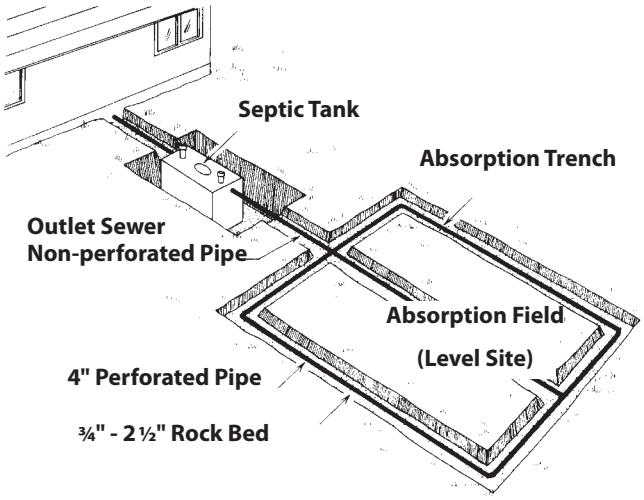
WATER Quality

K-STATE Kansas State University Research and Extension

Get to Know Your Septic System

(Onsite Wastewater Treatment)

Where sewers and central wastewater treatment plants are not available, some type of onsite wastewater treatment system is necessary. Onsite systems must completely treat the wastewater and allow it to be absorbed by the soil or through evaporation without causing contamination, nuisance, or odor. Surface discharge of wastewater from individual homes is illegal in Kansas.



Typical Onsite Wastewater System

A septic system composed of a septic tank and absorption field is the most common onsite system for homes. Treatment of the wastewater begins in the septic tank. Final treatment and absorption of the wastewater occur in the absorption field (also called lateral, leach, or drain lines/fields). Other types of onsite systems include lagoons and alternative systems that provide additional treatment before reaching the absorption field.

The Importance of Soil

Under the right conditions, soil is an excellent wastewater treatment system. The type and depth of soil determines the size and kind of onsite system that can be used. The soil with attached microbial life treats wastewater by:

1. Filtering out small solids,
2. Destroying pathogens,
3. Breaking down dissolved organics, and
4. Holding nutrients for plant growth.

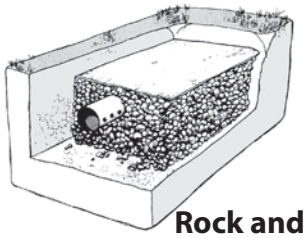
Enough soil depth is required to get sufficient treatment of wastewater. An adequate oxygen supply in the soil is essential for efficient treatment. If the thickness of soil below the trench bottom is not great enough to treat the wastewater before it reaches groundwater or a layer of rock, an alternative system can be used to pretreat the wastewater before it is applied to the soil.

The ability of the soil to absorb and treat wastewater is determined by careful soil profile examination or sometimes by percolation (perc) tests. A soil profile is the identification and evaluation of soil properties as seen in a trench at the field site. A percolation test measures the rate of drop of the level of water in a hole in thoroughly saturated soil. A soil profile can provide more information and more consistent results than a perc test.

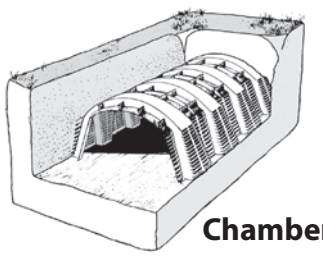
Soil Absorption Field: What Are The Options?

The soil absorption field disperses septic tank effluent (outflow) throughout a large area where it is further treated and absorbed. The size of the absorption field is based on soil properties and the expected wastewater flow.

Laterals or Trenches. The most common absorption field design is a system of trenches, usually 2 to 3 feet wide and spaced 7 to 10 feet apart. The bottom of a trench should be no more than 3 feet deep. For best oxygen transfer, 2 feet deep is more effective. To convey the wastewater throughout the field, the trenches are filled with rock surrounding a perforated plastic pipe or with chambers. Chambers are interconnecting plastic structures with open bottoms and side slots that allow the septic tank effluent to reach the soil.



