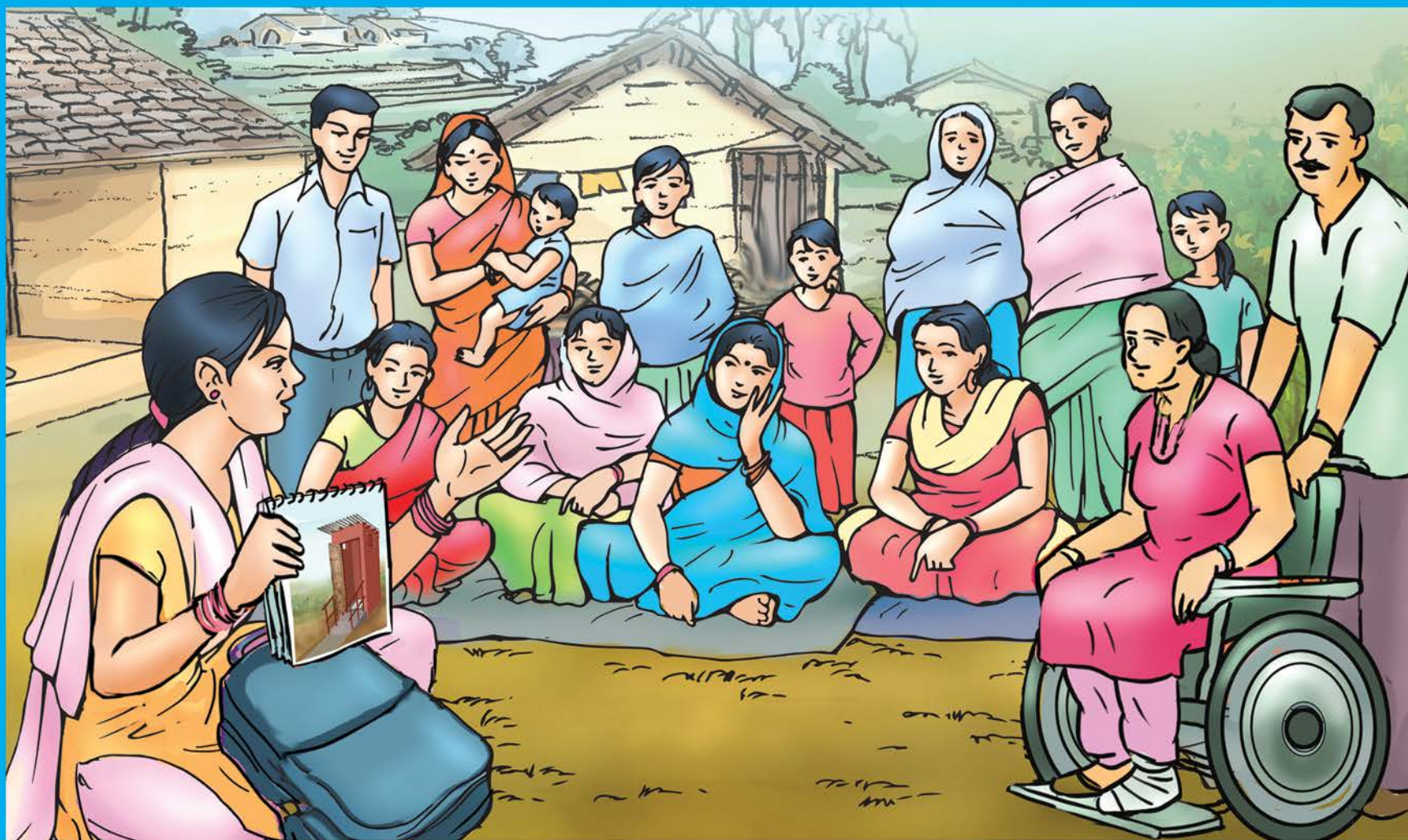


“Dedicated to the Sanitation Campaign of Nepal”

# Household Toilet Options for the Terai



**National Water Supply and Sanitation Training Center  
Department of Water Supply and Sewerage**

Supported by:



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**Content** : Kailash Sharma (SNV Nepal)  
**Design and Layout** : Top of Mind Pvt. Ltd.  
**Illustration** : Sovit Baniya (Top of Mind Pvt. Ltd.)

## Message

The Government of Nepal has given importance to sanitation and hygiene since many years and recognises the harmful impacts of open defecation on human health and dignity and the environment. The Constitution of Nepal further affirms sanitation and hygiene as a basic human right. Progress in access to sanitation has been rapid and the country is on track to achieving Open Defecation Free status by the end of 2017.

The National Sanitation and Hygiene Master Plan (2011) establishes clear guidelines that every household must have access to a safe toilet with a permanent sub-structure. Here, under the leadership of the Department of Water Supply and Sewerage (DWSS) and its implementing offices in the districts, WaSH stakeholders have supported communities to build their

own toilets and achieve Open Defecation Free (ODF) status. In the push towards achieving universal sanitation coverage, the Terai belt of Nepal has however been lagging behind in sanitation access.

This handbook will help guide the people of Terai to make toilets suitable for their families as per their local context. I would like to congratulate the National Water Supply and Sanitation Training Centre (NWSSTC) for taking lead in preparing this practical guide that will support the sanitation campaign and future constructions in the Terai.

I would like to acknowledge SNV Nepal and its team for their financial and technical support in developing this handbook.



**Mr. Tej Raj Bhatt**

Director General  
Department of Water Supply and Sewerage

## Message

I am pleased to know that National Water Supply and Sanitation Training Centre (NWSSTC) is bringing forward this important handbook in a very critical time that can support the Terai communities of Nepal in building toilets. One challenge for people who have not used a toilet before is knowing which type of toilet is suitable for their household and falls within their investment capacity.

Typically, community people make toilets by copying each other without understanding the features of the toilet system and its advantages or disadvantages. In many cases, people are then reluctant to make any toilet at all.

I hope this handbook will be helpful in eliminating any misconception of in Terai people about toilet and also to choose proper toilet option. I would like to extend my sincere thanks to all those who were involved in developing this handbook, especially, the SNV team working on it and the members of the National Sanitation and Hygiene Coordination Committee for their inputs and feedback in finalising this document.

I am also pleased to note that this handbook will enable communities of the Terai to build quality toilets and would urge sanitation stakeholders to consider it as a reference for sanitation.



