

COMPETENCY PROFILE RELATING TO SEPTIC SYSTEMS

A critical reference!

Your job is to design decentralised domestic wastewater treatment systems but you are not aware of the competency profile¹ on the matter? Here are the main reasons why engineers who practise in this field should hurry and check out this valuable tool.

When it comes to members who work in private practice, their usual clients are rarely individuals, simple citizens. Yet, that is often the case for engineers who devote most of their time to installing septic systems in isolated dwellings. This particular fact alone dictates that engineers should have excellent communication skills, be it only to meet the needs of their clients and answer their questions, and promote their services in a competitive market.

Why hire engineers? Given their duties toward the public and the environment, engineers are bound by an absolute obligation, an obligation of result. They might also participate in the construction of infrastructures or environmental studies of the area. Consequently, they need to take the opportunity to raise their clients' awareness as to the importance of the approach, on the one hand, and the value professional services bring to the process, on the other hand; in other words, they should point out the link between evaluating the environment's potential and the possible choices, characteristics, maintenance requirements and associated costs. Engineers are in a very good position when it comes to designing and supervising the installation of decentralised domestic wastewater treatment systems, a field in which so many changes have occurred over the past forty years.

THE PAST EXPLAINS THE PRESENT

Engineers have not been designing septic systems for isolated dwellings for a very long time. Before the 80's, these types of facilities were governed by various municipal regulations and as such, municipal inspectors and excavating contractors were responsible for installing them.

However, over time, we appreciated the importance and complexity of the geologic and topographic factors which influence the design of these systems. The expansion of residential areas beyond urban regions resulted in the construction of an increasing number of residences for which wastewater was not treated through a centralised system. With the passing of the *Regulation respecting waste water disposal systems for isolated dwellings* in 1982, the standards were simplified and municipalities,

Engineers are in a very good position when it comes to designing and supervising the installation of decentralised domestic wastewater treatment systems.

which were then responsible for enforcing the Regulation, began to feel the need to call upon professionals for support.

Then, in 2004, the government modified the regulation so as to ensure that the involvement of a professional became mandatory during the site and soil investigation in order to make sure that the systems would perform. This measure immediately brought engineers and other professionals to turn to this field and offer their services. However, many of these professionals did not have the training or required skills, which translated in a greater need for training.

Nowadays, over 25% of residences located outside metropolitan areas use septic systems for their dwellings, and this market is always growing. Other than those competition and communication challenges discussed earlier, engineers in this field must deal with an academic training that is more or less tailored to their needs (a situation that is not particular to Qu ebec) as well as a lack of experience at the outset of their career.

For many years, the *Ordre des ing enieurs du Qu ebec* (hereafter the "Ordre") has helped these engineers in their quest for improvement. In 2006, the Ordre supported the development of a three-part training programme dealing with soil analysis, designing systems governed by the *Regulation respecting waste water disposal systems for isolated dwellings*, and designing systems governed by section 32 of the *Environment Quality Act*. This programme will soon be updated. More recently, the Ordre published a competency profile in its Guide to professional practice (www.gpp.oiq.qc.ca, Professional development section). This unique tool spells out the skills required to design or carry out decentralised domestic wastewater treatment

systems. By referring to it, engineers can pinpoint their strengths and weaknesses and take the necessary steps to correct their shortcomings.es.

DIFFERENTIATING TYPES OF SOIL, A COMPLEX SKILL

Make no mistake... designing and installing decentralised wastewater treatment systems, specifically systems using a treatment by seepage method, are highly complex tasks that take into account a multitude of skills based on an in-depth knowledge of the soil. A system's design changes according to the nature of the soil. As a result, it is imperative that one chooses the appropriate sanitation device.

Unfortunately and as previously mentioned, engineers interested in this field do not get the necessary training in a university classroom. They are forced to fill those theoretical and technical gaps by reading material on the matter (see the sidebar in this article), taking complementary courses offered by various establishments and institutions and, during their early years of practice, by working under the immediate guidance and supervision of a seasoned engineer with experience in the field.

First and foremost, in order to better identify their shortcomings, engineers are urged to look to the competency profile, particularly the section pertaining to assessing site and soil characteristics (section A2). With respect to the soil, engineers will see, for instance, that they must be able to:

- identify elements of the site that could influence which system is chosen and where it will be located;
- establish the stratigraphic profile of the soil for the host site using exploratory wells;
- assess the high level of groundwater and the hydraulic gradient;
- determine the soil's permeability level in the area or areas chosen for seepage;
- assess the possibility of surface effluent discharge when wastewater seepage in the soil is not possible;
- carry out a topographic survey;
- determine the space available on the host site.

Engineers should gain specific knowledge relating to soil in order to interpret its nature and anticipate the treatment capacity of each type of soil. Section A2 gives engineers a good idea of the scope of the science they may learn from other seasoned engineers and professionals.

