# The upgradeable Blair VIP (uBVIP) - explained

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2011

# The Blair VIP

**The Blair VIP (BVIP) toilet is a Zimbabwean invention and the forerunner of all VIP toilets. It has been a standardised piece of sanitary hardware recommended by the Government of Zimbabwe for 30+ years. The family unit is multipurpose and doubles as a washroom. A multi-compartment version is recommended for schools**


***The door-less spiral superstructure is the preferred option***

# Why the uBVIP has been introduced?

**At it's peak about half a million family and school BVIPs had been built in Zimbabwe, but by 2000 only one third of Zimbabwe's rural population was served with a family BVIP, the rest using pit toilets or no toilet at all.**

**In the last 10 years the coverage of adequate sanitation has declined in Zimbabwe to less than 20% in the rural areas.**

**These simple facts reveal that whilst the technology itself was sound, the method of financing and implementing the project was not sustainable and relied heavy on material subsidies provided by donor organisations.**

**A new approach is urgently required to re-establish the national sanitation program**

**Whilst the BVIP still remains the recommended standard, government has now accepted at least one new additional approach**

**This new approach uses a well researched technology known as the**
**uBVIP (upgradeable Blair VIP)**

**This year (2011) action is to be taken by government and its partners (NGOs) to widely test and monitor this new approach.**

# What is the uBVIP?

The uBVIP is a compromise technical solution
in which the principle

**START SIMPLE
AND
UPGRADE**

is applied

# Why the uBVIP has been introduced?

**The upgradeable  BVIP concept has been introduced, because it uses a "start up technology" which is a simpler and lower cost pit toilet, but has been designed so that it can be upgraded to a full BVIP**

***START SIMPLE AND UPGRADE***

**The aim is get much wider coverage of basic sanitation at much lower cost**
**And**
**to retain the possibility of gaining BVIP toilet status over time.**

**The wider coverage and relatively low cost linked to the upgrading and recycling principle provides a good opportunity to significantly increase coverage and reduce the extent of open defecation.**

**The provision of material support with a bag of Portland cement and some wire forms part of this operation. Other materials should be provided by the recipients.**

