



**UNICEF - Ministry of Education**

**Strategic Sanitation and Hygiene  
Promotion for Schools**

**Sanitation Technology Options**

**Part 2**

**CONSTRUCTION DRAWINGS**

**prepared by  
Bjorn Brandberg  
SBI Consulting**

**Introduction**

Part 2 of the of Sanitation Technology Options for School Sanitation contains drawings for a limited number of latrines and other sanitation facilities. Given that the catalogue contains more options the presented drawings should be seen as guidelines also for the options which not are represented here.

It is our anticipation that a later version of this presentation would be able to provide technical drawings also for the remaining latrine types.

**Comments on the drawings**

Many new school latrines will be built in Malawi and this presentation will undergo revisions. Comments and suggestions should be forwarded to:

The Project Coordinator  
UNICEF-WES  
School Sanitation Project  
P.O. Box 30375  
Lilongwe 3.

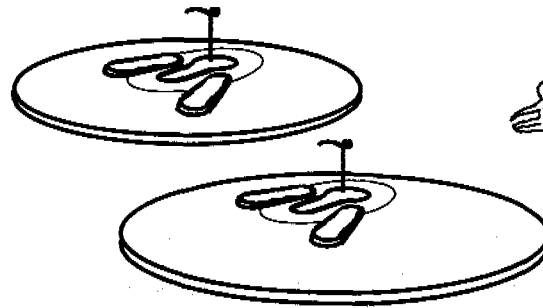
**Good luck!**

LIBRARY IRC  
PO Box 93190, 2509 AD THE HAGUE  
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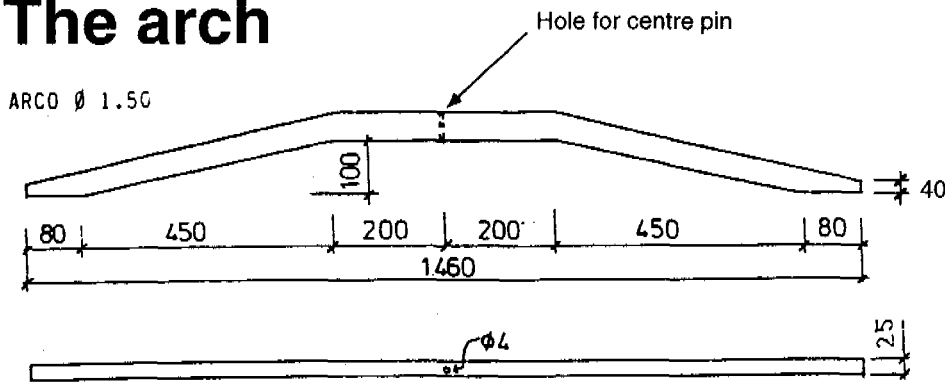
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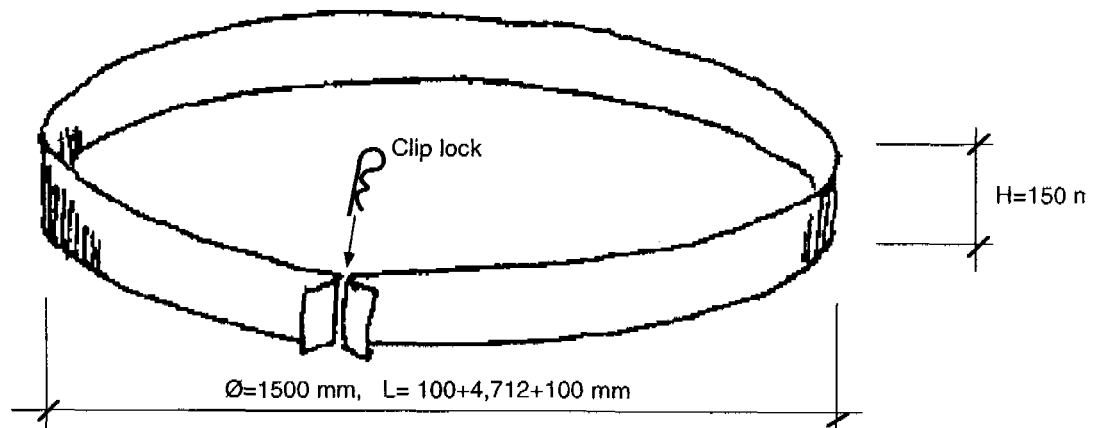
# Moulds for making dome-shaped SanPlats Ø1.5 m



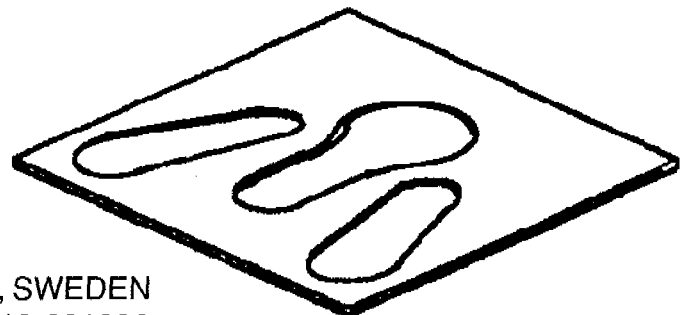
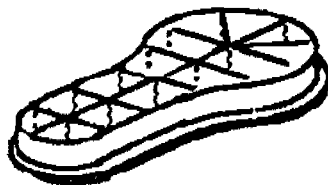
## The arch



## The sheet metal belt with a clip lock

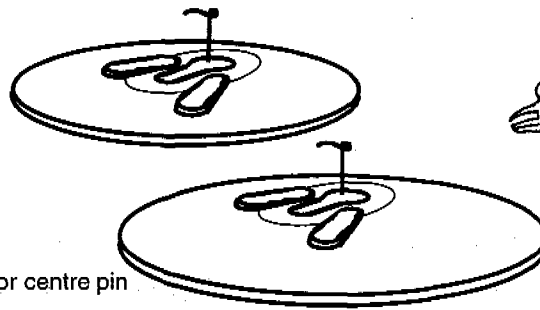


## The drop hole mould    The foot-rest mould



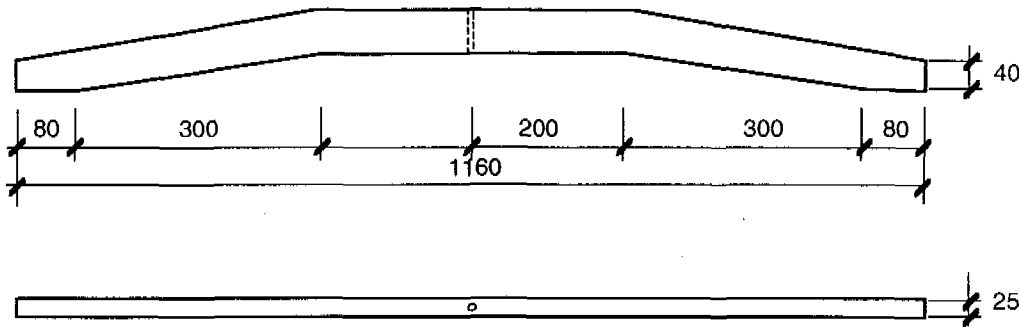
Moulds are available from  
 LCS ProMotion Int AB  
 Elisabet Levenskog, Flo 18, S - 467 96 GRÄSTORP, SWEDEN  
 Tel: +46 - 514 40058 Fax: +46 - 514 40273 cell: 0718-881396  
 E-mail: lcs@sanplat.com www.sanplat.com

# Moulds for making dome-shaped SanPlats Ø1.2 m

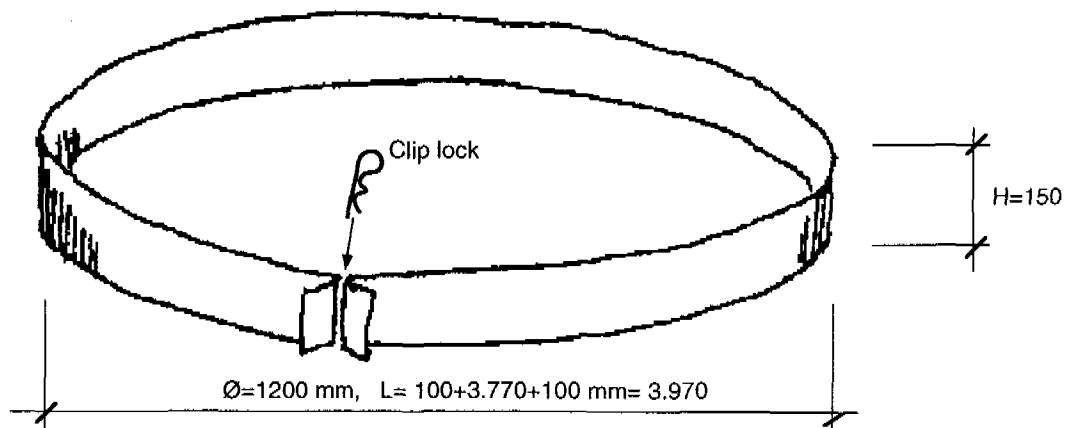


Hole for centre pin

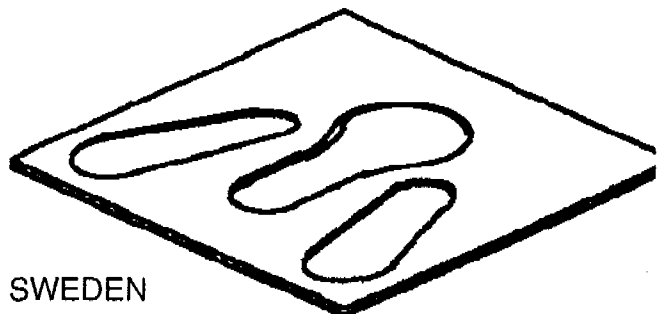
## The arch



## The sheet metal belt with a clip lock



## The drop hole mould    The foot-rest mould



Moulds are available from

LCS ProMotion Int AB

Elisabet Levenskog, Flo 18, S - 467 96 GRÄSTORP, SWEDEN

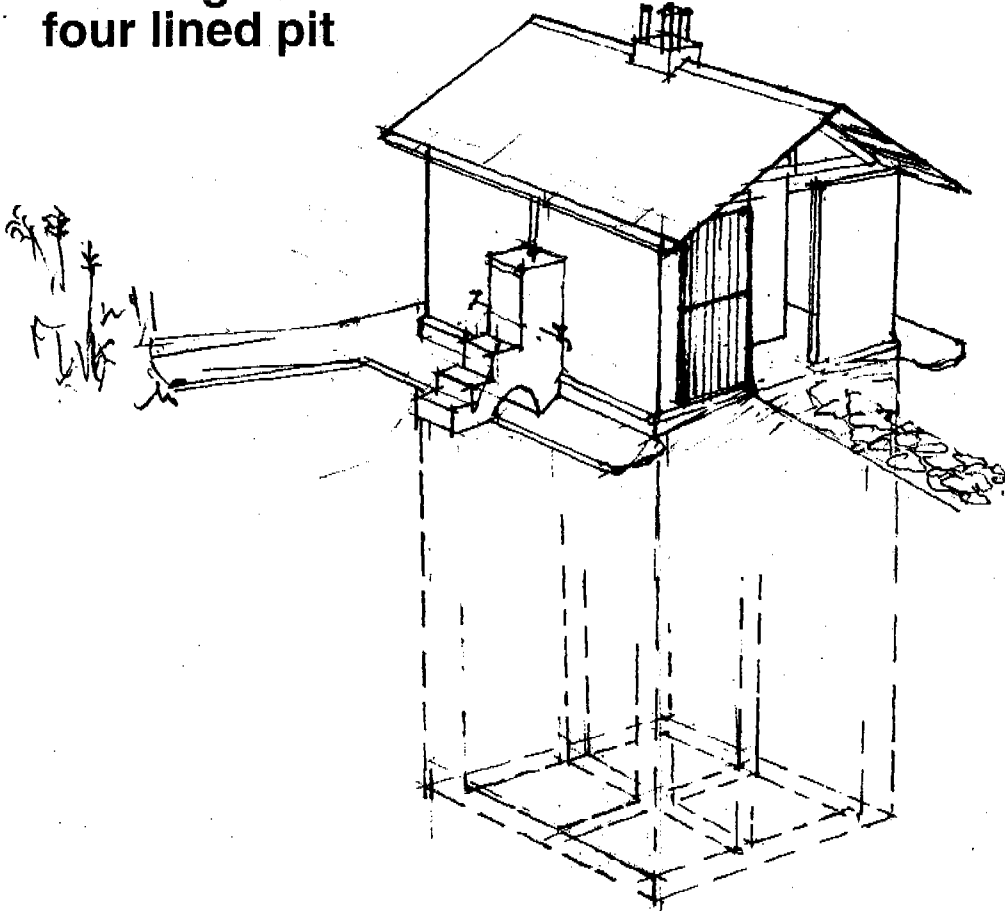
Tel: +46 - 514 40058 Fax: +46 - 514 40273 cell: 0718-881396

E-mail: lcs@sanplat.com www.sanplat.com

# "The Four by Four"

## Four cubicles back to back with handwashing facility

### Perspective of building with four lined pit



**The Four by Four Latrine**  
Offers alternative layouts for boys, senior girls and teachers.

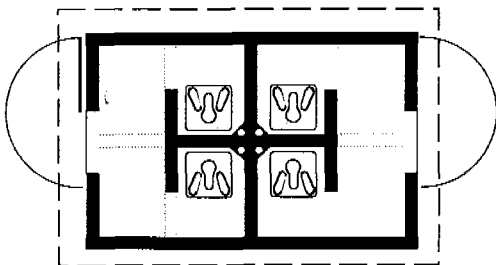
Three functions latrine, urinal and handwashing. It can be used for boys and girls of all ages.

