THE SIX-INCH PART OF THE MODERNIZATION PROGRAM OF 1940

Text by Robert D. Zink
Artwork by Gerald W. Butler

Author's Note: Magazine details in this article are based on Reports of Completed Works or personal visits to 48 magazines of the 89 projected and the 68 for which concrete work was completed.

BACKGROUND

Neither the Gun Foundry Board nor the Endicott Board made specific plans for guns smaller than eight inch. About 1895, planning began for protection for the electrically controlled minefields and for closing narrow or shallow channels. By the early 1900s, 3" to 6" guns were being installed in various places principally to keep minesweepers out.

Many of the 4.72", 5" and 6" guns were removed from the batteries in 1917-1918 for use as mobile field or railway artillery in France. By about 1921, the early 3", 4" 4.72" and 5" guns had been declared obselete. Most Armstrong-built 6" guns were scrapped,and most 6" in disappearing carriages were stored. Nearly all of the six inch guns that had been removed from barbette carriages were reinstalled as the six-inch pedestal mounted or barbette carriage gun had been established as the standard size weapon for defending minefields and narrow channels.

PROTOTYPING

In 1940,the modernization plan for the 20 continental U.S (CONUS) harbors to be defended called for 16" guns as primary and 6" guns as secondary armament. Battery Construction Number (BCN) 224, built at Fort Story, Virginia, 1940-41, was taken as "prototype" for the six-inch part of the program, though this battery was prototype only in the distance between guns (210 feet, center to center). In fact its magazine, shown in figure 1, was identical with a World War I temporary battery with new permanent magazine at Fort Tilden, NY, which had 296.6 foot gun spacing. These two batteries had M1900 guns on M1900 barbette carriages. Except as clearly noted, BCN 224 is ignored for the remainder of this article.

CENTRAL TRAVERSE MAGAZINES

We generally think of World War II U.S. Army equipment and construction in terms of vast numbers of identical things - one million trucks or ten million rifles or two hundred million bullets or hundreds of airfields. There were planned to be 50 six-inch batteries in the CONUS and about 40 more defending U.S. territories and lend-lease bases. Apparently 68 were completed as far as construction (concrete) of the emplacements, fire control and other ancillary structures. About 46 batteries were completed including guns, and it should be noted that due to production priorities, most of the 22 "not quite complete" batteries lacked only the guns and a few minor items that were obviously useless until the guns were installed. Figure 2 contrasts BCN 224 with what seems to be representative, referred to here as the "standard" battery plan.

The magazine structures contained, among other things, three 125 kilovolt-ampere 3 phase diesel-driven 440 volt 60 cycle alternators and all their auxiliary equipments, motor-generator or hydraulic equipments to control the gun carriage and an ammunition allowance of 600 rounds AP and 400 rounds HE projectiles and their associated propelling charges, primers, etc. Fire control provisions included Gun Data Computer (GDC) M8C or M8G, a plotting board as backup, the off-gun parts of Data Transmission System M7 (M1 and M3 carriages) or Cable System M12 (M2 and M4 carriages), assorted spotting and correcting boards and devices and in many batteries, a Fire Control telephone switchboard. See figure 3 for the key to rooms and equipment of the "standard" magazine structure and figure 4 for an isometric view of a late "standard" magazine.

Observation post equipment associated with this fire control system were Depression Position Finder M2 or Azimuth Instrument M1910A1, which transmitted data to the GDC directly (the data reader served only as a backup). Radar data was inout manually.

These batteries had no troop quarters, though in some Alaska defenses there were quarters connected by short tunnels.

CENTRAL TRAVERSE MAGAZINE DIFFERENCES

Excepting the "prototype", the completed and all but a few of the planned battery structures had many features in common: central traverse magazine, room sizes in the magazine, rooms for ancillary equipment (such as hydraulic pumps or motor-generator sets), rooms for engine-generator sets, cooling radiators, fire control functions (2 room layouts).

When one looks at the structures, there are several differences, as shown in figure 5.

BURSTER COURSE: The burster course was atop an eight foot sand course or cushion which was above the roof, or was above an 18" sand course above the roof, or was around the edge of the roof (referred to here as "edge" burster), or was combined with the ceiling (apparently to conserve money and material) to make a 6 to 7 foot roof/burster in one layer. Figure 6 illustrates the various ceiling / roof - burster types.

MUFFLER GALLERY: The muffler gallery was located at the side of the power room, however in some batteries there was none. Mufflers were mounted in the gallery, or just outside the gallery pointing up, or just outside the structure in a "T" shaped concrete support. In a "folded" battery (figure 7), the muffler gallery toward the front of the battery, just behind the magazine rooms.

POWER ROOM LOCATION, "normal" or "folded" (Right-hand folded in figure 7). There were also "Left-hand folded magazines, with "rear" entrance next to No. 2 gun lobby.

FRONT WALL THICKNESS: 3 feet or 7 feet or 7 feet tapering to 3 feet at the ends, as shown in figure 5.

ROOF / CEILING THICKNESS: 6-6.5 feet or 3.5 to 4 feet, as shown in figure 6.

REAR ENTRANCE: Depending on terrain (such as a hill near the rear of the structure) the rear entrance was short and straight (as in figure 4) or very long (in one case, BCN 314, about 65 feet from power room to rear doors) or with a sidewalk bent just outside the rear doors or at the side of a "folded" battery.

PURPOSE and DIMENSIONS of the room immediately to the right (in standard battery) of the plotting room: spotting or spotting and radio or switchboard, spotting and radio - 10x20.5 (figure 4) or 15x26 feet (figure 5).

BATTERY COMMANDER STATION (BCS) often is a separate structure, a tower or manhole, perhaps hundreds of yards distant. In several cases, BCS is sited atop the magazine on "legs", the legs & most of BCS buried in fill. In a few cases, a BCS on top of the magazine is connected into the magazine internally, shown in figure 8. In at least one case, a manhole BCS (BCN 248) is in front of the battery, downhill.

