

ROTA·LOO

RL2000 Owners Manual



Compostable Batch Cycle Toilet System



**FABRICATION
ROTOMOULDING**

Proudly manufactured in Australia by

PFG Group Victoria

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www.rotaloo.com.au

CONGRATULATIONS AND THANK YOU FOR PURCHASING A ROTA-LOO 2000

The Maxi RL2000 has been designed as a public use toilet facility with capacity for high use 2 toilet pedestals (Male and Female). It requires no water, minimal maintenance and leaves no unsanitary waste or ground seepage so is particularly suited to environmentally sensitive and 'out-of-the-way' locations.

The first portable composting toilet came into Australia from Sweden in the late 1970's. From this idea the Rota-Loo was born, and has been developed and improved over the years to become one of the best Waterless Composting Toilet (WCT) systems in the world and have been successfully installed and operated in thousands of places throughout Australia, New Zealand and further afield.

Today, Waterless Composting Toilets are becoming more widely accepted and other products have appeared on the market. With Rota-Loos installed decades ago still operating well and owners recommending them to others, the Rota-Loo remains the simplest, most efficient and cost effective WCT available.

We hope the Rota-Loo fulfills your expectations and that it may even ignite a hidden passion to live a sustainable lifestyle and pass on the message. If you have difficulty in installing or maintaining your Rota-Loo, please get in touch with your supplier or through our website at www.rotaloo.com.au.

Do not store your RL2000 in the open. Please store under cover.



AS/NZS 1546.2:2008 is the Standard that sets out the requirements for the design and performance of Waterless Composting Toilets to assure of safe, effective and efficient operation. Authorities regulating the installation of Waterless Composting Toilets (local Councils etc) require Certification to the Standard to approve the installation of a system like Rota-Loo

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INTRODUCTION

The aim of this section is to give you an overview of the use of a Waterless Composting Toilet and in particular a Rota-Loo. It will cover the composting process, and how Rota-Loo works to ensure correct composting and what you will need to consider in the installation of your Rota-Loo.

THE COMPOSTING PROCESS

Composting is nature's recycling process. It is how organic material is broken down by micro-organisms to produce a rich product called Humus, an organic fertiliser, mulch and soil conditioner made from decayed organic material. Because human waste is an organic material, it can be composted to produce humus. The quality of the humus from a Waterless Composting Toilet (WCT) will be influenced by the design and installation, the materials you are adding and climatic conditions. In a correctly installed and maintained Rota-Loo you can create humus which is soil like in texture and smell.

There are two main groups of bacteria that can be used in composting. Aerobic (requires oxygen) and anaerobic (no oxygen required). Aerobic bacteria processes material faster and with significantly less odorous gases than anaerobic bacteria. If the material in the bin gets too wet or compacted down, air (oxygen) cannot circulate through the pile and aerobic bacteria will die out and be replaced by anaerobic bacteria. Anaerobic bacteria are responsible for creating odours (nitrous oxide or rotten egg gas") which are associated with some composting and septic systems.



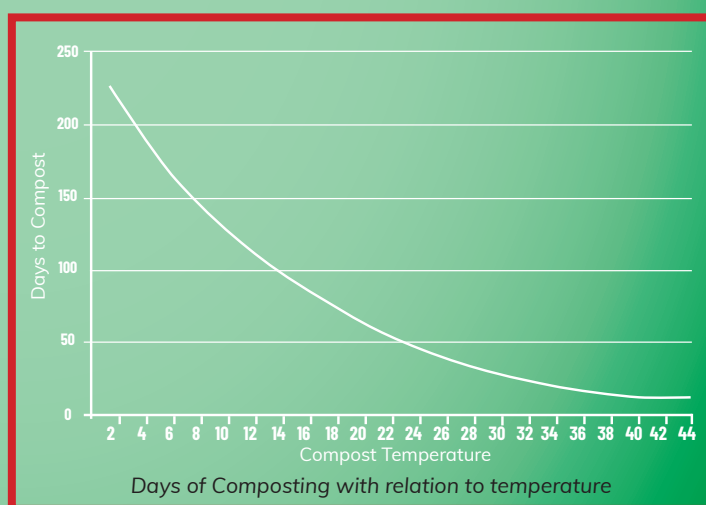
To maintain aerobic decomposition, it is important to keep the moisture containment of the material below 70%, and ideally between 50% and 60%. As fecal matter is 70-80% moisture and urine about 95%, for a WCT to work correctly there must be a method to separate the liquids from the solids.

The heat of the compost pile is also very important in composting. Depending on the temperature there will be different dominant bacteria groups:

- Below 5°C very little activity takes place.
- From 6°C to 20°C – Psychrophilic,
- From 21°C to 45°C - Mesophilic,
- From 46°C - 71°C Thermophilic.

From the graph shown (from AS1546.2) the time for organic material to be composted is very dependent on the temperature. Heat will be generated by the bacterial activity, but holding that heat and adding to it is important for effective operation of a waterless composting toilet system.

A realistic operation is to encourage the Mesophilic bacteria by maintaining warmth in the WCT and adding bulking materials to promote a loose textured pile that allows good air flow (oxygen supply). The Carbon-Nitrogen ratio (C/N) is a further important aspect in composting. Carbon and Nitrogen is the food required by micro organisms. The C/N Ratio can vary from 40:1 to 25:1, but in general terms you need a lot of Carbon to a small amount of Nitrogen so for optimum efficiency some high carbon bulking materials should be added.

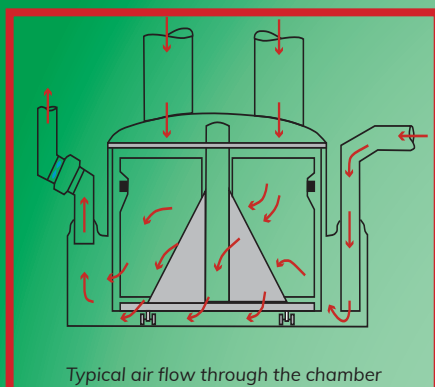


To learn more about naturally disposal of human waste and how to improve the composting process and end product, the book "The Humanure Handbook" by Joseph Jenkins is a useful resource.

HOW ROTA-LOO WORKS AND ENSURES EFFICIENT COMPOSTING

Rota-Loo deals with human waste using natural aerobic (requires oxygen) composting turning it to Humus, a soil like fertiliser which can be easily disposed of. This is achieved by keeping the composting pile dry and air circulating to provide the necessary oxygen.

The RL2000 has 8 large buckets sitting on a turntable in the Rota-Loo. Waste falls into the bucket(s) positioned directly below the toilet pedestal(s) which allow liquids to drain away into the base. Excess liquid may be drained away into a secondary system (see page 11). It may be worth considering including a waterless urinal in some installations to divert some liquid away from the solids pile.

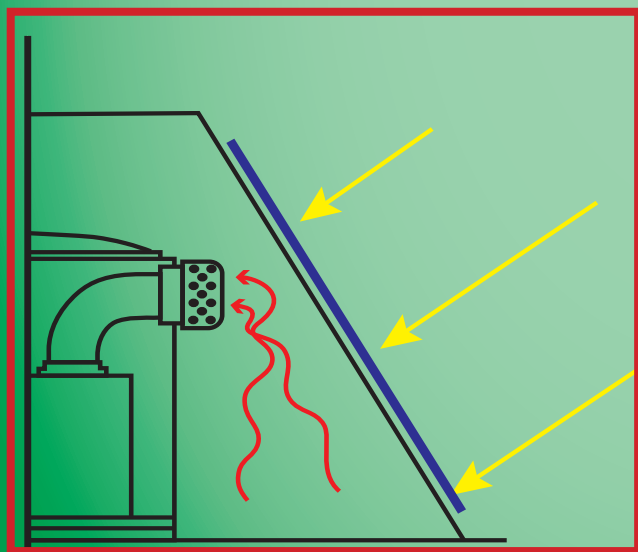


An air-warm airflow is promoted by a continuously running fan drawing air through a vent pipe heated by solar radiation, which both dries the composting solids and provides oxygen for the aerobic process. The fan also ensures airflow down the pedestal creating negative pressure and controlling any odours that may occur.

When the bucket is full it is rotated within the chamber where it stays promoting a good composting environment. Upon full rotation, bringing the original bucket back (rotation brings it back to the pedestal), composting should be complete and the Humus can be disposed of. Composting time is dependent on the pile temperature, but it is generally recommended that each bucket should stay in the Rota-Loo for at least

12 months. In the case of very high usage, where buckets may be rotated for use before composting is complete, additional buckets can be supplied to allow for further composting time. Heat for composting is generated by the bacterial activity. Retaining the heat available is important and adding extra heat will assist the process. Using good insulation within the structure and passive solar heat are both important methods to create and retain internal warmth.

