

U.S. NAVAL BASE, PEARL HARBOR, BOMBPROOF FACILITIES
Various Locations Throughout Base
Pearl Harbor
Honolulu County
Hawaii

HABS NO. HI-391

HABS
HI-391

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

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

HISTORIC AMERICAN BUILDINGS SURVEY

U.S. NAVAL BASE, PEARL HARBOR, BOMBPROOF FACILITIES

HABS No. HI-391

Location: Various locations
Pearl Harbor Naval Base
City and County of Honolulu, Hawaii

See HABS No. HI-60 for UTM coordinates of the base and HABS reports listed below for UTM coordinates of specific facilities.

Present Owner: U.S. Navy

Present Use: various

Significance: The bombproof buildings at Pearl Harbor Naval Base include several distinctive building types which were all constructed circa 1942, typically in response to the December 7, 1941 attack. However, Navy planning for bombproof buildings had started before the attack. These buildings were used as personnel shelters and for critical functions that had to continue even during attacks, including command centers, electrical stations, and telephone exchanges. The designers associated with several of these buildings include renowned architects Albert Kahn, Charles W. Dickey, and Vladimir Ossipoff.

Additional information, about specific bombproof buildings, is available in the following HABS reports:

Report Number	Fac. No.	Area.	Date	Report Name (all preceded by: U.S. Naval Base, Pearl Harbor)	Type of Bombproof Facility
HABS No. HI-32 (addendum)	250	Makalapa	1942	Headquarters, CINCPAC	Command Center
HABS No. HI-272	619	Submarine Base	1942	Telephone Exchange Building	Command Center
HABS No. HI-328	180	Ford Island	1942	Fallout Shelter	Personnel Shelter
HABS No. HI-329	181	Ford Island	1942	Fallout Shelter	Personnel Shelter
HABS No. HI-395	S 99	Ford Island	1942	Bombproof Personnel Shelter	Personnel Shelter
HABS No. HI-422	208	Ford Island	1942	Operations and Message Center	Communications Facilities
HABS No. HI-454	178	Shipyards	1942	Operations and Message Center, Navy Yard Communications Office	Communications Facilities
HABS No. HI-497	167	Shipyards	1942	General Storehouse	Command Center
HABS (in preparation)	S 17 (S17A & S786)	Shipyards	1919 / 1943	Dry Dock No. 1 Pumpwell (By-Pass Valve Chamber and Saltwater Chamber)	Miscellaneous

HISTORICAL INFORMATION

HISTORIC CONTEXT

Standard plans for bombproof buildings had been developed by the Navy's Bureau of Yards & Docks before the U.S. entered World War II. Funds for bombproof communications centers and personnel shelters were appropriated in March 1941 for the Naval Air Stations at Pearl Harbor, Kaneohe Bay, Johnston Atoll and Palmyra Islands (*Honolulu Star Bulletin* 1941). There was a rapid increase in the erection of such protective buildings at Pearl Harbor Naval Base after the December 7, 1941 attack by Japanese forces. Military installations in the Pacific (including Midway atoll and Alaska) were the only areas in the U.S. that erected this type of construction, since these locations were the most vulnerable to further attack. The majority of the active defensive facilities (gun positions, etc.), as well as the passive defensive facilities (bombproof and splinterproof shelters), built in response to the Pearl Harbor bombing were constructed by Contractors Pacific Naval Air Bases (CPNAB), a consortium of construction firms that built many facilities for the Navy in Hawaii and other Pacific locations. The CPNAB report on the work noted, however, that "local Navy and Marine Corps forces assisted the contractors in producing these emergency facilities" (Contractors Pacific Naval Air Bases n.d.: A-1197).

Several types of protective buildings were constructed at Pearl Harbor Naval Base. Some of the facilities were classified as "bombproof," or resistant to a direct hit by a 2000-pound (or less) bomb. Others were "splinterproof," designed to protect against the "splinter" effect of large near-miss bombs, including their shrapnel and other debris sent flying by the blast, as well as to provide protection from bullets or small projectiles during an attack. Bombproof facilities had heavily reinforced concrete walls and roofs, 4'-0" and 6'-0" thick respectively, while the concrete walls and roofs of splinterproof structures were typically only 10" to 14" thick.

Seventeen bombproof buildings (or buildings with bombproof portions) remain at Pearl Harbor. These are discussed below under four headings: command centers, electrical power facilities, communications facilities, and personnel shelters. The protective buildings typically had dual functions, such as a command or communications center, as well as a personnel shelter. The contractor's report quoted a 30 April 1942 memo from the Navy's Project manager to the 14th Naval District's Public Works Office, regarding which functions should be in bombproof structures:

Units of equipment which are not carried in duplicate, and which, if destroyed would take many months to replace, should be installed in bombproof structures. This applies to the automatic telephone equipment and standby electric power equipment (Contractors Pacific Naval Air Bases n.d.: A-349).

The bombproof buildings were generally constructed from standardized plans with cast-in-place concrete walls 4'-0" thick, and 6'-0" thick roofs and foundations. The buildings are instantly recognizable by their thick roofs, with 4'-0" overhangs. Heavy steel reinforcing (5/8" rebar) was provided at 6" o.c. in both dimensions along the top and bottom of each slab, and in both faces of each wall. Internal reinforcement consisted of prefabricated, truss-like assemblies set parallel to each other in one direction – to which, after erection, cross members were attached; both cross joints and lap joints were welded (see "Welding Details" on Y & D Drawing No. 220,738). Signs posted on many of the structures read:

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CAUTION. The upper story protects against small percussion-type bombs only.
LOWER FLOOR ONLY for complete bomb and gas protection.

Bombproof buildings have few openings and most of these are recessed deeply into the walls. For additional protection against the results of near misses, a reinforced-concrete apron 3'-0" to 5'-0" thick typically surrounds the buildings at grade.

