HUNTERS POINT NAVAL SHIPYARD, DRYDOCK NO. 4
East terminus of Palou Avenue
San Francisco
San Francisco County
California

HAER NO. CA-181-A

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN BUILDINGS SURVEY
National Park Service
Department of the Interior
San Francisco, California 97104

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HISTORIC AMERICAN ENGINEERING RECORD

HUNTERS POINT NAVAL SHIPYARD, DRYDOCK No. 4

HAER No. CA-181-A

Location: east terminus of Palou Avenue
Hunters Point Naval Shipyard
San Francisco
San Francisco County
California
U.S.G.S. Hunters Point Quadrangle (7.5')
Universal Transverse Mercator Coordinates
Zone 10:556020:4175200

Date of Construction: 1942-1943

Engineer: Hugo Frear

Builder: Pacific Bridge Company, San Francisco, California

Present Owner: United States Navy (Engineering Field Activity-West, Naval Facilities Engineering Command, San Bruno, CA)

Present Use: Ship repair dry dock (under commercial lease)

Significance: Dry Dock No. 4 appears to be eligible for listing in the National Register of Historic Places for its association with the events and patterns identified in the defense of the United States during World War II and as a significant marine engineering entity.

Report Prepared By: Steven R. Black
General Engineer
Mare Island Naval Shipyard
Vallejo, California

Date: April 1994

I. DESCRIPTION:

Hunters Point Naval Shipyard is located on the west side of Central San Francisco Bay in the southeast portion of the City and County of San Francisco, as shown on page 15. The immediate vicinity of the shipyard is interchangeably known as the Hunters Point/Bayview District and the South Bayshore Area of San Francisco. It is a mixture of residential/commercial neighborhoods and industrial areas, much of which was developed to support the extensive industrial mobilization of the United States during World War II.

Dry Dock No. 4 has a southeast to northwest orientation with the long centerline axis running in this direction (see site plan, page 16). The entrance into the dock is at the southeast end, accomplished by removal of the caisson after flooding of the dock is completed. Dry Dock No. 4 was last certified for a maximum docking capacity of 91,400 long tons, as documented in the 1979 Facility Certification Report (FCR) for the dock. Based upon original construction drawings, its dimensions are: 1092 feet in length, 171 feet wide (at the coping), and 53 feet in depth, as depicted on pages 19 and 20. The length is nominally measured from the face of the outer caisson seat along the dock centerline axis to the rounded northwesterly end at the coping face.

II. ENGINEERING INFORMATION:

The Japanese attack on the United States Pacific Fleet at Pearl Harbor in the Hawaiin Islands in December of 1941 finally brought the United States into World War II. It also brought about the decision by the U.S. Navy to purchase the dry docks and marine repair facilities from Bethleham Steel Yard at Hunters Point and to initiate construction of what would become the largest graving dry dock on the West Coast of the United States.

Construction of the largest graving dry dock at Hunters Point , eventually to become Dry Dock No. 4, began with initial site excavations in early 1942 under contract NOy-5377. The design of this dry dock was accomplished for the Navy's Bureau of Yards and Docks by renowned naval architect and engineer, Hugo Frear. Construction was accomplished by the Pacific Bridge Company under Mr. Frear's supervision as a consultant. Excavations began in early 1942, as seen in photographs CA-181- A-2 through CA-181- A-5 and CA-181- A-9 through CA-181- A-12, and the dock was completed and commissioned on June 19, 1943. Construction included removal of Point Avisadero, rising to 130 feet.

above the elevation of the present dock-side coping (dock edge curb). Excavations below the coping were entirely into the native serpentine rock, as seen in photograph CA-181- A-10. Over 5,000,000 cubic yards of material were excavated and moved, some of which was used for a temporary coffer dam around the site, behind which Dry Dock No. 4 was completely constructed in less than 10 months. The excavated material was also used to expand the shipyard's land mass, raising the site and creating building sites for the many industrial shops and facilities constructed during World War II, as evidenced in photograph CA- 181- A-5.

This dry dock is the largest graving dry dock on the West Coast and one of the largest in the world. Its construction in less than ten months is a significant achievement and a reminder of the extensive mobilization and build-up accomplished in the United States as a result of the country's entry into World War II. As a comparison, the large aircraft carrier dry dock built at Puget Sound Naval Shipyard, Washington, during the period of 1938 to 1942 took almost three years to complete.

One point of interest is brought to the readers attention. Review of the recordation dates of the original construction drawings, dated during and after the construction period, indicates that the design and construction of the dock was most probably done concurrently. This is a reasonable assumption considering the importance of getting the dock into operation in response to the crisis created by the attack on Pearl Harbor and subsequent entry of the United States into World War II. Part of the engineering feat reflected here is that such an engineering undertaking could be accomplished in such a short period of time without having complete design documents available throughout most of the construction period. Considering todays standards and construction practices, this must have required considerable on-site supervision by Mr. Frear and his associates. In addition, many of the engineering drawings were most likely done initially as preliminary drawings to support expeditious construction and were then completed to show actual as-built conditions.

Mr. Frear also designed Dry Dock No. 3 at Hunters Point (1918) and many other naval structures at various shipyards in the United States and around the world. An engineer of international reputation, he contributed to the knowledge of naval engineering practices and advanced technology in the field through his innovative designs and related articles written about his work.

Mr. Frear was awarded the prestigious title of Honorary Vice-President of the Society of Naval Architects and Marine Engineers in 1945.

As constructed, Dry Dock No. 4 is a fully relieved, reinforced concrete graving dock with integral flooding and dewatering systems. A utility tunnel and utility service galleries are located along both sides of the dock to provide utility services for ship-board and industrial uses. Basic dock and support system characteristics are shown on page 19. Photo CA-181- A-35 shows the basic dock plan view at the coping level (EL. 112).

Thirteen electrically powered capstans, built by Modern Engineering Company, are positioned around the dock, 6 on each side and one at the head (northwest end). Based upon the FCR for the dry dock, three capstans (1S, 1P and 7C) have a maximum pull rating of 30,000 pounds while the remaining 10 are rated for 12,000 pound maximum pull. Label plate information shows the capstans were manufactured by Modern Engineering Company and are of the reversing gypsy-head type, consisting of a barrel mounted on a vertical shaft and driven by a two-speed motor. The motors were manufactured by Fairbanks-Morse Company, with ratings of 40 horsepower(HP) for the three larger capstans and 15 HP for the remaining smaller capstans. Power is typically 480 volt/3 phase. An array of bollards and cleats are also spaced around the dock to facilitate line handling operations when docking or undocking a ship occurs. The use of these capstans, bollards and fittings can be seen in some of the photographs included with this report.

The dock floor is typically a thin reinforced concrete slab with expansion joints at 48 foot centers, with the slab placed directly upon the serpentine bedrock. When originally constructed, longitudinal drainage gutters ran along each side of the floor and transverse bilge block bearers were spaced at 12 foot centers throughout most of the dock length (see photo no. CA-181-A-34). Although the bedrock beneath the floor does not readily conduct water, weep holes are provided through the floor to insure that excessive uplift pressures will not develop beneath the slab. These weep holes are 4 inch diameter gravel filled drains capped with a thin layer of porous concrete and are typically spaced on a 12 foot by 12 foot grid pattern in the floor of the dock. The original construction drawings are somewhat unclear on the drainage construction, but it appears that transverse and longitudinal gravel filled trenches were cut into the bedrock to provide a collector system under the floor for these drains.

The lower, sloping portion of the dock walls (the section below the altar) is typically a thin reinforced concrete veneer over a steel reinforcing matt placed directly upon the surface of the serpentine rock. The slope is nominally 12 vertical increments to 3 horizontal increments. Uncapped weep holes at 12 foot centers are placed along the length of the dock walls at two levels and vertical expansion joints are spaced at 48 foot centers. The top of the lower wall section provides a continuous altar or walkway around the perimeter of the dock at 31.5 feet above the dock floor. The upper wall section, described below, is set back at this altar level by 7.25 feet.

The upper, vertical, portion of the dock wall (above the altar) is typically a counterfort retaining wall structure of reinforced concrete. Backfilled material has been placed behind the wall structures up to the level of adjacent paving. Excavations for the counterfort retaining wall structures are clearly seen in photograph CA-181-A-12. Six large and six small utility service galleries are spaced along both sides of the dock and are integrally supported by the counterfort retaining structures. In addition, large electrical manholes are incorporated into the structure to strengthen the dock walls in the vicinities of the large galleries. Crane rail support struts (16 foot-8 inch spacing) tie the walls to a parallel crane rail beam which in turn is anchored into the serpentine rock (see photo CA-181-A-36). Forty foot gauge portal crane trackage runs on both sides of the dock at grade; trackage on each side of the dock is connected at the head end of the dock. Counterforts, located adjacent to the crane rail struts, are of 1 foot-6 inch thick concrete except where thickened to accommodate vertical expansion joints. Weep holes are provided along the base of the upper wall sections, at 16 foot spacing, in order to drain the backfilled material to relieve the hydrostatic pressure on the wall structure.

Dry Dock No. 4 retains a very high degree of integrity as, basically, the number of major alterations and changes made to Dry Dock No. 4 since construction that would have impacted on the primary characteristics of the dock have been few. These include:

a. Bilge block slots and drainage trenches in the floor of the dry dock were filled with concrete to the elevation of the original floor. Integral floor weep holes were also raised to this new elevation and capped with porous concrete. The date of this modification is uncertain.

b. In 1957, three steel pipe columns were placed in the south-side (port) utility tunnel in conjunction with the extension of the crane trackage on this side of the dock.

c. In 1972, six small (25 feet long) utility service galleries were constructed along the both sides of the dock to house fresh water services. Four of the original twelve service galleries were also lengthened.

d. Various modifications were made to the utility systems servicing the dock since built. Most recently, additional salt water and electrical services were built (mid-1980's) to support docking of modern day, larger Navy surface ships. These modifications did not significantly affect the primary characteristics of the dock itself.

PUMP ROOM:

The pump room, flooding and dewatering chambers are located on the south side of the dry dock near the eastern end (entrance end) of the dock. Similar to the construction of the dock proper, serpentine rock was excavated to allow forming and placement of concrete. Review of the sectional drawings included with this report (see photos CA-181-A-37 through CA-181-A-42) show that the pumps, sumps and chambers are located below the control room, where dewatering pump motors and all controls are located.

Construction is essentially massive reinforced concrete formed integrally with the bedrock and the dock wall. The concrete roof structure is flush to grade and is constructed of a series of removable concrete sections, enabling pumps, motors and other large components to be removed by crane services. Discussions with Navy personnel (F. Stivender, 1983) familiar with dock characteristics indicate that the roof structure of the pump room was engineered to withstand the direct hit and explosion of a 16 inch ordnance shell. No records are found to substantiate this; however, considering that the dock was built under war-time conditions, establishing this as a part of the design criteria is not unlikely.

Page 21, taken from Military Handbook 1029/3, "Dry Dock Characteristics" shows that the three main dewatering pumps are vertical 46", 1500 HP/390,000 GPM pumps enabling the dock to be totally dewatered in 150 minutes. Two drainage pumps, located in the lower level of the pump room, are vertical 16 ",

150 HP/13,000 GPM pumps. Based upon approximate dock water volumn at mean sea level, the computed (FCR) pump-down rate for the 150 minutes is 402,000 GPM total discharge, for an average of 134,000 GPM per pump. Flooding of the dock is achieved through two flooding culverts, one on each side of the dock entrance, enabling the dock to be fully flooded in 60 minutes.

Dewatering pumps are original dock equipment, manufactured by S. Morgan Smith Company. They are of the adjustable blade, axial flow type and run at a constant speed of 600 revolutions per minute (RPM). Blade angle adjustment for altering pump capacity is accomplished by a hydraulic/electric control system. This system is normally controlled by manual loading of a servo-valve but may also be controlled automatically according to a load sensor. The "variable blade angle" feature allows these pumps to (a) start unloaded, (b) more nearly utilize the full available power under conditions of varying head (pressure) and thus decrease pump-down time, (c) avoid overloading when the water level in the dock is high, and (d) pump the dock to a lower level before vortexing or cavitation begins. Lubrication of pump and shaft bearings is accomplished by using smaller booster pumps to inject fresh water from the shipyard domestic water main into the bearings. Water lubrication lines are fed to the lower and intermediate bearings through a 10 inch cast iron casing which is embedded in the concrete adjacent to each pump. Motors for the dewatering pumps are 2400 volt, 1500 HP synchronous type, located on the upper level of the pump room (see photos CA-181-A-24 and CA-181-A-26). Motor-generator sets (480 volt) provide exitation power to motors. Materials of construction are: suction bells and bowls, cast iron; propeller assemblies, type 316 stainless steel; bearing assemblies, babbitted stainless steel; and shaft assemblies, carbon steel.

