NPS Form 10-900a
(8-86)

OMB No. 1024-0018

United States Department of the Interior
National Park Service

NATIONAL REGISTER OF HISTORIC PLACES CONTINUATION SHEET

Section _____ Page ___

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SUPPLEMENTARY LISTING RECORD

NRIS Reference Number: 08000086 Date Listed: 6/11/2008

Torpedo Storehouse-Torpedo (Mine) Assembly Building & Long Range Accuracy Storage Building | San Francisco | CA
Property Name | County | State

N/A
Multiple Name

This property is listed in the National Register of Historic Places in accordance with the attached nomination documentation subject to the following exceptions, exclusions, or amendments, notwithstanding the National Park Service certification included in the nomination documentation.

Signature of the Keeper — Date of Action: 6/11/2008

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Amended Items in Nomination:

Location:
The Location block should read: *East Point; North shore of Yerba Buena Island.*

Acreage:
The correct acreage should be listed as: *less than one (1) acre.*

These clarifications were confirmed with the NAVY FPO office.

DISTRIBUTION:
National Register property file
Nominating Authority (without nomination attachment)

NPS Form 10-900
(Oct.1990)

OMB No. 1024-0018

United States Department of the Interior
National Park Service

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National Register of Historic Places Registration Form

This form is for use in nominating or requesting determinations for individual properties and districts. See instructions in *How to Complete the National Register of Historic Places Registration Form* (National Register Bulletin 16A). Complete each item by marking "x" in the appropriate box or by entering the information requested. If any item does not apply to the property being documented, enter "N/A" for "not applicable." For functions, architectural classification, materials, and areas of significance, enter only categories and subcategories from the instructions. Place additional entries and narrative items on continuation sheets (NPS Form 10-900a). Use a typewriter, word processor, or computer, to complete all items.

1. Name of Property

historic name Torpedo Storehouse, Torpedo (Mine) Assembly Building, & Long Range Accuracy Storage Building

other names/site number Building 262 113424

2. Location

street & number _____ ☐ not for publication

city or town Yerba Buena Island, San Francisco ☐ vicinity

state California code CA county San Francisco code 075 zip code 94130

3. State/Federal Agency Certification

As the designated authority under the National Historic Preservation Act of 1986, as amended, I hereby certify that this ☒ nomination ☐ request for determination of eligibility meets the documentation standards for registering properties in the National Register of Historic Places and meets the procedural and professional requirements set forth in 36 CFR Part 60. In my opinion, the property ☒ meets ☐ does not meet the National Register Criteria. I recommend that this property be considered significant ☐ nationally ☒ statewide ☐ locally. (☐ See continuation sheet for additional comments.)

DFPO 17 December 2007
Signature of certifying official/Title Date

NAVY
State or Federal agency and bureau

In my opinion, the property ☒ meets ☐ does not meet the National Register criteria. (☐ See continuation sheet for additional comments.)

DSHPO 7/6/07
Signature of commenting or other official Date

State or Federal agency and bureau

4. National Park Service Certification

I hereby certify that this property is:

☒ entered in the National Register
☐ See continuation sheet.
☐ determined eligible for the National Register
☐ See continuation sheet.
☐ determined not eligible for the National Register
☐ removed from the National Register
☐ other (explain): _____

Signature of the Keeper — Date of Action

6/11/2008

5. Classification

Ownership of Property
(Check as many boxes as apply)

- ☐ private
- ☐ public-local
- ☐ public-State
- ☒ public-Federal

Category of Property
(Check only one box)

- ☒ building(s)
- ☐ district
- ☐ site
- ☐ structure
- ☐ object

Number of Resources within Property
(Do not include previously listed resources in the count.)

Contributing	Noncontributing	
1		buildings
		sites
		structures
		objects
1		Total

Name of related multiple property listing
(Enter "N/A" if property is not part of a multiple property listing.)

N/A

Number of contributing resources previously listed in the National Register

None

6. Function or Use

Historic Functions
(Enter categories from instructions)

DEFENSE/Arms Storage = Torpedo Station
DEFENSE/Arms Storage = Torpedo Assembly Building
DEFENSE/Arms Storage = Long Range Accuracy Storage

Current Functions
(Enter categories from instructions)

VACANT/NOT IN USE

7. Description

Architectural Classification
(Enter categories from instructions)

LATE 19TH CENTURY REVIVAL: Classical Revival = Neo-Classical Revival

Materials
(Enter categories from instructions)

foundation CONCRETE: Reinforced Concrete
roof METAL: Corrugated Metal
walls CONCRETE: Reinforced Concrete
other

Narrative Description
(Describe the historic and current condition of the property on one or more continuation sheets.)

See Continuation sheet.

8. Statement of Significance

Applicable National Register Criteria
(Mark "x" in one or more boxes for the criteria qualifying the property for National Register listing)

☒ A Property is associated with events that have made a significant contribution to the broad patterns of our history.

☐ B Property is associated with the lives of persons significant in our past.

☒ C Property embodies the distinctive characteristics of a type, period, or method of construction or represents the work of a master, or possesses high artistic values, or represents a significant and distinguishable entity whose components lack individual distinction.

☐ D Property has yielded, or is likely to yield information important in prehistory or history.

Criteria Considerations
(Mark "X" in all the boxes that apply.)

Property is:

☐ A owned by a religious institution or used for religious purposes.

☐ B removed from its original location.

☐ C a birthplace or a grave.

☐ D a cemetery.

☐ E a reconstructed building, object, or structure.

☐ F a commemorative property.

☐ G less than 50 years of age or achieved significance within the past 50 years.

Areas of Significance
(Enter categories from instructions)
Military
Architecture

Period of Significance
1891-1953

Significant Dates
1891

Significant Person
(Complete if Criterion B is marked above)

Cultural Affiliation

Architect/Builder
Ransome, Ernest Leslie
Ransome and Cushing
Percy, George W.
Percy and Hamilton
Hamilton, F. F.

Narrative Statement of Significance
See Page 7

9. Major Bibliographical References

(Cite the books, articles, and other sources used in preparing this form on one or more continuation sheets.)

Previous documentation on file (NPS):
- ☐ preliminary determination of individual listing (36 CFR 67) has been requested.
- ☐ previously listed in the National Register
- ☐ previously determined eligible by the National Register
- ☐ designated a National Historic Landmark
- ☐ recorded by Historic American Buildings Survey # _____
- ☒ recorded by Historic American Engineering Record # CA-232

Primary Location of Additional Data
- ☒ State Historic Preservation Office
- ☐ Other State agency
- ☐ Federal agency
- ☐ Local government
- ☐ University
- ☐ Other

Name of repository:

10. Geographical Data

Acreage of Property

UTM References
(Place additional UTM references on a continuation sheet)

	Zone	Easting	Northing		Zone	Easting	Northing
1	10	556481	4185259	3			
2				4			

☐ See continuation sheet.

