



KOROSAN

On-site Household Sanitation Guidelines for Fiji

#5 OPERATING & MAINTAINING SEPTIC TANKS & LAND APPLICATION SYSTEMS

1 PURPOSE

A safe, sustainable, effective and affordable sanitation system is an essential service for the health and wellbeing of all people. This guideline provides information for both home owners and servicing technicians on how to operate and maintain domestic on-site wastewater management systems for rural dwellings, clusters of dwellings, schools or community buildings in Fiji that are not serviced by a reticulated sewer service.

If septic tanks and their land application systems are not maintained properly there is an increased risk of the system, or some parts of it, failing to provide the safe service it was designed to perform. A failed or failing wastewater system is a health risk to occupants and villagers. It can result in nuisance odours, ponding of effluent, exposure of people to wastewater pathogens (disease causing organisms) and pollution of the environment. Failing systems can be costly to fix, and taking care of a problem while it's small and simple will often reduce this cost.

Health Risks

All wastewater from households, whether it is greywater from sinks and showers or blackwater from toilets, poses a serious potential health risk, even after it has been treated by a septic tank. Any surface ponding on or around the treatment system, pipe work and land application area should be regarded as hazardous.

When doing maintenance work on septic tanks and wastewater land application systems, precautions must be taken to avoid skin contact, inhalation and ingestion of both treated and untreated wastewater. It is important to always wear appropriate protective footwear, gloves and clothing when carrying out maintenance. On completion of work always wash thoroughly using soap. Ensure all children and animals are kept well clear of the system being serviced and other community members are warned of the health risks associated with wastewater.

2 FLUSHING TOILET

This guideline is specifically for households with flushing toilets. In most cases the toilet, when flushed, will discharge the “blackwater” to a septic tank system. The septic tank and associated land application system is designed to provide the homeowner with a wastewater management service that is convenient, free of nuisance odours and health risks, and protects the local natural environment.

2.1 OPERATING THE FLUSHING TOILET

- Make sure the toilet is flushing correctly, that there are no leaks and the toilet area is kept clean. Leaking cistern seals can result in a constant stream of water leaking into the toilet. As well as wasting valuable water this can substantially increase the flow of wastewater needing to be managed and overwhelm the infiltration capacity of land application systems. A small quantity of food colouring added to the cistern, can make it easier to see such leaks. Any leaking seals or valves in the toilet need to be repaired or replaced.
- Take care with what is flushed down the toilet and what must not be flushed down the toilet. Use toilet paper or soft leaves, rather than newspaper, rags or hard objects that can block the toilet and will not readily breakdown. In particular, avoid flushing baby and other wipes down the toilet as these pose a high blockage risk. Place them in the rubbish instead. Refer to the appended leaflets at the end of this document. These can be put on the wall of your toilet to remind users of the appropriate way to operate a flush toilet.

3 GREYWATER

Greywater is wastewater from showers, laundry and sinks. Some homes may also drain their greywater into their septic tank system. The septic tank must be designed to be big enough (sufficient capacity) for the additional load from the greywater (in addition to the blackwater), and the land application system also must be increased in size to receive the discharge from the septic tank. See KoroSan #3 and #4.

If greywater drains to the septic tank system, the following practices should be followed in the home to safeguard the treatment system:

- For kitchen wastewater scrape all dishes to remove food wastes before washing.
- Some products can cause harm to the wastewater system. Avoid putting large quantities of the following down the drain:
 - Strongly alkaline (caustic soda, sodium hydroxide) or acid cleaning products.
 - Bleaches, whiteners, nappy soakers, stain removers, disinfectants
 - Antibiotics
 - Excessive fats, cooking oils and greases
 - Antiseptic liquids
 - Pesticides, herbicides, chemicals
 - Paints, varnishes and paint thinners
 - Drugs and pharmaceuticals
 - Motor oil
 - Toys, clothing, plastic bags etc.

Apply common sense – The treatment system relies on living organisms (mainly bacteria) to break down body, food and wastes. Heavy doses of toxic substances will kill these essential organisms and cause the system to fail.

