Prefabricated Check Out at Library

Hybrid technology helps preserve the treasures of the past.

By Michael Chusid, RA, FCSI

A prefabricated wall system combining the durability and appearance of precast concrete with the light weight and strength of cold-formed steel framing is finding its place in history in a recently constructed facility at the Huntington Library, one of the most important research libraries in the country.

The new Munger Research Center, located in San Marino, Calif., outside of Los Angeles, adds 90,000 square feet to the institution. It contains laboratories and workrooms for the conservation of historic documents, rare book storage, administrative offices and a reading room for scholars.

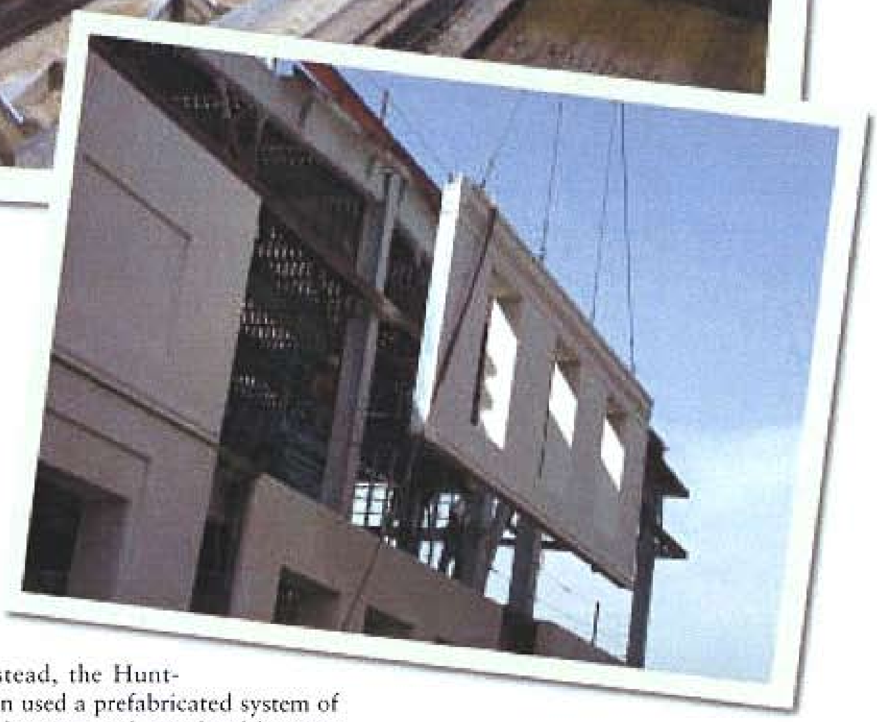
"We had so many different requirements for the project," says Avery Director of the Library David Zeidberg. "The challenge was to put them into one building and make them function seamlessly."

RELICS

The most important design objectives for the exterior cladding of the $20-million facility was to emulate the neoclassical architecture of the institution's original buildings, while working within a tight budget and to provide a safe home for its collection of rare, fragile documents and manuscripts. This required exterior walls that are nearly air tight in order to maintain the climate-controlled conditions required for the collection.

Most of the existing buildings on the Huntington grounds are finished with Portland cement plaster. The building team, however, was hesitant about using conventional stucco for the library's walls.

"Plaster requires joints every 10 to 20 feet in both directions to control cracking due to shrinkage and seismic movement," says Bert England, lead designer for the project and senior vice president of Earl Corp., the design/builder and general contractor on the job. "We felt the joints and cracks in plaster



Walls

would compromise our ability to seal the building."

He was also concerned that the joints would not be compatible with the distinguished appearance the Huntington wanted.

Conventional precast concrete was also considered but its weight posed two challenges. First, the building was designed to exceed Southern California's building code requirements for earthquakes to ensure that the building contents would not be damaged; the weight of conventional concrete would have required additional seismic bracing of the steel frame. The second weight-related problem was that it is difficult to transport and install large, heavy panels of conventional precast; using small pieces of precast would require many joints and made it challenging to seal the building.

Instead, the Huntington used a prefabricated system of load-bearing and non-load-bearing thin-shell precast concrete panels to clad the building. The prefabricated panels feature architectural precast concrete faces 2 inches thick that are supported internally by light gauge steel stud framing. Shear connectors, from Metal Stud Crete, join the thin-shell concrete and the metal framing to create composite strength. The panels attach to the building's structural steel with hardware embedded in horizontal concrete beams cast into the back of the panels. They were engineered to move independently from the structural steel frame to resist cracking due to building movement, yet provide the long-lasting quality and appeal of concrete.

AGGRESSIVE PRODUCTION

The precast concrete is integrally colored and has a light sandblasted finish that looks like fine limestone. The relatively lightweight wall sections, however, were cast in very large panels to create a visual scale not possible with small, quarried blocks of natural stone. The thin shell precast concrete panels were made in sizes up to 16 feet tall by 40 feet long.

"It was very aggressive to make precast panels this large," says Bob Konoske, vice president and general manager of Coreslab Structures (L.A.) Inc., the precast subcontractor, explaining that precast panels typically do not exceed 8 feet by 20 feet.

"If these panels were a more conventional 4½ inches thick precast concrete they would have been much heavier. Practically, we could not have made conventional panels this big; the panels would have had to be smaller and more joints would have been exposed."

The concern about joints was due to the requirement for absolutely steady levels of temperature and humidity inside the building to prevent deterioration of historic documents. Fewer joints, coupled with sprayed closed-cell foam insulation applied to the panels, helped achieve a moisture barrier and thermal break, minimizing air intrusion and maintaining the required climate control, says England.

Heavier panels also would have been more difficult, or even impossible, to transport to the job site. As it was, the larger, thinner panels were a challenge unto themselves. Coreslab shipped them to the location on a slant easel at a 35-degree angle so they would stay under legal height and width.

Initial concerns that panels of this size would be fragile were allayed after the ultimate test of their durability: surviving the 80-plus mile trip from the plant in Riverside County, Calif. to the Los Angeles area without a single crack. There was also no cracking during installation, which was performed by a mobile crane.

To create the panels, Coreslab set out large flat casting tables with smooth fiberglass surfaces and then built side rails around the perimeter. They laid the metal framing, supplied by Dietrich Metal Framing, with the Metal Stud Crete connectors attached, in the forms and then poured the concrete through the frame. In some panels, it was necessary to pour the concrete first and then set the frame onto the concrete.

While the panels are thin, windows were recessed 30 inches to make the walls look thick and massive, and to create dramatic shadows. Fabricating the 2½-foot returns required ingenuity to preserve the high-quality finish of the panels, Konoske remarks.

"If you were to pour the panel faces and returns as one unit, the returns would not have near the quality of surface we achieved doing it the way we did," he says. "Because of the requirement for a tight finish, we poured the panels in two-steps."

First, Coreslab poured the concrete for the panel faces in a downcast position. Then, panels were rotated 90 degrees so the returns could also be downcast. As a result of tight quality control, no pour lines or joints are visible at the transition between the two surfaces.

Konoske credits the wall system with allowing the period look required for the Huntington to be achieved. And, for all the technical requirements of the project, he says that prefabricating larger, lighter-weight panels was the only choice.

"Metal studs and precast concrete are a nice marriage," Konoske says. "It gives a lot of added strength to the thin section of concrete and looks wonderful." **W&C**

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