



Ministry of Rural Development
Government of India

Training rural masons

Learning unit 5



Toilet construction



International
Labour
Organization

Table of contents

5.0	Introduction	5
5.1	The toilet and its components	6
5.1.1	Purpose and importance of the toilet	6
5.1.2	General types and designs of toilets in rural areas	6
5.1.3	Important features of twin pit toilets	8
5.1.4	Sequence of activities when building a toilet	9
5.2	Constructing twin pit toilets	10
5.3	Arrangement of P-trap water seal	12
5.3.1	Water seal	12
5.3.2	Positioning the toilet pan	12
5.4	Constructing the toilet room	15
5.4.1	Foundation for toilet rooms	15
5.4.2	Plinth construction	15
5.4.3	Masonry walls	15
5.4.4	Roofing	16
5.4.5	Plastering and colour wash/white wash	16
5.4.6	Flooring	16

Learning Unit 3

Toilet construction – fittings and fixtures



5.0 Introduction

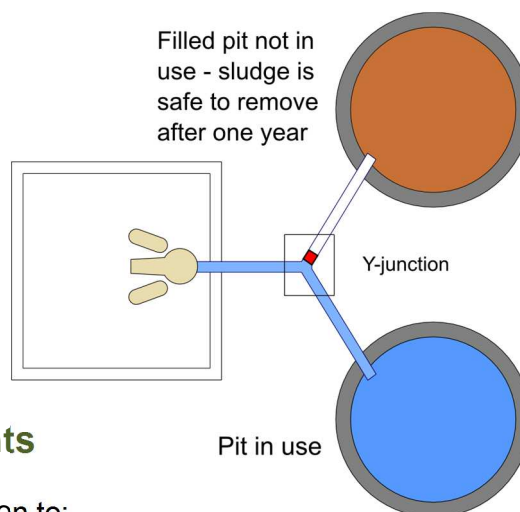
The purpose of this Learning Unit is to *enable a rural mason to describe the construction process of a toilet as part of a rural house and carry out all the required construction activities including fitting and fixtures.*

By the end of this Learning Unit the rural mason should be able to:

- (i) Describe the toilet with all its construction elements and describe the construction activities in their logical sequence.
- (ii) Carry out the construction of twin pits.
- (iii) Install a P-trap and linking it to a twin pit junction chamber.
- (iv) Describe the construction of the toilet room.

Every house needs a toilet. Generally, twin pit toilets are constructed as part of the rural housing programme. The rural mason needs to understand the various components of the toilet and efficiently undertake the construction. As part of making the nation free from open defecation, the Government is committed to construct toilets as part of its housing programme. Many states are providing additional assistance for the construction of toilets. Other national programmes, such as Swachh Bharath mission and MGNREGS, also support the construction of toilets.

This Learning Unit focuses on the construction of twin pit toilets. It provides the necessary information to the trainer so that he/she will be able to instruct trainee masons how to construct a toilet as part of a rural house with all its functional elements from the foundation stage to the roof including the construction of the storage pits, toilet pan and water seal.



5.1 The toilet and its components

This section is meant to enable the rural mason to:

- ✓ Describe the importance of a toilet.
- ✓ Explain the general types and layout of a toilet as part of rural houses under the housing programme.
- ✓ Describe a toilet with all the important structural features.

5.1.1 Purpose and importance of the toilet

Open defecation is the root cause of many health hazards and nutritional deficiencies among the rural poor and especially children. A lack of awareness on the use of toilets and a lack of resources to build toilets result in open defecation. Therefore, it is mandatory to include a toilet as part of houses built under the rural housing programme. The rural mason therefore needs to know how to construct a toilet.

5.1.2 General types and designs of toilets in rural areas

The following types of toilets are commonly in use in rural India.

- (i) Temporary toilets
- (ii) Septic tank toilets
- (iii) Single pit toilets
- (iv) Twin pit toilets
- (v) Toilets including a bath room

