Appendix 3-5

Eco-Toilet Demonstration Project Items

Program Guidelines and
Minimum Obligations for Town and Participant

Eco-Toilet Incentive Program – Demonstration Group I

IMPLEMENTATION OF ECO-TOILET INCENTIVE PROGRAM

PROGRAM STEPS:

1. Initial Contact with Interested Property Owners

- WQMC Technical Liaison calls property owners who have expressed an interest in the Eco-Toilet Incentive Program.
- Information on eco-toilets is provided and questions are answered.
- Site visit scheduled.

2. Eco-toilet Evaluation and Selection

- Property owner reviews product information, as well as installation and cost proposals from vendors.
- Property owner makes a decision on which eco-toilet system to install.

3. Eco-toilet Permitting

- Property owner must obtain a plumbing permit. Toilets must be installed by a licensed plumber.
- Property owner must obtain Board of Health approval. Board of Health (BOH) approval of a maintenance plan for the eco-toilet is required as part of this permitting process.

4. Eco-toilet Program Enrollment

4.1 Property Owner submits Enrollment Package to Town, through the Water Quality Management Committee. This package contains the following documents:

- Contract for Incentive signed by the following:
  - Property Owner
  - Plumbing Inspector (plumbing permit obtained)
  - Board of Health Agent (Board of Health approval obtained)
  - Barnstable County Department of Health and Environment Representative (testing equipment appropriate)
- Standard Installation Contract (executed between installer and property owner)
- Executed Promissory Note

4.2 Contract for Incentive signed by Town, signatories include:

- Town Counsel (as to form)
- Town Accountant (as to availability of funds)
- Subsequent to all other signatories, the Town Manager executes the Contract.

5. Eco-Toilet Installation and Maintenance

- The eco-toilet is installed according to manufacturer's specifications, and all permit conditions.
- The eco-toilet will be maintained according to the Board of Health-approved Maintenance Plan.
- Operation will be monitored by Barnstable County Department of Health and Environment.

6. Eco-Toilet Monitoring

The eco-toilet installation will be monitored in accordance with protocols established by George Heufelder, Barnstable County Department of Health and Environment (BCDHE) in accordance with the Memorandum of Understanding between BCDHE and the Town of Falmouth. Monthly testing of grey water and collection of water-use data, as well as bi-annual inspection of eco-toilets are planned.

PAYMENT TERMS AND MECHANISM:

Payment Terms:

The incentive of up to $5,000 shall be paid by the Town after the following conditions are met:

- Contract for Incentive, Standard Installation Contract and Promissory Note are fully executed
- Owner presents receipts for goods and/or services related to the installation of the eco-toilet at their property.
- Owner presents documentation that plumbing, building and Board of Health permits as well as all inspections have been obtained for the installation.

Interest-free Loan Forgiveness:

The incentive of up to $5,000 is in the form of an interest-free loan. Forgiveness of loan shall occur at the end of the two-year term of the Falmouth Eco-toilet monitoring program. The loan will be forgiven when the owner has complied with the testing program, and other terms of the program that are detailed

in the Contract for Incentive. When the program participant has complied with the terms of the Program, they must submit a Loan Forgiveness form to the Board of Selectmen for approval.

PARTICIPANT OBLIGATIONS:

- Owner agrees to allow the following for a minimum of 2 years following installation:
    - Access to the property by a Barnstable County Department of Health and Environment representative for the purpose of monthly sampling of grey water during reasonable hours.
    - Access to all water use records for the property. If necessary due to irrigation or other significant exterior water use, monthly readings of exterior water use during reasonable hours.
    - Inspection of the toilets during reasonable hours by appointment. Such inspections would include two inspections per calendar year by a representative of the Eco-Toilet Incentive Program.
    - Access to information on the occupancy of the residence.

- Owner agrees to remove all toilets of unmodified traditional design for a minimum of 2 years following eco-toilet installation.
- Owner is responsible to preserve the installation of, and properly maintain the eco-toilet for a minimum of two years.
- Owner agrees to operate the eco-toilet in accordance with the manufacturers' recommendations and report all problems encountered to the Board of Health after contacting the system installer.
- Owner agrees that after the two year project period, they will bear any costs for a conversion to conventional toilets.
- Owner agrees to disclose any and all agreements related to the Town of Falmouth Eco-Toilet Incentive Program in any purchase and sale agreement for the Premises.
- Owner acknowledges that the installation of the eco-toilet may not exempt them from future betterments assessed related to a public sewer system.

Promissory Note

Eco-Toilet Incentive Program – Demonstration Group I

$_____

Date:_____

Falmouth, Massachusetts

FOR VALUE RECEIVED, the undersigned _____, having an address at _____ ("Borrower"), promises to pay to the order of the Town of Falmouth, having an address at 59 Town Hall Square, Falmouth, Massachusetts 02540 ("Town" or "Holder") or at such other place as Holder may from time to time designate in writing, which term shall include the holder from time to time of this Promissory Note (this "Note"), the principal sum of _____ DOLLARS ($_____).

All principal and other payments due under this Note if not sooner paid or payable under the terms hereof shall be payable thirty (30) months after the date of execution hereof, on _____ (the "Maturity Date").

If the Borrower is deemed by the Board of Selectmen to be in violation of the terms of the Contract for Incentive, Eco-Toilet Incentive Program, Demonstration Group I (the "Contract"), then the amounts payable under this Note shall become immediately due and payable upon thirty (30) days written notice.

If the Borrower believes that he/she has complied with the terms of the Contract, the Borrower may apply to the Board of Selectmen for a determination of compliance and if the Board of Selectmen shall so determine compliance with the Contract, this Note shall be forgiven in full.

All payments due hereunder shall be made at Falmouth Town Hall, 59 Town Hall Square, Falmouth, Massachusetts, or at such other place as Holder hereof may from time to time designate in writing. If Holder shall exercise the right to declare the entire indebtedness evidenced hereby forthwith due and payable and if the indebtedness evidenced hereby is not paid on the Maturity Date, as the same may have been extended, then in addition to all other rights and remedies of Holder hereunder or other instruments executed incident hereto, Borrower agrees that all unpaid amounts shall bear interest until paid at five percent (5 %) per annum from the Maturity Date.

Any notice provided hereunder to the Borrower or Holder shall be sufficient if given in writing by certified mail to the address provided. This Note shall be construed and enforced in accordance with, and the rights of the parties herein shall be governed by, the laws of the Commonwealth of Massachusetts.

This Note may not be changed or terminated orally, but only by agreement in writing signed by the party against whom enforcement of such change or termination is sought.

If any term of this Note or the application thereof to any person or circumstances, shall, to any extent, be invalid or unenforceable, the remainder of this Note, or the application of such term to persons or circumstances other than those as to which it is invalid or unenforceable, shall not be affected thereby, and each term of this Note shall be valid and enforceable to the fullest extent permitted by law.

IN WITNESS WHEREOF, Borrower has executed and delivered this Note under seal as of the day and year first above written.

BORROWER:

_____

Signed in the presence of:

_____

FALMOUTH ECO-TOILET STANDARD INSTALLATION CONTRACT

Date: _____

Name and address of Property Owner/Applicant:

_____

Name and address of contractor: _____

Manufacturer of eco-toilet(s) being installed: _____

Model Number(s) of eco-toilets being installed: _____

Mass. Plumbing Board certification numbers: _____

Number of eco-toilets being installed: _____

Number of eco-toilets already in the home: _____

Cost and location for each eco-toilet to be installed: _____

Cost and location for sampling port to be installed: _____

Brief description and itemized cost of each installation (attach pages as necessary): _____

_____

Cost to install interior meter on one exterior faucet (sill cock): _____

Total Cost: _____

Payment Schedule: _____% at contract signing; _____% at delivery of components and start of installation; _____% upon completion and inspection

Eco-toilets must be installed by a licensed plumber. All permits, inspections and/or sign-offs are the responsibility of the Property Owner.

Please attach documentation of all terms and conditions of the product to be installed.
Please attach warranty information on labor and materials. NOTE: a minimum two year warranty is required.

Dated: _____

By and Between:

Owner

_____
Owner Name:

Installer

_____
Installer Name:

Contract for Incentive

Eco-Toilet Incentive Program – Demonstration Group I

This contract is entered into by and between the Town of Falmouth, having an address of 59 Town Hall Square, Falmouth, Massachusetts 02540 (the "Town") and _____having an address at _____ (the "Property Owner") pursuant to the Falmouth Eco-toilet Incentive Program (the "Program"). The Program provides for cash incentives to Falmouth property owners for installation of eco-toilets that comply with the terms of the Program ("Incentives"). For purposes of this contract eco-toilets shall include composting toilets, urine-diverting toilets and other alternative means of diverting portions of wastewater that comply with all federal, state and local laws and have received all necessary permits and approvals. The receipt of any cash incentive under this program requires the beneficiary to provide certain information, and access to the property so that the Town can develop an accurate cost/benefit analysis of this alternative wastewater management technology.

Property Owner(s)/Applicant(s)
Name(s):_____

Address_____

Mail Address 2_____

City/Town_____State_____Phone1_____

Mobile_____E-mail_____

Location of
Property_____

Map_____ Parcel_____ (the "Premises")

Number of Bedrooms: _____ Number of Bathrooms/Toilets _____

Is Septic System Title 5 certified? Yes/No

Has Septic System been "Failed" by Board of Health? Yes/No

Do you have a cesspool? Yes/No

Is this a seasonal or year round residence? (Please circle one)

Present occupancy of residence _____

Contract for Incentive

Eco-Toilet Incentive Program – Demonstration Group I

The cash incentive provided under this program is structured as an interest free loan from the Town to the Property Owner, which loan will be forgiven upon compliance with the terms of the Program as described herein.

OBLIGATIONS OF THE PROPERTY OWNER:

- Property Owner obtains all required permits for the installation of the eco-toilet and adheres to all applicable codes and regulations. Eco-toilets must be installed by a licensed plumber.

- Property Owner agrees to the following for a minimum of 2 years following installation:
  - Pay for the installation of a sampling port for gray water from the residence, and allow access to the property by a Barnstable County Department of Health and Environment representative for the purpose of sampling gray water monthly during reasonable hours.
  - Provide access to all water use records for the property.
  - Provide information on the occupancy of the residence.
  - Allow inspection of the toilets during reasonable hours by appointment. Such inspections shall include two inspections per calendar year by a representative of the Eco-Toilet Incentive Program.
  - If deemed necessary by the Town, pay for the installation of an additional interior meter for exterior water use such as irrigation, watering, showers, and allow monthly readings of this meter during reasonable hours.
  - Remove all toilets of unmodified traditional design (water flush without urine diversion) from the premises and agree to not connect any such unmodified toilets to onsite septic systems.
  - Preserve the installation of, and properly maintain eco-toilet(s).
  - Operate the eco-toilet(s) in accordance with the manufacturers' recommendations and report all problems encountered to the Board of Health or their representative after contacting the system installer.
  - Submit a maintenance plan or service contract (if required) and provide notice of all repairs and removal of compost, and/or leachate of the eco-toilet to the Board of Health. No residuals may be removed without first notifying the Board of Health or their representative. The Town may require compost and/or residuals to be removed off-site for water quality management purposes.

- Property Owner agrees that after the two year project period, they will bear any costs for a conversion to conventional toilets.

- Property Owner agrees to disclose any and all agreements related to the Town of Falmouth Eco-Toilet Incentive Program in any purchase and sale agreement for the Premises.

- Property Owner acknowledges that the installation of the eco-toilet may not exempt them from future betterment assessment related to a public sewer system.

Contract for Incentive

Eco-Toilet Incentive Program – Demonstration Group I

PAYMENT TERMS:

The cash incentive provided by the Program of up to $5,000 is in the form of an interest-free loan. The Incentive shall be granted by the Town after the following conditions are met:

- Property Owner presents an executed Promissory Note requiring repayment in full of the Incentive if the Property Owner fails to comply with the terms of this contract.
- Property Owner provides an executed copy of the Standard Installation Contract.
- Property Owner presents receipts for goods and/or services related to the installation of the eco-toilet at the Property to verify use of the Incentive as authorized by the terms of this contract and the Standard Installation Contract.
- Property Owner presents proof that all applicable permits and inspections have been obtained for the installation, including but not limited to plumbing, building, and Board of Health permits and inspections.

HOLD HARMLESS:

The Property Owner is voluntarily participating in the Falmouth Eco-Toilet Incentive Program and agrees to hold the Town harmless for all damages of any kind that may result from installation of eco-toilets(s) at the Property.

INTEREST-FREE LOAN FORGIVENESS:

Forgiveness of the Promissory Note shall only occur at the end of the two-year term of the monitoring component of the Falmouth Eco-toilet Incentive Program. The loan shall be forgiven if the owner has complied with the terms of the Program as described herein. When the Property Owner has complied with the terms of the Program, they may submit a Cancellation of Promissory Note form to the Board of Selectmen seeking forgiveness of the loan.

I/we understand that by signing below I/we agree to all of the requirements stated above for participation in the Town of Falmouth Eco-Toilet Incentive Program

Dated: _____

By and Between:

Property Owner

_____

Name:

Contract for Incentive

Eco-Toilet Incentive Program – Demonstration Group I

Town of Falmouth,
By

_____
Julian M. Suso, Town Manager, duly authorized

Approved as to form:

_____
Patricia Harris,
Associate Town Counsel

Certification that funds are available:

_____
Victoria Rose,
Assistant Town Accountant

Additional Signatories:

Barnstable County Rep (appropriate test equipment):_____Date:_____

Falmouth Plumbing Inspector _____Permit number_____Date:_____

Falmouth Board of Health Agent _____Permit number_____Date:_____

Cancellation of Promissory Note
Eco-Toilet Incentive Program – Demonstration Group I

TO: Falmouth Board of Selectmen

Property Owner(s)/Applicant(s)
Name(s):_____

Address_____

Mail Address 2_____

City/Town_____State_____Phone1_____

Mobile_____E-mail_____

Location of
Property_____

I/we, the Property Owner/Borrower named in the Contract for Incentive and Promissory Note issued under the Falmouth Eco-Toilet Incentive Program, Demonstration Group I (the "Program"), dated _____, certify successful completion of the terms thereunder.

The two year monitoring period under the Program began on _____ and ended on _____.

Property Owner/Borrower

_____Date:_____
Name(s)

I , _____, certify that the Property Owner/Borrower is in compliance with the terms of the Program.

_____Date:_____
George Heufelder, Barnstable County Department of Health and Environment

The Town, Holder of the Promissory Note (Falmouth Eco-Toilet Incentive Program, Demonstration Group I), dated _____, by and between the Town and the Borrower, hereby cancels the Promissory Note and forgives payment under the terms thereof.

Cancellation of Promissory Note
Eco-Toilet Incentive Program – Demonstration Group I

Town of Falmouth

_____
Julian M. Suso, Town Manager
Duly authorized

Approved as to form:

_____
Patricia Harris
Assistant Town Counsel

PO-MANU0-0602XX
December 03
Rev.D8

SUN-MAR CORP.

Product Info: (905) 332-1314 Fax: (905) 332-1315 Tech. Service: (905) 332-1314
E-mail: compost@sun-mar.com http://www.sun-mar.com

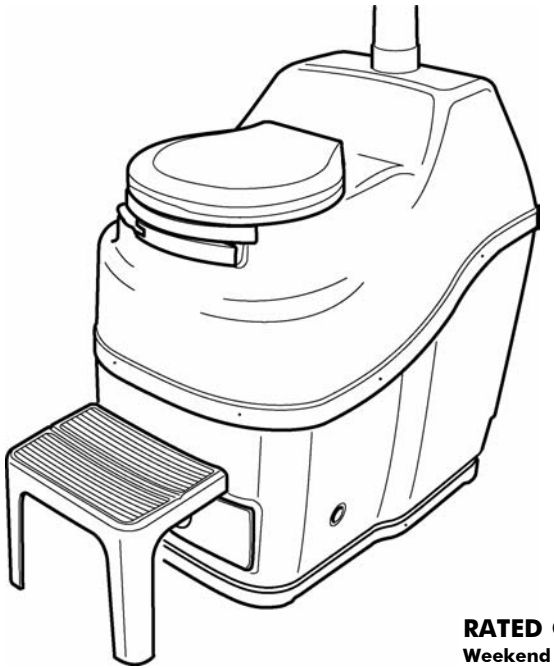
600 Main St.
Tonawanda, N.Y.
14150-0888 U.S.A.

5370 South Service Rd.
Burlington, ON
L7L 5L1 CANADA

Serial No. _____

SUN-MAR EXCEL NE

OWNER'S MANUAL



RATED CAPACITY

Weekend & Vacation Use
5 Adults or families of 7 (5 Adults and 2 Children)

Residential & Continuous Use
2 Adults or a family of 3 (2 Adults and 1 Child)

- NOTES -

OWNER'S MANUAL

CONTENTS

HOW YOUR COMPOSTING TOILET WORKS

How Composting Works

Composting is a natural recycling process where human waste and toilet paper are broken down by microbes into minerals and converted back to earth. Heat, oxygen, organic material and moisture are needed to transform this waste into good fertilizing soil, perfect for your flower beds.

Oxygen is provided by the ventilation system, and by tumbling of the composting drum. Additional organic material is introduced by adding"Compost Sure" (or peat moss mix). The waste entering the toilet is approximately 90% water content. Any excess liquid which is not absorbed will collect on the floor of the unit (evaporation chamber) where it may be evaporated into water vapor and carried back to the atmosphere through the venting system. The remaining waste material is transformed into an inoffensive earth-like substance.

The SUN-MAR "EXCEL-NE"

The key to the success of the "EXCEL-NE" lies in it's three chamber design. Each of the three chambers; composting, compost finishing, and evaporation have their own independent environments for optimum efficiency.

The Composting Chamber

The composting chamber is in the form of a Bio-drum which holds the natural compost heat, provides the necessary mass to maintain a good compost, and is rotated by turning the handle to achieve perfect mixing and aeration.

A drum locker (the white drum locker release button is behind the footrest) automatically maintains the Bio-drum in a top center position with the drum door open so that the drum is positioned to receive new material.

To mix and aerate, the recessed drum handle beneath the seat at the front of the unit is pulled out and rotated clockwise. Turning this handle clockwise rotates the drum counter-clockwise. As the drum rotates the drum door closes automatically so that the waste remains in the drum.

Material is extracted from the drum and into the finishing drawer by pulling the drum lock, and rotating the handle counter-clockwise. The drum turns clockwise, the drum door remains open, and some compost falls into the second chamber; the compost finishing drawer.

Compost Finishing Drawer

The compost finishing drawer sits tucked away below the step-stool, just above the evaporating chamber. Compost from the drum is isolated in the drawer where it is allowed to 'finish' composting. For seasonally used units, several drawers of finished compost are normally removed at the beginning of the season. Otherwise some composted material can be extracted into the drawer and left there for 3-4 weeks until it is time to remove more compost from the drum.

Evaporating Chamber

The third chamber is the floor of the Sun-Mar "Excel-NE" which forms the evaporation chamber in which excess liquid is collected.. You will frequently see liquid in this area. Some liquid will be evaporated, and the rest will flow out of the overflow drain.

Air is pulled through intake holes at the left side of the toilet; over the evaporating chamber, and up a vent stack which is attached to the rear of the toilet.

The partial vacuum which the fan creates within the toilet ensures there can be no smell.

WARRANTY

SUN-MAR Corp. warrants the original purchaser that this toilet is free from defects in material and workmanship under normal house or cottage use. SUN-MAR Corp. will furnish new parts for any part that fails within three years, and for the shell of the unit, should it fail within twenty five years of the date of purchase, provided that our inspection shows that such failure is due to defective material or workmanship. Any part supplied by us to replace another part is warranted for the balance of the original warranty period.

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 or manufactured by SUN-MAR Corp. or any damage resulting from the use of such items.
3. Damage or failure resulting from failure of the purchaser to follow normal operating procedure outlined in the Owner's Manual or in any other printed instructions.
4. Labor and services charges incurred in the removal and replacement of any parts found defective under the terms of this warranty.
5. All returns to the factory must by made freight prepaid. All shipments from the factory are made F.O.B. the factory.

This warranty is in lieu of all other warranties expressed or implied, and no person is authorized 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 without obligation to install these improvements on equipment previously manufactured.

ACCESSORY ITEMS FOR COMPOSTING

SUN-MAR has developed a number of composting accessory items over the years in response to frequent requests from users. These items may serve to improve composting speeds under some circumstances.

