

DRY DOCK GUARDRAILS PROTECT WORKERS FROM FALLING AT PORTSMOUTH NAVAL SHIPYARD KITTERY, MAINE

The Naval Facilities Engineering Command Southwest (NAVFAC SW) sponsored a dry dock guardrail implementation project at Portsmouth Naval Shipyard (PNS), Kittery, Maine. Dry docks are used in constructing, repairing, and overhauling oceangoing vessels such as ships and submarines. A dry dock is a huge deep water chamber, large enough to accommodate a ship the size of the 20,847 ton USS Kitty Hawk (CV 63), an aircraft carrier that is 1,069 feet long, 282 feet wide, and has a 38 foot draft.



USS Kitty Hawk (CV 63) undergoing repairs in dry dock.

Dry docks have thick masonry walls and floors, but no roofs. A vessel is floated into a dry dock; the gates are then locked, and the water is pumped out so that the vessel settles onto a cradle to stabilize it. The water is kept out until work on the dry docked vessel is completed. When the vessel is ready to be launched or relaunched, the dry docking process is reversed. Because dry docks are deep, masonry-lined pits, shipyards are required to protect people at or near the top of the dry dock from falling the 30 to 35 feet onto the concrete floor of the empty dry dock or onto a ship or submarine in dry dock.



The post and chain system, shown above, was replaced by guardrails that improve protection from falling into the dry dock.

A hazard assessment by PNS's Safety Manager established the need to update the fall protection perimeter surrounding one of PNS's three dry docks. The existing *post and chain* fall prevention system was replaced by a standardized, rigid railing system with toprails, midrails, and toeboards that provide maximum protection from falling into the dry dock. The posts that anchor the

rails can hold back a load of over 200 pounds from any direction at any point on the toprail.

The shipyard's Safety Department requested assistance from the Navy's Hazard Abatement Program to upgrade PNS's fall protection barrier system above and around the perimeter of the dry dock. The Chief of Naval Operations' Hazard Abatement Program funds the modification or repair of selected high risk occupational health and safety hazards for which other funding is not



Submarine in dry dock undergoing conversion from a Ballistic Missile Submarine (SSBN) to a Guided Missile Submarine (SSGN).

available. The Hazard Abatement fund is administered by the Naval Facilities Engineering Command (NAVFAC) to assist Navy commands in eliminating those high risk workplace hazards. When Hazard Abatement funding was approved for the PNS, the NAVFAC SW Fall Hazard Abatement Implementation Team carried out the dry dock guardrail project. NAVFAC engineers designed the guardrail system to protect shipyard workers from the fall hazard and to meet Navy and regulatory agency safety requirements.

NAVFAC's engineers duplicated and simplified the guardrail and anchoring system that they had successfully designed and constructed for another dry dock at PNS Kittery. The result is a guardrail system that is safer and easier to install and maintain than the *post and chain* system and is also easier to maintain than the guardrails installed on the previous dry dock at PNS Kittery. This simplified configuration included standardizing the size of the sections of guardrail that must be temporarily removed and replaced when a ship or submarine is moved into or out of dry dock. Standardization reduces the time as well as the expense of manufacturing and installing multiple sizes of guardrail sections. It also expedites the necessary removal and replacement of guardrails when vessels are moved into and out of dry dock.

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Guardrails, with toprails, midrails, toeboards, and posts, around the perimeter of PNS dry-dock

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In addition, the new guardrails meet Navy, industry, and regulatory agency requirements for protecting workers from falls from heights.

The PNS Kittery guard rail project was completed in less time than had initially been estimated. The cost saving for manufacturing and installation was approximately 25%, and the decrease in costs over operating and maintaining the outdated *post and chain* system is expected to be well over 50%. Maintenance cost savings now equal over \$10,000 per year. The role of the rigid guardrail system in preventing injuries to workers and others who might otherwise have fallen into the dry dock is incalculable.

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In dry dock, worker hydro-blasts Amphibious Ship propeller for preservation.