ADOBE LOO & WORMS

Organic Waste & Wastewater Treatment Systems

Installation & Maintenance Manual

Waterless Composting Toilet For

Kym Mogridge
PO Box 751
BEGA NSW 2550

(02) 6494 1051 Ph (02)6494 1051Fax
Mobile 0427 277 249
E-mail: info@wormsloos.com.au

TABLE OF CONTENTS

COMPONENTS

Please check that all components are available.

The components of the Waterless Composting Toilet are:

- ? x **Composting Chambers**
- ? x **Compost Chamber Lids**
  (? x 'In Use' lid, with hole in top for waste chute,
  ? x 'Out of Use' lid, without hole in top)
- 1 x **Toilet Pedestal**
- 1 x **Toilet Seat**
- 1 x **250 mm diameter x 730mm long Waste Chute Pipe**
- 1 x **O-Ring Seal for the Waste Chute and In-Use Lid.**
- 1 x **12 Volt Fan in Housing Assembly**
  1 x **240 volt to 12 volt 'plug-in' Transformer** for use with your 'In-Use' chamber
- 1 metre of Flexible Air Hose for connection to Vent Pipe
- 1 x **Vent Cap with Rain Hood** to fit to top of Vent Pipe
- 1 x **Moisture Trap** to fit to bottom of Vent Pipe
- 7 metres of 19mm Hose for Liquid Drain and 19mm Fitting
- 2 x Starter Packs of compost
- 2 x Bags of bedding material

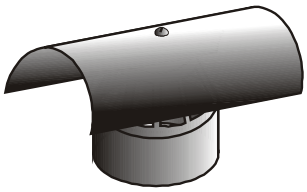
(Items listed in bold type are illustrated on the next page)

If anything is missing, ensure that you obtain them BEFORE installation.

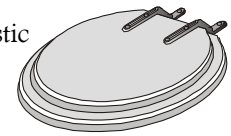
You will need to supply **wall brackets and a length of 100mm vent pipe** for connection to your air exhaust. This is available from your local hardware or plumbing store (ask for 100mm DWV pipe). The final length of the vent pipe will depend on your specific installation. Ideally you will want the top of the vent pipe to be at least 600mm above the highest point of the roof line to prevent any downdraft of odours.

You will also require the following materials for the Excess Fluid Absorption Trench.

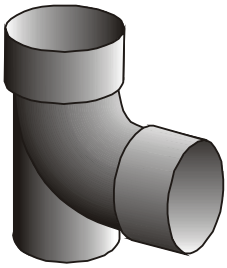
- 2 x 0.5m plastic or hessian Geotextile Mat
- 1 x 2.0 m length of 100mm agricultural pipe
- 0.25 cubic metre 25mm Aggregate



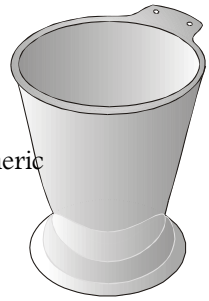
Vent Cap with Rain Hood
for top of your
100mm Vent Pipe



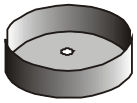
Wooden or Plastic
Toilet Seat

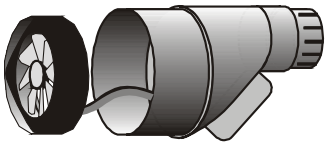


Moisture Trap
for bottom of your
100mm Vent Pipe



Ceramic or Polymeric
Pedestal

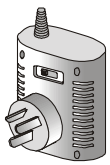




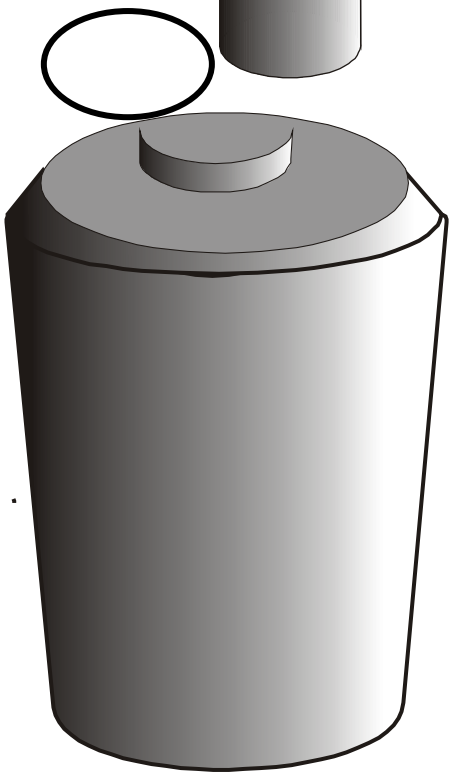
Fan in housing

Waste Chute &
Sealing O-Ring

2x Compost Chambers Lids:
1 with hole in top for in-use chamber
1 without hole for out-of-use chamber

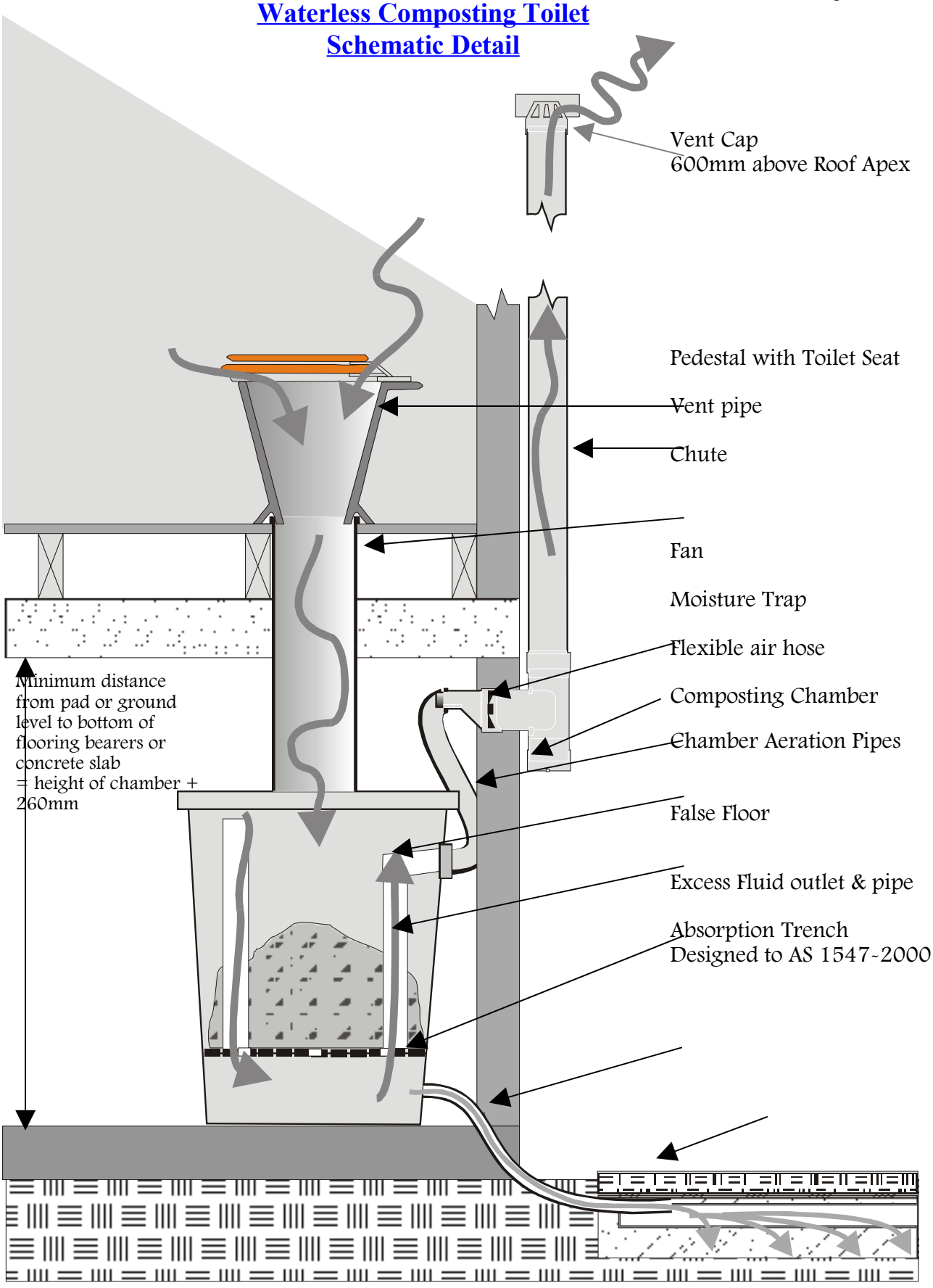


Transformer
for powering your fan from
Mains Power



2x Composting Chambers

Waterless Composting Toilet
Schematic Detail



INSTALLATION

Please read these instruction completely BEFORE you comence to become familiar with the whole process. Plan for a full day or more to allow for the unexpected.
Before beginning the installation, ensure that there is room beneath the toilet room floor for the composting chambers.