**Er. Sunil Kumar Das**

Deputy Director General  
Department of Water Supply and Sewerage

## Acknowledgement

Recent reports on sanitation progress indicate that the 'Sanitation Lagged' area of mid-eastern Terai is now picking momentum. In an average, the district sanitation coverage is reported to exceed 80% despite of sluggish progress rates in the recent past years while other areas of the country were skyrocketing in ODF achievements. Despite of the unprecedented progress rates during 2016-17, however, due to the very limited time period remaining to construct toilets in each and every households, to achieve universal sanitation coverage in the country within 2017 seems a Herculean task for the entire WaSH sector.

This small effort to make available a 'Terai Toilet Options Handbook' as a hands on pictorial guide to households willing to build their own toilets, is expected to contribute and accelerate towards achieving universal sanitation coverage in the country.

This handbook will help families to decide on an appropriate toilet option based on their investment capacity, space availability, availability of local materials, family preferences, and site-specific conditions such as ground water and flood levels. The

illustrations and material estimates presented can be used by sanitation promoters and service providers - masons, ring producers, hardware suppliers to inform people about different toilet options including the sub-structure and the super-structure. The handbook can also be used as a basic reference for new constructions and for people who are interested in upgrading their toilet in the future.

This handbook has been the result of the efforts of WaSH stakeholders of Nepal and the work done over the years in developing appropriate toilet options. I would like to thank the entire team of SNV Nepal and its Sustainable Sanitation and Hygiene for All (SSH4A) programme implemented with funding from Department for International Development (DFID), UK, Department of Foreign Affairs and Trade (DFAT), Australia, and the Ministry of Foreign Affairs (DGIS), the Netherlands for their financial and technical support in developing this handbook.

NWSSTC will highly appreciate any critical feedbacks on it.



**Er. Kabindra Bikram Karki,**

Director  
National Water Supply and Sanitation Training Centre



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# 1. Introduction

## 1.1 Rationale

Awareness on the importance of sanitation is increasing in the terai and there has been a rapid progress in access to sanitation. A key recommendation from District WASH Coordination Committees in a number of terai districts has been to develop a guide on technology options for toilets that are suitable for the socio-cultural and geo-physical context of the terai. Although various technical documents have been developed on toilet design, a guide focussing on the needs of the terai has been lacking.

Such a guide has to address the specific conditions of the terai such as preferences of the local communities, typically used construction materials, density of settlements, soil type and groundwater level, and maintenance requirements (faecal sludge emptying). It also has to present options for households with varying incomes and investment choices.

Consumer preferences in the terai have shown that people aspire for a (pour-) flush toilet and do not accept dry toilets. Therefore, dry latrines such as the ventilated improved pit latrine have not been included. The urine-separating eco-san toilet is the only dry toilet option presented for the small percentage of households that are interested in using treated urine and faeces as a fertiliser as well as its suitability for areas with high groundwater.

All pits are lined with rings, which is the cheapest and most effective way to construct pits in the terai with locally available materials. The location of a pit directly under the toilet or as an off-set pit as well as the number of pits depends both on space availability and the method and frequency of removing faecal sludge from the pits.

The terai, being the low-lying plains of the country, has large swathes of land prone to flooding and/or with a high groundwater table. In order to make environmentally safe toilets that do not

pollute water bodies, toilet options with sealed sub-structures or semi/fully above-ground collection chambers are also presented.

This handbook has been prepared by compiling, reviewing, testing, and updating the existing literature on toilet options published by different government and non-government agencies in Nepal. It aims to complement sanitation demand creation activities and assist households in selecting a toilet that meets their needs.

The handbook is divided into four parts: the introduction, commonly used toilet options, toilet options for flood and high groundwater conditions, and practical details on constructing a toilet including options for super-structures.

## 1.2 Target audience

This handbook is intended to be used by sanitation extension workers, social mobilisers, health motivators, and others who are engaged in motivating households to build their own toilets. It can be used to guide families in making a decision about the type of toilet to construct, the materials needed for the sub-structure, site selection and toilet dimensions, and options for the super-structure. It is also intended to serve as a reference document for masons and sanitation suppliers on different kinds of toilets and sanitation materials and to promote suitable options to clients.

## 1.3 Toilet

The National Sanitation and Hygiene Master Plan (NSHMP 2011) has defined an improved toilet as one that hygienically separates human excreta from human contact. It further recommends all toilets to have a permanent structure up to the plinth level. Therefore, all toilet options in this handbook meet these criteria, are durable, and minimise the risk of disease transmission.



**In Nepal the following, options are considered as an improved toilet:**

a. Flush or pour-flush to:

- Piped sewer system
- Septic tank system
- A pit

b. Ventilated improved pit (VIP) toilet

## 1.4 Basis for toilet selection

There are a number of factors that play an important role in selecting a desired toilet. Some key factors are as follows:

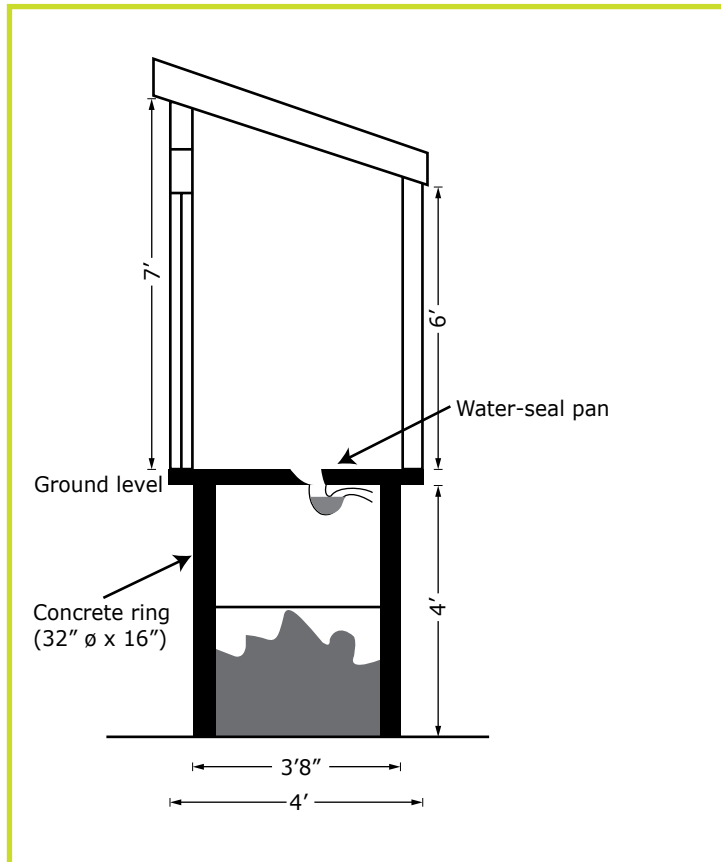
• Cost/affordability	• Space availability
• Water availability	• Social norms, cultural habit
• Geological condition: soil type, water table	• Faecal sludge emptying systems
• Cleansing habit	• Availability of sanitation products and services

## 1.5 Basis for material estimation

The primary basis for material estimation for different toilet designs in the handbook has been information collected from experienced masons engaged in toilet construction in the terai districts. Additionally, some references have been used from technical documents prepared by government and non-governmental agencies working in the sanitation sector.