Some of these differences go together - the 3 to 4 foot roof and 3 foot front wall are part of a package including an elevated burster course with sand cushion, found in early batteries. The six foot burster / ceiling with 3 foot front wall and "edge" burster were later modifications. The last magazines had six foot ceiling, no separate burster, and 7 foot front wall. An apparent later subset of the last group had electric cable chase 18" deep cut into the front wall.

A "folded" battery has no rear entrance, typically because there was a hill immediately behind or on top of it.

CERTAIN MAGAZINES HAVE WHAT SEEM TO BE UNIQUE FEATURES:

BCNs 202 and 204 have BCS built directly on the top of the magazine, with the BCS entry via a ladder in the wall of the front corridor of the magazine, as shown in figure 8.

Battery Jewell (209) at Boston has an extra room to the rear of the spotting/switchboard room.

For BCN 217, the walkway turns off at a 45 degree angle from the rear doors.

BCNs 218 and 220 have an "8-foot cube" box BCS set into a notch in the front top of the burster, not shown.

BCN 223 magazine is identical to 230 (and others) except at 223, the rear door is about 3' farther aft so the 8' thick walls extend farther.

Battery Gates (229) was converted from a 6" disappearing gun battery. As a result, it is "different" in almost every way imaginable except gun models - and the guns are only 105 feet apart. The battery is shown in figure 9.

The BCN 268 rear walkway turns at a sharp angle to avoid the hill to the rear.

The plan view in the Report of Completed Works for BCN 296 shows a "mirror image" of the "usual" magazine plan, that is, all rooms are in reverse position. left to right. The crossection drawing shows the gun decks and front corridor are on one level, the rest of the emplacement is on a level 10 foot lower, as shown in figure 10.

BCN 298 at Dutch Harbor has an extra room connected to the rear entrance, and apparently to the muffler gallery, with fuel tanks in or under the extra room.

BCN 301 BCS is atop the magazine, with entry to magazine rear down 4 feet from entrance and BCS entry up 8 feet. Also, there is an unlabelled room to the rear of the SSR room, which shows on no other battery for which I have RCW.

BCN 314 BCS is built into the top of the magazine, with entry from the rear corridor, a ladder up from just right of the power room entrance, figure 5. This battery has the rear door about 65 feet farther to the rear than is normal, with wingwalls extending about 50 feet farther to the rear.

Most 6" (and 8") batteries built on Oahu during WW II were tunnelled into cliffs or ridges and therefore do not conform to these drawings except in the distance between guns and in the approximate sizes of rooms for a given purpose. A number of these have a concrete canopy over each tunnel entrance - protection from falling rock rather than from enemy fire.

Possibly the best place to study battery construction is (was?) at Cape May State Park at the southern tip of New Jersey. The sand beach on which BCN 223 was built has been washed away (over 220 yards of width of beach is gone) to just behind the battery so the exterior shape and the pilings below, and cable ducts and gun block construction, may be seen (for perhaps a few years yet) along with the Panama mounts just in front of the battery.

ARMAMENT

For all these batteries except Gates (229), the guns are 210 feet apart.

The guns to be used in all the modern batteries (except that prototype) were to be M1903 or M1905 guns from long obselete, and mostly scrapped, disappearing carriages. The guns were modernized (hence, M1903A2/1905A2) to the extent of removing trunnions, modifying the forcing cone (section between the powder chamber and the origin of rifling) and adding provisions for gas ejection and scavenging (air expulsion of powder gasses). The guns were mounted in newly designed barbette carriages of four models differing only in methods of control, and outer diameter of the gun, but vastly different from the older (M1900) barbette carriage. In these new carriages, the guns were intended to have a maximum range of approximately 26,000 yards.

It was apparent soon after planning began that the supply of M1903 and M1905 guns was insufficient for the program, and a new gun, the 6" T2 (while in development, to be the 6" M1 when approved for service use) was developed, to fire the same ammunition as the M1900, M1903A2 and M1905A2. This more modern gun was smaller in diameter in the cradle section and weighed less but gave the same ballistics. Due to development time, along with higher priority given to other gun models, not very many (T2)M1 were produced before the end of the war cut off the program.

Because of the smaller diameter of the T2(M1) gun, a smaller cradle could be used, resulting in newer carriages. The M3 and M4 were identical to the M1 and M2 carriages except for the smaller cradle and wider elevating racks; the cylinders were closer together.

The M1 and M3 carriages used Waterbury Hydraulic Elevation Drives ("speed gears" which were a constant speed input / variable delivery rate output hydraulic system) for the elevating mechanism. A handwheel ("follow the pointer") regulated pumping rate by changing the tilt angle of a driving plate in the pump part of the speed gear. Elevation angles for all four models

were from about -5 degrees to about +47 degrees. Loading position was +10 degrees.

The M2 and M4 carriages had Atlantic Elevator Co. all-electric drives for the elevating mechanism, therefore were remotely controllable (i.e. could be directly driven by the computer for both loading and firing positions of the gun in elevation).

The M1 and M2 were declared "limited standard". The M3 and M4 were declared "standard".

All four models used "match-the-pointer" control of speed gears for training (azimuth) over 360 degrees.

On-carriage Fire control included Telescope M31 and Telescope Mount M35.

Subcaliber 75mm guns were provided (T16 for M1903A2, T17 for M1905A2, T18 for M1 gun).

The service ammunition was Army armor-piercing (AP) 105 lb at 2800 ft/sec muzzle velocity (27,150 yards range), Army high explosive (HE) 90 lb 2770 ft/sec (20,995 yards range), and Navy AP 108 lb (not supplied to (T2)M1 batteries)(17,000 yards range). The powder charges were single section separate-loading bag charges: 37 lb. M17 for 105 lb projectile, 33 lb. M16 for the 90 lb. and 108 lb. projectiles. Loading was by hand ramming, from a four wheel loading cart.

CAMOUFLAGE

Information on camouflaging these batteries is difficult to locate. The "camo" General Plan for BCN 241 at Los Angeles is included as figure 11. In general terms, a folding "umbrella" covered the weapon. The magazine structure was made to look as much as possible like local terrain features by plantings of local vegetation types and by painting. Where paths or roads intruded, they were carried across the magazine or weapon when necessary.

