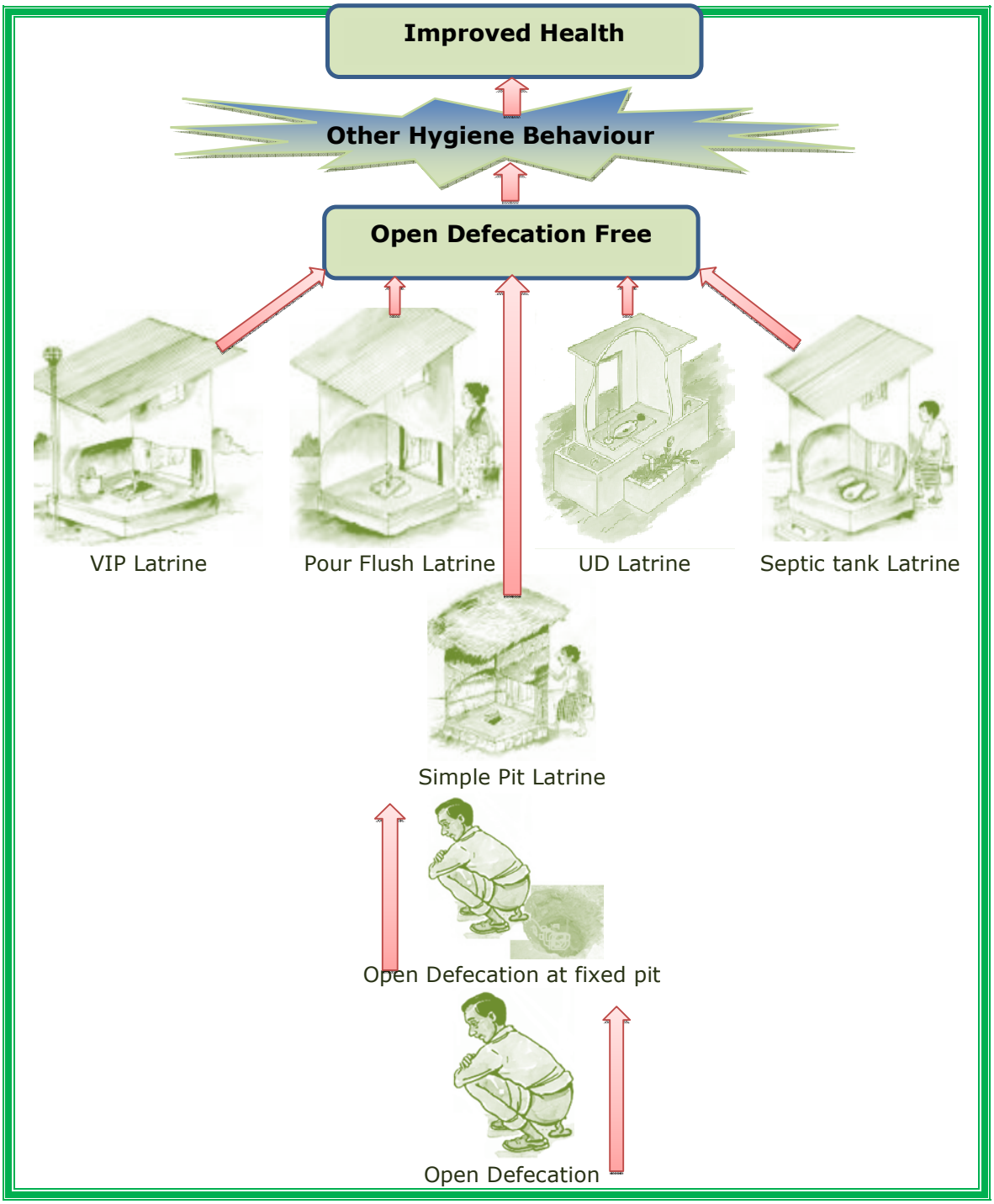
Household Latrine Options for Rural Hills of Nepal



SNV Netherlands Development Organisation
Connecting People's Capacities

Household Latrine Options for Rural Hills of Nepal

Compiled by:

Jagadishwar BARUN
WASH Advisor
SNV Nepal

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Part I

1. Introduction

Sanitation is 'way of life', which is expressed in clean home, community, institutions for better health and safe environment. Moreover, safe sanitary practice is a crucial indicator for qualifying improvement in standards of living. This concern is triggered by the fact that nearly 57% (NMIP 2010) of the rural population in Nepal still reported practicing open defection.

Improving this situation calls for sustained commitment and a comprehensive programme to effectively address the issues of sanitation. The Community Led Approaches (CLTS, SLTS, CLBSA, WLTS etc.) Campaign is the reflection of this commitment which seeks to improve the quality of life in the rural areas through accelerated rural sanitation coverage, generation of felt need through awareness creation and health education; coverage of rural schools with sanitary facilities; encouragement for suitable, cost effective and appropriate technologies; check in absenteeism; and reduction in the incidence of water and sanitation related diseases. Community Led Approaches have, therefore, developed strategic components to ensure full coverage of sanitation through programmatic support in software component of household, school, and community sanitation.

2. Why Household Sanitation

Excreta disposal is an important part of overall environmental sanitation. Inadequate and unsanitary disposal of infected human excreta leads to the contamination of the ground water and sources of drinking water supplies. It provides shelter to breed flies to lay their eggs and to carry infection from faeces to other human beings. Man is the reservoir of infection for several diseases. Faecal borne diseases and worm infestations are the main cause of deaths and morbidity in a community where they go for indiscriminate defecation.
It is interesting to note that all such diseases are controllable or preventable through good sanitary barriers through safe disposal of human excreta. As may be seen in fig 1, there are many ways by which disease-producing pathogen spreads or reaches the new host – the human being.

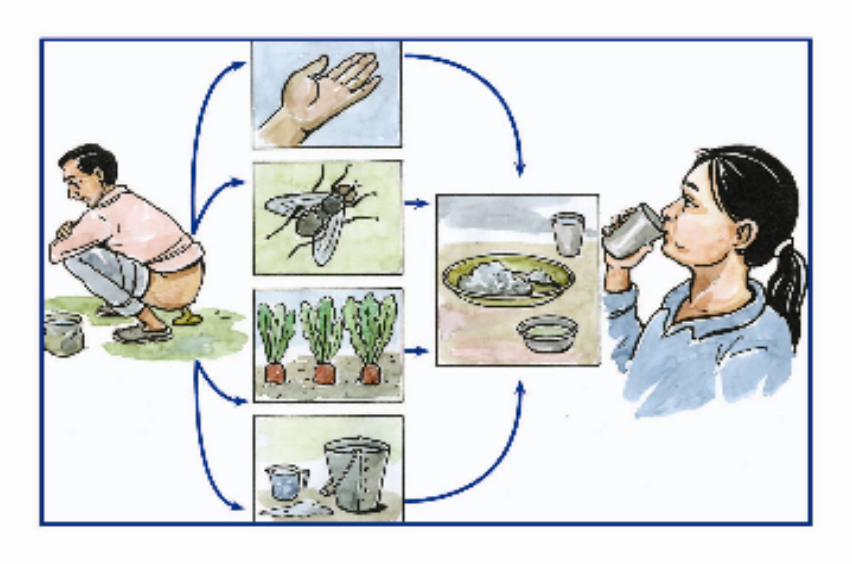


Figure 1: Disease Transmission Route *(Adopted from UNICEF presentation)*

Depending upon the hygiene behaviour of the individual, the causative agent or pathogen from faeces takes different mode to reach the host. This is illustrated in Fig 1.

The technical objective of sanitary disposal of human excreta is therefore to isolate or segregate human faeces so that the disease-producing organisms in faeces cannot possibly get into a new host through the common modes of transmission. The fig 2 shows the place at which the technology is applied to break the chain of transmission from human excreta. This technology is called sanitary barrier or sanitation technology for safe human excreta disposal.

Figure 2: Sanitation Barrier *(Adopted from UNICEF presentation)*

Faeco-oral disease cycle can be broken at various levels by:

- Segregating faeces
- Providing protected drinking water supply
- Keeping foods clean
- Improving personal hygiene (Hand washing with soap at critical moments)
- Controlling flies and
- Disposing waste water safely

These are some methods of breaking the faecal borne disease cycle. In this handbook we will focus on Latrines only. Of these, the most effective method is the segregation of faeces and its proper disposal. The method is called "Sanitary Barrier". This barrier can be provided by a "Sanitary Latrine" and disposing the faeces safely into a pit. Sanitary latrines are made to contain the entire waste material (excreta, urine and ablution water, sanitary pad), which efficiently prevents contact, by human beings, flies or any other animals or insects. In addition to this, the hand-washing facility nearby or inside the Latrine is also essential. Several models of sanitary latrines are now available to the people. The models and types vary from place to place and people to people. One should not forget to choose a model that fulfils the criteria of a 'Sanitary Latrine'.

Since, the households are first and primary unit of sanitary latrine system therefore, the importance of household sanitation becomes important part of any sanitation drive in order to ensure proper disposal of excreta waste as well prevent open defecation.

The greatest public health effects do not come from the quantity and quality of drinking water supply alone, but by ensuring that pathogens cannot reach the environment through the unsafe disposal of human excreta, especially faeces or are washed off safely through greater personal cleanliness.

Most water and sanitation related diseases can only be prevented by changing and improving a number of hygiene behaviours. The most significant of them appear to be:

- Sanitary disposal of excreta (faeces)
- Hand washing, after defecation and before touching food

- Maintaining drinking water free from faecal and chemical contamination

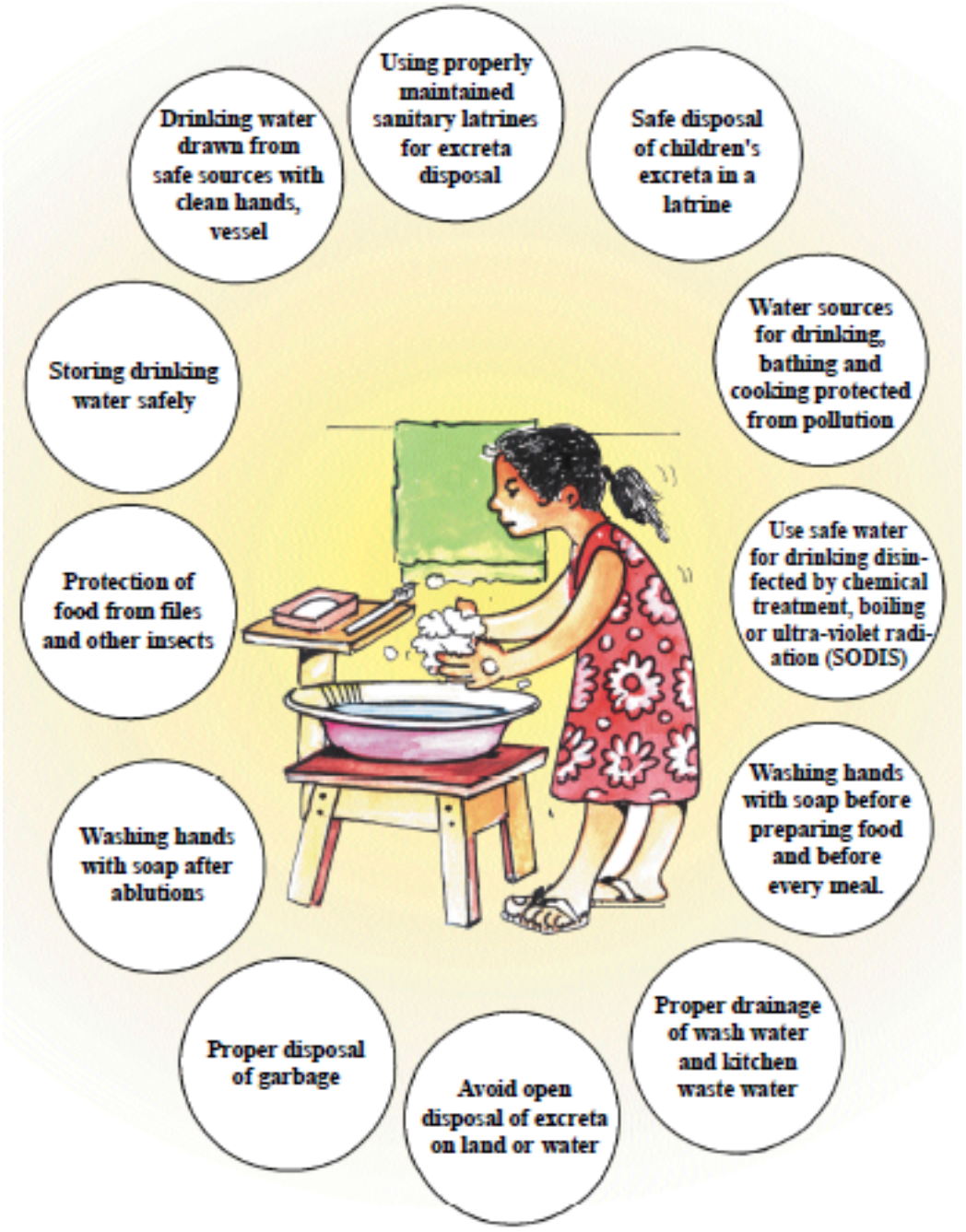


Figure 3: Behaviours that reduce risks of water and sanitation related disease transmission *(Adopted from Reference#6)*

3. Extent of the Problem in Nepal

In Nepal more than 86% of population live in rural areas. Several studies conducted in Nepal have shown that there is high prevalence of open defecation practices. Faecal borne diseases rank high among communicable diseases in Nepal. The recent data for the year 2010 A.D. published by Department of Water supply and Sewage indicated that only 43.04% of people do have access to latrine facilities. Nearly 80% of the total diseases occur due to lack of proper water and sanitation. High infant mortality and under nutrition are also attributed to the open air defecation which are high in rural areas. The high incidence of faecal borne diseases is aggravated with the people or community living in poor condition. Less than 30% households in most of remote area have access to improved Latrine whereas more than 70% people are able to afford the Latrine provided if they get right choice in-terms of technology, price and product suitable to them. Therefore, it becomes necessary to select and provide a suitable technology within affordable cost and the space available to them and to suit their location and place where they live. What they need is a sanitary latrine and good hygiene practices so that human excreta need not come into contact with the new host. In view of this, it is stressed that the sub-structures of the Latrine is the most important element of making a good Latrine.