## 2. Toilet Options

### 2.1 Direct pit, water seal toilet - concrete ring lining



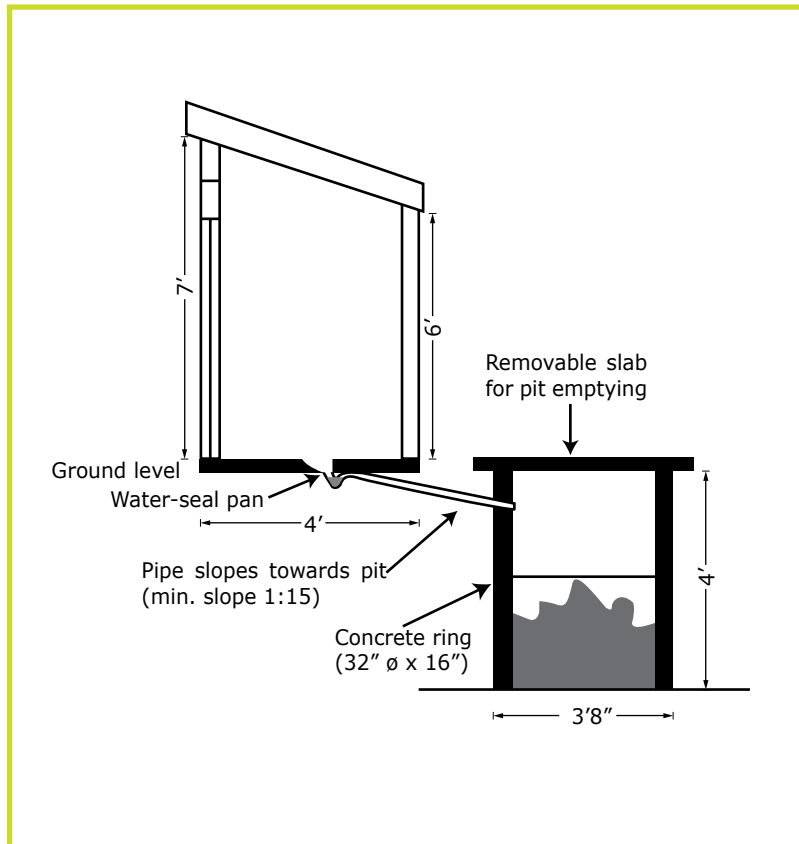
**Suitability: Low groundwater table, limited space**

Advantage	Disadvantage
Odour free	Water is needed for flushing excreta
Easy to clean	Skilled mason is needed for construction
Can be built on limited land	Risk of ground or surface water contamination if constructed near water points
Possible to upgrade to an offset pit toilet	Latrine needs to be shifted when pit fills up, every 3-5 years (no access to pit for faecal sludge emptying)
	Risk of slab collapsing if it is not installed properly
	Pit needs to be emptied every 3-5 years

**Material Estimation (up to plinth level)**

SN	Items	Unit	Qty.	Rate	Amount
<b>A.</b>	<b>Materials</b>				
1	Concrete ring (32" ø x 16")	Nos.	3		
2	Cement	Bag of 50 kg	2		
3	Sand	Cement bag	10		
4	Gravel	Cement bag	3		
5	Brick	Nos.	280		
6	Pan with siphon	Set	1		
7	Iron rod (8 mm)	Kg	10		
<b>B.</b>	<b>Human resources</b>				
1	Skilled mason	Person-days	1		
2	Labour	Person-days	2		

## 2.2 Offset single pit, water seal toilet - concrete ring lining



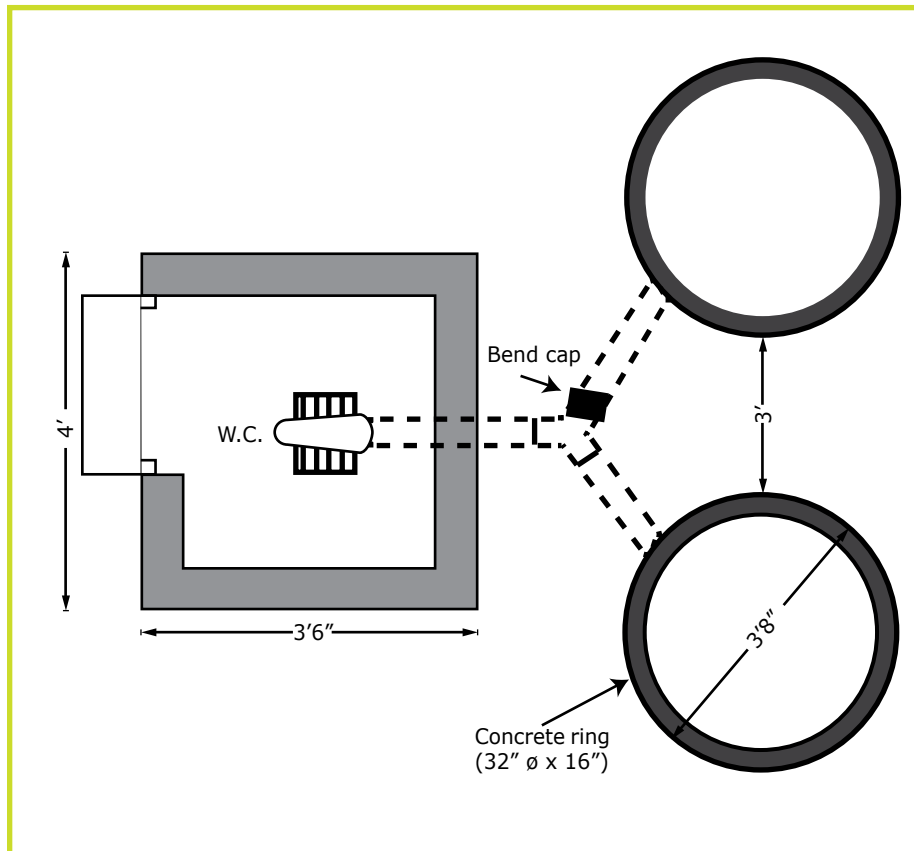
**Suitability: Low groundwater table**

Advantage	Disadvantage
Odour free	Water is needed for flushing excreta
Easy to clean	Skilled mason is needed for construction
Easy access to pit for faecal sludge emptying	Risk of ground or surface water contamination if constructed near water points
Possible to upgrade to an offset, double pit toilet	Requires more land for construction than a direct pit toilet
	Faecal sludge needs to be emptied from pit every 3-5 years

