



## **HOW A SEPTIC SYSTEM FUNCTIONS**

### **1. PURPOSE**

Frequently prospective buyers of a single family home have many questions regarding the septic system serving the dwelling: What does the existing septic system consist of? Is it working properly? How long will it last? If it fails, how much will a replacement system cost?

The attached "Connecticut Recommended Minimum Existing Septic System Inspection Form," should answer many of the above questions. In order for a buyer who is not familiar with the operation and proper maintenance of a septic system to understand the terminology made in the inspection report, the following fact sheet has been prepared.

### **2. OVERVIEW OF SUBSURFACE SEWAGE DISPOSAL SYSTEM**

The purpose of a home's subsurface sewage disposal system (septic system) is to dispose of the wastewater generated by the occupants in such a manner that the soils on the property can disperse it without causing an adverse effect on groundwater and in turn on public health and the environment. To accomplish this, domestic sewage is directed to a system consisting of the following elements:

- (1) A building sewer, which connects the home's plumbing to the septic tank.
- (2) A septic tank, which allows for the settling of solids and provides the initial treatment of the sewage. This is where waste material is broken down by bacterial action. A properly functioning septic tank will reduce pollutant levels and produce an effluent of fairly uniform quality.
- (3) A distribution system, which directs the flow of effluent from the septic tank to the drainage system in a manner that assures full utilization of the system. Most systems are "gravity" systems, meaning the effluent flows through piping and distribution boxes without the assistance of any mechanical device, such as a pump or siphon.

(4) A drainage (leaching) system, which disperses the sewage effluent into the surrounding natural soils. There are many types of drainage systems. The specific type utilized on a particular property is usually dependent on the soil conditions that exist on the site. Most residential installations utilize stone-filled leaching trenches, but galleries, pits and beds have historically been used.

**For a leaching system to function properly it must:**

1. Provide enough application area. The application area is the amount of surface area provided by the particular drainage system (sides and bottom area of leaching units) where sewage effluent is applied to soil. The amount of application area needed for a given house depends on the characteristics of the soils on the property and the daily flows (in gallons) generated from the house. The anticipated flow from a house is usually predicated on the number of bedrooms in the dwelling.

2. Be surrounded by natural soil conditions that will be able to dissipate and disperse the septic tank effluent discharge without becoming over saturated.

3. Provide enough capacity to store effluent during periods of unusually heavy use or when rainfall or subsurface flooding reduces the ability of the system to disperse the liquid. Note: Curtain drains/groundwater interceptor drains are sometimes installed upgrade of the drainage system to minimize high groundwater conditions.

It is important to realize that, once a system has been installed, the homeowner can control only one of the above factors. The homeowner can control how much water is actually being discharged to the system. Since each system has a set maximum capacity, it behooves the homeowner not to exceed that amount. It should be a goal of the inspection to determine the estimated water usage the existing septic system can handle before it would likely become overloaded and fail.

NOTE: Many homes in Connecticut are served by private wells. These homes rarely have water meters installed on the water service line coming into the home. Because of that fact those property owners are at a disadvantage when judging their water usage levels since they have no way to monitor usage. It is recommended that a water meter be installed whenever there is a concern that water usage levels from the home may exceed the capacity of the existing septic system.

**If a system starts to experience difficulties, what are some of the common symptoms?**

1. Plumbing fixtures may exhibit difficulty in releasing their contents (slow draining, bubbling, backups, etc.). This condition may be system related but it could also indicate just a clog in the interior piping or sewer line. The homeowner should have the interior piping checked before proceeding with an investigation of the sewage disposal system. However, on newer systems or retrofits, the above symptoms could indicate that the septic tank outlet filter is becoming clogged. In that case, tank maintenance is required in order to clean the filter and, more than likely, pump the tank.

2. Large volume discharges (such as, washing machines, dishwashers and bathtubs) cause either a backup, as noted above, or an overflow of sewage above the septic tank or leaching field. This condition is usually at its worst during and/or directly following a heavy rain event.

3. Foul septic odors in storm drainage piping, catch basins, footing drain piping or curtain drain discharges may indicate that sewage from your or an adjacent property is entering these groundwater systems.