The minimum clearance required for the chambers is approximately 260mm from the bottom of your floor framing members to the top of the Composting Chamber. Add 260mm to the height of the Composting Chamber and this will be the total distance from the bottom of your floor bearers or concrete slab to the ground or pad level. For example, if the Composting Chamber is 540mm high, add 260mm to this height to get a total clearance of 800mm.

If you are planning to excavate an area under the house for the compost chambers, please ensure that the area is well-drained and that any retaining walls are built to the satisfaction of the local authority.

Locating the Toilet Pedestal in the Toilet Room

The Ceramic Pedestal is connected to the composting chambers, below the floor, by the Waste Chute. A 250mm diameter *(approx. 10 inches)* hole must be cut in the toilet room floor to accommodate the waste chute.

To ensure a snug fit, you must use the waste chute as a template for cutting the hole.

The ***centre*** of the waste chute hole, to be cut into the floor of the toilet room, should be about 300mm from the wall to ensure that the pedestal will fit and the seat stays open when raised. The ***edge*** of the hole to be cut should then be 175 mm from the back wall.

Toilet pedestals are usually located towards the back wall of the toilet room in the centre between the side walls.

Locate the approximate area where you want the pedestal to go, then check under the floor area you have chosen and check for any potential problems or hazard; i.e., ***electrical wiring, plumbing or floor framing members.***

Caution – Hazard – Danger

Under-floor areas harbour electrical and plumbing lines.

Proceed with Caution!

Mark out the hole with a pencil, using the waste chute as a template, and drill one small (6mm, *¼ inch*) test hole in the centre of the marked circle and poke a length of string down the hole.

Go to the under-floor area again and look for the hole you have drilled, and the dangling string. Look to see if there is a floor joist, water pipe or electrical wiring under the area you are going to cut.

If there is wiring or a pipe in the way, you will need to engage a plumber or electrician to re-route the necessary line.

If there are electrical or water lines close, but not in the way, *cut the hole in the floor with extreme caution.*

If there is a floor joist in the way, you will have to cut the joist on each side of the waste chute hole, add trimmer joists to each end of the cut joist, and fix all connections with galvanised framing anchors with
4 nails each leg. (See 'Positioning the Pedestal' drawing.)
Alternatively, if possible, you can reposition the Pedestal to suit the joists.

Drill a 10mm hole inside the edge of the waste chute area for the insertion of an electric jigsaw blade and cut out the chute hole.

Locating the Composting Chamber under the Toilet Room

You will need access to your Waterless Composting Toilet Composting Toilet for changing the chambers. You can prepare a pad for the In-Service chamber, or let it sit on bare earth if weather and drainage conditions are suitable.

If you prefer a pad, lay a small, one square metre pad with either concrete, pavers or recycled brick or block directly beneath where the pedestal will finally reside.

The centre of this pad will line up with the centre of the waste chute and ceramic pedestal. Ideally the pad area will have a small incline or fall (20mm over 1000mm, ¾ inch over 3 feet) and fall down toward where the excess fluid pipe will be to aid the draining of the tank.The most rapid decomposition will take place if the Out-of-Service chamber is in the sun, and if possible connected to the vent pipe. If this is not possible you may wish to prepare a second pad next to the 'In-Service' chamber so that it can be easily connected to the vent pipe.

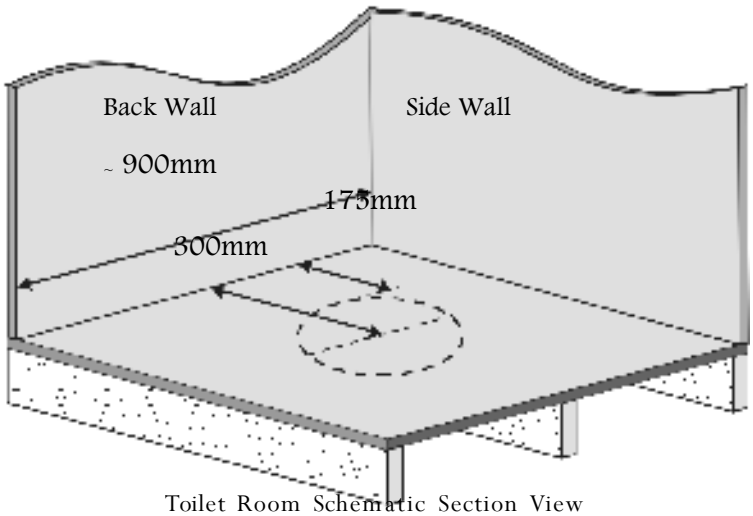
Positioning the Pedestal

The usual position for toilet pedestals is centred between the side walls.

If your pedestal is too far away from the back wall, when you open the toilet seat, it will fall back and hit the pedestal - and could break it!

The measurements are offered a guide only.

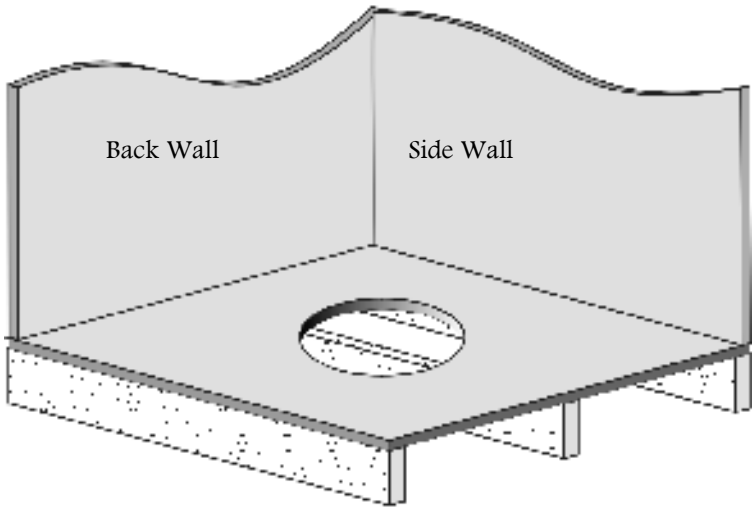
Locate the position for the Waste Chute, then use your Waste Chute as the template for drawing the hole to be cut.



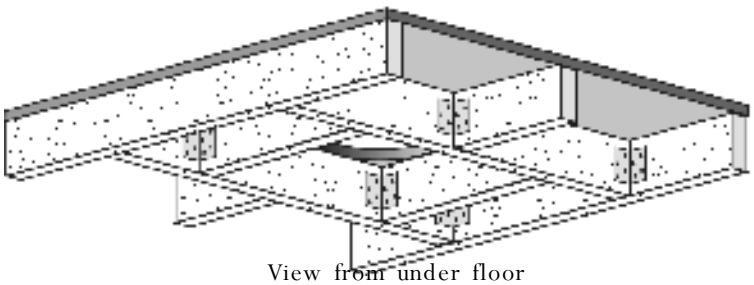
Toilet Room Schematic Section View

Drill a hole inside the perimeter for inserting the jigsaw blade, then cut the hole section.

