

# The Blair VIP Toilet

**Manual for the upgradeable BVIP model  
with spiral superstructure and tubular vent pipe**



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## **Introduction**

In 2010 the Government of Zimbabwe relaxed its technical policy guideline for family toilets (the spiral brick Blair VIP) to include an additional design called an Upgradeable BVIP (uBVIP). In this version the basic requirement is for a brick lined pit and a covering concrete slab, which allows the owner to upgrade in a sequence of steps to attain the final brick built Blair VIP. The starting point is a brick lined pit of suitable capacity capped by a slab which has both squat and vent holes. The government specifies that the range of vent pipe options should include those made from bricks as well as tubes (eg PVC or asbestos etc). It is a requirement that the minimum life of the pit be at least 10 years. However recent developments in manufacture have significantly reduced the cost of PVC pipes. It already well established that tubular vents are more efficient than brick pipes, and therefore there is a place for them in modern BVIP technology. There are certain other advantages in using tubular pipes. The configuration of the concrete slab can be modified to reduce the number of bricks used and also the ease of construction. A manual has already been written on the uBVIP designed for use with a brick (or tubular) pipe. This manual describes the construction of a BVIP designed specifically for the tubular 110mm pipe.

In modern Zimbabwe an era of constraint dictates that cement should be used sparingly so that the investment made is good value for money and time. Consequently a smaller, lighter and more economical 1.2m diameter concrete slab has been designed. This uses 12 litres of Portland cement and 60 litres of clean river sand (5:1) and 3mm or barbed wire for reinforcing.

The method of construction of the brick lined pit has also been streamlined. The depth is shallower than older pits (2m rather than 3m), but it is also wider (1.4m rather than 1.1m). In order for the wider pit lining to connect to the small diameter slab, a method known as corbelling is used – where the upper courses of brickwork are stepped in to the required diameter that will support the slab (1.2m). This revised method of pit lining is easier to construct since the builder can stand on the base of the pit throughout the construction. Also a well tested method of using a much weaker cement mortar has been introduced for bonding the pit brickwork. This consists of 20 parts pit sand and 1 part Portland cement. This well researched revision of the construction method means that a single 50kg bag of Portland cement is sufficient to line a pit and cast a suitable concrete slab.

## **Start simple and upgrade - an explanation**

It is possible to construct the well known standardised brick built Blair Ventilated Improved Pit (BVIP) toilet in a single building operation. Hundreds of thousands of these units have been built throughout Zimbabwe, and most have been built with the generous support of donor organisations. The “Blair” is popular because it doubles as a wash room and the square spiral structure without a door has become the most popular.

The BVIP is a pit toilet and eventually the pit fills up. The filling time varies between 10 and 20 years depending on pit capacity, the number of users and the amount of garbage which is thrown down the pit. However eventually the pit fills up and another toilet is required by the family. A standardised brick built BVIP requires several bags of cement and a trained builder to construct and this cost is beyond the means of most rural Zimbabweans. A new concept therefore had to be found which was far more affordable and adaptable and could provide a valuable starting point from which rural families could build a variety of toilets including the standardised brick BVIP. The starting point technology and the process whereby it can be upgraded is called the Upgradeable BVIP (uBVIP).

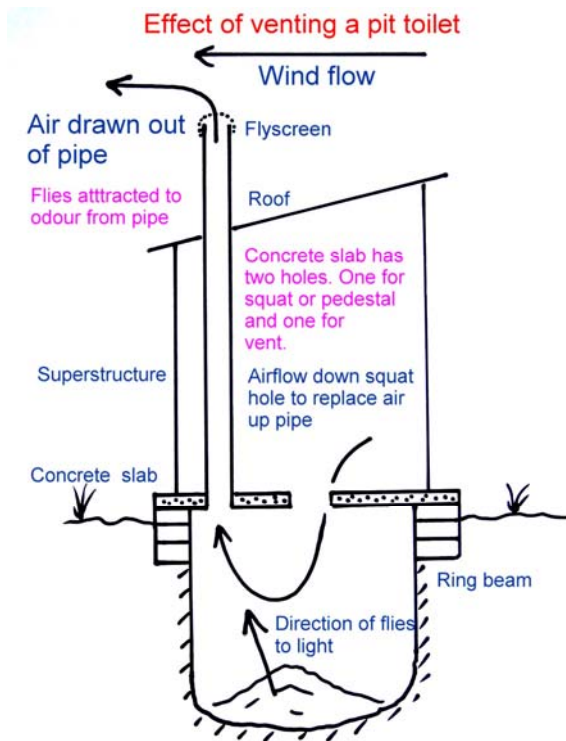
This basic unit consists of a brick lined pit and a concrete cover slab. This is the technical starting point from which a considerable range of pit toilets can be built, including the brick BVIP. A single 50kg bag of Portland cement together with about 500 bricks, river and pit sand and some reinforcing wire is sufficient to line and cover a brick lined pit which should provide at least a ten year life. The superstructure which is built on top and around the slab normally remains the responsibility of the owner. The structure built by the family above the slab provides just privacy at first. In the absence of a vent pipe, smells and flies can be reduced by the regular addition of wood ash and regular washing down of the slab. A loose fitting wooden or metal cover placed over the squat hole also helps. Also simple fly traps used in conjunction with the cover plate can reduce fly emission into the environment.

