Typical Septic System installation

Portions of the following information were provided from the following web site;

http://www.eco-nomic.com/septic.htm

The two **most common myths** on the subject of septic system function are that the septic tank ***treats*** the sewage, and that the soil ***filters*** the remaining particles out of the effluent creating pure water underground.

In fact the septic tank is merely a concrete box that holds roughly two days of sewage. In the calm environment of the tank, dirt and solids settle out and fall to the bottom. Grease and lighter particles from the sewage float to the top. Numerous anaerobic (water breathing) bacteria continue working to reduce some of the strength of the sewage, but **not much treatment happens in the septic tank**.

The human gut is an anaerobic (liquid) environment similar to that in the tank. The most hazardous materials in sewage are pathogenic (disease causing) bacteria and viruses from the human waste.

The separated liquid containing the dissolved sewage solids (called **effluent**) flows out of the septic tank through a pipe into the drainfield. Here it spreads over the floor of the drainfield trench. Now the real treatment takes place. Millions of aerobic (air breathing) bacteria live in the soil (*30 million or so organisms live in a teaspoon of soil*). The aerobic bacteria thrive in the area of the trenches and await the sewage effluent, their food source containing anaerobic bacteria, organisms and other organic particles in the effluent.

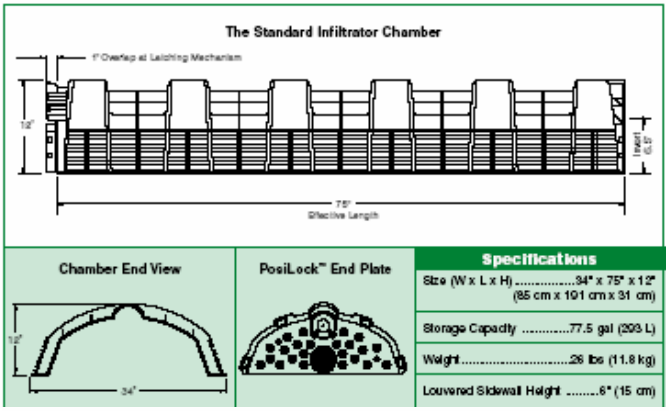
In a municipal sewage treatment plant, these **same bacteria** are doing the work of municipal sewage treatment.

The Gravity Type Septic System Design

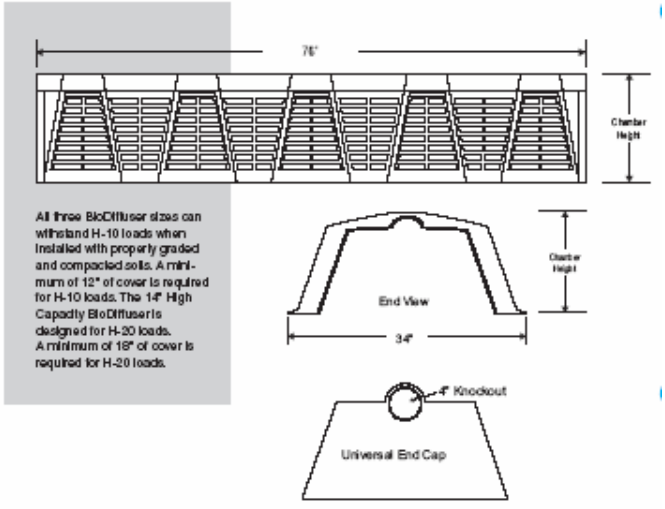
Many new septic systems use **vault technology**, although many of the points apply to the traditional drainrock systems too.


Gravity System With Vaults

The Standard
Infiltrator®
Chamber



BioDiffuser Specifications




Constantly Check Levels

Elevations are critical for all components. ***A*** laser level device and a special level rod, will allow an assistant to walk around and find the elevation of any point of the system within sight of the tripod by listening for a series of beeps.

This tool is particularly useful to ensure that the trenches are not over excavated. Constant attention to elevation is the key to a successful job. Older technology such as a surveyor's transit may be used, but don't attempt construction with a standard construction bubble type level. These tools are available anywhere to rent. The health inspector must be called for a final inspection of the job before any backfilling occurs. However, the tanks, pipes and vaults should be backfilled around their sides during construction.