Box 1 A sanitary Latrine

Nepal's National Sanitation and Hygiene Master Plan -2010 adopted the definition of Joint Monitoring Programme (JMP) of UNICEF and WHO. According to the JMP, an improved sanitation facility is defined as one that hygienically separates human excreta from human contact. The JMP uses the following classification for improved sanitation facilities, however, sanitation facilities are not considered improved when shared with other households or open for public use.

a) Flush or pour-flush to:
   - -piped sewer system
   - -septic tank
   - -pit latrine

b) Ventilated Improved Pit (VIP) latrine
c) Pit toilet with slab and lid
d) Composting toilet (eco-san)

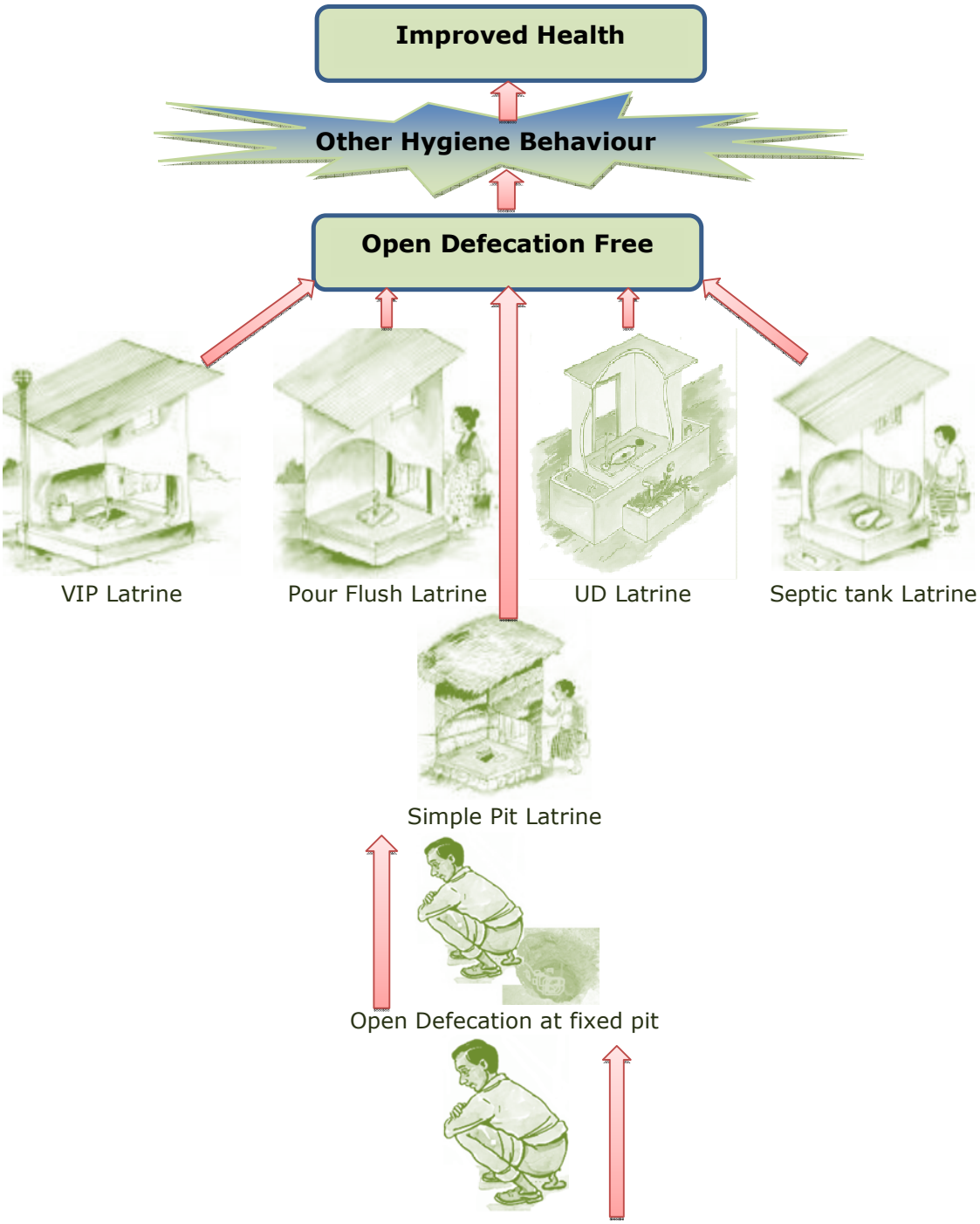
The country is in process of finalizing National Sanitation and Hygiene Master Plan and Implementation Guideline that serves as the visionary planning document for addressing blockages in the sanitation sector. With this master plan, Nepal has to achieve at least 53% Latrine coverage by 2015 to meet the sanitation Millennium Development Goal (MDG). The recent trend of Latrine coverage is in track which may attain the MDG but it needs pragmatic vision, operational strategies, strengthened institutional arrangements, adequate resources and stakeholders' collaborative efforts to achieve the national goal of universal Latrine coverage by 2017.There has been integration of the sector plans with the plans of the local development agencies. Many districts of the country have developed district level plan of action to achieve total sanitation through collaboration with an aim of supporting and promoting bottom up approach of sector development.

4. Technology for Safe Disposal of Human Excreta

It's time now to look at all the different kinds of options available to you for building a community sanitation system. There is no 'One size fits all' sanitation system that can be built and used anywhere and at any time. And, this is a good thing because sanitation systems differ greatly based on a complex set of factors such as technical, environmental, financial, institutional, politico-legal and socio-cultural.

Therefore, it is important to give several technological options for household latrines to the user to choose and own and maintain a sanitary latrine without much external

support. These options must help user to select the most suitable to them in terms of cost as well as design without compromising the criteria of sanitary latrine. For example, between indiscriminate open defecation and water seal latrine, one can identify several options by applying the sanitation upgradation approach - a movement from one alternative to another alternative, which is better than the previous one. This approach is taken into account of the affordability of the community and same time it is flexible to allow for upgradation. e.g. a simple pit can be upgraded by lining the pit. A lined pit can be upgraded into a seat over the pit with a water seal. A single pit can be upgraded into a double pit. A suitable super structure can be built and upgraded. Consistent and correct use of Latrine leads a community towards an Open Defecation Free (ODF) Community and sustainable ODF and good hygiene practice result towards Total Sanitation Practice.



Open Defecation

Figure 4: The Sanitation Transformation

Let's begin by looking at how sanitation systems are classified, the different sanitation systems available under each type of classification and a brief indication of their suitability for particular situations, and their disadvantages. For each type of sanitation system, we will also look at the typical costs for building and maintaining it. There are three main aspects to classify a sanitation system.

Classification of Sanitation Systems

A simpler way of understanding different types of sanitation systems is to think of them as primarily on-site and off-site systems that are each sub-divided into wet and dry systems respectively.

On-site, off-site and hybrid systems: On-site systems basically retain excreta and sometimes they retain also grey water (from bathrooms, including bathing and washing clothes and kitchen, including washing vegetables and utensils) on or near the point at which they are generated. Off-site systems remove both excreta and grey water from the vicinity of the plot for disposal elsewhere. Hybrid systems are a combination of on-site and off-site systems. They are used for systems that retain solids on or near the plot but remove wastewater elsewhere.

Wet or dry systems: Wet systems depend on water to transport excreta; dry systems don't transport excreta at all or use other means to transport excreta, such as vacuum trucks, etc.

Separated or Mixed at Source: This refers to the level of separation applied to different waste wasters and /or human excreta flows, e.g. separation of black water from grey water or separation of faeces from urine etc.

It is important to note that none of these classification systems take into consideration the method of anal cleansing, which varies widely from country to country. Indeed, whether on-site or off-site, a dry sanitation system could use water for cleansing while a wet sanitation system could use Latrine paper, leaves or other methods for the cleansing.

5. Selection of Technology in different Conditions

There are several designs and technologies available for installing a household type sanitary latrine. But several inter-related factors play important role in installing a sanitary latrine to a rural household. This includes:

- Affordability (Cost and Materials)
- Availability of space
- Geographical conditions - soil/water table etc
- Cultural habits, Social customs and anal cleansing practices
- Availability of water/scarcity of water
- Availability of skilled or semi-skilled manpower
- Desired level of aesthetics
- Preparedness for emptying a pit and recovery of compost
- Preparedness for constructing additional pit
- Local regulations in force
- Environment friendliness

- Means of disposal of sludge and waste water

A particular technology can't be applied in all conditions; therefore, it really becomes a challenge to select a suitable technology. Many technological options have been discussed but for the initial selection of a suitable disposal system technology, the following Box 2 may be useful.

Box 2 Selection of Latrine in different conditions

		Conditions										
		Rural areas	*Suitable for high ground water table*	*Suitable for areas prone to floods*	*Suitable for loose soil*	*Suitable for soils of low permeability*	*Water requirement*	*Areas with limited space*	*Areas close to natural water bodies*	*Ease of Construction*	*Ease of maintenance*	*Remarks*
Latrine type	Trench Latrine	✓	✓		✓			✓		✓	✓	Not recommended
	Simple Pit Latrine	✓	✓					✓		✓	✓	Owner can construct
	VIP Latrine (lined)	✓	✓	✓	✓	✓		✓		✓	✓	Owner can construct
	PF direct pit (lined)	✓	✓	✓	✓	✓	✓	✓		✓	✓	Skilled mason needed to fix a pan
	PF offset pit (lined)	✓	✓	✓	✓	✓	✓	✓		✓	✓	Skilled mason needed to fix a pan
	PF twin pit (lined)	✓	✓	✓	✓	✓	✓			✓	✓	Skilled mason needed to fix a pan
	Double vault (Eco-san)	✓	✓	✓	✓	✓	✓	✓	✓			Trained mason needed

6. Location of the Latrine Pits

Appropriate siting of a latrine is important for its effective use. Ensured availability of adequate water within a short reach from a latrine will enhance its proper maintenance. Following points should be taken into consideration while locating the pit:

- Convenient Location
- Privacy of the users
- Protection of surface and ground water sources from potential pollution especially dug wells
- Ensured air circulation for effectiveness of VIP latrines
- Environmental considerations

6.1. Convenient Location

A latrine should ideally be located in close proximity to the house making it easily accessible even at night to the old and the young alike. The most convenient location would be to have it integrated to the house itself with the pit at a safe distance from the foundation of the house. For this there has to be an adequate water supply close at hand of a minimum of 6 litres per use per person. A latrine attached to the house has to be kept clean at all times to eliminate the potential nuisance from flies or of bad odours. In case the latrine is detached from the house it has to be sited at a reasonable distance with an easy access in all seasons.

6.2. Privacy of the Users

This is one of the main factors to consider in siting a latrine. A latrine should, ideally be sited obscured from direct view preferably behind a house or on the side of a blank gable end with the entrance facing outwards. The design of the superstructure can also provide for the privacy of the user. However, in the case of VIP latrines it is important to ensure that the latrine cabin is oriented with the door facing the direction of prevailing wind. It is equally important to take care not to site a latrine in a location that would jeopardise the privacy and the comfort of ones neighbours.

6.3. Environmental Considerations

The texture of soil, stability and permeability are factors to be considered in the siting of a sanitary latrine. The depth of ground water table and the geography of the terrain in relation to surface water sources and drinking water wells are factors very importantly to be considered in siting a latrine. It is important to take necessary precautions in the construction and maintenance of latrines to eliminate possible room for mosquitoes breeding. Evacuation of pits when filled up is yet another aspect to be pre planned. How the evacuation is to take place and where the material is to be deposited or disposed of has to be carefully decided and planned so as not to pose any threat to the environment. Taking into consideration the factors discussed above the following criteria can be recommended for siting a latrine, more specifically the latrine pit.

- A latrine pit should be located outside a radius of 15 m from wells streams etc. This may vary with the type of latrine and the way of disposal
- It should not be located up-stream or uphill from any water source
- The bottom of the latrine pit should be a minimum of 2 m above the maximum ground water table.
- The latrine pit should be preferably dug in permeable soil, if not, select the appropriate latrine type to suite the location.

6.3.1. Protection of surface and ground water sources

Effluent passing into the soil from a latrine pit contains large amounts of micro-organisms of faecal origin which may include pathogens (disease causing bacteria). It also has a high content of nitrates and other salts. There is therefore the possibility for the underlying aquifers to be polluted by the liquids infiltrating into the soil from pit latrines. If there is at least 2 m between the bottoms of the latrine pit to the maximum level up to which the groundwater level rise during the peak of rainy seasons, there is little danger of pollution. Where this is not possible the pits have to be made watertight (eg. Septic tank, dry compost latrine pit) or built elevated above ground (eg. Stepped up or built up latrines). In the soil layers above the ground water table there is little lateral movement of liquids. However, if a pit penetrates the saturated zone where the spaces between the soil particles are filled with water these micro-organisms will travel with the water much faster. The rate of flow of ground water varies from place to place and from one soil type to another. It takes almost 10 days travel through the soil before the water

becomes safe. So the safe distance of a pit from a shallow dug well or a similar ground water source is equal to the distance travelled by the ground water in that period for any particular soil type. Basically the minimum distance between shallow dug well and latrine pit must be of 15 m radially.

6.4. Air Circulation for VIP Latrines

Siting of latrines to ensure adequate ventilation is critical to the success of VIP latrines. To ensure there is a flow of air through the latrine there must be adequate ventilation. This is usually achieved by leaving openings above and below the door. The latrine should be sited with the door facing the direction of prevailing wind. For effective functioning of the VIP latrine, the inside should be kept comparatively dark. A superstructure with the entrance facing the north or south direction provides with adequate darkness for effective functioning of a VIP latrine. This will prevent latrines from flies breeding and producing bad smell.

Box 3 Consideration in specific situation

Specific topic on which information/data is needed	**Considerations**
• Type of soil-stability	
Loose, sides of wall collapse	Line the pits with appropriate lining materials. In very sandy soils, sink cement rings that are perforated or set on top of each other without cement.
Hard to dig	Use the pour flush design rather than VIP, as the pits are less deep.
• **Permeability** (how water is absorbed by soil)	
Clay soil	Test by pouring water into a hole and measuring how long it takes to be absorbed. Pits in dense clay may need back filling about 1.2 meters with more sandy soil.
Coarse sand	Back fill around the rings with denser soil and/or locate the latrine pipes far (for example, 40 meters or more) from a well-used for drinking.
Hard laterite	If there might be cracks in the laterite, the latrine pits can pollute nearby drinking water sources. Place the latrine far from these sources
• Ground water level in wet season (deepest level)	
Water rises higher than one meter from bottom of the latrine pit, but never completely floods the latrine pits	Locate the latrine pit far from any well used for drinking purpose and should be away for example, 40 meters or more towards downstream.
Water rises to or above the ground level and sludge comes out the latrines	Raise the latrines above the ground level so that the top third of the pit is always above the water level. Place latrines far from drinking water sources.
• Distance to water sources	
Distance from latrines pit to drinking water sources	At least 15 meters
Children or teachers may be spent extra time, for example, more than 15 minutes going one-way to collect water	VIP latrine is preferred as it uses less water.

