PROFESSIONAL SURVEYORS CANADA
GÉOMÈTRES PROFESSIONNELS DU CANADA

UNDERGROUND INFRASTRUCTURE IN CANADA

Moving toward a more responsible and responsive system

Professional Surveyors Canada
Underground Infrastructure and Mapping Working Group

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PSC Corporate Office / Bureau principal :
101B – 900 chemin Dynes Road
Ottawa, ON K2C 3L6
45° 22' 10.45" N 75° 42' 16.50" W 82m elev.
Phone / Tél : 613-695-8333 Toll free/Sans frais 1-800-241-7200

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Overview

Professional Surveyors Canada and its members are working to bring the survey and mapping of underground infrastructure in Canada into a new era of proactive management for the benefit of the public, developers, utility companies, emergency responders, and government regulatory agencies. Underground infrastructure includes pipelines, fibre optic lines, telecommunication lines, sewers, water lines and all the other sub-surface infrastructure that is critical to allow Canadians to be safe and productive every day.

Professional Surveyors Canada has researched how countries around the world manage their underground infrastructure. Canada can use these models in developing an infrastructure management plan which would follow fundamental principles of data management system. These principles are;

a. Always on and on-line
b. Always current
c. Always open
d. Always secure

The guiding principles underpinning the property rights regime for the underground infrastructure system, follows that of other registered land interests in Canada. The principles are,

a. The right to know (open and notorious)
b. The right to participate (a transparent and simple process)
c. The right to refuse (standard consent or expropriation procedures)

These combined principles provide the guidance to create a better underground infrastructure management system for all Canadians. A better mapped and maintained underground infrastructure system increases productivity and increases public safety.

Background

Currently the systems in Canada dealing with underground infrastructure are a patchwork of regulatory and voluntary regimes. Federal and provincial legislation has sought to improve the system in Canada for the benefit of all Canadians and this is to be applauded. However, there is a long way to go. It should be an assumed fact that all underground infrastructure is mapped and has a known horizontal and vertical location to eliminate hazards to workers, the public and protect the environment. The following are the current deficiencies in the system.

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Installation Issues

Underground infrastructure in Canada is often not surveyed or mapped accurately, if at all. Compare this to above ground infrastructure such as roads and electrical transmission lines which are self-evident and have been mapped very accurately. This lack of data;

a. creates loss of use situations to critical infrastructure such as telecommunications
b. creates hazards for workers
c. creates inefficiencies in locates for customers
d. reduces efficiencies and productivity of One Call systems
e. increases cost for new development
f. increases cost for each new installation of underground infrastructure
g. greatly increases the amount of redundant locates being done
h. increases risk to the public
i. Increases risk to the environment.

Locates

Locates are done by utility companies themselves or by private contractors. This involves using tracing equipment to go find what is buried underground. These locates suffer from some fatal flaws. Firstly, the as-built information is not complete. Sometimes it appears there is nothing to locate underground, when there may actually be an oil or gas line. Secondly, there is no standard for locates and no guarantee of liability insurance. Thirdly, even under the best circumstances, a locate will map an underground infrastructure to within one meter horizontally and much worse vertically. This, by any measure, is less than ideal. Fourthly, underground infrastructure in Canada is located over and over again in the same areas, often in the same year. The locations done are in the horizontal plane but seldom in the vertical. This severely limits the usefulness of the captured data for future designs. Fifthly, no common system is updated, so even when a UI is located, the data is never accurately captured and updated. The CSA has standards for location of UI, but even if the data is captured, there is no reliable, repeatable, relatable system for all to use.

Locate Refusal

A common complaint is that owners of buried facilities will not perform locates or arbitrarily apply rules for locates. This is not an open system and transparency is needed. For instance, professional land surveyors will contact individual owners of underground infrastructure directly, or through One Call centers to request locates to provide information needed to plan a building, road or other development. There is usually a lot of lead time. The integrated surveying allows for plans to be made for the orderly and safe development of the lands in the area. Some owners will not perform underground locates if there is not an immediate ground disturbance being conducted, citing current regulation wording. As well, locates may be denied for underground infrastructure in existing road rights of ways due to the same citation. This is not reasonable. This makes planning for safe

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development difficult, more expensive, and benefits no one. The system proposed gradually eliminates that cost to utility companies while reducing risk and insurance costs.

Limitations to one call

One Call systems vary in complexity across Canada. Some One Call systems are active and have reasonably good data exchange from the utility companies registered. Passive systems for One Calls exist in some jurisdictions which are merely a central phone hub. This system saves the requester calling each utility, but it is not a robust reliable, repeatable and relatable processes. These passive systems are greatly affected if there is staff turnover in the system. Some jurisdictions have no data and no One Call systems.

