Public Health HOMENER'S MANUAL Onsite Sewage Disposal Systems

902 KAR 10:081, 10:085, 10:110 and 10:140

Includes:
Septic Tank Layout
Treatment Process
Lateral Fields
Permitting
Pipe Layout
and
much more

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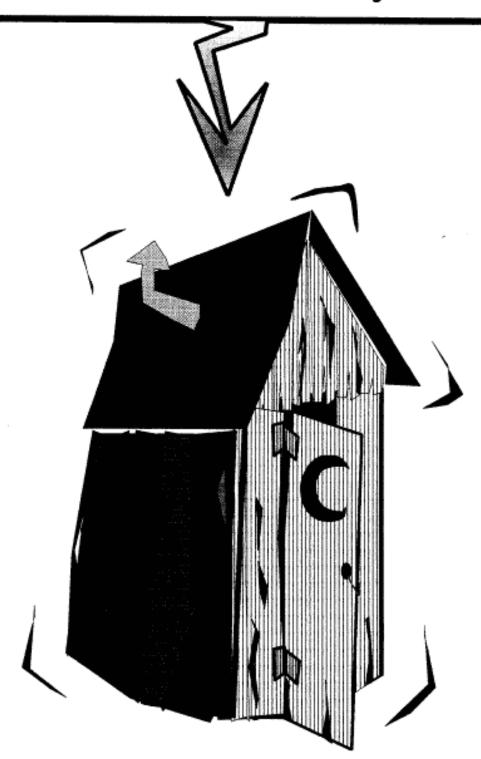
Department for Public Health



Division of Environmental Health & Community Safety

Environmental Management Branch

Onsite Sewage Disposal Systems replace the old out back way



Forward

This non-technical manual is provided to you as the owner/operator of an Onsite Sewage Disposal System. Approximately 60 - 70% of homes in Kentucky rely upon onsite sewage disposal systems as a method to dispose of liquid waste generated from their homes. When properly designed, installed and maintained, septic systems can be the most cost-effective and efficient method of wastewater treatment a homeowner can choose. However, once the design and installation process is complete it is up to you to maintain your septic system in a satisfactory manner.

By using this manual and seeking assistance and advice from your local health department Certified Inspector, you can make decisions on potential home sites, and the design and maintenance of your onsite sewage disposal system. Educating yourself about onsite systems is very important in protecting the environment, your health, and ensuring many years of reliable trouble-free service from your septic system.

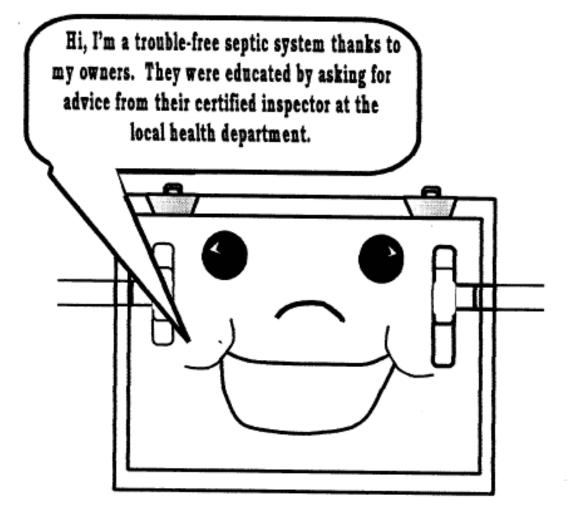


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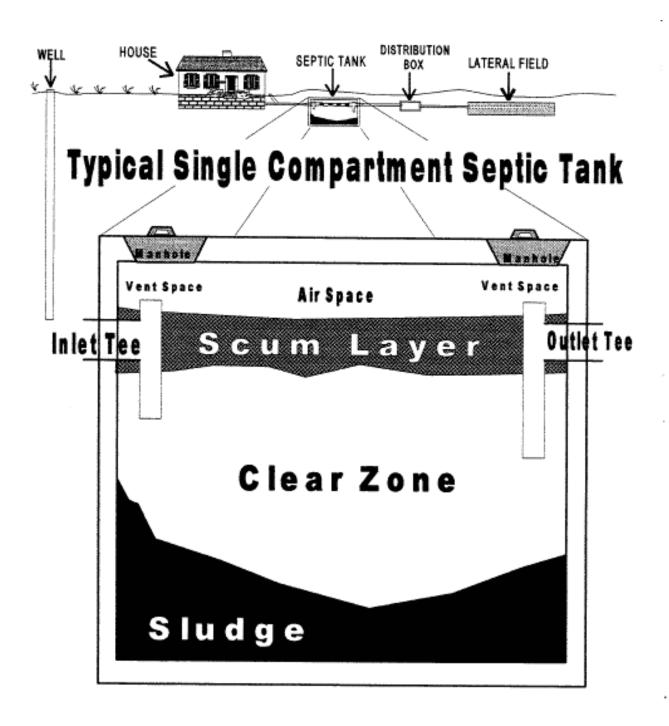
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Septic Systems, How Do They Work?

Septic systems are wastewater treatment systems that collect, treat, and dispose of wastewater generated by homes and businesses. A septic system consists of two main parts, a primary treatment unit (septic tank) and a soil absorption unit (lateral field).

Septic Tank

The standard septic tank operates through the bacterial breakdown of sewage solids. This breakdown causes the sewage to separate into three layers within the septic tank. The bottom layer consists of large solids or sludge which is slowly digested by bacteria. The middle layer consists of relatively clear water containing minute particles. The upper layer consists of floating solids or scum. Baffles or tees within the tank cause the sludge and scum layers to be retained for further treatment and storage, while the middle layer or clear zone is discharged to the lateral field for disposal and treatment.

