The Ventilated Arborloo

A hybrid between the Arborloo and the Blair VIP

An early ventilated Arborloo with portable superstructure built in Epworth in 2010

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Introduction

The *Arborloo* is a simple pit toilet using a shallow unlined pit between 1m and 2m deep, depending on soil type and firmness, which is protected at the surface with a ring beam made of concrete or cemented fired bricks. The ring beam is caste first, allowed to harden and cure and the pit is dug inside the ring beam. Normally the diameter of the pit is 1m and the outer diameter of the ring beam lies between 1.3m and 1.6m depending on soil type and method of construction.

A concrete slab is made to fit over the ring beam. In the ventilated version a 110mm hole is made for a 110mm PVC vent pipe as well as an aperture made for the squat hole or a pedestal if one is fitted. A suitable portable superstructure fitted with a roof is made for privacy. These portable superstructures are normally made with doors.

The *Arborloo* differs from the ventilated pit toilet (VIP) in that some soil, leaves and wood as are added to the contents. These do not necessarily need to be added after every visit. When the excreta is mixed with soil, leaves and ash the pit contents slowly change into a medium in which plants can grow. When the pit is nearly full the toilet superstructure and slab are moved to a new location where a new ring beam with dug pit has been prepared. Sometimes the ring beam can be moved as well to the new site and the slab and structure mounted on top. Normally, however, the ring beam may be left in place and the slab and superstructure moved on to a new ring beam. The ring beam will be more stable if it is freshly built at each site. If the ring beam is made of bricks, these can be taken apart and rebuilt on the new site.

The used pit is topped up with soil, preferably fertile soil and a young tree is planted in this soil. It is best to plant trees at the beginning of the rainy season if regular watering is not possible. The young tree may need protecting from animals. At first the roots of the tree will grow within the soil added to the pit, but as the pit material changes its form, the roots will invade the lower layers of the pit absorbing the nutrients found in the former excreta. Thus the old toilet site becomes the site of a new tree. Hence the name *Arborloo* – tree toilet.

All previous *Arborloo's* did not use ventilation pipes and fly and odour control were carried out by adding soil, leaves and wood ash regularly. Large numbers of *Arborloo's* have been built in Africa and have proved to be popular since they are low cost, ecologically friendly and produce trees which have great value for the family and the environment. However the addition of a vent pipe can enhance the control of flies and odours. The vent pipe can be made from a 3m (or 2.5m) section of 110mm PVC pipe (preferably thick walled) and the fly screen from a locally made type of shade cloth which allows most light through, which is currently under trial.

The system is very simple and relatively cheap to make and can eventually result in a woodlot or an orchard of fruit trees, or isolated trees in a garden or woodland location. Obviously space is required for this concept to work, as the *Arborloo* site moves about. For a family the pit may take about a year or two to fill up. It is possible to build one or more *Arborloo's* to support a single homestead which means the pit will last longer.

The first trial of the ventilated *Arborloo* with portable superstructure was undertaken in Epworth, near Harare, in 2010. The concept is entirely Zimbabwean and may offer a valuable addition to the type of toilet used in the Zimbabwe rural sanitation program. Much information is available on the original *Arborloo* on various websites. The ventilated *Arborloo* can also be described as a low cost and ecologically friendly version of the Blair VIP (ventilated improved pit) latrine. The method can be used with or without a pedestal. Low cost pedestals can be made and commercial units are also available. Since the unit described here uses a vent pipe, the interior is odourless. If the vent pipe is fitted with a fly screen, flies will also be controlled if the interior is semi-dark. This means a roof must be fitted and a door, if fitted, should only be opened when entering or leaving the toilet.