For junior students the doors may be omitted due to soil pressure on the side walls a ring beam with a cross beam has been incorporated.

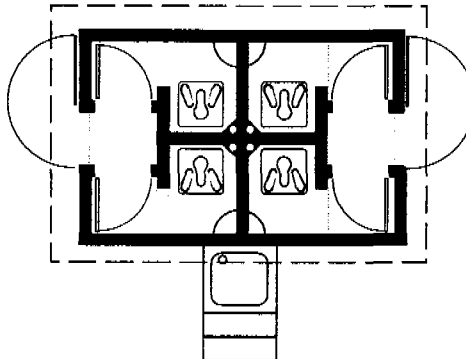
A roof gutter collects rain water to the tank of the hand washing facility.

For senior girls there may be a need of a tank on each side if a tap should be provided in each cubicle.

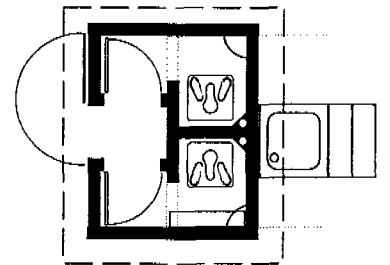
### Typical layouts



**Boys and Junior Girls**  
with separate handwashing facility

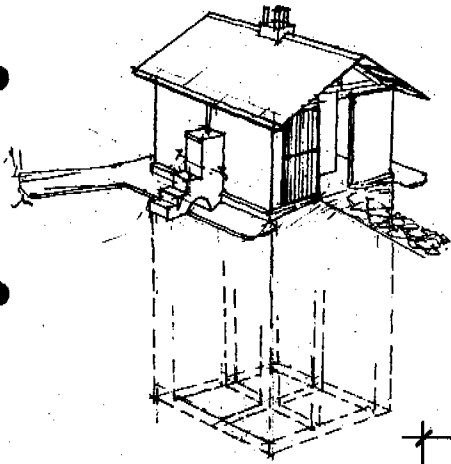


**Senior Girls**  
With integrated handwashing facility and a door for each cubicle, Outside steel gate is optional

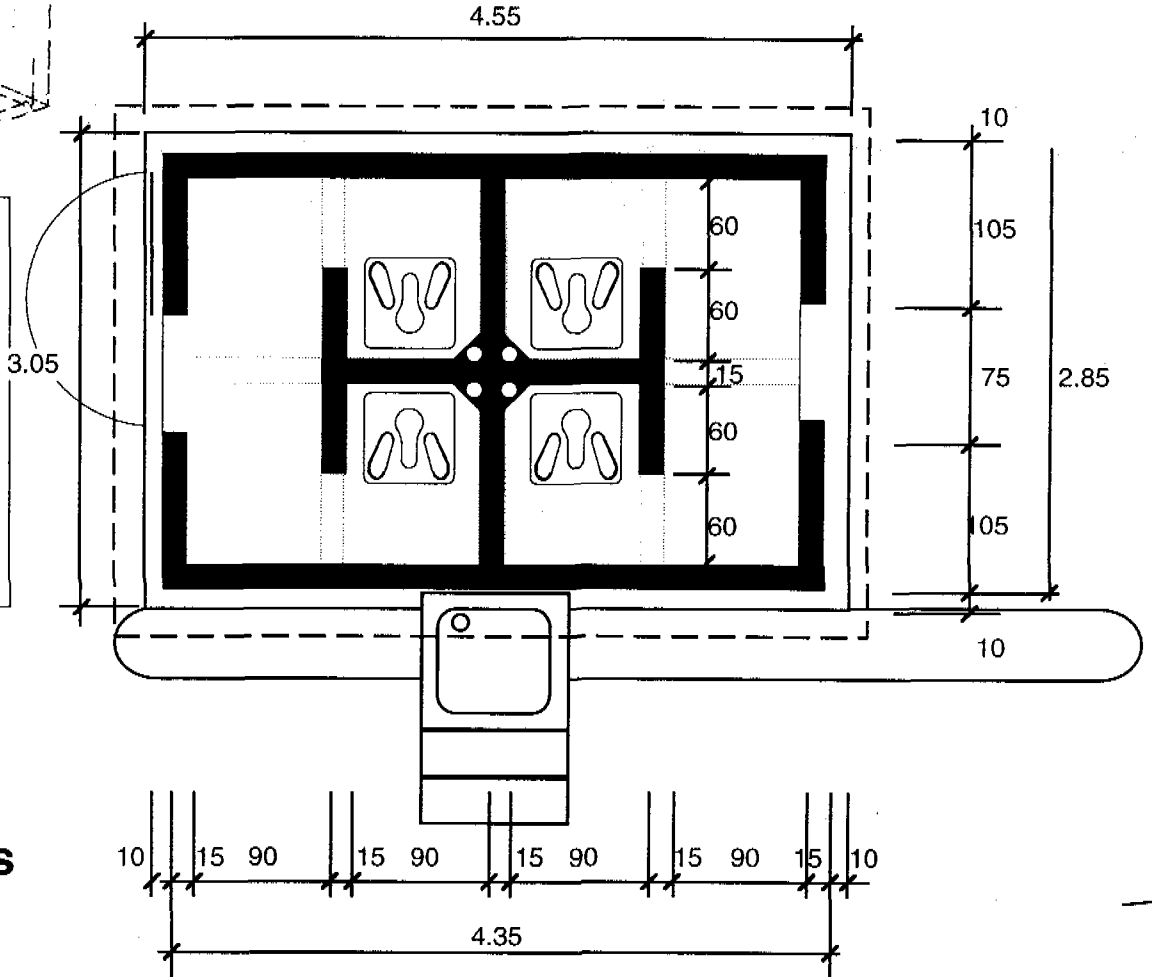


**Teachers**  
With integrated handwashing facility and a door for each cubicle, Outside steel gate is optional

# "The Four by Four"



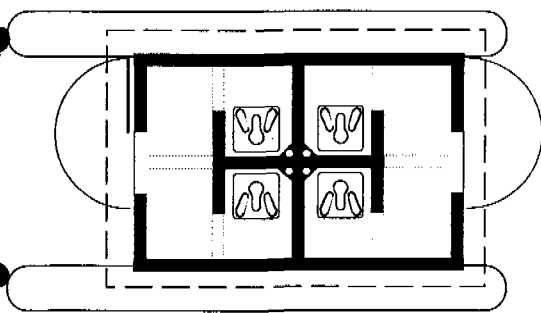
**Note** that ventpipes should be in the middle and that there should be a 150 mm gap between the walls and the roof for light and ventilation.



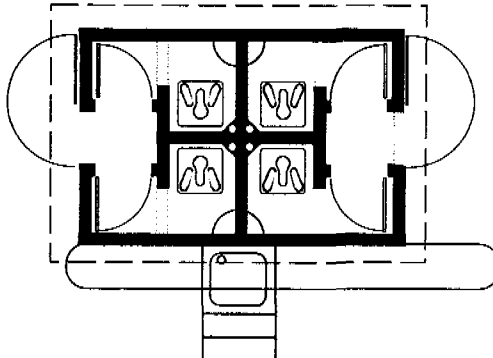
## General plan with dimensions

**Plan**  
Plan shows general dimensions. Typical layouts for different user groups are shown below.

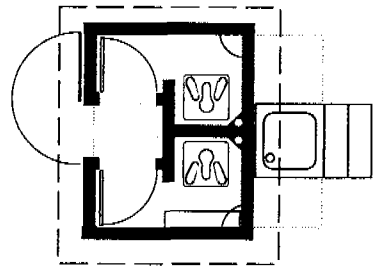
## Typical layouts



**Boys and Junior Girls**  
with separate handwashing facility



**Senior Girls**  
With integrated handwashing facility and a door for each cubicle, Outside steel gate is optional



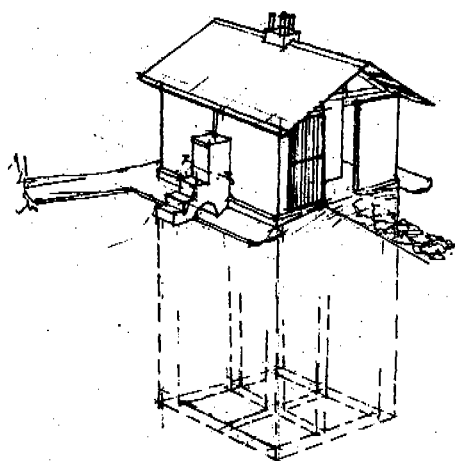
**Teachers**  
With integrated handwashing facility and a door for each cubicle, Outside steel gate is optional

# SSHP Malawi

## School Latrine Type 4.1

### A conventional VIP solution

#### Overview



#### Cost estimate construction

#### SUB-STRUCTURE

- Digging
- Pit lining
- Partitioning walls
- Slabs with finished surface
- SanPlats

#### SUPER-STRUCTURE

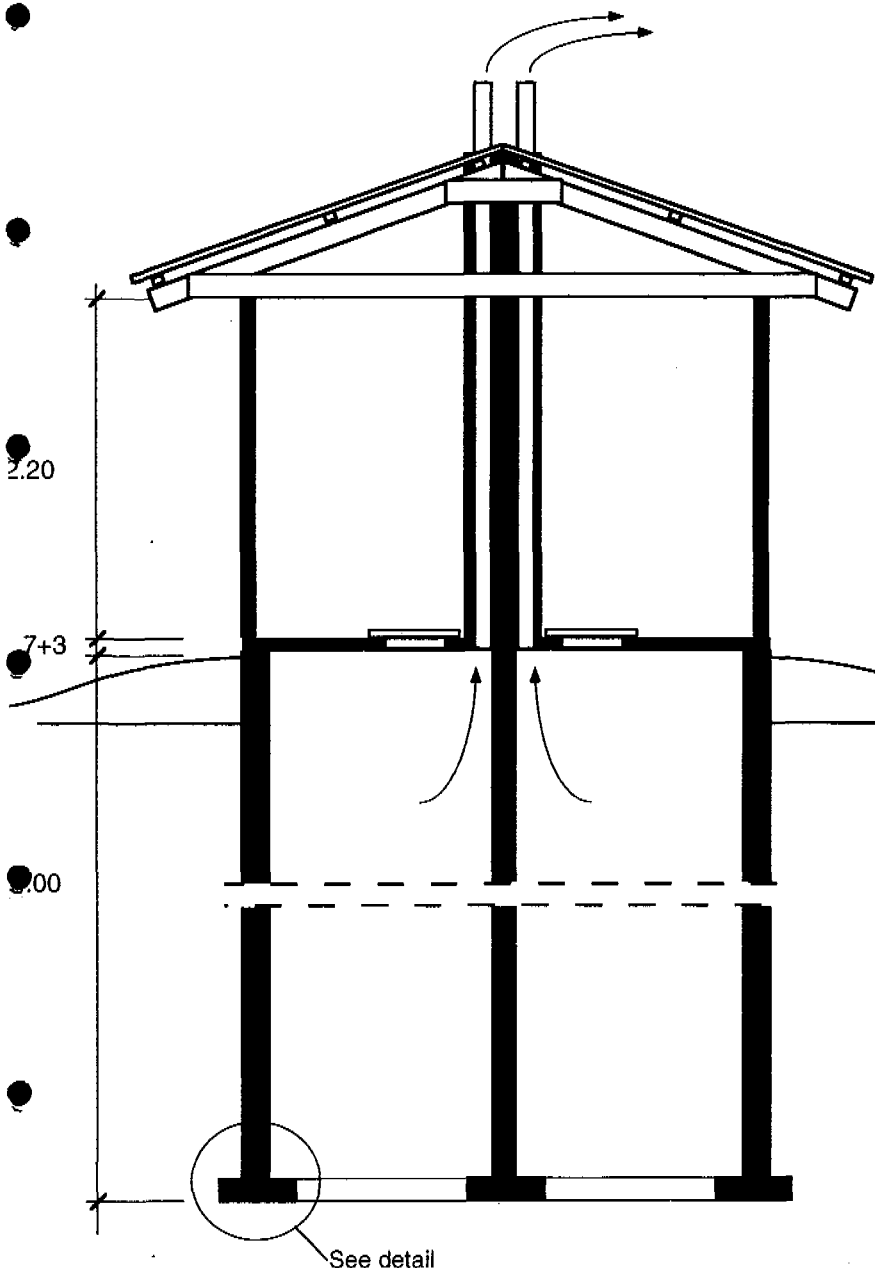
- Brick and mud walls 22 cm
- Brick and mud walls 13 cm
- Doors and fittings
- Plaster 15 mm
- Pointing of joints

#### Relative cost estimate

- Estimated Cost
- Rest value for reconstruction
- Resulting cost
- Estimated Lifetime
- Resulting cost per year
- No of compartments
- Resulting cost per compartment per year

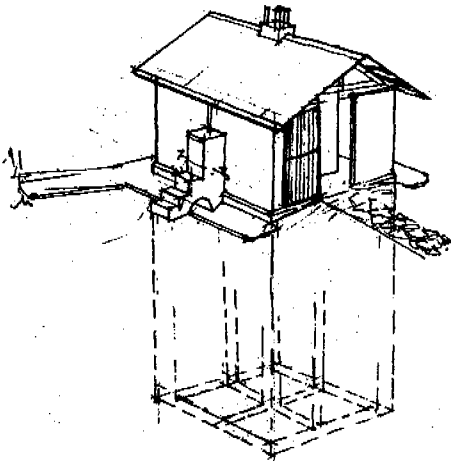
#### CONSTRUCTION

- Start by casting the slabs with holes for the drop hole and the ventpipes. Concrete 1+3+5 (volumes of river sand and stone). Reinforcement  $\varnothing$  6 mm #30x30 cm 2 cm from bottom. Place the SanPlats on the reinforcement before casting the concrete. The surface should be smoothed to full floor finish. Cover with plastic and keep wet for one week.
- Dig the pit exactly with the dimensions of the slabs + 20 cm. Depth to be defined at site.
- Widen the excavation for the footing at the bottom
- Lay a footing 500 mm wide with three courses of bricks set in strong cement mortar (1+3) Alternatively the footing can be cast in concrete 500x150 mm in concrete 1+3+5 with extra stones as a filler.
- Lay the brickwork to the pit with brickwork and cement mortar (1+5) with open vertical joints for outside walls facing the soil. Fill the gap with coarse sand as the laying of bricks proceed.
- Continue the brickwork 500 mm over the ground level with solid brickwork and arrange the surrounding ground.
- Put the slabs in place on top of a mortar bed and allow to cure for two days.
- Raise the walls with doors and openings in simple brickwork
- Finalize walls with a ringbeam in reinforced brickwork (2x $\varnothing$ 6 mm) also over partitioning walls with metal wires for anchoring the roof.
- Allow to cure for at least one week before moving them (full strength is achieved after 4 weeks)
- Build the complete roof on the ground starting with two roof trusses, purlines and roof sheets.
- Cut a hole for the four ventpipes
- Place the whole roof over the walls and adjust position for ventpipes to fit in the hole and anchor the roof trusses in the ring beam.
- Seal the roof around the vent-pipes with three layers of chicken wire and cement mortar.
- Fit and adjust doors, hand washing facilities etc as required.

