

**HIS MAJESTY'S GOVERNMENT OF NEPAL  
MINISTRY OF PHYSICAL PLANNING & WORKS  
DEPARTMENT OF WATER SUPPLY AND SEWERAGE  
ENVIRONMENTAL SANITATION SECTION**

## **FINAL REPORT**

**DEVELOPMENT OF DESIGN, DRAWING AND ESTIMATION  
FOR  
SCHOOL LATRINES IN DIFFERENT ECOLOGICAL REGIONS**

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## ACKNOWLEDGEMENT

The development of design, drawing and estimates for school latrines in different ecological regions have been prepared at the request of Environmental Sanitation Section (ESS)/Department of Water Supply and Sewerage (DWSS) with the technical and financial support from UNICEF. The knowledge of school children on health, hygiene and sanitation should be improved in their early childhood. This document is developed primarily to support the ongoing School Sanitation and Hygiene Education (SSHE) initiatives of district level steering committees and other concerned stakeholders executing SSHE programme in 8 districts with UNICEF support. However, this document could be guiding document for those who are initiating hygiene and sanitation programme in schools and communities in any part of the country.

To reduce mortality and morbidity, the provision of clean drinking water with appropriate sanitation facilities and their sustainable management is inevitable. In this context, this report aims to develop simple and affordable different technical design, drawing and estimation of school toilets with urinals suitable for different geographical regions of Nepal based on socio-economic conditions, viable infrastructure, traditional beliefs, customs, etc.

Altogether eleven technical design options with drawing and estimate are developed with the following breakdowns: three for mountains, six for hills and two for the Terai. It will be a very useful guideline for schools to choose appropriate toilets with urinals as per their requirement.

The present work has received support and co-operation from different individuals and institutions. I would like to express my heartfelt gratitude to Mr. N. K. Mishra, Chief, Environmental Sanitation Section, DWSS; Mr. Dinesh Bajracharya, NEWAH; Mr. Namaste Lal Shrestha and Mr. Madhav Pahari, UNICEF for their sincere co-operation. Their suggestions for improving the quality of this report are highly commendable.

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## 1. BACKGROUND

### 1.1 General Background

Nepal with the total area of 147,181 square kilometers and an estimated population of 23 million has significant human and geographical diversity. Nepal is geographically divided into three distinct regions: the mountains, the hills and the terai. The mountains comprise 35% of total surface area and is inhabited by 7% population. The hills and terai cover 42% and 23% of total surface area where 46% and 47% of the total population live, respectively. About eighty percent of the population is dependent on agriculture that dwells mostly in rural areas with poor infrastructures, such as transportation and communication. Nepal is still underdeveloped with per capita income of only US\$220 and has a HDI ranking of 144 out of 175 countries.

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 about Rs. 10 billion annually mainly due to lack of awareness about cleanliness and sanitation among the public. A high incidence of water related diseases contributes to significantly low production in Nepal. With the goal to decrease the intensity of water and sanitation borne diseases and increase the rural productivity, more efforts were made during the International Drinking Water Supply and Sanitation Decade (IDWSSD) from 1980-1990.

This served as a tremendous impetus for RWSS actions in Nepal. Though the goal and targeted coverage was not attained during the IDWSSD, current efforts continue to reflect the aims of the decade. The effort has resulted in marginal growth of national water supply coverage but the sanitation still remained far behind. About 80 percent of Nepalese do not use toilets. It shows that the lack of toilets, use of uncleaned toilets and improper hand washing after the use of toilets account for some reasons for deaths of thousands of children.

Official data shows that in 1997 about 61% of the rural and 62% of the urban population have access to safe water supplies with the corresponding sanitation figures of 16% and 51%. These figures are believed to be seriously flawed mainly because it does not take into account the poor operational status as well as poor quality of supplies of the facilities built.

Sanitation coverage figures refer to household latrines and partly built sewerage system in a few towns and cities. The population is still largely ignorant about the relationship between sanitation and health. Sanitation program being launched on the modalities of high subsidy by government or other agencies in latrine construction did not show any positive results towards the improvement of sanitation status of the communities. Only the promotion of latrine was considered as the sanitation activity whereas it has to be seen as complex combination of different components, namely, the personal hygiene, domestic and environmental cleanliness, safe excreta disposal, improved solid and waste water disposal systems, and safe drinking water. On the basis of long experiences, it has been established that together with hardware based activities, sustainability of sanitation program depends more on changes in traditional behavior, attitudes and practices. In this regard, Institutional School latrine will play an important role for the development of sanitation situation of the country.

Recently School Sanitation and Hygiene Education Programme (SSHEP) Guideline was developed by UNICEF with inputs from National Level Study and National Workshop. The guideline provides great support for the development of sanitation and hygiene education at school level.

## 1.2 Drinking Water and Sanitation Sector

The commitment to provide safe water and sanitation has appeared in the policies and programs of His Majesty's Government of Nepal (HMG/N) in different plan documents as well as government policies. The lack of safe water and adequate sanitation resulting in health problems and low productivity as well as quality of life has been understood by all and has been expressed in sufficient literature brought out by the government. The HMG of Nepal has made efforts in this direction. More emphasis has been placed in this sector since the inauguration of the United Nation's International Drinking Water and Sanitation Decade in 1981. The HMG of Nepal's commitment to provide drinking water to all by the year 2000 could not be achieved. Presently the target has been revised and the period extended to 2002.

The Eighth Five Years Plan (1992-1997) had emphasized in providing drinking water and introducing sanitation programs. In the preliminary introduction on the drinking water sector, the plan pointed out that in spite of numerous programs launched in the area of drinking water and sanitation in the past, a large part of the population was still not covered. In order to provide drinking water facilities the plan spelled out some important policy measures.

The Eighth Plan had the objective to provide drinking water to 72% and sanitation to 13% of the total population of the country. Within the plan period the emphasis had been placed on small and low investment projects with higher public participation. In order to make drinking water and sanitation programs sustainable community involvement right from the initial stages of project formulation was made mandatory. Emphasis had also been placed on small projects with community participation, operation and maintenance (O&M) provision, increased participation and coordination between NGOs, local bodies and private organizations for the implementation of drinking water and sanitation programs.

## 1.3 Sanitation Coverage

Coverage figures on sanitation are difficult to determine. The present practice is to regard access to sanitary facility for human excreta disposal as the main indicator of sanitation coverage. Based on this assumption a survey conducted by New Era/IIDS/VARG in the year 1991 has estimated the national coverage at 20% of the total national population. The Sector Review and Development Plan (1991-2000) estimated rural coverage to be only 3% in 1990. UNICEF gives a figure of 16% up to 1995. Thus there is a wide variation, making it difficult, if not impossible, to demonstrate any changes. (Fourth Rural Water Supply and Sanitation Sector Final Report the Project Preparation Technical Assistance).

The Ninth Plan has estimated the national sanitation coverage by the end of 1997-98 for rural and urban areas as 16% and 51% respectively. The total sanitation coverage is estimated at 20% of the total population of Nepal. The plan further estimates that by the end of the 9th Plan total sanitation coverage will be 40% with 36% rural and 60% urban breakdown. The Ninth plan emphasizes the sustainable improvement in the health status of the people. The goal of the plan will be achieved through the development and implementation of the sustainable water supply and sanitation facilities to improve personal, household, community hygiene and sanitation behavior.

## 2. SCHOOL SANITATION

Schools are one of the important institutions in the rural area of Nepal to facilitate and practice hygiene and environmental sanitation among children. Therefore, schools must be equipped with urinals, latrines and garbage pit of simple design with possibility of easiest O & M..

Although school latrines serve as an ideal media to induce a behavior change in the growing up generation, it is a deplorable fact that at present only very few school latrines fulfill this task. The teachers and School Management Committee (SMC) are reluctant to provide frank discussions and talk openly regarding such sensitive issues like human waste, body hygiene etc. This has grossly contributed to the failure of effective school sanitation programs.

Provision of sanitation facilities is not simply a technical intervention rather it has socio-cultural dimension attached to it. Therefore, to have a successful and sustainable sanitation program it is imperative to understand the social dimension and involve the teachers / students / parents or community in its planning as well as implementation. It is also important to understand the need of separate urinals and latrines for girls students in the school. Without these basic facilities quality education in the school cannot be ensured.

UNICEF had developed SSHEP Guideline in April, 2000 for the implementation of school sanitation and hygiene education promotion activities in Nepal. This guideline has been developed by incorporating valuable information and suggestions received from different stakeholders such as students, teachers, VDC/DDC, SMC, etc. It provides a great support for the SSHEP in Nepal.

The approach in the provision of the type of sanitation facilities is determined by the following factors:

- Simplicity of the technology involved for easy implementation
- Acceptability of the available technological options
- Effectiveness and sustainability of the options
- Cost effectiveness
- Replicability of the options
- Health and environmental sanitation facilities

## 3. TECHNOLOGICAL CHOICE

Over years various options for sanitation units have been developed in developing countries through research and development. Literature on such experiences have been published and are available from agencies like UNICEF, WHO and Helvetas. Based on the available information and depending upon the environmental and technical factors different types of technology have to be suggested as option.

### *Environmental Factors*

- Climatic condition
- Soil condition: soil texture, stability and permeability
- Groundwater table
- Proneness for flood
- Environmental pollution
- Disposal of decomposed human excreta/ Management of garbage rubbish
- Availability of water

### *Technical Factors*

- Technology preference
- Design preference
- Availability of construction material
- Cost of construction

Considering the above factors, the following technological options have been developed for school latrines in different ecological regions of Nepal :

### *Mountain Region*

The most suitable technological options which have been developed are as follows:

- M-1 Offset Type Double Pit Latrine (Wooden Sticks/Bamboo Mats)
- M-2 Direct Pit VIP Latrine (Wooden Sticks/Bamboo Mats)
- M-3 Pour Flush Double Pit Latrine (Wooden Sticks/Bamboo Mats and stone masonry pits)

### *Hill Region*

The technological options developed for this region are as follow:

- H-1 Offset Type Double Pit Latrine (Stone masonry)
- H-2 Offset Type Single Pit Latrine (Stone masonry)
- H-3 Direct Pit VIP Latrine (Stone masonry)
- H-4 VIP Latrine Offset Type with attached Pit (Stone masonry)
- H-5 Sulav Latrine in Stone Masonry with Precast Rings
- H-6 Pour Flush Double Pit Latrine (Wooden Sticks/Bamboo Mats and Stone Masonry)

### *Terai Region*

For the Terai Region, the following technological options have been developed and are available:

- T-1 VIP Latrine Offset Type with attached Pit (Brick masonry)
- T-2 Sulav Latrine in Brick masonry with Precast Rings

## **Brief Description of Technological Options of School Latrines for different Tropical Regions**

### **A. MOUNTAIN REGION**

In the mountain region of Nepal the transportation of non-local materials is difficult. The options are for toilets therefore developed depending on the availability of local construction materials. Locally available wood, bamboo, stone and mud are suggested for latrine construction whereas straw, bamboo or reeds and thatch are proposed for roofing materials. Because of high cost of transportation and low affordability of the local communities, provision of cement and other non-local construction materials are not recommended for the mountain region. Simple and low cost options suitable for mountain region are as follows:

### **1. Offset Type Double Pit Latrine (Wooden Sticks/Bamboo Mats)**

This type of latrine is suitable for mountain region and is constructed by using the local materials like wooden sticks, bamboo mats, stone etc. Two rectangular/circular pits separating the latrine units are constructed by wooden sticks/bamboo mats which is further joined by 90 mm diameter HDPE pipe/stone masonry drain. The pit should be used alternately. Stone masonry in mud mortar should be used for the foundation of the super structure. Superstructure should be constructed with wooden sticks/bamboo mats. The roof of the toilet is constructed by using local materials with transparent sheet (600\*600mm) which provides sufficient light inside the toilet. For the ventilation purpose, a 225\*225mm opening has been given in the upper portion of the wall. Stone pan with cement punning or fiber pan is used for safe disposal of excreta with 1:5 slope of the drain. The detailed drawing is shown in Model No. M1 .

### **2. Direct Pit VIP Latrine (Wooden Sticks / Bamboo Mats)**

This type of latrine has bamboo mats lined pit with wooden poles and bamboo mats superstructure. The roof of the toilet is constructed by using local material with transparent sheet (600\*600mm) which provides sufficient light inside the toilet. A vent has been fixed at the back of the latrine unit, to provide proper ventilation, with and mosquito screen at the top of the vent pipe. The details are shown in Model No. M2.

### **3. Pour Flush Double Pit Latrine (Wooden Sticks/Bamboo Mats and Stone Masonry)**

It is suitable for the areas where availability of water is minimum and local materials like wood, bamboo and stone are easily available. This type of model is having two stone masonry circular pit of depth upto 2 meters in which one is located just under the latrine unit and another is minimum one meter far from the first. Both pits are interlinked by 110mm HDPE pipe and one is covered by RCC circular slab whereas another is covered by pan attached RCC circular slab. The latrine unit is constructed of local materials like bamboo mats or wooden sticks with leun plaster over it. The roofing of the latrine unit has been done by using local materials with transparent sheet. Upper part of both the pits are protected by wooden planks. The details are shown as Model No. M3.

## **B. HILL REGION**

### **1. Offset Type Double Pit Latrine (Stone Masonry)**

This type of latrine may be suitable for areas where construction area is available as per requirements and the local materials such as stone, wood etc. are easily available. It consists of two stone masonry rectangular/circular pits separate from the latrine structure joined by stone masonry drain/HDPE pipe 110 mm dia. The drain should have a minimum gradient of 1:5. The drain leading to the pit, not in use, should be completely sealed with a temporary plug joined with weak mortar. The pits should be used alternately. The superstructure of the latrine unit consists of stone masonry in mud mortar with door made of local material like bamboo mat / wooden sticks / paneled shutter of local wood. The roofing of the latrine should consist of local material or CGI sheet with transparent sheet. A stone pan with cement punning or fibre pan is used for excreta disposal. The details are shown in Model No. H1.



## **2. Offset Type Single Pit Latrine (Stone Masonry)**

This type of latrine may be suitable where number of students is less. It has single pit separate to the latrine unit. The construction is similar to offset type double pit latrine (stone masonry). In this type of latrine only single pit is constructed for the accumulation of excreta disposal. The details are shown in Model No.H2.

## **3. Direct Pit VIP Latrine (Stone Masonry)**

This type of latrine may be suitable for hill region. It comprises of stone masonry pit hole with local materials superstructure like wooden poles, bamboo mats, stone masonry etc. A vent pipe has been provided, which may be of bamboo or 63 mm HDPE pipe, fixed at the backside of latrine unit with mosquito screen at the top. A wooden box with a hole is provided to cover the pit and to support the compacted earth on the pit. A wooden lid has been provided to cover the excreta hole. The details are shown in Model No. H3.

## **4. VIP Latrine Offset Type with attached Pit (Stone masonry)**

This type of latrine may be suitable for hill region. It has a rectangular stone masonry pit attached at the back of the latrine unit with RCC Slab cover and also stone masonry latrine unit is constructed having CGI Sheet roofing with transparent sheet. A HDPE pipe 125 mm dia. is provided to connect the latrine unit with the pit directly and a wooden lid is provided to cover the hole. The pit is ventilated by 63 mm HDPE pipe with mosquito screen at the top. The details are shown in Model No. H4.

## **5. Sulav Latrine in Stone Masonry with Precast Rings**

It may be suitable for hill region. It has two circular pit located minimum 1 meter far from the latrine unit and also between each other then pre-cast circular concrete rings are placed in that pit with RCC cover. A outlet drain is provided between the pit and the latrine unit operated alternately. A latrine unit of stone masonry is constructed having C.G.I. roofing. A pan is fixed and connected to outlet then from outlet to pit connected by 110 mm HDPE pipe. The details are shown as Model No. H5.