EXISTING MATERIAL

Apparently, all but two (Battery Schwan (263) in San Juan and BCN 207 at Fort Dawes) magazine structures still exist though a few are "camouflaged" by newer uses.

Three sets of power room equipment (engine-alternator sets, etc.) existed a few years ago, one near Boston (BCN 208), one at Fisherman Island (Fort John Custis), the third near Los Angeles (BCN 241). None of the equipment is in operating condition (auxiliary equipment missing or major equipment rusty from disuse. The BCN 241 units at Fort MacArthur were run as recently as 1970 so are probably in the best condition.

Six weapons are still in existence, two at Fort Pickens, Gulf Islands National Seashore, near Pensacola, Florida; two at U.S. Naval Facility, Argentia, Newfoundland; and two at Fort Columbia, Washington. The armament at Fort Pickens came from BCN 227 at Fisherman Island, that at Fort Columbia from BCN 281 at Argentia. The weapons still at Argentia are to remain as a Canadian memorial.

THE SIX-INCH LONG RANGE BATTERIES OF WORLD WAR II

HARBOR	FORT/LOCATION	BATTERY	COMPLETE	CONFIGURATION RNP MG E FW B
Portland	Two Lights St Pk	201	A	UAN
	Jewell Island	202	C	UAN
	Peak's Island	Cravens, 203	C	UAN
Portsmouth	Ft. Dearborn	204	C	SSR Y R 3' I
	Ft. Foster	205	A	SSR Y R 3' IE
Boston	East Point, Nahant	206	C	S Y R 3' S
	Ft. Dawes	207	A	S Y R 3' IE
	Fourth Cliff	208	C	S Y R 3' IE
	Outer Brewster Is	Jewell,209	C	UAN, extra room
New Bedford	Mishaum Point	210	C	UAN
Narraganett	Ft. Nat. Greene	211	C	S N R 3' S
Bay	Warren Point	212	C	S N R 3' S
	Ft. Burnside	213	C	SSR Y R 8T I
Long Isl. Sd	Wilderness Pt	214	B	SSR Y R 8' I
	Ft H G Wright	215	C	S Y R 3' IE
	Camp Hero	216	C	UAN
Long Isl. Sd	Ft. Terry	217	A	SSR Y R*8' I
New York	Ft. Wadsworth	218	B	S Y R 8' I
	Navesink Highlands	219	C	S Y R 3' IE
	Ft. Tilden	220	A	S Y R 8' I
Delaware	Ft. Miles	Herring, 221	C	S Y R 3' S
	Ft. Miles	Hunter, 222	C	S Y R 3' S
	Cape May	223	C	SSR Y R 8' I
Chesapeake	Ft. Story	Worcester, 224	C	Unique
Bay	Ft. Story	Cramer, 225	C	S N R 3' S
	Ft. Story	226	C	SSR Y R 8' I
	Ft. John Custis	227	C	S Y R 3' S
	Ft. John Custis	228	B	S Y R 8' I
	Ft. Wool	Gates, 229	A	Converted DC
Charleston	Ft. Moultrie	230	B	SSR Y R 8' I
Key West	Ft. Taylor	231	B	UAN
	Salt Ponds	232	C	UAN
Pensacola	Ft. McRee	233	B	SSR Y R 8' I
	Ft. Pickens	234	B	SSR Y R 8' I
Galveston	Ft. San Jacinto	235	C	S Y R 3' IE
	Ft. Travis	236	B	S Y R 8' I
San Diego	Ft. Rosecrans	237	C	SSR Y R 8' I
	Ft. Rosecrans	Humphrey, 238	C	S N R 3' S
	Ft. Emory	Grant, 239	C	S Y R 3' IE
Los Angeles	Pt. Vicente	H.C. Barnes,240	C	UAN
	Ft. MacArthur	241	A	S Y L 8' I
	Bolsa Chica	Harrison, 242	C	UAN
San Francisco	Ft. Miley	243	A	S Y L 8' I
	Milagra Ridge	244	A	S Y L 8' I
Columbia River	Ft. Stevens	245	C	SSR Y R 8' I
	Ft. Columbia	246	B	S Y Rt8' I
	Ft. Canby	247	C	SSR Y R 8' I
Puget Sound	Ft. Ebey	248	C	S Y R 3' S
	Camp Hayden	249	C	S Y L 8' I
	Ft. Hayden	250	NB	
	Ft. Hayden	251	NB	

HARBOR	FORT/LOCATION	BATTERY	COMPLETE	CONFIGURATION
San Juan	Ft. Mascaro	Buckey, 261	C	UAN
	Ft. Mascaro	Pence, 262	C	UAN
	Pta. Escambron	Schwan, 263	C	UAN
	Pta Cangrejos	Lancaster, 264	C	UAN
Roosevelt Roads	Isla Pineros	265	C	UAN
	Martineau Hill	266	NB	
	Pta Arenas	267	NB	
	Pta Lima	268	C	UAN*
	Cabo San Juan	311	NB	
	North Point	312	NB	
	Dolphin Head	313	NB	
	Ft. Segarre	314	C	UAN*
	Hill 411, St Thomas	315	NB	
Trinidad	Ft. Read	271-275	NB	
Argentia	Ft. McAndrew	281	C	
	Ft. McAndrew	282	C	
Bermuda	Stone Hill	283	C	UAN
	Ft. Victoria	284	C	UAN
Jamaica	Portland Bight?	285	NB	
later, to Roos Roads, Vieques		East End	NB	
Sitka	Ft. Babcock	290	88%C	UAN
	Ft. Peirce	291	98%C	UAN
	Ft. Rousseau	292	87%C	UAN
Seward	Ft. McGilvray	293	99%C	UAN
	Ft. Bulkley	294	87%C	UAN
Kodiak	Ft. J.H. Smith	295	NB	
	Ft. Tidball	296	C	S Y R 3' IE *
	Ft. Abercrombie	297	NB	
Dutch Harbor	Ft. Learnard	298	C	UAN
	Ft. Schwatka	299	NB	
Kaneohe Bay	Ft. Hase	French, 301	C	SSR Y R 8' I*
	Lae O Kaoio	Cooper, 302	C	In tunnels
Pearl Harbor	Puu-O-Hulu	303	NC	In tunnels
	Punchbowl Crater	304	NC	In tunnels
	Koke Saddle	305	NB	