Name	Description	Container	Price*
"Compost Quick"	Solution containing a mixture of enzymes designed to facilitate bacterial activity. Also useful as a cleaner.	16 oz. (454 gm) spray bottle	$15.50 Freight included
"Microbe Mix"	Special selected dried bacteria to decompose waste also includes dried enzymes.	16 oz, (454 gm) Jar	$17.50 Freight included
"Compost Sure"	Bulking material containing a mix of coarse peat moss, and chopped hemp stalk to provide moisture retention, porosity, and free air space within the compost.	30 litre (7.9USG) bag	$10.00* **Price does not include freight - see chart below for region specific freight charges*

Freight Charges

	Canada	Zone 1	Zone 2	Zone 3	AK, HI
Compost Sure	$5.00	$5.00	$7.00	$10.00	$15.00

Zone 1 ME, NY, CT, MA, RI, PA, NJ, DE, VA, WV, KY, OH, IN, MI, IL, IA, MN

Zone 2 NC, SC, GA, AL, MS, TN, FL, LA, AR, OK, TX, KX, KS, NE, SD, NC, WY, UT, CO, NM, AZ

Zone 3 WA, OR, ID, MT, NV, CA

Note:

If the peat moss you are using is powdery and fine, it will result in poor porosity and an excessively wet, oxygen deficient compost. You should change or modify your bulking material. This situation is most likely to happen with central units which are exposed to a lot of flushing liquid. Modify by adding wood shavings, or use "Compost Sure" for optimum results.

A 1" safety drain exits from both left and right at the rear. It is necessary to connect one of these drains to a holding tank or approved facility.

Start Up and Use

To start, put 1/2 a bag of Compost Sure and1/2 the sachet of Sun-Mar Microbe Mix into the drum. Moisten by sprinkling 1/2 gallon of warm water, and spray "Compost Quick" into the drum and the evaporating chamber under the drawer. After the initial start up, you simply need to add one cupful of "Compost Sure" after every bowel movement. Although our "Compost Sure" is specially formulated for optimum performance of your composting unit, 40 % coarse peat moss, mixed with 60% pine wood shavings (any wood but cedar) is an acceptable alternative.

To keep your compost healthy, the drum should be rotated three times per week by pulling the handle from under the seat and turning in a clockwise direction. To make sure your compost is mixed and aerated properly, the drum should be turned six complete revolutions (the opening in the drum should appear 6 times).

When the contents of the drum reaches 1/2 - 2/3 full (4-6 inches below where the drum door hangs), it is time to remove some compost to the 'finishing' drawer where it is isolated from the mass of the compost to finish the recycling process.

To remove compost from the drum into the finishing drawer, slide the handle forward, and pull the drum lock button(which is found under the footrest).

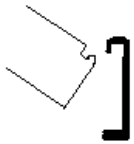
This will allow you to turn the handle in a counter clockwise direction. When turning the handle in a counter clockwise direction, the drum itself will turn in the clockwise direction allowing the drum door to stay open and compost to drop into the finishing drawer. When the drawer is filled, the compost should be left the minimum 3-4 weeks before being emptied(as necessary). When emptied after the required time, refill the drawer immediately so that there will always be compost waiting to be emptied.

Winter Use

Because "Sun-Mar" units are made of fiberglass and high grade stainless steel, freezing temperatures will not damage the toilet. Composting action decreases as the temperature drops, so for extended use, the toilet should be kept constantly at or above 55-60 degrees F (15 C).

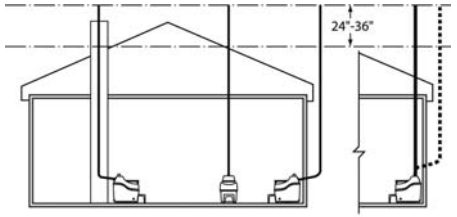
These are not ideal composting conditions. Room temperature should be restored as soon as possible for proper composting to occur. In extreme temperatures, an additional source of heat may also be required. If the Excel-NE will be used only occasionally throughout the winter, the toilet may be used as a holding tank with no damage to the unit or the compost. Space should be made in the drum to accommodate winter use.

INSTALLATION

Inspecting the unit for damage	**Receiving your Composting Unit** **i) If there is any visible damage to the carton-** the contents of carton MUST be inspected before signing bill of lading. Damaged units should be refused. Call Sun-Mar immediately. **ii) Before signing the shipping papers and dismissing the driver.-** ensure that the carton contents have been inspected. **iii) If the shipper has left-** Report the damage immediately to the transport company and call Sun-Mar. **iv) Soon after delivery, remove the Excel-NE carefully from the carton-** If there is hidden damage, or for any service Questions, contact Sun-Mar to determine the best course of action.
Check Carton Contents and Familiarize Yourself with the Excel-NE	Check to make sure the carton contains everything on the packing list. Notify Sun-Mar if you are missing anything. i) Turn the crank handle clockwise to rotate the Bio-drum for mixing and aeration. ii) Pull the white drum locker button on the front of the unit, and turn the crank handle counter-clockwise to simulate extraction of the compost into the finishing drawer. iii) Pull out the compost finishing drawer (situated below the foot stool at the front of the unit) where compost drops to finish composting. iv) Affix the "WARNING/CLEANING" sticker to the underside of the toilet seat cover, and check that another is on the access port of the composting unit.
Attaching and Detaching the footrest	The footrest attaches to the unit via the slot above the drawer. To insert, incline the footrest at a 45 degree angle to the floor as shown. Insert the round top edge of the footrest track on the stool into the round top edge of the track on the unit, and then lower the footrest to the floor. When it is necessary to remove the finishing drawer, the foot rest is removed the same way. Simply lift the footrest until it is at a 45 degree angle and withdraw it from the footrest track. Note: Footrest must be correctly attached before standing on it. 
Space Required	When selecting the best place for your toilet, make sure that there is room (an extra 15" is required) to remove the finishing drawer.
Other Considerations	The location of the vent stack, and the safety drain may determine the best place for the toilet. Ensure that the toilet is level front to back or is sloping slightly backwards. The unit should not tip forward. This will ensure that liquid is contained within the unit.

Symptom	Cause	Remedial Action	Prevention
Drum Door Not Opening/ Closing Properly (Cont'd)	Drum door cut improperly	Obtain a Drum Door Replacement Kit from Sun-Mar. Be sure to specify serial number and/or year of model for proper part.	
Noisy Fan	Fan vibrations resonating in vent pipe	Use pipe clamps to secure vent pipe or install fan with rubberized couplings to help absorb vibrations.	

Symptom	Cause	Remedial Action	Prevention
Overflowing Liquid	Overflow drain not hooked up	Connect overflow safety drain (See also increased usage above)	
	Unit tipped to the front	Check and ensure that the unit is level or tilting slightly towards the back by placing 1/4" - 1/2" shims under the front of the unit.	
	Drains Blocked	1. Rake peat moss away from back two corners of Excel NE and use rake handle to run under the drain baffle to loosen peat moss. These are the "buildup" areas. If drains are still clogged, proceed to step 2. 2. Check drain line for kinks, blockages or upward bends. Remove and flush if block ages present, unkink if bent and ensure that the drain pipe is sloping downward. If your drain pipe is in order, proceed to step 3. 3. Use a wire to poke peat moss out of the drain assembly at the back. You will notice if this is clogged because you will see a brown spot through the opaque assembly. (Only peat would make it through the drum screen). If there is no peat clog, or the problems continue, backwash the unit quickly with a hose by applying the nozzle to one of the drain assemblies and turning it on and off very quickly. If the bottom of the unit is full of liquid, you may wish to remove some prior to back-washing. A shop-vac works well.	1. A clogged drain is not very likely to happen if you rake your evaporating chamber 1 - 2 times a season (cottage use) and 3 - 4 times for continuous use. 2. Use premium 1" hose for the drain line. A good hose will be less likely to kink. Use elbows or fittings around bends to prevent kinks. 3. Use 'Compost Sure" as your bulking material.
Liquid in Finishing Drawer	Drum Screen Clogged	Rotate the drum 180 degrees so that the drum screen is on the top- you will just be able to see the edge of it if you take out the bowl liner. Scrub the screen with a stiff wire brush to remove encrusted debris.	
	Unit tilted to the front	Use 1/4" - 1/2" shims under the front of the unit to drain liquid more easily towards the overflow drain of the unit.	Install composting unit level or tilting slightly to the back, DO NOT install the unit tilting forward. If you are unsure of the grade of the floor, install it with a wedge piece.

Piping Location	Piping can be installed up the inside wall; through the wall at a slight angle and up the outside wall (with this configuration a 12 volt fan is necessary). The choice depends on ease of installation, visibility, and (especially if the toilet is to be used consistently through a cold winter), the necessity of insulating all exposed vent pipe.  The vent on the right is a 4" non-electric vent. All others show possible 2" EXCEL vent configurations.
Piping Installation	Piping and fittings are of standard 4" PVC sewer pipe. Additional pipe or fittings are easily available should you need them, from a building supply dealer. If you cannot find them near your location, they are available in 30" lengths directly through us. i) The vent stack should be installed as near to vertical as possible. ii) Silicone caulking should be used for the connection of the vent stack to the toilet because at some time the toilet may have to be moved or your may wish to install a 12 volt fan in the vent stack. iii) The Sun-Mar 12 Volt fan is fitted inside a 10" length of 4" vent pipe for easy installation, should it be needed. It is installed by either cutting out a section of the vent immediately above the composting unit, or by raising the vent stack off of the composting unit and inserting the fan section. The fan can be used with a solar panel and 12 volt battery, or by purchasing a 12 volt adapter from your local hardware store and simply plugging it into the wall. iv) If a 12 Volt fan is installed it should operate continuously, since otherwise it forms a partial blockage in the vent stack. To install, you can either use PVC connectors or a rubberized connector. v) All connectors in the vent pipe should be sealed.
Leading the vent through the roof	As shown in the installation, the vent stack should end about 20" above the peak of the roof so that it is less subject to downdraft. Where the piping is taken through the roof, the roof flashing provided may be used to seal the installation or if a new roof is being installed, the roof flashing should be laid underneath the new roofing material. DO NOT install horizontal sections of vent pipe to avoid leading the vent through the roof.
The Diffuser	The diffuser provided with the unit is a simple device to be installed at the top of the vent stack with the larger pipe protruding above the smaller. To install, simply glue the diffusor on the topmost section of vent pipe. The diffuser design encourages updraft, and discourages wind and weather from going down the vent stack. Unlike wind turbines, diffusers are less likely to freeze up in winter, and are more effective in calm weather.

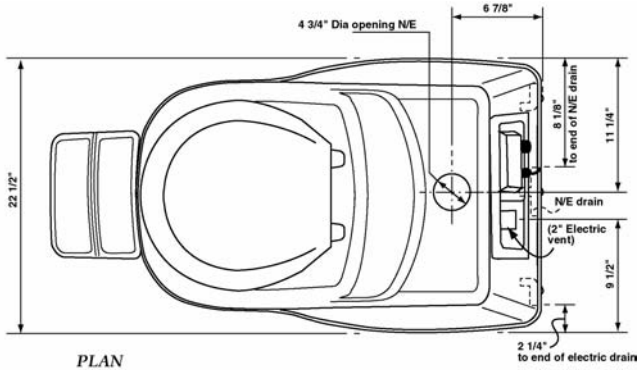
The Safety Drain

Drain Installation	The 1" Safety drains are at the rear of the composting unit, and exit to both the left and right. The drains offer protection against heavy loading, or prolonged electrical outage or failure. Although the "Excel-NE" has some evaporating capacity, we strongly recommend that the drain be connected for heavy use. To connect one of the drains, (whichever side is convenient), remove the plug, attach a 1" hose and secure with a hose clamp. Ensure there are no kinks or upward bends in the drain hose.
Handling Effluent	In an Excel-NE, there will be effluent. The following are possible options to take care of the liquid: -Use a container which is emptied periodically (water jug or small barrel). This ensures a closed loop system. - Feed into a lined pit filled with gravel and sand. Such a recycling bed also ensures a closed loop system. Contact Sun-Mar for a guide on how to build your own recycling bed. - Feed into a small cesspit or "french drain". -Plumb into an existing septic or holding tank line. Installation should be in accordance with applicable local regulations.

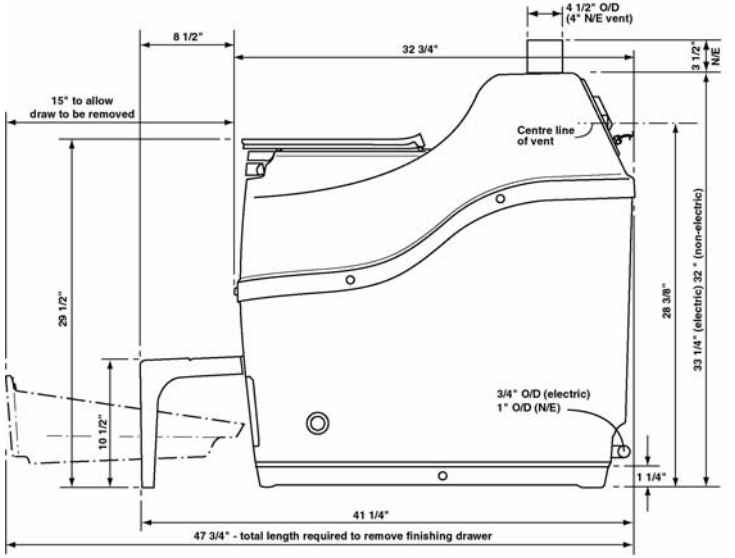
Symptom	Cause	Remedial Action	Prevention
Drum Will Not Stay Vertical	Drum Locker Broken	Have serial number ready and call Sun-Mar for a replacement part.	When returning the drum to top dead center position, do not bang against drum locker with excessive force. Remember to pull out the drum locker button before rotating the drum backwards.
Drum Will Not Turn	Set screw securing handle to shaft has broken	Drill out set screw and replace, or get handle replacement kit (instructions included).	Not a common repair.
	Steel pin securing gear wheel to shaft has broken	Have your serial number ready and call Sun-Mar for a replacement Small Gear Kit.	Keep composting drum from becoming overloaded. This puts undue strain on the nylon gear.
	Drum fallen from bearings	Have your serial number ready. If the drum has fallen, contact Sun-Mar immediately. We will make sure your problem is fixed quickly.	Not a common repair.
Drum Door Not Opening/ Closing Properly *(Compost will drop into the finishing drawer even when the drum is not being rotated backwards to extract compost).*	Drum too full	See Section on "Compost Troubleshooting- Drum Too Full"	Follow items in prevention column for "Drum Too Full".
	Hinges Stuck	Drum door slot has compost caked on it. Clean with wire brush. This will push the obstruction away so the door swings freely.	Drum should never be more than 1/2 - 2/3 full.

Symptom	Cause	Remedial Action	Prevention
Occasional Urine Odor Outside	1. Vent stack not installed 30" above peak of roof 2. If vent stack is installed above roofline, natural obstructions, such as tall trees, being located in a valley or close to a hill may be causing a downdraft.	1. Check that the vent is installed 30" above the peak of the roof. If not, extend the vent. Guide wires may be necessary. 2. Add lime to the evaporating chamber - as much as you think necessary. You will have to rake more often if you do this. You can also add lime to the compost if desired, but no more than 1/2 cup per week as it may upset the PH balance in larger amounts.	Downdraft is dependent on wind direction, as well as natural obstructions, etc. Initially, install the vent 30" above the peak of the roof. If symptoms of downdraft occur, add lime or a filter box.
Strong Sewage Odor Present when drum turns	Compost is anaerobic	Begin following: "Compost Troubleshooting" suggestions.	Follow "Ongoing Maintenance" and use proper bulking material.
Liquid Buildup/ Lack of Evaporation	Increased usage	The amount of liquid varies substantially between installations. The overflow drain needs to be installed on the Excel NE.	Install the overflow drain.
	Climactic conditions	Evaporation rates vary substantially with climate conditions. Expect faster evaporation rates during warm dry weather.	Evaporation will slow during damp weather, make sure drain hose is installed.

ROUGH IN DIMENSIONS



PLAN ELEVATION



SIDE ELEVATION

Initial System Start Up

Begin operation by carrying out the start up procedure described below, and then continue with the "Ongoing Toilet Maintenance" routine. It normally takes six weeks before a compost is properly established. You will know this has happened when:

- **Compost Volume increases more slowly**
- **Compost turns black and becomes loam-like**
- **Toilet paper decomposes within a few days**

	Action	Why?
ADD	3-4 gallons of peat mix (half the 30 liter bag provided) to the drum.	-Provides carbon base and initial mass for compost.
ADD	1/2 Microbe Mix packet at start up, other 1/2 in two weeks	-Adds necessary microbes which will breakdown the compost.
SPRINKLE	About 1/2 gallon of warm water into the drum	-Moistens carbon base
SPRAY	"Compost Quick" enzymes into drum before and after mixing. Coat the evaporation chamber with it before using the unit.	-Speeds start up of compost by acting as a catalyst to assist bacteria. -Prevents possibility of start-up odor in the evaporating chamber.
RAKE	Loose peat moss from the evaporating chamber until the compost is established, which takes approximately 6 weeks.	-Until the compost is active, some peat moss may fall through the screen or drum door into the evaporating chamber

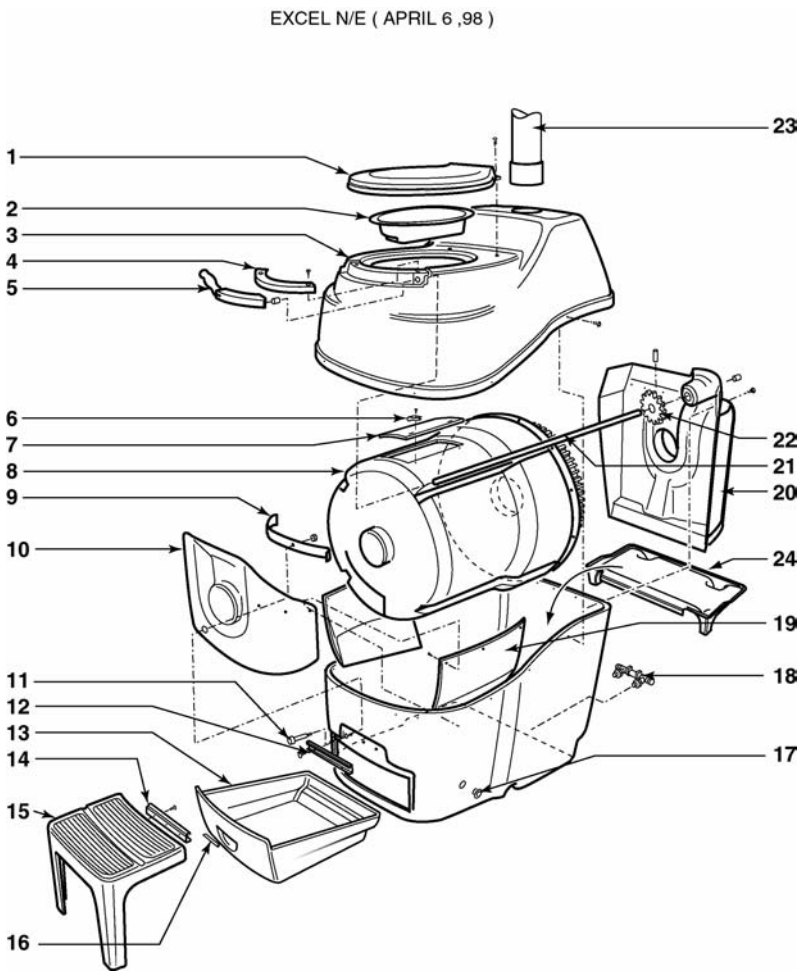
** Toilet paper is a good source of carbon and should be added after use.*

MECHANICAL TROUBLE SHOOTING

Most problems are prevented through proper maintenance and the use of proper bulking materials in the composting unit. If you do have a problem, the Trouble Shooting section will help you solve it. If you still have further questions, contact technical service at Sun-Mar for advice at 905-332-1314.

Symptom	Cause	Remedial Action	Prevention
Urine Odor in Washroom	Vent stack has too many bends and/or horizontal lengths	1. Re-install the vent stack to reduce the number of bends/eliminate horizontal lengths. 2. If the vent stack cannot be further straightened, install a 12 Volt fan in the stack.	Venting should be installed completely vertical, if bends are necessary, use 45 degree elbows, (max. 2) and install fan.
	12 volt Fan has failed, or is not running	Remove and replace fan. Fan should be on when installed. When it is turned off it forms an obstruction.	The fan is a constantly moving part and has a finite service life.
	Device other than Sun-Mar diffuser is installed on top of the vent stack	Wind turbines or vent caps may be discouraging air movement. If so, replace with a Sun-Mar diffuser.	Wind turbines or vent caps should not be installed on or, instead of a Sun-Mar diffuser.
	Room where unit is located is airtight.	1. Hold a lighter up to the air intake holes on the side of the unit. Air should be drawn into the holes. If air is not easily pulled in, check venting for too many bends or horizontal lengths and/or provide more ventilation to the room. 2. Install fresh air intakes on any competing appliances.	Install your Excel NE in a room with plenty of ventilation and watch for competing appliances such as bathroom fans and wood stoves.
	Vent is downdrafting	Increase the vent height to minimize "roof effect" and/or add a 12 Volt Fan.	Downdraft is dependent on wind direction, as well as natural obstructions. Vent should be installed 20" above the peak of the roof.
	Blockage in vent stack	Check air movement at the top of the stack. If very little, and other possible causes are eliminated, disassemble the stack until the blockage is found.	