LAWS AND REGULATIONS, INFORMATION THAT MUST BE MASTERED

Nowadays, wastewater treatment is a field that is highly regulated by laws, regulations and standards which, oddly enough, are not always fully understood, even by many

engineers (see www.mddep.gouv.qc.ca, "Water" section, "Wastewater" subsection). The competency profile clearly points out the steps where this skill is paramount.

As such, when it comes to defining the client's needs and the conditions relating to the project, engineers must determine the regulatory framework of the project (section A1). They must first be able to apply these requirements to the design, depending on whether they are dealing with an isolated dwelling or a building where the flow of wastewater exceeds 3 240 l/d or the wastewater has variable characteristics, and then select the documents required to obtain the appropriate authorizations (section A5). This will be done by, among other things:

- following the guidelines and requirements pursuant to the *Regulation respecting waste water disposal systems for isolated dwellings*; or
- using or completing the required forms and administrative and technical documents when the system is subject to sections 22 or 32 of the Environment Quality Act.

In other words, the competency profile highlights the need for engineers to master the laws and regulations that govern their field of practice in addition to providing a design approach specific to each regulatory framework.

DESIGNING AND DEVELOPING A SYSTEM, A NUMBER OF DETAILS TO CONSIDER

Designing a decentralised wastewater treatment system is not accomplished in a vacuum, far from it! Engineers must interact with clients and the authorities involved as well as take into consideration a multitude of factors. Clients and authorities are rightfully more and more in tune with the fact that septic systems must respect and safeguard the environment and public health, constraints which are as diverse as the number of natural environments.

The following example illustrates the variety of issues that the design must solve. On this topic, section A of the competency profile, in its entirety, will help engineers carry out the tasks associated with designing a system by spelling out each step:

- defining the client's needs and the conditions relating to the project;
- assessing the characteristics of the site and the natural environment;
- assessing applicable treatment options;
- developing the selected purifying device;
- preparing the technical documents and obtaining the required authorizations.

Engineers who supervise the execution of the projects must also deal with a number of elements, such as implementation levels, quality of materials, preparing the bases for the infiltration bed, etc. They will benefit from referring to section B of the competency profile pertaining

to providing professional services during and after the work, and which lists the skills required to prepare the execution of the work, ensure proper supervision and provide use and maintenance guidelines.

COMMUNICATION, A VALUABLE PROFESSIONAL ASSET

Finally, let us revisit the issues relating to the quality of communication and of the relationship engineers must establish with their clients, usually the owners of isolated dwellings. In order to adequately advise their clients on what can be a very complex matter, engineers should start by ensuring that they are well aware of their clients' needs and the conditions relating to the project. Based on this information, engineers will surely take the time to provide the explanations necessary to make sure that their clients understand and appreciate the proposed services as well as the related costs.

So many essential technical, professional and interpersonal competencies, so many reasons to use the competency profile!

1. This is the fifth in a series of six articles relating to competency profiles prepared by the Ordre des ingénieurs. You can find these profiles at www.gpp.oiq.qc.ca, "Professional Development" section.

Members of the drafting committee

Competency profile – Designing decentralised domestic wastewater treatment systems

Pierre Paul Dumoulin, Eng.

Member of the Professional Inspection Committee –
Ordre des ingénieurs du Québec

Hélène Lapointe, Eng.

Consultant, Major and Associates

Michel Morissette, Eng.

Retired – *Ministère du Développement durable, de l'Environnement et des Parcs*

Christian Vézina, Eng.

Consultant, Roy Vézina & Associates

Useful references in the field of septic systems

Regulations and other documents from the *ministère du Développement durable, de l'Environnement et des Parcs* (MDDEP): <http://www.mddep.gouv.qc.ca/eau/eaux-usees/index.htm>

Dubé, J. P., and Y. Barabé, *Guide technique sur la conception des installations septiques communautaires (petites agglomérations)*

Technical guide on waste water treatment for isolated dwellings (online on the MDDEP site, in French only)

Information sheet on applying section 4.1 of Regulation Q-2, r.22 (online on the MDDEP site, in French only)

Conventional Domestic Waste water Treatment Technologies: Study Guide (online on the MDDEP site, in French only)

Canadian Geotechnical Society, Canadian Foundation Engineering Manual

ASTM D-5921 – Standard Practice for Subsurface Site Characterization of Test Pits for On-Site septic systems

ASTM D-2488 – Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)

ASTM D-2487 – Standard Practice for Classification of Soils for Engineering Purposes (USCS)

Hantzche, Neikirk, Wistrom, Soil Textural Analysis for On-Site Sewage Disposal Evaluation

National Research Council of Canada, Canadian System of Soil Classification

NRSCS, The Cooperative Soil Survey, Soil Texture – Physical Properties

NSSC, NRCS USDA, Field Book for Describing and Sampling Soil

EPA : <http://cfpub.epa.gov/owm/septic/index.cfm> and http://cfpub.epa.gov/owm/septic/septic.cfm?page_id=268