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## Road and Bridge Supports at Greenbelt Station Combined for a Unique Solution

Eric Hilberath

Most drivers probably never think about it or even realize it's there until their laps are covered in coffee, but the "bump" at the end of a bridge can be as annoying and even as dangerous as a large pothole. For departments of transportation, the bumps represent a maintenance issue as well. They occur because most bridge abutments are supported on piles while most bridge-approach embankments are founded directly on existing soils or fills.

The bridge on North-South Boulevard in Greenbelt, Md. will have none of that. Spanning Branchfield Road and intersecting with the heavily traveled Route 193, the bridge adopts a design-build solution incorporating a combination of soil reinforcement technologies. For the bridge abutment, conventional sleeved H piles are used to support the bridge seat and the Geopier® system supports the mechanically stabilized earth (MSE) wing walls and embankments at the foundation level. This combination of support systems ensures that the differential settlements between the MSE wall and the bridge superstructure are minimized over the bridge's 100-year design life.

North-South Boulevard is the entrance to Greenbelt Station, a 240-acre mixed-use site under development and adjacent to the Metrorail and MARC commuter train stations. With 2,200 planned residential units, more than one million square feet of office space, and 300 hotel rooms, planners expect the 200-foot-long bridge and embankment to carry a lot of traffic. Site investigations identified undocumented/uncontrolled fills on both sides of the bridge, raising the probability of excessive differential settlement between the MSE-supported embankments and the pile-supported bridge superstructure. Geotechnical Engineer Hardin-Kight suggested that either over-excavation and replacement of soil or the installation of the Rammed Aggregate Pier® elements that would provide the additional support necessary to bring differential settlements down to acceptable levels.

The general contractor for the project, Concrete General, asked design-build specialist GeoStructures for a design for the Geopier soil reinforcement system, which is created by drilling 30-inch diameter holes and ramming well-graded aggregate into one-foot layers to reinforce the surrounding fill soils. With 150 of the elements installed 20 feet deep and providing a 4,000 psf allowable bearing capacity, the abutment areas were stiff enough to support the MSE walls.

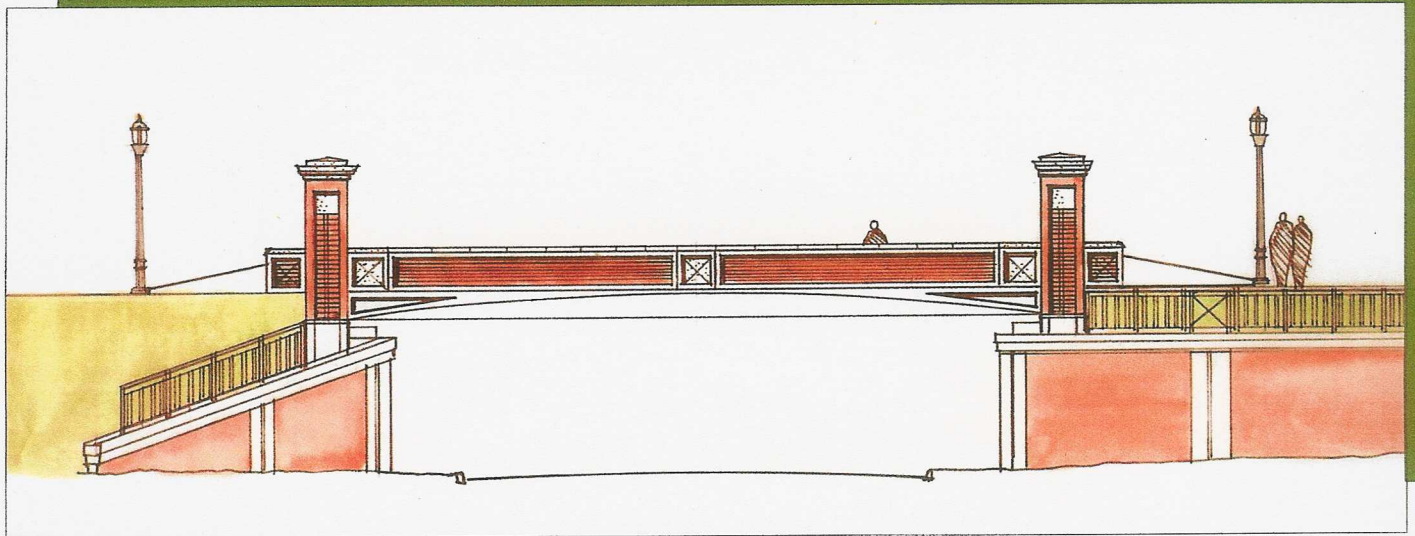
"Supports" continued p. 26



In the foreground is the completed North wall looking across Branchville Road at the piles that will support the bridge on the south side.



Northern wall under construction showing H piles inside the corrugated steel sleeves. Uses of sleeves gives the piles the necessary flexibility during expansion and contraction of the bridge without transferring those forces to the wall.



Rendering Courtesy of Dewberry, Structural and Architectural Designer, [www.Dewberry.com](http://www.Dewberry.com)

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"The other alternative was to excavate and replace the fill material with engineered fill, but using the Geopier system was easier," confirms Butch Lundgren, general superintendent of Concrete General.

For the walls themselves, GeoStructures subsidiary EarthTec used the company's EarthTrac HA™, an updated MSE wall system using galvanized, ribbed-steel soil reinforcements to which precast concrete facing panels are fastened. EarthTrac HA is an MSE design that works well with bridge abutments because the strips can be slightly skewed around the bridge support piles and sleeves. EarthTrac HA has been used on several other sites in the Mid-Atlantic, and at Greenbelt Station it is used for the abutments headwalls and for the 26' wing walls to the abutments. The architectural plan incorporates pilasters stained white with MSE panels finished in a brick color. EarthTec manufactures the panels in its own precast plant to avoid delays from outside suppliers.

The only approved product on the Maryland State Highway Administration list for walls up to 50 feet high, EarthTrac HA complies with the AASHTO Load and Resistance Factor Design (LRFD) Specifications and the Standard (Allowable Stress) Bridge Design Specifications. Under the Federal Highway aid program all states must adopt LRFD for bridge design.

For design-build projects like this, EarthTec and GeoStructures integrate geotechnical design solutions that deal with issues such as settlement, bearing capacity and global stability. The integration of the MSE wall design elements into a single package with the ground improvement options means highway engineers and general contractors don't have to piece together solutions using techniques that may provide uneconomical solutions.

Of course, the timely delivery of the infrastructure is required before the homes and other buildings can be completed at Greenbelt Station. The first section is scheduled to open in Spring 2008 at which point the developer will transfer ownership and maintenance of the road and bridge to the county. At least the adopting authority won't have to field complaints and make repairs because of the "bumps." ■

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