Temporary toilets

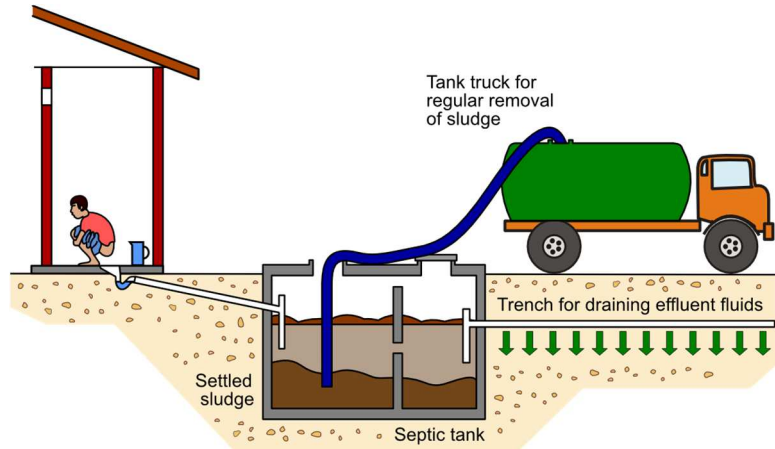
These are relatively simple in design and most cost effective. The toilet is constructed only up to plinth level. Temporary material like gunny bag material or bamboo mats or thatched roofing can be used to provide the necessary privacy.

A single pit may be dug and used for a few months. Once the first pit is full, another pit is dug in the vicinity. It can be a simple solution for sanitation in places of mass gatherings and during emergencies.



Septic tank toilets

A septic tank comprises a sealed tank having both an inlet and outlet. Excreta are flushed from a conventional cistern flush toilet using typically between 10-20 litres of water for each flush. The septic tank is connected to the toilet by a sewer pipe. Partially treated effluent flows out of the tank. This marks an important difference from the pit latrine, in which any water entering the pit leaves by percolation into the surrounding ground. Septic tanks receive toilet waste alone, or both toilet waste and sullage from sinks and water from baths.

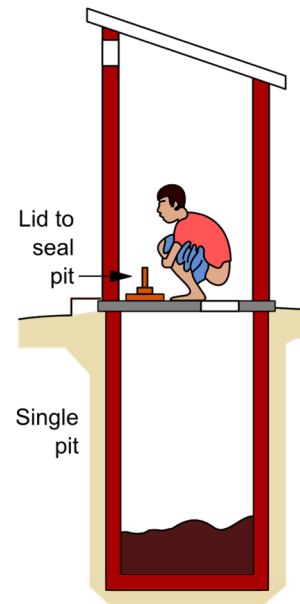


The septic tank acts as a settlement unit in which solids settle out by gravity. The solids undergo a process of anaerobic decomposition. The effluent, which flows out of the septic tank, constitutes a potential health hazard. A common disposal method is by absorption into the ground using a soakage pit or trench. The settled sludge has to be periodically removed by a tank truck.

Septic tanks can be built to combine several households or plots. Regular maintenance (removal of sludge) is essential and relatively expensive.

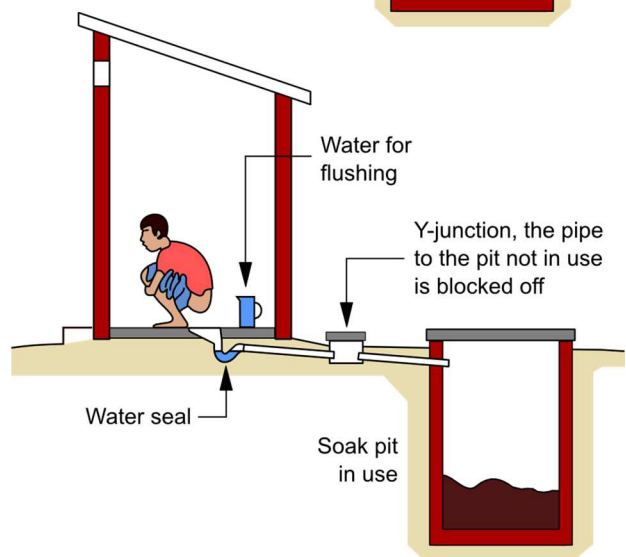
Single pit toilets

The principle of all types of pit latrines is that excreta and anal cleaning water are deposited in a pit hole in the ground. In its simplest form the pit latrine consists of a superstructure, which affords privacy to the user, a hole (or seat) set into a slab, which covers the pit beneath the slab into which excreta are deposited. Alternatively, the pit is dug a short distance away from the toilet room and connected through pipes.



Twin pit toilets

In this design, two leach pits are connected to one single pour-flush toilet. At any given time only one pit is in use. Once one of the pits is full, the other pit is put into use, receiving excreta and wastewater. The toilet has a permanent superstructure like a room for privacy purposes. It can also be used as a bathroom if the size is slightly increased. The toilet can also be constructed inside the house, while the pits remain located outside the house. The Government is promoting this type of toilet under its rural sanitation programmes.



