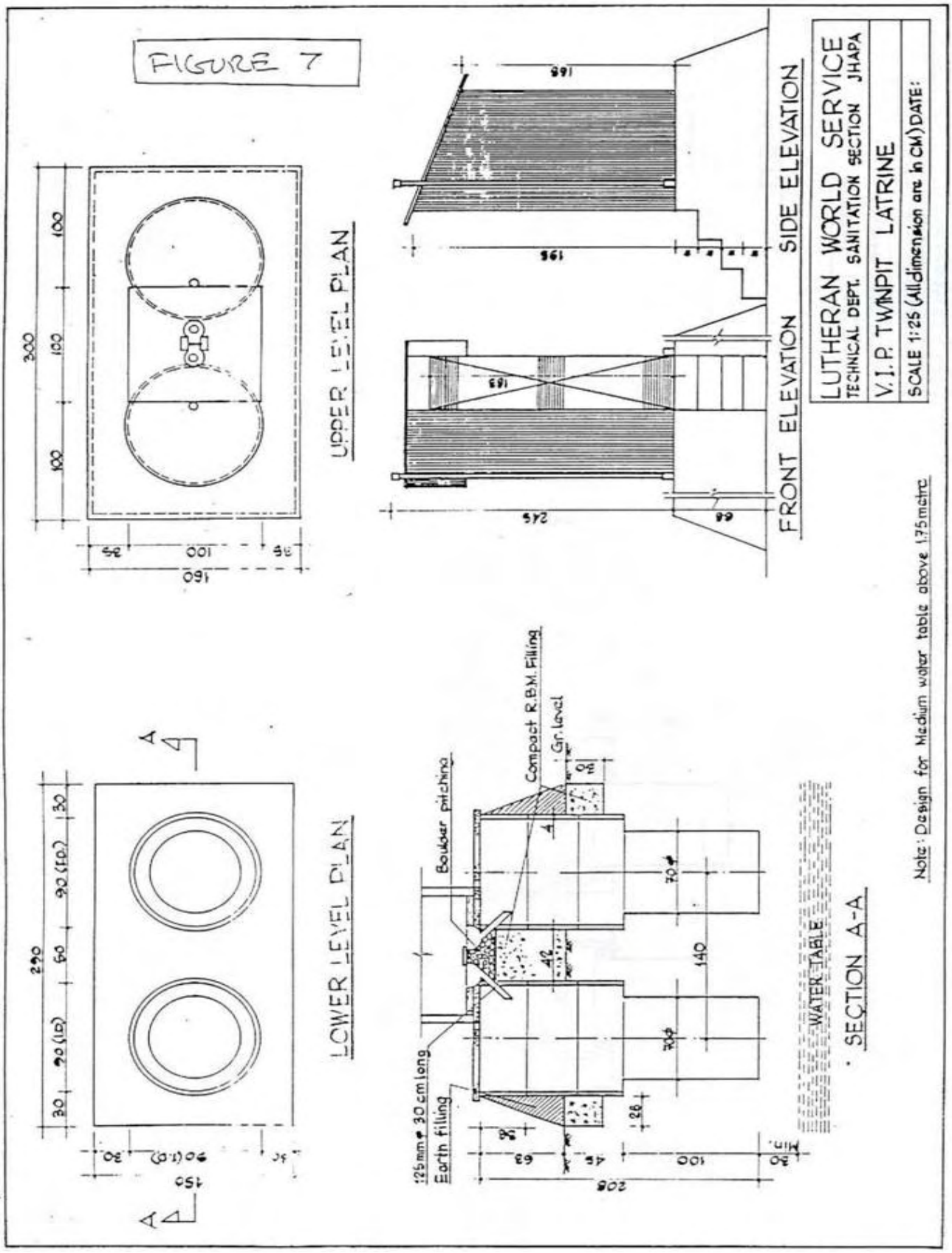
Annex E - Cont'd 9



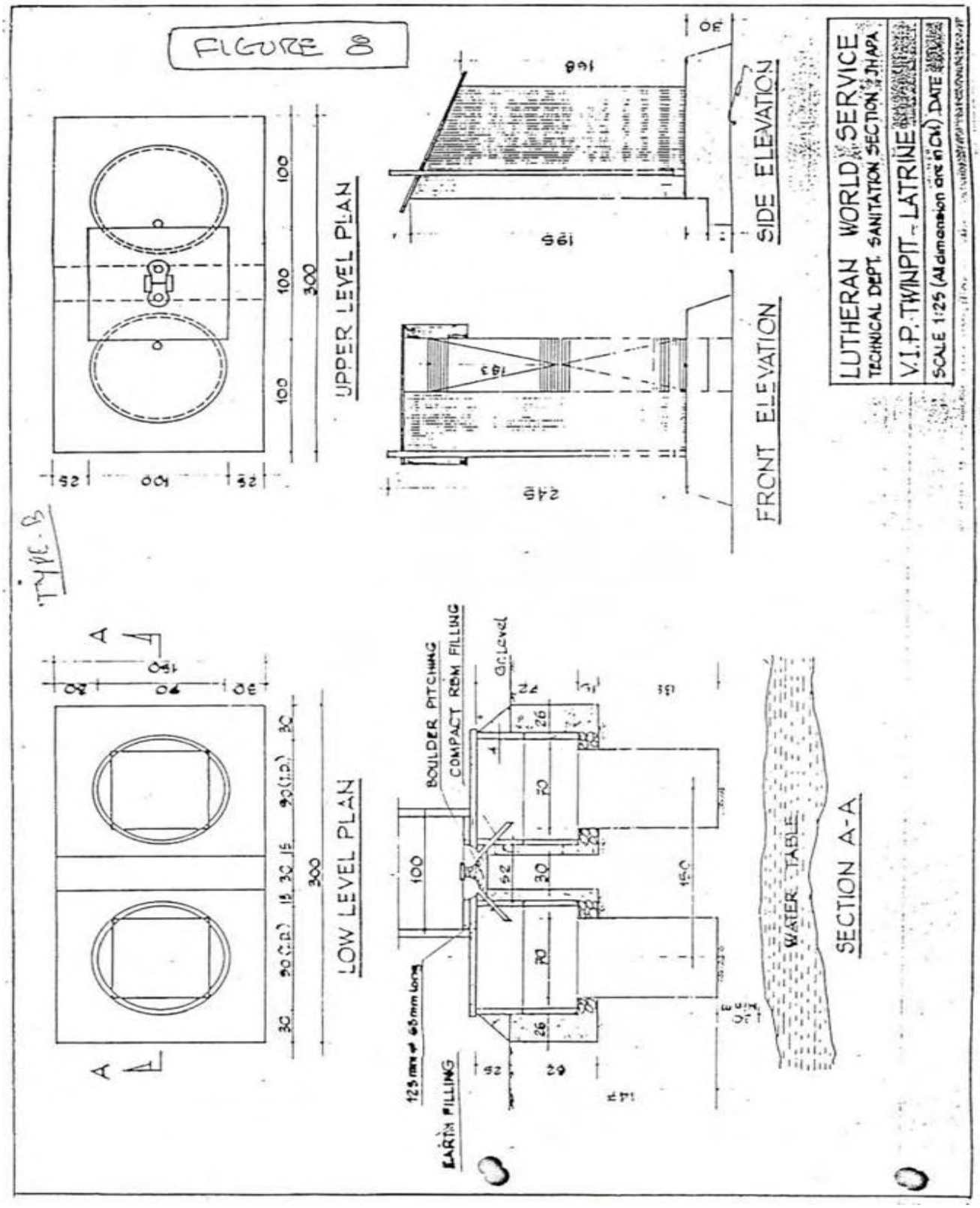
