Large precast concrete girders pose transportation challenge for Vermont bridge project

The $45 million Rockingham Bridge 24N and 24S project over the Williams River in Rockingham, Vt., was designed to replace the existing bridges with two new structures.

The Vermont Agency of Transportation (VTrans) originally developed a base technical concept (BTC) for the project that consisted of cast-in-place segments; however, Reed & Reed, the contractor, based in Woolwich, Maine, offered a different idea: converting the original BTC to four spans with prestressed concrete, post-tensioned bulb-tee girders.

JP Carrara & Sons of Middlebury, Vt., was selected as the precasting contractor. The main prestressed girders range in length from 96 to 147.5 ft (29 to 50 m) and vary in depth from 6 to 10 ft (2 to 3 m). The pieces range in weight from 144,920 to 186,920 lb (65,800 to 84,860 kg). These girders were some of the largest that Carrara had ever manufactured and maxed out the lifting capacity at its plant.

"We assisted Reed & Reed as well as HDR Engineering, their design consultant, in the concept development of the precast haunched splice girder system, preparation of erection and production shop drawings, design of the lifting and shipping stability of the girders, fabrication of all precast components, camber/deflection monitoring and reporting, and transportation of the girders on remote-controlled steerable dollies," says Joe Carrara, president of JP Carrara.

The most significant challenge the company faced during the design process was determining the maximum length, height, and weight of the girders that it felt comfortable fabricating and shipping, as well as making the concept work with the design team's optimal framing layout. "The size of the girders ended up being the upper limit of our fabrication, shipping, and handling capabilities," he says.

With the project requiring a 100-year service life for the structure, Carrara used a 9000 psi (62 MPa) low-permeability concrete mixture with a corrosion-inhibiting admixture. All embedded longitudinal reinforcing bar is black uncoated steel that is placed within stainless steel stirrups.

To deliver the pieces, Carrara used its own professional drivers because they are skilled in this type of work from having delivered extremely large pieces previously to other projects. In addition, the company used special steerable trailers, which can make turns that would otherwise be impossible. These super-load rigs are three to four times the length of the average tractor-trailer. "We experienced no major shipping problems other than dealing with the tight and winding Vermont roads, as well as some delays due to weather," Carrara says. In addition, coordination of the rolling roadblocks and the associated time limits posed some challenges.

Due to the weight of the girders, large cranes with 440-ton (400 tonne) capacity were used at the site for installation. To provide crane access under the bridge, the contractor built a temporary trestle across the river. "The haunched girder segments were the most challenging aspect of the installation process, as it took time to adjust the bearing seat elevations and plumbness of the girders," Carrara says.

The Rockingham Bridge 24N and 24S project over the Williams River in Rockingham, Vt., uses black uncoated steel embedded longitudinal reinforcing bar placed within stainless steel stirrups. Courtesy of JP Carrara & Sons Inc.

A 440-ton (400-tonne) crane places the first of the massive haunched precast concrete bulb-tee girder segments more than 130 ft (40 m) above the Williams River as part of a twin bridge replacement project on Interstate 91 in Rockingham, Vt. Courtesy of JP Carrara & Sons Inc.

"Detailed coordination between all team members through design, fabrication, shipping, and erection proved to be the key that made the project the success that it was," Carrara says.
—William Atkinson

GFRC helps give California mixed-used project Mediterranean feel

The 599 Castro project is a 110,000 ft² (10,200 m²), four-story, mixed-use project with three levels of below-grade parking in downtown Mountain View, Calif.

The project includes Class A office, retail, and residential spaces, with frontages on three streets, including the city's main thoroughfare, Castro Street. The project shares the site with the 100-year-old St. Joseph's Catholic Church. The church's traditional California Mission architectural style influenced the architecture of 599 Castro. "The new building and the existing church also share a new exterior courtyard that was designed to further integrate the two buildings into a cojoined and cohesive site master plan," says Daniel Kirby, a principal with ARC TEC Architectural Technologies of San Jose, Calif.

Early in the design process, the team decided to use glass-fiber-reinforced concrete (GFRC) as the primary facade material because of its high quality, lasting durability, and the architectural look and feel that it created. Precaster Willis Construction, based in San Juan Bautista, Calif., provided the GFRC for the project. "The developer and design team also favored GFRC for the exterior facade due to its ease of maintenance and the wide range of colors and textures that were available," Kirby says.

GFRC is made of a 1 in. (2.54 mm) thick cementitious skin, reinforced with alkali-resistant glass fibers, and attached to a 16-gauge steel stud frame system.

Once the GFRC was selected as part of the design, the challenge was to incorporate the high level of Mediterranean details that would be required for a successful project. In addition to the detailing of the GFRC panels, the team incorporated custom-carved limestone pieces into the GFRC. The combination of the details, materials, and careful changes in color and finish provided the project with the high-quality permanent feel that the design required. The majority of the GFRC panels were given a light sandblast finish, and about one-third of the panels were clad with more than 3000 individual limestone pieces.

Another challenge was that the location of the project had zero lot lines along the street frontages, which required an efficient skin system for installation in the confined space. The panelized GFRC system helped deal with the restrictions of the site and also helped with the construction schedule.

In terms of precast concrete components, the total GFRC square footage was 50,500 (4700 m²). There were 518 panels, with an average size of 8 × 20 ft (2.4 × 6.1 m).

Kirby says that a very cooperative and collaborative team approach among the Diocese of San Jose, the developer, the design team, general contractor and subcontractors, and the City of Mountain View was important for the success of the project. "Once the Mission style architectural concept was established for the building, all team members worked diligently to integrate this style of architecture into a modern, sustainable, state-of-the-art, Class A office building," he says.
—William Atkinson

The mixed-use 599 Castro project in Mountain View, Calif., uses glass-fiber-reinforced precast concrete to help maintain the Mission style architecture in the area. Courtesy of ARC TEC Inc.