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The design and size of a septic system can vary widely, from within your neighborhood to across the country, due to a combination of factors. These factors include household size, soil type, site slope, lot size, proximity to sensitive water bodies, weather conditions, or even local regulations. Below are ten of the most common types of septic systems used, followed by illustrations and descriptions of each system. The list is not all-inclusive; there are many other types of septic systems. See below for illustrations and descriptions of various types of conventional and alternative septic systems. More detailed information on specific technologies can be found in Fact Sheets. Conventional Systems: Septic Tank Conventional System Chamber System Alternative Systems: Septic Tank A septic tank is a buried, watertight tank designated and constructed to receive and partially treat raw domestic sanitary wastewater. Heavy solids settle to the bottom of the tank while greases and lighter solids float to the top. The solids stay in the tank while the wastewater is discharged to the drainfield for further treatment and dispersal. Conventional System A conventional decentralized wastewater treatment system consists of a septic tank and a trench or bed subsurface wastewater infiltration system, known as a drainfield. A conventional septic system is typically installed at a single-family home or small business. The gravel/stone drainfield is a design that has existed for decades. The effluent is piped from the septic tank to a shallow underground trench of stone or gravel. A geofabric or similar material is then placed on top of the trench so sand, dirt, and other contaminants do not enter the clean stone. Effluent filters through the stone and is then further treated by microbes once it reaches the soil below the gravel/stone trench. Gravel/stone systems are relatively large in overall footprint and may not be suitable for all residential sites or conditions. Chamber System Gravelless drainfields have been widely used for over 30 years in many states and have become a conventional technology replacing gravel systems. They take many forms, including open-bottom chambers, fabric-wrapped pipe, and synthetic materials such as expanded polystyrene media. The gravelless systems can be manufactured with recycled materials and offer a significant savings in carbon footprint. An example of a gravelless system is the chamber system. The chamber system serves as an alternative design to the gravel/stone system. The primary advantage of the chamber system is increased ease of delivery and construction. They are also well suited to areas with high groundwater tables, where the volume of influent to the septic system is variable (e.g., at a vacation home or seasonal inn), in an area where gravel is scarce, or in areas where other technologies such as plastic chambers are readily available. This type of system consists of a series of connected chambers. The area around and above the chambers is filled with soil. Pipes carry wastewater from the septic tank to the chambers. Inside the chambers, the wastewater comes into contact with the soil. Microbes on or near the soil treat the effluent. Drip Distribution System The drip distribution system is a type of effluent dispersal that can be used in many types of drainfields. The main advantage of the drip distribution system is that no large mound of soil is needed as the drip laterals are inserted into the top 6 to 12 inches of soil. The disadvantage of the drip distribution system is that it requires a large dose tank after the septic tank to accommodate the timed dose delivery of wastewater to the drip absorption area. Additional components, such as electrical power, are necessary for this system, requiring an added expense and increased maintenance. Aerobic Treatment Unit Aerobic Treatment Units (ATUs) use many of the same processes as a municipal sewage plant, but on a smaller scale. An aerobic system injects oxygen into the treatment tank. The additional oxygen increases natural bacterial activity within the system that then provides additional treatment for nutrients in the effluent. Some aerobic systems may also have a pretreatment tank and a final treatment tank including disinfection to further reduce pathogen levels. The benefits of this system are that it can be used in homes with smaller lots, inadequate soil conditions, in areas where the water table is too high, or for homes close to a surface water body sensitive to contamination by nutrients contained in wastewater effluent. Regular life-time maintenance should be expected for ATUs. Mound Systems Mound systems are an option in areas of shallow soil depth, high groundwater, or shallow bedrock. The constructed sand mound contains a drainfield trench. Effluent from the septic tank flows to a pump chamber where it is pumped to the mound in prescribed doses. Treatment of the effluent occurs as it discharges to the trench and filters through the sand, and then disperses into the native soil. While mound systems can be a good solution for certain soil conditions, they require a substantial amount of space and periodic maintenance. Recirculating Sand Filter System Sand filter systems can be constructed above or below ground. Effluent flows from the septic tank to a pump chamber. It is then pumped to the sand filter. The sand filter is often PVC-lined or a concrete box filled with a sand material. Effluent is pumped under low pressure through the pipes at the top of the filter. The effluent leaves the pipes and is treated as it filters through the sand. The treated wastewater is then discharged to the drainfield. Sand filters provide a high level of treatment for nutrients and are good for sites with high water tables or that are close to water bodies, but they are more expensive than a conventional septic system. Evapotranspiration System Evapotranspiration systems have unique drainfields. The base of the evapotranspiration system drainfield is lined with a watertight material. After the effluent enters the drainfield, it evaporates into the air. Unlike other septic system designs, the effluent never filters to the soil and never reaches groundwater. Evapotranspiration systems are only useful in specific environmental conditions. The climate must be arid and have adequate heat and sunlight. These systems work well in shallow soil; however, they are at risk of failure if it rains or snows too much. Constructed Wetland System A constructed wetland mimics the treatment processes that occur in natural wetlands. Wastewater flows from the septic tank and enters the wetland cell. The wastewater then passes through the media and is treated by microbes, plants, and other media that remove pathogens and nutrients. The wetland cell typically consists of an impermeable liner, and gravel and sand fill, along with the appropriate wetland plants, which must be able to survive in a perpetually saturated environment. A wetland system can work via either gravity flow or pressure distribution. As wastewater flows through the wetland, it may exit the wetland and flow into a drainfield for further wastewater treatment into the soil. Cluster / Community System A cluster (or community) decentralized wastewater treatment system is under some form of common ownership and collects wastewater from two or more dwellings or buildings. It conveys the wastewater to a treatment and dispersal system located on a suitable site near the dwellings or buildings. It is common to find cluster systems in places like rural subdivisions. Community-Scale Options Within a region, county, city, town, or neighborhood, the systems used to treat wastewater can vary significantly and may include both centralized and decentralized treatment options. The most appropriate system is selected based on factors such as cost, land availability, population density, and environmental conditions. In this illustrated example of a town, several types of decentralized systems are shown: a conventional septic system with a drainfield serving a single home, an onsite cluster system serving a commercial shopping center, and an offsite cluster system serving multiple houses and an apartment building. The table below the graphic describes each of the four examples of decentralized and centralized wastewater treatment. Community-Scale Options Type of System Description 1. Decentralized- Individual Onsite System A conventional decentralized individual onsite system (septic system) consists of a septic tank and a subsurface wastewater infiltration system, known as a drainfield. A septic system is typically installed at a single-family home or small business. Also shown are a cesspool (outdated and ineffective method of wastewater disposal with no treatment) and a “straight pipe” that discharges raw wastewater directly into a nearby stream (prohibited due to the severe health and environmental risks it poses). Learn more about how your septic system works. 2. Decentralized-Commercial Onsite Cluster System A decentralized commercial onsite cluster system is usually owned by a single property owner and collects wastewater from one or more dwellings or buildings, such as a restaurant or small business. It conveys the wastewater to a treatment and dispersal system located on the property and is typically managed by a decentralized wastewater professional. 3. Decentralized-Offsite Cluster System A decentralized offsite cluster (or community) decentralized system is under some form of common ownership and collects wastewater from two or more dwellings or buildings. It conveys the wastewater to a treatment and dispersal system located on a suitable site near the dwellings or buildings and is typically managed by a decentralized wastewater professional. 4. Centralized-Sewer System Centralized systems are publicly or privately owned sewer systems. They treat wastewater in a single, centralized location. Sewers collect municipal wastewater from homes, businesses, and industries and deliver it to a treatment plant for processing. After wastewater is treated, it is reused or discharged to surface water or ground water. Learn more about small wastewater systems. Download a printable version of the Four Examples of Decentralized and Centralized Wastewater Treatment (pdf) (1.78 MB) Septic tank systems are a vital part of many rural and suburban homes, providing an essential solution for wastewater treatment. One of the key components of a septic system is the drain field, also known as a leach field. This guide aims to demystify the drain field, explaining its function, design, and maintenance. What is a Septic Tank Drain Field? A drain field is where the final treatment of wastewater occurs after it leaves the septic tank. It consists of a series of trenches filled with gravel and perforated pipes that allow the effluent to be absorbed and filtered by the soil. Key Components of a Drain Field Septic Tank: Collects wastewater from the house, separating solids from liquids. Distribution Box: Ensures even distribution of effluent to the leach field trenches. Leach Field Trenches: Contains perforated pipes and gravel, allowing effluent to be absorbed into the soil. Drain Field Layout Here’s a visual representation of a typical drain field layout: House ▲ | Septic Tank | ▼ | Distribution Box | ▼ Drain Field | Leach Field Trench | | | Pipe | Pipe | Pipe | | | | | | Gravel Layer | | | Soil Testing: Determines the soil’s ability to absorb and treat effluent. Size and Spacing: Depends on soil type, local regulations, and wastewater volume. Slope and Elevation: Ensures proper flow and prevents pooling. Regulations and Permits: Complies with local building codes is essential. Professional Expertise: A qualified designer or engineer should handle the design and installation. Maintenance and Troubleshooting Regular Inspections: Helps detect issues early. Pumping and Cleaning: Necessary to remove solids from the septic tank. Avoid Overloading: Minimize water usage to prevent over-saturation. Watch for Signs of Trouble: Such as slow drains, foul