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Agri-environment and the engineer: a few answers to your questions

For some time now, engineers practising in agri-environment have had certain concerns relating to their area of expertise. Some works carried out on farm lands, such as the development of a watercourse, surface or underground drainage and irrigation, have given rise to debates, a situation which needs to be addressed.

For this purpose, the Ordre des ingénieurs du Québec has set up a work group in order to take stock of the professional acts in agri-environment under the Engineers Act. Here are the basic guidelines.

LEGAL FRAMEWORK FOR ENGINEERS

Let us first recall what the Engineers Act states with respect to the engineer's field of practice. The law specifies that the engineer's field of practice includes works of the following kind:

(a) railways, public roads, airports, bridges, viaducts, tunnels and the installations connected with a transport system the cost of which exceeds $3,000;
(b) dams, canals, harbours, lighthouses and all works relating to the improvement, control or utilization of waters;
(c) works of an electrical, mechanical, hydraulic, aeronautical, electronic, thermic, nuclear, metallurgical, geological or mining character and those intended for the utilization of the processes of applied chemistry or physics;
(d) waterworks, sewer, filtration, purification works to dispose of refuse and other works in the field of municipal engineering the cost of which exceeds $1,000; […]
(f) structures accessory to engineering works and intended to house them; […]
(h) soil engineering necessary to elaborate engineering works;

(Engineers Act, division II, sec. 2)

With respect to professional acts constituting the engineer's practice, the law is also very clear:

The practice of the engineering profession consists in performing for another any of the following acts, when they relate to the works mentioned in section 2:
(a) the giving of consultations and opinions;
(b) the making of measurements, of layouts, the preparation of reports, computations, designs, drawings, plans, specifications;
(c) the inspection or supervision of the works.

(Engineers Act, division II, sec. 3)

WATER COURSES: UNEQUIVOCAL JURISPRUDENCE

Works relating to water courses can be quite diversified. For example, these could involve digging, reshaping or protecting a water course or even stabilizing its banks or bends. In these types of works, the engineer is called upon to determine a diagnosis and suggest solutions. In order to do so, the engineer must pinpoint the problems and identify the objectives, estimate the flow or discharge, draft an opinion, recommend the work to be carried out and finally, produce surveys, studies as well as plans and specifications.

All of these acts require advanced knowledge and skills in hydrology, hydraulics, soil mechanics and hydraulic structure design. That being said, water courses are considered to be collective goods and no one can take action with respect thereto without authorization. Protecting goods of this nature and ensuring the public's protection as a result thereof are important elements which have led to the creation of a legal scheme governing water courses.

Pursuant to this legal scheme, responsibility with respect to water courses clearly rests with engineers (see division II, section 2 of the Engineers Act). Incidentally, many judgements have confirmed the engineer's competency for all matters with regard to the use, improvement and development of waters. These works also relate to structures accessory to water courses, such as bridges, culverts and ford crossings. In short, jurisprudence has established that professional acts in matters of water courses are clearly engineers' exclusive responsibility.

DRAINAGE, IRRIGATION AND HYDROAGRICULTURAL STRUCTURES: ENGINEERING COMPETENCIES

In the following areas, many works and acts are subject to the Engineers Act and fall within the realm of the engineer's competence.

Underground drainage necessitates, first and foremost that requirements be analyzed, the site be characterized, the placement of drains be determined (depth and spacing) and that plans and specifications be prepared; in addition, a system must be designed and the work must be carried out and supervised throughout. Drainage network design, which requires know-how in hydraulics, the preparation of plans and specifications pertaining to drainage networks and field supervision are all acts falling within the engineer's area of expertise.

The production of a **surface drainage system**, used for surface water run-off, is achieved by carrying out many steps including a requirements analysis, the production of topometric surveys, the calculation of volumes with respect to cut and fill and the preparation of plans and specifications. Such work requires skills and knowledge in such areas as hydrology, hydraulics, ground surveys and surface drainage systems operations. Because of their training, engineers are well qualified to perform acts relating to site topography and incline, cut and fill volume calculations, the preparation of plans and specifications and field supervision in matters of surface drainage. These acts can lie

within the scope of section 2(b) of the Engineers Act, given that they are considered to be "works relating to the improvement, control or utilization of waters".

An **irrigation system** provides water or fertilisers to crops or even protects them from the frost. In order to develop such a system, one must determine the type, measurement and frequency of irrigation required as well as water quality criteria; one must also design the irrigation and water supply systems, prepare plans and specifications, and finally, execute and oversee the work. In this field, acts relating to the design of irrigation and water supply systems, the preparation of plans and specifications and field supervision require considerable engineering skills, more specifically in hydraulics. These acts fall within the engineer's area of expertise pursuant to sections 2 (b) and 2 (c) of the Engineers Act.

Hydroagricultural structures include dams, ponds, inlet wells and settling basins. Again, in this case, it is necessary to assess the requirements based on the site, conduct topometric surveys, carry out hydrological calculations, select and design the most appropriate structures, prepare plans and specifications, and carry out and oversee the work. Acts relating to hydroagricultural works fall within the engineer's field of practice pursuant to sections 2 (b), 2 (c), 2 (f) and 2 (h) of the Engineers Act, because they require a great deal of engineering knowledge in such areas as hydrology, hydraulics as well as soil mechanics and structure.

It bears reminding that many of the skills required to carry out these types of works can be acquired through university programs in rural, agricultural and agri-environmental engineering.

THE ENGINEER AND THE PUBLIC'S PROTECTION

Finally, let us note that in these areas of practice, engineers play a crucial role with respect to protecting the public. For example:

- by designing and constructing an underground drainage system, engineers see to the protection of the environment and to the installation's security with regard to road infrastructures;
- with respect to surface drainage, engineers will consider, among other things, hydrological aspects in hopes of avoiding soil erosion and sanding of water courses;
- with respect to hydroagricultural works, engineers will ensure that the structures truly reduce erosion and sediment transport towards water courses thereby protecting a public good.

As far as the Ordre des ingénieurs du Québec is concerned, having engineers on site is not only relevant but legally justifiable when it comes time to perform the professional acts discussed in this article in matters of agri-environment.