Project Spotlight

Precast concrete Z-shaped superstructure segments provide cantilever for seawall sidewalk

Oldcastle Precast of Auburn, Wash., was selected by the joint venture team of Mortenson-Manson, a general contractor/construction manager, to supply 400 precast concrete Z-shaped superstructure segments and 400 seawall face panels for the waterfront at the new Elliott Bay Seawall reconstruction project, part of the Seattle, Wash., Waterfront Program.

The Seattle Department of Transportation determined that the existing seawall, built between 1916 and 1936, needed to be replaced. The failing wall had suffered significant timber decay and deterioration as a result of continued exposure to storm waves and tides, as well as the 2001 magnitude-6.8 Nisqually earthquake.

Acting as a retaining wall between Elliot Bay and the waterfront, the new seawall structure consists of a cast-in-place concrete support slab with custom precast concrete face panels, precast concrete Z-shaped superstructure segments, and precast concrete sidewalk panels. Oldcastle provided the face panels and superstructure segments, and a Canadian firm provided the sidewalk panels.

To ensure the success of the project, Oldcastle worked closely with Mortenson-Manson to customize the design and engineering of the face panels and specialty Z-shaped superstructure segments that are essential for the seawall's stability. The Z-shaped superstructure segments are a vital structural component, acting as the concrete backbone of the new seawall's cantilevered sidewalk.

In all, Oldcastle Precast produced 400 precast concrete Z-shaped superstructure segments, which are 8 ft (2.4 m) wide by 9 ft (2.7 m) tall, with 13 ft (4.0 m) cantilever segments that extend over the waterfront from the seawall itself. They also provided 400 precast concrete face panels, which are 8 ft wide, up to 20 ft (6.1 m) tall, and 15 in. (380 mm) thick.

"I fully believe that much of the success of the quality precast concrete components and installation is due, in part, because of all the hours of planning that Oldcastle Precast invested in the project," says LJ Godsey, engineer for Mortenson-Manson.

"The project required a huge amount of planning to maximize efficiencies in production and also maintain product flow to support the schedule," says Dave Swanson, sales manager for Oldcastle. To maximize efficiencies and produce a superior product, the geometry of the Z-shaped superstructures required many hours of customizing formwork to allow for a monolithic pour. "Fortunately, our facility has the capability of managing the sheer size and weight of the structures while casting indoors and utilizing self-consolidating concrete," he says.

Precast concrete Z-shaped superstructure segments are the backbone of the new Elliott Bay Seawall reconstruction project's cantilevered sidewalks in Seattle, Wash. Courtesy of City of Seattle.

The mixture design incorporates a precise formulation of cementitious materials, admixtures (water-reducing and anticorrosive), and extensive testing. Using customized fixtures, Oldcastle created a production line to fabricate the nearly 4000 lb (18 kN) of reinforcement within each segment.

"Because of the random exposed reinforcement after casting, we needed to fabricate portions of the forming from lumber acting as temporary work forms," Swanson says. "This was all produced on CNC [computer numerical control] machinery to provide very accurate and consistent parts."

The closure wall behind the Z-shaped panels is being assembled near Waterfront Park in Seattle, Wash. Oldcastle Precast is supplying 400 precast concrete Z-shaped superstructure segments for the Elliott Bay Seawall reconstruction project. Courtesy of City of Seattle.

Oldcastle's customized precast concrete solution has improved constructibility, accelerated the construction schedule, and easily overcome the demanding challenges of the unique seawall project.

The project is scheduled for completion in mid-2017. "As of mid-December 2015, we have produced over 93% of the product," Swanson says. "We have installed roughly 30% of the product, and we are all pleased with the outcome so far. The project teams, from the architects to the engineers, production teams, and installers, have all aligned very well, which can be attributed to planning, communication, and relentless attention to detail."

—William Atkinson