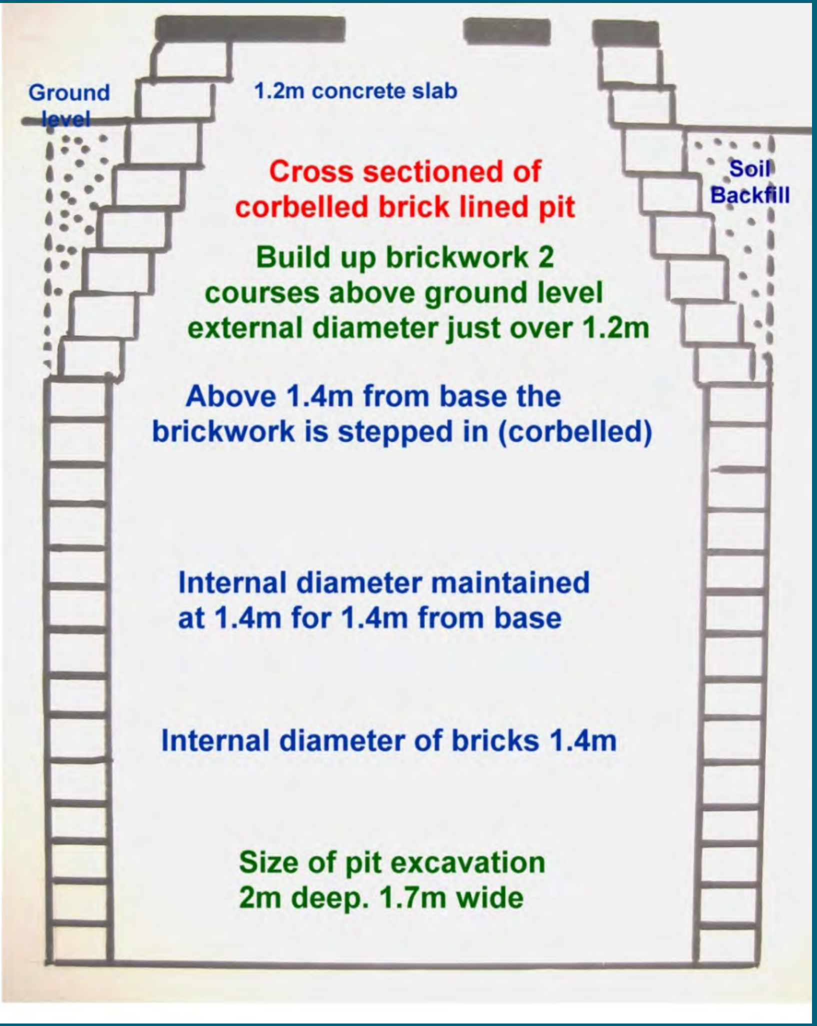
The start up technology

**This consists of a brick lined pit and a concrete slab**

The pit brickwork uses a corbelling technique where the upper brickwork is stepped in to reduce diameter.

This methods makes possible the construction of a smaller 1.2m slab and a full brick pit lining using only **one bag of Portland cement.**

The pit volume is the same as standard BVIPs with a pit life of 10 + years



The "start up" technology consists of a **brick lined pit** capped by a **versatile concrete slab**

The pit is shallower and wider compared to previous pits, but has the same capacity as the standard BVIP. It has been designed in this way for several reasons.

**Economy**
**ease of construction**
**reduced underground contamination**

The concrete slab is designed so it can be used on a wide range of toilet superstructures from simple grass and pole to fully brick BVIP

The slab is fitted over the pit in a bed of weak mortar and made level.

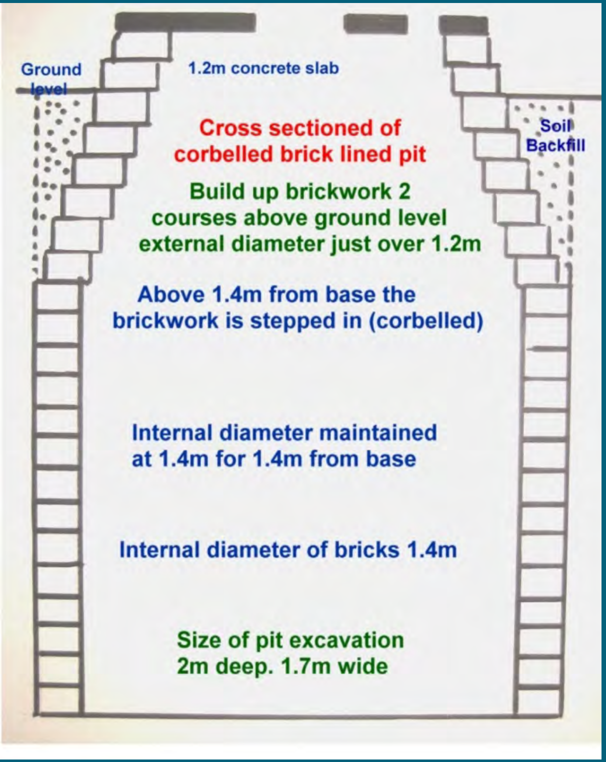
The pit is capped by a 1.2m concrete slab which has been constructed with both vent and squat holes. A great range of superstructures can be built on top and around this unit. At first the vent hole can be blocked off with a cement cap, which can later be removed when the toilet is upgraded

**Start off point- a capped lined pit**

The construction of this "**start off unit**" uses a single bag of Portland cement, about 500 farm bricks, sand and some 3mm wire.

