Transportation

Highways & Bridges

Client

Ohio Department of Transportation

Location

Dayton, Ohio, USA

I-70/I-75 Interchange Design and Modernization

Project Highlights

- Reconstruction of 7 miles of interstate highway, 8 ramps, and 17 bridges
- Design and construction services for a 20-span, horizontally curved flyover bridge
- Structure type study to compare the economy, safety, constructibility, maintenance, and aesthetics of multiple bridges
- Extensive public involvement and government agency support

Project Description

Constructed in the 1950s, the I-70/I-75 interchange near Dayton, Ohio, known as the “Crossroads of America,” and the first full cloverleaf interchange in the state, has become one of the most important interchanges in Ohio’s interstate highway system. Over the years, increased traffic volumes, traffic congestion, and a higher-than-anticipated volume of large truck traffic required that the interchange be upgraded to a more modern directional interchange, with three flyover ramps replacing the bottlenecked cloverleaf ramps.

CH2M HILL provided design, construction planning, and public involvement support to the Ohio Department of Transportation (ODOT) for this three-phase project involving the reconstruction of 7 miles of interstate highway, 8 ramps, 17 bridges, utility relocation, and right-of-way acquisition.

As part of Phase II, CH2M HILL designed and provided construction services for a flyover bridge on Ramp C, the highest level in the directional interchange. The resulting 20-span, horizontally curved Ramp C flyover bridge was designed to carry two lanes of traffic on the north-to-westbound directional ramp and is 2,375 feet long. The span arrangement allowed construction of the bridge in Phase II while maintaining traffic on the existing interior loop ramps, and also spanned the Phase III interior directional ramp alignments. The bridge begins and ends on tangent alignments, with a 650-foot circular curve and 230- and 330-foot spirals located completely on the structure. To increase horizontal stopping sight distance, the inside shoulder was widened to 12 feet for the entire length of the bridge.

Before preliminary design was initiated, a structure type study was performed to compare the economy, safety, constructibility, and maintenance of individual and multiple bridges, variable span arrangements, and different substructure types on the Ramp C alignment. Based upon this analysis, the proposed 20-span single bridge alternative recommended by CH2M HILL was selected for final design by ODOT.

A hammerhead pier configuration was used at all pier locations. Pier stem geometry varied to accommodate pier skews up to 45 degrees. ODOT selected the hammerhead pier shape, as well as structural steel paint color, concrete sealer colors, and retaining wall textures, for the entire interchange.

After conducting highway aesthetic public involvement meetings, the Ramp C bridge was designed with one cast-in-place abutment and one stub abutment supported by a mechanically stabilized earth wall. All substructures were founded on spread footing foundations.

The design team also took advantage of the project's location as a gateway to Dayton, featuring unique aesthetics that reflected the cultural heritage of Dayton. Dayton is known as the home of the Wright brothers, because the project team invited the community to brainstorm design features that would acknowledge Dayton's unique heritage as the birthplace of aviation. The results included aviation-related elements that were incorporated into the interchange walls, including images of the Wright "B" Flyer image of the plane the brothers used to take their historic flight. The project theme was "where great ideas take flight."

Public support was key in the traveling public's acceptance of the new design for the interchange. An extensive community involvement program successfully facilitated public consensus for the preferred new design. In addition, the project team, led by ODOT District 7 and CH2M HILL, worked closely with all involved stakeholders, including local governments, to develop an acceptable access plan and a construction plan that was funded over multiple phases.