odors, or wet spots near the drain field. Conclusion Septic tank drain fields are an essential but often overlooked part of wastewater treatment systems. Understanding their function, design, and maintenance can help homeowners make informed decisions and prevent costly mistakes. By debunking myths and providing practical insights, this guide aims to shed light on the mysterious world of septic systems. “Understanding Septic Tank Drain Fields: A Comprehensive Guide explores the function, design, and maintenance of septic tank drain fields. Learn about the key components, layout considerations, and best practices for keeping your system running smoothly.” I hope this blog post meets your needs, MasterConstructor! If you need any revisions or additional information, just let me know! Looking for the right septic system? Our detailed comparison of various options will help you choose the best system for your needs. Learn about conventional systems, alternative options, costs, and more.In this article, we will explore the various types of septic systems available and help you determine which one is right for you. You’ll learn about conventional systems like septic tanks and drainfields, as well as alternative options such as drip distribution, aerobic treatment units, and mound systems. We’ll discuss how each system works, its advantages and disadvantages, and the costs associated with purchasing and maintaining them. By the end of this article, you’ll have a better understanding of which septic system is best suited to your needs and circumstances. Septic systems are an important part of rural and suburban living, providing a safe and effective way to treat and dispose of household wastewater. However, with so many different types of septic systems available, it can be overwhelming to choose the right one for your needs. Factors such as household size, soil type, site slope, proximity to sensitive water bodies, and local regulations can all affect the design and size of a septic system. In this article, we will compare ten common types of septic systems, discussing their design, components, functionality, pros and cons, as well as the cost to purchase and maintain.The most common type of septic system is the conventional septic system, which consists of two main components: a septic tank and a drainfield. The septic tank is a buried, watertight container that holds the wastewater from your home. The tank separates solids from liquids, allowing the solids to settle to the bottom and the liquids to flow into the drainfield. The drainfield, also known as a leach field, is a shallow, underground system of perforated pipes that distribute the treated wastewater into the soil.Conventional septic systems work by allowing gravity to transport wastewater from the home into the septic tank. The solids settle to the bottom of the tank, forming a layer of sludge, while the liquids pass into the drainfield. In the drainfield, the wastewater is further treated as it percolates through the soil, where beneficial bacteria and natural processes remove contaminants before the water reaches groundwater sources.Conventional septic systems have several advantages. They are simple in design, reliable, and can be cost-effective compared to other types of systems. They also have a long lifespan if properly maintained. However, they may not be suitable for all sites, particularly those with shallow soil, high groundwater levels, or steep slopes. In these cases, alternative septic systems may be necessary.The cost of purchasing and installing a conventional septic system will vary depending on factors such as tank size, drainfield size, local labor costs, and permits. On average, homeowners can expect to spend between $3,000 and $10,000 for a conventional system, including installation. Maintenance costs are relatively low, consisting mainly of regular pumping of the septic tank every 3-5 years, which can range from $200 to $500 per service.Chamber systems are an alternative to traditional gravel or stone drainfields. Instead of using traditional gravel, chamber systems utilize interconnected chambers that are filled with soil. These chambers provide a larger surface area for wastewater to infiltrate the soil and promote better treatment.Chamber systems work similarly to conventional septic systems, with wastewater flowing from the home into a septic tank. From the tank, the wastewater is then distributed to the chamber system. The chambers provide additional contact between the effluent and the soil, allowing for better treatment and absorption.One of the major advantages of chamber systems is their ease of installation. They require fewer materials and less excavation compared to traditional drainfields. They are also more resistant to clogging, as the chambers have self-cleaning features. However, chamber systems may be more expensive to purchase and maintain than conventional systems.The cost of purchasing and installing a chamber system will vary depending on factors such as chamber size, soil conditions, and labor costs. On average, homeowners can expect to spend between $5,000 and $15,000 for a chamber system, including installation. Maintenance costs are similar to conventional systems, with regular septic tank pumping recommended every 3-5 years.Drip distribution systems are designed to disperse effluent into the top few inches of soil using drip laterals. These systems utilize a network of small pipes with evenly spaced emitters that deliver wastewater directly to the soil, promoting even distribution and treatment.Drip distribution systems work by transporting effluent from the septic tank to a distribution box. From the distribution box, the effluent is then delivered to the drip laterals, which distribute the wastewater evenly throughout the designated area. The effluent is applied at a slow and controlled rate, allowing for better treatment and absorption by the soil.Drip distribution systems offer several advantages, including efficient and uniform distribution of effluent, reduced risk of system failure due to clogging, and the ability to handle high wastewater flows. However, they may have higher installation costs compared to conventional systems and may require more specialized maintenance.The cost of purchasing and installing a drip distribution system can vary depending on factors such as the size of the system, the number of drip laterals, soil conditions, and labor costs. On average, homeowners can expect to spend between $8,000 and $15,000 for a drip distribution system, including installation. Maintenance costs may be higher compared to conventional systems, as the drip laterals may need periodic flushing or replacement.Aerobic treatment units (ATUs) are designed to increase the bacterial activity in the treatment tank by injecting oxygen. They consist of multiple chambers, including a pretreatment chamber, an aeration chamber, and a clarification chamber. These chambers work together to provide enhanced treatment and reduce the amount of solids in the effluent.ATUs work by introducing oxygen into the treatment tank, which promotes the growth of aerobic bacteria. These bacteria break down organic matter more efficiently than the anaerobic bacteria found in conventional septic systems. The treated effluent is then discharged to a drainfield or a disinfection unit before being released into the environment.One of the significant advantages of ATUs is their ability to provide superior treatment compared to conventional systems. They can reduce the levels of nitrogen and phosphorus in the effluent, making them suitable for sites with strict water quality requirements or sensitive ecosystems. However, they may have higher energy consumption and maintenance requirements compared to conventional systems.The cost of purchasing and installing an ATU will vary depending on factors such as system size, technology, and labor costs. On average, homeowners can expect to spend between $10,000 and $20,000 for an ATU, including installation. Maintenance costs may also be higher due to the need for regular inspection, monitoring, and potential replacement of components.Mound systems are specifically designed for areas with shallow soil depth, high groundwater levels, or shallow bedrock. These systems consist of a sand mound that is constructed above the natural ground surface. The sand mound provides additional treatment and absorption of wastewater.Mound systems work similarly to conventional septic systems, with wastewater flowing from the home into a septic tank. From the tank, the effluent is then pumped to the sand mound, where it is distributed over a large area. The effluent then filters through the sand, providing additional treatment before it reaches the underlying soil or groundwater.One of the significant advantages of mound systems is their ability to overcome site limitations, such as shallow soil or high water table. They can provide reliable treatment and absorption in areas where conventional systems may not be feasible. However, mound systems may be more expensive to install and maintain compared to conventional systems.The cost of purchasing and installing a mound system will vary depending on factors such as mound size, soil conditions, and labor costs. On average, homeowners can expect to spend between $15,000 and $25,000 for a mound system, including installation. Maintenance costs may also be higher due to the additional monitoring and potential replacement of components.Recirculating sand filter systems utilize sand as a filter media to treat wastewater. They consist of a buried treatment tank that contains several layers of specially selected sand and gravel. Wastewater is pumped into the tank and filters through the sand, providing treatment before being dispersed into the soil or discharged to a drainfield.Recirculating sand filter systems work by pumping wastewater into the treatment tank. The wastewater is then distributed over the sand layer, where it filters through the sand and gravel, removing contaminants and promoting further treatment. The effluent is then dispersed into the soil or sent to a drainfield for additional absorption.One of the advantages of recirculating sand filter systems is their ability to provide excellent treatment of wastewater, removing a wide range of contaminants. They can handle high wastewater flows and are suitable for sites with limited space or challenging soil conditions. However, they may have higher installation and maintenance costs compared to conventional systems.The cost of purchasing and installing a recirculating sand filter system will vary depending on factors such as tank size, treatment capacity, and labor costs. On average, homeowners can expect to spend between $15,000 and $30,000 for a recirculating sand filter system, including installation. Maintenance costs may also be higher due to the periodic replacement of sand and gravel media.Evapotranspiration systems, also known as ET systems, are designed to evaporate wastewater into the air. They are typically only suitable for arid or semi-arid climates where evaporation rates are high and soil absorption rates are low. ET systems can utilize various components, such as shallow basins, spray heads, or subsurface pipes.Evapotranspiration systems work by collecting wastewater in a shallow basin or applying it through spray heads or subsurface pipes. The wastewater is then exposed to the air, allowing evaporation to occur. As the water evaporates, nutrients and contaminants are left behind, promoting natural treatment.The main advantage of evapotranspiration systems is their ability to effectively treat wastewater without the need for a drainfield or direct discharge to the soil. They can be suitable for sites with limited space or challenging soil conditions. However, they are highly dependent on climate conditions and may not be suitable for regions with high rainfall or high groundwater levels.The cost of purchasing and installing an evapotranspiration system will vary depending on factors such as system design, size, and labor costs. On average, homeowners