ONSITE
WASTEWATER NEWS
ONTARIO ON-SITE WASTEWATER ASSOCIATION NEWSLETTER

## InSide


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Mailing address:
P.O. Box 599,
5524 Dickinson Street,
Manotick, Ontario
K4M 1A5

**Technical Review**
Terry K. Davidson

**Editor**
Jocelyn Chandler
LandOwner Resource Centre

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# Annual On-Site Wastewater Conference and Exhibition

Submitted by Angela Mason and Doug Joy

The 4th Annual On-Site Wastewater Conference and Exhibition went off in March with tremendous success. This conference brought over 250 on-site experts from as far away as Texas, USA. It was more than just numbers that made the conference such a success — the message that "on-site solutions begin at home" came through loud and clear.

Keynote speakers gave engaging and lively presentations which stressed the important challenges facing our industry including the future of septage disposal, value of education, and policy making. Dennis Dick of OASIS filled in at the last minute and gave an insightful talk on the challenges facing the septage industry. As you probably know, land application of untreated septage will be banned as of 2007 and this presents a significant hurdle for the industry. Bruce Lesikar from Texas A&M gave a lively talk on the on-site industry in Texas. One eye opening statistic shared with us was the fact that 50% of all on-site systems installed in Texas are advanced treatment units. Jim Bradley, the former Ontario Minister of the Environment rounded out the keynote speakers. His perspective on environmental issues and in particular water quality after some 20 years in elective office was convincing that the on-site industry is seen as a key player in protecting Ontario's resources. Overall these talks inspired discussion and thought on the issues which will shape our industry's future.

Presentations from leading designers, engineers and researchers gave us the opportunity to hear about new technologies, applications and initiatives which are currently underway that will ultimately provide improved performance and innovative solutions for on-site systems. We were also reminded of the importance of proper management for on-site systems.

*Conference attendees listening to presentations from a variety of industry representatives. There are many more photos from the conference on the oowa.org website. More pictures will be published next issue.*

While there were many highlights, we would especially like to mention the "A to Z of On-Site" sessions which covered topics from wastewater chemistry to advanced system design. These sessions drew a larger than anticipated turnout of designers, installers and other professionals which brings to light that no matter how long you have been involved in this industry there is always a need to continue learning.

Once again, the exhibition area was an excellent venue for showcasing new technologies, establishing new contacts and renewing existing ones. The 2003 conference brought a larger number of exhibitors than in any previous year, proving that the on-site industry is thriving in Ontario.

While the 4th annual conference is now behind us, planning for the 2004 conference is underway. Next year's conference promises to be full of information and contacts important to those involved in the on-site business. Thanks to the many people that worked together to make this conference such a success.

# Letter to the Editor

(this article has been slightly edited from the submitted version for length requirements-my apologies, Ed.)

Dear Editor,

I am writing to you about our industry's lack of concern over what, in my opinion could be the downfall of "state-of-the-art" sewage systems. The on-site industry in Ontario has been deluged with a wide variety of new technologies for sewage treatment, and to a lesser degree, effluent disposal. These technologies have been a boon to our industry which has lived in the ancient world of the conventional septic system for far too long. However. it is my opinion that the vast majority of designers, engineers, installers, haulers and inspectors have not fully grasped the magnitude of an insidious problem. This is the fact that millions of tons of sand that we use everyday in our sewage systems is impermeable.

A few years ago at the Ontario On-site Wastewater Conference I presented a paper entitled "The Impermeability of Sand." For the readers who listened to this talk I will not re-iterate the paper here. However, for those readers who did not attend the conference shame on you and I will summarize the paper. In essence I designed a sewage system which would service a golf course clubhouse with a tertiary treatment unit (Whitewater Unit) and discharge the effluent into a leaching bed comprised of shallow buried trenches.Due to the soil conditions the leaching bed had to be fully raised. It considered of 160 m of trench in 4 independent cells in 1.2 m of sand having a T-time of 6-10 mins/cm (verified at 2 independent laboratories). Fairly standard. Effluent treatment was as expected and sewage loadings were less than anticipated. Within 24 hours of start up effluent was discharging onto the ground surface. A detailed inspection of the system involved excavation of the chambers. We observed that water ponded in each of the trenches to a depth of approximately 10 cm (4 inches). Effluent discharged out of the top of the bed at the cleanouts and not out of the side of the leaching bed. Excavation into the sand revealed that the sand was dry. We also observed that holes augured next to the trench remained dry while the trench had 10 cm of liquid in it. A standard percolation test, as described in the supplementary guidelines to the Building Code, was performed at 5 locations throughout the leaching bed. Each hole was abandoned after 400 minutes with no drop in water level.