If there is a joist in the way, you will have to cut it on each side of the Waste Chute hole.



Install trimmer joists as shown and fix with framing anchors -
4 nails each leg.


View from under floor

Installing the Waste Chute

First ensure that the pad or ground level on which the 'In-Use' chamber will reside is at its final level beneath the toilet room.

Insert the waste chute into the hole cut into the toilet room floor.
The flange will stop the pipe from falling through.

Back under the house, remove the 'In-Use' compost chamber lid
(the one with the hole in the top) from the chamber and put it to one side.

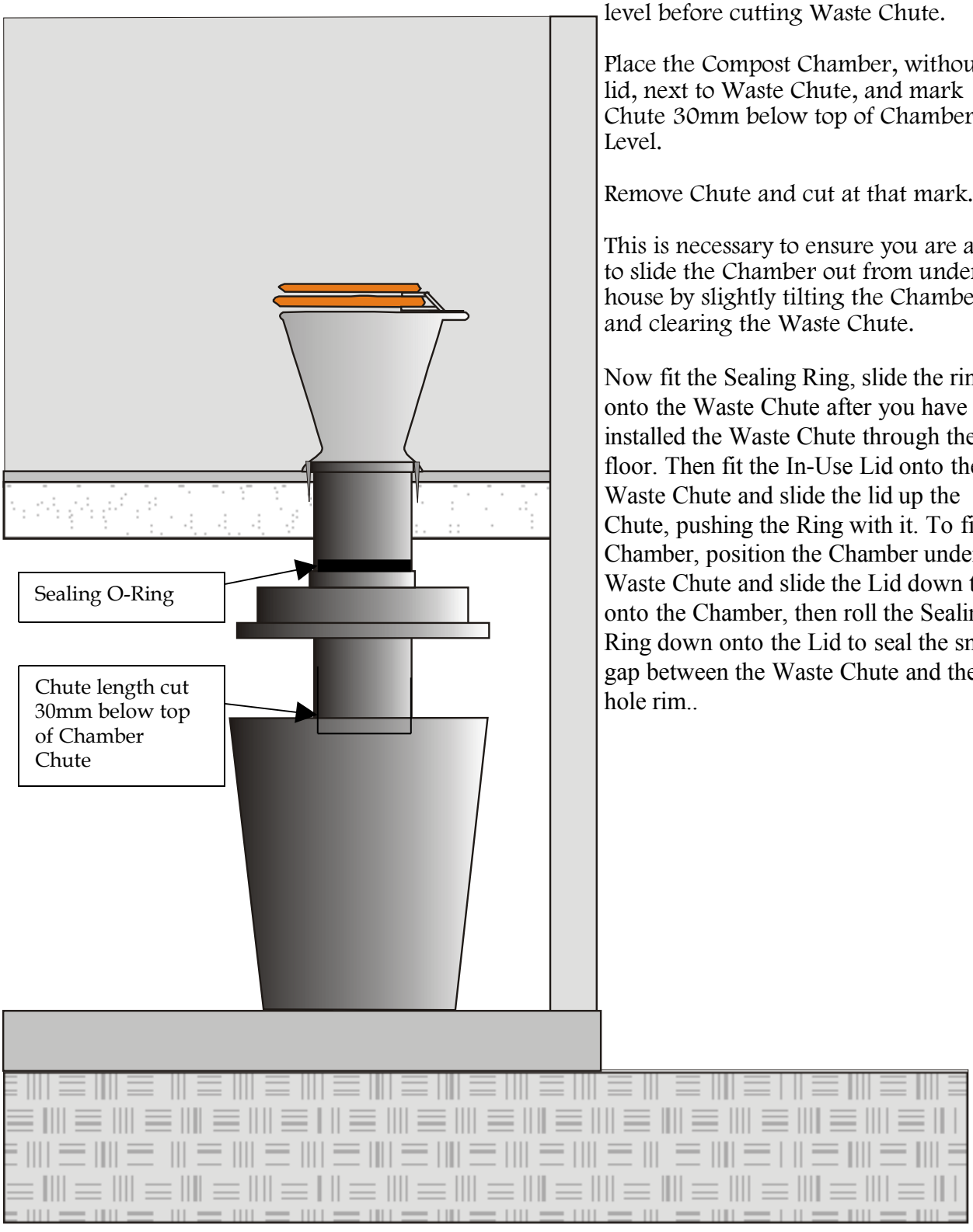
Position the chamber next to the waste chute, which is hanging from the hole already cut above.

Mark the position of the top of the chamber on the waste chute. Then mark the ***cut*** position 30mm down the waste chute. ***This is so you can slide the 'In-Service' chamber in and out from under the Waste Chute by slightly tilting the Chamber to clear the Waste Chute.***

Remove the waste chute and cut off the excess length. The waste chute pipe can now be re-inserted through the hole in the toilet room floor. The large rubber O-Ring goes on the Waste Chute after it has been inserted in the hole just cut. It is used to seal the small gap between the Waste Chute and the Chamber Lid.

If you have a distance longer than 730mm you will require additional lengths of chute, fixed together with four small screws at the flange joint. When installing more than one length, the top section must be inserted through the toilet room floor first, then the other waste chute sections joined on.

Toilet Room



Cutting the Waste Chute to the length to suit your site

The 'In-Use' compost Chamber Lid can slide up and down the Waste Chute.

Ensure Chamber Pad area is at final level before cutting Waste Chute.

Place the Compost Chamber, without lid, next to Waste Chute, and mark Chute 30mm below top of Chamber Level.

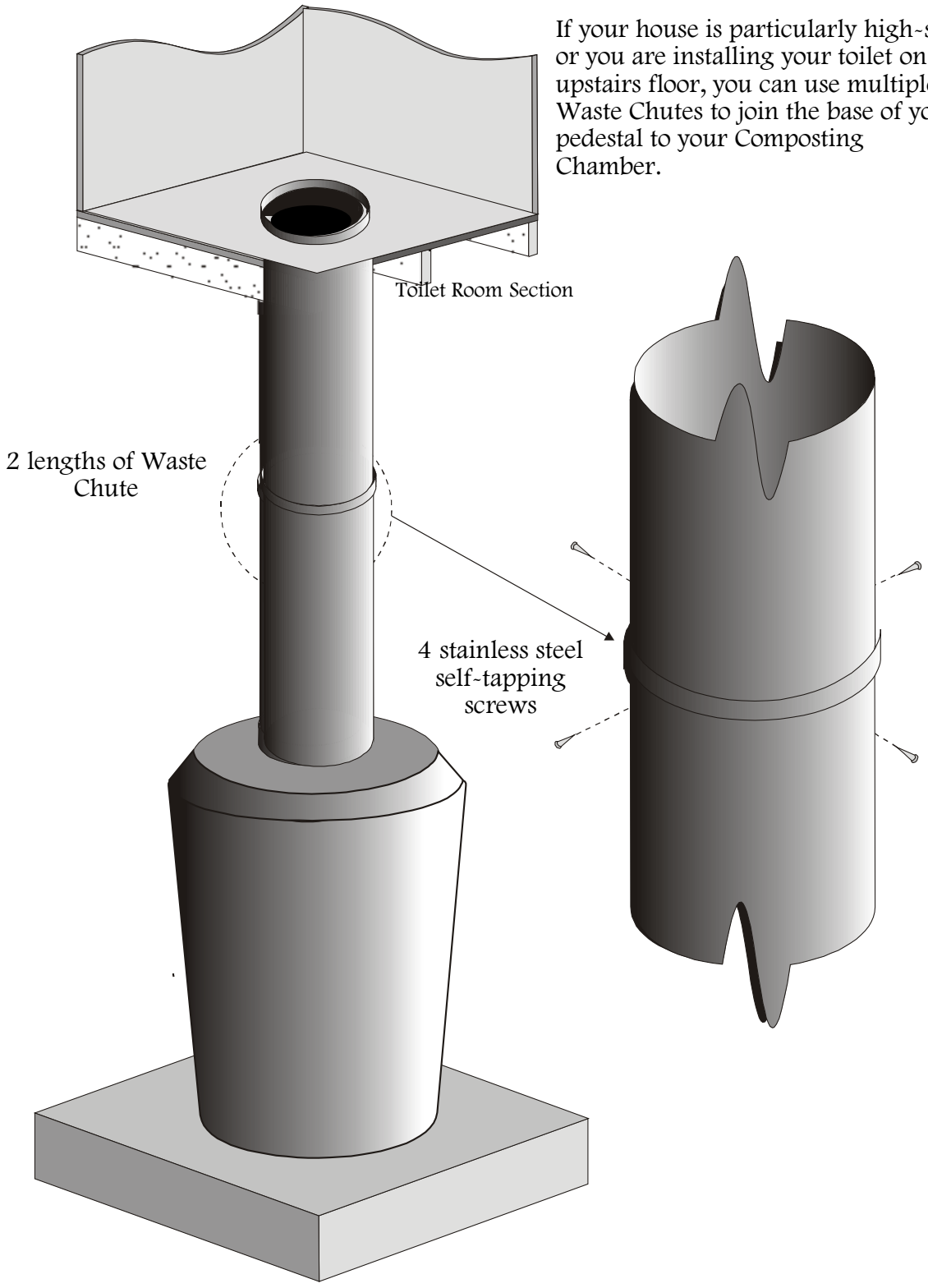
Remove Chute and cut at that mark.

