




Volume XII  
Number 1

BY DESIGN

## Robotics Simplify, Streamline Surveying

 R2D2 it's not. The familiar Star Wars robot won't be found in the field surveying with BMI employees, as much as they might enjoy the company. Nonetheless robotics are in the field, changing the face of surveying as we enter the new century.

Traditionally, surveying has been done by teams of two or more people, one making observations through a survey instrument mounted on a tripod, and another establishing the control points at a distance. The surveyor at the tripod moves the lens into precise vertical and horizontal alignment, then records the measurement. The team works together, compiling data that will make accurate mapping and construction possible.

New robotic surveying equipment makes it possible for one person to accomplish the work that was done by two in the past. It's a "point and shoot" concept.

How does it work? When a surveyor takes measurements alone, a radio communicates information between a robotic control unit, or base total station, and a prism (reflective target). The base total station automatically follows the prism target, which is on the rod, without the need for aiming or focusing. This, in many cases, eliminates the need for an operator at the base instrument. The equipment is accurate even in low-visibility environments. Data is collected with less margin for error, and quality is higher because measurements are taken at the point being measured, where errors can be quickly identified and corrected.

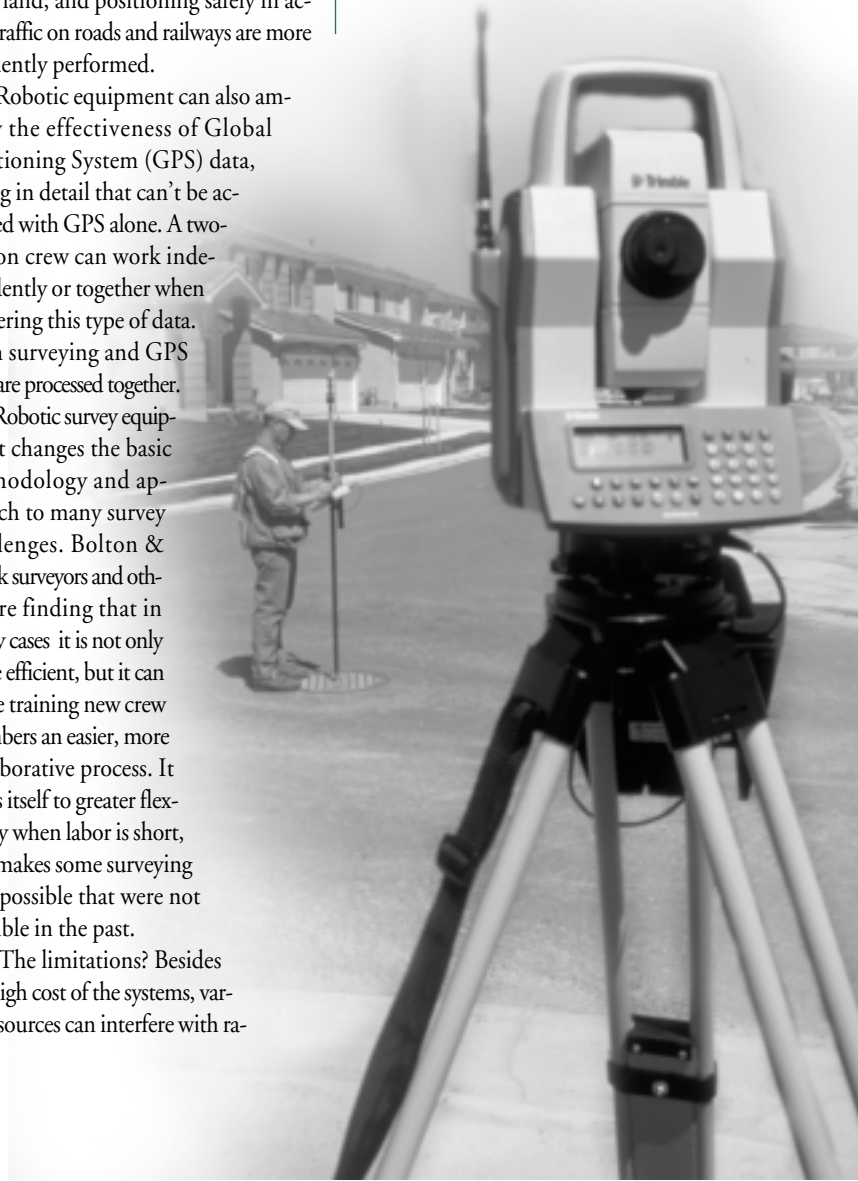
In addition to remote control operation, the new instruments in use at Bolton & Menk allow the operator to make measurements of any kind of surface. Now it may be easier to survey where the target is difficult, impossible, or dangerous to reach. Tasks such as tunnel profiling, determining building elevations, measuring to objects on inaccessible land, and positioning safely in active traffic on roads and railways are more efficiently performed.