**This economical use of cement is possible because:**

1. A well tested mortar mix of 20:1 pit sand and cement works well as a brick mortar.
2. The corbelling technique makes possible the use of a smaller, lighter and more economic slab.
3. The pit is shallower but wider making it easier to build and further away from ground water.



**Using a single 50kg bag of Portland cement and local bricks and sand, a pit can be fully lined and capped by a versatile concrete slab.**

***Perhaps this is the incentive for home made toilet construction!***

The technology uses locally available materials (farm bricks, pit and river sand) with wire and cement also used for construction.

This substructure and slab unit will provide service for 10 – 15 years

From this beginning a large number of toilet options can be built – starting simple with the possibility of upgrading over time.

# The uBVIP is built in three stages.

**Stage 1.** The pit is lined with bricks and capped with a concrete slab. The slab is designed in such a way that this basic unit can be upgraded over time to a full VIP

**Stage 2.** As a starting point, a low cost superstructure made from traditional materials (grass and poles) is erected around the slab to provide privacy. A slab extension is made to one side. Simple brick structures can also be built.

**Stage 3.** Using the latest techniques, a durable brick spiral superstructure can be built with a light weight and durable roof and tubular vent fitted with corrosion resistant fly screen

# The slab extension

**Many types of superstructures can be build on or around the slab. The spiral door-less version has the least maintenance problems. But toilets with self closing doors can also be built using rubber hinges. In both cases an extension to the slab on one side can be made and the walls of the toilet built on the slab and extension.**

*Slab extensions made for spiral structure (grass and brick)*

**At first the toilet may be of the simplest type, being made of poles and grass. The owners themselves provide the materials and do the traditional construction.**

**When built in large numbers this immediately reduces the risk of open defecation.**

**At first flies and odours can be reduced by adding wood ash and using a cover plate over the squat hole**

# pre-BVIP toilets

**At first there will be no vent pipe to control flies and odours. The vent hole which has been made in the standard slab is either filled with a weaker cement mortar or capped by a small disc of concrete. The disc is preferred. The vent hole can be opened up when the upgrading takes place.**

# Fly and odour control in pre-BVIP toilets

**At first the unventilated pit toilet will produced odours and fly breeding will occur. These problems can be reduced by wood ash into the pit and placing a covering over the squat hole. It is also possible to place a fly trap over the opened vent hole.**