The design of the Rota-Loo provides a natural air-gap insulation around the bins. It is recommended that the Rota-Loo is installed in an insulated space to help retain heat - this is particularly important in cold climates where temperatures are regularly below 10°C. Placing the Rota-Loo in a sun-facing position and/or in a Soltran module will improve operation.



The Soltran Principal
Clear sheeting is angled at 60 degrees with the largest surface preferably facing north. The rays of the sun heats up the cool air inside, the warm air is drawn into the Rota-Loo by the fan in the vent pipe. The front of the Soltran can also be used as the access door to the Rota-Loo room.

A significant amount of heat is lost in the airflow system, so a Rota-Loo installation requirement is that the inlet air is drawn from a warm air area, preferably through piping that acts as a solar collector (being placed in a sunny location and painted black are the simplest methods).

When a composted bin has rotated through the Rota-Loo chamber, it will be ready to empty before filling again. If all has been operating well, the result will be a soil like Humus compost which can be used as a fertiliser in the garden.

State Regulations often stipulate the disposal methods of composted waste from a compostable toilet. Please check with your local authority. Typically in Australia, authorities require that humus from a composting toilet be buried with 300mm of soil on top and in a location that is not intended to be used for food cultivation for three months.

A QUICK GUIDE - INSTALLATION

It's all in the planning! Read **Pages 4 to 6** for a detailed guide in properly planning your installation.

For proper operation of the Rota-Loo you should consider a number of issues during the building design stages to enable the natural composting processes the best chance to give trouble-free operation. The design of the site and building needs to allow for:

- The location of the toilet pedestal(s) in the building as well as the required structure to have the Rota-Loo placed below floor level.
 - Space for the Rota-Loo and a firm, dry and sheltered base for it to sit.
 - Adequate access to service and maintain the Rota-Loo.
- Warmth to assist the composting process by locating the Rota-Loo in a sunny place and maybe installing insulation, particularly in cooler climates around the structures cavity
 - Good ventilation to provide oxygen and evaporate liquids
 - Electrical supply (240VAC or 12VDC) to the fan location
 - Excess Liquid (urine) that may occur in high use areas

The Rota-Loo RL2000 is supplied as a kit containing most of the components required and can be installed using basic building tools and materials available at plumbing suppliers or hardware shops. See the Appendix on **Page 22** for a list of supplied parts and required materials and tools. **Pages 7 to 11** highlight your installation instructions.

Installation of the Rota-Loo involves:

- Positioning the Pedestal and Rota-Loo to ensure a vertical drop from the pedestal to the waste bins
 - Preparing a flat, level and firm base for the Rota-Loo to sit
- Installing the ventilation pipe-work, including vent pods, inlet, fan and Turbo Vent
 - Connecting the Pedestal, waste chute and Rota-Loo
 - Final checks before use.

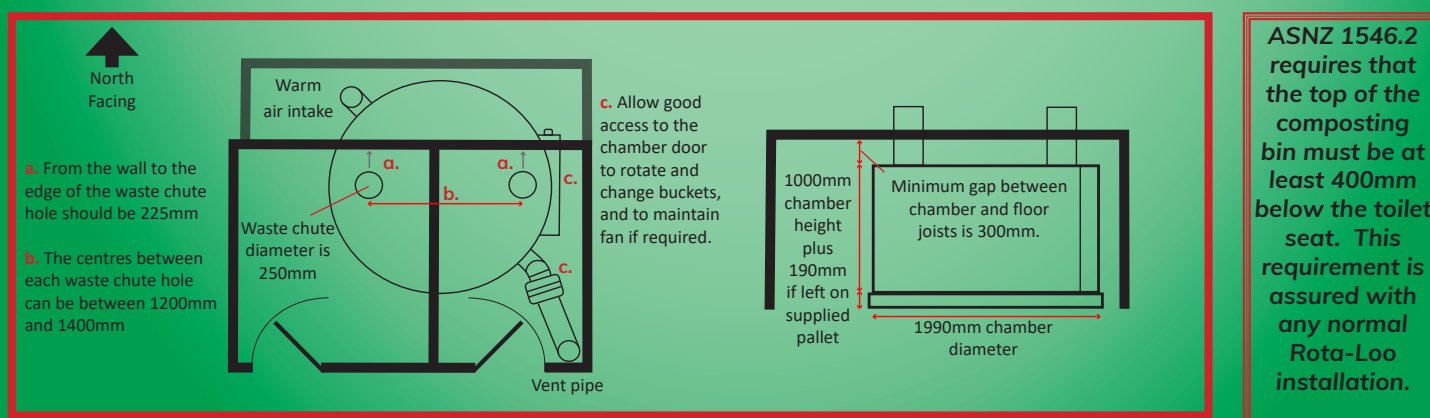
PREPARATION & BUILDING DESIGN

Space Required

The building needs to allow easy access for the removal of the compost bins and servicing of the fan. Because the Toilet pedestal is elevated above the Rota-Loo, situating the Rota-Loo building on a slope may be beneficial, allowing easier access to the toilet. Other considerations for the building layout:

- The Air vent inlet should be on the warm side of the building
- The vent inlet and outlet should be diametrically opposed.
- Toilet pedestals must be directly over a bucket - if 2 pedestals are to be used, they should be located over opposite buckets.

The basic dimensions of the floor plan and minimum clearances of your building must be the same (or larger) as that shown in the picture below to accommodate your Maxi Rota-Loo.

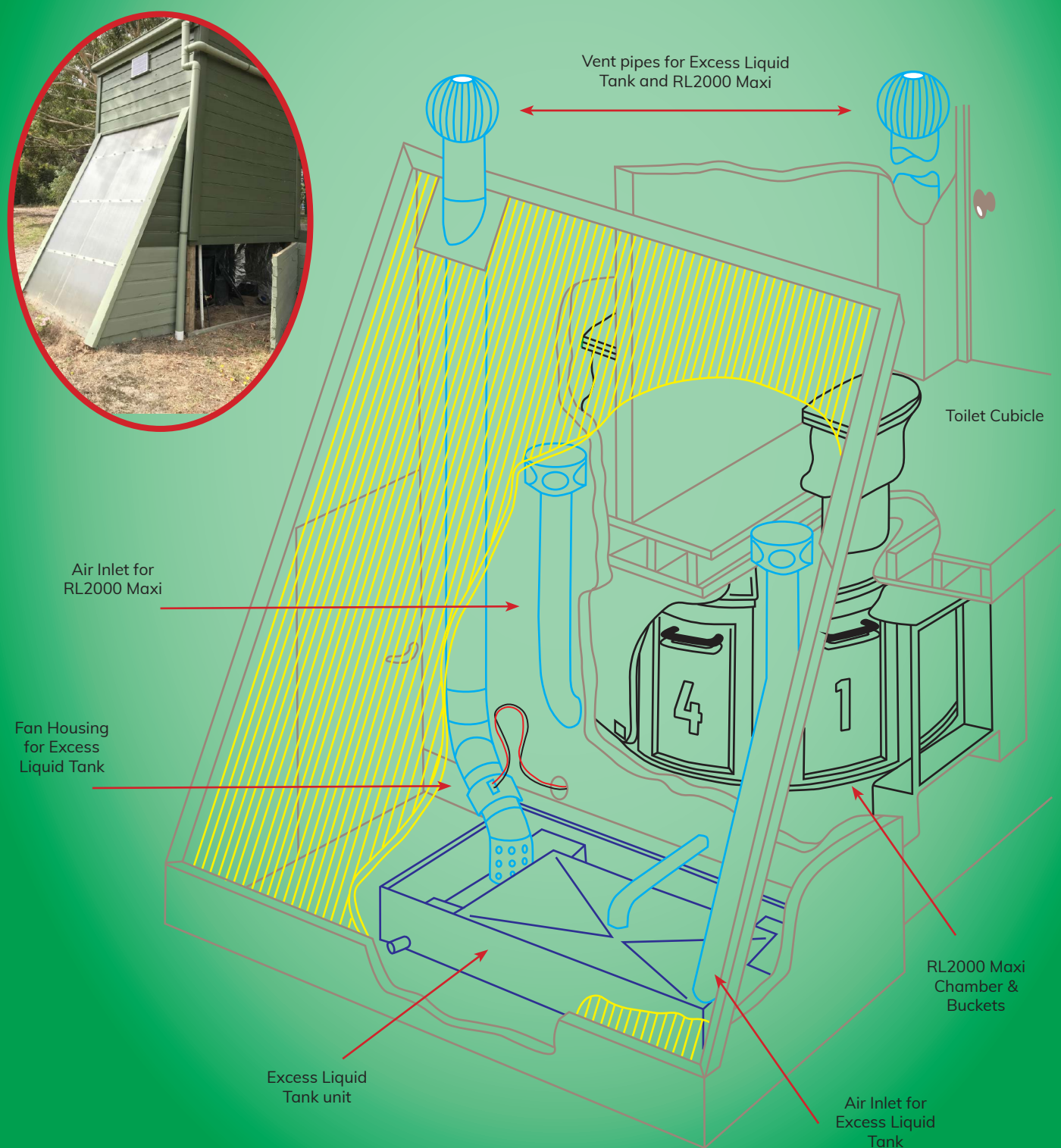


Allow sufficient space to permit fitting insulation throughout the build cavity. This is essential in cold climates. See graph on page 2 for further information.

