SepticSmart!

New Ideas for Household Septic Systems on Difficult Sites

Almost all rural residents in single-family homes depend upon on-site septic systems to treat household sewage. The traditional septic system that is used across Ontario has three main components: septic tank (or other treatment unit), distribution system, and leaching bed.

The "conventional" leaching bed design relies on perforated pipes laid in stone-filled trenches 0.5 metres wide with a 0.9 metre depth in unsaturated soil. The surrounding soil provides a suitable filter to cleanse the septic effluent. The second most common design is the "raised bed." This option involves importing appropriate soil onto the site to create a leaching bed which is high enough above the water table or bedrock to provide sufficient filtering for the effluent.

With proper and regular maintenance, traditional septic system designs can perform very well in a variety of soil types and site situations. However, investigators currently estimate that 30 per cent of the estimated one million household septic systems in Ontario, are failing to adequately protect the environment.

A New Homeowner's Guide to Septic Systems is a recent publication available free of charge from the Ontario New Home Warranty Program. It is an excellent resource for all rural home owners. The booklet explains the design and operation of conventional systems, reviews licensing, approvals and inspection under the *Ontario Building Code* (OBC) and provides tips on regular maintenance. It is recommended reading to anyone seriously considering a new or replacement system — whether it is a traditional design, or one of the alternative designs presented in this booklet.

There will be situations that due to difficult soil conditions, a shallow water table, shallow soil depth to bedrock, remote areas, or small lots, where traditional septic designs are not suitable or have failed. A failed system can present major inconvenience and pose a serious health threat.

More and more companies are offering new ideas to improve or replace the conventional septic system design.

The options presented in this booklet are categorized as:

- Improving Performance of Existing Systems, and
- New Design Ideas.

The alternative septic system designs described here are for household systems generating less than 10,000 litres per day of effluent. **Each can be accepted as "equivalent" systems at the discretion of the Chief Building Official for your municipality, if they are satisfied that the level of performance conforms to the requirements of the *Ontario Building Code*. Proper approvals must be acquired prior to installation.**

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ONTARIO FARM ENVIRONMENTAL COALITION

AGRICULTURAL ADAPTATION COUNCIL

Agriculture and Agri-Food Canada

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Ontario Soil and Crop Improvement Association

Mention of trade names and individual companies in this booklet are not intended as endorsements; nor is criticism intended towards products or systems not identified. The contributing writers focused on the presentation of systems they were familiar with, and had already been successfully used for Ontario households.

Several factors will guide your decision regarding septic system design, including: the physical features of the site, practicality, level of performance, cost, maintenance, availability, and personal preference.

clay back-fill

Failure of this system was due to the use of clay as the back-fill material over the geotextile.

Problem Identification
Symptoms of a Failed Septic System

- **drains slow down**
- **toilets back up**
- **sewage smell**
- **grass over system is unusually green or spongy**
- **bacteria or nitrate contamination showing up in drinking water tests**
- **surface ponding of effluent**

Consequences of a Failed Septic System

- **backing up into the home and/or breaking out and pooling on the ground surface**
- **contamination of surface water and ground water supplies with nitrates, pathogens, viruses and phosphates**

Inappropriate design, bad construction practices, or poor maintenance can all lead to system failure. Failure of this exposed system was due to the use of clay as the back-fill material over the geotextile covering the leaching bed tiles. The clay back-fill prohibited oxygen from the atmosphere from reaching the tile bed. The resulting lack of aerobic microbial activity accelerated the formation of a restrictive "biomat" or slime layer.

The failed system exposed.

Improving the Performance of Existing Systems

Sand and Wood Chip Filters

Description: Sand and wood chip filters act as an intermediate step to improve effluent quality prior to disposal into a conventional leaching bed, constructed wetland or other treatment system.

Intended Use:

- Environmentally sensitive areas where a higher level of wastewater treatment is required.
- To prolong the life of the leaching bed in impermeable soils.

Details:

Sand Filter: The overall sand filter dimensions range from 3 m to 6 m square. Typically, the distribution tile is installed within a 20 cm layer of 19 mm washed and crushed stone, underlain with 60 cm layer of sand, over a 8 cm layer of pea gravel, over a 20 cm base layer of crushed stone. The entire filter is typically below ground level, and is contained within plastic PVC. Effluent from the septic tank is dosed onto the filter and collected at the bottom through a single perforated pipe, where it is then pumped to the final disposal system. The entire system is located beneath at least 25 cm of topsoil, separated with a geotextile (see diagram).

