Indiana State Department of Health Construction Guidelines for Gravity and Flood-Dose Trench Onsite Systems

The septic tank-absorption field sewage treatment system is composed of two major elements; the septic tank and the soil absorption field (Figure 1). The septic tank (a settling and decomposition chamber) allows the sewage solids to separate from the liquid, undergo partial decomposition, and be stored as sludge at the bottom of the tank or floating scum at the top of the tank. The effluent from the septic tank then flows by gravity into the soil subsurface absorption field where it infiltrates into the soil. The distribution box is a container that accepts effluent and distributes the effluent evenly to one or more trenches in the absorption field.

In some cases gravity flow from the septic tank to the absorption field is not feasible and a dosing tank is necessary. This system is called a flood-dosed onsite system. The dosing tank pumps a measured amount of septic tank effluent to the absorption field through a distribution box. Other treatment components may also be necessary, such as a tank for trapping grease, an outlet filter in the septic tank, and/or a system to reduce the strength of the effluent from the septic tank (secondary treatment).

Onsite systems require care in site selection, design, and construction. The location of each absorption field should shed water, and should have the most suitable soils on the property. The location of the absorption field should even have location priority over the new commercial facility or residence. In fact, before the property is acquired, serious consideration should be given to its suitability for an onsite sewage system and the appropriate location on the property.

Each individual onsite system must be designed and constructed according to Indiana State Department of Health (ISDH) rules, the onsite soil characteristics determined during an onsite soils evaluation, and the estimated daily sewage flow. The onsite soil evaluation for commercial projects submitted to ISDH must be conducted by a Indiana registered soil scientist. Onsite systems for commercial projects submitted to ISDH must be designed by an Indiana registered engineer or architect. For gravity and flood dose residential onsite systems, the requirements as to who may conduct the onsite soils evaluation and who may design the system is set at the county level.

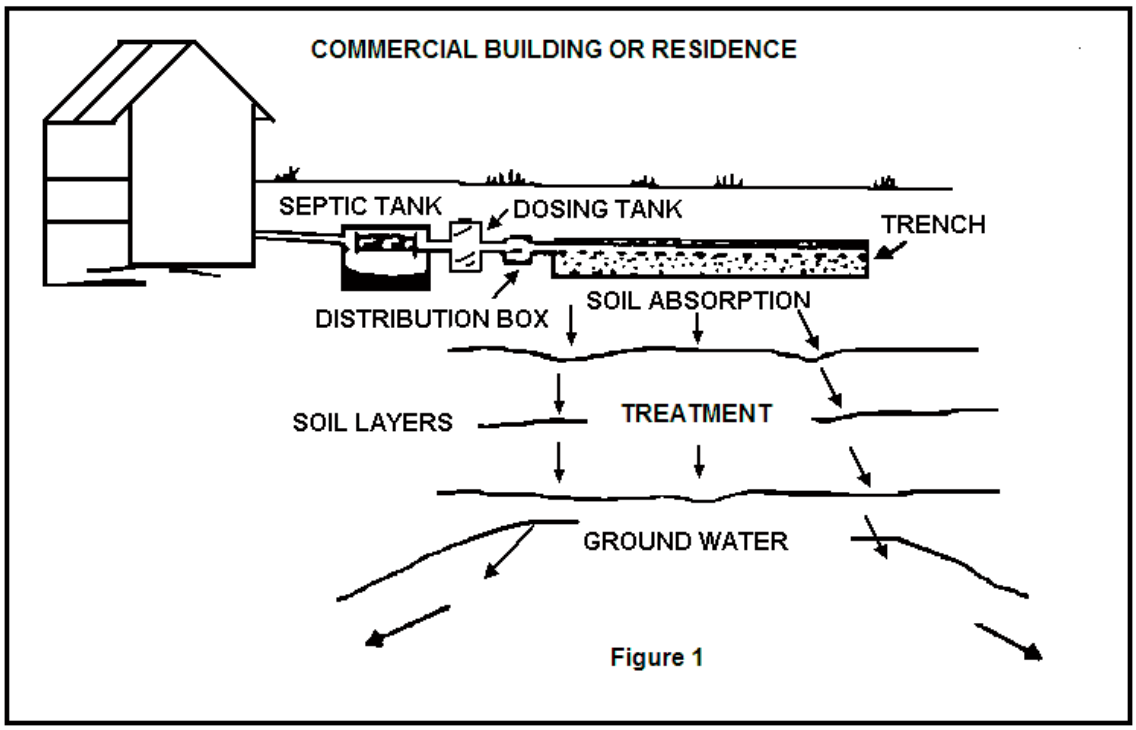

Figure 1

Construction Procedure

The following construction steps explain the basic procedure for installation of an onsite system. If the guidelines are carefully followed, they should help insure trouble-free operation of the system for many years.

