ONSITE
WASTEWATER NEWS
ONTARIO ON-SITE WASTEWATER ASSOCIATION NEWSLETTER

InSide

- Hydraulic Short-Circuiting in Septic Tanks
- Canada's Costal Cities Worst Sewage Polluters
- The Case of the Persistent Pump
- Last Laugh

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President's Message

Doug Joy, January 29, 2004

As I write this near the end of January the ground is snow covered, the sun is bright and its -20°C, its hard to imagine that in a few months the business of on-site will be in full swing with new designs, permits being applied for and new construction under way. Having said that, I can say your association Board of Directors is hard at work on a number of activities on your behalf. First, we continue to pursue our objective of making inspections and maintenance of all on-site systems, not just advanced treatment units, mandatory across the province. To this end we have opened a dialog with members of the Building and Development Branch at the Ministry of Municipal Affairs and Housing and I am confident that they respect and support, to some degree, our position. We will continue this dialog. In addition, we have written to both Ministers of the Environment and Municipal Affairs to lay out our position. Finally, we have prepared a response to the Ministry of the Environment's posting on the EBR the reports dealing with the Provinces plans for a new approach to source water protection. Although progress in this area is slower than we would like, I honestly feel we are making good and steady progress.

On another front, the Board of Directors has come to recognise that our association has grown (nearly 200 members), to the point that we need help with our day-to-day activities. In addition, we need help as well to carry the larger initiatives we want pursue to continue to promote on-site as a viable long-term solution to environment protection and wastewater treatment. We have benefited over our formative years by substantial support from the Rideau Valley Conservation Authority and the Ontario Rural Wastewater Centre. While they are still willing to provide assistance, the Association needs to take on more of the day-to-day operations for long-term success. Thus, we have begun to actively pursue the hiring of an Executive Director. Although we are at the preliminary stages of how to accomplish this, we have struck a special committee to develop this plan. The members include Bill Seabrook, Terry Davidson, Doug Joy and Al Brown. We are meeting with other associations to learn from their experiences with this position as well as beginning a discussion of position details such as part-time or full-time status, salary, job description, etc. Give us your thoughts on this.

We have just completed putting the program together for the next Conference in Niagara Falls this coming March. As usual the program looks excellent and includes the addition of not only a site tour on the Sunday before to see a unique on-site system as well as a Winery, but also a spouse and family program on the Monday. Mark the dates of March 6 to 9 on your calendar so we can see you all in Niagara Falls.

Finally, I had the good fortune of attending the Alberta Onsite Wastewater Contractors Association (AOWWCA) Conference in early January. It was an excellent chance to share ideas and experiences with another Canadian group like AOWWCA committed to excellence in on-site. In addition to Alberta and ourselves, representatives from BC, Saskatchewan and Manitoba were also in attendance. Besides being amazingly cold (-43°C one morning!), the conference was excellent. I can confidently say that we also share a number of the same problems and somewhere, down the road, a national onsite conference would be an excellent idea to bring us all together.

Source Water Protection and What it Might Mean to the On-site Industry in Ontario

Doug Joy

I had the privilege over the past year of serving on the Technical Experts Committee giving advice to the Ontario Ministry of the Environment on their new strategies on Source Water Protection. This was one of two committees set up over a year ago in response to the recommendations by Justice O'Conner for the Province to examine and change its strategy toward protecting source waters for drinking. The reports of these two committees have been submitted to the Province and as a result they have been released for public comment. They are loaded with recommendations — many of which have the potential to have dramatic impacts on the on-site industry.

The basic idea behind the work was to reduce, to an acceptable level, the risks of getting sick from Ontario's drinking water. It was central to the committees considerations that any work should be based on good science and be practical to implement.