Part II

7. Latrine Options

There are minimum three components that define the sanitary Latrine. They are – pit or tank, pan/platform and superstructure, in addition the overall technology in which they operate i.e. water seal or slab with hole etc. plays major role to become a sanitary latrine. The components of Latrine are further described in detail in Chapter 8.

A. Pit **B. Pan/Platform** **C. Superstructure**

Figure 5: Major Component of Latrine

As far as Latrine technology is concerned, water seal, as indicated, is more prevalent in Nepal due to the practice of anal cleansing with water. But with many other successful experiments, we now have several sanitary Latrine options for rural Nepal which can be used depending upon the soil conditions, water availability and affordability of the user. Some of the key technological options are:

1. Trench latrine
2. Simple pit latrine
3. Ventilated Improved Pit (VIP) latrine
4. Pour flush latrine (manual or attached to cistern)
5. Eco-san latrine

Figure 6: A simple Pit Latrine

7.1. On-site Sanitation: Dry Systems

7.1.1. Trench Latrine

Sometimes called a 'Shallow Pit Latrine', this is generally used by people working on farms. It is built by digging a small pit for each time of defecation; the faeces are covered with the excavated soil that is heaped near the pit. This is sometimes known as the "cat" method. The fairly deep pit (about 30 cm.) may be used for several weeks. As there is a large bacterial population in the topsoil, the faeces in the shallow pits decompose rapidly. However, flies breed in large numbers; hookworm larvae spread around the holes and have been known to migrate upwards from excreta buried less than 1 m deep, penetrating the soles of the feet of subsequent users.

Figure 7: Trench Latrine

There is practically no cost involved in setting up a trench latrine and maintenance is simply a question of closing one trench and moving to another.

7.1.2. Pit latrines

It is basically a hole in the ground into which all kinds of sanitary wastes including human excreta and anal cleaning materials are deposited. The liquids in the excreta percolate into the surrounding soil and the organic material decomposes producing gases such as carbon dioxide and methane, which are either liberated to the atmosphere or disperse into the surrounding soil. A decomposed residue is left behind.

7.1.2.1. The Advantages and Dis-advantages of Pit Latrines

Pit latrines are one of the most widely used forms of sanitation especially in the developing countries.

- They are easy to build and maintain, cost very little and can be built by individual households with very little external assistance.
- Most of the time they are effective at breaking the faecal-oral disease transmission route.
- They are ideal for places rural or urban where there is no reliable, continuous or sufficient water supply.

A well-designed, constructed and maintained pit latrine is as good a sanitation system as more sophisticated methods.

On the flip side, poorly designed, constructed and maintained pit latrines produce unpleasant smells, breed insects, are liable to collapse and may lead to chemical and biological contamination of groundwater. Such pit latrines are worse than open defecation.

7.1.2.2. Designing pit latrines

You should keep the following considerations in mind when designing, constructing and maintaining pit latrines:

Pit Life: It is possible to design pit latrines that will last for 10-15 years. A longer pit life reduces the average annual cost and maximizes the social benefits accruing from the original input. As a general rule, every pit must have a minimum life of two years as research has indicated that pathogenic, disease-causing organisms can live longer than a year. So it is always good to have two alternating pits for sustainable use. Pits should be taken out of use when the solids reach about 0.50 m below ground level. The 'life' of a pit is the time it takes for solids to fill up to that level. The rate of solids accumulation in a pit depends on:

- The number of people using the latrine
- The amount of faeces each user excretes
- The material used for anal cleansing
- The nature of the surrounding soil
- The level of ground water
- The pit lining
- The texture of the pit, wet or dry

Assumed average accumulation rate-of-solids-per-person-per-year are:

- 0.04 m3 (1.4 cu ft) in wet pits where water is used for flushing and anal cleansing
- 0.05 m3 (1.75 cu ft) in wet pits where water is used for anal cleansing
- 0.06 m3 (2.1 cu ft) in dry pits (Latrines with separate wash area)

However, it is likely that over several years, natural consolidation results in reducing the rate of accumulation of solids in a pit. Pits are usually designed for use over periods of 10 years at an average. Alternatively twin pits when provided can be designed for periods averaging 2 – 5 years.

A pit design has to be done taking into consideration all the factors mentioned above and as best suited to the local situation.

The size of a pit directly determines the period of time it can be used until it is filled up. The larger the pit volume, the longer it lasts. The volume of a pit depends on the cross section and the depth. Therefore, we can say by adhering to the specified cross-sectional dimensions mentioned above, the required volume of a pit can be achieved by changing the depth – **the deeper the pit, more voluminous it is!**

The formula for calculating a pit volume is as follows:

Pit Volume, V (m^3)= Number of people using latrine X Sludge accumulation rate (m^3/year) X Number of years between emptying

Generally in the context of rural hills of Nepal, a pit with 1.7m diameter and 1.8m depth lined with stone is suitable that lasts for more than 5 years for family comprising 6 people in average.

Pit shape: Pits can be square, rectangular or circular. The depth of the pit influences its shape, with shallow pits generally being square or rectangular and deeper pits being circular. It is important to note that in a deeper pit, the ground exerts a greater load on the pit's lining; therefore, the circular design is more stable at greater depths.

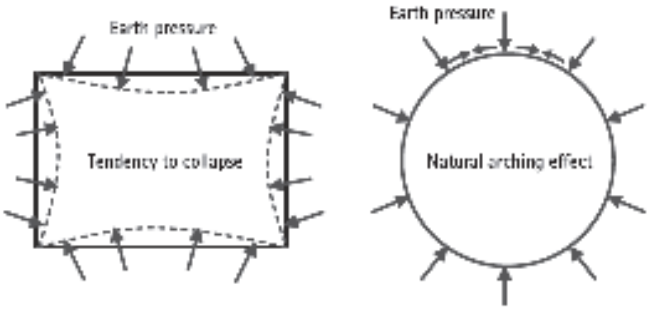


Figure 8: Pit Shapes

Once the shape of the pit has been chosen and the volume of the pit calculated, the opening of the pit needs to be determined, with consideration given to land availability, durability of materials, and the ability to manoeuvre when digging the pit. It is suggested that in order for a person to be able to dig the pit properly, the minimum width of the pit should preferably be 0.8m. Commonly used diameters or side measurements are 0.8m, 1.0m and 1.2m. However, the wider the pit, the stronger the pit lining type and slab type required. For a pit with a diameter or width of more than 1.2m, a stone lining is suitable whereas for pit with diameter less than 1.0m bamboo lining is also feasible.

It is important to note that the total depth of a pit should not exceed certain maximum values. The maximum depth is determined by one or more of the following factors:

- A loose soil type – hard to dig because it constantly collapses inwards during digging.
- Large number of rocks or a rock layer below the topsoil layer – makes digging very difficult or impossible.
- Groundwater levels too close to bottom of the pit.
- Lining materials – bamboo or wooden pole linings become weaker and less able to support the pit as it becomes deeper.
- Affordability – the deeper the pit, the higher the cost.
- The deeper the pit, the harder it is to remove the contents – especially by hand.

Number of pits: This depends on various factors. If land is available to a household in rural or low-density urban areas, a second pit is dug when the first one is filled up to within half a metre of the latrine cover. The first pit is then filled up with soil and left to decompose for about two years. When the second pit also fills up, the first pit can be dug out and used again; the contents of that pit would have decomposed enough to be used as a fertilizer. The process is repeated.

If there is sufficient space available for an alternating pit, the second pit volume (as well as its diameter and depth) should be the same as the first pit. A point to remember is that the distance between the two alternating pits should be the same as the outside diameter of the pit.

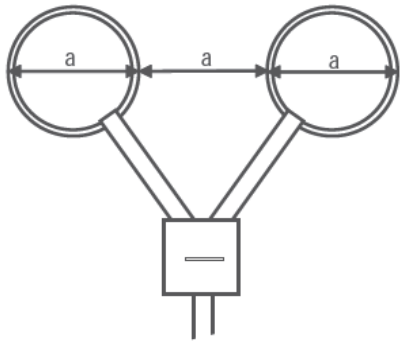


Figure 9: Distance between two alternating pits

Emptying pits: In most rural areas, this is not a problem as land is usually available and a new pit is dug for the latrine. However, in some more densely populated areas, this is often not possible and the pit must be emptied. Ordinary vacuum tankers of the kind used to empty septic tanks are the most efficient means of removing and disposing the wet sludge in the pit. Manual removal should be avoided from a public health point of view. In some places, hand-powered diaphragm pumps have been used but found to be very slow and laborious in emptying the pits; therefore, they have not been widely adopted.

Superstructure: This can be anything from thatched leaves, cloth, mud, Reed, Bamboo, Stone, Cement sag or brick walls with or without a roof. Needless to say, a lighter superstructure and latrine cover facilitates greater mobility when moving from using one pit to another.

7.2. Conventional Pit Latrine with Cover

Conventional pit latrine is a non-water dependent latrine, which does not require water for functioning, though a small amount of water can be used to clean the squat plate occasionally. This type of latrine is suitable in water scarce areas or where community uses dry cleansing materials. Therefore, the introduction of an unlined or lined pit with a squat plate with or without a super structure can be the second option. This will be particularly applicable for those communities who have open defecation practice.

Box 4 Advantages and Disadvantages of Conventional Pit Latrine

Advantages	Disadvantages
• Affordable • Simple technology • Helps to develop practice use latrine • Appropriate for low-income group who wants to use latrine initially	• Odour • Risk of falling into the pit • Risk of ground water pollution • Fly breeding

Materials required

Capital cost for making squatting platform with hole. Operational cost is negligible

S.N.	Description	Unit	Quantity
1	Cement	Bag	0.75
2	Sand	Ltr.	70
3	Gravel	Ltr.	100
4	Re-bar-6mm	Kg.	5

The conventional pit can also be upgraded by adding vent pipe, superstructure and lid for covering hole and lining pit with locally available materials. This modified and improved version is called Lid Cover Latrine. This type of latrine doesn't require water for functioning, though a small amount of water can be used to clean the squat plate occasionally. These groups of latrines are suitable in water-scarce areas. This is provided with a manual closing-lid (or cover) for the squat hole, to make it as fly-tight and odour-tight as much as possible.

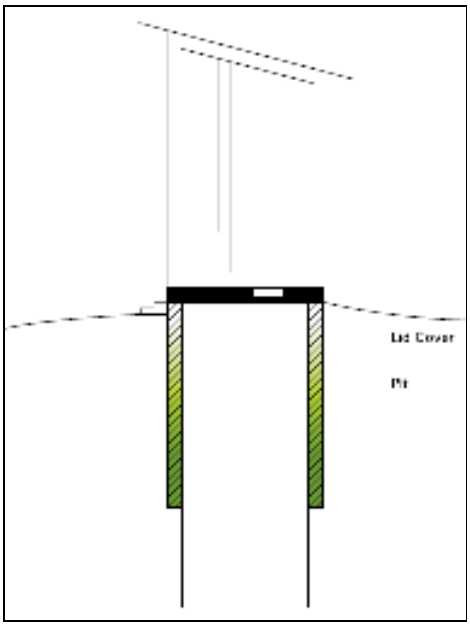


Figure 10: Upgraded Conventional Pit Latrine

Working Life
2 to 3 years (depending upon number of users and pit size).

Important features

- Squat plate with a hole
- A lid (or cover)
- Foot rests near squat hole
- A pit below the squat hole
- House or latrine room
- No need of water to operate this system although a little water can be used, especially for cleaning
- Cross ventilation for air circulation will eliminate odour inside the latrine room.

7.3. Ventilated Improved Pit (VIP) Latrine

A VIP doesn't require water for functioning, though a small amount of water can be used to clean the squat plate occasionally. These groups of latrines are suitable for water-scarce areas. A ventilated improved pit latrine is an improved conventional pit latrine, slightly offset from the pit and having a tall vertical (gradually tapered towards the pit) vent pipe with a fly-screen fitted outside the superstructure to trap flies and reduce odour nuisance.

Box 5 Advantages and Disadvantages of VIP Latrine

Advantages	Disadvantages
• Little odour • Less chances for transmission of excreta related disease than lid or cover latrine • Good for environment • Can be used as fertilizer after one year of composting • Suitable for water scarce area, no need for water except occasional cleaning of the squat plate • Affordable and Suitable for communities using dry cleansing materials	• Technical support required when installed as proper construction is crucial • Risk of groundwater and surface water contamination • Once filled the latrine has to be moved to another location • Odour nuisance is not fully controlled.

Advantages	Disadvantages
• Can be built with local materials • Construction and maintenance are easy • Can be upgraded to pour flush latrine by installing water seal pan • Suitable for less densely populated area where space is available for relocating the latrine when it is full	

Working life
3-4 years depending on number of users and pit size
Users responsibility
Needs maintenance for vent pipe, fly net, squatting plate and the superstructure.

Material required with stone lining (Excluding Superstructure)

S.N.	Description	Unit	Quantity
1	Cement	Bag	1.8
2	Sand	m^3	0.1
3	Gravel	m^3	0.1
4	Stone	m^3	2
5	Re-bar-8mm	Kg.	8

Important features
- Squat plate with a hole
- Footrests near squat hole
- A vent pipe extending above roof.

The vent pipe outside should be painted with black colour and should be gradually tapered in bottom portion for getting effective functioning. Fly screen-covering top of vent pipe. Single pit under the squatting plate, House or latrine room should be oriented either on north or south to avoid direct sunlight. House should not be located under trees or structure to allow adequate wind flow. Ventilation for the latrine room should be always in the upper portion of the latrine room and should preferably be covered by fly screen.

