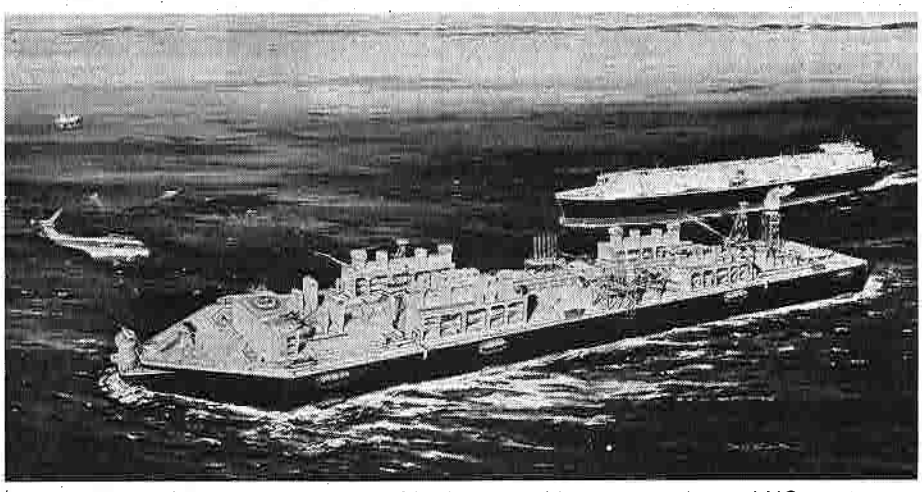


Precast, prestressed concrete barge, 860 ft long, would process and store LNG.

Concrete LNG vessel halves costs of onshore facility

Constructing a $270-million precast, prestressed concrete barge to process and store liquefied natural gas (LNG) would be about half as costly as building a comparable facility onshore, according to the vessel's designer.

A liquefying plant mounted on deck of the 860-ft-long ship-like vessel could produce almost 450 million cu ft of LNG per day from offshore wells or from unwanted natural gas flared from oil production operations. Lined cryogenic holds below deck could store up to 5.6 million cu ft of the liquid gas.

Part of the cost saving would result from being able to moor the plant adjacent to offshore wells, thus eliminating pipelines to shore. Construction of berthing terminals and extensive dredging also would be unnecessary because the 140,000-ton vessel would double as a dock for LNG tankers. When fully loaded, the barge would draw about 48 ft.

The top and bottom slabs of the 192-ft-wide barge would be of a patented honeycomb sandwich panel design, similar to aircraft construction but using concrete instead of metal alloys. Precast, prestressed concrete slabs compositely join and enclose a core of multiple cylindrical cells connected by thin walls.

This concept "utilizes the least amount of materials to give the greatest rigidity and strength," says Alfred A. Yee, of Alfred A. Yee & Associates, Inc., Honolulu engineer-architect that developed the concrete panel system. He says the cellular system "inherently involves double-walled structures that present substantial advantages in damage stability and environmental protection." In addition, Yee says, among concrete oceangoing vessels, the design provides advantages "in terms of light ship weight, structural strength and localization of damage in collisions or groundings."

Why concrete? Concrete was chosen because of its "superior resistance to thermal shock and low temperature exposure and durability in an ocean environment," says Yee. He says the hull will probably never have to be drydocked for maintenance and that any hull repairs could be made while afloat. Yee introduced concrete prestressing to Hawaii in 1955, with construction of concrete bridges, buildings and barges to his credit (ENR 4/15/71 p. 16).

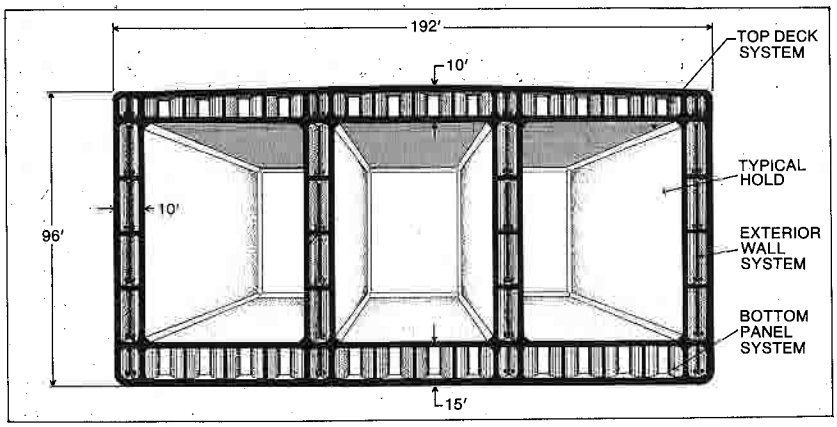
Global Marine Development, Inc., Newport Beach, Calif., will coordinate overall design and construction of the barge, including mechanical equipment. Global originated the idea for a floating concrete LNG vessel and approached Yee to design it.