Perhaps one of the first and foremost items in the documents is the recognition that on-site systems present a source of contaminants and thus present a potential risk to drinking water supplies. These could be both sources for individual family homes but also larger drinking water systems, although the tendency is to focus on larger systems. Secondly, it was recognized in the recommendations that all potential risks to drinking water sources need to be inventoried so that their risks can be assessed. These would be sources within a defined captured zone for an individual well or group of wells. The size of the capture zone would depend on the type of the contaminant of concern, for example chemicals such as nitrates or pathogens such as *E.coli*.

Since on-site systems are a potential source of both of these, on-site systems would need to be inventoried. How big are these capture zones? Well, no one knows for sure but it may be a zone in which water can travel to the drinking water source in a time of up to two years – this could be measured in kilometres from the well. I am now reading beyond the text of the reports but this could mean an inspection and assessment of every on-site system in the capture zone.

Once the inventory takes place the next phase is the management of the sources. Again, this could mean any number of things but for on-site systems it could mean routine inspections, it could mean the requirement for advanced technologies, it could mean the prohibition of on-site systems in certain, highly sensitive areas.

What the recommendations did not do was to recommend compulsory maintenance and routine inspection of all on-site systems as our association has advocated. It did, however, make recommendations to make it easier for municipalities to do this. This is progress, but we would like to see a whole lot more.

At this point the reports only present recommendations and we are working as an association to make sure that the collective wisdom or our members is being heard.

News Release

Date: January 18, 2005
To: Onsite Wastewater Publications
From: Zabel Environmental Technology
Contact Name: Brian Borders
Contact Phone: (502) 992-8214

Zabel Environmental Technology, a leading manufacturer in the onsite wastewater industry, announces the formation of a new division within their corporate structure.

This new division, called the Engineered Systems Group, has been formed to meet the increasing demand of the engineering and land development community for alternatives to existing STEP and decentralized technologies. The Engineered Systems Group will provide tools, resources, products and assistance in the development of small community, subdivision, commercial and single-family residential wastewater treatment systems which require engineering and/or design expertise.

Zabel has long been an industry leader in providing the highest standard of customer service and assistance to all stakeholders in the onsite industry. The Engineered Systems Group will continue this same great tradition by providing assistance and support to Onsite Wastewater Engineers while allowing them to maintain local control and oversight.

For more information regarding the Engineered Systems Group please contact Brian Borders at 1-800-221-5742.

Stan Koebel jailed a year in Walkerton water tragedy

By ANTHONY REINHART From The Globe and Mail, Tuesday, Dec 21, 2004

Walkerton, Ont. — By May of 2000, Stan Koebel had spent his entire working life, 28 years, at the Walkerton Public Utilities Commission, secure in his job and respected within the town's municipal institutions.

By lunchtime Monday, Mr. Koebel found himself in less friendly surroundings — the 138-year-old Walkerton Jail — where he began to pay a debt too meagre for some, too rich for others, and irrelevant to many who will continue to suffer regardless.

Mr. Koebel, the 51-year-old former PUC manager, was sentenced to one year in jail for his role in a bacterial outbreak in the town's water supply that killed seven people and harmed 2,300, some permanently, nearly five years ago.

His 46-year-old brother, Frank Koebel, a former PUC foreman, will serve nine months of house arrest, Mr. Justice Bruce Durno of the Ontario Superior Court told a packed and silent courtroom.

Sentencing of the Koebels, who pleaded guilty to committing a common nuisance by endangering the public, marked the end of judicial proceedings in a public-health disaster that drew international attention to the town of 5,000 in southwestern Ontario.

"It's been a long four years plus for all the families," said Tom Pearson, whose 83-year-old mother, Edith, died. "I hope the rest of the families find some measure of closure from what happened here today."

Others stepped out of the courthouse and into the bitter cold with only a tepid notion that justice had been served, if at all.

"We're trying to marry legal justice on a technical level with the emotional and physical devastation in this community, and you're not going to find a marriage there that works," said Bruce Davidson, of Concerned Walkerton Citizens. "I think the greater tragedy is that this venue did not allow for an exploration of the roles of those that did not receive criminal charges."