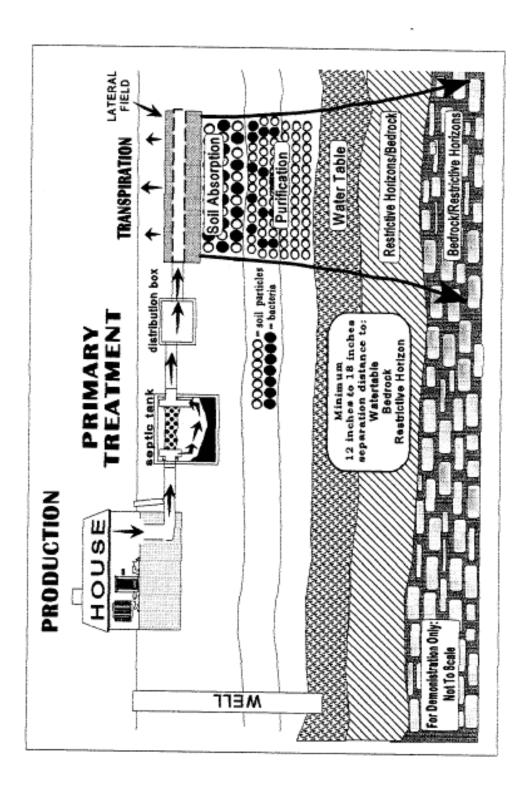


Lateral Field

The lateral field is the final step in the wastewater treatment process. The lateral field treats the wastewater by allowing it to trickle down through the soil. As the wastewater percolates to the groundwater below, the filtration process and organisms in the soil work together to clean the effluent. The soil acts as a biological filter to remove, bacteria, viruses and other pollutants from the septic tank effluent. This process can effectively treat the wastewater to an acceptable level that will not contaminate the groundwater.

The size and type of lateral field is determined by the amount of water that is anticipated to be discharged into the system on a daily basis and by the site evaluation performed by a Certified Inspector. There are many types of lateral fields from conventional rock lateral lines to many modified and alternative systems. The Certified Inspector will use all available resources to recommend a lateral field that will best meet your family's needs as well as the needs of the site.

Wastewater Treatment Process



Choosing a Suitable Site

Trouble-free service from your septic system should begin with the selection of a suitable site on which to construct or purchase a home. Although the main attraction of the property may be its location, attractiveness, or initial suitability to your family's needs and budget, a wise homeowner will also consider the method of disposing of the wastewater your family will generate.

Before purchasing land for your building site you should have the property evaluated by the certified inspector at your local county health. On the next page is a checklist to aid you in this evaluation.



Checklist Choosing a Suitable Site

Determine if a recent Site Evaluation has already been performed on the property by the Certified Inspector. A copy should be on file at your local health department.
Does the property contain enough room for the house, drive, patios, pools, outbuildings, etc. and still accommodate the septic system. Remember to allow for a repair area if at some point you should need to add to or replace your septic system.
Will the slope and topography support a septic system? Is the lot very steep or dissected by gullies or drainage ways? Steep slopes can indicate shallow soil conditions and cause system cost to be higher.
Are there rock outcroppings visible? These can be an indicator of very shallow soil.
Are there streams, springs, ponds, lakes, sinkholes or wells on the property or adjacent property? The septic system will have to be installed away from these features to prevent pollution.
What is the depth and type of soil on the site, sandy or silt loams are best, excessively sandy or clay soils may require system alterations.
Is the site heavily wooded, which may require the removal of trees or system design alterations.
Is the overall lay of the site such that surface runoff from adjoining lots will drain onto it?

Choosing a Existing Home

Before purchasing an existing home, old or new, an investigation of the septic system is warranted. Taking the time to investigate the home's septic system may save you from making costly repairs or replacement later. On the next page is a checklist to aid you in evaluating an existing home's septic system.



Checklist Choosing a Existing Home

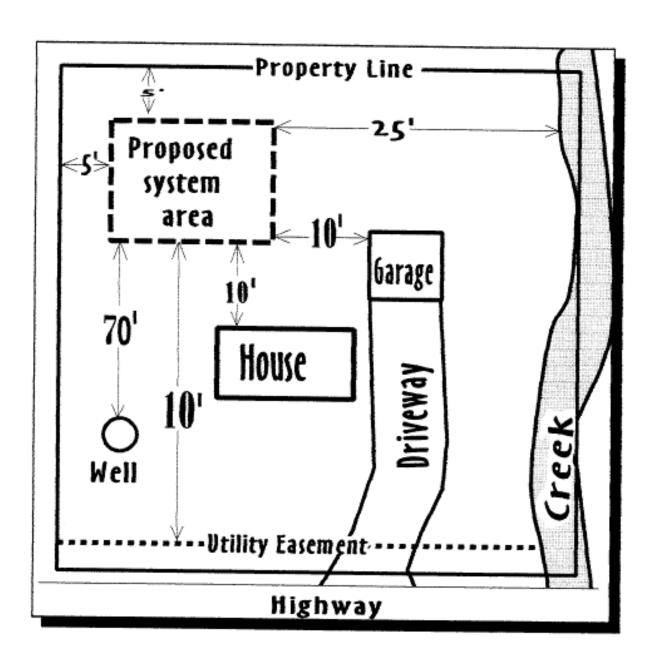
Contact your local health department to determine if any information is on file concerning the property. You may also request the local health department to conduct an existing system inspection, which will include a signed affidavit from the current owner in regards to the size of the existing system.
Question the homeowner concerning past maintenance or repairs that have been made to the septic system. This could indicate possible future problems.
Do toilets flush slowly or drains gurgle? This could indicate that the system is not functioning properly.
Consider the difference between your water use and that of the current owners. Septic systems may work properly with the current residents but if you anticipate your water usage to be greater than the current owners there is a possibility of overloading the system which may lead to failure.
Examine the property deed for easements, right-of-ways, etc., which may restrict or prevent the modification of the system. Will the property allow additional soil absorption area in case of necessary system repairs or expansion?
Verify the location of the onsite system and its proximity to the house. Knowing the precise location is important so that future landscaping and/or construction of patios, swimming pools, outbuildings, etc., will not damage the system or render it inaccessible for maintenance.
Carefully examine the area for evidence of system malfunction, such as surfacing sewage, wet spots, areas with dense growth or recently excavated areas. Also check the property boundary lines for evidence of sewage being piped to gullies, creeks, wooded areas, etc.