EXCEL NE EXPLOSION DRAWING



ONGOING TOILET MAINTENANCE

The procedure below is designed to keep the compost:

- Moist, but not too wet
- Well aerated and mixed
- Well balanced and aerobic

Action	Reason for Action
Add 1 cupful (or 2 handfuls) of Sun-Mar Compost Sure (or 40%f peat moss and 60% non-cedar wood shavings) to the Bio-Drum after every bowel movement. This usually represents one cupful per person per day of use.	- Maintains the carbon/nitrogen balance - Absorbs liquid - Helps oxygen penetrate for aerobic composting
Turn Handle to rotate the drum 6 complete revolutions, twice a week when in use, or, if used only at weekends, only on departure.	- Mixes and oxygenates the compost
Extract some compost into the finishing drawer when the drum is 1/2 - 2/3 full. It is 2/3 full when the compost reaches a level about 2-3 inches below the drum door when the door is open. To empty some compost into the drawer, pull the drum locker button and rotate the handle counter-clockwise (to turn the drum clockwise). Turn at the same speed you would normally do for mixing. If necessary, use the rake to level the compost in the drawer. If there is not enough compost in the drawer, turn the drum backwards (clockwise) again 1 rotation. Leave the compost in the finishing drawer to finish for 3-4 weeks or until you next need to remove compost from the drum.	- Moves some compost to the next stage for finishing - Ensures that the drum does not get too full
If your unit is used seasonally and is not used heavily, you may not have to remove any compost at all during the season. If so, follow "Annual Startups".	- Provides extra time for composting to be completed

CAUTION

1. Do NOT add or clean the toilet bowl with chemicals. Chemicals will kill the bacteria. INSTEAD, clean the bowl liner with"Compost Quick", or very hot water and baking soda.
2. Do NOT add plastic, glass, metal, cleaning fluids, cigarettes. Add only waste and bulking material.
3. Kitchen or garden waste are NOT recommended.

ANNUAL START UP - Seasonal Units Only

Many units are only used regularly throughout the summer. For such seasonal units Sun-Mar recommends that the following start up procedure be followed at the beginning of the season.

Action	Reason for Action
Empty the compost that had been left in the finishing drawer, and use the rake to clean out the evaporation chamber.	- *Your fertilizer is ready.* - *This is a good time to remove peat debris*
Remove additional drawers of compost (if there is more than 6 - 8" in the drum), by releasing the drum lock (white button under foot stool), and rotating the drum clockwise (the handle turns counter-clockwise) to extract compost into the drawer. (At the beginning of the season, it will all be finished compost) Empty the drawer and repeat extraction cycle until the level in the drum is reduced to about 6"	- *Frees space in the composting chamber for the new seasons composting.*
Add 1/2 gallon of warm water.	- *Raises moisture level*
As an option for optimal composting, Add SUN-MAR "Microbe Mix" or unsterilized black earth from a garden center. We do not recommend using topsoil as it may contain fly larvae. SUN-MAR "Compost Quick" enzyme can also be used as a compost accelerant.	- *Even though the compost still has microbes in it, you may want to start the year by replenishing your batch of microbes.* - *Compost Quick helps to accelerate the action of the microbes.*

PERIODIC CHECK UP

Once your unit has been through initial or annual startups, and ongoing maintenance procedures are being followed, Sun-Mar recommends a system of periodic checks be undertaken.

Action	Reason for Action
Rake peat moss debris from the evaporation chamber, making sure to rake from the rear of the chamber, including the back two corners of the unit. The handle of the rake may be used to loosen debris from under the drain baffles. Raking should occur on a yearly basis for cottages (best done at annual startups), and a bi-monthly period for continuous users.	- *Ensures drains cannot get plugged and evaporation is improved.*
Check your compost moisture level on each visit for cottage users and once every two weeks for continuous users. This can be done by shining a light into the Bio-Drum. The compost should have a slight gloss or shine to it. A moisture meter may also be used if so desired. Range should be 4-6, which represents 40% to 60%.	- *A good compost is between 40% and 60% moisture content.* - *Prevents lumps, ensures toilet paper breaks down quickly.* - *Prevents insects*

EXCEL NE PART NUMBERS & DESCRIPTIONS

#	PART	DESCRIPTION	#	PART	DESCRIPTION
1	EN-0208	Toilet Seat	13	EN-0752	Excel Drawer
2	EN-0246D	Bowl Liner	14		Footrest Channel
3	EN-0454	Excel NE Top	15	EN-0380	Footrest
4	EN-0467	Excel Top Front Cover	16		Drawer Finger Strip
5	EN-0307B	Handle	17	EN-0197	1 1/2" Air Intake
6	EN-0451	Nylon Drum Hinges	18	EN-0199	1" Safety Drain
7	EN-0452	Excel Drum Door	19	EN-0113	Humus Deflector
8	EN-0107B	Excel Composting Drum	20	EN-0111B	Rear Bearing Plate
9	EN-0468	Drum Locker Release	21		Stainless Steel Shaft
10	EN-0111B	Front Bearing Plate		EN-0267	Roll Pin (5/32 X 1 3/4" SS)
11	EN-0468	Drum Locker Release	22	EN-0440	Nylon Drive Gear
12	EN-0198	Footrest Channel	23	EN-0305	4" Vent Inlet Coupling
			24	EN-0789	Evaporation Tray

Symptom	Cause	Remedial Action	Prevention
Flies Present	-compost too dry -compost anaerobic -kitchen/garden waste added -foreign material added	1.To get rid of flies, you can use pyrethrin (organic) or Malathion(manufactured) pesticide. Pyrethrin breaks down very quickly and so will require multiple applications. Malathion is more effective because it takes 30 days in a compost to break down. Should you be interested, we would be happy to refer you to the scientific literature on the breakdown of Malathion in com post. Neither pyrethrin or Malathion harm the aerobic bacteria in the compost. 2. Purchase either pesticide from the local garden store. Malathion is best in the liquid form; do not dilute it more than 1 part Malathion to 10 parts water, or it will be ineffective. 3. Sprinkle about 1/2 cup of the mixture directly over the compost. Using a spray bottle, apply throughout the entire toilet (finishing drawer, evaporating chamber, drum, out side of drum) until the fly population is eliminated. Open a window or door to ventilate the room while applying and keep children and pets away from the area for a few hours after application Repeat if you see another fly after the initial application. With Malathion, a light infestation will disappear with 2- 3 applications, a heavy one with about 5-6 applications. Pyrethrin will take numerous daily applications in order to be effective because it breaks down much faster than Malathion. IMPORTANT: Application of Malathion in a Sun-Mar composter is not a health concern because all Sun-Mar's are vented. Resmethrin may be used as a substitute for Malathion if Malathion is unavailable.	1. Keep compost moist. In order to determine a good level of moisture, shine a flashlight into the drum. The compost should have a slight gloss or shine. If it does not, add warm water to it until it reaches this consistency. Fungus gnats tend to be attracted to a dry compost, due to the fungus which begins to form on the surface when it dries out. A good, moist compost will not be attractive to flies. 2. Do not add topsoil from the ground, com posted matter, or kitchen scraps to the toilet. Flies may be present in, or attracted to these items. 3. If toilet is installed over an old septic line, make sure that the lines are well sealed. Insects find unused lines attractive. 4.See "Compost Remediation" if the compost smells- anaerobic compost will attract flies and drastically reduce the performance of your composting unit 5. Use "Compost Sure" or a mixture of peat moss and non-cedar wood shavings.

TROUBLE SHOOTING YOUR COMPOST

Requirements of an Aerobic Compost

In a Sun-Mar, a good compost is predominantly aerobic, which means that oxygen is available for aerobic bacteria throughout the Bio-drum. Aerobic bacteria consume waste quickly and odorlessly to produce carbon dioxide and water vapor and leave behind a small fraction of the original waste volume in the form of basic minerals. The end compost is a mix of valuable minerals and bulking material that has not decomposed.

To work effectively to break down waste, aerobic bacteria need oxygen, moisture, available carbon (from the bulking material), and warmth.

In a Sun-Mar, oxygen is provided by the tumbling of the drum and the bulking material leaving free air space within the compost. Moisture is provided by the waste, and is made available to aerobic bacteria by the moisture retention properties of the bulking material. If the compost is too dry, add warm water.

In summary, to keep the compost aerobic, it is important to rotate the drum, add bulking material, and keep the compost moist.

Oxygen

Lack of oxygen becomes a problem where:
- Too much moisture eliminates the free air space,
- A lack of bulking material limits free air space,
- Aerobic bacteria use up oxygen in the compost.

Lack of oxygen causes the compost to become increasingly anaerobic, which means that aerobic bacteria are displaced by anaerobic bacteria. Anaerobic bacteria work slowly and produce undesirable ammonia, hydrogen sulphide, and methane.
Consequently, the maintenance of 'free air' space by periodically rotating the drum and adding the right bulking material is very important in Sun-Mar units. Excessive rotation is not helpful and can harm the compost by disturbing the bacteria too much.

Moisture

If there is too much moisture, and the compost is approaching saturation, oxygen is pushed out and anaerobic activity predominates. On the other hand, if there is too little moisture, aerobic activity slows. For this reason, it is important to maintain adequate moisture levels (40-60% moisture content is ideal). Generally, if you shine a flashlight in after mixing, there should be a slight sheen of moisture on your compost.

Warmth

Too little warmth will cause aerobic activity to slow. Below 55-60 degrees F., microbes will go dormant and composting will stop. Composting speeds increase dramatically with temperature.

Characteristics of a Bad Compost

If your compost is over 8 weeks old and it exhibits one or more of the following characteristics , then an operating change is indicated.

- ✔ Extraction required too often (under 4 weeks)
- ✔ Large Lumps present in compost
- ✔ Compost muddy or clay-like
- ✔ Flies present (this may also be a problem with foreign matter being added to unit; see section on flies)
- ✔ Compost has strong unpleasant smell of sewage when drum is turned.
- ✔ Toilet paper present in finishing drawer

Troubleshooting

In using this troubleshooting section, you should follow remedial action in the order that they are given, unless you are sure of the problem. You should see improvement in a week, and your compost should be back to normal in 2-3 weeks. If it is not, make sure that "Ongoing Toilet Maintenance" is being followed and check the mechanical troubleshooting section.

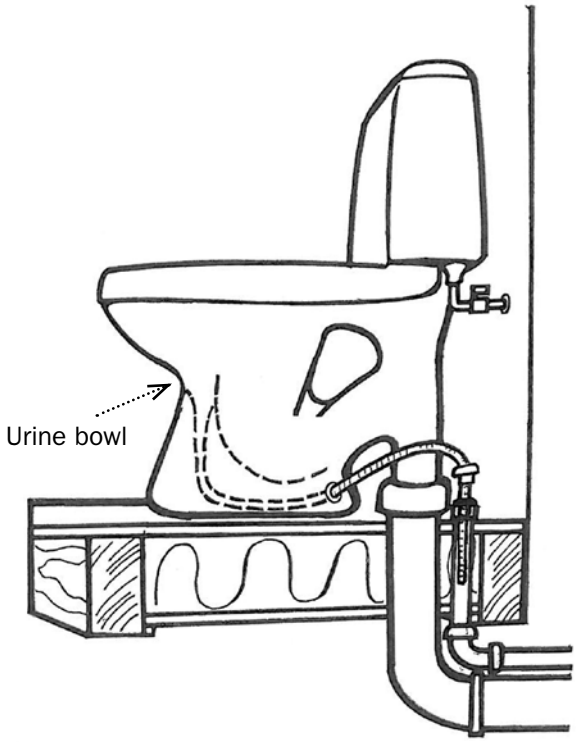
Symptom	Cause	Remedial Action	Prevention
Waste not Breaking Down at all	Antibiotics being used for more than a few weeks on a continuous basis may kill bacteria	Empty drum. Hose out inside of drum. Restart compost according to "Initial System Startups".	When used normally, antibiotics will only slightly slow compost. Add Sun-Mar Microbe Mix and/or Compost Quick during this period to accelerate compost action. Urinating elsewhere during this period will also help minimize the damage to the compost.
Lumps *If many large lumps have formed in drum, you will need to remove them or break them up with the rake tool. Follow the prevention column to ensure this does not happen.*	Compost Too Dry	Follow instructions for "Compost Too Dry" above. Also, add 1/2 gallon of wood shavings.	Follow recommendations for checking and adding moisture in "PERIODIC CHECKUP".
	Over-Rotation of Drum	Follow "ONGOING TOILET MAINTENANCE", and also add 1/2 gallon of wood shavings.	Drum should be turned three times a week, 4-6 rotations each time; once before departure for weekend use.
	Peat moss used as bulking material with no wood shavings.	Begin using 60% wood shavings, 40% peat moss as bulking material.	Use proper bulking material.
Drum Too Full *Note: The drum is too full when it is over 2/3 full, and the door is not closing properly.*	Compost not emptied into finishing drawer in a timely fashion.	1. Remove compost until drum is only half full or less. Rotate compost thoroughly to aerate, and add compost accelerants (Compost Quick and Microbe Mix) if available. 2. If you need to dump more than one drawer of compost, and you do not already have a suitable backyard compost heap, you may use an open-slatted wooden crate (such as the kind used to pack age fruits and vegetables). Layer compost with bulking material and leave crate outside for around 2 months to finish composting.	When drum is 1/2 full, remove some compost to the finishing drawer by rotating the drum backwards, to avoid surprise over-filling of drum. Do NOT let drum get above 2/3 full. (The drum is 2/3 full when the level of the compost reaches 2-3 inches below where the drum door hangs) This will lead to lack of aeration, and anaerobic compost, and the inconvenience of having to remove more than one drawer.
	Kitchen/Garden Waste added		Do Not add kitchen or garden waste.

Symptom	Cause	Remedial Action	Prevention
Compost Too Wet *Your compost is too wet when there are standing pools of liquid. Compost will smell of sewage and is anaerobic*	Compost porosity is poor. Too much peat moss has been used as a bulking material. This is compacting, preventing liquid from draining through, and leaving no free air space for oxygen.	For an immediate improvement in porosity add about 1/2 gallon of wood shavings, of any kind (except cedar) to the drum. On an ongoing basis, change bulking material to Compost Sure or a half wood shavings and half peat moss mix.	Use Sun-Mar Compost Sure or 40% peat moss, 60% wood shavings as a bulking material.
	Drum screen clogged	Rotate drum 180 degrees so that the drum screen is on top - you will just be able to see the edge of it if you take out the bowl liner. Scrub screen with wire brush.	
Compost Too Dry *Compost is too dry when compost looks flat and brown rather than rich and black.*	Moisture not being added periodically or before departure on cottage units. Toilet not used for urination .	Add 1/2 to 1 gallon of hot water to compost in order to bring it up to appropriate moisture level.	Follow section on moisture in "PERIODIC CHECKUP". Use toilet for urination.
	Insufficient bulking material or not enough peat moss.	Peat moss retains moisture. 40-60% moisture content is ideal for aerobic microbes to thrive.	Add correct bulking material.
Waste not Breaking Down at all *If this is the case, the drum will fill up quickly*	Insufficient Microbes	Add Sun-Mar Microbe Mix or unsterilized black earth from a garden center.	Be sure to add microbe packet at startups.
	Room Temperature under 60F/15C	Install heat source to increase temperature. Temperature should be kept above 55-60F/15C constantly if toilet will be used on an ongoing basis.	Install unit in warm area. The warmer the area, the better your compost will be! If evening temperatures fall below the prescribed temperatures on a residential unit, consider installing a heat source.
	Bleach or other antibacterial chemicals added.	Empty drum. Hose out inside of drum. Restart compost according to "Initial System Startups".	Never add bleach or cleaning chemicals.

EcoFlush™

MANUAL

NOTE, read the entire manual before ordering the toilet or installation is started.



How EcoFlush™ works

Urine diverting toilet to save water in sewage systems. Connected to the sewage tank. Advantages: Extra-low water consumption, less tank emptyings, and the possibility of using urine for fertilizer.

External, EcoFlush looks like a regular toilet. Inside is a urine-separating front. Two flushes. Large flush button for faecal: approximately 2.5 liters, small flush button for the urine bowl: about 0.3 to 0.5 liters. Average water consumption is about 1 liter / flush. (average of 6 spoln / day / person). EcoFlush consumes approximately 70-90% less than other toilets (other “low flush” toilets use about 3 liters).

The urine is led either to a separate urine tank or to a common septic tank for all the waste water.

Included:

- EcoFlush toilet RSK 7809023
- Toiletseat (white plastic self-closing)
- Urine hose 75cm (glued to urine bowl)

What you need:

- Waste water tank
- Pipelines
- Glue, eg transparent wet room silicone

For accessories to hidden urine drains, look under each option for the info.

Details:

Water supply:	Flexible stainless steel hose. 1/2” R15
Water flush:	Big flush: 2,5 l, Small flush: 0,3 l
Dimensions:	Height 420 mm, width 360 mm, depth 650 mm.
Urine drain:	Possible in many ways (see next page). Choose visible or hidden urine hose when ordered. 50 mm transition adapter is included.
Dimension outlet:	110 mm.
Toilet seat:	Seat in standard size. White plastic. Self-closing.

Wostman Ecology

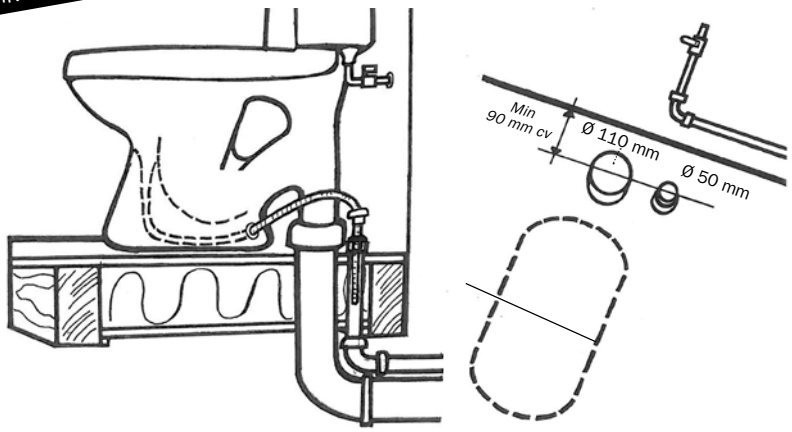
Wostman Ecology AB | Sprängarvägen 18 | 132 38 Saltsjö-Boo | SWEDEN
tel 08-715 13 20 | fax 08-715 13 21 | info@wostman.se | www.wostman.se

Wostman Ecology AB is the Swedish innovative company with long experience in toilet systems and wastewater treatment.

WC-fitting & Outlet

The urine is led either to a separate urine tank, if you want to take care of the urine itself, or to a common sewage tank, for those who only want to use EcoFlush to save water.

Delivered as standard

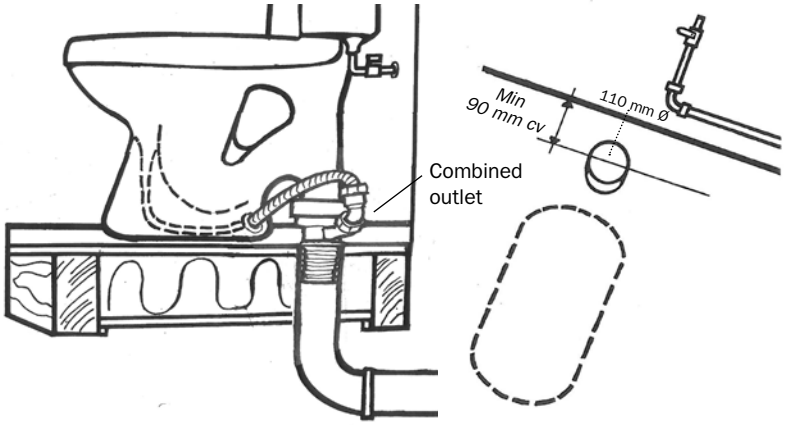


Diverting outlet

Separate urine drains into the urine tank. Take care of the urine itself. Visible white urine tube.

Needed: Fittings for urinary drainage, urine tank, sewage tank

Supplys: White rubber sleeve (RSK 3107417), white plastic cover (RSK 8082005)

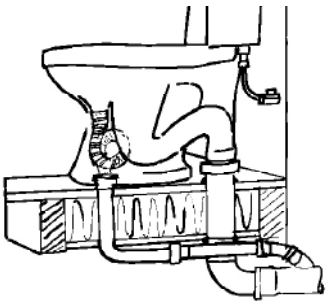


Common outlet

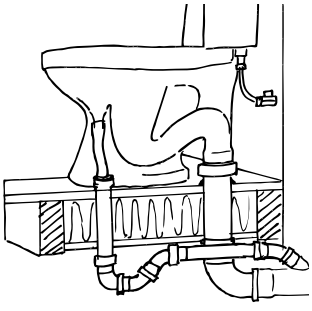
Common waste water tank. Saves water by reducing the amount of flush water, but do not have to separate urine tank. Urine tube led to the common drain with toilet flange. Good alternative if such concrete slab is already cast for the regular toilet. Visible white urine tube.