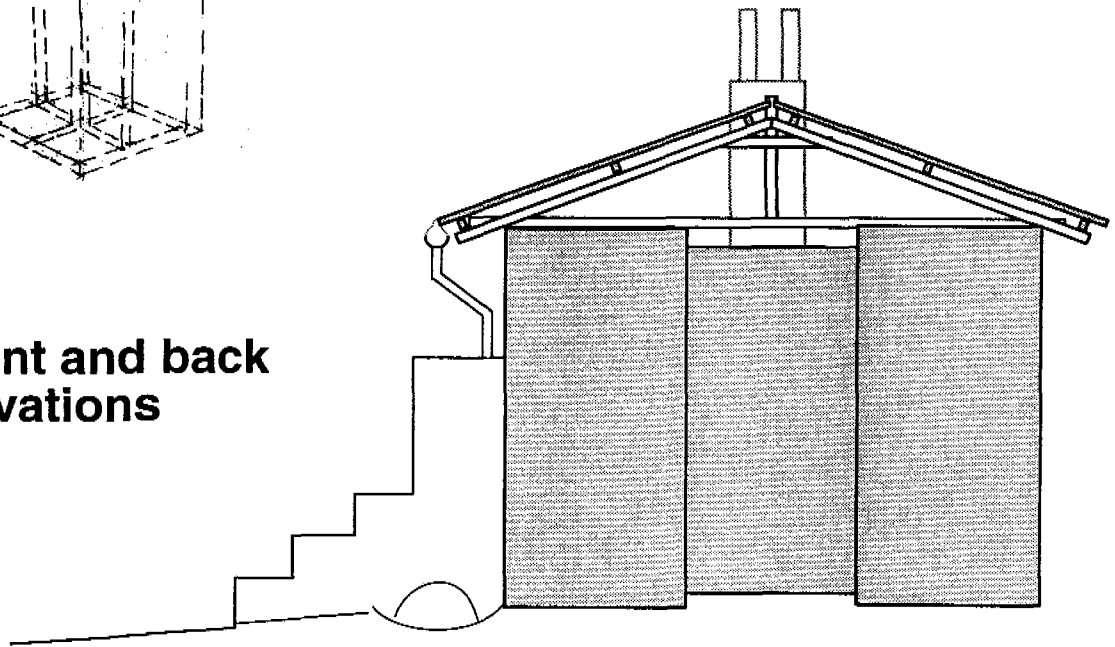


**Cross section**

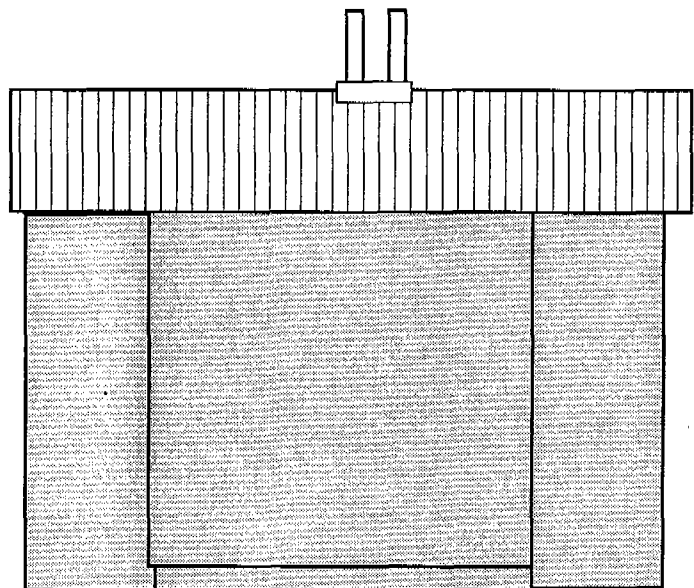
# SSHP Malawi School Latrine Type 4.1 A conventional VIP solution Elevations



**Front and back elevations**

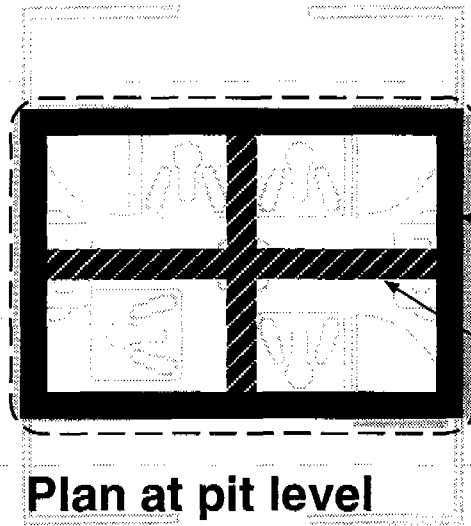
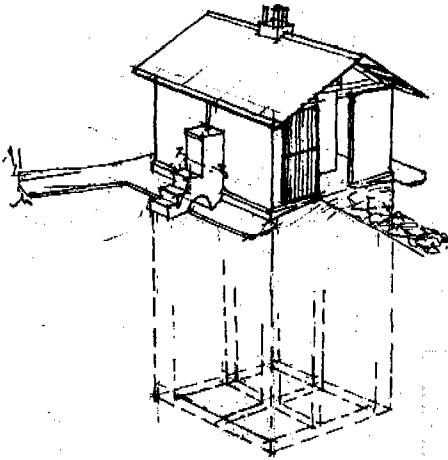


**Side elevations**





# Four for Four Plans

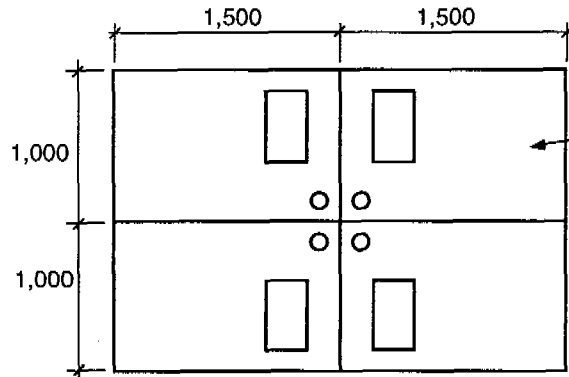


**Pit excavation**  
2.20x3.20 m

**Pit lining**  
Full mortar  
brickwork 200 mm  
with 100 mm sand  
fill outside

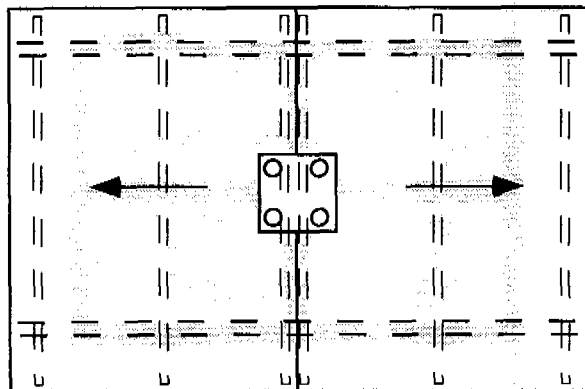
**Dividers**  
Open vertical joints  
Placed in the middle

**Plan at pit level**



**Concrete slabs**  
70 mm with  
Reinforcement  
Ø6 mm #300 mm  
with holes for  
SanPlats and  
ventpipes.  
Slabs are best cast  
before the digging,  
hence allowing them  
to cure while the  
sub structure is  
being built.

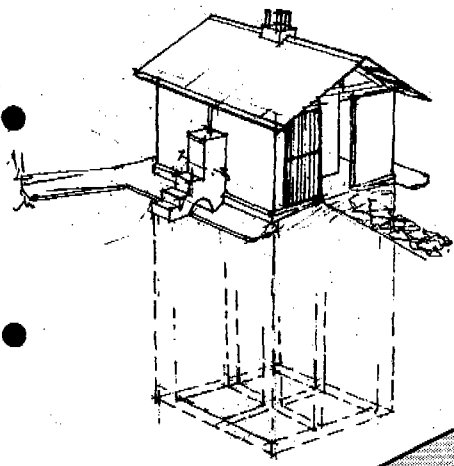
**Plan at slab level**



**Plan at roof level**

# Construction details

Drg 1.6



**Nails**  
4x5 inch bent  
on opposite  
side

**Roof truss**  
50x70 mm  
treated timber or  
bluegum

**Termite  
proof joint**  
Cement  
mortar (1+3)

**Roof anchors**  
Ø 4 mm fencing wire bent  
under reinforcement and over  
roof truss member and fixed  
with nails

**Reinforcement 2 x Ø6 mr**

**Door  
openings**  
2.100

**Termite proof joint**  
Cement mortar (1+3)

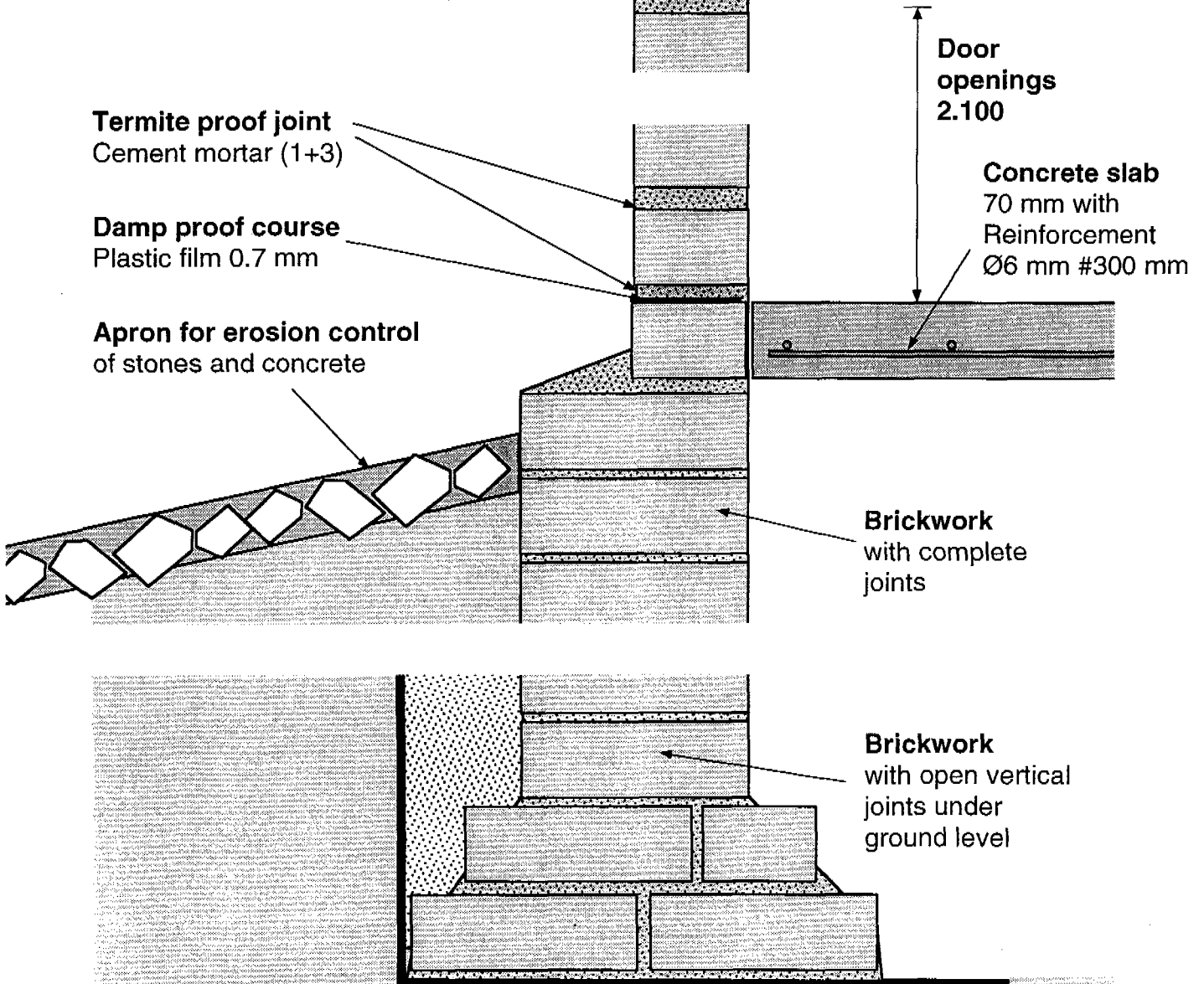
**Damp proof course**  
Plastic film 0.7 mm

**Concrete slab**  
70 mm with  
Reinforcement  
Ø6 mm #300 mm

**Apron for erosion control**  
of stones and concrete

**Brickwork**  
with complete  
joints

**Brickwork**  
with open vertical  
joints under  
ground level



# "The Four by Four for Ever"

## Four cubicles back to back with handwashing facility

The Four by Four for Ever Latrine can be emptied and is therefore a permanent solution.