4. System is operating at capacity: As stated above, all leaching systems are sized to release a certain quantity of sewage each day. If the system is maintained and operated properly (the septic tank is cleaned periodically and the water usage is within limits), theoretically, the system should last indefinitely. However, if the leaching system's interface area becomes clogged or more sewage is discharge into the system than it was designed for, the system could be operating at capacity. This means that when a system is opened sewage would be observed up to and above certain system elements (outlet pipes of distribution boxes and or the septic tank). The conclusion which should be reached from such an observation is that whatever the recent daily flow from the building has been, any increase would likely cause a system failure and a need for corrective action.

### Gray water/Black water Systems, what's the difference?

A normal septic system technically is a black water system. All wastes enter a septic tank followed by a leaching system. When toilet wastes are separated from kitchen or laundry wastes the non-toilet waste discharge is defined as gray water. Separation was a standard practice of septic system installations prior to 1970. However, studies have found that gray water systems are detrimental to the environment, especially when the discharge is directed to a leaching system, bypassing a septic tank. It is for that reason that whenever an existing gray water system fails, connection must be made to the building's black water system or, a septic tank must be installed prior to a new leaching structure.

### 3. OLD VERSUS NEW SEPTIC SYSTEMS AND THE INSPECTION PROCESS

As stated in the first section, prospective buyers of a single family home want to know what the existing septic system consists of and whether the existing system will satisfy their needs. To answer those issues the inspector must use some point of reference in order to evaluate what was found and determine the likelihood it will perform adequately. The point of reference utilized for comparison is the present Public Health Code. This may put older homes with aging septic systems at a disadvantage but it is the only way that conclusions reached during the inspection process can be consistent from one inspector to the next or from one house to the next. The client should understand, however, that an older system, which may not meet today's standards, could be perfectly adequate for their needs and may serve them well for many years. It is hoped that the inspection process will be able to give meaningful and accurate information to the client so that they can make an informed decision relative to the existing septic system. It should also be noted that whenever an older system is found to deviate from present health code requirements, the system does not have to be upgraded or repaired unless it is in a state of failure (overflow condition or illegal discharge, etc.) causing a health hazard.

#### **4. GLOSSARY OF TERMS REGARDING SYSTEM SIZING**

**Water Usage:** Is the amount of wastewater that will be discharged into the system each day. For residential dwellings it is assumed that each occupant will discharge an average of 50 gallons per day (GPD). Under normal circumstances not more than two people would occupy any bedroom, therefore, a maximum of 100 GPD average usage has been set for each bedroom for sizing the system per code. For other uses, such as, office/retail, restaurant, industrial, etc., the water usage would be determined on a case by case basis. As stated in Section III, if a home is served by a well and there is a concern over water usage, a water meter should be installed.

**Flow Test (or “push test”):** Although not usually recommended, this test can be used as a screening procedure in order to expose those systems that are near capacity (on the verge of failure) and vulnerable to moderate water usage. The test consists of discharging a quantity of water into the existing septic system to simulate a typical “peak” usage of water by a family. After a certain amount of water is “flushed” down sinks, tubs and toilets, the inspector examines the leaching area to observe any signs of an “overflow” condition. If an “overflow” is observed, the conclusion reached by the inspector is that the system is not functioning properly. It should be noted, however, that “passing” the test does not necessarily mean that the system is working properly. There is a concern with performing this test. Unless this test is performed in a responsible, site specific manner, it could cause harm to the existing system or lead to erroneous conclusions.

**Number of Bedrooms:** The number of potential bedrooms in a home determines the maximum occupancy for that home. This in turn will determine the size of the leaching system based on this maximum occupancy assumption. It is not possible for anyone to foresee future utilization of a home over and above the present occupants. It is for that reason that reductions in leaching system size are not allowed even though the present owners may not be using all the potential bedrooms as bedrooms (they may be using rooms as studies, or sewing rooms, or computer rooms, etc.) or occupying each room with two people.