Site Evaluation and Permit

Before beginning construction of a home you will need to contact the local health department Certified Inspector and complete an application for a site evaluation to be performed on the property. A site evaluation consists of an examination of the property for several factors that will affect the performance of your septic system. These factors include topography, landscape position, soil texture, soil structure, internal drainage, depth to restrictive, depth to rock and useable area. Examination of these factors by the Certified Inspector will determine if the property is suitable for an onsite sewage disposal system and determine the type and size of the system that will best suit your needs.

Completing an Application

To apply for a site evaluation, contact your health department and obtain a copy of the required form. The application will need to be thoroughly completed and accompanied by a proposed drawing of the property. This drawing should give a detailed overview of the property including placement of the structure, driveway, easements, wells, ponds, streams, and a proposed septic system area. Once the application is complete and accompanied by any fees that may be required, the Certified Inspector will perform the site evaluation. It should be noted that a backhoe pit on the property may be required by the Certified Inspector.



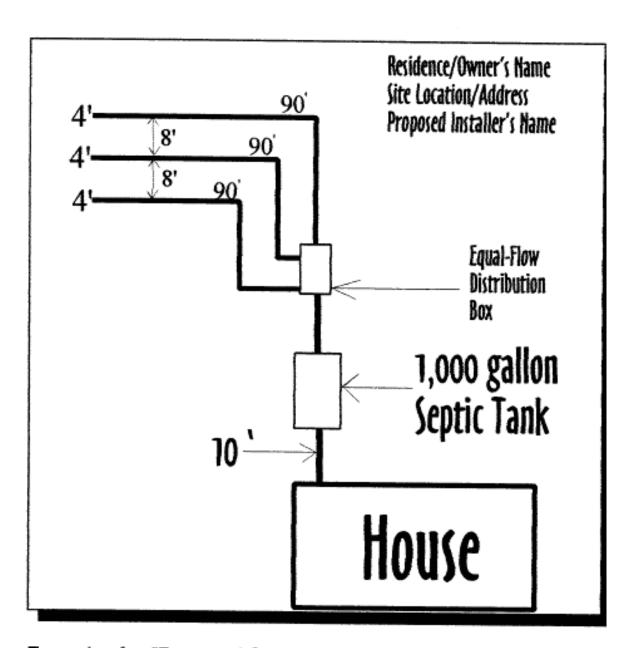
Example of a "Proposed Site Drawing of the Property" with the minimum measurement distance from the proposed system area. See the Kentucky Onsite Sewage Disposal Regulations for other setback requirements.

What to Do After the Site Evaluation is Completed

After receiving a copy of your site evaluation you should then contact a Certified Septic System Installer. The installer will need a copy of the completed site evaluation to bid the job. Once you and the installer have come to an agreement concerning the installation, the installer will layout the system and bring a proposed drawing to the Certified Inspector for approval. When approval is granted, a permit to construct an onsite sewage disposal system will be written. There will be a fee for this permit and the permit shall only be valid for one year after it is issued. It should be noted that no plumbing permits may be issued by the State Plumbing Inspector in your county until the onsite permit is issued.

Septic System Inspection and Completion

After installation of your septic system is complete the Certified Inspector will conduct an inspection of the system. Once the inspection is complete and the system meets with the requirements of the site evaluation and the permit, a final approval shall be granted. You may then begin to use your new onsite sewage disposal system.



Example of a "Proposed Septic System Drawing" by the proposed certified installer.

Rock Lateral System

Description

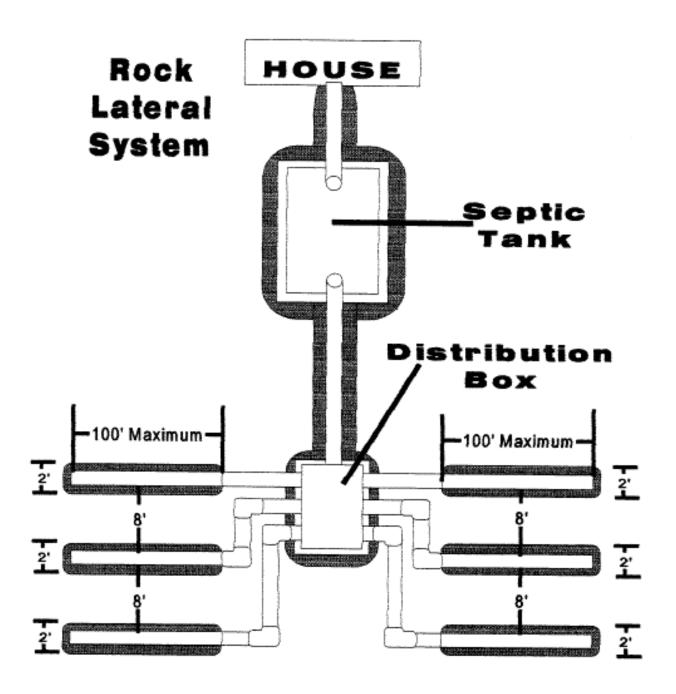
A conventional rock lateral system is the most common system used either on level land or moderate slopes with adequate soil depth above the water table or other restrictive horizon. The liquid or effluent flows from the septic tank through solid piping to a distribution box(s) and then into perforated piping within gravel filled trenches, where it then seeps into the soil.

The total length of the trenches is determined by comparison of total daily waste flow into the system and the absorption capability of the soil. No trench can be greater than 100 feet in length and are ideally 24 inches deep and 24 inches wide. There is a minimum distance of 12 - 18 inches of acceptable soil required below the bottom of the trench to any bedrock, water table, or restrictive horizon. Crushed or fragmented clean rock is to be used in the system. The trench has 6 inches of rock in the bottom, a section of 4 inch perforated pipe, and then 2 inches of

Leave & Mound Fill 4"-6" Over Trench for Settling



additional rock is placed over the pipe and leveled for a total of 12 inches. A barrier material (straw or synthetic polyester) must cover the rock in the trench to prevent soil from clogging the trench rock and perforated pipe when covered with soil.



Advantages	Restrictions/Disadvantages
This system can be used on either level or moderately sloping lots.	Typically uses the most space of any system, a minimum of 8 feet spacing between trenches must be allowed to achieve an adequate absorption area.
Most common type of system, therefore, installers are very familiar with the installation procedures.	There must be a minimum usable soil depth of 18 inches to use this system.
May be used with all types of distribution boxes.	If the system is installed at a shallow trench depth additional fill soil will be needed over the entire lateral field area.