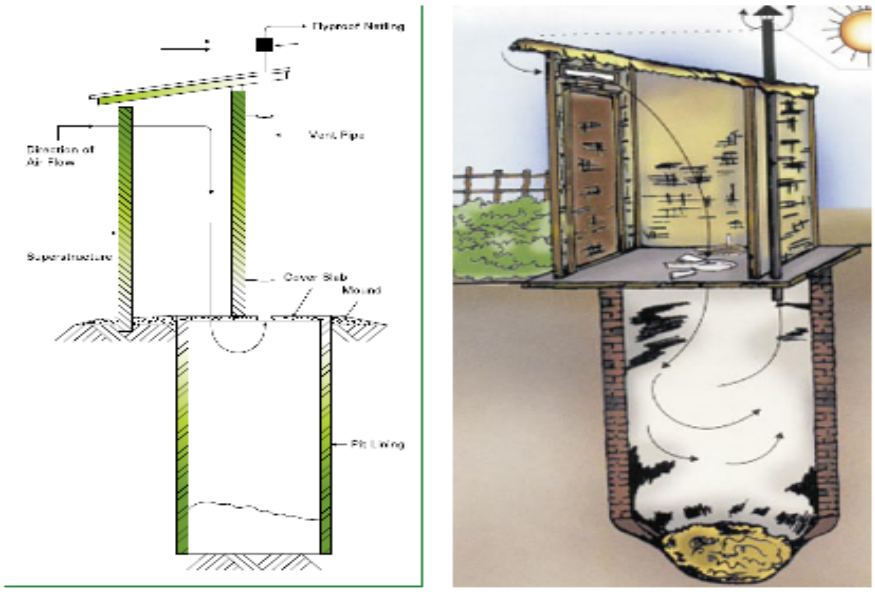


Figure 11: Typical VIP Latrine

7.4. Pour Flush Latrine

This is water dependent latrine and these latrines fail to operate without water. The water flushes out excreta from pan, which consists of a water-seal generally known as a trap. The water dependent latrines can be further categorized on the basis of: Flushing (pour flush or mechanical flush). Pour flush, though, is more operational and suitable to the conditions of rural areas.

The pour flush latrine is a specially designed water-sealed pan, which requires 1-2 Litres of water for flushing the excreta. Some water always remains at the bottom of the pan after it has been used. This water seal latrine eliminates the entry of odour and prevents rodents to the latrine room from pit through the pan. This pour flush latrine consists of a single pit either just below the pan (onset type) or may be offset from the pan (offset type) using the pour flush type bowl (pan and trap).

Box 6 Advantages and Disadvantages of Pour Flush Latrine

Advantages	Disadvantages
• Odour free. • Privacy. • Little chance for transmission of excreta related disease. • Appropriate where water is available. • Long lifetime and no need to move for many years. • A water requirement for flushing is low (1-2 litres). • Construction and maintenance are cheap and easy. • Offset type can be adjusted in any type of dwelling without causing any foul smell. • Suitable for less populated areas where space is available for relocating the latrine. • Possible to upgrade it into twin pit pour flush system (for offset type).	• Water necessary for flushing, 1-2 Litres • Risk of groundwater and surface water contamination if constructed nearby water points • Not appropriate where water is not available • Dislodging of Latrine required every 3-5 years • Difficult to construct in high ground water table area.

Working Life

5-10 years, depending upon pit size and number of users and soil etc.

Users' responsibility

- Need awareness on how to use.
- Need to clean the squat plate and pan regularly.
- No paper, cotton etc. should be thrown into the pan; otherwise water seal will be choked.
- Water for flushing is a must after each use.
- Pan options: (Plain cement/plastic/mosaic/fibreglass reinforced/ceramic etc.), the pan (the trap portion) is different for onset type and offset type pits.
- For lined pit: A shovel to dig the pit and lining materials such as, bamboo/stones/earthen rings/ bricks/hollow blocks/Ferro-cement rings etc. In all cases the sidewall of the pit has to be perforated.
- Cover for offset pit in concrete or wood.
- Latrine floor with foot rest: The pan should be fixed into either a squat plate just on the top of the pit or to be aligned from Latrine floor for offset pit. Proper finishing needs to be done of the floor.
- House for privacy made of any local materials.

Important features

- Pour Flush Bowl (the pan and trap: water seal generally 20 mm)
- Squat platform/floor where bowl and water-seal trap fixed along with foot rest

- Lined or unlined pit for on-set type; lined pit for offset type
- Perforated sidewall for lined pit
- Suitable for areas where water supply is available

7.4.1. Options in Pour Flush/ Water seal Technology

7.4.1.1. Direct Pit Water Seal Latrine

This unit consists of a squatting slab monolithically cast with a cement pan having an in-built water seal. The slab can be of either a circular or a rectangular shape. The slab may be constructed either Reinforced Cement Concrete (RCC) or Ferro Cement (FC) type.
A pit is dug in the ground and the squatting slab is placed over it. Normally no pit lining is required in the case of hard and compact soil. However, in case of loose soil, the pit is to be lined in order to prevent the side from collapsing. The size of the pit should be such that it takes two years to get filled up. A superstructure may be built over it for privacy and protection.
After defecation, 1-2 Litres of water is poured to flush the excreta out of the pan, which accumulates in the pit where decomposition takes place. The gas formed during decomposition escapes through the joints/ openings of the pit lining and is absorbed by the surrounding soil. The effluent is leached out and absorbed by the soil while the solid part (sludge) accumulates in the pit. Thus, on prolonged use, the pit gets filled up. When this happens, a second pit is constructed and the squatting slab and superstructure are shifted over it. The filled up pit is covered with a thick layer of soil and allowed to be stabilized for about two years. During this time the contents of the filled-up pit will have become organic humus and safe for handling. When the second pit also gets filled up, after two years or so, the first pit is cleaned, the squatting slab and superstructure is shifted back over it and thus a continuous operation of a direct pit Latrine is achieved. Since the superstructure has to be shifted repeatedly, only a temporary construction is recommended for this type of a Latrine.

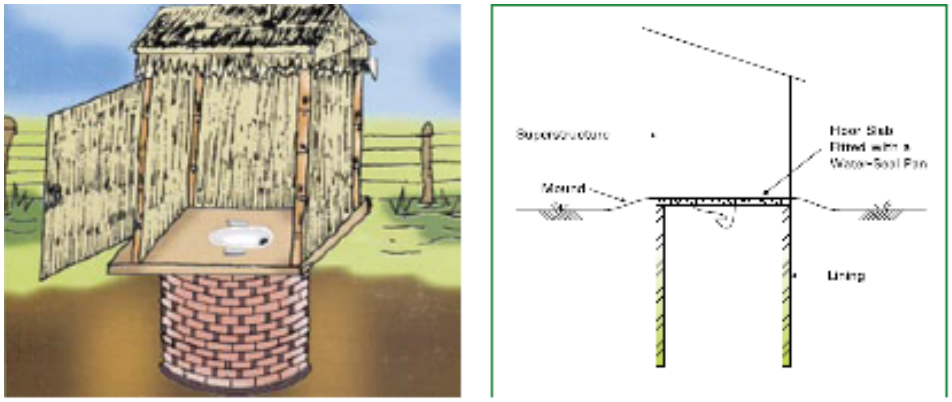
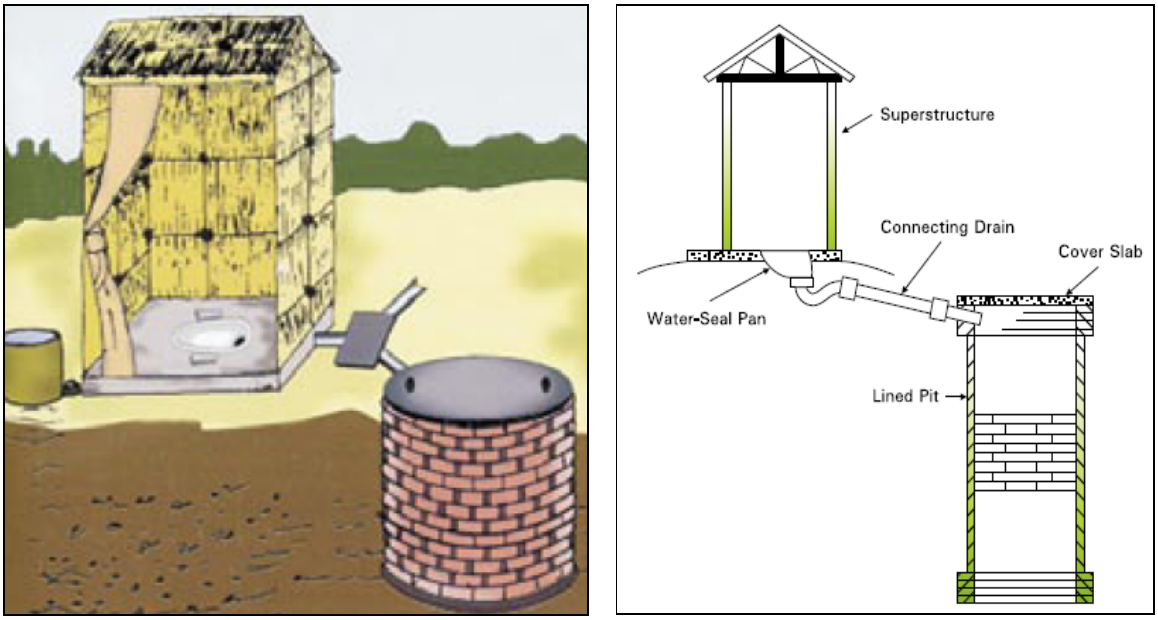


Figure 12: Direct Pit Pour Flush Latrine

7.4.1.2. Single Offset Pit Water Seal Latrine

A 'Single Offset Pit Water Seal Latrine' consists of water seal pan, a squatting platform, a junction chamber, a temporary/ permanent superstructure and a single pit instead of two pits as described above. The pit is constructed away from the squatting platform and connected to the same by a pipe through a junction chamber. A single offset pit Latrine functions in the same manner as a twin-pit one. Once the single offset pit gets filled up, another one is dug nearby and connected with the junction chamber by a pipe. The flow of excreta is diverted to the new pit by blocking the outlet of the first pit at the junction chamber. The contents of the first pit are left undisturbed for two years after which it is safe for manual cleaning. When the second pit also gets filled up, the first one is cleaned

and the flow of excreta is diverted to the same. Thus, a single offset pit Latrine eventually turns into a twin-pit over a period of time.



A. Pictorial View of PF Latrine B. Typical Section of PF Latrine

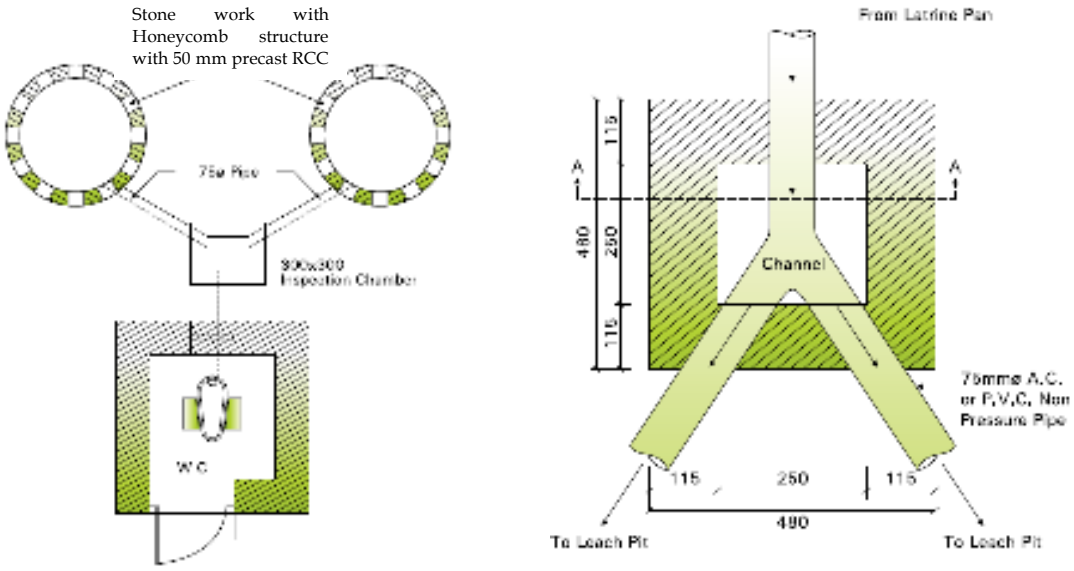
Figure 13: Offset pit Pour Flush Latrine

7.4.1.3. Twin Pit Water Seal Latrine

The 'Twin Pit Water Seal Latrine' is a complete excreta disposal system which, on one hand fulfils all the sanitary requirements and on the other hand, provides continuous operation with minimal effort. The main components of such a Latrine are the water seal pan/ trap arrangement, squatting platform, junction chamber, two pits and a superstructure.

The squatting platform is a raised pucca floor constructed with appropriate plinth and foundation. The pan has a steep bottom slope which allows easy flushing of excreta. The outlet of the pan is connected with a water seal P-trap. On flushing, some water always remains in the trap and forms a 'water seal'. The water seal prevents the bad odour coming from (and the insects reaching the) excreta. The outlet of the trap is connected with a junction chamber either by using a pipe or by constructing a covered brick drains. The junction chamber has one inlet (connected to the P-trap) and two outlets (connected to the leach pits) which are for alternate use. A temporary or permanent superstructure is constructed over the platform for privacy and protection.

For making a twin-pit Latrine operational, one of the outlets of the Y-junction in the junction chamber is blocked while the other outlet is kept open to the corresponding pit. The disposal process of the excreta is the same as in a 'direct pit Latrine'. In this case, when the first pit gets filled up, the flow of excreta has to be diverted to the stand-by second pit. For doing this, one has to remove the cover of the junction chamber, open the outlet connected to the second pit, block the outlet connected to the first filled up pit and replace the junction chamber cover. The contents of the filled pit will become organic humus and safe for manual cleaning in about two years. When the second pit also gets filled up, the first pit is cleaned and the same operation is repeated to divert the flow of excreta from the second pit to the first pit as was followed earlier. Thus a 'Twin-pit Water Seal Latrine' provides a continuous operation.



A. Plan of twin pit latrine B. Detail of Junction Chamber

Figure 14: Double pit Pour Flush Latrine with detail of Junction Chamber

Figure 15: Typical Double pit Pour Flush Latrine *(Adopted from Reference#3)*

Box 7 Functions of different components of twin pit PF Latrine

The functions of different components of two-pit pour flush toilet

- Water Closet Pan: To direct excreta into water seal trap.
- Water seal trap: To prevent emission of foul smell (gases) from the leach pit and entry of flies and other insects into leach pit.
- Junction chamber: To restrict flow of excreta to one leach pit at a time and facilitate removal of accidental blockage in the connecting pipes.
- Drain pipes: To carry excreta from Junction chamber to leach pits.
- Leach pits: To facilitate leaching of liquid from excreta into surrounding soil and dispersion/absorption of obnoxious gases into surrounding soil and decomposition of excreta.

