

# PROJECT PROFILE

## VALUE ENGINEERING STUDY FOR BRIDGE PIER FOUNDATIONS

D'Appolonia provided value engineering (VE) design services to the foundation contractor for bridge pier pile foundations for Section 52-E of the Mon Fayette Expressway. This highway, which has some complete segments, will eventually connect the Parkway East near Monroeville, Pennsylvania to Interstate 68 near Morgantown, West Virginia.

Section 52-E of the Mon Fayette Expressway required the construction of two dual bridge structures to cross valleys in Washington County, Pennsylvania. The first bridge consisted of dual eight-span structures with twelve piers supported on deep foundations. The second bridge consisted of dual six-span structures with four piers and all four piers supported on deep foundations.

The original foundation design for these piers consisted of vertical and battered (inclined) steel H-piles. These piles were intended to extend to depths 16 to 60 feet below footing level and were to be installed by driving through pre-drilled, sand-filled holes.

The installation procedure for the original design had the substantial drawback



*Dual bridge structures at Section 52-E of the Mon Fayette Expressway under construction.*

that the piles would have to be installed in a three-step process – drilling, back-filling and driving. The original design for the two dual bridge structures required about 1,500 piles, having a total length in excess of 51,000 lineal feet. About 60 percent of these piles would have been battered.

When the Pennsylvania Turnpike Commission agreed to consider alternative

foundation systems, D'Appolonia was retained by the foundation contractor, Brayman Construction Corporation, to develop an alternative deep foundation design for the two dual bridge structures.

D'Appolonia developed design parameters and designed the drilled pipe pile foundations using the FLPIER software. FLPIER is a three-dimensional finite element program developed by the University of Florida in cooperation with the Federal Highway Administration for the integrated analysis and design of pile groups and structures.

The original design bridge pier foundation design would have required pre-drilled 18- and 22-inch-diameter holes. D'Appolonia's VE design required 12-inch-diameter holes that could be advanced with track-mounted drill rigs typically used for tieback construction, as shown of the picture to the left.

D'Appolonia's VE design resulted in savings of about 500 piles and about 20,000 lineal feet of pile length and a reduction in foundation costs for the two bridges of about \$1,000,000.



*Installation of 12-inch-diameter pipe piles recommended in D'Appolonia's VE design.*