The two drainage pumps were manufactured by Byron Jackson Company as single stage, turbine type pumps operating at 1175 RPM. These pumps have enclosed, oil lubricated line-shafts and water lubricated pump bearings. Bowls and impellers are cast iron, pump shafts are type 303 stainless steel, and bearings are zincless bronze. Drainage pumps are driven by 480 volt, 150 HP induction motors located on the lower level of the pump room (see photo CA-181-A-25).

The 63 inch diameter discharge elbows for the three dewatering pumps transition into three separate 4 foot by 6 foot concrete discharge tunnels which are an integral part of the pumping plant structure. Each of these discharge tunnels is equipped with a sluice gate. Tunnels then offset upwards and

transition to 4.5 feet by 8.0 feet in size, at which point each of the tunnels is equipped with a multiple butterfly-type check valve. Immediately beyond the check valves, discharge is run through a large, single tunnel transition section which tapers to a 9 foot square cross-section before expanding to 9.0 feet by 12.0 feet at its point of discharge into the bay. The discharge opening is normally completely submerged and is equipped with a trash rack and stop log (gate). When the stop log is in position, the tunnels can be drained for inspection or maintenance.

Photos CA-181-A-27 through CA-181-A-32 show existing motor control centers located on the upper level of the pump room, controlling the dewatering and drainage pumps as well as the various valves, check valves and gates necessary for dock operations. Pages 25 through 46 are the dry dock security operations (procedures) required to be followed by the dry dock operations and watch crews.

CAISSON:

This closure, constructed concurrently with Dry Dock No. 4, is a reversible, rectangular type floating caisson that can be positioned in either the inner or outer dry dock caisson seat. A rubber seal runs vertically on both ends of the caisson and across the bottom. Concrete ballast is placed within the ballast and trim tanks along the entire bottom. The caisson is divided into six compartments by a watertight deck and two watertight bulkheads, these being the operating room, the center ballast tank and trim tanks (see page 22). A draft range of 29.0 feet to 55.5 feet is achieved either by flooding the lower three compartments or dewatering these tanks with pumps mounted in the caisson. All equipment is controlled from the upper operating room, with communications provided by portable two-way radios.

The basic construction (see photo CA-181-A-43) is of structural steel plates and shapes with welded connections and seams. Shell plating varies in thickness from 3/8 to 7/8 of an inch. Horizontal girders are typically spaced 8 foot on centers with intermediate breast hooks added at each end. The top deck, main deck and outer quarter panels of the typical girders are longitudinally stiffened plate girders, while the middle portions of the girders

are trusses comprised of structural tee and angle shapes. Vertical (transverse) frames are made of bent plates and are spaced 2 feet on center with additional cross bracing spaced at 8 foot centers. Sacrificial zinc anode blocks are attached to the shell to provide cathodic corrosion protection.

Four screened inlets exist for caisson flooding. Gate valves at these inlets have cast iron bodies. These are operated by reach rods that extend to floor stands located in the operating room. The valves for the two smaller 8 inch inlets are hand-operated while the valves for the two larger inlets are motorized. Two vertical propeller pumps are available to dewater ballast water from the central ballast tank and to provide redundancy for the ballast dewatering system. The pumps are 18 inch, 8,000 gallon-per-minute pumps powered by 75 horsepower motors. Discharge is by means of 18 inch motorized gate valves.

Caisson electrical power--480 volts/3 phase/60 hz--is obtained from a detachable umbilical cable that is connected to shore-side power connections, located on either side of the dock entrance, when the caisson is in place. A transformer is located within the caisson to convert the 480 volt power to 120 volt /1-phase power for lighting and convenience outlets.

III. HISTORICAL CONTEXT:

Private capital early recognized Hunters Point as an ideal site for dry docks and ship repair facilities and, at this location in 1867, the first dry dock (Dry Dock No. 1) on the Pacific Coast was built. These same interests built a second dry dock (Dry Dock No. 2) here in 1903 because time proved the advantages of the mile long, rocky peninsula extending out into the deep water of San Francisco Bay. The importance to the nation of this privately-owned (Union Iron Works Company), deep water dry docking facility was officially recognized in 1916, when the United States Navy agreed to subsidize construction of a new 1,000 foot dry dock on the site of original Dry Dock Number 1. Photograph CA-181-A-1 shows site conditions prior to construction of Dry Dock No. 4, reflecting the location of Dry Dock No. 3. Dry Dock No. 3 was completed and first used by the Navy in 1919. Photograph CA-181-A-1 shows a battleship, believed to be either the USS PENNSYLVANIA or USS ARIZONA in Dry Dock No. 3 in 1935, attesting to the Navy's interest and use of the Hunters Point facility prior to World War II. Both ships were operational with the U.S. Pacific Fleet between 1931 and 1941(Pearl Harbor) and were characterized by having tripod mast structures fore and aft and a 12-gun main battery, two turrets each with 3 barrels fore and aft.

These features can clearly be seen in the photograph. Other battleships of similar configuration either had fewer guns in their main batteries or had caged mast structures fore and aft. The USS ARIZONA was sunk at Pearl Harbor during the December 7, 1941 attack with virtually her entire onboard crew and today is maintained as a national memorial. The USS PENNSYLVANIA was damaged during the attack on Pearl Harbor and was repaired and modernized shortly thereafter and returned to service with the Pacific Fleet for the remainder of World War II.

The "Great White Fleet" of the United States Navy while on its historic around-the-world cruise of 1907-1908, came to the San Francisco Bay with some ships in need of repair. Access to the existing Navy-owned repair facility at Mare Island, located above San Pablo Bay in the City of Vallejo, was impossible for many of the capital ships since their navigational drafts exceeded the water depths surrounding the facility. In view of this situation, during May and June of 1908, 23 vessels from this fleet were serviced at the privately-owned, dry-docking facilities at Hunters Point. It then became apparent that any major expansion of fleet operations in the Pacific area must include establishment of a new deep water naval repair facility at a location central to operations. In recognition of the problem, a Navy General Board was appointed in 1910 to survey the Navy's needs on the West Coast. In general, the Board recommended construction of a deep water naval repair base on the lower San Francisco Bay--a recommendation that was reaffirmed in 1916 by the Helm Commission, in 1919 by the Parks McKean Board, in 1920 by the Navy General Board and in 1923 by the Ball Committee of Congress. In the face of growing international tensions, the Navy subsequently obtained permission to buy the Hunters Point dry dock facilities. On December 29, 1939, the Navy purchased the Hunters Point dry docks from the owners, Bethlehem Steel Company, and on December 18, 1941, 11 days after the Japanese attack on Pearl Harbor, took possession of its new facility known as the Hunters Point Naval Dry Docks. Construction of Dry Dock No. 4 then commenced in early 1942. Page 16 shows the outline of Dry Dock No. 4 and the resulting land mass (from the excavated materials) overlaying the existing site conditions in 1916, also reflected in photograph CA-181-A-33, which changed very little until 1942. Operation of the complex was initially placed under the long-established Mare Island Navy Yard (later the Mare Island Naval Shipyard). On November 30, 1945, the Hunters Point facility was redesignated as the United States Naval Shipyard, Hunters Point and placed under its own Commander, making it a

separate component of the San Francisco Naval Base within the 12th Naval District.

The original purchase included approximately 48 acres of land, the two existing dry docks and associated pumping equipment. Under the pressure of war, the extent of facilities and employment was rapidly expanded. By 1945, employment exceeded 18,000 and facilities now included six dry docks, including Dry Dock No. 4, as well as extensive industrial shops and warehouse and support facilities. The dry and submerged land area also expanded to 635 acres, primarily from placement of excavated soils and rock from the construction of Dry Dock No. 4. Construction of the dock and evidence of the vast extent of the expansion of facilities is reflected in photos CA-181-A-5 through CA- 181-A-8. Dry Dock No. 4 was placed into service in mid-1943 to repair and overhaul Navy ships, many of which were docked to repair battle damage during World War II. It was therefore a significant component of United States Navy facilities on the West Coast. For instance, the aircraft carrier USS INTREPID, one of the largest ships in the Pacific theater during World War II, was docked to repair battle damage to its hull and to receive general maintenance on three different occasions between 1942 and 1945. Photograph CA-181-A-13 shows a typical docking of the period with the battleship USS IOWA in dock. When not occupied by larger ships, two or more smaller ships could be simultaneously docked for servicing at the same time, as shown in photograph CA-181-A-14. This contributed significantly to the Navy's dominance in continually having a large numbers of ships committed to Pacific battle areas at any given time throughout World War II.

After World War II, Dry Dock No. 4 was continuously used to dock a large variety of Navy capital ships, and in some instances those of foreign nations, for repair, overhaul, maintenance and conversion. Photographs CA-181-A-15 and CA-181-A-16 show the undocking of the USS MIDWAY after undergoing a major conversion in Dry Dock No. 4 during the 1960's. Photographs CA-181-A-6 through CA-181-A-8 provide additional aerial views of Dry Dock No. 4 and the Hunters Point Naval Shipyard at various times following World War II.

For a brief period of time , Hunters Point Naval Shipyard and Mare Island Naval Shipyard operations were combined under a single operational command known as the San Francisco Bay Naval Shipyard. On November 19,1964, Secretary of Defense Robert S. McNamara announced the merger of Hunters Point Naval Shipyard and Mare Island Naval Shipyard which was accomplished in a

command ceremony on May 11, 1965. According to Mare Island Naval Shipyard historian, Ms. Sue Lemmon, thus was created the largest shipyard complex in the world, comprised of assets of approximately $250 million, over 20,200 civilian employees and over 9,400 military personnel on active duty. This relationship existed until January 31, 1970, when both shipyards returned to autonomous operations. Hunters Point Naval Shipyard was subsequently formally disestablished by the Navy, and Navy ship repair operations were terminated in 1974.

The shipyard was leased by the Navy to Triple A Machine Shop in 1976 and operated as a private marine repair yard until termination of the lease by the Government in 1986. Of note, Dry Dock No. 4 was continuously operated by Triple A as the primary repair facility during this period. After disestablishment in 1974, title to all land and facilities was held for the Navy by the Supervisor of Shipbuilding, Conversion and Repair, San Francisco Bay until transferred to Naval Station Treasure Island, as the Hunters Point Annex, in September, 1987. The heaviest ship ever docked is believed to be the T T STUYVESANT, a commercial tanker, docked in August, 1978 with an overall length of 1094 feet-8 inches, an extreme beam of 143 feet-8 inches and a full-load displacement of 75,000 long tons (FCR). The heaviest Navy ship to be docked prior to the short period of dockings in the mid-1980's, was the aircraft carrier USS KITTY HAWK (CV63). The actual displacement of this ship when docked is not currently known, but since the KITTY HAWK has a full-load displacement of 80,800 tons, it is considered likely that she was docked at a displacement on the order of 70,000 tons (FCR). Other Navy aircraft carriers docked in Dry Dock No. 4 include the USS RANGER (CV61), the USS CORAL SEA (CV43), the USS MIDWAY (CV41), the USS ORISKANY (CV34), the USS BON HOMME RICHARD (CV31), the USS HANCOCK (CV19) and the USS HORNET (CV12). Most recently, the USS ENTERPRISE (CVN65) and the USS CARL VINSON (CVN70) have been docked. The largest of these, the USS CARL VINSON, has a full- load displacement of approximately 91,500 long tons. While no figure is available on the actual displacement when docked, the CARL VINSON was most likely docked at a displacement over that of the KITTY HAWK (70,000+ long tons), making her probably the largest and heaviest Navy capital ship ship to be accommodated in Dry Dock No. 4.

In 1984, Mare Island Naval Shipyard personnel completed an in-depth study of Dry Dock No. 4 to determine the requirements to return the dry dock to a condition to support emergency dry docking of Navy nuclear surface ships.

Improvements to salt water and electrical distribution utility services, previously mentioned in this report, were constructed shortly thereafter. Between November 1985 and August 1989, six separate dockings of Navy surface ships occurred, including dockings of the aircraft carriers USS ENTERPRISE -see photographs CA-181-A-17 through CA-181-A-23, and USS CARL VINSON, the cruiser, USS TEXAS, and the cruiser, USS CALIFORNIA.

Upon termination of the lease to Triple A Machine Shop, title to Ex-Hunters Point Naval Shipyard and almost all facilities, passed to the Naval Station Treasure Island, with actual ownership of Dry Dock No. 4 and its associated facilities and utilities passing to Mare Island Naval Shipyard in 1987. After August 1989, no dockings of Navy ships occurred, and Dry Dock No. 4 was subsequently placed into an inactive status.

At the time of writing this report, the Navy is evaluating potential leasing of the Hunters Point Complex, including Dry Dock No. 4, to commercial interests.

