

U.S. NAVAL BASE, PEARL HARBOR, DRY DOCK NO. 4, EAST &
WEST PUMPWELLS
(U.S. Naval Base, Pearl Harbor, Naval Shipyard, Facility Nos. 398 &
399)
Near south end of Third Street, at east & west sides of Dry Dock No.
4
Pearl Harbor
Honolulu County
Hawaii

HABS HI-506
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PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN BUILDINGS SURVEY
PACIFIC GREAT BASIN SUPPORT OFFICE

National Park Service
U.S. Department of the Interior
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HISTORIC AMERICAN BUILDINGS SURVEY

U.S. NAVAL BASE, PEARL HARBOR, EAST AND WEST PUMPWELLS – DRY DOCK NO. 4 (U.S. Naval Base, Pearl Harbor, Naval Shipyard) (Facility Nos. 398 and 399)

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- Location:** Near the south end of Third Street
Flank the east and west sides of Dry Dock No. 4
Pearl Harbor Naval Base
City and County of Honolulu, Hawaii
- These buildings fall within the UTM coordinates of the Pearl Harbor, Naval Shipyard as defined in the location section of the overview report HABS No. HI-483. Building 398's UTM coordinates are: Zone 4 607180E 2360810N. Building 399's UTM coordinates are: Zone 4 607240E 2360760N.
- Significance:** Facilities 398 and 399 are located within the Pearl Harbor National Historic Landmark. These two facilities were built in 1943 in association with the expansion of dry dock facilities at Pearl Harbor during World War II. The two pumpwells along with the floating caisson gate, capstans, blocking, service and track systems, and short quay walls on both sides of the dock entrance are fundamental components of the operation of Dry Dock No.4. All four dry docks at Pearl Harbor are ingenious engineering feats and are critical facilities for the Navy Yard and its main function of ship repair. Dry Dock No.4 and its two pumpwells are still in active use today.
- Description:** Facilities 398 and 399 are four-story, concrete frame industrial structures located entirely below grade. They flank the east and west walls of Dry Dock No.4 and have mirrored identical rectangular floor plans. The first deck below grade is the largest in size of the four, measuring approximately 64' x 35'. The second deck is smaller at only 43'-9" x 16'-5". The bottom two floors are normally inaccessible. The depth of each pumpwell is at least 47' descending from ground level to just below the dry dock floor.
- The below grade concrete foundation has 3'-0"-thick exterior walls. Access to the underground pumpwells is through an industrial-style, flat roof, metal enclosure that is bolted to a 14'-2"-long concrete platform on the roof of the pumpwell. All sides of the enclosure are at 90° angles to the concrete with the exception of the side facing the dry dock (east for Facility 398; west for Facility 399), which slopes from base to roof. The length of the enclosure is 7'-6" at the floor and 4'-6" at the rooftop. The door at each enclosure is a metal, hinged door with filleted corners. Industrial in style, these doors mimic that of a ship's door. Inside the enclosure a concrete stair descends to an expanded metal mesh door with sliding vision panel at the first deck

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below grade. The opening of the mesh door is 4'-0"-wide.

Two 13'-0" x 9'-0" x 2'-0" interior concrete walls project from the north and south walls to provide a division of space within the floor plan. The side of the floor closest to the entrance is 16'-5" wide and contains two main de-watering propeller-type pump motors of variable pitch at the north and south ends and one deep-well turbine drainage pump motor centered between the two main pumps. In the ceiling above each pump motor is a square steel panel with an interior metal gutter lining the perimeter. The panels are removed on the exterior and the motors are lifted out of the pumpwell by a crane for overhauls and repairs. The gutters are installed for leakage purposes. At the north end adjacent to the dividing wall, there is a toilet situated atop a short concrete stair. Towards the south end adjacent to the dividing wall there is a 24"x30" opening in the floor with a steel stepladder secured to the concrete wall that leads to the second deck below. At the wall opposite the entry there is an opening that leads to a 10'-0" x 6'-0" space with a steel ladder riveted to the concrete wall. This ladder ascends to the ground level and serves as an alternate means of egress. On the opposite side of the dividing wall the space is 43'-9" x 10'-4". This area contains the motor control center switchboard for the operation of the pump motors. Other miscellaneous items on the first floor include a workbench, sink, drinking fountain, and freestanding desk and chairs.

