Global ambitions

The development of subsurface utility engineering standards

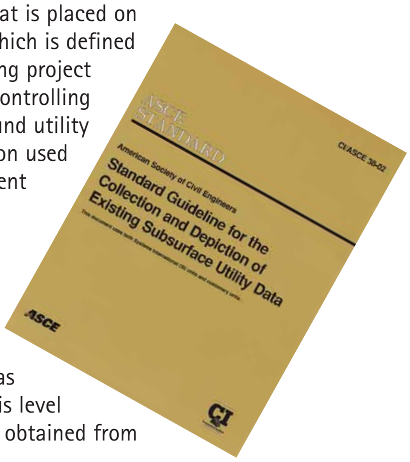
Nick Zembillas, Senior Vice President, Cardno TBE UK

IN 1996, the first ever American Society of Civil Engineers (ASCE) committee was created to produce a standard for subsurface utility engineering (SUE). One current country of focus is the UK, where a British Standard Institute (BSI) publicly available specification (PAS) for detecting and mapping subsurface utilities is now in the drafting process. Although this is a major and positive step forward, there are some who remain sceptical about its purpose within the utility detection and mapping industry.

In January 2012, the general opinion of the industry attendees at the initial BSI symposium was to proceed with a PAS as a fast-track method to obtaining a utility detection and mapping specification. This fast-track approach does not come without strong reason. One major factor is the successful implementation of subsurface utility survey standards in America, Canada, Malaysia, and to launch in 2013, Australia. These four countries have each launched a national consensus standard for detecting and mapping subsurface utilities. They have all been created to address issues from how utility information can be obtained, to what technologies are available to obtain that information, and how that information can be conveyed to the information users.

America: ASCE 38-02

The ASCE *Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data* (CI/ASCE 38-02) was the first national consensus standard in the world to define the quality of utility location and the attribute information that is placed on plans.[1] Based on SUE, which is defined as a process for managing project risk by identifying and controlling the quality of underground utility infrastructure information used in the design, development and construction of a project, ASCE 38-02 is a 'standard of care' based on quality levels:



- Quality Level D typically referred to as 'records research', this level provides information obtained from existing records.
- Quality Level C adds field survey of visible above-ground utility facilities such as valves and manholes, reconciled to existing utility records.
- Quality Level B requires the use of subsurface geophysical methods to determine the existence and horizontal position of underground utilities.
- Quality Level A is the highest level of accuracy and generally uses vacuum excavation equipment at critical points to determine the precise horizontal and vertical position of underground utilities.

The US justice system holds this type of standard in high regard, and courts and lawyers use it to assist in both defining a professional's standard of care and in adjudication of blame.

A problem for the ASCE 38-02 committee had been that although SUE is a well-developed risk mitigation process for utility surveying in the US, 25 years ago, companies across America were doing different things, but all calling it the same. Not only did this confuse project owners and engineers using SUE services, but also made accountability for errors almost impossible. Encouraged by the US courts and the Department of Transportation, committee chair Jim Anspach approached ASCE about the possibility of launching a standard. Mr Anspach managed the drafting process and in 2002, ASCE 38-02 was launched as a national consensus standard.

Although ASCE 38-02 was devised as a non-mandatory consensus standard, the US justice system holds this type of standard in high regard, and courts and lawyers use it to assist in both defining a professional's standard of care and in adjudication of blame. It is even state law in Minnesota, Georgia and Pennsylvania, and the majority of state departments of transport protect themselves by including this standard by reference in their contract documents.

In the early days, when the standard was in draft, Mr Anspach's idea of a standardised approach hit some obstacles. During the outreach programme, it was believed that accurately detecting subsurface utilities could not be done by anyone other than the utility owners, but utility owners did not feel it was their duty to provide such services for any purpose other than construction safety. The draft made the case that such a standard was common sense for the greater public good, especially throughout the project development process.

The project owner and engineers are responsible for taking appropriate actions to consider and deal with utility risks. Through

Top: The ASCE 38-02 standard.
Right: Obtaining and recording underground utility information can have several benefits.

A BSI publicly available specification for detecting and mapping subsurface utilities is currently in the drafting process.

ASCE 38-02, they can determine an appropriate level of effort for utility mapping by specifying utility quality levels to be attempted or achieved. The engineer will furnish the achieved utility quality levels to the owner in accordance with the standard and, by doing so, is responsible for negligent errors and/or omissions in the utility data for that certified utility quality level.[2]

Since its launch in 2002, ASCE 38-02 has driven SUE companies across the US to improve their working practices for the good of the design and construction industry. This indemnified reliability to the surveys produced by SUE engineers should be a prime consideration for the BSI technical committee, as it has proved to be a success in the US.

Canada: CSA S250

In 2011, Canada published the Canadian Standards Association (CSA) S250 *Mapping of Underground Utility Infrastructure* – described as a collective framework of best practices to map, depict and manage records across Canada. It was instigated by several authorities, including the city of Toronto, as there was a recognised need from utility owners, the Federation of Canadian Municipalities, contractors and utility locators to get better at collecting records and improving existing mis-collected data.[3]

For the first time in a national consensus standard, CSA S250 defines exact ± accuracy parameters of x, y and z coordinates from levels 1-5 (as well as a supplementary record level 0) for as-built records. The standard also provides guidance on data sharing and specifies the utility attributes (for example colours, naming conventions, symbology) to be used for describing and depicting newly built underground utility infrastructure.