This is necessary to ensure you are able to slide the Chamber out from under the house by slightly tilting the Chamber and clearing the Waste Chute.

Now fit the Sealing Ring, slide the ring onto the Waste Chute after you have installed the Waste Chute through the floor. Then fit the In-Use Lid onto the Waste Chute and slide the lid up the Chute, pushing the Ring with it. To fit the Chamber, position the Chamber under the Waste Chute and slide the Lid down to fit onto the Chamber, then roll the Sealing Ring down onto the Lid to seal the small gap between the Waste Chute and the hole rim..

Waste Chute Detail

If your house is particularly high-set, or you are installing your toilet on an upstairs floor, you can use multiple Waste Chutes to join the base of your pedestal to your Composting Chamber.



Installing the Pedestal

You are now ready to install the pedestal.

The waste chute should be placed into the hole in the toilet room floor with the waste chute flange sticking up about 30mm.

The pedestal can now be placed in position, over the waste chute flange, with the seat mounting flange to the back wall of the toilet room.

If the pedestal does not sit flush on the floor, it is likely that the waste chute flange may be a little too long for your pedestal *(the pedestals are all hand-made and there are minor differences in each)*.

Remove the pedestal again and trim the waste chute flange with a sharp knife, rasp, file or hand plane.

Trim a small, even amount of material off the waste chute flange and replace the pedestal to check the position. Repeat the process until the pedestal sits flush on the floor.

Do not trim off too much at once or the waste chute and pedestal may leak.

Replace the pedestal and mark the positions of the screw holes on the toilet room floor with a pencil. Remove the pedestal once more and drill out the mounting screw holes with an undersized drill bit.

Before replacing the pedestal and fixing it to the floor, run a 10mm bead of sealant around the waste chute flange at the floor level and work it into the joint with your finger. Also, fill the flange of the ceramic pedestal with waterproof sealant to ensure that there will be no leaks.

Replace the pedestal and screw it down.

Be very careful not to tighten the screws too much as you can crack the base of the pedestal.

It is advisable to do this by hand. Power tools are known to have caused problems.

Installing the Compost Chamber

Back under the toilet room floor, fit the "O-Ring" over Waste Chute opening and roll it up the chute about 15cm. Then slide the 'In-Service' compost chamber lid up onto the Waste Chute from underneath. Rig up a hook on a piece of wire or string attached to the underfloor to hold the Chamber Lid up on the Waste Chute.

The compost chamber can now be put into position. Locate it directly under the toilet pedestal so the waste chute pipe is vertical. The Chamber will need to be tilted slightly to place it under the Waste Chute. Slide the lid down to fit on the chamber. Leave the hook hanging to assist in holding the lid when changing Chambers.

Connecting the Vent Pipe and Fan

The heart of the Waterless Composting Toilet Composting Toilet is the 12 volt fan which runs the Ventilation System.

The fan runs 24 hours a day to continuously circulate air through the compost heap.

The air is drawn down through the toilet pedestal through the compost chamber and out of the vent pipe. This set-up ensures that no odours enter the toilet room.

You will need to purchase a length of 100mm DWV plumbing pipe and brackets for fixing the pipe to the side of the building. The length of the pipe needs to be from 1m *(3 feet 4 inches)* above the base of compost chambers to 600mm *(2 feet)* above the highest point of your roof.

The Waterless Composting Toilet comes with flexible hose connections for easy connection to vent pipes.

First, connect the Moisture Trap & Fan in Housing onto the 100mm vent pipe as per diagram. Make sure that it is kept out of the weather, as this will increase the life of the fan. ***Do not glue the fan housing to the vent pipe system as you will have to remove it later to exchange the fans when they fail after about 2 years. Ensure that the fly screen is secure in the groove of the fan housing.***

Check that the air is flowing *away* from the chamber. Then connect the 50mm flexible hose onto this air exhaust fan and tighten the clamping ring to seal the connection.

Connect the other end of this hose to the white fitting extending horizontally from just under the top rim of the chamber. Ensure that the vent pipe is placed or supported so that moisture from condensation cannot accumulate in it as this will stop the air flow (i.e there is no "U" shape in it between the 2 connection points). If the Flexible Hose does fill with water, air circulation by the fan will be stopped. This will stop airflow down through the pedestal and some odours may result. Also efficient composting will be reduced and odours may increase further.

The vent pipe can be located on an outside wall, or through an inside wall. Where it is located will be totally site-dependant. ***The only critical factor is that the top of the pipe has to clear the top of the roof line (ridge cap) by at least 600mm if the Vent Pipe is within 3 metres of the ridge OR be 1 meter above the roof exit point if more than 3 metres from the ridge cap.***

Glue all of the joints *(except the fan)* to prevent the intrusion of moisture. In colder climates, this vent pipe should be insulated to stop any condensation. A 100mm vent pipe cap is supplied to fit to the top of the vent pipe to stop rain entry, and a moisture trap is supplied to fit to the bottom of the vent pipe to collect moisture and protect the fan from damage.

Ventilation Fan

Important – Please Read This Before Connecting the 12 Volt Fan to Power

The high quality 12 volt fan that is supplied with your Waterless Composting Toilet is designed to function 24 hours a day and with proper installation and care, will provide several years of reliable service. Ventilation is one of the most important factors in the operation of a Waterless Composting Toilet and it will ensure that your toilet room remains free of odours.

However, experience has shown that improper installation may result in the failure or greatly reduced life of this product.

