SUPERIOR ON-SITE SOLUTIONS

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SUPERIOR ON-SITE SOLUTIONS

Homeowner's Manual

1500/1500 Gallon Pressure Distribution Wastewater System

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PROMOTING ADVANCED WASTEWATER TECHNOLOGY

Homeowner's Care & Maintenance Guide

For Your **Pressure Distribution Wastewater System**

Dear Homeowner,

Congratulations on the purchase and installation of your quality Merrill & Sons 1500 gallon wastewater septic tank and 1500 gallon pump tank! Your system, utilizing a pressure distribution wastewater system, has been designed, constructed, engineered and installed to provide long-term, effective treatment of your household wastewater. Included with your purchase are two years of service/maintenance with remote alarm monitoring.

THE FIRST FEW WEEKS

During the first few weeks of system operation, your system's "biological ecosystem" must establish itself and it is common for odors to develop around the system and its components. After the first month of operation, your system will stabilize and these odors should go away. A normally functioning septic system will have a damp, musty type odor.

A Normally-Operating Pressure Dose System:

- Makes no sound
- Alarm light is not glowing
- No odors

SEPTIC MAINTENANCE: Inside and Outside the Home

Regular septic maintenance is necessary in order to avoid problems. Problems such as blocked pipes, or a contaminated or flooded pressure dose field can cost thousands of dollars to repair, and worse, they could cause a health hazard to you and your family. Done right, maintenance steps will definitely increase the life span of your system, and it will ensure that you don't need to worry about possible health problems.

Maintaining the septic involves taking steps to ensure that it's kept free from any major problems, and this can be achieved both inside the home and on the outside.

Inside The Home

Your tank works to break down solid waste matter so that wastewater can be decontaminated and drained away safely. In order for this to happen, the wastewater needs to spend long enough in the tank for bacterial processes to work. If your tank fills up with excess water, this could lead to solid matter migrating into the drainage field before it has had time to break down properly, causing blockages in your pipes or the drainage field itself.

Therefore, it's necessary to make sure that too much water doesn't enter the system. This can be done by installing aerators to reduce water consumption, or special 'low-flow' attachments to shower heads and toilets. Other steps you can take include not overloading with water. If you have the shower, washing machine and dishwasher all running at the same time, this could cause your septic tank to overflow, so this should be avoided if at all possible.

Garbage disposals are a problem, as they significantly increase the amount of solids entering the tank. That's not to say you shouldn't use a garbage disposal system, but if you do you should ensure that waste is grinded up as small as possible, and you will need to pump the tank more often.

Outside The Home

On the outside, there are several steps involved in septic maintenance. One of the most important is to keep the ground area around the system from becoming saturated. To do this, make sure that the runoff from the roof flows away from the system. In addition, the soil above the drainage field should be kept loose to allow the effluent to drain away efficiently. Do not allow any vehicles to drive over the drainage

field, and avoid building anything over it, as this is the fastest way to compact the soil. Not only will the effluent fail to absorb in the ground, but compacted soil could also lead to cracked or blocked pipes, causing effluent to backflow into your system.

Experts recommended maintaining fairly dense grass coverage over the drainage field as part of your maintenance. This is the best way to prevent soil erosion, which could ultimately lead to the drainage field becoming saturated. However, you should avoid planting any trees or larger plants above the drainage field, as their roots could eventually damage the pipes underground.

The last, most important aspect of septic maintenance is to have the tank pumped regularly to dispose of the solids. If the solid matter is left to accumulate for too long, it will eventually enter the drainage pipes and start contaminating the leach field and clogging drain pipes. The general consensus is to have the tank pumped once every three to four years, depending on the size of the tank and how much water is disposed through it.

What Should Not Be Put into the Septic System?

Make sure you are aware of the types and amounts of extra waste materials that are poured down the drain. Limiting the use of your garbage disposal will minimize the flow of excess solids to your tank. Garbage disposals usually double the amount of solids added to the tank.