The basic aim of this new approach is to provide, at relatively low cost, a system which can considerably reduce the extent of open defecation (in the absence of any toilet), and has the potential to be upgraded into the familiar BVIP over time. “Farm brick” are common in most parts of Zimbabwe and are produced locally and at low cost. Where bricks are not easily available alternative approaches must be found.

## How the Blair VIP works

The Blair VIP is a ventilated pit toilet. The toilet slab is made with two openings, one for the squat hole and one for the ventilation pipe which is fitted with a corrosion resistant fly screen. The vent pipe sucks out air from the pit and fresh air is drawn down through the squat hole. The toilet itself should therefore remain fairly free of odours if the toilet floor is kept clean and washed down.

Flies approaching the toilet are attracted to odours coming from the pipe, but cannot pass the fly screen to enter the pit. Any flies escaping from the toilet are attracted to light coming down the pipe. But these will be trapped in the pipe. All Blair VIPs are fitted with a roof and a semi dark inside.



## How it works

## Materials required

The Upgradeable BVIP is constructed in two stages. The first stage is the pit lining and the construction and fitting of the concrete slab. The second stage is the construction of the superstructure.

### Stage 1. The pit lining and concrete slab stage

**Portland cement (PC15) – 1 X 50kg bag**

**River sand – 60 litres (for slab)**

**Pit sand – about ½ cu.m. (for making cement mortar for bricks)**

**Reinforcing wire – 12m of 3mm or barbed wire (for slab)**

**Bricks (fired). 450 (standard size is 225mmX 112mmX75mm)**

### Stage 2. The superstructure

The materials for the superstructure vary considerably depending on the type of structure built.

#### 1. Simple grass and pole structure (spiral).

The minimum will be about 10 treated gum poles and grass and wire and binding string. Poles, plastic sheeting and grass for simple roof.

#### 2. Brick structure (new spiral configuration)

**Bricks** for foundations (50+) and superstructure (450) = 500

**Portland cement.** 20 litres (**0.5 bag**) if cement is used for wall bonding. Or if internal plaster 1 x 50kg bag.

**Traditional mortar:** 1 part ant hill soil and 2 parts sandy soil.

**River Sand.** 50 litres for slab extension and toilet floor

**Pit Sand.** For brick foundation, wall bonding and plastering (**500li**)

**Roof . Wooden frame:** (1x2m x76mm x 50mm + 1x 2m x38mm x 38mm + 5x 0.95m 38mmx 38mm. **Corrugated tin sheet** 3 X 1.5m.

**Vent** 1 X 2.5m X 110mm PVC fitted with aluminium flyscreen

### Measuring the cement

The 12 litres of cement required for making the concrete slab is one level 10litre bucket full. Each bucket is filled with material which is tapped down and leveled off. The 20:1 cement mortar used for bonding brickwork is best measured using a 5 litre container. 5 litres of cement is mixed with 100 litres of pit sand to make the mortar. Two full wheel barrows contains about 100 litres of sand.

## **SITING THE uBVIP**

**The site should be chosen by the family with assistance from the Environmental Health Technician and should be at least 30 metres from a well. The toilet site should be:**