Annex E - Cont'd 10



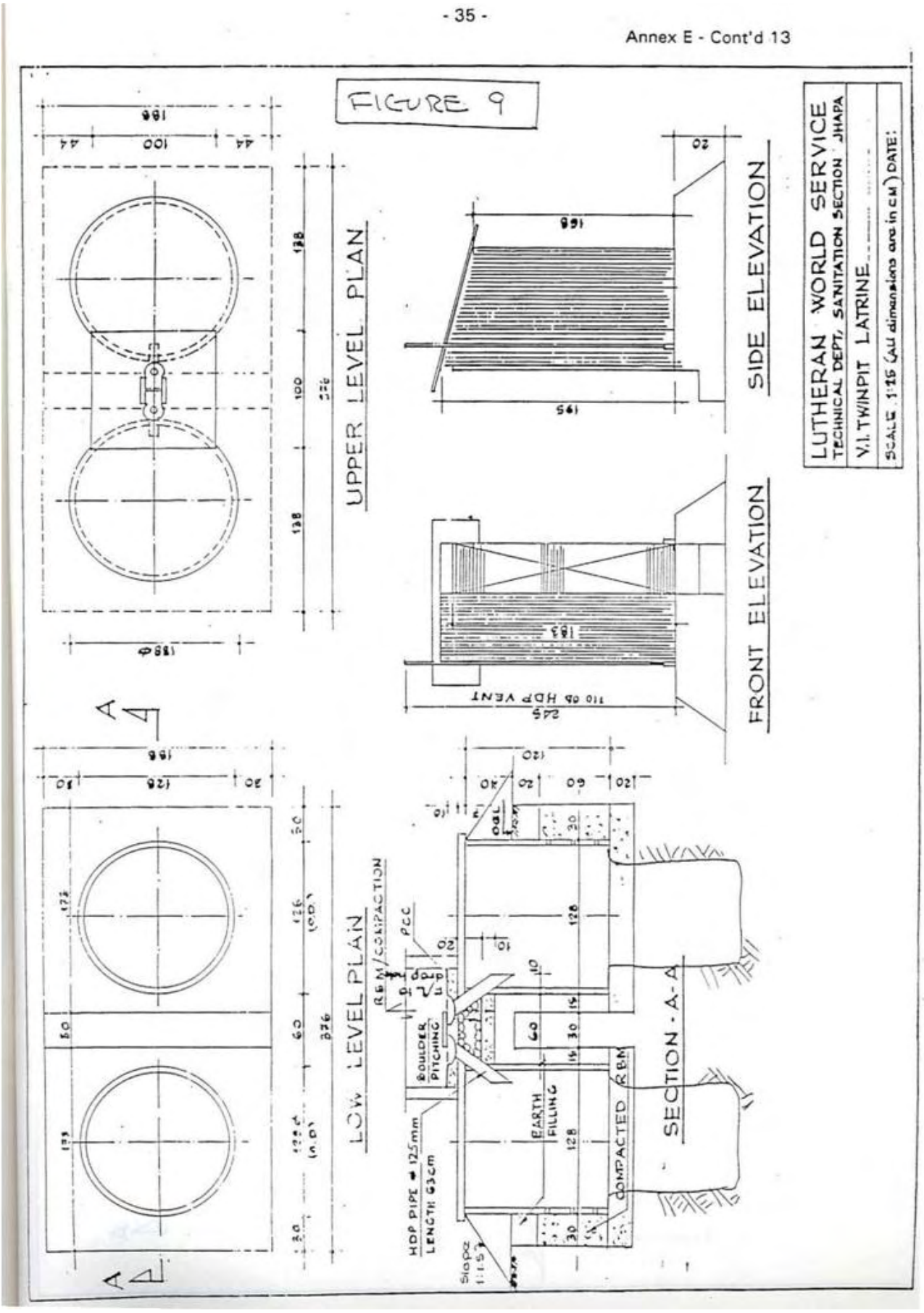