PREPARATION & BUILDING DESIGN Cont...

The Vent inlet pipe should be located on the North side and it is recommended that north facing solar transfer be used where possible to provide heat for the Rota-Loo and Excess Liquid evaporation where installed.

- If your Maxi is going to have a solar powered fan there needs to be northern exposure and a clear view of the sun.
- If your Maxi is going to have an evaporative trench to handle any excess liquid your site needs to have a patch of level diggable ground adjacent to the building. If your building is going to have a suspended concrete floor it is best not to use the chutes as forms when pouring the slab on decking. Plan to cast the holes about 30mm larger. They can always be grouted later.
- The drawing below shows a typical Maxi Rota-Loo installation with Excess Liquid Tank and Soltran enclosure.



INSTALLATION

Prepare Base for Rota-Loo Maxi 2000

- The Maxi must be placed on a level, hard dry foundation. If you don't wish to pour concrete, paving slabs on 100mm of compacted sand are quite adequate. In damp areas it is advisable to put a vapour barrier (black builder's plastic) between the sand and concrete or slabs. In addition to this, insulation is required between the Maxi and the floor; this can be Masonite, builders plywood or cement sheeting. The pallet on which the Rota-Loo is delivered may serve as part of the base and insulation for the installation.
- Take the door off and remove all the bins from the Maxi and set them aside.



Position Chamber and Pedestals

Reminder Notes:

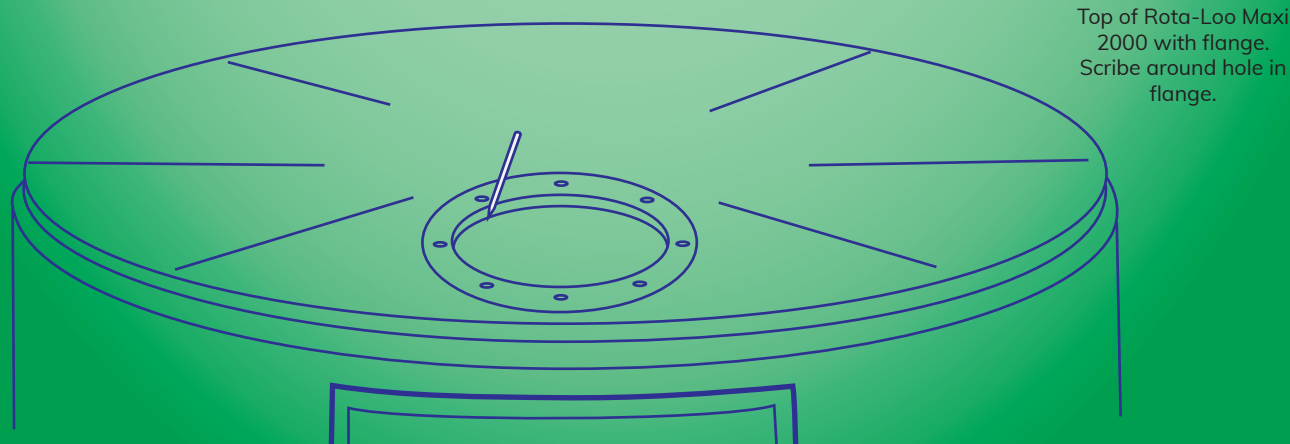
*Be careful not to install a toilet light directly above the pedestal.
The floor joists will need to be clear of the waste chute and provision should be made to secure the waste chute to the floor joists or another part of the building structure.*

1. Mark the holes in the floor of the toilet cubicle. The Maxi is normally fitted with two pedestals. These are located over diagonally opposite chambers at between 1200mm and 1400 mm centres, with a recommended centre distance of 1350mm.
 - The Pedestals must be directly above the Rota-Loo and the waste chutes must be vertical
 - Ensure that the waste chute hole positions are clear of floor joists and do not impact the structural integrity of the floor.
 - Place the pedestal in position and check that with the waste chute centre lined up, there is adequate clearance of the pedestal to walls.
2. Drill a small hole in the centre of the marked chute hole, position the Maxi under the floor and check with a plumb bob that the hole centre aligns with the eventual centre of the chute on the top of the Rota-Loo. Also check before you cut the holes that you don't have to shift or trim the floor joists.
3. When the location of the waste chute centres are confirmed, cut a hole in the floor to allow the waste chute to fit through (260mm diameter)

Fit Waste Chutes to Rota-Loo Chamber

Don't cut out the Waste Chute hole in the floor until you are sure you have everything lined up in case you need to adjust the position.

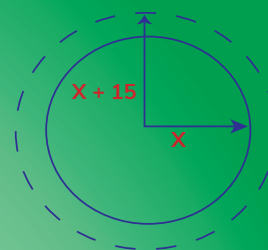
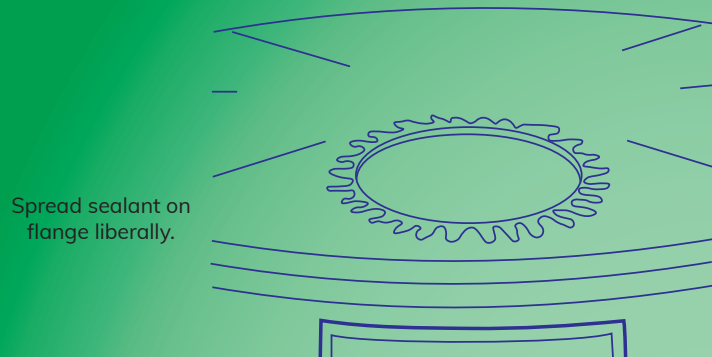
- Using the centre point determined by the plumb bob, or by inserting the waste chute through the floor, locate the Waste Chute Flange in position on the Maxi RL2000 lid **directly under the chute**
- Scribe the size of the internal hole in the Waste Chute Flange



Top of Rota-Loo Maxi 2000 with flange.
Scribe around hole in flange.

INSTALLATION Cont...

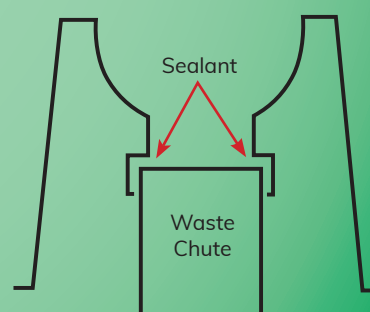
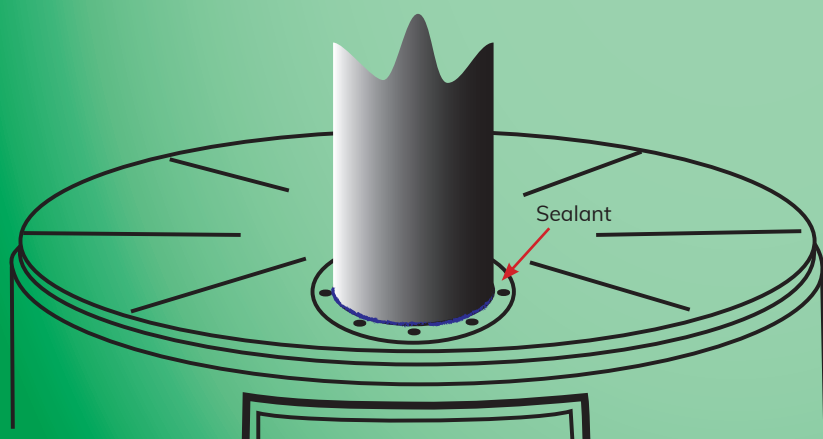
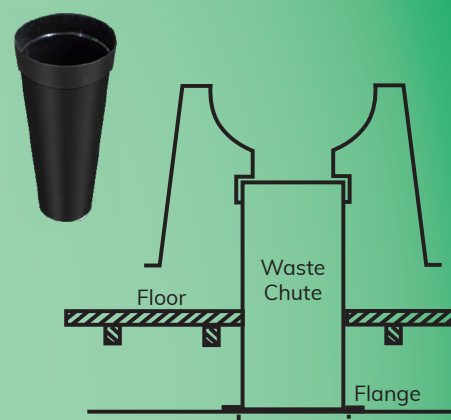
- Remove the flange and scribe a second circle that has a radius 15mm larger than the first.
- Cut out around the larger circle ($x+15\text{mm}$ radius) and clean up around the hole.
- Liberally apply sealant around the edge of the hole



TIP

Our current product is Sikaflex PRO which we have found good in sealing polyethylene to polyethylene.