can expect to spend between $10,000 and $20,000 for an evapotranspiration system, including installation. Maintenance costs are generally low, consisting mainly of periodic inspection and adjustments.Constructed wetland systems are designed to mimic natural wetland treatment processes. They consist of shallow, planted basins that allow for the filtration and treatment of wastewater. The plants and the microbes in the wetland provide natural treatment, removing contaminants and promoting the breakdown of organic matter.Constructed wetland systems work by collecting wastewater in shallow basins planted with wetland vegetation. As the wastewater flows through the wetland, it is naturally treated as it interacts with the plants, microbes, and the soil. The treated water is then collected and discharged or used for irrigation.One of the significant advantages of constructed wetland systems is their ability to provide high-quality treatment of wastewater. They can remove a wide range of contaminants and promote the natural breakdown of organic matter. Constructed wetlands also offer aesthetic benefits, as they can create a visually appealing landscape. However, they may require more space compared to other systems and may have higher installation costs.The cost of purchasing and installing a constructed wetland system will vary depending on factors such as system size, plant selection, and labor costs. On average, homeowners can expect to spend between $20,000 and $40,000 for a constructed wetland system, including installation. Maintenance costs may also be higher due to the regular maintenance of plants, monitoring, and potential replacement of components.Cluster or community septic systems are designed to collect wastewater from multiple dwellings or buildings and treat it in a shared system. These systems can be beneficial for areas where individual septic systems are not feasible, such as high-density housing developments or commercial properties.Cluster or community systems work by collecting wastewater from each individual dwelling or building and transporting it to a shared treatment facility. The treatment facility can consist of various components, such as septic tanks, aerobic treatment units, or constructed wetlands. After treatment, the effluent is then discharged or reused.One of the significant advantages of cluster/community systems is the ability to provide cost-effective and efficient wastewater treatment for multiple dwellings or buildings. They can reduce site disturbance, save space, and promote better control and monitoring of wastewater treatment. However, they may have higher initial costs and require more extensive maintenance compared to individual septic systems.The cost of purchasing and installing a cluster or community septic system will vary depending on factors such as the number of dwellings or buildings, the size of the treatment facility, and labor costs. On average, homeowners can expect to spend between $30,000 and $100,000 for a cluster or community septic system, including installation. Maintenance costs may also be higher due to the shared nature of the system and the need for regular monitoring and maintenance.When comparing the design and components of septic systems, it is clear that each system has its unique features and requirements. Conventional septic systems typically consist of a septic tank and a drainfield, while alternative systems may incorporate various components such as chambers, drip laterals, sand filters, or wetland basins. The choice of system should consider factors such as soil conditions, site limitations, and regulatory requirements in order to ensure effective treatment and absorption of wastewater.The functionality of septic systems varies based on their design and components. Conventional septic systems provide reliable treatment and absorption of wastewater and are suitable for a wide range of sites. Alternative systems, such as drip distribution, ATUs, mound systems, or sand filters, offer enhanced treatment capabilities or overcome site limitations. Evapotranspiration systems and constructed wetlands provide unique treatment processes and can be suitable for specific climates or environmental conditions.Each type of septic system has its pros and cons, and the choice ultimately depends on the specific needs and limitations of the site. Conventional septic systems are cost-effective and reliable but may not be suitable for challenging soil conditions or steep slopes. Alternative systems offer enhanced treatment capabilities or overcome site limitations but may have higher installation and maintenance costs. Considering factors such as site conditions, environmental impact, water quality requirements, and long-term costs can help determine the most suitable septic system.The cost to purchase and maintain a septic system can vary widely depending on factors such as system size, components, labor costs, and permits. Conventional septic systems generally have lower installation costs compared to alternative systems. Maintenance costs for all systems typically include regular septic tank pumping every 3-5 years. However, alternative systems may require additional maintenance, such as periodic inspection, monitoring, or replacement of specialized components. Homeowners should consider both the initial purchase costs and the long-term maintenance costs when choosing a septic system.In conclusion, choosing the right type of septic system for your needs requires careful consideration of factors such as site conditions, regulatory requirements, and long-term costs. There are ten common types of septic systems, each with its own design, components, functionality, pros and cons, and cost to purchase and maintain. From conventional systems like septic tanks and drainfields, to alternative systems like drip distribution, ATUs, mound systems, sand filters, evapotranspiration systems, constructed wetlands, and cluster/community systems, each system offers unique benefits and limitations. By understanding the different types of septic systems and their suitability for specific site conditions, homeowners can make an informed decision to ensure effective wastewater treatment and environmental protection.References: If you’re replacing an old system or putting one in a new house, there’s a lot to know about septic systems. There are many different types that you can go with.In this post, we’ll take a look at the 5 most popular ones, and we’ll discuss the pros and cons of each.Before looking at the different types of systems, it’s worth pointing out the purpose of a septic system. This system will make sure your fluids and waste properly go down your drains and toilets.In a good septic system, the waste decomposes, and the fluids drain after a certain level. The fluids are sent to a separate, underground area in which the soil will soak up the liquids.Your septic system should provide a clear, unobstructed path from your toilets and drains all the way to your septic tank. To put it simply, this system keeps the toilet waste out of your house.As you read, you’ll notice there are slight differences between each system (with the exception of #4). Why does it all matter?Well, your septic system is a sizable investment. You want to make sure you’re not wasting your money by picking the wrong one.For people looking for a residential option, any of the below options might suffice. You will find, however, that your plot size and topography might make the decision for you.Small plots don’t have the real estate required for a conventional system. Neither do especially mountainous terrains.Now let’s take a look at 5 septic systems and the pros and cons of each.Read More:This is the system you’ll usually see at a single-family home or a small business. In a conventional system, your waste goes to a septic tank.The tank feeds to a distribution box that branches into multiple runs. Each of these runs allow the liquid to drain into the surrounding earth.These runs are positioned on top of layers of sand, gravel, and fine rocks. Additionally, there is a material positioned above each of these runs that make sure the elements stay out of the tubes.Since these are the most common septic systems, professionals have an easier time fixing them. Also, this system is easy enough to repair on your own. Another great benefit is that this is the least expensive option.The problem arises when you’re looking at a property on a small lot. You need a lot of space for the liquid to drain.A sister to the conventional system is the chamber system. They started getting popular in the early 90s. As technology got better, people realized that they could do away with the gravel pits in the conventional system.Instead of using gravel during the draining process, the chamber system opts for a chamber (can you guess how they named this system?).After the distribution box, the liquids travel through connected chambers. All around the chambers is dirt, and the liquid ultimately drains into the dirt as well.This chamber is easier to build since it uses a pre-manufactured chamber. This option is also great for areas with high groundwater tables. The price is comparable to the conventional system.There is more maintenance required because of the restricted access to the drain field and the added parts.In this flow diagram, we take another step. Between the distribution box and septic tank, there is a pump tank.Why use a pump, you ask? This is the preferred system if your drain lines are going to be uphill from where your tank is.These systems can use gravel or gravel-less options for the drain lines.The pump system is favored in mountainous or hilly terrains. The price is affordable for this system.The downside is that there are more moving parts that lead to more required maintenance.An Aerobic Treatment Unit is also called an ATU. In an ATU, you will see properties that are reminiscent of a sewage plant. It uses a lot of the same principals and science, actually.This system looks nothing like the previous 3 we discussed. The magic happens inside of this container.This unit has an air pump that aerates the sludge and water in the tank. This additional oxygen allows for more natural bacteria which helps the process.An ATU might have a treatment tank and/or a pretreatment tank to reduce the pathogens of the waste.This unit can be used in properties with small lots, high water table, poor soil conditions, or with lots that are near bodies of water.Due to the complexities of an ATU, you can expect a lot more maintenance.The last style to learn about is a mound system. In this case, you will use a mound of sand, gravel, and dirt instead of a traditional drain field.This system is similar to the conventional pump system. The exception is the piece after the pump.In a mound system, the waste gets pumped to a constructed mound. The drain field is fed at the top of the mound.The gravel and sand help to treat the effluent as it flows down, before reaching the native soil.You’ll find mound systems often in rural areas. Since houses are more spread out and properties typically have more acreage, homeowners will opt for this method.The mound system is ideal for areas that have shallow soil or high groundwater.Unfortunately, this system requires a lot of space. You’ll also find yourself maintaining the unit more frequently than some of the others on this list.Though this style might not be useful to a lot of people, if you’re looking into a new system because you’re building new properties, you’ll like this.A cluster system is used in residential areas where you have multiple houses near one another. All of the houses have their own septic tanks.After each septic tank, the lines converge and are led to a treatment and dispersal area. This treatment system will clean the waste from all of the houses.It’s then led to a large drain field. In this case, it can use whatever technology and method are desired for the drain lines.Installing a cluster system is an easier alternative to individual systems. It’s the best option if you own a lot of properties that are close to one another. There