**Material Estimation (up to plinth level)**

SN	Items	Unit	Qty.	Rate	Amount
<b>A.</b>	<b>Materials</b>				
1	Concrete ring (32" ø x 16")	Nos.	3		
2	Ring cover	Nos.	1		
3	Cement	Bag of 50 kg	2		
4	Sand	Cement bag	10		
5	Gravel	Cement bag	3		
6	Brick	Nos.	280		
7	Pan with siphon	Set	1		
8	HDPE pipe 4"	ft	3		
<b>B.</b>	<b>Human resources</b>				
1	Skilled mason	Person-days	2		
2	Labour	Person-days	3		

## 2.3 Offset double pit, water seal toilet - concrete ring lining



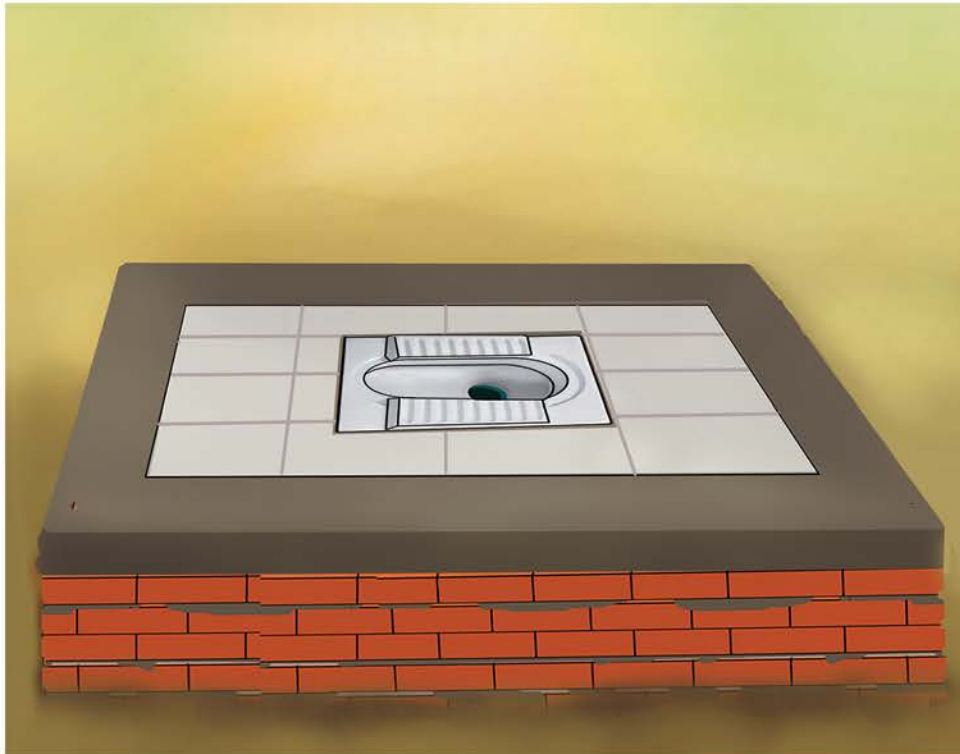
### Suitability: Low groundwater table

Advantage	Disadvantage
Odour free	Water is needed for flushing excreta
Easy to clean	Skilled mason is needed for construction
Easy access to pit for faecal sludge emptying	Risk of ground or surface water contamination if constructed near water points
Twin pits can be used alternatively and therefore require less frequent emptying	Requires more land for construction than an offset, single pit toilet
Low maintenance cost	Construction cost is higher than a single pit toilet
Material from pit can be used as manure after sufficient decomposition	

### Material Estimation (up to plinth level)

SN	Items	Unit	Qty.	Rate	Amount
<b>A.</b>	<b>Materials</b>				
1	Concrete ring (32" ø x 16")	Nos.	8		
2	Ring cover	Nos.	2		
3	Cement	Bag of 50 kg	2		
4	Sand	Cement bag	10		
5	Gravel	Cement bag	3		
6	Brick	Nos.	300		
7	Pan with siphon	Set	1		
8	HDPE pipe 4"	ft	10		
9	HDPE Y (4") or tee	Nos.	1		
<b>B.</b>	<b>Human resources</b>				
1	Skilled mason	Person-days	2		
2	Labour	Person-days	4		

