

**GRASS ROOT LEVEL  
TRAINING MODULE**



**CONSTRUCTION OF HOUSE HOLD LATRINES AND OTHER  
RURAL SANITATION FACILITIES.  
TRAINEES' GUIDE**

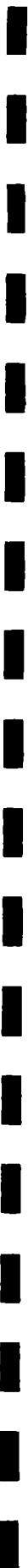


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**RAJIV GANDHI NATIONAL DRINKING WATER MISSION**

**MINISTRY OF RURAL AREAS, AND EMPLOYMENT**

**GOVERNMENT OF INDIA**



# RAJIV GANDHI NATIONAL DRINKING WATER MISSION

MULTI-MEDIA PACKAGE ON CONSTRUCTION OF LOW  
COST LATRINE AND OTHER RURAL SANITARY FACILITIES

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## TRAINEES' TRAINING MODULE

*Developed By*

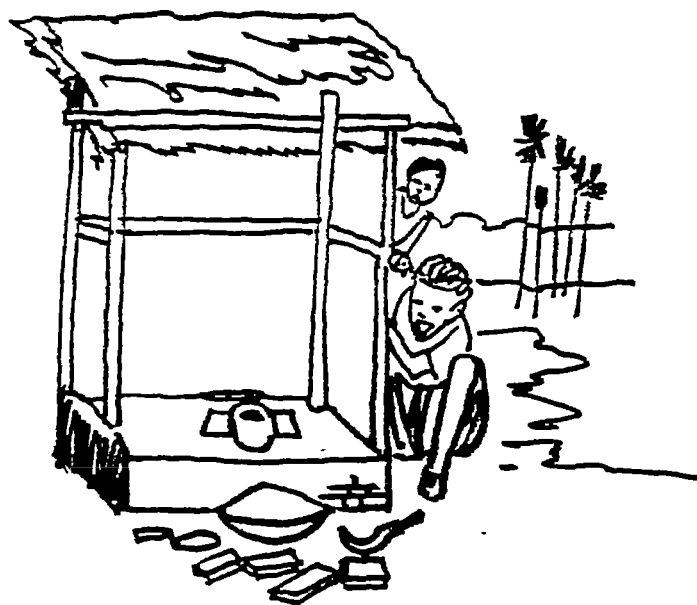
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TECHNICAL TEACHERS' TRAINING INSTITUTE TARAMANI,  
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(MINISTRY OF HUMAN RESOURCE DEVELOPMENT GOVERNMENT OF INDIA)



MULTIMEDIA PACKAGE ON CONSTRUCTION  
OF HOUSEHOLD LATRINES AND OTHER  
SANITATION FACILITIES  
(SPONSORED BY RAJIV GANDHI-  
NATIONAL DRINKING WATER MISSION)



DEVELOPED BY

INSTITUTE OF PUBLIC HEALTH TECHNICAL TEACHERS  
COONAMALLEE-MADRAS TRAINING INSTITUTE  
DEPT - DPH & PM TARAMANI-MADRAS  
TAMILNADU (MINISTRY OF HUMAN RESOURCE  
DEVELOPMENT, GOVT OF INDIA)



# CONSTRUCTION OF FOUR PLUSH TOILETS

## INTRODUCTION

More than 50 diseases and 80% of the sickness are due to lack of potable water supply and good sanitation facilities for the disposal of human wastes. Indiscriminate open air defecation is the cause for transmission of diseases like Cholera, Dysentery, Typhoid, Worm infections etc., sanitary disposal of human excreta prevents the transmission of these diseases.

To control the transmission of diseases it is necessary to provide a sanitary barrier between the source of infection, the disease producing organisms in infected excreta and the successtible hosts-the human population. The barrier will prevent faecal matter from coming into contact with man or with his food, milk or drinking water. The function of sanitary barrier is to prevent contamination from one agent to other like water, soil, arthropads etc., sanitary barrier is nothing but sanitary latrine.

## SANITARY DISPOSAL OF HUMAN EXCRETA

The human excreta can be safety disposed off by any one of the following three methods, they are :

- ... Connecting the toilets to the Drainage system
- ... Connecting the toilet to the septic tank
- ... Connecting the toilet to leach pits

## CONNECTING THE TOILETS WITH DRAINAGE SYSTEM

At present drainage system is available in some of the major cities that too with partial coverage. The chances of having drainage scheme to all the town in the near future is remote, as it involves high cost of installation, high operative cost, large extend of land for disposal of collected wastes, high techniques for treatment of wastes etc. Hence alternative systems for the disposal of human excreta for the unsewered areas at a lesser cost is needed.

## CONNECTING THE TOILETS TO SEPTIC TANK

This is one of the alternatives for the disposal of human excreta for the unsewered areas. This system also involves high cost of installation.

The system also needs additional units such as soak pit, absorption field, etc., for the disposal of effluent.

Periodical removal of sludge is needed which is to be treated and disposed off.

## CONNECTING THE TOILETS TO LEACHPITS

The system is the cheapest in sanitation technology. In this system the human excreta is finally disposed off in the leach pit. The system has the following advantage.

- ... Cheaper in cost of construction
- ... Need little quantity of water for flushing
- ... Can be upgraded and connected to drainage system
- ... Free from odour and foul smell
- ... Free from flies breeding and insects nuisance
- ... Easy construction and maintenance
- ... Involvement of local body not much needed
- ... Resource recovery from end products
- ... No need for scavenging for emptying

The system is otherwise called pour flush toilets.