IV. SOURCES:

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Lemmon, Sue and Ernest D. Wichels, SIDEWHEELERS TO NUCLEAR POWER-A PICTORIAL ESSAY COVERING 123 YEARS AT THE MARE ISLAND NAVAL SHIPYARD, Annapolis, Maryland, Leeward Publications, Inc., 1977, located at the Mare Island Naval Shipyard's Historian Office.

Schmidt, Edwin G., HISTORY OF THE DEVELOPMENT AND OPERATION OF A NAVAL REPAIR YARD AT HUNTERS POINT DURING WORLD WAR II, unpublished, reportedly located at the offices of the Supervisor of Shipbuilding, Conversion and Repair, Hunters Point, and at the San Francisco Maritime Museum, San Francisco, California (a recent query concerning this document was made to the staff at the maritime museum, and they had no direct knowledge of this document).

MASTER PLAN-NAVAL STATION TREASURE ISLAND,HUNTERS POINT ANNEX-EXISTING CONDITIONS REPORT, prepared for Western Division, Naval Facilities Engineering Command by Hall, Goodhue, Haisley and Barker, inc. 1987.

FACILITY CERTIFICATION REPORT-TRIPLE "A" SHIPYARD-DRY DOCK NO. 4; HUNTERS POINT, SAN FRANCISCO, CALIFORNIA, prepared by Moffatt & Nichol Engineers, 1979, located at Mare Island Naval Shipyard, Code 910.

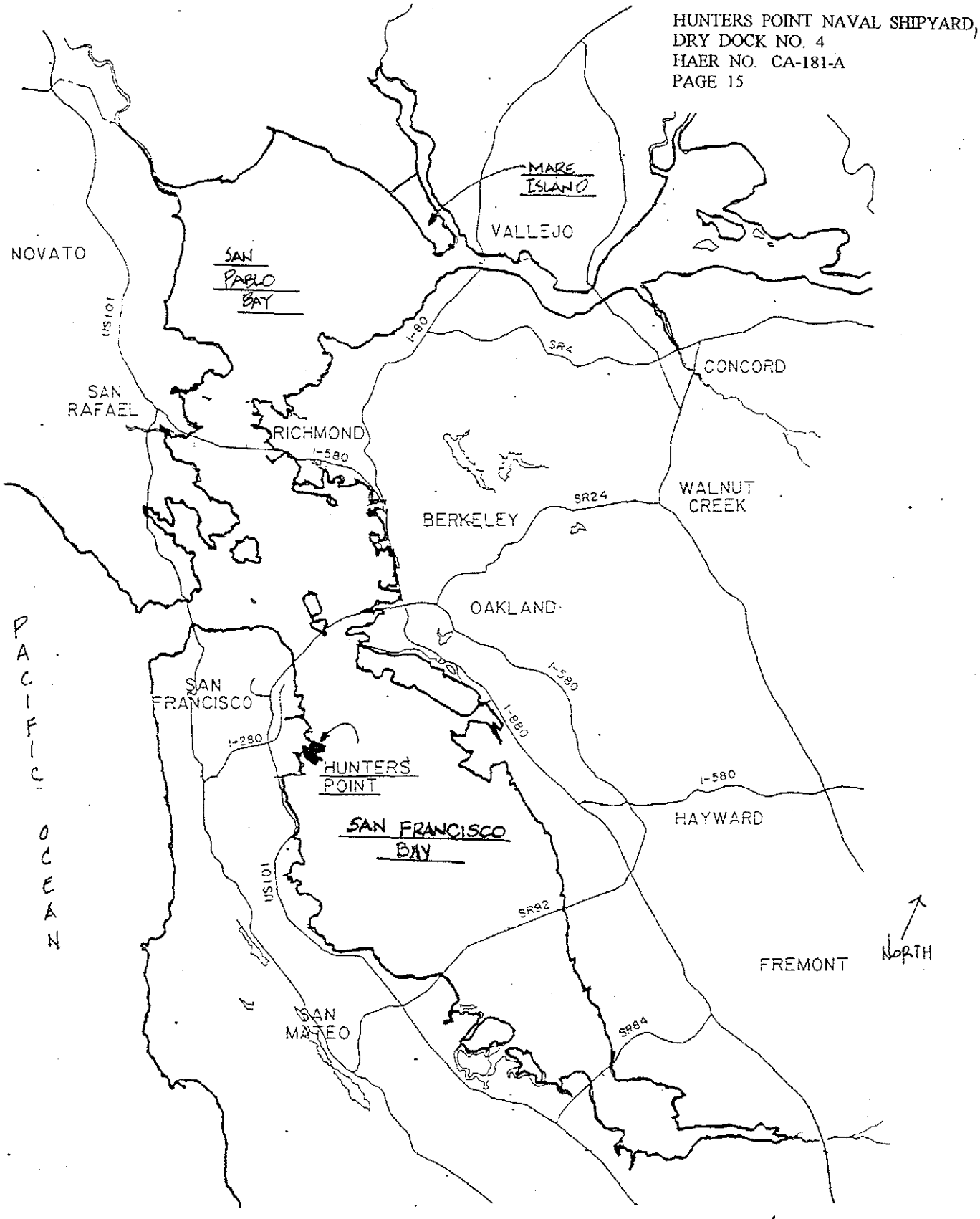
Urban Programmers, National Register Nomination for Dry Dock No. 4, prepared by Bonnie L. Bamburg/Principal Consultant and Ann Bloomfield/Research Assistant.

US NAVY WAR PHOTOGRAPHS, editied by Edward Steichen, New York, New York; Crown Publishing, Inc., 1980, located at Mare Island Naval Shipyard, Code 1222.

V. PROJECT INFORMATION:

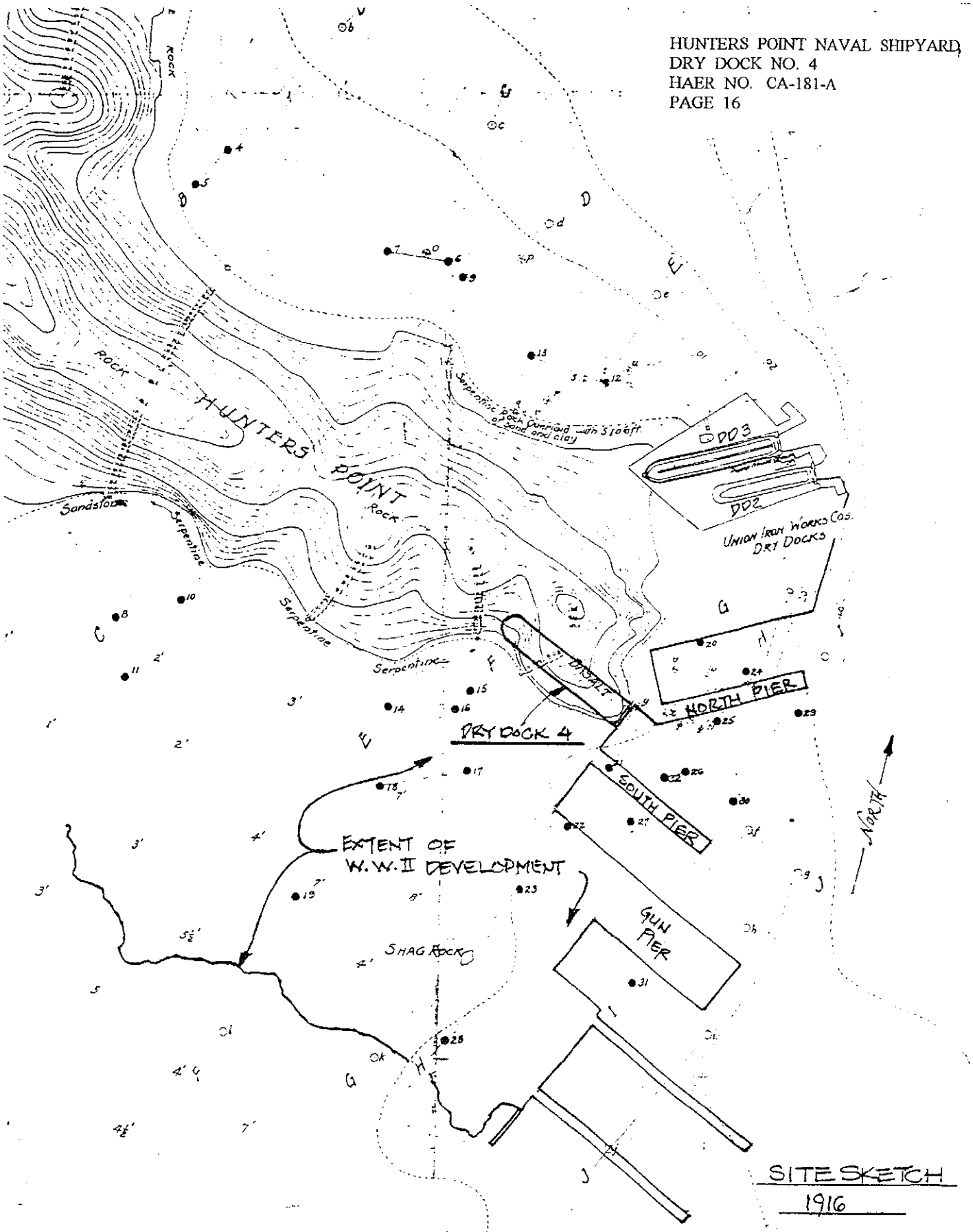
This documentation has been prepared as the result of a Memorandum of Understanding between the National Park Service, the California State Historic Preservation Officer, and the United States Navy (Mare Island Naval Shipyard) to mitigate the potential adverse effect of leasing the drydock to commercial interests.

Project Manager and investigator for this recordation was Mr. Steven R. Black of Mare Island Naval Shipyard. The documentation is based upon review of various available materials, historical records held at Mare Island Naval Shipyard Historian's Office, engineering drawings, and of the National Register Of Historic Places-Registration Form, prepared by Urban Programmers, San Jose, California.