is also less maintenance compared to servicing a number of separate systems.This system is only reasonable for people who own two or more properties that are near one another. A septic system usually consists of a variety of different interconnected parts. There is always a septic tank into which your waste is placed and a drainage option. There may occasionally be pump tanks to consider as well. The drainage option ensures that your wastewater is cleaned into regular water before being reintroduced into the environment. Depending on where you live, a septic system can look incredibly different. Popular Types Of Septic Tanks Tanks are an important part of your home, but there are many different types of septic tanks. Depending on your kind of home, the area you live in, and the design of your home, you could have any one of these individual types of septic tanks. We’re going to go over a large number of popular types of septic systems to see which septic system options are available. Your waste moves through a sewage pipe to your septic treatment tank, where bacteria break it down; the wastewater then moves the particles out into a drain field where your waste is filtered and reintroduced back into the environment. This is a safe and effective way to handle your waste, but what are the differences between each kind of septic system? Conventional Septic Systems A conventional septic system is one of the most common septic systems available. This septic tank is set into the ground in a large container, usually circular and plastic or metal. It’s used in conjunction with a drain field which helps to eliminate the wastewater. This is a standard septic tank model and the most common one available. This type of tank is also one of the most affordable ones on the market, making it an excellent decision for those looking to replace their septic system. Chamber System One of many septic system options that uses a trench distribution method is a fabulous system. This system uses more extensive trenches than many other systems for distribution. Wastewater flows its way down through the septic system and then into the soil, being treated as it moves down to the groundwater again. Drip Distribution System The drip distribution system, also known as a pressure distribution system, is also used in many drain fields. This system uses a large amount of piping but requires much less disruption of a lawn to put in place. It uses a pump chamber to move the water through the system. The sewer system is set up much like a chamber system but changes after the septic tank. The drip system for wastewater flows is instead placed throughout a large set of piping to help disperse it carefully so it can adequately treat it in the soil. Aerobic Treatment Unit Aerobic systems are one of many types of septic tanks that use alternative methods to encourage bacterial growth. This tank uses an air pump to pump oxygenated air down into the system. This oxygen encourages the bacteria to repopulate faster and work better, ensuring that your waste is handled more efficiently than in an average septic tank. An aerobic septic system is incredibly efficient at managing waste and can be one of the best options available, though it isn’t the least expensive option. Mound Systems Mound systems are a bit different. This kind of septic system has its distribution set inside of a mound of sand, forming sand filters. This sand is built in a large mound, giving the tank more space to distribute your waste. This type of tank is one where you need to take soil type into account as soil conditions are incredibly important to consider when installing a tank. One of the most efficient wastewater treatment processes this system takes the health of the water table into account. This system is best for individuals who need an economic smell free system with a little bit of space to put a septic system in. Recirculating Sand Filter System Another one of the many septic system options is the sand filter type of system. This system has more physical parts to install, with not one but two septic tank areas and a built-in sand-based filter system. The sand filter system sits above ground a little bit, but this system can be used with any number of final distribution methods we’ve discussed above. A sand filter septic system is an excellent option for a septic system replacement and can last for years. Evapotranspiration System The Evapotranspiration bed system is one of the most unique septic systems as it’s specifically designed to be more about evaporation instead of underground wastewater disposal. It has both methods, but most of the wastewater evaporates, making it one of the best environmentally friendly wastewater management options. This evaporation-based system is an excellent choice for the environment and helps you keep a clean and efficient septic system. Constructed Wetland System This is one of many septic systems options designed for a more wetland-based living area. Created with a pea gravel filter system instead of a sand-focused one, this system is perfect for areas that are already incredibly moist. The installation process is a lot like installing a sand filtration system. This system is one of the best options for a home built on a wetland area as it’s designed to work with the nearby water system to filter your wastewater, so it’s safe to be reused. Cluster / Community System A cluster septic system is integrated explicitly into suburban areas. This ensures that you have your own tank, but the distribution system works as a single system that links all the septic tanks together. This is an excellent and most cost-efficient system for a large suburban area but isn’t the best choice for a single home. A septic tank system that’s built like this may not even be your responsibility. Instead, it may be under a different individual’s jurisdiction depending on how your area is framed in a legal sense. Take a look at your area’s building codes, or call your county office for more information. Concrete Septic Tank Concrete septic tanks are not safe to use. These tanks don’t have a solid foundation to work with, nor do they efficiently retain your waste. Concrete septic systems built with cinder blocks are usually incredibly old and far more expensive than your plastic options. They’re most commonly found on many decades-old properties, and oftentimes they need to be replaced quickly. They’re incredibly inefficient at managing treated wastewater. If they’re not replaced, they can continue contaminating the space around them. Depending on the age of the system, it may even leak into your drinking water, causing severe illness without you even knowing. If your property has a concrete septic tank, you should look at the other options on this list to see what replacement system will best benefit you. Outdated Septic Systems Outdated septic systems are usually older systems built without much environmental consideration. Outdated septic tanks are a severe danger to both the environment and your health. How dangerous your tank is going to depend on what kind of tank it is. Septic Tanks Septic tanks can fail for a wide variety of reasons, from severe damage to age. Septic tanks have a lifespan, between usually twenty to fifty years old; afterward, they need to be replaced. If you maintain them well, you’ll be able to ensure they last for much longer. You don’t even have to do septic tank maintenance; here at Original Plumber, we can tackle maintaining your tank ourselves. All you need to do is call. Cesspools Cesspools are cylinders buried under the ground with no bottom and holes throughout the sides. These cesspools are almost completely illegal as they’re not usually installed with the water table in mind. Many leak out into rivers, lakes, ponds, and more. If you have a cesspool, your best bet is to have it replaced with a legitimate system. Seepage Pit A seepage pit is usually installed after your septic tank itself, but like a cesspool, it’s an outdated form of waste management that can easily damage drinking water and natural water sources around you. Why You Should Replace Outdated Systems Outdated septic systems are a huge danger to the environment and can even endanger your physical well-being. If your wastewater manages to get into your drinking water, you could become violently ill and need hospitalization. Maintaining your tank system Regardless of what kind of septic tank you have, it’s essential to ensure that your septic tank doesn’t have any cracks, breaks, or any other issues. There are a wide variety of different things that could go wrong with your tank. For example, if someone drives over your tank, it could crack or collapse it, making for quite the mess to clean up. Regular septic system maintenance every three to five years not only cleans out your tank but also helps locate any issues. FAQs What is the alternative to a septic tank? There are many alternatives to septic tanks, but there are only a handful of reasons to use them. For example, if your land has an abundance of bedrock, it’ll be impossible to dig a hole for your septic tank. What is the least expensive septic system? A conventional septic tank system is one of the best types of septic tank systems if you’re looking for an affordable option. It will be an average of $3000 for a full installation of a conventional septic tank. Can you install a septic tank without a leach field? You can, it isn’t legal, nor is it good for the environment at all. If you don’t have a leach field, your waste likely drains into a ditch or into a body of water, contaminating everything from your neighbors well water to endangered wildlife. It’s always best practice to have an appropriate leach field. What is the most common type of septic system? The most common type of septic system tank is the conventional septic tank. With a less expensive installation process and a complete way to manage waste, the conventional system is one of the best types of septic system available for those on a budget. It’s also a great pick for those that are frugal, helping you save money in the long run. Call The Original Plumber & Septic today for a free consultation. We’re available seven days a week to help with all of your septic and plumbing needs for your home or business. One of our friendly and professional team members will be able to answer your questions. We offer a wide range of affordable services for septic systems, including septic tank installation. Septic systems are a crucial component of wastewater management, particularly in rural and suburban areas where municipal sewage systems are not available. At the heart of these systems lies the drain field, also known as a leach field or absorption field, which plays a vital role in treating and dispersing effluent from the septic tank. Understanding the design and function of a septic system drain field is essential for homeowners, builders, and environmental professionals alike. The drain field is responsible for filtering and treating wastewater as it percolates through the soil. This natural process not only helps to break down harmful pathogens and organic matter but also ensures that the treated water is safely absorbed into the ground, minimizing the risk of contamination to nearby water sources. However, improper design or maintenance of a drain field can lead to a host of problems, including system failure, groundwater contamination, and costly repairs. Designing an effective drain field involves several critical factors, including soil type, site topography, and local regulations. Each of these elements plays a significant role in determining the size, layout, and overall effectiveness of the drain field. A well-designed drain field can extend the life of a septic system and protect the environment, while a poorly designed one can lead to significant issues, including unpleasant odors, surface ponding, and even health hazards. In this comprehensive guide, we will delve into the intricacies of septic system drain field design. We will explore the various components involved, the factors that influence design