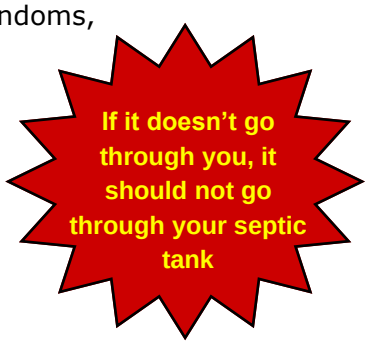
Do not pour cooking greases, oils, and fats down the drain. Grease hardens in the septic tank and accumulates until it clogs the inlet or outlet. Grease poured down the drain with hot water may flow through the septic tank and clog soil pores completely.

Pesticides, paints, paint thinners, solvents, disinfectants, poisons, and other household chemicals should not be dumped down the drain into a septic system because they may kill soil microorganisms that help purify the sewage. Also, some organic chemicals will flow untreated through the septic tank and the soil, thus contaminating the underlying groundwater.

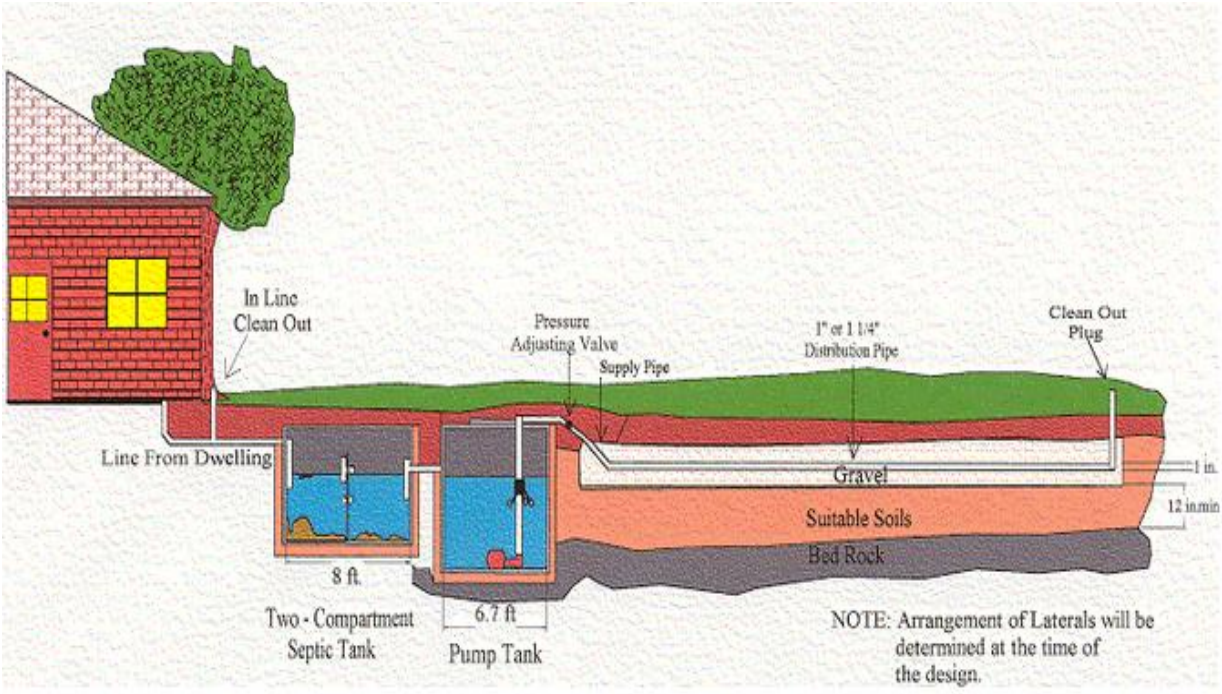
COMMON SENSE CARE OF YOUR WASTEWTER SYSTEM

Your septic tank is a simple wastewater treatment system that has no mechanical or moving parts. Like a car, your 1500 gallon septic tank and 1500 gallon pump tank require inspections and routine maintenance to ensure proper system function. Regular contracted maintenance and the following tips will help to avoid malfunction, failure, and costly repairs:

- Inspect and service your system regularly; pump as needed. Visually check area surrounding tank and drainage field to insure the system is functioning properly.
- Use water wisely and maintain all interior plumbing fixtures to prevent excess water from entering your wastewater system (i.e. leaky faucets).
- Watch your drains and don't flush dental floss, feminine hygiene products, condoms, diapers, baby wipes, cotton swabs, cigarette butts, coffee grounds, cat litter, paper towels and other kitchen/bathroom items that can clog and potentially damage your system.
- Try to use products labeled "Nontoxic" and "Septic Safe" and always use commercial bathroom/kitchen cleaners and laundry detergents in moderation.
- Avoid household toxics… flushing household chemicals, caustic drain openers, gasoline, oil, pesticides, antifreeze, and paint can stress or destroy the biological ecosystem within your tank.
- Spread your water usage throughout the week. For example, doing all of the household laundry in one day may be a time-saver, but it could overload you're system. Also consider using a water-efficient washer and installing water-efficient toilets, faucets and showerheads.

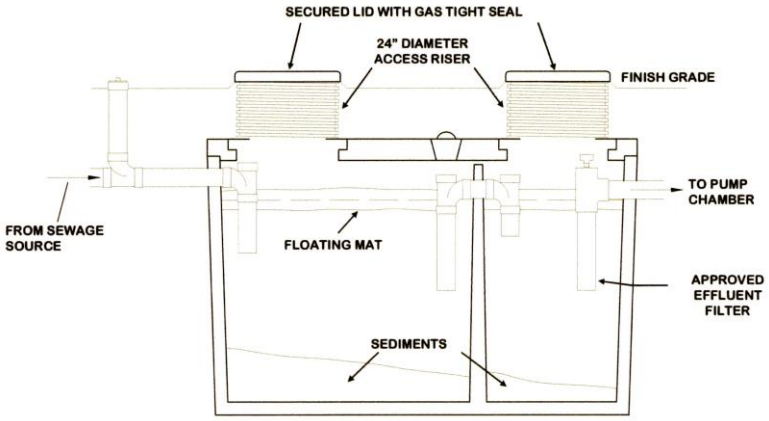


- Eliminating the use of a garbage disposal can reduce the amount of grease and solids entering your system. Frequent use of a garbage disposal can significantly increase the accumulation of sludge and scum in your tank, resulting in the need for more frequent pumping.
- Do not use additives or septic system cleaners.
- Be aware that the extended use of some strong pharmaceuticals may harm the working bacteria population and/or pH balance inside the tank.
- Ensure that water softeners or water purification systems do not backwash into your wastewater system.
- Keep records of repairs, pumpings, inspections, permits issued, and other system maintenance activities.
- Protect the tank, manhole ports, risers and riser lids from potential damage. Do not drive or operate heavy machinery over or near the tank and above-ground equipment. Use caution with lawn mowers and weed eaters near the equipment.
- Educate your household members about what is and what isn't good for your system so they can develop good maintenance habits.
- Do not add materials (chemicals, sanitary napkins, applicators, and so on) other than domestic wastewater.
- Make a diagram showing the location of your tank drainfield and repair area.
- Install a watertight concrete riser over the septic tank to simplify access.
- Periodically have the solids pumped out of the septic tank.
- Maintain adequate vegetative cover over the drainfield.
- Keep surface waters away from the tank and drainfield.
- Keep automobiles and heavy equipment off the system.
- Do not plan any building additions, pools, driveways, or other construction work near the septic system or the repair area.



What Is a Septic Tank?