Rock and Pipe



Chamber

The lateral system provides optimum treatment because oxygen enters through the soil on each side to reach the wastewater around the trench. The rock or

chambers should be covered with 6 to 12 inches of soil to allow grass to grow and to prevent freezing. Shallow, widely spaced laterals maximize the opportunity for nutrient removal and evaporation.

To divide wastewater between lateral lines, pipe systems or distribution boxes can be used. When an absorption field is on a slope, the laterals should be level and parallel to the contours of the hill. Drop boxes or raised pipe segments transfer the wastewater to the next lower line when the higher one is full.

Drip Irrigation. Subsurface drip irrigation may be used for an absorption field. Pretreatment by an alternative system is used ahead of the drip system.

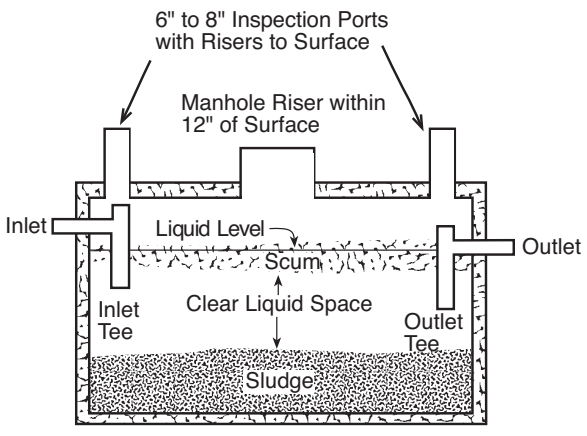
Beds. When space is very limited, a seepage bed or an evapotranspiration bed is sometimes used because it can fit into a smaller area than a lateral system. Beds lack most of the sidewall area of laterals and thus the oxygen supply is very limited in the center of the bed. These systems are more effective in dry climates than in wet, humid conditions.

Seepage pits and cesspools (**dry wells**). These systems have been illegal in Kansas since regulatory changes in 1996. They are not designed for good wastewater treatment and may cause groundwater contamination.

The Importance of a Septic Tank

To reduce the amount of waste that the absorption field must treat and to protect the field, raw sewage flows through a tank where the solids separate from the liquid before it enters the field. Lighter materials such as soap scum, oil, and fats form a floating layer at the water surface. Heavier solids accumulate at the bottom and are partially decomposed by microbial activity. The anaerobic environment in the tank begins the treatment process and digests accumulated solids, reducing sludge volume. Effluent from the tank contains small solids, dissolved organics, nutrients, and microorganisms including pathogens. Although wastewater is partially treated in a septic tank, the effluent is still sewage.

The septic tank should be watertight, corrosion-proof and of proper size and dimensions. A tank that has easy surface access and inspection ports is essential to perform needed inspection and maintenance.



Septic Tank

Safety. Never go into a septic tank unless properly equipped. The natural processes in a septic tank generate gases that are poisonous, flammable, and will cause asphyxiation.

Should I Use Septic Tank Additives?

A "starter" is not needed for a new septic system and additives are not needed for an operating system. A wide range of bacteria is already present in the sewage entering the septic tank. Those bacteria that are best adapted to the conditions in a septic system thrive in the septic tank and soil absorption field, treating the wastewater.

Septic tank additives are of no benefit. Some of them, especially solvents or petrochemicals, do not degrade easily and may damage the system or contaminate groundwater.

Additives that clean solids out of the tank may result in early absorption field failure. Money saved by not using additives will pay for regular septic tank pumping.

Are There Alternatives to Traditional Septic Systems?

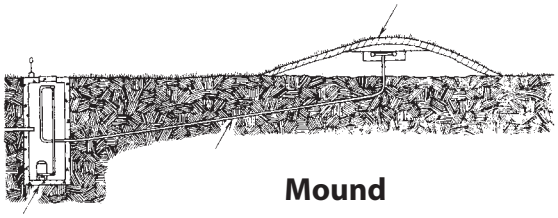
Yes! If a site does not have enough deep, permeable, well-drained soil for a septic system, there may be several alternatives, depending on site conditions.