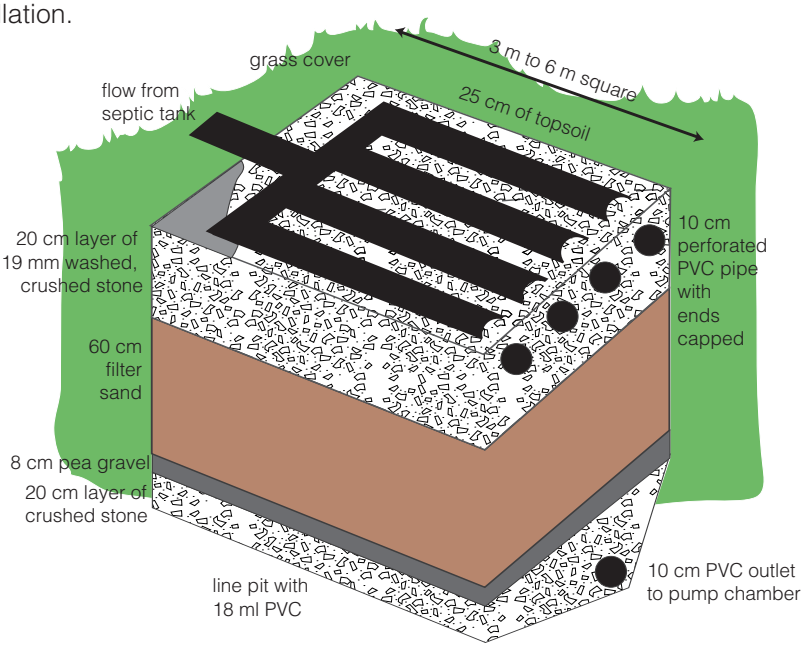
Wood Chip Filter: The filter is similar to the sand filter except the sand component is replaced with wood chips.

Estimated Cost: Adding a sand or wood chip filter can double the cost of a typical septic system. Where a site limitation is involved (e.g., bedrock) the cost is the same. The conventional leaching bed typically costs $23 – $33 per metre of trench, including materials and installation.

Commercial Systems

There are patented intermittent sand filter systems that are allowed through the OBC. They typically rely on a more sophisticated effluent distribution system that is pressurized. Primary treatment is achieved in the septic tank. The sand filter provides for further decomposition. Approved suppliers are:

- Sand Filtration Inc.,
  Kitchener, Ontario.
  Tel: (519) 743-1780
- OSI Onsite Sewage Inc.,
  Kitchener, Ontario.
  Tel: (519) 578-0969



Effluent Filters

An effluent filter installed at the outlet of the septic tank, dramatically improves the quality of effluent being discharged to the leaching bed, effectively extending its life. The addition of an effluent filter to all systems is strongly recommended.

Description: Sewage enters the first chamber of the septic tank through an inlet baffle or tee. Most of the larger particles settle out and the effluent enters the second chamber. The second chamber (much smaller than the first) further enhances the settling process. If flows are heavy at times, solids can pass through both compartments and enter the leaching bed. The effluent filter minimizes this. Effluent filters have two main purposes:

- Assist in the settling of both large and small particles, and
- Help slow down flow to further enhance particle settling before damage is done to the leaching bed.

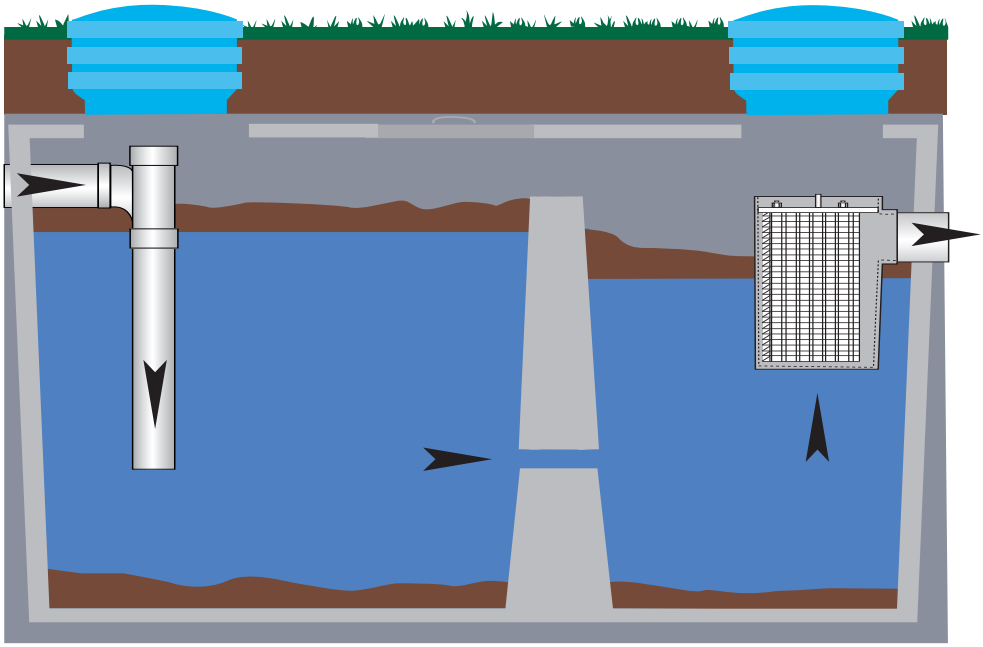
Intended Use:
- Improves effluent quality.
- Extends leaching bed life.