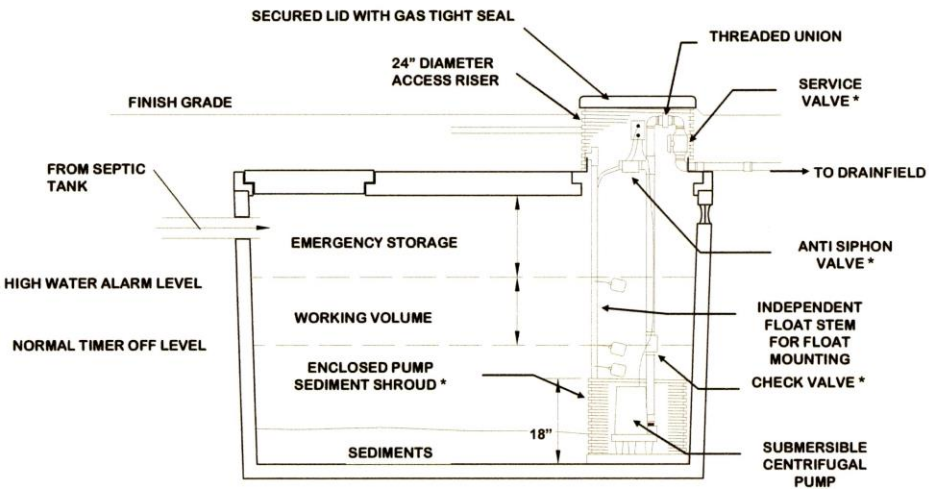
In a pressurized system, the septic tank is one of the most important and, unfortunately, most overlooked components. Without a properly designed, structurally-sound, watertight septic tank, a system is doomed from the start. Infiltration into a leaky tank can cause washing of solids out of the tank, waterlogging or damage in downstream components, excessive wear on the pump, and unnecessarily high electrical costs. exfiltration from a leaky tank reduces the biological activity which breaks down solids and thus increases the need for sludge removal. Exfiltration also lowers the scum layer in the tank, allowing scum to plug the pump and/or pump vault inlets. Scum that escapes the tank inevitably corrupts the downstream portion of the system. Perhaps most insidious of all, exfiltrated septic tank contents may go directly into the ground without any treatment and contaminate groundwater and surface waters.



With the advent of the Screened Pump Vault, the use of single compartment dosing septic tanks has become widespread, eliminating the need for a secondary dosing tank in most situations. When dosing directly from a single compartment dosing septic tank, maintaining a liquid level approximately equal to 90 percent of the tank's working volume is recommended. If extra reserve volume is needed, a larger tank should be used. For most residential applications, a 1500 gallon tank furnishes 300 to 500 of reserve capacity. The discharge rate from a single compartment dosing septic tank should be limited to approximately 30 gallons per minute or less. If a discharge rate greater than 30 gallons per minute is necessary, pumping from the second compartment of a two compartment tank or from a separate dosing tank is recommended. In that case, the temptation to use the pump chamber for all the reserve capacity by pumping from its bottom should always be resisted. The liquid level in the pump chamber should be kept as high as possible to maintain effluent quality: scum and sludge layers develop even in a second chamber—less rapidly, of course, than they do in the main septic tank—and effluent quality will suffer if the pump is not protected from these solids. The appropriate way to maintain reserve capacity, when needed, is to oversize a single tank rather than to introduce a second tank and pump off its bottom. Exceptions are systems for processing high strength wastes or those expected to have very large, uneven flows. These require an experienced designer to establish proper protocol.

What is a Pump Tank/System?

A pumping system for a septic tank or dosing chamber has seven main components:



(1) A riser and lid attached to the top of the dosing tank is essential for access to the pumping equipment.

(2) An electrical splice box is recommended for installation inside the riser to allow splicing of wires from the control panel with the cords from the pump and float switches.

(3) A pump vault is recommended for housing the pump in a dosing tank. Merely setting the pump on a concrete block or in a bucket on the bottom of the pump chamber is a guarantee that sludge, fats, oils, grease, and floc will end up downstream in the system.

(4) Liquid level float switches are mounted in the tank to control and/or monitor the liquid level inside the tank.

(5) An effluent pump is required to move the effluent to a distribution point.