Verbal Boundary Description
(Describe the boundaries of the property on a continuation sheet.)

Boundary Justification
(Explain why the boundaries were selected on a continuation sheet.)

11. Form Prepared By

name/title Toni Webb, Architectural Historian

organization JRP Historical Consulting date March 29, 2004

street & number 1490 Drew Avenue, Suite 110 telephone 530-757-2521

city or town Davis state CA zip code 95616

Additional Documentation

Submit the following items with the completed form:

Continuation Sheets

Maps

A **USGS map** (7.5 or 15 minute series) indicating the property's location.

A **Sketch map** for historic districts and properties having large acreage or numerous resources.

Photographs

Representative **black and white photographs** of the property.

Additional items
(Check with the SHPO or FPO for any additional items)

Property Owner

(Complete this item at the request of the SHPO or FPO.)

name Base Realignment and Closure, Program Management Office West

street & number 1455 Frazee Road, Suite 900 telephone

city or town San Diego state CA zip code 92108-4310

Description (continued):

The Torpedo Assembly Building is located just north of the elevated, cantilevered spans of the San Francisco-Oakland Bay Bridge/Interstate 80 at the East Point, also known as Army Point, of the 155-acre Yerba Buena Island, about three miles west of the City of San Francisco. Sitting at sea level, approximately 25'-0" from San Francisco Bay's shoreline, this building is surrounded on the north, east, and south sides by a dirt access road built for the construction of the building. A hillside covered with dense vegetation is sited to the west of the building. At the time of recordation, California Department of Transportation was constructing towers for the new east spans of the San Francisco-Oakland Bay Bridge, which are located approximately 200'-0" west of the building. Although the East Point originally incorporated other buildings and structures, including a keeper's cottage, various tanks and a dock, the Torpedo Assembly Building is the only structure existing today. However, concrete supports for a tank are still extant at the southwest corner of the building (see **Figure 4** for a view of the complex in 1934).

The Torpedo Assembly Building is a one-story rectangular, reinforced concrete building constructed on a concrete slab. Facing southeast and measuring 158'-0" x 72'-0" with 24'-0" high walls about 0'-18" thick, it is uncomplicated in its symmetrical, Neo-Classical design. The walls are formed using Ernest Leslie Ransome's patented method of patterned molds, which create joint lines that simulate stone masonry joints. The wall surface is then tooled to produce a finished stone-like appearance.[1] In this instance, the Torpedo Assembly Building has a rusticated finish that exposes aggregate, with V-shaped joints (see **Photographs 1** through **13**). The building is topped by corrugated metal roof supported by steel trusses and wood rafters. Historic photographs reveal that the roof was replaced after 1937. Clearly visible in **Figure 4** are the roof's projecting eaves, no longer extant today. The main facades, the south and north sides shown in **Photographs 3** and **6**, are dominated by a central, semicircular arched doorway with fanlight transom surrounded on each side by a sixteen-light wood casement window with six-light wood fanlight. A twelve-light semicircular arched window is centered above the doorway (**Photograph 7**). The remaining sides of the building are identical, divided into six bays, each with a window matching those on the main facades (**Photographs 4, 5,** and **9**). These windows are highlighted by molded concrete that emulates stepped voussoirs, with the peak voussoirs being the keystone. It appears that some of the building's original window glazing remains, but is currently underneath protective wood shutters installed by the Navy during base layaway. The interior of the building is divided into two interior rooms, each of equal size measuring 72 feet square. Narrow gauge railroad tracks have been laid into the concrete floors of the building and are still evident (**Photograph 11**).

[1] Ernest L. Ransome, Letters Patent No.405,800 "Finishing Concrete and Artificial-Stone Surfaces" June 25, 1889.

Statement of Significance:

Building 262 historically has been known as the Torpedo Storehouse, Torpedo (Mine) Assembly Building, and Long Range Accuracy Storage Building. However, for this discussion, it will be referred to as the Torpedo Assembly Building. As the only extant building constructed by the Army on Yerba Buena Island, this building is significant under Criterion A for its important association with the development of the military presence on Yerba Buena Island. It also is significant under Criterion C as a significant and rare example of an early reinforced concrete building, and as a representative example of a significant work by Ernest Leslie Ransome. The building retains a very high degree of integrity to its period of significance between 1891, the date of its construction, through 1953, when the building became a Long Range Accuracy (LORAC) Storage facility.

Historical Background

The history of Yerba Buena Islands extends into the 18th century when Spanish explorer Juan Manuel de Ayala first recorded the island in 1775. During the early period, it was sparsely populated and subject to a succession of private owners who did little to develop the land. Ayala named the 155-acre island Isla de los Alcatraces, or Alcatraz, although another island subsequently assumed that title and Yerba Buena officially remained nameless for many years. During the early American period, the island also became known as Goat Island, after the herd of goats that grazed there in the 1830s, but "Yerba Buena" was already the unofficial adopted name, used by the local Spanish and Mexican citizens. With the exception of a few settlers, there was little settlement on the island prior to the island's U.S. military presence.[2]

After the war with Mexico in 1848, the military took over all aspects of law enforcement in the isolated California Territory. In particular, the Army was an important force in domestic order of the United States' newest frontier. The federal government established dozens of military installations, mostly Army posts, all over California between 1846 and 1865. Their primary purposes were to impose order and to control conflicts between the Indian and white population. Most of the permanent facilities, like the Army's San Francisco Presidio and Benicia Arsenal, and Mare Island Naval Shipyard, were located in the San Francisco Bay Area, but over the years, other sub-installations to the Presidio were constructed such as coastal defense batteries, which included one on Yerba Buena Island. The onset of the Civil War in 1861 transformed the mission of the main Army facility in the Bay Area. For example, the Presidio's primary concern went from frontier law

[2] Unless otherwise noted, the general history of the Yerba Buena Island and Naval Station Treasure Island is taken from the following works: Mare Island Naval Shipyard, BRAC Environmental Division. "Historical Study of Yerba Buena Island, Treasure Island and Their Buildings," Revision 1 (prepared for Environmental Department, Naval Station March 1996); JRP Historical Consulting Services, "Cultural Resource Inventory and Evaluation Investigations: Yerba Buena Island and Treasure Island Naval Station Treasure Island, San Francisco, California, March 1997," (prepared for Engineering Field Activity, West, Naval Facilities Engineering Command); JRP Historical Consulting Services, "History and Historic Resources of the Military in California, 1796 to 1989," Volume II of *California Historic Military Buildings and Structures Inventory* (prepared for the US Army Corps of Engineers, Sacramento District, March 2000); Historic American Engineering Record, HAER No. CA-232, Torpedo Assembly Building (Naval Training Station, Building 262) San Francisco, San Francisco County, California, July 1998.

enforcement to coastal defense, and its forces were increased accordingly. Part of the nation's coastal defense, both the Army and Navy attempted to occupy three islands within the San Francisco Bay in the 1850s and 1860s: Alcatraz, Angel and Yerba Buena islands. Both Angel and Alcatraz islands were used by the Army during the Civil War as a temporary prison, training camp and general coastal defense, but neither of these posts grew into major installations. In the same manner, the Army began occupation of Yerba Buena Island as its third line of defense in the bay just after the end of the war. Since early 1867, when the Army established a post on the island, the history of Yerba Buena Island has been dominated by its military occupation, first by the Army, and later by the Coast Guard and Navy.