## **6. Pour Flush Double Pit Latrine (Wooden Sticks/Bamboo Mats and Stone Masonry)**

It is suitable where availability of water is less. It comprises of two circular pit in which one is located just under the latrine unit and another one placed minimum one meter far from the first. Both pits are interlinked by 110 mm HDPE pipe and stone masonry walls are placed in both pits. One pit is covered by RCC circular slab whereas another is covered by pan attached RCC circular slab. The latrine unit using local material like bamboo mats or wooden sticks mat with leun plaster is constructed over it. The roofing is done by local material/ C.G.I.sheet with transparent sheet. Upper part of the both the pits are covered by RCC slab. The details are shown as Model No. H6.

## C. TERAI REGION

### 1. VIP Latrine Offset Type with Attached Pit (Brick Masonry)

This type of latrine may be suitable where bricks are easily available. In this type, brick masonry rectangular pit is attached at the back of brick masonry latrine unit having C.G.I. sheet roofing with transparent sheet. The pit is covered by R.C.C. slab and ventilated by 63 mm HDPE pipe with nylon fly screen at the top. The pan is fixed and floor is finished by cement punning. The details are shown in Model No. T1.

### 2. Sulav Latrine In Brick Masonary With Precast Rings

It may be suitable where brick as well as sand and aggregates are easily available. It comprises of two circular pit located minimum 1 meter far from the latrine unit. The concrete rings are placed in the pit with RCC cover and one rectangular collection chamber is provided between the pit and latrine unit to operate alternately. A brick masonry latrine unit is constructed having CGI roofing with transparent sheet. A pan with U trap is fixed and connected to collection chamber. The pit is connected by 110 mm HDPE pipe from the collection chamber. The details are shown in Model No. T2.

## DESIGN CONSIDERATIONS :

### a) *Number of Latrines and Urinals*

Field survey revealed that about 7% of students require facilities for defecation and all students and teachers need facilities for urination.

Two units of latrine, one for boys and one for girls with urinal facilities, have been proposed to serve the strength of 200 students. Similarly, four units of latrine, two for boys and two for girls with appropriate urinal facilities, is developed for 201-1000 students. The arrangements of latrine and urinals for different number of students in school are given in the annex.

### b) *Volume of Pit*

Depending on the numbers of users and the desired service life time of the latrine, the required pit volume shall be computed with the below mentioned formula:

$$V = 1.15 \times C \times P \times N$$

where,

- V = Volume of pit after lining (m<sup>3</sup>)
- C = Excreta accumulation (0.02 m<sup>3</sup>/person, year)
- P = Number of users/student members
- N = Pit design life time (years)

[ For Terai region, N = 2 years  
For Mountain / Hill region, N = 3 years ]

1.15 is used since the pit will have finished its useful life when 85% full

## Dimensions of the Pit

(Pour Flush Latrines with Circular Leach Pit)

S. No.	No. of Users	Volume of Pit (V= 1.15xC×P×n)	Dia. of Pit mm	Usable Depth of Pit mm	Free Bound mm	Total Depth of Pit (dry) mm	Increase the Depth of pit for Flood Zone (mm)	Total Depth of Pit for Flood Zone (mm)
1	Upto 200	0.644 m <sup>3</sup>	900	1000	300	1300	400	1700
2	300	0.966 m <sup>3</sup>	900	1500	300	1800	400	2200
3	400	1.288 m <sup>3</sup> /2	900	1000	300	1300	400	1700
4	500	1.610 m <sup>3</sup> /2	1000	1000	300	1300	400	1700
5	600	1.932 m <sup>3</sup> /2	1000	1200	300	1500	400	1900
6	700	2.254 m <sup>3</sup> /2	1000	1400	300	1700	400	2100
7	800	2.576 m <sup>3</sup> /2	1100	1350	300	1650	400	2050
8	900	2.898 m <sup>3</sup> /2	1100	1500	300	1800	400	2200
9	1000	3.220 m <sup>3</sup> /2	1100	1700	300	2000	400	2400

#### 4. QUANTITY ESTIMATE

An approximate quantity estimate has been worked out for different types of school latrine construction in mountain, hill and terai region of Nepal. The number of latrines and urinals required for boys and girls for different number of students (such as upto 200 students, 201-300 students,.....,upto 1000 students) for the school have been calculated and different set of configuration has been planned. The quantity estimate and required material breakdown have been worked out upto 400 students for mountains, upto 600 for hills and upto 1000 for terai region for each options. The detailed quantity and material breakdown for each options of latrine suitable for mountain, hill and terai regions are presented in Annex of this report.

#### 5. CONSTRUCTION AND O & M

##### (1) SIMPLE PIT LATRINES

##### A. Construction

The major components for the construction of simple pit- latrines are as follows:

##### a) *Base*

The base of simple pit latrine serves as the support for squatting slab and the latrine super structure to be raised above ground level. It helps to prevent surface water, insects and small animals from entering into the pit, and hookworm larvae from emerging from the pit. Boulder masonry with cement mortar/mud mortar is used to construct the base of the latrine.

b) *Squatting slab*

Different type of squatting slabs are used, as per the availability of the local materials, which are as follows:

- single large stone plate; or
- flat stone floor with mud mortar bedding and pointing, resting on bamboo or timber poles supporting structures; or
- ferro-cement slab cast on situ; or
- hard wooden planks

c) *Lid for squatting hole*

A lid on squatting hole is placed where venting is purely through openings between walls and roof of the latrine building and not by means of a vent pipe.

d) *Latrine building*

The latrine building should be properly built by using local construction materials fitted with a door keeping the pit with the excreta and the squatting area as dark as possible. This darkness minimizes the number of flies and mosquitoes entering the pit because usually they tend to stay away from dark places. Different locally available construction material are used to construct the latrine building such as, bamboo/timber poles, bamboo matting/boulder for wall construction, thatching/bamboo matting/slates/C.G.I. sheets for roof construction, etc

*Placing of latrines*

The latrine building should be placed such a way that the door will face the main wind direction and if possible, away from the direction of main rains. The latrine should be safe against flooding by surface water as well as against damage by land slides.

**B. Operation and Maintenance**

Operation and maintenance of Simple pit latrine is very simple but it is necessary to educate the users regarding its proper use and maintenance.

*Do's and Don'ts*

The following Do's and Don'ts should be explained to the users:

*Do's*

- Once the latrine is built, all the students and teacher must use the latrine each time they need to defecate.
- In un-ventilated latrines the lid needs to be placed on the squatting hole after each use and to reduce the odor and insect development, some wood ashes should be thrown into the latrine pit.
- Regular cleaning of the squatting slab is required to keep it clean from spilled excreta.
- Minimum water should be used to anal cleansing and squatting slab cleaning.

- When 2/3 to 3/4 full, the remaining portion of the pit should be filled with soil and a new pit will have to be dug and a new latrine building to be constructed by using the re-usable material from the previous latrine.

#### *Don'ts*

- Do not use excessive amount of water in the pit, it slows down the decomposition of excreta causing a reduction in the expected service life of the latrine.
- Do not use undegradable materials for anal cleansing such as stones, etc.

## 2. VENTILATED IMPROVED PIT LATRINES (OFFSET TYPE)

### A. Construction

In the mountain, hill and terai regions, ventilated improved pit (VIP) latrine is the better hygienic toilet construction compared to simple pit latrines. The cost is also comparably higher than the simple pit latrine. It is a modified construction of simple pit latrine. It differs by a vent pipe covered with a fly screen and the offset pit back of the latrine building. The excreta is disposed to the pit by a bigger size HDPE pipe (225 mm) or other pipes placed in a steep slope which effectively work to transport the excreta to the offset pit.

VIP latrines can be constructed with a double pit. The latrine has two shallow pits, each with their own vent pipe but only one superstructure. The cover slab has two drop holes. Only one pit is used at a time. When one is full, its drop hole is covered and the second pit is used. After a period of at least one year, the contents of the first pit can be removed safely and used as manure. The pit can be used again when the second pit fills up.

### B. Operation and Maintenance

Operation and maintenance of Ventilated Improved Pit (VIP) latrine is quite simple but it is necessary to educate the users regarding its proper use and maintenance.

#### *Do's and Don'ts*

The following Do's and Don'ts should be explained to the users:

#### *Do's*

- Regular cleaning the slab with water to remove any excreta and urine.
- Adequate water should be available in or near the latrine.
- Vent pipe and fly screen must be inspected to ensure against the corrosion and damage.

#### *Don'ts*

- Drop hole should never be covered as this would impede airflow.
- Non-biodegradable material like stones, plastic, rags etc. should not be thrown in the pit as they reduce the effective volume of the pit.

### 3. POUR FLUSH LATRINES

#### A. Construction

In the Terai, the size of latrine unit should be 1000 × 1000mm, internally. The foundation of the latrine wall should be designed as per site conditions. The plinth should be minimum 250mm above ground level.

##### a) *Squatting Pan and Trap*

The rim of the squatting pan could be ceramic, cement concrete, cement Mosaic or fiber glass. The squatting pan should be installed horizontally and the trap connected to ensure a 20mm water seal. While fixing the trap, keep the top of the inlet and the top curvature of the trap horizontal; the squatting pan should then be fixed over the trap in such a way that its rim is horizontal and flush with the latrine floor. This process will ensure 20mm waterseal in the trap. The distance between the pan and the back wall of the latrine superstructure should be about 200mm.

##### b) *Footrests*

These can be of ceramic, cement concrete, cement mosaic or plastered bricks. The top of the foot rests should be about 20mm above the floor level and inclined slightly away from the squatting pan in the front.

#### *Pit Lining*

Alternative materials should be used for pit lining and are as follows:

##### a) *Brick Lining*

The pits should be lined to avoid collapsing. Bricks are jointed in 1:6 cement mortar for lining of the pit. The thickness of lining could be 115mm.

##### *Size of Holes in Brick Lining*

The lining in the brick work should be by honey-combing upto the invert level of the incoming pipe or drain. The size of the holes should be about 50mm wide and extend to the full height of the brick course. The holes should be provided alternately in brick courses.

If the soil is sandy or chances of damage by field rats, then the width of the openings should be reduced to 12 to 15mm. Where the foundation of the latrine unit is close to the pit, holes should not be made in the portion of lining facing the foundation. However while designing pits in such a situation, the infiltrative area should be increased. The lining above the invert of the pipes or drains, upto the bottom of the pit cover, should be in solid brick work with no openings.

##### b) *Cement Concrete Ring Lining*

The concrete rings used for the lining should be 40mm thick, 300mm in height and concrete with 1:3:6 cement concrete, reinforced with 2 rings of 6mm diameter mild steel bar. The rings should have 50mm diameter circular holes staggered about 200mm apart. The rings are not to be joint with mortar but are put one over the other. Below the pit cover two courses of brick work in 1:6 cement mortar should be provided for supporting the pit cover.

### *Pit Bottom*

The pit bottom should be left in a natural condition except where precautions are to be taken to prevent pollution of drinking water points.

### *Pit Cover*

Generally RCC (1:2:4) slabs are used for covering the pits, but depending upon the availability and cost, wooden planks can be used. The RCC slabs may be casted in two pieces for convenience of handling. The thickness will depend upon the expected load of to come on it.

### *Interconnection between Pits and Squatting Pan*

The trap is connected to the pit through a 75mm brick channel of 'U' cross sectional shape covered with bricks or 75mm dia. PVC pipes. In case pipes are used, a chamber should be provided at the bifurcation point to facilitate cleaning and allowing flow to the pit. The channel or pipe should have a minimum gradient of 1:15. The pipe or drain leading to the pit, not in use, should be completely sealed with a temporary plug, say of brick or concrete, joined with weak mortar.

### *Latrine Superstructure*

The superstructure of the latrine units should be designed to ensure privacy, convenience, comfort and easy maintenance. For the terai region, the different types of superstructures can be used which are as follows:

- i) Brick wall constructed with mud mortar or cement mortar (1:6) and thatched or tiled or CGI sheet roof.
- ii) White or color washed jute or thick plastic sheet enclosures on a bamboo frame.

## **B. Operation and Maintenance**

Operation and maintenance of Pour Flush latrine is very simple but it is necessary to educate the users regarding its proper use and maintenance.

### *Diversion of Flow from One Pit to Another*

Only one of the two pits is to be used at a time. It is very important to completely seal the entry to the pit which is not in use. This is done by blocking one of the branches of the drain or in the case of a pipe, by blocking the mouth of one pipe at the junction chamber. When water does not flow out of the pan, either there is choking or the pit in use is full. If by rodding, the choking is not removed, then the pit in use is full and the load needs to be diverted to the second pit. For this, remove the cover of the drain or junction chamber and take out the blockage to allow the flow to the pit not in use and block to flow to the pit which is full. Cover the drain or the junction chamber properly so that foul smell is not emitted.

### *Removal and Disposal of Pit Sludge*

When the filled pit is allowed to rest for a minimum of one and a half years, the pit contents are completely decomposed and free of foul smell. The pit can then be safely emptied manually, without being hazardous to health, by the user himself or through the local authority or a private agency. However, in the case of combined pits and pits located in water logged and high sub-soil water areas, de-sludging of pits should be done carefully because the sludge might not be completely safe and dry to handle due to travel of pathogens from the pit in use to the pit to be desludged. After the pit is emptied, the pit cover should be placed in position and the joint made air tight. The humus collected has rich manure value and is a good soil conditioner. The humus from dry pits can be used directly either in the kitchen garden or in the fields, but from wet pits it can be used only when it is sun dried.

### *Do's and Don'ts*

The following Do's and Don'ts should be explained to the users:

#### *Do's*

- Keep a bucket full of water outside the latrine.
- Keep a 2 litre can in the latrine filled with water for flushing.
- Before use, pour a little quantity of water to wet the pan so that excreta slide smoothly into the pit.
- Flush the excreta after each use.
- Pour a little quantity of water, say half a litre, in the squatting pan after urination.
- The squatting pan should be cleaned daily with a soft broom or soft brush with a long handle after sprinkling small quantity of water and detergent power.
- Use minimum quantity of water in washing the pan and latrine floor.
- Wash hands, using soap or ash, after defecation at the assigned place.
- If any construction defect is observed during the guarantee period, report the matter to the local authority or the construction agency.
- When the pit in use is full, divert the flow to the second pit.
- If the trap gets choked, rodding should be done from the pan side as well as from the rear side by means of a split bamboo stick, after removing the cover of the drain of junction chamber.
- Care should be taken when desludging the pits located in water logged or high sub-soil water areas and in the case of combined pits, as the humus may not be safe for handling.

#### *Don'ts*

- Do not use both the pits at the same time.
- Do not use more than 2 litres of water for each flushing (if the waste is not flushed with 2 litres, pour more water at the specific spots for flushing the waste).
- Do not use caustic soda or acid or acid for cleaning the pan.
- Do not throw sweepings, vegetable or fruit peelings, rags, cotton waste, and cleaning materials like corn cobs, mud balls, stone pieces, leaves etc in the pan or the pits.
- Do not allow rain water, kitchen or bath waste water to enter the leach pits.
- Do not provide water tap in the latrine.
- Do not throw lighted cigarette butts in the pan.
- Do not desludge the pit before one and a half years of its being out of use.



## 6. CONTRIBUTION AND SUBSIDY

For the construction of Latrines in schools, FINNIDA is providing 50% cost of the institutional school latrines and another 50% cost are provided by school and the VDC jointly. This arrangement has been found working properly in the Lumbini zone.