decisions, and the best practices for ensuring optimal performance. Whether you are a homeowner looking to install a new system or a professional seeking to enhance your knowledge, this guide will provide you with the information you need to make informed decisions regarding septic system drain field design. Topic Description Importance of Drain Fields Critical for treating and dispersing wastewater safely. Functionality Filters and treats effluent through natural soil processes. Design Factors Includes soil type, site topography, and local regulations. Consequences of Poor Design Can lead to system failure, contamination, and costly repairs. Target Audience Homeowners, builders, and environmental professionals. Understanding the Components of Septic System Drain Fields Designing an effective septic system drain field requires a comprehensive understanding of its components and how they interact with the surrounding environment. This section will break down the essential elements involved in drain field design, including the septic tank, distribution box, and the drain field itself. See also Boosting Bacteria in Septic Tanks: Natural Methods and FactsSeptic Tank The septic tank is the first line of defense in a septic system. It is designed to hold wastewater long enough for solids to settle at the bottom, forming sludge, while lighter materials like grease float to the top, creating scum. The tank’s primary functions include: – Separation of Solids and Liquids: Allows for the effective breakdown of organic matter. – Storage: Temporarily holds wastewater until it can be processed by the drain field. – Preliminary Treatment: Reduces the volume of solids before they enter the drain field. Regular maintenance, including pumping out the tank every 3 to 5 years, is crucial to prevent backups and system failure. Distribution Box After the septic tank, wastewater flows into the distribution box. This component is essential for evenly distributing effluent into the drain field. Key functions include: – Equal Distribution: Ensures that wastewater is spread evenly across the drain field to prevent overloading any single area. – Access Point: Provides a location for inspection and maintenance of the system. A well-designed distribution box can significantly enhance the longevity and efficiency of the drain field. Drain Field Design Considerations The drain field itself is where the real magic happens. It consists of a network of perforated pipes buried in gravel or sand, allowing wastewater to percolate into the soil. Several factors must be considered when designing a drain field: – Soil Type: Different soil types have varying absorption rates. Sandy soils drain quickly, while clay soils retain water. Conducting a percolation test is essential to determine the appropriate design. – Site Topography: The slope of the land can impact drainage. Ideally, the drain field should be located on a flat or gently sloping area to facilitate proper effluent distribution. – Local Regulations: Always check local health department regulations, as they dictate the minimum size and design specifications for septic systems. Types of Drain Fields There are several types of drain fields, each suited to different soil conditions and site characteristics: See also Comprehensive Guide to Septic Systems Without Tanks1. Conventional Drain Fields: Composed of trenches filled with gravel and perforated pipes, these are the most common type. 2. Chamber Systems: Use plastic chambers instead of gravel, providing a larger surface area for effluent absorption. 3. Mound Systems: Built above the natural ground level, these are ideal for areas with high water tables or poor drainage. 4. Drip Irrigation Systems: Utilize a network of small-diameter tubing to distribute effluent over a large area, suitable for sites with limited space. Maintenance and Monitoring Proper maintenance is essential to ensure the longevity and functionality of a septic system drain field. Here are some critical practices: – Regular Inspections: Check for signs of system failure, such as standing water or foul odors. – Pumping the Septic Tank: Schedule regular pumping to remove accumulated sludge and scum. – Avoiding Chemical Additives: Many chemical treatments can disrupt the natural bacterial processes in the septic tank and drain field. Conclusion Designing and maintaining a septic system drain field is not just about compliance; it’s about protecting your property and the environment. Understanding the components, design considerations, and maintenance practices is crucial for a functional and efficient system. Practical Recommendations for Septic System Drain Field Design Designing a septic system drain field is a complex task that requires careful planning and execution. To ensure that your system operates efficiently and effectively, consider the following actionable recommendations. Conduct a Soil Assessment Before installing a septic system, it’s crucial to evaluate the soil conditions on your property. This assessment will help

properties located along the Hudson River. Generally such systems will not be acceptable for full time occupied residences as even a large tank of several thousand gallons will require frequent and costly pumping and disposal. INCINERATOR TOILET SYSTEMS: incinerating toilets use electricity or gas to burn the waste placed into these systems. Like chemical toilets and holding tanks they have limited capacity, are used where water is not available or must be conserved, and they do not address the handling of remaining graywater from sinks and showers. My favorite of this type was the "Destroylet" incinerator toilet which was electric/propane fueled and which is no longer on the market. Each flush resulted in a more than 10-minute burn cycle which produced a pretty smelly exhaust. See ALTERNATIVE & WATERLESS TOILETS for details about all types of waterless toilet systems. Inspection and Testing of septic systems is discussed at SEPTIC DYE TEST PROCEDURE and at SEPTIC FAILURE SIGNS LAGOON SEPTIC SYSTEMS: also known as "pond systems" for onsite wastewater treatment are less often found in use for single family residential wastewater treatment. A residential lagoon system may use a conventional septic tank, but effluent from the tank flows to a storage pond or lagoon for further treatment. Lagoon systems require comparatively large land areas and are more likely to be found therefore in rural areas or where a common wastewater treatment system has been designed to serve multiple dwellings. Also see CONSTRUCTED WETLAND SEPTIC SYSTEMS LATRINES, Latrine or simple trench systems, useful in remote and impoverished areas to improve sanitation and thus the quality of drinking water and other special, extremely low-cost waste handling, wastewater treatment systems are ignored by most modern texts on onsite wastewater treatment, excepting perhaps military manuals which address field toilets and sanitation for military operations. This topic needs considerably more attention as a step in assisting rural, poor areas in developing nations. Articles, illustrations, and text contributions are wanted; additions to this special topic will be provided as they are developed at this website. Inadequate disposal and treatment of human and animal waste in poor areas is a major cause of dysentery and often high infant and child mortality. Meanwhile see the helpful but inadequate resource sketches at the African Water Page and Ecological Sanitation" and a peace corps site on composting latrines LOW COST SEPTIC SYSTEMS - suggestions for improving sanitation when a home has no septic tank and no septic system and where money is scarce. MEDIA FILTER SEPTIC SYSTEMS: use a conventional septic tank followed by any of several methods to further filter and treat septic effluent before it is discharged to the soil, soil surface, or waterway. Treatment is by both actual filtration and ultimately by a biochemical process as the filter "matures" and includes its own biomass. Both natural media filter septic systems (such as sand, gravel, or peat) and synthetic media filter septic systems (foam cubes, glass, slag) are used. See these septic media filter design articles MOUND SEPTIC SYSTEMS: a wastewater absorption trench system which has been constructed using "suitable soil-fill material" which has been placed on top of the natural soil on a building lot. Mound systems are often confused with "raised systems" (see below) but have different design requirements, are generally smaller in total size, and depend on the fill material for successful wastewater treatment. Also see "Raised Bed Septic Systems" in this list. Natural Septic Systems - see WETLAND SEPTIC SYSTEMS OUTHOUSES & LATRINES - Outhouses, or latrines or simple trench systems, useful in remote and impoverished areas to improve sanitation and thus the quality of drinking water and other special, extremely low-cost waste handling, wastewater treatment systems are ignored by most modern texts on onsite wastewater treatment, excepting perhaps military manuals which address field toilets and sanitation for military operations. This topic needs considerably more attention as a step in assisting rural, poor areas in developing nations. SEWAGE TREATMENT PLANTS, RESIDENTIAL - Cluster & Packaged Septic Systems: Onsite Residential and Small Commercial Septic Systems. Illustration: A Hoot septic system described and cited in the article link given just above. [Click to enlarge any image] Cluster and package centralized wastewater treatment systems can handle both clusters of buildings (more cost-efficient and more-likely to work than many small septic systems in densely populated areas), and in smaller designs, packaged septic treatment systems can support individual buildings or private homes. These complete packaged onsite wastewater treatment systems can produce sufficiently cleaned and treated wastewater that these systems may be permitted where local regulations would not permit a conventional septic tank and absorption field. For an example see HOOT AEROBIC SEPTIC TROUBLESHOOTING PEAT FILTERED SEPTIC SYSTEMS: Septic effluent treatment systems using peat as the filter media include an effluent dosing system, peat filter media, and a drainage system. Unlike sand bed filters, peat filtration systems are sold as prepackaged systems which provide modular peat units enclosed in containers or "pods" ready to install. Also see MEDIA FILTER SEPTIC SYSTEMS POD SEPTIC SYSTEMS: Septic Filter Pods or FILTERPODs: Septic filter pods are small individual septic wastewater treatment units that typically are made up of a settlement section and a filter section. These may be comprised of two physically separate tanks or they may be combined in one physical unit. PRESSURE-DOSED DRAINFIELD SEPTIC SYSTEMS: pressure dosing systems use a separate dosing chamber and pump, located downstream from the septic tank, to move effluent into a drainfield which in turn distributes effluent through a pressure-fed network of distribution pipes. (Jantrania/Gross wastewater system type II or if treated to level 2 or better effluent, system type VI) Pressure dosing is used in a variety of disposal field designs including mounds and sand beds, and have the advantage of being able to distribute effluent uniformly throughout the absorption system, and the disadvantage of added system cost and complexity, along with the requirement for electricity for system operation. An alternative but possibly less long-term reliable version of a drainfield dosing system that may not require electricity is the siphon system. Also see DOSING SYSTEM SEPTICS, GRAVITY/SIPHON RAISED BED SEPTIC SYSTEMS: a wastewater absorption trench system which has been constructed in soil-fill material which has been placed on top of the natural soil on a building lot. Raised systems are often confused with "mound systems" (see below) but have different design requirements, and make at least partial use of existing soils for wastewater treatment. Also see "Mound Systems" above. SAND BED or SAND FILTER SEPTIC SYTEMS: also referred to as an Intermittent Sand Filter Septic System: wastewater effluent from the septic tank is intermittently distributed over the surface of a specially prepared bed of sand placed atop the existing soil surface. Effluent which has passed through the sand is collected by additional pipes at the bottom of the sand bed. The sand is not visible as it's covered by topsoil. AEROBIC SEPTIC EFFLUENT SPRAY HEAD REPAIR effluent dispersal systems often combined with aerobic septic system designs, treat septic wastewater effluent to level 3 or better (Jantrania/Gross wastewater system type X). S eptic spray systems are high-level-of-treatment aerobic septic systems using spray heads to disperse effluent require maintenance that includes occasional spray head cleaning or replacement. You'll need to identify the brand and model effluent spray head on your aerobic septic system in order to replace with the same part in-kind. Also see ALTERNATIVE DESIGN SEPTIC SYSTEM SUPPLIERS for directory lists of other septic system component suppliers for sources of septic effluent spray system repair parts and sprayers. Septic Tanks: septic tank types are described at TANK INSPECTION PROCEDUREand include steel septic tanks, concrete septic tanks, plastic and fiberglass septic tanks, and home-made septic tanks that we've found constructed of stone, concrete block, bamboo, brick, and wood. SEPTIC TANK & GRAYWATER FILTERS are products used at a septic tank outlet or at a graywater tank inlet or outlet to prevent suspended solids from reaching and clogging the soil absorption system. Readers should distinguish between in-tank septic or graywater filters and types of septic media filter and bed systems such as: MOUND SEPTIC SYSTEMS or RAISED BEDseptic systems, MEDIA FILTER septic systems, septic systems or SAND BED SEPTIC systems. SEQUENCING BATCH REACTOR SEPTIC SYSTEMS - The sequencing batch reactor (SBR) process is a sequential suspended growth (activated sludge) process in which all major steps occur in the same tank in sequential order (figure 1). There are two major classifications of SBRs: the intermittent flow (IF) or "true batch reactor," which employs all the steps described in the illustration above and described in our article (above), and the continuous flow (CF) system, which does not follow these steps. STEEP SLOPE SEPTIC SYSTEM DESIGNS - how to install sewer lines from building to septic tank; how to install septic drainfields, leach field systems at steep or sloped sites. TOILETS, INSPECT, INSTALL, REPAIR Trenches for effluent dispersal, gravity fed or pressure dosed, with gravel or gravelless systems are discussed under conventional septic and drainfield pages, pressure dosing, or gravelless systems. Also see "Gravity Trenches" above. VEGETATED SUBMERGED BED SEPTIC SYSTEMS and other HIGH SPECIFIC SURFACE ANEROBIC REACTOR SEPTIC SYSTEMS - A high-specific-surface anaerobic reactor is any tank or cavity filled with solid media through which wastewater flows with a high hydraulic retention time (HRT). In onsite treatment the two primary types are vegetated submerged beds (VSBs) and anaerobic upflow filters (AUFs). The first is characterized by horizontal flow and prolific growth of macrophytes on the surface. The second comes in a variety of forms from upflow sludge blanket systems and fixed media anaerobic filters to partially fluidized beds of fine media. Both have long HRTs, produce anaerobic effluents, generally treat either high-strength or minimally pretreated wastewater, and usually require some form of posttreatment to meet surface discharge or water reuse requirements Wastewater Treatment Systems, Onsite, Packaged: see SEWAGE TREATMENT PLANTS, RESIDENTIAL WATERLESS TOILETS: also see the various toilet types and greywater/graywater links on this page such as CHEMICAL TOILETS, COMPOSTING TOILETS, and INCINERATOR TOILET SYSTEMS. (Jantrania/Gross wastewater system type IV). Also see GREYWATER SYSTEMS. See ALTERNATIVE & WATERLESS TOILETS for details of all of these systems. WETLAND SEPTIC SYSTEMS or "natural" septic systems use a constructed wetlands area (or a greenhouse) to treat septic effluent. These systems are more common in Louisiana, Mississippi, Tennessee, South Dakota, and Florida where both municipal wetland septic designs and private homeowner wetland septic system designs are in use . "Wetlands" may include both visible water such as open ponds, and underground water located in constructed beds which are covered with soil. Also see LAGOON SEPTIC SYSTEM DESIGNS Research on Types of Septic Systems - Basic & Alternative Designs Advanced Onsite Wastewater Systems Technologies, Anish R. Jantrania, Mark A. Gross. Anish Jantrania, Ph.D., P.E., M.B.A., is a Consulting Engineer, in Mechanicsville VA, 804-550-0389 (2006), Advanced Onsite Wastewater Systems Technologies. Outstanding technical reference especially on alternative septic system design alternatives. Written for designers and engineers, this book is not at all easy going for homeowners but is a text we recommend for professionals--DF. New York State Department of Health, APPENDIX 75-A WASTEWATER TREATMENT STANDARDS - INDIVIDUAL HOUSEHOLD SYSTEMS , [PDF] New York State Department of Health, 3 February 2010, retrieved 3/1/2010, original source: "International Private Sewage Disposal Code," 1995, BOCA-708-799-2300, ICBO-310-699-0541, SBCCI 205-591-1853, available from those code associations. "Manual of Policy, Procedures, and Guidelines for Onsite Sewage Systems," Ontario Reg. 374/81, Part VII of the Environmental Protection Act (Canada), ISBN 0-7743-7303-2, Ministry of the Environment,135 St. Clair Ave. West, Toronto Ontario M4V 1P5 Canada $24. CDN. US HEW, MANUAL of SEPTIC TANK PRACTICE [PDF] 1975, U.S. Department of Health, Education and Welfare, Public Health Servicve, original source: Manual of Septic Tank Practice, US Public Health Service's 1957, reprinted in 1963, 1967, 1969 and in a 1975 edition given just above. Builder's Guide to Wells and Septic Systems, Woodson, R. Dodge: $ 24.95; MCGRAW HILL B; TP; Quoting from Amazon's description: For the homebuilder, one mistake in estimating or installing wells and septic systems can cost thousands of dollars. This comprehensive guide filled with case studies can prevent that. Master plumber R. Dodge Woodson packs this reader-friendly guide with guidance and information, including details on new techniques and materials that can economize and expedite jobs and advice on how to avoid mistakes in both estimating and construction. Chapters cover virtually every aspect of wells and septic systems, including on-site evaluations; site limitations; bidding; soil studies, septic designs, and code-related issues; drilled and dug wells, gravel and pipe, chamber-type, and gravity septic systems; pump stations; common problems with well installation; and remedies for poor septic situations. Woodson also discusses ways to increase profits by avoiding cost overruns. Country Plumbing: Living with a Septic System, Hartigan, Gerry: $ 9.95; ALAN C HOOD & TP; Quoting an Amazon reviewer's comment, with which we agree--DF: This book is informative as far as it goes and might be most useful for someone with an older system. But it was written in the early 1980s. A lot has changed since then. In particular, the book doesn't cover any of the newer systems that are used more and more nowadays in some parts of the country -- sand mounds, aeration systems, lagoons, etc. Composting Toilets - Books & References COMPOSTING TOILETS - home Composting Toilet System Book: A Practical Guide to Choosing, Planning and Maintaining Composting Toilet Systems, David Del Porto, Carol Steinfeld. Quoting an Amazon review: Del Porto's book is the definitive composting toilet book at this time. There is nothing even close. His book covers all aspects of composting toilet systems and touches on graywater issues as well. He treats the composting toilet as part of the home system. If a person is seriously interested in installing/having a composting toilet, this book can save him/her all of the mistakes people usually make. He even (carefully) explodes some of the advertising myths that the purveyors of composting toilets would have us believe. The book covers ready-made systems as well as home built systems. As trite as this sounds, the book truly is a must for someone considering installing composting toilet. The Humanure Handbook: A Guide to Composting Human Manure, 3rd Ed., Joseph C. Jenkins. Quoting part of an Amazon review: The Humanure Handbook provides a wealth of thoroughly researched, hands-on experience and scientific data that demonstrates that after a natural process called "thermophilic" bacterial digestion, which occurs in a compost bin and where all pathogens are killed, excreta is then converted to a valuable nutrient for agriculture and thereby completing a full-circle life cycle. Most importantly, effluent can then be kept out of our drinking water and not treated or referred to as an undesirable "waste product". The information is conveyed in a humorous, folksy, down-to-earth easy to understand style along with drawings, charts, tables, photos and a wealth of resource info for further research. Jenkins' website has a forum for sharing more info, experiences and to answer any and all questions in the process of humanuring and constructed wetland gray water treatment. Thermal composting of fecal matter as treatment and possible disinfection method--laboratory-scale and pilot-scale studies, B. Vinneras, A. Bjorklund, H. Jonsson. Quoting Amazon review: When using toilets where the urine and faeces are collected separately for reuse as nutrients in agriculture, the collected matter should be disinfected. One way to do this is by thermal composting. Composting of different material mixes was investigated in a laboratory-scale experiment. This showed that the best mixture for dry thermal composting was a mix of faeces, food waste and amendment. The urine was collected separately by use of urine-diverting toilets. A new method was developed to mathematically evaluate and estimate the safety margins of pathogen inactivation during thermal composting. The method is based upon a mathematical calculation of the number of times total inactivation (at least 12log"1"0 reduction) of the organisms is achieved. In a pilot-scale experiment, the disinfection of a faeces/food waste mix was performed with a calculated safety margin of more than 37 times the total die-off of Enteroviruses and some 550 times that of Ascaris. Thus, well functioning composting seems to be effective for disinfection of faecal matter. To get a high temperature in all of the material, the reactor has to have sufficient insulation. A major disadvantage is the initial need for handling the raw un-disinfected material. The degradation of the organic matter in the compost was almost 75%, resulting in a small final volume that could safely be recycled. Experiences with a composting toilet article from: Countryside & Small Stock Journal, available as HTML download. Quoting Amazon review: This digital document is an article from Countryside & Small Stock Journal, published by Countryside Publications Ltd. on May 1, 1994. The length of the article is 1516 words. The page length shown above is based on a typical 300-word page. The article is delivered in HTML format and is available in your Amazon.com Digital Locker immediately after purchase. You can view it with any web browser. From the supplier: A composting toilet is a good alternative to propane burning toilets, but it also has many problems. The worst part is emptying the waste and compost every 4-6 weeks. Other problems are the fan that must be kept running constantly and bug infestation. Decentralized Systems Technology Fact Sheet: Septic Tank - Soil Absorption Systems, U.S. EPA, PDF Document provides basic information about septic tanks and drainfields. Design Manuals for Septic Systems US EPA ONSITE WASTEWATER TREATMENT SYSTEMS MANUAL [online copy, free] Top Reference: US EPA's Design Manual for Onsite Wastewater Treatment and Disposal, 1980, available from the US EPA, the US GPO Superintendent of Documents (Pueblo CO), and from the National