## TYPES OF POUR FLUSH TOILETS

There are two types of pour flush toilets

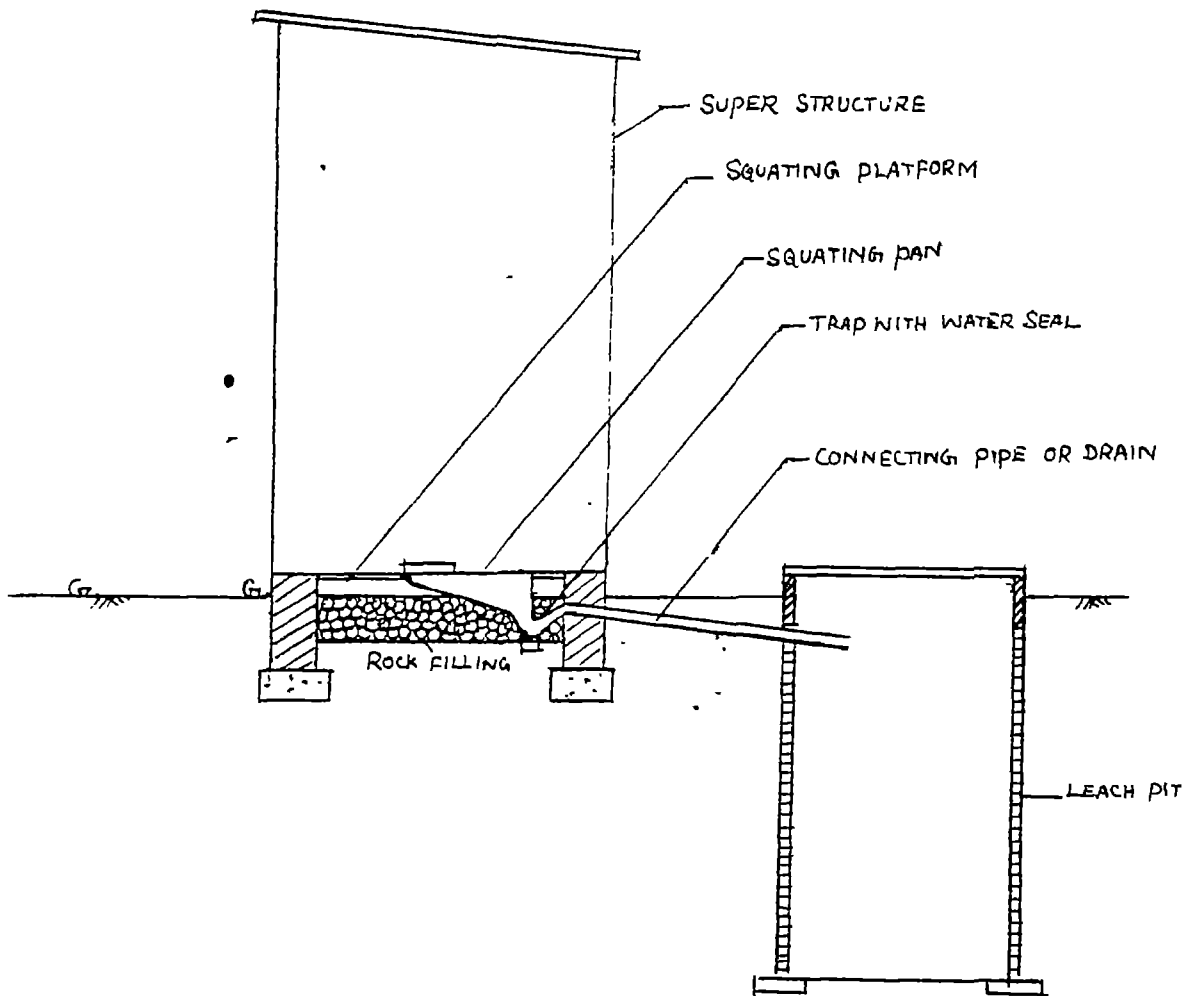
- ... Single pit pour flush toilet
- ... Double pit pour flush toilet

Double pit Pour flush toilet provides a permanent facility which can be used without interruption for pit emptying or relocation because the double pits are used alternatively.



## POUR FLUSH TOILETS COMPONENTS

- a. Squatting platform
- b. Super structure
- c. Squatting pan
- d. Foot rest
- e. Trap with water seal
- f. Connection from trap to pits
- g. Leach pits



COMPONENTS OF POUR FLUSH TOILET.

a. **Squatting Platform :**

A minimum size of 80cm x 100 cm will provide comfort to users.

b. **Super Structure :**

Any design which will provide the desired privacy and shelter to the users at a lesser cost. Some of the low cost material used for superstructure are, bamboos mat, mudwall etc. They need periodical replacement and also have insects nuisance. A neat structure is attractive and is generally better maintained, Brick work and concrete slab the permanent facility.

c. **Squatting Pan :**

Can be of ceramic, glass fibre reinforced plastic (GRP), PVC, HDPE mosaic or cement concrete.

Horizontal length 425 mm

Width at Squatting hole 200 mm

Width at Narrow end 125 mm

Steep bottom slope 25° to 30°

Deeper slope facilitate easy movement of excreta into the pit with little quantity of water. Prevents the splashing of urine and flushed water out of the pan.

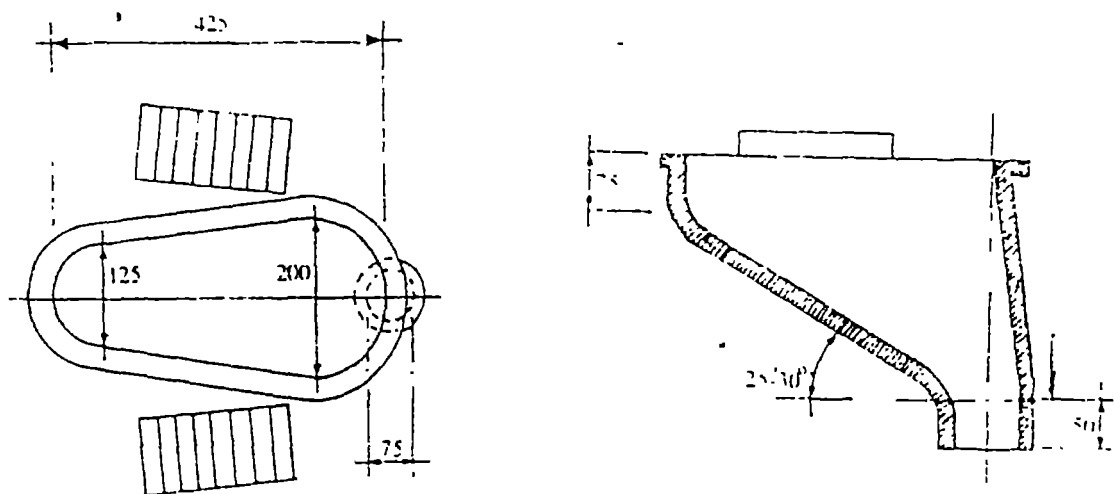


Figure 2: Dimensions of the Pour-Flush Pan and Waterseal

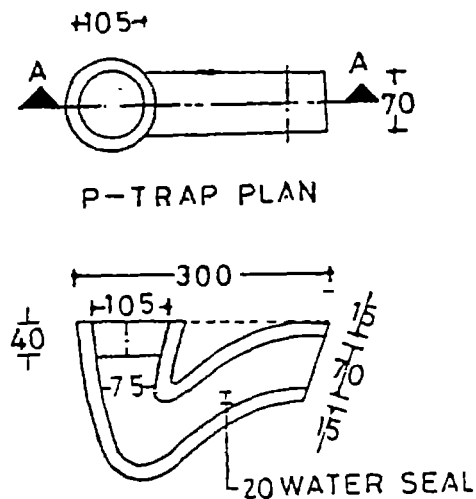
## TRAP WITH WATER SEAL

Can be of ceramic, glass fibre or cement concrete.

