

# Cement Speeds Up, Stabilizes TxDot San Antonio Project

Story and photos by Jeff Hawk, Cement Council of Texas

Faced with a tight construction schedule and highly expansive soils, TxDOT engineers turned to cement to speed up work and lower plasticity levels for a \$7.5-million San Antonio highway project. The Spur 66/Watson Road project, located off SH 16, involves building a new 1.8-mile, four-lane state highway spur feeding into a Toyota manufacturing plant currently under construction.

TxDOT is also administering a \$15.8-million Bexar County contract to widen Applewhite and Zarzamora, two county-owned roads that also service the new facility. TxDOT officials were under the gun to finish the projects prior to the plant's slated opening in early 2006. The projects' designers opted for cement because it offered "faster construction" than lime, says Larry Coyle, assistant area engineer, TxDOT Bexar 410 Area Office.

Treating soils with cement is similar to lime-treating subgrade except "you cut your time and work more than half," says Jim Stockbridge, project superintendent, Zachry Construction Co., San Antonio. Zachry is the main contractor for the Spur 66 project. Stockbridge says that processing and curing lime-treated material requires five to seven days before placing the surface. In contrast, cement modification of the subgrade soils takes only two days, says Stockbridge.

"If you can eliminate the five days curing time and the second mix [for lime], you're able to get your asphalt crew or your concrete crew in faster. Time is money," says Stockbridge. "With cement, you're getting more done with less labor."

Accustomed to working with lime, Zachry estimators projected that production rates would run about 2,500 SY a day. Stockbridge says cement is allowing him to double the amount of work his crews complete on a daily basis. "We're averaging 4,500 SY a day," he adds.

## Lowering PI Levels

Before construction could begin, TxDOT had to address a problem shared by all three roads: highly expansive subgrade soils. Tests run on soil samples taken from the Spur 66 project site showed plasticity levels in the high 30s in some areas. Plasticity index is a



**A pulverizer mixes cement into raw subgrade to reduce plasticity levels.**

measure of a soil's tendency to expand and contract. PI levels greater than 20 indicate highly expansive soils, which can shift under roadways and cause premature failures.

TxDOT engineers had to find a stabilizer that would bring those levels down before placing concrete and asphalt on top of the subgrade. The San Antonio District Lab hired Raba-Kistner Consultants Inc., San Antonio, to evaluate how cement at different volumes affects the plasticity in soil samples taken from the project site. Results showed that an addition of only 4 percent of cement by volume of dry weight of soil cut PI levels from 38 to 16. A 7 percent cement mixture dropped the PI levels below 10. Engineers decided to specify 5.3 percent cement for the project. San Antonio-based Capitol Cement supplied the cement.

The addition of cement is working well. Zachry crews are "getting working platforms up pretty quick and able to maintain them," says Coyle. Cement has "done what we hoped it would do," he adds.

"The workability of it is excellent," says Stockbridge. "Cement will set up and give you a good working surface. Something you can finish really tight."

Cement has not only helped create a working platform out of expansive, "black gumbo" soils, it has helped crews work through a very rainy spring. Wet weather turned untreated subgrade to mush, stalling work, says Stockbridge. But in areas treated with cement, Zachry crews were able to place asphalt "after a day or two of drying," says Stockbridge.

Cement modification permanently changes the characteristics of the soil, making it more resistant to water, say cement industry officials. The untreated soil on the site "really holds the moisture and pumps," says Stockbridge. After mixing the raw subgrade with cement, "we haven't had any problem with pumping. It's holding up our asphalt trucks and lay down machines really well," he adds.

### Simple Construction

Another benefit realized with cement modification is the simplicity of the process. "It's not difficult at all," says Stockbridge, who has the process down to a near science. First, crews work to bring the site down to the subgrade and level it out. Three lanes measuring 38-ft by 388-ft are marked off.

Cement trucks equipped with a spreader bar then distribute 25 tons of cement within each marked lane. Crews scarify and mix the cement six inches deep and then peel it back to the original subgrade. A motorgrader layers the cement-treated soil back in place in two-inch lifts. Each lift is compacted with pneumatic and steel-wheeled vibratory compactors. This not only ensures that the cement is well mixed, it also helps Stockbridge meet density requirements. "We haven't had any density failures and we're running close to 100% density," says Stockbridge.

After compaction, crews blade the area to final grade and cure. Subcontractor Rammin Paving Co. tops the cement-treated subgrade with either asphalt and/or concrete pavement structure. Stockbridge says he tries to place the surface immediately after finishing the cement-treated subgrade because it seals in the moisture, allowing the subgrade to cure underneath.

He adds that the process is well-suited for "fast-track" projects like Spur 66. Says Stockbridge, "In this urban environment that we're all working in, you don't have the luxury of waiting seven days [for lime processing]. You need to be moving traffic, so cement works out very well for us."



Cement is spread in a 37-ft by 388-ft lane marked off by Zachry crews.



Zachry crews scarify a cement-treated area during subgrade preparation on TxDot's Spur 66 project in San Antonio.



**Portland Cement Association**  
5420 Old Orchard Road  
Skokie, Illinois 60077-1083  
847.966.6200 Fax 847.966.9781  
[www.cement.org](http://www.cement.org)

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