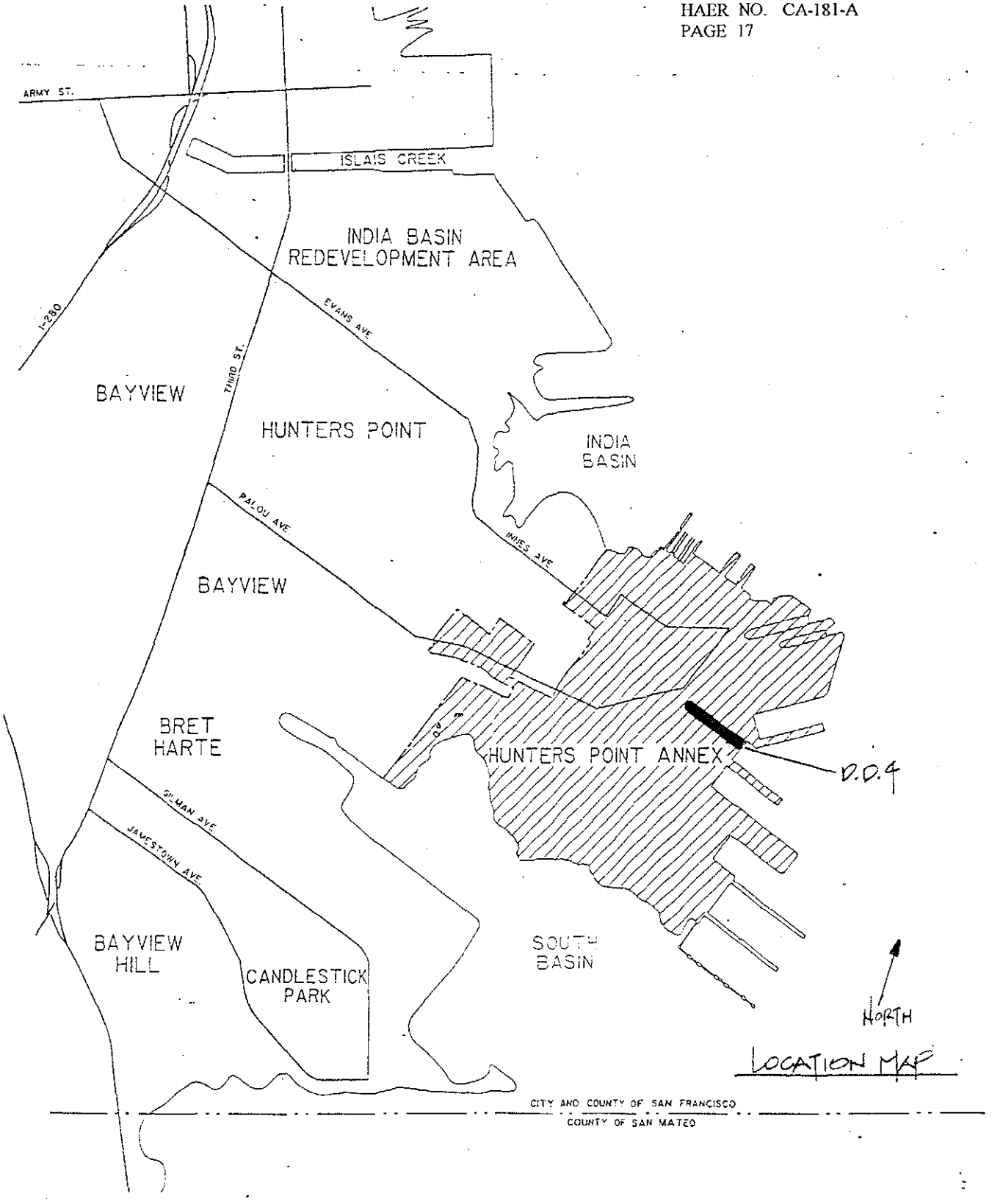


VICINITY MAP

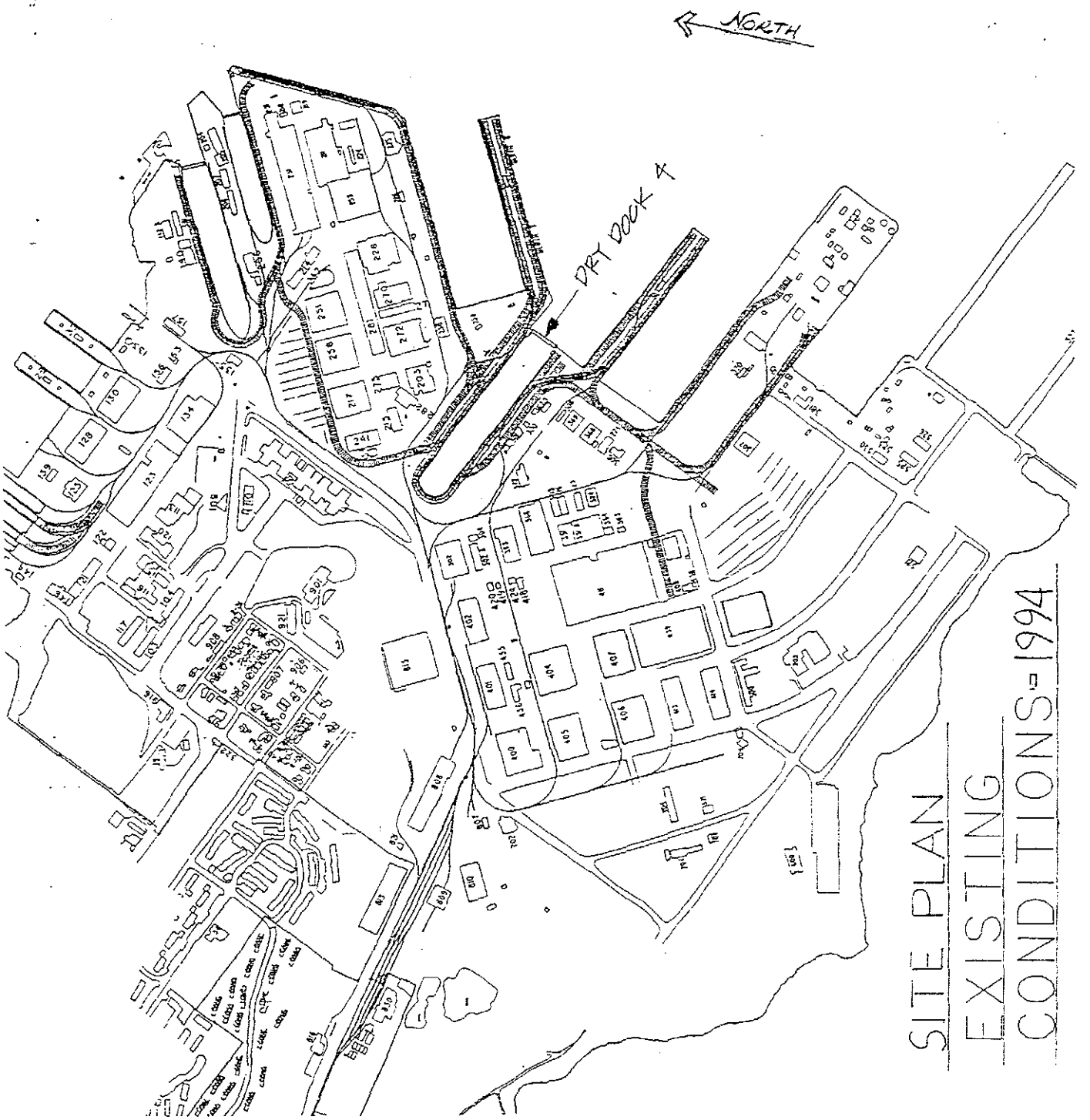
HUNTERS POINT NAVAL SHIPYARD
DRY DOCK NO. 4
HAER NO. CA-181-A
PAGE 16



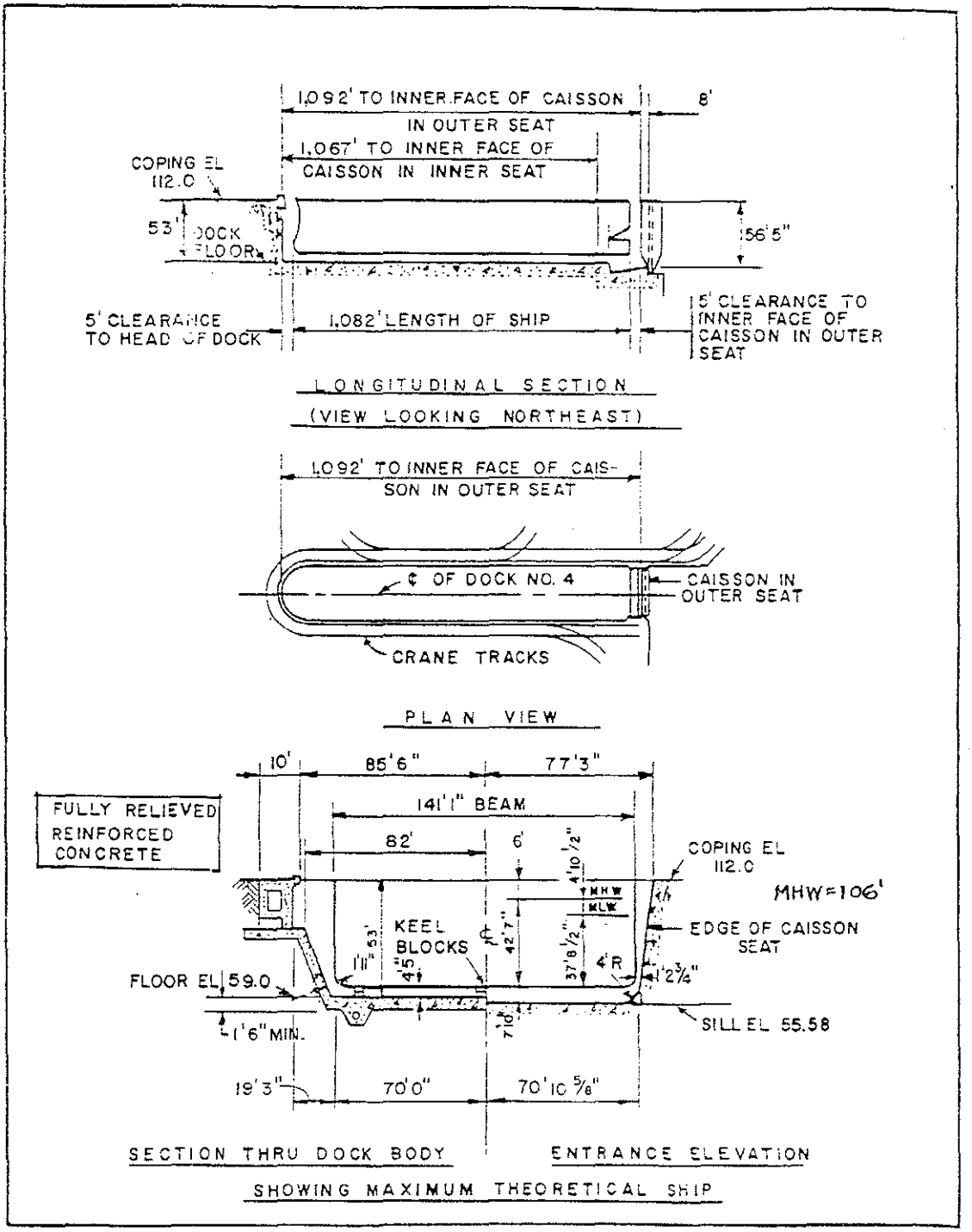
SITE SKETCH
1916



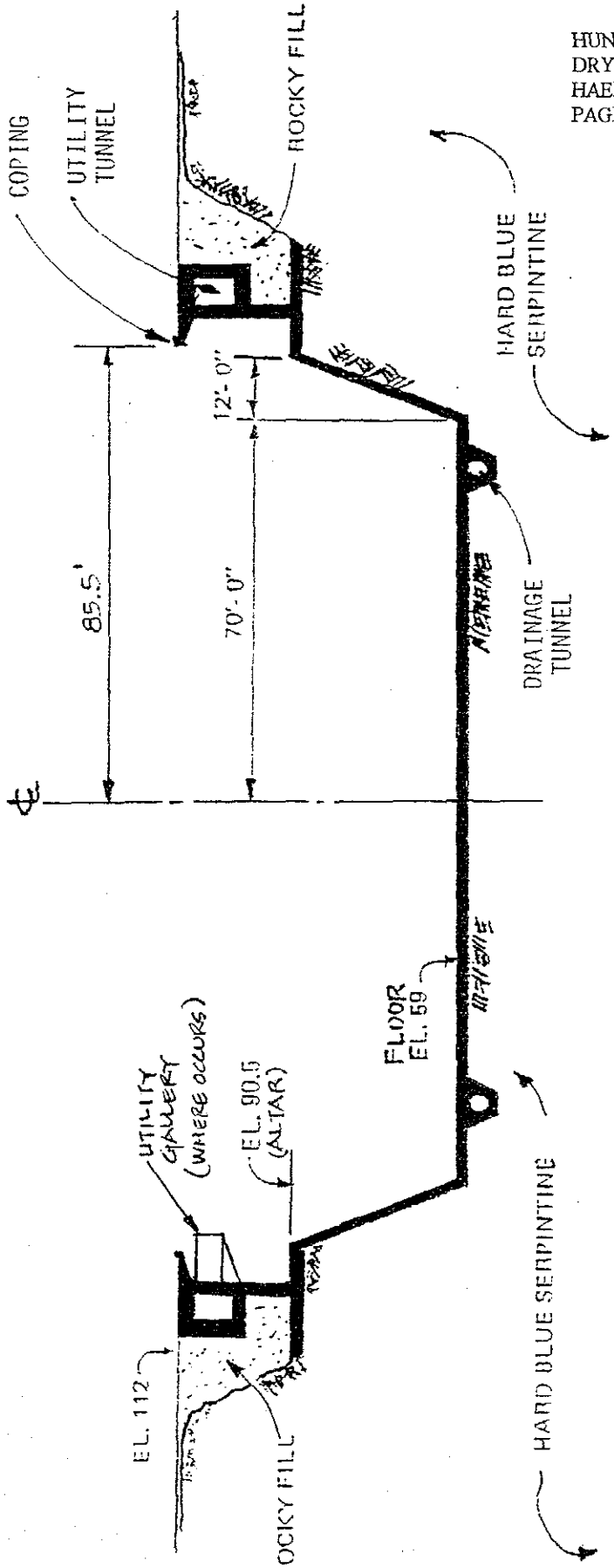
LOCATION MAP



SITE PLAN
EXISTING
CONDITIONS-1994



DRY DOCK CHARACTERISTICS
Hunters Point Naval Shipyard Drydock No. 4



TYPICAL CROSS SECTION

Date Completed	Suitable for Docking	Foundation	Construction Material
6/19/43	CV	Rock	Concrete

Item	Data
Closure	Caisson, steel (rectangular box type).
Dewatering pumps	Three 46", 1,500 hp, 390,000 gpm. Time to dewater: 150 min.
Drainage pumps	Two 16", 150 hp, 13,000 gpm.
Flooding	Through culverts. Time to flood: 60 min.
Capstans	13 total: 1 at head, 2 each side of entrance, 76 fpm at 33k; 5 each side, 76 fpm at 13k.