(6) A discharge assembly connects a pump to the point of discharge from the tank. Head losses through discharge assemblies are very difficult to calculate theoretically because of the interdependence of the various types and positions of fittings and valves.

(7) A control panel to govern the operation of the pump should be mounted within sight of the pump system.

The Transport Line

The transport line provides a means of moving the effluent to the distribution network. The length and profile of this line influences how it is sized and laid out. PVC pipe is the most common material used for piping, although HDPE may also be used, particularly in extremely cold climates and areas plagued with unstable soils or earthquakes. Lines should be laid out in a consistent grade to avoid unwanted air trapping. In some cases, air release assemblies at high points are necessary.

The Manifold

A manifold is usually considered to be that portion of transport line which has side connections for laterals or other distribution piping. Because the volume of effluent flowing through the manifold is reduced each time a lateral connection is passed, the pipe size along the length of a long manifold may be reduced. However, there must be a minimal amount of head loss across the length of the manifold to ensure equal distribution. The method using the Hazen Williams equation which is outlined in the following section on laterals can be used in a similar fashion to calculate head losses in the manifold.

The Laterals

Laterals are the distribution lines that actually disperse the effluent into or on the media to be dosed. Most laterals are constructed of PVC pipe in which small orifices, 1/8 inch to 3/16 inch (3.2 to 4.8 mm) in diameter, are drilled. The lateral should be sized so that there is no more than 10% difference in flow from the first to the last orifice, which is generally considered to be "equal distribution." At the same time, velocity in the lateral should be as high as possible to allow "scouring" to limit the biological growth that occurs on the interior of the pipe walls. Such buildup on the pipe sidewalls has the potential to slough off and plug distribution orifices.