Needed: Combined outlet (with extra inlet) (RSK 3106664), waste water tank

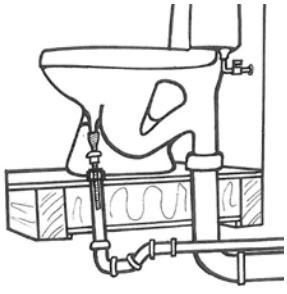
Alternative solutions for hidden drainage:



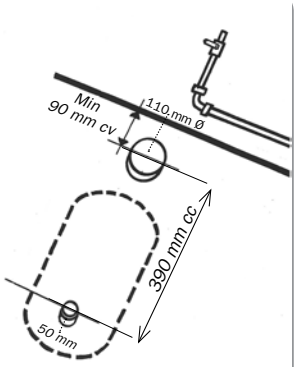
Diverting urine drainage with circle as stench trap.



Common drainage

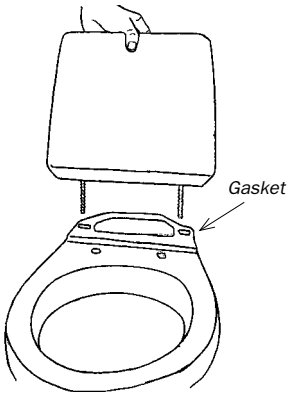


Diverting drainage



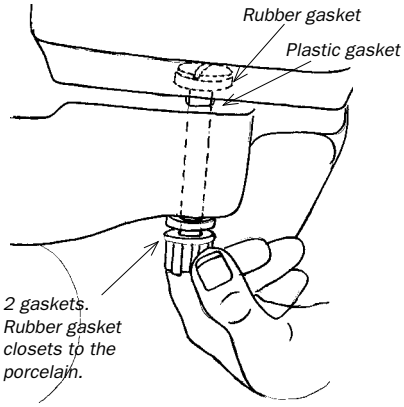
Mounting toilet tank

In order to assure the quality of transport and minimize damage, the toilet comes in two packages. The tank is water tested and just need to be mounted on the chair.



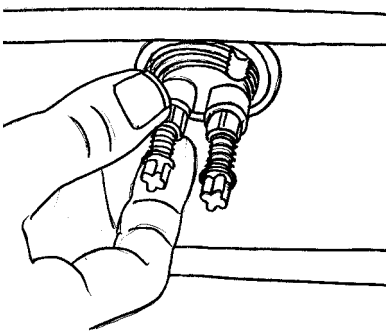
1. Mount tank

Insert the plastic screws in the holes in the tank, and further down into the holes of the toilet bowl. Glue tank gasket carefully. N.B. that the rubber gasket on the plastic screws are located right inside the tank, so that it is tight.



2. Screw the tank

Tighten the nuts on the bottom while the tank is kept in place. N.B. the rubber gasket should be closest to the porcelain. Then plastic gasket.

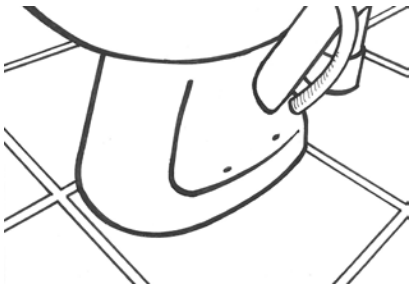


3. Adjust flush volume

The flush wolumes are standard set. If necessary, adjust the flush volume. Large button adjusts so that the button moves down into 2 mm before flushing begins. Small button adjusts so that the flushing begins near the bottom. Length of screw: small flush approx 40mm, big flush approx 50 mm.

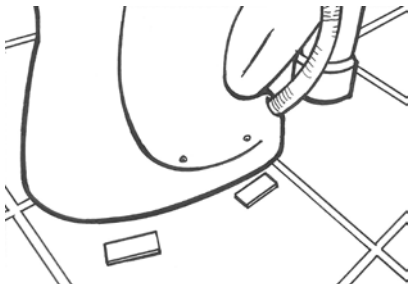
Fixing to the floor

The floors in bathroom usually leans so that water will drain to floor drain. To compensate for this and get a horizontal toilet, use the attached plastic spacers underneath the toilet to adjust height. Plastic Spacers for 4, 2 and 1 mm attached. Do not screw the toilet, because the risk of damaging the membrane.



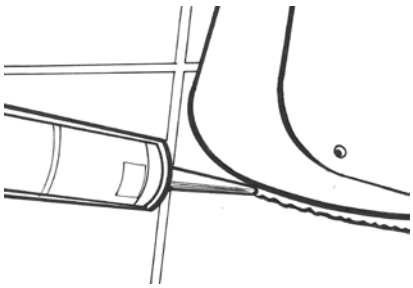
1. Place the toilet

Set toilet on site. Check the slope using a spirit level.



2. Compensate ev. slope with spacers

Combining the different spacers untill the toilet is horizontal. Use a spirit level.



3. Glue

Put a string of glue (eg bathroom silicone). The smooth the string with moistened finger.

Wostman Ecology

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Wostman Ecology AB is the Swedish innovative company with long experience in toilet systems and wastewater treatment.

clivus multrum

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CM20 | CM40 | CM60

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SERVICING QUICK GUIDE

DAILY OR WEEKLY

» clean restroom & toilet fixtures using only bio-compatible cleaners

» flush urinal piping using bacterial based cleaner

» add bulking material via pedestals around 10 litres per 100 toilet uses

MONTHLY

» remove non-biodegradables for proper disposal in trash

» check pile moisture texture is moist and crumbly, not sodden or dry

» check pumps and drains maintain proper operation and free flow

» level pile and add bulking material when cone reaches 40 – 50 cm in height

» remove liquid as needed keep standing liquid to no more than 5 cm

» add compost enhancing bacteria if extreme usage has occurred or is expected

» check user instruction signs replace as necessary to mazimise user co-operation

ANNUALLY

» clean vent system remove any obstructions inside ductwork

» service fan clean and assure proper functioning

» clean drain line remove debris and flush with clean water

» service pump and float switch clean and assure proper functioning

» remove compost if necessary only enough to make room for new material

OVERVIEW

Congratulations on purchasing a Clivus Multrum™ composting toilet.
This manual covers the full Clivus Multrum range of toilets when used in commercial or publicuse facilities.
The rated capacity of the units is designated by the number in the model.
For instance, in the CM8, the "8" stands for 8000 uses per year.
The other model numbers similarly relate to unit size.

GENERAL OPERATION AND MAINTENANCE

In normal use the Clivus Multrum toilet needs no chemicals, applied heat or water and has no polluting discharge. It is based on one of the oldest principles in nature – simple organic decomposition.
The operation and the care requirements of the composting toilet are much the same as a regular garden compost pile. It requires an adequate supply of air, sufficient moisture and moderate temperature to support a wide variety of composting micro organisms. Human waste is deposited on top of the pile in the compost processor and is a rich source of nitrogen for the micro organisms to feed on. In addition to this a carbon rich bulking material is required to obtain an appropriate carbon/nitrogen ratio and avoid the release of excess nitrogen as ammonia. As in the garden compost pile, micro organisms break the organic matter down into safe usable humus.
The addition of organic bulking matter is needed firstly to absorb liquid, secondly to give the composting pile a friable texture that ensures sufficient aeration, and thirdly to maintain the carbon/nitrogen ratio at an optimum level for the micro organisms. This produces an environment that optimizes the decomposition process.
Under these conditions the composting process is aerobic (i.e. oxygen is present), generating heat and leading to an increase in temperature within the compost pile. It has been found that harmful pathogens present in human waste are destroyed when exposed to the unfavourable environment in the compost for a sufficient period of time. A sufficient holding time for human wastes within the compost processor is therefore an important operating factor, and Clivus Multrum units are designed to provide this when operated in accordance with this manual.

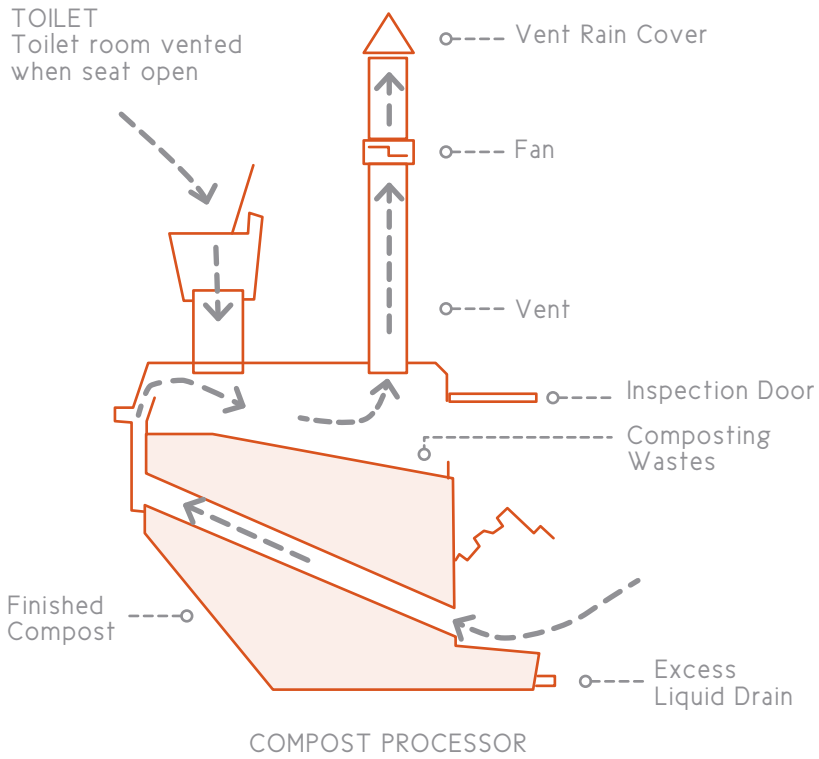
HOW THE CLIVUS WORKS

The composting process works on the same principle as an ordinary garden compost bin. Waste is collected into the composting chamber along with carbon rich material such as wood shavings and garden wastes. Here the materials gradually decompose in the ventilated environment.
Baffles and air channels in the tank distribute air flow, helping to aerate the pile, and this promotes the aerobic composting process.
As the organic material decomposes it will reduce in volume by up to 90%. The compost pile is

therefore always "shrinking in the middle" whilst new material is being added to the top, and finished compost is removed from the bottom of the pile when appropriate.
A small electric fan in the vent pipe creates airflow within the system and ensures that the toilet room is always kept clear of any odours from the processor.

CHOOSING A BULKING MATERIAL

Composting of human waste is a natural process and environmentally benign. In keeping with this, the best choice for a bulking material is one that is readily available in your local area as a waste product from some other activity.
Woodshavings have been found to be the ideal bulking material and provide consistent results. Woodshavings entrap air, are absorbent and do not become compacted as does other matter such as fine sawdust, newsprint or large quantities of grass clippings. A granular pine bark mulch isalso suitable.
Woodshavings are the material recommended by Clivus Multrum, and are generally available from:



COMPOST PROCESSOR

- joinery workshops and some timber mills
- commercial distributors that collect and package it
- produce stores
- pet shops
- nursery and landscape suppliers

Please note: Woodshavings or sawdust must not be from treated timbers as the treatment process will hinder the growth of, or even poison, the micro organisms essential to the composting process.

If you will be using woodshavings in your Clivus Multrum system you can now skip to the Start Up Procedure.

However, if woodshavings are difficult to source in your area, read the following information to assist in choosing alternatives.

The key characteristics of a good bulking material are:

- dry, but readily absorbs moisture.
- has a high carbon/nitrogen ratio.
- remains friable, traps air and does not form a mat or ball when damp.
- is known to compost well, and has no chemical contaminants to affect the compost bacteria.
- availability and cost.

Human waste has a carbon/nitrogen ratio less than 10, whereas the optimum C:N ratio for the compost pile is 20–30. A bulking agent with a high C:N ratio is therefore preferred, as this allows a smaller quantity of the agent to be used in comparison with other materials.

Representative ratios for commonly available bulking agents are shown below to indicate the relative ability of the materials to provide additional carbon.

BULKING AGENT (DRY)	CARBON/NITROGEN (C:N) RATIO
Softwood shavings	650
Hardwood shavings	550
Newsprint	500
Softwood bark	500
Sawdust	450
Wheat straw	130
Rice hulls	120
Straw – general	80
Leaves and shrub trimmings	60
Grass clippings	20) not
Hay	20) recommended
Vegetable scraps	20)

For example, to achieve the same C:N ratio in the compost pile around 10 kg of leaves would

need to be added if used in place of 1kg of woodshavings.
Mulched leaves and garden clippings can replace or supplement wood shavings as a bulking agent. Use material that has already started to compost, for example leaf matter that has fallen on the ground and started to decompose. Fully decomposed matter is also ideal as this matter contains useful compost bugs and micro organisms along with a high level of good bacteria.

> Please note: Fresh gum leaves do not make a good bulking agent, however, those that are partly decomposed and mixed with other composting matter can be good for the system.
> Material such as large woodchips, unshredded newspaper, grass clippings, straw, long grasses, treated wood shavings or highly resinous wood should be avoided as they take a longer time to break down or are unsuitable to compost.

Finely chopped vegetable scraps and peelings may be added to the process as long as they are not too wet and have been kept in an airtight container to prevent insect infestations. However, because of their high nitrogen content the addition of these scraps will require even more bulking agent, not less, unless earth worms are also used. Addition of these materials will reduce the working capacity of the tank available for processing human wastes.

OPERATING PROCEDURES

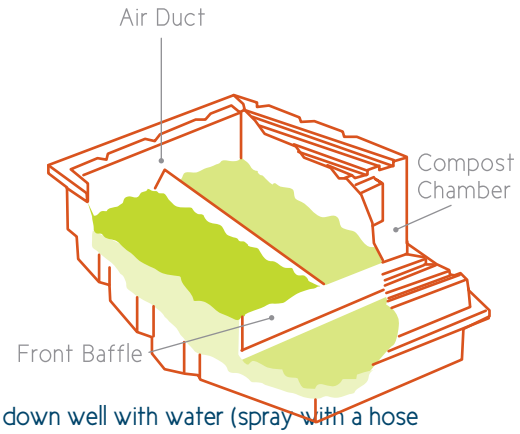
START UP PROCEDURE

This procedure should also be followed should the tank ever be completely emptied for any reason.

> Please note: This is a crucial part of the installation process and must be completed before the unit is operational.

We recommend wood shavings as the starter-bed material or bulking agent as they are high in carbon and are of a good texture so as to trap oxygen and retain moisture. Alternative bulking agents are discussed in the previous section.
Unsatisfactory materials for the starter-bed include: large quantities of lawn clippings, fine sawdust, large wood chips and long stemmed grasses. These materials will decompose but in your Clivus may have a tendency to form solid "clumps".
Spread the bulking material evenly in the tank bottom and so as to cover the forward part of the air ducts as shown in the following diagram. Material must come 150mm up behind the bottom edge of the front stainless steel baffle to ensure a seal between the compartments.
Approximate volume required is

- CM8 0.25 cubic metres
- CM10 0.3 cubic metres
- CM14 0.4 cubic metres
- CM20 0.5 cubic metres
- CM40 1.2 cubic metres
- CM60 1.2 cubic metres



Once the woodshavings have been added, dampen down well with water (spray with a hose through the top inspection door). This breaks the surface tension and allows the bulking material to begin absorbing the urine that will enter the tank. If this is not done liquid can simply run off the organic material without slowly leaching through.

Clivus Multrum provide a packet of starter bacteria with your new system. For this to be effective it is necessary to have some waste in place to provide nutrients before the bacteria is added to your unit. We therefore suggest that the toilet is used in the normal way for say 7 – 10 days (depending on usage level) before the bacteria is added.

Hydrate the supplied Clivus compost starter bacteria in a bucket of warm water for 10 minutes or longer, then add the bacteria to the toilet. An alternative source of bacteria is to add several bucketful's of well composted garden material or commercial compost humus and mix into the top of the pile. This can be repeated as often as you wish.

TOILET USE

The toilet should be used in the same manner as conventional toilets, with paper disposed into the toilet. No special toilet paper or method of use is required.
When not in use, the toilet seat lid should be left closed to maintain the proper ventilation draft in the compost tank. Where multiple pedestals are installed on one tank this also ensures odour control in the restroom.
"Close Lid" stickers and signs should be maintained so as to gain co-operation from the patrons.
To ensure an odour free restroom, the compost system ventilation fan must be run continuously to ensure a draft down into the pedestals.

FREQUENCY AND QUANTITY OF BULKING MATERIAL REQUIRED

Composting occurs more rapidly when there is a good mix of waste and bulking agent. This mix happens naturally if bulking agent is added at each toilet use, reducing the amount of

maintenance raking needed on the compost pile.

We recommend placing a receptacle of woodshavings in the toilet room and adding one handful (or a small cupful) of shavings down the pedestal after each use.

In public amenities this may not always be practical, and the addition of bulking agent may be made regularly when the toilets are cleaned. In this situation, about 10 litres of woodshavings (or equivalent) should be added for each 100 uses. This quantity may need to be adjusted depending on the climate and the nature of use. More mixing of the pile with the maintenance tool may be required to ensure even distribution and avoid "layering" of the wastes if bulking agent is not added frequently.

If different bulking material to woodshavings is used, greater quantities will generally need to be added. Refer to the section on Choosing a Bulking Material for details.

TOILET CLEANING

Frequency of cleaning should be adequate to provide a pleasant and hygienic restroom that will encourage the respect and co-operation of users.

Other than adding of bulking agent, the frequency of cleaning does not impact on toilet operation.

PEDESTALS

The inside of the toilet bowl is easily cleaned with a small quantity of water and biodegradable cleaner, using a soft toilet brush. Suitable cleaners are generally labelled "biodegradable" or "safe for septic systems". Chlorine based cleaners, bleaches and disinfectants must not be used as these will kill the compost bacteria.

The addition of a bucket or so of water during cleaning will present no problems to toilet operation, and in dry climates will even be beneficial.

If excessive ammonia type odours are being experienced in installations with a particularly high urine load, the use of a bacterial based cleaner with odour control properties is advisable. Contact Clivus Multrum Australia for recommendations.

The seat and outside of the toilet can simply be wiped with some disinfectant applied to a damp cloth. Avoid using abrasive cleaners on the gloss finish of toilet and seat, as these surfaces will scuff. If required, the chute interior may be easily cleaned with a swivel-head brush and some biodegradable cleaner.

Scuff marks or slight scratches on the pedestal may be carefully polished out using a small quantity of fibreglass cutting polish, following the product instructions.

URINALS

Non-flush urinals require a regular clean to avoid build up of odorous deposits. Using a spray, thoroughly wet the surface then brush or wipe down. Also use a litre or so of water or cleaning solution to flush the piping and reduce long term scaling and blockages. Use of a suitable

bacterial based cleaner with odour control properties is recommended.

THINGS TO AVOID

Do not put the following items into the toilet.

» Disinfectants or other harsh cleaning solutions e.g. bleach, caustic, chlorine, etc.

» Chemical toilet wastes

» Paints, solvents or any other chemicals

» Plastic of any kind eg. disposable nappies, sanitary products

» Cigarettes or hot ashes

» Anything that is inorganic or non-biodegradable.

Kitchen food and vegetable scraps can be added as a means of disposing of these items, especially if earth worms are used in the processor. These wastes are high in nitrogen however, and may require additional use of bulking agent. Excessive amounts will lead to overload of the system. They have also repeatedly shown to be a source of unwanted insects in the compost tank.

OTHER CONSIDERATIONS

Provide proper receptacles for disposable nappies and feminine hygiene products. Trash cans and recycling bins should be available for cans, bottles, etc...

Provide receptacles for portable toilet waste if unauthorised disposal is a potential problem.

Keep loose objects such as extra toilet paper rolls out of the restroom or in a locked cabinet where they cannot be dropped down the toilet chute.

Avoid accidental fires in the compost tank. "No Smoking" signs should be posted in conspicuous locations. Provide ashtrays outside the restroom building.

Assure user co-operation by maintaining clean, well lit and pleasant restrooms. For all toilets and urinals, affix Clivus Multrum "1-2-3" user plaques and "Close Lid" stickers within easy view of the user. Provide signs explaining the system to users.

USE OF WORMS

While the Clivus Multrum system is based on microbiological decomposition, it is also perfectly suited to the use of worms, more so than most other compost toilet systems. However, we do not actively promote the Clivus as a worm-based system because our aim is to provide the most trouble free system we can. Being a higher life form, worms need more care, for instance ensuring correct carbon/nitrogen ratios and pH balance are maintained, that they have adequate moisture at all times and plenty of food. If this care is given then worms are a valid addition to

the Clivus system.
The use of worms increases the rate of volume reduction for the compost, and effectively increases the working capacity of a tank in a particular environment. This can be of real benefit in cold climates, or where additional waste material is being added to the compost tank.
Garden earthworms are not very suitable however, and advice should be obtained on the most suitable variety of compost worm for your location. Local worm farms or nurseries can assist with this.
The population of worms will be largely self-regulating in the presence of sufficient moisture. Additional moistening may be necessary to provide the worms with an adequate amount of water. Worms should not be introduced until the system has been in active operation for a period of at least six months. Open the maintenance access hatch and place the worms in a front corner of the tank, away from the waste cone. The worms will migrate on their own throughout the compost pile.