3.1 AVOID EXCESSIVE WATER VOLUMES ENTERING THE SEPTIC SYSTEM.

Techniques for reducing wastewater volumes include:

- Installing water conservation fittings (dual-flush toilets, low flow taps and showers, and water efficient washing machines)
- Taking showers instead of baths
- Managing showering duration
- Don't leave taps running when rinsing clothes etc.
- Only use washing machines when there is a full load, and
- Only use dishwashers when there is a full load
- Maintain tap washers and cistern seals to avoid constant drips and seeps. A small constant drip can generate large volumes over an extended period. A tap losing one drip per second can waste 20 litres of water a day, and a leaking toilet more than 40 litres per day. If 2 or 3 fittings are leaking, then this volume will be multiplied.

4 SEPTIC TANK OPERATION AND MAINTENANCE

Septic tanks need regular maintenance to work properly and avoid clogging of soakage pits or land application systems. Public health risks, nuisances and the impact on the environment will be minimised if the system is well-maintained.

4.1 WHO SHOULD SERVICE A SEPTIC TANK?

People who have been trained to service septic tank should be engaged to do this work, and they should be paid. It is unpleasant work, there are serious health risks and the work must be done correctly.

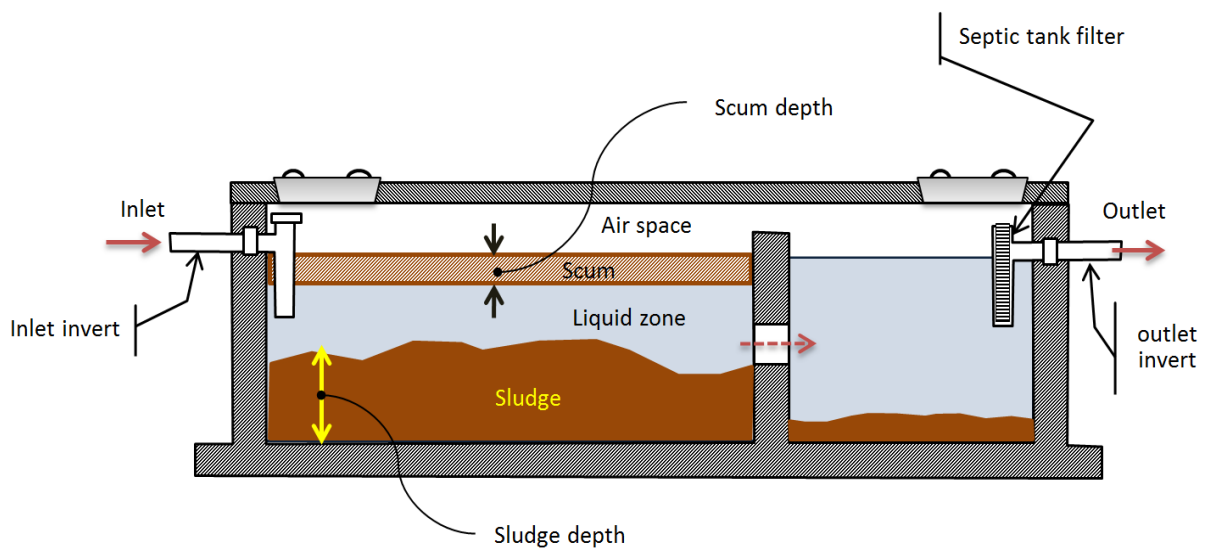
Figure 1 provides an illustration of the key servicing components of a dual chamber septic tank. Operation and management of the septic tank must include the following measures:

1. Inspect the tank and surrounding area for signs of structural damage or leaks. Protect the tank from vehicle access and damage.
2. Ensure access covers on the septic tank are able to be readily accessed, and are adequately sealed and then re-sealed after servicing.
3. Ensure that air vents are screened with insect mesh to exclude mosquitos. If mosquitos or flies are found to be breeding in the septic tank spray sparingly with an insecticide that will not adversely affect the septic tank (e.g. pyrethrin fly spray), and screen all access points. Mosquitos growing in such circumstances can be important vectors of diseases such as dengue, chikugunya, zika and malaria, and along with flies and other insects can spread a range of human pathogens.
4. Check the septic tank filter every six months. If the filter is clogged with accumulated solids on the filter, clean as detailed below.