While the first recommendation for garrisoning Yerba Buena Island came from the Navy in 1861, it would be a year before the Army included the island in its plans for coastal defense. Nevertheless, construction was delayed until after the end of the Civil War. Fearing plans by Confederates to invade the harbor, engineers recommended two batteries on Yerba Buena Island. Given that the primary line of defense was still incomplete at that time, the Army determined a battery on Yerba Buena Island of secondary importance and construction plans were canceled. It would be another five years before any plans were initiated for a military post on the island.[3]

There was some controversy over the Army's taking of the island for military use that led to private citizens pursuing litigation for the compensation of the government's taking of the land. The military based its taking of the island on an 1838 Mexican decree that declared California's islands were "... added to the territory for public distribution ..." and the 1848 Treaty of Guadalupe-Hidalgo, in which Mexico transferred Upper California, including the coastal islands, to the United States government. Two years later, President Fillmore issued a Presidential order asserting the federal government as owner of the California's coastal islands. It was seventeen years before the Army established military presence on the island in early 1867.

The Army retained possession of Yerba Buena Island, also known as Camp Yerba Buena, for 31 years, but its occupation of the island was intermittent. During its first period of occupation, which covered just twelve years between 1867 and 1879, the Army constructed and operated an artillery post and quartermaster depot. Built on the east side of the island, the island's only naturally flat terrain, and west of the present location of the Torpedo Assembly Building, the post garrisoned up to 150 men. Various wood-frame support buildings included a large, two-wing barracks, a mess hall, laundresses' quarters, commanding officer's quarters, hospital, guard house, bakery, sutler store, engineer's store house, wharf, and a boat house. Similar to most early military installations, these buildings were built around an open parade ground, shown in **Figure 1**. Within the first year, a detachment of 125 men arrived on the island, and by 1871, the Army's Fourth Artillery Detachment was assigned to Yerba Buena Island. The following year, the Army officially listed the post as a quartermaster depot.

[3] Colonel Herbert M. Hart, "Historic California Posts: Camp Yerba Buena Island," at the California State Military Museum, www.militarymuseum.org/YBI.html, accessed March 19, 2004.

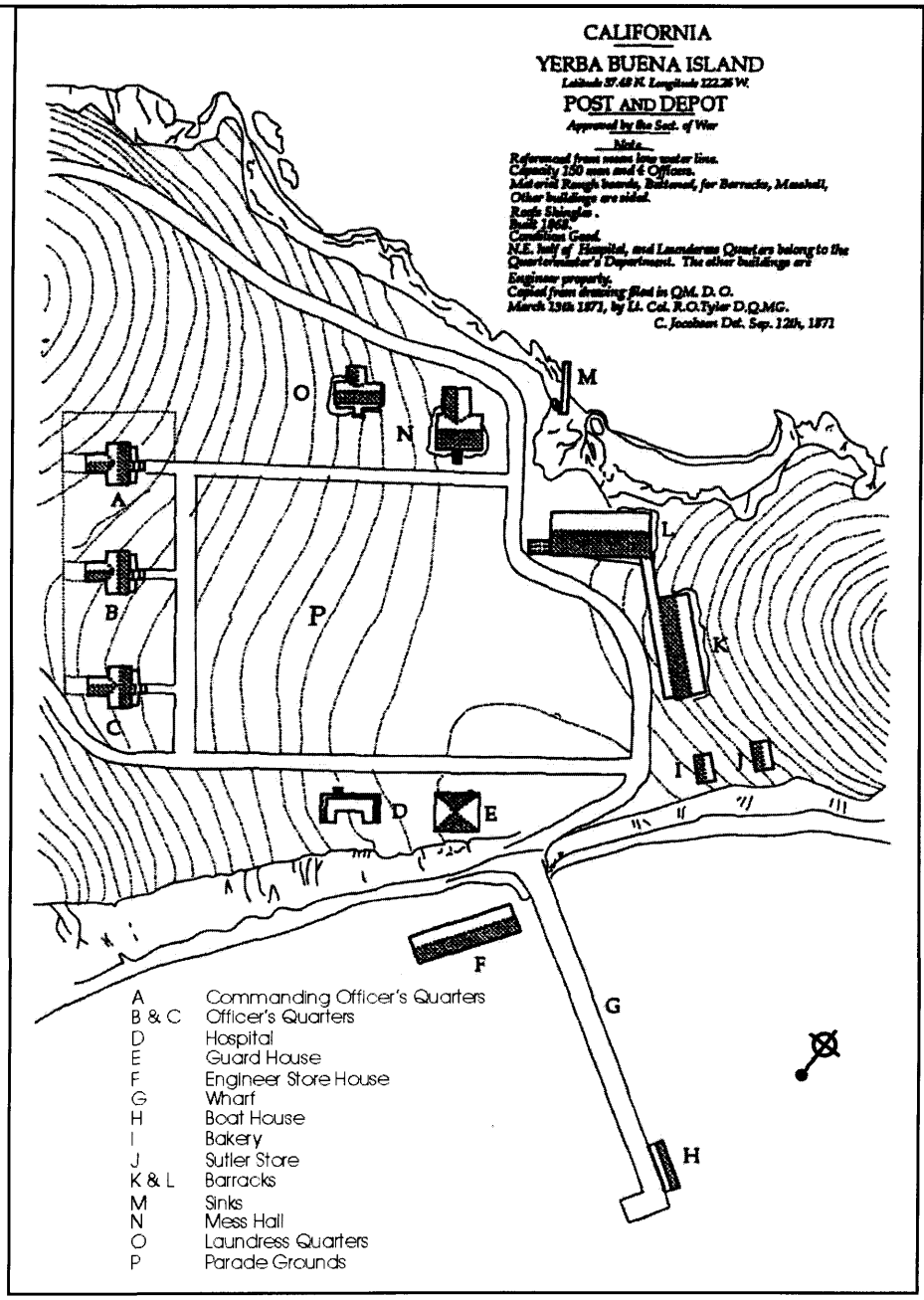

Figure 1. *Cartograph of the Army Post and Depot, Yerba Buena Island, 1871.* [Reproduced via computer by BRAC Environmental Technical Division in "Historical Study of Yerba Buena Island, Treasure Island and their Buildings," 1996.]

