



Understanding Your Septic System

Why Are Septic Systems Necessary?

Over 25 percent of Minnesota households use on-site sewage treatment systems, commonly referred to as septic systems, to treat their wastewater. While septic systems are designed and installed by licensed professionals to meet the needs of individual sites, homeowners are responsible for the system's operation and maintenance. Often septic systems fail because owners do not maintain them after installation.

This publication provides basic information homeowners need to:

- protect human health,
- protect water resources,
- lengthen septic system life,
- reduce current and future costs, and
- protect property values.

What Do Septic Systems Do?

Septic systems protect human health and the environment by safely recycling wastewater back into the natural environment. Septic systems treat wastewater as well as, or better than, municipal treatment systems at a reasonable cost when properly designed, installed, operated, and maintained.

Federal, state, and local regulation of on-site systems focuses on proper treatment of sewage to protect citizens, communities, and the environment.

How Does a Septic System Work?

In typical on-site treatment systems, all wastewater is co-mingled, treated, and dispersed by one system. There are a few separation systems in which toilet wastes are treated separately from other wastewater.

Common septic systems all have three basic components: plumbing, septic tank, and a soil treatment area. Individual systems may have variations of each of these.

Plumbing

The wastewater side of household plumbing collects used water from fixtures and appliances and delivers it to the treatment system(s).

Septic Tank

The septic tank is a solid watertight tank, or series of tanks, that receives waste water. It separates the solids from the liquids and stores the solids until they are decomposed or removed. The liquid, called effluent, is delivered to the soil treatment system.

Inlet and outlet baffles trap the floating solids in the tank. Inspection pipes allow monitoring of the tank and the manhole facilitates cleaning.

The size of the septic tank is based on the home's potential water use volume and the type of appliances used. In aerobic tank systems, pumps and other mechanisms are necessary to deliver air to the tank.

Soil Treatment Area

The soil treatment part of the typical septic system is a network of perforated pipes or tubes surrounded by small rock and soil. Some designs use large plastic tubes or chambers instead of rock to disperse effluent from the tank into the surrounding soil.

The design of the treatment area (trench, mound, etc.) is based on the soil condition. The soil in the treatment area must not be saturated with water for extended periods of time during the year. Three feet of unsaturated soil below the system is necessary to complete the treatment process.

The size of the soil treatment area needed depends on the volume of water to be treated and the type of soil on the site. For example, a much larger soil area is needed for a large home or a home on clay soil than for a small home or one on sandy soil.

Pumps and a lift station may be components of a system where gravity flow doesn't work. For example, in mounds and drip irrigation systems a pump is required to provide pressurized flow for distribution of effluent.

Enhancements

Sometimes enhancements, known as pretreatments, are added to septic systems. Some of the options are aerobic tanks, single pass or recirculating sand or peat filters, and constructed (lined) wetlands. These are located between the septic tank and the soil treatment system to improve the performance of the system or provide treatment in difficult soil conditions (for example, shallow bedrock or high water tables). These may require additional pumps and control devices.

Separation technology systems may require containers in the home that collect and compost solid organic wastes. Other devices may collect and store wastewater for delivery to a soil treatment or dispersal unit.

How Is Sewage Treated?

In the typical system, raw sewage is collected by the plumbing in the home and delivered to the septic tank. There the light solids float to the top, forming a scum layer, and the heavy solids sink to the bottom, forming sludge.

In the tank, organic solids such as food particles and human waste are decomposed by millions of naturally occurring bacteria.

The septic tank delivers the partially treated liquids, or effluent, to the soil treatment area. Effluent contains pathogens (disease-causing organisms), nutrients, and some fine solids. A thin layer of fine solids, dead bacteria, and soil bacteria, called a biomat, forms naturally where the effluent enters the soil. The biomat restricts the flow sufficiently to keep the soil beneath unsaturated.

The unsaturated soil contains oxygen which allows aerobic bacteria to live and destroy pathogens. These air spaces also force nutrients such as phosphorus and sodium to come in direct contact with soil particles to which they become attached. A portion of the nitrogen passes through into the groundwater. After passing through the unsaturated soil, the now harmless water evaporates into the air or returns to the soil and groundwater system. In regular septic tanks, the bacteria are anaerobic, that is, they live without air in the liquid. In aerobic tanks, the bacteria are aerobic and require air to live.

Why Do Septic Systems Fail?