Toilets with attached bathroom

Combined toilet and bathrooms usually includes arrangements for water storage, bathing and washing facilities. Most importantly it provides privacy for the users - not only for defecation but also for bathing. Bathrooms involve additional costs for the construction of the added facilities. Such toilets may be connected to a septic tank or two pits.

5.1.3 Important features of twin pit toilets

The following are the different components of a toilet as provided in the housing programme.

(i) Twin pits

Two circular pits are dug at a distance of 1 metre. Each pit has a diameter of 0.9 m and 1m depth. The walls are constructed either by prefabricated concrete rings or from in-situ brick masonry. Each pit has a pre-cast reinforced concrete cover of 5 cm thickness. If the walls are constructed with bricks there should be weep holes left at the rate of two holes in every layer of brick course. These holes allow fluids to exit and be absorbed in the ground.

(ii) Junction box

The junction box is constructed to direct the flow of excreta and water from the toilet pan to the pit. The junction box is constructed as a 'Y' shape allowing the excreta and water to reach one pit at a time. The junction chamber is constructed from bricks and mortar, connected to clay, PVC or asbestos pipes.



(iii) Toilet pans and water seals

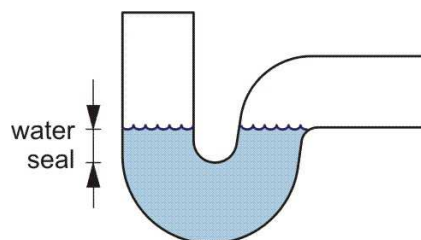
The efficiency of the entire toilet depends on the positioning of the toilet pan and thus creating a proper water seal. The toilet pan is connected to the Y junction chamber through a pipe. The 'P' shaped trap, which forms part of the toilet pan, contains the water seal.



The presence of water in the curved pipe inside the toilet pan works as a seal preventing foul smell to travel from the pit to the toilet room. The

correct positioning of the pan secures the presence of the water seal.

Hence the mason needs to know how to position the toilet pan in a perfect horizontal position. The correct position of the P-trap perfectly horizontal is critical to ensure that the water seal performs as desired.



(iv) Toilet room

The construction of the toilet room consists of the same components as when building a house. These include foundations, plinth, masonry walls, roof, flooring and a door. The room itself is the most expensive part of the toilet. Depending on the taste and financial capacity of the household, each of these components may have different specifications.

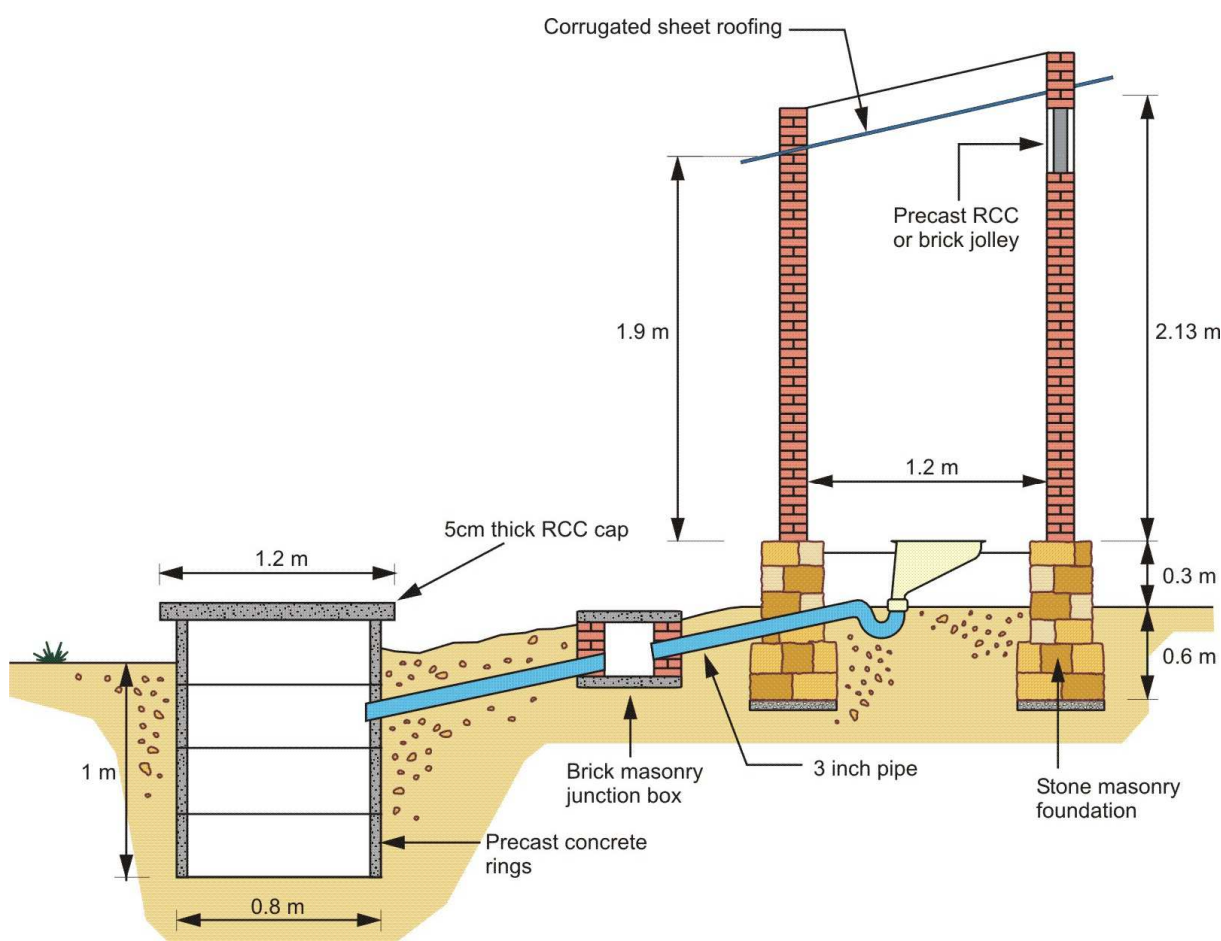
Some may choose a concrete roof instead of using corrugated sheets. Depending on the region and the choice of the house owners, walls, roof, type of flooring and door may change. The construction of these building components is covered in detail in the following elements of this learning unit.