**\*Down hill from a well or borehole** – to reduce possible underground contamination of the water supply.

**\*Where the soil is firm** – to avoid possible latrine collapse

**\*On slightly raised ground** – so that rainwater can drain away from the site of the toilet

**\*Near the house** – for the convenience of the householders

**\*Away from trees** – so that air can flow easily over the pipe

**\*The orientation of the structure** - to provide the best privacy for the users

## **Stages of construction**

**The stages of construction are as follows:**

1. Dig the pit.
2. Make the concrete slab
3. Line the pit with bricks and fit the cured slab
4. Build the superstructure

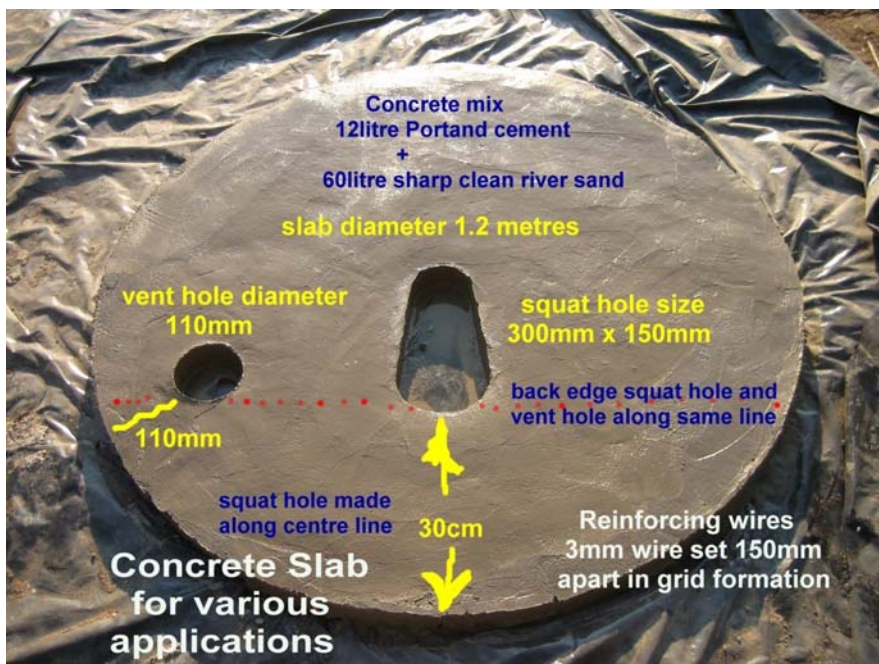
### **Stage 1. Dig the pit**

**Dig a round pit 2m deep and 1.7m in diameter. Dig the pit with straight sides and a flat bottom.**

## Stage 2.

## The concrete slab

The concrete slab for the uBVIP is 1.2m in diameter and made with a mix of 12litres of Portland cement and 60 litres of clean river sand (1:5 mix). The hole for the vent is 110mm in diameter and the squat hole measures 300mm X 150mm. The vent hole is designed for a 110mm PVC pipe which is placed inside the structure. The 110mm hole is placed 110 – 112mm from the edge of the slab and the vent and squat holes are about 200mm apart. The arrangement of the holes are shown in the photo. The vent hole is made by using a short length (75mm) of PVC pipe as mould. The squat hole in this case is made using a specially designed steel mould. 12m of steel wire or barbed wire is required for reinforcing per (4 X 1.1m + 5 X 1m + 4 X 0.6m). The slab is cast over plastic sheet or on levelled ground covered with sand which is wetted down. One level 10 litre plastic bucket contains 12 litres of material. One level 10 litre bucket of cement and 5 level buckets of river sand are used.



Details of concrete slab for uBVIP with tubular pipe

## Making the concrete slab

A mix of 12litres of cement (one level 10litre plastic bucket) and 60 litres of clean river sand (five level 10 litre plastic buckets) is thoroughly mixed and water added to make a slurry-like concrete. This is added into the shuttering around the vent and squat hole moulds which are held in position whilst the concrete is added. Half the concrete mix is added first and levelled off. Then the lengths of 3mm reinforcing wire or barbed wire are added as shown. The wires are added in a grid formation about 15cm apart. About 12m of wire is required and cut up. The remainder of the concrete mix is added and smoothed down. After about 2 hours the squat hole and vent hole moulds are removed. The outer shuttering is also removed. The slab is covered with plastic sheet and left overnight to harden. The following morning it is carefully watered and covered again. To gain the proper strength before moving the slab should be kept wet and covered for at least 7 days. It can then be lifted carefully and place on the upper course of pit lining brickwork in a bed of weak cement mortar. It must be level.



**Half the concrete mix is added first. Then the wire reinforcing is added. The 3 – 4mm wire reinforcing is cut and laid in a grid formation 15cm apart.**



**Once the wires have been laid, with an extra piece between vent hole and slab rim, the remainder of the concrete is added and smoothed down flat.**

### Stage 3.

#### Line the pit with bricks using the corbelling technique

Whilst the slab is curing the pit can be dug and lined with bricks. A technique known as corbelling is used where the upper courses of brickwork are stepped in, so the diameter of the pit is reduced nearer the top of the pit. This allows a large diameter pit to be used together with a smaller and economic concrete slab which caps the pit. This technique allows for a large diameter pit to be built which is shallower (total depth 2m with 0.2m above ground level) and this easier to build.