RWSSFDB is providing 100% cost of institutional school latrines under the water supply scheme as demonstration latrine which will make aware the communities for the construction of latrines in their houses. School Physical Improvement Plan (SPIP) under Ministry of Education, is found to provide maximum assistance of Rs. 31,000/- to a school for external environment improvement which include Rs. 15,000/- for toilet construction, Rs. 6,000/- for water supply facility and Rs. 10,000/- for fencing and plantation of the school. SPIP has been implemented in total 13 districts of Nepal and is being funded by JICA. UNICEF has recently launched SSHEP in 8 districts namely Sunsari, Chitwan, Kapilbastu and Dadelhdhura (Intensive Programme) and Kavre, Tanahu, Kaski and Nawalparasi (Non-Intensive Programme). This programme is ongoing to achieve the objectives of school sanitation and hygiene education. The main partners engaged in the construction of school latrines are VDC, SMC/School and the Donors.

Some existing situations reveal that different funding agencies have their own system. In this context, it is advisable to use appropriate technological options. Any recommendations should be based on the study of the financial status of individual school and their felt need, then only funding system should be worked out for financial assistance and its proper utilization.

## 7. CONCLUSION

Institutional School latrines have two dimensional approach in the community sanitation: one as school sanitation and other as demonstration latrine for the local community. School latrine serve as an ideal media to induce a behavioral change in the growing up generation. By learning the use of sanitation facilities, the teacher and students are one of the best media for spreading the importance of sanitation and hygiene in rural areas. As schools have direct linkage with the local community, they can explain the importance of sanitation and awareness on the community health. Therefore, it is necessary to induce a curriculum on sanitation importance with all the potential beneficiaries i.e. student, teachers and the community.

The selection of technology depends mainly on social and cultural, environmental and technical factors etc. The technology should be such that it should be easily acceptable to the users and must be users friendly. Although, different types of latrines have been proposed for mountain, hill and terai regions, the ventilated improved pit (VIP) offset type latrine is the proper design suitable for all the three regions. Also, the pour flush latrine is suitable for terai region where the water is easily available. Local construction materials should be used for the construction of school latrines. Slight changes or modification, if necessary, should be done as per the site condition.

The following actions should taken for the sustainability of school latrines:

- Both the students and teachers should be well convinced and aware of the importance of sanitation and its effect on health/hygiene and environment.
- Students should be mobilized on rotation basis for the cleansing of sanitation facilities.
- A minimum amount if possible, should be charged per student for sanitation fund. This amount should be properly used for sustainable operation and maintenance of school sanitation facilities.
- Latrines must be constructed with proper number of urinals.
- The students and teacher must use the latrines for defecation and urinals for urination.
- There must be provision of water to be used for sanitation facilities.
- Proper handwashing facilities must be provided nearby the school latrines and all the users must use the handwashing facilities properly.
- Separate latrines/urinals should be made available for girls students.

## SUMMARY OF LABOUR AND CONSTRUCTION MATERIALS REQUIRED FOR INSTITUTIONAL LATRINES

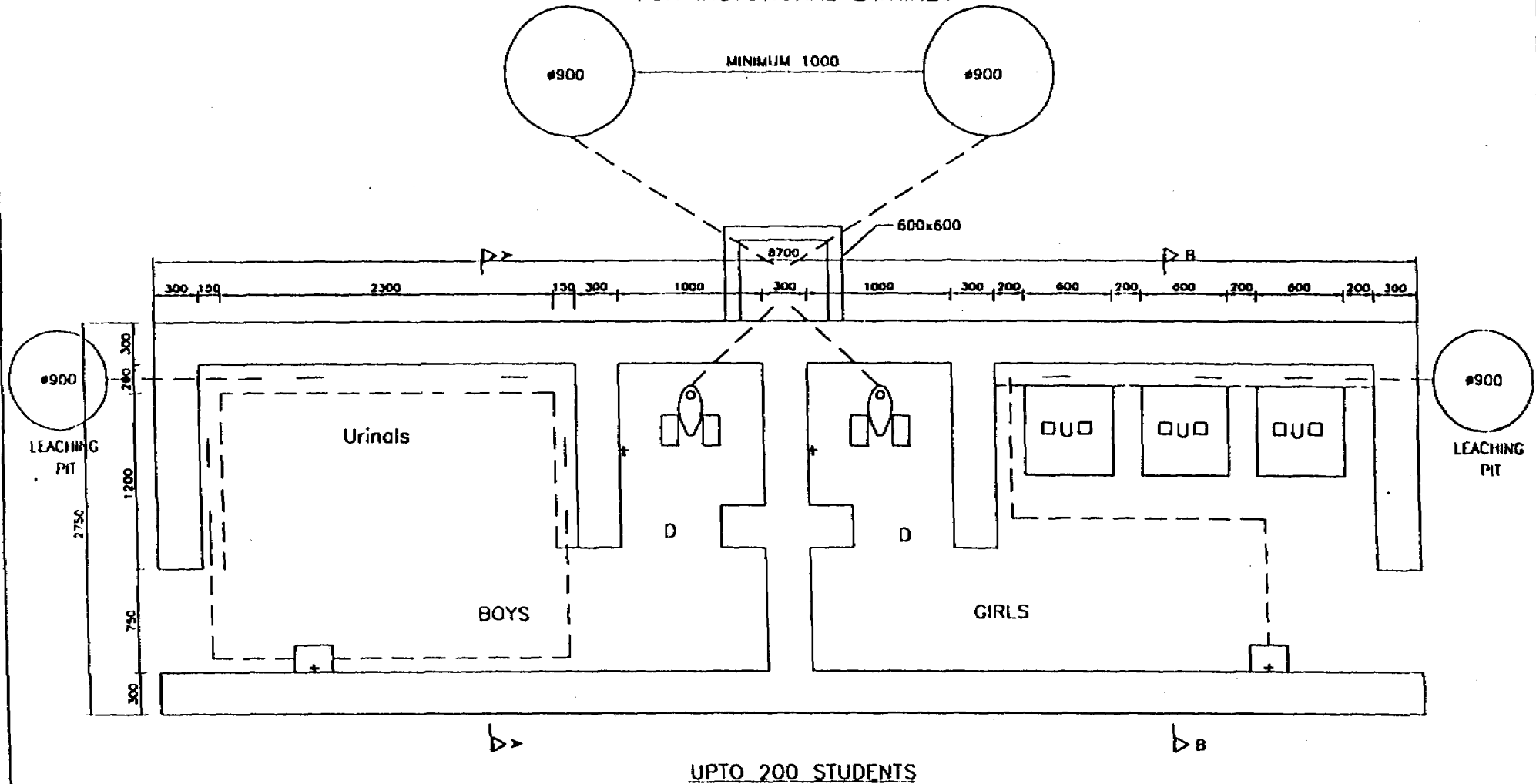
S No	Description	No. of Students	Unskilled Nos	Skilled Nos	Stone m <sup>3</sup>	Bricks Nos	Aggregate m <sup>3</sup>	Sand m <sup>3</sup>	Cement Bag	MS Rod Kg	Binding Wire Kg	Civil Sheet m <sup>2</sup>	Sheet roof m <sup>2</sup>	Plaster/White m <sup>2</sup>	Plumb m	Paint & Tint Nos.	Mud m <sup>3</sup>	Wood m <sup>3</sup>	Transparent Sheet m <sup>2</sup>	HDPE Pipe m	Water Tap Nos	Remark		
A	MOUNTAIN REGION MODEL 1 (M-1)	upto 200	99	40	44											2	1.91	0.27		0.72			4	
		201-300	141	60	66												4	2.34	0.40		1.44			6
		301-400	173	74	82												4	2.65	0.40		1.44			6
		upto 200	95	38	42												2	0.21	0.78		0.72	5.50		4
	MODEL 2 (M-2)	201-300	148	60	66												4	0.21	0.91		1.44	33.00		6
		301-400	178	74	81												4	0.21	0.91		1.44	11.00		6
		upto 200	134	48	53												2	5.36	0.97		0.72	3.40		4
		201-300	220	79	87												4	10.38	1.81		1.44	6.80		6
	MODEL 3 (M-3)	301-400	252	94	103												4	10.70	1.81		1.44	6.80		6
		upto 200	192	65	65								29.15				2	18.24	0.25		0.72			4
		201-300	232	86	85								41.30				4	22.09	0.42		1.44			6
		301-400	253	94	94								49.60				4	24.40	0.42		1.44			6
B	HILL REGION MODEL 1 (H-1)	401-500	265	99	99							54.30				4	24.86	0.42		1.44			6	
		501-600	268	101	100							54.30				4	25.21	0.42		1.44			6	
		upto 200	171	60	59								29.15				2	16.11	0.25		0.72			4
		201-300	209	80	78								41.30				4	19.61	0.42		1.44			6
		301-400	230	88	87								49.60				4	21.92	0.42		1.44			6
		401-500	244	94	93								54.30				4	22.79	0.42		1.44			6
MODEL 2 (H-2)	501-600	247	96	94								54.30				4	23.14	0.42		1.44			6	
	upto 200	148	49	46								29.15				2	11.49	3.44		0.72	5.50		4	
	201-300	187	56	55								41.30				4	14.11	5.88		1.44	11.00		6	
	301-400	206	64	60								49.60				4	15.16	6.57		1.44	11.00		6	
	401-500	220	70	66								54.30				4	15.84	7.03		1.44	11.00		6	
	501-600	223	71	66								54.30				4	16.11	7.03		1.44	11.00		6	
MODEL 3 (H-3)	upto 200	148	49	46								29.15				2	11.49	3.44		0.72	5.50		4	
	201-300	187	56	55								41.30				4	14.11	5.88		1.44	11.00		6	
	301-400	206	64	60								49.60				4	15.16	6.57		1.44	11.00		6	
	401-500	220	70	66								54.30				4	15.84	7.03		1.44	11.00		6	
	501-600	223	71	66								54.30				4	16.11	7.03		1.44	11.00		6	

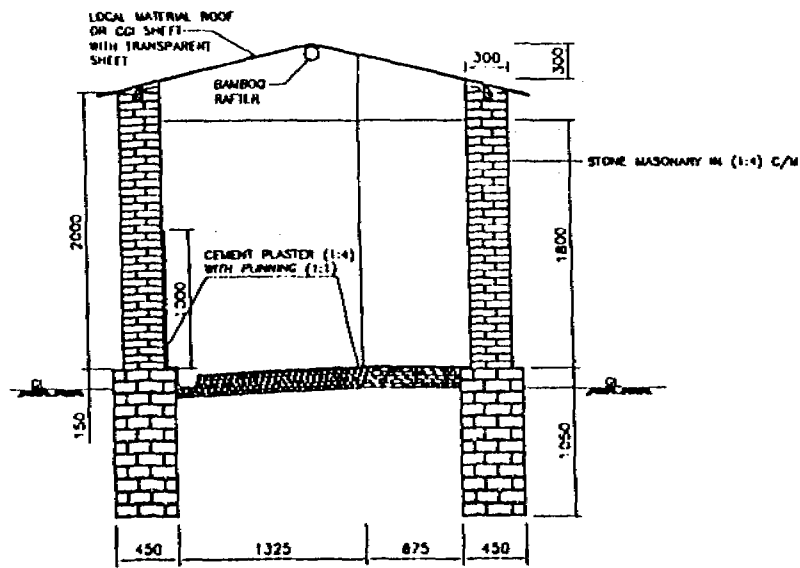
S No	Description	Unskilled		Skilled		Stone	Bricks	Aggregate	Sand	Cement	MS Rod	Binding Wire	UTI Sheet	thatched roof	Wood/Plamboo	Plamboo	Tan & Tin	Mud	Wood	Transparence Sheet	HYPH PIP	Water Tap	Remarks	
		Nov	Nov	Nov	Nov																			kg
HILL REGION MODEL 4 (H-4)	upto 200	202	64	58		0.83	0.80	12	78	8	29.15				17.40	2	16.03	3.02	0.72	5.50				
	201-300	273	81	78		0.92	0.89	13	87	9	41.30				28.10	4	22.77	5.04	1.44	11.00				
	301-400	299	91	87		0.92	0.93	14	87	9	49.60				34.00	4	25.5	5.73	1.44	11.00				
	401-500	318	100	94		0.92	1.18	16	87	9	54.30				37.00	4	26.84	6.19	1.44	11.00				
	501-600	322	102	95		0.92	1.26	17	87	9	54.30				37.00	4	27.11	6.19	1.44	11.00				
	upto 200	183	76	47		1.52	11.14	76	64	6	29.15						2	3.29	0.52	0.72	3.00			
	201-300	238	101	61		2.22	14.71	103	101	10	41.30						4	4.43	0.77	1.44	6.00			
	301-400	266	111	68		2.31	16.38	114	101	10	49.60						4	4.92	0.83	1.44	6.00			
	401-500	287	121	74		2.46	17.65	121	101	10	54.30						4	5.19	0.86	1.44	6.00			
	501-600	293	124	75		2.46	18.06	125	101	10	54.30						4	5.19	0.86	1.44	11.00			
MODEL 5 (H-5)	upto 200	106	42	35		0.45	0.77	10	42	4	17.40				52.52	2	7.43	0.61	0.72	3.00				
	201-300	153	59	48		0.79	1.23	17	74	7	43.70				82.08	4	9.79	0.84	1.44	6.00				
	301-400	154	59	48		0.79	1.23	17	74	7	50.70				90.63	4	10.53	0.94	1.44	6.00				
	401-500	165	64	53		0.79	1.27	17	74	7	55.50				95.35	4	10.94	1.03	1.44	6.00				
	501-600	166	64	53		0.79	1.27	17	74	7	55.50				97.50	4	10.94	1.03	1.44	6.00				
	upto 200	112	40			0.96	10.16	40	23	2	34.27						2	0.25	0.72	6.00				
	201-300	133	48			1.42	12.54	48	41	4	46.40						4	0.42	1.44	6.00				
	301-400	153	58			1.77	14.71	59	41	4	55.81						4	0.42	1.44	6.00				
	401-500	162	59			1.77	15.73	59	41	4	61.01						4	0.42	1.44	6.00				
	501-600	166	61			1.77	16.02	61	41	4	61.01						4	0.42	1.44	6.00				
C TERAI REGION MODEL 1 (T-1)	upto 200	112	40			0.96	10.16	40	23	2	34.27						2	0.25	0.72	6.00				
	201-300	133	48			1.42	12.54	48	41	4	46.40						4	0.42	1.44	6.00				
	301-400	153	58			1.77	14.71	59	41	4	55.81						4	0.42	1.44	6.00				
	401-500	162	59			1.77	15.73	59	41	4	61.01						4	0.42	1.44	6.00				
	501-600	166	61			1.77	16.02	61	41	4	61.01						4	0.42	1.44	6.00				
	601-700	166	61			1.77	16.03	61	41	4	61.01						4	0.42	1.44	6.00				
	701-800	167	62			1.77	16.08	61	41	4	61.01						4	0.42	1.44	6.00				
	801-900	167	62			1.77	16.11	61	41	4	61.01						4	0.42	1.44	6.00				
	901-1000	167	62			1.77	16.14	61	41	4	61.01						4	0.42	1.44	6.00				
	MODEL 2 (T-2)	upto 200	62	23			1.06	6.83	23	15	2	34.27						2	0.52	0.72	6.00			
201-300		82	31			1.21	9.02	31	15	2	46.40						4	0.72	1.44	6.00				
301-400		91	35			1.36	10.26	35	15	2	55.81						4	0.87	1.44	6.00				
401-500		97	38			1.51	11.30	38	15	2	61.01						4	0.89	1.44	6.00				
501-600		101	40			1.51	12.17	40	15	2	61.01						4	0.92	1.44	6.00				
601-700		101	40			1.51	12.20	40	15	2	61.01						4	0.92	1.44	6.00				
701-800		101	40			1.51	12.24	40	15	2	61.01						4	0.92	1.44	6.00				
801-900		102	41			1.51	12.24	41	15	2	61.01						4	0.92	1.44	6.00				
901-1000		102	41			1.51	12.27	41	15	2	61.01						4	0.92	1.44	6.00				