The sand supplier maintained that there was no problem with the sand and that they had delivered the material requested. They stated that they had sold this material for over 20 years under the pit name of "septic sand." Why then did the percolation tests reveal that the true percolation time was in excess of 400 minutes? It must be noted here that the typical grain size distribution curves obtained from laboratories as standard industry practice do not provide us with a percolation time. The estimate provided with these is just "an estimate." It is based not on the properties of the soil material but rather on the experience and judgement of the person analysing the sample (who may have never seen a septic system let alone design one). As an industry we have come to depend on these numbers as accurate. This may be our failing in the future if we do not improve our understanding of what these curves mean and what information can be obtained from them.

Many people in the audience questioned me afterwards why I would give a presentation on a system which failed. My reason is to get the information out to others so that we as an industry can develop the respect that other professionals have and to save our clients and ourselves time and money. Since giving my presentation I have been deluged with sand samples from designers, installers and homeowners from across the province. Each person has had the same problem — failure in a very short period of time for no logical reason. By that I mean that the water use is usually below the level of expected use, all components operate normally and at or better than expected with one exception. The liquid just won't get out of the leaching bed. Based on the calls I have received I have now solidified my position that every technology available today has had, or is having, or iif not careful will have a failure due to the impermeable sand phenomena.

Okay, so what is this phenomenon that has me so perplexed and worried. Simply put water will not move through the sand and down into the native soil. As a result is backs up into the system and breaks out at the weakest point. This is usually the leaching bed. We are not talking about very fine sands but coarse grained T less than 10 or lower sands. In fact the sand samples that we have examined to date are in excess of 85 sand and many have had percolation times reported as less than 6 mins/cm. Which we would normally have said

*continued on page 12*

## COMPONENT FOCUS

# RISERS

*(Graphics and photo for this column were provided by Linda Carter of Zoeller Pump Co.)*

For the most part, risers are not standard equipment on septic tanks or treatment units . . . yet. Risers provide surface access to underground tanks by maintaining a open path to the hatch that is buried below ground. This is important to allow the tanks to be monitored and for good system maintenance, such as periodic cleaning of effluent filters and tank pump outs. Risers are manufactured by a broad group of companies, most of whom distribute other septic products and equipment. They are made of concrete, fiberglass and plastics and have some method of sealing to the tank they are mounted on. Usually this uses tar or a similar adhesive and some care on the part of the installer. Once the tank is placed in the ground, the required height of the riser can be determined. The lid of the riser should either sit at, above or within 8 inches of ground level. Risers come in different sizes or can be cut onsite. The body of the riser is centered over the hatches of the tank and sealed according to the manufacture's specifications. Risers can be adapted to new and existing systems. Many of the lids have locking mechanisms to keep people and critters out. The *Ontario Building Code* does not yet require risers on all tanks, however systems like Ecoflo, which have an effluent filter in the septic tank as an integral part of the system must have a riser to ensure access for filter maintenance.

*8 in. septic tank riser*

*24 in./30 in. septic tank riser*

*concrete septic tank with one riser installed.*


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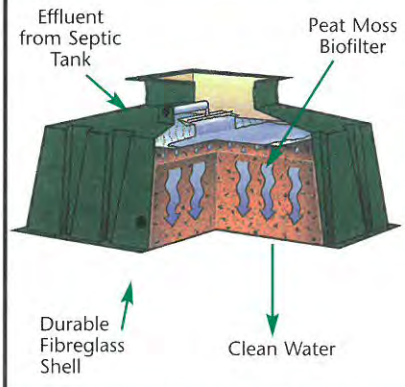


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# It's a Beautiful Thing: the science behind the sewage treatment process.

This article is reprinted from the Summer 2001 issue of *Zabel Zone*, published by Zabel Industries International. Zabel has kindly given us permission to share it with you.

The septic tank is a beautiful thing! It is simple in design but complex in its functions. We generally assume that its primary purpose is to remove settleable and floating solids from wastewater to protect the infiltration system from clogging due to settleable solids, greases, and oils. But it does much more than this! It also stores the wastewater solids it removes from the wastewater stream and "digests" the stored solids to stabilize them (reduce them to non-degradable compounds) and reduce their volume. The digestion process is very important to the septic tank's role in protecting the soil from clogging and something that should be better understood.