5. Check the sludge level and surface scum thickness in the septic tank annually. Refer to instructions on how to do this below. Pump out the septic tank when:
 - a. the scum layer/surface crust in Figure 1, comes down to within 100mm of the bottom of the inlet tee junction or filter at outlet
 - b. the sludge build-up and the scum takes up half or more of volume of tank's first chamber volume. Refer to Figure 1.

When servicing a septic tank ensure all children and unauthorised villagers are kept safe and remain at least 10m distance from all cleaning activities.

Figure 1. Servicing elements of a septic tank.



4.2 CHECKING AND CLEANING THE SEPTIC TANK FILTER

The septic tank filter is to be checked, and if necessary cleaned every six months.

1. Always wear protection gloves.
2. Remove the access lid above the filter.
3. Loosen and slowly lift the septic filter inner element to a sufficient height to be able assess whether cleaning of the filter is necessary. If cleaning is required (say more than 30% blocked) leave the filter lodged partly lifted (Refer to Photo 1, Figure 2).
4. Arrange for a water hose to be available for hosing down the filter, or fill a container with water.
5. Dig a soil pit (at least 300mm depth) into which the filter is to be washed. Alternatively, if accessible, it can be washed into the septic tank.
6. Remove the filter completely and hose it down or pour water over it into the soil pit (or septic tank). (Refer to Photo 2 Figure 2). The filter should not be cleaned 100% to bare plastic. Leaving some biological film (slime) on the filter element is recommended.
7. Once clean return the filter to the outlet tee and ensure that it is correctly seated.
8. Replace and if necessary re- grout the access lid to the filter.
9. Fill in and fully cover the soil pit.
10. Wash and disinfect equipment and hands.

Figure 2. Photos of septic tank servicing.

Photo 1. Checking the septic tank filter.



Photo 2. Cleaning the filter into a soil pit.



Photo 3. Probing septic tank first chamber for scum and sludge depth.



Photo 4. PVC tee fixed to the end of a length (at least 2.5 m) of 15mm PVC pipe to form a probing rod.



4.3 CHECKING SEPTIC TANK SLUDGE LEVEL

The simplest and lowest cost method for determining scum thickness and sludge depth is to use a length (at least 2.5m) of 15mm PVC pipe with a 15mm tee firmly fixed to one end. A measuring tape could be fixed to the pipe. Refer to Photos 3 and 4, Figure 2.

1. Remove the access lid to the first chamber.
2. Establish a datum level at the lid from which the depth of the PVC probe is measured.
3. Slowly lower the PVC probe until it strikes the top side of the floating scum. Record the probe depth (if there is no scum present go to step 5).
4. Continue to lower the PVC probe through the floating scum, slightly twisting and lifting every, say 25mm to detect, with the tee, the under surface of the floating scum. Once found record the probe depth.
5. Continue to lower the PVC probe until the tee senses the top of the sludge layer. Record probe depth at this point.
6. Continue to lower the probe until the tee strikes the base of the septic tank. Record probe depth.
7. Using the above recorded depths calculate thickness of both the floating scum and the settled sludge layer.
8. If the sum of the scum and sludge depth is more than the depth below the invert of the septic tank outlet, the septic tank should be pumped out.

Provided there is access, the PVC probing can also be used to determine the location of the inlet and outlet inverts and base of the inlet tee and outlet filter.

Note: Always wear gloves for this work and wash and disinfect equipment and hands after each job.



5 LAND APPLICATION SYSTEM MAINTENANCE

There are several designs for land application systems described in detail in KoroSan #4. The key components of the land application system are:

- Dosing mechanisms¹
 - Pump
 - or
- Flout or siphon
- Soakage pit or trench

5.1 PUMPS

Full details of the servicing and maintenance of pumps should be sought from the pump supplier. If this information is not available, then it is unlikely to be a reliable pump. Find another supplier.