# ANNEXES

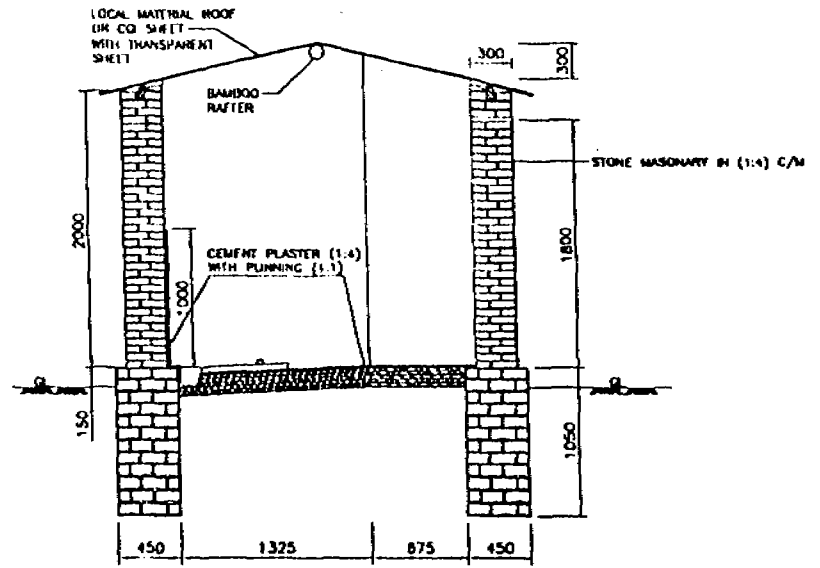
**ARRANGEMENT OF TOILETS AND URINALS  
FOR  
INSTITUTIONAL LATRINES**

ARRANGEMENT OF TOILETS & URINALS  
FOR INSTITUTIONAL LATRINES



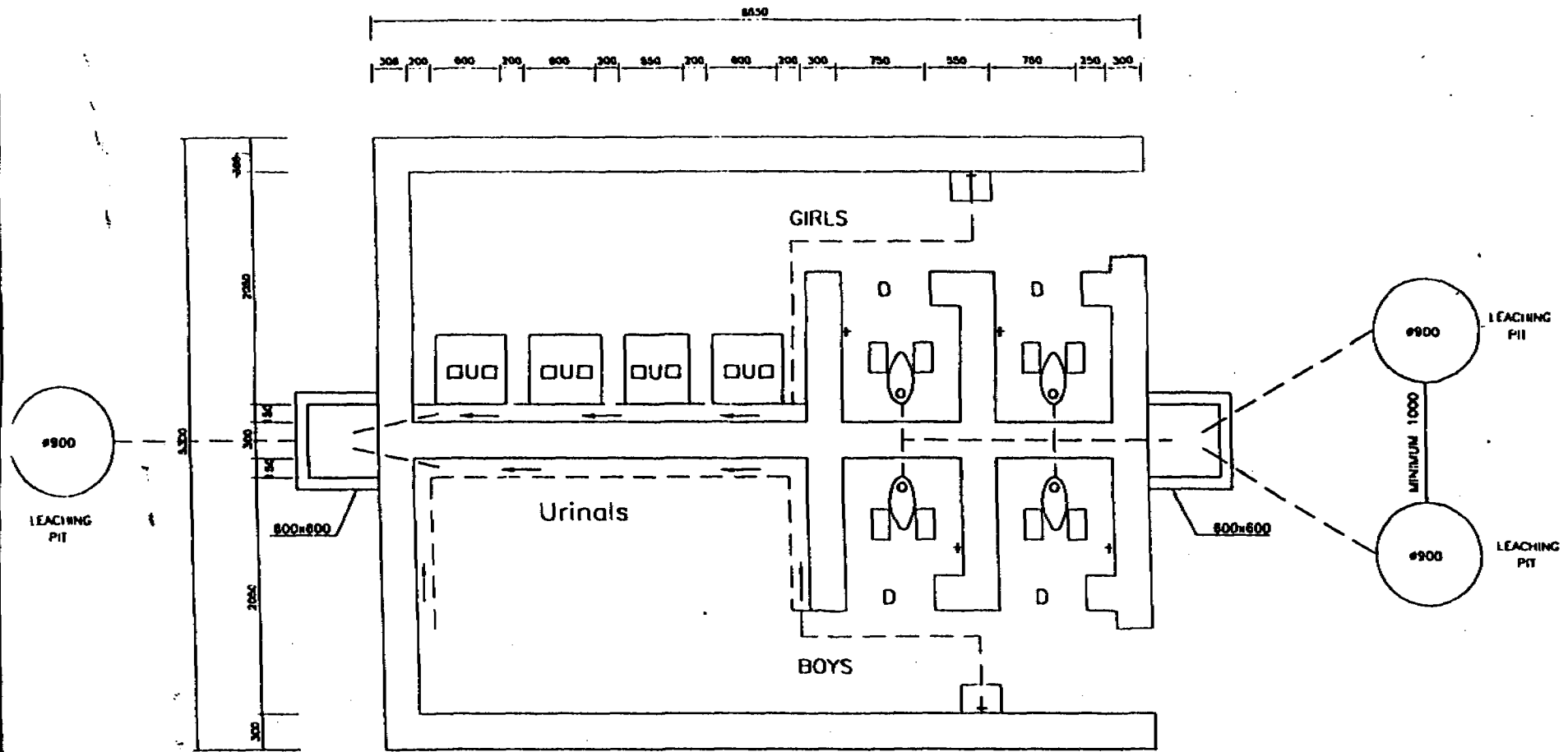


SECTION A-A  
BOYS' URINALS



SECTION B-B  
GIRLS' URINALS

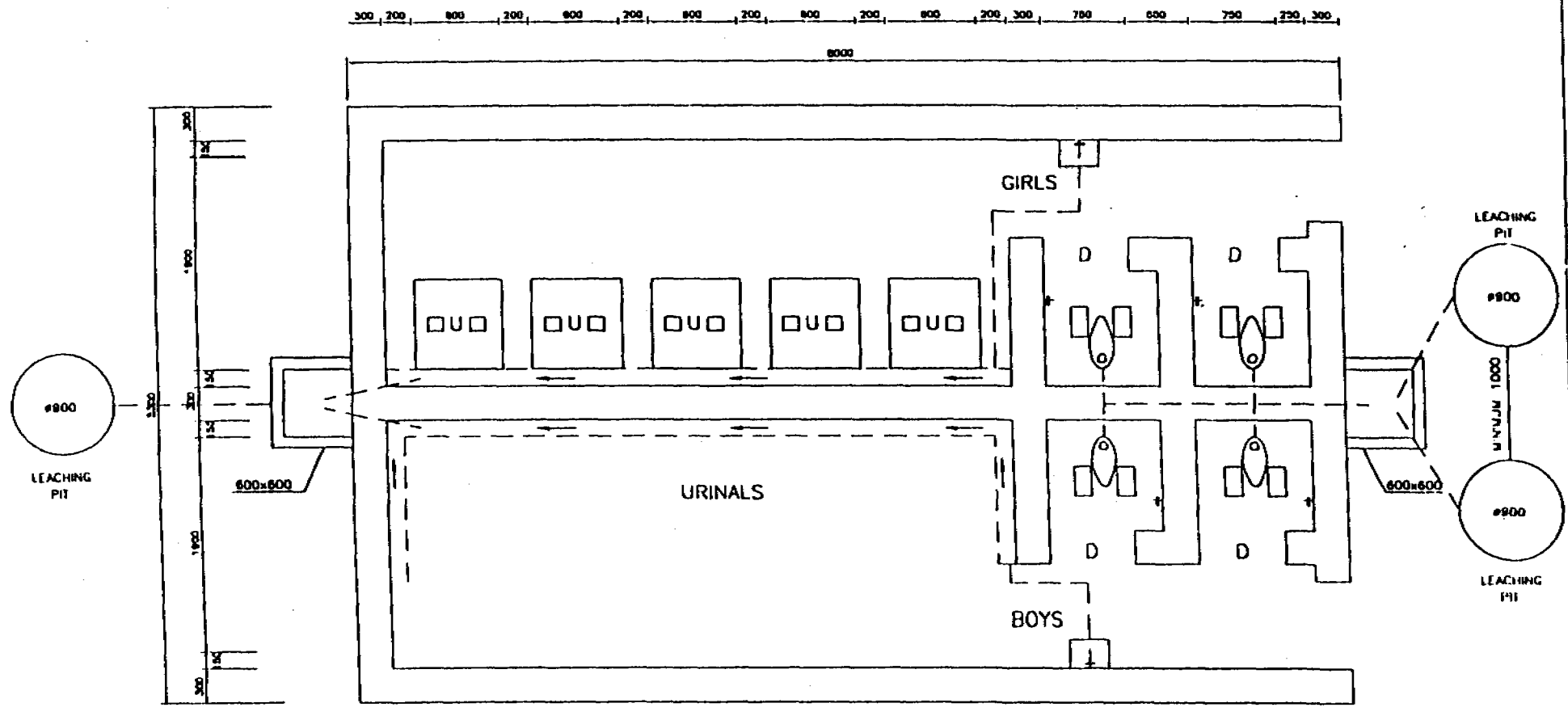
**ARRANGEMENT OF TOILETS & URINALS  
FOR INSTITUTIONAL LAIRINES**



UPTO 201-300 STUDENTS

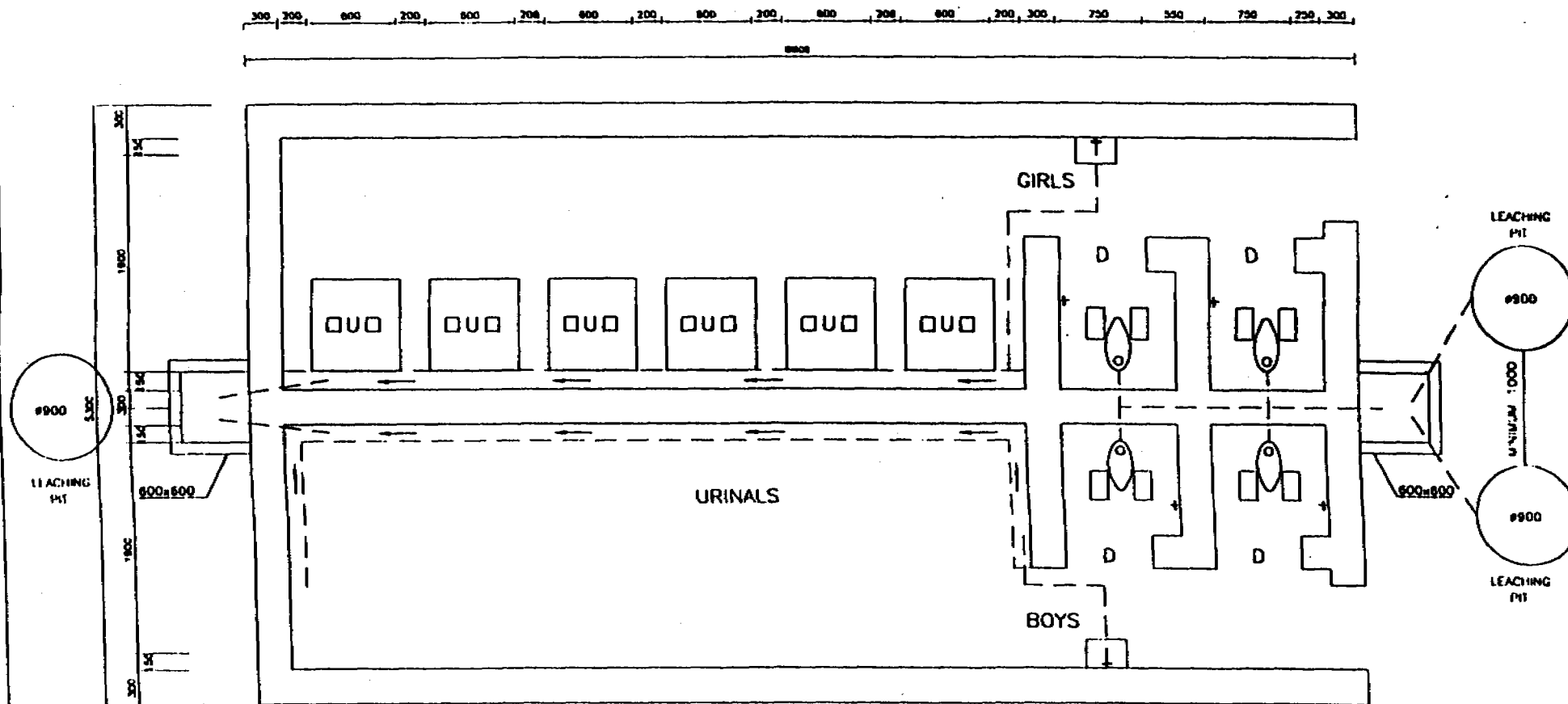


**ARRANGEMENT OF TOILETS & URINALS  
FOR INSTITUTIONAL LATRINES**



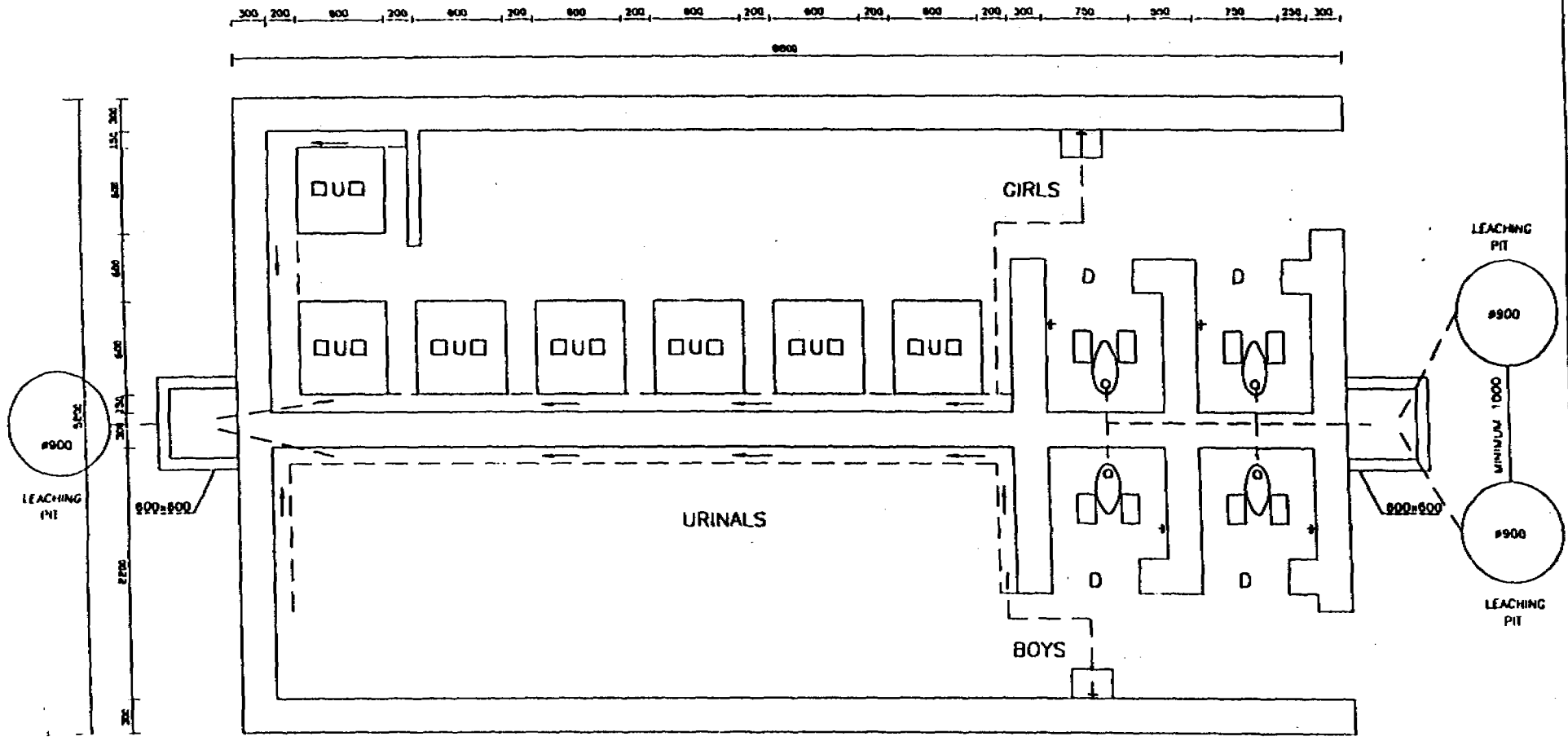
UPTO 301-400 STUDENTS

ARRANGEMENT OF TOILETS & URINALS  