Site Selection and Layout

Step 1

The soils within the area where the absorption field is proposed will have been identified to evaluate their suitability to support an onsite system. The site will have been evaluated and the results reported to ISDH or the local health department, whichever has jurisdiction. For commercial sites, the soils evaluation must include at least three (3) soil borings within the area selected for the absorption field. For residential onsite systems, the minimum number of soil borings is determined by the local health department. In cases where the soils are extremely variable, the soil with the most limited conditions should be used and in order to properly describe the area, additional soil borings will be needed. This may mean the absorption field may be large, and/or more than one absorption field required. It is important that when laying out the absorption field that it must be located over the soil borings. Should the absorption field be placed on another area of the property, then additional soil borings may be required.

The size of the soil absorption field must be determined by calculating the area of trench bottom required based on the estimated volume of wastewater and the most restrictive soil loading rate of the 24-inch depth of soil below the proposed depth of the trench bottom. In laying out the absorption field, the long axis of each soil absorption field trench must be oriented parallel to the contours of the slope (i.e., lines of equal elevation) (Figure 2.) Areas where the long axis would run up and down the slope or where wastewater movement would converge down slope of the system are not acceptable.

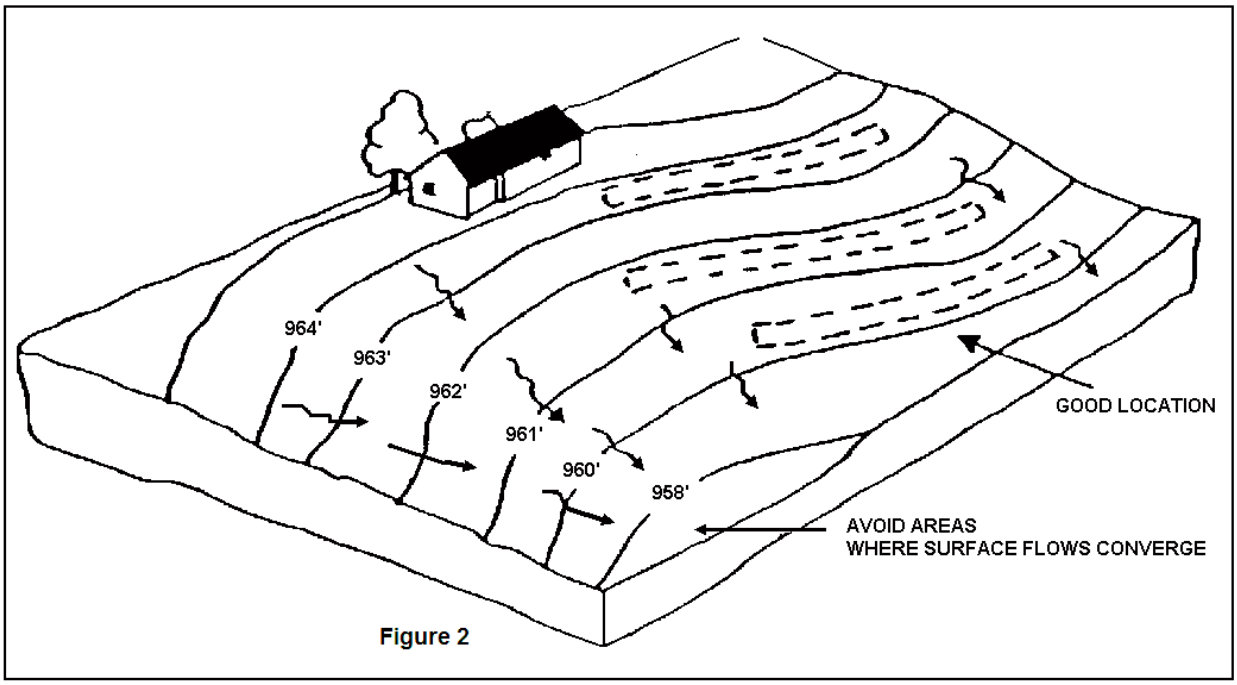

Figure 2