- Place the flange in the hole. Drill pilot holes and fasten in place with the stainless steel self tapping screws provided. Check that the Waste Chute fits vertically through the floor before finally sealing and screwing.
- Place the Waste Chute in position and place the toilet pedestal onto the Waste Chute. Measure the distance Y (height of Pedestal above floor).
- Remove the Waste Chute and cut off the measured distance from the length of the Waste Chute. NB - one end of the Chute has a socket, which is provided for when more than one Chute are joined together - this end should be cut off so the final Chute is smooth and straight.
- Replace the Waste Chute. Seal with sealant the inside pedestal lip, where the Waste Chute meets the pedestal. Fix the pedestal to the floor.



Fixing Vent Pipes

Two Vent Pipe connection Pods are supplied with the Maxi RL2000:

- One with a hole cut for a 100mm DWV pipe - this is the Inlet connector
- One with a hole cut for a 150mm DWV pipe - this is the Outlet connector
- The vent pipes are not supplied with the kit as each installation will be unique. All connections are designed to fit standard 100 and 150 DWV PVC pipe.
- Keep bends in vent pipes to 45 degree - 90 degree bends are too sharp and slow the airflow unnecessarily.

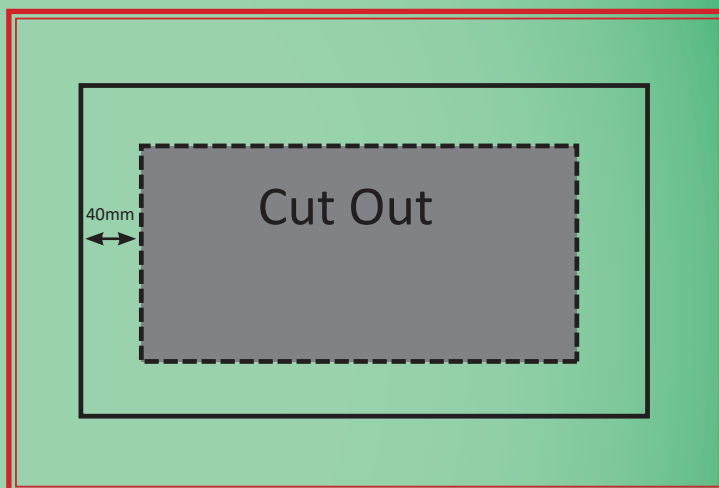
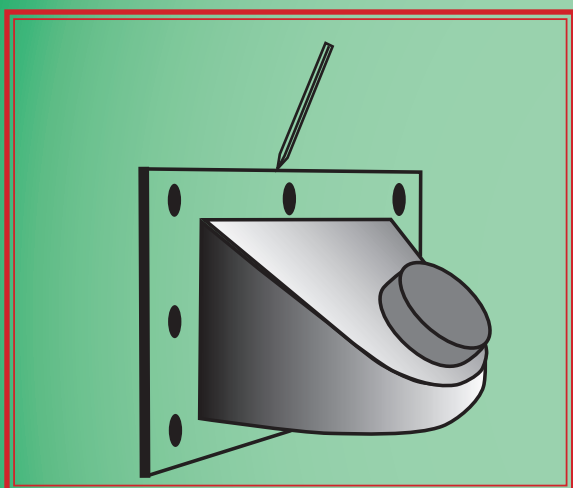
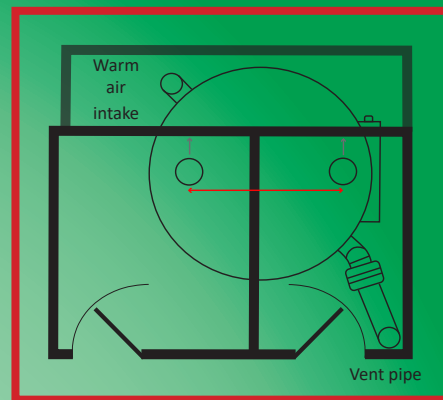
INSTALLATION Cont...

The Vents must be diagonally opposite each other (see figure adjacent) and the fan should be installed at 45 degrees. As far as possible try to keep the vent pipe at direct run between the fan and the vent cap or wind turbine. Don't snake the vent pipe all over the place! Use as few bends as possible and also make sure there is easy access to the vent fan and inlet filter for cleaning or replacing.

Fix the Connectors

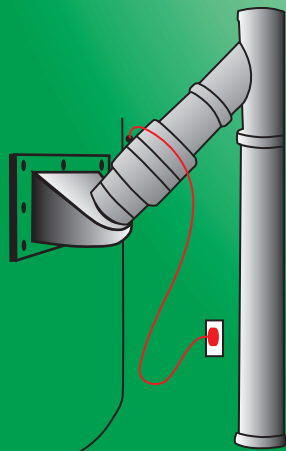
When the position of the connectors is determined, fix them to the Rota-Loo:

- Place the connector on the side of the Maxi where it is to be fixed.
- Scribe around the connector.
- Remove the connector and inscribe a line 40mm inside your marked line.
- With a jigsaw cut out the inner area.
- Liberally apply sealant and attach the connector to the Maxi. Drill pilot holes and fix with the stainless steel self tapping screws provided.



Inlet Pipe (100mm DWV)

- The air inlet has to be located diagonally opposite the outlet pipe, (see figure adjacent) and should be positioned on the side of the unit **approximately 200mm** from the bottom. The air inlet is attached to the 100mm 45° connector.
- From the connector run the air intake pipe to wherever there is a source of warm air. This might be at the northern side of the building or from a Soltran module (the warmer the better). Do Not fit a vertical pipe from the roof space to the air intake. This may over load the fan and cause equalization of the air flow and cause internal odour.
- A 100mm filter cap is provided in the kit - this is to go on the inlet pipe to prevent insects entering the Rota-Loo.



Outlet Pipe (150mm DWV)

- The air outlet has to be located diagonally opposite the inlet pipe, (see figure above) and should be positioned on the side of the unit **approximately 550mm** from the bottom. The air inlet is attached to the 150mm 45° connector.
- The Fan housing will be fitted directly after the connector at the 45° of the outlet connector.
- The vent cap and the wind turbine (supplied) have been designed to improve the air flow. Don't ever be tempted to substitute them with the conventional mozzie trap as this could impact on the operation of the vent and turbine.

INSTALLATION Cont...

- Make sure the vent cap is at least 600mm above the ridge line of your roof, so that you don't experience down drafts. Trees close to the vent cap can also cause down draft problems even though the vent pipe may be well above the ridge line. In a situation like this it may be necessary to use a wind turbine as well as a fan.
- The vent pipe must be insulated where it runs up the outside of the building and in the roof space. (not that critical in arid regions because of lower humidity) In general, it is preferable to have the vent pipe inside the building, to reduce the possibility of condensation of evaporating liquid. In colder areas to improve efficiency, you may wish to insulate the vent pipe even if it runs inside the toilet room. The easiest way to do this is to simply frame it into a corner and then fill the cavity with discarded insulating material i.e., Styrofoam packing chips or cellulose.
- Liquid is being evaporated from the Maxi all the time and if the pipe is cold, the vapour will condense and the liquid will run back down the pipe and could short out your fan, which is why the fan should be placed at 45 degrees. The brackets supporting the vent pipe should be large enough to go around the pipe and insulation. In dry hot regions the vent pipe, if not insulated, may be painted black to increase the chimney effect.
- If the vent pipe is to be fitted inside the toilet room, a 150mm hole must be cut in the floor, ceiling and through the roof. The pipe must be flashed as it passes through the roof.
- Continue the vent pipe down to the floor (drawing as above). This will support the fan motor assembly and act as a condensation collector. Fit a 20mm drain outlet (supplied).



Installing the Fan

The fan is an important part of the Rota-Loo and ensures adequate airflow in the right direction.

The moulded fan housing is designed for both 100 and 150 DWV pipe options. The Maxi RL2000 fan housing will be supplied ready to fit to 150 DWV pipe which is the recommended pipe size for the Maxi Rota-Loo.

The fan should be specified for your power supply (240VAC, 12VDC or 24VDC) and will have been fitted in the factory.

The fan can be accessed easily via the cover, which should be installed in a location that is easily accessible for maintenance.

- Fit the fan housing at a 45° angle as close to the Rota-Loo outlet connector as possible but fitting 150 DWV pipe over the housing spigots, sealing with Sikaflex and screwing through using the stainless steel screws provided (pre-drilled).
- Take care to ensure the fan is installed in the correct flow direction. This should be marked on the housing and can also be found as an arrow on the side of the fan itself.
- Connect the fan to an appropriate power source. It is designed run at all times.



Installing the Vent Pipes

When all the pipe layouts are determined and prepared, fix it all together and support adequately with appropriate brackets.



As a guide, well composted material will be soil like in texture and appearance. It will be free of foul odours and there won't be anything that is recognisable as faecal matter. Even if it passes all these tests, remember to bury it away from food cultivation to ensure the natural process is complete.