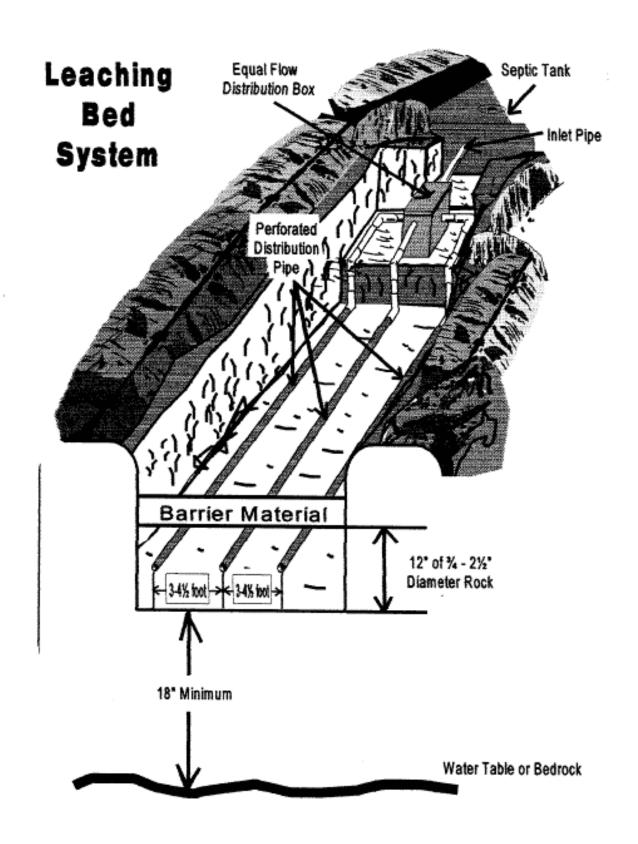
Leaching Bed System

Description

A leaching bed system is basically designed and functions on the same treatment principle as a conventional rock lateral system. They are used on level slopes with adequate soil depths above bedrock, water tables, and restrictive horizons. The liquid flows from the septic tank through solid piping into a distribution box(s). Then the liquid flows into gravel filled beds through perforated piping.

In a conventional rock system, the trenches are 2 foot wide, with one perforated pipe in the center. The width of leaching beds can be from 3 to 12 foot in width and 100 foot in length. This system allows for more absorption area in the bottom of the bed but less on the sides of the bed. The number of beds that are required will depend on the total width of the bed.

Advantages	Restrictions/Disadvantages
Uses less space than a conventional rock lateral system, although additional bottom area must be used to compensate for the reduction in the sidewall absorption area.	There must be a minimum soil depth of 18 inches to use this system.
Because it uses less space, if additional fill soil is required the amount may be lessened by using beds.	Slopes of over 5% may be unacceptable for bed installation.
	Size limitations of the bed due to equipment "reach" since all excavation must be done from the sides of the bed to prevent bottom compaction.