ROUTINE SERVICING PROCEDURES

The servicing described here will ensure the reliable operation of your Clivus Multrum system. If you have a particular problem, refer to the Troubleshooting Table at the end of the manual.

INSPECTION OF THE COMPOST CHAMBER

The ability to visually inspect the process is a significant design advantage of the Clivus Multrum system as it ensures the system can be managed to optimize performance. This process of checking the system and raking over the pile takes only a few minutes.

Approximately once a month (more frequently in heavily used units) open the inspection hatch (top door) and visually check the condition of the pile. This should not be an offensive task as the ventilation fan ensures that any odour is drawn away from the maintenance person and up the vent pipe. Remove large objects such as cans, bottles, plastic bags, disposable nappies and feminine hygiene products that can restrict compost aeration, that take up significant space or which may cause matting of the pile or slow the composting process. Small items such as tampon applicators or bottle caps are not large enough to need removing. Use the long-handled maintenance tool or other suitable means for removal and proper disposal.

If the pile is forming a cone 40-50cm in height this should be levelled using the supplied maintenance tool to ensure the full tank volume is utilised. Do not "turn" the compost pile, as this may bring uncomposted material to the area of the removal hatch and result in its premature removal. If bulking agent was not added regularly, add the larger quantity at this time and mix it in as you level. A system getting 100 uses per day would likely need this done once every 2-4

weeks. When the proper amount of bulking material has been added regularly, a good consistency is likely to be achieved: porous and crumbly, with no large clumps of waste.
For good composting the pile should have around 50% moisture content and appear moist, but not sodden. If the pile appears too wet simply add a generous amount of dry bulking agent through the toilet chute and rake through; also check the ventilation system is operating effectively. In dry climates, or where the toilet is not used for an extended period of time, a light spray of water will be required if the pile appears dry (hard or crusty on top, dry toilet paper).
The frequency and/or volume for adding bulking material should be modified if the pile is consistently too wet or dry.

After inspecting the composting pile, open the bottom access hatch and check that liquid drain is clear of obstruction. If there is more than 3 – 4 cm of liquid or an offensive odour in this area this indicates all is not as it should be, so refer to the Troubleshooting section at the end of this manual.

If the tank has no drain, liquid should be pumped out regularly to keep the pile from becoming partially submerged and creating an anaerobic condition. As much as 5 cm of liquid in the bottom of the tank is of no concern. Check the drain line, manual pump or automatic pump and float switch for proper flow and operation. Rinse automatic pump with clean water and remove debris from inlet screen on the bottom of the pump.

THE MAINTENANCE TOOL

After servicing the top of the compost pile it is possible that the maintenance rake is contaminated with fresh faeces. The best way of cleaning the rake is to run it through loose soil or through composted humus in the bottom section of the tank. The rake should then be left in a safe place out of reach of children and can be labeled "For Clivus Use Only". Standing it in a bucket of dry woodshavings is a good method for storage.

CHECKING THE VENTILATION SYSTEM

If the vent system is kept clear and well maintained this reduces resistance to the airflow, ensures odours do not develop in the toilet room/s and that there is good dilution of odours in the vent system.
The presence of an adequate draft can be checked by simply holding a piece of cotton where the vent leaves the composting chamber. The cotton should be drawn toward the vent pipe. A similar draft should also be present when the lid is up on the toilet pedestal, and can be readily felt on a wet hand.
The same method can be used to ensure the system is drawing air in from the front air inlet grille

on the bottom access hatch. If a draft is not present check that the air inlet grille and the vent fan are free from any obstruction. Also check the front of the V-shaped air baffles inside the chamber to ensure that these too are free from obstruction.

The inlet air grille and the vent fan should both be checked regularly and cleaned every six months.

If the fan is turned off for long periods at a time, or run only intermittently, an insect screen on the vent pipe may be required. Regularly check this screen does not become blocked with dust and cobwebs – this is most important if the fan is not operating.
Ensure that there is no obstruction at the top of the vent pipe from overhanging trees or spider webs. Trim trees back to maintain clear air flow around the vent.
Keep the toilet lid closed when not in use. If the toilet lid remains open for extended periods of time the fan will pull air down the toilet chute rather than through the compost pile, slowing the decomposition process and the rate of evaporation.

FAN REMOVAL – (Standard Fan)

To remove the fan for cleaning first switch off the power supply, then remove the two screws holding the fan cover to the housing and withdraw the cover. The fan may then be slid out of the housing without disconnecting the wiring. When reinstalling the fan, check that it will blow in the correct direction before sliding it into the housing and replacing the cover. If the fan requires replacement, a genuine spare part from Clivus Multrum Australia is recommended to ensure the correct air flow rate and power consumption are maintained.

BOOST COMPOSTING PROCESS

Use extra bacteria if the system has experienced extremely high usage, a high usage cycle is about to begin, or if the facility is opening or closing for the season. Air-dried bacteria are manufactured for enhancing the aerobic composting process. Use it at the rate of one sachet (mixed with one bucket of warm water and rested for 20 minutes), sprinkled as evenly as possible over the pile, to keep the decomposition process fully functioning. Sachets of bacteria are available from Clivus Multrum.

REMOVING THE FINISHED COMPOST

The minimum retention time required for wastes to remain in the compost processor is generally 12 months, however this varies from State to State and there may also be specific requirements imposed by your local Council. Check with your Council to determine any requirements for your area..
It is not necessary to remove compost from the tank until the levelled waste mass has reached the

bottom of the inspection door. In some situations it may take up to 3 years before any finished compost needs to be removed to create more space in the tank. This is dependent upon climate, the rate of usage and what type of bulking material is being used. First compost removal will normally need to occur after about 18 months.

Once the finished compost is ready for removal, up to 1/3 of the compost should be removed per year. Material must be taken from the compost removal chamber at the bottom front of the tank. The amount removed will vary with the size of the tank, and the compost processor should always be left at least 1/3 full, with material up to the underside of the baffles. Once compost is removed ensure that the compost pile settles to the bottom of the compost chamber. If compost has 'bridged' and is reluctant to settle, the maintenance tool (or other blunt instrument) can be used to loosen the bottom of the pile or prod down from the top.

We recommend removal of at least some material on a yearly ongoing basis even if there is still plenty of working space available at the top of the pile. This prevents the compost continuing to consolidate under its own weight and becoming very solid in the base of the tank.
After removal the finished compost should be buried under at least a 100mm layer of soil in a designated area of the property, or otherwise disposed as required by your local Council.

PUBLIC HEALTH CONSIDERATIONS

SERVICING THE TOILET

The Clivus Multrum™ waterless toilet system has undergone extensive testing. This testing has shown consistently that when the toilet is operated correctly that the finished end-product is safe to handle. However, when servicing the toilet system or removing the end-product Health Regulations advise that safety precautions should be observed. For instance, rubber gloves should be worn as well as eye protection and a dust mask.

USE OF END PRODUCT

The Health Departments generally require that the end-product is to be buried under no less than 100 mm of top soil. This should be done in a designated area reserved for this purpose and away from where children play. Health Departments are still undecided about whether they should allow the final product to be used on crops intended for human consumption. Your local Council may have further specific requirements in your area.

COMPOST TOILETS AND INSECTS

A situation that encourages an insect problem within the compost tank is if the fan is off for extended periods. This allows insects to enter via the top of the vent pipe, or can attract them via the pedestal. If your system is running only on daytime solar power or if you want to turn the fan off from time to time, some fine insect mesh should be placed across the top of the vent pipe. In addition, you should consider installing a wind driven turbo-vent that will maintain a draft through the system when a breeze is blowing.

From our experience, only a small proportion of compost toilets seem to attract insects. In some cases insects like the Soldier Fly help with the break down of compost. Other insects such as the small Vinegar Fly are only a nuisance. The Vinegar Fly is a small black insect that is small enough to go through standard fly wire and has very small white larvae. This insect can get in through any small gaps in the compost tank lids or it may hatch from eggs in fruit skins that are thrown down the toilet. Only very rarely will the common housefly find its way into the compost tank.

Whilst spraying down the toilet chute with a pyrethrum based spray often helps control the vinegar fly, the best way we have found to eliminate them is to introduce their natural predators such as millipedes, earwigs, beetles of varying kinds and other invertebrates. This is easily done through the addition of damp decaying leaf litter and soil found naturally under trees. The addition of 3 or 4 buckets of this material should be sufficient. However, raking some additional material through the pile will also help.
Be careful that spraying down the chute will not kill off the freshly introduced creatures and their hatchlings.

Vinegar flies are usually only active in a young compost tank (up to the first six months) and often are a sign that the pile is too acidic. This may be due to insufficient or the wrong type of organic bulking material being added to the system. It may also be due to the fact that the added starter bacteria has not fully developed.
The following steps outlined below should establish the correct balance within the composting tank and eradicate your immediate problem:-

Step 1
Ensure the top inspection door and the bottom access door on the composting tank are sealing properly. Always make sure the inspection door is securely closed after checking the pile. Ensure that the toilet seat is always down when not in use.

Step 2
Turn off the fan and spray a pyrethrum based insect spray through the inspection door

onto the waste pile (this will not harm the compost bacteria) to kill airborne and surface insects. Leave the fan off for ½ hour to avoid drawing the insect spray away before the flies have been exposed. This should be repeated daily over the next week as remaining fly eggs continue to hatch. The vinegar fly has a seven day breeding cycle.

Step 3

If there is an acidic odour apply a generous quantity of garden lime (available from nurseries) to the top of the pile and agitate into the pile with the maintenance tool provided. This will help correct any acidity imbalance. Adding lime should be a once only job as it will tip the balance the other way if used regularly.

Step 4

Ensure adequate quantities of bulking material are being added frequently to the system. Add an extra two to three buckets of woodshavings and agitate into the top of the pile at the same time as the garden lime. It is less attracting and more difficult for insects to breed if fresh wastes are immediately covered.

Step 5

After doing all of the above and having stopped spraying the pile, leave for a few days and then add 2–3 buckets of naturally occurring, decayed leaf litter along with the top few centimetres of soil. This helps to introduce a wider number of micro and macro organisms which helps establish the correct mini "eco-system" inside the tank.

Step 6

Ensure the tank is not being re-infested by insects from a nearby breeding source such as garden compost piles, soakage areas, farm wastes, etc. It is strongly recommended that no kitchen scraps or fruit and vegetable peelings be added until the situation has corrected itself.

TROUBLESHOOTING

PROBLEM

Odour present in the toilet room.

A properly functioning Clivus Multrum system does not produce odours in the toilet room. Occasionally, however, the draft of the system may become impaired or a leak may develop in a chute or a vent resulting in odour.

Note: You should never use a room exhaust fan where a Clivus is installed as the exhaust fan will draw up any odour from the toilet chute (particularly if the toilet seat is not closed). The fan in the toilet vent pipe will be sufficient to draw any lingering odour out of the toilet room.

RECOMMENDED COURSE OF ACTION

» Check that the power source is connected and voltage is set to 12V, and that power point is switched on.

» Check that ventilation fan is operating correctly and that vent pipe is free of blockages or dense cobwebs.

» Ensure that the fan has been installed so as to draw air up from the bottom of the vent, not blow downwards.

» Check that fan is not obstructed from turning by dust or cobwebs. Clean if necessary and replace into housing.

» Check that open windows and doors are not 'sucking' air out of the toilet room due to outside air turbulence. This can overcome the suction of the vent fan.

PROBLEM

An odour is present outside the building but not inside.

Some odour from the top of the vent pipe may occur, but it will rarely if ever be detected at ground level.

This is obviously not a desired occurrence.

RECOMMENDED COURSE OF ACTION

» Ensure that the vent pipe is installed correctly and that it clears the roof by at least 0.6mtr.

» If the house is in a very windy area you could be getting a swirling effect which is pushing the ventilation gases back down towards the ground. In this case, the only thing that can be done is to extend the vent pipe into clear air flow above the highest point of the roof.

» If the vent is in the wind shadow of nearby trees or buildings then odour may settle back to ground instead of being dispersed. Extend the vent pipe into clear air flow.

» Check that all joins in the vent pipe are sealed and are not leaking. Also check for cracks in the vent pipe and seal with silicone sealant and duct tape.

» A strong unpleasant odour is a sign the composting process is not operating in balance. This usually indicates the bulking material should be added more frequently or in greater quantities. Check the state of the compost pile and refer below for any corrections.

PROBLEM

Odour is associated with the end-product.

In a properly functioning system the final composted material should be virtually odourless, much like garden soil. However, if proper ventilation and oxygen are not provided during the composting process the pile may have become anaerobic.

RECOMMENDED COURSE OF ACTION

» Check that vent fan is operating properly and ensure there is no significant build up of liquid in the removal area.

» Shovel material from the removal area back in through the inspection door adding a substantial quantity of woodshavings and mixing through with the maintenance tool.

» Increase the quantity of woodshavings that are regularly added after each use.

PROBLEM

Fan is making a lot of noise.

RECOMMENDED COURSE OF ACTION

» Check fan for obstructions – has it been correctly installed in the fan housing and is not rattling.

» Lower the transformer voltage to 7 or 8 volts.

» The fan may be faulty, phone Clivus for a replacement.

PROBLEM

Some liquid present in removal access area of composting chamber.

With periods of very high use, especially when accompanied by low outside temperatures you may get a little liquid build up in the access area. However, if there is more than just a few centimetres and there is odour present ...

RECOMMENDED COURSE OF ACTION

» Ensure that sufficient woodshavings and/or other organic bulking material has been added to the system according to the operation and maintenance instructions. If not...

» Add several full buckets through the inspection door and toss through the top 30cm of the composting pile.

» Ensure that adequate quantities of woodshavings are regularly added to the system.

» Check that the liquid drain is clear from obstruction and has been correctly installed so as to slope away from the chamber.

PROBLEM

A significant liquid build up in the tank has occurred.

The Drain Line has become blocked

RECOMMENDED COURSE OF ACTION

» Check the tank outlet fitting is not blocked by any solids or plastics.

» Check the liquid drain and absorption trench are clear and not damaged, or affected by ground water.

» If liquid is non offensive and a clear 'tea' colour, drain off excess liquid and dispose according to local requirements.

» If liquid is more than 10cm deep, has an offensive odour or is contaminated with solids or scum, this indicates the lower part of the compost pile has become anaerobic (no oxygen). This situation is best remedied by emptying the tank and then restarting the compost process as described in the Operations Manual. Septic tank clean-out contractors can readily pump out the tank and dispose of the contents.

PROBLEM

Compost tank is getting too full

RECOMMENDED COURSE OF ACTION

» Is the pile too dry, too wet or too cold? (Refer below).

» Is the unit being overused, particularly in cooler months.

» Is the composting process active (Refer below).

PROBLEM

The composting process does not seem to be working.

Note: the top part of the pile will not be composted unless it has had sufficient residence time in the tank.

RECOMMENDED COURSE OF ACTION

» It is normal not to notice any composting for the first six months.

» Check that the a suitable bulking agent is being used.

» Check that disinfectant or antibacterial cleaners are not being used in the pedestal.

» Is the pile too dry, too wet or too cold? (Refer below).

» Adding a couple of buckets of damp decaying leaf litter and soil found naturally under trees or material from another compost pile will ensure that the correct microorganisms are present to break down the waste. A bacteria pack from Clivus Multrum will also stimulate the process.

PROBLEM

Composting pile appears too dry.

In normal circumstances there will be sufficient moisture entering the toilet to ensure adequate moisture levels. If however, there have been extended periods of little or no use or where outside temperatures have been very high, it may be necessary to periodically spray the pile with water via the inspection door.

RECOMMENDED COURSE OF ACTION

» Use the maintenance tool to agitate as much of the compost pile as possible and moisten lightly via the inspection door.

Note: Pile should be made damp NOT sodden. Optimum moisture content is around 50%.

PROBLEM

Compost pile appears too wet.

Pile should be damp NOT sodden. Optimum moisture content is around 50%. Too wet is a sign that insufficient woodshavings are being added to the pile and/or that the toilet has received heavy use and insufficient maintenance.

RECOMMENDED COURSE OF ACTION

» Add several buckets of dry bulking material (woodshavings in particular) through the inspection door and agitate thoroughly through the pile.

» Increase the quantity of woodshavings added regularly. (Refer page x).

» Check the vent fan is operating correctly and vent pipe is clear of obstructions. (Refer page x).

PROBLEM

There seems to be too much toilet paper visible on the top of the pile.

RECOMMENDED COURSE OF ACTION

» Ensure sufficient woodshavings are being added regularly.

» Some people use much more toilet paper than is really necessary. Simply dampen down if necessary and agitate top 100mm or so of the compost pile to mix with the woodshavings.

PROBLEM

Composting pile may be too cold for composting.

If the compost tank has been correctly sized for the usage and climate, this problem will rectify itself in the summer. Clivus Multrum systems operate successfully in very cold climates if properly sized and maintained.

RECOMMENDED COURSE OF ACTION

» If the tank is in a cold location and is becoming full without sufficient composting occurring, the following measures can increase the rate of decomposition:

» insulate the tank from a concrete floor.

» insulate the sides and top of the tank to retain heat in the compost tank.

» reduce the airflow through the inlet grille at the front of the tank, or duct it to draw air from a warmer location.

» if tank is in a cellar, duct warmer air into the cellar.

» introduce earthworms into the compost. A local worm farm or nursery can advise on a suitable variety for the conditions.

PROBLEM

Undesirable insects in the compost tank.

» Refer to section on Compost Toilets and Insects in the Manual.

WATERLESS COMPOSTING TOILETS

OWNER'S RECORD SHEET

Address: ....

....

....

Clivus Multrum Tank Model : ....

Serial Number: ....

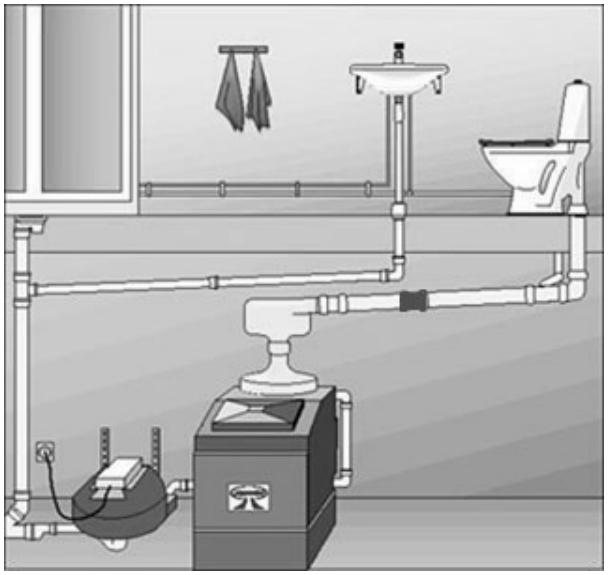
Installed by: ....

Date installed ....

COMPOST TANK INSPECTION			MAINTENANCE EVENT (raking of pile, compost, removal, vent, cleaning etc)	
DATE	COMPOST LEVEL	NOTES (moisture, odour, bulking agents etc)	DATE	EVENTS + ACTION

go green pay less no mess

AQUATRON®



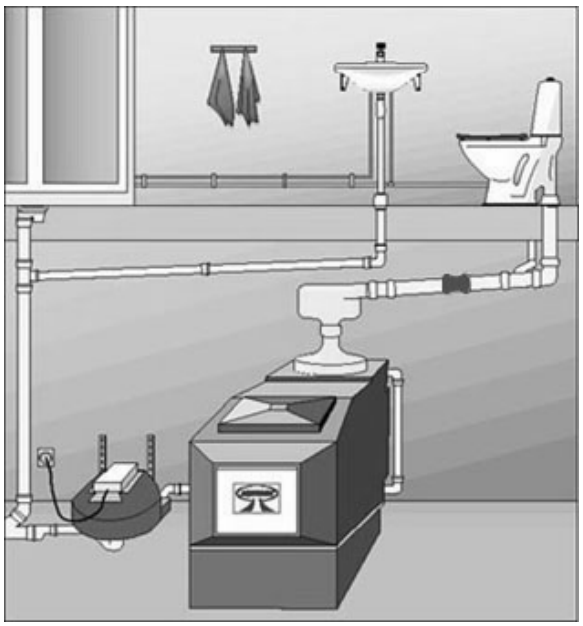
USER'S MANUAL

(INSTALLATION AND MAINTENANCE)

AQUATRON MODELS 90 AND 400

AQUATRON 90

AQUATRON 400



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May 2007

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1. INTRODUCTION

IMPORTANT!
For optimal functionality it is very important that this installation manual and the maintenance instructions are being followed closely. In case of problems please contact the main supplier.