"Septic" means to make putrid. We have all smelled a septic tank. The odor is far more objectionable than that from a municipal wastewater treatment plant. This is because there is no oxygen in the septic tank. As a result, only facultative and anaerobic microorganisms can thrive in this anoxic or anaerobic environment. Without free oxygen available, these microorganisms that feed on the accumulating organic solids have difficulty completely oxidizing the organics into carbon dioxide (an odorless gas) and water. Some organic removal is accomplished if combined oxygen is present in the form of such compounds as nitrate ($NO_3$) or sulfate ($SO_4$). These compounds can be reduced by facultative organisms to nitrogen gas ($N_2$) and hydrogen sulfide ($H_2S$) to free the oxygen for oxidation of organics. After the combined oxygen is depleted, some of the microorganisms, called acid formers, split or hydrolyze the proteins into incompletely oxidized products called volatile fatty acids. This is the first step in the digestion process. The volatile acids are released in the water phase and some escape into the air creating very foul odors. Where strict anaerobic conditions exist in the tank, methane generating bacteria can convert these fatty acids into methane ($CH_4$), an odorless gas. The production of methane is the final step of the digestion process.

Complete digestion usually does not occur in septic tanks because conditions inside the tanks are not optimum for the methane producers. First, methane producers are strict anaerobes. They cannot tolerate any oxygen, even if it is in the combined form of nitrate ($NO_3$), sulfate ($SO_4$) or other oxygen containing compounds. Second, they like warm temperatures in the range of ninety degrees. Most septic tank temperatures are below sixty degrees. Finally, they cannot withstand low pH's. If the pH is close to 6, which can happen if the fatty acids are not removed, methane production stops.

Why is it important we know this? First, it is the gases that are released during digestion that are what make it very dangerous to enter a septic tank. Hydrogen sulfide is extremely toxic. It paralyzes the diaphragm and breathing stops. Humans are quickly overcome and die. Carbon dioxide and methane are also dangerous because they can displace oxygen and are odorless. A worker can be unaware that there is no oxygen until he faints. If not quickly removed, he would die of asphyxiation.

Second, the first step in the digestion process breaks down the solids in the sludge into simpler compounds. Many of these simpler compounds are released into the septic tank effluent as dissolved compounds. In other words, many of the settleable organic solids are converted to soluble fatty acids and leave the tank in its effluent. While this increases the organic loading on the infiltrative surface over what would be released if merely sedimentation occurred in the tank, the fatty acids are more easily oxidized to carbon dioxide and water under aerobic conditions by the soil microorganisms.

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# MMAH – Shallow Buried Trench Study Final Report

Submitted by Hal Lewis, P.Eng of Stantec Consulting Ltd. to MMAH

The Ministry of Municipal Affairs and Housing (MMAH) initiated a study in February 2001, to assess the use of shallow buried trench disposal systems in the Province of Ontario. The objective of the study was to evaluate the effectiveness of the systems, and to provide recommendations for optimizing the design and construction requirements of the use and operation of shallow buried trench technology.

The study included an initial questionnaire investigation to determine the use of shallow buries trenches (SBTs) through the Province. The questionnaires were distributed and made available to the approving authorities and tertiary treatment distributors/manufactures across Ontario.

Upon evaluation of the questionnaire responses, SBT system owners were asked to participate in a field investigation portion of the study. To best provide a cross-section of the use and operation of SBT systems, the sites were selected based on geographic location, as well as the type of treatment unit used in conjunction with the SBT system.

Three separate field investigations were completed. The first round of investigations was completed near the end of the Summer 2001 to obtain data during a dry season. The second round was completed during January/February 2002 to obtain data during a cold season, and the third round was completed during April/May 2002 to obtain data for a wet season. During each inspection, the SBT systems were inspected both visually and intrusively, and sewage samples were collected and submitted to a laboratory for analysis.

The following provides the conclusions and recommendations of this report.

## Conclusions

Based on the questionnaire, the following conclusions are made:

- Many of the respondents indicated that there were no SBT systems installed in their areas. Specifically, all of the regions that responded from Northern Ontario indicated they did not have any SBT systems.
- The majority of regions where SBTs are installed, are not receiving the sewage effluent sampling results for the treatment units, as required under *Section 8.9.2.4.*

Based on the three rounds of field investigations the following reoccurring concerns were noted:

- Grading works were incomplete on many sites, or were not completed in such a manner as to direct surface water away from the SBT area
- Many systems were being volume dosed
- Access ports were unavailable on several systems, making if difficult to obtain effluent samples, or perform maintenance if required
- End caps were not in place on several SBTs
- From the sewage effluent sampling results, it is concluded that there is a large variation in the operating efficiency for the majority of the treatment unit types

Based on a review of the field investigation and a literature review, the following conclusions are presented:

- Soil characteristics and hydraulic loading conditions of the subsurface system are highly important to the proper operation of an SBT system
- Current design and construction criteria listed in the OBC (length of trench and separation distance) should be re-evaluated
- Consideration should be given to the inclusion of a requirement for dosing rates and a modification to the current pump chamber sizing requirements
- Based on the questionnaire, interviews with the system owners, and findings in the field investigations, the operational effectiveness of SBT systems is dependent on the efficiency of the tertiary treatment unit and on-going maintenance of the entire sewage system

## Recommendations

Based on the above conclusions, the following recommendations are presented:

The method of evaluating soil conditions for the purpose of designing leaching bed areas should be re-evaluated Final construction inspections for SBT systems should ensure construction practices comply with the requirements of the OBC.