Diameter 70 mm

Depth of water seal 20mm

The water seal prevents the odour coming out of the pit. Prevents the flies coming out of the pit. The water seal trap should be made separately from the pan so that it can be connected to leach pit with the outlet pointing in any direction relative to the pits.



## FOOT REST

Can be of ceramic, concrete with mosaic finish, brick or stone. The size of foot rest 250 mm x 125 mm, thickness 15 to 20 mm. pan fitted with foot rests are available in market.

## CONNECTION FROM TRAP TO PITS

The trap can be connected to leach pit either by pipe or covered drain. The pipes may be PVC or non pressure AC pipes. Minimum diameter of pipe 75mm. Larger pipe needs more quantity of water for flushing. A junction chamber of size 250 mm square should be provided for inspection purposes and to set right the blockage if any during use. The junction chamber is constructed at the bifurcation point to double pits.

In case suitable pipes are not available a covered channel with brick work can be built although this is more expensive.

## LEACH PITS

The size of leaching pit depends upon the factors such as number of users, cleaning interval, soil composition including its permeability water table condition, water used for flushing and anal cleaning, sludge accumulation rate which is in the order of  $0.045\text{m}^3$  to  $0.05\text{m}^3$  per capita per year under dry and wet conditions

$$\text{Effective volume } V_e = ARNT$$

(The volume between bottom of the inlet pipe and pit bottom)

Where AR = sludge accumulation rate  
 N = No. of users  
 T = Time for filling  
 (Minimum 2 years preferable 3 years)

## RECOMMENDED VOLUME AND SIZE OF PITS FOR DIFFERENT USERS

Volume (cum) for 3 Years			Pit size and effective depth in metre			
No. of users	Pit under dry condition	Pit under wet condition	Inside Premises		Outside Premises	
			Dia	Depth	Dia	Depth
5	0.68	1.00	0.90	1.10	0.90	1.10
10	1.36	2.00	1.10	1.40	1.20	1.20
15	2.04	3.00	1.25	1.60	1.30	1.40

Effective depth is the distance between bottom of inlet pipe and bottom of pit.

The economical size of pit at any particular place would however depend on the local rates of materials and labour.

## SHAPE OF THE PIT

Circular pit is preferred because of stability point of view and easy construction.

Square, rectangular are the alternatives.

## **SITTING THE PITS**

The pits are to be placed preferably on the back of the latrine cubicles. If space is not available, the pits can be placed on the side or even in the front. In these cases water required for flushing will be more.

## **LOCATION OF PITS**

Preferably be within the premises of the House either in the open spaces or in the courtyard. If space is not available it can also be located either in the varandah or even in the room as the pits are covered and free from odour.

If space is not available within the premises the pit can also be located either in the foot path or in the road with the concurrence of the authority concerned. The design of pit and pit cover needs changes to with stand the vehicular traffic.

The pits are located even far from the cubicles upto 25m provided the pipes or drain are to be laid at a slope 1 in 5 to 1 in 15.

## **LINING OF PITS**

The pit should be lined to its full length with honey comb brick work or stone in cement or lime mortar.

The pits can also be lined with random rubble stone masonry without any mortar.

Lining can also be done with burnt clay or concrete rings

## **IMPORTANT ACTION TAKEN PLACE IN THE PIT**

1. Water and soluble matter leaches into the soil surrounding the pit through the openings.
2. Bio digestion taken place anaerobically and the pathogen gets destructed within a year.
3. Reduction in volume of solid particles.

4. Gases evolved are diffused into the soil and hence free from odour. No vent pipe needed.
5. The content in the pit after one year is in a semi solid state called Humus and free from disease causing pathogens. The Humus after one year becomes soil conditioner.

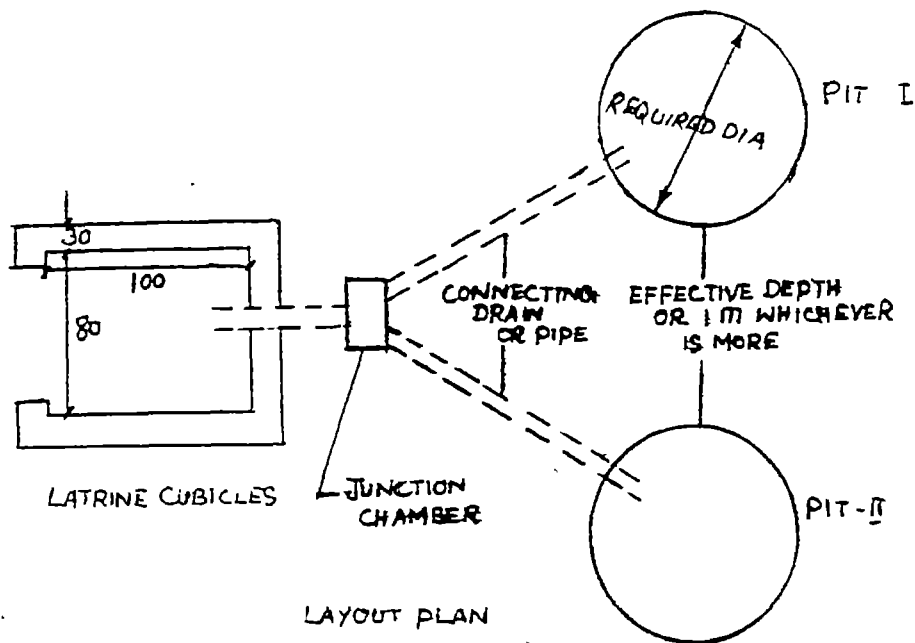
## **CONSTRUCTION ASPECTS OF POUR FLUSH TOILETS**

### **SELECTION OF SITE**

- ... Construction within the premises is preferable
- ... Locating the pits 10m away from water source prevents contamination of that source.
- ... Easy access for emptying. This is not needed where manual methods are used.
- ... The pits as far as possible be close to toilet compartment.
- ... No trees are available very near to the construction as the roots and branches may disturb the construction.
- ... A minimum distance of 1m is to be provided from the existing structure for locating the pits to prevent the possibility of damage to the foundation of existing building.
- ... The pits should be located in an elevated place to prevent rain water and waste water entering into the pit.
- ... The pits should not be located on drainage line.

