NOVA GROUP INC
Quality & Innovation in Construction
7411 Napa-Vallejo Hwy. • P.O. Box 4050 • Napa, CA 94558

Construction Innovation Forum - Nova Award Nomination
Open Ocean Surface Transportation Supply Pier
San Nicholas Island, California

This "one-of-a-kind" design/build project, completed in 2005, provides a permanent barge landing site with a 270 foot by 35 foot open-ocean roll-on, roll-off concrete supply pier for offloading of 120 to 220 tons of fuel and freight materials including heavy equipment (missiles, targets, launchers, and military hardware), fuel trucks, construction supplies, and other items not feasibly transported via aircraft to San Nicolas Island (SNI); one of the Channel Islands located about 85 miles off the coast of Southern California, The Naval Air Warfare Center Weapons Division uses SNI as a sea range for the U.S. Military training to maintain operational readiness.

Prior to completion of this project, most materials and supplies were transported to SNI by barge from Port Hueneme or Long Beach. Offloading was accomplished by running the barge aground, using bulldozers to construct sand mat ramps, and moving equipment over the beach which was inefficient and dangerous. The annual tonnage requirement is 120 to 220 tons per trip for 30 to 40 trips along with the requirement to return 150 tons of non-construction and non-burn trash to the mainland each year. Approximately 20 percent of the scheduled barge trips were not able to land due to rough seas or marine mammals on the beach which delayed deliveries up to ten weeks. This method of landing the barge was unsafe due the sea state, multiple high tension cable tie-downs that often broke during the process causing injuries, speed required to offload barges, and equipment damage from dragging across sand.

The initial design of the pier was one of the most challenging aspects of the project, because it was the first open-ocean, roll-on, roll-off project in the world. The design involved many innovative and original ideas, although many of the concepts used in the design were conventional or standard. Elements that were unique included the analysis of the barge in an open-ocean environment, design of the steel bridge ramp system as a floating barge, development of a patented pile system that allowed the piles to be drilled into place, and the use of new seismic criteria for the design of the pier.

The configuration of the pier was driven by certain criteria including a fixed land-side elevation that was not adjustable, keeping the bottom of the pier structure above the wave height for the beach, and the vertical curvature of the pier to allow trucks to access the pier in the tide range specified. At low tide, the pier had to allow a "low-boy" trailer with an 8-inch clearance maximum ramp slope of 12% to drive down to the barge.

The pier and dolphin structures are approximately 640 feet long with a deck elevation that varies from ten feet to 29 feet above Mean Low Low Water (MLLW). The pier has an adjustable mechanical adjusted steel ramp that is lowered to the water elevation for the barge landings. The fixed concrete pier is the key connection point between the land and the 180 foot by 22 foot steel mechanical ramp that lowers from deck elevation to water level at times of barge arrivals for roll-on, roll-off cargo transfer to the barge.

Pile installation was also a challenging aspect of the pier and mooring dolphin construction. The installation and drilling of the patter piles involved a large number of sequentially, precisely timed tasks that had to be completed in a one shift phase. The pile installation steps involved with installing the piles included the pile setup in the drill rig leads, setting the piles in place, jetting the overlying sand, drilling the piles into the rock, removal of the drill string, drilling of rock anchors (for select piles), installation and grouting of rock anchors, pressure grouting of the pipe piles, and grouting the remaining length of pile. The pile installation complexity of the pile installation was increased for several battered piles ranging in length from 60 feet up to 85 feet since the piles had a tendency to deflect while being installed.

Nova fabricated and installed 72 piles which were a combination of concrete and steel. The combination steel and concrete pile included a 24 inch octagonal precast prestressed concrete jacket around a 12 inch steel pipe projecting from the concrete at both ends. The installation process included a down-the-hole hammer fed through the 12 inch pipe projecting from the concrete at both ends. The installation process included a down was to drill through the 12 inch pipe and install a rock anchor through the pipe allowing for significant improvement of both lateral and tension capacity. Underwater demolition was required to remove the trestle work platform which included the underwater cutting of piles and removal of trestle work platform debris. This was accomplished by lifting with airbags. The underwater construction was at 30 foot depths.

An original concept for the ramp was a 180-foot long by 22-foot wide, steel-reinforced structure to be built with conventional shapes. Utilizing the concept of a box structure, Winzler and Kelly and Nova designed and fabricated a 173.9-foot long by 22-foot wide by 6-foot deep steel plated ramp built in sections. Each section weighs about 80,000 pounds. Nova built the steel ramp in sections in the Napa, California fabrication shop to closely monitor the fabrication of the barge sections as well as apply the corrosion coating and the non-slip coating in a controlled environment. Once the sections were completed, they were trucked to a large pipe manufacturing yard five miles away and connected to form the completed ramp structure. At the pipe manufacturing yard, the ramp was lowered into the Napa River and towed through the San Francisco Bay under the Golden Gate Bridge, and out to sea. The trip from Napa to San Nicolas Island took three days and was completed without incident. Once at the site, the ramp was floated into position, connected to the lifting mechanisms, and lifted by a crane into final position. Of additional note, the ramp was also designed for ease of accessibility capable of being lowered in the water and towed to a dry dock for repairs if damaged. With a 50-year service life, this structure is a significant benefit to the Navy in terms of maintenance and long-term functionality.

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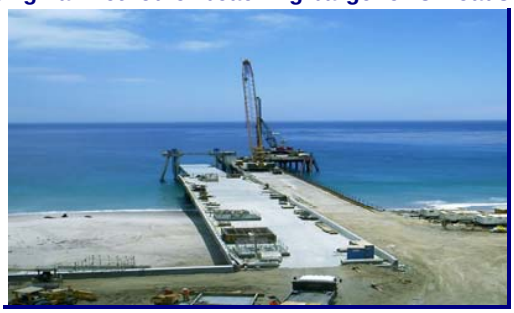
Arial view of San Nicolas Island

Original method of beaching barge for Offloads

Construction of Pier Foundation



Platform

Trestle Bend

Catwalk used to interconnect structures

Ramp being hoisted into place

Chain Locks on Ramp Hoisting Mechanism

San Nicolas Island Open-Ocean Supply Pier

Nova's →

"To be continuously recognized for using innovation to construct quality projects that exceed customer's expectations, safely and profitably in a manner that rewards teamwork".

← Mission