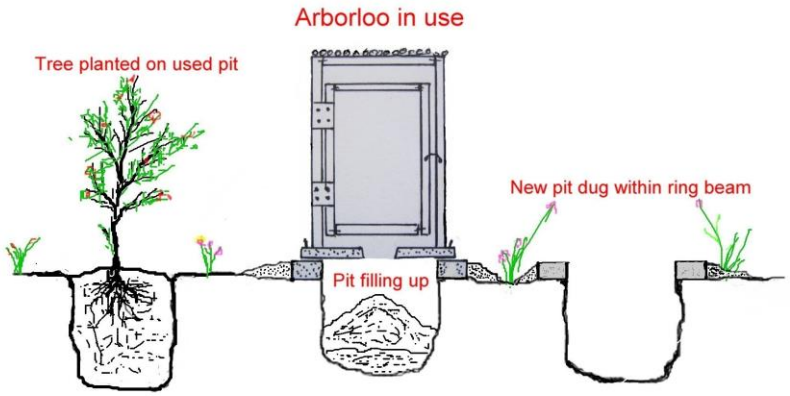
The superstructure can be constructed in many ways which suit the family. A number of alternative designs are shown in this report. The main features of the superstructure are that they should offer privacy, should be relatively light weight and portable, strong and be fitted with a roof. A steel framed structure, where the side walls can be made from many types of material including grass, reeds, bamboo, shade cloth etc, is strong, versatile and long lasting. The frame can also be made of wood, but is subject to termite attack. It is also possible to build a spiral steel framed structure, where no door it fitted. But the ring beam must be extended to suit the size of the superstructure.

The concept of the *Arborloo* is that the site of the toilet moves about over time. So the main feature is that the superstructure is light weight and portable and can be easily moved about over time from one location to another close by. Steel frame structures are very versatile and can be easily and quickly moved from one site to another. They have a long life, as the writer can testify. The first ventilated *Arborloo's* were built in Epworth in 2010 using a steel framed superstructure.

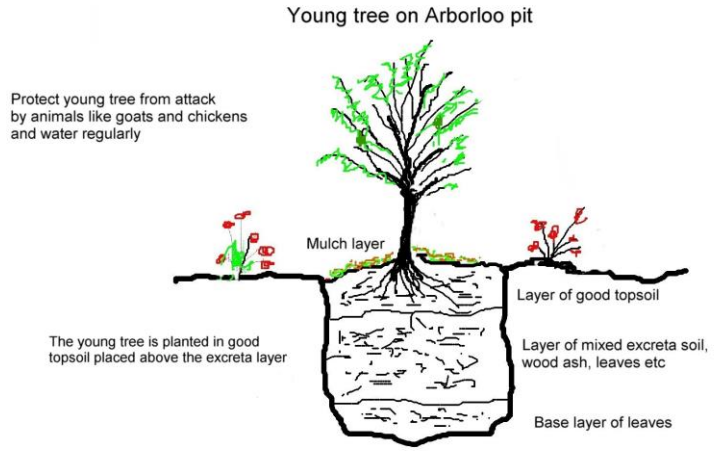
The *Arborloo* is ecologically friendly. The excreta is never touched and when mixed with soil changes its form underground and out of site. The advantage over the normal brick lined pit toilet or even standard Blair VIP toilet is that the excreta comes into contact with soil along the side walls of the pit as well as the base. Heavier ventilated Blair toilets made of bricks, must have a brick lined pit to support the weight of the superstructure. Adding some soil and leaves and wood ash to unlined pits, as they fill up can accelerate conversion of excreta into a product which tree roots will accept. Also the unpleasant pit contents are converted out of site and out of mind into something useful, like a medium in which trees can grow. Trees are most valuable assets to improve and protect the environment. The more trees, the better.

However *Arborloo* pits are smaller than brick lined Blair VIP pits, which may last a family for 10 to 15 years. The smaller pits fill up more quickly and garbage must not be added to the pit as this decreases the pit life. When standard Blair VIP toilet pits are full the toilet is normally abandoned. In the current situation (2023), most families living in the rural areas cannot afford to build the standard brick Blair VIP toilet. In earlier times, large numbers of these toilets were subsidised by donor material assistance, which no longer applies. So a new approach is required which is affordable to low income rural families living in Zimbabwe. This method may offer an alternative approach.

Simple illustrations of the *Arborloo* method



The *Arborloo* moves on a never ending journey leaving behind a series of fertile pits filled with a mix of human excreta, soil, wood ash and leaves etc which provide a suitable planting medium for trees when composted. Nutrients in the excreta are used by the tree to enhance its growth.



Many types of tree will grow on *Arborloo* pits. The most valuable are fruit trees of many types. These can be built in sites which can later become orchards. Trees can also be planted in areas which will later become woodlots, which can growing into trees useful for fuel or timber for construction. Trees can be planted for shade, making the environment more pleasant to live in.