The pit has ben dug 2m deep and 1.7m wide. Line the pit from the bottom with strong fired bricks. Using a cement mortar mix of 20 parts of pit sand and 1 part Portland cement (5 litres cement in 100 litres pit sand). The inside diameter of the first 1metre of brickwork must be 1.4m (about 19 bricks per course). Retain this internal diameter (1.4m) diameter for 1.4m above the pit bottom and then start to step in the brickwork Each additional course above 1.4m should be stepped in by about 20mm above the lower course. The brickwork should continue above ground level by about 20cm so the full pit depth is about 2.2m. This will take about 24 courses of bricks depending on brick size. The uppermost course of bricks uses about 15 bricks. The total number of bricks (standard size – 220mm x 110mm X 75mm) is about 500. The amount of cement in a single 50kg bag should be enough to make the slab, line the pit and leave some spare to make either the foundations of the spiral brick toilet or the extended floor in front of the slab for a doored toilet.



**The pit is dug 1.7m wide and 2m deep. Walls are straight and bottom flat**



**Ensure the walls are vertical and the pit base flat. The mortar mix is made with 5li of Portland cement and 100li of pit sand (20:1). It works!**



**Lay the bricks against the edge of the pit wall. The mortar is quite thin but sufficient to bond the bricks together. The internal diameter is 1.4m. Continue with this diameter for 1.4m**



**A simple ladder can be made to enter and leave the pit. After 1.4m each brick course is stepped in (corbelled) by about 20mm per course. This corbelling continues till the brickwork is about 2 courses above ground level.**



**The brickwork is stepped in at each course. The brickwork should rise about 2 courses above ground level with a final external diameter of just over 1.2m**



**The annular space between pit wall and brickwork is filled in and rammed hard.**



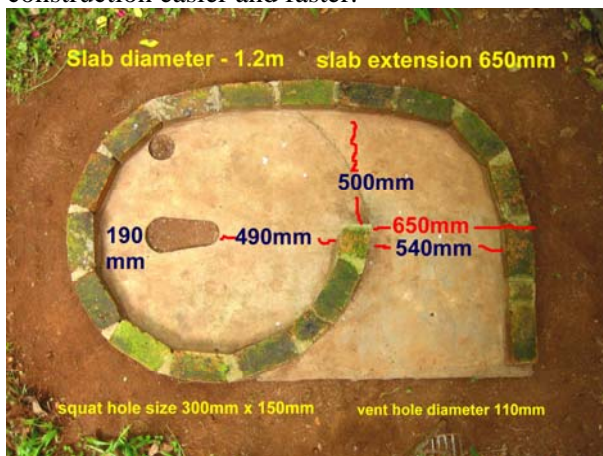
**The 1.2m diameter slab is carefully raised and washed and then rolled on to site. A bed of weak (20:1) cement mortar is laid on the brickwork, so that the slab can be bedded in it.**



**The slab is lowered down on to the brick work in the correct orientation that will suit the structure. The slab is made flat by adding small stones under the slab where it is low and filling with cement mortar.**

### **The orientation of the slab**

The orientation of the slab depends on the type of structure to be built. In this case a round spiral brick structure will be built. In a more recent development the orientation of the slab has been changed so the squat hole faces the entrance. This configuration makes the spiral wall easier to construct and also uses fewer bricks. Special wooden templates can be used to make the construction easier and faster.



**In this new and economic configuration the squat hole faces the entrance. The bricks are built around the rim of the slab and continue around the rim of the concrete extension to the slab. This configuration combined with the use of wooden templates makes the spiral structure easier to build.**

## **uBVIP Superstructures**

The concept behind the uBVIP is that once the first stage is complete (the construction of a lined pit and cover slab), the further construction of the superstructure is primarily for privacy and this stage is in the hands of the owner/user. The slab used in the first stage is very versatile and can be used to make a range of simple toilets with the superstructures made of poles, grass or reeds. However at not much greater expense a more durable brick structure can be built on the same slab. This section describes one example of a grass structure which can be built with locally available materials.

### **Simpler structures first**

Once the pit has been lined with bricks and capped by a durable concrete slab, the construction of the superstructure can begin. The family must decide what it can afford. At first this may be a simple grass and pole structure built for privacy only and not fitted with a roof or vent pipe. The preference is for a brick built superstructure which has no moving parts, like doors. Doors can be left open, and this will reduce fly control if the unit is upgraded to a BVIP. However in the first instance, the superstructure should be designed to provide privacy. In this way, the unit provides a start off structure, which can help to reduce open defecation at low cost. Over time the same substructure and slab can be upgraded in a series of steps to become the standard brick built Blair VIP, which doubles as a washroom. Wood ash can be added to the pit to reduce odour and flies if no roof and pipe are fitted. Also a tin or wooden sheet fitted over the squat hole can reduce fly nuisance and flies can also be trapped in a fly trap (see later).