Legislative changes such as Bill S-229 (Underground Safety Enhancement Act) requiring all utilities to register with a One Call system can have a positive effect. However, all systems suffer a fatal flaw in that there is no mechanism to ensure that the management of data and the location of the underground infrastructure in an area is reliable, repeatable and relatable. Achieving this goal requires the implementation of a new system.

Lack of Investment Potential

The current system of managing underground infrastructure requires constant investment by the utility companies and the taxpayer. However, the lack of a coherent system makes funding from multiple levels of government and utility companies difficult to correlate and plan. The approach advocated here would allow for costs to be reliably budgeted and largely funded at the time of installation, so that future development and operational cost and risk factors can be alleviated. A new system would also allow for a recoupment of investment dollars. This is the case in current land development in all other aspects. During a development, the cost of data capture and registration are captured for the express purpose of having a common operating system. A very small portion of that cost is absorbed for the maintenance of the common system such as public easements for utilities which are underground. It makes sense that the development cost match the intent of the easements and that the actual cost to locate and manage the underground infrastructure are not put on the taxpayer of the municipality or local government.

The Crowded Underground

Urban environments are where the majority of citizens live, and those environments have crowded undergrounds with aging infrastructure. Less and less space is available. This means that buffer distances are needed and more accurate installation and mapping is needed to effectively plan and prevent incidents. It is woefully unfair if one utility company installs underground infrastructure in such a way as to hinder further installation of underground infrastructure by another company or municipality.

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Changes to Standard Industry Practice

Currently all underground infrastructure is located in isolation, and new installations are not being surveyed and mapped, precisely when the data collection would be most cost effective, reliable and accurate. Further, the data that is collected is in disparate formats and exists in silos. The problems addressed in the previous section can be solved with the following changes and Canada can lead the world in this area. There are many areas where changes to legislation and creation of a new reliable, repeatable and relatable system will benefit Canadians and Canadian companies. These are guiding principles that allow for the standardized mapping and reduction of both physical, environmental and economic hazards that exist today.

Survey and Map All

All new underground infrastructure should be surveyed and mapped by licenced professional surveyors in standard formats during installation when the unit cost is at its lowest. All current surveys that locate underground infrastructure should update a common data set within a region or larger area. These surveys are being done every day in Canada, but the data is lost. This would be an exponential increase in productivity and safety. Professional Surveyors Canada is coordinating this effort and working to the standards necessary to benefit all Canadians and Canadian companies. The standard will provide interchange and interoperability between systems so that silos are not a deterrent to good data sharing.

Plans of Easement – Private Lands

All underground infrastructure that is placed on private lands should have an easement plan for service and notification to the land owner registered in the respective provincial registry. This is the only way for proper planning and assessments to be done on private lands. It also protects the underground infrastructure owner when conflicts occur. If it is good enough for every interprovincial pipeline, it is good enough for all others. Further, if a member of the public buys a property, they have a reasonable expectation that all hazards and encumbrances to the property are disclosed at the time of the purchase. Professional Surveyors Canada is working with our members to ensure our reporting reflects that standard.

Alignment Surveys

Underground infrastructure is commonly designed from a private property limit in a right of way. This practice should be supported by having the alignment surveyed by licenced professional land surveyors before placement of the underground infrastructure to ensure private lands are not affected by alteration to the plan. Alternation from the design plan is common and this erroneous placement of underground infrastructure hinders other underground infrastructure placement by

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utility companies and municipalities. This endangers the public and workers as there is no current system to convey these alterations to designs in a reliable, repeatable and relatable system.

Burial Depth or Depth of Cover

It is not easily understood why a ground disturbance depth standard exists in federal legislation but a depth of cover or burial depth does not. Hazard prevention should not be entirely put on the shoulders of workers and the public. At a minimum, it would be common sense to have burial depth mandated that is greater than the ground disturbance depth. Canadian Standards Association standards which are part of regulation should be enhanced for all underground infrastructure. The standards should be made to be equal that of other countries, where the minimum standard in most areas is 1 metre and 0.610 of metre in bedrock areas, unless protective conduits are used. As with current standards for interprovincial pipelines, depth of cover is verified and recorded and the lines are accurately mapped during installation.

Buffer Distance

The crowded underground landscape requires that utilities are not adversely affecting other underground infrastructure and that safe and orderly development can occur. Ensuring new installations are placed where they are designed to be, will reduce strikes on existing infrastructure, protect workers, and protect the systems we all rely on such as communications systems and natural gas systems that heats many homes.

Registration Time Limits

In the oil extraction industry in particular, legislation exists to ensure easements are registered in a timely manner. This process should be improved upon and updated to reflect the current business practices of each underground infrastructure owner in each industry. This standard would normalize all pipelines whether they cross private lands, First Nation reserve lands, Parks etc.

