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Fixed GPS reference stations save surveyors time, money

BY ELLEN JENSEN | CONTRIBUTING WRITER

Recent upgrades in technology are providing for more accurate surveying on construction sites.

The Kansas City Reference Network helps surveyors and earth-moving contractors save time and money as they determine the boundaries, area and elevations of land or structures during the construction of projects such as roads and bridges.

The network was conceived in 2003 by Total Risk Management, a wholly owned subsidiary of Clarkson Construction Co., and Olathe-based Laser Specialists, a Leica Geosystems distributor. Total Risk Management handles safety, security, telecommunications, insurance and litigation for six companies that Clarkson owns or has an interest in, said Ed DeMoss, Total Risk Management's CEO.

The Kansas City Reference Network consists of 10 permanently mounted Global Positioning System reference stations throughout the area that cover 8,400 square miles and most of four counties. End-users connect to a centralized computer to obtain longitude, latitude and elevation data, eliminating the need to buy and set up a temporary base or reference station. The 10 networked towers communicate together with data processed at a central computer and then return corrected signal information to end-users, said Brian Phipps, Laser Specialists' vice president. The towers are set up on concrete pillars or buildings to provide maximum stability and security.

"This allows end-users to achieve the very tight, real-time accuracies that are mandatory in construction and surveying," Phipps said.

Traditional survey-grade GPS, while valuable, is a two-part setup — a temporary base and the rover, where the measuring, mapping or grading takes place, said Bob Parker, GPS sales manager with Laser Specialists. The two pieces communicate through a radio link, so the temporary base is often several miles from the end-user, making it vulnerable to theft and vandalism.

"We lost three base stations," DeMoss said. "People would just run up and steal them from the sites."

He said he thought that if surveyors could plug into a fixed reference station, they would save setup time, alleviate theft and gain accuracy. Total Risk hired Laser Specialists to install the reference stations, and the network was born.

"Leica was the only company at that time with the capability to install fixed reference stations and network them together," DeMoss said.

Clarkson's numerous properties throughout the area made it simple to put together a network. Laser Specialists continues to monitor the system and services end-users.

Because the network was already in place, it made sense for Clarkson and Laser Specialists to turn it into a revenue stream. There is a $3,000-a-year fee for unlimited use of the system, Phipps said.

That's a bargain considering that productivity is increased by eliminating base setup time, and costs come down by about 45 percent to perform the same work, Phipps said.

"The savings can be multiple thousands of dollars," Phipps said. He added that end-users also save because they are eliminating the temporary base stations, which cost $18,000 to $25,000.

The network benefits private surveyors, earth-moving contractors, Department of Transportation personnel, city public works agencies and the Federal Emergency Management Agency.

For example, if a bulldozer accidentally wipes out a fixed reference point with known coordinates on a construction site, the contractor previously would have to call out the survey crew to find and mark that reference point again. The reference stations make it much easier to plug in the GPS coordinates to find the fixed point, DeMoss said.

He said municipalities use the network to keep track of the water and gas shut-off valves and fire hydrants.

"If there is a natural disaster and the roads and landmarks are missing or altered, city personnel can plug in the coordinates on a handheld GPS device and walk to within five to 10 feet of the valve or hydrant," DeMoss said.

End-users are connected through Internet connections and data modems, eliminating the need for radios and the hassle of FCC radio licensing, Phipps said.

TOTAL RISK MANAGEMENT

With GPS coordinates, everyone uses the same frame of reference: designers, inspectors, surveyors and builders, which means any error in one phase of a project can be caught early.

Recent hardware and software upgrades have improved the system even more. On the software side, Laser Specialists added Leica's Spidernet, which allows users in the field to connect to multiple reference stations at one time, Parker said. This allows for redundancy and better accuracy.

On the hardware side, the company added new GPS sensor boards and GPS antennas that track not only the U.S. satellite navigation system but also the Russian satellite navigation system (GLONASS) and the European satellite constellation, Galileo, which is in development. The upgrade greatly increases the number of satellites users can access, which is especially important at sites with tree canopy, bridge overpasses or other obstructions.

"The upgrades allow us to be future-proof, to track new technologies on the horizon," Parker said.

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