He was referring to officials behind other factors cited at the public inquiry that preceded the criminal case against the Koebels. Those factors included continued use of Walkerton's poorly planned Well 5, where deadly bacteria entered the system in manure-laced runoff, and cutbacks at the provincial Environment Ministry that led to lapses in water monitoring.

"We know there were serious flaws in the system all along," said Mr. Davidson, who provided a letter to Stan Koebel's defence, urging leniency for a man who, despite incompetence, was found not to have caused the tragedy directly. Judge Durno acknowledged as much.

The Koebels, he said, "did not and do not stand alone." He also accepted an expert's finding that unusually heavy rains overwhelmed Well 5 with more contamination than the Koebels could have prevented with chlorine.

"The offenders are not being sentenced for being the cause of the Walkerton water tragedy," Judge Durno said, no matter how eager the public may be to see someone, anyone, punished criminally for it.

The penalties, which will leave the men with criminal records, rest mainly on what they did after they knew there was a problem: Stan lied to officials scrambling to find the source of the outbreak, which delayed the issue of a boil-water advisory and led to illness in 200 to 630 more people, while Frank, under Stan's direction, falsified a well report.

Rejecting defence calls for conditional discharges, Judge Durno said penalties were necessary to deter other officials from breaching the public trust.

Some may argue that house arrest for Frank and a year in jail for Stan who could be paroled in just four months — is hardly a deterrent, but Judge Durno cited the toll already paid by the brothers. Neither has found steady work. Stan moved away while Frank stayed in Walkerton to face the music, which has included the sounds of eggs striking his house and nails being sprinkled on his driveway.

"Not a day will go by in either man's life that they don't think about the events of May 2000, and their own role in it," the judge said.

Outside, where passing motorists gazed, perhaps hopefully, at the last big media scrum Walkerton is likely to see for a while, John Finlay made a similar prediction for the rest of his community.

"This tragedy is part of Walkerton, and we will never escape it," he said. "It's part of who we are, and will be for the rest of our lives."

MEMBERS

Don't forget your 2005 Membership! Download the application at http://www.oowa.org/member/membership_form_2005.pdf

Summary of January 2005 OOWA Sub Committee Meetings

Operation and Maintenance

- response to EBR is being put together, a plan detailing different alternatives for O&M will be part of this
- letter being written asking the MAH to clarify their position on O&M

Public Relations

- Website Updates
  - Website to have new members only section with a discussion forum
- New panels are being made for the OOWA exhibit booth
- PowerPoint is being made to go with exhibit
  - each manufacturer who is part of OOWA will be asked to submit 6-12 powerpoint slides for the presentation
- Care and feeding
  - existing material is being updated and draft of the brochure being printed

Membership

- Advertising
  - Partner with concrete precasters to target onsite audience
  - Send out OOWA information to colleges with programs that incorporate on-site systems (i.e., plumbing and home inspection)
    - Advertising in Cottage Life
- Exhibitor OOWA package
- OOWA package for all conference exhibitors
- Package will include a "proud member of oowa" plaque which can be displayed at exhibit booths

Government Relations

- Operation and Maintenance
  - Time is right to push this cause with the government
- Retrofits for Remediation
  - Initiate a branch opinion on this

Research

- Scholarship
  - Reminder sent out to universities about scholarship
- Insurance
  - Required insurance for designers begins in July 2005, committee is looking into group insurance carriers and potential discounts
- Failures
  - need information on reasons for failures
  - motivate other regulators to help collect this data

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S-Files

Unexplainable or inexplicable septic sightings

This photo of Doug Joy raises so many questions. All we want to know is: Are his facial expressions the result of what is in the tank, or what he had for lunch?

Rob's World

By Robert A. Passmore, B.Eng.

