Hawaii Engineer's Concrete Innovations Span the World

by Tony Dela Cruz, Staff Writer

In Hawaii, if a concrete building or structure possesses striking visual features, chances are Alfred A. Yee engineered it. His touch can be seen in a diverse range of familiar sights, from the Kahala Hilton and the Ala Moana Americana hotels to the Arizona Memorial and the punch card-like facade of the IBM building on Ala Moana Boulevard.

Yee's contribution to the state's construction industry goes well beyond those obvious examples.

In 1955, six years after receiving his master's degree in structural engineering from Yale University, he engineered the first precast, prestressed concrete mass production facility in Hawaii. Nine years later he designed the world's first pretensioned, prestressed concrete barges. Within another decade, Yee's honeycomb cellular core concept for marine structures became an important milestone in offshore design.

In recognition of these and other achievements in concrete applications that have brought him international renown, Yee recently was granted honorary membership in the Cement and Concrete Products Industry of Hawaii.

Alfred A. Yee: A unique touch.

The impetus for much of Yee's work can be traced to 1964, when he designed 19 prestressed concrete barges for use on the Pasig River in Manila.

The Pasig River demanded certain innovations in design because a combination of low-lying bridges and an overall shallowness set the draft limitation at 10 ft and the freeboard height at 8 ft.

"I had to keep it very light, so I made the internal framing system out of steel," Yee recalled. "As it turned out, it satisfied all the needs for an ocean-going vessel. The only problem was although the concrete was very durable and didn't require dry docking, the steel was constantly rusting.

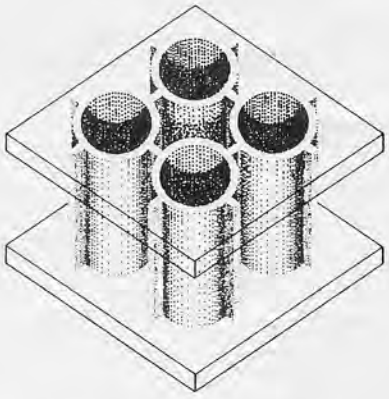
"The constant repair, replacement and all that made me think, 'My God, if I could make it out of all concrete, internals as well as the outer skin, I would have something that would be very useful to meet the needs of the marine industry.' "

This seedling of an idea reached full bloom in 1981 with the launching of ROFOMEX I, a floating platform designed to support a large phosphate processing plant. ROFOMEX I was the first commercialization of Yee's prestressed concrete honeycomb design, a system that utilizes reinforced concrete in the form of a honeycomb cellular core in composite action with prestressed top and bottom slabs and side walls.

Even though the honeycomb concept meant durable concrete without rust, it wasn't an idea that sold instantly.

"All good ideas can die on paper if you don't have a buyer or a user," Yee commented. It wasn't until seven years after the completion of the honeycomb design that the Roca Fosforica Mexicana Co. of Puerto La Paz, Mexico contacted Yee to design ROFOMEX I.

He recalls that the Mexicans wanted durability above all else; a steel vessel would have required dry dock



Yee's honeycomb design of prestressed concrete is ideal for floating platforms.

maintenance every two years. For mineral retrieval, that meant losing millions by the week in order to fix something that only cost $5 million. Yee's design offered an ideal solution to the Mexican company's maintenance dilemma.

In 1984, the prestressed honeycomb design was incorporated into the first Concrete Island Drilling System (CIDS), developed by Global Marine Development Inc. of Newport Beach, Calif., which was impressed enough with the honeycomb design to purchase from Yee worldwide patent rights.

Global Marine Development used the concept for off-shore drilling on the north slope of Alaska, a location where "a conventional platform is crushed like a paper box when ice comes down and freezes around it," Yee noted. As it turns out, another key attribute of the prestressed honeycomb design is its impressive structural strength.

"Up until the time my honeycomb idea came into being, the only method of drilling off the north slope of Alaska was the use of a gravel island," Yee said. That $100-million proposition entailed shuttling gravel out to the ocean, dumping it, letting it accumulate and then bringing in bulldozers to pack it down. The island had to be big enough to house 100 men and then it had to be broken down at even greater cost when the drilling was complete.

The honeycomb-based CIDS was a portable island built at a cost of $75 million, with fewer materials than a gravel island. Best of all, it was reusea-

ble. If an excavation turned up fruitless, the island could be towed somewhere else and its users could try again.

Reflecting on the years when his honeycomb design was greeted with skepticism rather than purchase offers, Yee remembers endless series of lectures, client presentations, marketing and research and development.

Often Yee had to tap the Far East to find firms willing and able to move his design from planning board to production. ROFOMEX I was constructed in Singapore and the CIDS project was built in Tsu City, Japan. Yee's patent for the steel splice sleeve for pre-cast concrete, which enabled the Ala Moana Americana Hotel to be built in record time — two floors every five days — was sold to a Japanese firm that now sells splice sleeves all over the world.

It's from these "smoke stack guys" that true models of efficiency emerge, Yee commented.

"We in America are good at inventing and developing things, and the people in the Far East are good at implementing. They have organization, they have good management and labor relations. People there are disciplined and tend to respond quicker," he said. □