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HENV-8-W

Home & Environment

Gravel and Gravelless Trench Soil Absorption Fields

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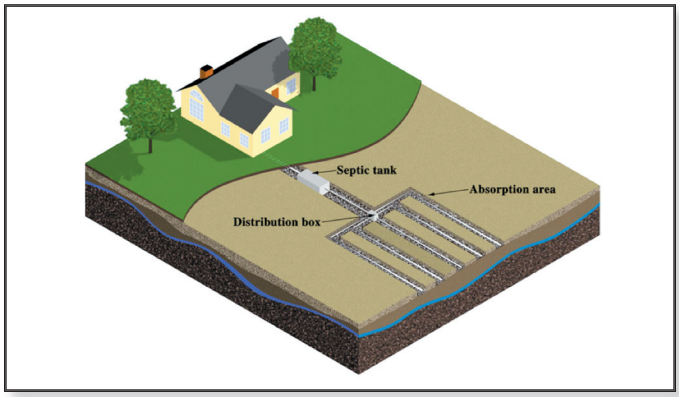
EXPERT REVIEWED

All septic systems in Indiana must discharge wastewater effluent into the soil for treatment. Where soil and site conditions permit, many Indiana homeowners use conventional trench septic systems because of their affordability, reliability, and low maintenance. In a conventional trench septic system, sewage is first treated in a septic tank where solids and floating material separate and collect, leaving a clarified zone of wastewater effluent. Wastewater effluent exits the septic tank by gravity and is distributed through pipes to the soil absorption field (Figure 1). Typically, the soil absorption field consists of several trenches installed along the contour of the land, spaced no less than seven feet apart as measured from the center of one trench to the center of the next. Each trench is no more than 100 feet long and contains a four-inch diameter perforated pipe surrounded by gravel.



Sharon Katz, Purdue Agricultural Communication

Figure 1. *A conventional septic system with a septic tank and gravel trench soil absorption field.*

In recent years, gravel trench substitutes have become available and some are now approved in Indiana under the experimental systems section of the state septic systems regulation. In Indiana, the first experimental soil absorption field technology was approved in 1988, but most of these experimental technologies have been approved only since the late 1990s. As a result, the performance record of these systems in Indiana is not as extensive as for conventional gravel absorption fields; for example, their expected useful life remains undetermined. Questions about these systems, such as their ability to handle Indiana's freeze and thaw cycles, can only be answered by observing them over time.

The purpose of this publication is to describe the different types of soil absorption field components — both traditional and experimental — that can be used in conventional trench septic systems under regulations of the Indiana State Department of Health (ISDH).

Gravel Trenches

Gravel trenches are the most common type of soil absorption field in Indiana and the United States. A typical gravel trench soil absorption field is made up of a 36-inch wide trench containing 10 to 12 inches of gravel and is installed 12 to 36 inches deep from the original ground surface. The gravel in each trench holds a perforated distribution pipe in place for distribution of wastewater effluent throughout the trench. The pore space between the gravel rocks allows wastewater effluent to move through the trench into the soil (Figure 2).

The advantages of gravel include its long track record of working well in a soil absorption field trench, its ability to withstand heavy loads without deforming, and its low cost and ready availability in many areas.

The disadvantages are its weight, bulk, and the heavy equipment required for installation. Furthermore, if soil conditions are not favorable when the soil absorption field is installed, the heavy equipment used to move and place gravel can increase soil compaction around a soil absorption field, greatly reducing the field's performance. In addition, problems associated with gravel sorting can introduce fine particles into the trenches that can clog soil pores.

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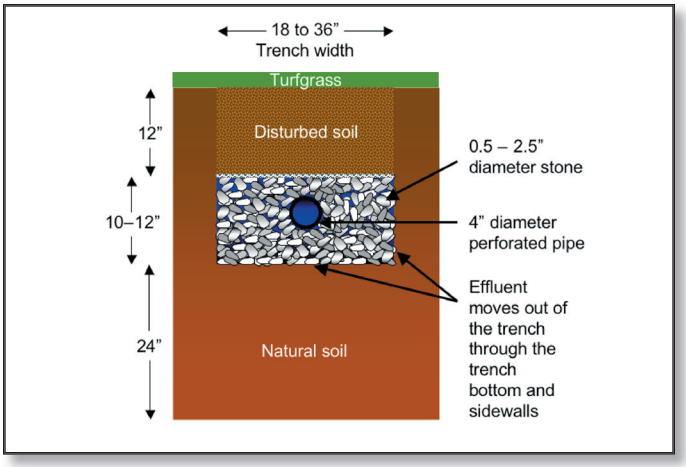