**Leaching System Size:** The size of a leaching system is determined by relating the percolation rate of the soil and the anticipated daily discharge, to the amount of sewage application area provided by the system. The application area is sometimes referred to as the “wetted perimeter”. It is the actual surface area that sewage comes in contact with just prior to entering the surrounding soil. Each type of leaching system (see Leaching System Section) provides different amounts of “wetted perimeter” per linear foot of system length. In a normal system, the “wetted perimeter” forms a biological slime layer that slows down and actually renovates the sewage prior to it entering the surrounding soils. The thickness of this layer, and the speed with which sewage passes through it, will be dependent on how much suspended solids and greases are released by the septic tank. That is why it is so important to clean the septic tank out periodically to maintain a uniform quality effluent leaving the tank.

## **5. SUITABLE SOIL CONDITIONS**

**Deep Test Holes:** Deep test holes are dug within and down grade of a proposed leaching area to determine the soil characteristics, maximum groundwater levels and ledge rock conditions. Depending on what is observed, the type of system and the configuration of that system will be determined. Deep test holes must be conducted and observed by a professional engineer and/or a local health department sanitarian.

**Percolation Tests:** In order for a septic system to function properly the soils in which it is placed must be permeable. The quicker water can pass through the soil the smaller the leaching system can be. The percolation test is an empirical means utilized to estimate a soil's general permeability. Unit of measure is in "minutes per inch," representing how long it takes a column of water to drop an inch in a small diameter hole dug in the soil strata that will be utilized for sewage disposal.

**Suitable Soils:** Soils which are permeable (percolation rates faster than 60 minutes per inch) must meet other criteria prior to being deemed suitable. There must be at least 24" of permeable naturally occurring soils over ledge rock. In shallow bedrock areas substantial amounts of "select" (good quality) fill material would be necessary to raise the leaching system at least four (4) feet above the ledge. Also, the soil in the leaching area must not flood from seasonal high ground- water. The code requires at least 18" of unsaturated soils be present during the wettest time of the year.

**Naturally Occurring Soils:** The code refers to a septic system being able to adequately absorb or disperse the expected amount of sewage into the surrounding naturally occurring soils without overflow, breakout or detrimental effect. Discharging a large amount of sewage in a confined area, especially if ground conditions can not support a great deal of extra water, could overload that area and lead to a septic overflow. Fill material (brought onto the site by artificial means) can never be classified as "naturally occurring soil." Likewise, bringing in fill material to cover a sewage overflow condition is not an acceptable repair, since it does not correct the inherent problem of the leaching system which is its inability to release the sewage into the ground.

**Minimum Leaching System Spread (MLSS):** In order to prevent the overflow or breakout of sewage from occurring within or downgrade of a leaching system, the Public Health Code stipulates that the system must be spread out a minimum length across the slope. The calculation of this length is determined by use of tables referred to as "Minimum Leaching System Spread" Factor Tables or by a formal hydraulic analysis. The greater the depth of unsaturated naturally occurring soil, the greater the slope of the ground and the faster the percolation rate are conditions which will result in reduced system spreads. In the case of repairing an existing system when there is limited available area, the amount of sewage discharge from the building (home) may be restricted. Proposed additions or remodeling (which would increase the number of bedrooms) may not be allowed under these restrictions.

## 6. SEPTIC TANK

**Purpose of Septic Tank:** The septic tank's function is to slow down discharges from the building's plumbing fixtures so that solid material can fall to the bottom of the tank and greases and scum can rise to the top. A stable biological system within the tank promotes the conversion of organic solids to soluble organic chemicals and gases. The result is a relatively uniform quality septage that will proceed to the leaching fields. There is no need to introduce any commercial additives to the tank to promote biological growth.

**Cesspool:** Cesspools were utilized frequently more than 50 years ago to dispose of all wastes from the home. A large diameter pit would be dug approximately 6 or 7 feet below grade then be lined with large stones or concrete blocks. The cesspool would then be connected directly to the home's plumbing. A cesspool is not technically a septic tank since it does not separate out solid material, allowing such material to come in contact with the soils surrounding the pit. Since this condition could lead to contamination of groundwater in the area, the current Connecticut Public Health Code requires the installation of a septic tank whenever an existing cesspool malfunctions and requires repair.