# Even simple grass structures can be fitted with vent pipes.

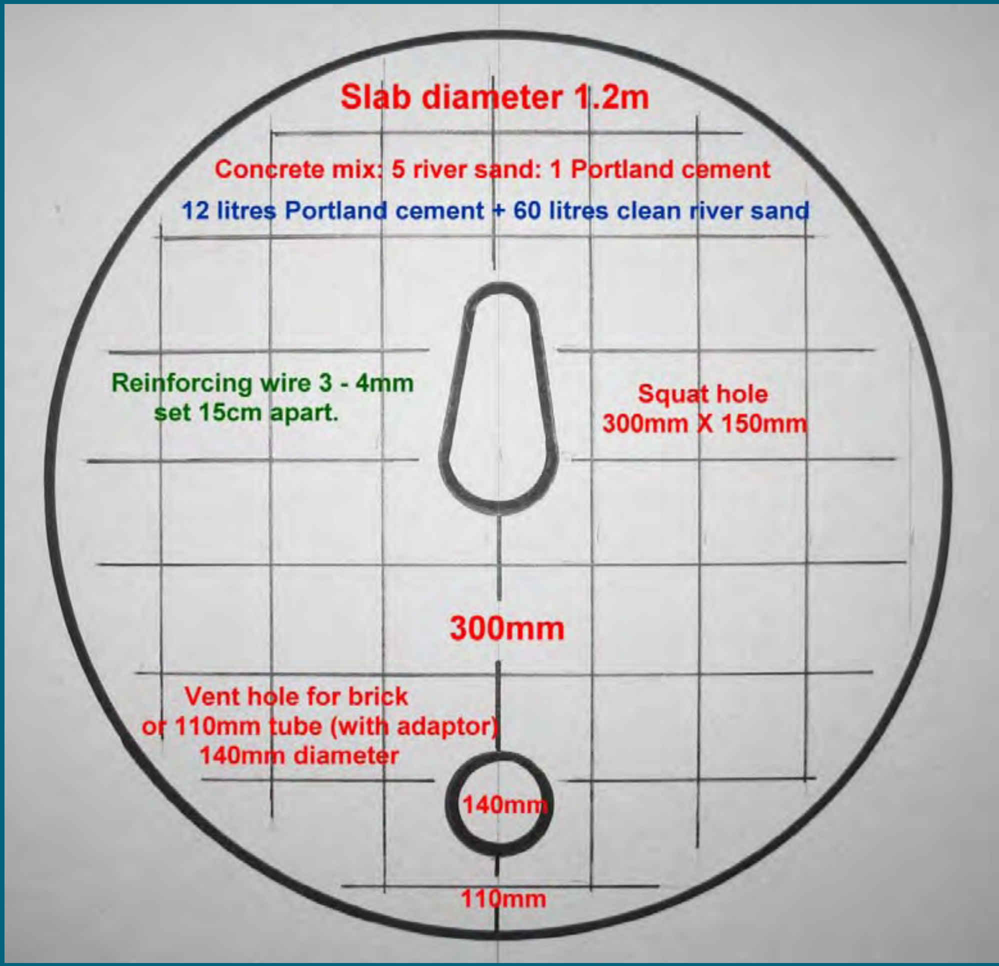
**In this case the vent hole is inside the structure. Fly and odour control will take place if a screened vent pipe is fitted to a spiral structure fitted with a roof.**

# Building the BVIP in stages

1. Constructing the concrete slab
2. Digging the pit and lining with bricks
3. Fitting the slab over the pit
4. Extending the toilet floor beyond the slab
5. Building the toilet superstructure
6. Making and fitting the roof
7. Adding the screened vent pipe
8. Sloping the floor
9. Making a hand washing device (optional)
10. planting trees around the toilet (optional)

# Making the concrete slab

The concrete slab is 1.2m in diameter and uses 12 litres Portland cement and 60 litres clean sharp river sand.
It can be made in a special steel shuttering. Special moulds are available to make vent and squat holes. The slab is reinforced with 3 – 4mm steel wire arranged in a grid formation at 15cm spaces. It is cured for at least 7 days in the wet state. This is made first whilst the pit is dug and lined with bricks



# Making the concrete slab

*Half the concrete mix is added first. Then the wire reinforcing is added. Then the remainder of the concrete is added and smoothed down flat. The shuttering is removed after about 2 hours and the slab is left to cure in the wet state for at least 7 days. See manual.*

## Stages of construction – dig the pit

**The pit is dug 2m deep and 1.7m wide. Walls must be vertical and the bottom level. After the pit has been lined with bricks the internal diameter of the pit is 1.4m for most of its depth but the diameter is reduced higher up the lining to match the 1.2m slab. A corbelling technique is used for bricking up the pit.**

# Stages of construction – line the pit with bricks

**Between 400 and 500 standard fired bricks are required to line the pit. These are bonded together using a cement mortar mix (Portland cement) of 20 parts pit sand and 1 part cement. This is a weak mix but years of it is very effective. 5 litres of cement are thoroughly mixed with 100 litres of pit sand. The use of this mix and the economy slab means that the pit can be lined and the slab made using a single 50kg bag of Portland cement with about 5 - 10 litres of cement left over.**

# Stages of construction - lining the pit with bricks

**The size of bricks varies considerably, but about 400 -500 farm bricks are normally enough to line a pit of this size. The pit is lined so the internal diameter within the brickwork is 1.4m. This diameter is maintained for 1.5m above the base of the pit. Then the corbelling begins, with each course being stepped in by about 20 -25mm. The brickwork should rise above ground level by about 2 courses. The external diameter of the uppermost course should be slightly larger than the slab diameter of 1.2m.**