Powering the fan by unregulated power sources such as some solar-based systems or other sources in excess of a regulated 12 volts will reduce the life of this fan and may result in immediate failure. ***If you are considering connection to a source other than a transformer or solar panel as supplied with your System, you should read the warranty conditions below.***

Limited warranty conditions - 12 volt fan

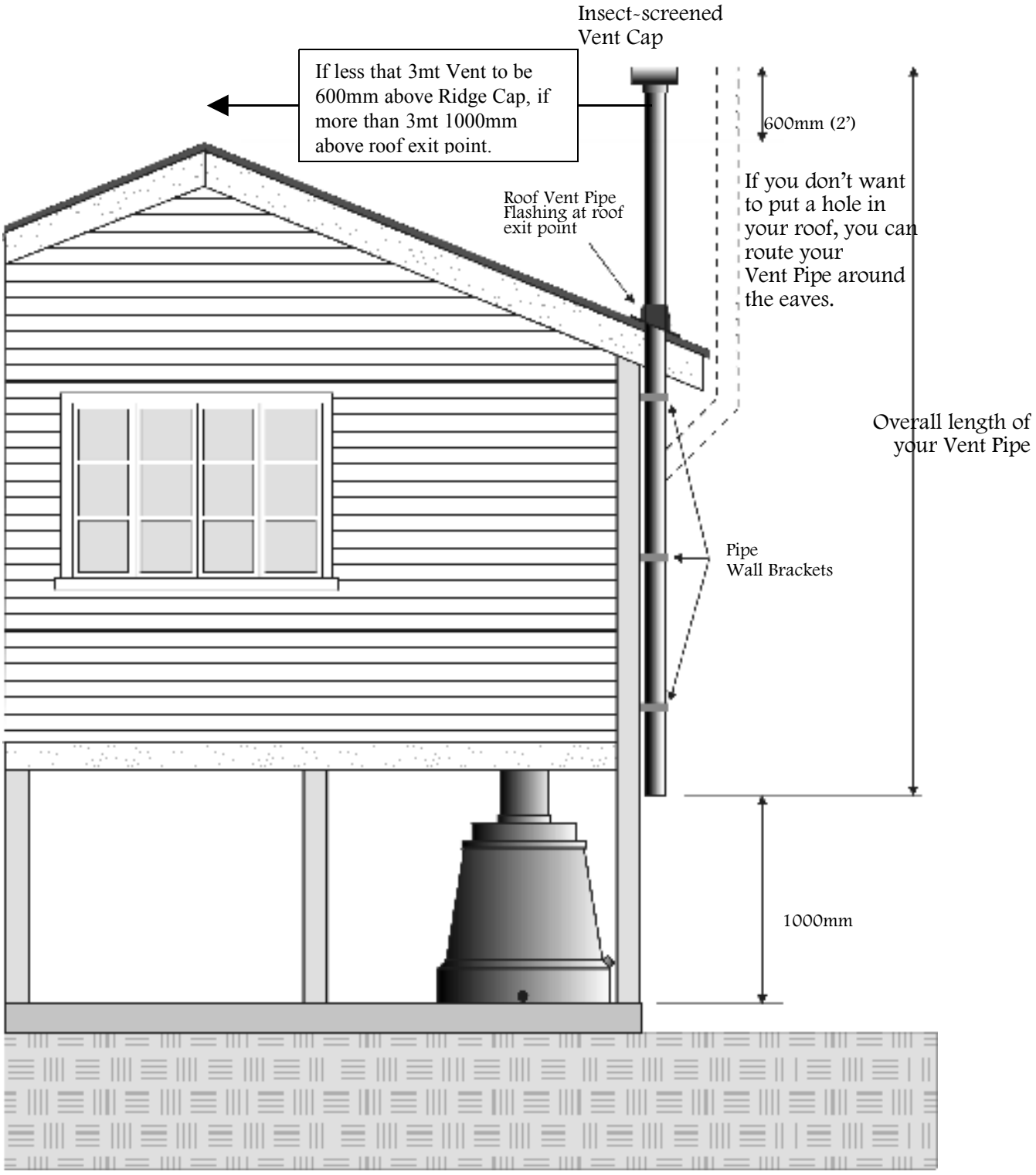
The 12 volt fans supplied with your System come with a three month manufacturer's warranty. South East Worm Farms will arrange replacement of any fan that fails during the warranty period but only under the following conditions:

- The fan must be connected and powered by either a 12 volt transformer or solar panel supplied or otherwise recommended in these Instructions. Connecting your fan directly to a power source other than one supplied or specified by these instructions may result in immediate damage to the fan and will void all warranties.
- The fan must be installed as specified in these Instructions and must not be modified or altered in any way.
- In the event of failure during the warranty period, the faulty fan must be returned to South East Worm Farms who will ship a replacement by regular mail service on the next business day providing that the above conditions have been met.

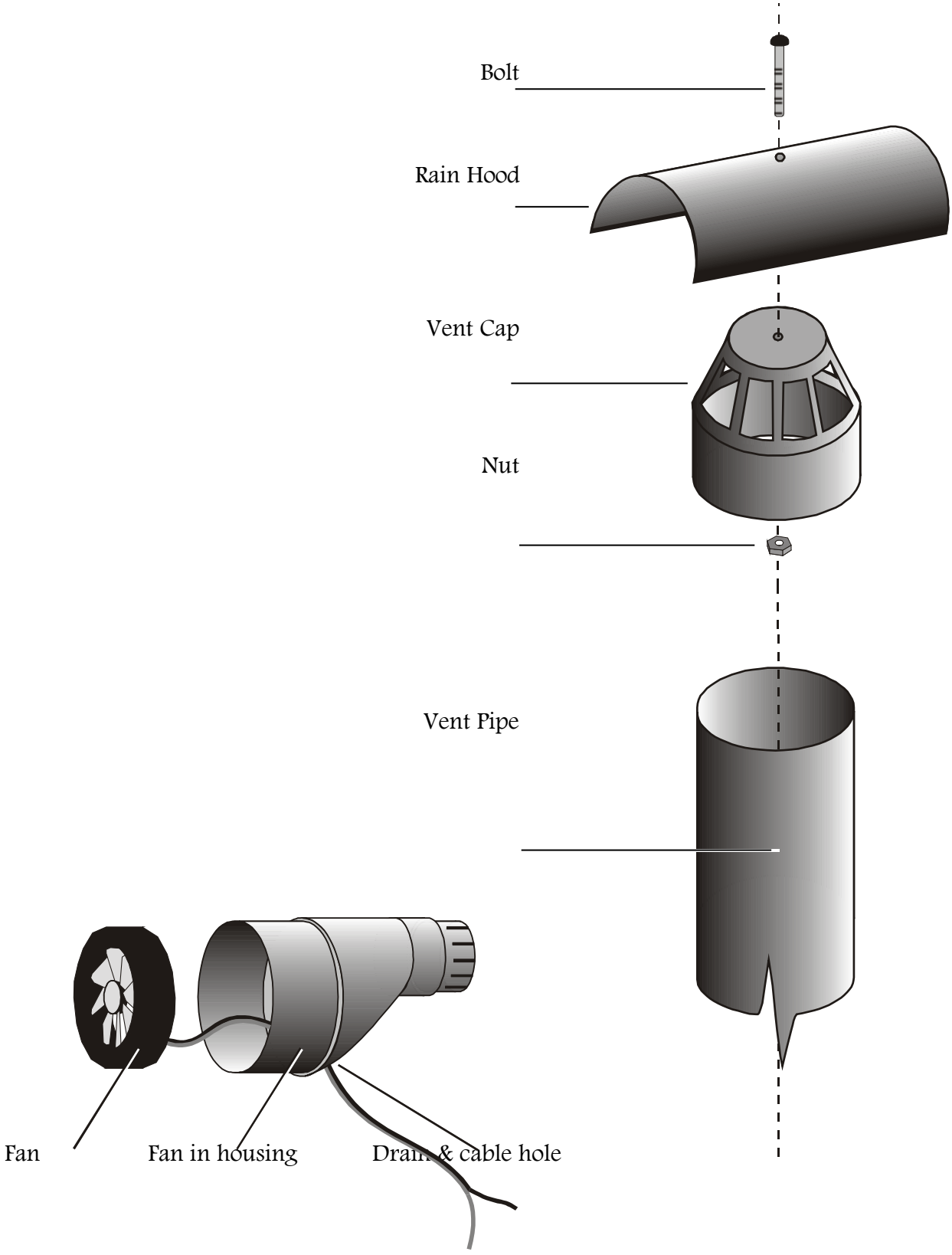
Fans are expected to last about 2 years. It is recommended that a spare fan be kept on hand once the installed fan has been in service more than one year.