As it is shallow it can be used also where it is difficult to dig because of high ground water tables or rocky soil.

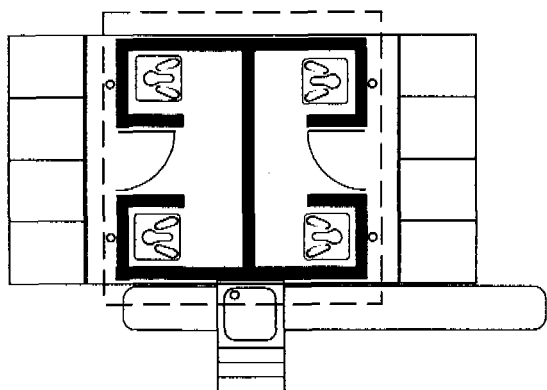
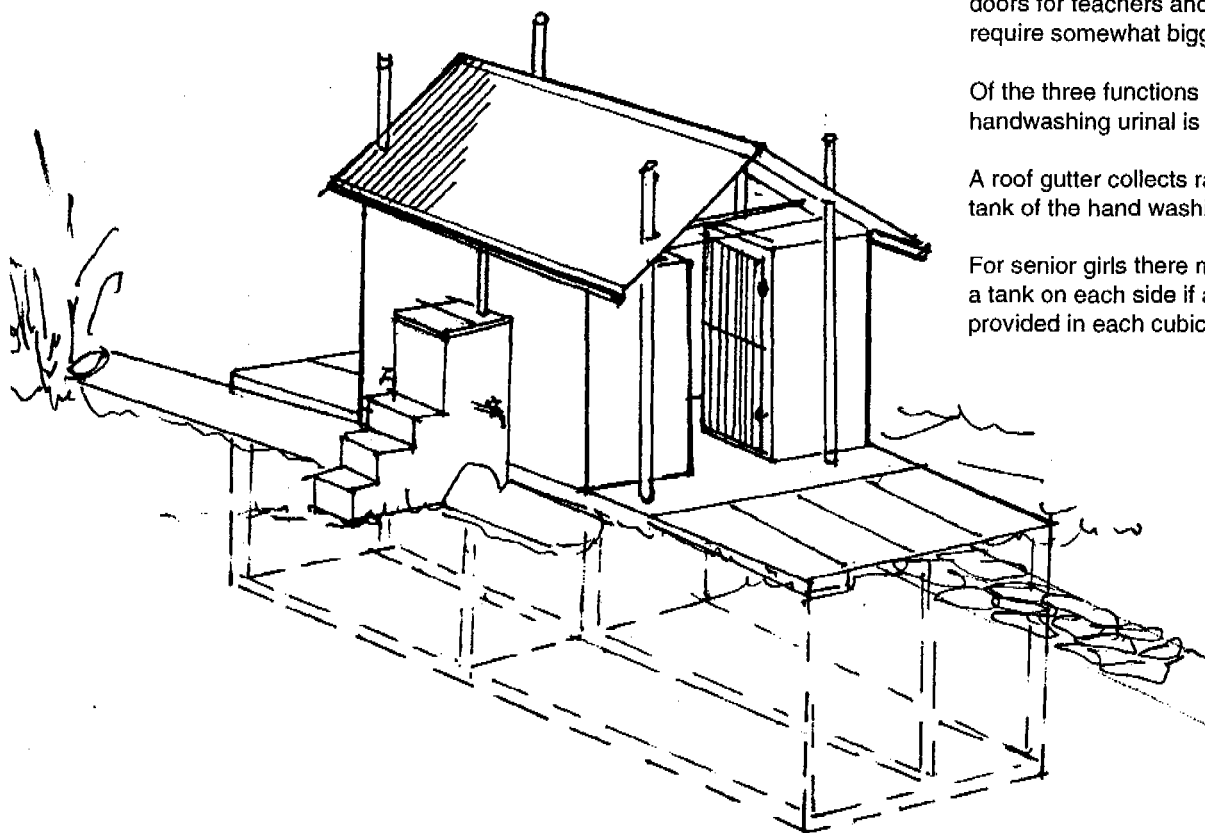
It can be adapted for boys, senior girls and teachers though the inclusion of doors for teachers and senior girls may require somewhat bigger dimensions.

Of the three functions latrine, urinal and handwashing urinal is not included.

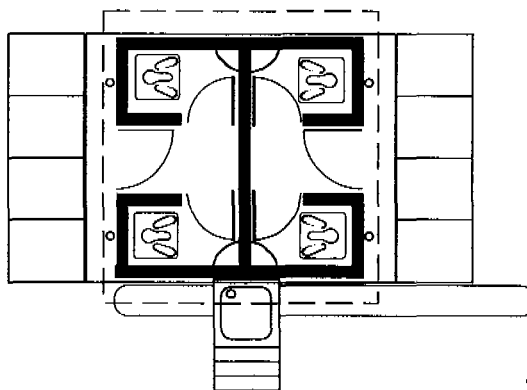
A roof gutter collects rain water to the tank of the hand washing facility.

For senior girls there may be a need of a tank on each side if a tap sold be provided in each cubicle.

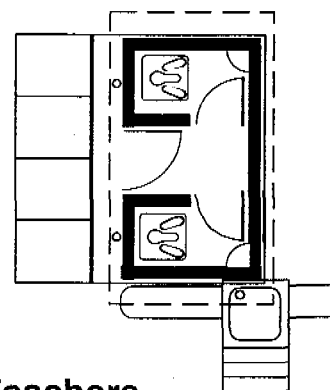
### Perspective of building with lined pit



**Boys and Junior Girls**  
with separate handwashing facility



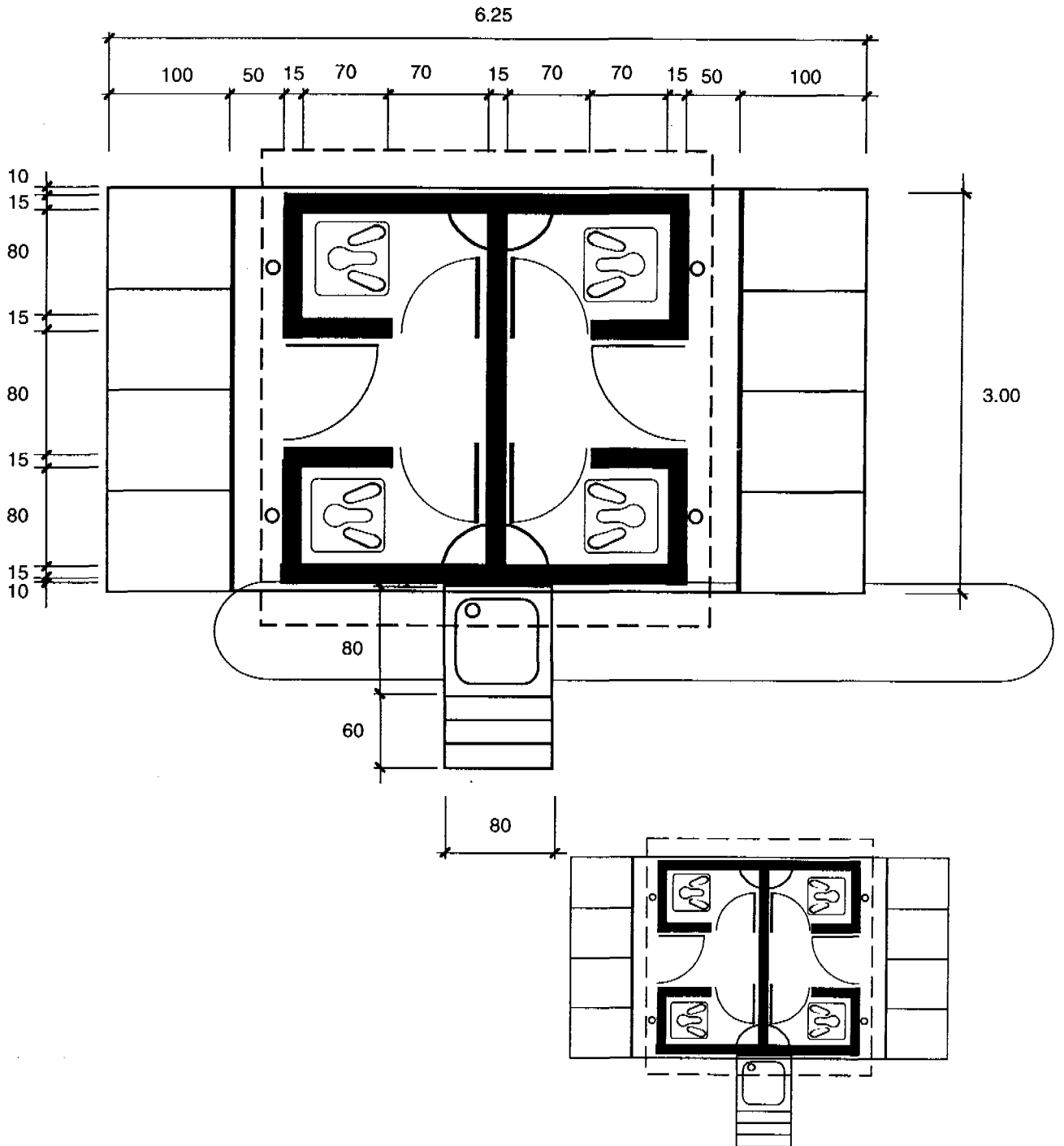
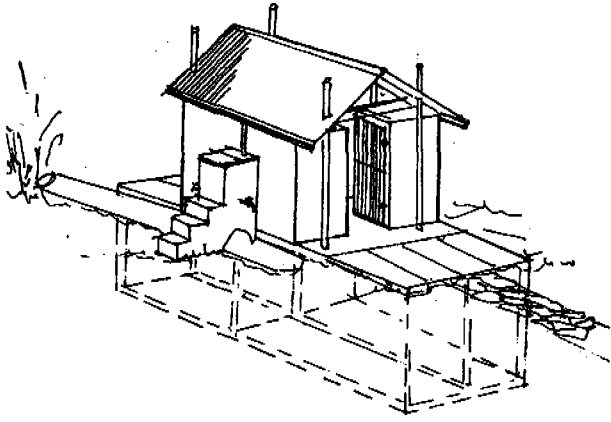
**Senior Girls**  
With integrated handwashing facility and a door for each cubicle, Outside steel gate is optional



**Teachers**  
With integrated handwashing facility and a door for each cubicle, Outside steel gate is optional

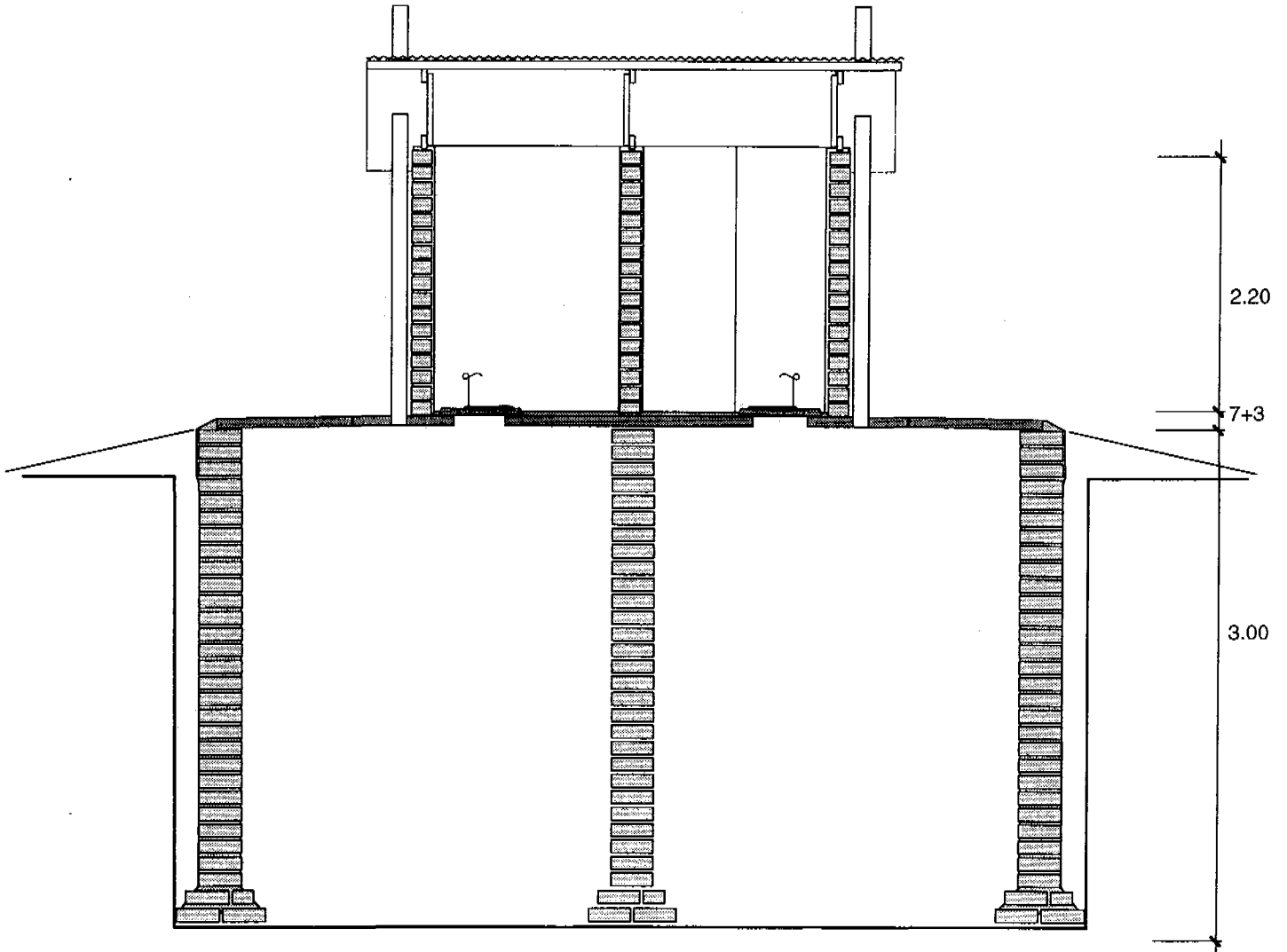
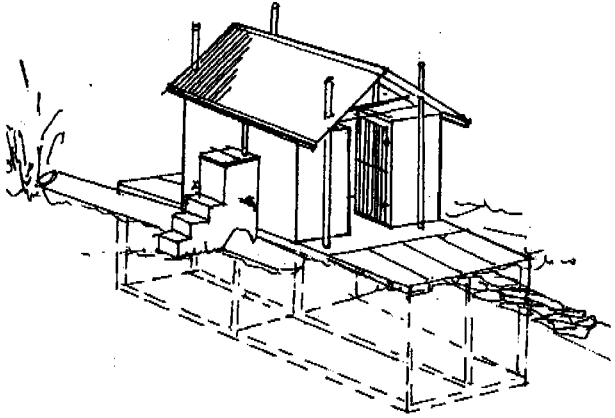
# "The Four by Four for Ever"