The area for the proposed absorption field and immediately down slope from the absorption field area must be protected from traffic and construction to avoid disturbing the area. Construction and traffic in this area can cause the soil to become compacted and result in failure of the system. It is recommended that this area be fenced (construction fence) off to assure adequate protection.

Step 2

The locations of the septic tank, dosing tank, delivery line, and the center line of all soil absorption field trenches should be laid out and staked (Figure 3). The exact locations of these components are dictated by minimum distance requirements from water supplies, structures, property lines, and bodies of water as outlined by Indiana State Department of Health rules.

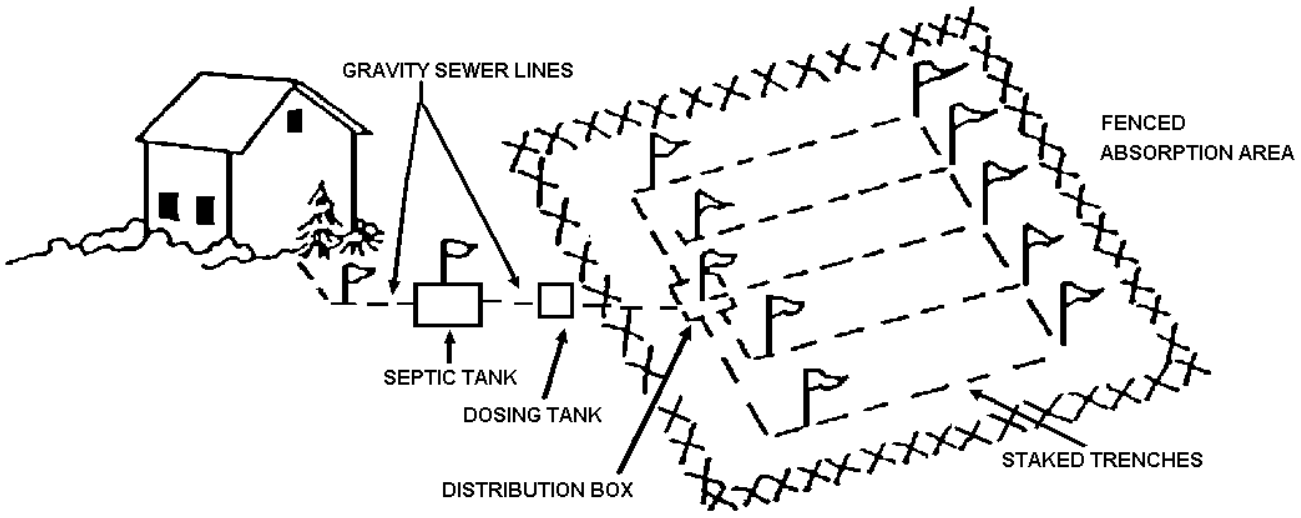

Figure 3

Step 3

The center lines of the absorption field trenches must be staked, so that the trenches are spaced a minimum of 71/2 feet center to center, unless specified otherwise by the health department having jurisdiction. Please note that as the slope increases or the subsoil becomes more impermeable, a greater spacing between trenches may be advisable to keep from overloading the soil around the lower trenches. This is because wastewater entering the soil from upslope trenches will tend to move downhill. In addition, the trenches must not be longer than 100 feet to ensure relatively uniform application of wastewater.

Step 4

The total area required for the soil absorption field plus an additional distance of at least 50 feet down slope should be fenced. This will prevent soil disturbance, scalping, or compaction by vehicular traffic or construction equipment. All traffic should be prohibited from the area before, during, and after installation of the system to prevent damage to the soil structure.

