Simply Accurate Underground Information

By Jeremy Cook, P.Eng and Donna Cragg

Canada's new CSA S250 'hits the mark' by introducing a framework for accuracy in mapping of underground utility infrastructure.

The publication of Canadian Standards Association (CSA) S250 – Mapping of Underground Utility Infrastructure is expected in March 2011 and will inevitably be compared with the only other like standard in existence, the American Society of Civil Engineers' CI/ASCE 38-02 (ASCE 38-02). The comparison is interesting because although both standards cover similar ground their focus of application differs. ASCE 38-02 is aimed at *existing infrastructure* and provides a framework for *quality analysis* of mapping records. CSA S250 is aimed at *new infrastructure* and provides a framework for defining *accuracy* and *reference datum* with respect to mapping and as-built records.

Development of the CSA S250 standard started in the fall of 2007 with the establishment of a Technical Committee that included subject matter experts from across Canada. Funding for development through to publication of CSA S250 has been provided by the member municipalities of the Regional Public Works Commissioners of Ontario, Public Works and Government Services Canada, Department of National Defense, TELUS and the Association of Ontario Land Surveyors. A draft version of the standard was released for public review in September and the review period concluded on November 6th, 2010. The final version is now in the last stages of preparation with the Technical Committee prior to presentation and approval by the CSA Board. Once this is completed CSA S250 will be formally released.

Mark Braiter, CSA's Project Manager for S250 says its introduction will be aimed at setting a "Standard for Mapping of Underground Utility Infrastructure in Canada ensuring that underground plant is readily identifiable and locatable". Underground plant has increasingly been on the radar for two main reasons, cost savings and safety. The Ontario Regional Common Ground Alliance estimates the value of underground infrastructure in the province to be in excess of $70 billion, which represents a significant investment to be safeguarded. Actually the initiative to develop S250 has been driven in part by the recognition of the increasing business and social costs incurred from not being able to define with standard accuracy what is under the ground.

What will this mean to surveyors?

The essence of CSA S250 is that it provides a selection of accuracy and reference datums defined as Levels 1 to 4, plus a Level 0 for unknown spatial accuracy such as when copying previous records to create base mapping. The accuracy selections range from ±25mm to ±1000mm and the reference datum is to be geodetic for the two higher Levels with a choice of geodetic, cadastral or topographic for the two lower Levels. Except for Level 0, results must be referenced to an acceptable datum with a 95% confidence level. Subject to any last minute adjustments the published specifications are expected to be as illustrated in Table 1.

The obvious benefit of CSA S250 to those involved with underground infrastructure is that there will be a clear understanding of the accuracy associated with any utility map or plan. One of the challenges of the pre S250 situation has been the inability to determine the required accuracy level, or an inconsistency here that has led to confusion when viewing the results. In this respect S250 will offer a simple and consistent approach that is easily understood. For those on the receiving end of mapping requests this improvement will be appreciated.

Another important aspect of CSA S250 is that it will permit certification by any competent person, whereas ASCE 38-02 only permits certification by a professional engineer. At times requests for underground information have been phrased in terms such as "equivalent to ASCE 38-02" when a professional engineer's stamp is not required. Licensed surveyors will meet the competency requirements outlined in the standard and will be able to certify their results under S250.

This may also influence the use of the term Subsurface Utility Engineering (SUE) which was introduced by ASCE 38-02 in 2003 and rapidly became synonymous with mapping of underground utilities. The popularity of this term led to many requests for SUE studies and attendant engineering certifications when all that was really required was a mapping exercise. In response to this some companies began to introduce new terminology such as Subsurface Utility Mapping (SUM) or Subsurface Utility Investigation (SUI) in order to distinguish requests for mapping when engineering services were not actually required. The problem was that even where companies were properly licensed to provide engineering services the extra cost involved might have led to loss of work in a competitive environment. The advantage of S250 is that as long as the

Table 1.

Specification	Accuracy Requirement	Reference Datum
Level 1	±25mm in x, y, z coordinates	geodetic
Level 2	±100mm in x, y, z coordinates	geodetic
Level 3	±300mm in x, y, z coordinates	geodetic, cadastral or topographic
Level 4	±1000mm in x, y, z coordinates	geodetic, cadastral or topographic
Level 0	No spatial accuracy	

mapping meets the standard there will be no need for additional services or cost in order to meet certification.

One area that remains somewhat unclear prior to CSA S250's publication is how users will respond to the distinction between new and existing infrastructure installations. S250 is aimed at the measurement of newly installed infrastructure or existing infrastructure when it is exposed during the course of subsequent excavation. Users are referred to ASCE 38-02 when dealing with existing infrastructure that is not exposed.

This means that CSA S250 is not intended to apply to the measurement of locate marks or where the position of a buried utility is determined by remote detection methods. The problem of switching to ASCE 38-02 in this situation is that although it can classify the result as Quality Level "B" it does not provide any guidance as to how accurate to make the positional measurements. One possible consequence of this is that people will start to combine the two standards to create a hybrid approach. For example they may ask for detection methods that will provide ASCE 38-02 Quality Level "B" combined with accuracy and reference datum that meet CSA S250 Level 2. This is not necessarily a problem because it appears that both standards can accommodate this type of interaction.

Surveyors and clients alike will benefit from a clear and consistent understanding of the accuracy when requesting and receiving mapping results. With a consistent approach come cost and time savings, and ultimately improved mapping that is universally recognized and understood. CSA S250 promotes better communication between all stakeholders and will help streamline the growing challenges resulting from mapping an increasingly changing infrastructure.

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Calendar of Events

February 9 to 11, 2011

2011 ORCGA Damage Prevention Symposium
Niagara Falls, Ontario
www.orcga.com

February 23 to 25, 2011

119th AOLS Annual Meeting
"Setting our Sights on Education"
London, Ontario
www.aols.org

May 1 to 5, 2011

ASPRS 2011 Annual Conference
Milwaukee, Wisconsin
www.asprs.org

May 18 to 22, 2011

FIG Working Week & XXXIV General Assembly
"Bridging the Gap Between Cultures"
Marrakech, Morocco
http://www.fig.net/fig2011

July 3 to 8, 2011

25th International Cartographic Conference
Paris, France
www.icc2011.fr

July 7 to 12, 2011

Survey Summit
ESRI/ACSM
San Diego, California
www.thesurveysummit.com