The concept of upgradeability

Whilst the ventilated *Arborloo* is itself an upgrade on earlier unventilated *Arborloo's*, there are many ways for starting simpler and then upgrading, as was the case for the upgradeable Blair VIP (uBVIP). In this case the concrete slab may remain similar or identical to be included in a series of upgrades. This will vary a little depending on whether the toilet is used for squatting or sitting on a pedestal. The method of making the ring beam, from circles of bricks to concrete may vary depending on the type of soil. The ring beam is important because it protects the erosion of the soil beneath it. Perhaps the greatest range of upgradeable options is the superstructure itself. This may vary from very simple, made from locally available materials to portable framed steel structures fitted with roofs. The aim is that the superstructure should be portable or easy to rebuild. The side walling of the portable framed structures can also vary from grass, reeds, bamboo or even shade cloth. Also a choice can be made on whether the toilet is fitted with a pedestal in which case the hole made in the slab must suit the insertion of the pedestal which is larger than for squatting. Vent pipes for this concept are made from 110mm PVC pipe, which must pass through the roof as the vent is placed inside the structure. Formerly fly screen was made from stainless steel and then aluminium. These are not commonly available in Zimbabwe, so the screen can be made from a type of locally available shade cloth (40% black).

These same superstructures, especially the steel framed superstructures can also be fitted to larger deeper brick lined pits. *Arborloo* pits are narrow and shallow. They fill up much faster than deep pits. So they require moving from one location to another. But in the rural areas there is space to move a pit from one location to another. Where there is less space the concept of the *Fossa alterna* (alternating between 2 pits) can be used.

The starting point in the upgradeable series will clearly depend on the resources available to the family living in the rural areas. Some will be very poor, whilst others will not be so poor and others quite well off. These better off or related families may assist those who are not so well off.

In any event the methods used and demonstrations of the types of *Arborloo* or ventilated *Arborloo* must be available for people to see. This may be the responsibility of the MoH and Child Welfare, operating at district or village level, or NGO/s or training institutions linked to water and sanitation programs. Also trial runs of the ring beam concept need to be evaluated in various locations with different types of soil type from sandy to more stable red or other soils.

In effect the end result of the use of the *Arborloo* concept is to leave an "organic plug" of rich medium – that is converted excreta, in which plants like trees can grow. The so called waste and offensive material is thus put to good use, by a process of natural recycling which actually occurs within Nature itself.

But as always, the concept should be tried on a small scale first, evaluated by the users so that a possible future which benefits the users and the environment can be safely assured. Growing more trees is a very popular and a well discussed topic these days.

Photos of a range of ventilated *Arborloo's*


A steel framed superstructure which is light enough to move and has a roof. In this case covered with hessian material and built in Epworth in 2010. Well-made steel framed superstructures can last for many years – even generations - and can be covered again and again with the most suitable walling and roof material. They can be used not only on shallow pits, but also on deeper lined pits. The purchase of such a frame is an excellent family investment.


The steel framed superstructure is very versatile, and far more durable than wood, although will cost more than the home made wooden framed structure. Both will required a roof which can be made in a number of different materials like the side walls of the structure. Since the vent pipe is placed inside the structure a hole must be made in the roof to accept the vent pipe. On the right a ring beam protected pit with concrete slab and a commercially made pedestal and PVC vent pipe fitted with fly screen made of 40% shade cloth.

Some more portable superstructures


A steel framed square spiral structure covered with hessian. A wooden structure


Portable structures made in Malawi


A simple vented *Arborloo* made for a child

Ventilated *Arborloo* structure with treated gum poles and reeds


The ring beam is made in concrete and the pit dug down inside to a depth of between 1m and 2m. The firmer the soil the deeper one can dig


Poles are used as uprights and should be treated against termite attack. A steel door frame can be made and suspended on car tyre rubber hinges or strong metal hinges.


The completed toilet fitted with pedestal and screened vent pipe

Making the parts of the ventilated *Arborloo*

These consist of the concrete cover slab, the ring beam, the portable superstructure, the vent pipe with fly screen and preferably a simple suitable hand washing device. Generally the concrete slab is made first as it must be allowed to cure and kept wet after it has hardened. It is best covered with plastic sheet during the curing process.