Around this time, the Secretary of War authorized the Department of Treasury to install a lighthouse on the south point of the island in 1875, and subsequent support structures, like a wharf and warehouses, were constructed nearby. With the building of additional structures, including storehouses, shops, dock and two residences, the facility eventually became the Twelfth Light House District Light House Reservation and Buoy Depot, providing supplies to all 28 lighthouses in the district. These buildings have remained in continuous use, and currently the Vice Admiral of the US Coast Guard resides in the lighthouse keeper's residence. Although a modest operation during the nineteenth and early twentieth century, over the years the Coast Guard installation has grown into a major presence on the island.

By 1875, the Army barracks at Yerba Buena Island were destroyed by fire and just four years later, the Fourth Artillery Detachment transferred back to the Presidio, as did the Quartermaster. Many of the remaining buildings were dismantled and moved to other installations. Only two buildings (Quarters 11 and 12) are known to exist today, moved and rebuilt on Angel Island. Over the next two years, the island was deserted, and although the Army closed its post, it never officially relinquished ownership or control of the island. A decade passed before the Army reoccupied the island.

By 1883, experimentation with submarine mines, then called torpedoes, advanced substantially, enough for the Office of Chief Engineers to send a shipment of buoyant torpedoes to Corps of Engineers Lieutenant Colonel George H. Mendell in San Francisco in 1884. Stored in an unfinished casemated barrack on Alcatraz Island, the torpedoes rusted within months of arrival, prompting Mendell to recommend the construction of a permanent storehouse on Yerba Buena Island. Located near the mouth of San Francisco Bay, the island site was effective for the function of a torpedo station. It could serve as a second line of defense, and also protected torpedoes from rust associated with ocean fogs.[4]

Mendell designed a "torpedo shed" that would measure 158'-0" x 48'-0" on the interior. He called for walls of brick construction with a metal roof, concrete floor and two, four-tier wood racks that would measure 110'-0" x 16"-0" and hold 576 torpedoes. It took more than two years to obtain funding for the construction of a permanent torpedo shed, and in early 1889 Congress passed an appropriation of $250,000 for "Torpedoes for Harbor Defense." Congress allocated $60,000 for two casemates, or bomb-proof rooms, on Alcatraz and Fort Mason, and an additional share was allotted for torpedo storage shed at Yerba Buena Island. Although Mendell was in charge of the construction of the torpedo sheds, the building constructed on Yerba Buena Island was not his original design. By the time funds were available, the cost of bricks had increased by over 30 percent. Consequently, Mendell suggested the building be constructed with reinforced concrete, a material that although in its infancy, had been gaining popularity in commercial and industrial construction throughout the United States over the previous ten years. With the approval of the chief engineer, Mendell sought out the leading expert in the field of reinforced concrete, Ernest Leslie Ransome, of Ransome and Cushing.[5] Ransome may have collaborated with the San Francisco architectural firm of Percy and Hamilton, which has been

[4] Erwin N. Thompson, "Historic Resource Study, Seacoast Fortifications, San Francisco Harbor, Golden Gate National Recreation Area, California," (National Park Service, 1979) 121-124.
[5] Thompson, "Seacoast Fortifications," 121-124.

credited with the architectural design of the Torpedo Assembly Building in previous documentation.[6]

Completed in 1891, the torpedo shed measured 158'-0" x 72'-0" with 24'-0" high walls and had the capacity to store over 1,100 torpedoes. The Torpedo Station was controlled by the Army Quartermaster until the next year, when they relinquished control to the Army Corps of Engineers.[7] Inspected in 1893 by Mendell, the station included a $2,000, one-and-a-half story, wood-frame keeper's cottage, and 80'-0" x 60'-0" wharf with two derricks operated by a portable steam engine for loading torpedoes. While materials for narrow gauge rails were on site, construction was not yet started. By this time the torpedo shed housed 579 torpedoes, and a powder magazine and loading room was yet to be completed.[8]

The mine depot was actively used over the next decade, but as coastal defense strategies changed, the station became obsolete. In 1898, under an executive order signed by President McKinley, the majority of Yerba Buena Island was set aside for a Naval Training Station. Two exceptions to this order were the Torpedo Station and Lighthouse, which remained under the control of the Army and Lighthouse Service respectively. By 1903, the operation and management of mines in the San Francisco Bay was transferred from the Army Corps of Engineers to the Coast Artillery Corps. Unhappy with the location of the depot on Yerba Buena Island, the Artillery Corps constructed a new depot and wharf on Fort Point (now located just southeast of the Golden Gate Bridge) between 1907 and 1910.[9] It appears that the mine depot on Yerba Buena Island remained relatively unchanged over the next twenty years (see **Figures 2** and **3**) until the construction of the San Francisco-Oakland Bay Bridge in the 1930s. The island's topography was dramatically altered by construction of the largest diameter tunnel in the world (southwest of the mine depot), installation of an anchorage, piers and abutments just south of the Torpedo Assembly Building, and the leveling a portion of the hillside at East Point during the bridges construction (**Figures 4** through **6**). In 1937, the building, no longer actively used, was described as being 76'-0" x 162'-0" with a narrow gauge track extending the length of the building. The complex as a whole included twelve cable tanks, each measuring 23'-0" x 14'-0" x 6'-0", and one larger repair tanks, all constructed in 1897. Additionally, the Oakland Bay Bridge Company constructed a mine wharf that was 83'-0" x 72'-0" long parallel to the shore.[10]

By 1953, the building ended its association as a Torpedo Mine Assembly Building. Today the Torpedo Assembly Building is the only remaining Army building on Yerba Buena Island. By 1960, the remaining buildings from the Army's period of occupation were transferred to the Navy.

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[6] JRP, "Cultural Resource Inventory and Evaluation Investigations: Yerba Buena Island and Treasure Island Naval Station Treasure Island," 1-4.

[7] The Army Corps of Engineers pioneered the development of torpedo defense systems, and as such were responsible for the installation and management of the systems until after the turn of the twentieth century, when operations were transferred to the Coast Artillery Corps and later to the Navy. Gordon Chappell, "Historic California Posts, Forts Under the Sea: Submarine Mine Defense of San Francisco," California State Military Museum, www.militarymuseum.org/Mines.html, accessed March 15, 2004.

[8] Thompson, "Seacoast Fortifications," 124-125.

[9] Chappell, "Historic California Posts, Forts Under the Sea: Submarine Mine Defense of San Francisco."