Let me begin this column by thanking those of you who have responded to my column in the last edition. By far it has been the most feedback that we have received on any part of the newsletter since we started producing one. The feedback has been somewhat surprising, with several important issues being raised both for and against the appointment of an provincial auditor. That being said, I will extend the request for another issue to get as much feedback as possible before I present a detailed analysis for further discussion.

In an effort to lighten the mood somewhat, I though it would be a perfect occasion to discuss the onsite versus municipal wastewater treatment. As some of you are already, my wife and I recently moved into our newly constructed house in Kanata, Ontario. I was quite pleased with the house and lot itself, except for one major problem: the lot is municipally serviced!

I do have to qualify my statement by first acknowledging that purchasing a house on municipal services solves a long standing dilemma concerning what type of sewage system I would choose to install had the lot been privately serviced. At least I've ducked the issue for the moment!

So why then is municipal servicing a problem? Well, I arrived at this general position several years ago when a collegue and I ran some numbers that showed that rural serviced lots were cheaper to own and operate over a 20 year period. As well, we found that the costs of rural servicing were generally more transparent and much easier to quantify.

My position was solidified, if you will, when I discussed the issue of wastewater treatment with several of my new neighbours at a recent city budget meeting. It became readily apparent that virtually all of the people that I spoke with, were of the opinion that rural servicing was much more expensive and that septic systems were problematic. Even those with some familiarity with septic systems stated that they hated having to be conscious of water use, items flushed down toilets, chemical use, and how they had to protect the bed area. These people wanted to just flush and forget. What makes matters worse is the fact that these same people don't care that onsite wastewater treatment uses natural treatment processes and generally have little impact on the natural environment if they are designed, constructed and maintained properly.

Alas, we have brought this plague onto ourselves. We, as an industry, have allowed gross misconceptions of septic systems that cause people favour the sewer. The end result is that the municipality is generally welcomed with open arms when it arrives with the municipal sewer. Furthermore, the municipality smiles all the way to the bank when they provide municipal services, because they know those people are dependent on them for the life of the lot.

It is utterly frightening when you sit and really think about it. What is potentially even more frightening is when someone on municipal services actually figures out what they have actually done and realize that there is no escape unless they move. So that just leaves me with one question: Does anyone want to buy a house in Kanata?

You can email Robert at robert.passmore@rideauvalley.on.ca for comments on this or any other column.

Check www.orwc.uoguelph.ca for upcoming courses

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The Science Corner — Sulphuric Acid Attack on Concrete Tanks

By: Iggy Ip, B.A.Sc., E.I.T. Waterloo Biofilter Systems Inc.

Introduction

Our on-site industry relies heavily on concrete for septic and pump tanks. Concrete has the benefits of strength, long service life, and cost effectiveness, but in cases where sulphur-rich water or sulphate-rich soil is present, problems arise with corrosive reaction occurring, and premature failure can be expected.

The two most common methods in which concrete septic tanks can be attacked include:

1. Corrosion by Sulphate-Rich Soils

Sulphate-rich soils are primarily across Western Canada, and attack the exterior of the tank. The problem is addressed by using sulphate-resistant concrete such as type-50 cement (Darby, 2004)

Through a series of chemical reactions, sulphate ions (SO_4^{2-}) in the soil react can react with hydration products present in hardened cement {such as tricalcium aluminate ($3CaO \bullet Al_2O_3$), calcium hydroxide ($Ca(OH_2)$) and silicate hydrate ($C_3S_2H_8$)} to form two reaction products (Neuwald, 2004):

a. **Ettringite:** The formation of ettringite causes an increase in volume to the concrete matrix, leading to the physical expansion and cracking of the hardened concrete. (Neuwald, 2004)
b. **Gypsum ($CaSO_4 \bullet 2\ H_2O$):** The formation of gypsum makes the concrete softer and can lead to failure and collapse of the concrete structure. (Neuwald, 2004)

Depending on the amount of sulphur in contact with the concrete, it may be necessary to protect the concrete with a plastic liner, sulphate resistant concrete mix, or a protective adhesive coating. Sulphate-resistant concrete tanks are dealt with in CSA B66, but it is the responsibility of the local regulatory authority to determine where soils require the use of sulphate-resistant concrete.