The Drainfield

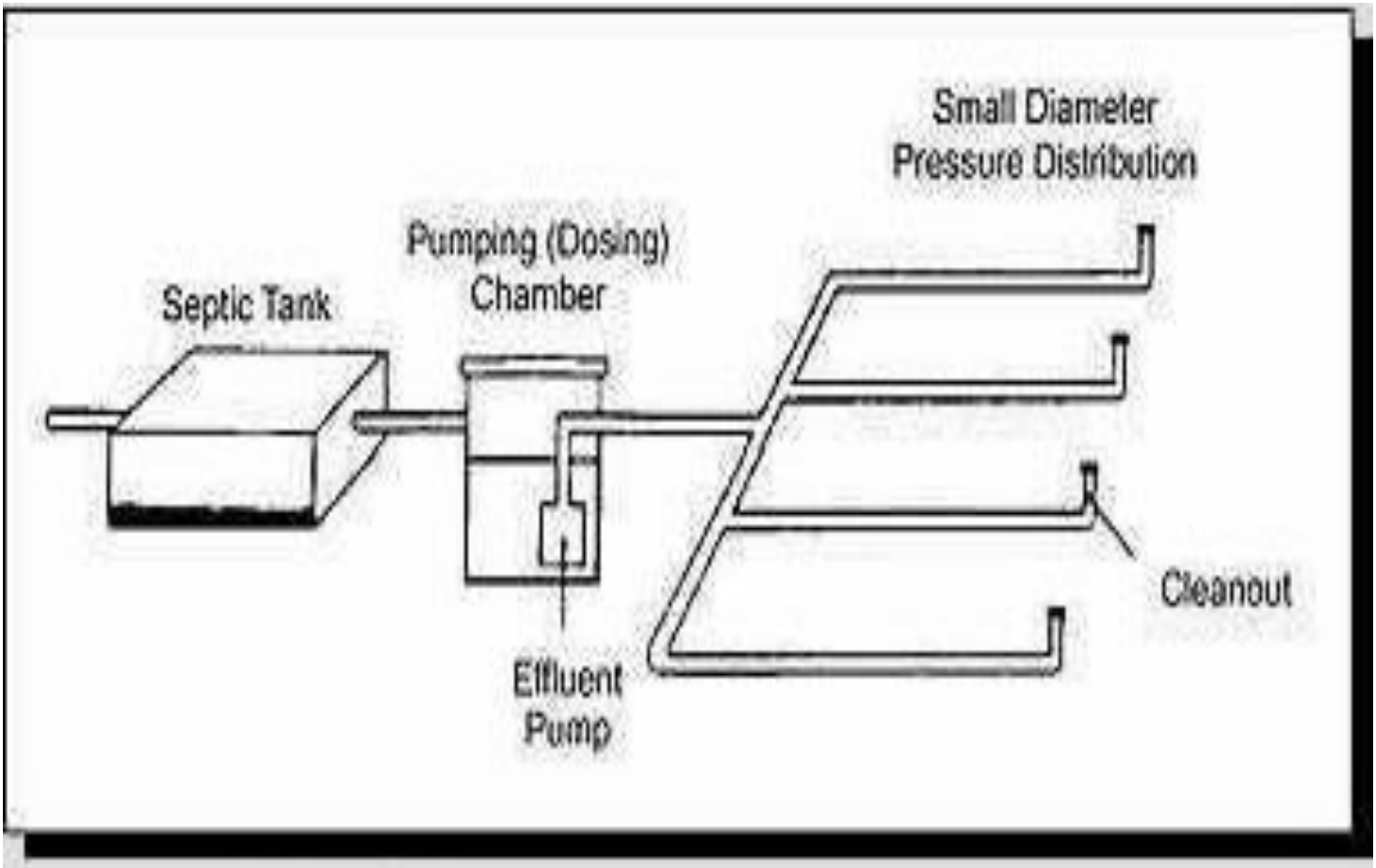
The drainfield is a network of pipes placed in gravel-filled trenches (2–3 feet wide) or beds (up to 10 feet wide) in the soil. Effluent is pumped through the pipes in controlled doses to insure uniform distribution throughout the drainfield. The effluent leaves the pipes under low pressure through small diameter holes, and trickles downward through the gravel where it reaches the soil. The soil filters and treats the effluent, removing bacteria and other pollutants before it reaches the groundwater. Every new drainfield is required to have a designated replacement area. It must be protected should the existing need additional lines on need to be repaired.

A thick layer of washed gravel or stone is placed around a 4-inch-diameter perforated distribution pipe. After the trenches are covered with soil, the area must be landscaped to keep surface waters from ponding over the drainfield.

The drainfield has also been called the nitrification field or the soil absorption field. The sole purpose of the drainfield is to deliver wastewater to the soil. The soil purifies the wastewater by removing the germs and chemicals before they reach the groundwater or any adjacent surface waters such as rivers, lakes, and estuaries.

The Remote Monitoring

Your Pressure dose wastewater treatment system is being remotely monitored. Connected to the home's telephone system, the RMSYS Autodialer will contact the local service provider in the event your septic system alarms. The autodialer will not interrupt active telephone calls, but will check every 15 minutes until the line is clear.



Pressure Dose System

Pressure Dose System Components

A pressure dose wastewater treatment system, also called an onsite wastewater treatment system (OWTS), is made up of a house sewer drain, septic tank, pump tank, distribution box and soil absorption (dose) field.

1. The house sewer drain collects all the discharge from home fixtures, such as toilets, sinks, showers and laundry and connects to the septic tank.
2. The septic tank collects all the discharges from household plumbing and provides the needed time for wastes to settle or float. The heavy solids settle to the bottom of the tank where they are broken down by bacteria to form sludge. The lighter solids, fats and grease, partially decompose and rise to the surface to form a layer of scum. This process allows the partially treated wastewater to be released to the absorption field.
3. The pump tank collects the septic tank effluent. Chamber contains pump vault, control floats and high water alarm. Pump moves pressurized effluent to drainfield.
4. The distribution box evenly distributes wastewater from the septic tank to pipes in the trenches of the absorption field. It is important that each trench receives an equal amount of flow to prevent overloading to one part of the absorption field.
5. Trenches receive partially treated sewage.
6. The absorption (pressure dose) field is a system of trenches and distribution pipes where wastewater is biologically treated by the surrounding soil. The system is partially filled with washed gravel, stone or a gravelless product. The absorption field must be properly sized, constructed and maintained to assure satisfactory operation and long life.
7. The vent permits gases that build up in the plumbing to exit the system.