7.5. Double Vault (EcoSan) Latrine

The double vault latrine can be identified as a more environment friendly type of excreta disposal system where the use of decomposed pit content as a resource is promoted and encouraged. Double Vault Compost Latrine is based on recycling principles. In this approach, the excreta and urine are separated for disposal. The eco-san model consist the double-vault compost latrine consists of two water-tight chambers (vaults) to collect faeces. Urine is collected separately as the contents of the vault have to be kept relatively dry. Initially, a layer of absorbent organic material is put in the vault and after each use, the faeces is covered with ash (or saw-dust, shredded leaves or vegetable matter) to deodorise the faeces, soak-up excessive moisture and improve carbon/nitrogen ratio, which ensures that sufficient nitrogen is retained to make a good fertilizer. When the first vault is three quarters full, it is completely filled with dry powdered earth and sealed so that the components can decompose anaerobically. The second vault is used until it is also three quarters full and the first vault is emptied by hand, the contents are used as a fertilizer (Refer Figure 16). The vaults have to be large enough to keep faeces for at least a year in order to become pathogen free. The superstructure is built over both the vaults with a squat-hole over each vault which can be sealed-off. The latrine can be built everywhere as there is no pollution coming from the water-tight chambers to pollute the surroundings.

Box 8 Advantages and Disadvantages of Double Vault Latrine

Advantages	Disadvantages
• It is most ideal for areas where water is scarce and pour-flushing implies water to be carried from source, or areas where water table is high such as flood plains or coastal areas and densely populated areas where risks of ground water pollution from pits to drinking water sources is assessed high.	• Proper operation needs full understanding of the concept, lack of which makes the system dysfunctional. • Where people are eager to use the contents as fertilizer, they may not allow sufficient time for the contents to become pathogen free. • This system is only to be used where people are motivated to use human excreta as a fertilizer. • Inadequate numbers of trained masons impact the quality of construction.

Working Life

- 5-6 years, depending upon pit maintenance and numbers of users.

User's responsibility

- To ensure that the system is well-designed and quality constructed.
- O&M should be done properly otherwise, the system would fail and become breeding ground for many diseases.

Figure 16: Typical EcoSan Latrine

7.6. Adjustment to Latrines

In some cases minor adjustment may needed in design and construction of Latrine to address the need of Child, Gender, Elder and Differently abled people. Special attention should be given while constructing a Latrine where such types of people are resided. Several design options related to this scenario can be found in literatures and other reference books.

- Child friendly features: include water taps, knobs and latches of Latrine doors and windows at suitable heights and convenience for children at different ages.
- Gender friendly features: The location of the Latrine should be appropriately selected in a safe and secure place and the door, windows and ventilation should safeguard privacy. In addition to water, in schools and other public institutions, the Latrine should have facilities for maintaining menstrual hygiene management. For example, a bucket with cover/ lid inside the Latrine or an incinerator attached just outside the Latrine is essential.
- Elderly people friendly features: Include appropriate type of sitting arrangements and support on the Latrine wall.
- Differently-abled friendly Latrine: should include a ramp up to Latrine, sufficient space for a wheelchair in the passage, hand railing in the passage and, within the Latrine cubicles, appropriate types of seating arrangements and support on the Latrine.

The adjustment may also need for the case where the ground water table is significantly high. The Latrine with elevated plinth and water sealed lining is generally suitable for this case.

8. Component of Latrine

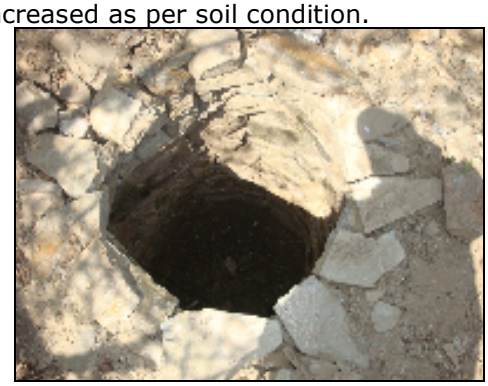
8.1. Pits/Tanks

The function of the pit or tank is to isolate and store human excreta in such a way that no harmful bacteria are carried to new host. Though there is marked difference between pit technology and tank technology as there is practically 'nil' daily maintenance in pit technology for disposing of sewage (water mixed with excreta) as it percolates in to the soil every day, continuously. The digested solid removal needs to be attended to once in 2 to 3 years only and not daily. The dirty solid excreta are rendered harmless as humus which can be used as beneficial manure. This technology is popularly known as leach pit technology which has many advantages over septic tank.

Figure 17: A Typical trench pit

8.1.1. Leach Pit

According to this technology, the water and gas of the excreta gets absorbed through the pores of the pit and the solid gets decomposed into manure. This technology maintains the system under hygienic condition that is free from odour and insect nuisance. Pits may be circular, square or rectangular and squatting slabs may be circular (refer Figure 25) or rectangular (refer Figure 26). These are preferably lined as it holds the soil and prevent the pit from collapsing; lining may be done with honey-combed brick wall or perforated concrete rings, apart from twigs, split bamboo matting, an old drum, dry stone masonry, etc. Leach pits are generally provided at the back of the squatting pan. For circular pits, the minimum distance between the two pits should not be less than the depth pit while for rectangular pits; both the pits can be clubbed together with common partition wall plastered on both the sides. The area for percolation shall have to be adequate and the dimension shall have to be slightly increased as per soil condition.



A. Dry stone lined trench with unfinished top.

B. Dry stone lined trench with finished top and Circular Slab Cover.

Figure 18: Mostly used Leach pit in rural hills of Nepal

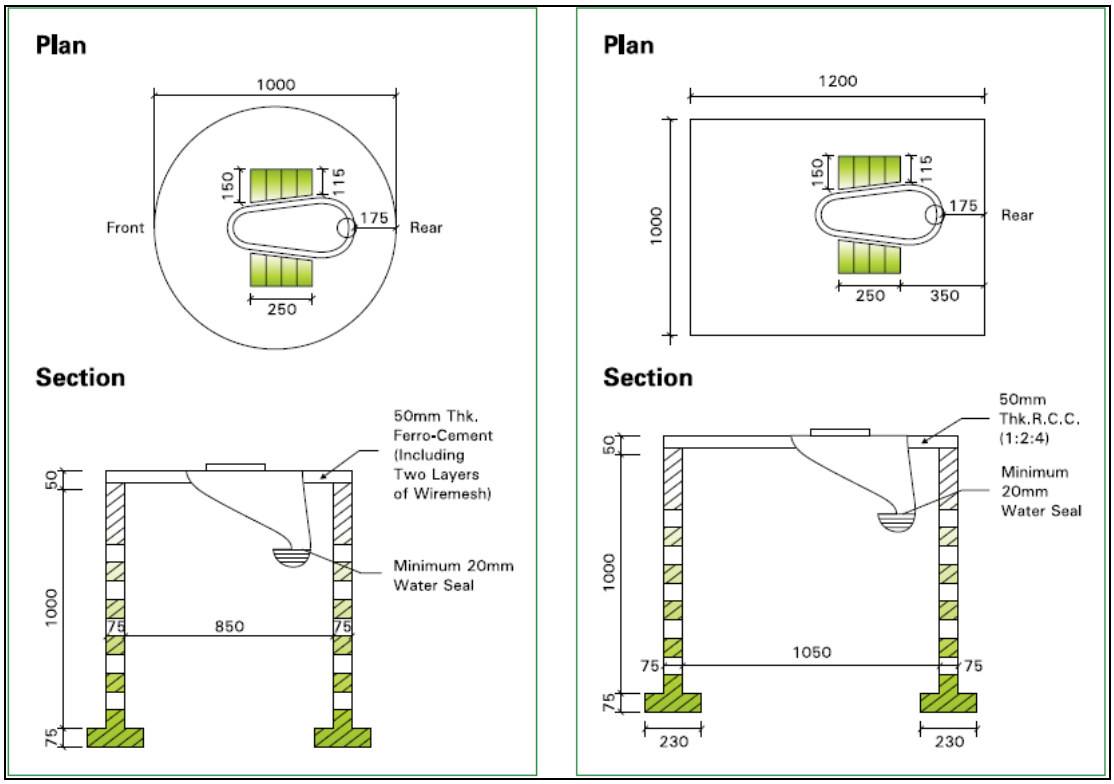


Figure 19: Difference between Circular and Rectangular lined Latrine pits.

Box 9 Key points to remember for pit

Key Points

- Remember a dry pit latrines/compost latrine fills quickly than a wet pit like leach pit.
- A minimum of 3 feet effective depth is a must for all leach pits
- Pit should be located below and away from the water point
- Pit size and location varies from soil to soil
- Pit should have life period of minimum 5 years

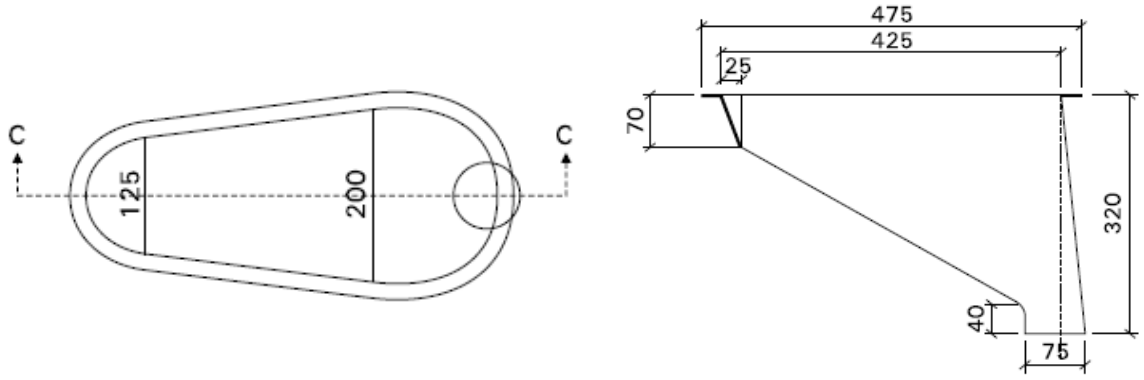
8.2. Pan and Platform

Pan forms a very important item in Latrine construction. There are various designs of pans available in the market. In this context, the quality and design of pan is a very important. Rural pans having higher gradient with less water consumption for flushing are technologically superior to flat pans which require more water for flushing. Flat pans are not suitable for leach pit Latrine due to its requirement of low gradient. They need lot of water and pit fills up early as a result affecting the longevity of the pit. The platform is simply a base where a pan can be placed appropriately. The platform can made up of any type such as RCC slab, built structures etc.

The key specifications are.

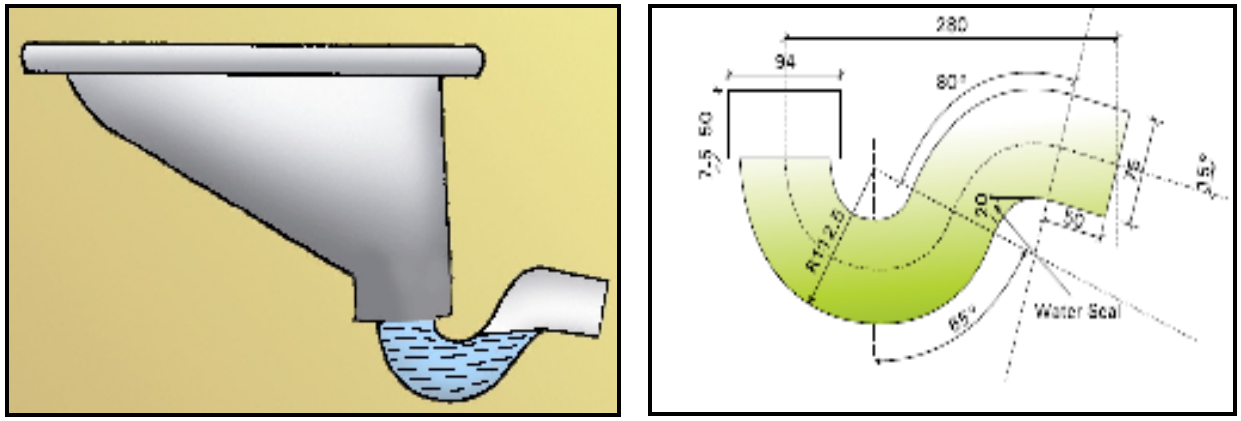
- The bottom slope of rural pan is very steep that is less than 25 to 40 degrees

- The inner length of the pan is 425 mm and the outer length is 475 mm.
- The depth of the rural pan is 320 mm



A. Plan of Squatting fibre pan B. Typical section of Squatting fibre pan

Figure 20: Typical Plan and Section of Squatting Pan



A. Pan with Water seal B. Details of Water seal syphon

Figure 21: Typical Section of water seal syphon

EcoSan Pan	Ceramic Pan

Figure 22: Commercially available pan in Nepal

8.3. Super Structures

In order to ensure safe disposal of excreta, the superstructure of the Latrine is of least importance but always play vital role for practicing sustainable sanitation. Its primary function is to provide privacy and protection to the user from the natural elements. Undue emphasis on costly super-structure in the design of the Latrine is not required. The norms of super-structure are purely restricted to the choice of the user though it should be built in order to ensure privacy and sustainability of the system especially for VIP latrine. The cost may vary depending upon the affordability of the user that can be built using bamboo, mud, stone, bricks, woods, plastic cover, etc. depending upon the users' interest, the atmospheric conditions, rainfall and locally available material. In some cases a temporary super structure can also be erected which can be replaced afterwards with a permanent one. Though, it should be noted that irrespective of the type, a super structure must have following minimum characteristics:

- The super structure should be properly closed from all sides to ensure safety and privacy to every user and should not have chinks and holes in it.
- The super structure must have at least one ventilator of appropriate size for light and aeration.
- It must have a proper roof; otherwise the latrine will be out of use in rainy season. Similarly the rain water will accumulate in leach pits through exposed W.C. pan and may choke the system.
- The fixtures of door like latches should operate properly.