**Pump-Out Frequency:** It is recommended that septic tanks be cleaned every 2 to 5 years. The frequency should be based on the occupancy of the home and how quick solid material builds up in the tank. It should be noted that the use of a garbage disposal significantly increases the amount of solid material and greases entering a tank and therefore, should result in more frequent pumping. Septic tanks that have less than 1,000 gallons of capacity or are undersized for the existing usage have to be pumped more frequently.

**Septic Tank Depths and the Need for Risers:** Whenever the top of a septic tank is located deep into the ground it becomes more difficult to gain access to that tank for maintenance (cleaning and the "snaking" of clogged sewer line). For that reason the Technical Standards to the Connecticut Public Health Code, effective January 1, 2000 requires that all new and existing septic tanks have at least one cleanout manhole located not more than 12" from final or existing grade. When the top of a septic tank is more than 12" from grade a riser collar shall be installed over the cleanout manhole so that access to the tank will be less than 12" from grade level.

**Volume of Tank:** The Public Health Code requires a minimum 1,000 gallon septic tank for all new buildings. For residential buildings an additional 250 gallons of capacity shall be added for each bedroom over three (3). Therefore, a four (4) bedroom home would require a 1,250 gallon tank, a five (5) bedroom home a 1,500 gallon tank, etc. If an older house has a septic tank which falls below the present sizing requirements, it does not have to be replaced (unless physically damaged in some way), but may have to be cleaned more often.

**Inlet and Outlet Baffles/Compartment Wall:** In order to reduce the flow of septage through the tank, baffles are placed on the inlet and outlet piping to and from the tank. In most cases, the baffles consist of "tee" connections of 4" PVC piping. The piping is submerged into septic liquid a minimum of 8" at the inlet and 10" at the outlet. On all new tanks a compartment wall is installed in order to separate the liquid in the tank into 2/3, 1/3 volumes. The septage in the tank passes from the first compartment to the second through a mid-depth opening.

## Outlet Effluent Filter:

As of July 1, 2000, all newly installed septic tanks shall have an effluent filter placed at the outlet in place of the outlet baffle. The purpose of the filter is to trap suspended solids that are not heavy enough or have not had enough time to sink to the bottom of the tank. This occurs frequently when a tank hasn't been pumped in a timely manner and contains a significant amount of material that reduces its effective volume. Filters must be periodically cleaned so that they do not plug and back seepage back into the house. The cleaning interval should correspond to the recommended pump-out frequency. If the filter plugs at a higher frequency the options would be to change the type of filter presently being utilized (increasing the flow through surface area) or, add extra filters in series to increase the time interval between cleanings.

## 7. LEACHING SYSTEMS

### Trenches:

Are linear excavations that are a maximum 48" in width and 18" in height. Trenches are backfilled with one-inch stone surrounding a 4" perforated distribution pipe located 6" or 12" above the bottom of the trench. The distribution pipe is covered with a minimum 2" of stone.

### Galleries:

Are hollow structures that are a minimum 48" in width and of various heights (12" up to 48"). Originally these structures were made of concrete, but today plastic structures are available either in single or multiple unit configurations. All galleries are installed with one-inch stone on each side, within the required minimum six (6) foot wide excavation.

### Pits:

Are hollow structures that are usually placed in deep round excavations. The structures are between five (5) feet and ten (10) feet in diameter. Pits are installed with 12" to 24" of one-inch stone surrounding the units. Pits are usually installed only when groundwater levels are very low and the soil in the area has a relatively fast percolation rate.

### Proprietary Leaching Systems:

Are various types of leaching products that combine different materials, such as, plastic, filter fabric, and cardboard, into configurations that either eliminate the need for stone, reduce the amount of "select fill" needed, or provide more Effective Leaching Credit per foot than more traditional products listed above.

## 8. ACCESSORY ELEMENTS

**Curtain Drains:** In some cases groundwater levels on a site may interfere with the proper operation of a septic system. If conditions permit, as determined by soil testing, a curtain drain may be installed uphill from the septic area in order to lower groundwater levels. Curtains drains are not always effective in lowering groundwater levels, therefore, before a leaching system can be installed, springtime monitoring of the area is needed in order to determine the lower water table levels.