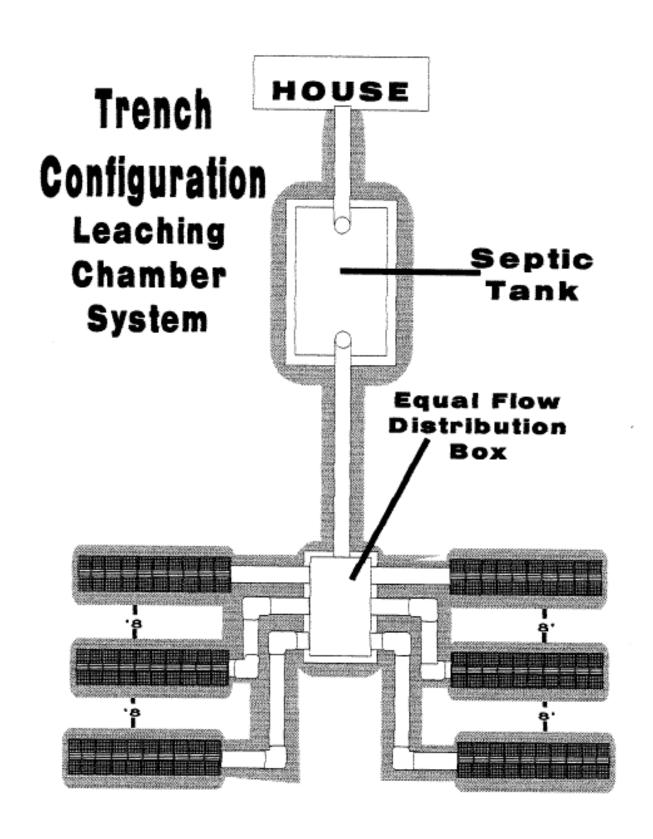


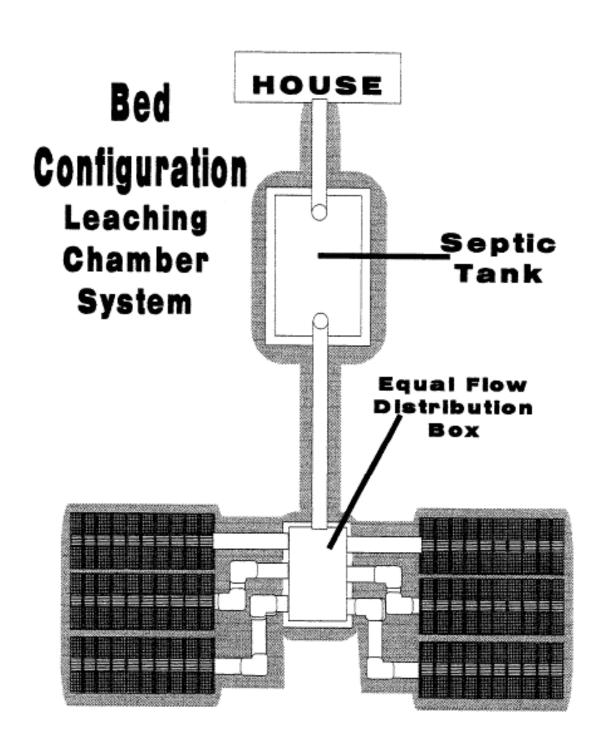
Leaching Chamber System

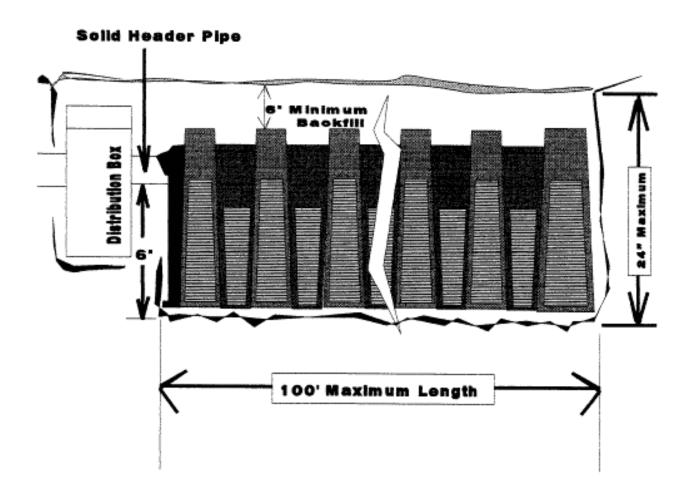
Description

Leaching chamber systems function like a conventional rock lateral system but without rock. They are used on level to moderately level lots with adequate soil depth above the water table or other restrictive horizon. The liquid flows from the septic tank through solid piping to distribution box(s) and then into open bottom chambers that create an underground cavern that stores the effluent. The effluent floods the soil surface prior to seeping vertically through the bottom of the trench allowing soil bacteria and oxygen to purify it. Since no rock is used, nearly all of the soil surface of the trench bottom and sidewall is exposed and available to treat effluent.

The chambers are constructed in sections approximately 6 foot long and 3 foot wide. They may be installed in either trench or bed configuration. The individual sections snap or screw together and contain end caps to complete each line.







Advantages	Restrictions/Disadvantages
Very space conservative, compared to a conventional rock lateral system.	Limited to 5% slopes for bed configuration and 10% for trench configuration.
Requires less fill soil above the top of the chambers.	Are not flexible, therefore, may not bend enough to follow along with the natural contours of the property.
Are easier to install and require fewer trips over the area with heavy equipment.	Vehicle traffic over the chamber area both before and after installation is prohibited to prevent soil compaction as well as crushing the chambers.

Gravelless Pipe System

Description

A gravelless pipe system can be used on level land or moderate slopes with adequate soil depth above the water table or other restrictive horizons. This system uses corrugated polyethylene tubing eight or ten inches in diameter. The tubing has specifically designed perforations encased in a protective synthetic wrap. No rock is needed in the trenches. The liquid flows from the septic tank through solid piping to a distribution box(s) then into trenches in which the corrugated tubing is placed. The tubing then allows the effluent to seep into the soil where it is then treated. The synthetic wrap prevents soil from blocking the perforations in the tubing, and acts as a wick to draw effluent out in contact with the surrounding soil.

Advantages	Restrictions/Disadvantages
This system can be installed at a shallower depth without the need for additional fill soil.	Cannot be installed in Group IV soils (clay).
Requires less labor and equipment, thus is easier to install.	High incidences of failure have been attributed to installations in clay and wet soils.
	Manufacturer supplied tape must be used to fasten individual sections together.

Gravelless Pipe System Example of a Typical Hillside System Layout showing excavations for tank, piping, boxes, and trenches Septic Tank Distribution Boxes 8' minimum Typical Gravelless Pipe Installation Typical Trench Layout ORIGINAL GRADE (NOT TO SCALE) TAPED FILTER WRAP TUBING PIPE FILTER WRAP TAPED FILTER WRAP and TAPED JOINTS **EDJOINTS** TAPED FILTER WRA **HEADER** DISTRIBUTION BOX 21 " minimum for TAPED JOINTS TAPED JOINTS 10" pipe COUPLEROR END CAP OFFSET REDUCER Benched undisturbed CONNECTOR 24° maximum TRENCH BOTTOM CONNECTOR soil bedding for either pipe size header piping 100' maximum length

Low Pressure Pipe System

Description

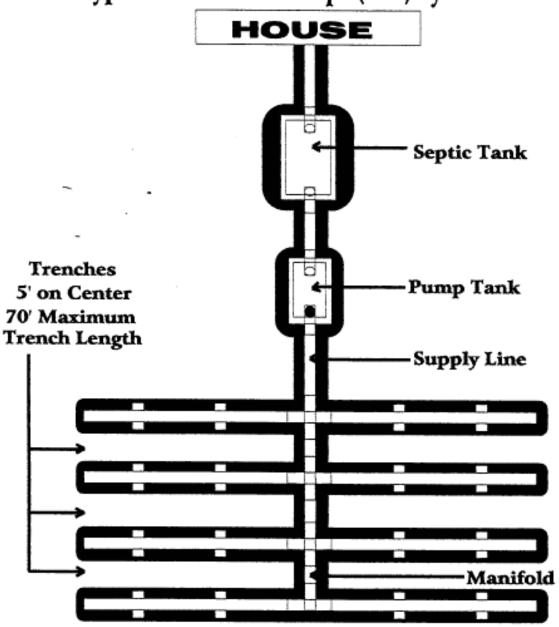
The low pressure pipe system consists of the following: 1) septic tank, 2) pumping tank, 3) submersible effluent pump, 4) high water alarm, and 5) supply line, manifold, and lateral lines.

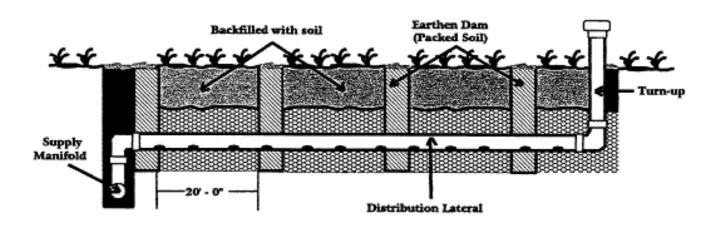
A low pressure pipe system functions in the following manner:

When septic tank effluent rises to the level of the pump control in the pumping tank, the pump turns on and effluent moves through the supply line and distribution laterals. The laterals contain small holes (5/32 - 1/4 inches) and are placed 3 to 8 foot apart. From the trenches, the effluent moves into the soil where it is treated. The pump turns off when the effluent level falls to the lower control. The dosing takes place 2 to 4 times a day, depending on the input of sewage from the structure. If a pump malfunction should occur, the alarm would alert the home owner of failure.