INSTALLATION Cont...

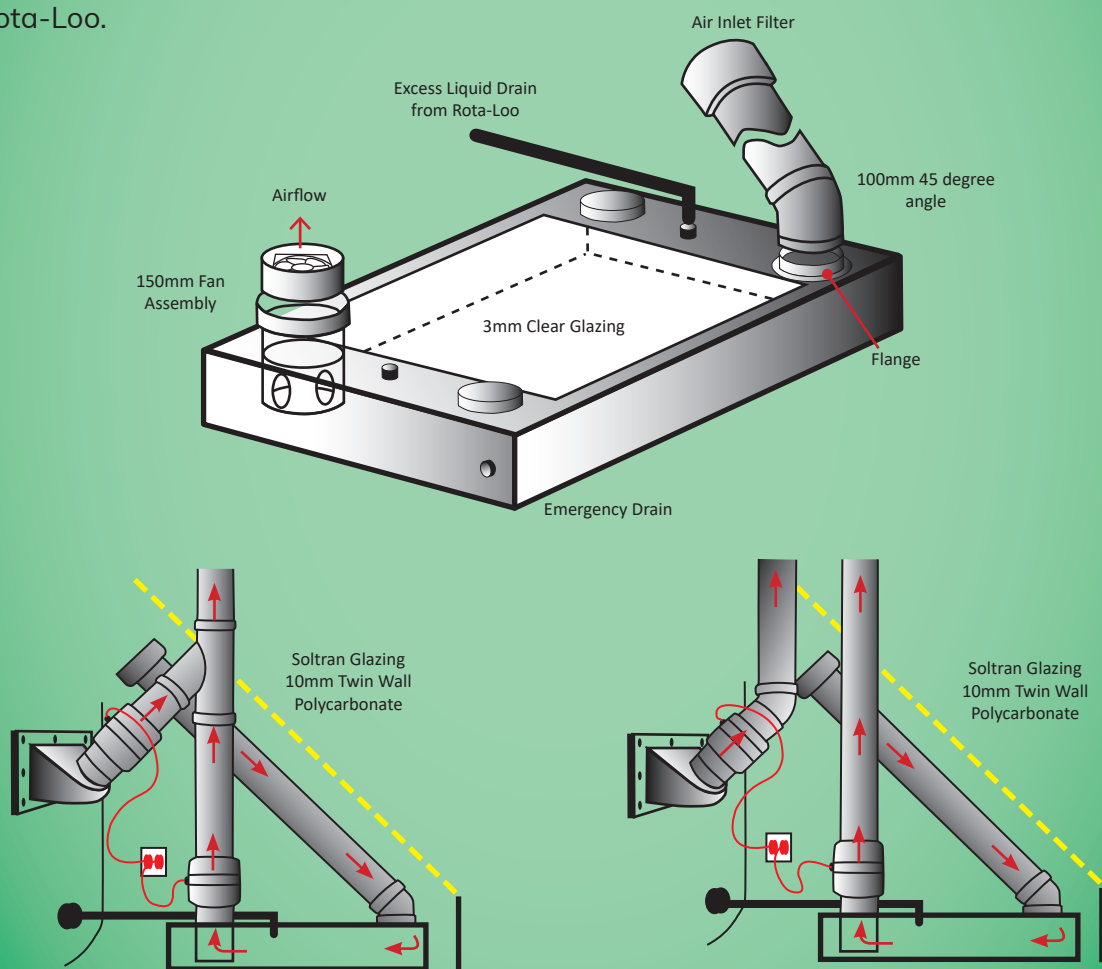
Excess Liquid Equipment

Often in high use public facilities, natural evaporation of liquids in the Rota-Loo is insufficient. Or this may occur in colder climates. In these instances the excess liquids must be drained away to keep the composting environment dry. If your Maxi uses a solar powered fan or relies on a wind turbine, the emergency overflow outlet on your Maxi must be connected to an excess liquid tank.

Excess Liquid Tank

The Excess Liquid Tank (ELT) comes as a kit which accepts liquids drained from the Rota-Loo via the 40mm pipe outlet provided in the Rota-Loo (either side of door). The Excess Liquid tank consists of an enclosed tank with a solar transfer top and evaporating tray. The kit comes with a vent system similar to the Rota-Loo.

- Install the ELT flat on the ground next to and slightly lower then the Rota-Loo -on the North side under a Soltran enclosure (see picture Page 5).
- Connect the Rota-Loo to the ELT via pipe (rigid or flexible) between the 40mm pipe nipples.
- Connect the inlet and outlet vent pipes, fan housing and turbo vent using the same principles as those for the Rota-Loo.



Using your Rota-Loo is great for the environment... you will use less water and less energy and you'll return nutrients to the local eco-system. But using a Rota-Loo requires some effort and care - it is not the same as pushing a button and having someone else look after your waste, but with a little care and maintenance you can expect many years of trouble free operation.

PLEASE READ THIS OPERATION MANUAL CAREFULLY. IT IS IMPORTANT THAT YOU MAINTAIN THE ROTA-LOO PROPERLY

OPERATIONS - OVERVIEW

Using the Rota-Loo (Page 12-13)

The Rota-Loo is used as any other toilet but care must be taken:

- Always keep the toilet seat down when not in use
- The toilet may be used to compost other waste, but only certain materials
- Do not use disinfectants to clean the toilet
- Use good quality recyclable toilet paper

Rotating the Rota-Loo (Page 13)

You will need to check regularly to make sure the waste bins do not overflow - this can be done by looking down the waste chute with a torch. When a bin is full a bin rotation needs to be done - expect to do this several times each year depending on use:

- Cover the waste pile with a suitable material
- Rotate the bin to the left
- Empty the bin that is next to be used.

When emptying the Bin, use gloves, eye protection and a dust mask to protect yourself from any residual pathogens that may exist.

Bury the compost under 300mm of top soil away from where food cultivation may occur for a 3 month period - this is a requirement of many Authorities and an additional safe guard against disease transmission

Routine Maintenance and Checks (Page 13-14)

It is recommended that each time the Bins are rotated, you:

- Check that the fan is operating and air flow is unobstructed
- Flush out the base of the Rota-Loo with a bucket of water
- Unscrew and empty the condensate cap

Trouble Shooting (Page 15-16)

Sometimes things go wrong! Most problems are due to the composting process getting too wet or out of balance. An outline of common problems and remedies are listed in the Manual.

OPERATIONS - OPERATING THE ROTA-LOO

Each installation will be slightly different because we all have different lifestyles and diets and we live in different climates. Rota-Loo is designed to operate in a wide range of conditions and in most cases composting will be effective with a minimum attention.

Start-up

- Make sure that the geotextile filter as supplied is in position in the bottom of each bin. Mushroom or good garden compost can be used as a start-up accelerator. A shovel full in each bin is all that is required.
- Replace the bins and door, switch on the fan and the toilet is now ready for use. NB - A Maxi RL2000 has 8 bins marked 1 - 4 on one side and 1 - 4 on the other side. With 2 pedestals in use, the bins should be used in sequences of 1&1, 2&2, 3&3, 4&4.
- Fit stickers ("please close the seat") and wall signs provided to encourage proper use of the Rota-Loo.



It is a good idea to place a small amount of mushroom compost, potting mix, pea straw or similar in the bottom of the bin - this will help start the composting process more quickly

Liquid & Moisture

The Maxi should be examined at regular intervals for excess liquid, especially during the initial period and also during periods of cold weather. If the liquid level continues to build up, it is an indication that the system requires more heat. During the initial period, the capacity to handle liquid by evaporation is less than when there is a large volume of humus material. As the chamber fills up, its capacity to handle urine is gradually increased.

If, on inspection, the composting pile is found to be too dry (target is 45%-70% moisture) then a little water added down the pedestal may assist the composting.

OPERATIONS - OVERVIEW

Room Ventilation

The fan in the Maxi, which operates continuously, will draw air down the chute from under the seat. No odour will rise into the toilet room against the negative pressure thus created. Ventilation into the toilet room can be by a 20mm gap under the door or preferably by a fly wire grill in a flush fitting door. There is no need for a ventilating fan in the toilet room. In fact, in relatively air tight buildings a ceiling fan or extractor can actually impede the performance of the Maxi.

If odours are apparent or liquid is building up, check the fan as it may have stopped working and airflow reduced or flowing the wrong way.

Notices & Stickers

Check that Wall Signs and Toilet Seat Stickers are in place to help educate and encourage users to use the toilet in the correct manner.

IMPORTANT NOTE: Keep the seat cover closed at all times when the toilet is not in use. If you fail to close the lid, there will be a decrease in the rate of evaporation and odour may occur.