### **Pole and grass structures**

In the first instance the most easily built structures designed for privacy may be made with poles and grass. These are temporary structures but will provide suitable privacy for a period of time. Such structures can be built with doors or in a spiral (door-less) form without doors. Gum poles may be the best poles to choose, but they are vulnerable to termite attack. The best gum poles will be pressure treated, but these will normally only be available in the city centres. Treatment of the poles can be undertaken by

painting the poles, or the lower parts of the poles with old car engine oil, carbolineum or creosote or a combination of these. However, even these materials may not be available in the rural areas. Poles made of hardwood can be used if available. However depletion of natural woodlands is also not advisable. The burning of bricks also uses wood fuel, and these pose problems in terms of the negative effects of toilet building on the environment. A compromise can be sought by growing trees nearby the toilets. The growth of such trees, such as gum, can be enhanced by the application of diluted urine and also once the roots have penetrated more deeply can absorb nutrients provided by the composting excreta held in the pit. These aspects will be described later in further literature prepared for this development.

## **Construction of spiral pole and grass structure**

The simplest structure is made of poles and grass in a spiral shape. It is designed to provide privacy only and is not fitted, at first, with a roof or vent pipe. First the concrete floor is extended in front of the slab within a mould of bricks. Cement left over from the construction of the slab and lining of the pit should be enough to make this extension. The hole for the vent pipe is plugged with cement.



**Poles are placed around the slab in a spiral shape. Cement left over from the pit lining is used to make a cement floor in front of the slab. This cement can be extended into the entrance of the toilet. Note in this photo the slab-squat-vent hole configuration is intended for a future brick or tubular pipe.**

## **Finishing off the floor and entrance**

In simple “start off” grass and pole structures, the aim is to provide privacy only. At first there will be no vent pipe added and the vent pipe hole is either filled with a weak concrete mix or a round disc of concrete is made up and fitted over the hole.



**Extension of the concrete floor made at the entrance. The vent hole can be plugged or capped with a concrete plug.**

## **The grass spiral superstructure**



**The grass work is finished and neatened up.**

Pole and grass structures are only temporary and will eventually be eaten by termites. Old engine oil or carbolinium or a mix of both can be used to lengthen the life of pole and grass structures. Such structures can be built very neatly and work well, but eventually they should be replaced with brick superstructures. Flies and odours can be partly controlled by the liberal addition of wood ash to the pit and also by placing a loose tin cover over the squat hole. This cover can be moved by foot. Fly traps can also reduce the number of flies entering the environment in unventilated pit toilets.



**The concrete floor is extended in front of the slab and also within the spiral entrance. The vent hole has been temporarily plugged.**

### **Fly and odour control in unventilated pit toilets**

Simple pit toilets, built without vent pipes will smell and breed flies. But at first they will reduce open defecation in the environment. Smells can be reduced by washing down the slab regularly and adding wood ash down the pit. A cover plate can also be placed over the squat hole, when the toilet is not in use. The plate can be moved by foot. Fly breeding can become considerable and thousands of flies may be released in a few days. This is because they are attracted to the odour coming out of the squat hole. They lay their eggs in thousands, which become larvae, the pupae then emerge as flies. Flies can be trapped by the use of a simple fly trap used in combination with the squat-hole cover plate. This is because flies are attracted to light when they emerge from a pit. They will fly towards the strongest light source. The trap can be placed over the future vent pipe hole if it is opened up after being closed. The trap will only work, however, if the squat hole is covered with the cover plate. If the cover plate is not fitted over the squat hole, flies will emerge in their thousands from the squat hole. Adding a roof and making the interior darker will also help to reduce flies a little. The use of a roof, a cover plate and adding ash can help a lot. Washing the slab down regularly with water also helps as the smell of urine absorbed by the concrete also attracts flies.

## **A fly trap**

The screened vent pipe of the BVIP is a fly trap as well as a ventilator. How its works has been described earlier. However at first the vent may not be available due its cost (the cost of tubular vents is going down rather than up). Many types of fly trap can be made. Those made of glass last longer than those made of plastic. The photos below show a fly trap in use in an unventilated pit toilet which has been built with a vent pipe hole, and where later a vent pipe be fitted.