Annex E - Cont'd 11



Annex E - Cont'd 12



Annex E - Cont'd 13



Annex E - Cont'd 14

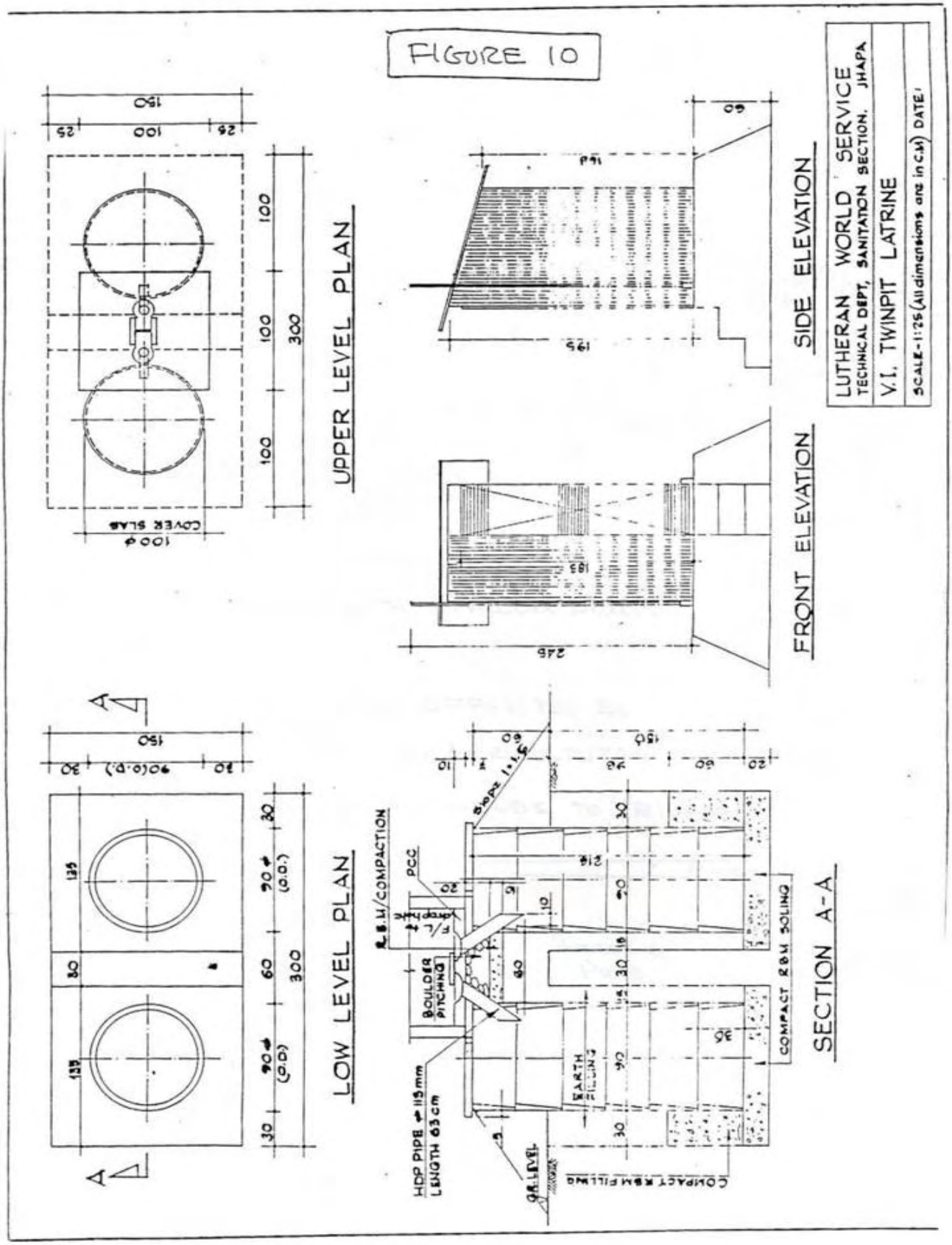
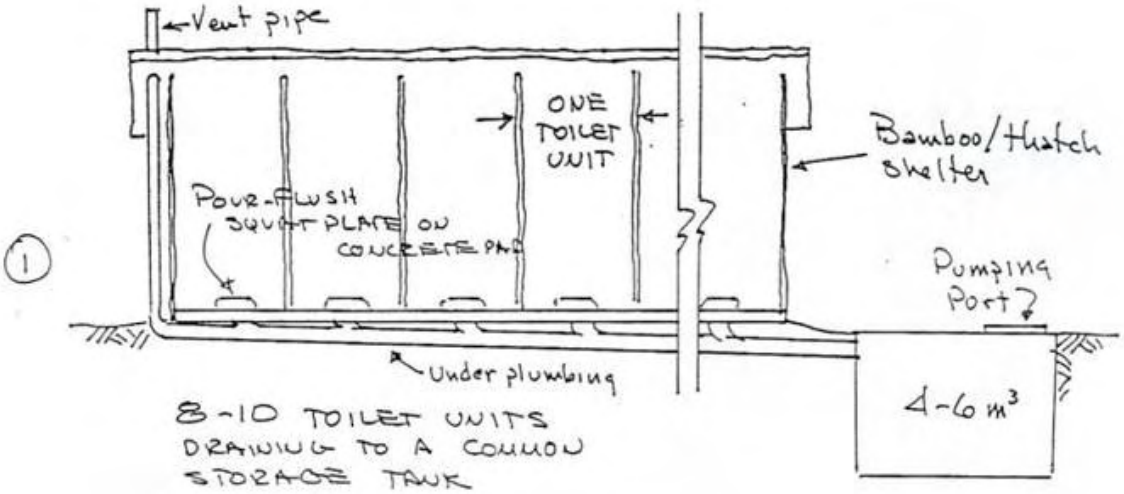