Most of the bombproof buildings had air locks, at least on the lower level, to provide protection against gas attacks, as well as bombs. Similar precautions were taken for all military installations in Hawaii. A 1941 Army publication

called for gasproofing first aid stations, plotting rooms for 6- and 16-inch batteries, battery switchboard and radio rooms, harbor defense and groupment command posts, post and fire control switchboard rooms, post radio stations, and mine casements. In addition, toilets were gas-proofed to protect soldiers at their most vulnerable (Smith 1999: 80).

Gasproofing meant having seals on all doors (and windows if any), and purifying the air supplied to the inside. The basic concept was that poison gas is heavier than air. Therefore, tall intake air pipes rose at least 25' above ground level to draw in relatively clean air. The air was filtered and sent to the gasproof room(s) under pressure. This higher pressure prevented the poison gas from entering the room(s). Valves controlled the escape of the air and maintained the proper interior air pressure. The machinery that provided the air pressure and included these valves was called a "collective protector."

Entrances were designed and placed to minimize formation of gas pockets. Air locks were small rooms at the entries that were designed to limit the introduction of gas into the protected spaces. The collective protector included an air blast mechanism, which was usually placed in the air locks. The blast of purified air "removed loose vapors from clothing, reducing the amount of gas carried into the protected space. The contaminated air was drawn back into the collector and refiltered" (Smith 1999: 82).

BUILDING TYPES

Command Centers

The three buildings that contain bombproof command centers at Pearl Harbor are Facility 167, Supply Department warehouse in the Shipyard, which contains a bombproof Administrative Unit on the ground floor; Facility 250, the Headquarters for Commander-in-Chief, Pacific Fleet at Makalapa, of which the first floor and basement are of bombproof construction; and Facility 619 in the Submarine Base, which is a two-story bombproof building topped with two wooden stories.

Facility 167, a five-story reinforced-concrete storehouse for general and miscellaneous dry stores, was constructed at the Shipyard in 1942. The CPNAB report mentions that architect Albert Kahn of Detroit, Michigan was employed by them, at the direction of the Bureau of Yards and Docks, to prepare plans for Navy Yard structures, notably the multi-story concrete warehouses and industrial buildings (Contractors Pacific Naval Air Bases n.d.: A-1023). Kahn designed Facility 167 in June 1941; his name and signature appear on the original drawings.

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The building, approximately 180' x 500' in plan, was provided with an 18"-thick concrete roof slab, which made it partially bombproof. A fully bombproof section was constructed on the west end of the ground floor, to house the offices for the Captain of the Yard and as a Command Center to coordinate the defense functions of all the units or activities around the Harbor. The bombproof section was not part of the original design, but was added in February 1942 as a response to the attack on Pearl Harbor. This work appears to have been designed "in-house" by the 14th Naval District Public Works Department.

Facility 250 at Makalapa was originally constructed in 1942 as Headquarters of the Pacific Fleet and to accommodate the offices of the Commander-in-Chief, Admiral Chester W. Nimitz. The original three-story structure, measuring approximately 50' x 250' in plan, was designed by architect Charles W. Dickey. It originally consisted of a bombproof ground floor and basement and a splinterproof upper level.

As the primary command center for the Pacific Fleet, the building was designed for protection of personnel and equipment in the event of another attack. Like other bombproof structures, Facility 250 was designed with only the lowest floor being fully bombproof and gas-proof. Unlike other bombproof buildings, the lowest level of Facility 250 was underground, while most of the other buildings at Pearl Harbor had no basement.

In 1945, the upper two wood-framed levels were constructed on top of Facility 250 for use as additional administrative office space. The structure reflects two periods of World War II, with the bombproof original portion showing the defensive construction of the early war years, and the wooden addition indicating the period when the U.S. was on the offensive and had no fear of attack. Facility 250 was individually designated a National Historic Landmark (NHL) in 1987. This NHL is separate from and outside the boundaries of the Pearl Harbor NHL.

Facility 619, Submarine Base Headquarters, was originally intended for use as the shore headquarters for the Commander-in-Chief of the Pacific Fleet (Admiral Husband E. Kimmel, at the time). The original footprint of the facility measures 47'-6" x 111'-0" in plan, which includes the projecting toilet room section added on the top of the bombproof airlock, transformer room, and cable vault on the east end of the building, but not the projecting airlock entry on the east end. As with Facility 250, two additional wooden stories were built above the concrete bombproof stories about 1944 for the expanding support staff. The footprint of the wooden addition measures 47'-6" x 91'-0" in plan. In 1968 an abutting two-story concrete building (Facility 1310) was erected on the south side of the original bombproof section. Noted Hawaii architect Vladimir Ossipoff apparently had a hand in the design of Facility 619, because the initials V.O. were found on the Fourteenth Naval District's drawings for the facility (both for the original bombproof building and for the additional wooden stories). The building was under construction at the Submarine Base when the Japanese forces attacked on December 7, 1941. It was completed but never used for headquarters of the Commander-in-Chief of the Pacific Fleet, because of the decision to build a larger building on the Makalapa crater rim (Facility 250). The lower floor of Facility 619 operated as a bombproof telephone exchange and the upper floors included the offices, some living accommodations, and support spaces for the Commander, Submarine Forces, U.S. Pacific Fleet during WWII. After the war these functions continued, except that the living spaces were converted to offices. When Facility 1310 was built the Admiral and top staff moved to that adjacent building, but Facility 619 continued to serve as administrative and supply offices (Arimoto 1994: 2).

Facility S96 is an extant underground building in the neighborhood at the northeast end of Ford Island, but it has been long abandoned and its entrances sealed. It is listed as a "bombproof

shelter" on a 1945 map of the island (Fourteenth Naval District 1945), and called a "Command center" on the Navy's 1945 buildings list (U.S. Navy, Bureau of Yards and Docks 1945: 1083). It is the only known underground command center at Pearl Harbor, and very different from the above-ground ones discussed above. Since only a portion of the shelter has been accessed, and no original drawings for the facility have been located, very little is known about it. A Navy Property Record Card indicates that the footprint of the building is approximately 34' x 98' (Mason Architects, Inc. 2004: 1.3-50). The thickness of the walls is not known.