**The parts of a glass fly trap made from the upper half of a glass bottle which has been cut in half using a method described on the next page. A glass jam jar is placed over the neck of the bottle to tap the flies**



**A fly trap fitted over the vent pipe hole can only work if the squat hole is covered with a plate. In this case the plate is made of wood. Flat metal plates are better. They stop light entering the pit through the squat hole, and thus emerging flies fly towards the light coming through the trap. The trap is emptied of dead flies from time to time. On the right a photo of flies accumulating in the trap.**

## **Making a flytrap from glass bottle**

This requires a little experimentation and great care. A glass bottle with long neck is taken and thick string is soaked in petrol and tied around the bottle about 10cm below the neck. Light the string so it burns all round then plunge the bottle in water. The bottle should crack at the string point. Take care, wear goggles and gloves.



**Light the string and plunge into water**



**Use the top of the bottle**



**Encase the bottle top on concrete and allow to cure**



**Mount the mounted bottle top over the vent hole and cover with a jam jar**

## **Upgrading the simple superstructure**

The simple grass spiral superstructure can be upgraded in several ways. A grass roof supported by poles with plastic sheet placed between the poles and the grass protects the users from rain and also shades the interior of the toilet. This helps to reduce fly ingress into the pit. A roof is essential once a vent pipe is fitted. A squat hole cover-plate with or without a fly trap can also be fitted to reduce fly breeding and fly release into the environment. Wood ash can also be added to the pit to reduce odour and fly breeding. A screened vent pipe can also be fitted as an upgrade even to simple grass structures to reduce odours in the toilet and also to trap flies. Toilet floors can be sloped to assist in washing down with water. The next upgrade would be to replace the grass structure with brick and fit a more permanent roof and vent pipe if one has not already been fitted.



**Simple grass spiral superstructures can be upgraded step by step**



**Vent pipes can also be fitted to simple grass structures**

## **Building an economical spiral brick superstructure**

By far the best superstructure for the BVIP is made of fired brick. Brick technology is well established in Zimbabwe. The conventional brick spiral superstructure has already been described in another manual. The new method described below saves on bricks and is easier to build than the original version. It uses about 440 bricks rather than 700. In this version a tubular vent is used. The orientation of the slab within the superstructure has been changed. The roof is made of a wooden frame and tin sheet, so that it can be detached easily and fitted to a new toilet when the old pit is full. The unit is made by putting together a series of components (bricks, pipe, roof) which are relatively easy to assemble and take apart. This makes the unit more easily recyclable. Like the standard BVIP the slab is extended to one side which enables the brickwork to be extended to form the open spiral shape.

## The shape of the superstructure brickwork



The spiral shape of the new BVIP. The orientation of the slab has changed within the structure. The shape is in the form of an almost continuous curve which provides strength. There are no moving parts. The unit provides privacy and semi darkness for fly control.

## Stages of construction

### The slab extension

Once the 1.2m concrete slab has been mounted with the correct orientation over the pit, the next stage is to extend a foundation for the part of the brick wall which lies outside the slab area. The topsoil to the right of the slab is taken away and a brick foundation is laid down in a curved shape which extends 65cm beyond the slab. The brick work is built up to slab level. The area within this brickwork extension is then filled with stones and rubble and then capped by a thin layer of strong concrete. The slab and extension are thus set at the same level. This is left to cure overnight.



**The curved extension to the 1.2m slab is built up in bricks to the height of the slab. The brickwork also is built up across the entrance as shown.**



**Stones, broken bricks and rubble are rammed into the extension within the brick wall. A thin layer of strong concrete is laid over this extension so the level of the slab and the extension is the same.**

## Building the superstructure wall



To make construction easier for those less skilled in brick laying 2 wooden templates have been designed as guides. These photos show how the templates (2) are positioned on the slab and extension. These act as guides and are set at each end of the curved wall. When the wall has been built they are taken away.



Preparing the bricks. Each course of the wall takes about 20 bricks and there are 22 courses. This is 440 bricks. This may vary a little as brick size varies. Allow for 500. The mortar is made with mixes of 5 litres of Portland cement mixed with 100 litres of pit sand (20:1). About 4 mixes will be required.



The two wooden templates are placed in position and made upright with a spirit level. The templates are supported by wooden timbers. The bricks are then laid around the slab rim and the rim of the extension.