[10] Thompson, "Seacoast Fortifications," 346-347.

Figure 2. Yerba Buena Island, May 1928. Building 262 is shown far right. [HABS No. CA-1793-1]

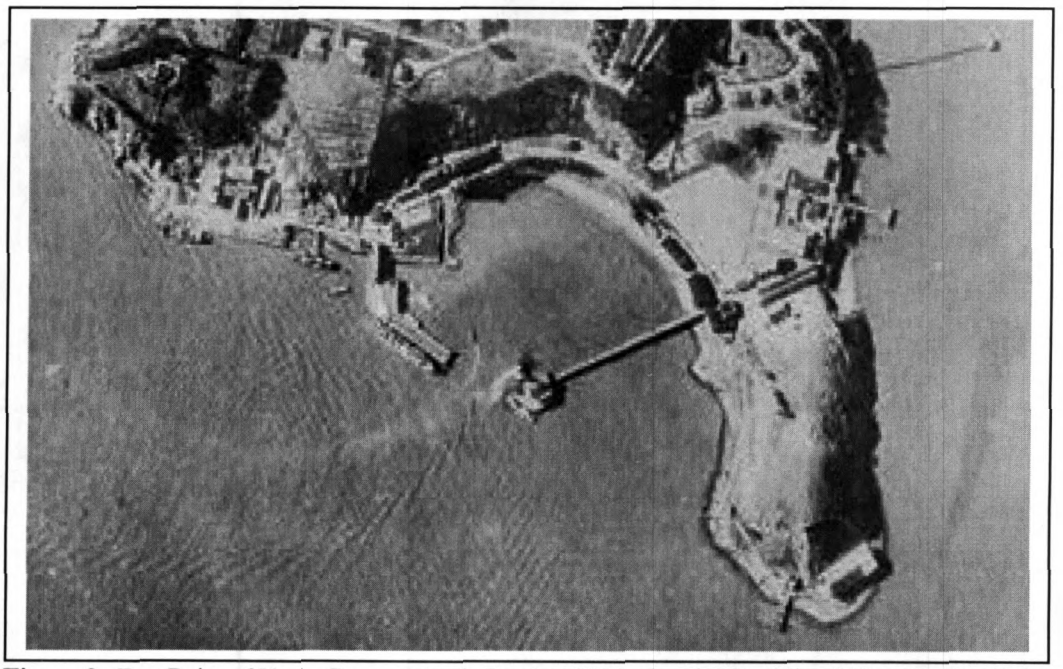

Figure 3. East Point of Yerba Buena Island, October 1931, showing Building 262 at the East Point, bottom right. [HABS No. CA-1793-2]

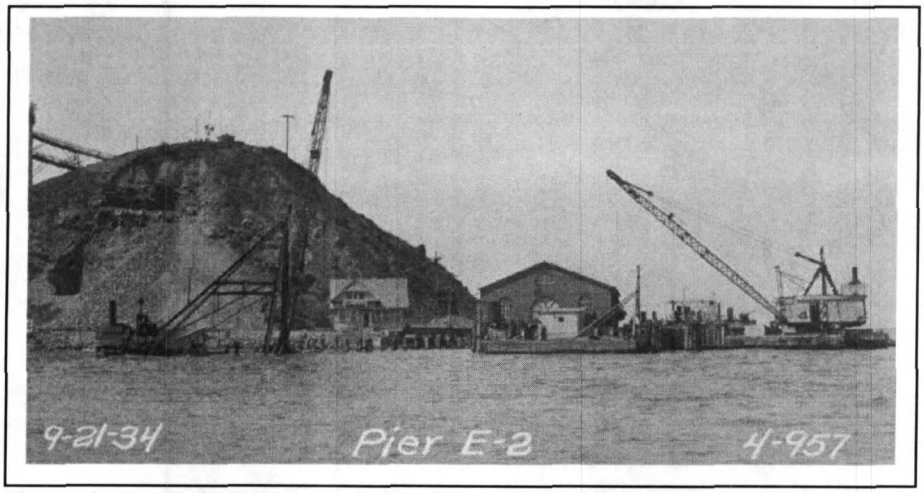

Figure 4. East Point, 1934, showing Building 262 and the keeper's cottage at center. [*Construction Photographs of the San Francisco-Oakland Bay Bridge, 1931-1936* BANC PIC 1905.14237-272, Bancroft Library, University of California, Berkeley.]

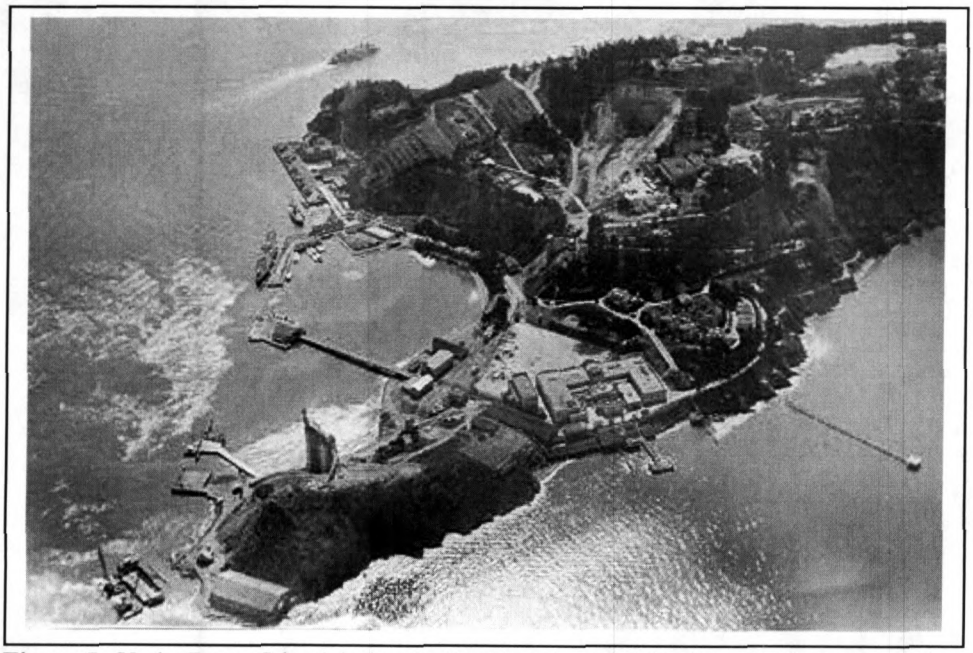

Figure 5. Yerba Buena Island during the San Francisco-Oakland Bay Bridge construction, circa 1934. Building 262 shown bottom left. [HABS No. CA-1793-3]