Robotic equipment can also amplify the effectiveness of Global Positioning System (GPS) data, filling in detail that can't be acquired with GPS alone. A two-person crew can work independently or together when gathering this type of data. Both surveying and GPS data are processed together.

Robotic survey equipment changes the basic methodology and approach to many survey challenges. Bolton & Menk surveyors and others are finding that in many cases it is not only more efficient, but it can make training new crew members an easier, more collaborative process. It lends itself to greater flexibility when labor is short, and makes some surveying jobs possible that were not possible in the past.

The limitations? Besides the high cost of the systems, various sources can interfere with ra-

dio signals, and there are times when it's not wise to leave the base instrument. Safety can often mandate multiple person crews. But robotic survey equipment does offer benefits in productivity and accuracy that pay off for both surveyors and clients.



## New at Bolton & Menk

### *RDA Names BMI 2001 Firm of the Year, BMI's Brown as Project Manager of the Year*

Bolton & Menk was named 2001 Minnesota Firm of the Year by the U.S. Rural Development Authority.

The award was presented by Chris English, a Representative for the Rural Development Authority. English noted that Bolton & Menk has, on several occasions, advised clients to select alternative solutions that were not always in the best financial interest of the firm, but did serve the client and funding agencies well.

At the same time the agency honored Robert Brown, V. P. of Bolton & Menk's Environmental Division, as the 2001 Minnesota Project Manager of the Year.

### *Bolton & Menk, Inc. Inducted into Mankato Chamber of Commerce Hall of Fame*

On Tuesday, February 19, 2002, Bolton & Menk, Inc. was inducted into the Business Hall of Fame sponsored by the Mankato Area Chamber and Convention Bureau.

The Mankato Area Business Hall of Fame was established by the Mankato Area Chamber of Commerce to honor special businesses and individuals in their community for contributions to jobs, economic and community development and the spirit of entrepreneurship. The Business Hall of Fame was established in 1987 and includes over 47 local area companies.

The firm has always encouraged employees to be active in their communities. Bolton & Menk was founded upon this value. Awards such as this are partially a result of individual efforts, both personal and professional, that help our communities become better places to work and live.

### *Piece of Minnesota Surveying History in BMI Mankato Office — For a Year*



Each year the Minnesota Land Surveyors Foundation awards scholarships to students who are pursuing careers in land surveying. Members of the Minnesota Society of Professional Surveyors make the scholarships possible through fund-raising. In 2001, 32 scholarship awards totaling \$23,000 were given by the Foundation.

Peter Blethen of Bolton & Menk recently participated in the scholarship campaign in a big way. As the highest bidder in a live auction at the group's annual meeting, he purchased the right to keep and enjoy a unique piece of Minnesota surveying history for one year.

Standing in Blethen's office in Bolton & Menk's Mankato office is a portion of an original bearing tree. These trees were a part of the original government survey conducted in Minnesota during the late 1800s. This bearing tree, which was uprooted during recent road construction, has been preserved. A small statue of a surveyor, donated by *Point of Beginning*, a national surveying magazine, completes the traveling trophy.

Volume XII      Editor: Nancy Thorkelson  
Number 1      Production: ENVISION: Design that Works, Inc.  
Saint Peter, Minnesota

Published Quarterly by Bolton and Menk, Inc.

