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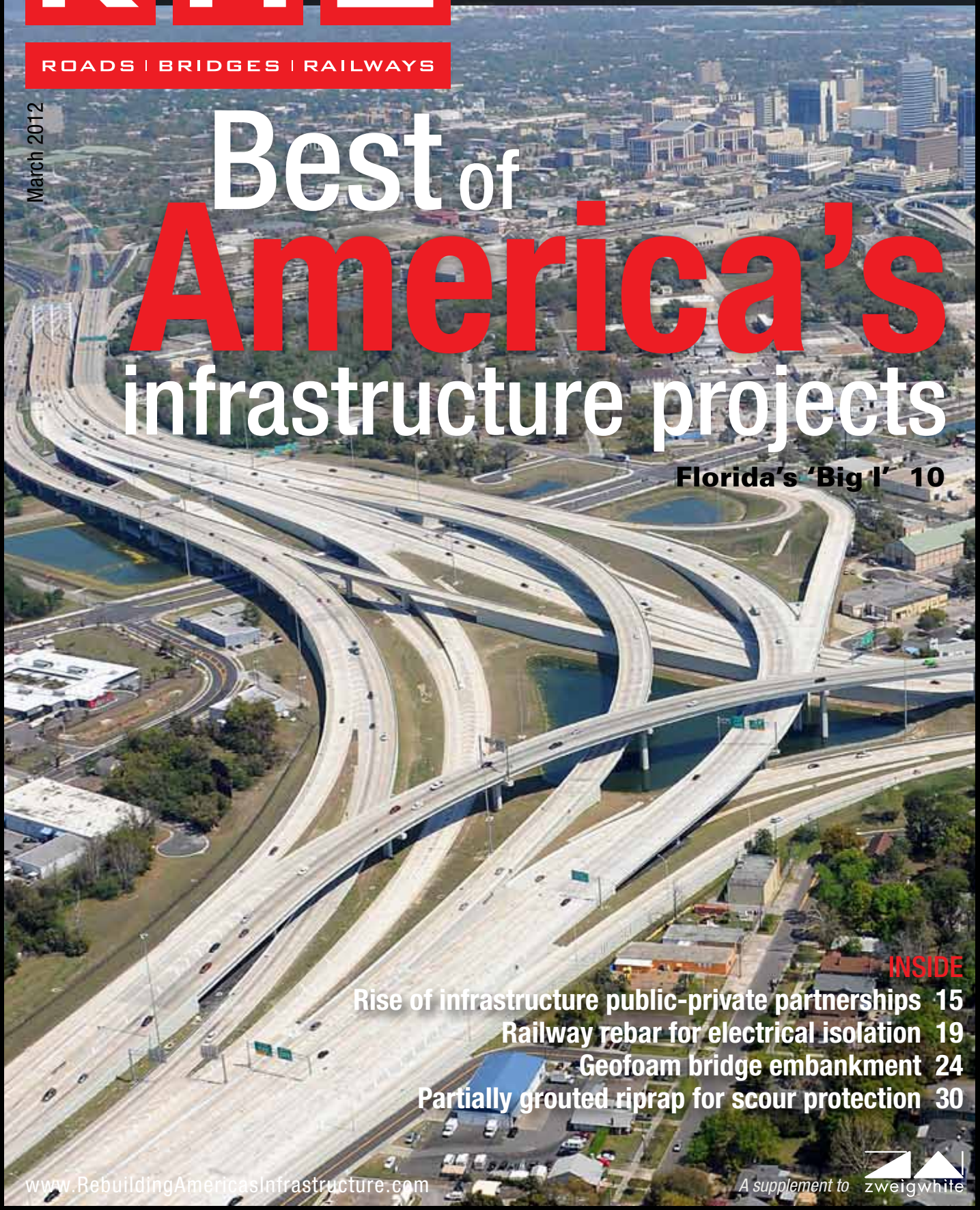

INSIDE

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PROJECT SPOTLIGHT

Cost-saving approaches

Light rail bridge embankment features the largest continuous section of geofoam fill in the United States.

