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Septic systems for residential developments in Quebec

The plan for the septic system installation of an isolated dwelling is quite standard. Likewise, building a wastewater treatment system for a campground or a worker's camp is relatively straightforward. The designer develops a plan for a commercial, community, and institutional (CCI) treatment system, which is different from systems for isolated dwellings. What about a cluster of residences that are not connected to the municipal sewage system? This cluster can be considered as a separate entity to be served by a single wastewater treatment facility rather than several. These systems are referred to as semi-collective, individual cluster, non-collective cluster, or sometimes, small cluster, depending on the location or the regulations in force.

What are the criteria for making a sound decision between several individual systems or a semi-collective system for a cluster of dwellings?

APPROVAL OF SEMI-COLLECTIVE PROJECTS

Although semi-collective systems treat residential wastewater of a domestic nature, in Quebec they are considered to be collective because they exceed the criteria provided in the Regulation respecting waste water disposal systems for isolated dwellings (Q-2, r. 22).

The flow rates and loading rates for these systems are calculated according to Chapter 2 of the Guide pour l'étude des technologies conventionnelles (MELCC, 2001), depending on the use or occupancy of buildings. Each province has its own methodology dictated by various regulations or guides.

There is a similar principle in Ontario, with section 8 of the Ontario Building Code that is applicable to systems of no more than 10,000 L/day, but a cluster of systems would instead be governed by the Ministry of the Environment, Conservation and Parks of Ontario. We will use the Quebec example for the purposes of this article.

PROS AND CONS OF A SEMI-COLLECTIVE SYSTEM (APPLICABLE IN QUEBEC)

There are many advantages when implementing semi-collective septic systems for residential clusters in Quebec:

- Lower number of septic installations and equipment required;
- Less management required (owners are not responsible for the maintenance of the system);
- Reduced overall installation costs;
- Costs are shared between multiple owners;
- Reduced risk of failure and pollution through more frequent monitoring;
- Increased available space for each individual lot;
- Increased ease of reducing the size of individual lots if neighbourhood development requires densification.

However, there are also several disadvantages:

- Authorization required from the *Ministère de l'Environnement;*
- Obligation to obtain a signature from an engineering firm;
- Specific, non-reproducible approach, even for very similar projects;
- Agreement with the municipality required to assign responsibility for the management of the filtration system;
- More frequent monitoring (therefore higher associated fees).

Lastly, the case that possibly deserves the most attention:

- Desensitization and removal of accountability of users regarding the best practices applicable to septic installations.

It should be noted that the administrative delays range from 6 to 8 months for individual systems, and from 9 months to 2-3 years for semi-collective projects technologies.

EXPERIENCE GAINED FROM PROJECTS ALREADY CARRIED OUT IN QUEBEC QUÉBEC

Our experience with semi-collective projects completed to date with System O)) has demonstrated the exemplary performance of this technology for a variety of flow rates ranging from approximately 3,241 L day to 90,000 L/day. The latter is equivalent to a cluster of about 70 three-bedroom dwellings.

With System O)), a unique characteristic of the solutions applied in the Quebec commercial, community, and institutional field (CCI) is the mandatory 50% markup factor when a facility is operated annually. This means that, for more than 8 months a year, one third of the system is continuously at rest, ensuring that the lines of the System O)) and the seepage surface go into aerobic mode for a prolonged period of time, allowing passive and natural regeneration and unparallelled longevity of the septic system.

It is an excellent solution to the main issue that is desensitization of users with regard to the best practices of use of a septic installation, without requiring any special corrective action or maintenance of the system.

From a technical point of view, the alternation is achieved by means of a triplex pumping station or a valve chamber with 3 outlets. Thus, it is possible to turn off one out of the three sections of the system by closing a manual valve.

When designing a System O)) infiltration system for annual use, there are two methods:

- Multiple of 3 cells (1/3 of the cells continuously at rest):

In this case, an additional area must be provided since putting a cell in resting mode results in the loss of leaching field area;

- Multiple of 3 rows, nested (1/3 of the rows at rest):

In this case, the closure of one out of three rows still allows the use of all the available leaching field.