Bin Rotation

When the bin is full (the waste pile is no higher than 100mm below the top of the bin):

- Open the access door.
- Pour 2 to 3 litres of water into the bin – this can be done via the pedestal
- If available, we recommend you cover the compost with about 30mm of mushroom compost, potting mixture, chopped straw or hay, or any mixture of similar organic material.
- Rotate the bins one position in the clockwise direction (to the left).
- The bin now under the waste chute will be full of composted material (unless it's the first use) and needs to be emptied.
- Empty the composted material in a safe place, taking care to retain the Geo-textile filter.
- Replace the filter, return the bin to the Rota-Loo (place some mushroom compost or potting mix in the bottom if desired) and close the door - it's ready to use again



DO NOT USE a bin that has already been used and the contents composted until it has been emptied.

Adding some earthworms to the full bin will further improve the humus and speed up the composting process. If you wish to try this, check to ensure you are using the right worms.

Bin Emptying

Bin emptying is normally concurrent with rotating the Rota-Loo - when bin is full and rotated the bin presented for use needs to be emptied.

Open the door, rotate the full bin as noted above and remove the bin presented. Under normal use this bin will have been inside the Maxi tank for a minimum of 1 year. The contents will have composted, be quite dry and have an earthy odour.

Remember that where 2 pedestals are fitted, both bins should be emptied.

- Removal of bins - The bin to be emptied could be quite heavy. Pull the bin out until you can transfer it to a hand trolley for moving to a location for disposal.
- Disposal of compost - Bury the compost under 300mm of top soil away from where food cultivation may occur for a 3 month period - this is a requirement of many Authorities and an additional safe guard against disease transmission
- Replacing an empty bin - Make sure that the geotextile filter is in position in the bottom of each bin. This acts as a liquid filter. Cover the filter material with about 5cms of mushroom compost, or garden compost or some of the compost material from the previous contents. This will act as a compost starter. Make sure that the empty bin is placed under the pedestal, close up the door and continue use.

What to put in the Rota-Loo

- use only a good quality toilet paper (either unbleached, recycled or new white paper). Try not use excessive amounts of toilet paper as the paper may break down slower than the heap.
- The recommended amount of Bio-stimulant per week



OPERATIONS Cont...

Bio-Stimulant is a sea-weed based pro-biotic, available from Rota-Loo, that helps keep the right environment and balance in the composting pile for the aerobic bacteria to grow and work. Adding a small amount of Bio-Stimulant regularly according to the instructions on the bottle will improve composting and control odours. It is recommended that Bio-Stimulant be used weekly, or at least monthly, and whenever a bin (or the house) is being closed up for a period. APPLICATION Dilute 1 part Bio-stimulant in 10 parts water 1:10). Apply 50ml of diluted mix three times a per week in active bins (pour down the pedestal).

The following additives help to allow oxygen to flow around the solid material as well as add some carbon rich matter ensuring that it remains aerobic and healthy so you obtain good quality compost. We recommend that you at regularly intervals (about once a week) put down the toilet a handful of two of the following:

- Chopped pea straw (compressed bales are at available from most garden supply shops)
- Hard vegetable peelings (ie. Potato or carrot). The peelings should be chopped to no larger than 30mm (1") square
- Fresh grass clippings
- Hay, Peat moss, Rice hulls, Peanut shells. Pop corn, or similar organic materials
- Wood shaving can be good but DO NOT USE PINE OR EUCALYPT as they are disinfectants! Disinfectants kill the bacteria required for good composting.

The Rota-Loo can be used to help compost other household wastes, but please don't expect it to do everything. The aim is to safely handle human waste and adding other materials should be done with the objective of improving the composting process only. Adding additional matter to the bins will fill the bins more quickly so keep an eye on the bin levels more often. It may also mean that you will need to rotate the bins more often, but remember that if the composting bacteria are healthy, decomposition will occur quickly.

What NOT to put in the Rota-Loo

- any burning materials such as cigarettes or matches,
- disposable nappies, tampons, wet wipes or sanitary napkins,
- plastic, rubber, metal or glass material.
- vegetable scraps, fruit scraps or meat/fat scraps, as they are subject to putrefaction and attract flies and other vermin.

Cleaning of the Pedestal And Seat

Generally once a week, or more often if required, clean the pedestal and seat with water and if necessary, a small amount of biodegradable detergent. No problem is caused if a small amount of water is let into the system. Keep the use of disinfectant to a minimum and wherever possible use only biodegradable disinfectant. When using disinfectant, use it only on a damp sponge around the pedestal and seat areas to prevent any spillage.

Be careful that disinfectant is not allowed to go down the chute. Should this happen, add a dose of Bio-Stimulant and up to a small bucketful of peat moss or potting mixture into the bin. This will help restart the bacterial activity and isolate fresh wastes from the disinfected area. Alternatively you can rotate the Rota-Loo. In this case add Bio-Stimulant and bulking material to give the bacteria plenty to work on.

Keeping Record

Use the Bin Rotation Diary supplied, either on the door of the Rota-Loo or kept in a safe and accessible place, to keep a record of when the bins are turned and emptied.

- In the 'clear' triangle fill in the date that bin was filled and rotated to the next bin
- In the 'greyed' triangle note the date that bin was emptied and rotated into the 'active' position.

ROTA-LOO

BIN	DATES FILLED AND EMPTIED				
1	F				
	E				
2	F				
	E				
3	F				
	E				
4	F				
	E				
5	F				
	E				
6	F				
	E				

Use gloves, eye protection and a dust mask to protect yourself from any residual pathogens that may exist.

Manufactured by Kiel Industries
87-89 Tranway Road
Morwell, VIC 3600
Australia

Bury under 300mm of soil for 3 months or as required by your local authority.
If contact is made between compost and skin, wash thoroughly with water.

sales@rotaloo.com
+61 3 5135 3900

TROUBLE SHOOTING

The Rota-Loo is a simple system that if maintained, will operate without problems for many years. However, sometimes things go wrong! This section will help you diagnose and rectify some issues that may arise, and addresses a few common questions. If in doubt, please call your dealer or contact Rota Loo for help and advice.

If the Liquid level in the bottom of the Rota-Loo is greater than 50mm deep.

The liquid needs to be drained off. Do this by placing a container under the drain outlet (near the access door) and removing the cap.

If the Rota-Loo emits an unpleasant odour.

The composting matter is probably too wet. Excess liquid may need to be drained off as above. Check the fan operation and Turbo vent. Insufficient air flow which may be caused by a failed fan or blocked air piping (a bird's nest in the Turbo vent!) will reduce evaporation. Or, if the fan stops, the airflow from the Rota-Loo may flow up the pedestal bringing what odour there is into the room. Restart the fan (failed power supply maybe) or replace the fan.

If the Liquid Level is continuously building.

Check the fan, as above. It may be that the airflow is not enough to evaporate the liquids. Or, more heat is needed for the system to evaporate the liquid properly. A Soltran Module may need to be installed or an excess liquid handling system should be constructed.

If the turntable won't rotate.

Check for obstructions. On the RL650 the bins are quite close to the chamber sides and it may be that a bin has got caught on a Vent Pod screw that is a little long. The Bins may not be located on the right part of the carousel as per the included photo. This would simply require the bins to be relocated to lock onto the carousel properly.



On models with turntable castors (RL950 and RL2000), check for salt build up on the base of the chamber as it may be that salt crystals block the turntable wheel path - flush with water and drain from the excess liquid outlet.

The turntable hasn't been rotated and a Bin has become overfilled.

Should the bin overflow, the Rota-Loo will need to be cleaned out carefully. The overflow bin will need to be removed and excess waste transferred to the next bin (after emptying). Any overflowed waste solids can be cleaned out by flushing with water and pumping out the Rota-Loo base (block-off the excess liquid outlet) to be disposed of properly (a septic pump out truck will take the waste to a proper disposal facility).

There was a power failure during the last few days.

This will not affect the composting? The heat generated from the composting process is usually sufficient to maintain the correct temperature in the composting pile. Also, the heat from the compost will set up a natural draught, which should take away the odours and keep the toilet free of smell.

TROUBLE SHOOTING - Cont...

What should be done if the area will be closed down for a while?

If the toilets will not be used for only a few days, we would recommend you keep the fan on, but if the toilets are not to be used for a few weeks, the fan may be turned off. When you turn the fan off, a smell may enter the room. However, this should be gone in a few hours, after the heat from the composting process starts to push the gases up the vent on its own, or the fan is restarted on return. It is also recommended that you add a dose of Bio-Stimulant down the pedestal before closing down. This works to keep the right balance of bacteria whilst the system is not being used.

If there are too many flies in the composting chamber.

Generally, flies are attracted by excessive amounts of carbon dioxide and methane, which is a result of anaerobic bacteria indicating that the composting pile is too moist, there is not enough heat or the wrong things have been dropped down the pedestal.

A few flies may be part of the process and may be helpful, but if they become a nuisance they can be dealt with.