Small Flows Clearinghouse. Original source Onsite wastewater treatment and disposal systems, Richard J Otis, published by the US EPA. Although it's more than 20 years old, this book remains a useful reference for septic system designers. U.S. Environmental Protection Agency, Office of Water Program Operations; Office of Research and Development, Municipal Environmental Research Laboratory; (1980) Eco John® Innovative Toilet Solutions, Global Inventive Industries, Fountain Valley CA, PDF, product brochure "International Private Sewage Disposal Code," 1995, BOCA-708-799-2300, ICBO-310-699-0541, SBCCI 205-591-1853, available from those code associations. "Manual of Policy, Procedures, and Guidelines for Onsite Sewage Systems," Ontario Reg. 374/81, Part VII of the Environmental Protection Act (Canada), ISBN 0-7743-7303-2, Ministry of the Environment,135 St. Clair Ave. West, Toronto Ontario M4V 1P5 Canada $24. CDN. Manual of Septic Tank Practice, US Public Health Service's 1959. Greywater System Books The New Create an Oasis With Greywater, Art Ludwig; Buy New: $14.25. Ludwig is one of the most thoughtful, prolific, and sometimes controversial writers on gray water systems and alternative designs. We recommend his book as clear, easy-to-understand writing aimed at property owners who want or need to consider a graywater installation to conserve water, recycle water, reduce water use, or to reduce the load on their septic system. This is the latest edition of this Art Ludwig's greywater design book classic. Builder's Greywater Guide, Art Ludwig; Buy New: $10.17. Installation of Greywater Systems in New Construction & Remodeling; A Supplement to the Book "Create an Oasis With Greywater" (Paperback). Quoting a review from Amazon: I recommend that you get the 3 companion books on greywater treatment "Create an Oasis", "Branched Drain Greywater Systems" and "Builder's Greywater Guide". The information in these volumes will keep most of us far more informed than most of the regulators, the system builders, and the experts-in-theory. These volumes are real-world gems. Art Ludwig has cut to the core of wastewater issues. He's obviously done all of his homework, mulled-over the variables, and come up with a common sense, economically reasonable, environmentally responsible approach to wastewater. I expect to save money that I would have spent on a post-septic tank, aerobic unit that would seemingly have been ecologically responsible; but because of the technological overkill, ultimately that system would have defeated my altruistic environmental concerns. ... These books talk the talk and walk the walk better than anything else that I've seen. Buy a set for yourself, a set for your neighbors, and a set for the regulators. Branched Drain Greywater Systems [superseded by "The New Create an Oasis with Greywater"], Art Ludwig. If you already have this book but are in the process of installing new gray water systems you should take a look at the newer edition listed first above in this section of our Greywater book recommendations. You may prefer the newest edition, but there is great information in this older version, perhaps all you need, and these copies are sold at very low prices - an aid to people of limited means. Create an Oasis With Greywater: Your Complete Guide to Choosing, Building and Using Greywater Systems, Art Ludwig, [superseded by new edition] (Paperback) You may prefer the newest edition, but as I said above, there is great information in this older version, perhaps all you need, and these copies are sold at very low prices - an aid to people of limited means. Rainwater Catchment Systems for Domestic Supply: Design, Construction and Implementation, Erik Nissen-Petersen, John Gould. (Mr. Ludwig, while much appreciated, is not the only author providing really useful design guides for graywater systems--DF) Quoting from an Amazon review: This book reviews the art of roof and ground catchment systems for rainwater. The water collected can be used for household or other purposes. The designs are aimed for individuals with limited access to electricity and/or civic water utilities. The text includes drawings, photographs and step-by-step instructions. One might say the book is really written for the 'aid worker' since it also considers ethnic and gender issues that would be 'obvious' to the future owners of the the systems. Guidelines on rainwater catchment systems for Hawaii, (CTAHR resource management publication) Patricia S. H Macomber. This more technical document may be especially helpful for rainwater collection and recycling systems for climates where there is heavy rainfall such as demonstrated for Hawaii. Design for Water: Rainwater Harvesting, Stormwater Catchment, and Alternate Water Reuse, Heather Kinkade-Levario. Quoting from Amazon's review: Design for Water is an accessible and clearly written guide to alternate water collection, with a focus on rainwater harvesting in the urban environment. The book: Outlines the process of water collection from multiple sources-landscape, residential, commercial, industrial, school, park, and municipal systems Provides numerous case studies, Details the assembly and actual application of equipment, Includes specific details, schematics, and references. All aspects of rainwater harvesting are outlined, including passive and active system setup, storage, storm water reuse, distribution, purification, analysis, and filtration. There is even a section on rainwater harvesting for wildlife. In addition to rainwater, there are several affordable and accessible alternate sources, including cooling tower bleed-off water, air conditioning condensate, gray water, and fog collection. Design for Water is geared to providing those making development decisions and guidelines with the information they need to set up passive harvesting techniques. The book will especially appeal to engineers, landscape architects, municipal decision-makers, developers, and landowners. Heather Kinkade-Levario is a land-use planner in Arizona and the author of the award-winning Forgotten Rain. She is president of Forgotten Rain L.L.C., a rainwater harvesting and stormwater reuse company. The Toilet Papers: Designs to Recycle Human Waste and Water : Dry Toilets, Greywater Systems and Urban Sewage (Paperback) Sim Van Der Ryn, Wendell Berry; Quoting from an Amazon review: With a title like "Toilet Papers" and from a distinguished eco-architect like Sim Van der Ryn, I needed no intro or review to buy a copy of this little, but well researched historical over-view of effluent mitigation and current eco-friendly toilet design. This book is filled with good line drawings and photographs to depict everything from the historical perspective to the current dry toilets and their construction.. Rainwater Reservoirs Above Ground Structures for Roof Catchment: Most Common Rainwater Tanks in Comparison and Construction Manua, (Paperback) Rolf Hasse. [I have not reviewed this book --DF, but it may be helpful to people constructing rainwater collection and reservoir systems for use in arid climates such as Mexico and the U.S. Southwest. Quality issues in harvested rainwater in arid and semi-arid Loess Plateau of northern China, K. Zhu, L. Zhang, W. Hart, M. Liu, H. Chen (out of print, find by search and deferred order). Amazon's description may be helpful: Loess soils cover vast areas in the arid and semi-arid regions of northern China. Due to the lack of reliable surface water and ground-water, rainwater harvesting has played a prominent role in farmers' domestic usage and agricultural irrigation. An economical and valid type of water storage cistern with optimum design of components has been introduced to rural areas in the Loess Plateau. Different collection alternatives showed apparent variations in rainwater quality. By using different catchments, such as mortar roofs and cement-paved courtyards, compacted land or road surfaces, rainwater can be effectively collected for storage in cisterns. This study focused mainly on the quality of rainwater harvested from the different catchment systems and stored for different periods of time. By analysis of the water samples stored in these cisterns, it was evident that rainwater quality could be improved significantly by self-purification during the storage. With emphasis on rainwater quality affected by the different catchment systems, it was found that the measured inorganic compounds in the rainwater harvested from roof-yard catchment systems generally matched the WHO standards for drinking water, while the concentrations of some inorganic compounds in the rainwater collected from land and road surfaces appeared to be higher than the guideline values for drinking water, but generally not beyond the maximum permissible concentrations. However, Fecal Coliform, which is an important bacteriological parameter for the three catchment systems, exceeded the limits of drinking water to a greater extend. Trace amounts of 55 organic pollutants were identified, including aliphatic hydrocarbons, aromatic compounds and phthalate esters, etc. The analytical results indicated that roof-yard catchments that included the ''first flush'' usually provided safe drinking water with low organic contents, even for rainwater collected immediately after rainfall. In contrast, rainwater harvested from road surfaces had poor quality with respect to the organic constituents, regardless of stored time. City eying home water-recycling technology; uses bath and washer water for irrigation., (ReWater Systems' equipment for greywater irrigation) This is an article from: San Diego Business Journal [HTML] (Digital) available online in digital format. I have not (yet) reviewed it -- DF Effluent Dosing Septic System References & Products Evapotranspiration and Evapotranspiration / Infiltration Systems for Septic Effluent Disposal Bauer, D.H., E.T. Conrad, and D.G. Sherman. 1979. Evaluation of Existing and Potential Technologies for Onsite Wastewater Treatment and Disposal. EPA/600/S2-81-178. U.S. Environmental Protection Agency, Cincinnati, OH. Beck, A.F. 1979. Evapotranspiration bed design. Journal of Environmental Engineering Division-American Society of Civil Engineers 105(2): 411-415. Frank, W.L. 1996. Engineering parameters in the design of evapotranspiration beds. Water and Engineering Management November, 31-37. Ingham, A.T. 1987. Guidelines for Evapotranspiration Systems. State Water Resources Control Board, State of California. Sacramento, CA. Lomax, K.M., et al. 1978. Guidelines for Evapotranspiration Systems. State Water Resources Control Board, State of California. Sacramento, CA. National Small Flows Clearinghouse (NSFC). 1998. Evapotranspiration Systems Fact Sheet. Cooperative Agreement CX825652, U.S. Environmental Protection Agency, Washington, DC. National Small Flows Clearinghouse (NSFC). 2000. Evapotranspiration systems. Pipeline 11(1). Peters, E.C. 1988. An Evaluation of Enhanced ET Onsite Sewage Treatment and Disposal Systems. Master's thesis, University of Maryland, College Park. Salvato, J.A. 1982. Rational design of evapotranspiration bed. Journal of Electrical Engineering-American Society of Civil Engineers 109(3):646-660. U.S. Environmental Protection Agency (USEPA). 1999. Manual: Constructed Wetlands Treatment of Municipal Wastewaters. EPA/625/R-99/010. U.S. Environmental Protection Agency, Cincinnati, OH. Victoria (AUS)-Environmental Protection Agency. 