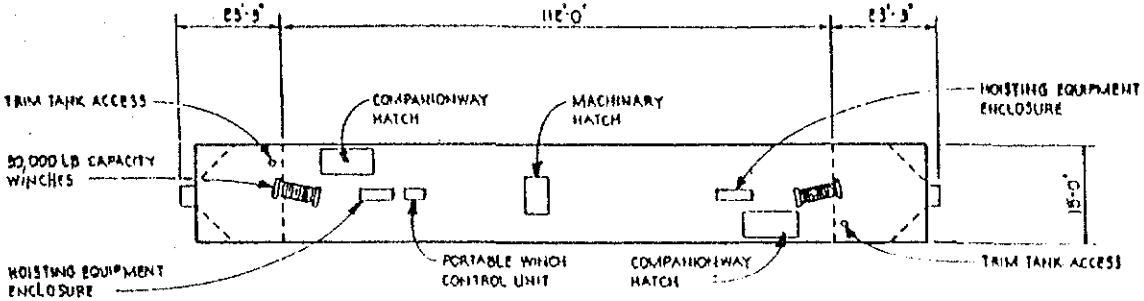
Portal Crane Maximum Capacities and Heights

Hook	5 ft beyond dock centerline	Max height above coping with hook at dock centerline
Main	44 lg tons	82' 9"
Auxiliary	28 lg tons	169' 8"
Whip	5 lg tons	188' 8", 90' 0" min radius

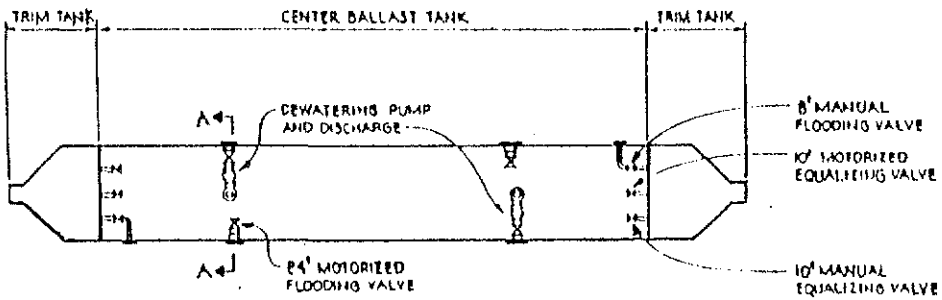
Ship and Industrial Services Furnished at Dock

Electrical	Volts	Amp	Receptacles
Ac, 3 Ph, 60 Hz	460	12,800	2 each side at 3,200 amps; 4 each side at 1,600 amps.
Ac, 3 Ph, 60 Hz	4,160	1,734	5 at 400 amps each on north side

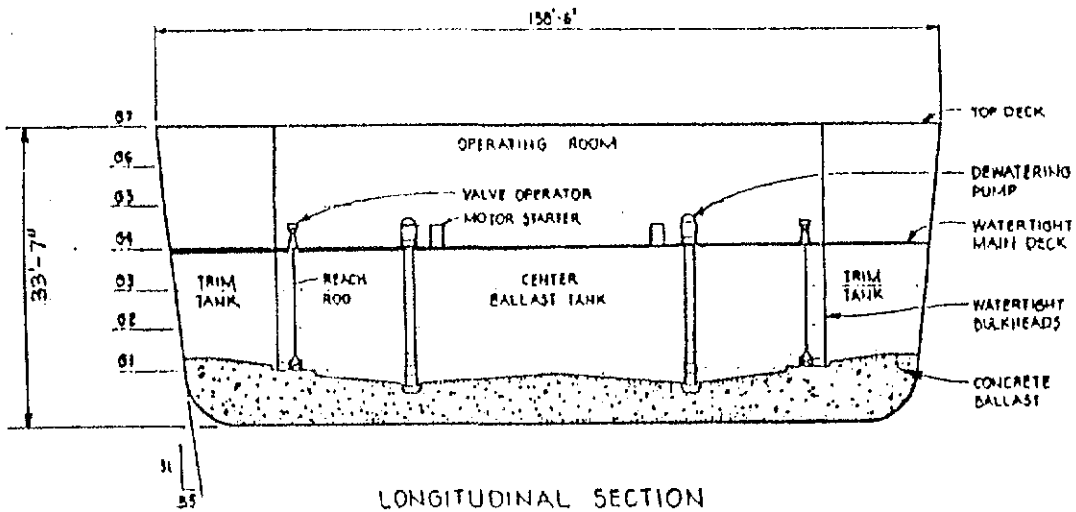
Fresh water	6" mains, 400 gpm at 40 psi, eight 2-1/2" and four 1-1/2" outlets each side.
Salt water	[8" mains, 2,000 gpm at 100 psi, six 4" outlets each side, 4" headers at dock floor with outlets: Not operational].
Fire protection	10" and 12" mains, 12,500 gpm at 150 psi, sixteen 4", four 6" outlets each side.
Low pressure air	6" mains, 8,000 cfm at 100 psi, six 3" outlets each side. 3" headers at dock floor with outlets.
High pressure air	1" mains, 160 cfm at 3,000 psi, [one 1" outlet south side not operational].
Steam	6" mains, 24,000 phr at 150 psi, six 3" outlets north side, [five 3" outlets south side, not operational]: Provided by rental boilers (portable).
Oxygen	[2" mains, 1,000 cfm at 100 psi, six 1" outlets each side: Not operational].
Acetylene	[2" mains, 1,000 cfm at 5 psi, six 1" outlets each side: Not operational].
Sanitary sewer	8" mains, 500 gpm, two 4" inlets each side.
Natural gas	[4" mains, 15 psi, one 1" outlet each side, three 2-1/2" north side, four 2-1/2" south side: Not operational].



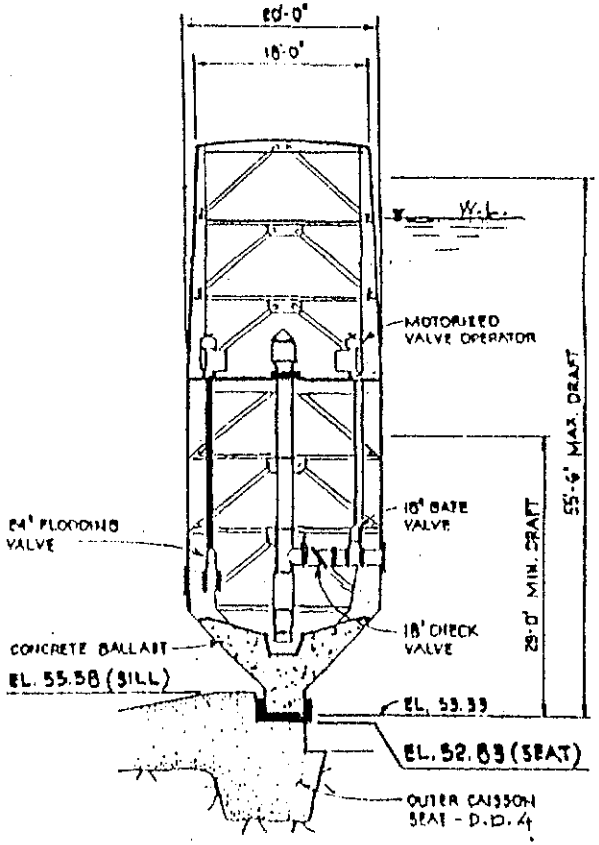
PLAN AT TOP DECK



PLAN ABOVE CONCRETE BALLAST



LONGITUDINAL SECTION



SECTION A-A

CAISSON

HUNTERS POINT NAVAL SHIPYARD,
DRY DOCK NO. 4
HAER NO. CA-181-A
PAGE 22

CHAPTER 5

HUNTERS POINT PUMP HOUSE NO. 4
SECURITY OPERATION

Figures

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5-11 Hunters Point Pump House No. 4 Status Board
5-12 Hunters Point Dry Dock No. 4 Pump Control/Alarm Panel
5-13 Hunters Point Caisson No. 4 Alarm Panel

CHAPTER 5

HUNTERS POINT PUMP HOUSE NO. 4 SECURITY OPERATION

5.1 INTRODUCTION

1. This chapter applies specifically to the operation and security of Dry Dock No. 4 at Hunters Point when there is a ship in dock and the pump house is manned by a watch stander. When there is no ship in dock, this chapter will be used by maintenance and inspection personnel as a reference for general operations and security of related systems and equipment.

2. The watch stander will maintain general dry dock security in accordance with chapter 3 of this manual, and will adhere to all the instructions and requirements of this manual.

3. The watch stander will perform specific security operations in accordance with the procedures of this chapter.

5.2 HUNTERS POINT WATCH STANDER RESPONSIBILITIES

5.2.1 Primary Responsibilities. The primary responsibility of the watch stander is to control the operation and security of the pump house, Dry Dock No. 4 and caisson, and all related dockside equipment.

5.2.2 General Duties. The following list is provided as a general summary of watch stander duties for Pump House No. 4. Paragraph numbers providing detailed instructions elsewhere in this manual are provided where appropriate.

1. Control operation and security of assigned dry dock areas.

2. Maintain a concise record in the station log books of all conditions affecting the operation and security of the dry docks.

3. Maintain good housekeeping conditions in all assigned dry dock areas.

4. Maintain physical security of assigned dry dock areas as required by appropriate paragraphs of this chapter.

5. Perform required operator maintenance checks, lubricate machinery, make minor repairs and adjustments as necessary, and relamp assigned areas.

6. Place and remove clearances as directed in assigned areas, and restore systems to normal when clearances are removed.

7. Rotate operation of drainage pumps.

a. Run pumps in 1+2 mode Monday through Friday.

b. Run pumps in 2+1 mode Saturday and Sunday.

8. Locate the CASCON Station for the ship in Dry Dock No. 4 and log the appropriate telephone extension and location in the log book.

9. Report equipment problems and deficiencies to the watch supervisor.

10. Perform normal valve lineup verification at the start of each shift.

11. Maintain Dry Dock No. 4 drainage level as required by appropriate sections of this chapter.

12. Maintain Caisson No. 4 tank levels as required by appropriate paragraphs of this chapter.

13. Perform additional duties as assigned by the dock supervisor.

5.2.3 Security Inspections

1. The watch stander will perform two complete security inspections of all assigned dry dock areas each shift when there is a ship in dock. When there are no ships in dock, at least one inspection tour will be accomplished each 24 hours.

2. The watch stander will notify Mare Island at (1-707-646-5828) prior to departure and upon return from each inspection tour during day and swing shift. Grave shift, weekends, or holidays, will call (1-707-646-4206).

3. During these inspections, general conditions and security of all equipment will be checked. Inspection will include, but is not limited to:

a. Equipment lubrication and cleanliness.

b. Oil or hazardous material spills.

c. Fire and safety hazards.

d. Water in capstan and valve pits.

e. Leaks under dock caisson.

f. Leaks through caisson valves.

g. Unauthorized items tied to caisson or on the caisson deck.

h. Station lamps and dockside flood lights needing replacement.

i. Damaged or missing fire extinguishers.

j. Any other unusual conditions.

4. Any unusual condition will be reported to the watch supervisor and entered in the log book.

5. During docking evolutions, the watch stander will be relieved of pump house operational duties ONLY. Security inspections will not be suspended.

6. The dock supervisor will have the authority to waive a security inspection tour due to unusual conditions which demand the watch stander's attention to other duties.

5.3 PUMP HOUSE NO. 4 VALVE LINEUP

5.3.1 General Requirements. Except during docking evolutions, the watch stander will ensure that the normal pump house valve lineup is maintained at all times.

5.3.2 Normal Valve Lineup

1. A diagram of Pump House No. 4 piping systems, pumps, and valves is provided by figure 5-1. Component designations are provided by figure 5-2.

2. The Pump House No. 4 normal valve lineup is provided by figure 5-3.

3. Temporary changes to the normal valve lineup must be approved by the dock supervisor. Any changes which may be necessary for longer than 48 hours must be authorized in accordance with paragraph 1.5.2.

5.3.3 Valve Lineup Verification

1. A normal valve lineup verification will be performed by the watch stander at the start of each shift when a vessel is in dock (figure 5-3) & 5-4)

2. When there are no ships in dock, the normal valve lineup verification will be performed by operations/maintenance personnel during the daily inspection tour.

5.4 PUMP HOUSE NO. 4 MAIN DEWATERING SYSTEM

5.4.1 General Requirements

1. The main dewatering pumps (MP-1, MP-2, and MP-3) are normally operated ONLY during docking evolutions per specific docking/undocking procedures.

2. The electrically operated main pump discharge valves (MV-01, MV-02, and MV-03) will be maintained normally closed.

3. The security watch stander will operate the main dewatering system ONLY in support of specific maintenance/test procedures OR in extreme emergency conditions. The following instructions are provided for this purpose.