- First check all the other ventilation systems (fan etc.) are working properly. and that liquid drainage and evaporation is adequate.
- Commence using a bulking regime to aerate the pile. This allows more air through the pile and will increase aerobic activity and evaporation.
- The most effective way to kill the flies is by using the Rota-Loo Bio-Stimulant. Bio-Stimulant helps the compost pile by increasing and sustaining a higher metabolic rate of aerobic bacteria, therefore increasing the compost rate and producing less gases to attract the flies.
- It is also recommended that a pyrethrum (natural insect repellent) spray or powder be added to the pile and the bin rotated. Two tablespoons of boracic acid can also work.
- Another option to kill these flies is by pouring boiling water down the waste chute. The boiling water kills the larvae and stops the breeding cycle. About 4 litres of boiling water down the chute, everyday for about 14 days is required. Make sure you have a drainage system in place first.
- If flies are still present and all methods have failed, it would be worthwhile emptying all bins and flushing the whole system out with water. This will allow you to start afresh.



Sphaeroceridae are a family of true flies in the order **Diptera**, often called small dung flies. The larvae are microbial grazers found in abundance in many micro-environments with decomposing organic material. Most species appear to be associated with decaying plants or fungi and they are a part of the nutrient cycle. Many species are associated with various kinds of faeces including human faeces. Sphaerocerids may abound in decomposer communities such as compost and manure.



Vinegar Flies or Ferment Flies are a small, yellowish fly (3- 4mm) with distinct red eyes and are commonly seen around rotting fruit. The Vinegar Fly is not actually a fruit fly as it does not feed on fruit directly, just the yeasts associated with rotting fruit. They are common in homes and restaurants and wherever food is allowed to rot and ferment. With a life cycle of 1 week and the ability to lay 500 eggs, they can become very plentiful very quickly.

RISK ASSESSMENT - OVERVIEW

The Australian Standard for Waterless Composting Toilets (AS/NZS1546.2:2008) requires that a Risk Management Plan be provided to inform Rota-Loo Operators and Users how to cope with unusual or emergency situations.

Most of these issues are dealt with in the Operations Manual. This Risk Management Plan contains additional information and refers to the Operations Manual to demonstrate that a Risk Management Analysis has been carried out and to provide additional support to operators and users if required.

Design and Operation of Rota-Loo

Inherent in the design of the Rota-Loo are factors that mitigate many of the risks, however it is essential to understand that some care and maintenance is required. The design of the Rota-Loo intends to ensure effective composting occurs in most environments with little operator effort (see Page 2 - The Composting Process for greater understanding), however some occurrences may render the Rota-Loo ineffective.

**PLEASE READ THIS OPERATION MANUAL CAREFULLY
IT IS IMPORTANT THAT YOU MAINTAIN THE ROTA-LOO PROPERLY**

RISK ASSESSMENT

This assessment is based on the criteria set out in AS/NZS 1546.2:2008 Appendix J for WCT deemed to be acceptable risk.

Inspections by Authorities

The Rota-Loo is a fully contained WCT system that has no need for inspection or maintenance by any outside agent or authority for safe operation. The design cycle time for waste composting is 12 months so should an authority require regular inspection, 12 monthly or greater is sufficient.

The Operations Manual contains sufficient information for the operator / user to carry out all servicing and maintenance tasks and includes a Trouble-Shooting guide to address most unusual situations. The manufacturers contact details are included on the serial number plate for contact in unknown situations.

Storage of, and access to Uncomposted Material

Being fully self contained, all uncomposted waste is retained inside the Rota-Loo in the controlled aeration and drainage system until fully composted. All material is held inside the bin / bucket into which it is deposited and moved only by rotating the turntable, which does not require operator contact with the waste. The Operations Manual includes instruction to wear gloves when rotating to ensure random contact with skin is not possible.

Service and maintenance access is by a door on the Rota-Loo. The door is securely fitted with catches and note is made in the Installation Manual that the installer should consider security of access against unauthorised persons (e.g., small children) in the placement of and access to the Rota-Loo.

Waste is only removed from the Rota-Loo when fully composted and is removed by removing the entire bin and emptying (instruction to bury as per Regulatory requirements) - with instruction to wear gloves, even the composted material does not come into contact with persons.

An option noted in the Operation Manual is for the possibility in very high use situations for additional bins to be purchased to extend the composting time outside the Rota-Loo. In these cases the first part of the composting (approx 6 months) will occur in the Rota-Loo controlled environment. Instruction in the Operations Manual includes the need to store extra bins outside the Rota-Loo for additional composting time in a flat, safe place.

End Product Quality

Rota-Loos have been operating in diverse climates from cold and alpine to tropical for many years achieving effective composting results and safe end product quality. Records of testing date back to 1975 showing end product quality conforming to AS/NZS 1546.2:2008 standards.

RISK ASSESSMENT Cont...

As part of the Product Certification process, end product tests were carried out on an installation in a temperate climate (monthly average temperature <12°C for 3 months and relative humidity ~80% for 2 months) under 'worst case' (high use, low maintenance) conditions and found end product results conform with AS/NZS1546.2:2008 standards.

There is a high level of confidence that Rota-Loo will deliver safe end product quality in all situations, provided some operator / user care is taken and instructions are followed.

RISK IN UNUSUAL SITUATIONS

The following are "unusual situations" listed in AS/NZS 1546.2:2008 Appendix J that may be considered to pose a risk to the safe operation of a WCT, together with notes on how these risks are or may be mitigated. **Appendix J, J3, d, e and g are not relevant to the Rota-Loo design.**

Transfer of Owner / occupier

If on transfer of ownership the new owner / occupier does not receive information about how to operate the Rota-Loo they may not attend to it's operation properly.

Rota-Loo provide with the kit a Wall Poster to be attached near the toilet to inform users of the basic operational needs of the system. Manufacturer contact details are also provided on the Rota-Loo access door and serial number plate and the Operations Manual is readily available to anyone who requests it.

Should the new operator / user not learn of the need to attend to the Rota-Loo before a bin overfills, they will need to address the issue as per "Carousel not turned" below and as addressed in the Troubleshooting Guide on Page 15.

No Bulking Material is Fed in

While the addition of bulking material is recommended it is not essential for effective composting. The use of toilet paper and the design to drain the compost pile of moisture is sufficient to ensure correct composting conditions. The C/N balance may result in less efficient composting, but the design composting time is sufficient to cope with this - test site for Product Certification verified this.

The Carousel/Turntable is not turned

If the Turntable (Carousel) is not rotated the waste bin will over-fill, which is not good.

The risk to health and safety in this event is mitigated by:

- The top of the bin is very close to the waste chute, so overflow of waste to the turntable and 'tank' should be minimal before being noticed and rectified.
- The waste chute is long enough so that even if the waste chute starts to fill, the level of waste will be greater than the minimum required by the Standard.
- The bin is contained within the Rota-Loo so all waste will be contained within the Rota-Loo system.

Should the bin overflow, the Rota-Loo will need to be cleaned out carefully. The overflow bin will need to be removed and excess waste can be transferred to the next bin. Any overflowed waste solids can be cleaned out by flushing with water and pumping out the Rota-Loo base (block-off the excess liquid outlet). It is recommended that this be done by a contracted septic clean out specialist. (This eventuality is also addressed in the Troubleshooting Guide on Page 15).

The Compost gets too hot

The Rota-Loo design has continuous air ventilation so excess generated heat will be removed preventing the compost pile retaining excess heat. Should the compost pile get hot, the chimney effect of the ventilation system will increase air flow and remove more heat.

RISK IN UNUSUAL SITUATIONS - Cont...

The Compost gets too cold

Should the compost pile fall below 6°C for an extended period (2-3 months) composting will slow to the point that it's retained time may not achieve full composting. This risk is mitigated by:

- The design has natural insulation which helps retain composting heat in cold climates.
- The Installation Instructions stipulates that in cold climates the Rota-Loo must be installed in a solar collecting area and with further insulation. This allows the system to gain and retain heat to continue the composting process even in cold periods.
- The Rota-Loo capacity design anticipates 12 months composting time, which in theory will ensure full composting as low as 2°C (see Figure E1, AS/NZS 1546.2:2008 Appendix E) in with a safety factor of about 50%.

In the rare event that the composting process has stopped due to low temperature and lack of compostable material, it can be restarted by adding compostable material and a dose of Bio-Stimulant.

The Compost gets too humid

If the compost gets too humid, (above 70% moisture) the composting process will become anaerobic which will be noticeable by the odour produced. This event can occur for a number of reasons and is addressed in the Troubleshooting Guide on Page 15.

It is important to maintain aerobic composting and the Rota-Loo design uses a number of features to separate and evaporate the liquids from the solids for this purpose. Should the composting become anaerobic due to excessive liquid (high humidity of the pile) there is no immediate health risk. The odour will be unpleasant which will encourage rectification. The fan-driven ventilation system will clear any produced methane.