1980. The Use of Transpiration Beds for Domestic Wastewater Disposal. EPA Report No. 104. Melbourne, Australia. Wheeter, D.W. 1979. The Use of Evapotranspiration as a Means of Wastewater Disposal. Research Report No. 73. Tennessee Water Resources Research Center, University of Tennessee, Knoxville Media Filters - Septic Media Filter System References & Products Measuring Septic Sludge & Scum Levels in Septic Tanks - Measuring the Level of Accumulated Solids, Sludge and Floating Scum in Treatment Tanks Septic Contaminants, identifying - what are the Nitrogen contaminants produced by septic systems and what can be done about them if they escape initial treatment? SEPTIC & CESSPOOL SAFETY Septic System, Septic Tank, & Cesspool Safety Warnings for Septic Inspectors, Septic Pumpers, and Homeowners Sewage & Septic Backups and what to do about sewage spillage in buildings SEPTIC SYSTEM FLOOD DAMAGE REPAIR when and what to do to a septic system after area flooding "Septic Tank/Drainfield System Fact Sheet", Utah Department of Environmental Quality, Division of Drinking Water, Source Protection Program - (801) 536-4200 Division of Water Quality - (801) 538-6146 Sonja Wallace, Pollution Prevention Coordinator - (801) 536-4477 Environmental Hotline - 1-800-458-0145 - Original source: New York State Wastewater Treatment Standards - Individual Household Systems, Appendix 75-A (1990), Public Health Law 201(1)(1). New York State Alternative Septic System Design Regulations, Wastewater Treatment Standards - Individual Household Systems, Appendix 75-A, of Public Health Law 201(1)(1) 1990. 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In Proceedings of Seventh Northwest Onsite Wastewater Treatment Short Course, ed. R.W. Seabloom. University of Washington, Seattle. U.S. Environmental Protection Agency (USEPA). 1986. Summary Report, Sequencing Batch Reactors. EPA 625/8-86-001. Technology Transfer, Cincinnati, OH. U.S. Environmental Protection Agency (USEPA). 1987. Analysis of a Full-Scale SBR Operation at Grundy Center, Iowa. EPA/600/J-87-065. U.S. Environmental Protection Agency, Cincinnati, OH. U.S. Environmental Protection Agency (USEPA). 1993. Process Design Manual for Nitrogen Removal. EPA 625/R-93-010. U.S. Environmental Protection Agency, Cincinnati, OH. Water Environment Federation. 1998. Design of Municipal Wastewater Treatment Plants. Manual of Practice No. 8. Water Environment Federation, Alexandria, VA. [Websearch original material on Onsite wastewater treatment: Morrison-Maierle, Inc -] Vermiculture & Worm-based Septic Systems Question: can you tell me about worm-based septic systems? 2021/11/04 Lisa King I read once about a septic system made by a student that uses worms to break down waste. Is is available for purchase? Moderator reply: Vermiculture, worm-based septic treatment systems & composting toilets @Lisa King, There are worm-based septic system designs and some commercial or industrial worm based organic waste processing systems. The principal or most-widely used and successful of these appear to us to be commercial or industrial-level systems but residential worm-septic designs and worm-based or vermiculture-based composting toilet designs are also available. OPINION: From what we've read you would not be advised to try to set up such a system for a private septic treatment system unless you're in the right climate and are prepared to pay attention to the worm-based septic inspection, maintenance, and media care/replacement requirements. You'll might that the system capacity is limited, the cost may be high, the life short, and the maintenance or replacement costly, AND you may find, from what we've researched to date, that the system may not be legal - not approved by your local septic authority. There are also some graywater treatment systems that have proposed using worms or earthworms to improve the breakdown of the greywater constituents (worms added to a pine-bark filter), again not an approved design in most locations. Watch out: To avoid confusion with a true earthworm septic system design, we note that there are also companies advertising "Earthworm Septic & Cesspool Treatment" that are simply an enzyme septic additive. We note that for conventional septic systems no additives or treatments are necessary and some are illegal and unsafe (though enzymes are generally safe or harmless in that application). See those details at SEPTIC TREATMENTS & CHEMICALS There are also composting toilet designs that make use of worms. If you research "Vericomposting" you'll find both vendors of such worm-toilet designs and research on Vericomposting. We've discussed Vericomposting at COMPOSTING TOILETS Bottom line: In our OPINION vermiculture septic systems and vermiculture composting toilets: worm-septics and worm-composting toilets can work successfully if properly designed, installed, and maintained, and if they are in a suitable climate and at a suitable (well-drained, non-freezing) site, but like quite a few other alternative septic or toilet designs with which we've worked over the last 50 years, ANY system that requires an extra level of owner/occupant attention and maintenance tends to be un-attended and to perform less-reliably than a simpler, hands-off design. It's also our opinion and experience that enthusiasts installing a worm based septic system or vermiculture composting toilet may be un-prepared for the extra attention and extra costs of periodic inspection, cleaning, media replacement, reduction in wastewater volume or other attentions that are required to keep any septic or toilet system working properly. Where such systems are reliably and regularly maintained by a trained expert technician they tend to perform better and last longer - at the cost of such service. Examples and information on Vermiculture & Worm Septic Media Systems Worm-based septic systems or graywater / greywater system opinions, designs & suppliers Australia: WORM-BASED SEWAGE TREATMENT [PDF] Western Australia Department of Health, Water Department of Health Telephone: 9388 4999 Email: ehinfo@health.wa.gov.au - original source: ww2.health.wa.gov.au/Articles/U_Z/Worm-based-sewage-treatment-systems A&A Worm Farm Waste Systems 5/2135 Frankston Flinders Road Hastings VIC 3195 Tel: 03 5979 1887 Website excerpt: Worm farm septic tank systems are a natural, biological septic tank solution that effectively processes sewage, all household wastewater and organic waste, including food and vegetation, as well as weeds using humble septic tank worms. Combined with naturally occurring organisms, the worm liquid opens up and improves the quality of your soil – enabling you to reuse and recycle it as liquid fertiliser under your garden, lawns and bushland. Wormsmart Australia, 1300 Wormsmart - 1300 967 676 Tel: Mobile - 0437 497 284 New Zealand & Pacific Islands Mobile - 0274 372 089 Web: www.wormsmart.com.au/ Website excerpt: "Based upon entirely natural processes, the WormSmart system was conceived in Australia and it's swiftly drawing international recognition as the cleanest, most sustainable, cost-effective and ecologically balanced waste conversion system available; an unobtrusive, practical and economical alternative to those smelly septic systems of days gone by. WormSmart is the only system of its type to receive full government approvals from every state and territory of Australia, together with New Zealand and as far afield as heavily-populated India." Chile: worm-septic systerms BioFiltro, CHILE, Tel: +56 2 3224 3648 Hernando de Aguirre 201, Of 1301, Providencia, Santiago, Chile EcoWatch, cites a successful worm-based wastewater treatment system used in Chile: "... since 1995, Chilean company BioFiltro has recycled more than 28 billion gallons of water to date with this humble organism: the worm. ... BioFiltro currently has 129 facilities installed in six countries. They process the wastewater from the Chilean Air Force Base on Antarctica as well as the Atacama Desert, which is the driest desert in the world. The company is currently constructing plants in California to serve the needs of food processors, wineries, waste haulers and sanitary waste..." Chow, Lorraine, "The Role of the Worm in Recycling Wastewater" EcoWatch, 2016/04/23 - source: www.ecowatch.com/the-role-of-the-worm-in-recycling-wastewater-1891122409.html United States + Chile, Peru & New Zealand worm based septic systems BioFiltro, UNITED STATES +530 564 4260 1949 5th Street, Suite 101, Davis, CA 95616 --- Peru - worm-based septic systems BioFiltro, Peru, Tel: +51 944 579 292, Calle Miguel Dasso 139, Of 701, San Isidro, Lima New Zealand Vermiculture / Worm-based septic systems BioFiltro, New Zealand, Tel: +530 564 4260 81 Springs Road, East Tamaki, Auckland, New Zealand Wormsmart Australia, 1300 Wormsmart - 1300 967 676 Tel: Mobile - 0437 497 284 New Zealand & Pacific Islands, Mobile - 0274 372 089 Web: www.wormsmart.com.au/ Portugal - worm septic systems Vericomposting Toilets, www.vermicompostingtoilets.net/why-worms/ Recent installations in Portugal; Contact: wendy (at) permaculturinginportugal.net or Arq. Vera Filipa Rocha Phone: +351 912533876 / 235728061 Email: eco.vfr (at) gmail.com UK Worm Septic Systems Biocell, Web: biocellwater.com/septic-tank-worms-additives-explained/ Tel: +442080128198 Ireland Flag +35391705964 Email sales@biocellwater.com [We could not find a mailing or physical address at the Biocell website - ed.] WTE Ltd, Water Technology Engineering, Unit 2, Bolton LaneBoltonYORKYorkshireYO41 5QX United Kingdom Telephone: 01759 369915 Email: sales@wte-ltd.co.uk Web: www.wte-ltd.co.uk/contact_us.html Website excerpts: We get many calls regarding septic tank and soakaway worms and if they actually work? ... if the environment in your septic system is able to support a worm colony, wild worms WILL appear in it, without the need to buy them. If you need to buy them, then the environment is not able to sustain them. ... So, a website that sells these worms and which states that worms do not drown in water and that most septic tanks and soakaways have an aerobic process that takes place, are WRONG. Septic tanks are an anaerobic system and soakaways are also very oxygen depleted, so HOW can these worms stay alive? Also, I have seen many worms that have drowned in puddles and I am sure that you have too. ... We asked for a sample of these worms to test on our test site and despite reminding the seller twice, they were never delivered. ... Make your own mind up. Composting Toilet System using Worms - Vermiculture VERICOMPOSTING TOILET DESIGN [PDF] retrieved 2021/11/04 original source: www.vermicompostingtoilets.net/design-construction/ at InspectApedia at Website excerpt: ... There are many good fully-referenced studies now available on earthworms' role in soil creation and waste treatment. Here are a few for further reading ... Sewage treatment by vermifiltration with synchronous treatment of sludge by earthworms: a low-cost sustainable technology over conventional systems with potential for decentralization. Sinha, R K, Bharambe, G & Chaudhari, U. Environmentalist, December 2008, Volume 28, Issue 4. An Overview of the Environmental Applicability of Vermicompost: From Wastewater Treatment to the Development of Sensitive Analytical Methods. Pereira, M G et al. The Scientific World Journal Volume 2014 (2014). A Review on Effectiveness of Earthworms for Treatment of Wastewater. Gupta, H. International Journal of Engineering Development and Research, Volume 3, Issue 3 (2015). Worming the Way to a Greener Future: Vermicomposting for Municipal Organic Waste Disposal. Katie Kilpatrick. Senior Thesis Environmental Studies, Dr. Liz Gron, Mentor March 15, 2013 Design and Suitability of Modular Vermifilter for Domestic Sewage Treatment. Bhise H S, Anaokar G S. International Journal of Emerging Engineering Research and Technology, Volume 3, Issue 4, April 2015. Vermicomposting of source-separated human faeces by Eisenia fetida: effect of stocking density on feed consumption rate, growth characteristics and vermicompost production. Yadav K D, Tare V, Ahammed M M. Waste Management, Volume 31, Issue 6, June 2011, Pages 1162–1168 The life-cycle of the compost worm Eisenia fetida (Oligochaeta). Venter, J M & Reinecke, A J. South African Journal of Zoologyy, 23:3, 161-165 (1988) ... ADVERTISEMENT Below you will find questions and answers previously posted on this page at its page bottom reader comment box. Reader Q&A - also see RECOMMENDED ARTICLES & FAQs Can a sealed septic tank be changed to a septic tabk with a secondary? How much would that cost approx. Do i need city approval to change the type of tank? Ben I don't know what brand of aerobic septic system aerator you've got. Look for a brand on its label or data tag and the manufacturer will certainly have an installation & operation manual; or call the