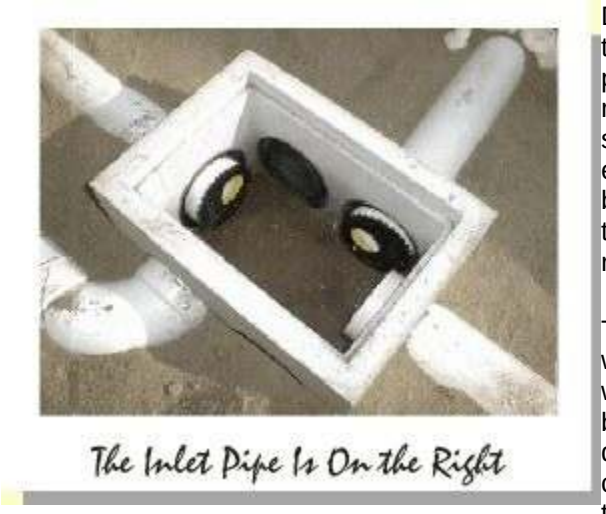
Pipe Slope and Type for Proper Drainage. A word here about pipes and drainage. PVC (Polly Vinyl Chloride) pipe comes in a variety of sizes and types. Pipes in a gravity system are 4 inch diameter. **ASTM 3034** or **ASTM Schedule 40** are both good for sewer lines between the house and the tank. These pipes can not be crushed by stepping on them. ASTM 2729 (perforated drainfield pipe is made of this stuff) and ASTM CL160 (known as *Class-160*) are too thin to stand up to being driven over with a car, etc when placed in shallow trenches. Some counties allow the thin wall pipe between the tank and the drainfield. The "building sewer" must be *sloped* (sometimes called fall) at between 1/8" per foot and 1/4" per foot (in other words the pipe must drop at least one inch for every 8 feet of sewer line and not more than one inch for every 4 feet). Less slope and the flow is too slow to clear the pipe. More slope and the water drains off too quickly and the solids will become stranded and cause a blockage. Do not ignore this slope requirement for any reason, or the spot will become a perpetual problem in the system.

If the yard down to the tank slopes ***too*** much, the sewer may have to be dropped straight down in a series of steps. Remember also that any *right angle* bends in the sewer pipe are **not** allowed when changing direction in the sewer, down or side-to-side. Always use two 45 degree "elbows" instead of a 90 degree elbow to allow proper cleaning with a snake or roto-rooter. Also put in a clean-out (sweep "T" with a riser and cap) to direct a snake (a metal probe for cleaning out blockages from the surface) toward the tank every 50 feet (100 feet absolute maximum) in the *sewer* line. Clean-outs and 45 degree elbows are not needed in the effluent line although some health departments want them there anyway. If the ground slopes towards the house from the drainfield area, or if the site is flat, you may need a pump in the tank to deliver the effluent to the proper elevation.

After the septic tank, and *after* the D-Box all the way to the drainfield, the slope may be as little as 1/64" per foot if the excavation is expert. The effluent line has no solids in it so the slope is only required to keep the pipe clear of liquid. The effluent line may drop down at any angle for the same reason. All effluent lines must drain fully and not have a "sag" in the line that could cause pools to form and in cooler climates cause a **line freeze**.

Septic systems are plumbing systems. In this view, the concrete D-box has been placed where it belongs and the effluent lines are being pushed into the seals. Although all the other pipe joints are glued together, where the lines enter the tank and D-box, the pipes are pushed into the special seals without glue. Older construction methods require lines to be sealed into D-boxes and tanks with concrete grout. To the left bottom of the view, the yellow plastic rotatable flow control seals are waiting to be placed into the pipe ends to evenly distribute the flow between the trenches.

Next to the excavator is the level rod for checking the level of the D-box and the pipes. The system works because of the difference in elevation between the sewer line leaving the house, the septic tank, the D-box, the effluent lines to the trenches and the floor elevations of all of the trenches themselves. These final elevations must be from the plans. The finish grade and backfill will have to cover everything at the required depth when you are done. Often the top of the septic tank is used as a datum or benchmark. The floor of a well house, an existing slab, any reasonably immovable object will qualify as a benchmark. Property corners on a site can change elevation.