## Plan wit dimensions



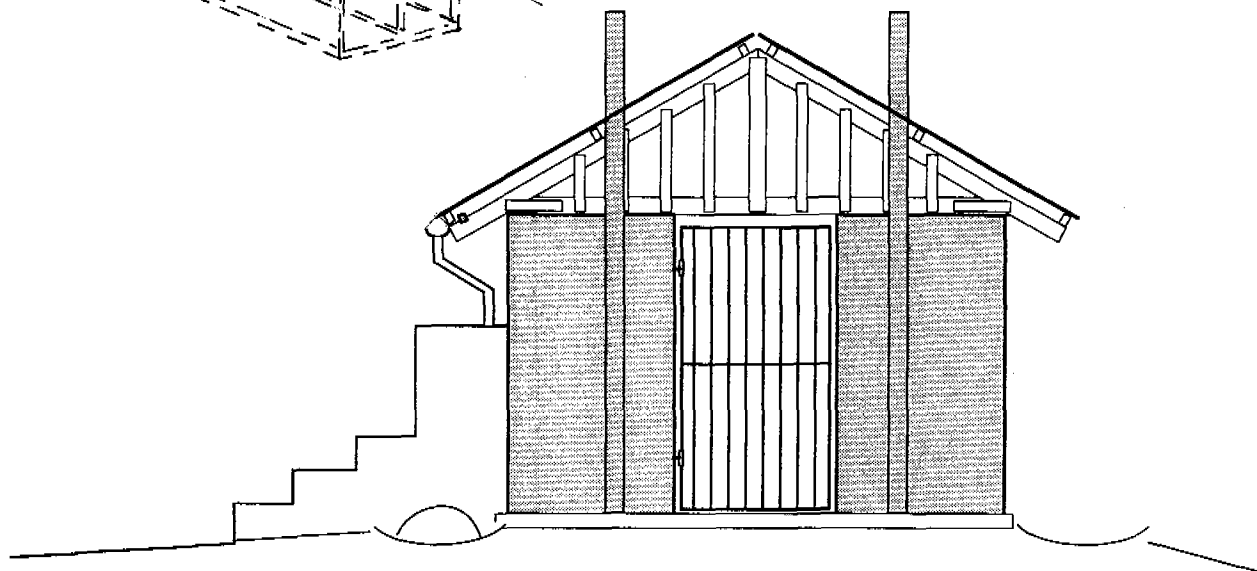
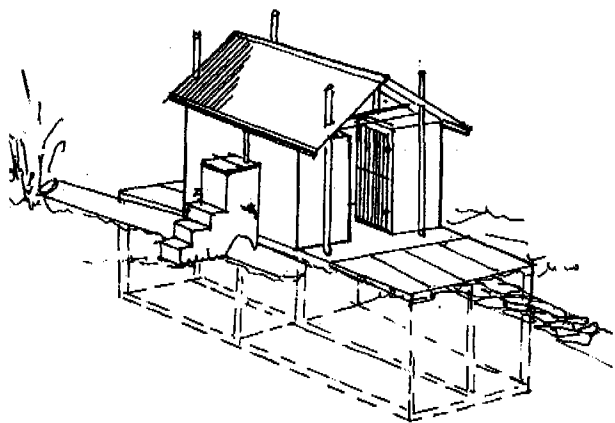
# "The Four by Four for Ever"

## Cross section

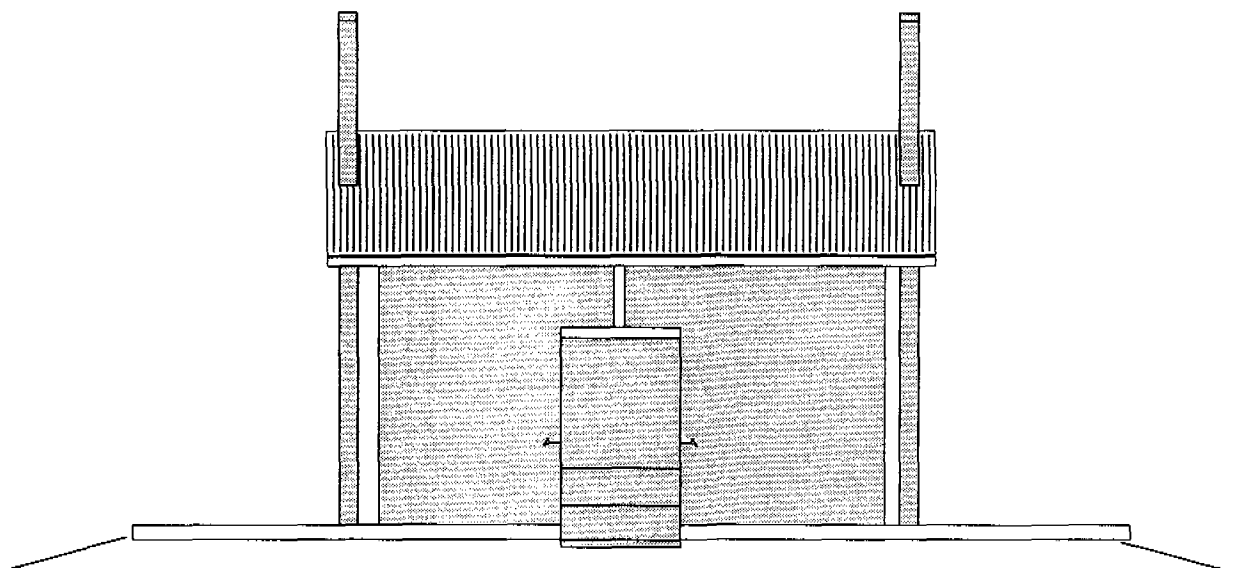


# "The Four by Four for Ever"

## Elevations



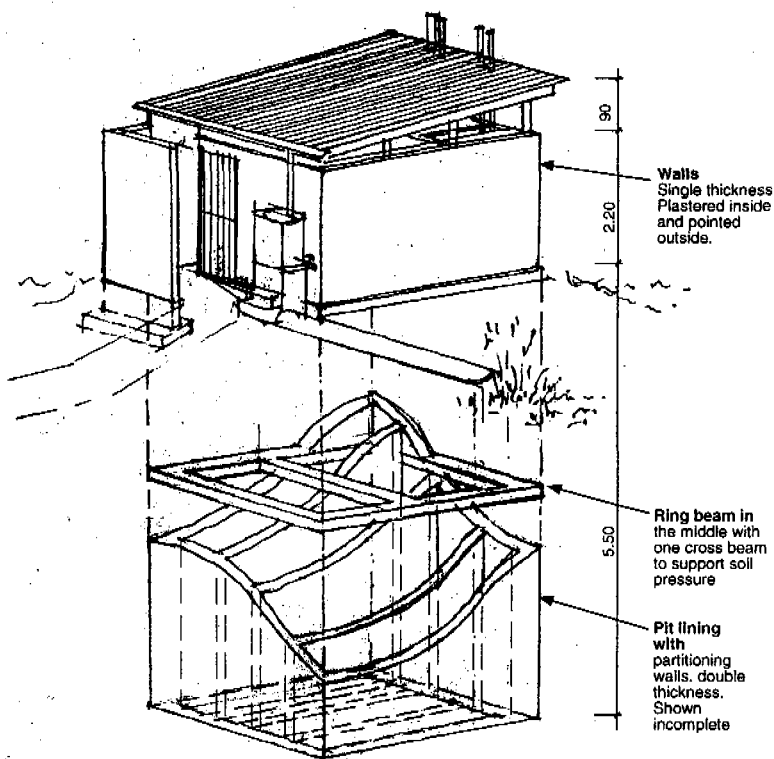
**Gables**



**Side**

# The Super Drop

Four cubicles side by side  
with urinal and hand washing facility



**This building** encompasses the three functions latrine, urinal and handwashing. It can be used for boys and girls of all ages.

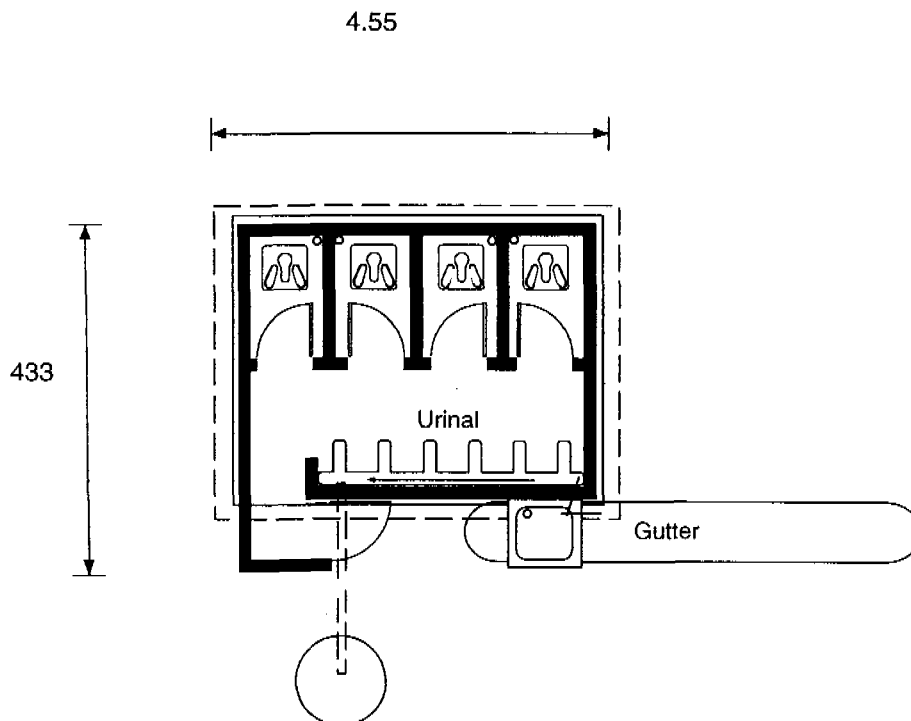
For junior students the doors may be omitted

Due to soil pressure on the side walls a ring beam with a cross beam has been incorporated.

A roof gutter at the lower end on the roof collects rain water to the tank of the hand washing facility.