# Stages of construction - lining the pit with bricks

**At 2m depth a man can line the pit by standing on the pit base and take bricks laid around the rim of the pit. The cement mortar is passed down into the pit in a bucket. If pupils line the pit, the bricks are thrown down to them. A simple ladder is used to enter and leave the pit. As the corbelling proceeds the gap between the brickwork and dug pit increases.**

## Stages of construction - lining the pit with bricks

**The corbelling (stepping in) technique allows for a large capacity pit to be dug and lined (about 3 cu.m. in volume), whilst using a smaller, lighter and cheaper concrete slab.**

## Stages of construction - lining the pit with bricks

The space between the earth pit wall and brick work is backfilled with soil to ground level and rammed in. The next stage involves fitting the concrete slab on top of the brickwork. The external diameter of the upper most course of brickwork should be slightly more than 1.2m

## Stages of construction – fitting the concrete slab

**The cured concrete slab can then be moved and placed over the pit. It is very important that the slab is made level and is placed in a bed of weak cement mortar which is laid on the bricks. This will support the slab all round and prevent the slab from cracking. The slab must be oriented in the correct direction to suit the future superstructure which will be built on top of it.**

# Stages of construction – fitting the concrete slab

**The slab is laid flat over the pit and mortar fill can be placed between the and the bricks to ensure it is level and properly embedded. Once the slab is caste in position and the pit "capped" the toilet floor is extended. The method depends on the type of superstructure used – doored or spiral.**

# Building the superstructure

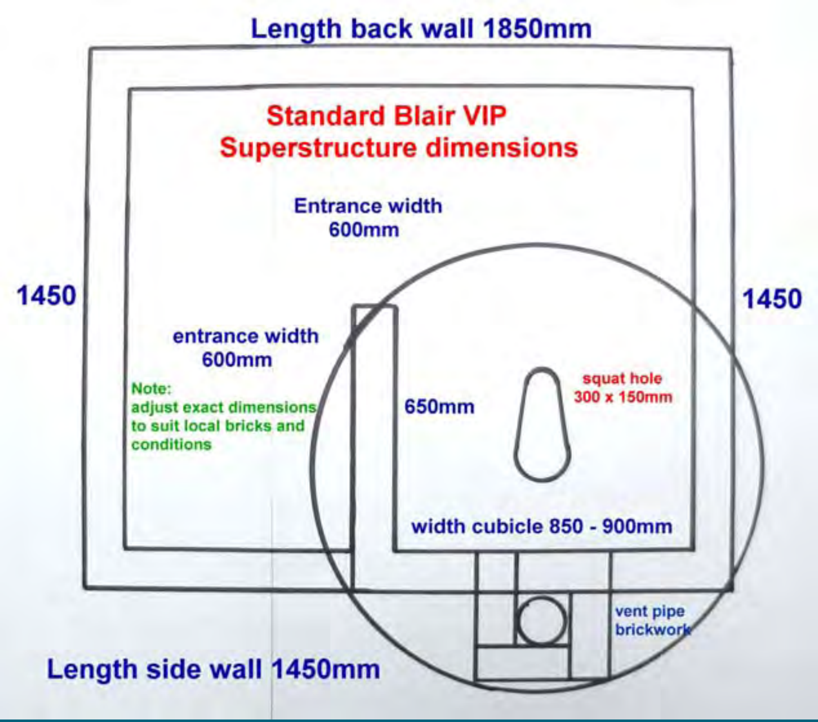
The superstructure is constructed in various local materials - grass, poles or bricks. In fact locally made bricks are low in cost and can be bonded with traditional materials like anthill mortar.  The spiral version is  preferred because it has no moving parts and guarantees semi – darkness within. In a new technique wooden templates can be used to guide those less skilled at brickwork.