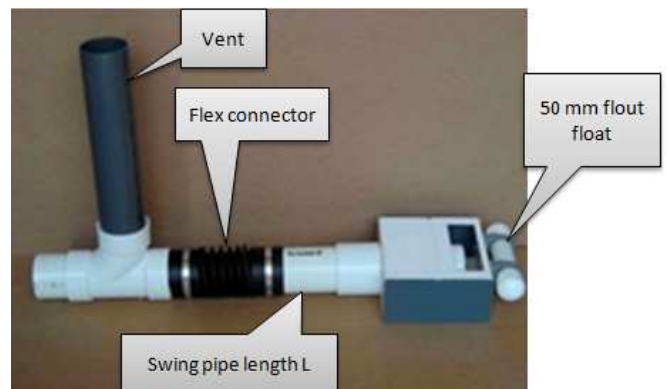
Every 3 months:

- Flow test the pump to ensure it is still pumping effectively.
- Check the action of the float switch to ensure it is switching on at the appropriate level.
- If fitted check the function of alarms.

5.2 FLOUTS

The flout is a simple device that will require minimal servicing and maintenance.

Every 3 months check the flouts operation. Ensure that the flout float is level. Further information on repair and maintenance can be obtained from the manufacturers website at: <http://www.rissyplastics.com/>



5.3 DOSING SYPHONS

From our experience, we consider flouts are a simpler, more robust and reliable option than siphons. Where they are fitted, their functioning should be checked at 3 monthly intervals, and manufacturers servicing and maintenance instructions followed.

¹ Some systems may not have or require a dosing system. The outflow from the septic tank simply flows directly to the soakage field. This is described as “trickle loading”. While a cheaper option it is not the preferred loading technique. Dose loading achieves more even application over the infiltration area of the soakage field, giving better in-soil treatment and reducing the risk of the soakage field clogging and failing.

5.4 PUMP AND FLOUT CHAMBERS

If there is an excess of sludge (say 50mm depth) at the base of the pump or flout chamber it will be necessary to desludge and clean the pump/flout chamber. Sludge removed should be disposed of into a pit at least 30 cm below ground level

5.5 DISTRIBUTION BOX

As explained in KoroSan #4, it is sometimes necessary to install a distribution box to evenly distribute the discharge from the septic tank to a number of soakage trenches. This distribution box needs to be inspected, at least every 6 months, by raising the lid and ensuring there are no blockages or any other problems.

5.6 SOAKAGE FIELD

There are a number of types of soakage fields, ranging from a simple soak pit, conventional soakage trench, a sand trench and the sand trench with an under-drain.

Operating and servicing the different land application systems is reasonably straight forward. The key requirements are:

- Prevent access by vehicles, unauthorised people and stock (e.g. sheep, pigs, cattle and horses).
- Exposed surface components (vents, Toby boxes) should be well protected. Check for damage every 3 months and repair/replace if damaged.
- Regularly check to ensure that there are no broken pipes, leakages or surface ponding, fixing the cause if found.
- Three monthly check for surface ponding on and around the perimeter of the soakage bed.
- Soakage fields fitted with distribution pipes should also be fitted with flush valves. It is recommended the distribution pipes are flushed every six months.
- If the land application system has an under-drain, check that the drain is not blocked and ensure the discharge for the drain is not creating a health risk to children, community members and animals.



