

## Chapter 9

# Understanding and Living With Your Septic System

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### **Rural versus urban sewage treatment**

One of the big difference between rural and city life is how sewage is dealt with. Cities usually have community sewage disposal systems that your household waste pipe is connected to. A community sewage treatment plant deals with the waste. Rural homes are usually spaced so far apart that a community sewage system is not economically feasible. There are many alternatives for rural sewage treatment.

### **Septic system options**

The kind of sewage treatment septic system you will have will depend on local ordinances and soil conditions near your house site. The three main options are absorption field, lagoon, and mound systems.

The most common residential sewage treatment scheme in most areas is the septic tank - absorption field system. Sewage from your house flows into an underground, unvented septic tank where it is processed by various kinds of bacteria. The fluid effluent from the septic tank is gravity fed to an absorption field of perforated pipes laid in ditches lined with gravel and covered with dirt.

Septic lagoons are a type of system used in many parts of the country where soil conditions prevent adequate absorption field operation. This can happen with heavy clay soils. A septic lagoon is a small pond to which waste is piped. To most city folks, this usually seems like a very unsanitary way to deal with sewage. In fact, it is merely a smaller version of those larger community sewage treatment plants. Residential lagoons are dug in clay instead of formed from concrete and use larger surface area per gallon of sewage treated than municipal system to compensate for not using mechanical agitators and activated sludge.

The third category is the mound system that substitutes a covered sand or gravel mound for a perforated pipe absorption field. This system is sometimes used when terrain or local concerns about open water preclude the use of septic lagoons. It requires pumps and timers to operate correctly so require frequent operational checks to detect possible mechanical failures.

## **Selecting a septic system**

If local ordinances don't override your choices, soil is the big determining factor in choosing a septic system. What matters is how fast water percolates down into the soil. There are several different ways percolation or Perc tests are performed in different parts of the country. You can check with the local county health department for specifics.

## **Perc test description**

In general, to perform a Perc test, you dig a hole a few inches in diameter and two or three feet deep. Roughen the sides and bottom of the hole to eliminate any compression of the soil that might impede water flow. Add a couple inches of gravel to the bottom. Presoak the hole by keeping at least a foot of water in it for several hours. You then come back the next day and check how fast water soaks into the hole.

The actual Perc test consists of filling the hole (or bailing it out if necessary) to a depth of several inches. You then log how much the water level has dropped every half hour, adding water to bring it back its initial level. You continue this process until you get three readings within 10% of each other. Depending upon local soil conditions the time between readings may have to be increased or decreased to get meaningful numbers.

## **Evaluating the Perc test results**

Percolation rates less than 10 minutes per inch are too fast to protect ground water sources from sewage contamination so special systems are needed. You should contact the local county health department for further information. In the 10 to 60 minute range, leach field absorption systems work well. Percolation rates around 60 to 120 minutes per inch usually require mound systems or very large leach fields. Above 120 minutes per inch, such as often found with heavy Ozark clay soil, lagoon systems work best.

Now, the interesting point is that this test should really be run in the rainiest time of year. You certainly want whatever system you install to work even when the ground is soaked from spring rains. One spring, we attempted to perform Perc tests at a couple spots located appropriate distances from our house site. What we discovered was that water started seeping into the holes before we had finished digging them. That did not bode well for a successful absorption leech field system installation. Ultimately, we had a septic lagoon system installed.

There are many alternatives to the above systems. My recommendation is to go with the simplest, least mechanical system possible for your application. People will recommend all kinds of neat sounding, expensive, hi-tech systems for YOUR installation. What you want though is a system you do not have to think about and can operate for years at a time without attention.

## **Septic Tank – Absorption Field installations**

Septic tank – absorption (leach) field systems are probably the best-known rural waste treatment installations. In rural Missouri, these systems typically cost \$2000 - \$4000 to install.

A septic tank is usually 900 to 3500 gallons in size. It is sized to hold sewage long enough for anaerobic bacteria to digest most of the solids in the sewage. This is typically figured as 48 hours. Normally, a sewage flow rate of 120 gallons per day or so per bedroom is assumed.

New single-family homes should use a minimum 1500-gallon size. I would recommend the 2500-gallon size. Bigger is better with septic tanks as it allows longer digestion times and need to be pumped out less frequently. Septic tanks gradually fill with solids that bacteria are not able to digest. A small tank may need to be pumped every year or two.

## **Absorption Field size**

The size of this absorption field will depend upon local soil conditions. Your Perc test will help you figure out how large a field is needed. You can start with the **Table 1** below for a rough estimate.

Perc Rate	Minutes/Inch	Field Size Per Bedroom	Sq. Ft.
	10 – 30		200
	30 – 45		265
	45 – 60		300
	60 – 120		600

*Table 1: Recommended minimum absorption field size*

You will notice there is a value shown for Perc rates between 60 and 120 minutes per inch even though absorption field systems are not recommended for this low percolation rate. Some counties may require absorption field systems regardless of their suitability.

Field size is calculated as the width of the absorption field trenches multiplied by the length of the perforated pipe in them. Assuming a 2-foot trench width, a single 50-foot long trench would provide 100 square feet of absorption.

When trenches are paralleled to reduce the overall field length, they should be spaced about 3 times their width. Changing the above example to two 50-foot trenches, 500 square feet of ground area would be needed when space between trenches is included.