Figure 2. *Cross-section of a conventional gravel trench. This trench is the most common type found in Indiana septic systems.*

Chamber Trenches

Typical chamber trenches are plastic domes that come in interlocking segments that are 48 to 60 inches long, 18 to 36 inches wide, and about 10 inches high. The domes are solid plastic on top with slotted sides and are placed at the bottom of an excavated trench and covered with soil (Figure 3). Wastewater effluent enters one end of the trench and flows over the soil surface, percolating into the soil through the trench bottom and the slotted chamber sidewalls.

The advantages of chambers include their light weight, stackability for easier transport to the site, lack of dust and fine particles associated with gravel, and ease of installation. The rigid interlocking framework of chamber segments requires flexible connector segments to allow installation along the natural contours of sloping sites.

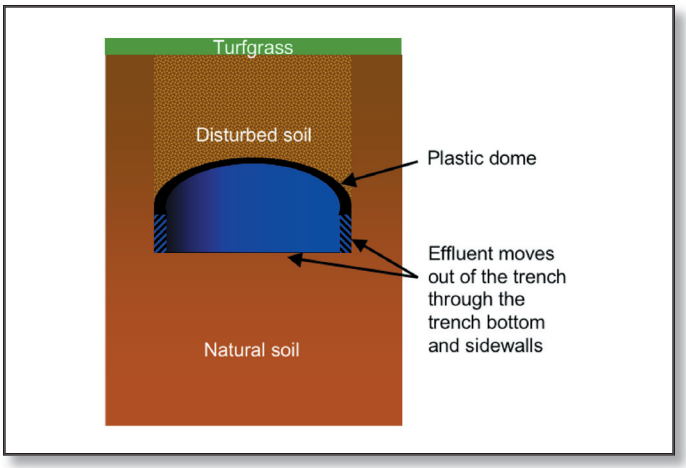

Figure 3. *Cross-section of chamber trench.*

The primary disadvantage compared to gravel trenches is their higher cost, although the added cost is somewhat offset by savings in installation. To offset the higher cost of chamber trenches, manufacturers have petitioned states to allow them to reduce the area required for soil absorption fields, arguing that chamber trenches allow for more efficient absorption of effluent by the soil. However, the ISDH has stated that manufacturers have not yet demonstrated this assertion; therefore any chamber soil absorption field that uses a downsize credit, must have a full size set-aside area available should the system fail and need to be replaced.

Polystyrene Trenches

Polystyrene (foam) trenches work similarly to conventional gravel trenches, but without the weight of rock. Instead of gravel, small foam "packing peanuts" held in place by a nylon mesh are placed around distribution pipes. The finished diameter of each foam bundle is 12 inches and can be manufactured in almost any length. Three of these foam bundles are placed side-by-side on the bottom of a 36-inch wide trench with the middle bundle containing the distribution pipe inserted along its entire length to carry wastewater effluent (Figure 4).

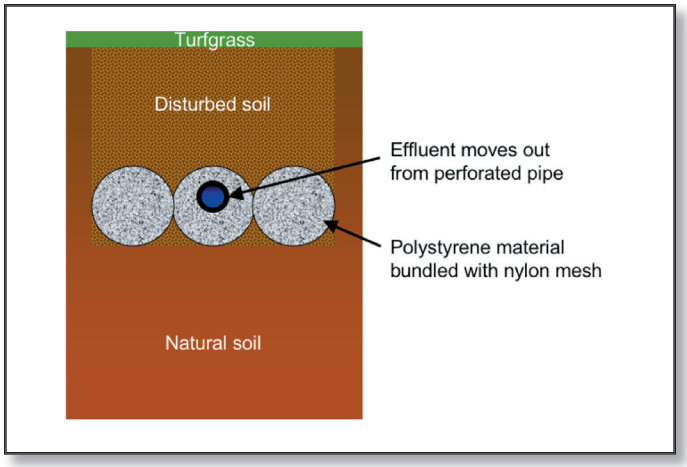

Figure 4. *Cross-section of polystyrene trench.*

The advantages of polystyrene over gravel include its reduced weight, flexible framework, a surface area that's greater than gravel, lack of dust and fine particles (compared with gravel), and ease of installation.

