

PRECAST CONCRETE & LEED

US NAVY NIMITZ-MACARTHUR PACIFIC COMMAND HEADQUARTERS



- Project Type:** Military—Command headquarters
- Location:** Oahu, Hawaii—U.S. Pacific Command Camp H.M. Smith
- Owner:** U.S. Navy
- Architect:** The Benham Group, Oklahoma, City, Okla.
- Engineer:** The Benham Group, Oklahoma, City, Okla.
- Contractor:** Dick Pacific Construction Co., Honolulu, Hawaii
- Precaster:** Rocky Mountain Prestress (now GPRM Prestress), Kapolei, Hawaii

OVERVIEW

New headquarters for the U.S. Pacific Command (USPACOM), the six-story, 274,500-square-foot Nimitz-Mac Arthur PACOM Center Headquarters houses the PACOM Commander and a military and civilian staff of 2,000. It consolidates the personnel of the Commander-in-Chief, U.S. Pacific Command (UNCINCPAC) and Special Operations Command Pacific (SOC PAC) in one secure facility.

Equipped with the latest information and decision-making technologies, the building houses state-of-the-art communication, intelligence systems and fiber optic networks. The Benham Group served as architect, engineer of record, and provided comprehensive interior design. The firm specializes in the design-build of projects that require reliable crisis response systems and advanced networking/display technology for communication and visualization. In addition to mission-specific operational space, the facility houses a cafeteria and dining and food preparation areas. The highly flexible interior is designed for future reconfiguration as necessary.

The structure consists of heavily articulated precast concrete architectural panels with an acid-etched finish, steel framing, and concrete floors on a pan deck. "Precast concrete was selected," says Les Kempers, P.E., vice president of marketing and sales, Rocky Mountain Prestress, "because [the Navy] wanted something that was going to be permanent and not have a maintenance issue down the road. And, they wanted something that could carry the heavy articulation massing without looking cheap."

Located on Halawa Heights in Camp Smith, the command center has stunning views of Halawa Valley and Honolulu. It replaces the former HQ that was housed in a 60-year-old structure that was built as a hospital during World War II. Befitting the location, the project is designed in a Hawaiian/Pacific Rim or Asian architectural style reminiscent of the 1920s Hawaii.

The goal of designers was to capture the Hawaiian architectural style as it related to natural elements, such as earth, water, mountains, and sky. This was accomplished with the use of seven different form liners to cast various textures and forms into the architectural precast panels covering the exterior. The result is a façade that features such natural elements as waves, stone textures, and pineapple-leaf patterns, as well as multi-level reveals, fluted mullions, cornices, dentals, bullnoses, and ribs. Even the Navy's globe symbol was integrated into the façade and is featured on the building exterior in a 4-in.-deep bas-relief.

7 FORM LINERS

Number needed to create exterior design themes of earth, water, mountains, and sky

100 PERCENT

Amount of precast concrete components that were locally produced

\$1 MILLION

Amount saved by redesigning architectural precast exterior to reduce the depth of returns

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Precast concrete exterior had to meet Force Protection and blast-resistance requirements.

Photo: Les Kempers, GPRM Prestress



Architectural precast panels featured designs symbolizing earth, water, mountains, and sky.

Photo: Les Kempers, GPRM Prestress



All precast components were locally-sourced. Even the form liners were made locally.

Photo: Les Kempers, GPRM Prestress

"The architectural precast panels were some of the most articulate I've seen," says Kempers. "There were seven types of flat spandrel forms with various designs to accommodate different themes for each level. The lower level is Earth and panels have a stone texture. The next level up is Water, and these panels used a liner with waves in it. The level above that is Mountains, depicted by reveals that look like a mountain range. The top level is Sky and panels were formed with an open pattern."

Because of the heavy amount of articulation on the precast panels, it took quite an effort to create piece drawings in such a way that the panels could be stripped from the forms. In addition, it was a challenge to maintain color uniformity because of the limited availability of aggregates in Hawaii, adds Kempers. "The aggregates in Hawaii are basalt, which is a charcoal color, and coral. With basalt, you have to be careful with the depth of the acid etch. With a light color panel and black aggregate, if you etch it too deep it's going to turn the panel darker. We had to perform a very uniform, very light acid etch."

Careful planning of the design elements allowed the precaster to capitalize on cost-saving manufacturing techniques. The original design contained slight differences in panel lengths, and consequently in the articulation from resulting re-entrant corners, outside corners, and various setbacks. That would have required many costly form changes or the need for additional forms. By working through these situations early, the team was able to take advantage of the economies of repetition in the architectural precast pieces, with only minor modifications to the formwork.

"The original RFP design had deep recesses on the lower three floors. When you came around the columns, the windows were recessed some three feet, so the bottom three stories had very heavy massing. Not surprising, the bids came in way over budget," explains Kempers. "The contractor asked if we could reduce the depth of the returns and still keep the look of the building. We reworked the exterior envelope to create a design that had the same basic look but with the windows set back only about 6 in. That cut close to \$1 million out of the project costs."

The need for concrete colors was minimized by using different textures in the architectural precast. Further modifications to panel joinery allowed nearly all of the panels to be cast in a single color, providing an overall building scheme of two distinct colors.

PRECAST CONCRETE'S CONTRIBUTION TO SECURE CONSTRUCTION PRACTICES

The architectural precast concrete exterior had to meet Force Protection and blast resistance requirements. The steel-framed structure also had to meet fairly stringent progressive-collapse requirements.

"We studied the design loads provided by the structural engineer and analyzed our connection details," says Kempers. "It really did not change the precast design very much. All we had to do was increase the walls on the connection by an inch or so and increase the mesh in the panel by 10 or 15%. They were happy to find out it wasn't a big cost to have the precast be blast resistant."

In addition, most of the precast bears on itself and then on the footings, so that it does not impose gravity loads on the structure and only has wind loads to resist. The wind loads in that area are not as extreme as the blast loading requirements and the seismic design demands in this area of Hawaii.

The design and construction team also had to meet the demands of a government quality-assurance program. The quality-control process for the concrete work began with concrete material submittals and mix designs and ended with the last 28-day cylinder strength-break tests. In between were regular form inspections, verification of reinforcement placement, blockouts, and inserts. Close coordination was achieved for concrete placement, mix-design verification, admixture and water verification, finishing, curing, sealing, staining, and stamping.

PRECAST CONCRETE'S CONTRIBUTION TO SUSTAINABLE CONSTRUCTION PRACTICES

Materials sourced within the region included the aggregate used in the concrete for the building's structure and architectural precast concrete panels. Even the form liners were made locally by the precaster, rather than importing forms.

In total, the command headquarters used 834 architectural precast concrete panels, or 77,777 sq. ft, 76 stair units, and 10,000 lineal feet of 16.5 in. octagonal piles. In addition, there are five types of curved spandrel forms and 11 types of column cover and mullion forms. A typical panel measures 10 ft 2 in. tall by 20 ft long. Panels range from 5 in. to 12 in. thick. Some panel connections are bolted, some welded.

Sustainable features incorporated into the design include insulation of the exterior envelope to reduce heat gain, large roof overhangs, exterior glazing to reduce the amount of solar heat gain into the building, incorporation of recycled materials, and the use of windows to allow day-lighting into office and conference rooms to reduce the need for artificial lighting.



Precast/Prestressed
Concrete Institute

200 West Adams Street
Suite 2100 Chicago, IL 60606
Phone: 312-786-0300
Fax: 312-621-1114
www.pci.org