The configuration of the new BVIP is slightly different to the old to facilitate ease of construction and saving on the number of bricks.

Various manuals describe the superstructure construction.

# Configuration of spiral brick superstructures

## Standard square spiral brick structure



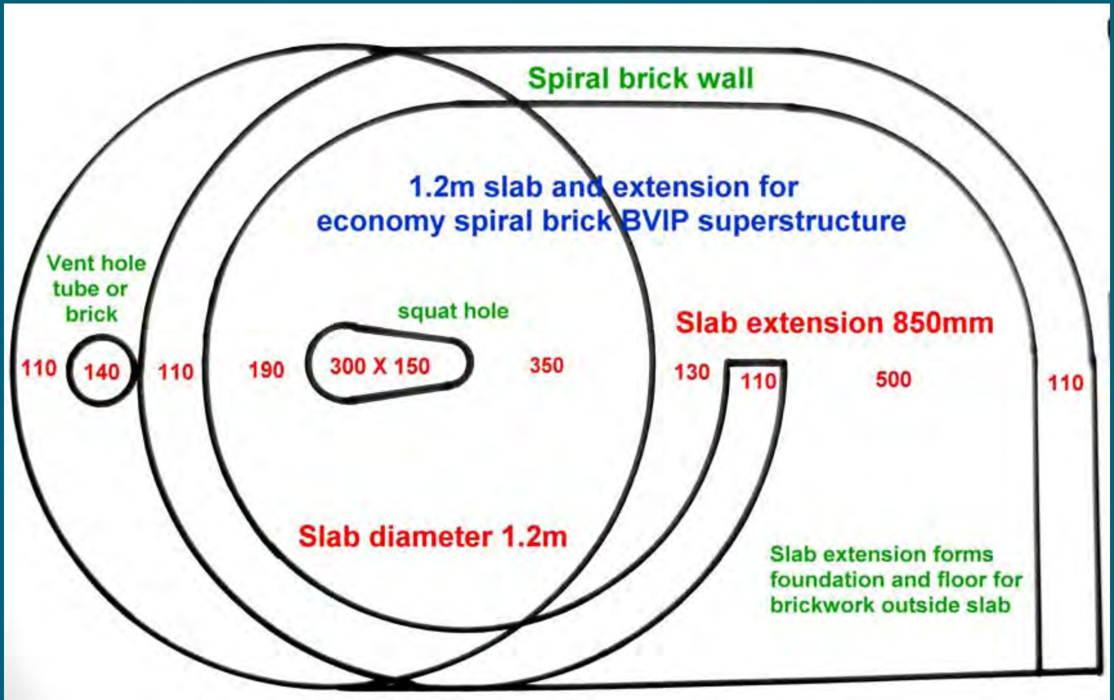

**This method of construction uses the same dimensions as the existing standard BVIP.**

# Standard square spiral brick structures

Both brick and tubular vent pipes can be used. Tubular pipes are normally made of PVC. The fly screen must be made of a non corrosive material like aluminium.

# Configuration of spiral brick superstructures

## Economic rounded spiral brick structure




**This method uses less bricks, and is easier to construct. This method can be used with brick or tubular vent pipes. The floor area is slightly smaller. The roof area is also smaller, which can lower cost. The roof technology can also be upgraded over time from poles and grass to a wooden frame and tin sheet.**

# Erection of economical brick spiral wall.

## Using the templates as guides build up the wall of the spiral superstructure. The toilet entrance should be 50cm wide.

**This method of construction and the use of templates has been specifically designed to make it easier for school pupils and less skilled builders to construct the spiral BVIP superstructure.**

# Building the spiral wall using the well established bonding technique

**The spiral shape of the structure provides great strength to the wall, even if it not made perfectly.**

# Making and fitting the roof

The roof is made so it is relatively light weight and also removable and replaceable once the time comes to build a new toilet. The roof can be made with poles and grass at first, with a plastic sheet fitted under the grass.