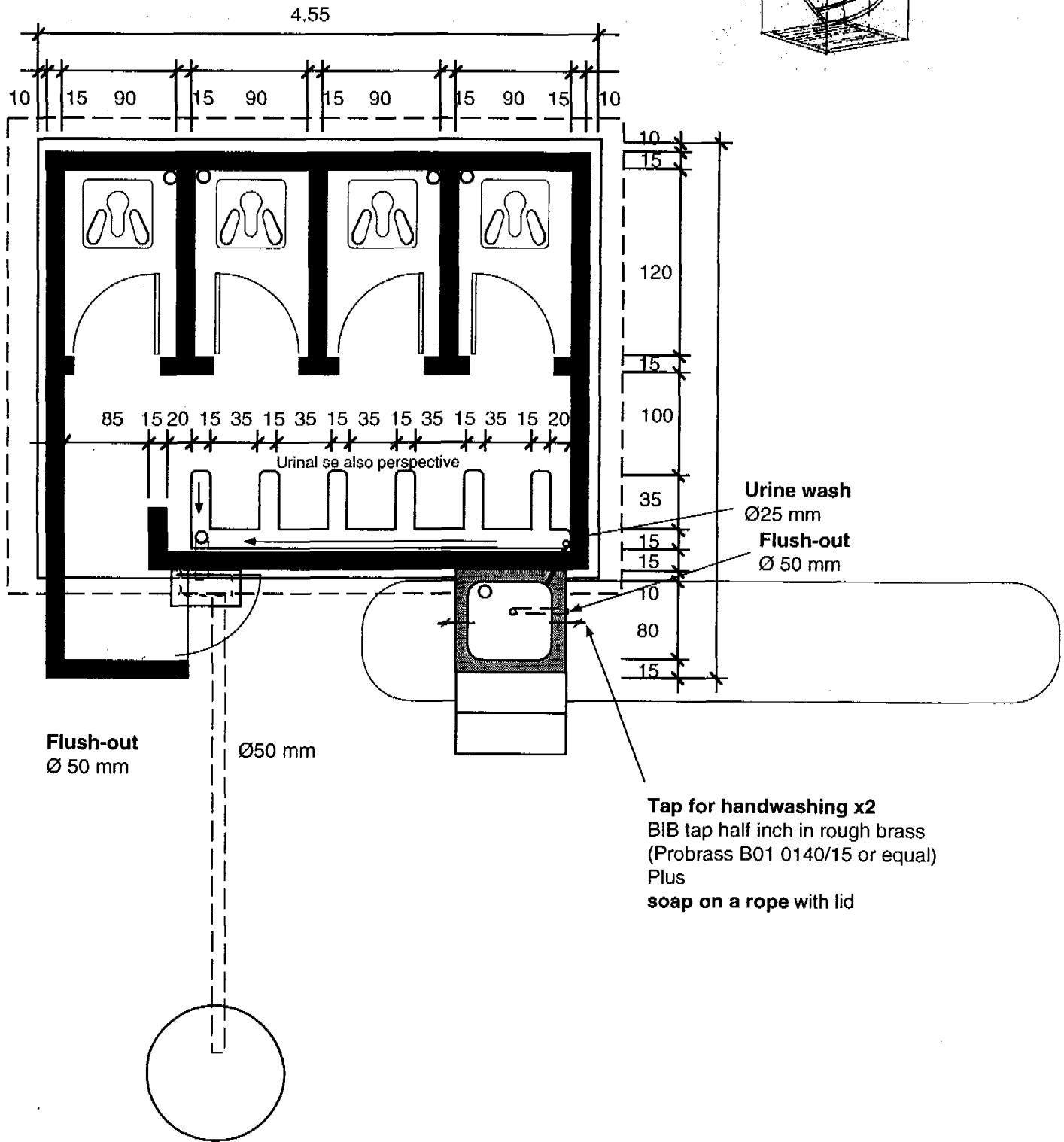
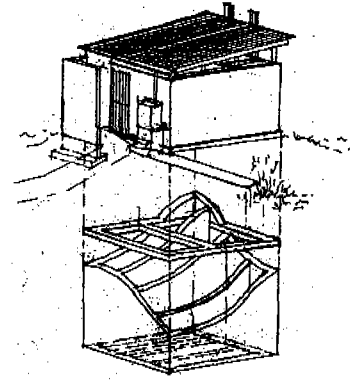
Excess water can be used for washing out the urinal to reduce smell.

## Typical layout

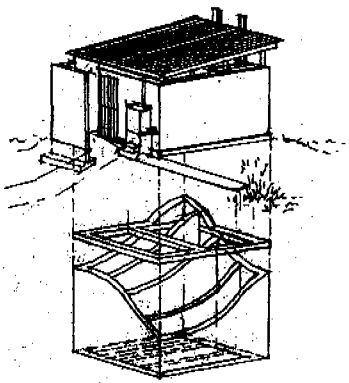


# The Super Drop

## Plan wit dimensions

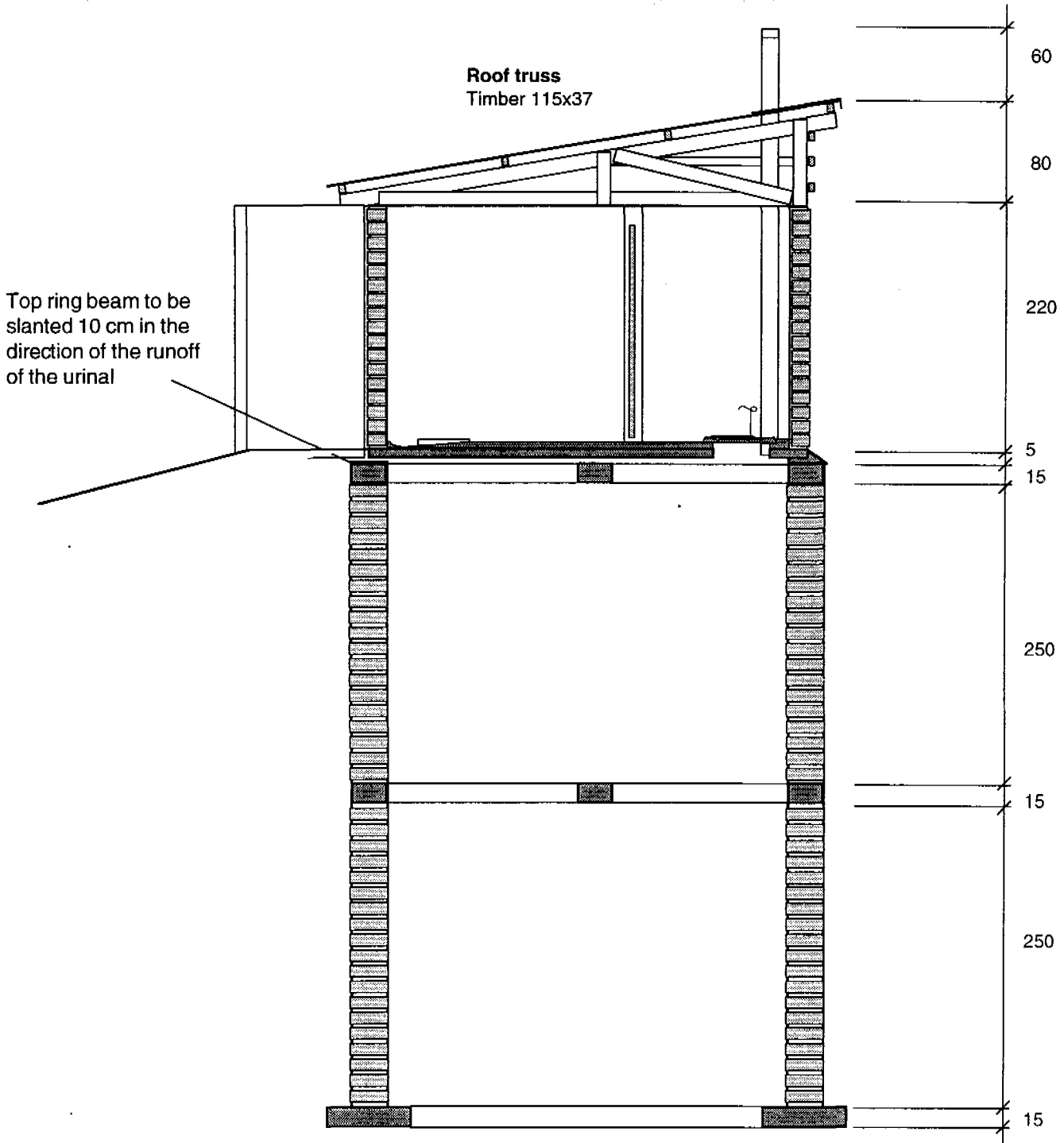






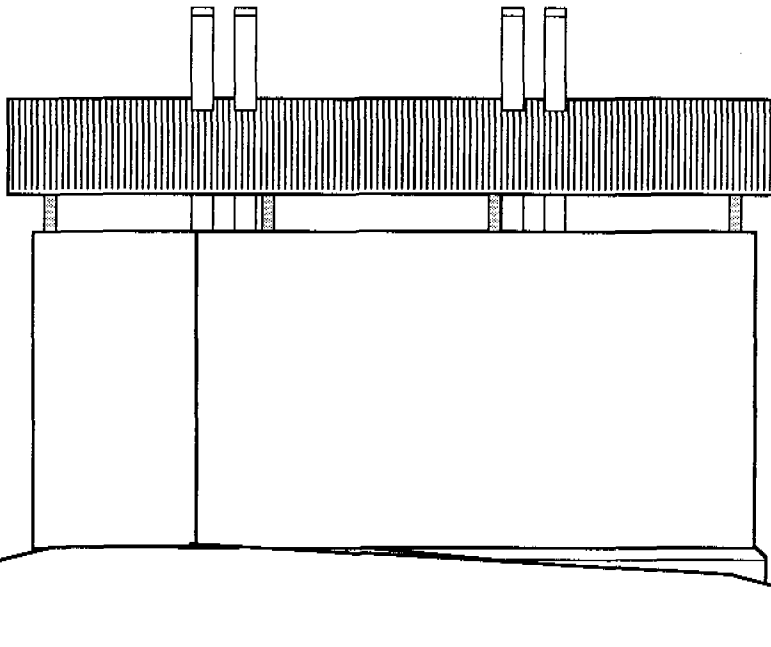
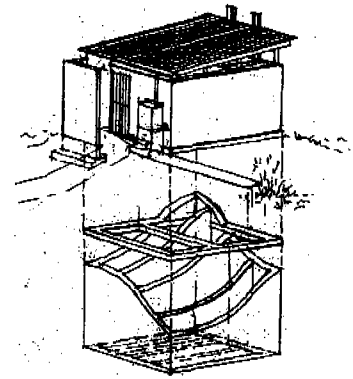
# The Super Drop