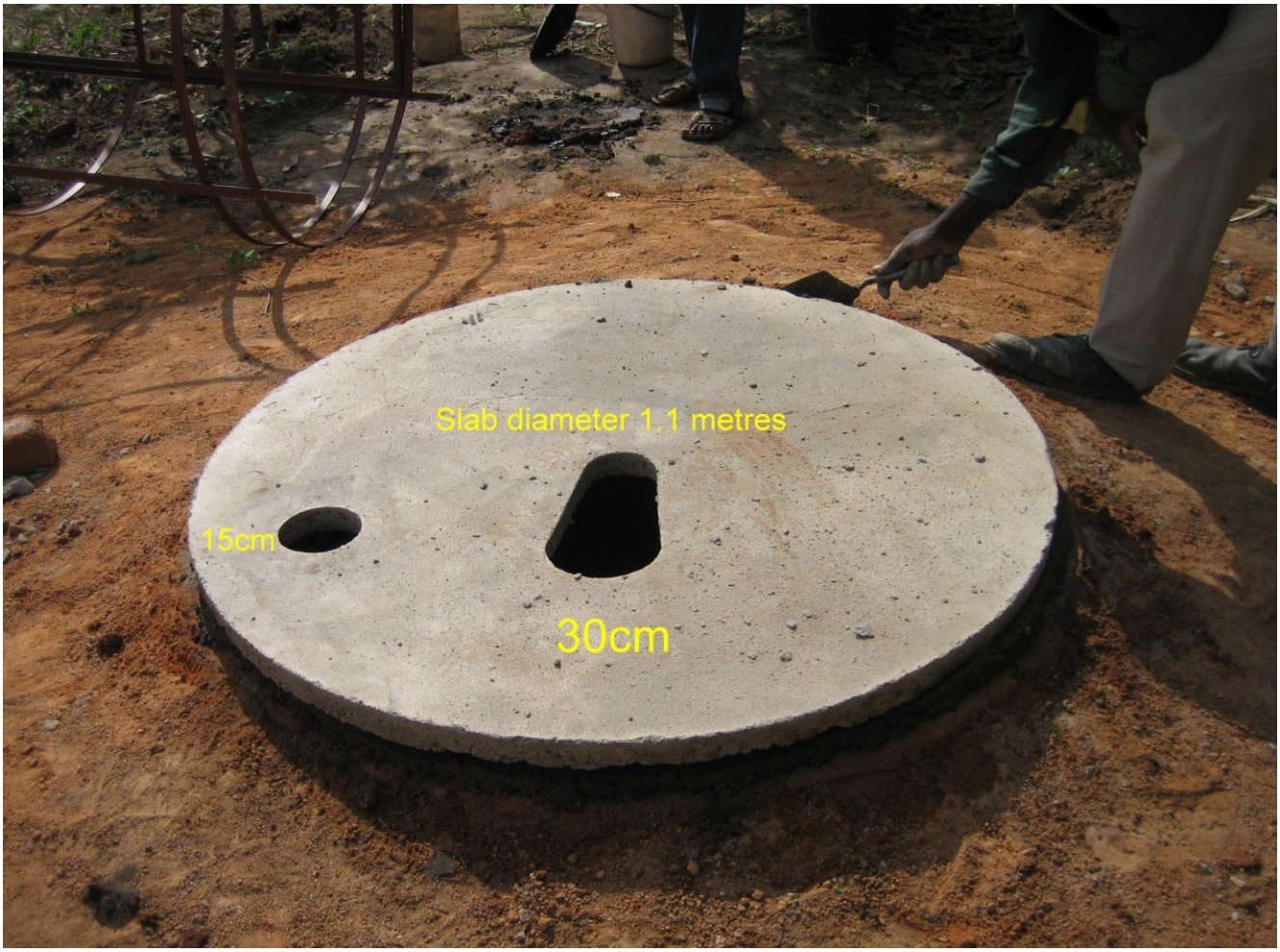
Making the 1.1m diameter concrete cover slab

This is made in concrete using clean river sand and Portland cement at a ratio of 5 parts sand to one part cement. A 9 or 10 litre bucket can be used as a measure – 5 buckets sand to one bucket cement. The slab is caste with two holes, one for the 110mm PVC vent pipe and one for the squat hole. Reinforcing wire such as 3mm wire or barbed wire placed in a grid formation or chicken wire can be used. Add half the concrete mix first, then the reinforcing wire, then the remainder of the mix and level off. Then leave the mix to harden and cure for at least a week and best 2 weeks before moving.


