Secure Pentagon Entrance
Washington, DC

Location: Washington, DC

Contractor: Facchina Construction

Designer: Dewberry, Fairfax, VA

Geotechnical Engineer: Mactec, Richmond, Va

Construction is underway on the new Pentagon Secure Bypass (PSB), a $25-million design-build project and a significant component of the ongoing Pentagon Renovation Program. The project involves the relocation of a major highway and improvements to the existing road and site access network to address increased traffic volumes and enhance security. The bypass was awarded to Facchina Construction and Dewberry through an on-call engineering and construction services contract that covers the design and construction of roads, grounds, and security projects. 1

The work also includes site roads, parking lots, retaining walls, and three bridges. Professional services provided by Dewberry include roadway design and structural engineering; site/civil engineering; architecture; landscape architecture; surveying; mechanical/electrical engineering; and construction administration.

Staged construction packages are being designed to accommodate the 22-month construction schedule. Construction began ten weeks after the Facchina/Dewberry team was awarded the project in September 2002. “This project truly demonstrates the benefits of the design-build process, as well as collaborative partnering,” says Dewberry Design Manager Sam Bertolino, PE. “By working directly with Facchina and the Pentagon staff, we’re able to deliver this important enhancement to our national security on a fast-track basis.” 1(Dewberry)

The construction of the entrance crossed an area of underlying compressible clay soils, which were up to 15 feet thick. Compression testing of the subgrade soils showed an estimated total consolidation using normal weight fill of about 15 inches. The time of consolidation of the subgrade soils using normal weight fill soils (110 pcf) was estimated to be more than 180 days. The construction schedule for the entrance did not allow the contractor the extensive consolidation period required with normal weight fill.

The geotechnical engineer suggested the option of using lightweight fill in place of the normal weight fill materials. The use of lightweight fill was determined to reduce the total consolidation from 15 inches to 6 inches. The time of consolidation of the fill section using the lightweight aggregate was also reduced to 60 days. This decrease in total consolidation and the decrease in construction delays were the primary influences in the contractor choosing to use lightweight aggregate in the project2.

Lightweight Aggregate

The project specified lightweight aggregate produced by the rotary kiln method conforming to the specifications of ASTM C330 and having a minimum angle of internal friction of 40° and maximum dry density of 65 lb/ft3. The gradation of the lightweight aggregate was ¾" to number 4 with the average gradation as follows:

Sieze Size	Percent Passing
1in (25 mm)	100
3/4 in (20 mm)	96
1/2 in (12 mm)	55
3/8 in (10 mm)	26
No. 4 (4 mm)	5

The average moist density of the lightweight aggregate delivered to the site was 52 lb/ft3, which more than meet the project specifications. The internal angle of friction was determined on a 6-inch diameter sample using cell pressures of 0.5, 1.5 and 3.0 ksf. The test showed an angle of internal friction (Φ) of 43.2°.

From Interstate 95 Construction

The lightweight aggregate for this project was delivered through a terminal in Springfield Virginia. The terminal location is Virginia Concrete's Edsel Road plant. A total of 10,000 tons of Stalite lightweight aggregate was used in the project. The rate of placement was variable at the site but general exceeded 500 tons per day during construction.

Acknowledgements:

1. Introduction from Dewberry Press Release March 25, 2003
Author Brenda Brown-Dewberry Fairfax, VA
2. Eric Burke, P.E. Mactec Engineering – Richmond Virginia