Step 5

If the trenches are constructed in the side of or at the base of a slope, a surface diversion ditch and/or swale upslope of the absorption field must be provided. Perimeter subsurface drains may be necessary to control a shallow water table beneath the field. The subsurface drains around the absorption field must construct as specified by the ISDH (Figure 4) for an outlet that is free flowing and not submerged.

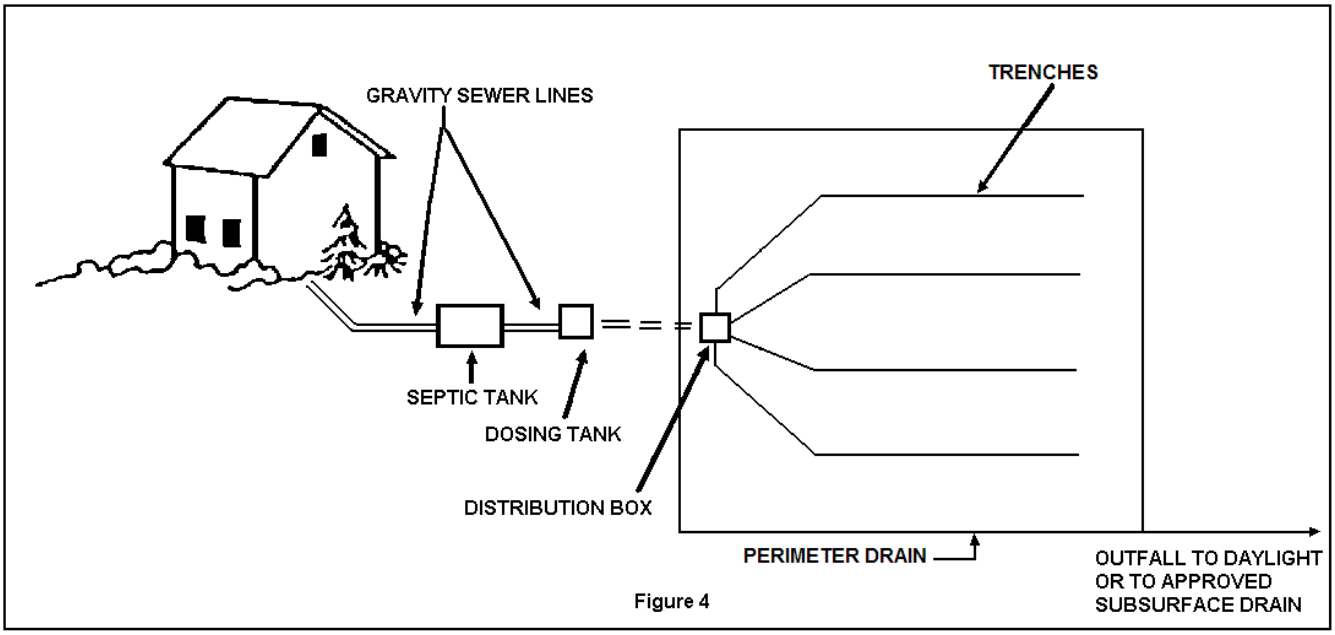

Figure 4

Septic Tank, Dosing Tank and Distribution Box Installation with Perimeter Drain

Step 1

Excavation depths for the gravity system septic tank and distribution box are determined largely by what is necessary to obtain gravity flow in the sewer from the point where it leaves the building. The top of the septic tank should not be installed at a depth greater than 24-inches. A 1.33 percent slope for a 4-inch PVC pipe is required for the building sewer pipe to the septic tank, while a 0.2 percent slope for trench 4-inch or 6-inch PVC pipe is sufficient for the pipe carrying septic effluent to the distribution box. If a dosing tank is located after the septic tank, then the slope of pipe to the distribution box is not critical since the effluent is being pumped to the distribution box. The distribution box must be installed on the high side of the absorption field to allow gravity flow of the effluent to the trenches. The septic tank, dosing tank and distribution box must each be installed level for proper operation. See figure 5 for typical septic tank, dosing tank and distribution box layout.