Table 8 provided in section 6.2.1 of this report outlines preliminary recommended loading rates for SBTs. The table has been set up similar to Table 8.7.4.2. A used to design fill based absorption trenches. It is recommended that the development of a detailed numeric model be completed to further analyze the recommended length of trench and separation distances for SBT systems.

Dosing rate requirements should be implements and pump chamber sizing should be revised as per this report In conjunction with the use of SBT systems, the sampling requirements of the tertiary treatment units, as currently required by the OBC, should be transferred to the treatment unit manufacturer or representative of the manufacturer.

## It's a Beautiful Thing: the science behind the sewage treatment process.

*continued from page 4*

removes organic carbon from the septic tank effluent. This has the effect of reducing the organic loading on the infiltrative surface. Unfortunately, because of lower than optimum temperatures for methane producers in septic tanks, the rate of methane production is low. Therefore, many organics that had been held by the settled solids are released to continue their travel out the septic tank.

Why worry about the organics in the septic tank effluent? Isn't it the suspended solids that clog the soil? Not really. Suspended solids can help speed the clogging process along, but it is the organic carbon released by the septic tank in both dissolved and particulate form that has the greatest impact on soil clogging. The soil microorganisms thrive on the waste organics and create more microorganisms as they feed. It is the increase in microorganisms and their metabolic byproducts that fill the soil pores and cause clogging. Unfortunately, nearly all septic systems are sized according to the estimated hydraulic loading, but we really should be sizing based on the organic loading. Therefore, the function of the septic tank is not only suspended solids removal but also 'conditioning' of the wastewater to make the waste organics more available to the soil microorganisms. The beauty of it is that it does this without mechanical equipment or much attention from the homeowner!

So what role do effluent filters play in this? Effluent filters remove suspended solids that might otherwise leave the tank. By retaining more solids in the tank, potential clogging is reduced and the digestion process has an opportunity to partially digest these retained solids into forms more readily available as a food source to the soil microorganisms. Thus, treatment performance of septic tank systems is enhanced.

By better understanding what a septic tank can do, we can better design our systems. With proper sludge management and prevention of solids scour from the tank by use of effluent filters, the septic tank is an extremely effective wastewater treatment device. It truly is a beautiful thing!

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# Feature Installation

Article submitted by: Designed by Trow Consulting Engineers Ltd., Installed by Eric Draper Backhoe Service

This system works by gravity flow from the residence to a 18168 L primary tank (septic tank) with one Orenco pump pumping at timed intervals through an automatic distribution valve to the Intermittent Sand Filter. The effluent is distributed through an automatic distribution valve over the sand filter through 3 mm diameter orifices spaced evenly at 600 mm on center along the underside of twelve, 25 mm diameter PVC sand filter laterals which are spaced at 360 mm apart across the width of the sand filter. Microbial and biological breakdown of effluent occurs in the sand media. The treated effluent is collected at the bottom of the sand filter via an under drain pipe and directed towards a pump basin located center of the sand filter. Effluent is pumped via a pump in the sand filter pump basin to the 6 shallow buried trenches that make up the drainfield.

*Installed intermittent sand filter pump component*

*Uncovered shallow buried trenches.*

### The Septic Tank

The primary treatment required for this Orenco intermittent sand filter treatment system is a conventional two compartment septic tank. The effluent is drawn from the clear zone and pumped to the sand filter for treatment. The solids are accumulated in the tank over time and anoxic digestion reduces solids volume. Effluent from the relatively clear zone of the septic tank, between the scum and the sludge layer, enters the Biotube® effluent filter through its inlet holes. Effluent then enters the space between the housing and filter cartridge, utilizing the entire screen surface for filtering. Particles larger than 3 mm are detained in the interior space, where continued decomposition of organic material occurs. Once the effluent has been screened through the filter it is drawn by the pump and dosed in small volumes to the sand filter over a 24 hour period. The septic tank pump operating system is controlled by the float assembly in the tank and by the programmable timer in the control panel.