A. Stone masonry Super structure without roofing.

B. Stone masonry super structure with CGI roofing and erected vent pipe.

Figure 23: Stone masonry superstructure with CGI sheet roofing

A. Stone masonry super structure with stone roofing.

B. Mud block made super structure with hay roofing.

Figure 24: Roofing Options for HH Latrines

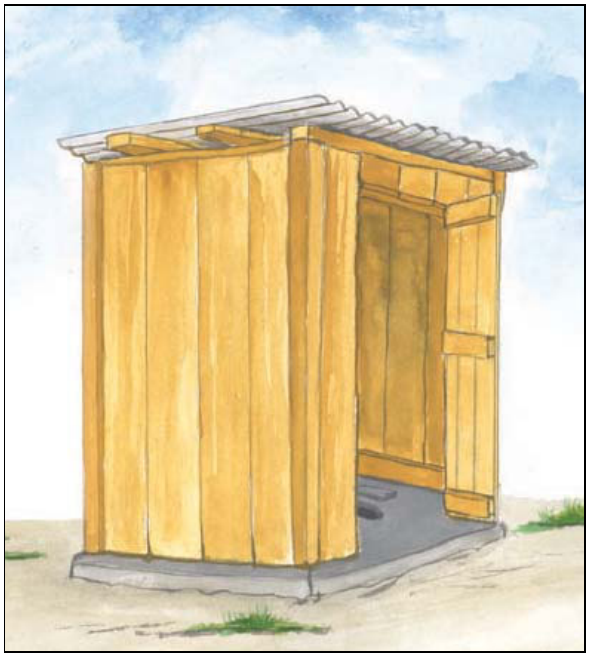
Figure 25: Latrine options for land scarce settings

A. Sustainable Superstructure

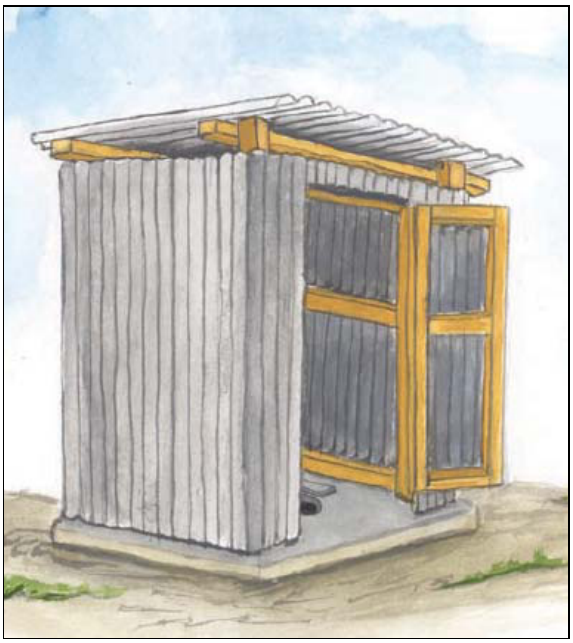
B. Basic Superstructure

Figure 26: Example of Sustainable and Basic Superstructure

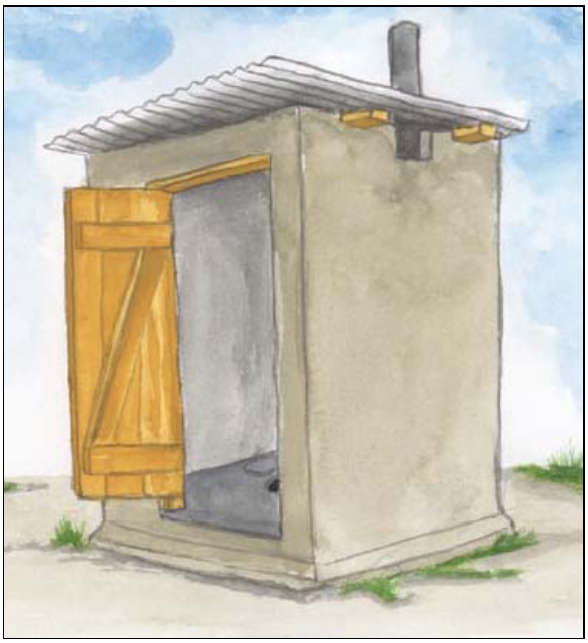
A. Super structure made with Wooden frame and Jute sag, Plastic sheet roofing.



B. Super structure made with Wood and ACC roofing



A. Super structure made with CGI sheet



B. Super structure made with Plastered Stone Wall.

Figure 27: Different types of superstructure for HH Latrines

9. Operation and Maintenance

For proper operation and maintenance of the latrines following matters should be explained to the users:

GENERAL

- Ensure that there is adequate drainage around the latrine to prevent the surrounding area from getting soggy or flooded.
- Provide for washing hands with soap after using the latrine, after cleaning a child or a sick person.
- Water must be readily available. Keep a container filled with water handy at the latrine at all times taking care not to leave room for mosquito breeding.
- Maintain the superstructure of the latrine. Encourage an occasional lime wash to improve the external appearance of the latrine.
- Refrain from storing heavy loads (fuel wood etc) on the latrine roof.
- Keep the latrine door closed at all times, when in use and otherwise.
- Always keep the interior as well as the immediate surroundings of the latrine clean.
- Ensure drainage of rainwater conveniently away from the latrine to protect the pit lining and the foundation of the cabin from possible erosion and collapse.
- Simple catchment system to collect and store rainwater from latrine roof is a dual-purpose option in this regard.

- Keep the door panel painted with either a wood preservative or an enamel paint to protect it from decaying.
- Refrain from using disinfectants (chemicals) to clean the squat holes or squatting pans. It would eliminate all bacteria including those that effectively carry out the decomposition process inside the pit. Ash is a suitable material for this purpose.

VIP-LATRINE

- As a daily routine clean the latrine floor and the edges of the squatting hole thoroughly by using a Latrine brush (coir brush). From time to time (once a week) use ash. Refrain from using disinfectants to clean the squatting holes. It would eliminate all bacteria including those that effectively carry out the decomposition process inside the pit.
- After each use, sprinkle a small amount of ash or soil through the hole to help eliminate odours and prevent fly breeding.
- Use the cover for the squatting hole and shut the door after using the latrine.
- Keep the vent pipe clear and free of leaves.
- Maintain the fly screen on top of the vent pipe. Keep it free from blocks and replace as necessary.
- In a VIP latrine with twin pit arrangement a pit has to be put out of use when it fills up to about half a meter below the drop hole level. Once this occurs the pit has to be filled up with a layer of soil and allowed to decompose. In the meantime the drop hole is to be covered with the lid provided and the second pit is to be put to use. In about a year the decomposed matter from the old pit (by then will be rich harmless soil without any smell) could be removed and used as organic manure.

POUR FLUSH LATRINE

- After using the latrine, flush it with a bucket of water and refill the bucket immediately so that it is ready for the next user.
- Avoid using bulking material for cleansing to prevent the siphon from getting blocked.
- A latrine pit has to be put out of use when it fills up to about half a meter below ground level. Once this occurs the pit has to be filled up with soil and allowed to decompose. In the meantime the sewer pipe could be deviated to a new pit or if provided into the second pit (twin pit arrangement). In about a year the decomposed matter from the old pit (by then will be rich harmless soil without any smell) could be removed and used as organic manure.

ECOSAN LATRINE

- As a daily routine clean the wash area of the latrine floor with a bucket of water taking care not to let any water flowing into the pit.
- Provide a container with ash or lime or fine soil or saw dust handy inside the latrine
- Clean the edges of the squatting hole thoroughly by using a Latrine brush (coir brush). From time to time (once a week) use ash. Refrain from using disinfectants to clean the squatting holes. It would eliminate all bacteria including those that effectively carry out the decomposition process inside the pit.
- After each use, sprinkle a small amount of ash or soil through the hole to help eliminate odours and prevent fly breeding
- Use the cover for the squatting hole and shut the door after using the latrine.
- A latrine pit has to be put out of use when it fills up to about half a meter below the squatting plate level. Once this occurs the pit has to be filled up with soil and allowed to decompose. The squatting hole is to be covered with the lid provided and the alternative pit (twin pit arrangement) can be put to use. In about a year the decomposed matter from the old pit (by then will be rich harmless soil without any smell) could be removed and used as organic manure.

10. Summary

In view of widespread practice of open defecation, the household Latrine options presented in this manual will help in accelerating the sanitation drive in rural Nepal. Not because they are cheap or easy to use but also suitable to the respective conditions, environment friendly as well as addressing the needs of the people. The sustainability, therefore, of the sanitary system if created, increases manifold which helps in improvement and reinforcement of hygiene practice. It is expected that during demand triggering and promotion of Community Led Approaches, this manual will help WASH practitioners in their efforts to make Nepal open defecation free by 2017 and achieve the Millennium Development Goal nearly within UN timeframe.

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9. Technology Options for Household sanitation, Rajiv Gandhi National Drinking Water Mission, Department of Drinking Water Supply, Ministry of Rural Development, Govt. of India, 2006.
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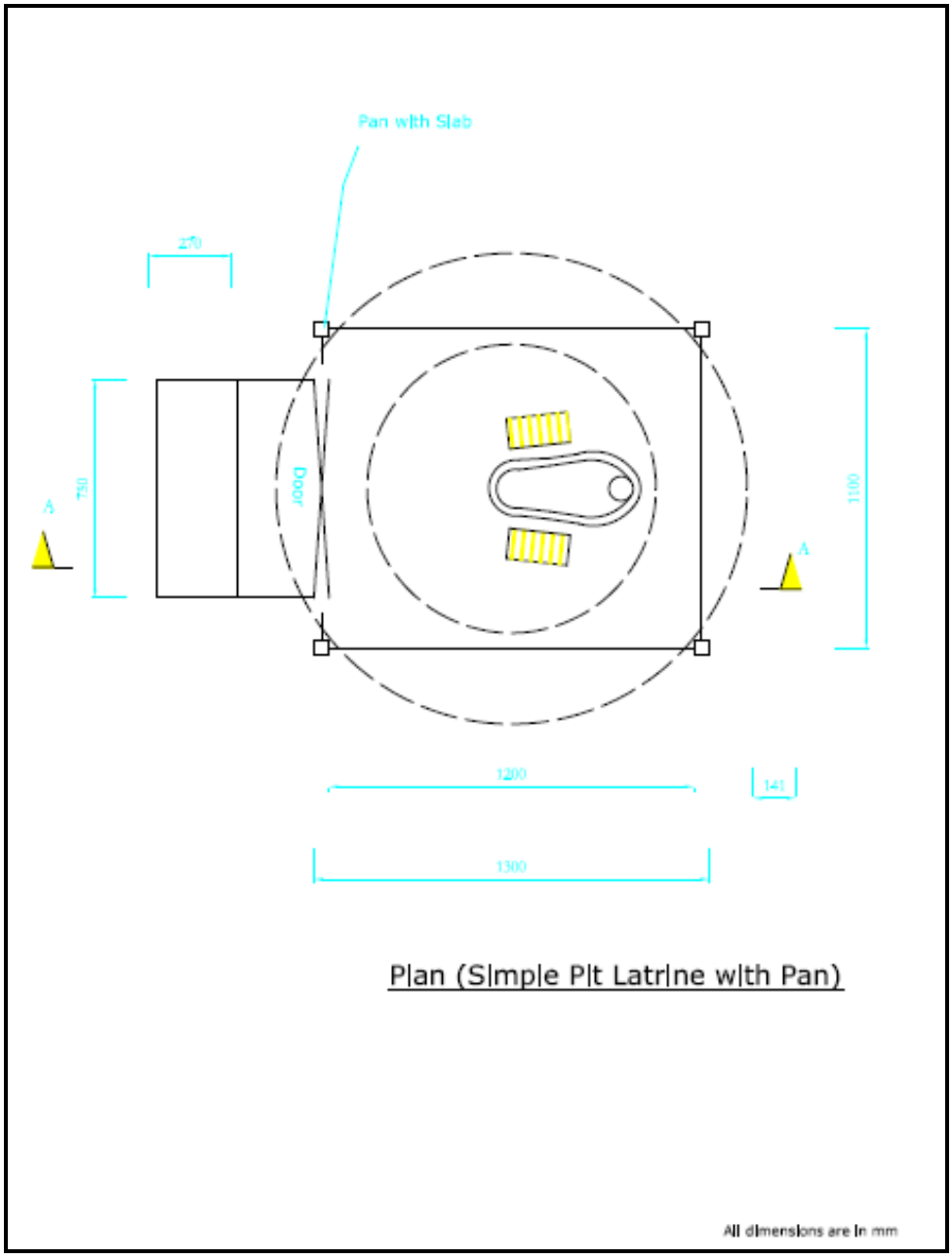
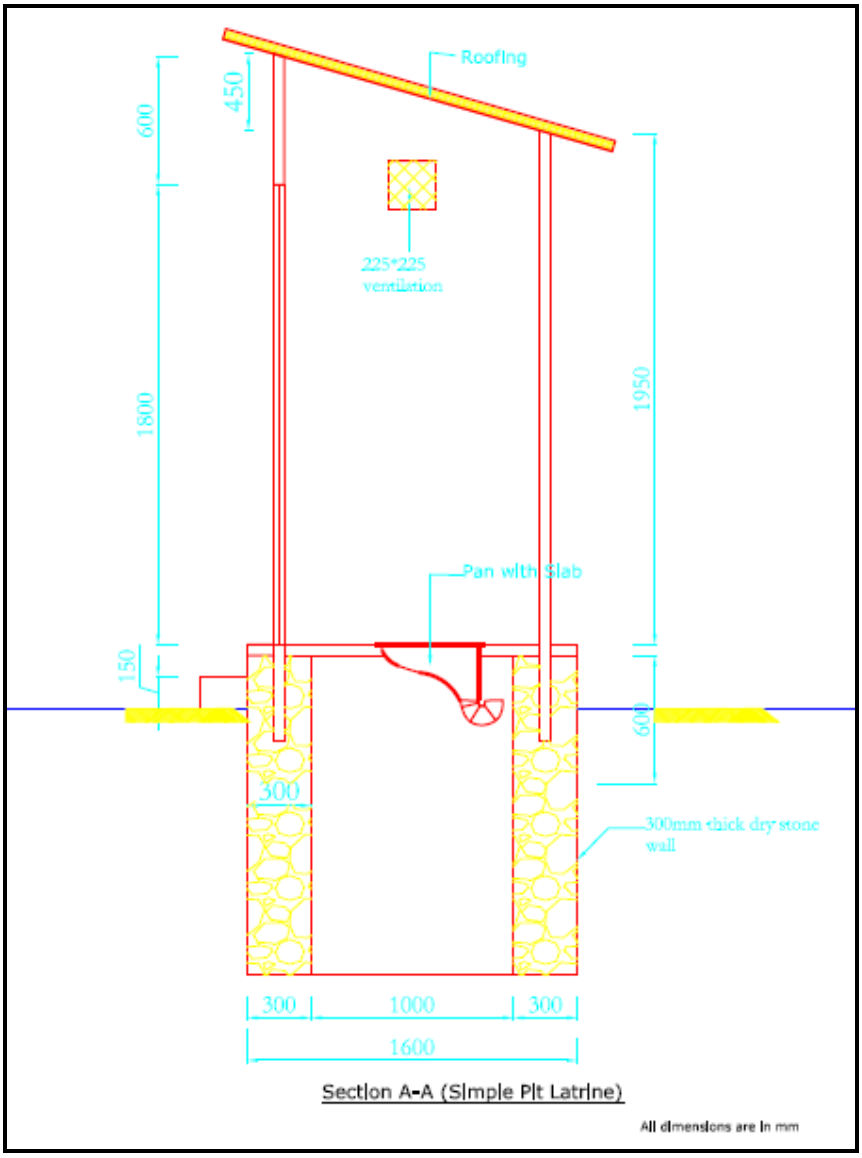
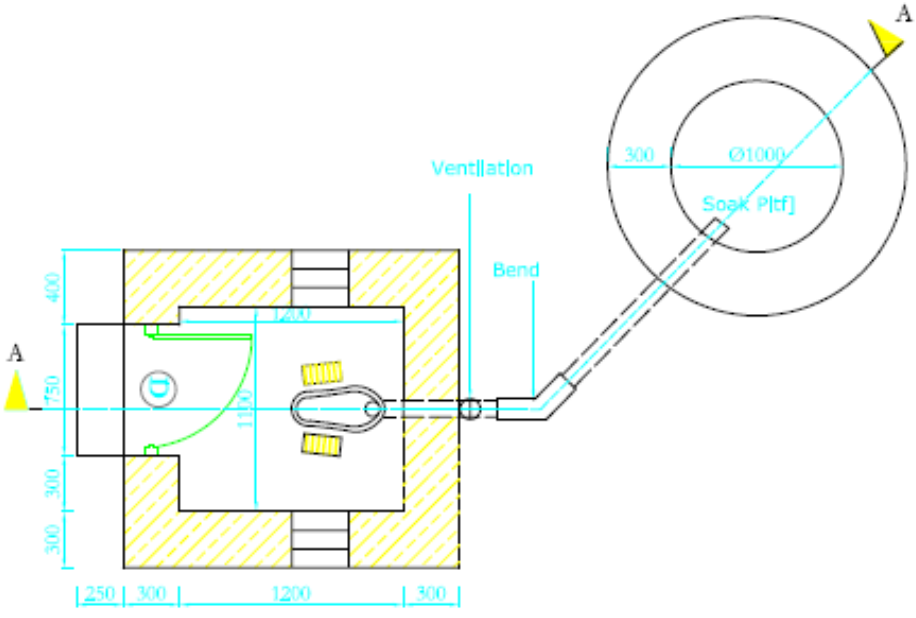
Part III