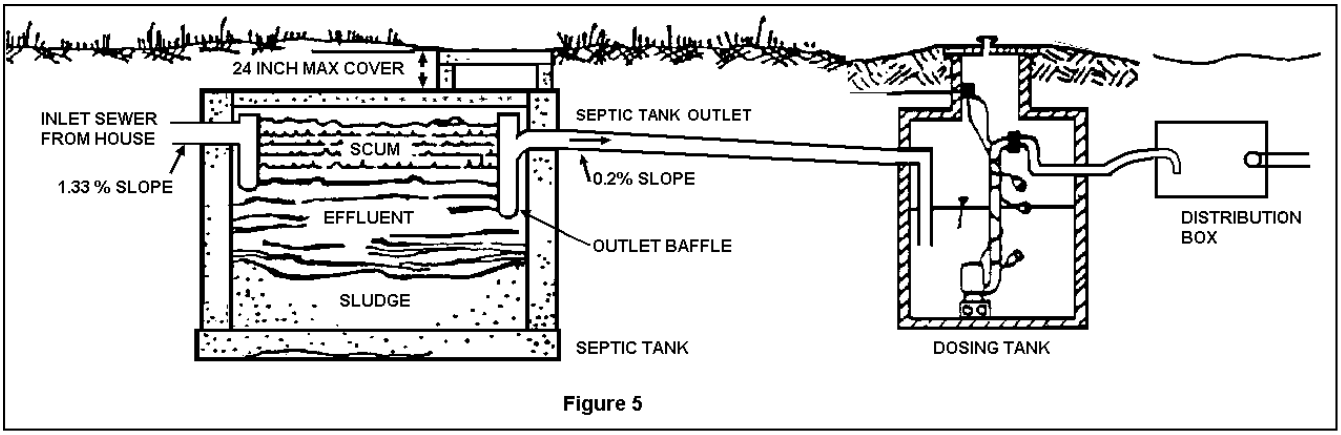

Figure 5

Step 2

Access ports with a diameter of at least 18-inches must be provided to all tanks for future inspection and maintenance. Tank seams and inlet and outlet connections must be sealed with an appropriate material to prevent groundwater seepage and tree

root intrusions. Four-inch minimum diameter PVC sewer pipe (PVC: ASTM-D-2665, 3034 or other ISDH approved piping) with watertight connections between the building and septic tank and between the septic tank and/or dosing tank and the distribution box should be used.

It is recommended that soil backfill be crowned over the tank, dosing tank and distribution box to a height of 6 inches to allow for settling and to divert surface runoff. Footing and roof drains must not be connected to the onsite system.

Trench Excavation

Step 1

The soil must be dry and friable when the trenches are excavated. Smearing and compaction due to construction in a wet soil decrease the soil's ability to absorb wastewater. If a sample of the soil at the trench bottom depth forms a ribbon (e.g. 1/8-inch diameter) when rolled between the palms of the hands, the soil is too wet to excavate. If the soil crumbles into its natural structure, excavation may proceed (Figure 6). This pre-excavation examination is essential to help ensure proper operation of the system.

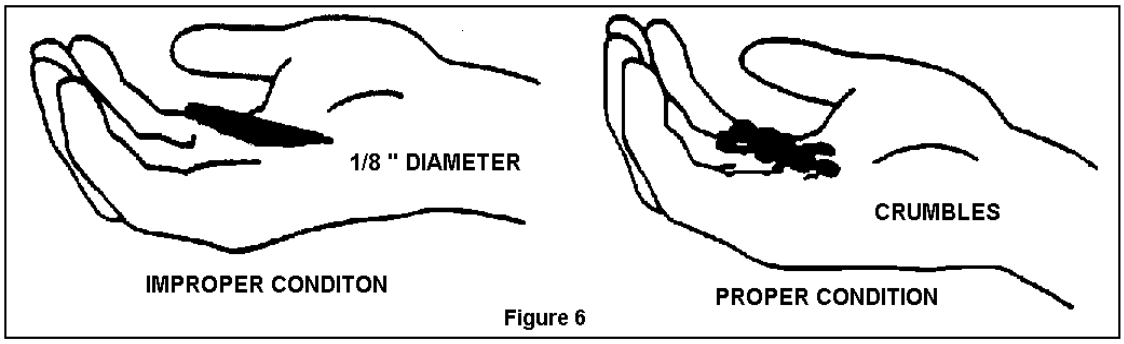

Figure 6

Step 2

The absorption field trenches must be excavated to the design depth and width in accordance with the approved plans. The bottom elevation should be checked with an engineer's level to ensure that the trench bottoms are level over the length and width of each trench and no deeper than specified below the existing surface. After most of the soil is removed, an excavating bucket with teeth should be used to rake each trench bottom to its final bottom elevation (Figure 7).