5.4.2 Preparing the Main Dewatering System for Operation

1. Remove the stop log from the opening of the main discharge tunnel at seawall.

2. Verify actuators for the main discharge gate valves MV-01, MV-02, and MV-03 are in the motor position in the valve pit and turn on circuit breakers for the valve actuators. REFER TO FIGURE 5-5

3. Close the disconnect switches to three hydraulic pumps for main check valves MCV-1, MCV-2, and MCV-3 in valve pit.

NOTE: Ensure the check valves are fully closed and operational by verifying the sight glass on each hydraulic tank indicates full before opening the main discharge gate valves.

4. Place control switches for main check valves MCV-1, MCV-2, and MCV-3 inside the main pump control panels in the "AUTO" position.

5. Line up the fresh water bearing cooling and flushing system for each main pump as follows: (figure 5-6)

a. Open three cooling water valves CW-1, CW-2, and CW-3 to lower, middle, and upper bearings on all three pumps (provides flushing for bearings when dock is flooded).

b. Open cooling water valve CW-4 to motor thrust bearing.

c. Line up and start the cooling water booster pump if fresh water pressure drops below 30 psig or if the yellow low pressure warning light begins to flash. Low cooling water pressure to any of the three main bearings will prevent the pump from starting.

6. Start the ventilation system intake and exhaust fans prior to running the main pumps to provide adequate ventilation for the main motors and lower pump level.

5.4.3 Starting the Main Dewatering Pumps

1. Open the main discharge gate valves MV-01, MV-02, and/or MV-03 for the pumps to be used. The main pumps will not start unless their respective discharge valves are open.

2. Start one hydraulic pump to the main variable-pitch pump control, then line up the appropriate valves (figure 5-7).

3. Open the two hydraulic valves HY-1 and HY-2 on each main pump (figure 5-6).

4. Place the main pump selector switch in the "start" position on the pump control panel.

5. Place the variable-pitch blade control switch in the "manual" position on the pump control panel, and "lower" the blade pitch control until the angle reads -4 degrees on the pump dial indicator, or reaches its lowest position, closing the microswitch in the uppermost position.

6. Energize the main pump motor with the breaker control switch, and verify that the main check valve hydraulic pump has started to assist opening the check valve as indicated by the read light on the main pump control panel. REFER TO FIGURES 5-7 and 5-9)

> NOTE: If necessary, the main check valve hydraulic pumps can be started manually from the valve pit.

7. Adjust the field current to 60 amperes with the field rheostat on the auxiliary control panel when the pump is running.

8. Place the selector switch in the "run" position.

9. "Raise" the blade pitch control to a blade angle where the motor is drawing 200 to 250 amperes.

10. When a constant operating speed has been obtained, adjust the field rheostat to obtain a unity (1.0) power factor.

11. The operator may need to adjust the blade angle periodically in order to maintain a constant motor load as the water level in the dock decreases.

5.4.4 Securing the Main Dewatering Pumps

1. When the dock water level reaches one foot, or the motor current begins failing quickly indicating loss of suction, start "lowering" the pump blade angle.

2. When the pump blade angle reaches the lowest (-4) position and the microswitch is closed, secure the pump motor with the breaker control switch.

3. Close the main discharge gate valves MV-01, MV-02, and MV-03, and open the circuit breakers to the valve actuators.

4. Secure the cooling water booster pump (if in use) and close the four cooling water valves CW-1, CW-2, CW-3, and CW-4 on each main pump.

5. Close the two hydraulic valves HY-1 and HY-2 on each main pump, and secure the hydraulic pump and associated valves.

6. Place the control switches for main check valves MCV-1, MCV-2, and MCV-3 in the "off" position, and open the disconnect switches for the three hydraulic pumps in the valve pit. Verify that all three main check valves are closed.

7. Replace the stop log over the main discharge tunnel opening at the seawall. SEE FIGURE 5-10.

5.5 PUMP HOUSE NO. 4 DRAINAGE SYSTEM

5.5.1 General Requirements

1. The watch stander will record the status of the drainage pumping system on the pump house status board (figure 5-8).

2. The pump controller manual-off-auto switches for drainage pumps DP-1 and DP-2 located on the lower pump level will normally be maintained in the "auto" position with the electrical float bubbler system controlling the pump operation.

3. The pump controller switches "hand" position will only be used to manually operate drainage pumps DP-1 and DP-2 in the event the electrical float switch bubbler control system fails.

4. Prior to flooding the dock for docking/undocking evolutions, the pump controller switches for drainage pumps DP-1 and DP-2 will be placed in the "off" position.

5.5.2 Description of Electrical Float Bubbler Control System

1. The bubbler control system is supplied by two 100 psig air compressors located on the lower pump level. The system requires a regulated air pressure of 50 psig and also requires a regulated fresh water pressure of 10 psig and also requires a regulated flow of 2 to 3 gpm for a continuous flush of the system and for testing the column for proper operation.

2. The electrical float bubbler system controls the operation of the drainage pumps when they are in the "auto" mode.

3. A selector switch located on the electrical float bubbler control panel provides the following functions:

a. "Auto" automatically starts and stops drainage pumps DP-1 and DP-2 as follows:

(1) DP-1 starts when the drainage level reaches 72" below the dock floor.

(2) DP-2 starts when the drainage level reaches 60" below the dock floor.

(3) Both DP-1 and DP-2 will stop when the drainage level drops to 162" below the dock floor.

b. DP-1 "manual" manually starts drainage pump DP-1.

c. DP-2 "manual" manually starts drainage pump DP-2.

d. "Maintenance" removes the pump from the system for maintenance functions.

5.5.3 Operation of Drainage Pumping System

1. The watch stander will normally maintain the drainage pumping system in the "auto" mode for normal automatic drainage pumping.

2. When it is necessary to pump drainage manually, the watch stander will pump drainage as follows:

a. Place the auto-off-manual control switch in the manual position to start the pump. NOTE: Both DP-1 and DP-2 have a 90 second delay to start. There are not check valves in this system; therefore, when the pump being used stops, the drainage left over in the discharge pipe is allowed to free flow back to the suction chamber, causing the pump to turn in reverse. This would cause damage to the pump if it was allowed to start while turning in reverse.

b. Return the auto-off-maintenance-manual control switch to the "off" position when the drainage level reaches 162" below the dock floor.

c. When the drainage pumps are in manual control, the watch stander will pump drainage prior to leaving the pump house for routine inspection rounds or when the drainage level reaches the 72" level below the dock floor.

5.6 PUMP HOUSE NO. 4 SUMP PUMPING SYSTEM

1. Automatic Sump Pump. Normal dewatering of the pump house sump is provided by a float controlled electric sump pump located in the lower pump level.

2. Emergency Sump Pumps. A second electric pump and an air-operated pump are provided for dewatering the pump house sump in the event the automatic pump fails, and must be operated manually by the watch stander. The control switch for the electrical emergency back-up sump pump is located on the control/alarm panel on the main operating level.

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5.7 HUNTERS POINT DRY DOCK NO. 4 TRANSFER SEWAGE SYSTEM

5.7.1 1. The sewage transfer system is located at the 162" mark on the starboard side of Dry Nod. No. 4. All service connections are made by the Service/Facilities and Maintenance Group.

2. The watch stander will report any leaks or other problems with this system to the dock supervisor immediately.

5.8 HUNTERS POINT DRY DOCK NO. 4 ALARM SYSTEMS

5.8.1 Pump House No. 4 Drainage Alarm

1. A red warning light and audible alarm are located on the port side of Dry Dock No. 4 at welding tub D4-7 with duplicate indications inside the pump house on the electrical float bubbler system control panel. SEE FIGURE 5-12

2. The red warning light and audible alarm will come on at 48" below the dock floor indicating high water.

3. The alarm cut-off switch located on the electrical float bubbler system control panel can be used to turn off the audible alarm after the reset button is pressed.

5.9 HUNTERS POINT CAISSON NO. 4 SECURITY

5.9.1 General Requirements

1. The watch stander will record the tank level in the caisson log book during the first inspection tour each shift (or daily by operations/maintenance personnel when there is no ship in dock).

2. Any significant short- or long-term changes in the normal tank level will be reported to the dock supervisor immediately, and an attempt will be made to determine the cause of the change. Minor fluctuations in the tank level may be attributed to temperature changes.

3. The dock supervisor will obtain the necessary assistance and direct operations as required to restore normal tank level.

4. Caisson No. 4 system diagram for pumps and valves is provided in figure 5-6

5.9.2 Caisson No. 4 Tank Level and Alarms

1. The normal tank level for Caisson No. 4 is between 22 feet and 23 feet in the main ballast tank.

2. There are alarms installed for the main ballast and trim tanks levels (figure 5-5).

5.9.3 Operation of Caisson No. 4

1. Caisson No. 4 ballast fill and dewatering systems are normally operated only during dry docking evolutions per a specific docking/undocking procedure for Dry Dock No. 4.

2. The watch stander will operate the caisson systems ONLY in support of specific maintenance/test procedures OR when extreme emergency conditions warrant dewatering or filling the main ballast tank. The following instructions are provided for this purpose.

3. Dewatering the main ballast tank:

a. Verify that pump and motor lubricators are full, all tank hatch covers are secured, and tank vents are open.

b. Open ONLY the outboard ballast discharge valve (BV-1 or BV-2) facing the sea. A check valve will prevent back flow into the tank until the pump is started.

c. Start the outboard ballast pump (BP-1 or BP-2) and dewater the ballast tank to a minimum level of 22 feet, then secure the pump and lubricators.

d. Close the ballast discharge valve.

4. Filling the main ballast tank:

a. Verify that all tank hatch covers are secured and tank vents are open.

b. Open ONLY the outboard ballast fill valve as required to fill the ballast tank to a maximum level of 23 feet, then close and secure the fill valve.

5. Record all valve and pump operations and the ballast tank level in the caisson log book.

FIGURE 5-1

PUMP HOUSE NO. 4 SYSTEM DIAGRAM

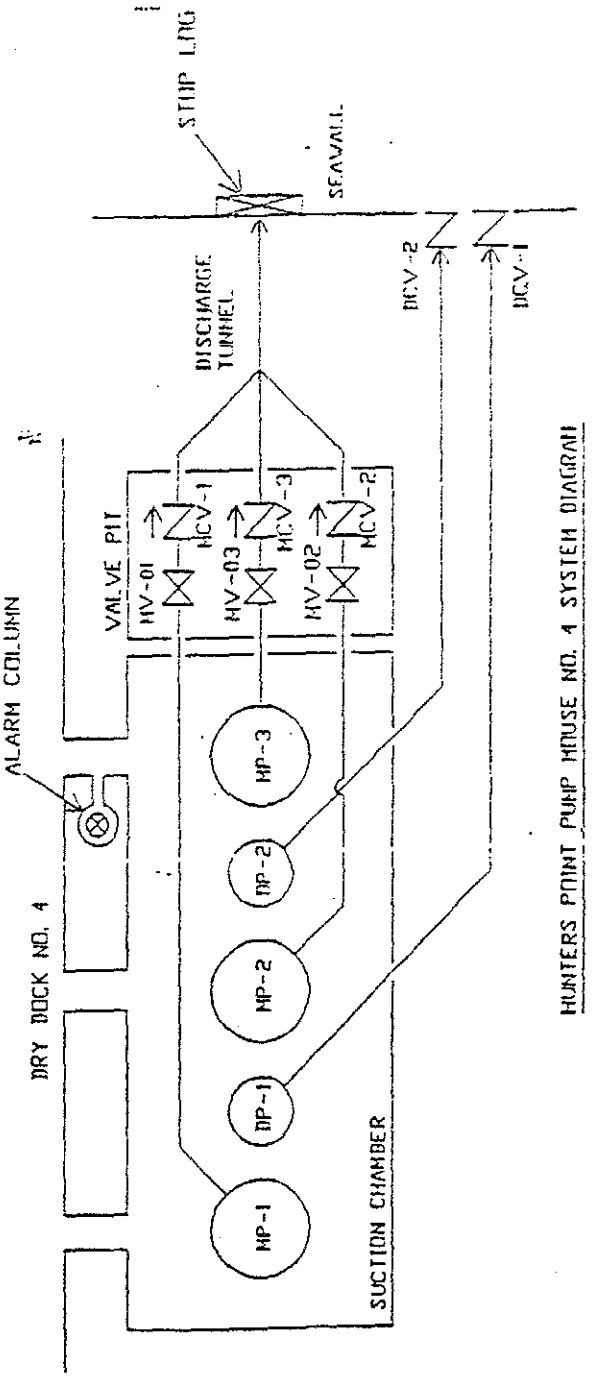

FIGURE 5-2

PUMP HOUSE NO. 4 EQUIPMENT IDENTIFICATION

PUMP	DESCRIPTION
MP-1	Main Dewatering Pump No. 1
MP-2	Main Dewatering Pump No. 2
MP-3	Main Dewatering Pump No. 3
DP-1	Drainage Pump No. 1
DP-2	Drainage Pump No. 2

VALVE	DESCRIPTION
MV-01	Main Pump No. 1 Discharge Valve
MV-02	Main Pump No. 2 Discharge Valve
MV-03	Main Pump No. 3 Discharge Valve
MCV-01	Main Pump No. 1 Check Valve
MCV-02	Main Pump No. 2 Check Valve
MCV-03	Main Pump No. 3 Check Valve
DCV-01	Drainage Pump No. 1 Check Valve
DCV-02	Drainage Pump No. 2 Check Valve

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FIGURE 5-3

PUMP HOUSE NO. 4 NORMAL VALVE LINEUP

VALVE	NORMAL POSITION	REMARKS
MV-01	Closed	
MV-02	Closed	
MV-03	Closed	
MCV-01	Closed	Hydraulic assisted valve
MCV-02	Closed	Hydraulic assisted valve
MCV-03	Closed	Hydraulic assisted valve

FIGURE 5-4

PUMP HOUSE NO. 4 HUNTERS POINT NORMAL VALVE LINEUP VERIFICATION

Pump House No. 4 Hunters Point Normal Valve Line-Up Verification

VERIFY ALL VALVE POSITIONS PRIOR TO SIGNING SHEET AT START OF WATCH. ANY DISCREPANCIES SHOULD BE NOTED IN THE REMARKS SECTION.	0000-0800		0800-1600		1600-2400	
	OPEN	CLOSED	OPEN	CLOSED	OPEN	CLOSED
MV-01 MAIN PUMP 1 DISCHARGE VALVE						
MV-02 MAIN PUMP 2 DISCHARGE VALVE						
MV-03 MAIN PUMP 3 DISCHARGE VALVE						
TEST DOCK 4 DRAINAGE LEVEL ALARMS						

OPERATORS SHALL INITIAL VALVE POSITIONS & DOCK LEVEL ALARM TESTS.