### **MARKING LAYOUT ON THE GROUND**

- ... Choose the size and shape of pits based on no. of users, time for cleaning etc.,
- ... Mark the required dimensions of all the units on the ground using chalk powder.



### COLLECTION OF MATERIALS

- ... The required materials for construction to be procured locally or at the nearest place at which available cheaply.
- ... The labour required may be mobilised locally to prevent time lapsing.

### REQUIRED MATERIAL FOR CONSTRUCTION FOR VARIOUS NUMBER OF USERS UPTO BASEMENT LEVEL

Materials	Units	Quantity		
		5 Users	10 Users	15 Users
Brick	Nos.	470	600	850
Cement	Kg.	135	165	265
Local sand	Cu.m	0.35	0.42	0.65
Course sand	Cu.m	0.06	0.10	0.15
Brick Ballast	Cu.m	0.19	0.10	0.38
Stone Ballast	Cu.m	0.11	0.17	0.28
M.S.Rod	Kg.	7.00	8.00	12.00

## CONSTRUCTION OF SQUATTING PLATFORM

Inner Dimension 80 cm x 100 cm

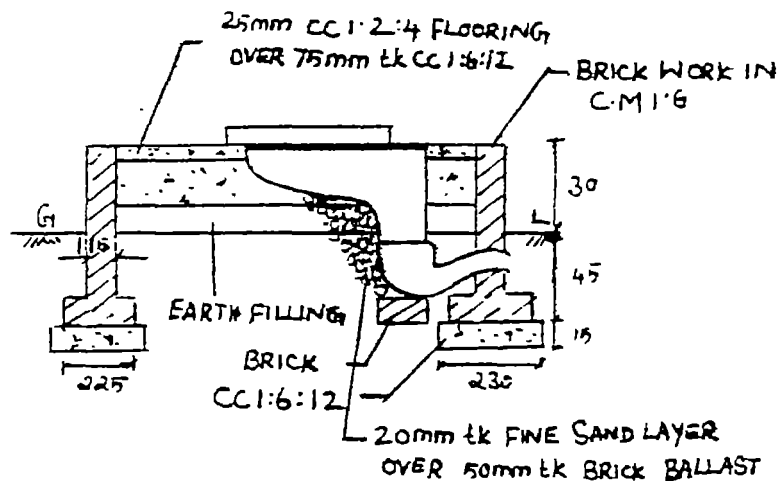
Fdn. Concrete 1:4:8 10 cm thick

(one cement 4 sand and 8 HB stone 40 mm size)

Basement upto 30cm above Ground level. BW in CM 1:6 or

Lime mortar 1:3 9" (225mm) thickness.

1. Earth work excavation as shown in the figure for 60cm depth.
2. Spreading sand in the trench 5 cm depth.
3. Laying foundation concrete 1:4:8 using cement 1, sand 4, and 8 HB stone) for 10 cm thick.
4. Basement upto 30 cm above G.L. using Bricks in CM 1:6 or L.M. 1:3 115 mm thick.
5. Damp proof course above basement using CM 1:4 mixed with crude oil 25 mm thick.

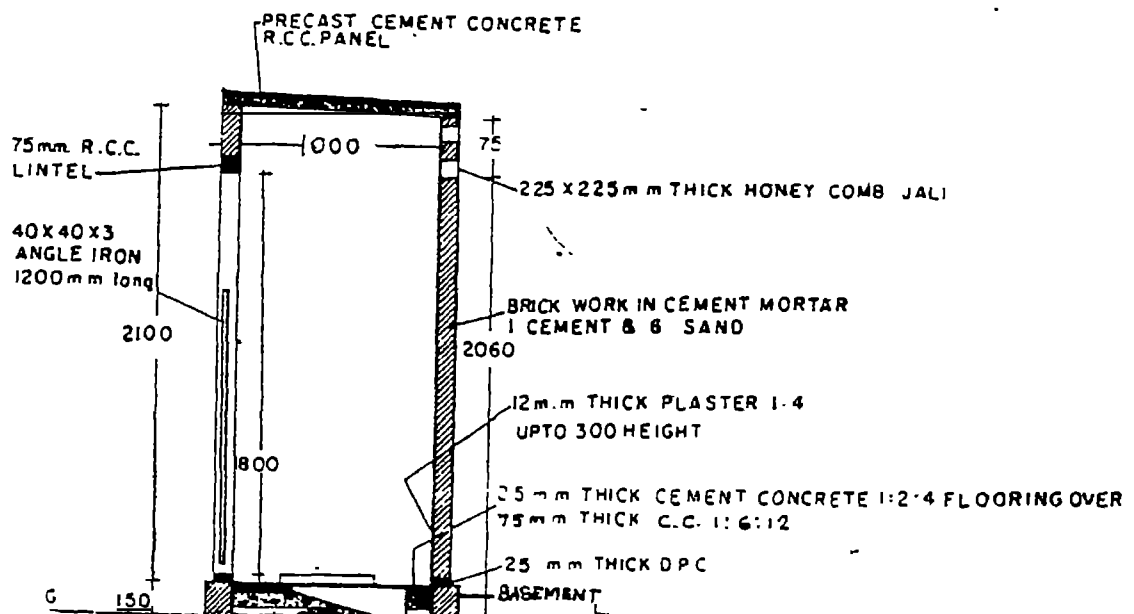


## SUPER STRUCTURE

1. The local materials used for building houses may be the suitable and cheapest for super structure.
2. For weaker section super structure could be constructed out of bamboo matting with mud mortar both inside and outside. But it needs periodical repair, and insects nuisance.