6 SEPTIC TANKS: FREQUENTLY ASKED QUESTIONS

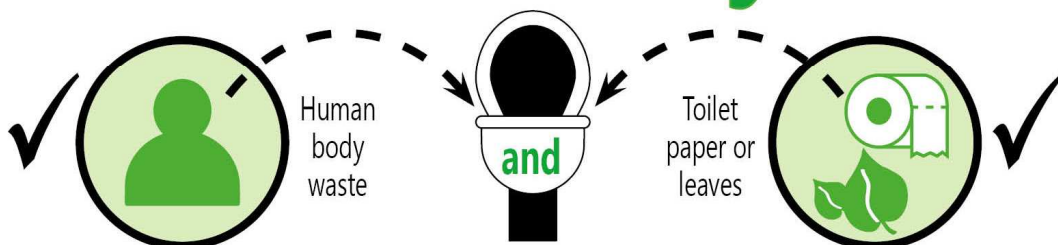
What is a septic tank?	It is a tank (usually made from concrete) that is buried in the ground, to receive and treat wastewater flushed from the toilet. For a typical family, the daily volume of wastewater from the flushing toilet could be 200 to 300 litres each day, and the septic tank should be about 2.5m long, 1.2 m wide and 1.2 m deep. Generally, the tank has two chambers and, ideally, will be fitted with a special septic tank filter at the outlet. The volume of the septic tank will be about 2500 L if just blackwater from the toilet is treated, and 4000 L if all wastewater is being treated. They must be built so that they are water tight and don't leak.
What does a septic tank do?	When the toilet wastewater flushes into the septic tank the solids in the wastewater settle to the bottom of the tank to form sludge. This sludge very slowly breaks down due to the action of bacteria. Some solids may float on the top to form a surface mat usually described as scum. The liquid in the tank (contaminated wastewater) flows through the septic filter and out the outlet. This liquid is usually called septic tank effluent . If 300L of wastewater enters the septic tank each day, then 300L of septic effluent will flow out of the other end of the septic tank each day. Septic tank effluent is very dangerous to human health as it carries many disease organisms.
Why do septic tanks smell sometimes?	Septic tanks will always create some smell. This is why it is important to vent them correctly and why they should be sealed. Sometimes the smell can become very foul and objectionable. This can be caused by over loading or flushing toxic chemicals and antibiotic medicines that kill off septic tank bacteria.
What happens to septic tank effluent?	The septic tank effluent goes into a dosing chamber where there is a device (pump or a flout) that sends a dose of effluent to a sand trench. In this trench the septic tank effluent filters through the sand which removes most of the disease organisms and other contaminants. After this it soaks into the surrounding soils. WARNING. If you see exposed wastewater or sludge, avoid contact with it and keep children and others away from it – it can make you sick
Does a septic tank have to be pumped out and when?	Yes. There will be a time when the septic tank must be pumped out. Obtain advice from a qualified person about when and how the septic tanks should be pumped out. Considerable care must be taken when removing this sludge. Seek advice from the Village Water and Sanitation Committee.
Does a septic tank filter have to be checked and cleaned	Yes. A trained person should check the filter every 6 months and clean if necessary. See the separate instruction for cleaning the septic tank filter. If help is needed ask the Village Water and Sanitation Committee for assistance.
Can we connect a neighbour's toilet to my septic tank?	Unlikely but it may be possible. It will depend on the size of the septic tank and the size of the soakage field. First seek advice from a qualified and experienced wastewater engineer. There is a risk of overloading the system and causing it to fail.
My flush toilet is leaking. What should I do?	It is important to fix all leaking taps, pipes and cisterns. If you know how to, fix the leaks immediately. Otherwise you should pay a plumber or trained person to fix the leak for you. Ask the Village Water Committee to provide training for fixing leaks. <u>Water should not be wasted.</u>
We have run out of water. What should we do?	This is a real problem. Flush toilets need a reliable water supply. If you continue to use your flush toilet without flushing, it will become blocked and a severe health risk to your family. You should advise the Village Water and Sanitation Committee immediately.
Mosquitoes are breeding in my septic tank – What should I do?	Spray the ST with suitable insecticide. Check that the septic tank is air tight and that there are no entry points for mosquitoes. Securely cover the terminal air vent, and any other vents, with approved mosquito mesh and block entry via any other holes.

Don't flush trouble!



These will clog drains & septic tanks and be hard to fix.
The overflow will cause health risks and pollution.

Flush only



Mo kakua ni Suviya na veika oqo ni Vakavu leqa!



Na veika oqo e sogota na salasala ni wai ni valelailai kei na taqe ni wai ca ka dau dredre me. Na sinai ni wai ca e dau drodro ka vakavuna na duka ni tikotiko ka vakaleqa talega na noda bula

Mo Suviya ga



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For more information contact:

The Department of Water and Sewage.

The Ministry of Health, or your local

Provincial Council

KoroSan Guidelines

The WASH w project has produced the following series of technical and participatory guidelines to help mobilise villages and settlements to improve their water supply, sanitation and hygiene. These guidelines may be freely disseminated provided the source is acknowledged.

KoroSan #	Title
1	Choosing a village wastewater management service
2	Site, soil and wastewater flow assessment
3	Septic tank construction using concrete blocks.
4	Land application systems
5	Maintaining your septic tank and land application system
6	Water-less ecoVIP2 toilet
7	Greywater management
8	Village participation in water and sanitation actions

KoroSan - for healthy villages