FOR INSTITUTIONAL LATRINES



UPTO 401-500 STUDENTS

ARRANGEMENT OF TOILETS & URINALS  
FOR INSTITUTIONAL LATRINES



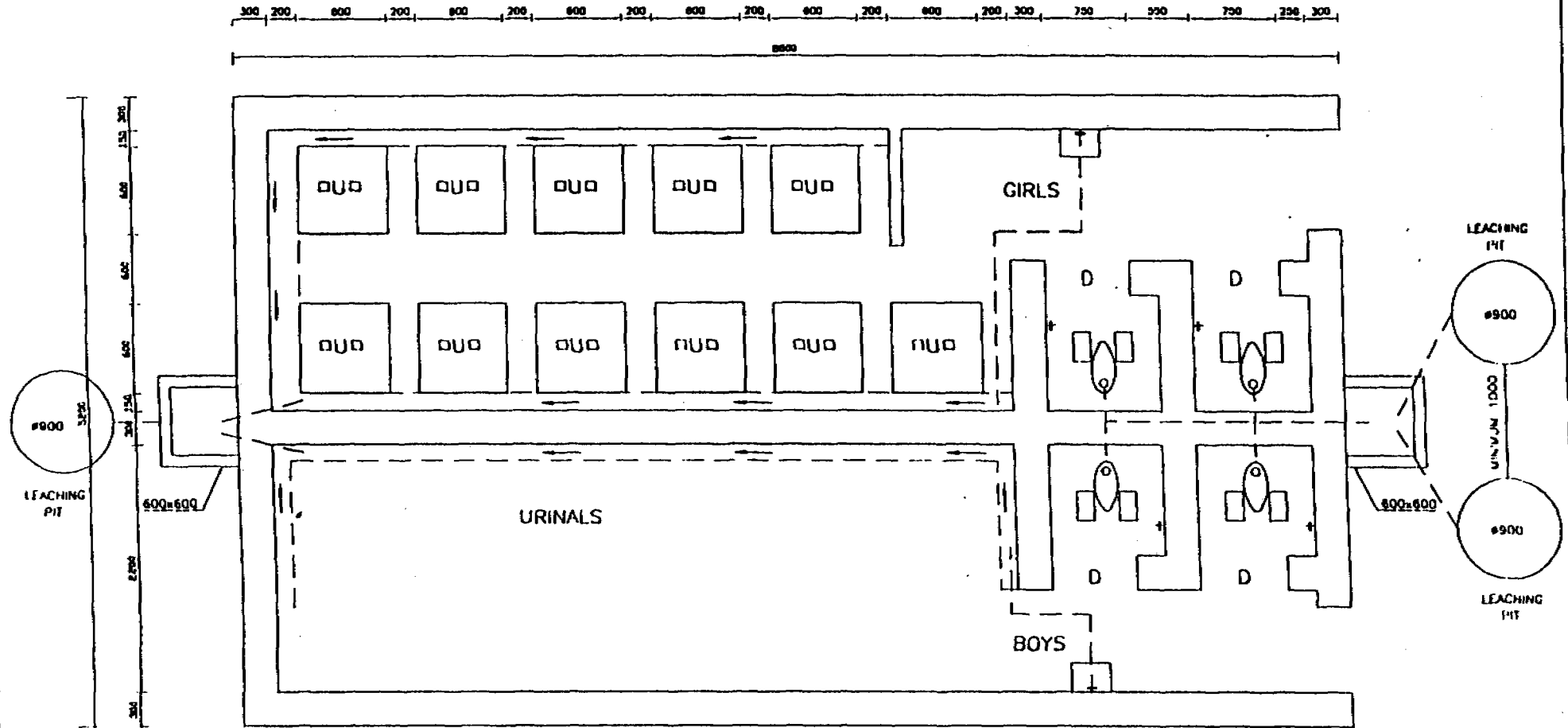
UPTO 501-600 STUDENTS







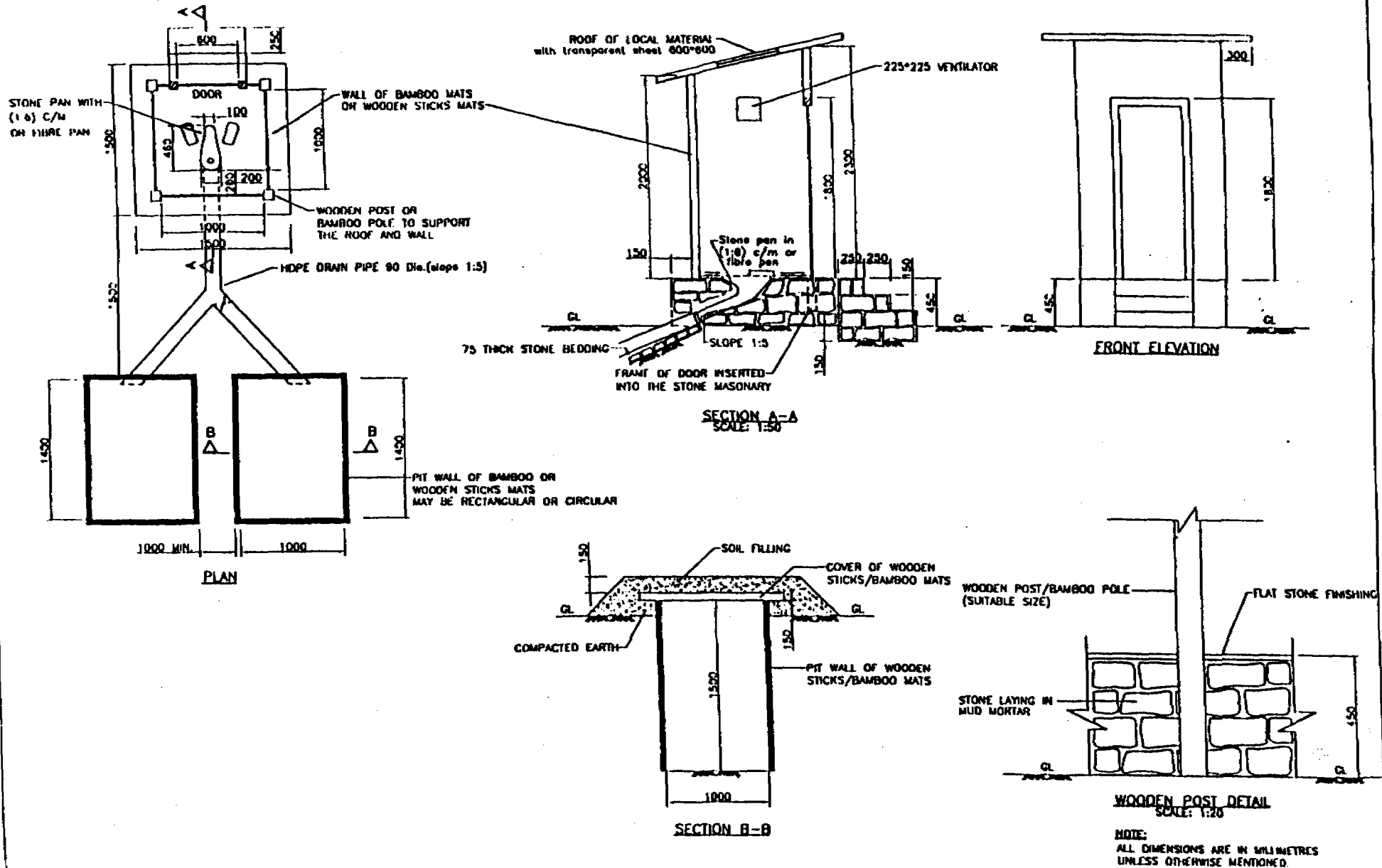
ARRANGEMENT OF TOILETS & URINALS  
FOR INSTITUTIONAL LATRINES



UPTO 901-1000 STUDENTS

OFFSET TYPE DOUBLE PIT LATRINE (WOODEN STICKS/BAMBOO MATS)  
FOR MOUNTAIN REGION (MODEL-1)

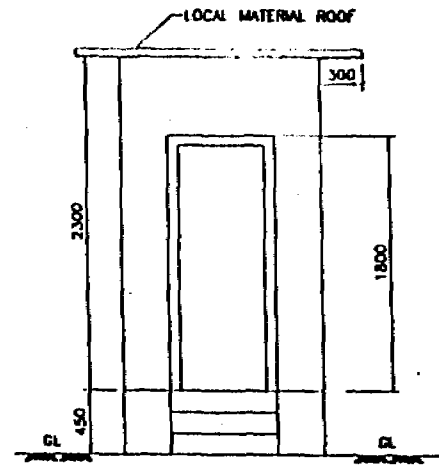
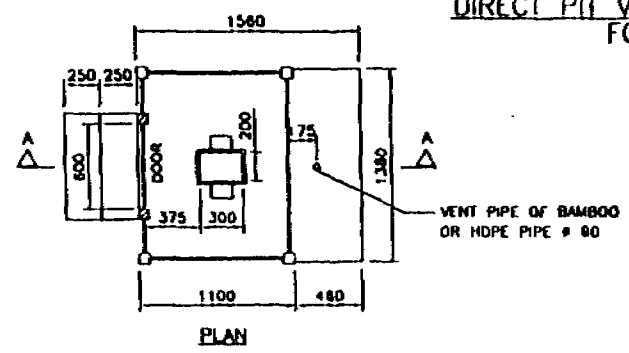
M1



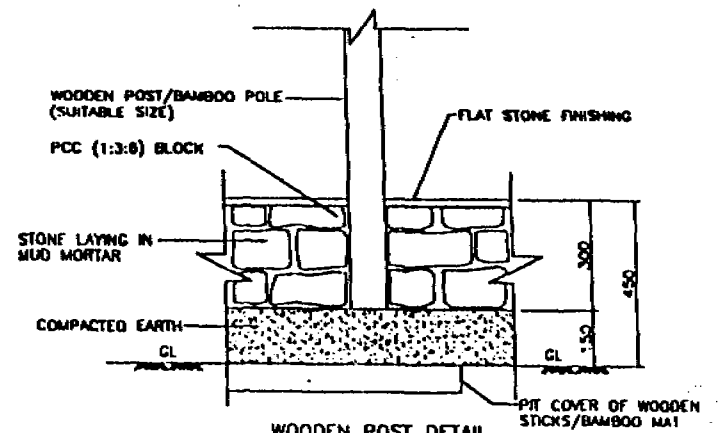
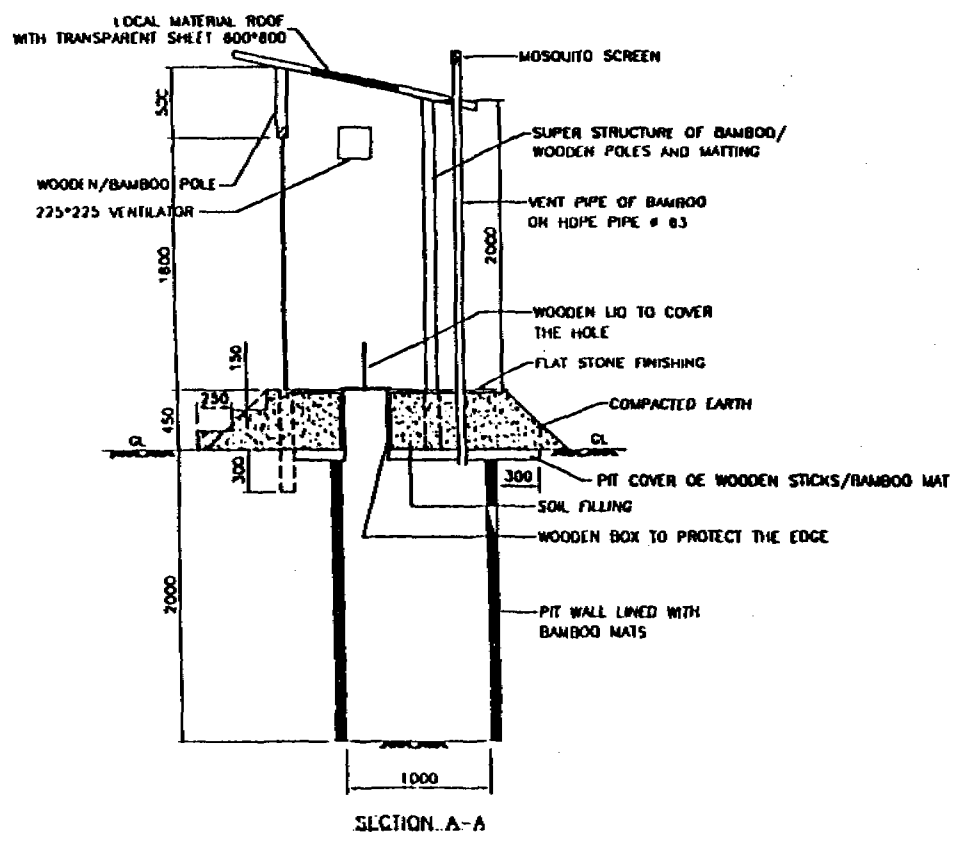
NOTE:  
ALL DIMENSIONS ARE IN MILLIMETRES  
UNLESS OTHERWISE MENTIONED.



