When complete, the Dulles Corridor Metrorail Project, Phase 2 will, to the east, connect Washington Dulles International Airport to Washington, DC and Loudoun County, Virginia, to the west, with numerous stops along the way. The project includes a station at Dulles, and an aerial guideway that will carry passengers above the busy airport. The Precast Concrete Producer on the project was Coastal Precast Systems of Chesapeake, VA.

The aerial guideway required a thoughtful design strategy, says Gregory Shafer, bridge technical manager for Parsons, in Baltimore, Md. In addition to filling a gap in the transportation network, it needed to complement the landscape of a historically significant transportation hub. It also had to be delivered at a reasonable price. "It is a huge design-build project with a $1.2 billion bid value, where the low bids were separated by just 1.2%, making it very cost-competitive," he says.

Several structure types, including steel box girders, were considered for the aerial guideway structure. Precast concrete girders were selected for several reasons. Precast concrete offered a high-durability and low-maintenance solution, which was critical to meeting the 100-year service life requirements, Shafer says. The use of precast
Concrete also minimized impacts on nearby roads and wetlands, and delivered a high-quality product at a lower cost relative to the alternatives. “The fully-prestressed, factory-produced precast concrete elements met serviceability requirements and fit well within the historic airport architecture.”

The ability to quickly mobilize and erect the precast concrete girders was another advantage of precast concrete, as it minimized impacts on airport traffic and operations.

**Precast Solution**

Overall, the Dulles Rail Project expansion adds 11.4 route miles to the Metrorail system, including the 6 track miles of aerial guideway that passes through the airport, over wetlands to a maintenance yard, and connects to the western section of at-grade rail.

Elements of the bridge required tight 800-ft-radius curves, along with higher live loads and overall requirements for rider comfort.

The use of prestressed concrete girders in a chorded configuration worked well with the spans of up to 150 ft on the curved alignment. The girders incorporated draped prestressing strands with flared spacing at the ends, Shafer explains. Florida wide-flange I-beams (or FIB) sections with four different depths were used to minimize the structure depth and deliver an efficient structure, Shafer says. “It was the first use of these FIB shape girders in the region.”

The flexibility of these precast concrete elements also accommodated various challenging elements, including track cross-overs and turnouts, as well as features for power and control systems. The ability to adjust the girder depth also allowed the designers to “tune” the structure to meet the vibration requirements for rider comfort, Shafer explains. To further minimize costs and expedite construction, the design used a pair of precast, prestressed concrete girders to support each track. The design of the girders considered redundancy, strength, and serviceability.