Communications Facilities

The bombproof communication buildings at Pearl Harbor are Facility 178, Operations and Message Center at Shipyard, and Facility 208, Operational Administration Office (originally Communications and Message Center) for Ford Island.

Facility 178 was designed prior to the Pearl Harbor attack to serve as the Navy Yard Communications Center. The two-story structure, about 30' x 88' in plan, is located behind Facility 1, the Administrative Headquarters, in the Shipyard. Noted Hawaii architect Vladimir Ossipoff appeared to have been involved in the design of this building, also, as indicated by the initials V.O., on the "Arch-Eng" line of the drawings for the facility. The building contains a bombproof and gas-proof communications center on the first level, which housed a "top-secret" code room, and offices on the upper level. The building is of standard bombproof construction with 4'-thick reinforced-concrete walls and interior floors, and 6'-thick reinforced-concrete roof slab. It is surrounded by a 5'-thick reinforced-concrete apron to protect from the results of near misses.

Facility 208, a bombproof Communications and Message Center, was designed in March 1942 as a response to the Pearl Harbor attack. The building, measuring approximately 40' x 87' in plan, is located across Hornet Avenue from Facility 77 (NAS Headquarters) on Ford Island. The structure has the standard features of bombproof construction. It contained a communications center and an emergency transformer vault for "continuity of electrical supply." The WWII antennas on the roof of the building have been replaced by a satellite dish.

Electrical Power Facilities

The bombproof electrical buildings at Pearl Harbor are Facility 177 (Power Plant No. 3) at Shipyard; Facility 41 (Switch Station "C") located off Eighth Avenue near Hale Alii; Facility S 46 (Switch Station "L") located adjacent to Building 150 near the Naval Station Main Gate; Facility 47 (Switch Station "M") located off Avenue G behind Building 157 at Shipyard; Facility S 246 (Substation "C") located near Drydock No. 4; Facility S 633 (Switch Station "H") located near Magazine Loch off North Road; Facility S 638 (Switch Station "E") at Submarine Base; and Facility 6 (Switch Station "G") at Aiea Bay. The last is abandoned and no longer listed on the Navy's database.

Power Plant No. 3 (Facility 177) was constructed by the Pacific Bridge Company in 1943. This building, about 242' x 111' in plan, is divided into four nearly equal areas: two areas, 53'-0" high inside, originally housed boilers and turbo-generators (separated by a 3'-0" thick wall); the other two areas, 25'-0" high, originally contained the substation for the west side of Drydock No. 4 and eight air compressors. These spaces were enclosed by walls 4'-0" thick, a 5'-0" thick sub-floor slab, and a roof slab 4'-0" thick. Above the latter is an air space approximately 8'-0" high, surrounded by four walls, pierced by full height openings and covered with a 6'-0" thick

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roof slab with a 4'-0" overhang. This extra air space and the high first floor make this building the tallest of the bombproof facilities (without extra wooden additions) at Pearl Harbor.

The switching stations and substations were constructed in 1942-43. They are all two-story structures, square or rectangular in plan, and are surrounded on all sides by a 20'-0" wide concrete apron. The smaller switching stations (Facilities S 633, S 46 and 47) are approximately 30' x 39' in plan. The larger switching stations (Facilities 41, S 638 and 6) are about 30' x 70' in plan. Substation C (Facility S 246), at approximately 58' x 88' in plan, is larger than the switch stations.

These structures are key elements of the electrical engineering system developed to accommodate WWII demands for increased and more reliable power. The new interconnected switching station system was a departure from the earlier radial distribution network. The CPNAB report stated:

War demands of the Navy Yard that electrical power be available in continuing, unflinching supply. The equipment required to produce that energy is – particularly under war conditions – very hard to replace. Consequently, the power plant and such substations . . . which house vital equipment are of bombproof and splinterproof construction (Pacific Bridge 1944: 84-85).

All eight of these bombproof electrical power facilities had anti-aircraft gun emplacements built on their thick flat roofs during WWII. The guns have all been removed, but concrete remnants of these gun positions remain on all except Facility S 633. Facility 41 also had another function, since a sign over the door, in a 1945 photo, shows it was the Power Plant Main Office at that date, as well as Switch Station "C."

Personnel Shelters

This building type includes Facility S 99 which is located near Facility 55, the Bachelor Enlisted Quarters on Ford Island; as well as Facilities 180 and 181 which are located near the housing area on the northwest side of Ford Island. These personnel shelters have standard bombproof construction features and are essentially identical in appearance. The buildings have similar floor plans and are all 47'-6" wide. Facility 180, a 200-man shelter, is 77'-2" long; Facilities 181 and S 99, both 300-man shelters, are about 94' long. Standard plans for a 400-man shelter (an example of which was built at Kaneohe Naval Air Station, Facility 217) show that size building as 114'-2" long. All the buildings are constructed on continuous concrete piles and are surrounded by a 5'-0" thick concrete apron. The concrete portions of anti-aircraft gun batteries remain on the roofs of these three Pearl Harbor structures. The batteries are composed of elements seen at other military air fields in Hawaii. See HABS No. HI-279-V for a discussion of a similar battery at Naval Air Station Barbers Point.

