



BEATING A WINTER DEADLINE

The latest grading technology gives excavating contractor a competitive edge.

By Don Talend

Construction technology is getting so advanced that once-novel aspects of projects such as state-of-the-art measurement precision and fast-track scheduling are becoming the rule rather than the exception. A case in point is a new \$28 million police station for the Village of Hoffman Estates, Illinois, located about 30 miles northwest of Chicago, which is scheduled for a June 2010 completion. Construction of the two-story, 79,000-square-foot facility's foundation began during the second week of October 2008 and was scheduled for completion by the end of the year—an 11-week timeframe. Critical scheduling adherence meant that the latest grading technology wasn't just a luxury for the excavating contractor but a necessity.

The suburb's 105-member police force reportedly outgrew its old station. A unique aspect of the 32,000-square-foot basement level of the facility that replaces the old one is its multiple functionalities. About 24,000 square feet of the basement will be used for 44 parking spaces and the remaining 8,000 square feet are devoted to a shooting range and emergency operations center. This layout makes its grading and excavation a bit more challenging than most projects of this type, Pat Wood, project manager for MTI Construction Services, LLC, notes.

"The overall project is on a traditional track as I would call it, but if we don't get [the foundation] in by December 31, we're going to be impacted by winter weather and there would be significant cost issues," he says.

Chris Aspegren, project manager for Berger Excavating, knew how time-sensitive the foundation work was. "[Falling behind]

would delay occupancy of the building and it would just multiply the associated costs, especially with concrete," Aspegren says. "It's not so much my costs, but my work depends on the concrete guy getting in behind me and his costs would go up exponentially with winter conditions—air entrainment of the concrete, different admixtures, and the inability to actually work."



Mike Clark spreads out ¾-inch recycled stone that serves as the foundation base for the police station.

CRITICAL PARKING AREA GRADING

Berger started by excavating 20,000 cubic yards of soil from a 32,000-square-foot excavation, a task that was completed in only 8 days from the contract award, Aspegren reports. The entire project requires a total of 30,000 cubic yards to be excavated, a total that includes a retention pond of 45,000 square feet, or just over an acre.

The most challenging part of the site-preparation work, from a grading standpoint, was the underground parking area, which has two levels. "The unusual thing about this particular building is the parking garage in the basement," Aspegren points out. "It's going to have multilevel slabs, if you will, in the basement at different grades and then we have different grades for all the footings and the piers and everything else." The grading of the parking area floors had to be both fast and precise; the floors are designed with trench drains down the middle and pitch toward the center at roughly a 2 percent grade.

GLOBAL NAVIGATION SATELLITE SYSTEM

A Global Navigation Satellite System (GNSS) gave Berger a significant productivity boost in grading the parking area and basement and the entire 5-acre-plus site. The company is an early adopter of this technology, having purchased its first GNSS in 1997. Aspegren reports that the company used the equipment for about 1 year and then discontinued its use, mostly due to problems with user interfaces and programming. Berger switched technology providers and reintegrated GNSS grading control in 2005, purchasing Topcon equipment from Positioning Solutions Company.

On this project, Berger had a Deere 750 dozer equipped with a 3D-MC dual antenna that receives signals from positioning

satellites in order to position the dozer's blade at the proper level to provide grades in adherence to the topographical survey.

A GNSS machine-control system uses a rugged antenna mounted to a shock-absorbing, vibration-damping pole and a receiver box mounted in a secure location on the machine. Satellites send positioning data to another antenna/receiver combination at a stationary base station. The stationary base and machine work together to provide real-time kinetic (RTK) position information, revealing the machine's three-dimensional location on the site. Software compares the machine's position to the design grade at a given location.

EXCAVATION FLOOR GRADING COMPLETE

With the basement excavation dug, Berger began fine-grading the foundation floor subgrade in early November, while crews from Builder's Concrete set up wall formwork in one corner of the foundation and concrete mixer trucks fed a concrete pump that placed concrete into the forms. Mike Clark, Berger's site foreman, viewed the GNSS monitor inside the cab while spreading 3-inch Illinois State CA-1 Classification Recycled Crushed Concrete with the dozer blade. The final step in fine-grading the floor would be adding a layer of Illinois State Classification CA-6 crushed ¾-inch stone. "Essentially, we're done in the bottom until we backfill the walls," says Aspegren. In about 3 weeks, he adds, Builder's Concrete would be done constructing the foundation walls and Berger would then backfill the walls from spoil piles from the foundation excavation.

Aspegren then retrieved his rover unit and displayed the two-dimensional model of the site on his FC-200 Pocket 3D field monitor to show the footings and columns. A series of intersecting lines showed the footing and column lines. He checked the location and depth of the footings and columns, and he could see where cuts or fills were needed anywhere on the foundation floor. Aspegren reports that the surveyor came out to the site once, after the full excavation was made but prior to footing excavation to verify footing locations, and determined that the footings and columns were located within hundredths of an inch of their locations according to the official survey.

What would grading this foundation be like without these high-tech tools, using stakes and stringlines? "We would have had a surveyor on site every day, staking and verifying the grades," Aspegren says.

"Because of the nature of the cut, this cut had to be done in two lifts in order to make it productive." He points out that productivity on a site of this nature depends on the speed with which Berger can load the trucks and get them on the road to the dump site. If the hole had been cut to a depth of 18 feet in one pass, the time required for the backhoe to reach the full depth would have been more than

double the time required to reach 9 feet. So the hole was cut first to a depth of 9 feet and then cut another 9 feet.

According to Tim Matthews, Berger's sale representative at Positioning Solutions, the productivity that the equipment made possible eventually saved the owner a substantial amount of money on materials that would have been spent on winter concreting. ■



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Chris Aspegren, project manager for Berger Excavating, checks location footings using a Topcon HiPer Lite+ rover unit and an FC-200 Pocket 3D field monitor.

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