

# Steel Component Module System for Rapid Repair of Navy Piers and Wharves

Ben C. Gerwick, Inc., in collaboration with Perrigo Technology, Inc., has been undertaking an innovative, multi-discipline research program to develop a rapid repair system for U.S. Navy piers and wharves. The proposed repair system consists of prefabricated “steel component modules” suitable for various common repair scenarios, including corrosion damage, ship impact damage and earthquake damage. Besides the requirements of regular usage with minimum maintenance, the Navy waterfront structure must constantly stand ready for rapid surges in demand during critical events.

The repair of concrete waterfront structures has conventionally involved removal of damaged concrete by manual labor, preparation of concrete surface and patching of the removed areas with concrete or grout. Such repairs usually involve intensive field labor and prolonged construction schedules. One of the key elements in our development efforts is to utilize prefabricated steel modules as repair components. The use of steel component repair modules has many advantages: Steel construction has been well established for many years. The steel



Current technology of upgrading existing deck by concrete deck overlay.

components are readily available in many parts of the world. They can be easily transported to and stored at the Navy ports. Based upon the previous experiences with modular construction, it is believed that proper steel module repairs systems will not only meet the Navy’s rapid repair requirements but also provide an effective way to upgrade many existing piers and wharves.

Modular construction has a long history in offshore construction of oil production plants where topside facilities are first fabricated into modules and then transported by barge and set on the platform by a derrick barge. Recently, this technology has become increasingly attractive for waterfront and inland waterway construction. When properly planned and engineered, modular construction often results in substantial reduction of field manpower and construction time. It also reduces potential construction risks and improves quality control.

This study intends to integrate emerging corrosion control technology with many recent developments in the use of steel components to strengthen concrete structures. Proper corrosion

control measures will be utilized to ensure low maintenance and long life expectancy of the repaired structures. The majority of the U.S. Navy waterfront infrastructures are now well over 30 years old. Aging and deterioration of these structures, along with increasing demands on their operational capacities, impose new requirements on their maintenance and rehabilitation. It was reported that up to 1991 the maintenance backlog for repairing and upgrading the U.S. Navy waterfront infrastructures amounts to well over one billion dollars and is increasing in an accelerating rate. This amount of maintenance/repair costs for the Navy piers and wharfs warrant innovative looks into economical and effective repair methods.

Although Navy waterfront structures have unique requirements with respect to surge usage, alternating with lower usage in regular times, the structures themselves are virtually identical to commercial ports. It is believed that the repair technologies developed in this study can be readily applied to commercial structures.

## Services Performed:

- **Development of Modular System**
- **Corrosion Control Technology**

Year of Completion: 1996

Construction Cost: \$100,000

Client: Naval Facilities Engineering Service Center Port Hueneme, CA



Conventional repair of piles and pilecap by dry-mix shotcreting.