**The bricks are laid using the cement mortar as bonding with bricks off set as shown. Half bricks are also used. The spiral shape follows the curve of the slab and extension.**



**The structure shown in these photos was build by school pupils guided by a builder**



**The combination of templates and building around the rim of the slab and extension makes construction much easier than the earlier BVIPs.**

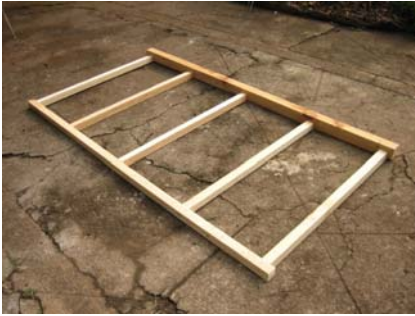


**The internal walls of the structure. These can be plastered later if the family chooses. Once the wall has been built up to the required height 1.8m (about 22 courses), the two templates can be carefully removed.**

## **Making the roof**

In this case the roof is made by attaching sections of thin corrugated tin sheet to a wooden frame. The wooden frame is made with 7 pieces of softwood. Most are standard brandering (38mm X 38mm). The front long timber is 2m x 76mm x 50mm, the rear long timber is 2m x 38mm X 38mm. The five shorter pieces are 0.95m long. This arrangement gives a slight slope to the roof once the iron sheets are fitted. The timbers are nailed together with 100mm nails. It helps to drill holes in the timbers first through which the nails can pass tightly. The wooden frame can be treated with a mix of carbolinium or creosote and old engine oil which gives it a long life. The corrugated iron sheets used on the roof are 1.5m long and three are required to span the 2m width of the roof. The best idea is to buy 3 X 3m long sheets and cut these in half. Two roofs can be made with his material. This roof should last several decades – the life of at least 2 pits. It is a good investment. The roof is light yet durable. It is easily removed and fitted back on a new toilet once the original pit has been fileld after 10 – 15 years. Recyclability of the parts is a feature of the new BVIP.

## The wooden frame



**The untreated and treated wooden frame which is nailed together**



**Three sheets are used each 1.5m long. These are cut from 3m sheets. The three sheets are fastened to the wooden frame with small nails with large heads. Each sheet overlaps the one next to it.**



**The nails should be driven through the tin sheet and made tight in the wood.**

## Attaching the roof to the structure



**The roof is placed over the structure and located so all the walls are protected from rain.**



**The wooden frame is made level. Stout wires are then used to attach the wooden frame to the brickwork. The wires pass through the mortar in the brickwork about 3 courses down.**

## Cutting a hole in the roof for the vent pipe



**A nail, sharp knife and tin snips can be used to cut a hole in the roof just over 110mm in diameter and directly over the vent hole in the slab.**



**The vent pipe is added through the roof hole and then placed in the vent hole in the slab. A weak cement mortar is laid around the vent on the roof.**



**In this case a resin filled hessian pipe has been used. PVC pipe is the most common. The diameter should be 110mm. The pipe is held fast in the slab using a little cement mortar. The pipe must be fitted with a corrosion resistant fly screen made from like aluminium or stainless steel.**

## **Plastering the floor**



**The floor is plastered with a strong mix of river sand and Portland cement and is sloped downwards towards the squat hole from the entrance.**

## **Operation and Maintenance of the Blair VIP**

The basic maintenance requirement of all Blair VIPs is that they are kept neat and clean with washing water being used to clean down the slab regularly. Also the ventilation pipes should be washed down with water every month or two to clear any spider webs that develop inside. A pipe filled with cobwebs will not ventilate. Also the fly screen should be inspected from time to time. A broken or damaged screen cannot trap flies and fly control is lost. Fly screens must be made of corrosion resistant material such as aluminium or stainless steel. Aluminium is much cheaper. The ideal BVIP has no moving parts (spiral shape without door) and should provide a long almost trouble free service to the family if it is well made and well maintained. Any version of the BVIP fitted with a door will only work well if the door is self closing. Once the pit eventually fills up a new pit can be built and several parts of the superstructure recycled. In this model the roof, slab, and if quality bricks were used, many of the bricks can be reused in a new construction. The pit contents will slowly convert to compost, but this will take many years unless soil has been added to the excreta. The addition of fertile soil, wood ash and some vegetable material like leaves will considerably accelerate the rate of change from excreta to compost. However most Blair VIP toilets will also be used as washrooms. Wet BVIP pits do not form compost whilst in use, but once abandoned the pit contents will start to dry out and will slowly convert to compost. The best way of recycling the pit contents of either BVIPs in use or abandoned pits is to plant trees around them. The tree roots will tap nutrients available in the pit.

### **Extending pit life**

Pit life is reduced considerably if a lot of garbage is added to the pit. It is far better to put garbage into a separate garbage pit and keep the Blair VIP toilet pit for excreta and anal cleansing materials alone. A garbage pit can be built using a concrete ring beam and covering slab (with lid) with the pit being dug within the ring beam. It does pay to build a pit with large capacity for long life. The cost per person served per year is reduced as the pit volume is enlarged. Using the corbelling technique pits lasting 20 years or more could be built using a single bag of Portland cement to make the brick mortar. Once the pit is full to capacity many any of the components (slab, roof, bricks etc) can be reused on a newly constructed pit.