## 2.4 "Easy latrine"





### Differences with other options

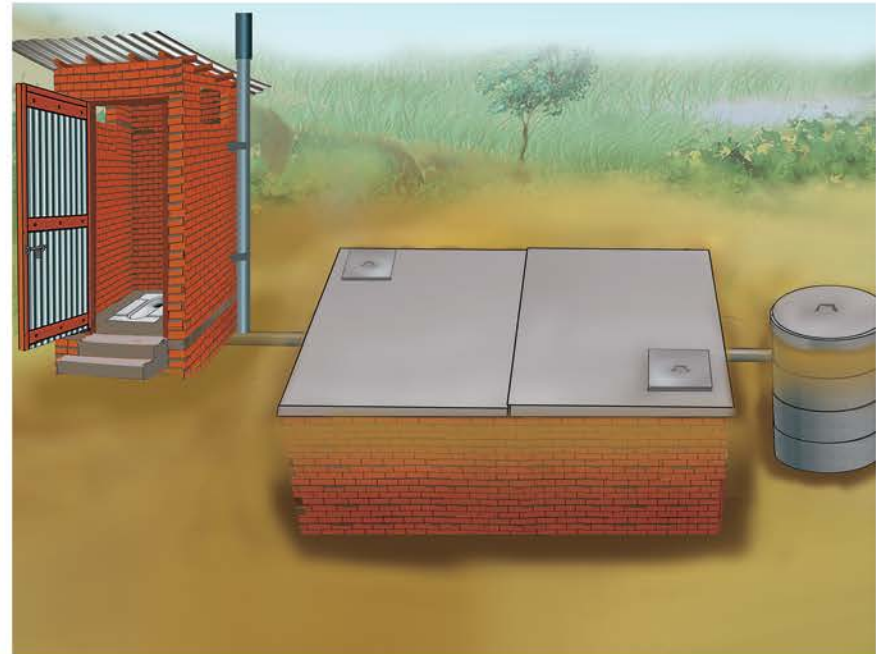
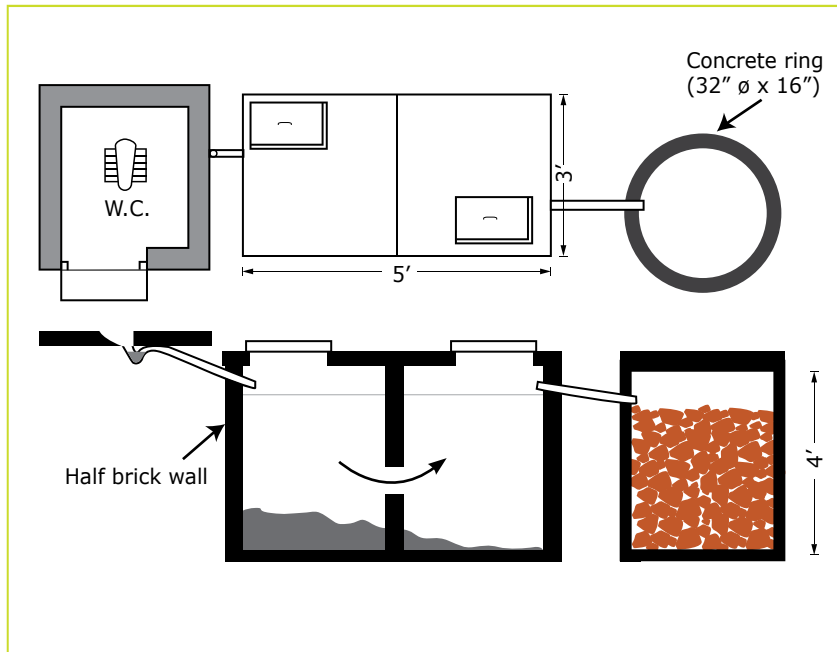
1. Pan is fixed in a pre-fabricated, tile-faced concrete slab. There is no need to construct a slab separately.
2. Three-piece rings can be disassembled for easy transport with minimum damage.
3. Toilet can be constructed by household members with basic guidance by supplier and minimum support from mason.
4. Toilet can be constructed in less time.

### Material Estimation (up to plinth level)

SN	Items	Unit	Qty.	Rate	Amount
<b>A.</b>	<b>Materials</b>				
1	Concrete ring (3-piece ring)	Nos.	4		
2	Ring cover	Nos.	1		
3	Cement	Bag of 50 kg	1		
4	Sand	Cement bag	5		
6	Brick	Nos.	280		
7	Pan with siphon	Set	1		
8	HDPE pipe	ft	3		
<b>B.</b>	<b>Human resources</b>				
1	Skilled mason	Person-days	1		
2	Labour	Person-days	2		

# 3. Flood and High Groundwater Toilet Options

## 3.1 Toilet with septic tank and soakpit



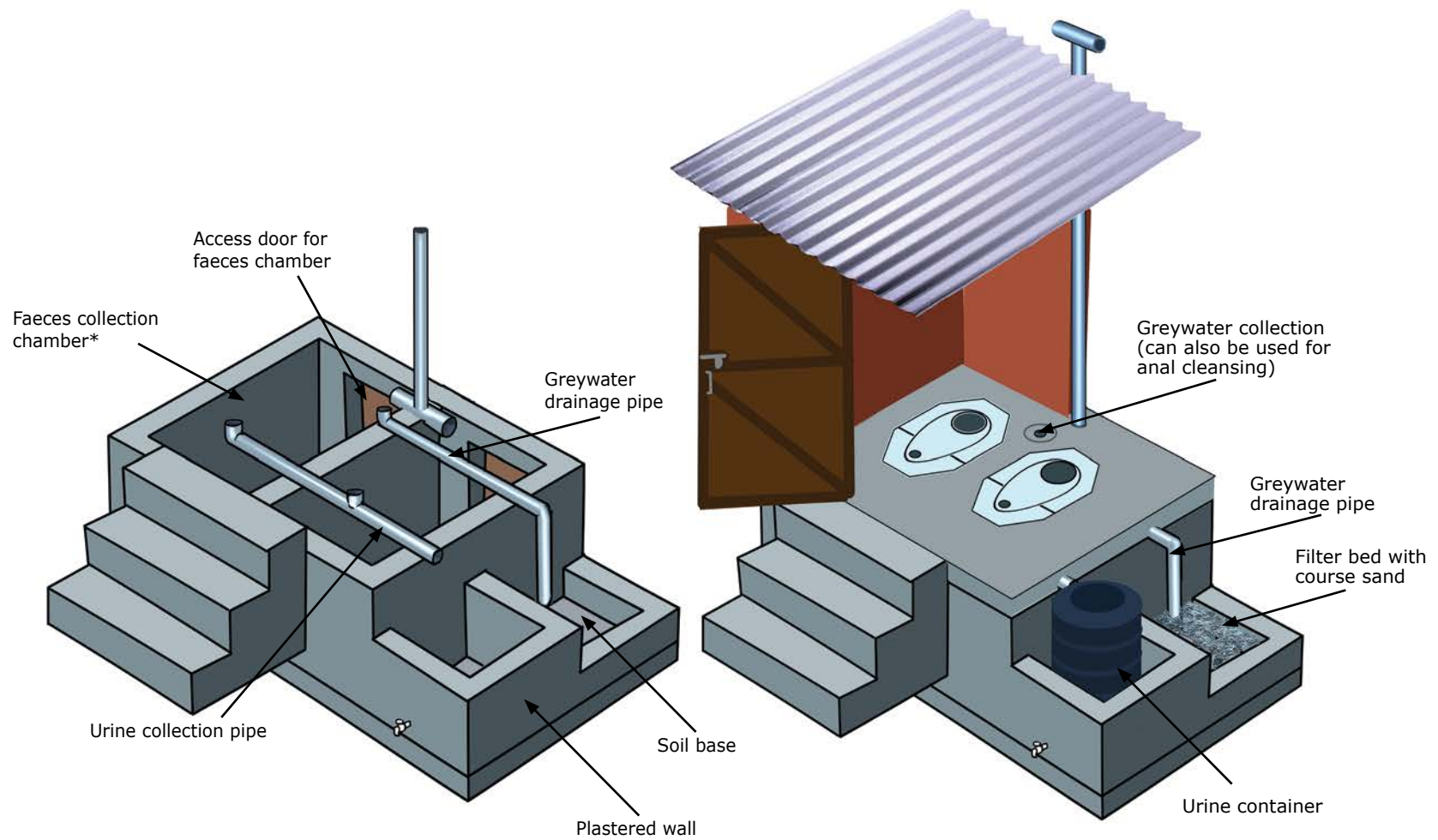
## Suitability: high groundwater table and water logged area