DIRECT PIT VIP LATRINE (WOODEN STICKS/BAMBOO MATS)  
FOR MOUNTAIN REGION (MODEL-4)



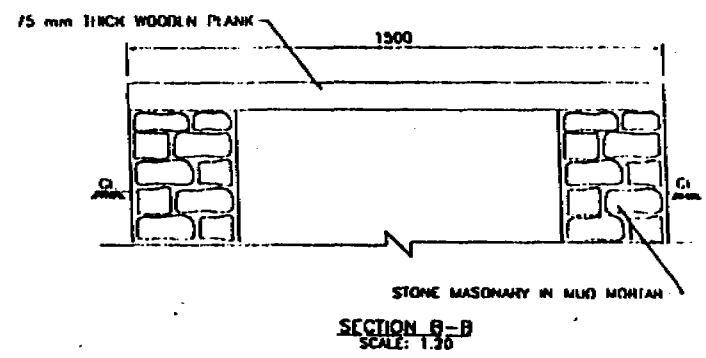
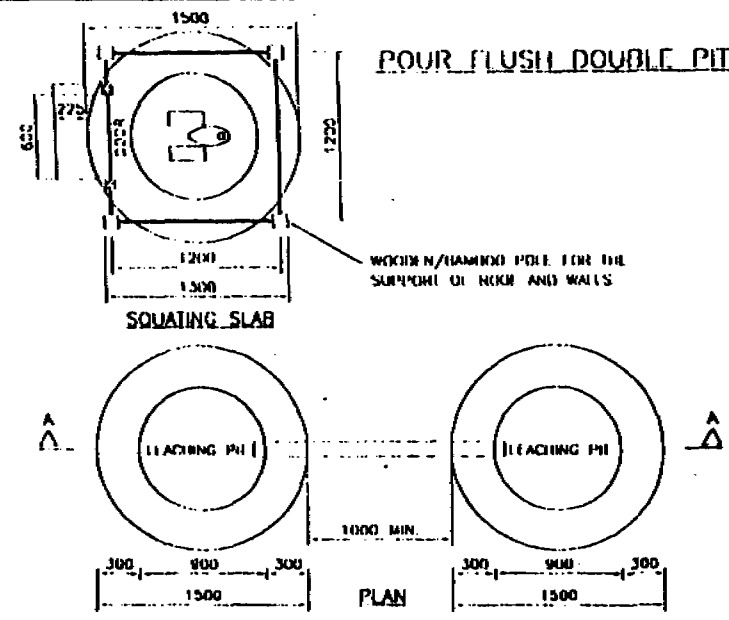
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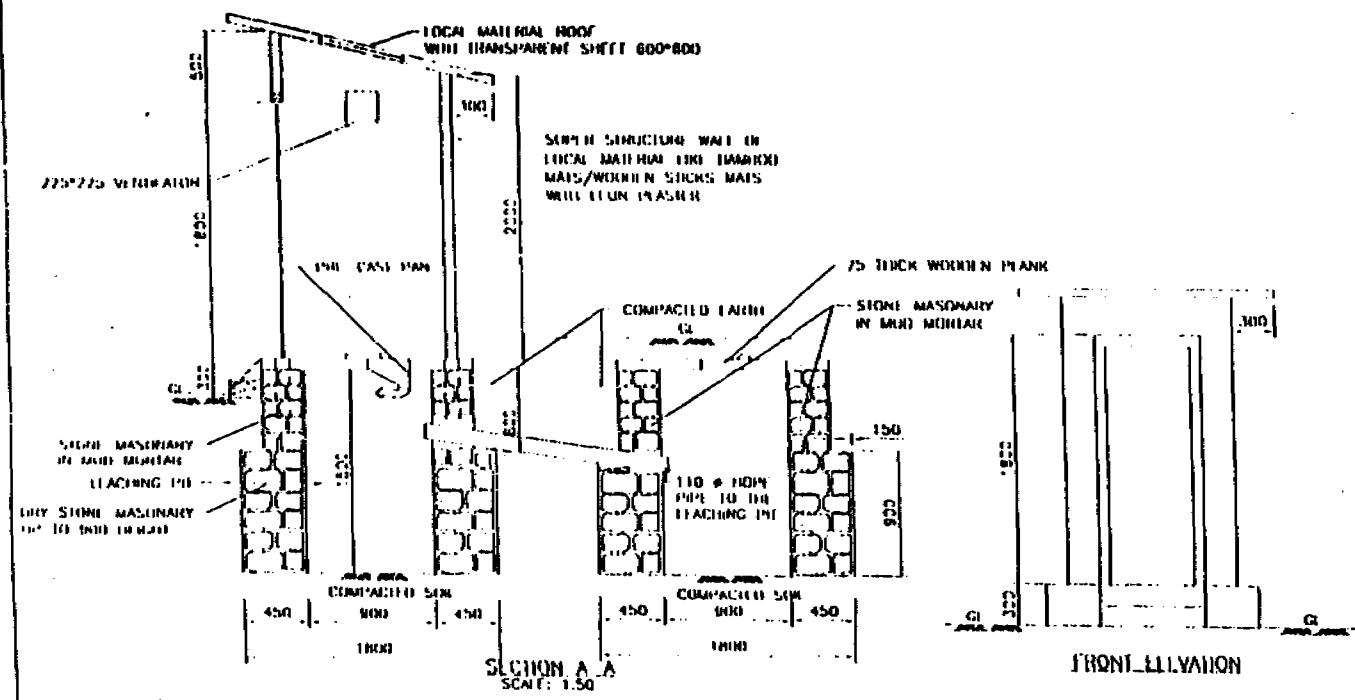
SCALE: 1:20

NOTE:  
 ALL DIMENSIONS ARE IN MILLIMETRES  
 UNLESS OTHERWISE MENTIONED.

**POUR FLUSH DOUBLE PIT LATRINE (WOODEN STICKS/BAMBOO MATS AND STONE MASONRY PITS FOR MOUNTAIN REGION (MODEL-5))**



**SECTION B-B**  
SCALE: 1:30



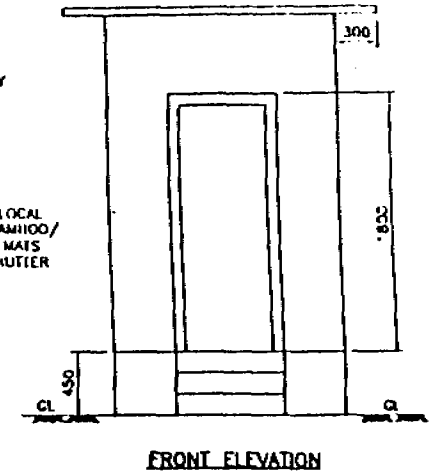
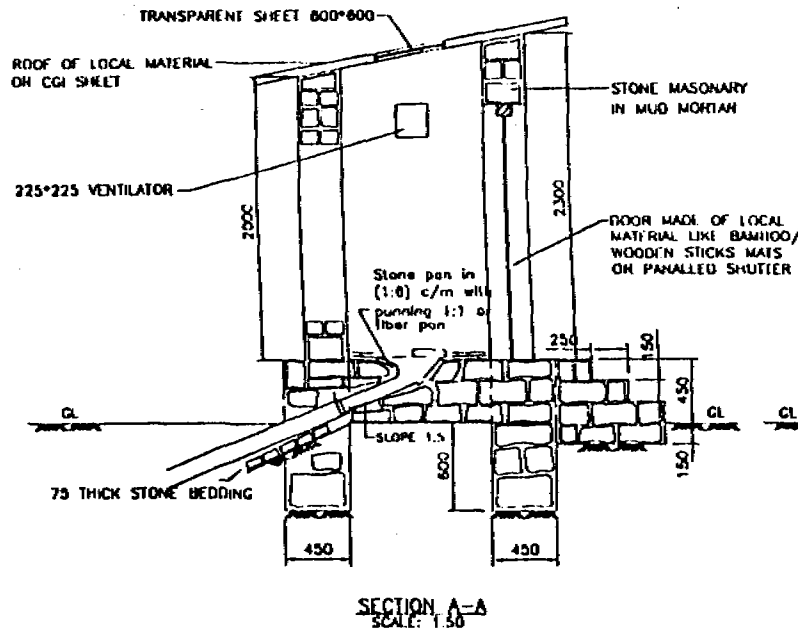
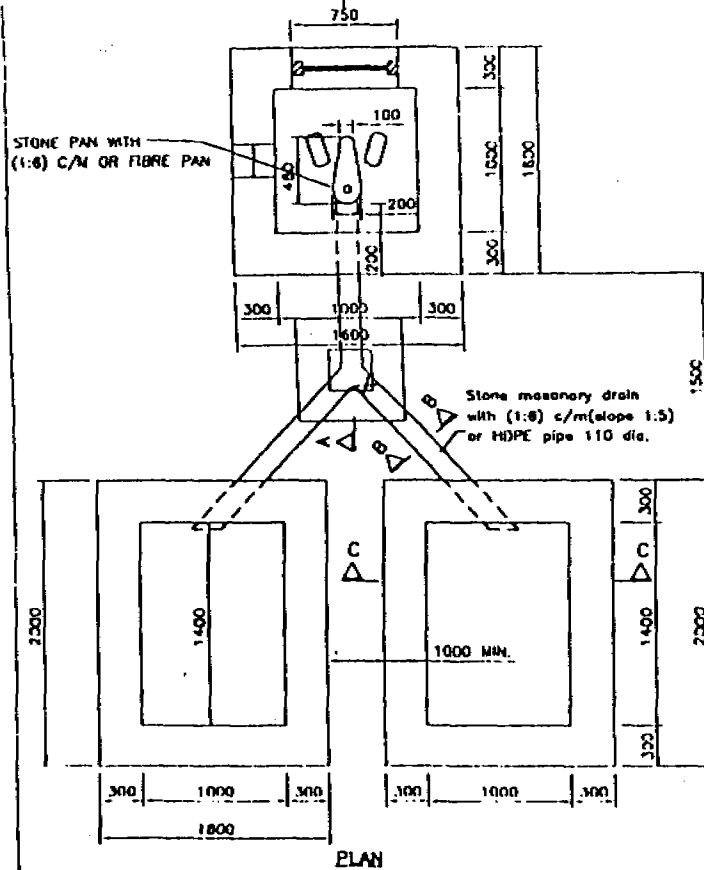
**SECTION A-A**  
SCALE: 1:50

**FRONT ELEVATION**

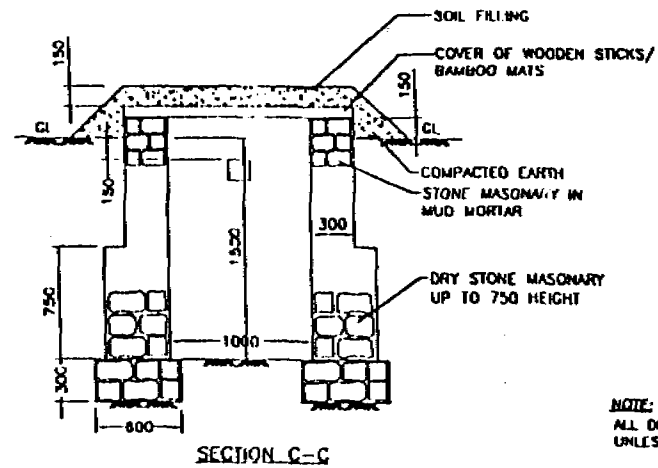
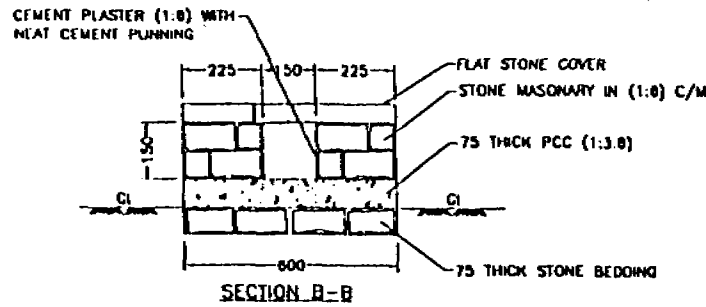
**NOTE:**  
ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE SPECIFIED

# OFFSET TYPE DOUBLE PIT LATRINE (STONE MASONRY) FOR HILL REGION (MODEL-1)

H1



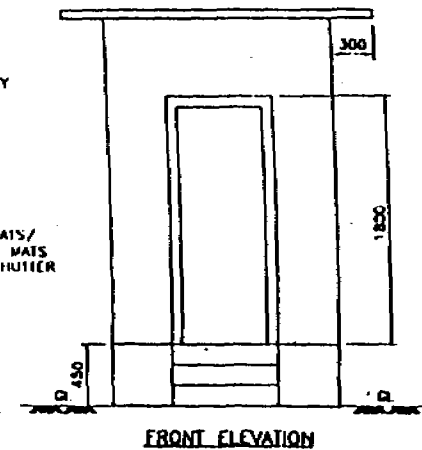
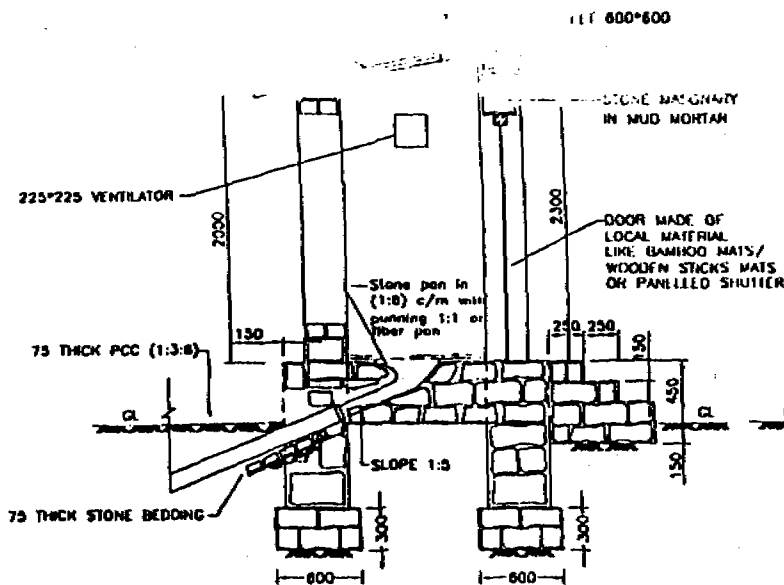
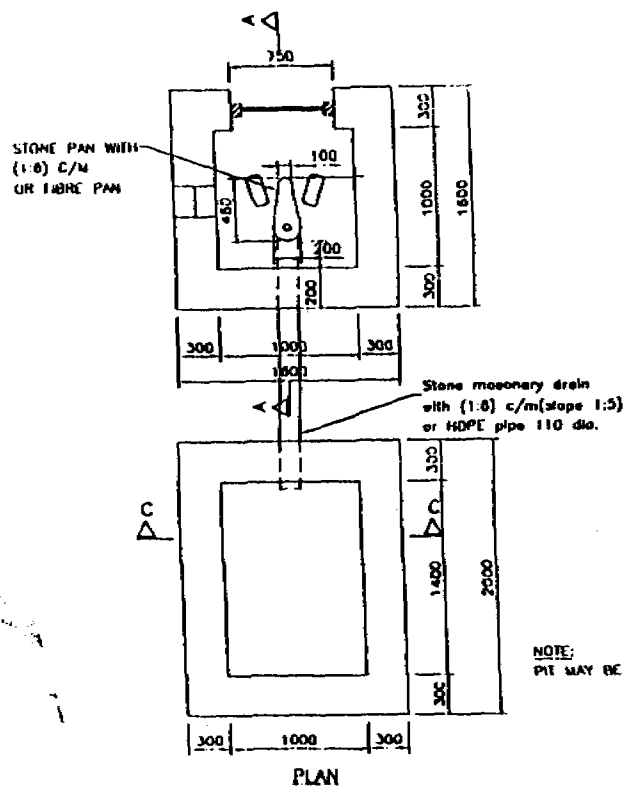
NOTE:  
PIT MAY BE RECTANGULAR OR CIRCULAR



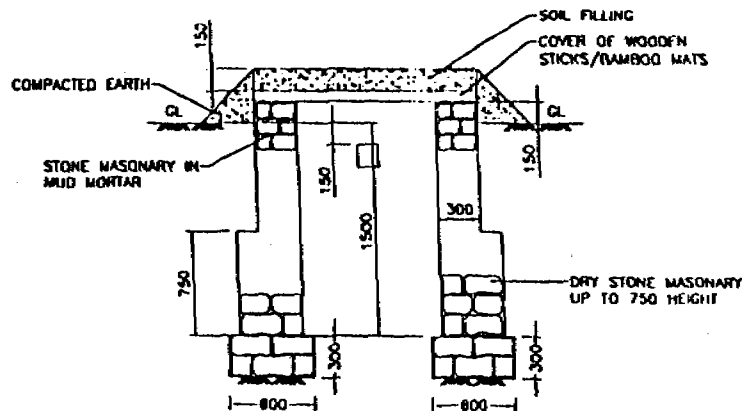
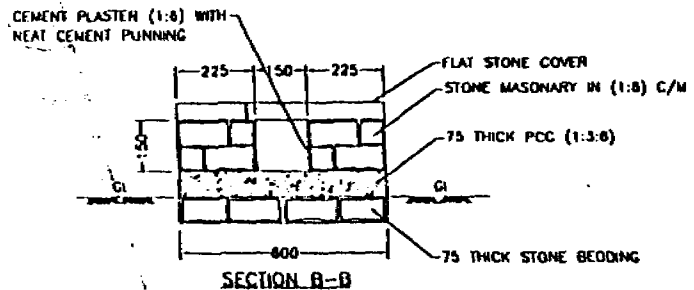
NOTE:  
ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE MENTIONED.