Miscellaneous

Facility S 17, a pump house at Shipyard, differs from the other bombproof buildings at Pearl Harbor since it was an alteration of an earlier structure. The pump house, approximately 45' x 115' in plan, was originally constructed in 1919 to service the first drydock at Pearl Harbor. A bombproof roof was added in 1943 as a response to the December 7, 1941 attack on Pearl Harbor, although it had been planned earlier (Pacific Bridge Company n.d.: 4). The Pacific Bridge Company of San Francisco was assigned this work as a change order to a larger

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contract. The company was at the time engaged in the construction of Drydocks Nos. 2, 3 and 4 at Pearl Harbor. Harry R. Byers, Inc. was employed by the contractor to furnish engineering services and supervision in connection with the mechanical and electrical aspects of the project (Pacific Bridge Company 1944: 47).

ARCHITECTS

Standardized plans for the construction of bomb-proof buildings were developed by the Navy Bureau of Yards and Docks. However, architects and engineers were generally utilized to adapt the standard plans to their specific sites and functions. Significant architect/engineers associated with the design of the bombproof structures at Pearl Harbor include Albert Kahn, Charles W. Dickey, and Vladimir Ossipoff.

Albert Kahn

Architect Albert Kahn of Detroit, Michigan designed many of the buildings at Navy bases in Hawaii and the Pacific (Contractors Pacific Naval Air Bases n.d.: A-338). He was "one of the country's foremost industrial designers, and had been chosen to prepare plans for the barracks, messhalls, and hangars that could be standardized for the various bases" (Woodbury 1946: 76). Facility 167 was the only one of Kahn's buildings at Pearl Harbor that included a bombproof section, and this was added later, as noted above. German-born, but raised in the United States, Kahn specialized in factory design and had several commissions from the Ford Motor Co. (Richards 1977: 163). His buildings were noted for their simplicity, efficiency, and use of natural light. The firm also became famous for the speed of its design process when a huge aircraft factory in Baltimore was completed, from design to construction, in 81 days (Bucci 1993: 105). This simplicity of design and construction was much needed and appreciated when Kahn's firm was awarded the contracts to design buildings for the new Navy bases in the Pacific, as well as for established installations on the West Coast and Eastern Seaboard.

Charles W. Dickey

Architect Charles W. Dickey, scion of a Maui *kamaaina* family, was born in California in 1871. The family returned to Maui when young Charles was two years old. He was trained as an architect at the Massachusetts Institute of Technology. He returned to Maui in 1895 and in 1896 joined the office of C.B. Ripley, who may have been the first trained architect to come to Hawaii with the intention of operating a professional practice (*Honolulu Star-Bulletin* 1992). Due to economic downturn in Hawaii, Dickey relocated to Oakland, California in 1905, where he concentrated on schools, banks, and other public buildings (Jay 1992: 77). Dickey finally settled in Hawaii in 1924 and remained in practice there until his death in 1942.

With the enormous American military build-up in Hawaii in the months before the outbreak of World War II, Dickey turned his attentions to the problem of housing the rapidly increasing military population in the vicinity of Pearl Harbor. The day after the surprise attack on Pearl Harbor, Dickey held a meeting in his downtown office to begin planning the citywide blackout and other civil defense measures. During the first months of the war, Dickey's attention was focused almost exclusively on construction projects at Pearl Harbor and other Oahu military bases (Jay 1992: 178). In addition to Facility 250, Dickey's firm designed a number of buildings at Pearl Harbor during the early 1940s, including all the housing at Makalapa (see HABS No. HI-355), the Naval Air Station (NAS) Headquarters building (Facility 77) on Ford Island (see

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HABS No. HI-68), as well as the Dispensary (Facility 76) (see HABS No. HI-381), and the Bachelor Officers Quarters (Facility 78) (see HABS No. HI-382) at the NAS. Dickey never lived to see the end of the war; after a brief illness, he died in April 1942.

Vladimir Ossipoff

Architect Vladimir Ossipoff was born in Vladivostock, Russia in 1907, and grew up in Tokyo, where his father was a military attaché at the Russian embassy. The family emigrated to the United States in 1923. Ossipoff graduated from the University of California at Berkeley in 1931 with a degree in architecture. He came to Hawaii in 1932 to visit a classmate and took a job with Theo H. Davies, moving on in 1935 to the firms of Charles Dickey and Claude Steihl, then opening his own firm (Mason 1998).

As World War II approached and military construction accelerated in the islands, Ossipoff undertook projects such as a 2,000-man mess hall and a bomb-shelter. When the war broke out, he like all other architectural firms in Hawaii, except Dickey and Associates, suspended their private practices (Mason 1998). He spent about five years in the 1940s working as a Project Engineer for Contractors Pacific Naval Air Bases and the Navy (Murphy 1956: 30). It was while working for the Navy that he apparently became involved with the bombproof structures, Facility 178 (Operations and Message Center) and Facility 619 (Telephone Exchange Building). After the war, Ossipoff returned to private practice.

His work, which included many residences, was recognized as masterful by his contemporaries. Ossipoff's architecture is sophisticated and modern with extensive use of natural materials; it exploits indoor/outdoor relationships and respects Hawaii's climate and culture without being trendy or nostalgic. His office produced an impressive amount of work: a recent recounting of the firm's project list showed over 1,000 projects completed during its 62 years. Among his public buildings are the Pacific Club, the Outrigger Canoe Club, Thurston Memorial Chapel at Punahou, the IBM Building, Hawaii Preparatory Academy, and the University of Hawaii's administration building (Bachman Hall). In the 1940s and '50s he designed many homes in the then-new suburbs of Waiialae-Kahala and Aina Haina. Val Ossipoff was posthumously awarded the Hawaii State Council/American Institute of Architects' Medal of Honor in 1998.

SOURCES

A. DRAWINGS

There are numerous drawings for specific bombproof facilities on microfiche cards at the Plan Files of the Naval Facilities Engineering Command, Pacific. These are referenced in the HABS reports for individual facilities. A few typical drawings are reproduced in this report.