EPS geofoam creates the bridge embankments for the TRAX airport extension line in Salt Lake City. The use of geofoam allowed for the embankments to be built adjacent to buildings while minimizing interruption to businesses and residents.

In 2008, construction management general contractor Stacy Witbeck began early reviewing the preliminary design for the Utah Transit Authority's (UTA) $200 million TRAX airport extension from downtown Salt Lake City. The light rail extension travels along North Temple to the Salt Lake City International Airport.

"UTA relied on us to understand the community via public outreach," said Stacy Witbeck Project Manager Ryan Snow. "It was important to make the inconveniences inherent in a project such as the TRAX airport extension — road closures and traffic delays — as painless as possible. We set out to find every possible means of efficiency — in cost as well as timeline."

A portion of the extension from 600 West to 400 West on North Temple is a viaduct that crosses over the Union Pacific Railroad tracks and the UTA Frontrunner tracks. "For this portion of the project, we developed a unique team approach we call the Alliance Contracting Method," Snow said. "The UTA, together with the city of Salt Lake and Stacy Witbeck, worked as a team to identify cost-saving approaches based on our estimated budget. Cost savings identified were split three ways between all members of the alliance agreement. The Alliance method worked superbly — with a cost savings over 20 percent." Snow added that the overall airport extension is currently 5 to 10 percent under budget.

Geofoam's light weight allows for it to be easily moved and installed without the need for heavy equipment.

"We instituted several cost-saving measures," Snow said. "Geofoam was installed in the viaduct structure as part of the Alliance model. The team evaluated various fill materials and determined that geofoam would assist us in keeping on schedule and costs under budget for several reasons."

Geofoam weighs 1 to 3 pounds per cubic foot, which is 100 times lighter than soil and 20 to 30 times lighter than other alternative lightweight fill materials. The difference in unit weight, compared with other materials, makes EPS geofoam an attractive fill material to significantly accelerate construction schedules.

Because geofoam is light weight, large earthmoving equipment is not required for construction. After the blocks are delivered to the construction site, they can be trimmed to size and placed by hand. In areas where right-of-way is limited, geofoam can be constructed vertically and faced, unlike most other lightweight fill alternatives. It also is unaffected by adverse weather conditions.

Expanded polystyrene (EPS) manufacturer ACH Foam Technologies provided Types 29 and 39 geofoam for the bridge approaches in two sections of equal size for a quantity of more than 1.5 million cubic feet, or 500 truckloads of geofoam. According to the company, each of the two sections is estimated to be larger than any known continuous section of geofoam fill used in the United States. "West Valley Light Rail Project was 2,130,000 cubic feet — installed in seven different sections — whereas the airport line is 1,890,000 installed in two different sections," explained ACH Foam's Frank Kiesecker. "Each of the two airport line sections tops any other continuous section of geofoam in size."

"The ease of installation was one aspect of our decision to use geofoam," Snow said. "Settlement was another major concern. When compared to traditional soil fill, we found that the impact of soil settlement on the adjacent Union Pacific Railroad area would be eliminated with the use of geofoam. While surcharging the ground with soil exerts a lateral load on existing structures, geofoam does not," said Snow.