The size of the primary tank determines hydraulic retention time and the frequency of solids removal. Based on the annual average flow of 4,372 L/day the septic tank volume (18,168 L) was designed to provide for sludge storage and removal at approximately a 5 year frequency. The float setting and tank size also allow for approximately 24 hour emergency storage space. An Intermittent High Load Sand Filter is expected to produce an effluent quality of; TSS – 5mg/l, $BOD_5$ 5mg/l, $NH_3$ - <1mg/l - provided influent levels are of domestic strength.

Orenco High Load Intermittent Sand Filter: The single pass sand filter consists of an excavation in the ground, a frame of braced 12 mm waferboard which is lined with a 30 Mil PVC liner. The liner is filled with filter sand that meets a specific grading specification for 100 L/sq. m/day. The wood frame is designed to hold the shape of the filter liner in place until the surrounding soil becomes stable after construction. The wood frame will eventually bio-degrade and the sand filter liner will remain in place supported by surrounding soils.

An under drain is installed in the filter prior to backfilling with the filter media. A low pressure effluent distribution grid (sand filter laterals) is installed on the surface of the filter sand. 100 to 150 mm of pea gravel is then placed over the top of the laterals. A geotextile cloth is placed over the pea gravel and the entire sand filter is covered with approximately 150 mm deep layer of sandy loam. Only the access ports at the end of the laterals, and the riser and lid for the automatic distribution valve are visible above the soil covering. It is important to note that, except for cutting the grass periodically, traffic over the sand filter should be kept to a minimum.

The effluent distribution grid (sand filter laterals) is designed to operate in two distinct separate zones. All zones are fed by a high head pump which is dedicated to the sand filter. For this project the sand filter size is approximately 6.55 m by 6.71 m and is 1 m approximaely deep. The under drain carries filtered effluent to the sand filter pump basin which doses the 100.5 m of shallow buried trench drainfield consisting of 6 runs 1.6 m apart, each run being 16.76 m long.

# Percolation Tests

This article has been culled from the National Small Flows Clearinghouse Quarterly Summer 2002, entitled: *Soil Evaluation Techniques by Andrew Lake.*

Soil evaluations are performed to determine whether the proposed soils will be able to treat and dispose wastewater and how well it will do it. There are two main ways in which to do this, by a soil evaluation or a percolation test. These tests are typically performed on site to get a better understanding of how well the soils will take the wastewater. For an inspector to evaluate the soil he/she will look into at least two test pits dug in the area of the proposed leaching bed. "The test pits must be deep enough for the evaluator to determine that enough unsaturated soil is available below the proposed bottom of the absorption area." The inspector is looking for soil texture, which will indicate the various particle sizes and permeability, the soils physical structure, and color changes such as mottling which will indicate the "influence of ground water."

The percolation test or "perc test" is designed to determine the "rate of water absorbed into the soil of an excavated test hole relates to the amount of water flowing through an onsite system and how rapidly the soil can absorb it." Percolation tests are performed by "excavating three to four holes uniformly spaced within the proposed absorption area." The sides of the holes are to be scarified to "expose the natural soil surface and to make sure that smearing of the sides does not interfere with the testing procedure." The bottom of each hole is filled with two (2) inches of one half (½) to three quarter (¾) inch washed stone to prevent damage to the bottom when the water is being poured in. The hole is filled with at least twelve (12) inches of clear water. This level is maintained for several hours to ensure that the soils are saturated. This will ensure greater accuracy in the test. Once this has been completed the person performing the test will measure the drop in water level over a set amount of time. The results are measured in minutes per inch. The water level drop is what is used to calculate the percolation rate. This "test may produce varying results depending on the soils present condition and is best used along with soil boring test results."

A Permeameter can be used to get more accurate results in less time. The permeameter "is placed in several augured holes within the perimeter of the proposed absorption area. The depth of the holes should be at least 18 inches." "The permeameter is then filled with water and the placed within the hole. The use of permeameter allows the soil to become quickly saturated, and testing can begin within 5 minutes of activating the permeameter. Readings are taken every 5-7 minutes for at least 20 minutes. When the minutes-per-inch fall for two consecutive water level readings are consistent, saturated soil conditions around the auger hole have been created, and the readings can be converted to conductivity values."

The tests mentioned work well in determining the soils ability to accept and treat wastewater and should not be used exclusively but together. This will help the evaluator to get a better understanding of the soil conditions in the proposed absorption area and allow him/her to more accurately determine the size of the bed. The Ottawa Septic System Office performs soil evaluations but may require an engineer to perform a percolation test or to use a permeameter to better for the inspector to determine the more accurately the soils percolation rate.

# Installers Comment

## Market Your Business and Our Industry

Submitted by Dave White, owner of Ken White Construction 2000 Ltd.