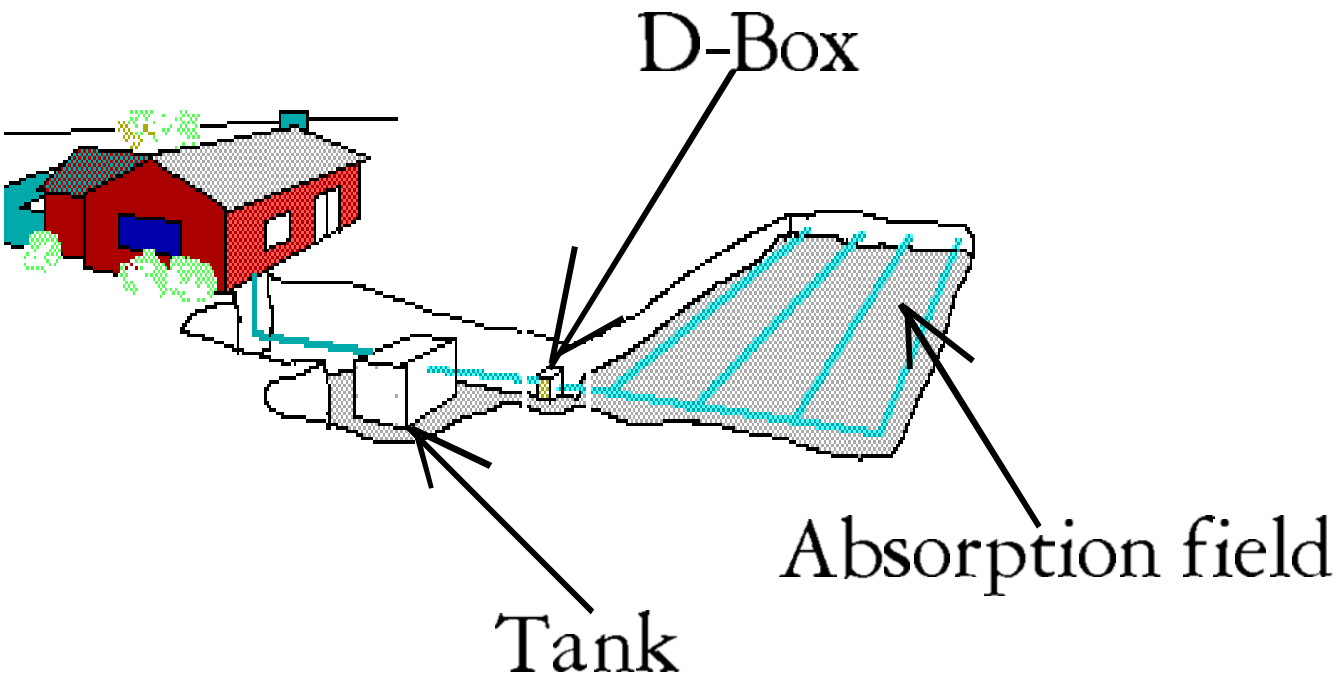


The Inlet Pipe Is On the Right

Distribution must be even:The D-box is ready to go. The flow control has been set by pouring a bucket of water into the box and rotating the seals to make the opening in each seal break the surface at the same elevation. This evenly distributes the flow between the three outlet lines leading to the three trenches. The inlet to the d-box is on the right and does not have a flow control seal.

The sandy dirt around the pipes has been walked and compacted to ensure that the lines will not be disturbed during backfilling. The backfill will form a slight hump over the drainfield so that eventual settling will not cause low spots over the drainfield over time. Note the expandable urethane foam sealing the effluent line at the top of the view where the northeast effluent line disappears into the vault. This attention to detail by some excavators distinguishes the best from the rest. Skill and attention to details will help you more than anything else to ensure that the septic system will not fail within its useful life of fifteen to twenty-five years. Most Owners' say at the first meeting with the designer "I don't want to have to mess with it." They will call the contractors back to the site at the first sign of trouble

Typical layout of system



The color sketch is courtesy of Purdue's Environmental Education Software Series. Educational software on diskettes is available from the Farm Building Plan Service, 1146 AGEN Building, Purdue University, W. Lafayette, IN 47907-1146