The shafts from the pump motors run from the main pump motors to each pump foundation on the second floor. The pump foundations are 10'-2" x 8'-3" x 6'-1" (at their maximum height) of solid concrete. They are octagonal in plan and triangular in side elevation with chamfered edge details. The shaft from the drainage pump motor on the first floor leads to the drainage pump on the second floor. It is used to pump out all the seepage from the dry dock walls as well as the discharge water of the ships when they are docked. Much smaller in size, this pump discharges 6,000 gallons per minute (gpm). The wall opposite the entry (on the first floor) to the pumpwells consists of square air filters covered by metal mesh screens that help ventilate the space. Two wood posts, adjacent to the main pump foundations, provide additional support to the first deck above.

The third and fourth decks house the pump shafts, which descend to the suction chamber below the dry dock floor.

The flooding pits are below ground spaces adjacent to Facility 398 and 399 that contain the valves for Dry Dock No.4. The valves, operated from the flooding pits, are opened and water from the harbor passes through a sluice to flood the dry dock. The valves regulate the flow of water thus closing when the dry dock is full.

Historical Context:

The east and west pumpwells (Facility 398 and 399) were significant elements of the large construction project of Dry Dock No. 4. The dry

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dock installation included a dry dock (similar to No.2) that measured 147 feet wide (at the floor), 1100 feet long, 47 feet deep over floor and sill; a floating caisson gate; pumping plant; capstans; blocking; service and track systems; and short quay walls on both sides of the dock entrance (Pacific Bridge, Company. 1944, 53). The floor of Dry Dock No.4 was tremie-poured concrete, a method by which concrete is deposited under water, with wood pilings under the floor slab. The walls were also poured, to high-water line, by the tremie method and only the top or gallery section was poured in the dry. Conversely, for the construction of the pumpwell sections, cofferdams were fabricated and erected, so that all the concrete for Facilities 398 and 399 might be poured dry (Pacific Bridge Company 1944, 61).

Most of the work done during the time of intense military buildup during World War II was contracted to two firms, the Pacific Bridge Company and the Contractors Pacific Naval Air Bases. The contract for the construction of Dry Dock No. 4 et. al. was awarded to Pacific Bridge Company on October 4, 1941. The contractor, already at work on Dock No. 2 and No. 3, began work on these new facilities during November 1941 (U.S. Navy Bureau of Yards and Docks 1947, 122). Dry Dock No. 4 was ready for emergency use by July 19, 1943. By October 1, 1943, both main pumps (on the west side), and one east-side pump were ready for operation (except for the substitution of different-type propellers specified by the Bureau). By this date, also, the floor and bottom altar were complete, keel blocks in place; fresh- and salt-water, air and steam lines were completed and connected. The first docking occurred on October 6, 1943 (Pacific Bridge Company 1944, 84).

Dry Dock No.4 is the largest and newest of Pearl Harbor Naval Shipyard's four dry docks; capable of drydocking CVN (nuclear-powered carrier vessel) Class ships. The structure displaces approximately one billion pounds of water, or half a million tons. The operation of the pumpwells is significant to the function of Dry Dock No.4. In general terms the system works as follows: from the flood pits the valves are opened to flood the dry dock; when the dry dock is filled the caisson is (under controlled movement) moved away from the dry dock and horizontally to in front of a quay wall; a ship moves in to dock; once the ship is positioned the caisson is returned to its original location to enclose the dry dock; the ship is precisely positioned over wood support blocks on the dock floor; the water is then pumped out until the dock is dry. The same process occurs when the ship leaves drydock without having to position the ship. Each of the four pumps is driven by a 1,250 HP synchronous motor; they are axial flow, propeller-type pumps, with variable-pitch propeller blades keeping a constant load on the motor. Each pump is capable of pumping 150,000 gallons a minute. The pumps' combined capacity of 600,000 gallons a minute un-waters the dock in approximately two hours (Pacific Bridge Company 1944, 84). Unlike the other dry dock

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pumpwells, the pumps in Dry Dock No.4 discharge the water above sea level back into Pearl Harbor.

For additional information on Facilities 398 and 399 see ~~HABS No. HI-473~~ on Dry Dock No.4 (Facility S-782). WAER HI-15

For an overview of the Naval Shipyard See HABS No. HI-483.

Sources:

The original drawings for this building are on microfilm at NAVFAC PAC Plan Files, under Y&D drawing numbers 194395 through 194436 inclusive and 183611, 183612, and 183614. Information about Facility 398 and 399 was obtained from a copy of a 1947 Property Record Card, Nav. S. and A. Form 277 for each of these facilities that is on file at the Pearl Harbor Naval Shipyard Facility Files.

Nakahara, Kenneth. Historic Resources Inventory Forms for both Facility 398 and 399, 1980. Prepared by Pearl Harbor Naval Shipyard, Facilities Planning & Programming for State Historic Preservation Office.