It is my observation as an installer of the onsite wastewater treatment systems that as an industry we do not have a high profile in the eyes of the new homeowner. The construction of a new home requires many trades and disciplines.

Our trade is usually not held in high regard, perhaps because what we install is out of sight and out of mind. How often have you heard at a housewarming party the owner bragging about his or her septic system? So what can we do as an industry?

I personally market my business in a professional manner and yes, it costs some money to do this. It starts with the initial quote and follows through including the personal delivery of the final invoice. With the initial quote I break apart the different stages (i.e., septic system, backfill, topsoil, etc.). This ensures that the homeowner has no surprises at the end. Remember a dissatisfied customer will tell ten of their friends.

Also, I explain the different types of septic systems available and the pros and cons for these different systems on the owners property. Remember, just because one type of system is less expensive, doesn't mean it is the right one for the property. It is important to ask the owner what trees they wish to save, what future plans they have for the property (pools or sheds), and what they want the topography of the yard to be (i.e., fully raised bed).

During the construction phase, I require all my staff to be identified on the site. This can be as simple as providing company t-shirts. Also, all equipment is identified with the company logo. Remember, the owner may show up on site and be concerned about strangers on his or her property.

At final grading, a little extra time with the dozer can make or break the project. Remember, the new owner wants to be proud of their property.

I personally like to deliver the final invoice and leave the educational material on the do's and don'ts for their new onsite wastewater treatment system. When presenting the invoice I dress respectfully and leave the customer with a token gift (ie. A pen with the company logo). Remember, most home owners have friends who may seek you out in the future.

In closing, I would like to say that it is up to our industry to improve our visibility with the overall construction of the new home, Dave White.

# Did You Know?

That OOWA has just had the *Do's and Don'ts* pamphlet put through a second print run? If you are a member of the Ontario Onsite Wastewater Association, you can order up to 250 pamphlets at a time, free for you to distribute to your clients. Currently, we are awaiting news from the Ontario Trillium Foundation to see if our application for funding was granted. This project would update and produce the 'Care and Feeding" publication, in co-operation with Ontario Association of Sewage Industry Services and the Concrete Precasters Association of Ontario.

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# S-Files

***Unexplainable or inexplicable septic sightings***

*The "above ground" approach, a true "outhouse." This is a demonstration display at the 2001 Ontario Plowing Match in Navan.*

# Percolation Tests

This article has been culled from the National Small Flows Clearinghouse Quarterly Summer 2002, entitled: *Soil Evaluation Techniques by Andrew Lake.*

Soil evaluations are performed to determine whether the proposed soils will be able to treat and dispose wastewater and how well it will do it. There are two main ways in which to do this, by a soil evaluation or a percolation test. These tests are typically performed on site to get a better understanding of how well the soils will take the wastewater. For an inspector to evaluate the soil he/she will look into at least two test pits dug in the area of the proposed leaching bed. "The test pits must be deep enough for the evaluator to determine that enough unsaturated soil is available below the proposed bottom of the absorption area." The inspector is looking for soil texture, which will indicate the various particle sizes and permeability, the soils physical structure, and color changes such as mottling which will indicate the "influence of ground water."

The percolation test or "perc test" is designed to determine the "rate of water absorbed into the soil of an excavated test hole relates to the amount of water flowing through an onsite system and how rapidly the soil can absorb it." Percolation tests are performed by "excavating three to four holes uniformly spaced within the proposed absorption area." The sides of the holes are to be scarified to "expose the natural soil surface and to make sure that smearing of the sides does not interfere with the testing procedure." The bottom of each hole is filled with two (2) inches of one half (½) to three quarter (¾) inch washed stone to prevent damage to the bottom when the water is being poured in. The hole is filled with at least twelve (12) inches of clear water. This level is maintained for several hours to ensure that the soils are saturated. This will ensure greater accuracy in the test. Once this has been completed the person performing the test will measure the drop in water level over a set amount of time. The results are measured in minutes per inch. The water level drop is what is used to calculate the percolation rate. This "test may produce varying results depending on the soils present condition and is best used along with soil boring test results."

A Permeameter can be used to get more accurate results in less time. The permeameter "is placed in several augured holes within the perimeter of the proposed absorption area. The depth of the holes should be at least 18 inches." "The permeameter is then filled with water and the placed within the hole. The use of permeameter allows the soil to become quickly saturated, and testing can begin within 5 minutes of activating the permeameter. Readings are taken every 5-7 minutes for at least 20 minutes. When the minutes-per-inch fall for two consecutive water level readings are consistent, saturated soil conditions around the auger hole have been created, and the readings can be converted to conductivity values."