Advantage	Disadvantage
Odour free	Water is needed for flushing excreta
Easy to clean	Skilled mason is needed for construction
Easy access to pit for faecal sludge emptying	More non-local materials are needed for construction
Lower risk of ground or surface water contamination	Requires more land for construction than all other toilet types
	High construction cost
	Faecal sludge needs to be emptied from septic tank every 3-5 years

## Material Estimation (up to plinth level)

SN	Items	Unit	Qty.	Rate	Amount
<b>A.</b>	<b>Materials for toilet</b>				
1	Brick	Nos.	280		
2	Sand	Cement bag	10		
3	Gravel	Cement bag	2		
4	Cement	Bag of 50 kg	2		
5	Pan with siphon	Set	1		
6	HDPE pipe 4"	ft	3		
7	HDPE tee 4" x 2"	Nos.	1		
8	HDPE vent pipe 2"	ft	7		
9	Vent pipe cap with fine wire mesh	Nos.	1		
<b>B.</b>	<b>Materials for septic tank</b>				
1	Brick	Nos.	850		
2	Sand	Cement bag	40		
3	Gravel	Cement bag	15		
4	Cement	Bag of 50 kg	8		
5	HDPE pipe 4"	ft	4		
6	HDPE tee 4"	Nos.	2		
7	Iron rod 8 mm	Kg	50		
8	Binding wire	Kg	0.5		
<b>C.</b>	<b>Materials for soak pit</b>				
1	Ring (32" ø x 16")	Nos.	3		
2	Concrete ring cover	Nos.	1		
3	Brick bats	Cement bag	25		
<b>D.</b>	<b>Human resources</b>				
1	Skilled mason	Person-days	10		
2	Labour	Person-days	13		

### 3.2 Eco - san toilet (dry)



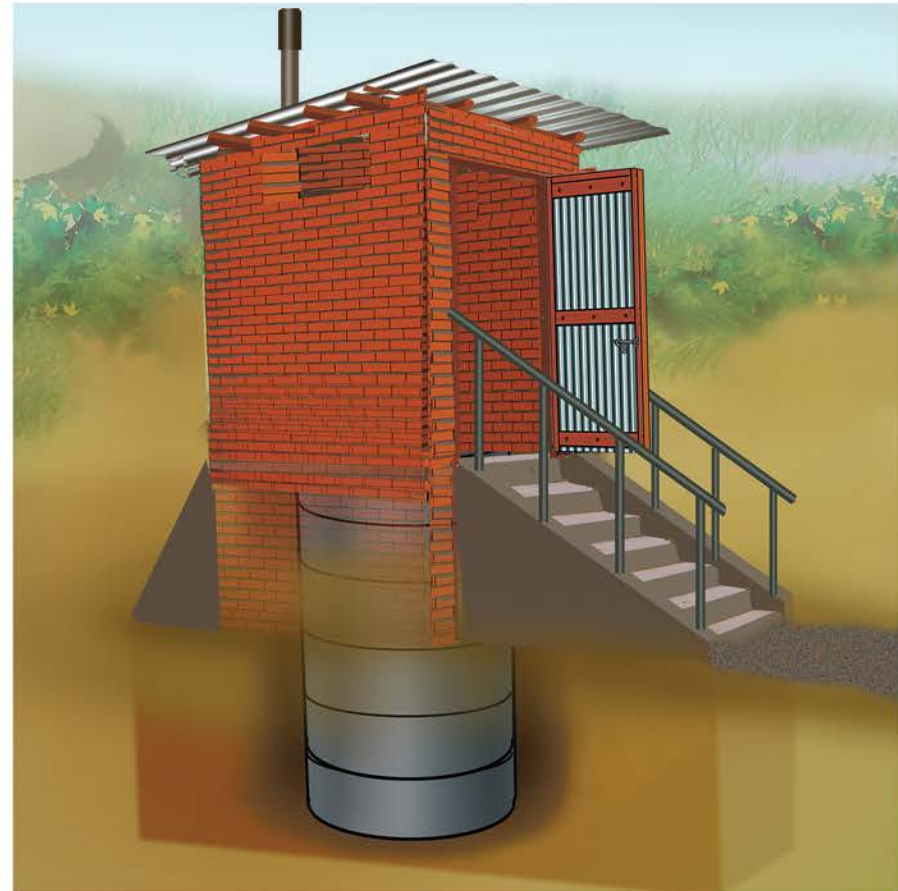
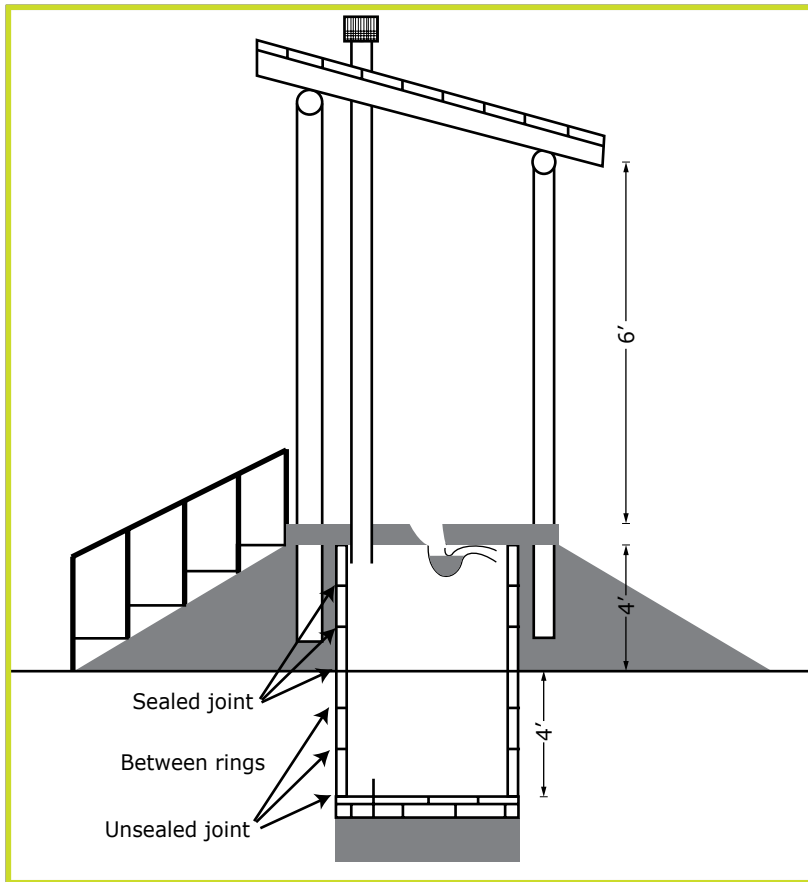
### Suitability: High groundwater table, water-logged, and flood-prone area