Advantages	Restrictions/Disadvantages
Space Conservative compared to a conventional rock lateral system.	Some low pressure pipe systems may gradually accumulate solids at the ends of the lateral lines, therefore requiring maintainance.
Can be used on irregular lot shapes and sizes.	Must have electrical components
Can be installed at shallower depths and requires less topsoil cover.	Design and installation can be very difficult.
Provides alternating dosing and resting cycles.	

Typical Low Pressure Pipe (LPP) System





Lagoon System

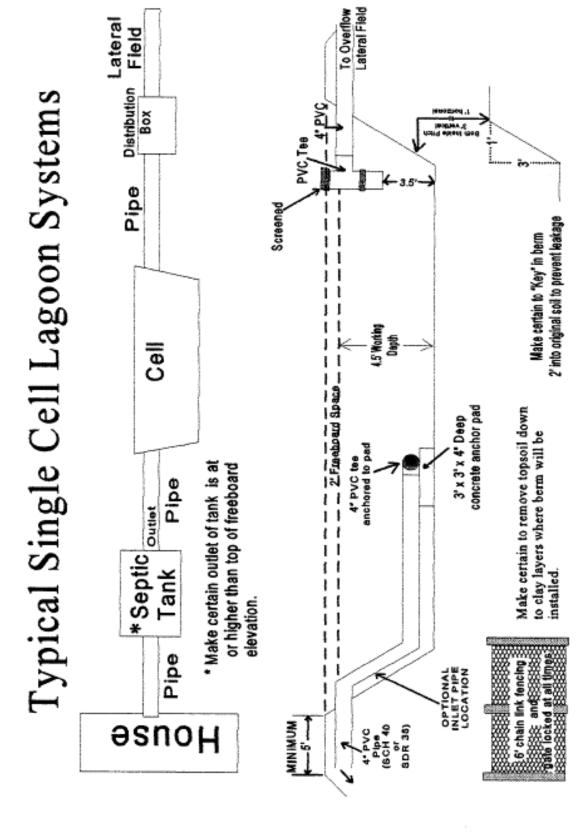
Description

A lagoon is an evapotranspiration absorption system where the effluent is treated by exposure to air, sunlight and bacterial action.

The lagoon is designed to have a maximum 4 ½ foot water depth, berming of 3:1 slope ratio, and a total depth of 6 ½ foot. Sizing depends on the number of bedrooms in the structure. For example, a 3 bedroom structure would need approximately 1800 square feet of surface area or possibly a 30 foot x 60 foot lagoon.

Effluent is discharged to a septic tank for solids removal and then carried through solid piping to the bottom of the lagoon where it is discharged. Any overflow from the lagoon is carried into a small lateral field where it is treated further and absorbed into the soil.

Advantages	Restrictions/Disadvantages
Space efficient when compared to conventional rock lateral sized for a Group IV clay soil.	Six foot fence and locked gate surrounding the perimeter of the lagoon.
Cost efficient and easily installed.	Duck weed or other surface vegetation must be removed from surface.
Relatively low maintenance and long life span.	Difficult to install in rocky soils or on steep slopes.
No odor and no mosquito problems.	Open water may not be attractive to some potential users.



Mound System

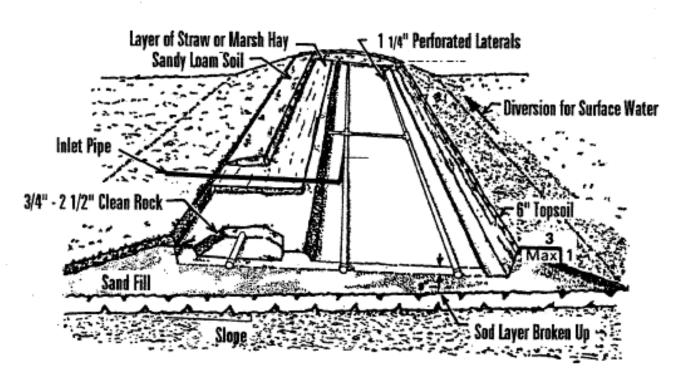
Description

A mound system is a soil absorption system that is elevated above the natural soil surface in suitable soil material.

The system basically consists of: 1) a suitable fill material (match head size sand), 2) an absorption area, 3) a distribution network, 4) a cap, and 5) top soil. After initial treatment in a septic tank the effluent is pumped or siphoned into the absorption area through the distribution network located in the upper part of coarse soil. The effluent passes through the soil, the fill material, and the unsaturated zone of the natural soil. The cap provides frost protection, sheds precipitation and retains moisture for good vegetative cover.

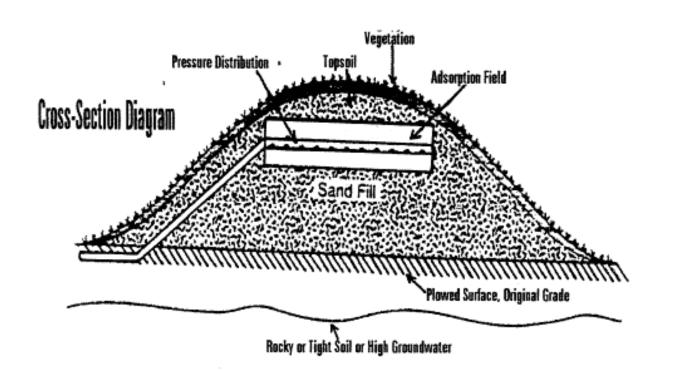
Advantages	Restrictions/Disadvantages
May be used in areas with high groundwater, bedrock, or clay soil near the surface.	Must be installed on relatively level lots.
Space efficient compared to a conventional rock lateral system.	Regular inspection of the pumps and controls is necessary to maintain the system in proper working condition.
	Flushing of the distribution network is required.
	System maybe expensive.
	System maybe difficult to design.