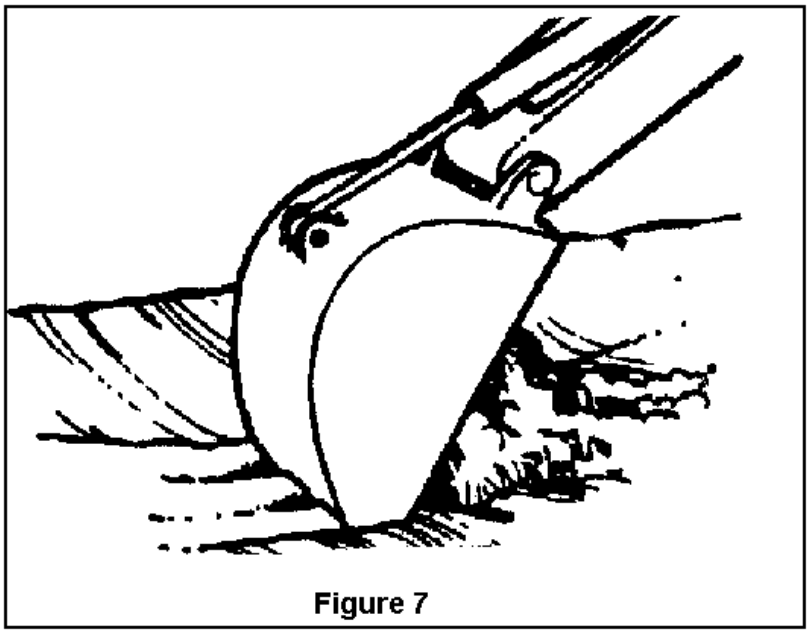
Figure 7

The sides of the absorption field trenches should also be raked to a depth of 1-inch to expose the natural soil structure and to remove any smeared and compacted soil surface caused by the excavating bucket. This can be done by attaching fabricated raker teeth to each side of the bucket (Figure 8). Foot-traffic on the excavated trench bottom should be minimized to prevent further compaction. If foot traffic is necessary, planks should be used to spread out the worker's weight. The trenches must be connected individually to the distribution box by non-perforated pipe in a header or manifold trench with the soil compacted around the non-perforated pipe to prevent movement of effluent between trenches. Distal ends of the trenches may be tied together on level sites but not on sloping sites.

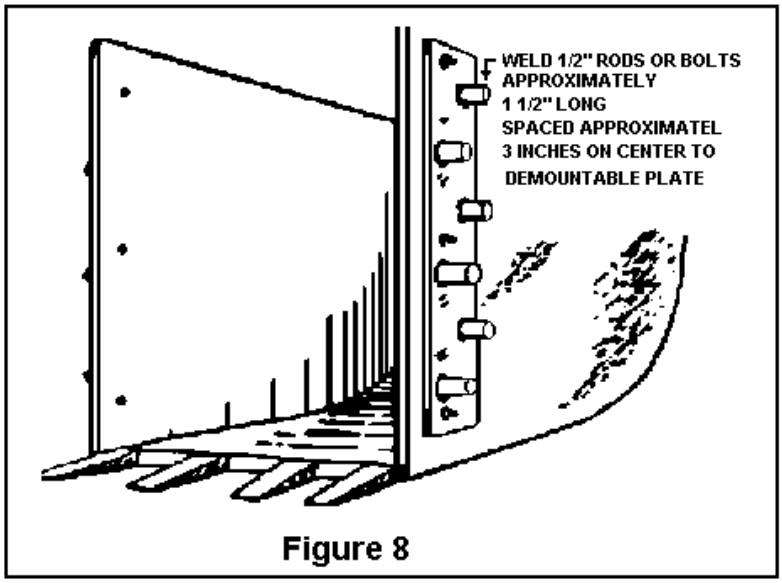

Figure 8

Step 3

Monitoring wells should be installed to permit evaluation of the performance of the absorption field once it is in operation. These wells are usually 4-inch diameter PVC pipe. Each monitoring pipe is perforated with 1/2-inch holes over the lower 6-inch length with the bottom of the pipe open. The well should extend from the trench bottom to the ground surface and be covered with a friction-fit cap or screw cap. A monitoring well should be located in each trench (Figure 9). This will provide a means of evaluating the depth of ponding in a trench, a measure of the system's performance.