## Cross section

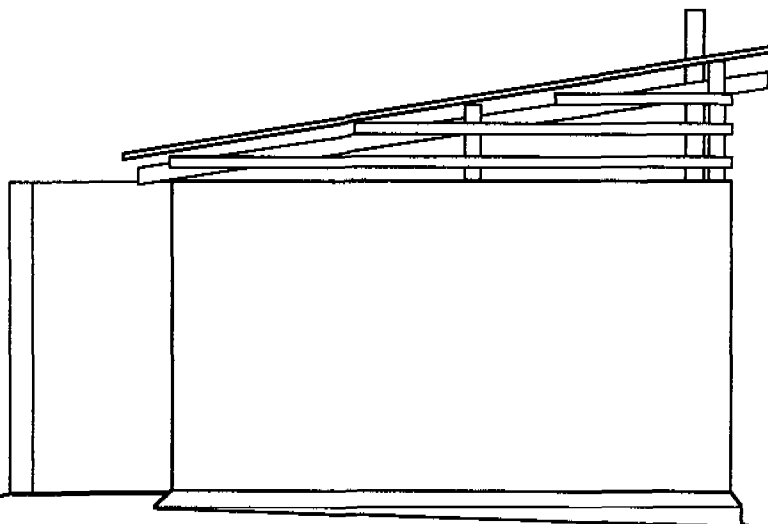


# The Super Drop

Principal elevations



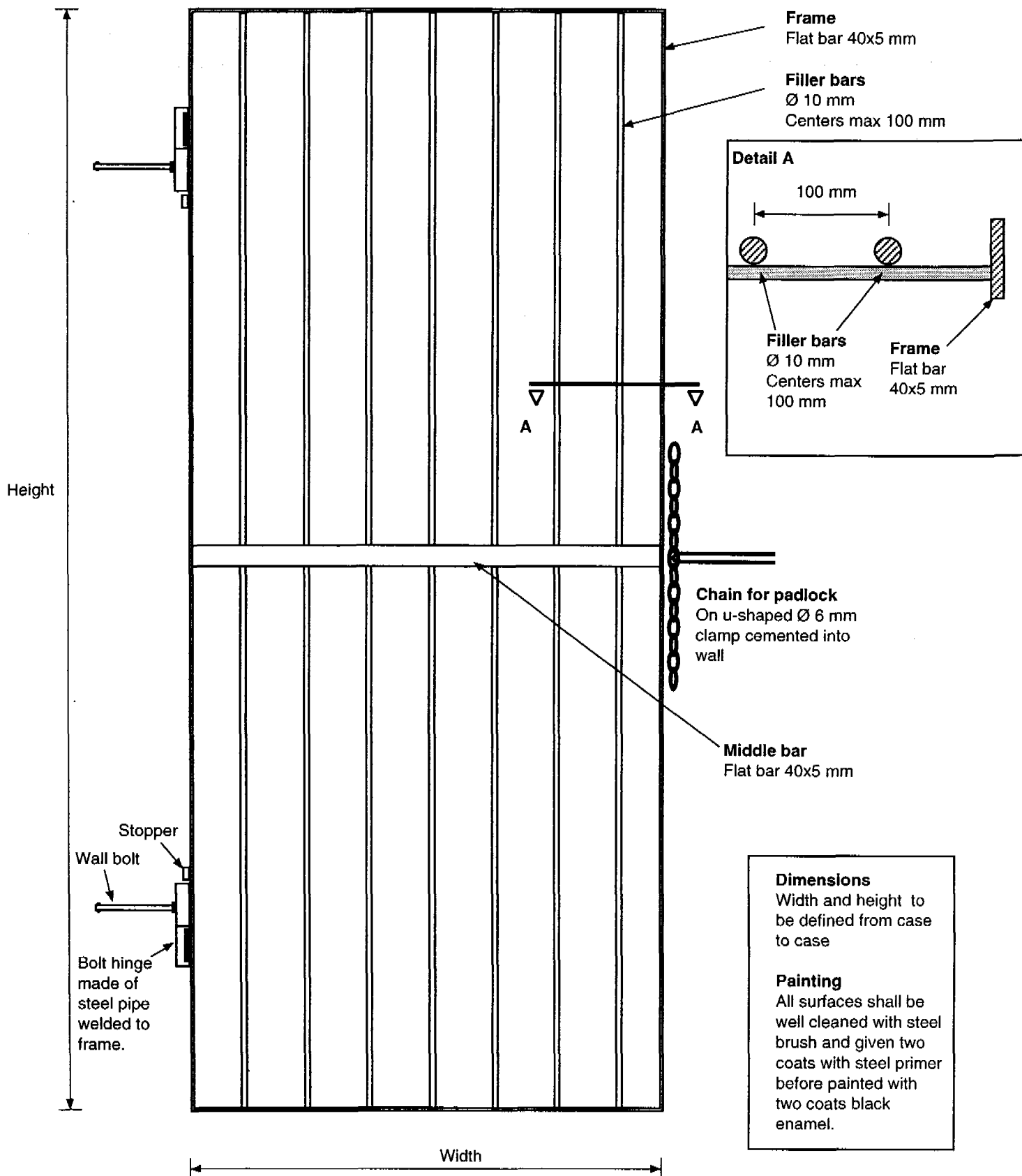
Front



Side

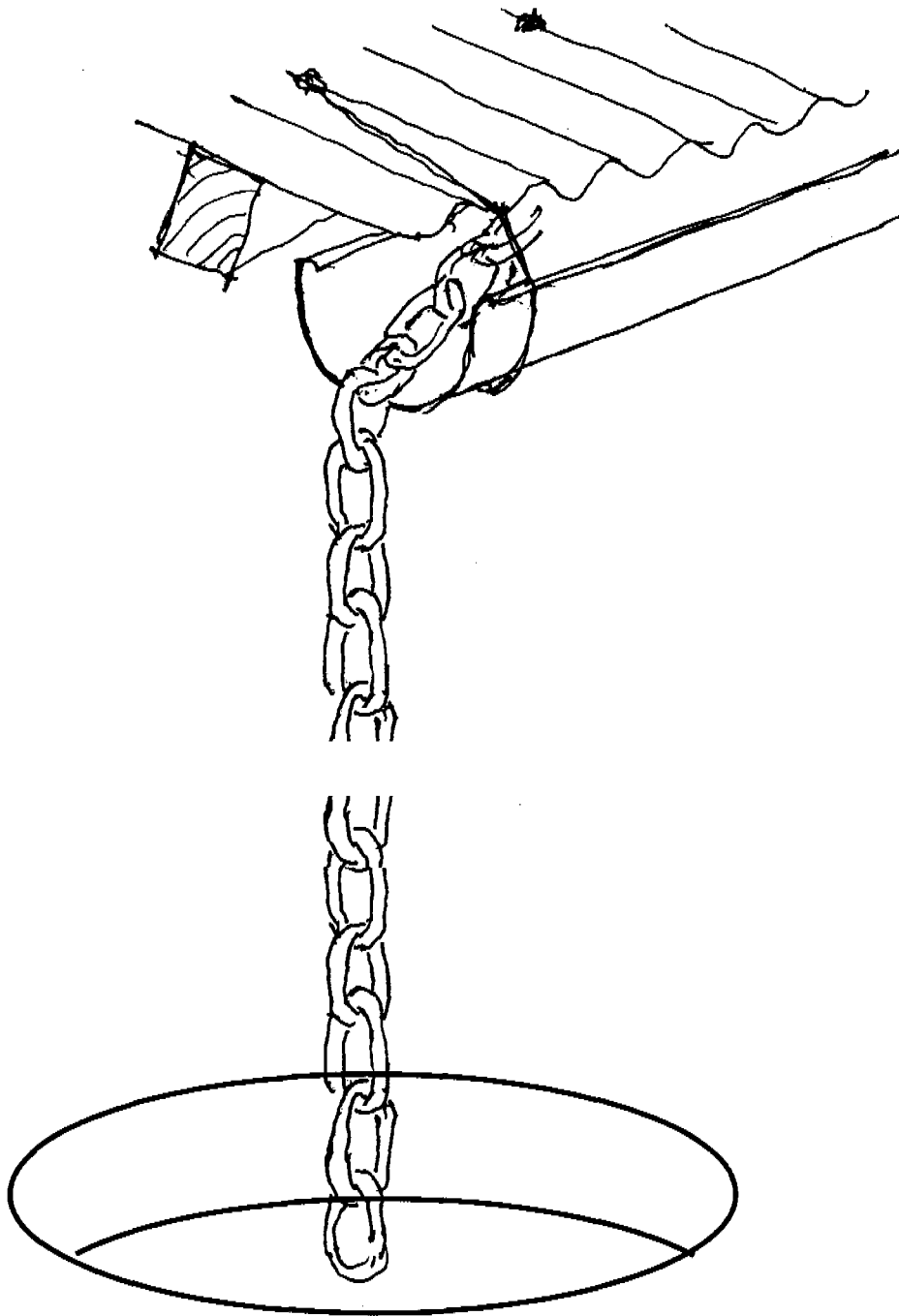
# Steel gate

**For security but not for privacy  
Resists rain and thugs.  
Locks with a chain and a good padlock**



# Rain on a Chain

A simple way of leading  
roof water into a water tank



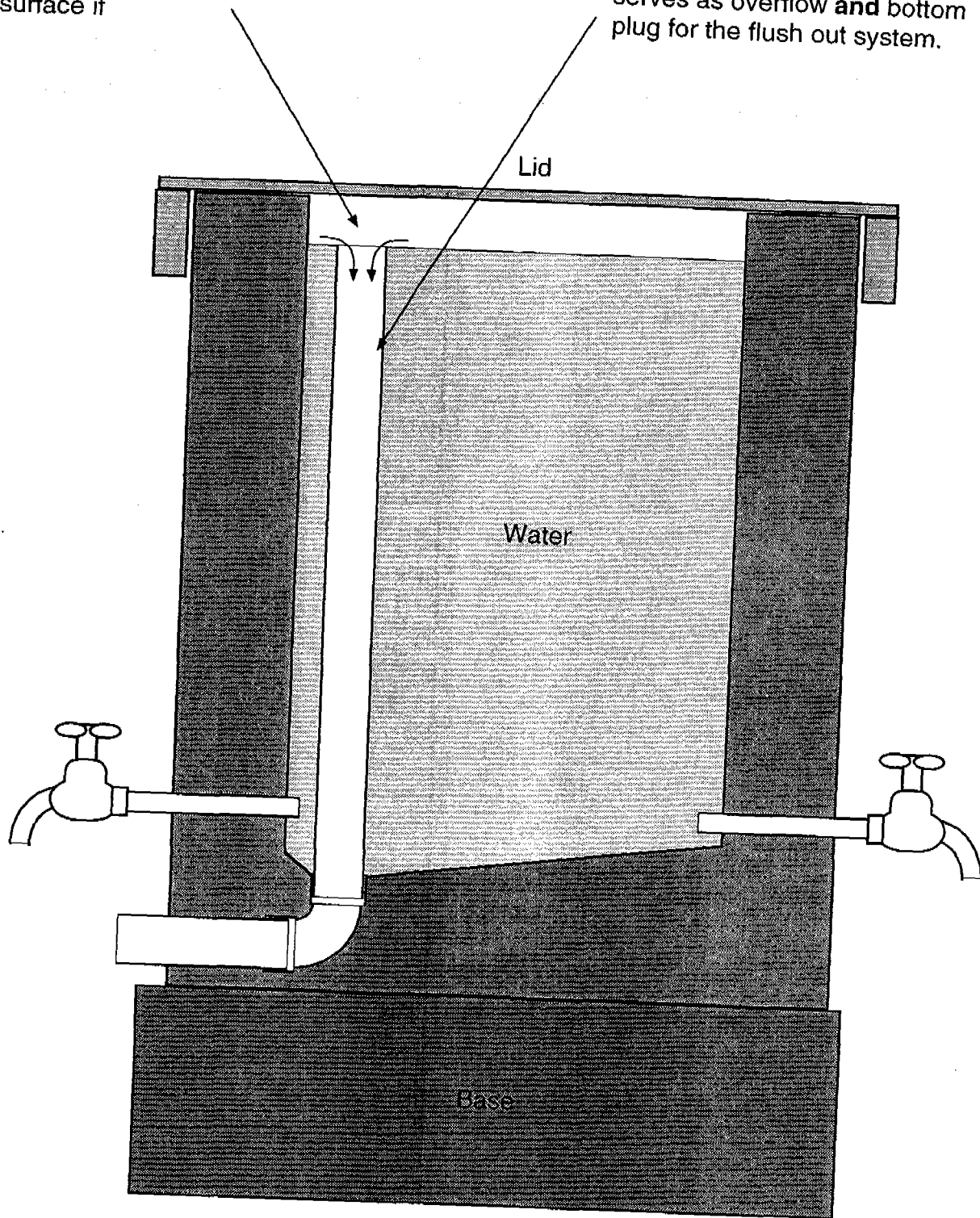
fine all the  
ded to make  
to lead the  
pipe to te

ier to find  
l if t is not

# Water tank with flush out system

The overflow system will help in removing mosquito eggs from the surface if

Removable 50 mm PVC pipe which serves as overflow and bottom plug for the flush out system.



# Urinal with handwashing facility in corner position (a simpler version)

Drg 9.4

There are many varieties on this theme. This is an example only.

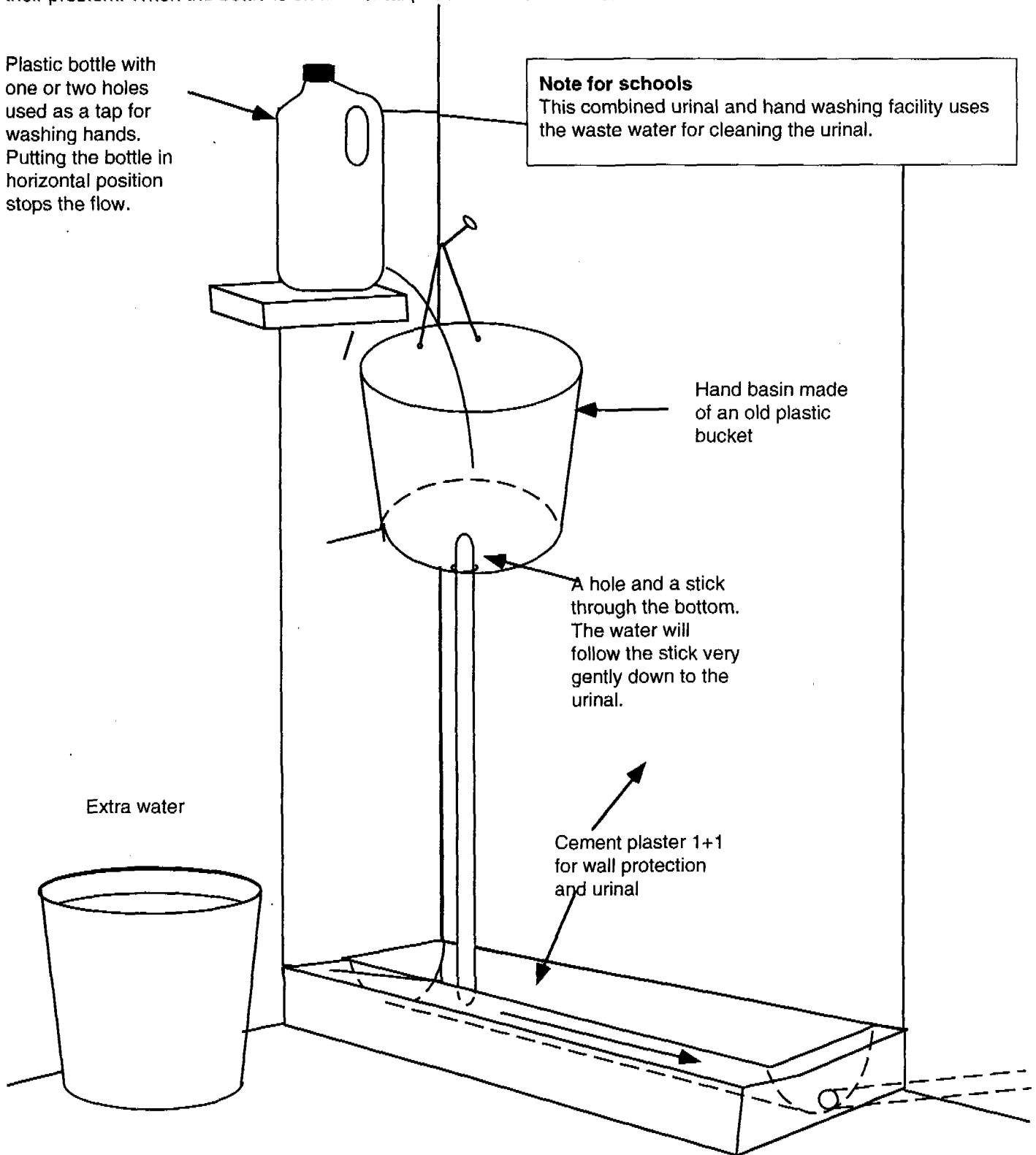
The water from the hand washing basin (the bucket) is led through the urinal before it is led out through the wall and reaches the soakaway or the trench garden.

The "leaking" plastic bottle is especially useful for menstruating girls as normal hand washing facilities does not solve their problem. When the bottle is on horizontal position no water will leak .

Plastic bottle with one or two holes used as a tap for washing hands. Putting the bottle in horizontal position stops the flow.

### Note for schools

This combined urinal and hand washing facility uses the waste water for cleaning the urinal.

