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Combined function saves space

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An engineered solution allowed construction of a combined post-and-panel sound barrier and retaining wall.

By Jim Ballentine

Caisson-supported, 33-foot-tall wall doubles as earth-retaining structure and sound barrier.

Project

Dulles Toll Road ramp widening, Tysons Corner, Va.

Civil engineer

GeoStructures

Product application

Drilled caissons support a free-standing cantilever sound/retaining wall in a narrow right-of-way.



Following a recent roadway widening project, nearly 500,000 weekday drivers on the crowded Washington, D.C., Beltway now have a second lane on the ramp accessing the Dulles Airport Toll Road. Additionally, residents near the road still have the sound barrier, along with a new retaining wall with a smaller combined footprint than originally planned. And, the Virginia Department of Transportation (VDOT) was able to accomplish the feat two weeks ahead of schedule.

How this happened in a confined space with minimal disruption is a case study in value engineering because the revised plan solved a problem, did not cost any more than the original arrangement, and resulted in a more durable structure.

As part of the state's long-range plan for a safe and efficient transportation system that minimizes environmental impact, widening of the ramp was designed to improve traffic flow in the congested Tyson's Corner area. What complicated the project was an existing sound wall, a 20-plus-year-old precast structure that bordered a steep, 45-degree slope down to a tree line, a creek, and houses. In the original plan, about 300 feet of this wall had to be moved to

accommodate the configuration of the new ramp, and this created the need for a low-level retaining structure next to the road.

The problem with this plan was that the retaining wall would have been difficult to build because of the narrow site, would waste as much as 4 feet of space between the retaining and sound walls, and would not be cost efficient because the section of sound wall still had to be replaced (see Figure 1). General contractor Lane Construction (<http://www.laneconstruct.com>) needed another option.

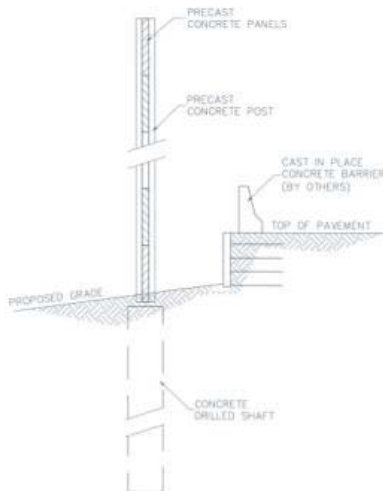


Figure 1: The original plan required as much as 4 feet between the retaining and sound walls.

An alternative came from design-build subcontractor GeoStructures, which proposed a new section of cantilever wall supported by caissons and capable of supporting a free-standing sound wall (see

Figure 2). Enabling the combined sound/retaining wall are 27 drilled shafts with reinforcing steel cage, each averaging 20 feet deep. This stabilizing feature is necessary to handle the 33-foot height of the post and panel structure.

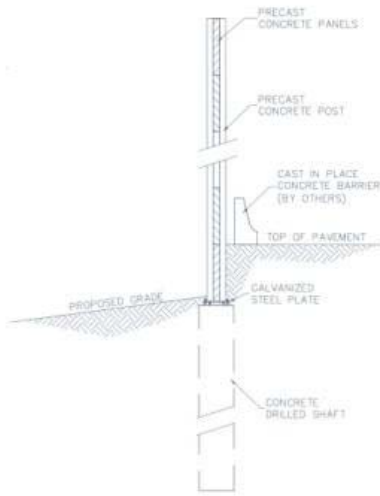


Figure 2: GeoStructures' revised plan better accommodates the narrow right-of-way.

The new section, comprised of 312 linear feet (10,425 square feet) of wall, was constructed with precast concrete to reflect roadway noise. It has a form-board finish to provide a barn-like look, a texture that blends well with the wall's original sections. Faddis Concrete (<http://www.faddis.com>) matched the tan color with the adjacent sections, a difficult task even under the best circumstances because fading in the older sections, moisture, and the amount of color additives all have to be factored in. Ultimately, the process also had to meet ASTM and VDOT specifications, the latter of which scored GeoStructures' effort at 93 out of 100 in the standard performance evaluation for quality, prosecution of work, communication, safety, and environmental considerations.



Drilled caissons averaging 20 feet deep are filled with concrete.

techniques that maximize the use of space, even if they are incremental improvements such as this widened ramp and combined wall.

Many research reports cite continued growth in population and housing in the Washington, D.C., region and the rest of the country, while improvements and investment in transportation infrastructure will be relatively modest. It's an outlook that calls for innovative construction

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