Replacement fans that are not covered by the terms of this limited warranty may be ordered directly from Adobe Loos & Worms (02) 6492 7205.

Vent Pipe Installation



Fan & Vent Cap Details



POWERING YOUR FAN

If you have access to Mains Power

A 240/12 volt regulated transformer is included to run the fan from mains power. Simply connect the wires from the transformer to the fan, and plug it in, making sure that you connect positive-to-positive (red-to-red), and negative-to-negative (black-to-black). The fan is polarity sensitive and if the wires are not colour coded connect the terminals and if the fan fails to operate, reverse the connections and then the fan will operate.

The fans are pre-wired to a junction box on the side of the fan housing. If there is a powerpoint within 1 metre, the wires from the transformer can be connected directly to the fan. If this distance is greater than 1 metre, you will need extra cable and another junction box, which can be purchased from any major hardware store. This junction box must be fixed solidly under the floor, or in some other convenient position. Make sure that it is kept out of the weather.

If you already use Solar Power

If your house is powered by solar, you will have a battery bank that will generally be either 12 volt or 24 volt DC. If you have a 12 volt system, just connect the battery directly to the fan. Don't forget to put a 0.5 amp fuse in line to the fan.

If you have a 24 volt system, obtain a voltage reducer (to 12 volts) from your solar supplier which will allow you to run the fan directly from your 24 volt battery bank. The fan will use about 2.8 amp-hours of power on a 12 volt system.

If you have an inverter, ***don't use it.*** The inverter will run very inefficiently when it is powering only the small fan and you will waste a lot of precious power. It may even flatten your batteries.

If you have 12 Volt solar power, you do not need the transformer. Simply connect your 12 Volt supply to the junction box, ensuring that you connect the positive to the red lead and the negative to the black lead.

If you have No Power

Small Solar Panels

A 21 watt solar panel connected to a controller regulator and sealed lead acid 12 volt 33 amp battery should give you continuous power to the fan even during poor weather. This system should power the fan even during 4-5 days of inclement weather. Lower rated systems are also available but will not give you continuous power during prolonged inclement weather.

Whirly Birds

Wind assisted ventilators can also help with the airflow required for a Waterless Composting Toilet. If your site doesn't have power, but gets a reasonably steady supply of wind, then a whirlybird on top of the vent pipe can pull air up through your vent pipe. They have been known to work very well in conjunction with small solar panels.

Enzymes

An enzyme is a substance that acts as a catalyst and initiator in chemical reactions. While enzymes are excellent at accelerating the composting process, they also have a remarkable ability to kill odours. So if your site is only intermittently powered by solar or wind, using enzymes with your Waterless Composting Toilet will help deal with odours.

A proprietary Flush Kit is available with a non-electric, marine-grade Micro Flush pump system to spray enzymes directly onto the solids in your In-Use chamber, and 10 litres of enzyme mix - enough for up to 4000 sprays.

If you find that the enzymes sound like a welcome addition to your Waterless Composting Toilet, a Flush Kit can be added at any time. You can also just buy the enzymes and apply using a hand held domestic spray bottle.

Flush Kit

If you have purchased a Flush Kit with MicroFlush pump system, you'll find it is simple and requires no more skill than is needed to install your Waterless Composting Toilet.

- Unpack the pump and enzyme reservoir and check that you have all parts. You should have the following:
    1. A foot pump unit complete with inlet and outlet lines attached.
    2. A 10 litre reservoir containing two bottles of enzyme concentrate.
    3. A modified In-Use chamber lid, with enzyme inlet and microspray heads positioned to spray directly on the solids in the chamber.
- Determine the position of the pump – on either side and slightly forward of the pedestal. Take time to determine the position that will work best for you before you drill the hole for the pump.
- Using a hole saw, cut a 75mm hole for the pump.
- Place the pump over the hole, with the attached tubing hanging beneath the toilet room floor. The pump should sit comfortably, with space around the hole to screw the pump to the floor.
- Attach the pump outlet line to the inlet fitting that protrudes from the back of the Composting chamber lid. To assist ease of fitting, you may use a hair dryer, heat gun or hot water to warm the end of the tubing before slipping it over the inlet fitting.
- Next, empty the two bottles of enzyme concentrate into the reservoir and top up with tap water.
- Place the pump inlet line (the smaller green tubing) into the hole in the reservoir lid. Make sure the hose is resting on the bottom of the reservoir, well below the level of the enzymes.
- Place the reservoir beneath the level of the connection to the chamber lid; otherwise, you could inadvertently cause the enzymes to syphon into the chamber without your needing to pump, and emptying your enzyme reservoir.
- Prime the pump by depressing it several times – you should see the enzymes fill the hoses and begin to spray out of the under-lid jets onto the chamber floor.
- Screw the pump down to the toilet room floor, and 'lock' it down if you like. Simply push and turn the pump head at the same time to disable the pumping mechanism. If you have children, you may want to leave the pump in this position, so they don't play with the pump and waste the enzymes in a short time.
- This completes the installation of the MicroFlush system.

Liquid Discharge Connection

The liquid discharge connection must be permanently connected to a small absorption trench.

Simply screw the 19 mm fitting into the base of the Composting Chamber and connect the supplied 19 mm hose. A standard absorption trench for excess liquid is shown in the enclosed drawing. ***It is essential that the Liquid Drain maintains a gravity flow from the discharge point on the Chamber to the small Absorption Trench.***

Do not to put the Chamber into a pit that is not well drained and may fill with water.
Do not place the Absorption Trench in a location that may fill with water during heavy rain and so stop the flow of liquid from the Chamber.
Either of these conditions or a combination of them may cause to liquid level in the Chamber to rise and prevent air circulation by the fan. This will stop airflow down through the pedestal and some odours may result. Also efficient composting will be reduced and odours may increase further.

Preparing the Waterless Composting Toilet for use

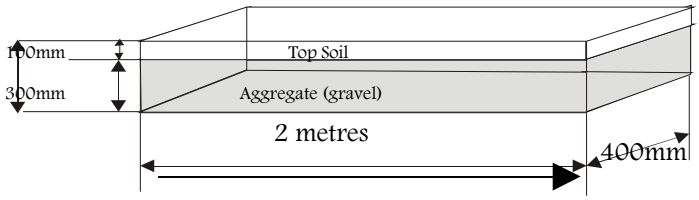
Before installing your Waterless Composting Toilet, it is necessary to prepare it for use. First, lay approximately 15mm of bedding material, shredded newspaper as supplied or clean chopped up straw, on the floor of the compost chamber. Then moisten the bag of Starter Compost supplied to activate it and spread the damp compost evenly over the bedding material. This compost will supply all the micro-organisms required for accelerated composting.

Waterless Composting Toilet
Excess Fluid Absorption Trench

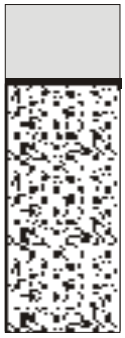
Dimensions for
the Absorption Trench

400mm

Overall Dimensions:
2m x 400mm x 400mm



You will need:
2meters of 100mm slotted plastic agricultural pipe
2 metres of Geotextile mat, Hessian, weed mat or old carpet
0.25 cubic metre aggregate (gravel)



Top Soil

Geotextile (woven plastic) mat,
weed mat or Hessian or old carpet

Aggregate (gravel)

Cross Section of Absorption Trench

CARE & MAINTENANCE

Initial Maintenance

Your Waterless Composting Toilet should be examined at regular intervals to ensure that the fan is working, and the liquid discharge connection is not blocked. If either is not working, there will usually be a tell-tale odour.

To compost effectively, the pile should be kept moist (see 'the composting process'). If it seems there is never any liquid in the liquid chamber, it may be from lack of use or high temperatures. You can overcome this by pouring extra water into the chamber each week.

Fan Motor and Insect Screens

You will also need to clean the insect screen at regular intervals. If the dust builds up on the screen, it will reduce the air flow, which reduces the efficiency of the Waterless Composting Toilet. Site conditions will determine the frequency of cleaning, but it is recommended to inspect it every month. If you are in a very dusty area, you may need to increase inspection rates.