Your absorption field must be placed so it can be protected from soil compaction. Vehicles and heavy machinery will compress the soil in and around the trenches reducing effluent absorption. Anything heavier than a riding mower should be kept away. Also, you should avoid planting trees or shrubbery that produces deep roots. Roots can quickly clog up your absorption field. Your best plan is to keep the absorption field mowed.

There are other considerations in field location. The field should be 100 feet or more away from wells, springs, and sinkholes. The field should be 25 feet or more away from property lines. It should also be lower than your basement if at all possible.

All this may sound complicated. It actually is. What I have written here can help you understand the principles of what is required for a successful new installation. You should, however, hire a professional to do any work on your system.

## Septic Lagoon installations

Above 120 minutes per inch percolation rate, a septic lagoon is often a good choice. These systems are costing roughly \$1000 to \$2000 to install. Residential septic lagoon technology is well established. The depth of the wastewater in the lagoon is nominally 3 feet. The bottom foot or so of the water, where wastewater is introduced, is anaerobic, similar to inside a septic tank. The top few inches of the water supports aerobic bacteria to further sanitize the waste. This is a feature not found in absorption field systems. The water between these two layers provides a combined environment for waste processing.

One of the first questions asked about septic lagoons is how bad they smell. Properly sized, a lagoon gives off little odor. Much of the objectionable odor from sewage is from the gasses given off by anaerobic bacteria. The wastewater layers above the anaerobic zone in the lagoon absorb and modify these gasses into something less obnoxious.

Some state and county health departments prefer that a septic tank be installed in line between you house and your lagoon. This is really optional. It adds no safety, sanitation, or performance advantage to a properly built lagoon. The septic tank is probably recommended because so many rural folks reduce costs by having a neighbor or relative come over with a tractor and dig a hole, typically undersized, for the their lagoon.

New residential septic lagoons should have a surface area of about 1200 square feet or larger at a minimum. The table below shows minimum surface area sizes recommended by the state of Missouri based upon the number of bedrooms in your house.

Number of Bedrooms	Surface Area – Sq. Ft.
1 – 2	900
3	1320
4	1760
5	2200

*Table 2: Minimum Septic Lagoon surface size*



A septic lagoon, of adequate size of course, is probably the simplest system to use and maintain. Because of its large size, solid buildup on the bottom is very slow. An oversized lagoon may never need to be pumped out during the lifespan of the house using it.



A septic lagoon does, however, have a problem not encountered with other systems. Unless you put a fence around your lagoon, eventually you will experience the fun of washing a dog that decided to go for a swim in it. Also, frogs grow big in lagoons. That tends to make you less likely to choose frog legs when they show up on a restaurant menu.

## **Mound System Installations**

There is a variety of septic systems available for use with soil types with percolation rates slower than that needed for an ordinary absorption leach field. These systems are typically used with percolation rates in the 60 to 120 minutes per inch range. Installation cost typically runs in the \$5000 to \$15000 range here in the Ozarks.

A mound system typically uses a large shallow pile of sand and gravel. The septic tank effluent is collected in an intermediate tank called a dosing chamber. The dosing chamber is allowed to fill to a measured level and its contents are pumped to tubing that distributes it throughout the mound. The sizes of the sand particles in the mound are chosen to control the rate of effluent movement. The goal is to allow sufficient time for the effluent to be adequately processed before it is introduced to the soil under the mound. A mound is typically about 4 foot high and often occupies a thousand or more square feet.

A mound system works by forcing the septic system effluent water onto the surface of the local soil. The percolation of the effluent water, under the added pressure of the mound, should then displace existing ground moisture. The location and size of the mound is critical, as is the type of sand used, the configuration of the dosing tubes in the mound, and the size and frequency of each effluent dose pumped to the mound.

Mound systems work well when installed properly. They do, however, require continuous monitoring for mechanical problems associated with the dosing chamber, the dosing pump, and its controls and alarms. Mound systems should be designed and installed by professionals.

## **Living with your septic system**

A properly installed and adequately sized septic system typically requires little thought or maintenance. Solid material should be pumped from a septic tank every couple of years or so. Septic tank pumping services can be located using the yellow pages in the local phone book. The cost is nominal.

Absorption leach fields and mounds must be kept clear of deep-rooted plants and traffic that might compact the soil. Typically these areas are mowed. Absorption leach fields will last 20 years or more if the septic tank is pumped out frequently. It is important to prevent solids from entering distribution pipes and clogging the soil. Once an absorption system becomes clogged, it must be completely rebuilt.

## **Internet Web links**

Here are some Internet web links that provide additional information about septic systems.

For septic lagoons:

<http://muextension.missouri.edu/explorepdf/envqual/wq0402.pdf>

For regular septic tank - leach field systems:

<http://muextension.missouri.edu/explorepdf/envqual/EQ0401.pdf>

And for mound systems:

[http://www.soils.wisc.edu/sswmp/SSWMP\\_15.24.pdf](http://www.soils.wisc.edu/sswmp/SSWMP_15.24.pdf)

<https://www.extension.purdue.edu/extmedia/ID/ID-163.html>

## **Lessons learned about septic systems**

- 1. Septic systems typically fail and overflow at the most inconvenient of times. It is usually when you have guests staying with you. Have your septic tank pumped on a regular schedule.*
- 2. If you have dogs, don't forget to put a fence around your septic lagoon. Putting up a fence is a lot more fun than giving a dog a bath after it has swum in a lagoon.*