FIGURE 11



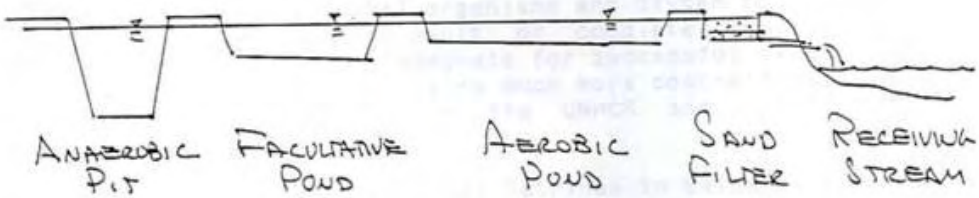
(1)

(2) DESLUDGING WITH VACUUM PUMPER

(3) FINAL DISPOSAL OFF-SITE BY

(A) SPREADING ON AGRICULTURAL/FOREST LAND

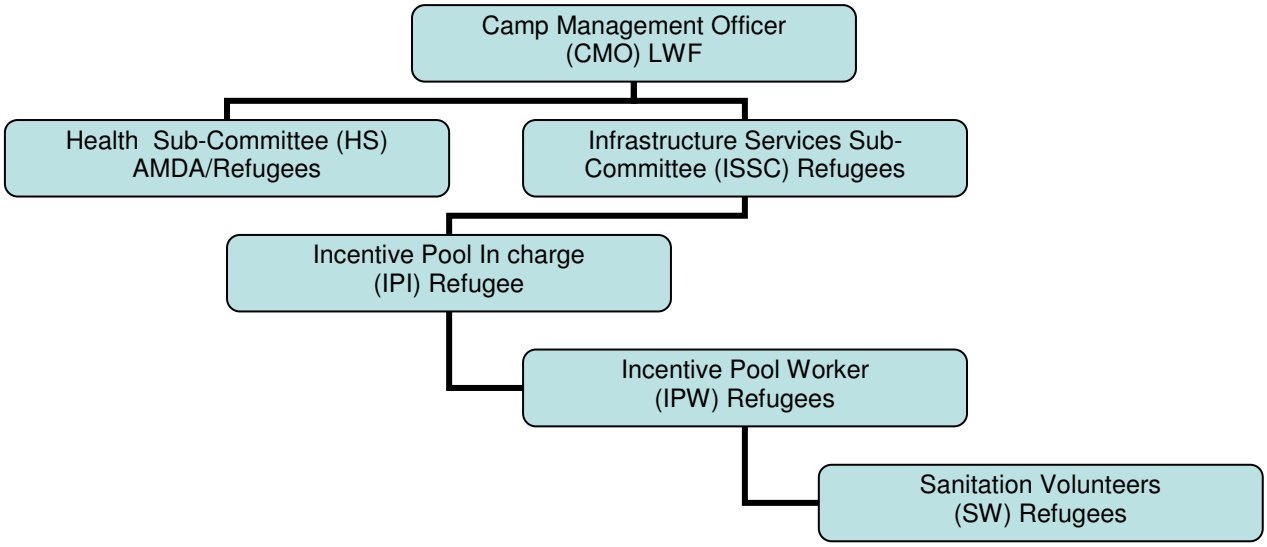
(B) STABILIZATION PONDS TO RIVER



ANNEX 15.

Organizational Chart for the Infrastructure Services delivery at Camp Level

Bhutanese Refugee Programme



ANNEX 16.

COMPENDIUM OF CONTACTS

Agency	Contact Person
UNHCR	Ms. Daisy Dell- Representative, Mr. Herve Isambert – Snr. Reg. Public Health and Nutrition Officer for Asia Mr. Tarik Muftic – Senior Programme Officer Ms. Rianawati Rianawati – Head Of Sub-Office Ms. Susanne Kindler-Adam – Programme Officer Mr. Richard Grindell –Associate Resettlement Officer Mr. Madhu Dhungana - Associate Programme Officer Mr. Govinda Adhikari - Senior Programme Assistant Mr. Anup Kumar Aryal – Programme Assistant Mr. Shailendra Gupta- Programme Assistant All the Field Assistants Mr. M.M. Taimur Hasan – Health & Nutrition Coordinator Mr. Basant Thapa – National Health Consultant
LWF	Mr. Ramesh Jung Rayamajhi – Finance/Admin Coordinator Mr. Mohan Koirala – Programme Finance Manager Mr. Dhruva Raj Pandit – Project Co-coordinator Mr. Gangadhar Chaudhary - Deputy Easter Region Co-ordinator Mr. Nanda Lal Tamang- Water & Sanitation Officer ALL the Camp Management Officers All the Incentive Pool In-charge (Refugees)