What Takes Place in the Septic/Pre-treatment Tank?

All of the wastewaters from the home should flow into the septic tank. Even waters from the shower, bathtub, and washing machine can contain disease-causing germs or environmental pollutants. As wastewater flows into the tank, the heavier solid materials settle to the bottom (forming a sludge layer), the lighter greases and fats float to the top (forming a scum layer), and the liquid (sewage effluent) flows out of the tank. An outlet baffle (or a sanitary tee at the outlet end) prevents solids from flowing out with the liquids. The tank's primary purpose is to retain the solids while releasing sewage effluent to the drainfield.

What Happens in the Drainfileld and the Soil?

The real treatment of the wastewater occurs in the soil beneath the drainfield. Sewage effluent flows out of the tank as a cloudy liquid that still contains many disease-causing germs and environmental pollutants. Effluent flows into the perforated pipe in the trenches, passes through the holes in the pipe, and then trickles down through the gravel to the soil. As effluent enters and flows through the soil, many of the bacteria that can cause diseases are filtered out. Some of the smaller germs, such as viruses, are adsorbed by the soil until they are destroyed. The soil can also retain certain chemicals, including phosphorus and some forms of nitrogen.

Will I Need to Pump the Tank?

After a few years, the solids that accumulate in the septic tank should be pumped out and disposed of at an approved location. If not removed, these solids will eventually overflow, accumulate in the drainfield, and clog the pores (openings) in the soil.

This blockage severely damages the drainfield. While some clogging of soil pores slowly occurs even in a properly functioning system, excess solids from a poorly maintained tank can completely close all soil pores so that no wastewater can flow into the soil. The sewage effluent will then either back up into the house or flow across the ground surface over the drainfield. If this happens, you may need to construct a new drainfield on a different part of your lot. Pumping the septic tank after the soil drainfield has become completely clogged will not rejuvenate the system. It will provide only a few days reprieve until the tank fills up again.

How Will I Know When to Pump the Tank?

The frequency with which you will need to pump depends on three variables: the size of your tank, the volume of your wastewater, and the solids content of your wastewater. If you are unsure about when to have the tank pumped, observe the yearly rate of solids accumulation. The tank should be pumped if the sludge layer has built up to within 25 to 33 percent of the liquid capacity of the tank. Therefore, a typical 1,000 gallon tank with a 4-foot liquid capacity should be pumped when the solids are 1-foot thick in the bottom of the tank. If the tank is not easily accessible, you may wish to inspect and pump it according to the frequency guidelines in **Table 1**. Your local health department should be able to tell you the size of your tank. When inspecting the tank, check the sanitary tee or the outlet baffle to be sure that it has not broken off and dropped into the tank. Also, be sure to have both compartments of the tank pumped.

Table 1. Estimated Septic Tank Inspection and Pumping Frequency in Years

Tank Size (gallons)	Number of People Using the System				
	1	2	4	6	8
900	11	5	2	1	<1
1,000	12	6	3	2	1
1,250	16	8	3	2	1
1,500	19	9	4	3	2

Source: Adapted from "Estimated Septic Tank Pumping Frequency," by Karen Mancl, 1984. *Journal of Environmental Engineering*. Volume 110.

If the septic system is not used very often (as in an infrequently used vacation home with a correctly sized tank), it will probably not need to be pumped as frequently as indicated in the table. If you use a garbage disposal, the tank may need to be pumped more frequently. After a few inspections, you should be able to adjust the schedule according to the rate at which solids accumulate.

Is Special Care Needed for the Drainfield?