B. EARLY VIEWS

There are numerous aerial and facility-specific photographs of Pearl Harbor in the Still Photo section of National Archives II, College Park, Maryland. One of the Bureau of Yards & Docks record groups, RG 71 CA, has the most useful set of historic photos. Many of the same photographs are also located in the 14th Naval District Photograph Collection, maintained by the National Park Service, U.S.S. Arizona Memorial Association. At Port Hueneme, California

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the archives of the Naval Facilities Engineering Command include over 100 photographs of Pearl Harbor taken by G.E. Kidder Smith in 1945, including some of bombproof facilities. Two historic photographs are included in this overview report.

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D. LIKELY SOURCES NOT YET INVESTIGATED

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National Archives, Pacific Sierra Region, 1000 Commodore Drive, San Bruno, California
94066, ph. (415) 876-9009.

Navy Historical Center, Washington Navy Yard, 805 Kidder Breese, S.E., Washington,
D.C. 20734, ph. (202) 433-4131.

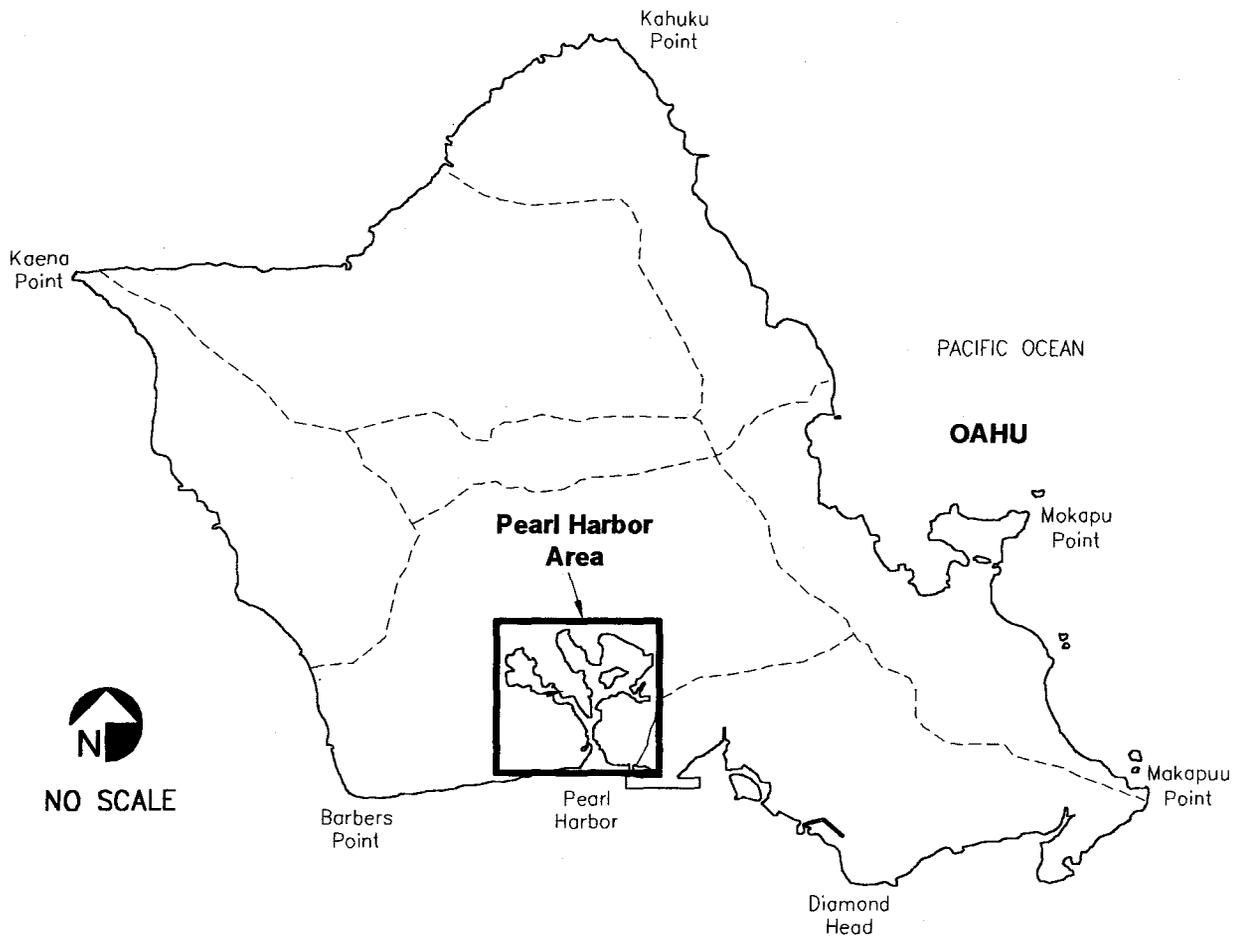
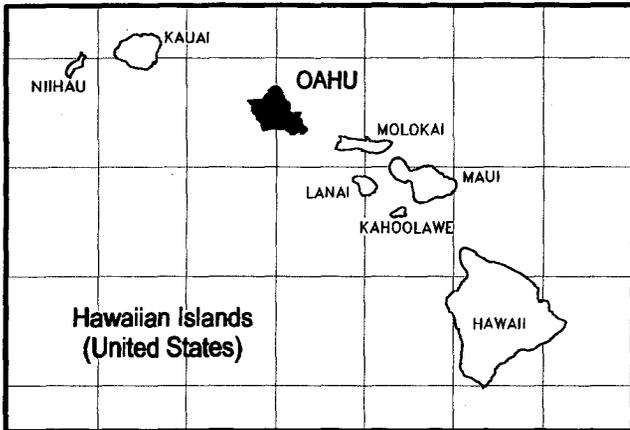
PROJECT INFORMATION

Commander Navy Region (COMNAVREG) Hawaii has embarked on a program of documentation of historic properties within its area of responsibility, with the goal of recording historic information about each property or set of facilities. In order to establish the context of significance for this facility group, this overview report was prepared. This information will assist COMNAVREG Hawaii in the appropriate management of these properties, be it routine repair and maintenance for continuing use, rehabilitation for continuing use / adaptive reuse, or demolition. This report was prepared under a Historic Preservation Services contract (N62742-97-D-3502) awarded to AMEC Earth and Environmental, the prime contractor, by the U.S. Navy, Naval Facilities Engineering Command, Pacific. The contract was funded through the Cultural Resources Program of COMNAVREG Hawaii. The photographic documentation was undertaken by David Franzen of Franzen Photography. The overall state and Oahu location map was made by Nestor Beltran of NAB Graphics. The map showing the locations of the bombproof facilities at Pearl Harbor was done by Angela Stiber, Historical Architect at Mason Architects, Inc. This report was researched and written Barbara Shideler and Ann Yoklavich at Mason Architects, Inc.