Pacific Bridge Company. Contract Noy-5049, for Construction of Dry Dock and Power Plant, Moorings and Additional Facilities, at the Navy Yard at Pearl Harbor, T.H., 1944. Prepared for the Navy Department, Bureau of Yards and Docks. Report is on Microfilm at Pacific Division Naval Facilities Engineering Library.

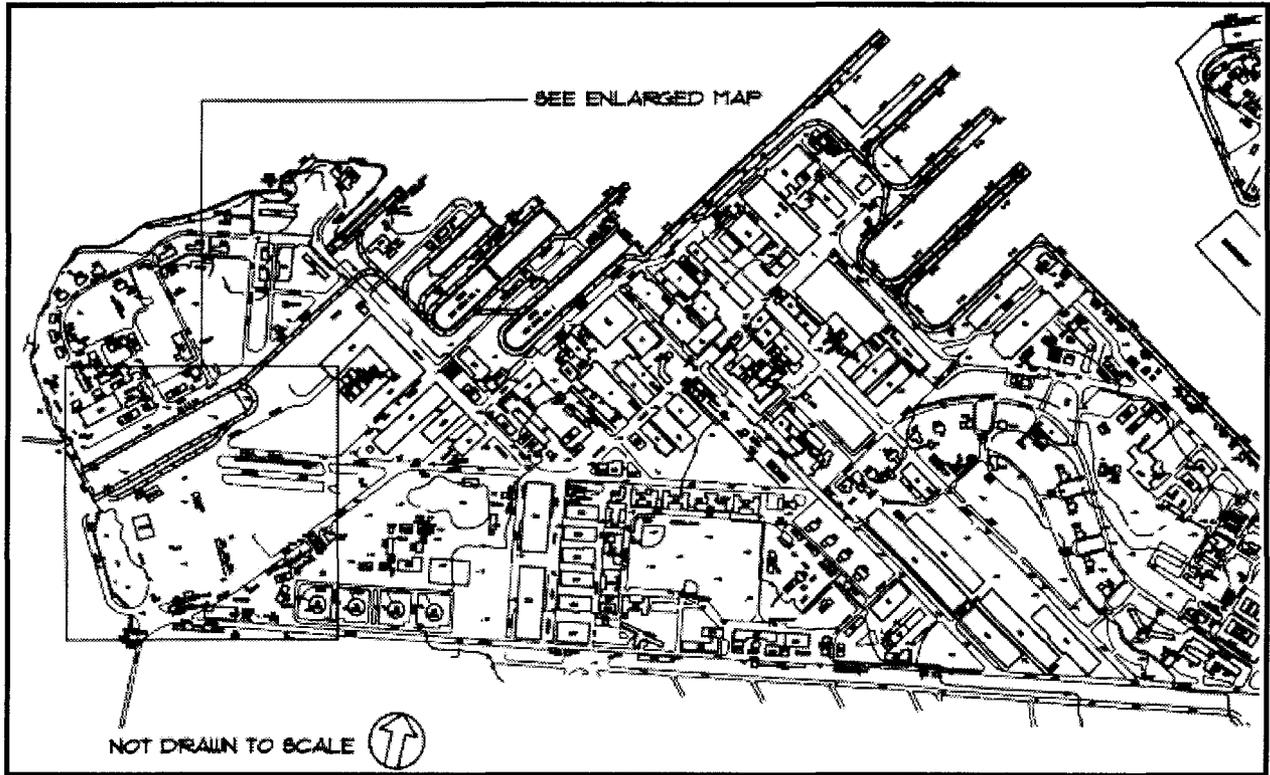
U.S. Navy Bureau of Yards and Docks. Building the Navy's Bases in World War II, History of the Bureau of Yards and Docks and the Civil Engineering Corps 1940-1946 Volume II. United States Government Printing Office: Washington, 1947.

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Project Information: Photo documentation and recordation of this facility by the Navy has been done in anticipation of future alterations or potential demolition of the structure. Photo documentation of historic facilities by the Navy assists in expediting planned undertakings by having the documentation prepared prior to taking actions. Also, photo documentation assists the Navy in gaining more information about its historic facilities to assist in making proactive management decisions. This project is being supervised by Jeffrey Dodge, Historical Architect, NAVFAC Hawaii. The photographic documentation was undertaken by David Franzen, photographer. Joanmarie N. Orłowski, Architectural Historian, of Mason Architects, Inc. prepared the written documentation. The field work and research was conducted for this report between July 2001 and December 2001.

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Shipyard Map



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Enlarged Area Map (reduced, not to scale)