Yes. The drainfield does not have an unlimited capacity. The more water your family uses, the greater the likelihood of problems with the septic system.

Water conservation practices can help reduce the amount of wastewater generated in the home. Periodically check your plumbing for leaky faucets and toilets. Uncorrected leaks can more than double the amount of water you use. Many soils that can absorb the 200 to 250 gallons of sewage usually produced each day by a family of four would become waterlogged if an extra 250 gallons were added.

Be sure that foundation drains, roof waters, gutter waters, and surface waters from driveways and other paved areas do not flow over the septic tank or the drainfield. Careful landscaping can help direct excess surface waters away from the system.

You don’t want to overload the tank with waste that could go in the trash like cooking oil and table scraps. In other words, avoid the garbage disposal:

% Waste Added to Septic by Garbage Disposal

Parameter	Reduction in pollutant loading (%)
Total suspended solids	25–40
Biochemical oxygen demand	20–28
Total nitrogen	3.6
Total phosphorus	1.7
Fats, oils, and grease	60–70

Source: University of Wisconsin, 1978.

Inspections

Regular inspections of the tanks, pump unit and field are suggested at the same time as pumping. Simply pumping the tank and observing the inside of the tank will go a long way toward finding maintenance issues. For example, issues with one of the tank's baffles may cost a few hundred to fix if it's found quickly, while it could cost several thousand to fix if solid waste isn't stopped by the baffle and ruins the drainfield. Almost all septic issues work this way…small problems lead to bigger problems.

Treating with Septic Maintenance Products

Septic tanks rely on bacteria in the tank to digest some of the solid waste so that it doesn't build up too fast. It's possible for household chemicals released into the tank to kill some or all of the bacteria and when that happens, certain additives might be able to help restore bacteria levels.

Similarly, there are some additives that have been developed to help when the drain field becomes overwhelmed with solid waste. The drainfield could theoretically work forever with specific and diligent maintenance, but it's easy for things to go wrong. Some additives on the market claim to dissolve small particles and grease inside the distribution pipes, break up clay soil (called hardpan), and kill off the biomat (helpful bacteria layer that has grown too thick). Keep in mind, for drainfield additives to be most effective, they need to be applied at the distribution box or at least the septic tank outlet riser.

Wastewater Flow Reduction Methods

Elimination of extraneous flows

- Improved water-use habits
- Improved plumbing and appliance maintenance and monitoring
- Elimination of excessive water supply pressure

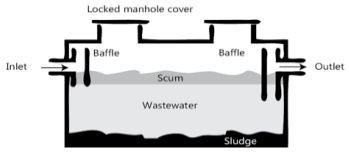
Reduction of existing wastewater flows

- Toilets
  - Water-carriage toilets
    - Toilet-tank inserts
    - Ultra-low flush (ULF) toilets
      - (1.6 gal or 6 L per flush or less)
      - Wash-down flush
      - Pressurized tank
  - Non-water-carriage toilets
    - Biological (compost) toilets
    - Incinerator toilets
- Bathing devices, fixtures, and appliances
  - Shower flow controls
  - Reduced-flow showerheads
  - On/off showerhead valves
  - Mixing valves
  - Air-assisted, low-flow shower system
- Clothes-washing devices, fixtures, and appliances
  - High-efficiency washer
  - Adjustable cycle settings
  - Washwater recycling feature
- Miscellaneous
  - Faucet inserts
  - Faucet aerators
  - Reduced-flow faucet fixtures
  - Mixing valves
  - Hot water pipe insulation
  - Pressure-reducing valves
  - Hot water recirculation

Wastewater recycle/reuse systems

- Sink/bath/laundry wastewater recycling for toilet flushing
- Recycling toilets
- Combined wastewater recycling for toilet flushing
- Combined wastewater recycling for outdoor irrigation

Sources: Adapted from USEPA, 1992, 1995.



Typical Septic Tank

CAUTION! Never enter a septic tank because it contains toxic gases that can be deadly.