It can also be made with a wooden frame and corrugated iron sheets.

Ideally the wooden frame should be treated with a combination of carbolinium and old engine oil.

# Making the roof with timber frame and tin sheets

## Fitting the sheets to the roof timber.

This size and shape of the roofing sheets covers the complete structure in an economic way. The sheets are easily fitted to the structure and when later the structure is taken apart (after 10 – 15 years), the same roof, if it has been looked after, can be used again. The toilet slab can also be used again,

# Care and Maintenance

***The spiral BVIP is easy to maintain. This involves washing down the slab with water from time to time. A protective cover of resin filled bitumen paint helps reduce urine absorption into the concrete. This may be most appropriate for schools. Also the vent pipe should be washed down with water from time to time to flush away cobwebs which build up in the pipe and reduce the efficiency of the air flow. The PVC pipe should be cared for.***

# Specialised pit linings. 1. Partial lining of pits

**The standard and most reliable technique is to line the pit with bricks down to the base. However if the soil is very firm, a ring of bricks or concrete can be laid down on a ledge about one metre down and the brickwork and corbelling built up upon this foundation. This pit is dug down 1m first and the ring of bricks built. Then the pit is dug a further metre down beneath the beam and the brickwork built up being corbelled to suit the slab size.**

# Specialised pit linings. 1. Partial lining of pits

**The brickwork is raised with corbelling to about 2 courses above ground level. The slab is then fitted on a layer of weak mortar laid on the brickwork**

**Note in this slide the slab is made in such a way that a brick pipe can be fitted as well as a tubular pipe. There are two types of slab possible for the uBVIP.**

# Specialised pit linings. 2. subsurface ring beam

If a lighter superstructure is to be built on the slab, it is possible to build a corbelled dome on top of a ring beam of bricks which is laid just below ground level. The topsoil is removed first, then the ring beam is constructed. The internal diameter can be 1.4m. Then the pit is dug down within the brickwork, possibly to 1.5 to 2m. Once the hole is dug the brickwork is raised on the brick ring beam and corbelled in to the require diameter to suit the slab which is just larger than 1.2m.

Soil is then raised around the brickwork and levelled off.

# Planting trees around shallow BVIP pit toilets

Where trees are to be planted around the toilet , the roots will come into contact with pit liquor seeping out of the toilet pit faster if the brick wall is made deliberately leaky from the side walls. It is also more effective if the pit is only partly lined with bricks (see earlier slides). It is now established that certain trees are able to withdraw nutrients from the soil surrounding an active toilet . Gum trees are particularly effective at doing this as well as banana and mulberry.

These important trees can derive nutrients from the pit contents even whilst the toilets are in use. Also it is possible that the absorption of pit liquor from the soil surrounding and under the pit may help to reduce ground water contamination.

# COSTS

## Slab and substructure

Cement used to line the pit and make the slab. One 50kg bag of Portland cement at about USD11.00

## Bricks.

About 500 for the substructure and 500 for the superstructure at about  USD 40 per 1000.

## Roof

Timber about USD 7.00 and tin sheet about USD15.00 Total USD 22

## Extra cement for floor and internal plaster

Small part of an extra bag of cement

## Labour per toilet

In Epworth about USD 40.00 per unit

# Conclusions

**This power point has shown that many new and interesting developments have taken place to make the new BVIP technology easier and cheaper to build and make it more eco-friendly. The possibility of ease of construction and ease if dismantling has become possible. The relative low cost of the substructure and the ease of transferring an old superstructure to a new substructure becomes possible. Also the recycling of pit nutrients to grow trees and make timber for fuel, construction, and even food or even for sale to make cash has become possible. Simple hand washing devices have also been designed which provide a greater health benefit when related to the toilet.**

**Several manuals and other power points have been made on the BVIP and upgradeable BVIP**