The Table presents the best information I have found on the individual batteries. Complete "C" data relates to concrete, not including armament, but "%C" includes armament.
"Complete" data from 1946 "Tilton Report": A -Incomplete, recommend Completion; B-Abandon, Incomplete; C-Complete (% includes armament), NB Not Built.
Magazine configuration:(my own abbreviations) see plans; for column labels, (RNP) room next to plot: Spot/Spot,Swbd,Radio; (MG) Muffler Gallery: Yes/No; (E) Entrance: Rear/Left/Right; (F) Folded; (FW) Front Wall 7',3',Taper 7' to 3'; (B) Burster: Separate, Integral with Ceiling, (IE) Integral, with Edge burster around top of front wall. (UNK) unknown, (UAN) Unknown but assumed "normal" or "standard"..

Sources: Letters Files, National Archives, RG77, Entry A52-87 boxes 1-22; Personal Observation; Reports of Completed Works, Forms 1 & 7 and "Tilton Report" (for which I lack the formal title).

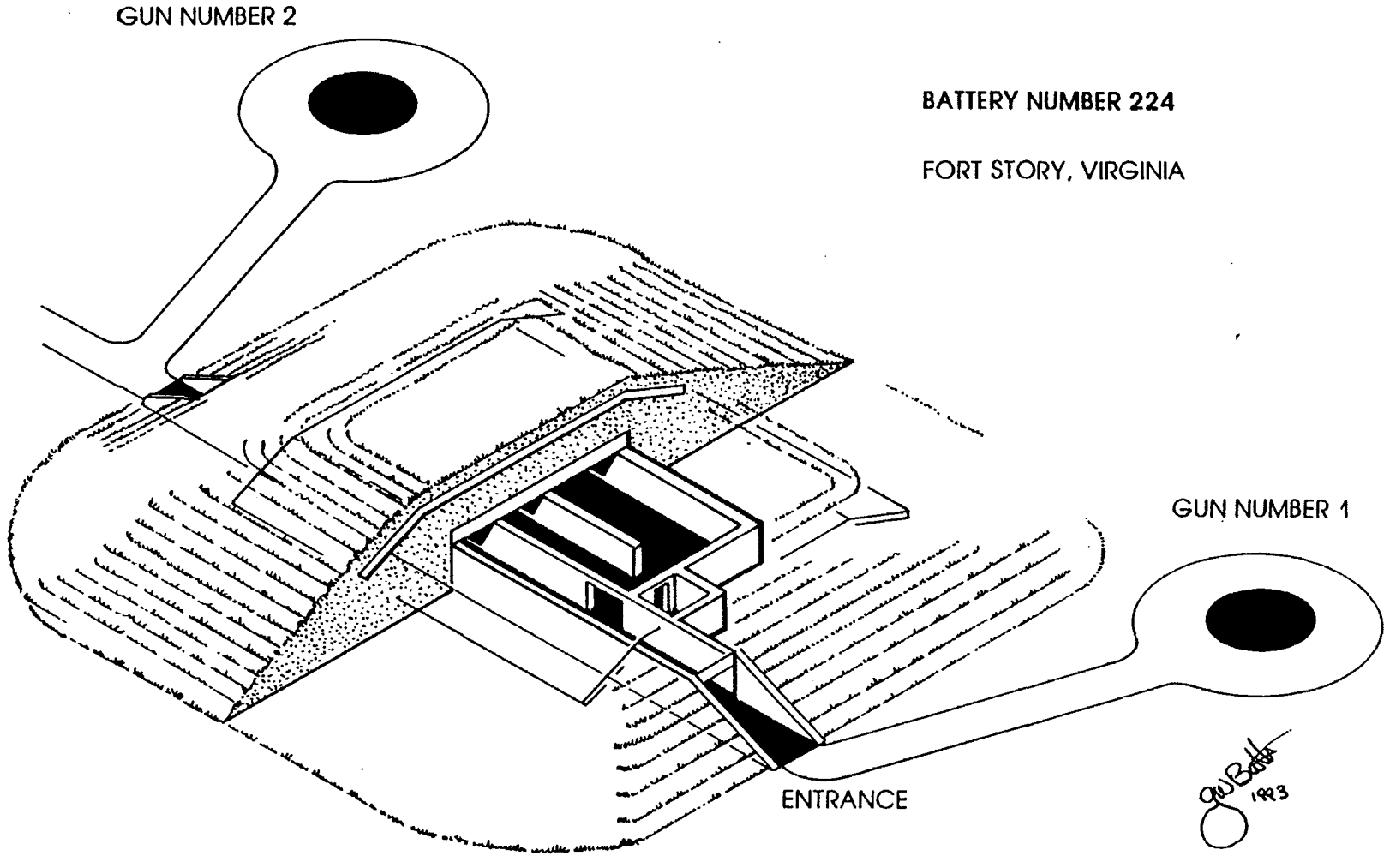
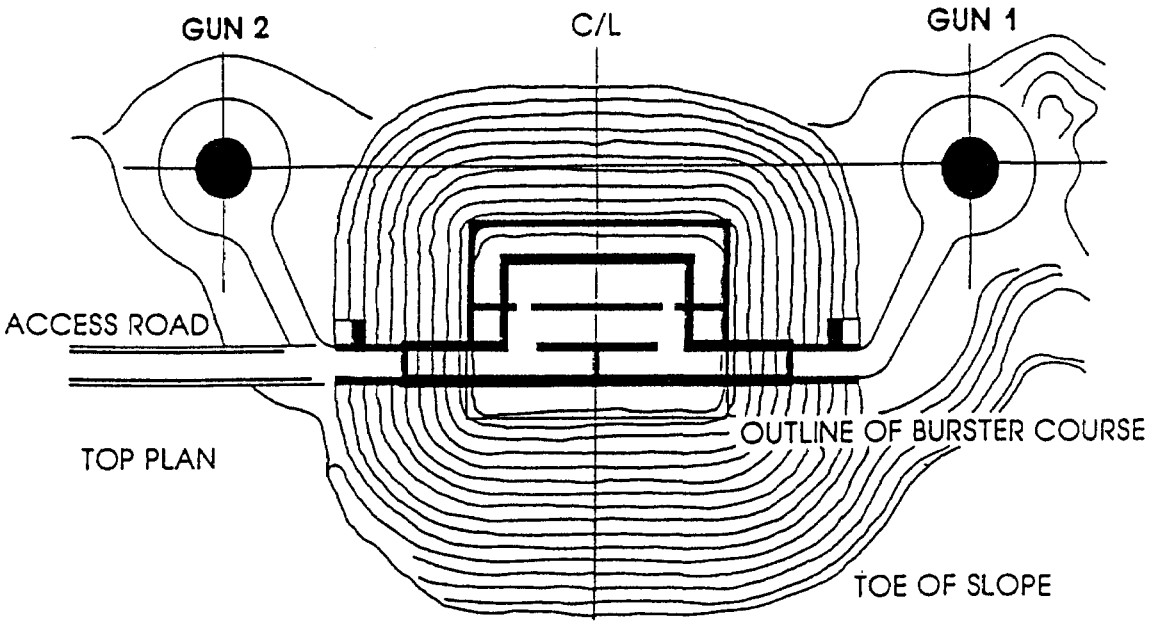
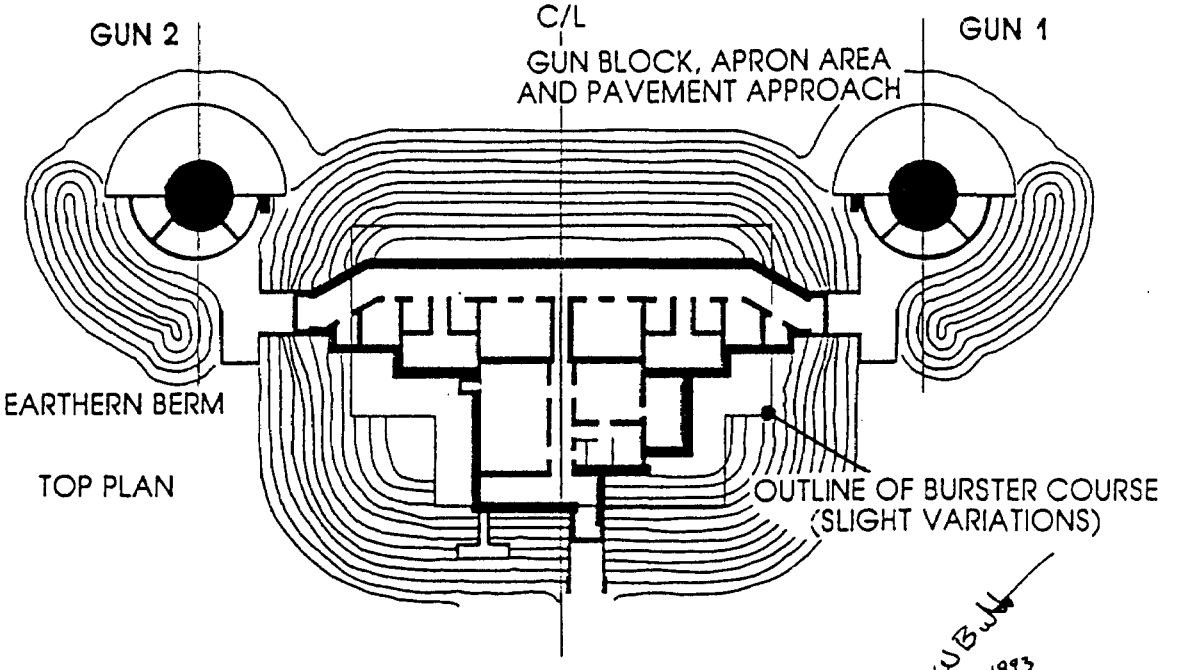