TYPE SINGLE PIT LATRINE (MASONRY)  
FOR HILL REGION (MODEL 2)

112

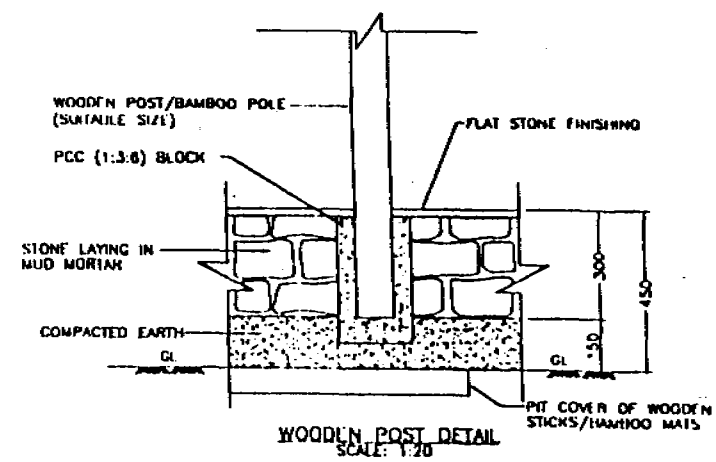
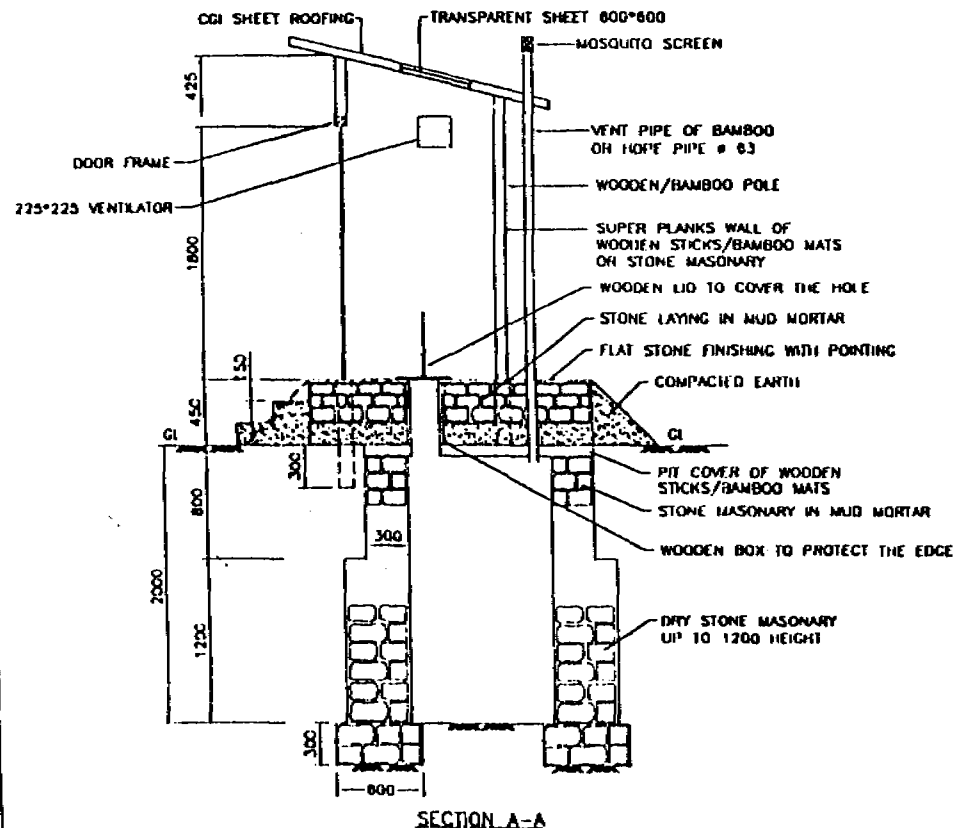
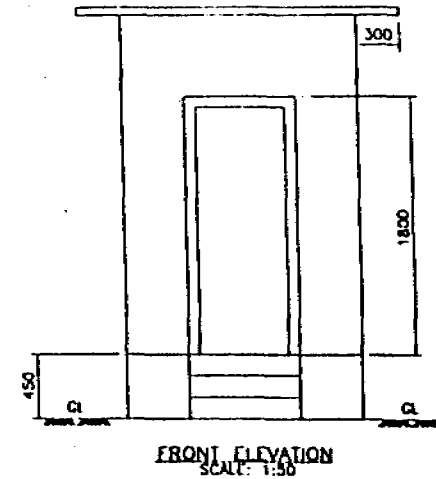
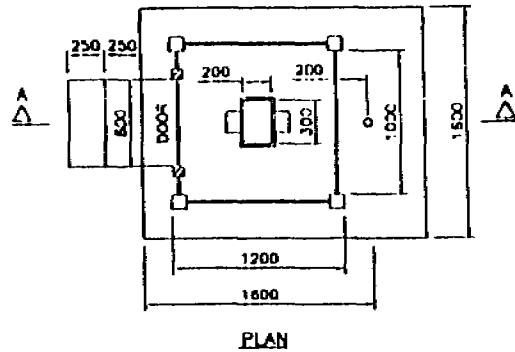


NOTE:  
PIT MAY BE RECTANGULAR OR CIRCULAR



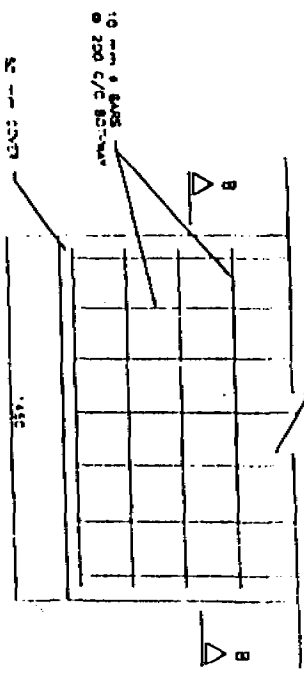
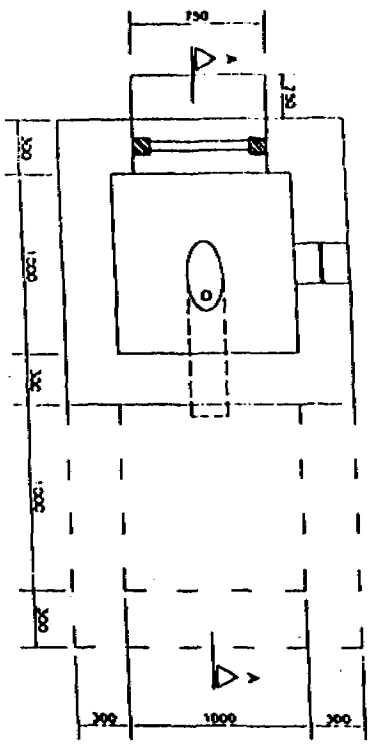
NOTE:  
ALL DIMENSIONS ARE IN MILLIMETRES  
UNLESS OTHERWISE MENTIONED.

DIRECT PIT VIP LATRINE (STONE MASONRY)  
FOR HILL REGION (MODEL-4)

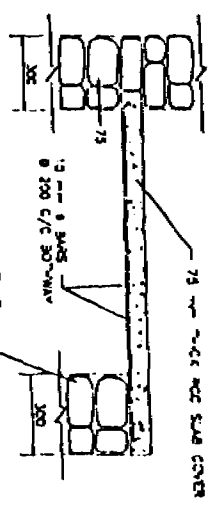


NOTE:  
ALL DIMENSIONS ARE IN MILLIMETRES  
UNLESS OTHERWISE MENTIONED.

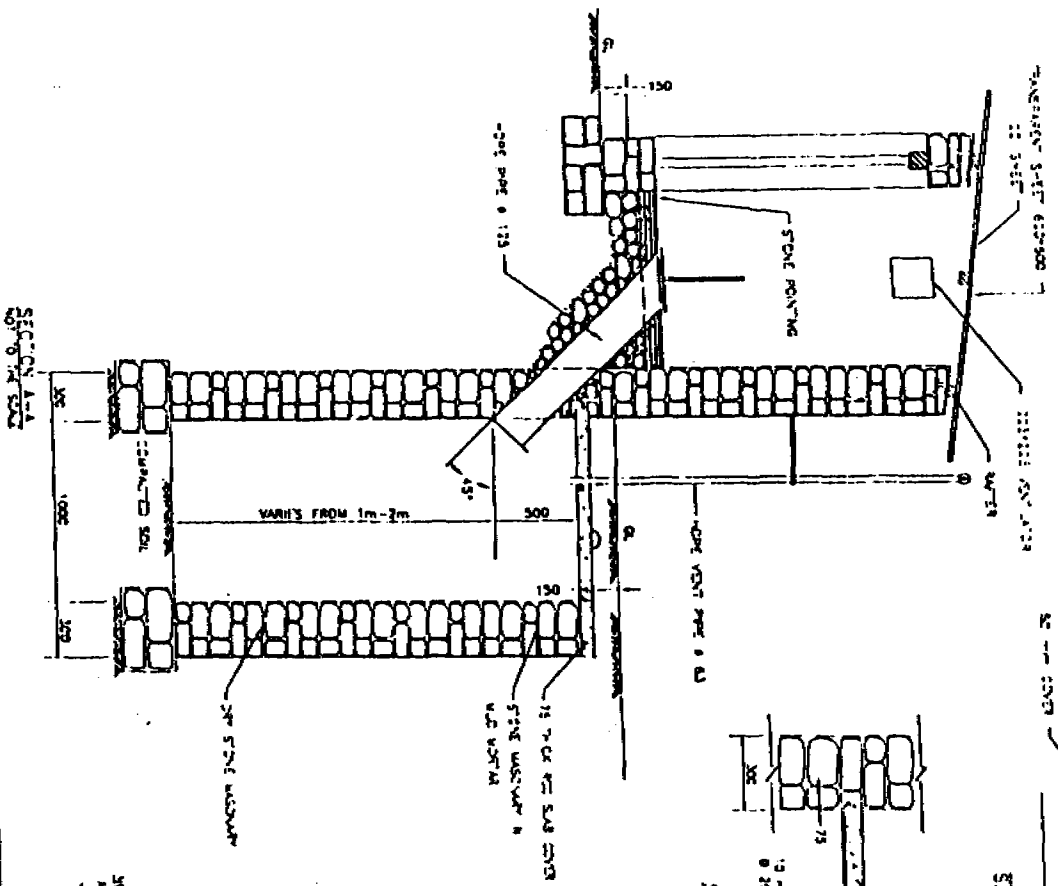
PLAN AND SECTION OF A REINFORCED CONCRETE WATER TOWER



SECTION B-B



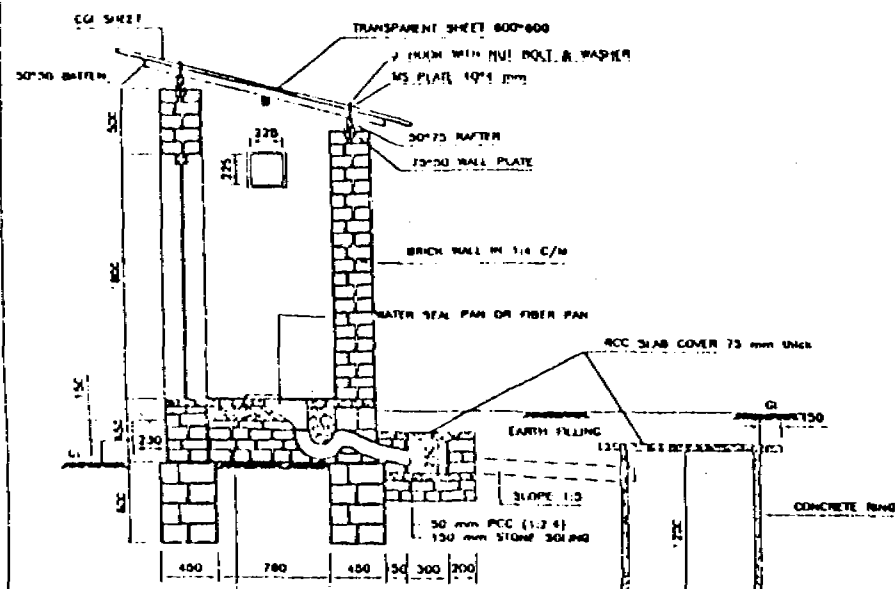
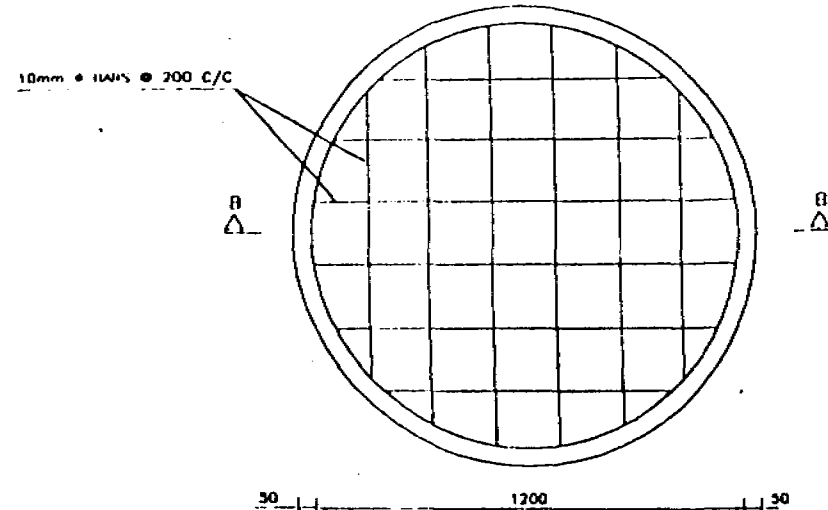
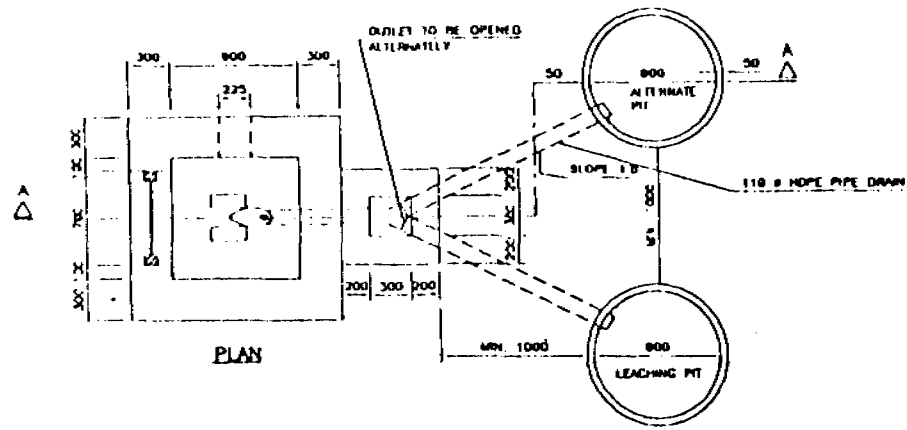
SECTION A-A