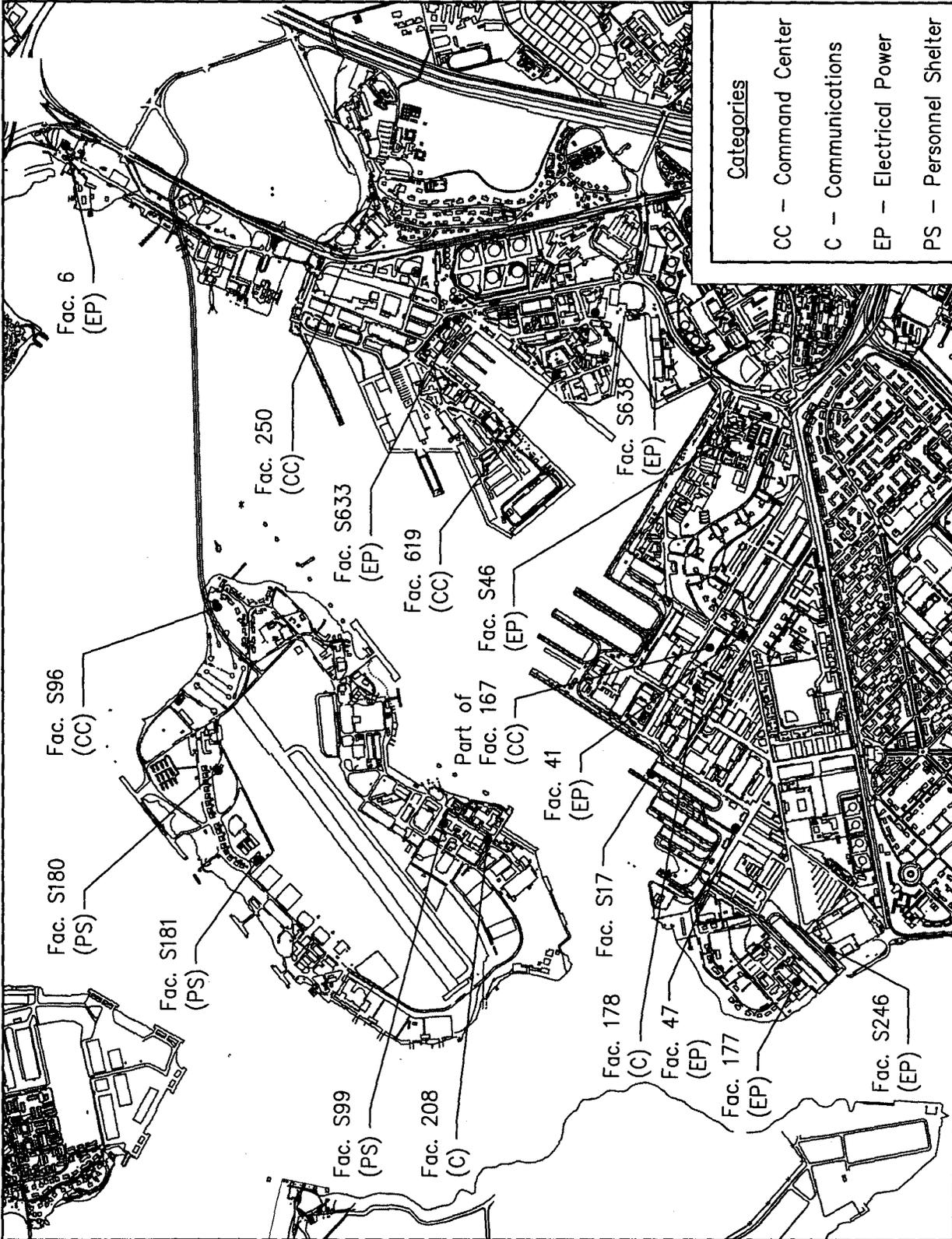
Prepared by: Barbara Shideler, AIA, Historical Architect and
Ann Yoklavich, Architectural Historian
Mason Architects, Inc.
119 Merchant Street, Suite 501
Honolulu, HI 96813

Date of Final Report: October 2004

U.S. NAVAL BASE, PEARL HARBOR, BOMBPROOF FACILITIES
HABS No. HI-391 (Page 13)