Advantage	Disadvantage
No water is needed for flushing	Can have slight odour in the toilet
Easy to clean	Need a high level of awareness and proper treatment to use excreta safely as a fertilizer
Easy access to urine collection container and faeces collection chambers for emptying	Need to collect urine frequently (depends on family size)
Prevents ground- and surface water contamination	Need to empty faeces collection chamber regularly (on average, after six months' storage)
Urine and faeces can be used as fertilizer after treatment	High construction cost

### Material Estimation (up to plinth level)

SN	Items	Unit	Qty.	Rate	Amount
<b>A.</b>	<b>Materials for toilet</b>				
1	Brick	Nos.	800		
2	Cement	Bag of 50 kg	8		
3	Sand	Cement bag	35		
4	Aggregate	Cement bag	12		
5	Iron rod 8 mm	Kg	36		
6	Binding wire	Kg	0.5		
7	HDPE pipe 4" - vent pipe	ft	8		
8	HDPE pipe 1.5" - urine & waste water pipe	ft	12		
9	Eco - san pan	Set	2		
10	HDPE tee 4"	Nos.	1		
11	HDPE L 1.5"	Nos.	3		
12	HDPE tee 1.5"	Nos.	1		
13	Plastic drum (50 liter)	Nos.	1		
14	Tap (0.5 inch)	Nos.	1		
15	Vent pipe cap with fine wire mesh	Nos.	1		
16	Wooden door (1.5 x 2 ft)	Nos.	2		
<b>B.</b>	<b>Human resources</b>				
1	Skilled labour	Person-days	5		
2	Unskilled labour	Person-days	9		

### 3.3 Direct pit water seal toilet - built up type (rcc lining)



**Suitability: High groundwater table, water-logged, and flood-prone area**

Advantage	Disadvantage
Odour free	Water is needed for flushing excreta
Easy to clean	Skilled mason is needed for construction
Can be built on limited land	Risk of groundwater contamination if constructed near water point
Pit can be emptied mechanically by removing vent pipe and inserting suction pipe	High construction cost
	Faecal sludge needs to be emptied from pit every 3-5 years
	Manual pit emptying is not possible

**Material Estimation (up to plinth level)**

SN	Items	Unit	Qty.	Rate	Amount
<b>A.</b>	<b>Materials*</b>				
1	Concrete ring (32" ø x 16")	Nos.	6		
2	Cement	Bag of 50 kg	3		
3	Sand	Cement bag	10		
4	Gravel	Cement bag	3		
5	Brick/ concrete block	Nos.	550		
6	Pan	Set	1		
7	Iron rod 8 mm	Kg	10		
8	HDPE pipe 4" - vent pipe	ft	7		
9	Vent pipe cap with fine wire mesh	Nos.	1		
<b>B.</b>	<b>Human resources</b>				
1	Skilled mason	Person-days	3		
2	Labour	Person-days	5		

\*The quantity presented is calculated for raising the plinth level 4 ft above the ground. The actual quantity will vary depending on the required height of the toilet (plinth level) above the ground.

## 4. Toilet Details

### 4.1 Site selection and orientation

The following aspects should be considered for selecting a suitable site to construct a toilet:

- a. Distance between the house and toilet – a toilet closer to the house is more convenient for use, especially at night, during emergency, and for family members having difficulty walking.
- b. Horizontal distance between the water point (hand pump, dug well, etc.) and toilet pit - desirable distance is 33 ft; if less than 33 ft, the pit should be lined or sealed properly.
- c. Vertical distance between the toilet pit and groundwater table - 5 ft (for most soil) between the bottom of the pit and the highest level of groundwater table. The distance may be decreased for fine soil or increased for fissured rocks and limestone.
- d. Positioning of the door - the entrance or door should not face directly towards the house or courtyard so that female members can use the toilet with privacy.

### 4.2 Pit sizes

The pit is designed for use over an average period of 3-5 years. The pit size varies based on the family size, available space, soil condition and level of groundwater. The diameter of the pit will depend on the type of lining materials used and its size.

Type of lining	Typical diameter	Standard depth*
RCC/ concrete ring lining	3 ft	4 ft
Brick lining	4 ft 9 in	4 ft

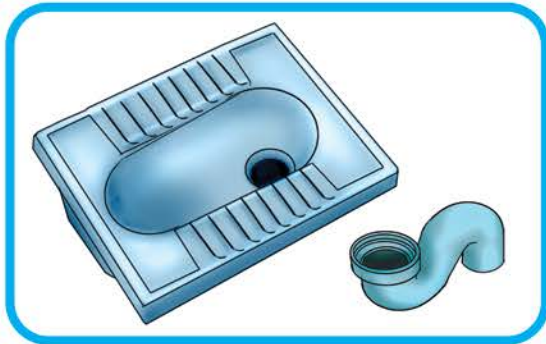
\*In the terai the depth of pit is often limited to 4 ft due to high groundwater table. In case of low groundwater table and larger family size, deeper pits can be made.