Failure of your or a neighbor's septic system means that wastewater may come in contact with people or enter the natural environment without complete treatment of all harmful contents. Indicators of problems or a failing system include the following:

- Sewage backup into the house
- Frozen pipes or soil treatment areas
- System alarms sounding
- Algal blooms and excessive plant growth in nearby ponds or lakes
- Sewage odors indoors or outdoors
- Water or sewage surfacing in the yard or a ditch
- High levels of nitrates or coliform bacteria in well water tests

System failure is most commonly the result of improper design or installation of the system, overuse of water in the home, or lack of proper maintenance.

Improper Design or Installation

This may be the result of mistakes made by the professionals when the system was installed. It is also possible that the wrong system was chosen for the site and soil conditions (for example, high water table, shallow bedrock) or that the residence has been modified to house more people or to use fixtures or appliances that the system was not designed for or sized to handle.

Overuse of Water

The typical Minnesota resident (man, woman, or child) uses about 100 gallons of water per day. Systems are sized for typical water use, but abnormally high usage or accidental overuse (such as from leaky fixtures) can quickly overload the system. A system partially damaged from improper maintenance may not be able to treat even typical volumes of water. This situation often occurs when a home of one or two people is sold to a family of five or six causing water use to increase dramatically.

Improper Maintenance

The solids that accumulate in the septic tank must be removed regularly. If excessive scum or sludge builds up, it will begin to enter the soil treatment area and over time will plug it. It is recommended that a septic tank be cleaned (pumped) through the manhole, removing all solids, every one to three years. Cleaning frequency depends on several factors, including the number of people in the home, the size of the tank, and the use of a garbage disposal. The complete removal of solids from the tank requires flushing and back-flushing between the tank and the truck several times.

Operation and Maintenance Tips

Proper operation and maintenance will prevent costly repairs and replacement in the future.

Control water use

- Repair all leaky faucets, fixtures, and appliances immediately.
- Install low water use fixtures and appliances (especially toilets and shower heads).
- Do not empty roof drains and sump pump water into the septic system.
- Wash only full loads of clothing and dishes.
- Reduce length of showers and number of toilet flushings.
- Reroute water softener discharge water out of the septic system.
- Spread water use, such as laundry, evenly throughout the day and week.

Eliminate harmful products from the system

- Reduce or eliminate use of harsh cleaners, disinfectants, detergents, and bleach.
- Dispose of solvents, paints, and unwanted medications through other means.
- Keep grease, lint, food particles, cigarette butts, paper towels, disposable diapers, coffee grounds, feminine hygiene products, plastics, and other solid products out of the system.
- Use only necessary amounts of liquid non-phosphorus detergents and cleaners.

Do not use additives

- It is not necessary to use additives to enhance the performance of a properly operating system. If the level of bacterial activity is low, it is because disinfectants and other products are killing them. Reduce or eliminate the use or disposal of these products in the system to allow the bacteria to re-establish. Some additives cause solids to become suspended in the liquids. These solids will end up in the drain field, causing significant damage.

Regularly clean/pump and inspect the septic tank

- The septic tank must be cleaned or pumped regularly to remove all solids. Never go into the septic tank. It lacks oxygen and contains dangerous gases.
- Always clean the tank through the manhole (20- to 24-inch opening).
- Always use a licensed professional.
- Be sure all solids are removed (flush and back-flush).
- Inspect the baffles to be sure they are in place and functioning properly.

Maintain pumps and filters properly

- All pumps and motors should be routinely checked for proper operation.
- Replace weak or faulty pumps and motors.
- Install and clean lint filters on laundry equipment.
- Clean or replace effluent filters regularly.
- Attend to alarms on pumps and filters immediately.

Protect the soil treatment area

- Mow but do not fertilize or water turf grasses.
- Keep heavy vehicles (cars, tractors, snowmobiles, etc.) off soil treatment area.
- Do not place gardens, swing sets, or sand boxes over this area.
- Do not plant trees and shrubs on or close to this area.
- Maintain stands of appropriate plants on constructed wetland sites.

Resources

The following University of Minnesota Extension Service materials are available through your county Extension office or the Distribution Center, 800-876-8636 or 612-624-4900.

Publications

- [Septic System Owner's Guide](#) - Item 06583
- [Taking Care of Your Septic System](#) - Item 07040
- [Landscaping Septic Systems](#) - Item 06986

Videos

- [Septic Systems Revealed: Guide to Operation, Care, and Maintenance](#) — Item 08243 (DVD)
- [Alternative Septic Systems](#) — Item 07572 (VHS)

Places To Go for Assistance

- Licensed/bonded Contractor
- [Local City, Township, or County Offices](#)
- Planning and Zoning
- Environmental Health

- [University of Minnesota Extension](#)
- Water Plan Coordinator
- Soil and Water Conservation District
- Regional or State Offices
- [Minnesota Pollution Control Agency](#)
- [Minnesota Department of Health](#)