A disadvantage of this system is its cost relative to gravel, although the added cost may be somewhat offset by savings in installation.

Multiple Pipe Trenches

Multiple pipe trenches work similarly to chamber trenches but without a completely exposed trench bottom (Figure 5).

The advantages of multiple pipe trenches include their light weight, lack of dust and fine particles associated with gravel, and ease of installation.

A disadvantage is cost, although the added cost is somewhat offset by savings in installation.

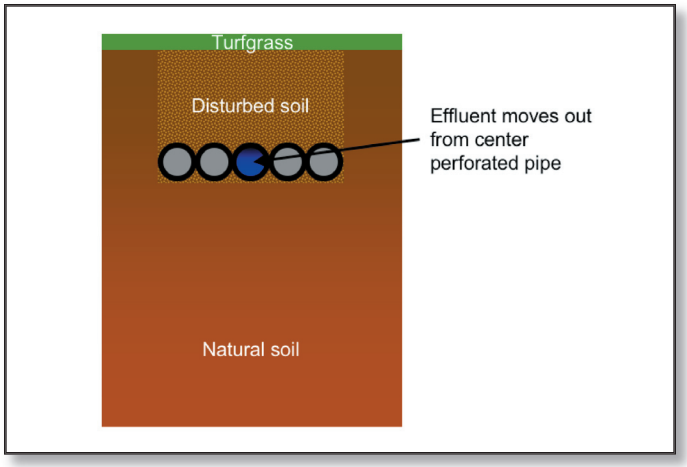

Figure 5. *Cross-section of multiple pipe trench.*

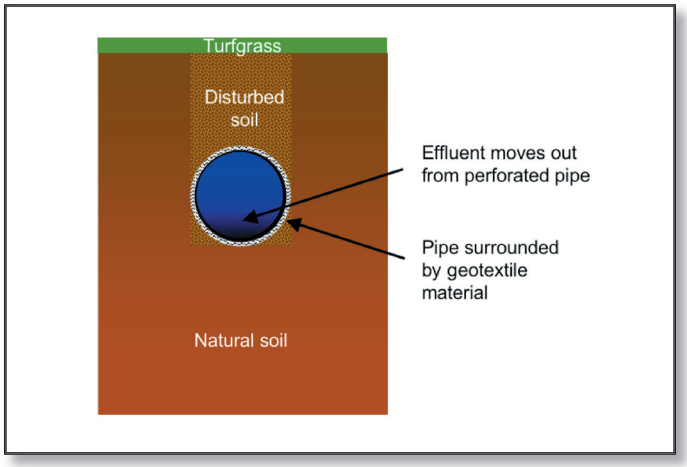

Figure 6. *Cross-section of geotextile wrapped pipe trench.*

Geotextile-Wrapped Pipe Trenches

This trench system includes an 8- or 10-inch diameter corrugated pipe with perforations wrapped with a geotextile fabric. The wrapped pipe is installed in a narrow trench and backfilled with native soil material (Figure 6). The geotextile fabric allows wastewater to move into the soil without soil clogging the pipe.

The advantages of geotextile wrapped pipe trenches include their light weight, lack of dust and fine particles associated with gravel, and ease of installation.

A disadvantage is cost, although the added cost may be somewhat offset by savings in installation.

Summary

There are a number of alternatives to using gravel in soil absorption field trenches. While they offer significant advantages in terms of simplified installation, convenience, and protection of the site from compaction compared to conventional gravel trenches, most of these technologies are more expensive (costing 30-100 percent more than gravel trenches) and relatively new to Indiana, with little solid information about how they are likely to perform over time. More time and experience with these alternative systems will be required before we can adequately assess their true cost and benefits.

For additional information contact the Indiana State Department of Health, 2 North Meridian Street (5E), Indianapolis, IN 46204, or visit the ISDH web site at http://www.in.gov/isdh/regsvcs/saneng/.

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