2. "Bacterial Acid" Corrosion

Interior concrete walls are also attacked when sulphuric acid forms in the airspace above the waterline. Eastern Ontario especially has high sulphur in the source water, both as sulphate or sulphide, both of which form hydrogen sulphide in the septic tank or pump tank. The hydrogen sulphide gas comes out of solution and forms sulphuric acid in the air space, which reacts corrosively with the concrete, decreasing the structural strength and durability, and increasing the permeability. This causes concrete tanks to corrode and crack, also known as "crown rot" (Crites and Tchobanoglous, 1998), which ultimately causes them to collapse and fail. This type of sulphur attack is the predominant one in septic systems.

This problem is recognized in OMAF/MOE (2003) (www.gov.on.ca/omafra/english/nm/regs/conpro/conpro04.htm) for animal wastes, but not yet in CSA B66 for human wastes. The damaging effects of sulphur on concrete are illustrated in Figure 1.

Figure 1
Sulphur attack in pump chamber causes the concrete to corrode and the concrete changes to soft gypsum. This type of concrete deterioration is also known as "crown rot"

Bacterial acid corrosion is caused when anaerobic bacteria in the septic tank convert sulphate ions (SO_4^{2-}) into sulphide ions (S^{2-}), both in solution still, which in turn combines with hydrogen (H^+) to form hydrogen sulphide gas (H_2S). The H_2S gas is at first dissolved in the sewage, but then "exsolves" out into the airspace when it reaches a certain concentration. In the presence of oxygen from incoming water or from the air space in the septic tank or pump tank, exsolved hydrogen sulphide gas is converted to sulphuric acid (H_2SO_4) as shown in Equation 1 (Metcalf and Eddy, 2003).

(Equation 1)

$$\text{Organic matter} + SO_4^{2-} \rightarrow S^{2-} + H_2O + CO_2$$
$$S^{2-} + 2H^+ \rightarrow H_2S$$
$$H_2S + 2\ O_2 \rightarrow H_2SO_4$$

Sulphuric acid is highly reactive and reacts with calcium compounds in the concrete (e.g., $Ca(OH)_2$), ultimately to produce calcium sulphate ($CaSO_4$) and water (H_2O) as shown in Equation 2 (Thomson, 2000). Typically calcium sulphate and water are in equilibrium with gypsum as shown in Equation 3 (James, 1988). Similar to the corrosion by sulphate-rich soils, the formation of gypsum in the concrete through the 'Bacterial Acid' pathway causes the concrete to soften, ultimately leading to roof collapse.

(Equation 2)

$$H_2SO_4 + Ca(OH)_2 \longrightarrow CaSO_4 + H_2O$$

(Equation 3)

$$CaSO_4 + H_2O \longleftrightarrow CaSO_4 _ 2\ H_2O$$

This kind of attack can be protected by concrete liners and coatings as well, but it is important to remember that the areas that are most susceptible are the concrete walls at the waterline and in the air space of the septic tank and pump tank. To be more cost effective, the liner or coating can be applied above the waterline, which includes any concrete risers and manholes located in the air space.

Another option is to improve the overall quality of concrete tanks by increasing strength and durability of the concrete (decrease water-to-cement ratio). For farm agriculture storage, they require a minimum 28-day compressive strength of 40 mPa and a water-to-cement ratio when reinforced concrete is exposed to severe manure gases (OMAF, 2004). However, these specifications will not prevent concrete corrosion, but will delay it. Adding supplementary cementing materials such as slag fly ash can improve resistance to chemical attack (Bickley, 2001).