Mound System



Detailed Diagram of a Mound System

(EPA Onsite Design Manual)



Constructed Wetlands System

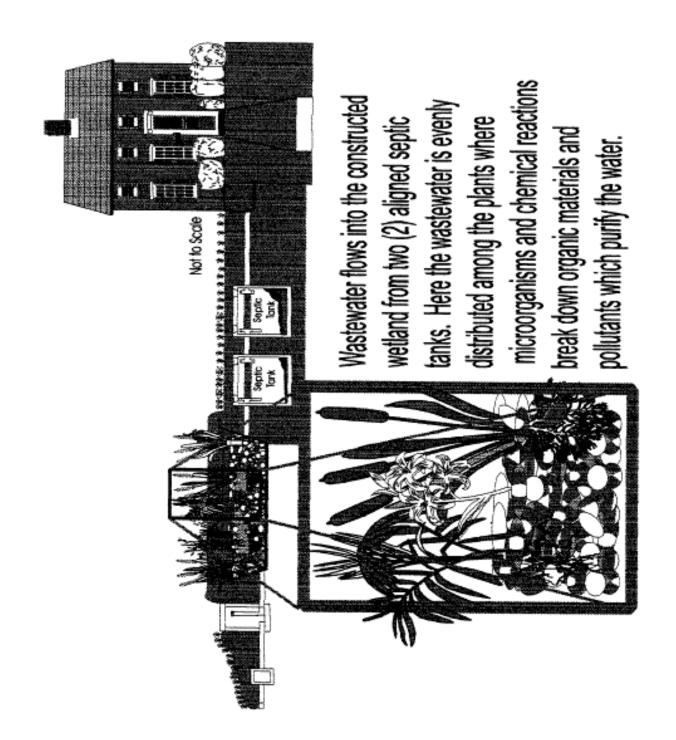
Description

Constructed wetlands or plant-rock filters generally consist of a primary treatment unit, usually a septic tank with 2 compartments or special filters, with a lined rock bed or cell containing approximately 12 inches of rock and a small overflow lateral field. Aquatic plants are planted in the rock media and treat the effluent to a very high degree. Any excess effluent is disposed of into the lateral field.

Wetlands are sized based on 1.3 cubic foot of gravel area for each one gallon of total daily waste flow. A typical size for a three bedroom home would be 468 square feet of interior area. Various length to width ratios are acceptable with generally a relatively narrow width to longer length preferable.

The system functions primarily by wastewater entering the treatment unit where some treatment occurs. The partially treated wastewater then enters the lined wetlands cell through solid piping where it is distributed across the cell. The plants within the system act to introduce oxygen into the wastewater through their roots. As the wastewater becomes oxygenated, beneficial microorganisms and fungi can thrive where they in turn digest organic matter. In addition, fairly large amounts of water may be lost through evapotranspiration.

Advantages	Restrictions/Disadvantages
Space conservative (approximately 1/3 of conventional rock lateral).	Require a higher level of maintenance than do other more conventional systems.
Can be placed on irregular or segmented lots.	May be more costly to install.
May be placed in areas with shallow water tables, high bedrock or restrictive horizons.	Unknown life span of system.



Glossary

- Absorption The process by which one substance is taken into and included within another substance, as the absorption of water by soil or nutrients by plants.
- Aerobic Having molecular oxygen as a part of the environment. Growing or occurring only in the presence of molecular oxygen.
- Alteration Means to make a physical change in the original design, sizing, layout, components, location, or method of operation of an existing onsite sewage disposal system.
- Alternative System Consists of a sewage pretreatment unit(s), necessary site modifications, waste flow modifications, and a subsurface soil absorption system using other methods and technologies than a conventional or modified system to overcome site limitations.
- Anaerobic The absence of molecular oxygen. Growing in the absence of molecular oxygen.
- Certified Inspector A person employed by the cabinet or by a local health department who has met the requirements for certification contained in KRS 211.360.
- Certified Installer A specific individual who has met with the requirements for certification contained in KRS 211.357.
- Clay A soil separate consisting of particles less than 0.002mm in equivalent diameter.
- Conventional System Consists of a sewage pretreatment unit(s), distribution box(es), and lateral piping within rock filled trenches or beds.
- Digestion The biological decomposition of organic matter in sludge, resulting in partial gasification, liquefaction, and mineralization.
- Effluent The liquid discharge of a septic tank or other sewage pretreatment unit.
- Evapotranspiration The combined loss of water from a given area, and during a specified period of time, by evaporation from the soil surface and by transpiration from plants.

- Landscape Position The location of the proposed onsite sewage disposal system area relative to the surrounding topographic relief of the land surface.
- Lateral Field The area in which the subsurface soil absorption system is installed and is a general term for the system itself.
- Manifold A pipe fitting with numerous branches to convey fluids between a large pipe and several smaller pipes.
- Percolation The flow or trickling of a liquid downward through a contact or filtering medium.
- Repair Minor replacement or reconstruction of a component of an onsite sewage disposal system.
- Restrictive Horizon A soil horizion, which due to its cemented, compacted or structural condition, is relatively impervious to the downward movement of water or treated effluent and, includes: fragipans; hard pans; iron pans; plow pans; and platy or massive structural grades.
- Sand A soil separate consisting of particles between 2mm and 0.05mm in diameter.
- Silt A soil separate consisting of particles between 0.05mm and 0.002mm in diameter.
- Slope Deviation of a plane surface from the horizontal.
- Soil Structure The combination or arrangement of individual soil particles into definable aggregates, or peds, which are characterized and classified on the basis of size, shape, and degree of distinctness.
- Soil Texture The relative proportion of sand, silt, and clay in a soil.
- Topsoil The layer of soil moved in cultivation.
- Variance A waiver of certain specified requirements of the onsite regulation granted by the cabinet after consideration of documented evidence that the granting of the waiver cannot reasonably be expected to result in the system contaminating groundwater supplies or creating a health hazard through the surfacing of effluent, or otherwise creating a public health nuisance.
- Water Table That level in saturated soil where the hydraulic pressure is zero.