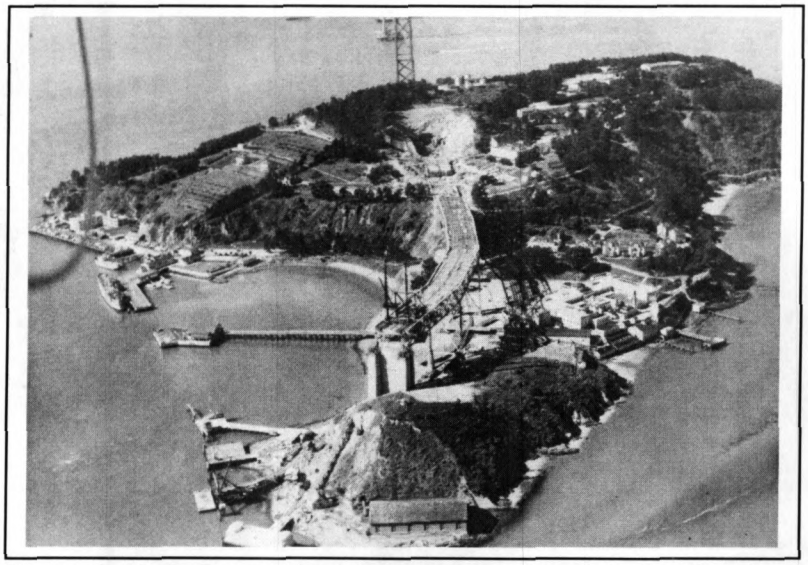

Figure 6. Yerba Buena Island during construction of the San Francisco-Oakland Bay Bridge, circa 1935, Torpedo Assembly Building bottom center. [Treasure Island Museum Collection, Yerba Buena Island folder]

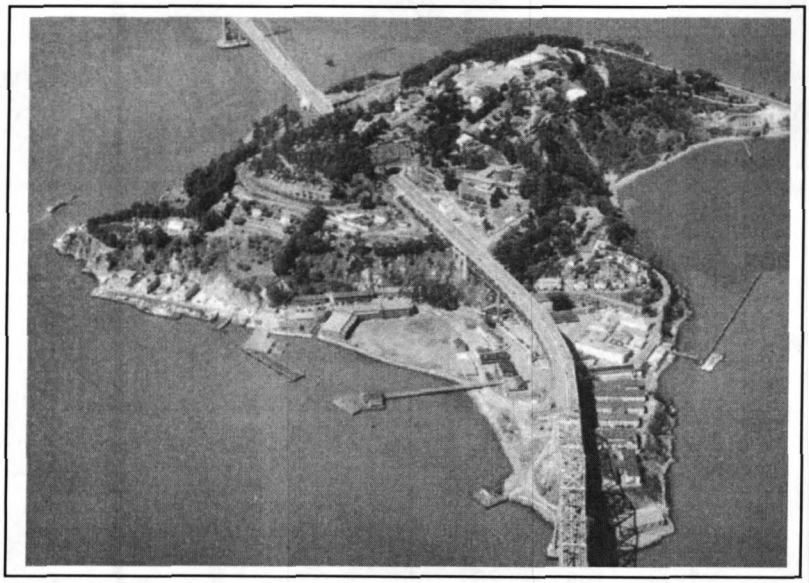

Figure 7. Yerba Buena Island, 1952, showing Torpedo Assembly Building bottom right, adjacent to the San Francisco-Oakland Bay Bridge. [Record Group 80, Negative 050852, NARA]

Reinforced Concrete and Ernest L. Ransome

The Army constructed the Torpedo Assembly Building during the early period of reinforced concrete construction in the United States. While the United States issued the earliest patent for reinforced concrete to S. T. Fowler in 1860, it would take nearly forty years before this type of construction was readily applied to all types of buildings. During this period, several scientists, engineers and architects experimented with the construction medium, some publishing papers and books on the subject. Yet it was not until Ernest L. Ransome invented the first practical commercial development of reinforced concrete in the early 1880s that this type of construction was successful.

Ernest Leslie Ransome was born in Ipswich, England in 1844, the son of a concrete manufacturer and inventor. After apprenticing at his father's company for ten years, Ernest immigrated to the United States in 1869 and became superintendent of San Francisco's Pacific Stone Company, where he introduced his father's process for artificial stone.[11] At that time, there was little advancement in the technology of reinforced concrete and the material was only principally used in foundations and arches suspended between iron beams. In 1882 the United States Patent Office issued Ransome one of the first of many patents associated with reinforced concrete. Among these were patents for several types of concrete mixers, including the Ransome mixer, illuminating panels (sidewalk lights) as well as concrete joinery methods.[12] Perhaps one of his most important inventions was the use of twisted bars to reinforce concrete, a method he patented in 1884.[13] Skeptics criticized his new method, citing that twisting the rod damaged the iron's structural integrity, but tests revealed that by cold twisting iron bars of up to 0'-2" in thickness and laying them the total length of the concrete greatly increased its tensile strength, thus reducing the need for heavy beams and girders. This twisted bar method is the precursor to modern-day re-bar, and the cornerstone of what later became the Ransome System of concrete construction.

While many of his early buildings, like the old, five-story California Academy of Sciences Building in San Francisco and the Bourn & Wise Wine Cellars in St Helena[14] utilized only concrete floor systems, in 1891 he

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[11] Frederick Ransome patented an artificial stone the same year his son Ernest was born. He also built the first rotary kiln, a key component in the manufacture of Portland cement for cement firing. There is some discrepancy over Ransome's relationship with the Pacific Stone Company. Some references cite that company, presumably also called Pacific Stone Company, as a subsidiary of his fathers' firm and that Ransome came to the US to work in the family business. But Ransome fails to disclose that connection in his own book, stating that he worked at the company for four years. Ernest L. Ransome and Alexis Saurbrey, *Reinforced Concrete Buildings: A Treatise on the History, Patents Design and Erection of the Principal Parts Entering into a Modern Reinforced Concrete Building* (New York: McGray-Hill Book Company, 1912) 2; Reynar Banham, *A Concrete Atlas: U.S. Industrial Building and European Modern Architecture* (Cambridge, Massachusetts: The MIT Press, 1986) 32.

[12] Ernest L. Ransome, Letters Patent No. 263,579 "Laying Artificial Stone or Concrete Pavement," August 29, 1882 and Letters Patent No. 448,993 "Illuminating-Panel in Concrete Floors," March 24, 1891, Letters Patent No. 518,045 "Illuminating-Floor," April 10, 1894, Letters Patent No. 647,904 "Concrete Construction" April 17, 1900.

[13] Ernest L. Ransome, Letters Patent No. 305,226 "Building Construction," September 16, 1884.