5.1.4 Sequence of activities when building a toilet

The various activities for constructing a toilet should be planned in the following sequence to ensure that the construction is smooth and avoids any dismantling work. This sequence also makes sure that the desired slopes are secured for the outflow from the toilet.

- (i) Pit construction
- (ii) Foundations up to plinth of the main room
- (iii) Positioning of the toilet pan
- (iv) Construction of the junction chamber
- (v) Fixing the pipes
- (vi) Superstructure of the toilet room

Common dimensions applied in toilets for rural houses are shown in the illustration below.



5.2 Constructing twin pits for toilets

This section intends to provide the following skills to a rural mason:

- ✓ Describe the purpose of the twin pits for toilets, and
- ✓ Construct twin pits for toilets.

As explained previously, the function of the twin pits is to receive and store excreta and water from the toilet. The walls inside the pits are either supported by brick or stone masonry or using prefabricated concrete rings available in the market.



Tips for the facilitation of Worksheet T1: *Constructing twin pits for toilets*

When facilitating the work process described in this worksheet the following approach is recommended:

- Display the poster of Worksheet T1 so that all trainees can easily see it.
- Instruct the trainees to open their handbook at 'Worksheet T1' and refer to it throughout the lesson. Also link the explanation to the respective training posters.
- Start explaining the worksheet by giving an introduction the function of a two-pit toilet and the most important issues of the pits, e.g. location of toilet and pit, depth and diameter of the two pits, construction of walls and cover.
- Split the trainees into groups of 3 to 4 and give them each a 'dry' setting out exercise. If no plan is available, prepare a sketch for each group. Assist where necessary. Demonstrate → observe → correct → encourage → refer to the worksheet all the time.
- Once the trainees master the setting out, instruct them to set out the actual toilet with pits for the training house. Set out the toilet and the two pits together with the trainees.
- When the trainees have finished their tasks, let them assess each other's work and comment on the achieved quality.
- Recapitulate together the work done. Use the training poster to review the 'Remember List'.

Throughout the training process refer to the required safety measures. Always display Training Poster No. 1: Safety at work.