Figure 1 PROTOTYPE FOR '200-SERIES' EMPLACEMENTS

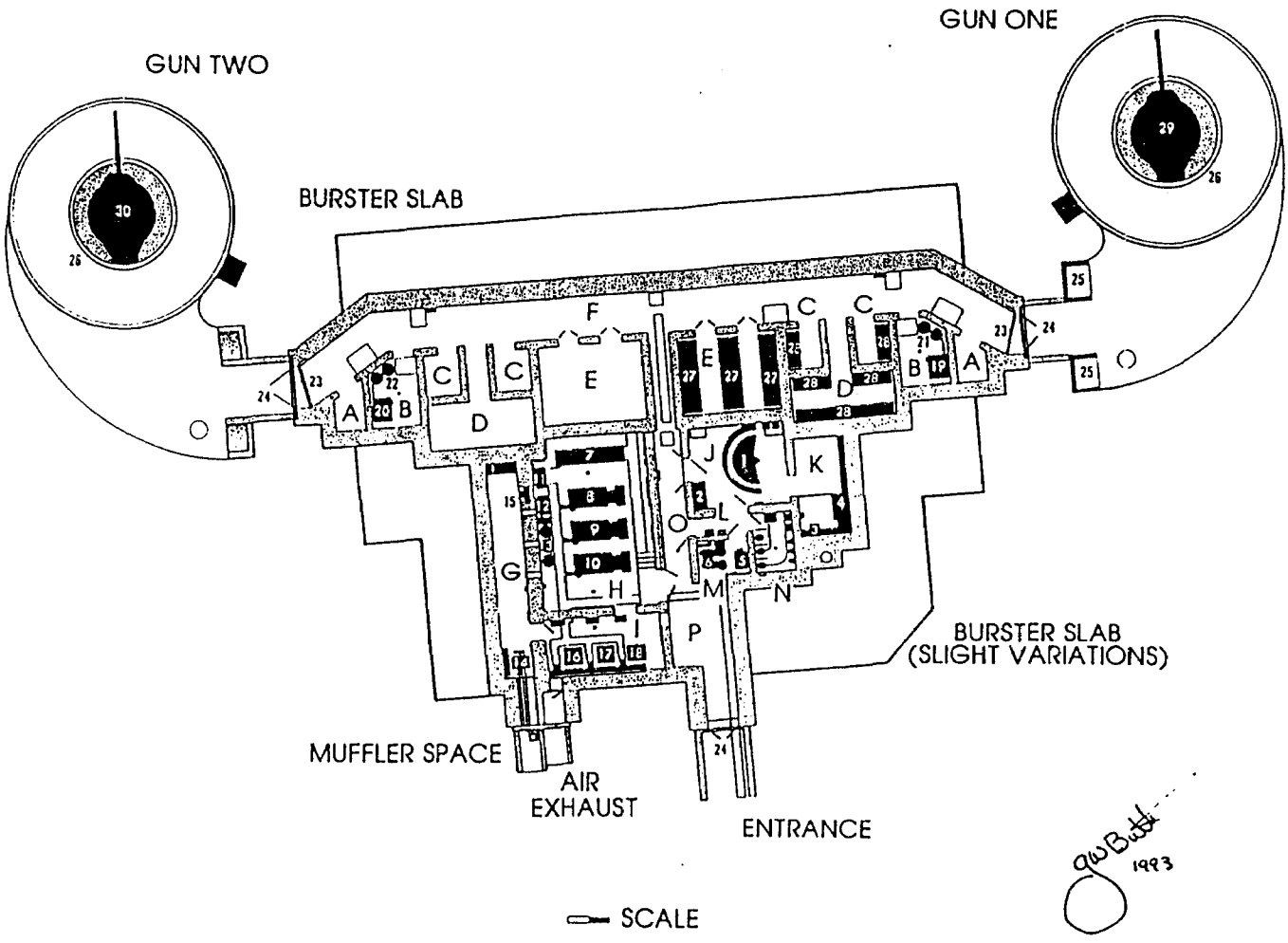


PROTOTYPE OF 6-INCH GUN BATTERY,
210-FEET BETWEEN GUNS



MAGAZINE FOR 6-INCH BATTERY, STANDARD
PLANS DATED: SEPTEMBER, 1941 U.S.E.D.
PROVIDENCE, R.I. SECRET SHEET 1 OF 21

Figure 2



'STANDARD' CENTRAL TRAVERSE MAGAZINE LAYOUT

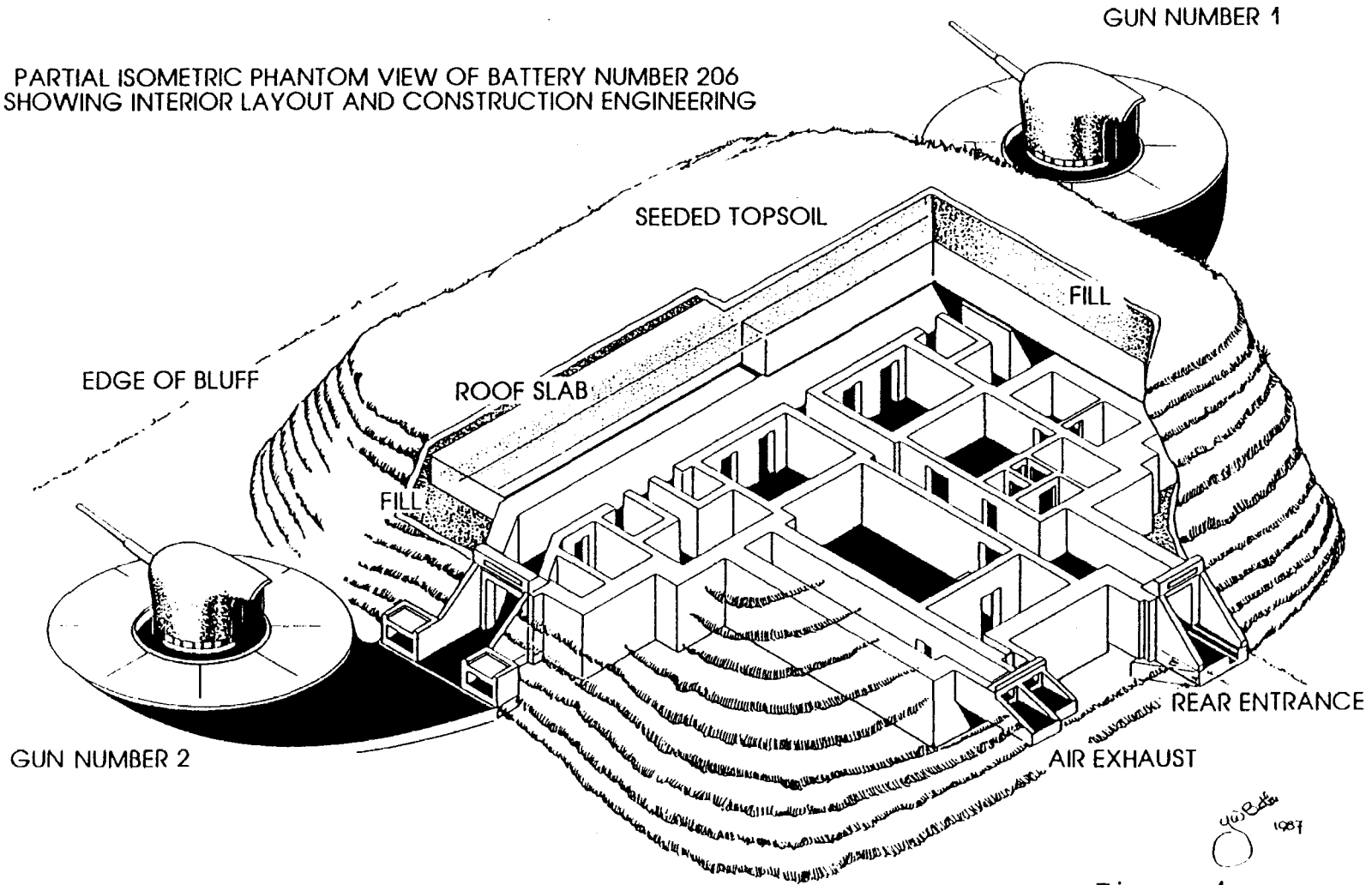
ROOMS	DIMENSIONS (FEET)
A. STOREROOM	7X9
B. AIR COMPRESSOR ROOM	10X12
C. SHELL ROOM (100 RDS, HE)	7X8
D. SHELL ROOM (400 RDS, AP)	9X21
E. POWDER ROOM (600 CHARGES)	15.5X20
G. MUFFLER GALLERY	6X44
H. POWER ROOM	34X22
I. WATER COOLER ROOM	11X22
J. PLOTTING ROOM	19X16
K. SWITCHBOARD, SPOTTING & RADIO ROOM *	*
L. AIR LOCK	4X7
M. CHEMICAL WARFARE SERVICE ROOM	7X10
N. LATRINE	8X11
* SWITCHBOARD, SPOTTING AND RADIO ROOM	15X26.5
(OR) SPOTTING ROOM	10X20.5
F. FRONT CORRIDOR	7X144
O. CENTER CORRIDOR	4/6X54
P. REAR CORRIDOR	13.5X16