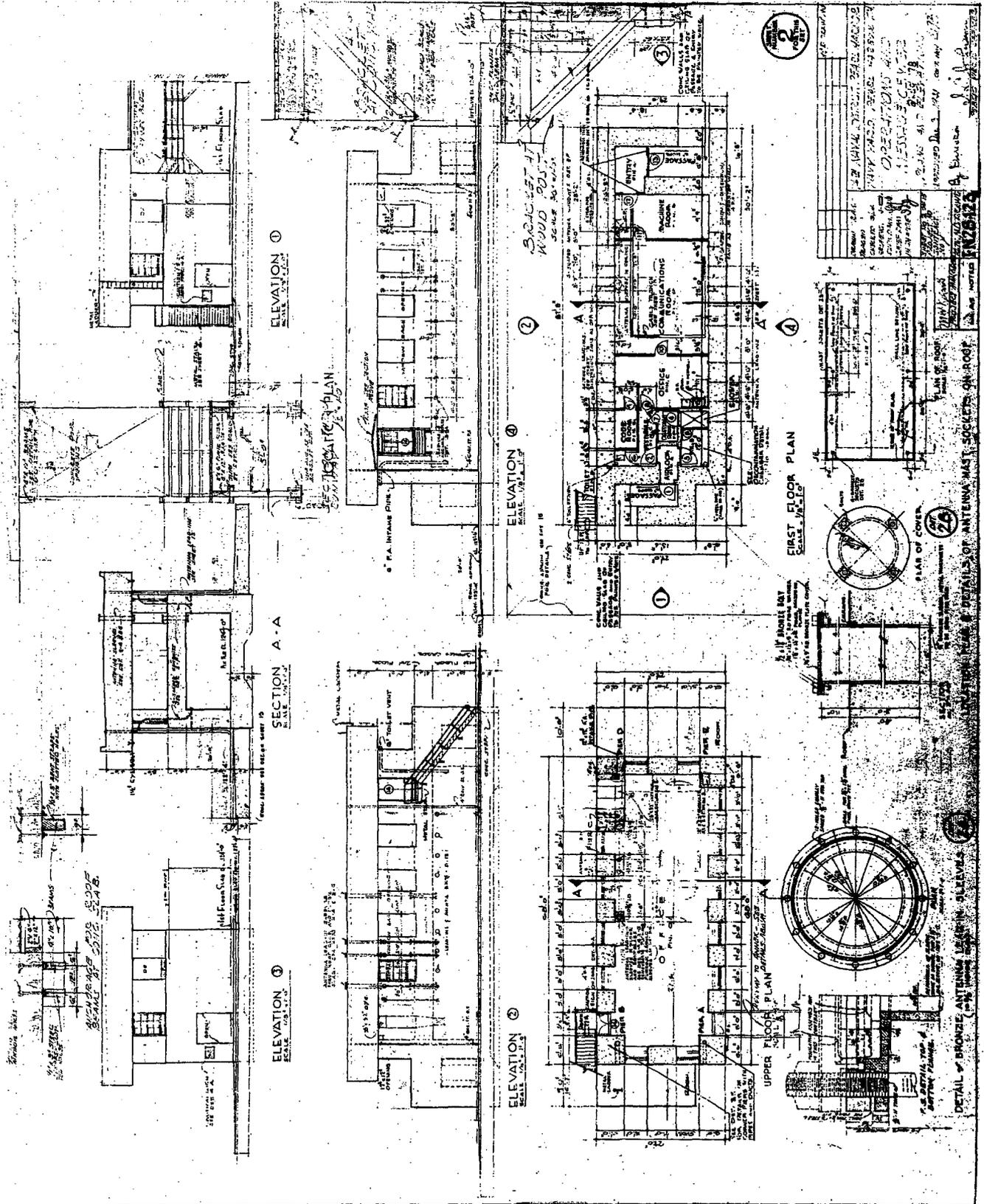


U.S. NAVAL BASE, PEARL HARBOR, BOMBPROOF FACILITIES
HABS No. HI-391 (Page 14)