REMARKS:

SHIFT	OPERATOR'S SIGNATURE	TIME	DATE
0000-0800			
0800-1600			
1600-2400			

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FIGURE 5-5

PUMP HOUSE NO. 4 MAIN VALVE CONTROL PANEL

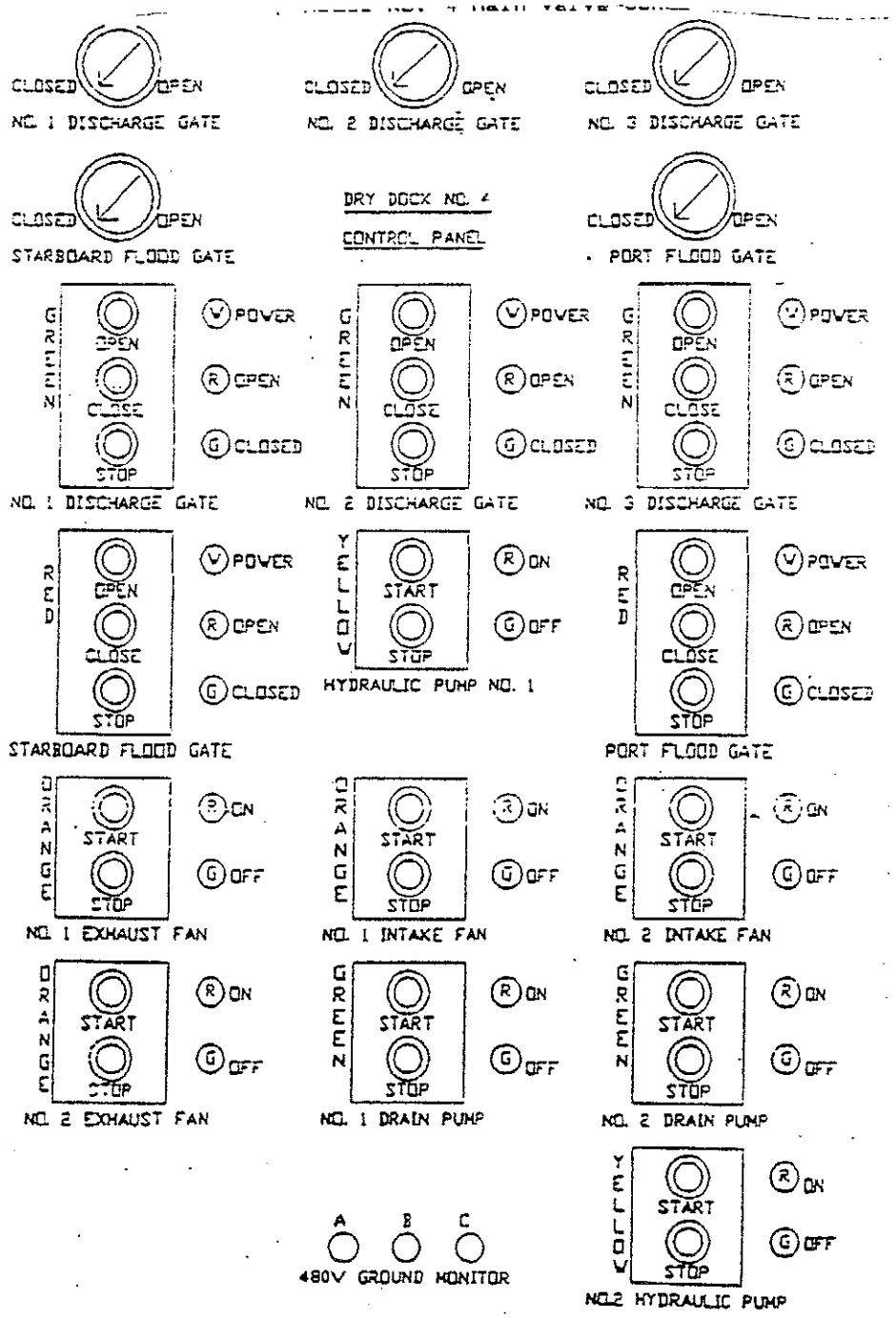

FIGURE 5-9

HUNTERS POINT CAISSON NO. 4 SYSTEM DIAGRAM

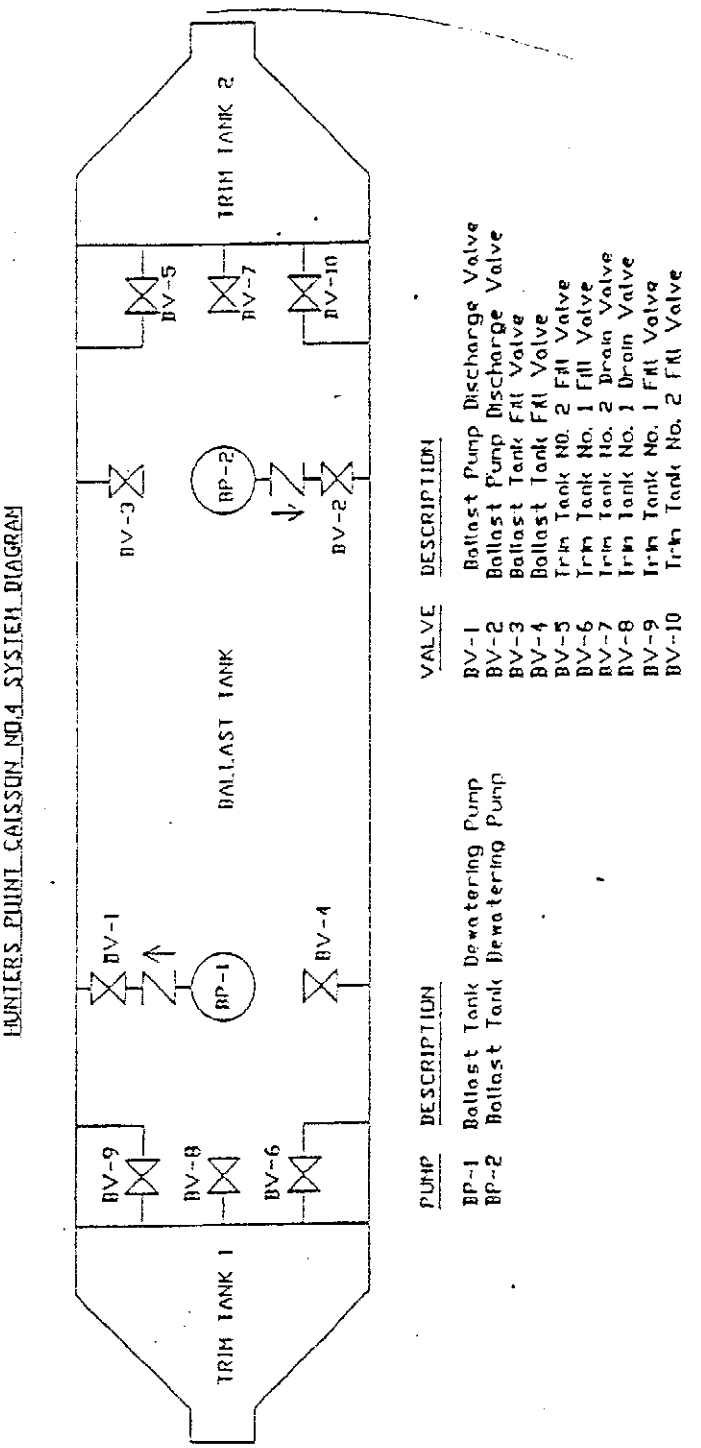

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FIGURE 5-5

PUMP HOUSE NO. 4 HYDRAULIC PUMP UNIT FOR MAIN PUMPS

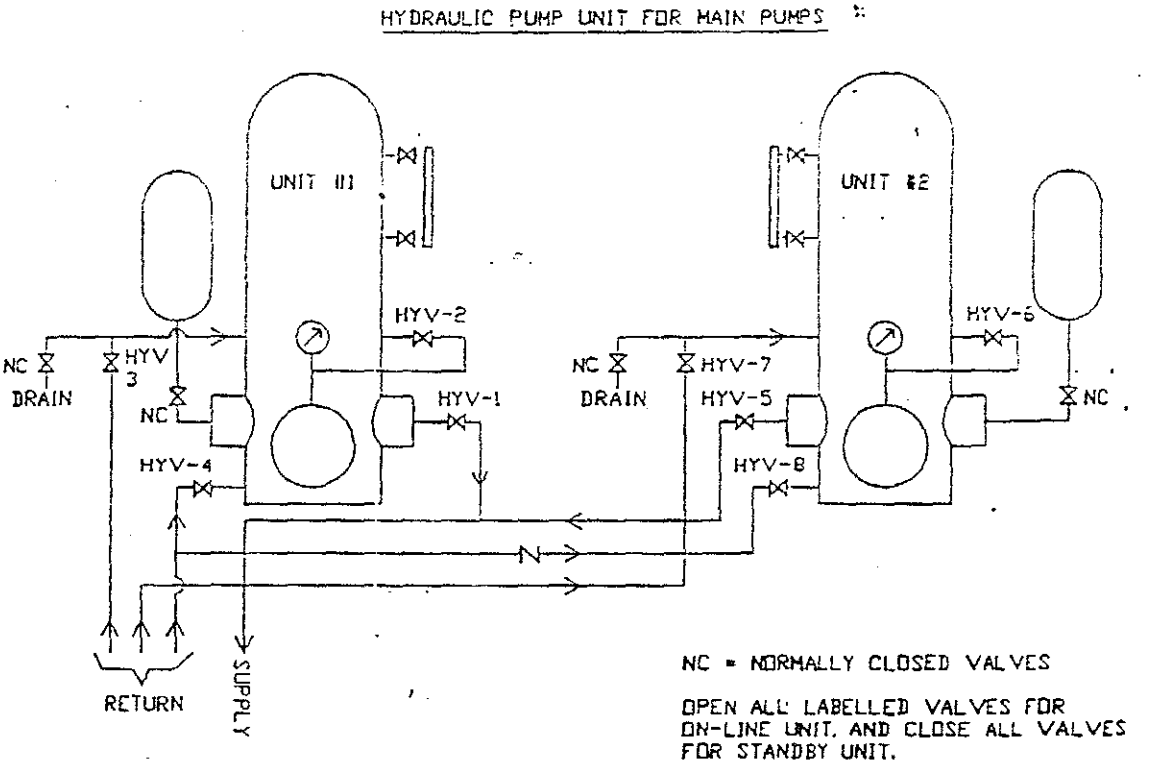

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FIGURE 5-6

PUMP HOUSE NO. 4 MAIN PUMP HYDRAULIC AND COOLING WATER SYSTEM

MAIN PUMP HYDRAULIC AND COOLING WATER SYSTEM

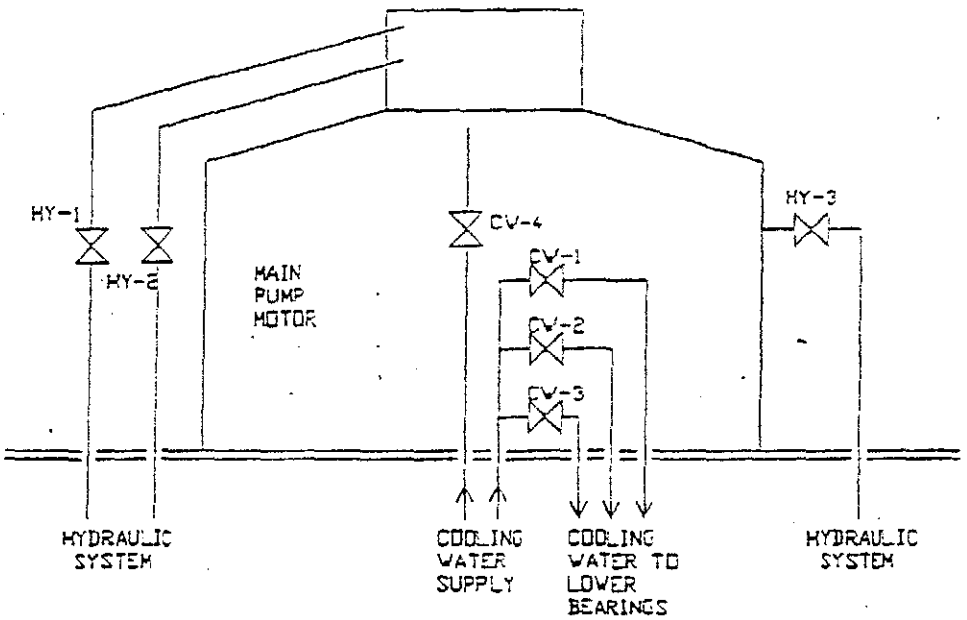

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FIGURE 5-9

PUMP HOUSE NO. 4 MAIN PUMP CONTROL PANEL

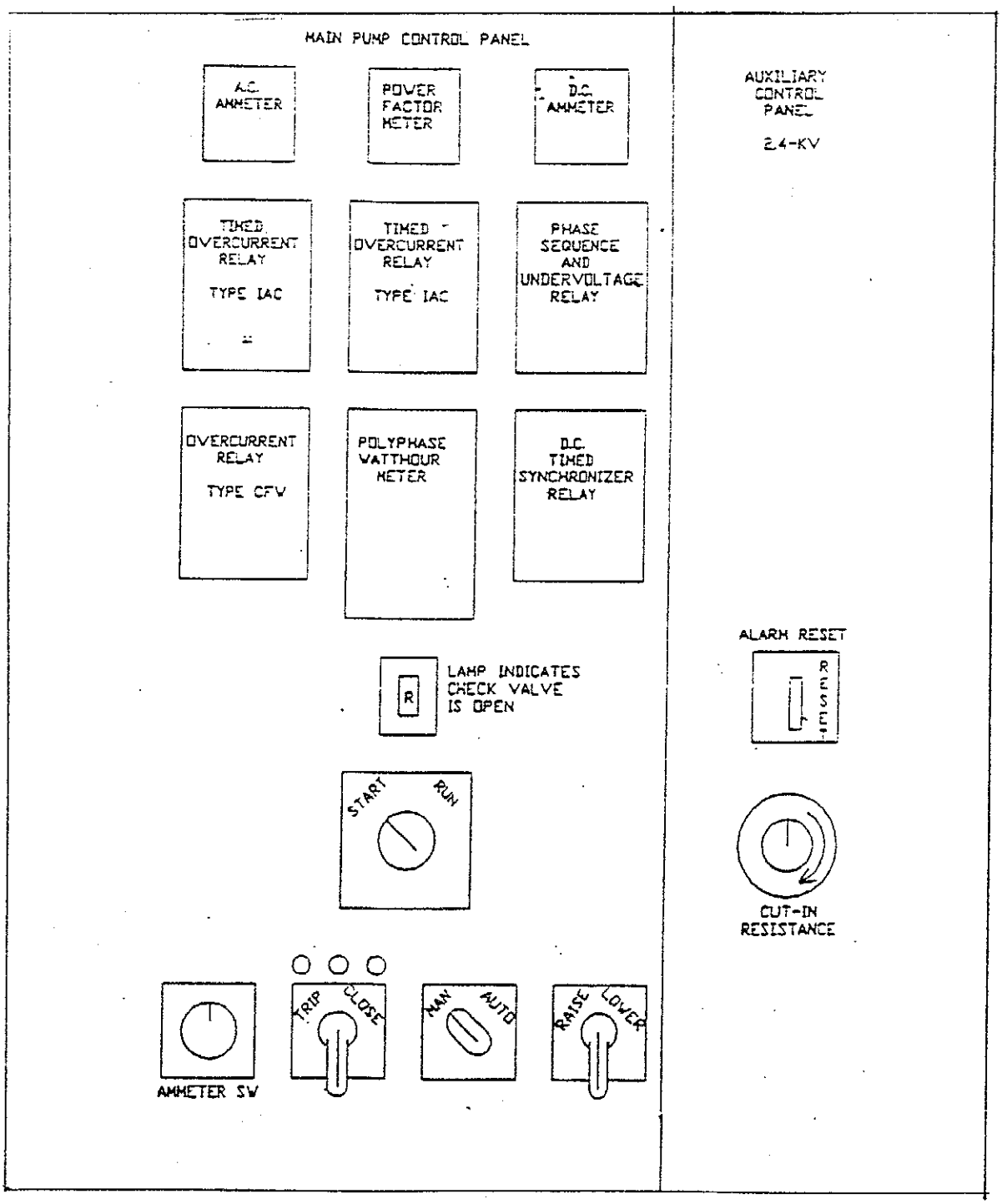

FIGURE 5-10

HUNTERS POINT DRY DOCK NO. 4 TUNNEL LAYOUT