INDEX AND KEY FOR BATTERY LAYOUT

1. PLOTTING BOARD, M3
2. RANGE SCALE STORAGE
3. DATA TRANSMISSION JUNCTION BOX
4. PANEL & SWITCHBOARD 65 & 75
5. AIR CONDITIONING UNIT
6. C.W.S. CANISTERS
7. DISTRIBUTION PANEL
8. 125 KVA DIESEL GENERATOR SET NO. 1
9. 125 KVA DIESEL GENERATOR SET NO. 2
10. 125 KVA DIESEL GENERATOR SET NO. 3
11. STARTING AIR COMPRESSOR, ELECTRIC
12. STARTING AIR COMPRESSOR, GASOLINE
13. AIR RESERVOIR TANKS (3)
14. STEAM BOILER & OIL BURNER UNIT
15. EXHAUST FAN
16. EVAPORATIVE COOLER NO. 1
17. EVAPORATIVE COOLER NO. 2
18. EVAPORATIVE COOLER NO. 3
19. SCAVENGING AIR COMPRESSOR
20. SCAVENGING AIR COMPRESSOR
21. AIR RESERVOIR TANKS (2)
22. AIR RESERVOIR TANKS (2)
23. WOODEN DOORS
24. STEEL PLATE DOORS
25. AMMUNITION RECESS (TYPICAL OF GUN 1 & GUN 2)
26. BASE RING & RECESS
27. POWDER ROOM CHARGE SHELVING
28. SHEEL ROOM PROJECTILE SHELVING
29. GUN NUMBER ONE
30. GUN NUMBER TWO

