

SEPTEMBER/OCTOBER 2013



Net Zero: Working on Water

Nibbi Brothers General Contractors and the Exploratorium at Pier 15 in San Francisco

By Matt Alderton

SITE

The Embarcadero is quintessential San Francisco. It's the city's eastern waterfront, meandering along the San Francisco Bay, traipsing

around the tip of the peninsula and toward the iconic red-orange suspensions of the Golden Gate Bridge. At one end is the San Francisco Ferry Building, and at the other is Fisherman's Wharf, a tangle of restaurants, shops, and attractions. But in between, thousands of tourists and locals stroll along the waterfront, drinking in the spectacular scenery—it's the perfect spot for a new, super-sized science museum.

At least that's what the Port of San Francisco decided in 2004 when it partnered with the city's popular hands-on science museum, the Exploratorium, in pursuit of a novel idea to turn two vacant piers, Piers 15 and 17, into a nine-acre museum campus that would reenergize both the Embarcadero and the Exploratorium.

Since opening in 1969, the Exploratorium had been located at the Palace of Fine Arts in San Francisco's Marina District, a beautiful but remote location some three miles from the bustling Embarcadero. The museum had long ago outgrown its space and was in the midst of a many-year search for new real estate. The massive size and strategic location of Piers 15 and 17 made them an ideal solution. There was just one problem—turning the 20th-century piers into a 21st-century museum would require an unprecedented act of intricate marine surgery.

SCIENCE

Most scientists don't believe in walking on water, but they do believe in building on it. Thus, the Exploratorium accepted the Port of San Francisco's proposal in spite of the construction challenges but not at all oblivious to them.



museum and protect it from earthquakes. The need to refurbish and seismically upgrade the piers meant construction would take place not only above the San Francisco Bay, but also below it, where piles extend more than 160 feet into the bottom of the bay.

An added challenge was historic preservation. The museum's design, courtesy of San Francisco-based EHDD Architecture, included a new all-glass observatory between Piers 15 and 17, yet the primary component was a historic warehouse, spanning the length of almost three football fields, on Pier 15 that would be renovated into the Exploratorium's main exhibit space. Although interior upgrades to the warehouse were allowed, its architectural façade would remain largely untouched.

As if that weren't challenging enough, the Exploratorium made sustainability a major priority early on in the planning phase. Endeavoring to be the world's largest net-zero energy museum, it required architects and builders to incorporate into the museum's design an ambitious roster of features to offset the facility's energy consumption, including one of the city's largest solar roofs and a cutting-edge bay-water heating-and-cooling system that naturally regulates the museum's indoor temperature.



using any power from the grid is amazing.”

SOLUTION

Based on its waterfront experience and preconstruction efforts, Nibbi Brothers was retained as the project's general contractor when construction commenced on the Exploratorium in November 2010. Almost immediately, Nibbi Brothers set to work solving the structural and seismic challenges of the piers. “Gigantic bulkheads at the far water side and then closer to the Embarcadero would be tied together to provide rigidity in the structure,” Olla says of Nibbi

In 2005, it retained preconstruction services from San Francisco-based Nibbi Brothers General Contractors, which in 2001 had completed a similar renovation of Pier 1. Among Nibbi's first orders of business was a preconstruction survey of the 2,400 piles beneath Piers 15 and 17, a significant number of which would need to be repaired or replaced in order to support the new

Along with reducing its environmental impact, the goal was to make the museum a living exhibit, showcasing the science of sustainability. Because the facility includes several energy-intensive components, including a theater, two retail stores, and a café, all of which are expected to host more than a million people every year, achieving it wouldn't be easy.

“Being able to incorporate all these environmentally driven elements dovetails nicely into what the Exploratorium is all about, which is really the direct correlation between science and nature,” says Nibbi Brothers vice president of business development and marketing Joe Olla, who expects the museum to achieve LEED Platinum certification. “For its massive size, not

Brothers' solution.

Five teams of divers worked on installing four sets of gargantuan steel pilings in the bottom of the bay to support the bulkheads. Each piling is 135 feet long and six feet in diameter. The work was arduous, but the substructure beneath the piers needed to be upgraded because the original pilings dated back to the early 20th century. "You basically had a scaffold hanging underneath the deck where workers were working between the bottom of the deck and the water, where you are contending with rising tides and other concerns, such as the marine life," Olla says. "A tremendous amount of effort was focused on that specific work." The piers' seismic overhaul means the Exploratorium can withstand up to an 8.2-magnitude earthquake.

With the base secured, Nibbi Brothers could focus on making the building use no more energy than it produced. A 1.3-megawatt SunPower solar power system will generate 100 percent of the Exploratorium's electricity. The galleries will use daylighting with windows that have high-performance glass designed to reduce heat gain. For water conservation, the bathrooms will have waterless urinals and low-flow plumbing fixtures and a roof rainwater system that collects water for restroom use in the building.



The bay-water heating and cooling system was the most difficult to install because the MEP systems had to be retrofitted into the historic structure without disturbing it. The job was accomplished using a 3-D spatial model created by InnovTech. Developed by Nibbi Brothers and Power Engineering Construction Company, the system captures water from the San Francisco Bay, filters and cleans it, then pumps it through a heat exchanger via eight 50-ton heat pumps made by Multistack. Depending on the season, the pumped bay water either heats or cools an estimated 73,800 gallons of water that recirculate through the facility via 200,000 feet of radiant tubing made by Uponor. Spanning 82 different heating-cooling zones controlled by individual

thermostats, the tubing will save 2 million gallons of water annually by not using evaporative cooling towers for heat rejection.

"There were a lot of challenges as it related to the bay-water intake system," says Olla, whose firm learned how to address those challenges when it attempted a similar, but ultimately unsuccessful, system during its 2001 renovation of Pier 1. "The first concern was, 'What if the system breaks?' So, we put in two [systems] to create redundancies. The next concern was, 'If the system breaks, how are [we] going to get it out to repair it?' because this thing is gigantic and sinks all the way down into the bay. So, the room where we built it has an opening in the ceiling where it can be pulled out for maintenance."

Despite the technical challenges associated with building over the water and integrating a net-zero-energy goal, Nibbi Brothers successfully completed construction on the new Exploratorium in November 2012. When the museum celebrated its grand opening in April 2013, the fruits of its labor were plain to see, even though its most intricate work—hidden under the floor and beneath the sea—was not.

"Before, it was a dilapidated pier," Olla says. "Now, it's safe, it's inviting, and it allows people to really enjoy the waterfront, whether they're in the museum or not."

ADAPTIVE REUSE

TECHNOLOGY

[+ Share This Story](#) | [f](#) [t](#) [e](#) [r](#) [0](#)

QUICK LINKS

Download Media Kit

To Advertise:

E-mail Laura Heidenreich
(312) 447-2394

For Editorial Consideration:

E-mail Timothy Schuler
(312) 256-8487

Download the iPad App:



LATEST TWEETS

- Following Denmark's example, the US now has floating wind power bobbing off the coast of Maine: <http://t.co/KHKfhBPpLa>
- Elevator giant @KONEamericas has a new elevator rope that uses less energy: <http://t.co/pU20HyxpJi>
- Who's excited for @BOMA2013 #EveryBuilding Conference in 2 weeks? We'll be there with bells on: <http://t.co/phl4FaN6Ik>

SOCIAL MEDIA



Register Now

February
26-28, 2014





[CONTACT](#) [GUERRERO HOWE](#) [PRIVACY](#) [TERMS AND CONDITIONS](#)

© 2014 Guerrero Howe, LLC. All rights reserved

Site by: Bowler Hat Creative

Based on designs by SomeOddPilot