While you are cleaning the insect screen, you should also check that the fan is clean and rotating freely.

Pedestal

The pedestals are hand made. In order to create the unique shape required to minimise soiling, the pedestal is not as robust as mass produced toilets. The seat is solid wood and as such is heavier than the plastic seats normally supplied with standard flushing toilets**.**

This combination means that you should never allow the seat or lid to fall freely onto the pedestal.

ALWAYS REPLACE THE SEAT AND LID BY HAND.

Replacement pedestals are expensive.

Foreign Objects

The system should not be used for the disposal of sanitary napkins or disposable diapers that contain ANY PLASTIC.

Replacement of Chambers

It is very important to observe safety procedures when dealing with fresh human waste. Please ensure that you wear protective clothing (gloves and old clothes). Depending on the individual, a face mask and glasses may also be necessary.

The Waterless Composting Toilet chambers will need to be changed on a regular basis. If they are used consistently by the same number of people, you will soon see how often the 'In-Use' chamber needs to be replaced.

Every few weeks you will need to shine a torch down the toilet pedestal to see if it is full.

When the 'In Use' chamber is full, you will need to swap it with the other chamber. First, prepare the spare chamber with 15mm (1/2 inch) of bedding material and a handful of mushroom compost.

Ensure these materials are insect-free or you will introduce insects into the system.

Disconnect the fan assembly and liquid discharge connection at the base of the chamber. Lift the lid slightly and slide the compost chamber to one side and immediately put the spare, sealed lid on it.

Before removing the full chamber, you may want to put a small bucket of mushroom compost or clean mulch, ie, sawdust, straw or grass clippings, down the chute to cover up the waste pile. This will reduce the odour, and assist the composting.

The spare chamber can then be placed into position under the toilet pedestal, and the lid lowered into position.

You now have an empty chamber in service and a full chamber by itself. This full chamber is best placed in a sunny position to speed up the breakdown process.

For hints on effective composting techniques, see 'The Composting Process'.

Removal of Compost

When the second chamber is full, the first chamber should be well and truly composted. This 'humus' must then be disposed of as per the local health department regulations. This normally means placing the humus in a trench 300mm deep and covering with soil. It is also recommended to wear rubber gloves and protective clothing when emptying a container. Ensure burial is not within 100m of a potable water supply.

Always leave a small amount of this humus to 'kick start' the composting process when it goes back into service. Use it in the same way as the mushroom compost when you commissioned your Waterless Composting Toilet. Alternatively, you can add a few handfuls of compost from your active garden compost pile, or buy a bag of mushroom compost from your local nursery.

Returning a Chamber to Service

When the compost chamber has been emptied, you can put it back into service. Before you do this, it is a good idea to wash it with a hose to remove any solid particles. Also, ensure that all hose and vent connections are clear. Place 15 mm of bedding material on the floor and spread the humus (or mushroom compost) in the centre of the chamber. It is then ready for exchanging.

If your chambers are filling up too quickly, it is very likely that your Waterless Composting Toilet is being overloaded. You will need to add another Composting Chamber and you can contact South East Worm Farms to arrange this.

Cleaning the Pedestal and Seat

Just like any other toilet system, you will need to clean it occasionally. To do so, use the enzyme liquid used as a compost activator, or a small amount of water with bio-degradable detergent.

THE COMPOSTING PROCESS

All organic materials will eventually break down.

Organisms and micro-organisms present in the open environment, bacteria, fungi and insects, will begin to inhabit and feed on the material, beginning the decomposition process.

As the material decomposes, its mass will greatly reduce. It's a basic, natural process that occurs wherever organic material accumulates, such as on a forest floor.

Composting is simply a way of speeding up that process. Through the design of the Waterless Composting Toilet, that process is controlled to ensure maximum efficiency and safety.

Ingredients

The essential ingredients of a compost heap are organic materials, micro-organisms, moisture, oxygen and temperature.

Organic Materials

In the Waterless Composting Toilet, the organic material used for the composting is human waste. It is not advisable to add vegetable matter as it will attract fruit flies (or 'vinegar flies') to your compost heap.

Micro-organisms

Some hundreds of species of micro-organisms, mostly bacteria, fungi and actinomycetes, are involved in decomposing organic materials. Most organic materials already have a native population of micro-organisms. With the Waterless Composting Toilet, we use this natural population, as well as introducing a large supply of micro-organisms (in the form of spent mushroom compost) to 'kick start' the breakdown process. These micro-organisms start their work of decomposition as soon as moisture and oxygen levels are favourable.

Moisture

The moisture content of a compost pile is very important. Below 40%, organic matter will tend to dry and not decompose rapidly. Over about 60%, not enough air can get into the pile and it can become anaerobic (no oxygen).

A moisture content of approximately 50% is ideal for composting. The Waterless Composting Toilet maintains this optimum condition in 2 ways. First, the liquid waste (urine) is separated from the solid waste immediately, by displacing it through a perforated floor into the liquid chamber. This prevents the process from becoming anaerobic. Next, the semi-sealed nature of the chamber tends to keep the humidity high. This high humidity ensures that the compost pile maintains an optimum level of moisture.

Oxygen

Micro-organisms that require oxygen to survive are called aerobes; those that do not are called anaerobes. Organic materials are decomposed most rapidly by aerobes (much quicker than the anaerobes used in septic systems).

Aerobes need plenty of air – many cubic metres/day – for rapid breakdown. Inadequate aeration allows anaerobes to supplant aerobes inside the compost pile, which leads to foul odours and slow decomposition rates. The Waterless Composting Toilet supplies ample oxygen for efficient composting with a small ventilation fan that supplies up to 420 litres of air/minute. This has the added advantage of acting as a highly-efficient extractor fan whenever the toilet lid is open.

Temperature

The heat coming from piles of organic materials is generated by the feeding and multiplication of millions of micro-organisms. Technically, the stage of the temperature cycle below 40 degrees C is termed mesophilic; above 40 degrees C is thermophilic. Composting is most rapid in the thermophilic stage.

As the temperature rises over 40 degrees C, mesophilic organisms die out and are replaced by an upsurge in the population of thermophilic organisms (the agents of fastest decomposition). Later, as the temperature drops, mesophilic organisms re-invade the centre of the pile from the cooler outer layer.

The Waterless Composting Toilet keeps the temperature in the thermophilic stage in several ways:

1) The containers are dark coloured. This means that they are an excellent absorber of heat, especially if they are located in natural sunlight.
2) The incoming air is entering via your toilet room. The air in most houses is warmer than the outside air (especially in winter). This warmer air tends to increase evaporation and aids in the composting process.
3) The compost chamber can be insulated by wrapping thermal insulation around it to hold in the heat generated.
4) In cold climates, we recommend using a heater system.

Pathogens

An important function of the composting process is the destruction of pathogens. Most are killed in the thermophilic stage, as composting at temperatures above 55 degrees C for 1 day kills almost all pathogens.

As the Waterless Composting Toilet chamber is in use for a minimum of 9 months, there is little chance of any pathogens surviving. In addition, the unique use of isolated chambers ensures no recontamination from fresh waste.

A typical analysis of the humus from a Waterless Composting Toilet shows no traces of Faecal Streptococci, Faecal Coliforms or Salmonella sp.

WORMS

Worms can be used in the in-use chamber provided the temperature does not get too hot. If you are in a cool climate worms may survive in the in-use chamber. You can try worms in the in-use chamber, if they do not survive they will simply compost with the rest of the organic matter in the chamber. Worms can definitely play an important role in the function of the Waterless Composting Toilet out-of-use chamber:

- by tunneling through a compost pile, they increase the availability of oxygen and the compost pile's ability to retain moisture.
- by producing benevolent bacteria in such overwhelming numbers that disease-producing bacteria find life difficult in an earthworm-rich environment.