## **Backwash from Water Treatment System (Water Softener):**

The State of Connecticut Public Health Code – Technical Standards prohibits backwash from a water treatment system from being discharged into a septic system (usually by connecting the discharge hose to the sewer line leading to the septic tank). The Department of Environmental Protection (DEP) is presently developing protocols for the proper disposal of such waste water.

## **9. PERMIT TO DISCHARGE**

Permit to Discharge: After completing the installation of any subsurface sewage disposal system (new or repair) a Permit to Discharge shall be issued by the local health department. The issuance of the Permit to Discharge shall imply that an “as-built drawing” has been provided indicating the location of all key elements of the system, the system has been installed in accordance with code requirements (unless specific exceptions to the code are granted in the case of repaired systems) and list any limits that have been placed on the use of the system (such as, limiting the amount of daily discharge).

## **10. INSPECTIONS**

Our real estate inspections are based on State of CT Dept of Health guidelines. Our inspection process was developed after years of New Milford Septic Technicians gathering important information in the field during inspections, repairs and new system installations. This field information was then compiled and a detailed inspection procedure was established and has been used by our company ever since. It continually evolves and improves yearly. While we are Septic System Experts, and have 60 + years of solid experience to back us up, we can only do what is reasonable and prudent. Some septic systems that are older or in certain layouts, may be inaccessible to our technicians at the time of inspection. Reasonable hand digging, probing and visual inspection is the base level of the inspection process and we do make all attempts to find and evaluate critical system components. However, in cases where the components are not accessible, then the inspection process will have to be modified accordingly. This may either be by a reduced rate for services rendered or extra costs if the customer wishes to explore further. These modifications may only be made in our office after the technicians have returned with the field data. Either way, our inspection only gives a “snapshot” of the operation of the septic system in a short window of time. We cannot guarantee the efficiency or future operation of the inspected system.



**DO NOT put the following materials in your septic system:**

- Septic system additives meant to correct a malfunctioning system or improve its performance. This includes: degreasing agents, caustic chemicals, solvents and bacterial digestion enhancers such as enzymes or yeast. At best they do little, at worst they can be dangerous and can impair the natural bacterial activity of the system. Many chemicals are not biodegradable and will pass through the system and soil and then into the ground water where they can potentially contaminate well water. You could render your own or you neighbor's well water unfit to use.
- Automotive oil, gasoline or any motor fuels or coolants (anti-freeze) in any quantity, should NEVER be disposed of in the septic system.
- Salt brine backwash water/solution from a water softener should NEVER be discharged into the septic system.
- Pesticides, disinfectants, acids, medicines, paint, paint thinners, grease, solvents, these wastes are hazardous, should be used with caution and NEVER be disposed of into the septic system because they will contaminate the soil, ground water and possibly your own or you neighbor's well.
- Coarse organic matter such as vegetable trimmings, ground-up garbage (sink garbage disposals should never be utilized on a septic system), condoms sanitary napkins, disposable diapers, coffee grounds, paper towels, etc. will over load the septic tank with sludge and floatables and will at the very least make for more frequent pumping.
- Cooking oils, liquefied meat fats (bacon grease) may pass through the septic tank and as they cool, solidify and clog the leaching fields. ALWAYS Dispose of the fats and greases in a container in the house hold garbage.

**MODERATE AMOUNTS** of bleach and other household cleaners will not significantly interfere with the septic system's bacterial processes.

**CONCLUSION**

We hope the outline above provides you with enough information to better understand how a typical septic system works....and fails !!!

New Milford Septic has been serving the New Milford area and all surrounding towns since 1940. In that time, we've seen many changes in the environment and the regulations that govern how a septic system should be repaired or installed for maximum lifespan and efficiency. We strive to be a leader in the septic industry, always providing our customers with the latest technology to better serve their needs, while helping to protect the precious land that we all share.

Our goal is to remain in the forefront of technology while never forgetting Old Fashioned Service and Commitment to our customers.

*George Sam* – 3<sup>rd</sup> Generation Owner