The tests mentioned work well in determining the soils ability to accept and treat wastewater and should not be used exclusively but together. This will help the evaluator to get a better understanding of the soil conditions in the proposed absorption area and allow him/her to more accurately determine the size of the bed. The Ottawa Septic System Office performs soil evaluations but may require an engineer to perform a percolation test or to use a permeameter to better for the inspector to determine the more accurately the soils percolation rate.

# Rob's World

By Robert A. Passsmore. B.Eng.

## The Environment versus the Economy: The Battle Rages On!

Many years ago, I found myself needing an elective course to fill my last semester of high school. I filled that opening with a geography course with the basic title: *The Environment and the Economy.* The course, as it turned out, was far from basic. In fact, it was probably the most enlightening courses that I have ever taken.

In studying the relationship between the environment and the economy it quickly becomes clear that the two are intricately connected. In fact, the relationship can be considered to be mutualistic as actions that adversely affect one have an adverse affect on the other. This relationship often goes unnoticed or is dismissed as "tree hugger garbage." The simple fact is: actions that adversely impact the environment will ultimately have a negative impact on the economy. These damaging impacts may not be realized in the short term, but can appear long after the initial action has occurred.

The most famous recent example of this relationship would be the Walkerton tragedy. We are all aware of the facts that lead to the potable water becoming contaminated with *E.Coli.* Here, poor well siting and poor well construction, allowed contaminated surface water to enter the well and aquifer. The cumulative impacts, including lives lost and livelihoods interrupted, resulted in economic suffering for the town and its residents.

In the Walkerton example, the results of adverse environmental impact were quick to be seen in the economy. However, there are many other examples of where the impact is much slower to be noticed. In Eastern Ontario there have been several examples where severe groundwater contamination has resulted from the leaching of chemicals from landfills and through the illegal disposal. In these instances, the economic effects are only now becoming clear. Economic hardships are befalling the municipalities that must deal with the contamination.

Unfortunately, groundwater contamination from chemical spills and other such discharges, while on the rise, only account for a portion of all groundwater contamination. A brief review of several literature sources reveals that onsite wastewater treatment systems are possibly the largest source of groundwater contamination in North America. While that fact remains to be adequately proven, it is quite possible given the large number of onsite wastewater systems currently in operation in North America. So why does the onsite wastewater system industry have this dishonour? The short answer is that the entire onsite wastewater treatment industry, like many others, has cast aside environmental issues in favour of short term economic ones. It has become the norm that the cheapest job is always done, as the contract frequently goes to the lowest bidder.

It would be inaccurate to assess blame for this problem by casting a wide brush to everyone involved in the onsite industry. However, everyone from the designer, engineer, regulator, academic, installer to the homeowner has a responsibility to remedy the situation. It is time to stop acting like you care about doing the right thing, the best way possible, when you know damn well that this is only the case if it doesn't cost anymore. The service provided by this industry is considered an 'environmental service'. The reason for sewage systems and associated regulations is to protect the health of humans and nature. Each time we chose to override best practice with economic considerations, we undo the whole reason that the industry exists. It is time the onsite wastewater industry took a stand and begins cleaning up its own "sewage."

# Folk Tales

People who work in the wastewater business hear a lot of interesting folk tales about the care and feeding of septic systems. A recent conversation with staff at a regulatory authority revealed that they still hear a lot of peculiar and disgusting ideas for curing or maintaining septic systems . . .

1. Kill a groundhog/gopher and put it in the tank.
2. Flush yeast down your toilet once a month.
3. Add roadkill to your tank.
4. Flush fresh ground hamburger meat
5. Flush rotten ground hamburger meat
6. Add compost (rotten fruits and veggies) to your tank.
7. Pump you tank as frequently as you can afford it.
8. Run fresh water through your system for a day to "flush" it out.
9. To lessen the smell around the tank, add bleach to the system.
10. Add a bag of dog food to the system every month.

— Woof

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To register for courses in Eastern Ontario, contact the LandOwner Resource Centre
e-mail: srobertson@rideauvalley.on.ca, Tel: 613-692-3571 or 1-800-267-3504

# Frequently Asked Questions

Composed by Ray Boyd, Part 8 Inspector, OSSO
Reviewed by Ahmed Sharaf, P.Eng. Building Code Advisor, MMAH

**Q** Does the Ontario Building Code permit the installation of filter media beds into native soils with a percolation time greater then 15 minutes/cm?