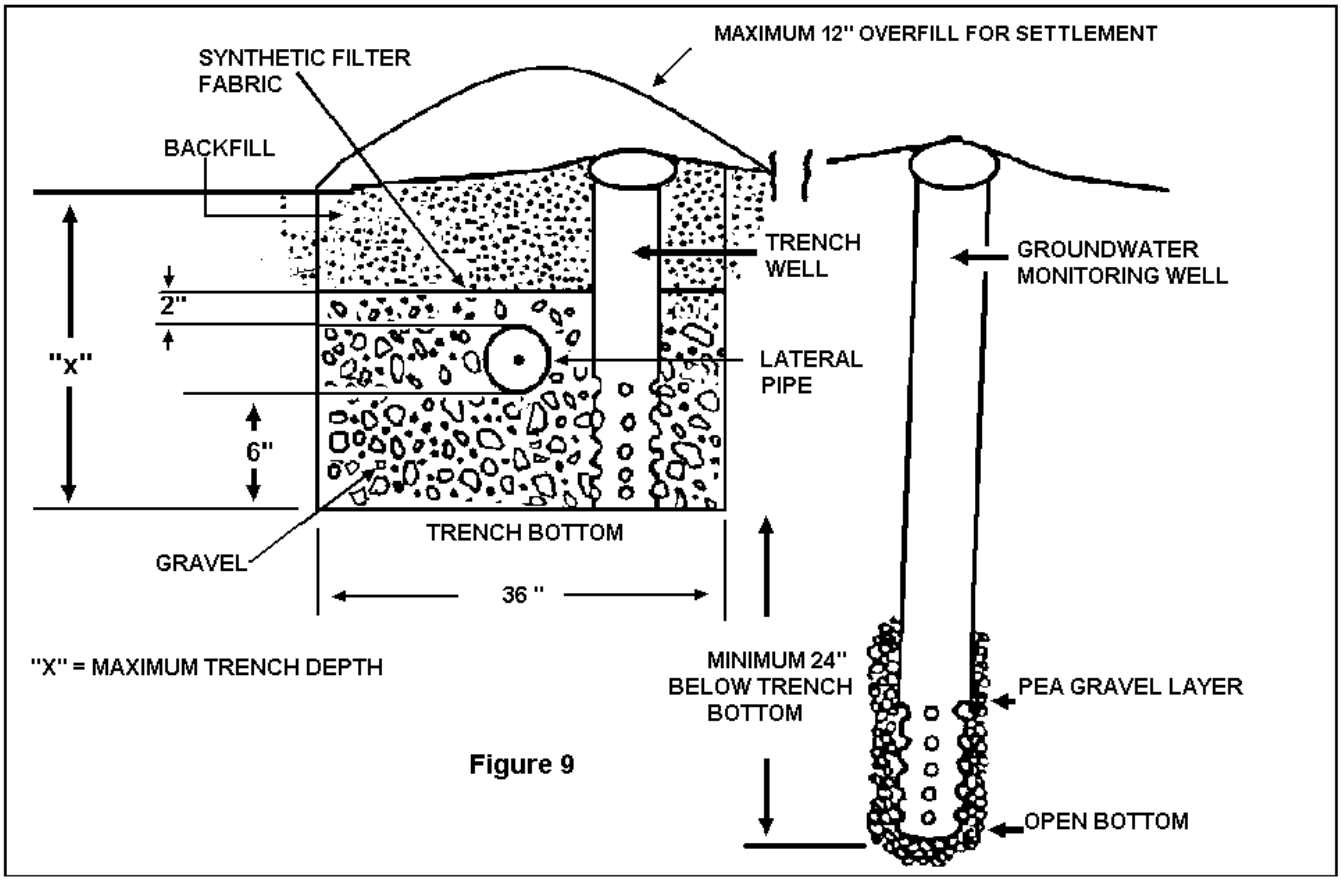

Figure 9

Installation of Distribution Laterals

Step 1

Cleaned aggregate (half-inch to two and half-inch) washed to remove clay, sand, fines and dust or other media approved by the Indiana State Department of Health should be carefully placed to a depth of 6 inches over the bottom of the trenches and the aggregate should be leveled. If tree stumps or root balls must be removed, the resultant excavation is not to exceed the width or depth of the trench design.