[14] The first California Academy of Sciences was built on Market Street and destroyed by the 1906 San Francisco Earthquake. The Bourn & Wise Cellars (1888) is also known as Christian Brothers Winery and Greystone Cellars.

constructed Stanford University's Leland Stanford Jr. Museum, in which the entire wall and floor system, including the roof, was of twisted-bar reinforced concrete. This building is the earliest reinforced-concrete public building in the world. That same year, he completed the Torpedo Assembly Building at Yerba Buena Island, likely with the same method.[15]

Among his other less significant patents was a method for creating an ashlar-like appearance in a reinforced concrete wall surface; this was the method employed at Alvord Lake Bridge, Stanford University's museum and dormitory, and Yerba Buena Island's Torpedo Assembly Building. This technique required pouring concrete into a mold that included patterns for joint lines, simulating stone masonry joints. Although not part of the patented method, the concrete surface could be finished, like that of the Torpedo Assembly Building, by post-construction tooling, or "bush-hammering" with a pneumatic tool to resemble quarry-faced ashlar.[16]

Ransome continued to experiment in various new concrete construction methods in San Francisco and in New York City, where he moved after 1900. There he was issued a series of patents that redefined factory construction in the United States. Known as the Ransome System, it allowed for all parts of a building, except the floors, to be cast separately and then assembled and secured by positive locks or cement bonds on site with flooring laid over girders and beams, thus strengthening the building.[17] Not only was this system efficient, it also allowed for exterior curtain wall construction that permitted the majority of a building's façade to be windows. Thus, the concept of a "Daylight Factory" was achieved. These factories were not only fireproof and economical, but they greatly improved the working environment for factory workers all over the nation. Ransome's system of construction became a standard for factory buildings through the 1930s. His most noteworthy example of this type of factory is the United Shoe Manufacturing Company in Beverly, Massachusetts, completed in 1905.[18]

Credited with constructing the first reinforced concrete commercial building in the United States, San Francisco's Arctic Oil Works (1884), which is no longer extant, Ransome, a pioneer in the concrete industry, is often referred to as the "father of reinforced concrete." His career is aptly summarized in *Twentieth Century Building Materials: History and Conservation;* Ransome "refined procedures for casting girders, beams and floor slabs as a unit on top of concrete columns, as well as designs by which load-bearing exterior walls could be replaced by expanses of windows."[19] Although he was quite active, there are relatively few extant buildings

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[15] Ransome, et al *Reinforced Concrete Buildings*, 4-5; Richard Joncas, "Three Models: The Design Competition for the Iris & B. Gerald Cantor Center for Visual Arts," http://ccva.stanford.edu/3models/ accessed March 19, 2004.

[16] Ernest L. Ransome, Letters Patent No.405,800 "Finishing Concrete and Artificial-Stone Surfaces" June 25, 1889; Both Roble (Sequoia) Hall, built in 1891, and the Torpedo Assembly Building include patent marks referring to Ransome's patent no. 405,800. The Museum included superficial joint lines but was not tooled.

[17] Ernest L. Ransome, Letters Patent No. 918,699 "Concrete Building Construction," April 20, 1909 and Letters Patent No. 694,580 "Concrete Construction," March 4, 1902.

[18] "Ernest L(eslie) Ransome," Artists Biographies from the Grove Dictionary of Art, www.artnet.com/library/ accessed March 10, 2004; "Cummings Centers, Architecture and History", Cummings Properties, www.cummings.com/arch.html accessed March 10, 2004; Banham, *A Concrete Atlas*, 68-71.

[19] Amy E. Slaton, Paul E. Gaudett, William G. Hime, and James D. Connolly, "Reinforced Concrete," Thomas C. Jester, editor, *Twentieth Century Building Materials: History and Conservation*, (New York: McGraw-Hill Co., 1995) 94;

and structures around the nation that can be positively attributed to him.

During his time in San Francisco, Ransome developed a standing relationship with the San Francisco architectural firm of Percy and Hamilton. Percy and Hamilton had long been progressive architects, who apparently saw in Ransome the key to innovative construction technologies. Percy and Hamilton worked with Ransome on several major commissions, including Stanford University's museum building and women's dormitory, and the old California Academy of Sciences. Although the collaboration is not well documented, it is likely that Percy and Hamilton worked with Ransome on the Alvord Lake Bridge in San Francisco, recognized as the first (and, of course, the oldest) reinforced concrete bridge in the world. Similarly, no documentation has been found to support the firm's direct involvement in the design of the Yerba Buena Island Torpedo Assembly Building. Because of their collaboration on the Stanford Museum during the same period, it is likely that the Torpedo building was also a joint effort.[20]

While Percy and Hamilton were prominent architects in San Francisco in the second half of the nineteenth century, the Torpedo Assembly Building is not an exemplary example of their work. There are several existing buildings that better represent their work, three of which are currently listed on the National Register of Historic Places: Bourn & Wise Winery (Greystone Cellars) in St. Helena, Trinity Presbyterian Church in San Francisco, and Alameda City Hall. Additionally, they designed many residential and church buildings in Pacific Heights neighborhood of San Francisco, some of which still survive. Other works include the Sharon Building at Golden Gate Park, and perhaps of their most prominent design, the 11-story reinforced concrete Hayward (Kohl) Building, at Montgomery and California streets in San Francisco.

Conclusion

The Yerba Buena Island mine depot was actively used for less than twenty years during the 1890s and early 1900s. In time, changes in the coastal defense strategy made it obsolete, although the Army did retain its use as a Torpedo (Mine) Assembly building until 1953, when the building became a Long Range Accuracy (LORAC) Storage facility. The Army retained ownership of the building until transferring it to the Navy in 1960. Under Criterion A, the Torpedo Assembly Building is the only extant building that signifies and commemorates nearly a half-century of Army presence on this island. No other buildings constructed or used by the Army remain on the island. The building is also directly associated with the submarine mine program of the Corps of Engineers, and is one of a small number of historic properties associated with that program. While there are many batteries still in existence from the Board's coastal artillery program, the short-lived submarine mine program is best represented by this building.

Only one building attributed to Ransome (and also Pittsburgh architect Carlton T. Strong) is listed on the

George W. Percy, "Concrete Construction," *The California Architect and Building News*, February, 1894, Vol. XV, No. 2, 14-17.

[20] The Stanford University Museum is discussed in Paul V. Turner, *The Founders & the Architects: The Design of Stanford University* (Stanford University: Department of Art, 1976). Ransome's career in bridge design is discussed in Stephen D. Mikesell, *Historic Highway Bridges in California* (Sacramento: California Department of Transportation, 1990); Percy, "Concrete Construction," 14-17.