Onsite System Maintenance

Septic Tank

Maintaining your septic tank is a key component in insuring many years of trouble free service from your septic system. Failure to have the septic tank pumped out on a regular basis may lead to sludge escaping the tank and clogging up the lateral field as well as the soil.

How often you need to pump the solids out of your septic tank depends on three major factors:

size or capacity of the tank

If more people are now living in the home than when the system was installed, then the amount of waste generated may exceed the capacity the system was originally designed for. Currently the size of the septic tank is based upon the number of bedrooms in the structure and whether or not the structure will contain a garbage disposal.

(2) the amount of wastewater entering the system

The amount of wastewater flowing into the system may be checked by obtaining a copy of water bills to figure the average daily waste flow. Current sizing of onsite sewage disposal systems in Kentucky is based on a rate of 120 gallons per day/per bedroom. Therefore, a three bedroom structure would have a total daily waste flow of 360 gallons.

(3) the volume of solids in the wastewater

The third factor is related to the volume of solids in the wastewater. If you have a garbage disposal, for example, you will need to pump the tank more often. Also flushing non-biodegradable objects into the tank will increase the frequency of pumping the tank.

As a general rule of thumb you should have your septic tank pumped by a Licensed Septic Tank Pumper every three to five years. If your onsite system contains an aerobic tank there may be a maintenance contract you must sign with the tank manufacturer before installation is complete. These maintenance schedules should be followed exactly to insure proper performance of these types of units.

Record Keeping

(For future use, please consider copying this form)

FOR NEWLY INSTALLED, EXISTING OR ALTERED SEPTIC SYSTEM

Fill in the necessary information. If help is needed contact your Local Health Department Certified Onsite Inspector.

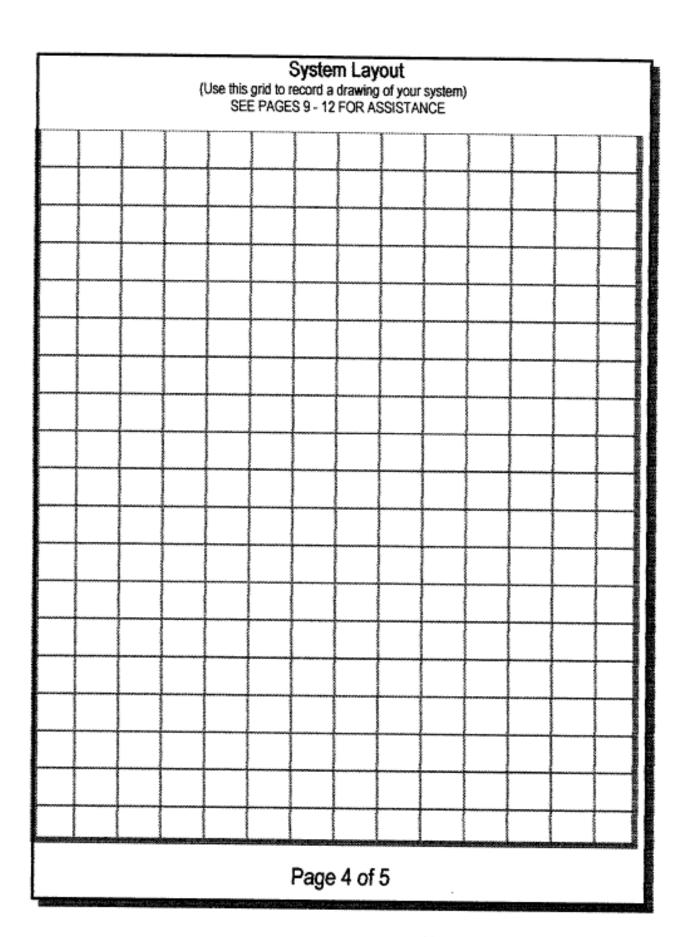
Address (Where the septic system is located.)

General:
Is the Septic system existing now or newly installed?
Check One: Information from previous owner (existing septic system)
If checked, give previous owner's name and any other
information
□Newly installed septic system
Septic System Permit:
Permit issued to:
Date Permit issued:
Certified Installer Name and Address:

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Septic System Description:					
Septic Tank Size:	How many gallons?				
Type of Septic Tank Pump Tank Size: Lateral Field Type: 0	Check one Concrete Plastic Steel How many gallons? Check One: Rock Lateral (Gravel Trenches) Leaching Bed (Gravel Bed) Gravelless Pipe Low Pressure Lagoon Mound Wetlands Leaching Chamber				
Lateral Field Dimensions:					
Accessories: Check item(s) used: □ Hillside Distribution Box □ Level Distribution Box □ Equal Flow Distribution Box □ Pump □ Alarm □ Curtain Drain □ Water Control Box					
	ent:				
Page 2 of 5					

System Maintenance Record					
Date	Description of Work (pumping; cleaning; repair; replace; alter, etc.)	Name of Installer, Pumper, etc.	Local Health Dept. Certified Inspector	Other Information	
Page 3 of 5					



USE THIS SHEET FOR ANY OTHER INFORMATION OR NOTES. Page 5 of 5

Septic Systems

Along with regular pumping of your septic tank you must also protect the lateral field.

Do's

- Fix dripping faucets and leaking toilets, no matter how small the leak.
- Practice water conservation by avoiding long showers, using washing machines and dishwashers for small or partial loads, letting the water run while brushing your teeth, etc.
- Compost your garbage or put it into the trash rather than using a garbage disposal of flushing it down the toilet.
- Direct down spouts, gutters, foundation, and surface water away from your system area.
- Call a professional when you have any problems.

Don'ts

- ✓ Use a garbage disposal.
- ✓ Allow anyone to drive or park over any part of the system.
- ✓ Use commercial septic tank additives.
- ✓ Flush sanitary napkins, tampons, condoms, diapers or other nonbiodegradable objects into the system.
- ✓ Dump solvents, oils, paints, thinners, disinfectants, pesticides, poisons, or grease into your system.
- Dig into your drain field or build anything over it.
- Make or allow repairs to be made to your system without first contacting your local health department certified inspector.