CMS	Mr. Ajay Lal Shrestha - Director/ Senior Civel Engineer Mr. D.R Dahal Water Supply & Sanitation Expert
DWSS	Mr. Kamal Adhikari, Sociologist Mr. Thakur Prasad Pandit – Sanitary Engineer
UNICEF	Mr. Richard Luff, WES officer and regional WASH cluster lead
NEWA	Mr. Ratan Budathoki, Knowledge Management & Advocacy
AMDA –Nepal	Dr. Dinesh Man Shrestha, Health Coordinator Dr. Nirmal Rimal, Project Director All the Community Health Supervisors and Community Health Workers
CARITAS	Sister Josephine
BRWF	Ms. Indira Maya Rai Ms. Nan Maya Sunwar Ms. Bishnu Maya Thapa Ms. Jeet Maya Rai Ms. Champa Rai Ms. Manmaya Puri Ms. Devi Maya Pokhrel
Garamuni VDC	Mr. Ekraj Karki, Ex-VDC Chairman Mr. Ramji Budathoki –Ex VDC Vice Chairman Mr. Budhi Poudel – Secretay
Khudunabari VDC	Mr. Chandra Kanta Pokhrel, Secretary

	Mr. Jiwan K. Bhandari, N.C. Party Representative Mr. Yogendra Acharya,, Chairman Beltar Water Supply Mr. Bam B. Karki – Chairman FUC
Humse Dumse FUC	Mr. Rosan Rai, Chiarman All the FUC Committee Members
Madhumalla VDC	Mr. Chandra Prasad Parajuli, Secretary Ms. Sushila Shrestha
Sanischare VDC	Mr. Meen B. Thakuri,
Patahri VDC	Mr. Kamal Bhattarai, Sectretary
Mechi Nagar Palika –	Mr. Rajan Kumar Bhetwa, Accounts Officer Mr. Ananta Prakash Wasti, Sociologist
Budhbare VDC	Mr. Ragunath Niraula, Secretary