Conclusions

Sulphur attack on concrete structures is an important issue in parts of Ontario where the water contains a high levels of sulphur. To prevent premature failure of concrete structures in septic systems, it is important for regulators and concrete tank manufacturers to take responsibility and be aware of locations with sulphur-rich waters or which contain sulphate-rich soils. Alternatives to concrete such as polyethylene tanks that are chemically resistant to sulphur attacks can be used as well.

References

(Available on the Web or by request)

Soil Characteristics – Demystifying Dirt

Adapted from: PIPELINE, Spring 2002 (Volume 13, Number 2) ©2002 National Small Flows Clearinghouse

Soil characteristics

A site evaluation is the first step toward installing an appropriate wastewater disposal system. Site evaluations determine soil characteristics at the building site and the soil's ability to treat and dispose of wastewater.

Texture

Most of the soil's solid framework consists of mineral particles. These particles in different size ranges and porportions determine the soil texture. The larger soil particles, which include stones, gravel, and coarse sands, are generally different kinds of rock fragments. Most smaller particles are composed of a single mineral. Any soil is made up of particles that vary greatly in both size and composition.

Sand grains are the most familiar mineral particles. They are large enough to be seen by the naked eye and feel gritty when rubbed between the fingers. Sand particles do not stick to one another; therefore sands do not feel sticky. Silt particles are somewhat smaller — too small to see without a microscope or to feel individually, so silt feels smooth but not sticky, even when wet. The smallest class of mineral particles are the clays, which form a sticky mass when wet and hard clods when dry.

Terms such as sandy loam, silty clay, and clay loam are used to identify the texture. See **Table 2** on for a complete list of textures and how they react when wet and dry. As effluent from a drainfield passes through a silty soil, particulates are filtered out in a relatively short distance. Most bacteria, viruses, or other potential disease-causing organisms cannot pass through long distances of dry soil; they remain within the first few feet. In saturated soils, organisms may travel greater distances. Water moves very slowly through soils with a high clay content, and consequently, clay soils require a large areas in order to treat the effluent.

When effluent enters gravel with little or no fine material (silt and clay particles), it will pass through the empty spaces in the soil unfiltered so quickly that pathogens can travel hundreds of feet. Slower travel gives opportunity for good contact between soil particles and effluent, thus providing more effective purification of the water.

(continued on next page)

Soil structure

Soil structure refers to how soil particles are arranged relative to each other. Soil particles tend to group themselves into blocks or clusters called "peds." If these peds have a characteristic shape, the soil is said to have structure. The space between these peds and how they are aligned influence how water moves within the soil. Structure is considered more important than texture for determining water movement in soils.

Soil structure can be adversely altered if compressed or compacted by heavy equipment during construction. Homeowners need to protect the proposed drainfield site from this type of damage.

Soil color

Color and color patterns may provide clues that help estimate how well a soil will absorb and transmit water. Much of soil color is due to the presence of iron. When there is no air in the soil, as in waterlogged soil, iron is lost from the soil and the soil becomes grayish. When the soil drains well, allowing air to enter, the iron oxidizes to brown, yellow, or red. Dark colors generally indicate higher organic content. Interpreting color helps to identify conditions where soils drain well or where soils remain saturated.

The soil in the pit should be examined in bright daylight and compared to the Munsell® color system, the universally accepted standard for identifying soil color. While soil color is easily seen and an excellent indicator of the soil's aeration status, temperature, mineral content, vegetation, and position in the soil profile can modify color. Soil color must be used in conjunction with the other soil features to form a complete analysis.

Typically, well-drained soils are red or brown in color, and poorly drained soils are a splotchy gray. A mottled appearance, where spots of color intermingle with the gray, usually indicates seasonally saturated soils.