The Compost is removed too early

This should not occur - the design provides for a factor of safety in time for composting. In the case of very high use when compost may be removed before the designed 12 months, instructions stipulate storing in additional bins (Operations Page 13).

The Operations Manual instructs to bury the composted waste when emptying the bin and using personal protective equipment (Operations Manual page 13) so in the case that composted waste is inadvertently removed before full composting, there will not be personal contact or significant health risk.

There is poor drainage of excess liquid

The Rota-Loo 'tank' has a significant liquid capacity (to depth of about 150mm) while still being able to properly drain the composting material pile.

The Excess Liquid drainage point is significantly lower than this level. Should a blockage occur in the drain point, the high liquid level will most likely cause some anaerobic composting which will produce an odour that will be investigated - dealt with in the Troubleshooting Guide (Page 15)

The Rota-Loo is Flooded

The Rota-Loo is not intended to be installed underground or submerged. In the event of a major flood event it may be possible that the water level is above the base of the Rota-Loo for a period of time. The Rota-Loo is designed to be air tight to improve ventilation and will therefore resist ingress of water so in minor events the waste material should be protected from flooding.

If significant water does enter the Rota-Loo (to above the turntable deck) the water needs to be considered contaminated. The sealed design of the Rota-Loo should prevent leakage and thus contamination of the surrounds but the Rota-Loo must be pumped out by a septic tank specialist and washed and reset before restarting use.

If the installation is in an area that may experience flooding, consideration should be given to adequate drainage of the area around if necessary securing the Rota-Loo to prevent floating in a flood situation (noted in Installation Page 7).

RISK IN UNUSUAL SITUATIONS Cont...

Decommissioning

Decommissioning may be required if the Rota-Loo is no longer needed, is to be relocated or if major maintenance is required.

When decommissioning a Rota-Loo to minimise any health and safety risks the critical issue is to ensure un-composted wastes are properly dealt with.

- All bins can be removed - only bins that have been in the Rota-Loo for 10 months or more may be emptied according to normal bin emptying procedures. All other bins are to be emptied to proper septic waste handling facilities (septic pump out truck or similar).
- The Rota-Loo can then be removed after disconnecting the waste chute and pipe connections. Re-fit the door to contain any remnant waste inside. Or the Rota-Loo can be closed up and left till future need.
- If work is to be done internally (replace turntable) the inside of the Rota-Loo should be washed out - use hose and drain through drain point - and left to dry before removing the lid for maintenance.
- If relocating, ensure all wastes are removed and the inside of the Rota- Loo is dry before transport.

Removing the Lid from a RL2000 Maxi requires a person sitting on the turntable to hold the nuts securing the lid. If this is to be attempted, the Rota-Loo must be left open and have a fan connected to ensure adequate clean air flow for the person - knowledge of working in confined spaces is advisable. Replacing the whole unit may be cost effective and is recommended. RL650 and RL950 Lids can be removed from outside the unit

ROTA-LOO WARRANTY

- ◇ We stand by our product and provide as much support as we can.
- ◇ The Rota-Loo and associated products are warranted against original factory imperfections in materials and workmanship, according to the Warranty conditions attached.
- ◇ It is important that you read and comply with the Rota-Loo Installation Manual and Operation Manual. Installing the Rota-Loo using poor workmanship and/or non-complying components or materials will invalidate the Warranty. Operating the Rota-Loo improperly will also invalidate the Warranty.
- ◇ If you are unsure about any part of the installation, please contact your supplier. 99% of problems are due to poor installations, stemming from a misunderstanding of how a Rota-Loo should be installed and how it works.
- ◇ If you feel that you do not wish or are unable to maintain your Rota-Loo, again please contact your authorised dealer, supplier or PFG Group Victoria Pty Ltd to discuss your options.
- ◇ PFG Group Victoria Pty Ltd will only consider return and repurchase of a composting toilet provided it has not been used, damaged or marked and within 30 days for the date of the invoice. The original freight, administration and handling costs would be deducted from the repurchase price, calculated as 10% of the invoice total.
- ◇ In the unlikely event of a breakdown, please contact your local supplier for advice and spare parts. PFG Group Victoria Pty Ltd have Distributors in most States and depending on the locality, could attend to repairs if necessary, providing C.O.D. payment was made for travel, time and labour.

ROTA-LOO WARRANTY - Cont...

Your Rota-Loo has been built carefully to high standards and is warranted for ten years (supplied part only) against original factory imperfections in materials and workmanship, to the original purchaser, under normal home, holiday home, trailer, boat, commercial or industrial use as described, with respect to capacities in our literature. Electrical parts are warranted for one year or as specified by the manufacturer or supplier of the part.

Rota-Loo Capacity

Model	Number of Bins	Full Time Users
RL650	6	Up to 4
RL950	6	Up to 8
RL2000	8	Up to 20

PFG Group Victoria Pty Ltd will furnish new or rebuilt parts, for any part that fails within the warranty period, provided that our inspection shows such failure is due to defective materials or workmanship. Any part supplied by us to replace another part is warranted for the balance of the original period.

PFG Group Victoria Pty Ltd or its Distributor will provide labour reimbursement for replacement of defective parts during the first ninety (90) days of purchase.

THIS WARRANTY DOES NOT COVER:

1. Damage resulting from neglect, abuse, accident or alteration; or damage caused by fire, flood, acts of God, or any other casualty.
2. Parts and accessories not sold by PFG Group Victoria Pty Ltd, or damage resulting from the use of such items.
3. Work carried out by persons not authorised by PFG Group Victoria Pty Ltd.
4. Damage or failure resulting from failure of the purchaser to follow proper installation and operating procedures as outlined in the Installation Manual and Operation Manual or other printed instruction.
5. Labour, traveling and services charges incurred in the removal and replacement of any parts found under the terms of this Warranty.

This warranty is in lieu of all other warranties expressed or implied and no person is authorised to enlarge our warranty responsibility, which is limited to the terms of this certificate. The Company reserves the right to change, improve, or modify its products and to install these improvements on equipment previously manufactured.

We need to record where your Rota-Loo is situated.

Please return the warranty registration card with your details within seven days of receiving your Rota-Loo to validate the Warranty.

APPENDIX

Checklist

A copy of our Batch Release/Packing List will be attached to the Rota-Loo. Please check that all the products you ordered have arrived. If any items are missing or any items damaged please contact your supplier or PFG Group Victoria Pty Ltd.

Kit Parts List



Rota-Loo 2000 Chamber

- Incorporating steel reinforced turntable and wheel system as well as the self-tapped lid with single hole cut out for waste chute.
- Access Door complete with Diary and direction stickers along with 6 Rubber replaceable latches to ensure unit seals tight to keep heat in and expedite composting process.
- 8 x Buckets drilled for air and liquid flow and individually numbered 1 to 6
- 1 x Trolley to help remove buckets

Waste Chute & 2 Side Pods

- 900mm long waste chute with flange should extra length be required.
- In and out pods to be applied to the side of the chamber on opposite sides.

Vent Fittings

- Inlet vent complete with screen to keep insects out
- 45 degree 100mm connectors x 2 for inlet and outlet piping
- Wind turbine Sewer Vent and Wind turbine adapter
- Y-Junction and Water Outlet pipe fittings
- Fan housing to suit both 12 volt and 240 volt fan
- 12 volt Solar fan or 240 volt fan complete with power lead

Accessories

- RL2000 filter pack of 8 filters
- 1 litre bottle of bio-stimulant
- Any optional items ordered will be shown on the batch release/picking list.

Items and Materials not Supplied

Other items needed not supplied with the Rota-Loo kit:

- Sand/crushed rock for level base and water proof board or similar to place the Rota-Loo on.
- PVC piping needed to build the air vent system - 100mm DWV pipe and 45° elbows to suit
- Pipe brackets as required to secure vent piping and PVC Pipe Glue and Priming Fluid
- Sikaflex 221 for sealing the waste chute (silicone tends to go brittle after a time)
- Material to attach the waste chute to flooring joists (hoop iron or similar)
- Power source for the fan

If additional screws are required, use Stainless Steel only - (8g x 20 or 8g x 25 SS304 screws)

Optional Materials

- Insulation for the Rota-Loo and / or vent piping
- Paint for DWV pipe-work (black to absorb heat or coloured for desired finish)

General Tools Guide

- Phillips Head Screwdrivers or Phillip's head drill bit
- Saws to cut the waste chute and PVC piping
- Drills including a hole saw (111mm ideal) to cut the Vent Pods to fit the Pod Connectors.
- Measuring Equipment - Level, Plumb bob, Tape measure, ruler, roofing square
- Markers, a white marker is useful when dealing with the waste chute
- Hammer
- Caulking gun

ROTA·LOO

BIN		DATES FILLED AND EMPTIED				
1	F					
	E					
2	F					
	E					
3	F					
	E					
4	F					
	E					
5	F					
	E					
6	F					
	E					



FABRICATION
ROTOMOULDING

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