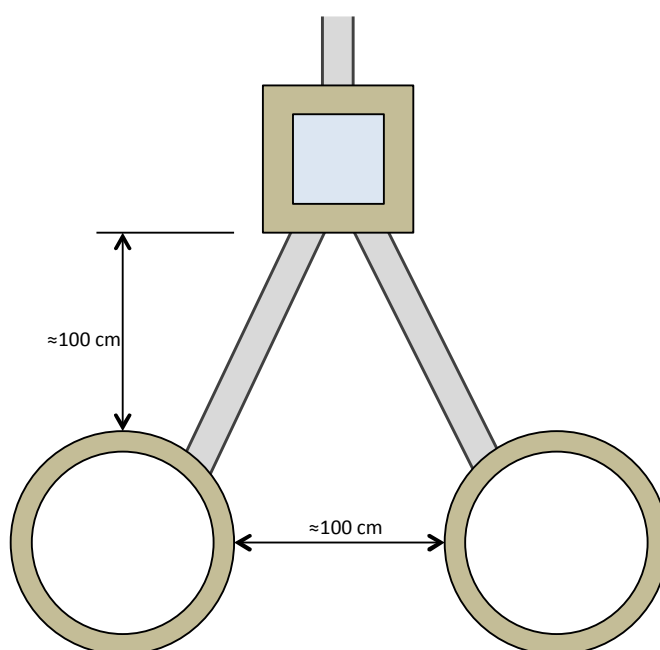
Worksheet

T1

Activity: Constructing twin pits for toilets

Work method:

1. Select the location for the toilet in consultation with the house owner. If the owner follows vastu it is better to give the choice of the location to him/her.
2. Using a string, set out the pit with a diameter of 0.9 m. Leaving a distance of 1m from the edge of the first pit, set out the second pit with the same diameter. The two pits should be at a distance of at least 1.6 m away from the main room of the toilet.
3. Dig the pits down to 0.9 m depth using a crowbar and a shovel. Deposit the excavated soil in a safe location away from the pits. This soil will not be used - hence it may be disposed off.
4. Construct a foundation footing with 22.5 cm width and 100 mm thick using brick or stone in cement mortar 1:3.
5. The pits are lined with brick masonry of 10 cm thickness (one brick wide). Leave seep holes of half a brick size. These holes allow water to be absorbed into the surrounding soil. The pit can also be lined with prefabricated concrete rings.
6. The brick masonry should be cured for a minimum of 14 days.
7. Build the pit lining up to ground level. The masonry wall above ground may be easier to construct after connecting the pipe from the junction chamber. Ensure that the pipes from the junction box have a sufficient slope to easily discharge by gravity into the pits.
8. The pits are sealed with a concrete cover with a thickness of 50 mm. The cover may be done in two segments so that it is easily lifted and fixed on to the pit
9. Follow the same construction process for the second pit.



Labour:

- Rural mason
- Labourers to assist

Tools:

- Tape measure
- Complete masonry tool set
- Crow bar and shovel
- Mortar pan
- Plumb bob
- Water tube and spirit level

Material:

- Bricks or concrete rings
- Cement and sand
- Steel bars for reinforcement
- Clean water for cement mortar

Quality checkpoints:

- Check the position of all elements and their levels to ensure that water is able to flow into the pit.
- Correct depth of the pits and their diameter during excavation
- Strictly follow the instructions as described in the masonry worksheets.

5.3 Arrangement of a P-trap water seal

This section intends to enable the rural mason to:

- Describe the water seal and its purpose.
- Position and install the toilet pan.

The purpose of the twin pits as explained previously is to receive the excreta and water from the toilet. The structure inside the pit is constructed by brick or stone masonry or using prefabricated concrete rings available in the market.

5.3.1 Water seal

Water sealing is an important concept the rural mason needs to understand in order to install the toilet. The purpose of the water seal has already been explained. Toilet pans with built-in water seals are also available in the market. These may prove to be more cost effective.

The trainer should demonstrate the working of a water seal by showing the actual water seal in the toilet pan by pouring water in the pan before it is installed.

5.3.2 Positioning the toilet pan

Positioning the toilet pan exactly horizontally is an important skill the rural mason needs to master. If the pan is not exactly horizontal, insufficient water will be retained in the neck portion and a proper water seal is not formed. This allows foul smell and insects to enter the toilet and make it unusable. Therefore, it is important to position the toilet pan in a perfect horizontal position. The trainer should explain how to position of the toilet pan in the toilet following the steps given in worksheet T2.



P-trap

Tips for the facilitation of Worksheet T2: *Positioning the toilet pan*

When facilitating the work process described in this worksheet the following approach is recommended:

- Display the poster of Worksheet T2 so that all trainees can easily see it.
- Instruct the trainees to open their reference handbook at 'Worksheet T2' and refer to it throughout the lesson. Also link your explanation to the respective training posters.
- Explain the function of the toilet pan again and describe how a pan should be installed
- Split the trainees into groups of two and let them 'dry' exercise positioning the pan on bricks or stone → demonstrate → observe → correct → encourage → refer to the worksheet all the time.
- Once the trainees master the positioning, instruct them to position the actual toilet pan.
- When the trainees have finished their tasks, let them assess each other's work and comment on the achieved quality.
- Recapitulate together the work done. Use the training poster to review the 'Remember List'.