A circular mark is made on the ground 1.1 metres in diameter which is wetted first. Then a circle of bricks is laid around the mark, so the final slab will be 1.1m in diameter. The mould for the vent pipe is made from a short length of 110mm PVC pipe and the mould for the squat hole can be made from an old bucket with the bottom taken off and shaped by adding a wire to form a horseshoe shape as shown in the photos above. The wide end of the bucket is placed 30cm from the brick mould. The 110mm short PVC pipe is laid 15cm from the brick mould and to one side as shown in the photos. The greater the number of wire or barbed wire strands used the better for reinforcing. It is best to make the slab on a plastic sheet.


Filling the mould with the concrete mix

The completed 1.1m diameter concrete slab. After overnight hardening, the slab should be kept wet and covered with a plastic sheet for at least week and better 2 weeks before moving.



The 1.1m concrete slab cured. The squat hole is 30cm from the back of the slab. The 110mm vent pipe hole is 15cm from side of slab - to one side.

Making the ring beam for a 1.1m concrete slab

The ring beam is designed to protect the upper end of the toilet pit and is used where a light weight superstructure is used. The internal diameter of the ring beam is 1 metre when used with a 1.1metre slab. The width of the ring beam varies depending on the type of soil it is mounted on. For looser sandy soils it will need to be wider compared to harder more stable soils. In most cases the ring beam is about 225mm wide, the same as a brick. The mould for the ring beam can be made with bricks or steel moulds. It is made using a 5:1 mix of clean river sand and Portland cement, the same as the slab. It can be reinforced with a loop or two of 3mm wire or barbed wire. These are laid when half the mix has been added to the ring beam and then the remainder of the concrete mix is added and smoothed down. The ring beam is best caste on slightly higher ground if possible and away from any water wells. Once the ring beam has cured the pit is dug down inside the ring beam to a depth of 1m to 2m.


In this case bricks have been used as moulds. Special bricks have been caste in halves to make the internal wall more rounded. Full bricks or half bricks can also be used.


Half the concrete mix is added first then the wire reinforcing, followed by the final mix which is smoothed down. Once the ring beam has hardened and cured the pit is dug down inside the ring beam. The soil taken out of the ring beam is place around and built up around ring beam. It is dug down to the required depth. In stable soil it can be dug down to 2m depth.

Making the ring beam with fired bricks

The ring beam can also be made with fired bricks. 2 courses should be made with a mix of pit sand and Portland cement (10:1 mix) to bond them together.


Once again the brick ring beam is made with an internal diameter of 1m. 2 courses are made. The ring beam is plastered with cement mortar to avoid erosion from rain.


Once the ring beam has hardened, the pit can be dug down inside to the required depth. The removed soil, is placed around the ring beam. This stabilises the site against rain water erosion.


A layer of weak cement is laid on top of the ring beam (about 20 parts sand to 1 part cement) This forms a seal between the ring beam and the slab which is important in ventilated pit toilets. The slab can also be levelled at this stage.


The pit has been dug down. A seal made between the slab and ring beam and the slab levelled. Soil from the pit has been placed around the ring beam.

The superstructure

There are many ways of making the superstructure of the ventilated *Arborloo*. Because the pit is unlined, it is best that the structure is lightweight, strong and portable, as it will need to be moved every one or 2 years to a new site. An earlier part of this report shows some of the range of structures which are suitable for the ventilated *Arborloo.* The choice must be left to the home owner which will depend on his or her decision based on what they can afford. Low cost structures made of timber do require more maintenance than framed structures made of steel and are more difficult to move.

For interest I now show a series of photos which record the construction of one of the first ventilated *Arborloo's* built in Zimbabwe in Epworth near Harare in 2010.

Building a ventilated *Arborloo* in Epworth, Zimbabwe, 2010


The slab has been placed on top of the ring beam above a pit. In this case a steel framed structure has been used as the following photos show.

These photos show the design of the steel frame structure, fabricated by V&W Engineering. It is light and strong enough to be carried by 4 people. Its legs sit on the ring beam surrounding the slab.