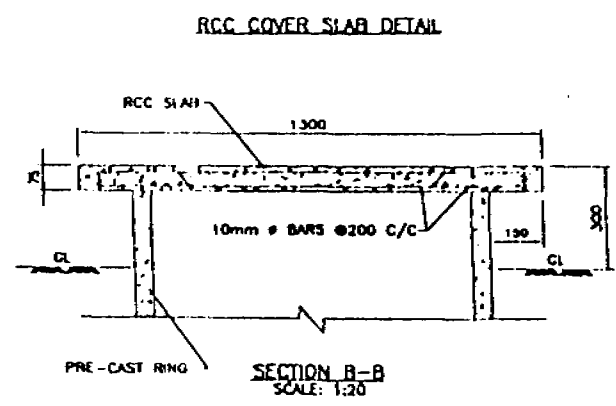
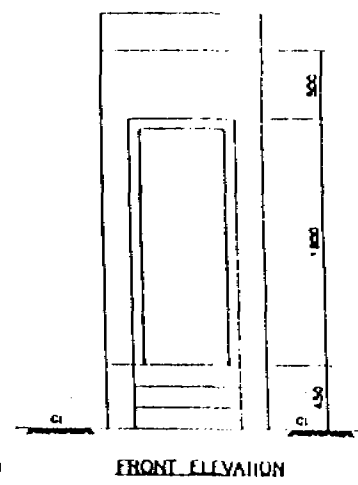
NOTE  
ALL DIMENSIONS ARE IN MILLIMETERS  
UNLESS OTHERWISE SPECIFIED

SULAV LATRINE IN STONE MASONRY WITH PRECAST RINGS FOR HILL REGION (MODEL B)

H5



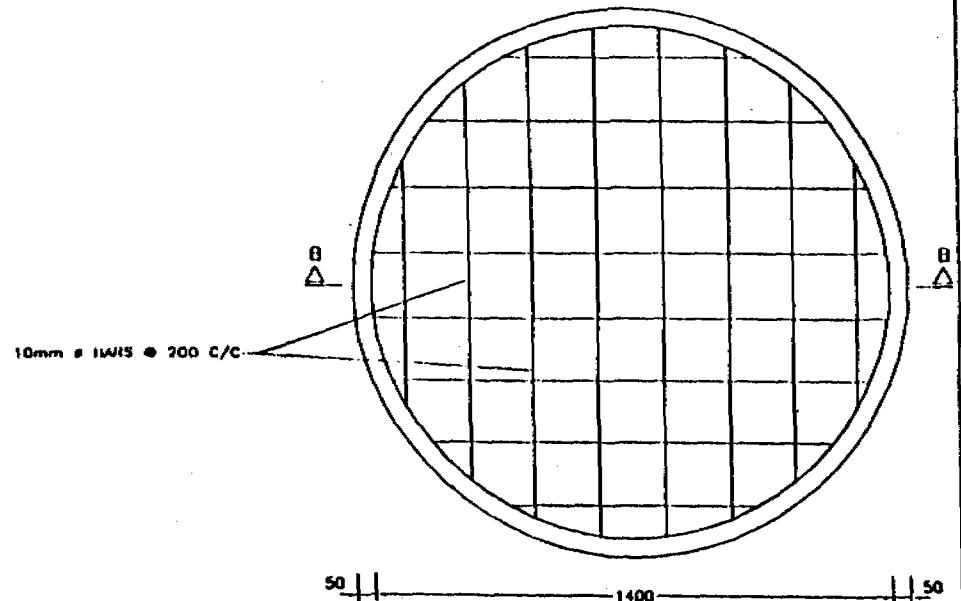
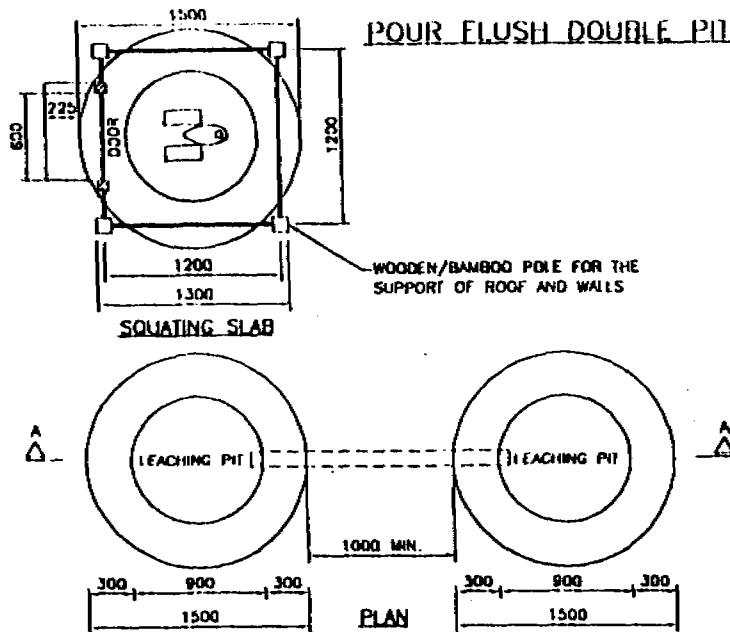
- 3 mm CEMENT MORTAR
- 12.5 mm CEMENT PLASTER (1:4)
- 50 mm PCC (1:2:4)
- 150 mm GRAVEL & SAND FILLING
- 300 mm STONE SOLING
- COMPACTED EARTH



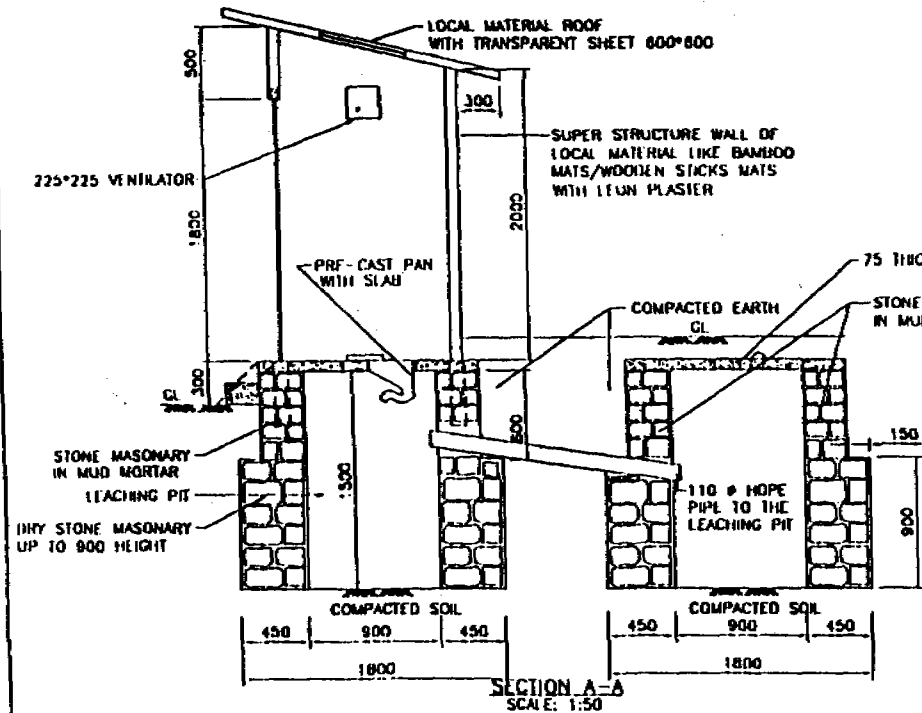
NOTE:  
ALL DIMENSIONS ARE IN MILLIMETRES  
UNLESS OTHERWISE MENTIONED.

POUR FLUSH DOUBLE PIT LATRINE (WOODEN STICKS/BAMBOO MATS AND STONE MASONRY) FOR HILL REGION (MODEL-7)

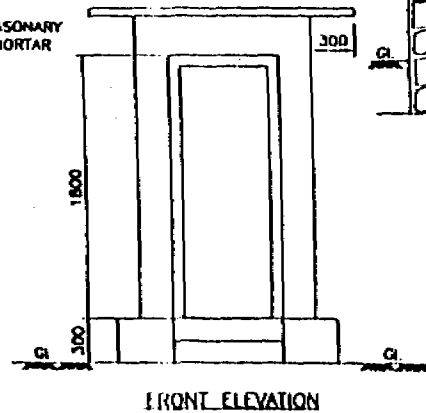
116



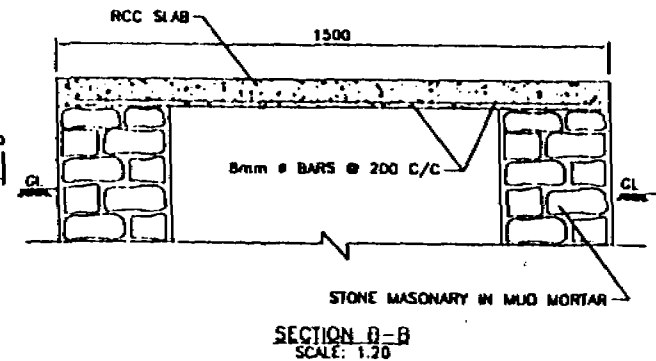
RCC COVER SLAB DETAIL



SECTION A-A  
SCALE: 1:50



FRONT ELEVATION



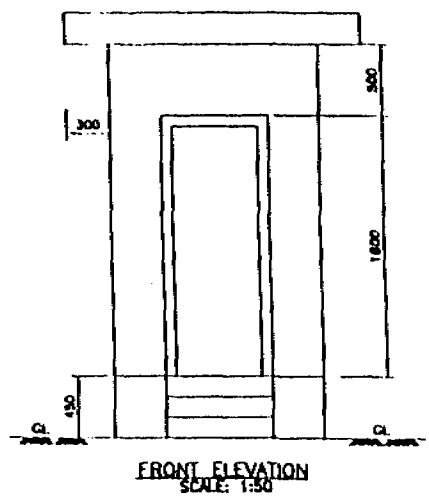
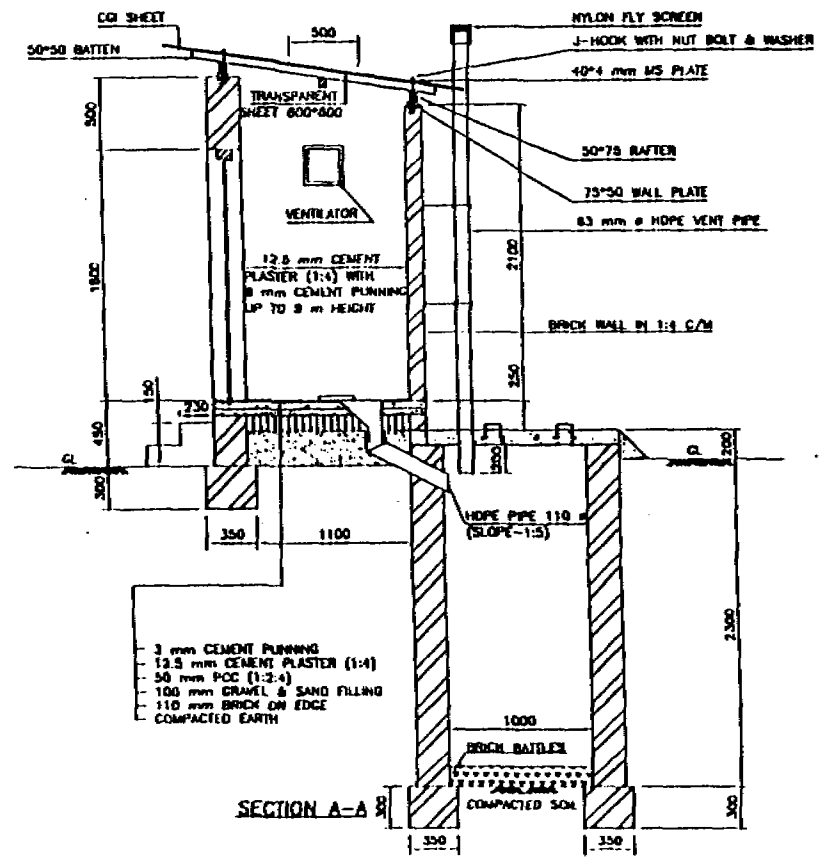
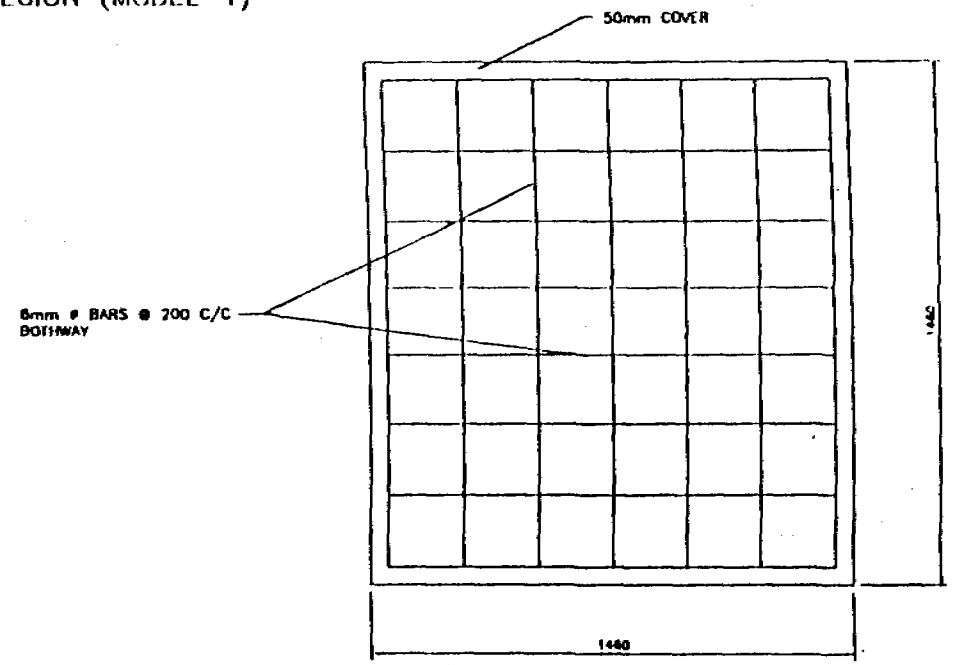
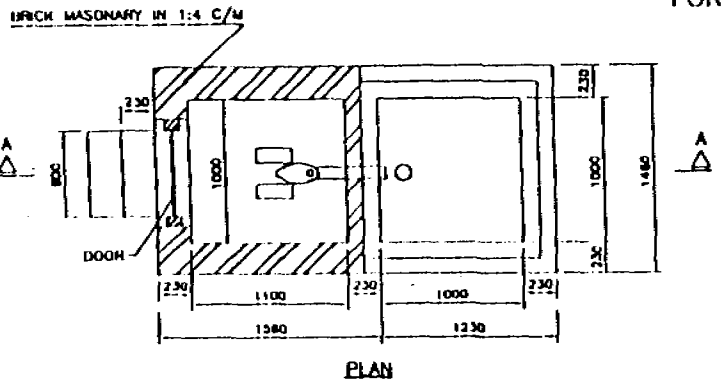
SECTION B-B  
SCALE: 1:20

NOTE:  
ALL DIMENSIONS ARE IN MILLIMETRES  
UNLESS OTHERWISE MENTIONED.



VIP LATRINE OFFSET TYPE WITH ATTACHED PIT (BRICK MASONRY)  
FOR TERAI REGION (MODEL-1)

T1



NOTE:  
ALL DIMENSIONS ARE IN MILLIMETRES  
UNLESS OTHERWISE MENTIONED.