Lagoons. A lagoon is a constructed pond, 6 to 7 feet deep, surrounded by a berm, and fenced to prevent animals and children from entering. All wastewater is discharged into the lagoon where it is treated by bacteria. For slowly permeable, high-clay soil, it is an effective, inexpensive option. A good lagoon that is properly operated and maintained rarely has an offensive odor. A lot size of 2 to 3 acres or more may be required to adequately accommodate a lagoon and provide setback distances.

Alternative Systems. Onsite systems designed to pretreat wastewater before it is sent to an absorption field are called alternative systems. Options include mounds, aeration systems, sand filters, filters using other materials, and rock-plant filters. Although all onsite systems require some maintenance, the mechanical and electrical parts or vegetation in alternative systems mean that additional monitoring and maintenance is required for good performance. Having a contract for maintenance service with a provider such as an installer or manufacturer is strongly recommended. Except for mounds, all alternative systems in Kansas still require an absorption field following the system.

Mound. When the soil has a shallow depth to a restrictive layer, such as a seasonal high water table, rock,

or slowly permeable layer, a mound may be a suitable alternative. A mound system consists of a layer of clean sand of a specific size on a prepared natural soil surface, and a pumped dosing system that applies the septic tank effluent over a distribution bed on top of the sand. Topsoil and grass cover the mound. Pump dosing of the distribution area is essential for uniform application to avoid overloading any one area. Mounds are usually limited to slopes

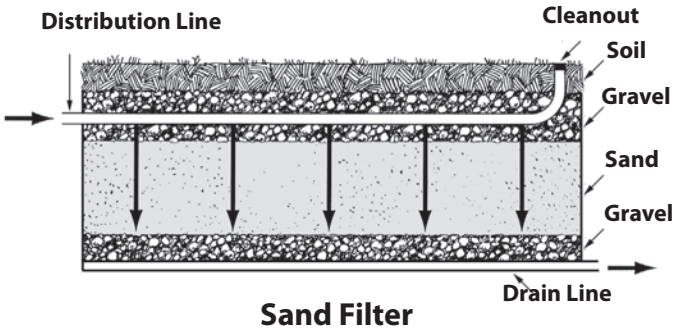


Mound

of less than 15 percent. A well-planned mound blends into the site and adds visual interest, but requires a site-specific design. The soil beneath the mound serves as the absorption field, eliminating the need for a separate field.

Sand Filter. A sand filter is similar to a mound but smaller, with the sides and normally the bottom of the sand bed lined with an impermeable material. Pre-engineered sizes and kit components enable easy installation, predictable costs, and a minimum of installation problems.

Systems similar to sand filters, but using expanded shale, peat, textiles, or other materials may also be used.



Sand Filter

Aeration. An aeration system increases the rate of microbial activity in the wastewater by adding oxygen. The oxygen is added by injecting air into the wastewater or by spraying the wastewater through air. There are many manufacturers of these units. Be sure that the system that you select has good service support in your location and a good warranty. NSF International has a certification program for aeration units.

Rock-Plant Filters, sometimes called constructed wetlands, have been developed since 1980. Wetland plants are set into a bed of rock in an impermeable liner. Septic tank effluent flows through this treatment cell. Soil absorption can be in a conventional absorption field or a second unlined wetland cell. A healthy stand of wetland vegetation contributes to wastewater treatment and removal. Rock-plant filters require maintenance to keep the plants vigorous.

Other Systems. The onsite treatment field is changing rapidly with many new products being developed. Many show promising results. As with any other major purchase, check the information on performance, length of time it have been in use, and the reputation and experience of the manufacturer, dealer, and installer.

How to Avoid a Septic System Failure

Each septic system has a certain capacity. When this capacity is exceeded, there will be problems of effluent oozing to the surface or wastewater backup in the house. Reduction of water use relieves a primary cause of system failure and is a great benefit for onsite systems.

Discharge all wastewater from the home into the septic tank. Laundry wastes must be run into the septic tank so that lint, detergent scums, and dirt are retained, and do not cause failure by clogging soil pores. Do not drain floor sumps or roof drains into the system. Only wastewater should go into the septic tank.