The lower end of the steel framed structure.


The 110mm PVC vent pipe is being lowered into the vent pipe hole in the slab.


The structure has been fitted with hessian for privacy. It has also been painted with a slurry of cement and sand. Many options are open for covering this type of framed structure. These include grass, reeds, bamboo, shade cloth etc. The roof ring has been fitted with thick black plastic sheet laying on a chicken wire base. Ideally the roof can be made with thin corrugated iron sheeting.

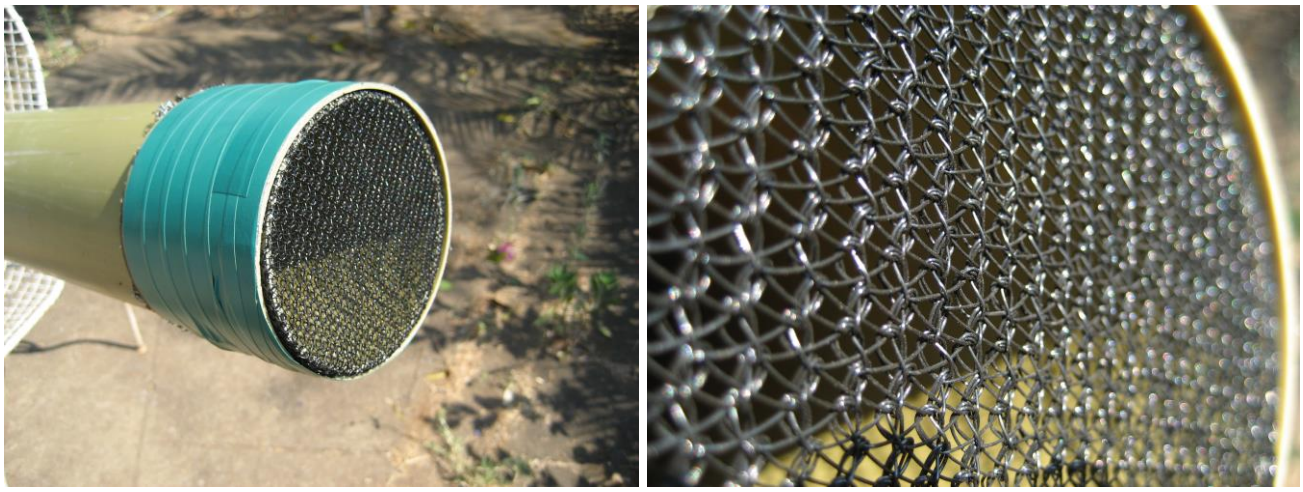
Whilst this concept cannot be considered as low cost, welders in the rural areas can make and sell these items once they are familiar with the design. Their advantage is that they are durable, light enough to move and can be covered with a variety of materials. They can even be placed onto deeper brick lined pits. In using a door, the structure cannot guarantee semi darkness within the structure, which is important for the correct functioning of the Blair VIP. So the door must be self-closing (in this case using rubber hinges), or should remain in the closed position when not in use.

The vent pipe

This can be made with 110mm PVC piping. The colour does not matter, but the thicker the walling of the pipe, the longer it will last. Formerly stainless steel and aluminium screens were used as fly screen, but these are either expensive or not easy to find. The pit gas rising up the pipe is corrosive and can erode steel screens. An alternative which looks promising for the fly screen is a certain type of shade cloth made in Zimbabwe which is available on the market and is low cost. It is the screen which allows most light through (40% shade cover.black).

Low cost screen which may be suitable as fly screen on the PVC vent pipe

Fitting the fly screen to the vent pipe



The final pipe and screen

Upgrading with a pedestal

Whilst most *Arborloo's* and Blair VIPs are designed for squatting, there is an increasing demand for fitting a pedestal for sitting. These are now available on the marker in Zimbabwe. If a pedestal is used the hole for squatting is too small and this hole should be larger as shown in the diagram below.

The slab design if used with a pedestal. The distance between the hole for the vent pipe and the edge of the slab is 15cm.

Types of pedestal.

Home made.


Two versions of a homemade pedestal. On the left one made with a plastic bucket and concrete. On the right one made with a bucket, a pedestal seat (with lid) and concrete. The method of construction can be viewed on other manuals on this website

The original simple bucket and concrete homemade pedestal.