(continued on next page)

Table 2 ***Textural properties of mineral soils – feeling and appearance***

Soil Class	Dry	Moist
Sandy gravel	Loose stones and single grains that feel gritty. Squeezed in the hand, the soil mass falls apart when the pressure is released	Squeezed in the hand, it forms a cast that crumbles when touched. Does not form a ribbon when rubbed between thumb and forefinger.
Silty Sand	Aggregates easily crushed; very faint velvety feeling initialy, but with continued rubbing, the gritty feeling of sand soon dominates.	Forms a cast that bears careful handling without breaking. Does not form a ribbon when rubbed between thumb and forefinger.
Sandy silt	Aggregates are crushed under moderate pressure; clods can be quite firm. When pulverized, soil has velvety feel continued rubbing. Casts bear careful handling.	Casts can be handled quite freely without breaking. Very slight tendancy to ribbon between the thumb and forefinger. Rubbed surface is rough.
Clayey silt	Aggregates are firm but may be crushed under moderate pressure. Clods are firm to hard. Smooth, flour-like feel dominates when soil is pulverized	Cast can be freely handled without breaking. Slight tendancy to ribbon between the thumb and forefinger. Rubbed surface has a broken or rippled appearance.
Silty Clay	Very firm aggregates and hard clods that strongly resist crushing by hand. When pulverized, the soil takes on a somewhat gritty feeling due to the harshness of the very small aggregates.	Casts can bear much handling without breaking. Pinched between thumb and forefinger, it forms a ribbon whose surface tends to feel slightly gritty when dampened and rubbed. Soil is plastic, sticky and puddles easily.
Clay	Aggregates are hard; clods are extremely hard and strongly resist crushing by hand. When pulverized, it has a grit-like texture due to the harshness of numerous very small aggregates which persist.	Casts can bear considerable handling without breaking. Forms a flexible ribbon between thumb and forefinger and retains its plasicity when elongated. Rubbed surface has a very smooth, satin feeling. Sticky when wet and easily puddled.

A guide to the changes in the Building Code Act, 1992 and the building code affecting designers

Taken from Ministry of Municipal Affairs & Housing www.mah.gov.on.ca

WHAT IS NEW FOR DESIGNERS?

Beginning July 1, 2005, a number of changes in the *Building Code Act*, 1992 and Building Code will affect designers. Among other changes,designers may be required to be registered and/or qualified.

Who is a designer?

Designers are individuals who:

- prepare designs or give information/opinions about whether a building or part of a building complies with the Building Code, where such information is submitted as part of a permit application.
- prepare written reports on building construction based on a general review, where required by the Building Code. Under the new legislation, designers may need to be qualified. Read section 15.11(5) of the *Building Code Act*, 1992 and section 2.17 of the Building Code for further details.

Design firms

Firms engaged in the business of providing design activities to the public may need to be registered. A design firm may be a sole proprietor, a partnership, or a corporation. This includes architectural or engineering firms, or interior design firms that provide design services.

HOW TO BECOME QUALIFIED

Designers must be qualified, unless they are exempted under the Building Code. To become a qualified designer, you must:

- successfully complete the Ministry of Municipal Affairs and Housing examination program in your area(s) of practice, and
- file your examination information with the Director of the Building and Development Branch. Once you apply for an exam, you receive a BCIN (Building Code Identification Number). You will later need this number in order to complete the process to become qualified, and to submit permit applications.

Exemption from qualifications

The Building Code lists a number of exemptions to the qualification requirement. For example, you may be exempt if you are designing:

- a house that you own
- certain farm buildings
- certain tents and signs

HOW TO BECOME REGISTERED

Design firms must be registered, unless they are exempted under the Building Code. To be come registered, a design firm must:

- ensure that all persons working in the firm who will review and take responsibility for design activities have successfully completed the exam program for their area(s) of practice;
- file its qualification information with the Director of the Building and Development Branch;
- carry insurance, as required by subsection 2.21.2 of the Building Code;
- After filing, the firm will receive a BCIN

Registrations are renewed annually.

Exemption from registration

The Building Code lists a number of exemptions to the registration requirement. For example, you may be exempt from registering if your firm's activities are:

- related to designing homes governed by Tarion (Ontario New Home Warranties Plan Act) where the design work is done "in-house"
- related to commercial, industrial or institutional buildings you own
- for certain house renovations
- for some farm buildings, tents and signs Please refer to the *BUILDING CODE ACT*, 1992 and Building Code for specific requirements.

