

## Resilient city hall annex in California uses hybrid moment frame design

The 82,000 ft<sup>2</sup> (7600 m<sup>2</sup>) Roseville City Hall Annex is the first precast concrete building constructed for the City of Roseville, Calif.; the first ever to be rated by the U.S. Resiliency Council (USRC); and the first to receive USRC's highest earthquake rating of platinum. USRC has established a rating system for building performance during earthquakes and other natural hazard events.

The original design called for a steel structure with a plaster finish. However, the city opted instead for a precast concrete hybrid moment frame manufactured and installed by West Sacramento, Calif.-based Clark Pacific, the precast concrete manufacturer selected by DPR Construction, the general contractor.

"Precast concrete hybrid moment frames are a codified resilient lateral resistance system, one of the latest such systems used in construction today," says Thomas Ketron, director of marketing for Clark Pacific. "It is unique because it is designed not only to resist earthquakes but also to self-right structures after an earthquake, resulting in no residual drift after a seismic event. This not only saves life and limb but also greatly reduces the costs for building owners to recover from an earthquake."

Besides the new levels of resilience possible with the system, the precast concrete hybrid moment frame allowed for additional levels of prefabrication on the project. "The precast units that form the precast concrete hybrid moment frame system are exterior panels that were produced with a high-end architectural precast finish, allowing the city to achieve its aesthetic goals, as well as resilience, with the same system," he says.

The city found the precast concrete hybrid moment frame appealing for a number of reasons. It realized that the system would not only provide the architect with additional flexibility in design but would meet tight delivery requirements and open up additional floor space in the building by eliminating the need to install additional interior columns. The precast concrete hybrid moment frame system's seismic resilience was important to the city, given that the building would house critical departments, such as information technology and fire administration. In addition, the high-performance precast concrete hybrid moment-resisting frame limits design-level drifts to less than 1.25%.

Ketron says that the precast concrete hybrid moment frame has been in development since the late 1980s, the



The City Hall Annex in Roseville, Calif., features an earthquake-resistant precast concrete hybrid moment frame design. Courtesy of John Swain.

result of research provided by the National Institute of Standards and Technology as well as the PRESSS (Precast Seismic Structural Systems) program funded and supported by PCI; the University of Washington at Seattle; Charles Pankow Builders; and numerous other entities and precast concrete firms, including Clark Pacific.

For the Roseville project, Clark Pacific produced 341 pieces, including columns, beams, architecturally finished moment frame columns and beams, double tees, and hollow-core, for a total of 2000 yd<sup>3</sup> (1500 m<sup>3</sup>) of concrete.

—William Atkinson

## Philadelphia museum's precast concrete blends with historical neighborhood

The new Museum of the American Revolution in Philadelphia, Pa., which opened in April 2017, is situated among other buildings of historical significance, including the First Bank of the United States and William Strickland's Merchant Exchange, which date back to the late 1700s and early 1800s.

As such, it stood to reason that the museum should feature a historical look. One option was to use hand-laid brick and limestone. However, the excessive costs of this process, the extensive installation time required, and the cramped environment (which would make it difficult to erect scaffolding and

bracing), made this unfeasible. In addition, the large, ornate, limestone-clad alcoves and arches would have required significant steel framing support.

Instead, the architectural firm Robert A. M. Stern Architects of New York, N.Y., opted for architectural precast concrete panels, a cost-effective, visually appealing, and more easily installed solution that would also achieve the distinctive features desired for the building's exterior. The plasticity of precast concrete was also appealing because it allows for high levels of design detail and character.

Universal Concrete Products erected about 320 precast concrete, brick- and limestone-clad wall panels, totaling 50,500 ft<sup>2</sup> (4690 m<sup>2</sup>), for the exterior of the museum. The use of precast concrete allowed for the inclusion of several large, recessed brick arches and unique limestone cornices and accents.

As part of their design, the panels feature thin-brick walls manufactured by Watertown Brick Co. of Watertown, Pa. The architect had worked with Watertown before. "For this project in specific, we offered a product that could meet the architectural design criteria, in that it matched up with the old

brick that was in the older buildings in the area," says Steve Barnhardt, national sales manager of thin wall products for Watertown. "Furthermore, our product is PCI compliant, which was something the architect required."

Watertown supplied about 132,000 thin flat-side bricks with dovetailed backing; about 130,000 headers, since every other brick was a header; and about 10,000 corners.

Although the project turned out to be a success, it was not without its challenges. "The arches were quite detailed," Barnhardt says. "The combination of this along with the inclusion of the limestone ended up being quite a feat for the folks at Universal Concrete."

Barnhardt says that the key to success was communication. "The technical people from both companies worked together. In fact, folks from our plant went down a couple of times to help the people at Universal Concrete work through the process. As a result, it ended up being an impressive-looking project."

—William Atkinson 



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