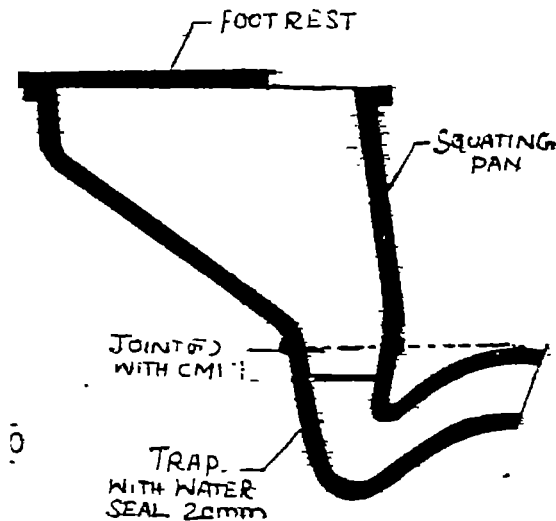


3. Brick work in CM 1:6 or L.M. 1:3 4½" (115 mm) thick, with RCC roofing will provide permanent facility.
4. Brick work in CM 1:6 (one cement and 6 sand upto roof level 115 mm thick, 2100 mm high).
5. Plastering both inside and outside with cement mortar 1:4 12 mm thick.
6. 60 cm width door way for entry
7. 75 cm thick RCC lintel at the top of door way with cement concrete 1:2:4 with nominal reinforcement.
8. Door to provide privacy made up of either country wood, AC, Tin or plastic sheet fitted in country wood frame. Ventilation with Jolly at the top in such a way which should not reduce users privacy. Roofing with AC sheet, Tin sheet, Thatched roof or pre cast RCC Panel.
9. White washing and colour washing the cubicles as desired by the beneficiary.
10. Roof should be given slight slope for easy drain of rain water.

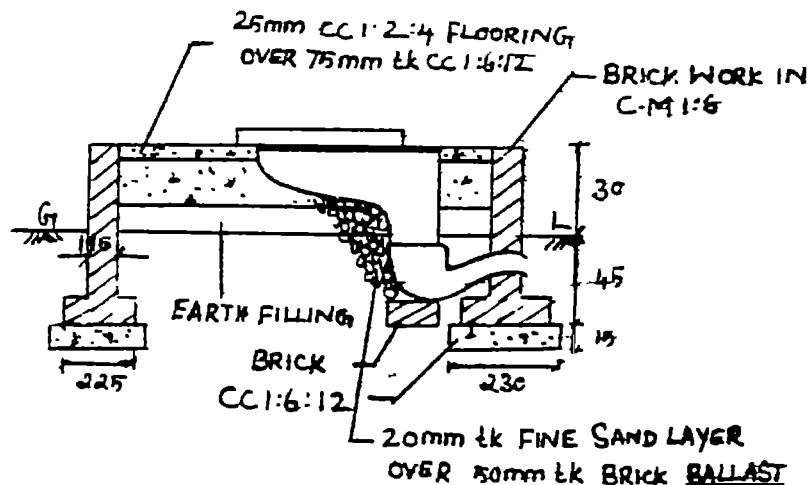


## FIXING PAN, TRAP AND FOOT REST

1. The squatting pan and trap should be fixed in such a way that the water seal has a depth 20 mm.
2. The squatting pan should be horizontally placed and flushed with the floor.
3. Rear end should 200 mm away from wall.
4. The squatting pan is packed with the floor with consolidated earth.
5. 50 mm thick Brick Ballast padding and 20 mm thick layer of sand underneath the pan.
6. The Trap should be placed over a brick.
7. The trap should be connected with pan and jointed with spun yarn soaked in neat cement and jointed with cement mortar 1:1
8. The Joint should be perfectly water-tight.

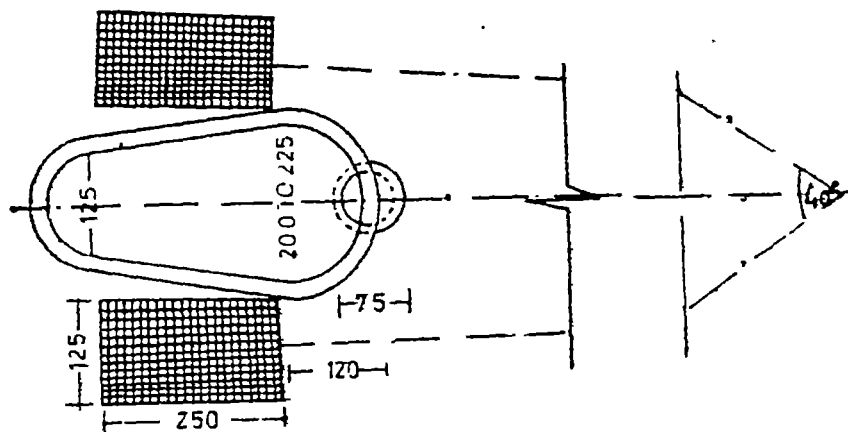


PAN, TRAP ASSEMBLY



## FIXING FOOT REST

1. The foot rest are to be provided in a right position so that it can provide comfort in the squatting position.
2. The alignment of the foot rest should be such that the centre line of both the foot rest placed on opposite sides of the pan intersect at an angle of about  $40^\circ$  and the apex of the angle lies along the longitudinal central axis of the pan.
3. It should be fitted 15 mm above the floor.
4. The back portion of the foot rests should be raised slightly to give a slope towards the pan to provide comfort to users in the squatting position.



DETAILS OF FIXING FOOTRESTS

## FLOORING THE CUBICLES

1. Concrete 1:6:12 using graded brick ballast 40 mm gauge, 75mm should be laid as sub grade.
2. It should be well compacted so that it provide a slope of 3 in 100 towards the pan.
3. The floor over the sub grade can be laid in two layers 22mm concrete 1:2:4 as lower layer and 3 mm thick cement mortar 1:4 as upper layer (comprising 1 part of cement and 4 parts of marble dust or coarse sand).