This is a fibreglass slab made by Prodorite some years ago caste to similar dimensions. This was made for squatting. But the pedestal illustrated will also fit into the squat hole as shown. The pedestal itself was supplied by Prodorite, but is a product made in South Africa.


The arrangement of a fibreglass slab and pedestal and 110mm pipe fitted made by Prodorite. These are fitted over a ring beam and shallow pit.


Photos of a rectangular steel framed portable superstructure lined with dried grass. These units have been in operation for several years and have proved to be very effective and long lasting. In the photos shown above, another ecological unit, called a "*Skyloo*" using a steel framed superstrcture is in use. The slab is rectangular in shape. The steel framed structire has also been used for another ecological toilet called a *Fossa alterna.* The *Fossa alterna* in this case uses a rectangular ring beam. Two of these are made near to one another and alterate at yearly intervals. Soil, ash and leaves are added to the pit alongside human excreta. The resulting pit material can be dug out and dug into and mixed with soil in small vegetable gardens.

Hand washing

Hand washing a a vital part of maintaining personal health. A hand washer should accompany every toilet, of what ever type. In most modern homes water will come from a tap, but this is not the case for countless millions of people. So a simple hand washer must be made and what better than using a article which is normally thrown to waste - the alloy can. This can be converted at almost no cost into an excellent hand washer. Descriptions on this web site show how this can be done. The method also uses a covered bucket filled with water or a mix of water and some additives like small amounts of a disinfectant like “dettol” and washing up liquid added.

A bucket with lid, preferably filled with some disinfectant and washing up liquid is used as a reservoir. The alloy can is prepared with holes and wire to form a handle. This is dipped in the water and hung on a peg.

The water drains out slowly to wash the hands. Full description on the website.

Preparation and use of *Arborloo*

Once the pit is dug and the *Arborloo* or ventilated *Arborloo* is completed, a sack of leaves can be added to the pit. This will help start off the conversion of excreta into a product acceptable to plants. Since there is no flush water mechanism, some side wall fouling of the pedestal shute may occur and will need cleaning off with water. The black colour of the pedestal shute helps disguise this a bit. But water thrown down the pit from time to time helps to level off the pit contents.

Also some soil, wood ash and leaves should be thrown down the pit from time to time to form a combination of excreta and these additional products. These various products will react with each other and the beneficial bacteria in the soil and fungi in the leaves will contribute to the conversion of the excreta. The ash also adds potassium and also cuts down on fly nuicance and odour. But the screened vent pipe should eliminate fly and odour nuicance. The vent should be washed down with water from time to time to flush out spider webs which interfere with air movement.

When the pit is nearly full the *Arborloo* (superstructure and slab) should be moved to a new nearby site. It may be easier just to cast a new ring beam in the new site and move and reassemble the slab and superstructure. Sometimes the ring beam can also be moved to the new site or the brick ring beam rebuilt using the same bricks.

The old pit site is topped up with soil or best fertile soil. The site can be left for a while for the contents to settle. At a suitable time, preferably at the start of the rainy seaon, a suitable young tree can be planted in the top soil. In fact young trees can be prepared beforehand in bags or pots or buckets so they are already growing before they are transplanted into the old *Arborloo* site. Young trees will require some protection from animals and it's a good ideas to add leaf mulch on the soil within the ring beam area.

Where the *Arborloo* is placed in a rural homestead many types of tree can be planted. These will often be fruit trees or trees planted for shade, beauty or timber for various purposes.

At first the young tree roots will grow in the topsoil added to the pit. Then they will invade the converted organic contents of the pit. The pit with its converted contents can be thought of as an organic plug or pit which may offer better growing conditions within lands which are more barren or sandy or less fertile. The *Arborloo* is a toilet which becomes a tree. The toilet itself is short lived compared to the tree which is planted which may live and be of great comfort and value for decades.

A great deal of information about the *Arborloo*, ventilated *Arborloo* and other ecological toilets, and the use of urine and converted excreta, as well as on-site and ventilated pit toilets such as the Blair VIP toilet together with many aspects of rural water supplies, sanitation and hygiene developed in Zimbabwe can be found on the website https://drpetermorgan.com/