This is how it works – the solution is given by nature itself!

The liquid is flushed to a separator where urine and water is separated from faeces and paper. The liquid will then pass through an Ultra Violet unit and may thereafter be infiltrated into the ground or into a suitable receptacle. The solid waste is being composted in a Bio Chamber. If so wished, composting worms may be added in order to accelerate the composting process.

1. Aquatron uses standard Water Closets (flushing volume 3-6 litres) or special models where the urine is mechanically diverted from the flushing water and the solid waste in the bowl itself.

2. When the toilet is flushed, the contents of the bowl are transported to the Aquatron Separator where approx. 98% of the liquid fraction is separated by using the momentum of the flushing water, centrifugal force and gravity. The Aquatron Separator needs no moving parts.

3. The solid waste (paper and faeces) falls down into the Bio Chamber where it is composted by bacteria and, if desired, by worms. If using worms, the volume of the solid waste will be reduced by approx. 90%. The need for emptying and handling the waste is therefore reduced to a minimum. Optionally, after installing an Aquatron System, some 250-300 worms are placed into the Bio Chamber. The number of worms needed to maintain the composting process will be adjusted automatically by nature. Optimal temperature for the composting is 12-25 degrees Celsius, a temperature level recommended for year-round inhabited homes. Freezing will kill the worms. The composting process is free from odour and flies because the Bio Chamber is ventilated and the small amount of liquid following the paper down into the Bio Chamber is removed by a drain at the base of the Bio Chamber. When the Aquatron 90 and 400 models are emptied, the refuse must be composted to soil in the garden together with the normal garden and kitchen waste. However, the models 4x100 and 4x200, require no further composting.

4. The liquid proceeds to the UV unit where it is exposed to Ultra Violet light which kills bacteria and viruses. The liquid may then be treated as Grey Water (bath, dish washing and laundry water) which means that the toilet wastewater may be infiltrated into the ground or into a suitable receptacle. Since the liquid fraction is separated from the solid waste, Aquatron Systems are not sensitive to peak load usage.

Congratulations to your decision to buy the biological toilet system Aquatron! Our experiences from many satisfied customers during more than 20 years is that a correctly installed and properly maintained Aquatron system will serve you and your guests well for many years to come.

Henry Steffensen
Managing Director,
Aquatron International,
Amberes AB

2. UNPACKING

The following parts are delivered: Separator, Bio Chamber 90 or 400, connecting pipes and – provided the UV unit is included in the delivery – a UV unit and a Waterseal to be attached to the UV unit. For pitch changes of the 110 mm inlet pipe, a special angled coupler double socket is provided. A mosquito net for the top of the vent pipe is also being included.

3. PREPARATIONS

To install the AQUATRON toilet system you will need the following material in addition to the WC. Items marked with an asterisk (*) are included in the delivery, the other items to be purchased locally if needed.

PIPES:

WC – Separator	4" x 90°	Soil pipe bend socket
	4"	Coupler double socket
	4" x **#**" x 45°	Soil pipe single branch for 3-4" (=**#**) vent pipes
	4" Angled coupler double socket (*)	For 4% change of inlet pipe pitch
	4" pipes as needed	Inlet pipe
Separator – Bio Chamber	2" Connecting Pipe (*)	Angled and specially made for Aquatron 90 and 400 respectively; coupler sockets at both ends
Bio Chamber – UV unit	2" x 500 mm (*)	Pipe with coupler socket
	2" x 90° (*)	Coupler single socket 90 ° bend
UV unit – Grey Water sewage	Waterseal (*)	For the UV unit outlet
	2" Coupler double socket	For Grey Water sewage attachment
	2" pipes as needed	Outlet pipe to Grey Water sewage

MISCELLANEOUS:
(purchase separately)

Course bark grinds, see Item 7.3:
- for Aquatron 90, 1 sack (approx 50 liters);
- for Aquatron 400, 2 sacks.

Grounded 230 V outlet for the UV unit.
Insulation board, 2" thickness.
Material for platform and consoles.
45° bend to be installed at inlet in the UV unit if a pump is installed between Bio Chamber and UV unit, see Item 6.1.
3-4" pipe and coupler sockets for vent pipe (WC ventilation),

4. INSTALLATION OF THE AQUATRON SYSTEM

4.1 Arrangement of the Bio Chamber

4.1.1 Build a platform for the Bio Chamber. Position a 2" (50 mm) insulation board on top of the platform. For measurements see Figure 1 (Aquatron 90) and Figure 2 (Aquatron 400). Put the Bio Chamber steadily on the platform.

4.1.2 Check the compartment where the system is to be installed. If low pressure occurs (e g if an oil-burner is installed), a separate room must be built for the Bio Chamber. The compartement must have a ventilator to the outside air and the door should be sealed by a strip seal.

4.1.3 The Aquatron system should be installed in a frost free compartement where:
- an optimal composting temperature is minimum 12° C (55° F),
- at year-round living or vermi composting a temperature above 15° C (60° F) is recommended,
- if necessary, insulate the compartment and install a thermostat controlled electric heater.

If the system is installed in a vacation house which is closed during the winter season, special precautions must be taken.

4.2 Installing the Separator

4.2.1 Check that the Wire-ring is fully pushed down into the Separator neck and that the wires are not crossed. The upper part of the Separator (Cyclone) should rest upon the Wire-ring. Tighten the hose

clip just as much as needed to keep the upper and lower parts of the Separator together. There must be no space between the Cyclone and the Wire-ring, see Figure 3.

4.2.2 Place the Separator on the Bio Chamber. Turn it so that the fluid outlet located in the bottom part faces towards the rear side of the Bio Chamber. Turn the upper part of the Separator towards the pipe coming from the WC. Tighten the hose clip.

4.2.3 The Separator must be installed in a vertical position, see Figure 3.

4.3 Installing the UV unit

4.3.1 The UV unit should be positioned in such a way that the waste water from the Separator and from the Bio Chamber can flow freely into the UV unit. It is recommended that the UV unit is placed on consoles fixed on to the wall, see Figure 4. Make certain that the aluminium lid is positioned in such a way that it can be easily removed for accessing the UV fixture when replacing burned-out UV light tubes, for inspection, cleaning the interior of the UV Unit etc.

4.3.2 The UV unit must have its bottom surface horizontally installed.

4.3.3 The 2" Waterseal should be installed underneath the UV unit, see Figure 1, 2 and 4.

4.3.4 The UV unit should be connected to a 230 V grounded outlet.

4.3.5 Germicidal UV-C light tubes are made by:
- PHILIPS, type TUV 15
- OSRAM, type HNS

WARNING! Do not expose your eyes or skin to direct UV light.

4.4 Waterseal alternative

If the Aquatron system was ordered without a UV unit, a waterseal must be installed between the branching pipe outlet and the Grey Water outlet. The waterseal is needed to prevent bad smell from the Grey Water outlet to enter the toilet system (Bio Chamber). Suggestion for waterseal, see Figure 5.

4.5 Pipe installation

4.5.1 Use 4" pipes between WC and Separator. For ventilation use 3-4" pipes.

NOTE! Only WC should be connected to the inlet of the Aquatron Separator. Separate pipes should be used for sewage from bath, kitchen, laundry etc. If these pipes are to be connected, it should be done after the Aquatron system.

4.5.2 The Separator should be connected to a 4" double socket.
NOTE: The Separator must be horizontal and its vertical line (Figure 3) perpendicular to the Bio Chamber. The inlet pipe must be fully inserted into the socket. See Figure 6.

4.5.3 The horizontal distance between the WC and the Separator must be minimum 1 metre and that last metre (closest to Separator) should be pitched at 5% (5 cm), see Figure 7. At further distances the earlier part of the pipe should have a 1% horizontal slope, or as national standards. If needed, use the special angled coupler double socket in order to achieve the pitch transition, see Figure 8.
NOTE: Turn the color mark of the angled coupler double socket downwards. Furthermore, check that the inclination of the inlet pipe is smooth and that there are no depressions where fluid waste may gather.

4.5.4 The ventilation should be installed between the WC and the Separator. The ventilation pipe should extend above the roof.

NOTE! Do not use a vacuum-valve. The toilet ventilation must have a separate vent pipe extending over the roof and must not be connected to the other sewer ventilation of the house, as this may cause problems with odour and flies.

4.5.5 If there is a large level difference between the WC-outlet and the Separator, then first install the horizontal pipe pitched at the specified angle and then make the necessary level adjustment with the vertical pipe, see Figure 1 or 2.

4.5.6 The pipe installation from Separator to Bio Chamber and further on to the UV-unit/sewer is shown in Figure 9. If the UV unit is to be postitioned to the left of the Bio Chamber (as seen from the rear side in Figure 3), the piping can be reversed. For Aquatron 90, please see text in Figure 9.

4.5.7 If horizontal bends are needed on the Separator inlet pipe, see Figure 10.

4.6 Flushing test

Ask someone to flush the WC with water only and check how much water is entering into the Bio Chamber. If correctly installed, when flushing with water only, a maximum of 0.5 decilitres should go that way. If too much water enters into the Bio Chamber there are two explanations:

4.6.1 If the water enters the Bio Chamber **at the beginning of the flushing** the velocity of the incoming fluid is too high and the pitch is too large – **decrease** the pitch of the inlet pipe.

4.6.2 If the water enters the Bio Chamber **at the end of the flushing** the velocity of the incoming fluid is too low and the pitch is too small – **increase** the pitch of the inlet pipe.

5. COMPOSTING

5.1 Start up

Drainage of the Bio Chamber: Spread a 4-6 centimetres layer of course bark grinds (**NOTE:** Not peat moss!) in the Bio Chamber, see Item 7.3 and Item 7.4. The bark grinds should be evenly spread at the bottom of the Bio Chamber. Make sure that the bottom drain is fully covered by bark grinds by increasing the layer to 10 cm. Add some compost from the garden in order to insert micro-organisms. By this the composting process will get a more rapid start.

5.2 Vermi composting

See Item 7.5.

6. SPECIAL SOLUTIONS

6.1 **Pumping**: A pump can be used in order to save approx. 150 mm of required installation height, or when the grey water sewer outlet level from the house is higher than the fluid outlet from the UV unit, see Figure 11.

6.2 **Urine diversion** (Urine sorting/Urine separation): Urine sorting WCs may be connected to Aquatron toilet systems. Please contact Aquatron International for more information.