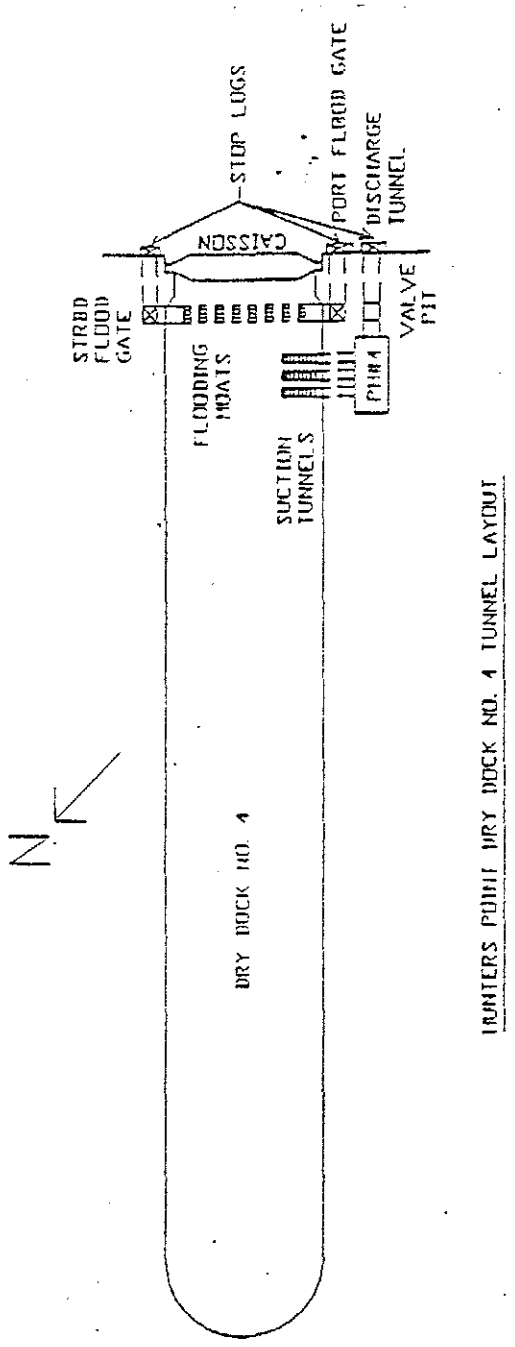

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FIGURE 5-[illegible]

HUNTERS POINT PUMP HOUSE NO. 4 STATUS BOARD

Hunter Point Pump House No. 4 Status Board

SHIPS IN DOCK	DRY DOCK NO. 4
SHIP NAME AND HULL NUMBER	
CASCON STATION LOCATION/PHONE	

EQUIPMENT STATUS

	AUTO	OFF	MAINT	MANUAL
DRAIN PUMP NO. 1				
DRAIN PUMP NO. 2				
SUMP PUMP				
BACK UP SUMP PUMP				
AIR COMPRESSOR				
BACK-UP AIR COMPRESSOR				

OUTSTANDING WORK PERMITS AND CLEARANCES

EQUIPMENT & LOCATION	SHIP/CODE PHONE NO.	WORK PERMIT NO.	EXPIRES	CLEARANCE NO.

OUTSTANDING TROUBLE REPORTS

TR NO.	DATE	EQUIPMENT & LOCATION	DESCRIPTION

REMARKS:

FIGURE 5-12

HUNTERS POINT DRY DOCK NO. 4 PUMP CONTROL/ALARM PANEL

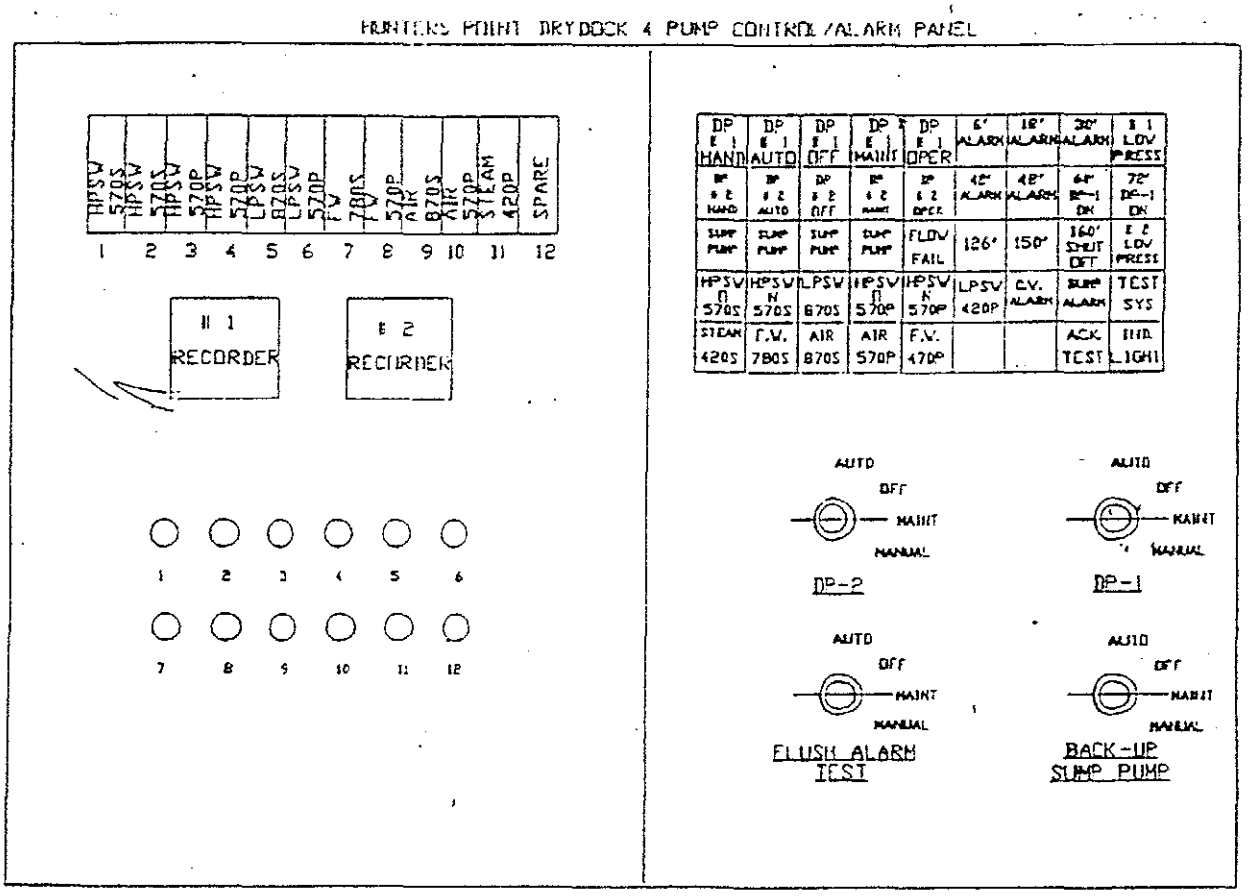

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FIGURE 5-83

HUNTERS POINT CAISSON NO. 4 ALARM PANEL