The Route 29 and Route 250 interchange in Charlottesville, Va., uses Smith-Midland's SoftSound concrete for noise barrier walls that have finishes designed to go with the look of the area. Courtesy of Smith-Midland Corp.

Designed to complement nearby historic Chapman's Mill, Va., the precast concrete sound walls for a highway widening project were provided by Smith-Midland. Courtesy of Smith-Midland Corp.

Sound-absorptive precast concrete meets aesthetic needs of Virginia noise barriers

When the Virginia Department of Transportation was developing plans for two new road projects in historic areas, one of the most important goals was to be able to facilitate traffic flow without disrupting nearby historic and residential areas. Another was to ensure that the new projects maintained the historical feel of the locations.

One was the Route 29 and Route 250 interchange in Charlottesville, Va. The other was the Interstate 66 widening project near Haymarket.

Civil Wall Solutions and Shirley Contracting selected Smith-Midland Corp. to supply the precast concrete sound wall products for the two projects.

Both of the projects feature Smith-Midland's proprietary SoftSound, a sound-absorptive concrete. The material is molded and compressed to meet the technical and aesthetic requirements of each project. It combines a specialized mineralized wood chip aggregate, using cement as a binder in the manufacturing process. Once installed, the material ensures acoustical absorption, privacy for neighborhoods, and durability against harsh weather conditions.

"We have been producing sound-absorptive concrete since the mid-1980s and were the first company in North America to use cementitious sound-absorptive material in large volume on noise barrier walls," says Ashley Smith, president of Smith-Midland. "We improved the product over the years, until about 10 years ago when we perfected the technology by developing the SoftSound wood aggregate sound-absorptive material."

For the interchange in Charlottesville, Smith-Midland supplied 47,751 ft^2 (4436.1 m^2) (279 panels) of precast concrete sound wall and retaining wall. The sound wall combines the strength and durability of precast concrete with finishes designed to match the surrounding environment. The project features concrete panels with a dry stack stone formliner finish on the highway side and a stamped dry stack stone finish on the residential side to meet historic Charlottesville's aesthetic requirements.

Smith-Midland also provided 3716 ft (1133 m) of prestressed concrete posts—104 total—for the project.

For the Interstate 66 widening project near Chapman's Mill, situated between Haymarket, Va., and Gainesville, Va., Smith-Midland provided 240,000 ft^2 (22,300 m^2) (1035 panels) of precast concrete sound wall. It is finished with a simulated stone formliner designed to match a nearby historic landmark.

"For the finish on this project, we had to match an existing historic mill, called Chapman's Mill," Smith says. "We had to get a formliner made for both the highway and residential sides, to match the hand-laid cut stone look of the original mill. This required some close work with our formliner supplier."

Smith-Midland also provided 13,644 ft (4158.7 m) of prestressed concrete posts—637 total—for this project.

"We were close enough to this jobsite that the trucks could off-load the panels at the site, come back to the shop and reload, and go right back out to the jobsite the same day," he says. "We received a lot of positive feedback from the public on both projects. Providing quality products is always our goal.".

—William Atkinson

BergerABAM used precast concrete deck elements for the container and bulk handling wharves located at a remote site on Colombia's Pacific coast. Courtesy of BergerABAM.

Precast concrete wharf deck expedites construction in large port projects

In late 2014, the Colombian-French consortium of Soletanche Bachy Cimas, Soletanche Bachy International, and Constructora Conconcreto (SBCC) contracted with BergerABAM to provide value engineering design and construction support services for a container wharf and a bulk handling wharf adjacent to each other in the Aguadulce peninsula off the Port of Buenaventura in Colombia. Sociedad Puerto Industrial Aguadulce S.A. (SPIA), owner of the container terminal, and Boscoal, owner of the bulk handling terminal, awarded contracts to SBCC for both projects.

The SPIA container wharf is a T-headed structure composed of a 600 m (1970 ft) long quay connected to the peninsula with a 160 m (525 ft) long access trestle and a 25 m (82 ft) long platform. The wharf is designed to accommodate several super post-Panamax ship-to-shore cranes and large container ships. The Boscoal bulk handling wharf is an inverted L–shaped structure west of the SPIA quay and includes a 250 m (820 ft) long quay connected to a 186 m (610 ft) long access trestle and a 47 m (154 ft) long platform. It has multiple conveyor belts serving coal exports and grain imports and is capable of berthing Handymax bulk vessels. Despite the varied usage of the two wharves, a common wharf design was envisioned to accelerate the construction schedule and preserve the owners' stringent operational requirements. The quays and trestle structures are separated by expansion joints.

The wharves are in a remote greenfield site with high rainfall and high seismicity. BergerABAM provided an innovative precast concrete wharf deck design for the two wharves. The driven steel pipe piles acted as the substructure. The wharf deck design maximized precast concrete to eliminate formwork, reduce in situ concreting, and provide superior durability. Most important, the precast concrete deck design was configured to be compatible with SBCC's innovative top-down system for installing the piles and deck. Deck design considered equipment limitations (size, shape, and weight of components and construction sequence) and satisfy seismic capacity protection design as dictated by nonlinear seismic analyses.

The wharves feature a precast concrete pile plug/pile cap unit connecting the steel pipe piles to the deck. This replaced time-consuming cast-in-place concrete pile plug connections and helped compress the schedule significantly given the large number of piles. The plugs had to provide for sufficient tolerance for pile driving, maintain adequate support for the precast concrete beams and deck, and provide appropriate vertical and lateral load transfer. Precast concrete reinforced beams and prestressed concrete deck panels had to be detailed with optimally designed projecting reinforcement to address seismic moment reversals and to minimize reinforcement congestion at joints. Cast-in-place concrete connections between the elements were easy to place, and provided the needed continuity. The wharves also used large precast concrete fender blocks to accommodate berthing of large and small vessels.

The SPIA wharf was constructed in record time of 12 months, whereas construction for the Boscoal wharf took 9 months. The design not only provided the owners with modern code-compliant seismic marine structures fully compatible with their stringent requirements but also was in harmony with SBCC's preferred means and methods of construction, site conditions, and a very tight construction schedule. Well-designed precast concrete elements were instrumental in achieving the project goals.

— Carlos E. Ospina, V. K. Kumar, and Jyotirmoy Sircar