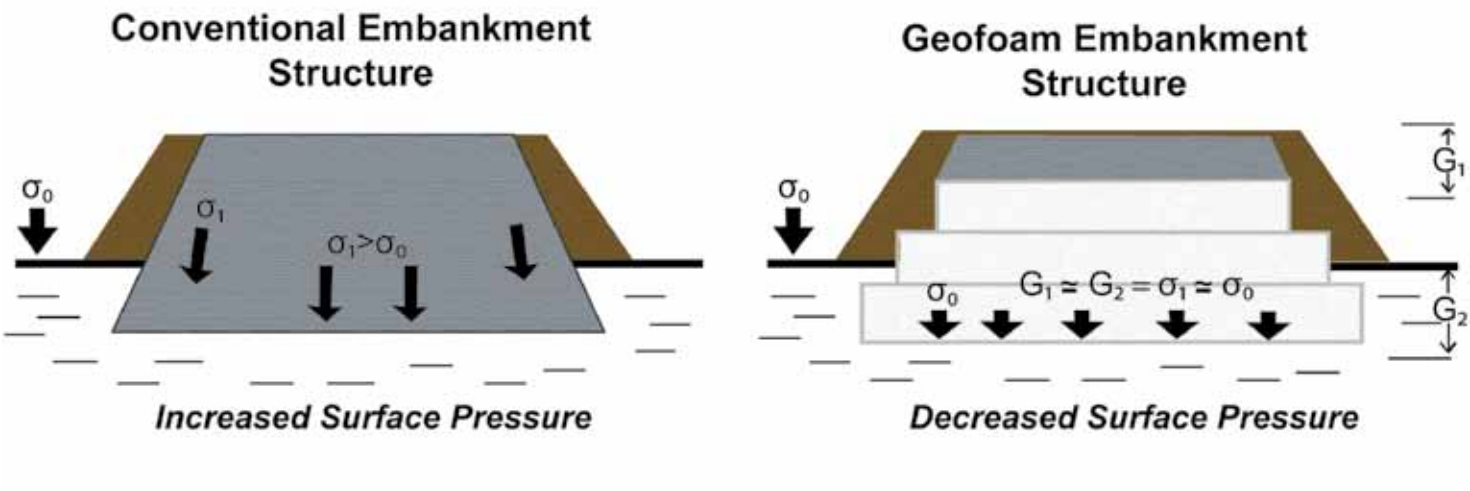
When using geofoam, blocks are installed below-grade (see Figure 1). According to Terry Meier, geofoam specialist at ACH Foam Technologies, geofoam reduces vertical pressure by a 120/1 ratio. "Geofoam embankments were designed to produce zero net load on the foundation soils. This is accomplished by full load compensation or removing a volume equal to the weight added by the new construction."

Geofoam also exerts no horizontal force on the bridge abutment and supporting walls as with other traditional fill materials. Soil creates approximately 40 pounds per cubic foot of lateral pressure.

"The use of geofoam backfilling against a vertical structure completely eliminates lateral pressure on that structure, whether it is a bridge abutment, retaining wall, or foundation wall," Meier said. "For example, with a foundation wall going 30 feet below grade, the compacted soil will create 3,750 pounds of vertical pressure at the wall base and 1,250 pounds of lateral pressure at the base of the foundation wall. The use of geofoam will greatly reduce lateral and vertical pressure."

Another strategic time- and cost-saving strategy used by Stacy Witbeck for the first time was a new technique for the final surface on the geofoam. "Traditionally, we would pour

Figure 1: Geofoam blocks are installed below grade. Embankments were designed to produce zero net load on foundation soils.



a load distribution slab to surface the geofoam," Snow said. "For the first time, we decided to create a thicker section of lightweight concrete — about 3 feet thick, rather than the traditional 8-inch slab. This is the first time this technique has ever been used, to our knowledge. It was a cost-savings approach."

Through a rigorous review process and design calculations it was determined that the thicker light-weight surface would provide functionality and cost savings while preserving the integrity of the geofoam.

According to Snow, the project saved two years of inconvenient road closures and traffic delays. "Because the geofoam doesn't require settlement, we can have the project completed two years ahead of schedule. That's not just time, but money saved. Commuters benefit tremendously, and the result is a happier community. The viaduct portion of the project was closed down for 16 months, which was four months ahead of schedule." Completion is scheduled for summer of 2013.

Snow elaborated on a third method for cost savings on the project. "Stacy Witbeck was able to perform test shafts to determine the load-bearing capacity of the drill shaft casings on the viaduct. We were able to reduce the diameter of the drill shafts significantly and use smaller casings without sacrificing load-bearing capacities. This process contributed to significant cost savings in the alliance agreement." ▼

This article was contributed by ACH Foam Technologies (www.achfoam.com).