# Annexes

## 1. Specialised pit linings

The ideal pit lining for a BVIP is brick from top to bottom. The corbelling technique enables a large capacity pit to be used with a slab which has a smaller diameter than the main pit. However there are conditions where a full pit lining may be unnecessary. These are where the soil is firm, and where a partial pit lining will support a brick structure. The second condition is where the superstructure is light and portable and where a ring beam is made and built up a few courses with brickwork. A third condition is where trees will be planted around the toilet pit and where some lateral seepage of pit fluid will assist tree growth.

### 1a Partial linings

This method is suitable only where the soils are firm. The pit is dug down to a metre deep and 1.7m wide. The pit is then bricked up and corbelled in the normal way. Then the pit is dug down another metre below the brickwork. This makes a 2 metre deep pit. About half the number of bricks are used compared to a fully lined pit.



**A partially lined pit used in firmer soils.**



**Partially lined pit after corbelling and where the soil is being backfilled between pit wall and brickwork. The slab is fitted. In this case the slab is designed for use with either brick or tubular vents (see other manual).**

## **1b. Sub-surface ring beam and corbelling**

This technique can be used where the future superstructure will be light weight, such as a portable unit or a unit made of grass and poles. The top soil, is removed and a ring beam of bricks two courses deep built up. The internal diameter can be 1.2m. Then three or four courses of bricks can be built up using the corbelling technique on the ring beam.



**Ring beam of bricks and three courses of corbelled brickwork**



**Soil is built up around the brickwork, weak mortar placed on the bricks and the slab fitted. A light weight structure is fitted on top.**

### **1c. Leaky brick wall lining**

In this technique holes are made in the brickwork lining to allow some seepage of liquid pit contents into the soil around the pit. Most seepage will be beneath the pit, but this technique enables the roots of trees planted around the pit to locate the high nutrient content of the pit more quickly. Glass bottles are used to make the holes in the mortar between brickwork. The bottles are left in place for 10 – 15 minutes then removed and reused. This technique is used only on the vertical part of the brick wall.



## **2. Planting trees around or close to BVIP pits**

The best way of recycling the nutrients found in the excreta of BVIP pits is to plant trees around or close by the pit. The tree roots move towards soil with a high nutrient content and will move towards pits in standard. Useful trees are gum, banana and mulberry.



**Trees growing around BVIP toilets**



**Mulberry and gum growing close to BVIP. One disadvantage is the proximity of tree foliage near to the vent pipe which interferes with the air flow. Gum trees will grow tall with the leaves above vent pipe level after a year or two.**

**Some experimentation is required.**

### **3. Garbage pit and cover**

Pit filling rates can be reduced considerably if garbage is not thrown down the toilet pit, but in some other pit designed for the purpose. This will extend the life of the pit considerably. A ring beam of bricks or concrete is made first (ID 1m OD 1.2m). Then a cover slab is made with central hole (30cm diameter) and raised collar (diameter 1.1m or 1.2m). Each uses about 12 litres of cement and 60 litres river sand and 3mm wires. The pit is dug down within the ring beam (1m to 1.5m) and a tin cover placed over the central hole.



**Making the ring beam and fitting the slab. The slab is made with a central raised collar around the 30cm diameter hole. A tin lid is fitted.**

## 4. Making a simple hand washing device

If improvements in health are ever to be achieved in programs linked to sanitation then hand washing should be an essential part of the program. Many hand washing devices cost almost nothing to make and add very considerably to the hygienic component of the toilet and the sanitation program. Hand washing devices can be made from plastic bottles and alloy cans.

### Making a hand washing device with an alloy can



The can is placed over a log or pole which makes the hole easy to make with a nail. Two holes are made on either side of the can at the top. Then a single hole is punched into the base of the can in a position between the two holes at the top of the can. A good nail diameter is 3mm.



A length of wire about 30cm long is then taken and passed through the two holes at the top of the can. The wires are twisted together behind the can as shown. A loop is made at the end of the wire. The hand washer is hung from another wire attached to the toilet roof.



**A container of water is required as a source of water. The hand washer is dipped into the water and then hung up on a wire hook suspended from the toilet. Then hands can be washed. Used water can drain on flowers.**



*A variety of hand washers*

## **Soap or wood ash?**



**Soap can be drilled with a hole and hung on a wire from the toilet roof. Also a tin container can be attached to the side wall of the toilet and filled with wood ash. The fingers are wetted first, dipped into the ash and then washed again. It is a very effective and simple method of washing hands.**