National Register of Historic Places, the concrete Berkeley Apartments, formerly the Graystone Hotel, in Buffalo, New York, constructed between 1894 and 1897. The Torpedo Assembly Building is significant under Criterion C, as a very rare and early example of reinforced concrete building. Furthermore, constructed by Ernest Leslie Ransome, this building was likely built using his 1891 patented method of twisted-bar reinforced concrete. Thus, constructed by perhaps the most important nineteenth century engineer of reinforced concrete construction in the United States, the building is significant as the work of a master. This building has received few alterations over its history. While the building's integrity of setting has been altered by the construction of the San Francisco-Oakland Bay Bridge in 1937, the building retains a high degree of integrity of materials, location, design, workmanship, feeling, and association.

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Boundary Description

The boundary of this property is defined by the footprint of the building.

Boundary Justification

The boundary includes the area immediately adjacent to the Torpedo Assembly Building. Any extant landscaping or hardscape adjacent to the building no longer retain integrity to the period of significance and are therefore excluded.

All photographs were taken by Toni Webb in San Francisco, California in March 2004. JRP Historical Consulting retains possession of original negatives.

1. Torpedo (Mine) Assembly Building
6. Contextual view showing south façade, camera facing northeast
7. Photograph 1

1. Torpedo (Mine) Assembly Building
6. Contextual view showing south façade with San Francisco-Oakland Bay Bridge in background, camera facing southwest.
7. Photograph 2

1. Torpedo (Mine) Assembly Building
6. South façade, camera facing northwest.
7. Photograph 3

1. Torpedo (Mine) Assembly Building
6. Oblique view of east side, camera facing northwest.
7. Photograph 4

1. Torpedo (Mine) Assembly Building
6. Oblique view of east side with San Francisco-Oakland Bay Bridge in background, camera facing south.
7. Photograph 5

1. Torpedo (Mine) Assembly Building
6. North façade, camera facing southeast.
7. Photograph 6

1. Torpedo (Mine) Assembly Building
6. Detail of the entrance on the north façade, camera facing south.
7. Photograph 7

1. Torpedo (Mine) Assembly Building
6. Detail of the window above the north entrance.
7. Photograph 8

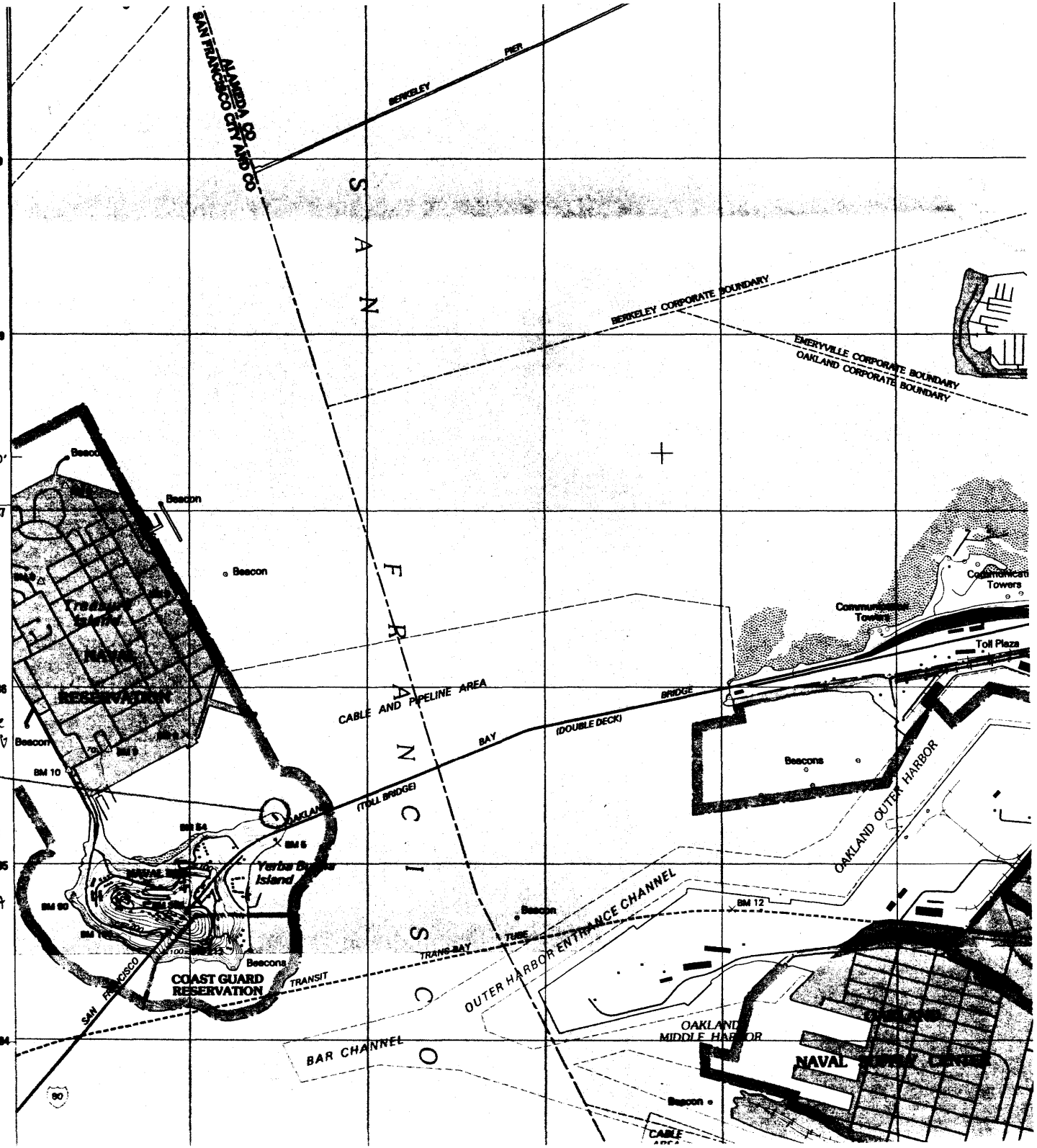
1. Torpedo (Mine) Assembly Building
6. Typical window on the north and south facades.
7. Photograph 9

1. Torpedo (Mine) Assembly Building
6. Typical window on the east and west sides.
7. Photograph 10

1. Torpedo (Mine) Assembly Building
6. Detail of south entrance, showing narrow gauge tracks.
7. Photograph 11

1. Torpedo (Mine) Assembly Building
6. Detail of south side, showing plaque with text " Ransome's Patent No. 405,800."
7. Photograph 12

1. Torpedo (Mine) Assembly Building
6. Detail of stone-like finish.
7. Photograph 13



Torpedo Storehouse, Torpedo (Mine) Assembly Building and Long Range Accuracy Storage Building (Building 262)

Yerba Buena Island, San Francisco County, CA

UTM Reference:

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