Throughout the training process refer to the required safety measures. Always display Training Poster No. 1: Safety at work.

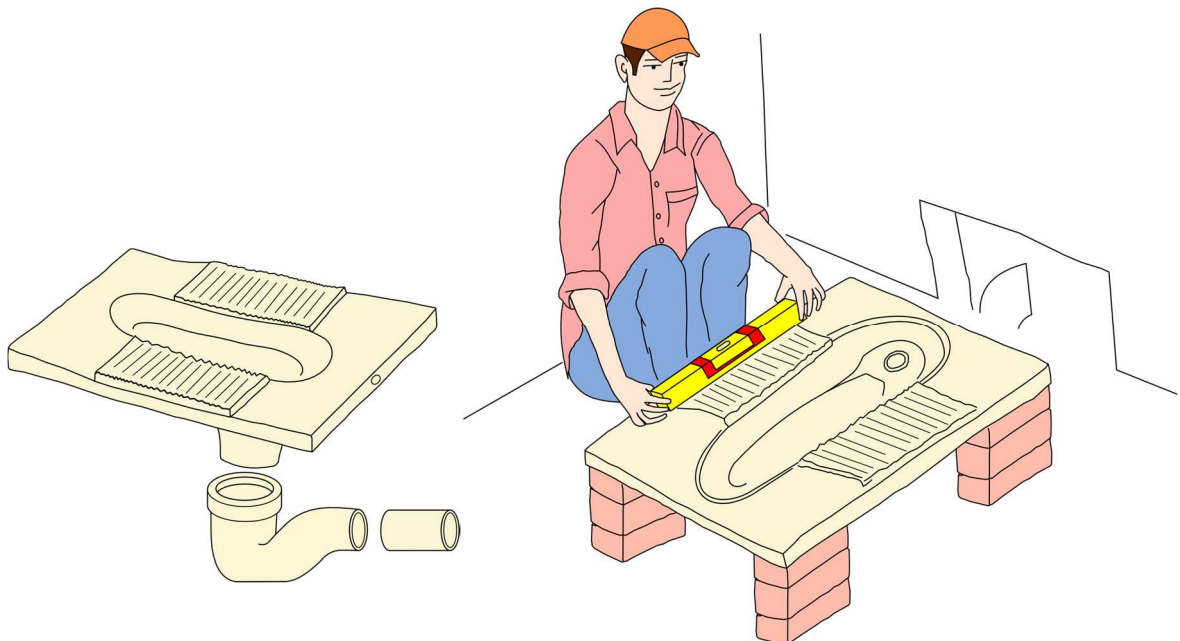
Worksheet

Activity: Positioning the toilet pan

T2

Work method:

1. Ensure that the masonry up to plinth is constructed
2. Fix the toilet pan temporarily on loose bricks/blocks. Ensure that the top of the pan is in line with the plinth level.
3. Check whether the top of the pan is level by setting the spirit level on the surface of the pan. Check in all directions.
4. Once it is perfectly levelled, fix the toilet pan at the plinth level using gravel and sand underneath.
5. Connect the pipe extending it to the outside of the plinth so that it will reach the junction box.
6. Once the toilet pan is fixed, lean concrete may be laid underneath the pan to fix it.
7. Seal all the joints using natural fibre (like jute) and cement putty.



Labour:

- Rural mason
- Labourers to assist

Tools:

- Complete masonry tool set
- Mortar pan
- Plumb bob
- Water tube and spirit level

Material:

- Bricks or concrete rings
- Toilet pan/pan
- 75 mm AC, HDPE or clay pipes
- Foot rests
- Sand and cement
- 20/40mm stone

Quality checkpoints:

- Check the correct positioning and level of the pan.
- Make sure the connections between the pan, P-trap, outflow pipe and junction box are properly sealed.
- Ensure that the masonry works follow the instructions as detailed in the masonry worksheets.