Leading Towards a Better System

Implementing a better system for underground infrastructure management is the goal of Professional Surveyors Canada. The concepts and technical standards are informed by similar data exchanges and cost sharing models such as implemented by IKT in Germany, the Pipeline Open Data System (PODS) in the United States and Canada and current registry systems in Canada.

Move from Second Rate to First Tier

Having a reliable, repeatable and relatable system benefits all users, significantly reduces cost and prevents accidents before they happen. The proposed system is designed to capture the cost associated with managing the system and change the business model to one that is responsive and reflective of the market. The proposed approach also allows government, if they chose, to speed the

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process to a better system in a reliable, fair and transparent way. This benefits the public, the utility companies and municipalities by reducing duplication of services and enhances environmental protection. This system also improves One Call systems progressively as more information becomes reliable and accessible.

The proposed business concept borrows from some current registry systems, which put the liabilities for the system with the users and suppliers. This incentivises all parties to work collaboratively in the most efficient manner possible, and allows government to play a consistent oversight role but not be encumbered by managing a program. Like banking, the government sets the path, the banks handle the day to day, with the costs shared by the users of the system. The business of underground infrastructure mapping and data retention and analysis needs to be a business that works. A successful model allows for the continued prosperity, safety and productivity of all Canadians.

Collaborative Leadership

Throughout the years, there have been many federal, provincial and local government laws and regulations created to protect the public and strengthen the critical infrastructure system in Canada. These laws and regulations serve Canadians well, however improvements can be made. Creating a proactive system rather than a reactive problem solving reality with each incident, is the goal.

There are several areas where regulatory agencies and governments can lead in this change to the system. The areas of leadership needed are;

1. As with interprovincial pipelines, all new underground infrastructure should be surveyed by licenced professional surveyors at the time of installation. This will allow for standardization of data formats and integration into common map formats. Professional Surveyors Canada will lead the data capture standards and will collaborate with Canadian Standards Association to achieve this goal. Legislation is an opportunity to provide guidance.
2. All underground infrastructure installed on private land should be required to be supported by registered easement plans based on the surveyed location of the installed infrastructure. This type of regulation exists in some provinces, but it should be a Canadian standard.
3. Legislation for basic safety and environmental hazard prevention need to be strengthened. General legislation regarding all underground infrastructure would assist in guiding interested parties that operate underground infrastructure to work collaboratively and self-fund their share of the process.
4. Legislation for basic property rights guidelines that are reflective of our common history and property rights and interest registration in titling systems.
5. Legislation such as Bill S-229, creating a level playing field for all utilities and strengthening notification systems.
6. Legislation or regulation that creates the environment for a reliable, repeatable and relatable data system so that notification systems are improved and liability is reduced. This would be similar legislation to Bill S-229.

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In the realm of public and worker protection along with property rights, Professional Surveyors Canada has released position papers on Bill S-229 and C-46 Regulations that speak to some of the related issues. The main points are summarized in the next section, but a greater detail can be observed in those papers, available on the PSC web site www.psc-gpc.ca . Below are proposed additions or wording changes to laws and regulations. We have tried to ensure that there is no conflict with other regulations or acts.

Specific Legislative Improvements

All new installations of underground infrastructure in Canada should have the following:

1. All new underground infrastructure should be surveyed and mapped to a CSA standard S-250 5.5, A or B. The cost for this is close to zero.
2. All underground infrastructure surveyed should be in a common format that can update a master map/GIS data set.
3. All underground infrastructure placed on private lands should have an easement plan of the area affected, registered in the corresponding provincial registry, First Nation Land Registry or federal crown registry.
4. Minimum buried depth of 1 metre except in the case of bedrock which should be no less than 0.6 of a meter. This is consistent with the US standards.

Given today's technology, Professional Surveyors Canada can see no reason for the location and depth data for any underground infrastructure to not exist, especially for new installations. Sharing basic information on the type, location and depth of underground infrastructure in a standardized form through a common, accessible system will reduce health risks, prevent environmental damage and limit liability, among other benefits. The potential productivity gains and risk reduction would be significant.

Moving to an active underground infrastructure management system would allow for information to be aggregated and to be utilized in the most secure and productive way. This reduces or eliminates disruption to the current systems. In this model, all companies and municipalities would benefit, as their shared data becomes more robust, with minimal or marginal cost to each. This new system can be thought of as an ever improving exchange of information for the benefit of all Canadians, Canadian companies and municipalities. Professional Surveyors Canada is working toward a reliable, repeatable, relatable system for all to use and expects that government and other agencies share this goal.

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