Soil Characteristics...Continued from previous page

Density

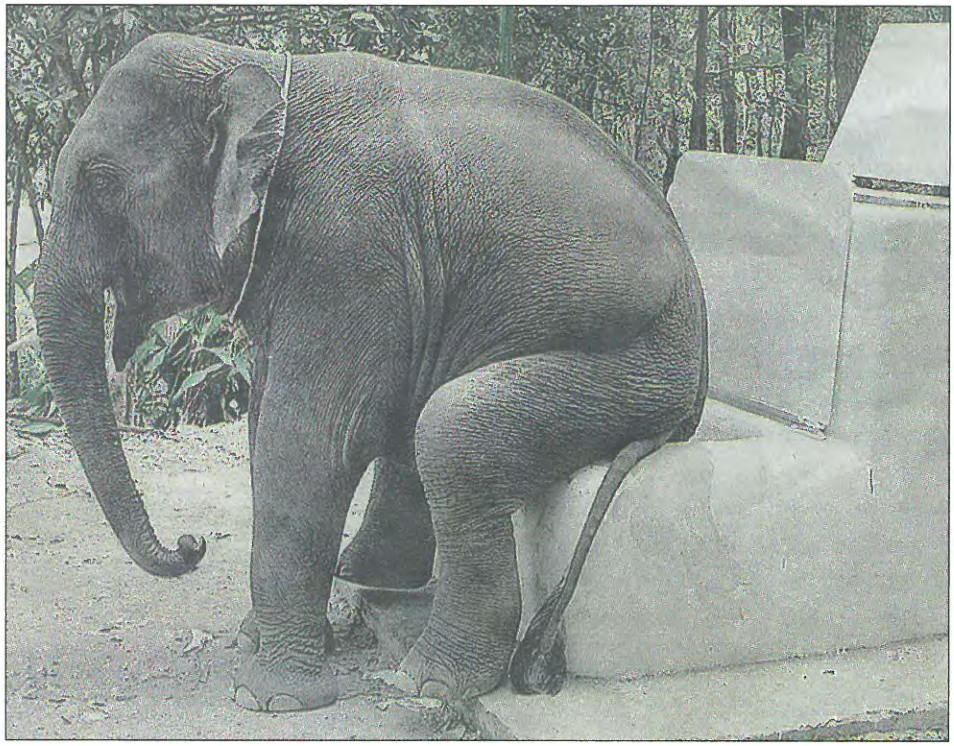
A soil's bulk density relates to the volume of mass of dry soil plus its air spaces. Soils with high bulk density are less porous and less permeable. For instance, clay soils have high bulk density. Their particles are tightly packed with minimal air spaces between them. Clays that swell when they become wet, seal off soil pores further, and can virtually stop the flow of water.

Approximately half of the volume of the soil consists of different-sized pore spaces. When water enters the soil, it displaces air. If you think of the network of soil pores as the ventilation system connecting airspaces to the atmosphere, it is easy to understand that when the smaller pores fill with water, the ventilation system becomes clogged.

The Final Flush

An elephant using a toilet?

The question we have is not how the elephant learned to use a toilet, but rather what is a Class 1 privy vault doing without an enclosure and door?



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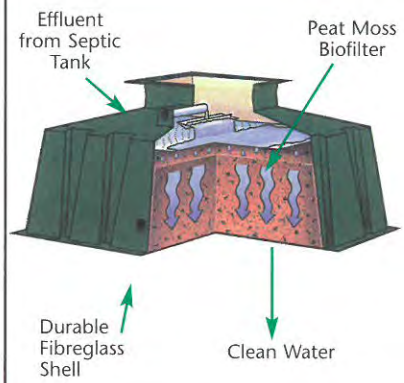

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