5.4 Constructing the toilet room

This specific element will enable the rural mason to:

- Describe the construction of the main room of toilets
- Construct the main toilet room



The main toilet room has the following sub-components:

- (i) Foundations
- (ii) Plinth construction
- (iii) Masonry walls
- (iv) Roofing
- (v) Flooring

5.4.1 Foundation for toilet rooms

Foundations for a toilet as part of a rural house can be built using bricks, stone or concrete blocks. The depth of the foundation depends on the type of soils. Generally, the depth should be 45 cm to 90 cm. The foundation width should be 45 cm to 60 cm. A levelling course with 10 cm thickness using lean concrete is placed before the stone masonry foundation is built.

5.4.2 Plinth construction

The plinth is the masonry wall above ground up to 30 cm height. The width of the plinth wall may be 30 cm. Generally, stone masonry is recommended for plinth walls. Brick or concrete blocks may also be used in case stone is not available.

5.4.3 Masonry walls

The walls are built on top of the plinth using brick, stone or concrete block masonry with a thickness of 20 - 22 cm. The height of the wall should be 1.9 m on one side and 2.15 m on

the other side. The difference of 25 cm between the two walls is to create a slope on the roof to allow rainwater to drain off. A finishing course of 30 cm height masonry is added after laying the roofing sheets.

5.4.4 Roofing

To keep the cost to a minimum GI or tin sheets are preferred for the roof. Wooden rafters may be used to support the roofing. Iron angles or tubular steel members may also be used as rafters.

5.4.5 Plastering and colour wash/white wash

When the masonry is constructed with clay bricks it is common practice to plaster the walls using a 1:3 cement mortar with a 12 mm thickness. The plastering shall be done as explained in Learning Unit 3. Sometimes the plastering is only applied to the external walls to save costs, leaving the inside walls without any plaster.

5.4.6 Flooring

Flooring around the toilet pan can either be with IPS (CC) flooring or with a stone slab. The IPS flooring is explained in Section 3. The floor needs a solid base consisting of hard soils or gravel filled up to plinth level and well compacted using a hand rammer. Finish of the base with a layer of 75-100 mm lean concrete.

Tips for the facilitation of Worksheet T3: *Constructing the toilet room*

When facilitating the work process described in this worksheet the following approach is recommended:

- Display the poster of Worksheet T3 so that all trainees can easily see it.
- Instruct the trainees to open their reference handbook at 'Worksheet T3' and refer to it throughout the lesson. Also link your explanation to the respective training posters.
- Explain the complete construction process for the toilet room. For this purpose also refer to all masonry worksheets as all details of construction are explained in Learning Unit 3.
- By this time, the trainees should be fully conversant with masonry works. Therefore move straight away to implementing the works, but continue with: → demonstrate → observe → correct → encourage → refer to the worksheet all the time.
- When the trainees have finished their tasks, let them assess each other's work and comment on the achieved quality.
- Recapitulate together the work done. Use the training poster to review the 'Remember List'.

Throughout the training process refer to the required safety measures. Always display Training Poster No. 1: Safety at work.

Worksheet

Activity: Constructing the toilet room

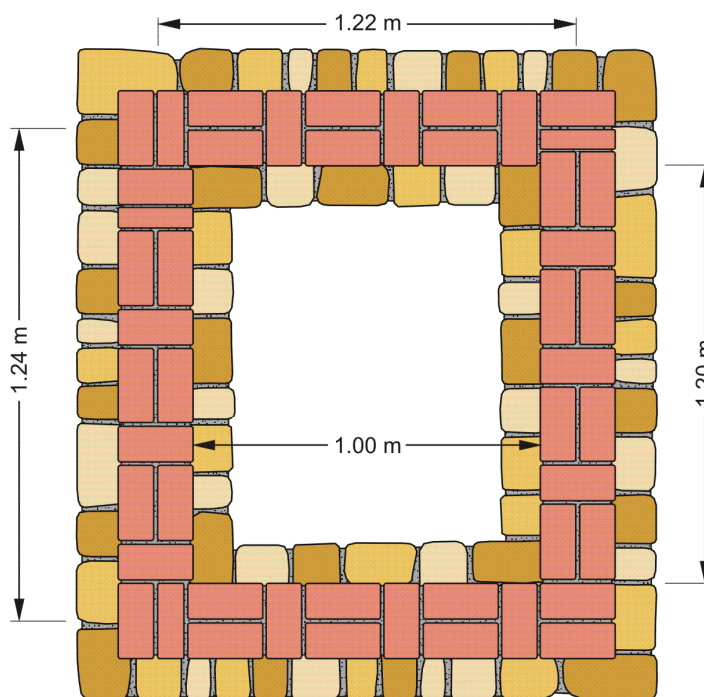
T3

Work method:

1. Set out the exact location of the toilet room (internal dimensions 1m x 1.2m), junction chamber (0.3m x 0.3m) and the twin pits.