Technical Drawings

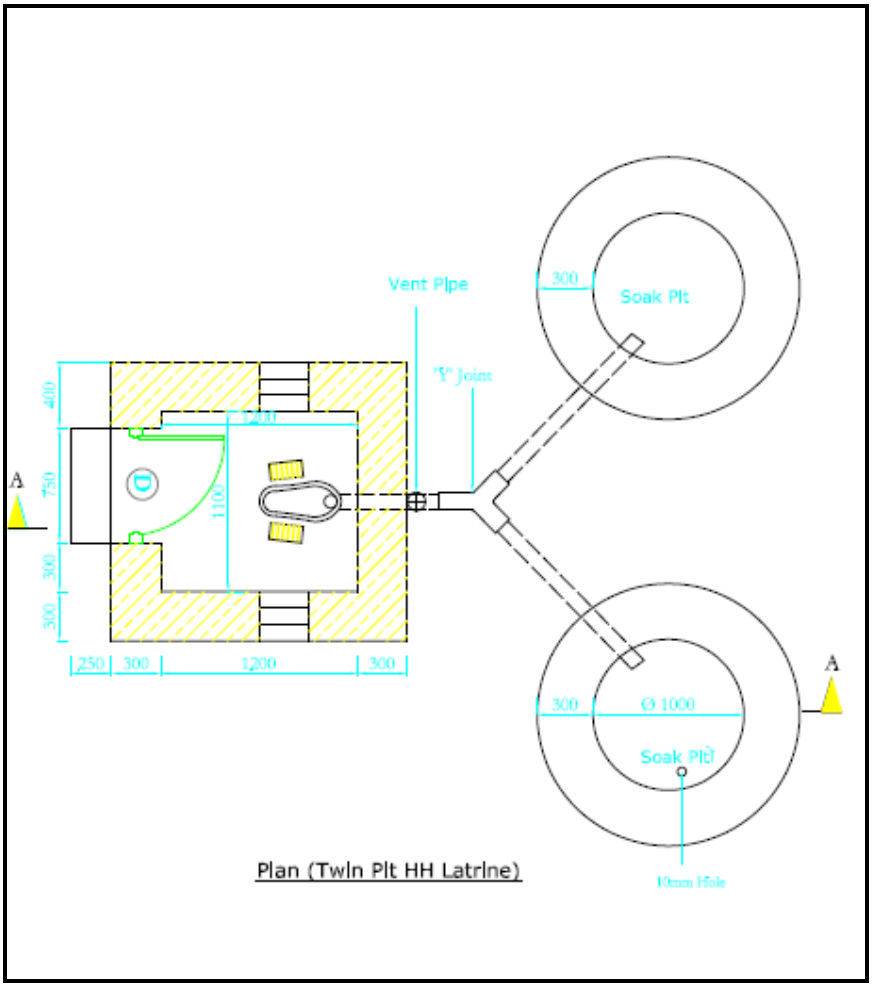


Plan (Simple Pit Latrine with Pan)

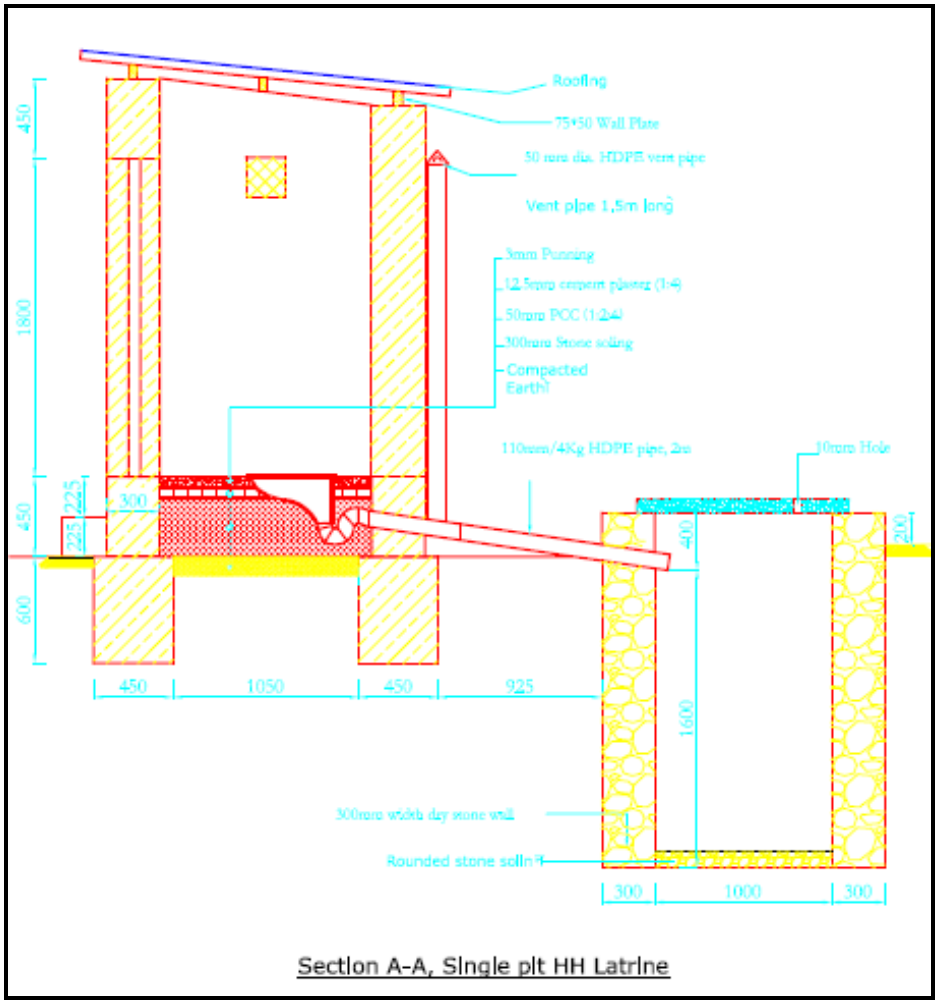

Roofing
450
600
225*225
ventilation
1800
1950
Pan with Slab
150
600
300
300mm thick dry stone
wall
300
1000
300
1600
Section A-A (Simple Pit Latrine)
All dimensions are in mm



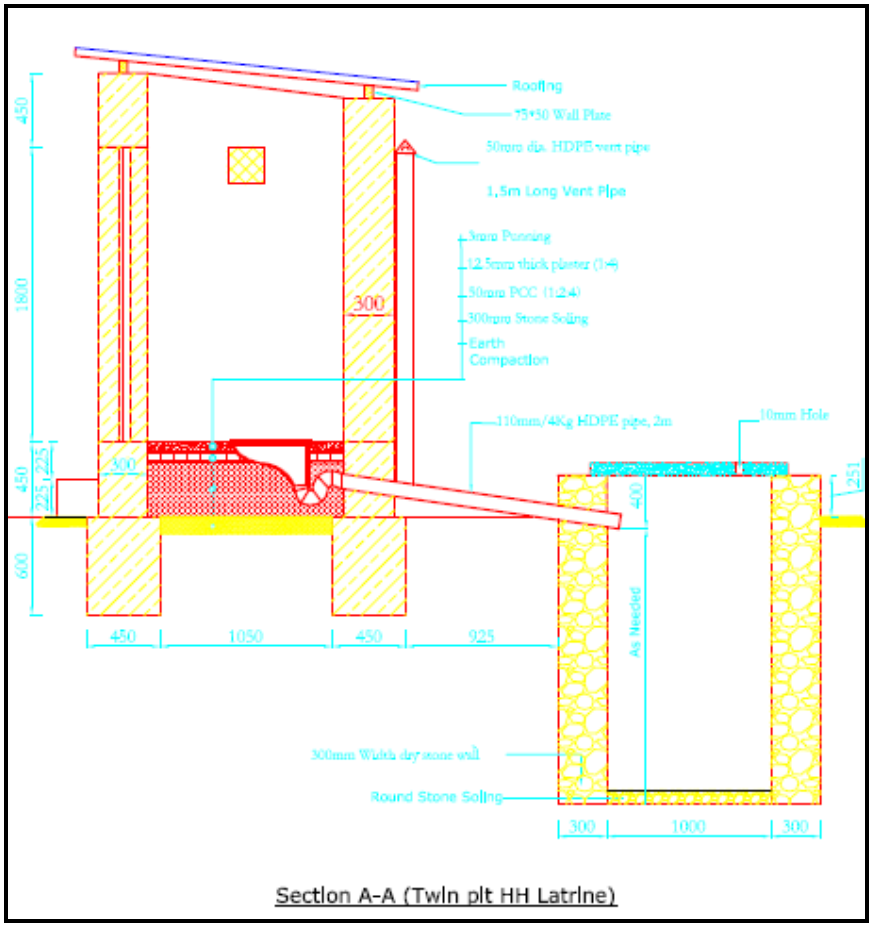
Single Pit HH Latrine



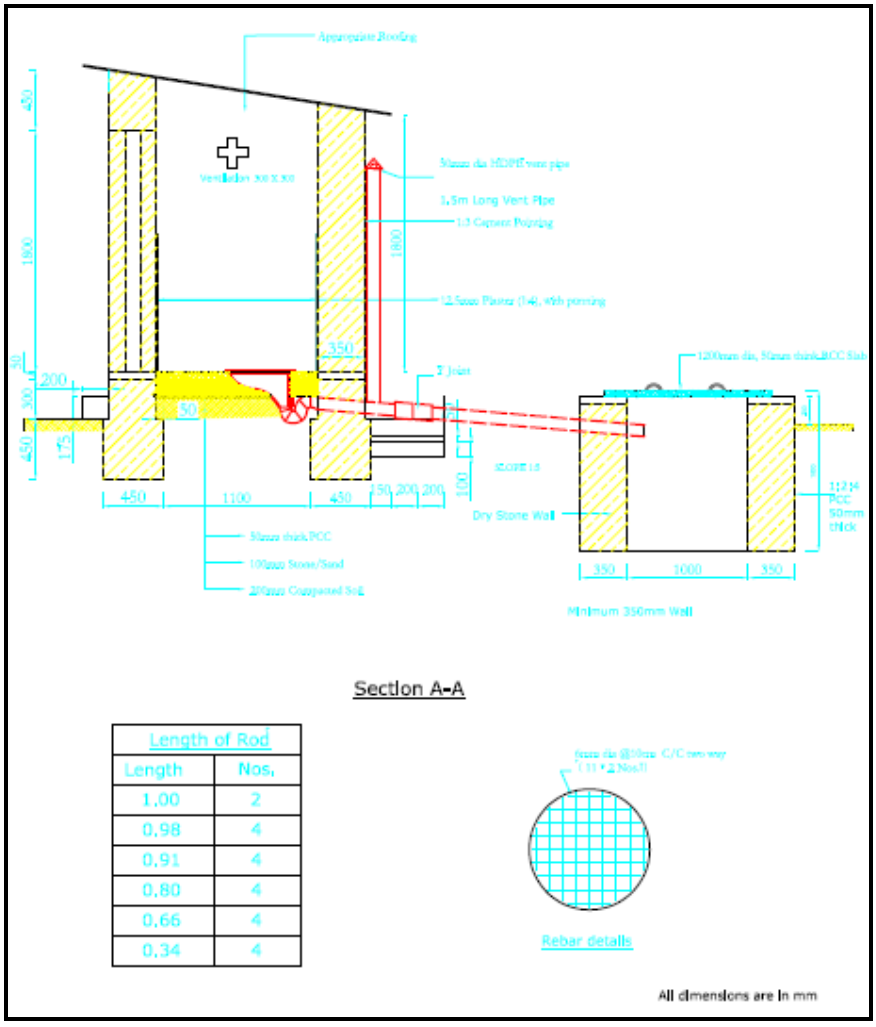
Plan (Twin Plt HH Latrine)

