

Winner: 2011 ASCE Hawaii Section Outstanding Building/Structural Systems Project

## SUBMARINE DRIVE-IN MAGNETIC SILENCING FACILITY (MSF), BECKONING POINT, PEARL HARBOR, HAWAII

### SUMMARY

In December 2010, the United States Naval Facilities Engineering Command completed construction of a new submarine magnetic silencing facility (MSF) for Joint Base Pearl Harbor-Hickam at Beckoning Point, Pearl Harbor, Hawai'i. The project replaced an aged, deteriorated and obsolete facility with one that is able to deperm submarines in the U.S. Navy's fleet, including the Virginia-class with its more stringent deperming requirements.

Deperming is a procedure for erasing the permanent magnetism from ships and submarines to camouflage them against magnetic detection vessels and enemy marine mines. MCON Project P-587 Pacific Fleet (PACFLT) Submarine Drive-In Magnetic Silencing Facility (MSF), Beckoning Point, Hawai'i was designed by the SSFM International / Moffatt & Nichol Joint Venture (SSFM/M&N), Honolulu, Hawai'i, and constructed for Naval Facilities Engineering Command Hawai'i, by Watts-Healy Tibbitts a Joint Venture (Watts/Healy Tibbitts), Honolulu, Hawai'i. The facility consists of two parallel 210- meter [690-feet] long finger piers that form a slip for submarines. A head pier connects the two finger piers and a trestle provides personnel and forklift access to shore. Operations at the former facility required heavy, high-voltage cables to be manually wrapped around a submarine in order to deperm it. The new MSF is set with fixed cables, permanently-supported and forming loops in three, orthogonal directions to create a facility into which submarines may simply "drive-in" for deperming. In addition to the electrical power requirements, potable water, sewer, oily waste, and fire protection water are provided. Design and construction of a turning basin and slip dredging were also part of the project. Due to the deperming function of the pier, nearly all components of the waterfront facility were required to be non-magnetic. Stainless steel alloys and structural aluminum components were implemented to ensure adequate performance under the unique requirements of the MSF. In addition to the metallic elements of the waterside facility, the concrete components were also required to meet the nonmagnetic criteria. Since local concrete aggregates and fly ash sourced in Hawai'i do not meet the magnetic permeability requirements, off-island sources for the materials were identified and used. Due to the deck height of the slip and the variably-deep soft soils of the site, relatively long piles – over 51.8-meters [170-feet] in some locations – were required for the piers. In order to control deflections and address stability issues, a batter pile system was used to resist lateral loads for the finger piers and head pier. Accounting for the magnetic permeability of the structural system, the precast, prestressed concrete piles were fabricated of stainless steel rebar spirals and stainless steel prestressing strands, which created a challenging pile design. Through a strong collaborative effort between the U.S. Navy, Naval Sea Systems Command (NAVSEA), NAVFAC Pacific, NAVFAC Hawaii, SSFM International /Moffatt & Nichol JV, and Watts-Healy Tibbitts a JV, truly innovative solutions were implemented to overcome the extremely complex design and construction challenges of this unique, state-of-the-art Naval facility. This collaboration was essential to the overall success of the project.

The SUB Drive-In MSF contributes to the social and economic well-being of the people and State of Hawai'i, maintained high standards of environmental and natural resource stewardship during construction, is an essential component of the Navy's undersea warfare program, supports our nation's military readiness, and is a state-of-the-art engineering achievement. The

SUB Drive-In MSF is a state-of-the-art facility capable of supporting the U.S. Navy's submarine fleet and the mission of our naval forces, today and into the future.