Details:
- Can be used in any septic tank.
- May be installed in a new system, or retrofitted into an existing tank.
- Corrosion proof construction.
- Relatively simple installation.
- Simple maintenance.
- Filters can be equipped with an alarm to warn that filter needs cleaning.
- Custom and standard sizes available from many manufacturers.

Estimated Cost: Generally $300 (plus installation).

Source: Available through most licenced suppliers and tank manufacturers.

A two-compartment tank with an effluent filter.



Aerobic Treatment Units

Description: Aerobic treatment units can be installed either ahead of, or after the septic tank. By pumping air into the sewage, aerobic microbes can improve effluent quality and may offer some relief to the leaching bed.

There are several different designs on the market. Each may have unique features. A typical design involves a single, precast concrete tank divided into four compartments. The first two are: an anaerobic pretreatment chamber, and an aerobic chamber. The final two are clarification chambers that further filter the wastewater, with options for disinfection and chlorination. Wastewater flows from one chamber to the next, with oxygen being added and the solids forced to settle out. A mechanical pump is required for aeration.

Aeration blower on an aerobic unit.

Intended Use:

- Prolongs the life of the leaching bed.
- May be installed in a new system, or existing system.

Details: Air is stirred or bubbled into the wastes, breaking down the material, resulting in a reasonably clear liquid and sludge. The liquid is discharged to the leaching bed. The sludge must be periodically pumped from the tank.

Estimated Cost: Typically up to $10,000.

A typical aerobic treatment unit alongside the septic tank.

Sources:

- Canadian Biocycle Ltd., British Columbia.
  Tel: (250) 558-5566
- Clearstream Sewage Treatment Systems
  c/o Northern Purification Systems, Ontario.
  Tel: (905) 729-3212
- C&M Environmental Technologies, Ontario.
  Tel: (905) 850-3904
- CMS Rotordisk Inc., Ontario.
  Tel: (416) 447-4964
- Klargester Rotopack, Ontario.
  Tel: (905) 850-7234
- Nayadic, Inc., Pennsylvania.
  Tel: (570) 784-1653
- Northern Purification Systems, Ontario.
  Tel: (905) 729-3212
- Norweco Equipment Company, Ohio.
  Tel: (419) 668-4471
- Whitewater Sewage Treatment Systems,
  British Columbia.
  Tel: (604) 596-0608
- Similar designs may also be available through local concrete septic tank suppliers.

(For further information refer to SG-5, 1997 *Ontario Building Code*.)

Leaching Bed Remediation

A patented system used to rejuvenate leaching beds without costly excavation.

Description: Terralift uses a long, narrow probe and built-in pneumatic hammer to penetrate the soil or fill. Compressed air is injected to fracture the soil. Dry polystyrene pellets are injected into the cracks created, in order to maintain the passages for the percolation of liquids away from the leaching trenches. This process is best suited to soils that allow cracks (i.e., heavy clays).

Intended Use:
- To prolong the life of an existing leaching bed.

Details:
- The cracks created by the compressed air can extend to depths of 90 cm.
- The system causes no damage to lawns.
- A site evaluation by a licensed sewage installer with experience using the Terralift system is required.

Estimated Cost: $3,500 for a three-year guaranteed system.

Source:
Terralift, Inc. Stockbridge, Massachusetts.
Tel: (413) 298-4272

Photo: Terralift Inc.

Where To Go For Approvals

The Ontario Building Code **(OBC) regulates design, construction, operation and maintenance of on-site septic systems for most single-family homes. In most areas, the local municipality's Building Department examines plans, issues permits, and does inspections for systems regulated under the OBC. In some areas, this approval responsibility has been delegated to local Conservation Authorities or Health Units. The Municipal Building Department will be able to redirect inquiries.**

Proper approvals under the OBC must be obtained by the homeowner before installing any of the suggestions for improving system performance, or the new design ideas presented in this booklet.

Ask To See The License

Anyone in the business of installing, repairing, emptying, cleaning or servicing septic systems must be licensed by the Ontario Ministry of Municipal Affairs and Housing. Licensed installers must have qualified personnel supervising all projects. Pumpers are licensed in Ontario by the Ministry of the Environment.