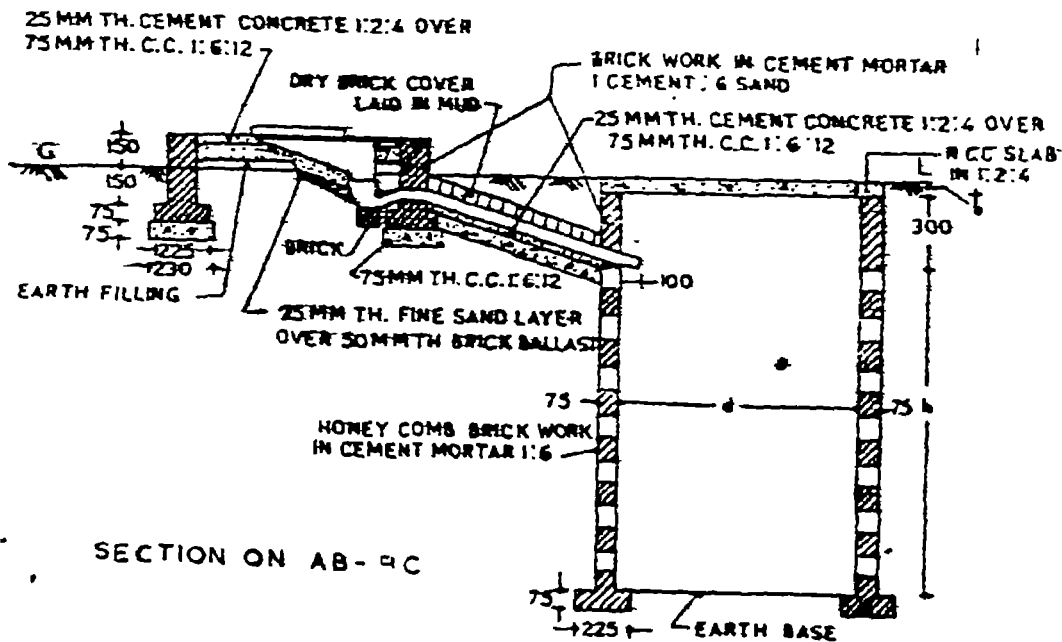
4. The curing started from next day and continued for seven days.
5. The floor should be smooth impervious, durable and sloping towards the pan in all directions.

### CONNECTION FROM TRAP TO PIT

The trap is connected to the leaching pits through a drain or pipe.

The leaching pits within the premises may be connected by a cover drain as shown in the figure.

The leaching pit outside the premises may be connected by pipe with a junction chamber at bifurcation point.



## **DRAIN**      **Brick drain constructed at a slope 1 in 5 to 1 in 15.**

- The base concrete should be laid in C.C. 1:6:12 (1 cement, 6 sand, and 12 brick ballast) of 40 mm gauge or lime concrete 1:3:6 ( 1 cement, lime 3 and 6 brick ballast. Over the base concrete C:C: 1:2:4 (one cement, 2 sand and 4 jelly 10 mm (thick) will be laid in channeled shape for 25 mm thick.
- The channel should be constructed in brick work in C.M. 1:6 (one cement and 6 sand).
- The inner face of the channel should be plastered in CM. 1:4 (one cement and 4 course sand) giving a slope of 1 in 5 to 1 in 15 towards the pit.
- The drain is covered by brick joined in mud mortar after blocking branch to one of the pit at the bifurcation point.

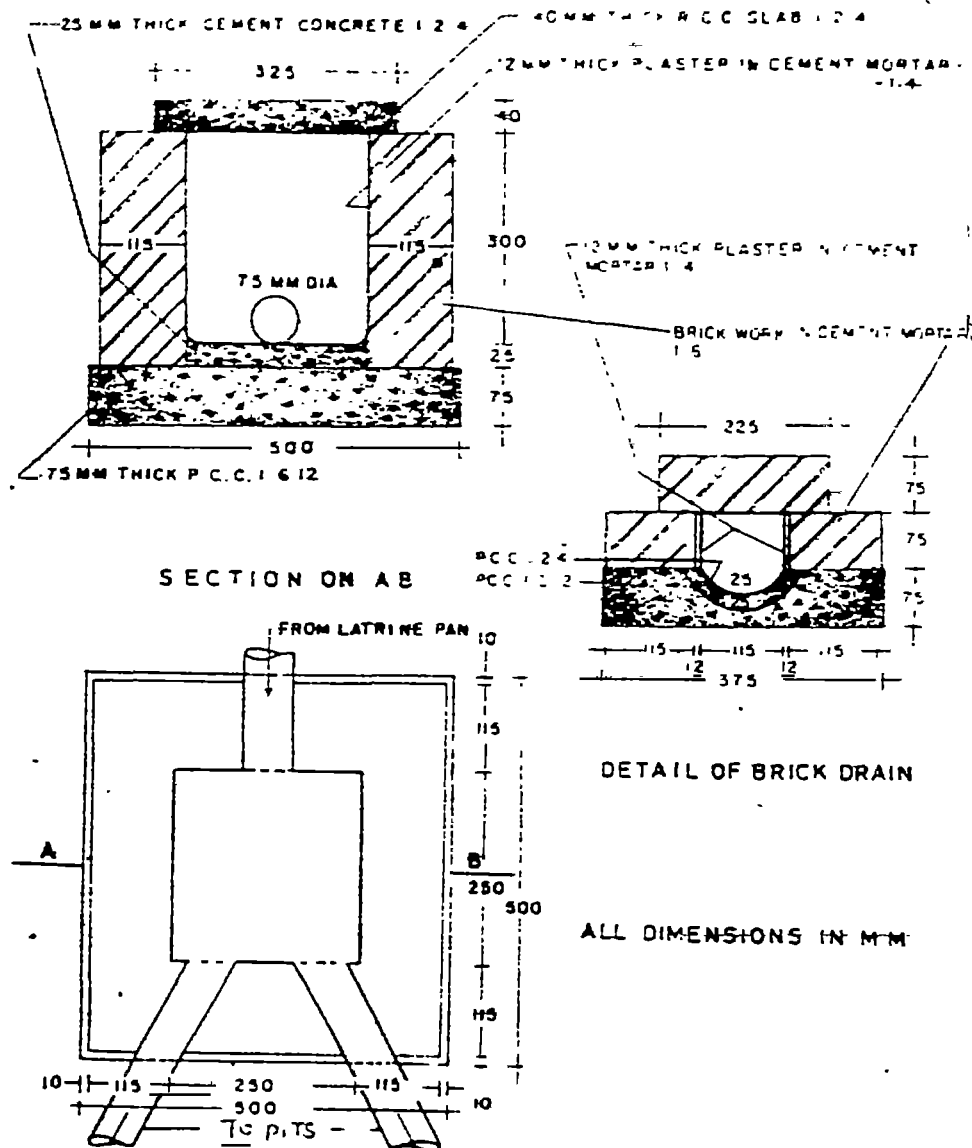
## **PIPE CONNECTION**

- Non Pressure AC pipe of 75 mm may be used
- Should be laid at a slope 1 in 5 to 1 in 15
- Jointing of AC pipe with cement mortar 1:1  
(One cement and one sand)
- The joint should be made water tight
- The pipe should extend 10 cm from the wall of the pit.