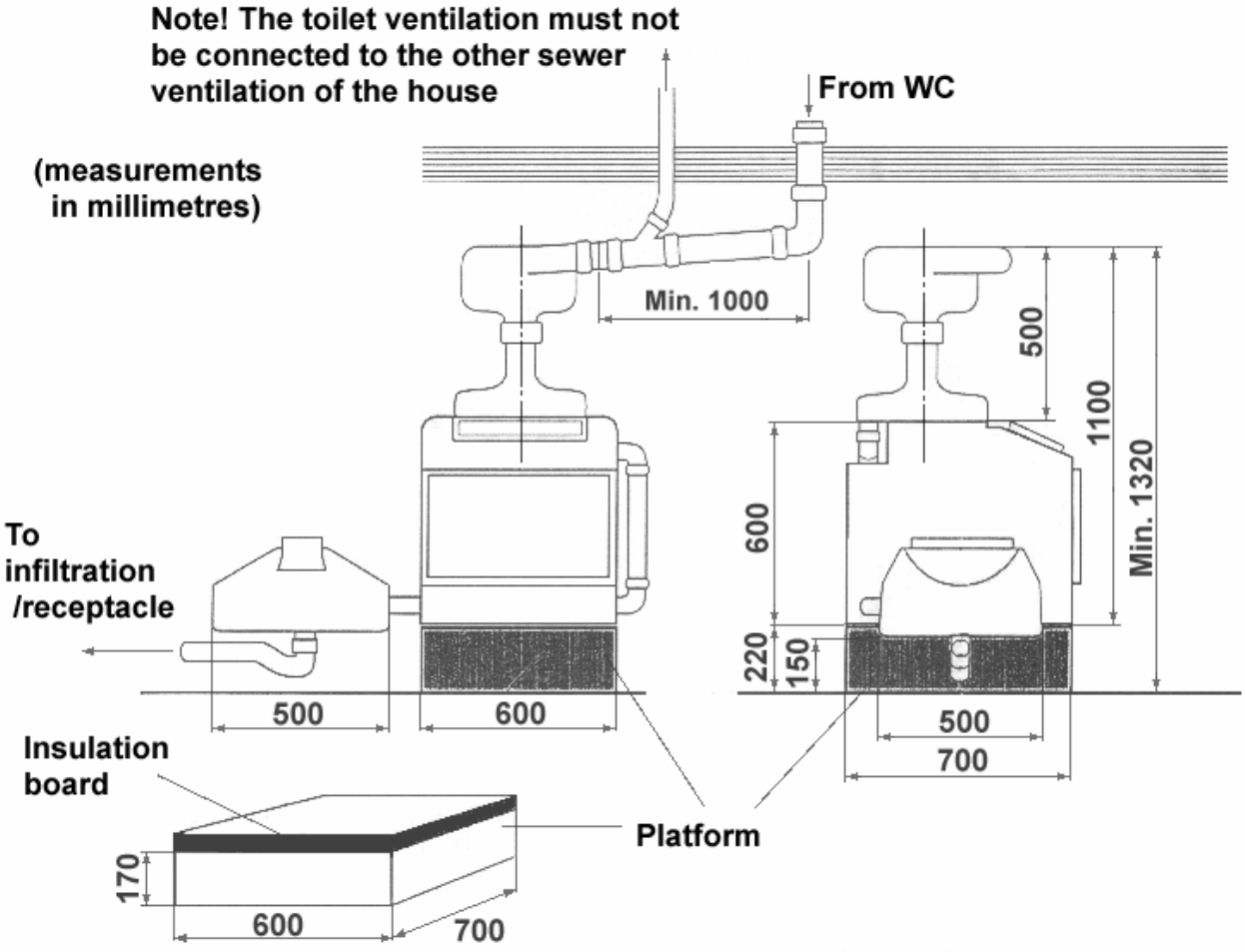


Figure 1: Aquatron 90 installation measurements

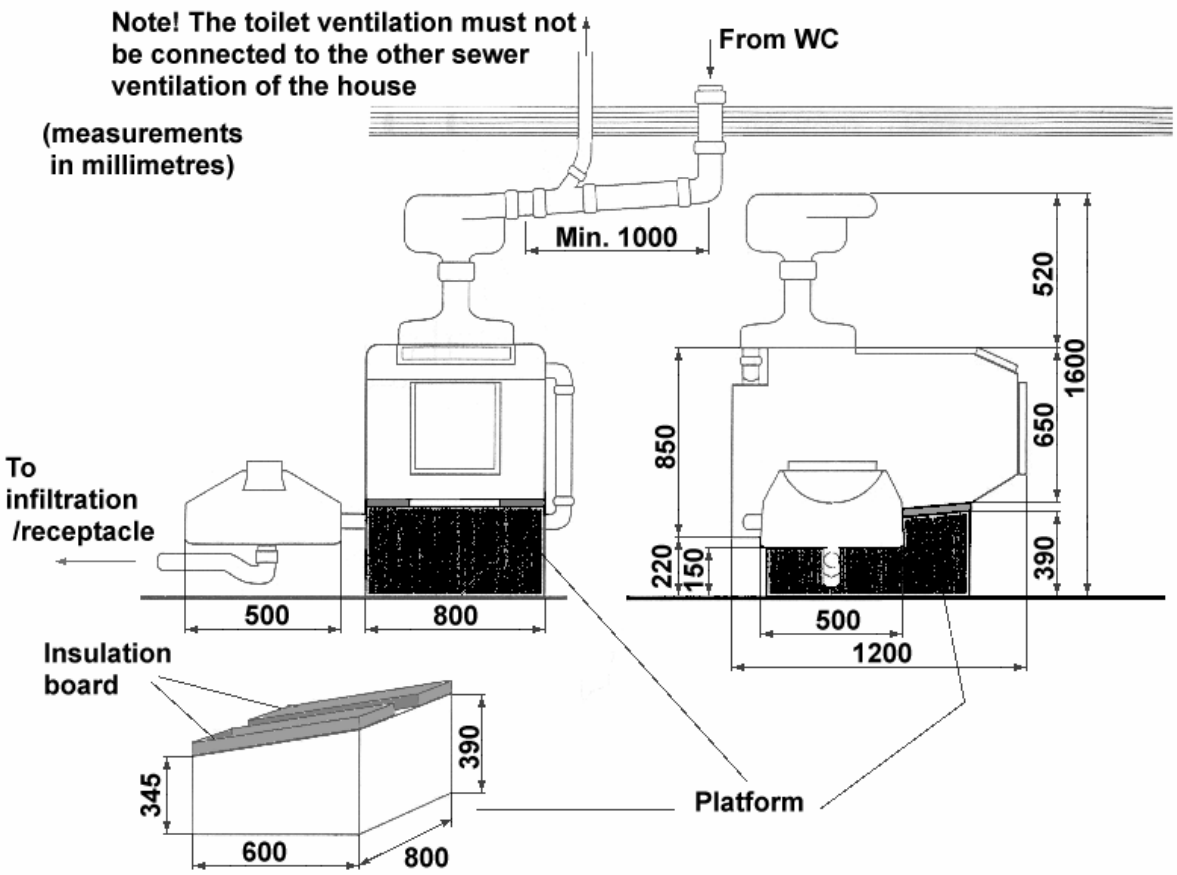


Figure 2: Aquatron 400 installation measurements

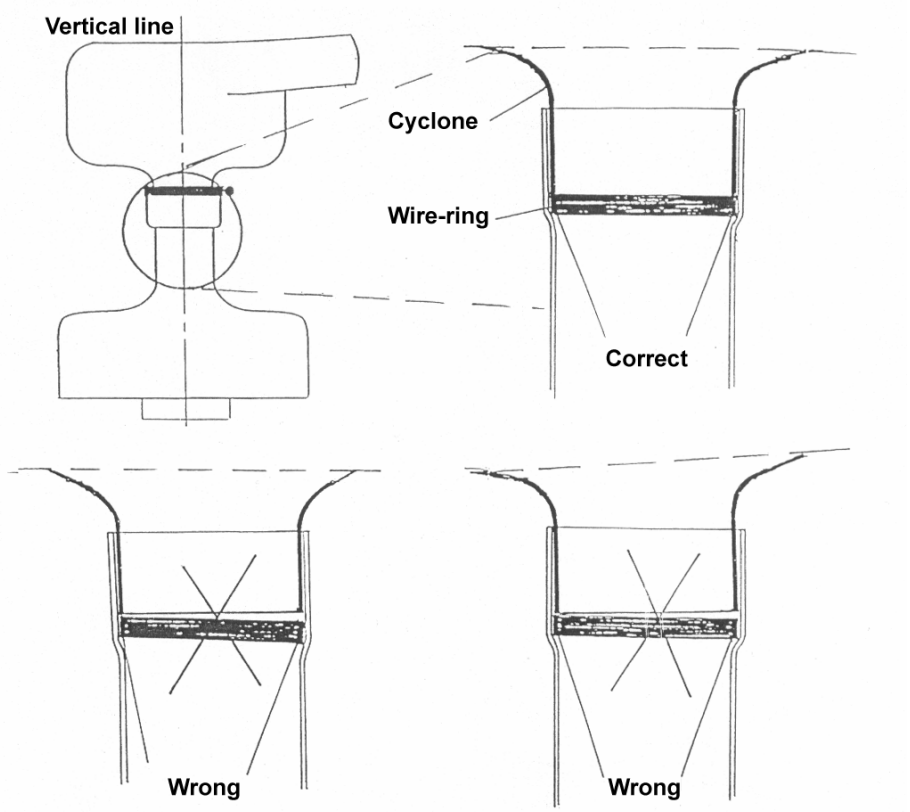


Figure 3: Separator installation

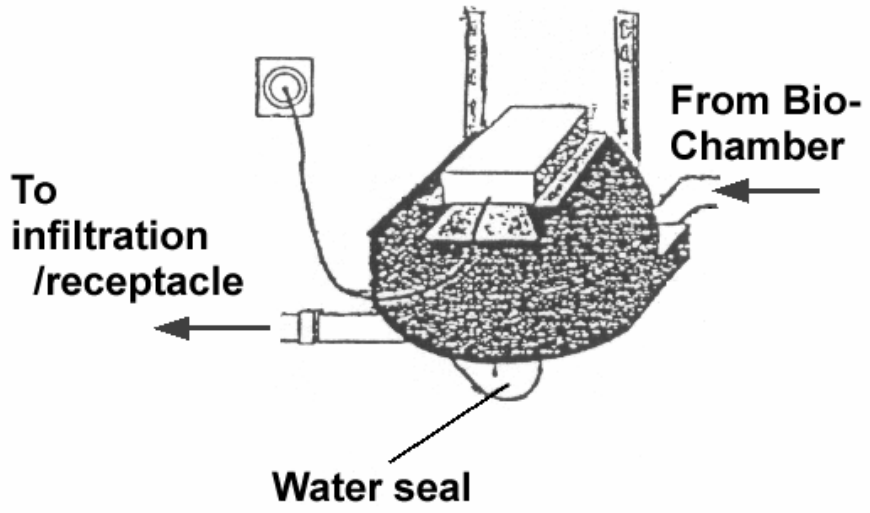


Figure 4: UV unit placed on consoles fixed on to the wall

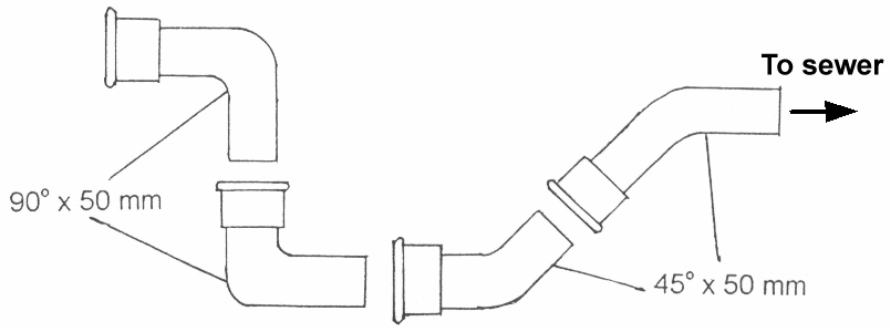


Figure 5: Suggestion for a waterseal

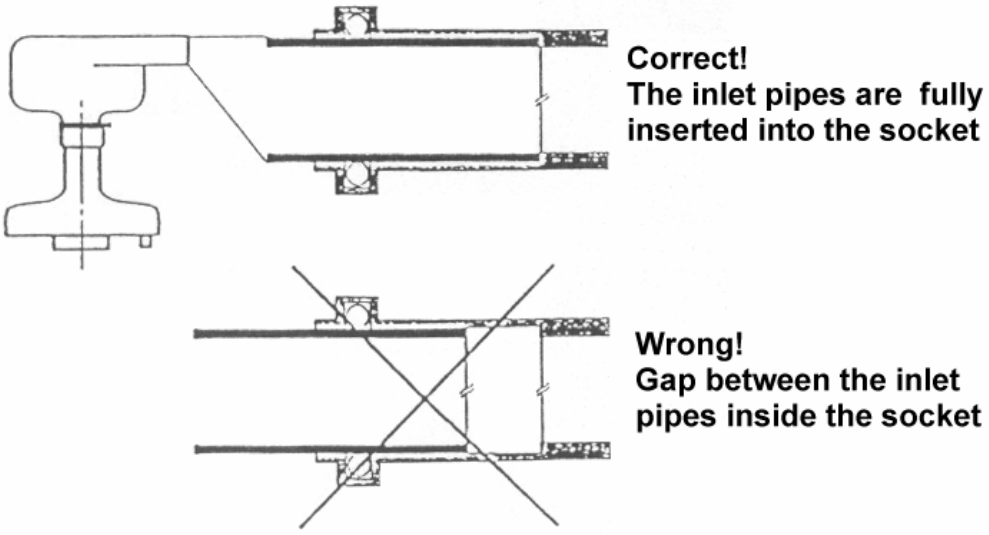


Figure 6: Connecting Separator and inlet pipe in coupler double socket

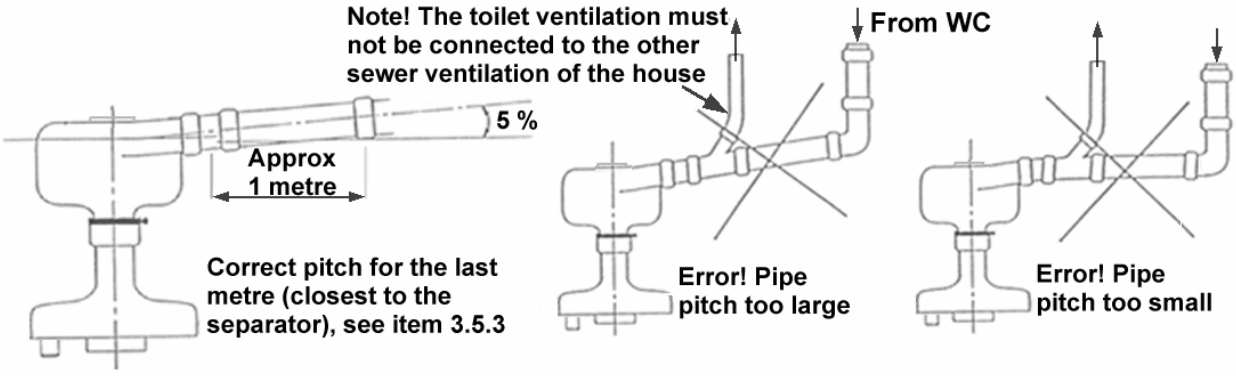


Figure 7: Pitching of inlet pipe from WC to Separator

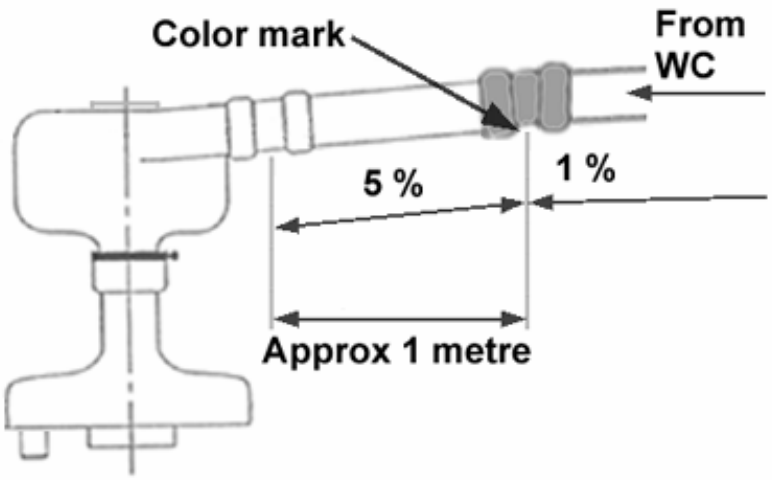
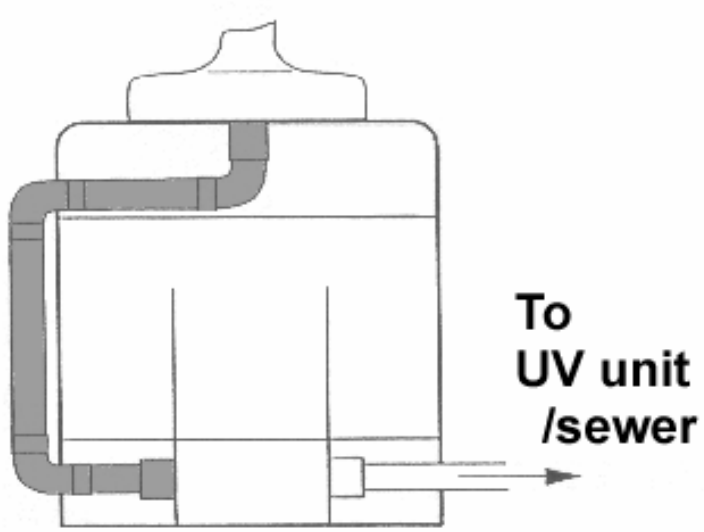


Figure 8: Angled double socket for inlet pipes longer than 1 metre



Connecting pipe and outlet to UV unit/sewer may be reversed. However, for Aquatron 90 where inlet/outlet on the rear side of the Bio Chamber is placed asymmetrically, the conntecting pipe must be adjusted and a 50 mm coupler double socket must be acquired and inserted.

Figure 9: Connecting pipe and outlet on rear side of the Bio Chamber

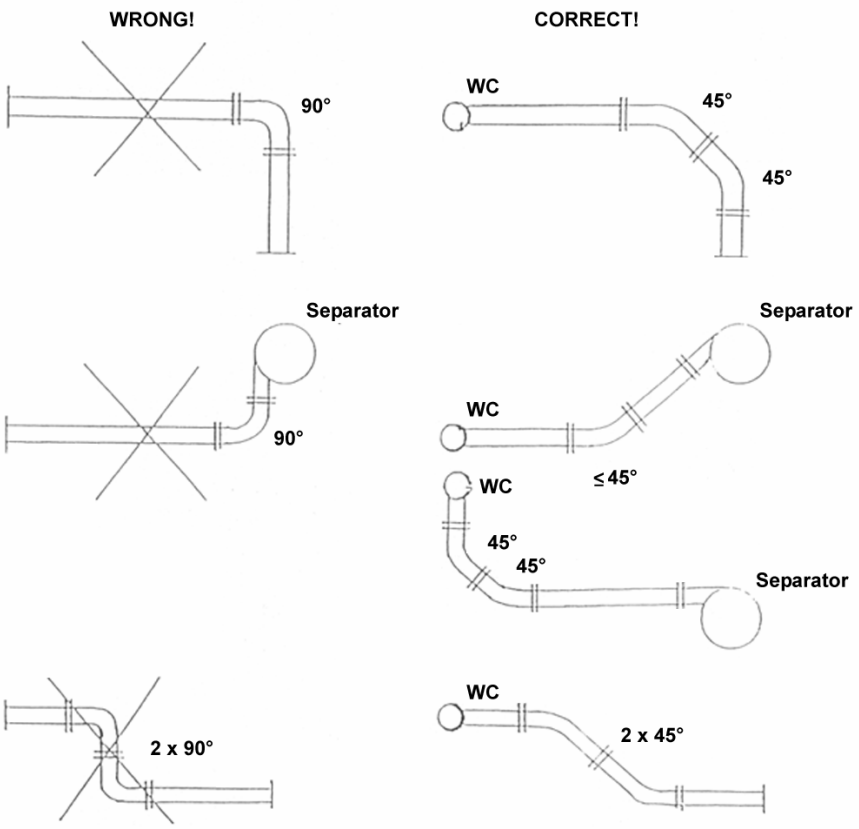
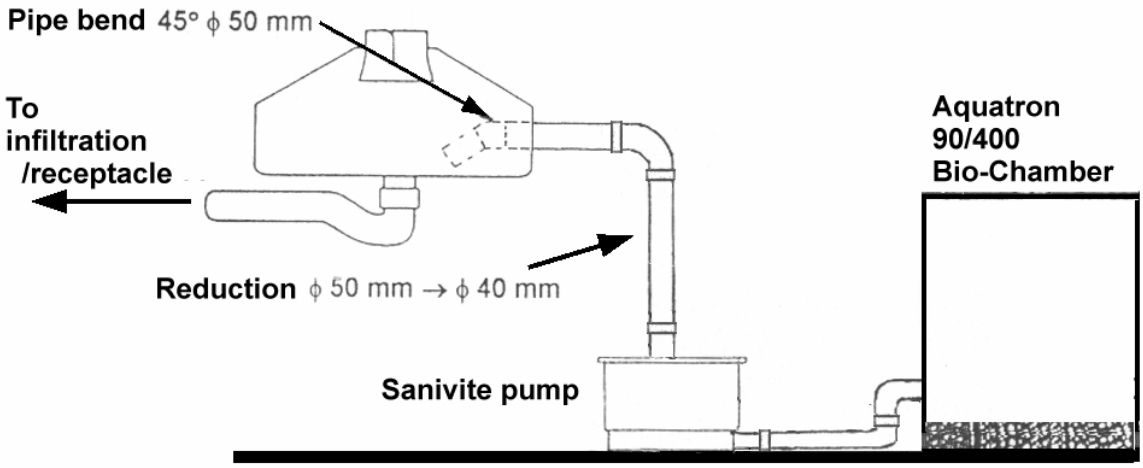


Figure 10: Some examples of horizontal pipe bends



The pump installed between the outlet of the Bio Chamber and the inlet of.the UV unit. **NOTE!** In order to prevent the fluid to splash on to the UV light tubes and its fitting, a 45° pipe bend must be put on the fluid inlet on the inside of the UV unit. The pipe bend should be turned towards the bottom of the UV unit. A reduction between 50 mm and 40 mm diametre should be purchased as well as the 45° pipe bend.

Figure 11: Example of an Aquatron 90 / 400 installed with a pump

7. MAINTENANCE INSTRUCTIONS FOR THE AQUATRON 90 / 400 MODELS

7.1 The monitoring of an Aquatron system in use

It is recommended that an Aquatron system in use should be inspected at two week intervals (approximately). By discovering possible disturbances at an early stage (and to correct them immediately), corrections can be made more easily as compared to cases where a minor disturbance over time have "built" up to a major functional disturbance. The Items 7.2 – 7.7 below give advice about checks and measures for such regular inspections. A special Error Checklist is also included in Item 8.

7.2 Separator

On the top of the Separator is an inspection lid. Occasionally paper may get stuck in the Wire-ring. Open the lid and push the paper down by using a stick or a small pole. Too soft paper may "felt" too soon and there is then a risk that it may stick to the wires which may cause too much water to fall into the Bio Chamber. To avoid this it is recommended that you switch to another type of toilet paper. Depending on water quality (water containing e.g. high contents of Calcium or Iron) a coating may develop on the wires. If heavily coated, remove the parts and clean them with a brush.

7.3 Maintenance and drainage of the Bio Chamber

Check regularly the drainage of the Bio Chamber and the consistency of the compost. Also check that the paper in the Bio Chamber does not build up a pyramid which reaches up to the Separator since that might cause a stoppage in the Separator. If so, tilt the pyramid with a suitable tool alternatively remove (part of) the compost. In the Bio Chamber there must be a 4-6 cm layer of bark grinds evenly spread at the bottom and a 10 cm layer extending up and covering the drainage grid (**NOTE:** important). Add some compost from the garden in order to insert micro-organisms. By this the composting process will get a more rapid start. It is important to use coarse bark grinds (**NOTE:** not peat moss). If it is too smooth it may block the drainage grid which will cause a wet compost. Suitable material is bark from pine or similar which may be acquired from garden shops or shops marketing composting products. After using the Aquatron for a couple of years the drainage layer may have to be renewed.

7.4 Composting

A balance between Carbon and Nitrogen is required for an optimal compost. In a latrine compost the Carbon comes mainly from the toilet paper and saw-dust (if inserted as sprinkling powder) while the Nitrogen is in the faeces. In the Aquatron systems a good balance between Carbon/Nitrogen is achieved when using normal amounts of toilet paper. If the compost, having a correctly installed Separator, still is wet; the reason might be too little Carbon. Then sprinkle some saw-dust over the compost. The composting compartments are differently designed:

- Aquatron 90 has a drawer which can be pulled out. The inner wall has a drainage grid through which excessive fluid is evacuated. The drawer should be emptied into a suitable container for after-composting or alternatively be replaced by an extra drawer. The filled drawer can then be directly used for after-composting.
- Aquatron 400 has one single compartment for composting. The inner wall has a drainage grid through which excessive fluid is evacuated. The compost material will gradually move towards the emptying hatch and the composting process has then commenced. When needed the compartment should be emptied and the refuse after-composted in a suitable container.

7.5 Vermi composting

To accelerate the composting process and to effectively reduce the volume (reduction with approx. 90% of the original volume), earthworms may be added (Eisenia Foetida, also called Dung Worm or Red Wiggler; or an equivalent specimen). The worms should be added after a couple of weeks of usage.Compost worms can normally be bought in gardening shops or in stores selling ecological products and equipments. The worms may also be found in garden compost heaps. The vermi composting process works best at temperatures between +12 and 25° C. In year-round living a temperature above +15° C is recommended in the compartment where the Bio Chamber is installed. At temperatures below +10° C the composting process and the activities of the worms is slowing down and their "food supply" will last longer which may be an advantage in summer houses which are inhabited for a longer period of time.

The Bio Chamber must be installed in a frost free area for the survival of the compost worms!

7.6 Emptying the Bio Chamber

Remove the compost using a shovel but leave a layer of approx. 5 centimetres thickness. This way you will leave the drainage layer (bark grinds) in which a major part of the worms stays. If the refuse has not become fully composted into soil, further composting might be needed.

7.7 Changing of UV light tubes in the UV unit

If one UV light tube fails, both tubes should be exchanged for new ones. For further information, see Item 4.3.5. At the same time as the UV unit is opened for replacement of failing UV light tubes it is recommended that the inside of the UV unit should be cleaned. Check also that there are no sediments in the waterseal underneath the UV unit. Clean the waterseal if needed.

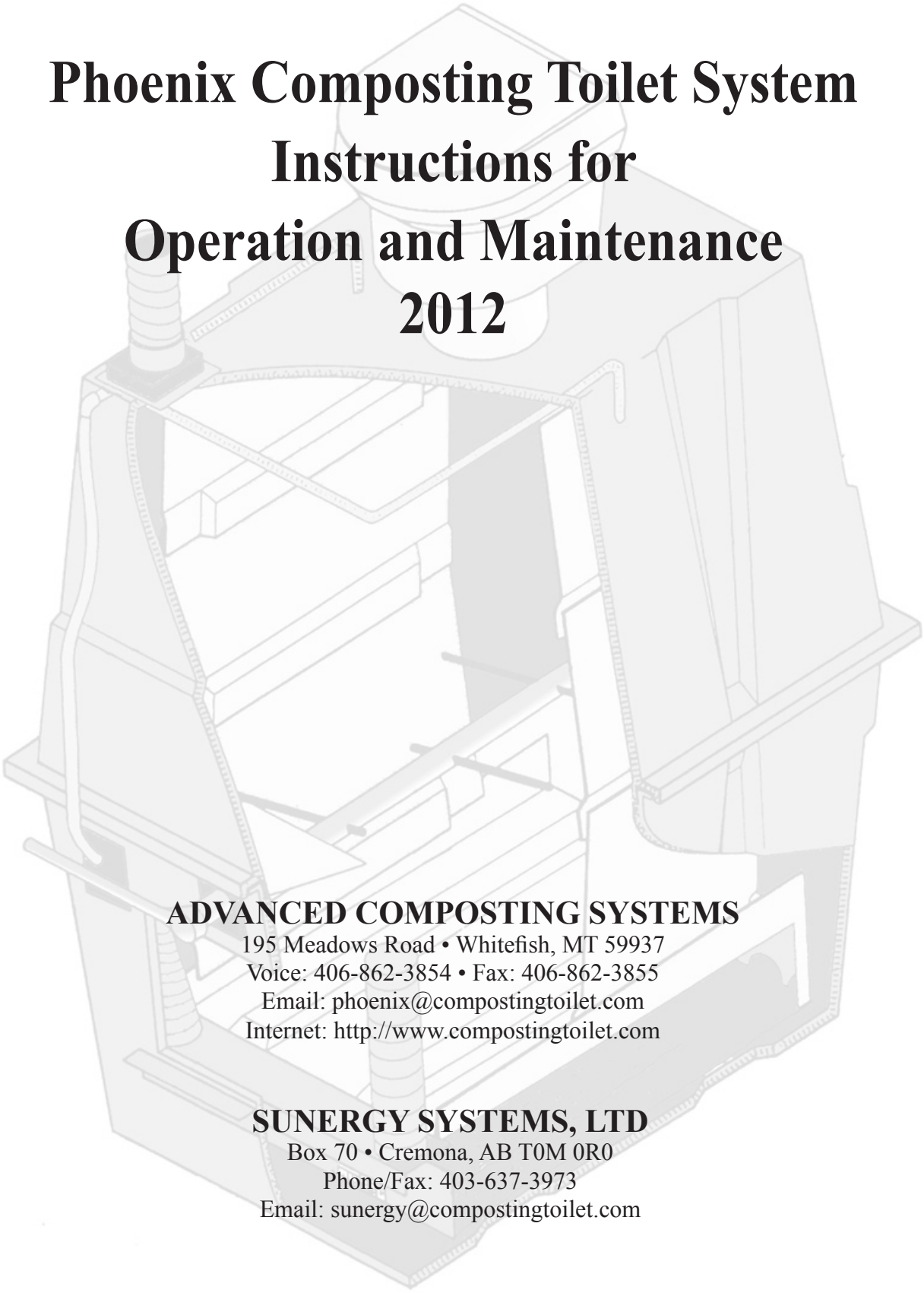
WARNING! Do not expose your eyes or skin to direct UV light.