The most common 'composting' worms are the Red, Tiger, and Blue Worms. All are ferocious eaters and rapid breeders. Worms will eat up to their own body weight each day. South East Worm Farms can supply you with Compost Worms through the mail if required, call 02 6492 7205.

Their by-product is called vermicast, which – like humus composted in a Waterless Composting Toilet toilet – is quite free of pathogens; it is also an excellent fertiliser for plants – better than pure humus.

A worm population can double in 12-15 weeks. This means that their processing of the contents of the chamber increases exponentially. When their food supply declines, the population diminishes, leaving a chamber full of pure vermicast. If there are any worms left alive, they can be transferred to the next chamber, or put into the ground as a soil improver.

Worms survive best in moisture and pH levels very similar to those ideal for composting. The only difference is their preferred habitat temperature of 20-30 degrees C. Above and below this range, the action of the worms will slow until optimum conditions return.

Now, recall that as temperature rises over 40 degrees, the number of mesophilic and thermophilic micro-organisms increases rapidly and continue the rapid breakdown of the compost pile in the Waterless Composting Toilet.

So, regardless of temperature, an ideal symbiotic relationship between macro-organisms (worms) and micro-organisms ensures that the Waterless Composting Toilet works to absolute maximum efficiency.

TROUBLE SHOOTING

Please read this section before using your toilet

Waterless Composting Toilets have proven themselves to be one of the easiest systems to manage. However being a natural process, reliant on a number of factors beyond our control, it can occasionally need some help to maintain an appropriate balance. The following suggestions should assist you to sort out any problems which may arise.

- **The In Use chamber is filling too quickly:**

This may be caused by a number of factors;
The temperature is too low for effective composting. You can improve this problem by wrapping the chamber in insulating material (including the base).

Insufficient air flow. This can be caused by a broken fan or the chamber being too full. Check the fan is operating and that the level of the pile is not too high. This problem could also be caused by a blocked insect screen. The positioning of the main screen in the body of the fan housing makes it a simple matter to clean.

The pile being too wet. This could be the result of the outlet of the liquid chamber being blocked and causing the upper chamber to flood. (This would also cause the fan to malfunction). Check the drain hose is not blocked. If this does not seem to be the cause of the problem then the exit from the liquid chamber is probably blocked. If this is the cause of the problem you will need to change chambers and thoroughly flush out the contents of the liquid chamber through the **50mm** air vent hole.

Antibiotics and disinfectants will slow down or stop the process. Restart the composting by reintroducing micro-organisms by covering the pile with a 25 mm layer of mushroom compost.

In many of the above situations the adding of enzymes will help solve inefficient composting by breaking down the solids and thereby speeding up decomposition. A small bottle of enzyme concentrate costs $8 including postage. It can be applied using a domestic spray dispenser. (Enzymes also reduce odours emitted from the vent pipe and are recommended for cleaning toilets and as a general multipurpose cleaner). The annual cost of using enzymes is about $20.

- **The out of service chamber is composting too slowly:**

This may happen as a result of one or more of the problems described above. At this point the most effective course of action is to aerate the pile by turning it over with a pitchfork. You could also spray enzymes from a domestic spray bottle as you turn the material and add some mushroom compost.

You should also consider locating the chamber where it has a greater exposure to direct sun light, even if this means disconnecting it from the vent pipe. To encourage air to flow through the system you can attach a small solar panel to an Out of Use chamber fan.
You can also introduce worms to the out of use chamber which will have the added benefit of enriching the resulting humus.

If there is not enough time for any of these measures to take effect prior to rotating the chambers you might consider adding an additional chamber.

If none of the above suggestions is giving the desired results it is possible that the pile is too compact or the carbon/nitrogen ratio is too low. Add, on a regular basis (try twice a week) to the in-use chamber, a cupful of fibrous material with a high carbon/nitrogen ratio (grass clippings). This will redress the imbalance and improve air flow. Alternatively increase the amount of toilet paper that you use. Please note that adding these materials will increase the speed at which the chamber fills. Good examples of such materials are shredded newspaper, rice hulls, chopped straw or wood shavings (not sawdust).

- **Odours coming up through the Pedestal**
  a. Check the fan is working, if not, it may need replacing.
  b. Check that the Flexible Air hose has not filled with water in a downward "U" that may have developed between the Chamber Vent Outlet and the Fan in Housing inlet. If this has happened, disconnect one end of the Flexible Air hose and empty the water and then reposition the Flexible Air hose to prevent the downward "U" occurring again. Refer to page 13 of this Manual.
  c. Check that the Liquid Discharge is not blocked or "backed up" from the Absorption Trench. If the Liquid Discharge is blocked, change Chambers, and when the "blocked" chamber is composted flush the Liquid Discharge with water from a garden hose. Refer to page 20 of this Manual.

- **Vinegar Flies:**

Sometimes vinegar flies are attracted into the chamber and can breed. Should this problem occur in your system refer to our information on 'How to deal with vinegar flies'. It is best however to not let them in.

Another potential entry point for flies is where the lid overlaps the chute. You could apply petroleum jelly (vaseline) to the joint area however the rubber sleeve should effectively block this entry point.

It is possible for flies to enter the system via the pedestal opening. If flies get into your system in this way we would suggest that your toilet room is insect screened with Solar-Mesh (call 1800 700 703) as regular insect screens are not fine enough.

As the pile builds up it is more difficult for air to circulate and as a result processing is slowed down. Slowly composting piles attract flies. This situation can be improved by adding fibrous carbon rich materials (for best results this should be done from the start) as described above. Changing the chambers more often, if practical, will be beneficial. The use of enzymes can also be very helpful (again for best results this should be done from the start).

Please note that broken fans should be replaced immediately in order to avoid flies entering the system. **It is recommended that you keep a spare fan on hand at all times.**

- **The odour from the out of service chamber is unpleasant:**

If the out of service chamber is not connected to the vent pipe it may smell immediately after it has been taken out of service. Odours can be greatly reduced or eliminated by covering the top of the pile with straw or grass clippings. You may wish to do this before disconnecting the chamber.

(Please make sure you use protective clothing and gloves when handling any human waste.)

HOW TO DEAL WITH VINEGAR FLIES

Vinegar flies are very small and can penetrate standard fly screens. They can appear during the warmer months of the year and are attracted to materials which are decomposing.

To minimise the risk of them being attracted into your toilet chamber you must ensure that the seat and lid are closed at all times, except when the toilet is in use. For other useful suggestions on how to reduce the chance of vinegar flies being attracted please refer to our 'Trouble shooting' information. It is important to avoid flies entering the system because once they have moved in they can multiply.

Once vinegar flies have entered your chamber it is difficult to remove them. No one remedy works for all installations. We can only suggest that you experiment with the following methods which have been successful in minimising the problem. In all cases it is recommended that the treatment is carried out daily for ten days to ensure that the breeding cycle is broken.

Pyrethrum spray

This is a natural insect repellent and can be purchased at garden and hardware stores. The Yates and Mitre 10 brands have been found to be most effective. It should be sprayed directly on the pile, the sides of the chamber and the lid. It can also be sprayed into the pedestal each time you use the toilet.

Wood Shavings

A light covering of shavings sprinkled over the pile. Wood shavings are stocked by produce stores. (They are used on horse stable floors)

Comfrey leaves

Drop a handful of comfrey leaves into the chute, ensuring that they get into the chamber. Comfrey leaves grow wild or can be cultivated.

Garden lime

A light covering of lime sprinkled over the pile. Lime can be purchased from most hardware stores.

Bin Kill

This is a product available form hardware stores which is designed for use in wheelie bins and has been reported to be effective with composting toilet chambers.

Mulch

A thin layer of mulch as per the bedding material supplied with the Waterless Composting Toilet.

Other Questions

If you have any questions about the operation of your Waterless Composting Toilet please call Kym Mogridge at Adobe Loos & Worms for advise. Contact numbers are:

02 6494 1051 or 0427 277 249