## **JUNCTION CHAMBER**

- Junction chamber of size 250 mm x 250 mm should be constructed at bifurcation point of pipe.
- base concrete 1:6:12 (one cement, 6 sand and 12 brick ballast or 1:3:6 Lime mortar. (One lime, 3 sand and 6 brick ballast) 75 mm thick.
- Side wall 115 mm thick using Bricks in C.M. 1:6 (one cement and 6 sand) or L.m. 1:3 (one lime and 3 sand).
- Pipe should be embedded in masonry

- 25 mm thick cement concrete 1:2:4 should be laid sloping towards the pit at the bottom of chamber.
- Inner side of the chamber plastered with CM 1:4 (one cement and four sand)
- The bottom should be rounded smooth and sides rounded off with neat cement.
- Curing started next day for a week.
- After curing mouth of one of the two pits should be closed with Flat brick with weak cement mortar.
- The top of the chamber should be closed with precast RCC slab of size 325 mm x 325 mm.



## LEACHPITS

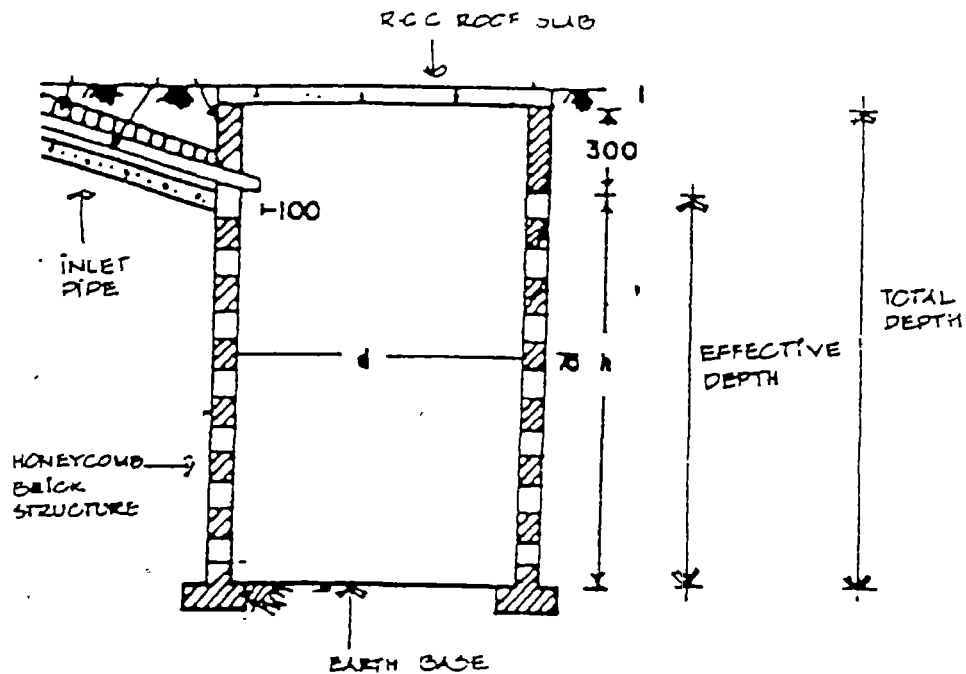
1. Leaching pit shall be lined with either brick work, stone masonry dry stone patching, RCC or burnt clay rings, keeping in view the cost and locally available materials.
2. Earth work excavation to the required size and shape has to be carried out. All sides should be uniformly vertical.
3. Basement course in Brick work in CM 1:6 or LM. 1:3 for 225 mm thick.
4. Honey comb construction 115 mm thick in CM:6 or L.M. 1:3 upto inlet pipe level.
5. Honey comb construction in alternative layer increases the stability.
6. The opening should be 1/3rd the brick length or thickness of the brick.
7. Normally the pit should be located 1m away from the existing structure. If the pit is very close to existing building, the construction need not be honey comb. But the vertical joints need not be mortared. The opening should also be reduced to 12 to 15 mm.
8. If the bottom of pit penetrates the water table, the bottom should be plugged with plastic or puddle clay. Sand envelope with fine sand for a width 500 mm around the pit has to be provided.

The opening should also be reduced to 12 to 15 mm to prevent water contamination.

9. The construction above the inlet pipe will be solid brick work in CM L:6 or LM 1:3 upto cover slab ie. 15 cm above G.L.

The pit should be covered with cover slab curing should be started from next day for 10 days.

The distance between the two pits should be at least 1m or effective depth whichever is more. In case space is constraint single pit with an impervious wall at the middle may also be constructed.



LEACH PIT DETAILS

### STONE MASONRY LINING

1. Lining of pit can also be done in random rubble stone masonry.
2. The stones should be dressed to such an extent that stones comes into close proximity.
3. The thickness of lining should not be less than 150 mm.
4. Construction either in CM 1:6 or lime Mortar 1:3.
5. The vertical joints need not be mortared.

### STONE PATCHING

Stones used should have thin weak corners and edges knocked off and dressed on the face, the sides and beds to enable them to come into close proximity with neighbouring stone. One layer at the bottom and the portion above the invert level of pipe or drain should be in random rubble stone masonry in CM 1:6 or LM 1:3. The portion in between the two layers of RR stone masonry dry stone pitching should be done. Thickness of pitching should not be less than 250 mm



## BURNT CLAY RINGS

Burnt clay rings used for lining should have uniform deep cherry red copper colour and should be properly burnt. Cracked or damaged rings should not be used. Rings should be placed one over the other keeping the socket upward and placing the next in the socket of the lower one.