8. ERROR CHECKLIST

TYPE OF ERROR	CAUSE	MEASURE
8.1 Wet bio-bed	- Bad drainage	Check that the drainage holes are not blocked and that the drainage layer is in accordance with the manual, see Items 5.1.1 and 7.3.
	- Too much water in the Bio Chamber	**A:** Check that the Separator was installed horizontally and its vertical line perpendicular to the Bio Chamber, see Figure 3. **B:** Check that the Wire-ring is positioned correctly and that the wires are not crossing each other. The wires should be slightly bent towards the middle of the Separator neck, see Figure 3. **C:** Check that no paper is stuck in the Wire-ring, see Item 7.2 **D:** Check that the cyclone is fully pushed down into the Separator neck and it rests firmly on the Wire-ring. See Item 4.2.1 and Figure 3. **E:** Check pitch of the inlet pipe. At too large pitch fluid enters the Bio Chamber at beginning of the flushing, at too low pitch fluid enters the Bio Chamber at the end of the flushing. See Item 4.6.
	- When flushing there is a surge or after flushing there is still a small string of fluid or batches of fluid entering the Separator	Check the pitching of the inlet pipe. It must have a smooth slope and no depressions where fluid waste may gather, see Item 4.5.3.
	- Leaking WC	**F:** Repair the WC.
8.2 Odour in the room	- Wet bio-bed	See above.
	- Wrong ventilation	**A:** The ventilation pipe is too short, it does not extend over the roof. **B:** The ventilation is coupled together with the other sewer ventilation of the house. **Note:** A vacuum-valve must <u>not</u> be used. **C:** Backflow? See Item 4.1.2. **D:** Check the waterseal to assure that no odour is coming from the sewer system.
8.3 Odour when windy	- Air is pressed into the ventilation	The ventilation pipe does not extend high enough above the roof. It must be lengthened. If needed mount a vane on the ventilation pipe.
8.4 Stoppage in the Separator	- A too high pyramid has been built up in the Bio Chamber	If so, tilt the pyramid using a pitchfork/shovel or remove (part of) the compost from the Bio Chamber. See Item 7.3.
	- The wires in the Wire-ring of the Separator are bent or crossed	Straighten the wires.

		- The inlet of the Separator is not fully inserted into the socket	Adjust, see Figure 6.
8.5	Stoppage in the fluid outlet of the Separator	- The flushing water is entering the Separator at too high speed	The pipe between WC and Separator has a too large inclination. See Pipe Installation, Items 4.5.3, 4.5.5 and 4.6.
8.6	Stoppage in the fluid outlet of the system	- Sediments or foreign objects in the fluid outlet	Check that the fluid is not stopped in the UV unit or in the waterseal underneath it. Clean the UV unit and the waterseal from sediments and foreign objects.
8.7	Flies in the Bio Chamber	- Wet bio-bed	See Item 8.1 and 8.2 above. Spray the inside of the Bio Chamber with an appropriate insecticide. Check the mosquitionet at the top of the vent pipe.

Phoenix Composting Toilet System
Instructions for
Operation and Maintenance
2012



ADVANCED COMPOSTING SYSTEMS
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Table of Contents

§0.0 — Introduction

These instructions describe the normal operation and maintenance requirements for the Phoenix Composting System. We explain why a particular maintenance task must be performed, not just *how* and *when*.

The Phoenix operates much like a garden compost pile, requiring adequate air, moisture, and a moderate temperature (18° C , 65° F, or higher) to support the organisms that transform wastes into a stable end-product. Maintenance requirements depend upon the amount of use the system receives and climate conditions. The quality of maintenance directly affects the quality of finished compost. Substandard maintenance will not cause irreversible damage to the Phoenix or the process, but it will ultimately require more time consuming remedial work and reduce the capacity of the system.

§0.1 — Maintenance tools provided

The following maintenance tools have been provided:

- A *rake* for mixing the bulking material and leveling the pile.
- A *bin* for removing finished compost.
- A liquid *spray system* for moistening the compost pile.
- A *door counter* to keep track of use (public facility models only).

§0.2 — Maintenance tools that you provide

You will need to supply:

- A standard *pointed shovel* for removing the compost .
- A *container* for storing the bulking material.
- A *container* for holding trash that is removed from the Phoenix.
- *Rubber gloves and Safety Glasses,* for standard hygiene practice.
- A *container* for storing the rake. A 5 gallon bucket works fine

§0.3 — Log book

Documenting maintenance activities and weekly use in a log book (a suggested format follows these instructions) will help establish an effective maintenance routine and promote consistency amongst maintenance persons.

§1.0 — Hygiene

Observe good hygiene practices while working with the compost pile. Many pathogens can be present in the composting system. Make sure that ventilation and lighting are adequate. Wear rubber gloves and safety glasses while raking the pile or removing compost. Moisten the top of the pile to reduce dust; wear a dust mask if prudent. When finished, thoroughly wash your hands with an alcohol based disinfectant soap. Store the rake and other tools in a bucket. *Use common sense.*

§2.0 — Cleaning the toilet room

Keep the toilet and room clean. This encourages cooperation among users and reduces maintenance requirements. The toilet should be cleaned with soap and water. Use a biodegradable cleaning agent such a Simple Green, no disinfectant, which could harm the composting process). Clean a urinal the same way but flush it out each month with a cup of vinegar to dissolve accumulating salts. Conspicuously locate the wall plaque describing the Phoenix and its proper use, along with any additional instructions for users.

§3.0 — Adding bulking material

Bulking material is necessary to improve drainage and aeration, and to provide extra carbon, thus creating conditions essential for composting. The right amount of bulking material gives the compost pile a crumbly, porous texture. An inadequate amount results in a wet, pudding-like texture, puddling liquid, and anaerobic conditions that generate an unpleasant odor. One to two gallons/100 uses is about the right amount.

The best bulking material is dry planer shavings from a white softwood such as pine. Do *not* use shavings from decay resistant woods such as cedar or redwood: this material will *reduce* the composting rate. The bulking agent must have a physical structure that resists compaction so that air voids will remain open. Do not use large wood chips, wood waste from treated lumber, or materials that form a mat, such as long grass or leaves. Dry pine shavings often are sold as bales of animal bedding.

Frequency of additions. Add material at least every 500 uses. More frequent addition of bulking material reduces mixing requirements.

With some semi-public and residential systems, a bin of bulking material can be available to users for "flushing." We supply a bin, a scoop with bead chain, and an instruction wall plaque for this situation.

§4.0 — Controlling moisture

Moisture is necessary for the decomposition process and for the proper texture of the compost pile. A moist pile also resists ignition from cigarettes or vandalism. Check the pile's moisture each week. If the pile is too dry, add additional liquid; if too wet, add additional bulking material. In public facilities, increase or decrease the frequency of the automatic spray system (between 4 and 12 hours). Add liquid with the pump and spray system; or add fresh water; one to two gallons at a time. Stir the pile between doses. If the pile has dried out significantly, a small quantity (approximately one teaspoon per gallon) of wetting agent such as liquid dish soap will help the liquid to remoisten the compost.

§5.0 — Mixing the pile

Bulking agent and waste must be thoroughly mixed to increase pile porosity so that liquids will drain and air can circulate throughout the entire pile. The compost pile often will heat up significantly when stirred. Mixing also assures a uniform, looser texture that facilitates compost removal.

Thoroughly stir the pile at least every 500 uses. After a period of heavy use, stir more frequently to further aid decomposition. If a routine inspection reveals puddling liquid, large dry or wet clumps, or layers of wet waste, more mixing and bulking material are necessary.

A rake is provided for mixing and leveling the top of the pile. Rake the material in the rear of the tank forward, mix and then rake back. Repeat for the front of the tank. Mix approximately one foot deep. Continue until all portions of the compost pile have the same moist, crumbly texture. Rotating the upper tines in both directions will also provide some mixing and aeration. *Do not rotate lower tines; their purpose is to control compost movement to the access area after removing end product and they should be rotated only at that time. Always leave tines oriented horizontally.*

§6.0 — Removing Trash

Removing trash from the Phoenix is important, for it can occupy valuable space and create barriers for the movement of air, liquid, and compost. Remove all cans, bottles, and large pieces of plastic.

§7.0 — Maintaining ventilation

Inspect the ventilation system for proper operation during each visit. It is easy to feel air being sucked into the air inlet when the toilet seats are closed and, it is easy to hear the fan running. Make sure that the vent hose has not sagged and filled with water from rain or condensation. Clean the air inlet screen to remove dust and cobwebs. Clean the fan if the blades rub against the housing (a scraping sound should alert you to this).

You can gain access to the fan through the upper access door, or by removing the fan from the housing. *Pay attention to air flow direction and electrical polarity (red = positive, black = negative) when installing a new fan.*

§8.0 — Managing the liquid end product

The liquid end product accumulates in the liquid storage area, and/or an auxiliary storage tank. An overflow drain keeps the liquid in the Phoenix from becoming so deep that it blocks the proper flow of air. Remove accumulated liquid with the pump, or by continuous drainage to an approved disposal system. Do not try to spray all of the accumulating liquid back on the compost pile, since this could be an excessive amount, and result in an excessively wet pile.

§9.0 — Removing the compost end product

Compost is easiest to remove after a period of little use and before a season of heavy use, since material in the bottom of the tank will be less moist and more stabilized. Rake the top of the compost pile level. If it is within 2 inches of the bottom of the top access door, it is time to remove compost end product. The tines should be horizontal (indicated by the bolt or hole in the socket on the end of the shaft) to keep new material from falling into the finished compost area. Remove the lower access door and inner door if present. Using the rake or a standard pointed shovel, remove approximately 12 cubic feet or 12 full bins (one-third cubic meter) of material from the bottom of the Phoenix.

Make sure to remove material from the entire bottom of the tank, exposing the side and rear walls of the tank. This will assure maximum utilization of the entire tank volume, not just the front portion. After replacing the access doors, rotate the tines (lowest tines first) to move new material downward. *Leave tines in horizontal orientation (indicated by screw, bolt or hole located on side of drive socket)*

Finished compost can be used as a fertilizer for ornamental plants. It should be buried and covered with at least six inches (15 cm) of soil.

§10.0 — Seasonal use

If the Phoenix is used only seasonally, such as in a vacation cabin or a summertime campground, prepare it for the idle period.

§10.1 — Deactivation

- Stir the pile and mix in additional bulking material.
- Rotate the upper tines.
- Follow the advice on the PV system controller and evaporator for seasonal use.

§10.1.1 — Warm, dry climates

- Cover the pile with a layer of moist bulking agent.
- Turn off the fan to avoid excessive drying.

§10.1.2 — Cold climates

- If the tank is going to freeze, remove as much liquid from the storage area as possible.
- Turn off the fan.

§10.2 Reactivation

To reactivate the Phoenix after a long idle period, such as a winter of no use:

- Inspect the pile for dryness. Remoisten and stir the pile if necessary.
- Turn on the fan.
- Inspect and test other system components such as the pump, spray system and photovoltaic system.
- Follow the advice on the PV system controller and evaporator for seasonal use.
- Remove compost at this time.

§11.0 — Cold weather use

The capacity of the Phoenix in cold or freezing conditions is limited because so little biological activity occurs. If the tank is not frozen, liquids will still filter through the pile and drain.

Add additional bulking material since there is little evaporation and the compost pile will be wetter.

If the tank is frozen, it will merely act as a storage container until Spring. As it thaws, the compost pile should be deeply stirred and aerated. Excessive accumulation of the liquid can be a problem if the liquid drain remains frozen while the tank is thawing, so remove as much liquid as possible before the tank freezes.

§12.0 — Maintenance schedule summary

Frequency of maintenance depends upon use. The more often maintenance is performed, the easier it will be. We recommend that the following tasks be performed at least as often as indicated during the season of use:

§12.1 — Weekly

- Add bulking material, mix and level the pile with a rake.
- Rotate the upper tines.
- Check the pile's moisture.

§12.2 — Monthly

- Check the pile's moisture, and add additional bulking material or spray additional liquid.
- Check the ventilation system and clean the inlet air screen and fan if necessary.
- Lift the sags in vent hose to drain liquid to the tank.
- Check the liquid drainage system.
- Check the spray nozzles and pump.

§12.3 — Yearly

- Remove compost end product. (Every two years is ok)
- Remove cover plate and check liquid storage area if necessary.
- Clean liquid storage area if necessary.
- Clean vent pipe and screened cap if necessary.

§13.0 — Problems and solutions

Learning of problems that have occurred with our Phoenix toilets is both interesting and valuable. If you encounter a situation that is not covered adequately in these instructions, or if something else is not clear, please share your experience with us. With your help, we can and will improve the Phoenix and our instructions for operating it.

§13.1 — Odor in the toilet room or tank

This can be caused by a dead fan, by a leaky or clogged vent pipe, or by high differential wind pressures on the toilet rooms in a two-toilet installation.

• Check to see if the fan is running. Clean it if doesn't rotate easily. If it still doesn't run check the power supply for the fan.
• Check for proper draft by using smoke or your hand in front of the air inlet or a partly opened toilet seat. Clean the vent hose by disconnecting it from the fan or vent pipe.
• Lift any sag in the vent hose to see if it has trapped water. Check the vent cap and clean the screen if necessary.
• If wind pressure seems to be sucking air out of a toilet, it may be necessary to block a toilet room vent or install a second fan to pressurize the toilet room.

§13.2 — Tines stuck

This is not a serious problem. The lower tines are used only to move compost downward after removing material from the bottom of the tank, and sometimes they can be difficult to turn. Usually during the removal process, the tines will rotate freely as the obstruction is swept downward. The tine shaft can be damaged by excessive force so do not use a "cheater bar" extension to the ratchet handle.

§13.3 — Clogged drain

If the overflow drain is clogged, disconnect the hose from the tank and clean the hose and drain. On older systems, you can also remove the lower access door and cover plate and clean the liquid storage area.

If the hose is frozen, thaw out the system so that it can drain.

§13.4 — Pump/spray system won't work

§13.4.1 — Manual pump

If pushing the pump handle in is difficult, clean the nozzles.

If the pump handle moves, but the pump won't pump, the diaphragm may have a hole in it or one of the check valves might not be sealing. We have a repair kit for these parts.

Inspect the liquid storage area by removing the lower access door and cover plate. Remove small debris (peat moss or wood chips) from the liquid storage area.

§13.4.2 — Electric pump

Test the pump using the controller test function or the switch on the j-box. Also observe the spray pattern. If the pump runs, but no liquid is being pumped, there may be no liquid in the storage area or the pump check valve may need to be replaced.

§13.4.3 — Spray system

If pushing the manual pump handle in is difficult, or if the spray pattern is not uniform, clean the spray system. Nozzles for the front mounted spray system are removed with a counterclockwise 1/4 turn. Use a pointed tool to clean the orifice.

§ 14.0 — Ordering spare parts

Some spare parts can be identified on the following diagram.

When contacting us for parts, please supply your Phoenix serial number from the nameplate on the front of the tank. Parts will be supplied with germane installation instructions.

For further information, please contact:

Advanced Composting Systems •195 Meadows Road •Whitefish, MT 59937

Phone: 406-862-3854, Fax: 406-862-3855 • phoenix@compostingtoilet.com

In Canada: *Sunergy Systems Ltd.* • POB 70, Cremona, Alberta, T0M 0R0

Voice & fax: 403 637-3973 • sunergy@compostingtoilet.com


Manual Pump
Repair Kit
Rake
Manual Pump
Electric Pump
Repair Kit
Trash Grabber
Electric Pump
Spray Assembly
Spray Nozzle
Bin
Tine Shaft Assembly
Ratchet
Hinge Pin
Vent Hose
Screened Cap
Toilet Top
Toilet Seat
Axial Fan
& Housing
Axial Fan Only
Toilet Liner
Complete Toilet
Radial Fan
& Housing
Radial Fan Only

Phoenix Composting Toilet Maintenance Checklist

Check off tasks as you complete them. Note problems or anything unusual in the comments column. Call 406-862-3854 for technical support.

Phoenix Serial Number: _____ Tank #: 1 2 3 4 5 Site:

Date	Trash Removed Y/N	Wood Shavings Added Y/N	Liquid Added Y/N	Compost Pile Mixed Y/N	Fan Running Y/N	Spray Pattern OK Y/N	Comments	Workers Initials

INSTALLATION INSTRUCTIONS

Full Circle Composting Toilet

Bathroom rough-in

1) Using the offset diagram, lay out a 12-1/2” hole on the floor of the bathroom to accommodate the chute. If the stock commode is being used and a ventilation connection is required, lay out the floor penetration anywhere within the footprint of the commode that space allows. If using a urine deverting commode, lay out a 2” penetration to accommodate the 1-1/2” drainage pipe.
2) Before cutting the holes, drill a pilot hole in the center of the chute area and use a plumb bob or laser level to project this point to the floor below. Using this projected point, double check that there is room for the required vessel offsets (also shown on the offset sheet.)
3) Cut the holes for the chute and other penetrations.

Chute installation

1) If using the stock commode, position the chute inside the hole so that the top of the chute projects 13-1/2” inches above the finished floor level. If using a different commode, follow manufacturers instructions. Ensure that the chute is vertical and secure it with three stainless steel screws (provided). Place a dab of silicone on the threads and drive the screws through the wall of the chute horizontally into the subfloor.
2) Add chute segments as needed to bring chute to within 48” of the floor, sealing chute segments with silicone and securing with stainless screws. Trim to 48”.
3) Slide the belled lid assembly (the lid with bell housing and flex boot) onto the chute from below. Place a composting vessel beneath the chute and lower the lid until it rests on the gasketed lip of the vessel. Secure the assembly to the chute with the provided hose clamp.

Leachate pump

1) Mount the hand pump to the wall using the provided screws. If there is not backing for all four screws to hold firmly, mount a piece of plywood to the wall first.
2) Cut a piece of the reinforced 1” tubing long enough to easily reach from bottom port of the pump to the fitting on the side of the compost vessel. Using a heat gun or boiling water, soften the ends of the tubing and slide it onto the pump and tank fitting. Secure with provided hose clamps.
3) Run the remaining piece of tubing from the top port of the pump to whatever storage tank or waste line is to receive any extra leachate that may be generated. Heat and fasten as above.

Air handling system

NOTE ON VENT: The vent pipe should be pre-installed and must begin within 3' of the chute and extend to the outdoors, preferably above the roofline. Bends should be kept to a minimum. A 4” Schedule 40 ABS or PVC vent with no more than 3 90-degree bends is recommended to minimize fan noise, although a 3” vent may be used with no more than one 90-degree bend.

Air handling system (continued)

1) Mount the fan assembly to the wall or other vertical support. Cut lengths of the 4” flex hose to connect the labeled ports on the fan assembly to the following: the vent stack, the port on the belled lid assembly, and the commode vent port (if equipped). Verify that connections correspond to labels. Apply a thin coat of silicone to each port, connect the flex hose, and secure each connection with the provided hose clamps. NOTE: Support flex hose if needed to prevent any sags between the fan assembly and the vent pipe that could allow accumulation of moisture.
4) Cut a length of the corrugated black hose to connect the port on the side of the vessel to the labeled port on the fan assembly.
5) Position the other vessel(s) in their intended positions and cut lengths of the corrugated black hose to run between the ports on the side and lid of the vessel(s) to the labeled ports on the fan assembly.
6) Secure all connections with the provided hose clamps.

Urine collection system (if urine-diverting commode is used)

1) Install the 1-1/2” bulkhead fitting in the top of the collection tank.
2) Connect a 1-1/2” ABS or PVC downpipe to the bulkhead fitting, extending to 1” above the level of the tank bottom.
3) Place the urine collection tank in place.
4) Attach the provided valved tee assembly to the top of the bulkhead fitting outside the tank.
5) Using 1-1/2” Schedule 40 ABS or PCV pipe, install a drain leading from the urine connection on the commode to the valved tee assembly on the top of the urine collection tank. **The drain must slope a minimum of 1” per foot.**

Bathroom final installation

If using the stock commode with urine diversion:

1) Position the commode in place and mark the 1-1/2” urine drain pipe at the height of the bottom of the urine diverter drain port on the commode.
2) Remove the commode and trim the drain pipe at the mark.
3) Cement the provided adapter to the drain pipe.
4) Place a bead of silicone along the bottom edge of the commode and around the outside of the urine diverter drain on the commode.
5) Set the commode in place, ensuring that the urine diverter seats inside the drain pipe adapter.
6) Secure the commode anchors to the floor using the provided stainless steel screws.
7) Secure the drain pipe to the urine diverter using the provided stainless steel set screw.
8) Place the commode front cover panel in place and secure using the provided finish screws.

If using the stock commode without urine diversion:

1) Place a bead of silicone along the bottom edge of the commode.
2) Secure the commode anchors to the floor using the provided stainless steel screws.
3) Place the commode front cover panel in place and secure using the provided finish screws.

If using a different commode, follow manufacturer's instructions.

Initiation of operation:

1) Verify that all hoses are connected to their proper ports and that all vessel lids are fastened in place and seated on their gaskets.
2) Plug the fan power adapter into an AC wall outlet.
3) Test the airflow through the commode by holding a stick of incense or a blown out match inside the commode. The smoke should be pulled steadily downward. If the smoke rises out of the commode or lingers without moving, then there is insufficient ventilation and the problem must be corrected before the toilet can be used. Check to make sure the fan is running and verify that it is installed in the right direction. Ensure that the vent pipe is not blocked and that all hoses and flex ducts are installed in the correctly.
4) Once proper ventilation has been established, decouple the active vessel from the belled lid assembly. Add an even layer of three gallons of pine shavings, topped with one gallon of living soil, (from a garden or forest,) to inoculate the vessel with composting microbes. Recouple the vessel to the lid assembly.