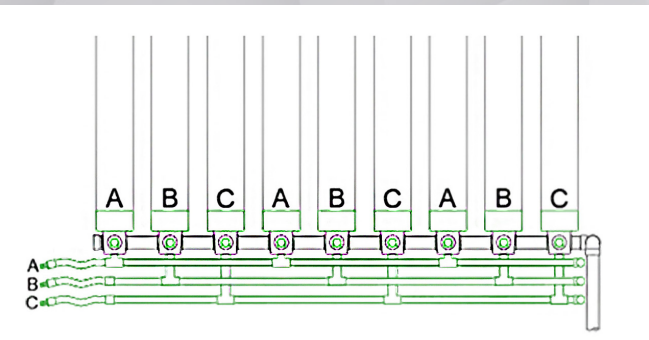

Figure 1 Nested supply

The table below shows the main parameters to design a system for three dwellings with three bedrooms, with a flow rate of 3,780 L per day, according to Quebec regulations and certifications.

Tableau 1 Comparison of scenarios for a cluster of 3 dwellings with 3

System type	Number of active pipes*	Total number of pipes	Minimum active area (m^2)	Total minimum area (m^2)
Semi-collective (multiple of 3 cells)	30	45	75.6**	113.4
Semi-collective (multiple of 3 rows, nested)	30	45	75.6**	75.6
Individual systems for each dwelling (x3)	3 x 10 = 30	30	3 x 32 = 96***	96

* 126 L/pipe/day
** Permeable soil hypothesis (50 L/m²/day)
*** According to the table in section 87.24 of Q-2, r. 22, for permeable soil

This demonstrates that the solution of grouping treatment for a few dwellings may even allow for the use of less seepage surface, despite the additional quantity of pipes, thus enabling passive regeneration of the system, which may prove useful considering the potential misuse to which a semi-collective system might be subjected. The System O)) installation is therefore an extremely interesting option for this type of application.

In addition, a broader range of tertiary treatment units are added to semi-collective systems compared to individual systems for isolated dwellings. Grouping also reduces the overall amount of equipment required.

A concrete example is the need for a UV lamp for a one-bedroom dwelling, whereas a single UV lamp would have the capacity to serve a system of approximately 17 m³/day. Semi-collective solutions also have access to phosphorus removal through coagulant injection or passive phosphorus removal and disinfection with the Dephos O)) solution, which presents a real advantage when site conditions require more advanced processing.

CONDITIONS FOR SUCCESS

As we have seen, obstacles to the development of semi-collective systems are mainly organizational and administrative in nature: the possibility of removing users accountability and the deadlines for the approval of the project. However, these obstacles are relatively easy to overcome.

First, with regard to the presumption of removing accountability, large projects of 20 m³ and larger requires monthly inspection, thus making misuse theoretically easier to detect than with the annual inspection required for an individual system. Even the smallest of semi-collective systems require quarterly inspection. In addition, the owners usually create an association to manage the system and relations with the municipality. This association also ensures that the best practices described in the user guide are applied.

A small annual fee is paid by each owner and put into a trust account that will be used to cover maintenance and repair costs, if applicable. An external engineering firm may also be commissioned for maintenance. All of this is intended as a guarantee of the efficiency of the system.

Speaking of administrative delays, which are inevitable, it would be fair to say that this type of project of installations for a cluster of dwellings is usually discussed in the early stages of the development of a residential neighbourhood or community. Planning is therefore in parallel with the designing of the streets and all other infrastructure, and approval comes in time for completion without causing additional delays. If it's a retrofit, it is critical to start the process at the very first signs that the current system is failing.

In summary, here are the conditions for the success of a semi-collective project:

- Start early, in parallel with the development of the neighbourhood;
- Create a cooperative to share system maintenance;
- Ensure owners are made very aware of the precautions to prevent the loss of accountability.

CONCLUSION

The idea of a semi-collective septic installation as an alternative to multiple individual septic systems was explored. The technical advantages of this type of system are so significant that we are of the opinion that this solution should be the preferred option in cases of developing a new residential neighbourhood, a small community, or even a multi-unit building not connected to the municipal sewage disposal system. Of course, there are some inevitable issues, but also ideas for solutions to successfully carry out such projects.

RÉFÉRENCES

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