The standard was created through a consensus standards development process approved by the Standards Council of Canada. The process brought together volunteers representing varied viewpoints and interests to achieve consensus. Throughout the process, CSA made the draft standard available for comment, review and approval until the final CSA S250 was launched in 2011.

It is too early to offer a definitive answer on its success, as the standard and its benefits are currently being promoted to relevant stakeholders across the country. However, the response has been positive, and the utility and right-of-way owners, such as Union Gas and the Ontario Ministry of Transportation, are looking to improve their current records practices by following the new CSA standard.

Although CSA S250 is primarily for the use of utility and right-of-way owners – with several SUE surveyors providers still complying with the ASCE 38-02 standard – the CSA standard is detailed and provides a solid guidance for future utility installations, quality utility records for future use and a standardised approach on data sharing.

Malaysia

The *Standard Guideline for Underground Utility Mapping* in Malaysia was launched in 2006 to create, populate and maintain the national underground utility database. Jabatan Ukur dan Pemetaan Malaysia (JUPEM) manages the database and expects it to be populated with data obtained from various utility agencies nationwide in accordance with the standard.

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This standard addresses issues such as roles of stakeholders and how utility information can be obtained, and was a call to action from the Malaysian government due to increasing demands for improvements on basic infrastructure facilities such as utilities. It therefore seemed pragmatic to create an accurate and standard utility database while this infrastructure was being developed.

It is very similar to ASCE 38-02, using quality levels D-A as its basis. Although it does not classify utility definition, colours or symbols, the Malaysian standard does specify an accuracy ±10cm for both horizontal and vertical readings. Unlike ASCE 38-02, CSA S250 and the Australian AS 5488 draft, a national consensus association does not support the Malaysian guideline. However, the backing from the Malaysian government – which has actively got involved and pushed for a more accurate record database – will ensure that construction projects in the future have better quality utility records, reducing health and safety risk, project costs and potential project redesigns.

Australia: AS 5488

A Standards Australia standard for subsurface utility information (SUI) completed the draft for public comment stage on 22 October 2012. A select committee prepared the draft, and now the comment stage is complete, the committee will examine the public comment and make changes where necessary. It is anticipated that the final standard will be released in 2013.

The objective of the drafting committee was to have a standardised approach that will allow SUI engineers to verify existing subsurface utilities when each quality level has been carried out in accordance with the Standards Australia document. It also provides guidance on how the SUI information should be obtained and how that information should be conveyed to the information users.

Standards Australia required broad representation by national bodies on the development committee to make it a national consensus standard. All these organisations had their own perspective of what the standard should and should not contain, and all had their own requirements depending on what part of the industry they were representing. At some times this encouraged debate, however the end result is a draft standard that is a consensus document with broad agreement across all involved parties.

The draft version of the standard is clear and concise which means it has the potential to become an excellent support document not only for the utility detection and mapping companies, but also for the surveyors out in the field. Combining both quality level breakdowns with strict spatial positioning accuracies and guidance on a standardised approach to record utility information, the draft AS 5488 has the potential to be a fit for purpose consensus which tailors itself to the Australian industry.

If all goes to plan in the draft phase then the standard will be endorsed by Standards Australia. On their own, Australian standards have no legal status and no requirement for compliance by manufacturers, consumers or the public. However, an Australian standard can often be called up in state and Commonwealth legislation. When this happens, these standards become a representation of best practice and can be subject to the scrutiny of the courts.[4] The committee implementing this standard therefore expects levels of working practice within the utility detection and mapping industry to greatly improve with this gravitas behind them.

Conclusion

As these fellow international standards have demonstrated, a standardised approach to obtaining and recording underground utility information can have several benefits. At Cardno TBE UK, engineers currently work in accordance with ASCE 38-02 and we have found twofold success:

- Firstly, engineers and surveyors work within a guideline that meets a client's expectation.
- Secondly, the client is assured that we hold full responsibility for the utility surveys we produce, in turn helping to alleviate project delays and redesigns associated with underground utilities, and more importantly, help eliminate risks associated with underground utilities during construction.

However, we would much prefer to work in accordance with a British standard compiled for the British industry. It is for these reasons that the development of a BSI PAS for the detection and mapping of subsurface utilities should be taken seriously and be supported industry-wide.

Nick Zembillas, Senior Vice President, Cardno TBE UK
cardnoSUEuk@cardno.com
www.cardno-uk.com

[1] American Society of Civil Engineers, *Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data*
[2] US Department of Transportation Federal Highway Administration ASCE Standard, Standard Guidelines for the Collection and Depiction of Existing Subsurface Utility Data www.fhwa.dot.gov/programadmin/asce.cfm
[3] YouTube: Mapping of Underground Utility Infrastructure - CSA S250 http://www.youtube.com/watch?v=NQ9FzaxFMIo
[4] Standards Australia