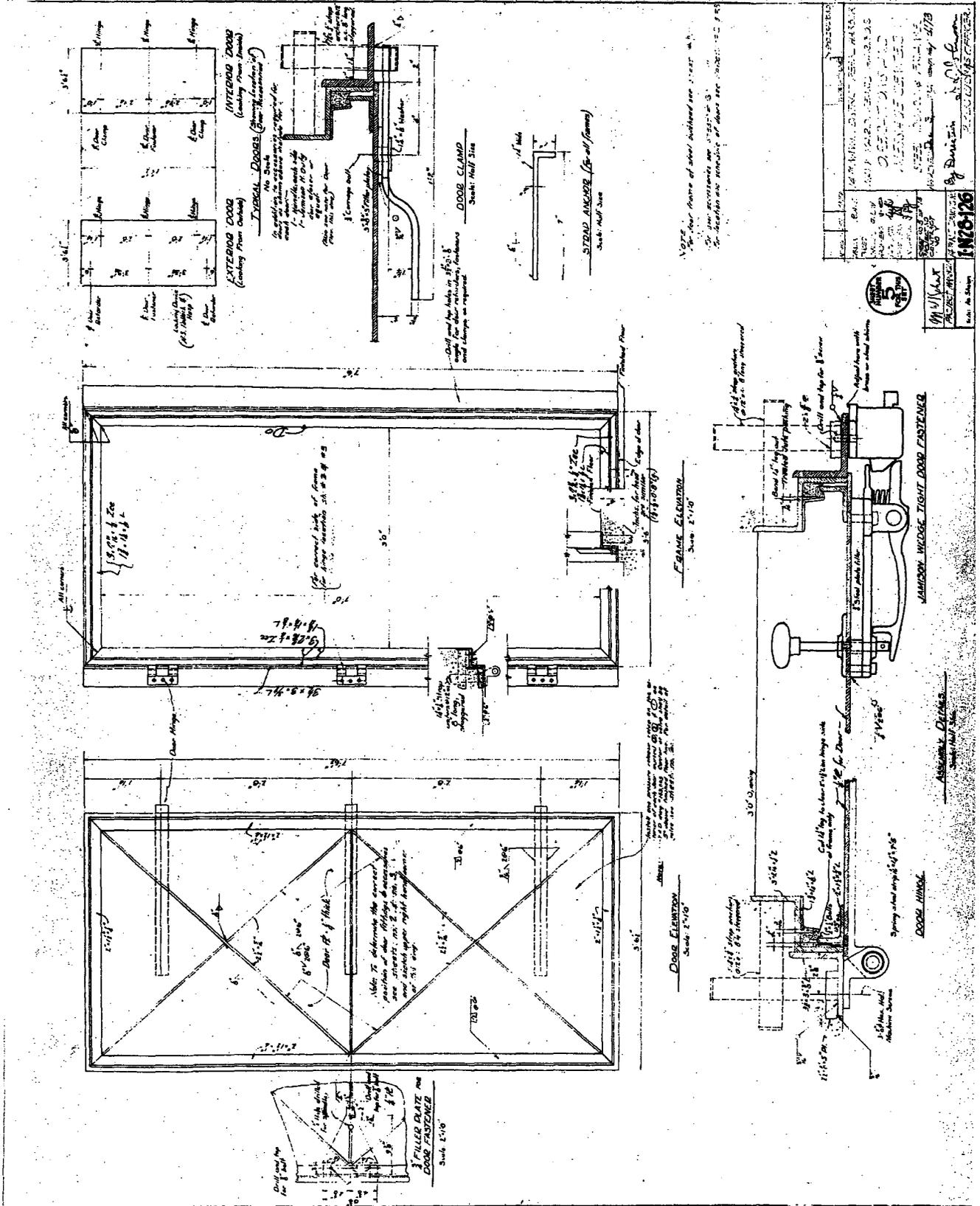


Locations & Categories of Bombproof Buildings

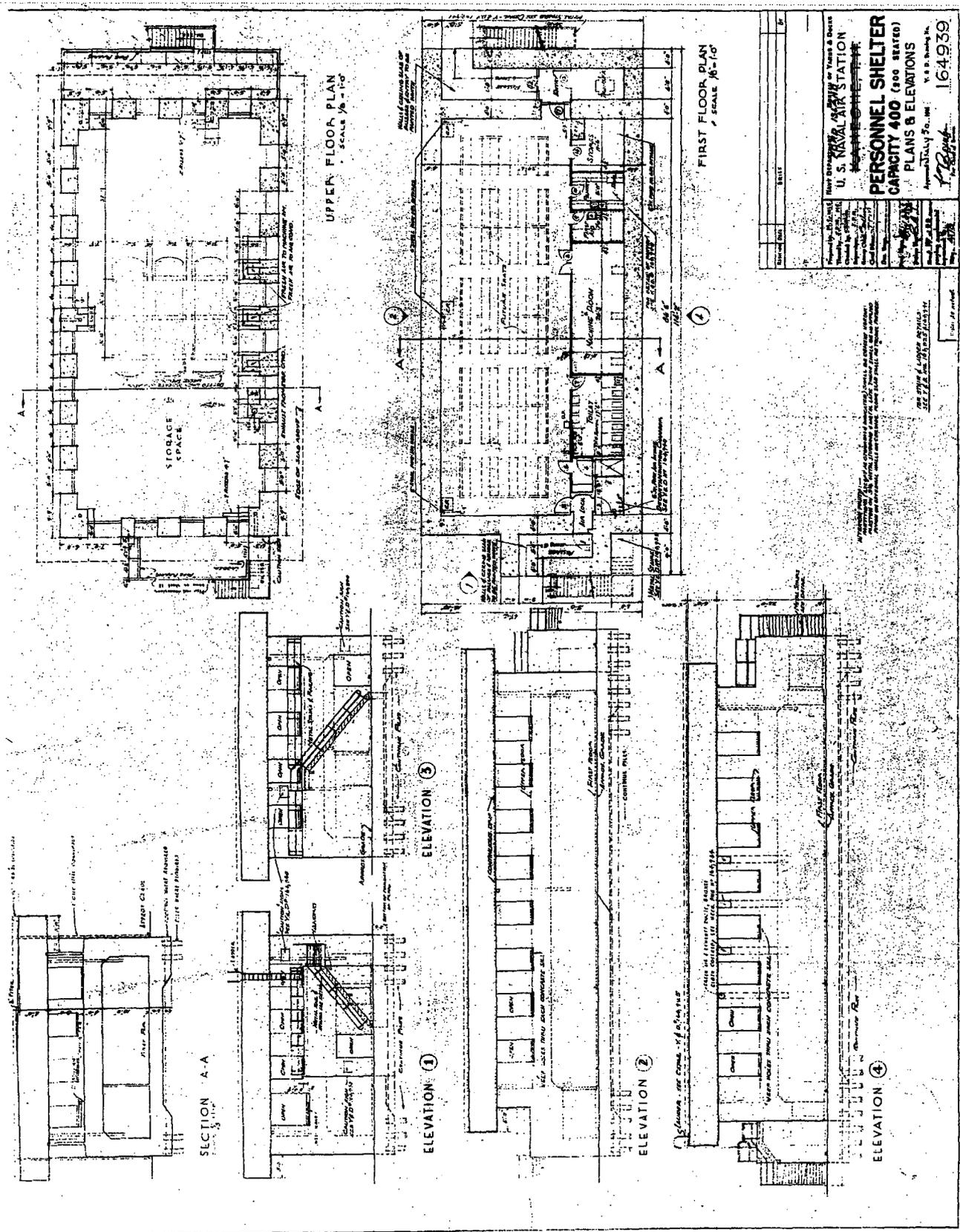
1941 Drawing of Fac. 178: Plans and Elevations (14th N.D. Drawing no. I-N28-123)



1941 Drawing of Fac. 178: Steel Doors and Frame (14th N.D. Drawing no. I-N28-126)



1941 Drawing of Fac. S 99: Plans and Elevations (Y & D Drawing no. 164939)



NO. 164939	DATE	BY	CHECKED
<p>U. S. NAVAL ARCHITECTURE PERSONNEL SHELTER CAPACITY 400 (300 SEATED) PLANS & ELEVATIONS</p>			
U. S. NAVAL ARCHITECTURE WASHINGTON, D. C.		U. S. NAVAL ARCHITECTURE PEARL HARBOR, T. H.	
DRAWN BY: [Name] CHECKED BY: [Name]		DATE: [Date] SCALE: 1/8" = 1'-0"	

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