When selecting plumbing fixtures and water-using appliances, choose those that are water-efficient. Some toilets, shower heads, dishwashers, and washing machines use much less water than others.

Lagoon Maintenance. Lagoons operate best when the level of the wastewater is 3 to 5 feet deep. More water may have to be added to maintain this depth. Vegetation in the water, such as cattails and duckweed, must be removed for good operating conditions, reducing sludge accumulation, and preventing mosquito breeding. Berms should be planted with grasses that are mowed regularly.

Alternative System Maintenance. The manufacturer and installer should provide information on the maintenance requirements for your specific system. Maintenance can include testing pumps, alarms, and blowers for correct operation. Testing of dosing systems may include measuring squirt height of a water column from the end of a line to check for plugged orifices. Maintenance may involve back-flushing or brushing out the lines.

Good Septic System Performance May Require Learning New Habits

Taking Care of Your System

Pump the tank regularly to remove the sludge and scum. For example, about every 3 years, pump a 1,000-gallon tank serving a three-bedroom home having four occupants and limited use of a garbage disposal. See K-State Research and Extension publication, *Septic Tank Maintenance*, MF-947, for details.

Do not dump grease down the drain. It may clog sewer pipes or build up in the septic tank and plug the inlet. Use a separate container for waste grease and dispose of it in the trash.

Do not dispose of materials such as coffee grounds, cooking fats, bones, high wet-strength paper towels, facial tissues, or cigarette butts in the house sewer. These materials accumulate as solids in the septic tank and do not decompose readily, resulting in the need for more frequent tank pumping.

Modest amounts of household detergents, bleaches, drain cleaners, and other household cleaners do not harm the bacterial action in the septic tank. Do not put excessive amounts of any household chemicals down the drain. Avoid automatic toilet cleaners that contain chlorine.

To help avoid overloading the system, use water carefully. Turn off the faucet when not using the water. If the toothbrush is in your mouth or the razor is on your face, running water is being wasted and adding to onsite system load. Save laundry and dishes until you have enough to run a full load in the washing machine or dishwasher. Be alert to leaky faucets and toilets — repair all leaks.

Softened water may cause problems in absorption fields installed in high-clay soils. The added salt in the water may reduce the permeability of the soil, shortening the life of the field. Returning the softener discharge to the septic system or only softening the heated water can reduce the impact of a water softener on a septic system.

What To Do Before Buying Real Estate

A home or building site not served by central sewer or a public water supply needs careful evaluation to avoid bitter consequences. When buying an existing home, get complete information about the existing water supply and wastewater system before completing the purchase. Find out exactly where the property boundaries, well, and wastewater systems are located. Be sure that the existing system meets all setback and separation requirements from wells, water lines, and property lines given in the sanitary code. An area meeting the same requirements should be reserved for a replacement field. Inspection by a trained person is essential to learn if the system meets the local code and state requirements.

Before buying a lot, determine the most desirable locations for your home, well, and wastewater system. Evaluate the soil suitability on the site for building foundations, septic system or wastewater lagoon, roads, drives, and other uses. Remember that steep slopes, rock, high-clay soils, water bodies, stream floodplain, and marshy areas will cause construction and drainage problems. Before finalizing any purchase contract, check with the appropriate office to find out what permits are needed, including a permit to install the wastewater system. It is wise to make the purchase of the property contingent on locating an adequate site for a reasonable cost wastewater system and a sufficient source of safe drinking water.

Sources of Additional Information

- Local Health Office or Zoning/Planning Office
- County K-State Research and Extension Office
- Kansas Department of Health and Environment
- Local Natural Resources Conservation Service/ County Soil Conservation District Office

The following K-State Research and Extension publications are available from your county Extension office, local health office, or from K-State Research and Extension Distribution Center, 16 Umberger Hall, Manhattan, KS 66506-3402, (785) 532-5830

- *Septic Tank Maintenance: A Key to Longer System Life,* MF-947
- *Why Do Septic Systems Fail?,* MF-946
- *Wastewater Pond Design and Construction,* MF-1044
- *Wastewater Pond Operation, Maintenance and Repair,* MF-2290

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