The 96-ft-high hull has three cryogenic sections in cross-section, which are separated by bulkheads of sandwich design. The deck is 10 ft thick and the bottom slab is 15 ft. The hull's sides are 10 ft thick. Transverse bulkheads, 10 ft thick, divide the storage areas generally every 154 ft and help support the deck. Construction would require about 86,000 cu yd of concrete.

Simple prestressing. Yee says, "The prestressing is not complex and no new techniques are required. Construction calls for conventional tendons, sheaths, anchorages and grouting." He says that importantly most of the precast components can be joined and prestressed at a conventional dry dock where workers, equipment and materials are readily available. Yee contrasts this with construction of onshore LNG plants often in remote areas where manpower and materials problems can boost costs significantly. Partly because of this he says construction of the floating facility will take three years, compared to five years for a conventional plant.

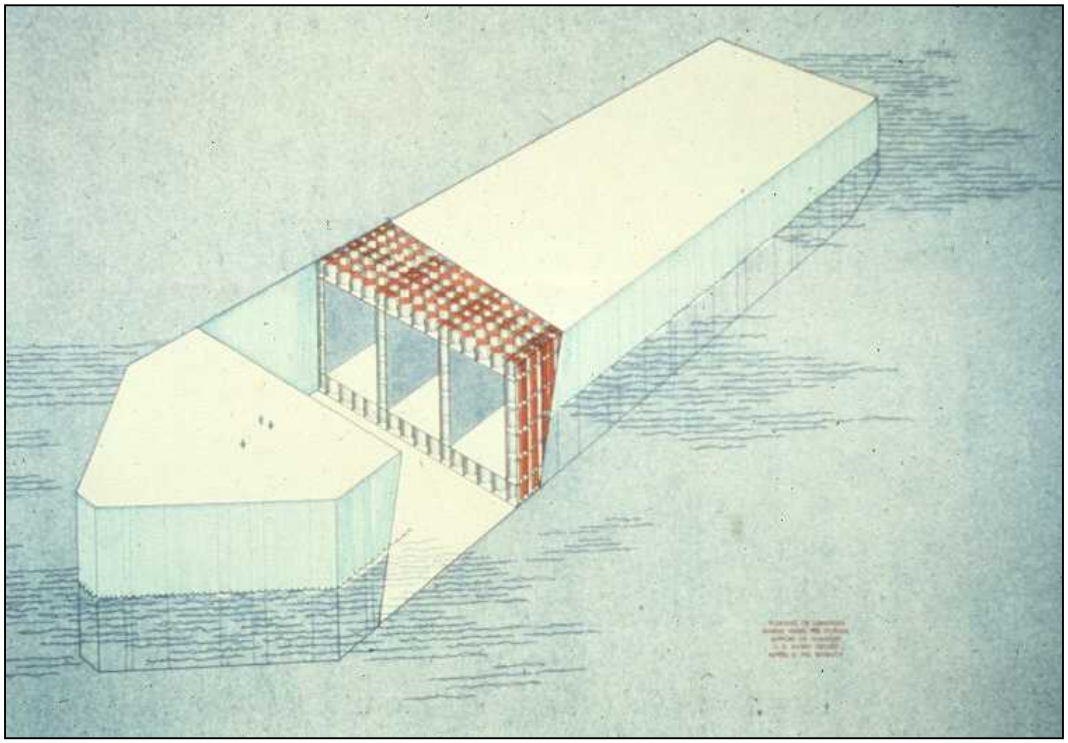
In addition to this application, the sandwich core concept can be used for dry cargo barges, floating oil storage containers, tankers, ships, floating piers and dry docks, says Yee.

Construction of the prestressed LNG vessel is expected to begin this summer, possibly in Hawaii or Japan, according to Yee. "There are serious discussions in progress with several gas companies and some foreign governments that want to build [production] platforms and get wells producing in their territories," he says. "Financing is being worked out by an international consortium based in New York City."



Cellular panel deck, bottom and bulkheads enclose hull's holds.

Proposed floating LNG processing facilities for Global Marine Corporation.



Hull section of LNG platform.

Testing of precast honeycomb elements for LNG platform construction.

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