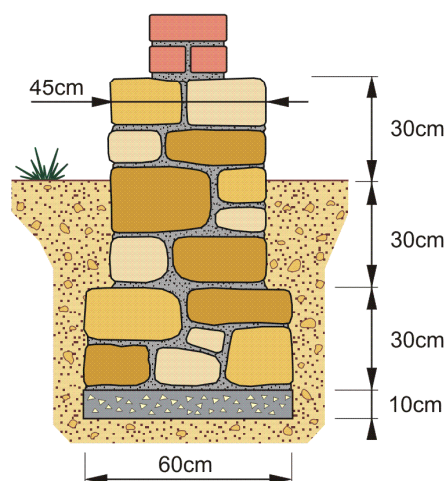
2. Foundations for the toilet room up to plinth:

- a) Excavate the trenches for the foundations to a depth of 0.7m unless otherwise required due to site conditions. The trench should be dug 0.6 m on either side of the centre-line. Make sure the bottom of the trench is firm, level and dry and that there is no remaining loose soil.
- b) Place lean concrete 1:5:10 to a thickness of 5 to 10 cm.
- c) Prepare cement mortar 1:6 for the stone masonry foundations.
- d) Construct the first footing using stone masonry with a width of 0.6 m and to a depth of 0.3 m.
- e) Construct a second footing 0.45 m wide to a depth of 0.3 m below ground and 0.3 m above ground. The masonry above ground will also function as the plinth.



3. Masonry walls

- a) Prepare cement mortar 1:6 for the masonry walls.
- b) The walls above the plinth can be built using red brick, stone or concrete blocks. The front wall should have a height of 1.9m and the rear wall should be 2.15m. The sidewalls are sloped accordingly.
- c) A 25 cm slope is provided to allow water to drain off the roof. Add another 30 cm height of masonry after laying the roof sheets.
- d) Plastering the walls is optional, depending on the financial capacity of the house owner. Plastering is not required for the stone masonry or walls made from concrete blocks.



For masonry details refer to the masonry worksheets.

4. Roofing

- a) Install three rafters made from wood, tubular or angular steel to support the roof.
- b) Fix the three rafters in parallel to the wall.
- c) Place roofing sheets on the rafters using 'J' bolts.
- d) Once the roofing sheets are fixed, extend the walls 22 cm above the sheets. This holds the sheets firm against wind.

e) Anchor the ends of the rafters properly in the walls.

5. Plastering and painting/white washing

a) Clean the walls, removing any protruding mortar.

b) Wet the walls with water before plastering.

c) Plaster walls with 1:6 mortar to a 12 mm thickness.

d) Ensure that the plaster is cured for a minimum of 14 days.

For plastering details refer to Worksheet M16.

6. Flooring

a) Fill the plinth with gravel and compact in layers of 100 mm thickness. Sprinkle water on each layer for good compaction.

b) Prepare lean concrete of 1:5:10 mix using 65-75 mm stone

c) Place the concrete up to a thickness of 100 mm. Ensure that the concrete is laid 50 mm below the top of the plinth.

d) Prepare concrete with a 1:2:4 mix. Lay the concrete with 50 mm thickness. It should be compacted with a rammer. The concrete should be flush with the top of the toilet pan.

e) Finish by applying cement slurry on the surface while the concrete is not yet cured. Red oxide may be used over the slurry to improve the aesthetics of flooring.

Labour: <ul style="list-style-type: none">• Rural mason• Labourers to assist	Tools: <ul style="list-style-type: none">• Complete masonry tool set• Mortar pan• Plumb bob• Water tube and spirit level• Hammer• Saw	Material: <ul style="list-style-type: none">• Bricks, sand and cement• Course aggregate of 20 mm, 65/75 mm• Clean water for mortar and concrete• 75 mm AC / HDPE / clay pipe• Nails, various sizes• Roofing sheet
--	---	---

Quality checkpoints:

- ✓ The level of the concrete floor should be flush with the top of the toilet pan and the top of the plinth so that when the floor is washed the water easily flows into the toilet pan.
- ✓ Do not spill mortar on the toilet pan when constructing and plastering the walls. The toilet pan should be covered with used cloths or gunny bags to avoid any mortar or concrete entering the toilet pan or P-trap.
- ✓ All concrete and masonry works should be cured for a minimum of 14 days.