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*Designing for a Better Tomorrow*

Bolton & Menk is an affirmative action employer.

## *Bolton & Menk's New Chaska Office Brings with it a Tradition of Outstanding Service and Municipal Capabilities*



William R. Engelhardt, P.E.

Bill Engelhardt credits the success of his business to the skill and dedication of loyal employees. Established in 1984 by Engelhardt and one designer, William R. Engelhardt & Associates, Inc. (WREA) earned a reputation for highly professional, specialized expertise in municipal engineering. By 2001, the

firm provided municipal engineering services to eleven Minnesota cities and numerous private clients.

In December 2001, William Engelhardt and Associates became part of Bolton & Menk, Inc. The change was motivated by a desire to better serve both BMI and WREA clients.

"Technically," Engelhardt explains, "this firm has been very strong through the years. We have some of the best engineers in the industry. The staff is mature, experienced and well qualified. They've been with me from ten to seventeen years,

and are the reason we have so capably delivered sound, practical engineering to clients. Clients have come to expect that Engelhardt and Associates will deliver a project that is well thought out, well designed, and accomplished in a timely manner."

As he pauses to reflect on the values he's sought to instill in WREA employees for almost two decades, Engelhardt's voice resonates with respect for his colleagues. "In my opinion, a municipal engineer has to be the most honest person on the face of the earth. These people have lived that kind of professionalism."

President Jon Rippke of Bolton & Menk considers the merger of the two companies a win/win situation, because the culture and principles of the firms are a good match.

"Engelhardt clients now have access to a broader range of services," he explains, "and Bolton & Menk has the opportunity to deliver its specialty services to a larger service area."

Engelhardt will serve as Principal-in-Charge of BMI's Chaska office and is enthusiastic about its potential for growth. "The strengths and services provided by Bolton & Menk allow this office to better serve growing client needs. The merger creates new opportunities."

## *Arsenic in Drinking Water*

Reprinted with permission from the Minnesota Department of Health.

Although arsenic has often been used as the poison of choice in murder mysteries, the reality is that arsenic in our environment is found in very small levels, too small to be of use to anyone with homicidal intent and much too small to pose an immediate health threat to people. However, even small amounts of arsenic, if consumed over a long period of time, can cause adverse health effects.

Arsenic occurs naturally in our environment. It is part of the earth's crust. As a natural component of underground rock and soil, arsenic works its way into groundwater. As a result, municipalities and other public water suppliers that get water from underground sources may draw water from their wells that contains small amounts of arsenic.

Groundwater in the west-central and

northwestern parts of Minnesota tends to have higher concentrations of arsenic, although it can be found throughout a large part of the state.

Arsenic is regulated in drinking water and a maximum allowable limit—known as a maximum contaminant level (MCL)—has been set for it. Some people who drink water containing arsenic in excess of the MCL over many years could experience skin damage or problems with their circulatory system and may have an increased risk of getting cancer.

For many years, the maximum contaminant level was 50 parts per billion (ppb). During the 1990s, however, it was determined that this level was too high to provide for maximum public health protection. After many years of study, the U.S. Environmental Protection Agency

(EPA) decided to lower the MCL to 10 parts per billion. The new standard will take effect in 2008.

The Minnesota Department of Health is monitoring community water suppliers to determine which systems have arsenic levels in excess of 10 ppb. Although no community water systems in the state exceed the current limit of 50 ppb, it is estimated that as many as 60 to 80 systems will have to install or upgrade treatment processes in order to meet the stricter standard of 10 ppb.

Common treatment methods for the removal or reduction in levels of arsenic include reverse osmosis, ion exchange or lime softening treatment processes. In some cases, it is also removed in the iron and manganese treatment process.



# engineering

It is a great profession.  
There is the satisfaction of watching a fig-  
ment of the imagination emerge through the  
aid of science to a plan on paper. Then it moves to  
realization in stone or metal or energy. Then it  
brings jobs and homes to people. Then it elevates the  
standards of living and adds to the comforts of life.  
That is the engineer's high privilege.

Herbert Hoover

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U.S. POSTAGE  
**PAID**  
Owatonna, MN  
Permit No. 110