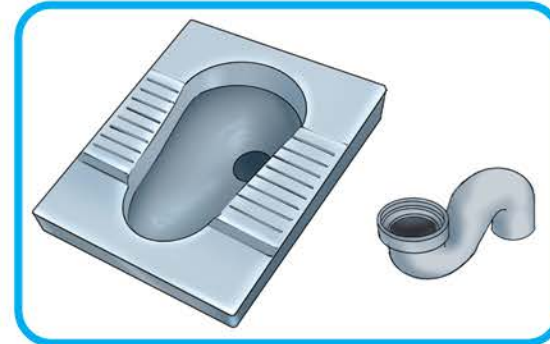
## 4.3 Pan options

Pan options are of two types, individually available squatting pan or a pre-cast slab fitted with a squatting pan.

### a. Squatting pan



Plastic pan (low cost)



Ceramic pan (high cost)

### b. Ceramic pan casted in concrete slab



“Easy latrine” -  
Square RCC slab with  
tiles and pan



Square RCC slab with pan



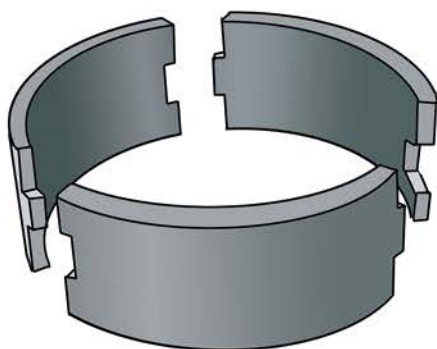
Round RCC slab with pan

## 4.4 Ring options

Different sizes of concrete rings are available in the market. The height of the ring varies from 12–18 inches whereas the diameter varies from 30–36 inches. The height of the ring is one factor that helps to decide the number of rings to be used for lining a pit. Two types of rings are available in the market.



Single - piece ring

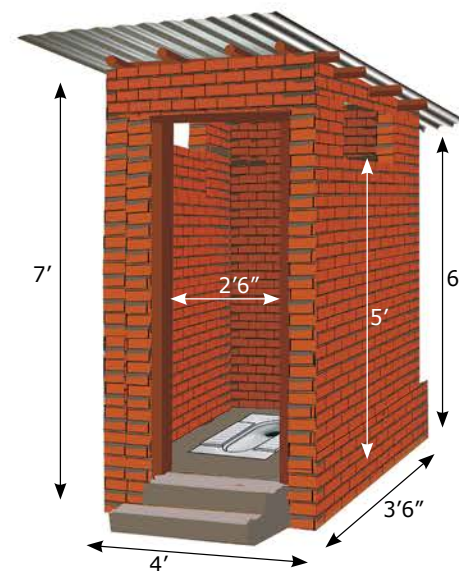


Three - piece ring

## 4.5 Super structures




Two types of super structures can be built to house the toilet - permanent or temporary. The standard size of a super structure is as follows:





- Floor size (inside toilet): length 3 ft 4 inches, width 2 ft 10 inches
- Wall height: front 7 ft, rear 6 ft
- Door size: height 6 ft, width 2 ft 6 inches
- Height of door latch: 2 ft 6 inches (should be easily reachable for children and people with disabilities)
- Height of ventilation window from floor: 5 ft from floor
- Size of ventilation window: width 1 ft, height 8 inches
- Height of vent pipe: 6 inches above the highest roof point (not shown)
- Light fixture is recommended inside



\*Outside dimensions of toilet floor will vary depending on the thickness of the material used to construct the toilet wall.

## Super structure: wall and roof materials

Structure type	Illustration	Material details	Advantage	Disadvantage
Straw house		Wall and roof materials: straw/ thatch	<ul style="list-style-type: none"> <li>• Low cost</li> <li>• Local materials</li> <li>• Skilled mason not needed for construction</li> <li>• Ventilation can be created at the top of the wall by making a space between the roof and the wall</li> </ul>	<ul style="list-style-type: none"> <li>• Temporary structure</li> <li>• Needs regular repair</li> <li>• Maintaining privacy is difficult if not constructed properly</li> <li>• Placing door latch might be difficult</li> </ul>
Bamboo house		<p>Wall materials: bamboo</p> <p>Roof materials: straw/thatch</p>	<ul style="list-style-type: none"> <li>• Low cost</li> <li>• Local materials</li> <li>• Skilled mason not needed for construction</li> <li>• Ventilation can be created at the top of the wall by making a space between the roof and the wall</li> <li>• Can be easily upgraded to clay- or cement- plastered wall structure</li> </ul>	<ul style="list-style-type: none"> <li>• Temporary structure</li> <li>• Roof material needs to be replaced periodically</li> <li>• Needs regular repair</li> <li>• Maintaining privacy is difficult if bamboo is not fixed properly</li> </ul>
Clay-plastered house		<p>Wall materials: bamboo or straw wall plastered with clay on both sides</p> <p>Roof materials: straw/thatch</p>	<ul style="list-style-type: none"> <li>• Low cost</li> <li>• Local materials</li> <li>• Skilled mason not needed for construction</li> <li>• Privacy can be maintained</li> </ul>	<ul style="list-style-type: none"> <li>• Temporary structure</li> <li>• Roof material needs to be replaced periodically</li> <li>• Needs regular repair- clay will erode through contact with water</li> <li>• Wall may collapse if not constructed properly</li> </ul>

Zinc sheet		Wall and roof materials: CGI sheet	<ul style="list-style-type: none"> <li>• Semi-permanent structure</li> <li>• Privacy can be maintained</li> </ul>	<ul style="list-style-type: none"> <li>• Semi-skilled mason needed for construction</li> <li>• Toilet becomes hot during the summer and noisy during the monsoon rain</li> </ul>
Wooden house		Wall materials: wood Roof materials: CGI sheet	<ul style="list-style-type: none"> <li>• Semi-permanent structure</li> <li>• Privacy can be maintained</li> </ul>	<ul style="list-style-type: none"> <li>• Semi-skilled mason needed for construction</li> <li>• Maintaining privacy is difficult if wood is not fixed properly</li> </ul>
Stone house		Wall materials: stone Roof materials: CGI sheet	<ul style="list-style-type: none"> <li>• Permanent structure</li> <li>• Privacy can be maintained</li> <li>• Maintenance is easy</li> </ul>	<ul style="list-style-type: none"> <li>• Skilled mason needed for construction</li> <li>• Costly</li> </ul>
Brick house		Wall materials: brick Roof materials: CGI sheet	<ul style="list-style-type: none"> <li>• Permanent structure</li> <li>• Can use both clay and cement mortar for laying bricks</li> <li>• Privacy can be maintained</li> <li>• Maintenance is easy</li> </ul>	<ul style="list-style-type: none"> <li>• Skilled mason needed for construction</li> <li>• Costly</li> </ul>

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