**A** No. A filter media bed is constructed with leaching bed fill (filter media sand), and as such, is a fill based system. O.B.C. 8.7.4.2.(2) requires that the leaching bed fill (filter media sand) have a percolation time not less than 75% of the percolation time of the unsaturated soil (native soil) or leaching bed fill. For soils with T > 15 min/cm, the leaching bed fill (filter media sand) must have a percolation time not less than 75% of 15 min/cm. This would be a minimum T = 11.25 min/cm. A filter media sand percolation time should resemble an SP sand from the Unified Soil Classification System and therefore have a percolation time of 2-8 min/cm. Therefore, filter media beds can only be installed in native soils or leaching bed fill with a percolation time of 15 min/cm.

**Q** When constructing a fill based filter media bed, what thickness of leaching bed fill is required between the bottom of the filter and the native soil?

**A** The entire loading area (O.B.C. Table 8.7.4.1.A) requires 250mm (min.) of leaching bed fill ( T 15 min/cm). The portion of loading area beneath the filter bed also requires 250mm(min.) of leaching bed fill. O.B.C. 8.7.5.3.(3) requires 750mm(min.) of filter media sand and O.B.C. 8.7.4.2.(2.1)(a) requires 900 mm (min.) from underside of stone layer to native soil. Therefore, the lower 100mm of filter media sand and a layer 150mm of leaching bed fill (T 15 min/cm) would be needed to meet both the requirements of O.B.C. Table 8.7.4.1.A and O.B.C. 8.7.4.2(2.1)(a). The 150mm thickness of leaching bed fill required beneath the filter bed could also be comprised partly to entirely of filter media sand.

# From the Editor

Happy summertime and we hope you are all in the midst of a busy and profitable season. As you may have noticed, this newsletter is rather…late. We will be getting the full three issues out to you this year, just in a shorter time period. A large part of the delay is getting members to contribute articles. This is your newsletter. Information that contributes to the knowledge of others in the industry and increases awareness is always welcome. We always give out free ONSITE t-shirts or caps for our contributors. We want to hear from you about the frustrations and discoveries that you talk about locally…why not give them a provincial forum! We had hoped to have some news of what the various ONSITE committees were up to in this issue, but looks like we will have to stay tuned for a report in a few months. As always, suggestions and comments are always welcome. This issue, free ONSITE gear goes to Dave White of Ken White Construction 2000 and to John Garrah of the Ottawa Septic System Office.

## Letter to the Editor

*continued from page 4*

and many have had percolation times reported as less than 6 mins/cm. Which we would normally have said "Great!" then whamo failure.

Our investigation has revealed that this has been reported numerous times and there are obscure reports available pertaining to sands and gravels being impermeable. In a discussion with geotechnical engineer it was pointed out that silt and clay can block pores sufficiently even when there are small amounts of these materials. In fact if one looks at the text triangle you will not that at 20% clay we begin to use clay in the soil name (loam excepted). See for yourself next time you look at the triangle. This prompted us to look at the silt and clay content of the soil samples we had used in our raised leaching beds. We immediately noted that the soils which had a failure associated with them had a total fine content of more than 10%. Sands with fines less than 10% did not have any failures.

Recently we were contracted to investigate a failure of a sewage system's area bed which was believed to be a result of the sand material. Prior to our investigation the installer took it upon himself to replace the sand material. The original failure took about 6 weeks to materialize. After the sand was replaced the failure took about a month to materialize. The sand samples from each material showed that fines were in excess of 10%.

Given our observations it is now our practice to specify sand material which has a percolation time of 6-10 minutes and a fine content of less than 8%. At this point there is not absolute guarantee that this specification is sufficient but we have had no failures of systems with this specification. Furthermore, examination of other systems with similar specification also show no failures. However, cross the magic 10% fines line and failure is virtually assured.

One of the questions we are asked is how can a supplier sell this sand for so long without any failures being noted and the material being considered acceptable. It is my opinion that we have seen failures using these materials. However, the material was used in a conventional leaching bed which has a much lower loading rate than the newer technologies. So it was not really noted. n fact I am convinced that the failures would occur 10 to 20 years after construction. This coupled with a sand sample analysis at a laboratory and find that the T-time is less than 10 mins/cm and thus conclude that the material is acceptable. In many cases we would have labelled the failure on use despite the claims of the homeowner that they use very little water. Now bring on the new technologies with their high loading rates on area beds and shallow buried trenches and we have a very short time to failure (24 hrs in my case). The impermeability of sand comes into play right away and failure results.

As a result it is my opinion that if we do not take care and look at our specifications for sand in more detail more failures will result. These failures will tarnish the new technologies which have become prevalent in Ontario and we risk returning ourselves to the dark ages of on-site sewage treatment. You remember …those days when all there was was a conventional septic system or a filter bed.

Sincerely,

Alex Campbell
On-site Waste Management Specialist
R. J. Burnside & Associates Limited
15 Townline
Orangeville, Ontario
L9W 3R4