The joints should remain open (i.e) no mortar should be used to join them. Rings should be raised upto the bottom of inlet pipe or drain. Above these 115 mm thick solid brick work in CM should be provided upto cover slab. Clay rings should not be used for the pits proposed under food path or the main roads but only in open spaces and courtyards with in the premises.

## USE OF RCC RINGS FOR LINING

Cement concrete rings if used should have perforation. Use of cement concrete may not be economical.

## COVER SLABS

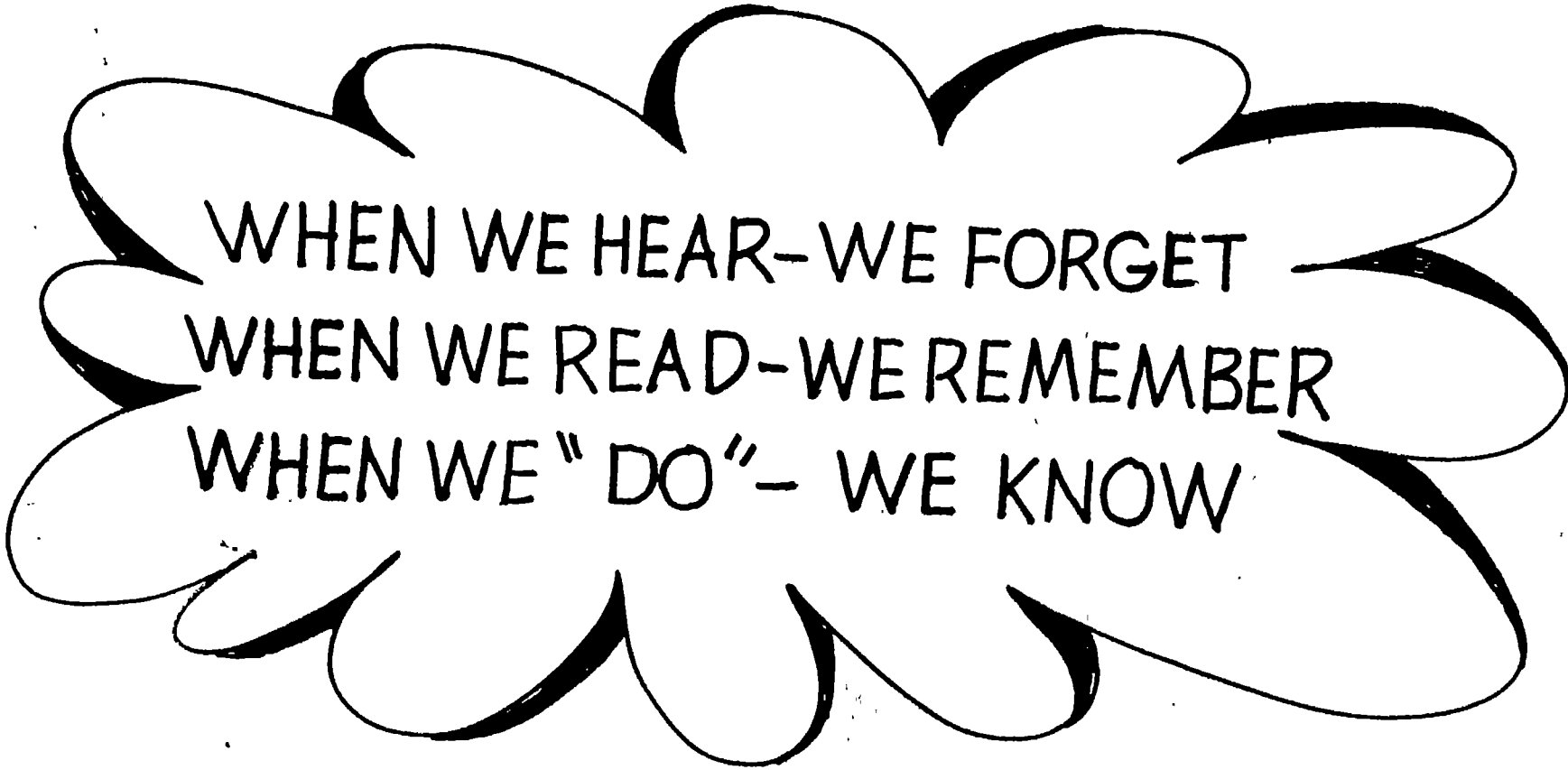

The pits are generally covered by slabs usually of reinforced concrete. Slab in CC 1:2:4 with nominal reinforcement some time stone slabs may also be used. They can be made in one piece but it may be more convenient to split the cover into two or more pieces for handling it easily. The cover slabs is placed over the pit and packed with weak cement mortar to prevent insects or odours exposed from the pit.

## MAINTENANCE OF POUR FLUSH TOILETS

### Maintenance of household pour flush toilet is simple

1. The squatting pan should be cleaned daily with a broom or a brush with long handled brush after sprinkling a little quality of mild detergent powder. Don't use heavy dose detergent as it may create harm to bacterias responsible for destruction of pathogens.
2. Use little quality of water for flushing (about 2 to 2.5 litres). If large quantity of water is used the filling time of the pits gets reduced.

3. Wet the pan before use which inturn avoid the sticking of excreta in the pan and enable easy movement of excreta.
4. Don't allow waste water or rain water entering into the pit.
5. Don't throw wastes like kitchen waste, sweeping rages, cotton pieces in the pan as it may block the passage.
6. The blockage if any during usage can be removed by a flexible stick like split bamboo. If rods are used the parts may get damaged.
7. The pits are put into use alternatively when one pit is in use close the other passage with flat brick in week cement mortar. When the 1st pit is filled divert the flow to the second pit by removing the blockage and placing it in the entrance of 1st pit which is filled. The cover slab of the filled pit is removed and soil to a depth of 150 mm should be filled over the content in the pit and covered. When the second pit is filled up, the content of the 1st pit in the form of soil conditioner may be used for gardening and the pit is reused.



WHEN WE HEAR-WE FORGET  
WHEN WE READ-WE REMEMBER  
WHEN WE "DO"- WE KNOW



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