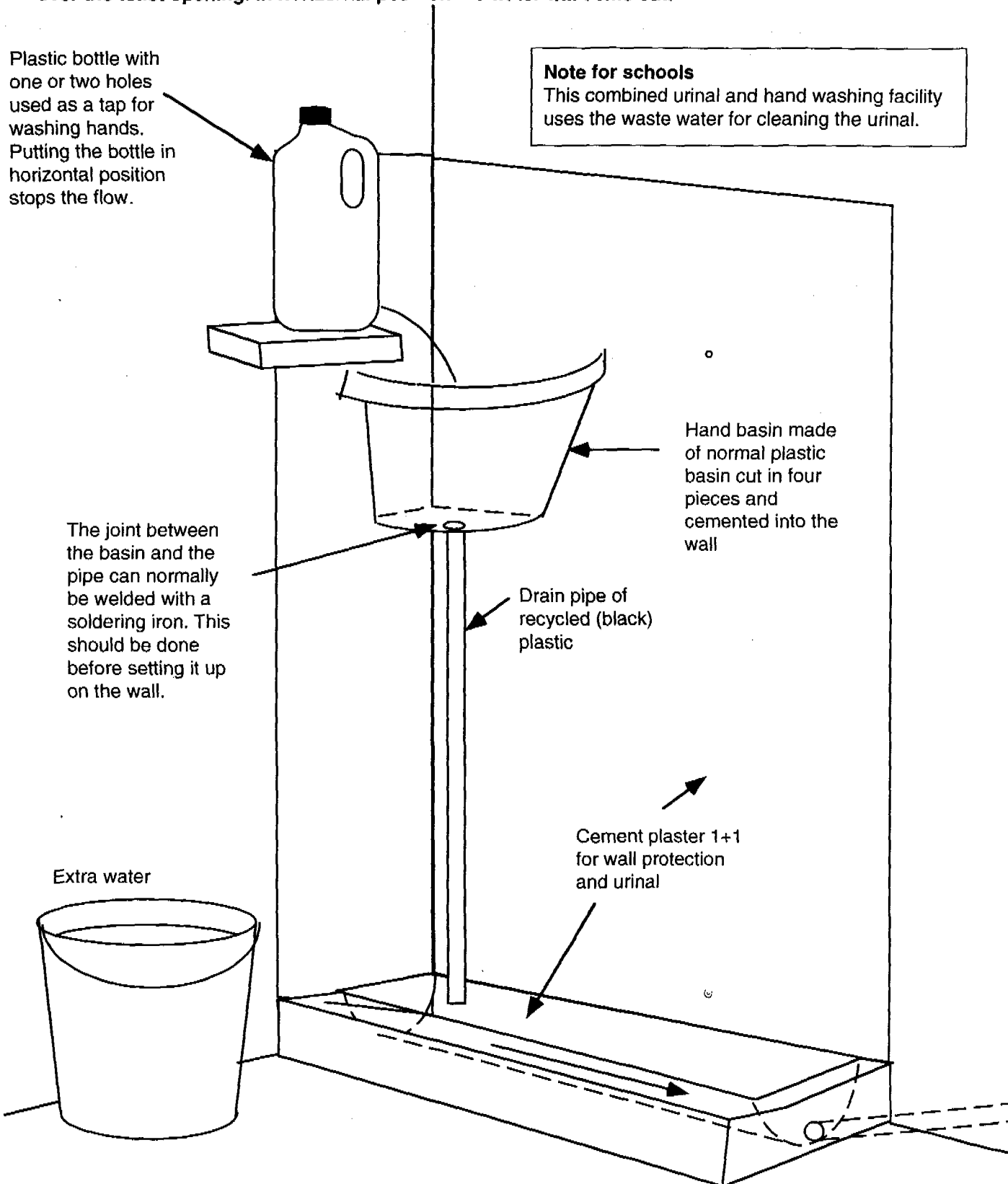


# Urinal with handwashing facility in corner position

There are many varieties on this theme. This is an example only.

The water from the handwashing facility is led through the urinal before it is led out through the wall and reaches the soakaway or the trench garden.

The leaking plastic bottle is especially useful for menstruating girls as the bottle can be used also over the toilet opening. In horizontal position no water will come out.



# Plastic bottle as a handwashing facility

This little invention provides running water for handwashing for practically no cost at all. Except for the bottle no special materials tools or skills are required.

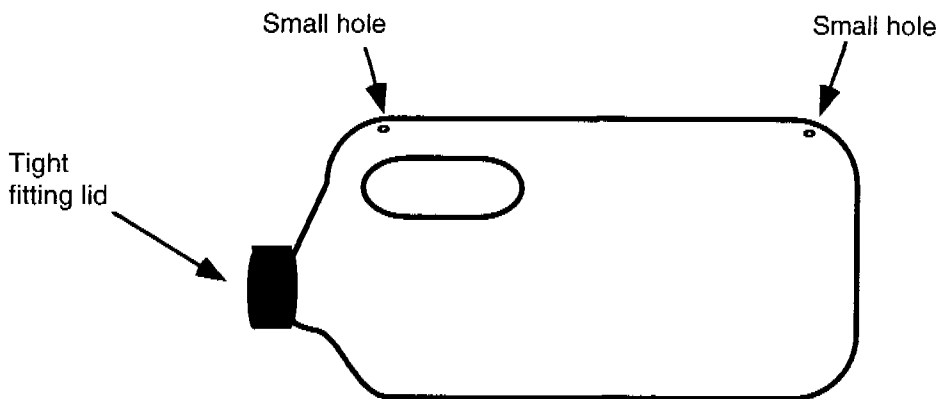
**Note**  
The lid needs to be tight fitting. If not it will lose its water when in horizontal position.

Support of wood or bricks

**Horizontal position**  
No water coming out as holes are at the top.

**Note**  
If only round plastic bottles are available the platform/shelf will need to have corresponding rounded shape.

**Vertical position**  
A fine jet of water comes out of the bottom hole. The top hole is an air intake, which is required for an even flow unless you open the lid slightly.

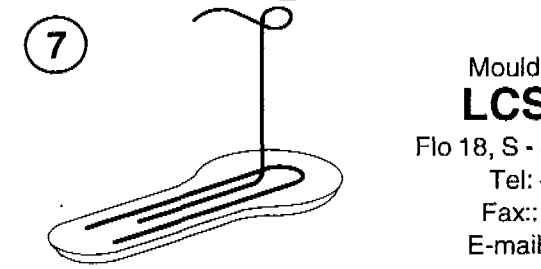
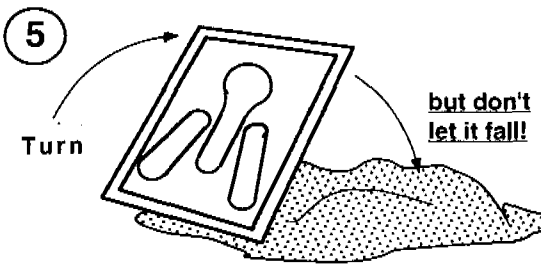
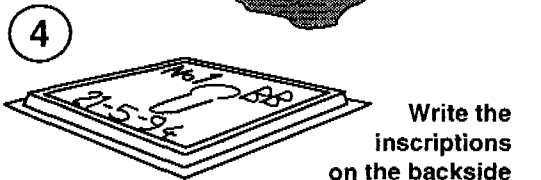
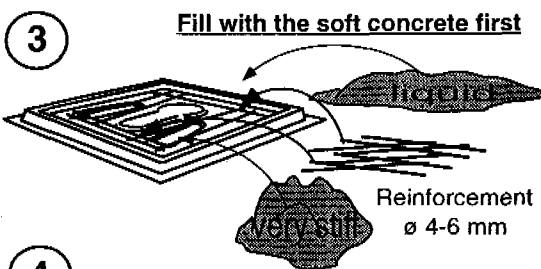
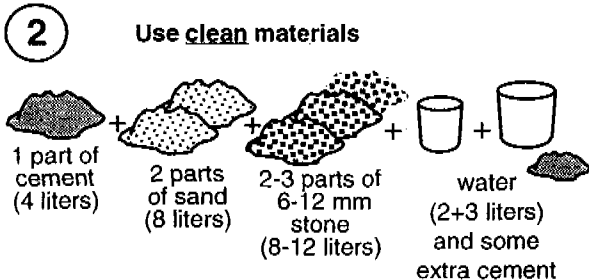
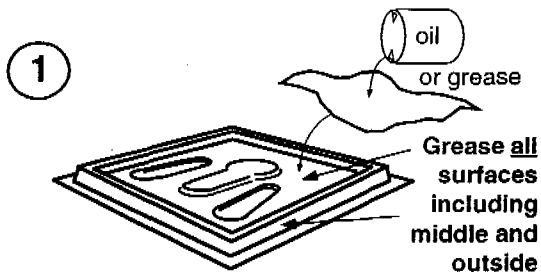


With a sharp object, like a nail, make a small hole close to the bottom (the water-outlet) and an other further up (the air in-let). The size of the bottom hole must correspond to the amount of water you would like to receive.

**There are other solutions,**  
like the tippi-tap and the leaking tin



# Manual to the **all-in-one** SanPlat Mould for the better SanPlat making



1. **Start by greasing** the shiny side of the "all in one" SanPlat Mould with clean motor oil or grease on a cloth, even on the outside. The oil will protect the surface of the mould from being destroyed by the cement.

2. **Wash the sand and stone** if you have any doubts about its purity and let it dry before mixing with the cement. Dust and impurities make the concrete weak.

**Mix cement** with dry and clean sand and stone in the proportions 1+2+2 (or 1+2+3), add very little water and mix well.

**Divide in two parts** and add extra water and cement to the softer one of the heaps to make it liquid. Stir well in bucket or mortar basin.

3. **Pour the liquid concrete** in the mould and tap/hammer gently on the mould with a piece of wood to release air bubbles from the plastic surface. (If not you may get plenty of small holes in the surface of the SanPlat.)

**Put in reinforcement bars** as required before adding the very stiff concrete to cover well the reinforcement. Extra reinforcement may be required for transport reasons.

**Compact the concrete** with a piece of wood until the cement water comes up to the surface. (You may choose to start an other slab while the water soaks up.)

**Seal the backside** by sprinkling cement powder on it and smoothen it out (extra protection for the reinforcement).

If it was too wet use less water for the next one.

4. **Write the date, your initials and the number** of the SanPlat in the fresh concrete. Start with no 1 and continue with 2 on the next one etc. You may need to sprinkle some sand-cement at the place of writing. The Initials, date and the number will help you to monitor the production and the progress.

While still soft, **put the mould on a flat surface** and allow to harden for one or two days. Using two planks under the footrests you can pile the ones that are ready and save space.

5 **When hard enough, turn the mould** very gently over soft sand or grass to get the SanPlat out of the mould. Don't let it fall! It is still very weak.

**Clean the mould** with a soft cloth and some oil and it is ready to be used again. Do not use sharp objects or stones to remove concrete rests from the plastic. It will destroy the surface

6. **Put the SanPlat** (and the moulds) in the shadow not to catch too much sun, cover with plastic and sand and keep the SanPlat wet for one week.

7. **A lid** of concrete can be made using a special mould, but you can also use the back side of the "all in one" mould as a mould for the lid.

The handle can be made of a piece of reinforcement bar well fixed in the concrete. Put in extra reinforcement to make it extra strong.

Keep also the lid wet for one week to cure properly.

Moulds are available from:

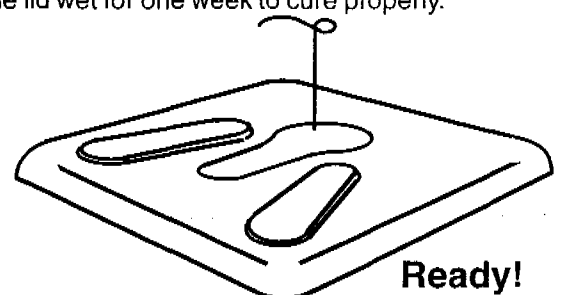
**LCS ProMotion**

Flo 18, S - 46796 Grastorp Sweden

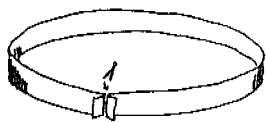
Tel: +46-(0)514 40058

Fax: +46-(0)514 40273

E-mail: lcs@SanPlat.com



# Casting a dome-shaped SanPlat



Start by putting the sheet metal belt mould on the ground.



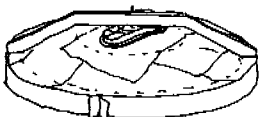
Fill with some sand in the middle and adjust the circle to become exactly round, using the arch mould with the nail in the drop hole mould as a centre point.



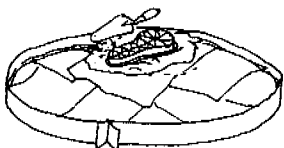
Fill with more sand, compact well and rotate the arch until you have a beautifully shaped heap, for the bottom shape of the dome.



Remove the drop hole mould and fill the hole gently without disturbing the shape.



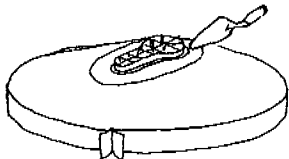
Verify that the edge is exactly 4 cm for the thickness of the slab.



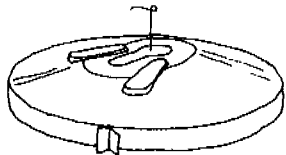
Cover with paper from cement bags.



Start filling concrete around the drop hole mould to be sure that the mould does not move out of position, using a sand cement mortar 1+2 portions of cement and sand. Make sure that the mortar fills well around the drop mould, through beating with the edge of the trowel.



Then fill up the rest with concrete 1+2+2 volumes of cement, river sand and 12 mm crush, using a straight piece of wood between the edges of the drop-hole mould and the sheet metal mould.



Make the inclination towards the drop hole by digging down into the mortar using the tip of the trowel. At the same time build a ridge around the drop-hole, and finish off the surface using a steel float.

When the concrete starts getting a bit stiff, make the footrests and the lid in the same way as for the smaller sanplats.

When the dome-shaped SanPlat is one week old, test-load it with the weight of six people to make sure it is strong enough.

## Note

Several dome-shaped SanPlats can be made one on top of the other if the sheet metal belt is pulled up with a pair of pliers and the recently cast SanPlat covered with more sand.



Good luck!