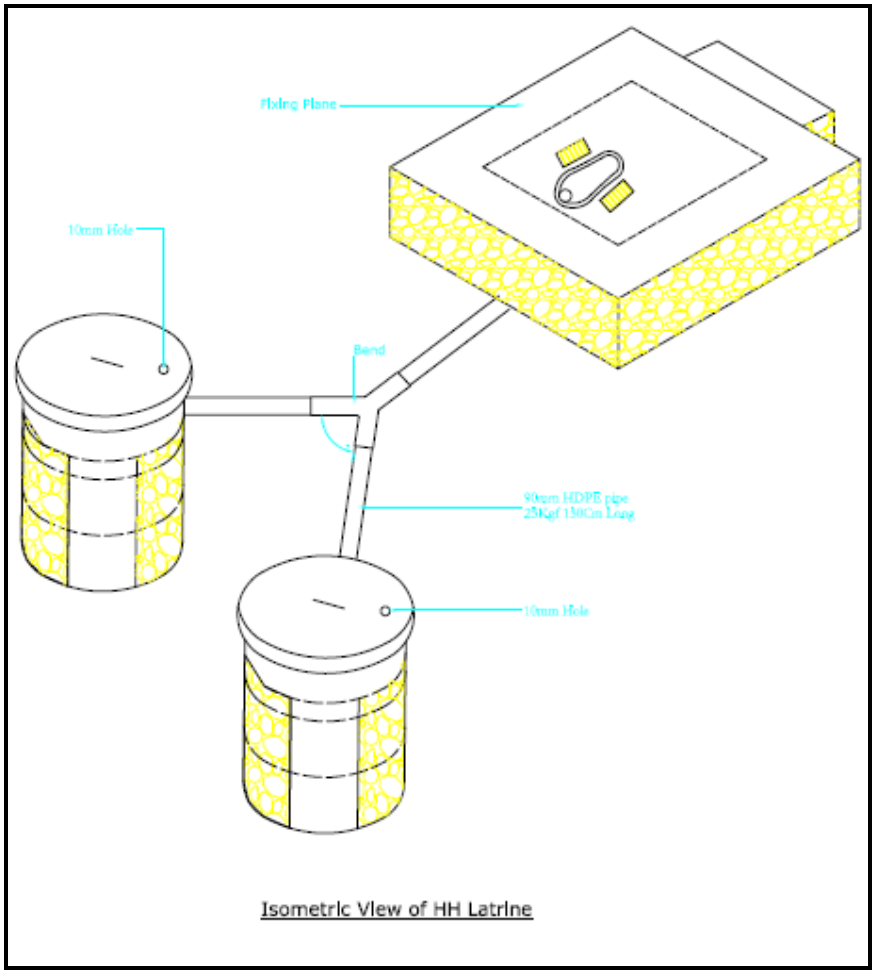


Section A-A, Single pit HH Latrine

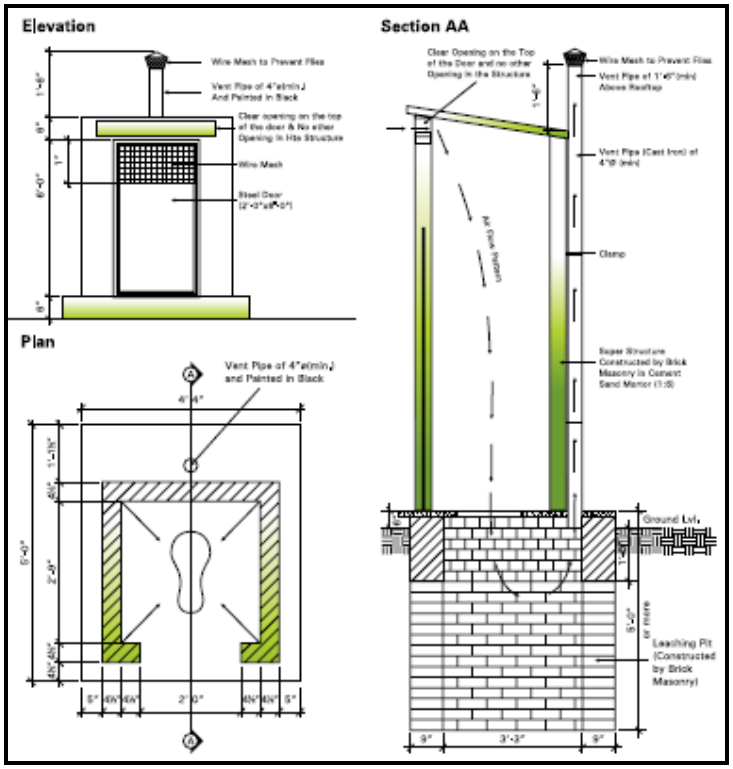


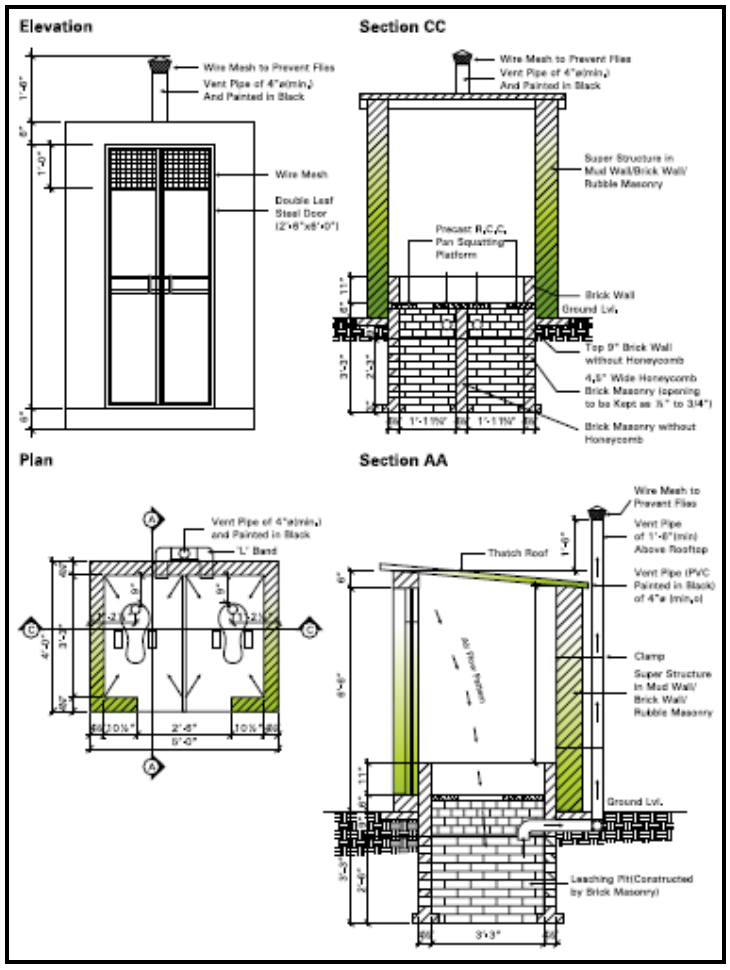
Section A-A (Twin pit HH Latrine)

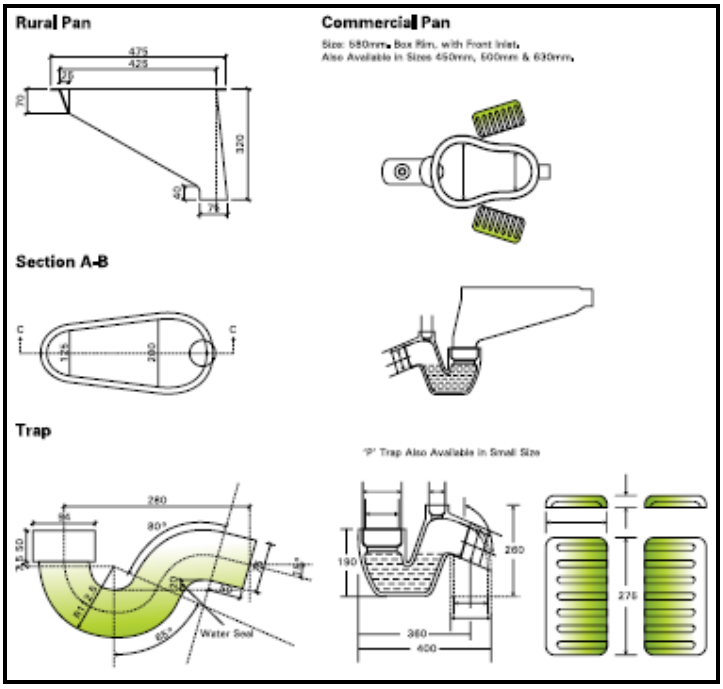

Appropriate Roofing
1.5m Long Vent Pipe
1:3 Cement Pointing
12.5mm Plaster (1:4), with pointing
3 Joint
1200mm dia, 50mm thick RCC Slab
Dry Stone Wall
50mm thick PCC
100mm Stone/Sand
200mm Compacted Soil
Minimum 350mm Wall
Section A-A
Length of Rod
Length
Nos.
1,00
2
0,98
4
0,91
4
0,80
4
0,66
4
0,34
4
Rebar details
All dimensions are in mm

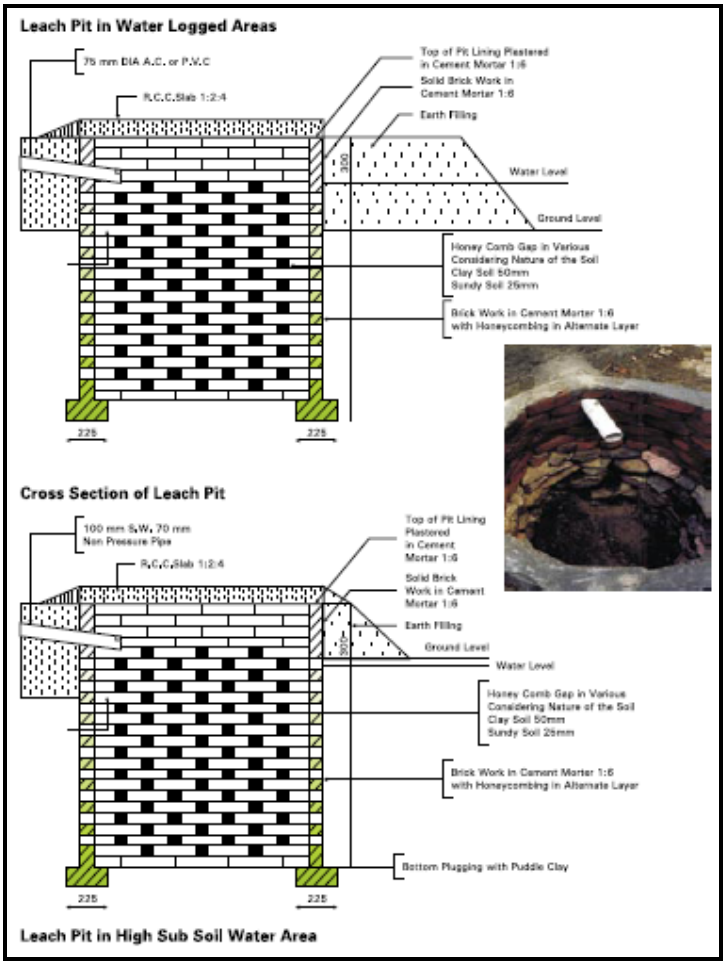


Isometric View of HH Latrine


Elevation
Section AA
Plan
Wire Mesh to Prevent Flies
Vent Pipe of 4"ø(min.)
And Painted in Black
Clear opening on the top
of the door & No other
Opening in the Structure
Wire Mesh
Steel Door
(2'-0"x6'-0")
Vent Pipe of 4"ø(min.)
and Painted in Black
Clear Opening on the Top
of the Door and no other
Opening in the Structure
Vent Pipe (Cast Iron) of
4"ø (min)
Clamp
Super Structure
Constructed by Brick
Masonry in Cement
Sand Mortar (1:6)
Ground Lvl.
Leaching Pit
(Constructed
by Brick
Masonry)
9"
3'-3"
9"


Elevation
Section CC
Plan
Section AA
Wire Mesh to Prevent Flies
Vent Pipe of 4"ø(min.)
And Painted in Black
Wire Mesh
Double Leaf
Steel Door
(2'-6"x6'-0")
Super Structure in
Mud Wall/Brick Wall/
Rubble Masonry
Precast R.C.C.
Pan Squatting
Platform
Brick Wall
Ground Lvl.
Top 9" Brick Wall
without Honeycomb
4.5" Wide Honeycomb
Brick Masonry (opening
to be Kept as ½" to 3/4")
Brick Masonry without
Honeycomb
Vent Pipe of 4"ø(min.)
and Painted in Black
'L' Band
Thatch Roof
Vent Pipe (PVC
Painted in Black)
of 4"ø (min.ol
Clamp
Super Structure
in Mud Wall/
Brick Wall/
Rubble Masonry
Ground Lvl.
Leaching Pit(Constructed
by Brick Masonry)
3'-3"


Rural Pan
Commercial Pan
Size: 580mm, Box Rim, with Front Inlet.
Also Available in Sizes 450mm, 500mm & 630mm.
Section A-B
Trap
'P' Trap Also Available in Small Size
Water Seal


Leach Pit in Water Logged Areas
75 mm DIA A.C. or P.V.C
R.C.C.Slab 1:2:4
Top of Pit Lining Plastered in Cement Mortar 1:6
Solid Brick Work in Cement Mortar 1:6
Earth Filling
Water Level
Ground Level
Honey Comb Gap in Various Considering Nature of the Soil
Clay Soil 50mm
Sandy Soil 25mm
Brick Work in Cement Mortar 1:6 with Honeycombing in Alternate Layer
Cross Section of Leach Pit
100 mm S.W. 70 mm Non Pressure Pipe
R.C.C.Slab 1:2:4
Top of Pit Lining Plastered in Cement Mortar 1:6
Solid Brick Work in Cement Mortar 1:6
Earth Filling
Ground Level
Water Level
Honey Comb Gap in Various Considering Nature of the Soil
Clay Soil 50mm
Sandy Soil 25mm
Brick Work in Cement Mortar 1:6 with Honeycombing in Alternate Layer
Bottom Plugging with Puddle Clay
Leach Pit in High Sub Soil Water Area