Step 2

A 4-inch diameter perforated distribution pipe approved by ISDH shall be laid level on top of the six inches of washed aggregate in the bottom of the trench. Each lateral pipe for the absorption field on a sloping or level site must be individually connected to a leveled distribution box by a non-perforated header pipe at the same invert elevation to ensure equal distribution to all the trenches. During the assembly of the piping in the trenches, it is important to ensure that the pipe is installed with the perforations as shown in Figure 10.

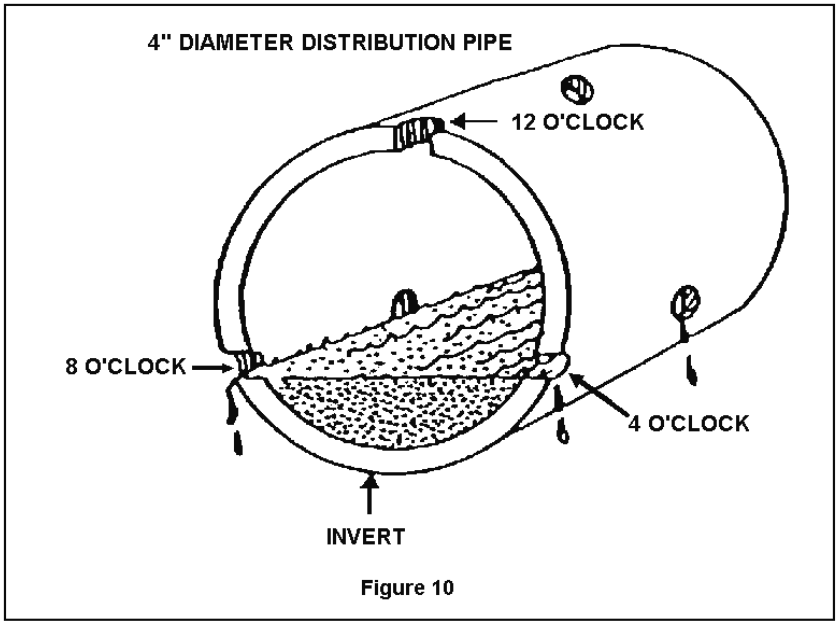

Figure 10

Backfilling the Trenches

Step 1

The distribution laterals should be carefully covered with additional washed aggregate to a depth of at least 2-inches above the crown of the pipe.

Step 2

A backfill barrier (synthetic fabric of non-biodegradable material) must be placed over the aggregate cover.

Step 3

The trenches should be backfilled with excavated soil and compact slightly. The soil should be mounded 12 inches over the top of the trench to allow for settlement. Individual trenches can be excavated and completed in sequence for ease of construction.

Step 4

The construction area should be sodded or seeded immediately, using grasses adapted to the area. The seed area must be covered by straw or other cover to prevent erosion.

Maintaining the System

To maximize the uptake of water, good grass or vegetative cover should be maintained over the area. The owner of the system should maintain a layout diagram of the onsite system, referenced to the building and lot boundaries. This will facilitate location of the tanks and absorption field for future maintenance.

Sludge should be removed from the septic tank every 3 - 5 years. This clean-out schedule is important to prevent carryover of solids which can plug the absorption field trenches. Owners should monitor the performance of the onsite system by routinely checking the depth of water in the monitoring wells during spring, summer, and fall. Any progressive increase in ponding depth within the trenches over time may be indicative of future problems.

Water conservation measures in commercial buildings or residences will help to ensure that the soil absorption field will not be overloaded. It would be wise to install faucet aerators and low-flow fixtures and appliances.