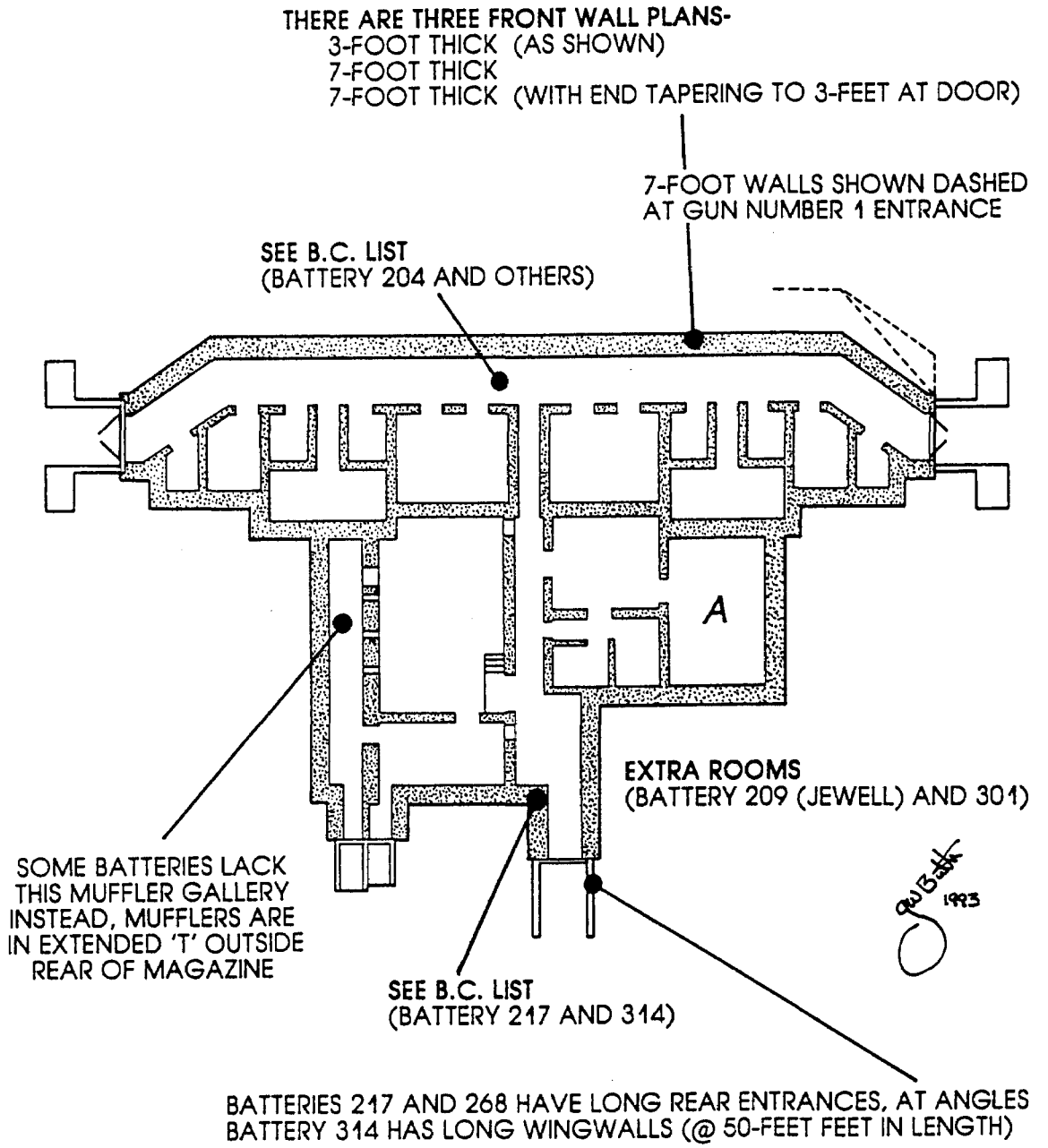
Figure 3

PARTIAL ISOMETRIC PHANTOM VIEW OF BATTERY NUMBER 206
SHOWING INTERIOR LAYOUT AND CONSTRUCTION ENGINEERING



TYPICAL 6-INCH '200-SERIES' BATTERY OF THE THIRD SERIES

Figure 4

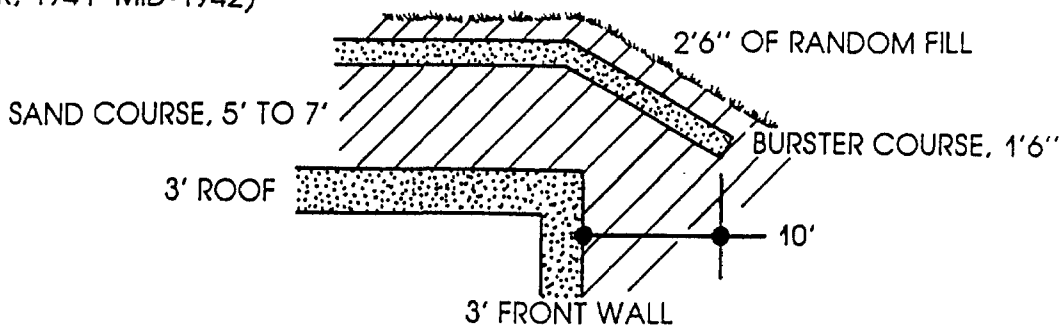


A TWO SIZES TO THIS ROOM, DEPENDING ON SPOTTING (10X20.5 OR SO)
OR SPOTTING AND SWITCHBOARD ROOM (26X15 OR SO)

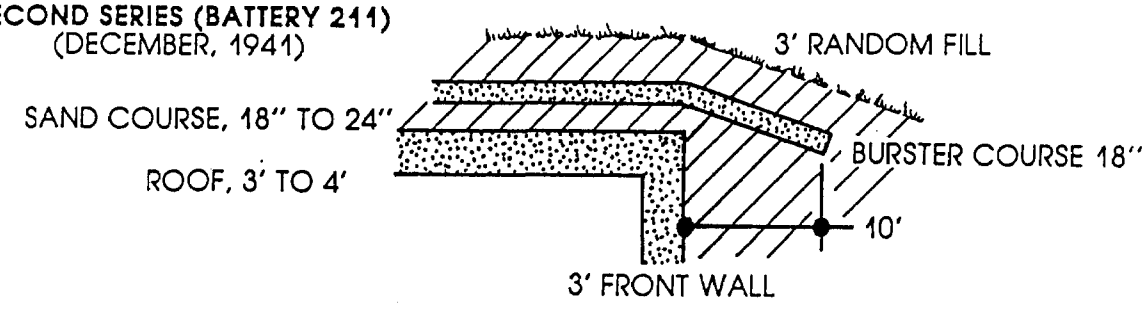
MAJOR VARIATIONS BETWEEN MAGAZINES

Figure 5

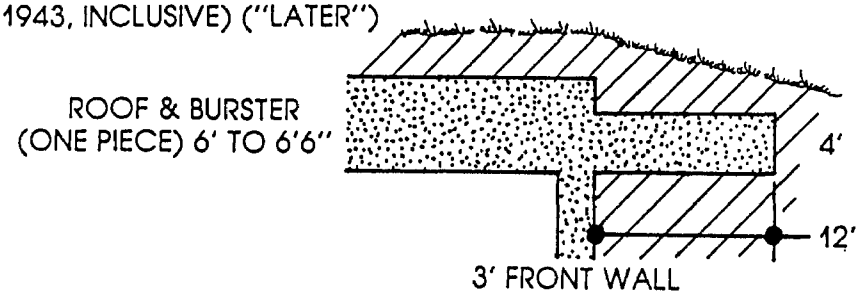
FIRST SERIES (BATTERY 212 AND OTHERS)
(NOVEMBER, 1941- MID-1942)



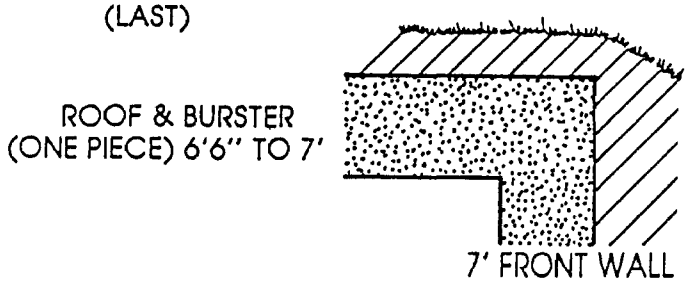
SECOND SERIES (BATTERY 211)
(DECEMBER, 1941)



THIRD SERIES (BATTERY 207 AND OTHERS)
(1942-1943, INCLUSIVE) ("LATER")

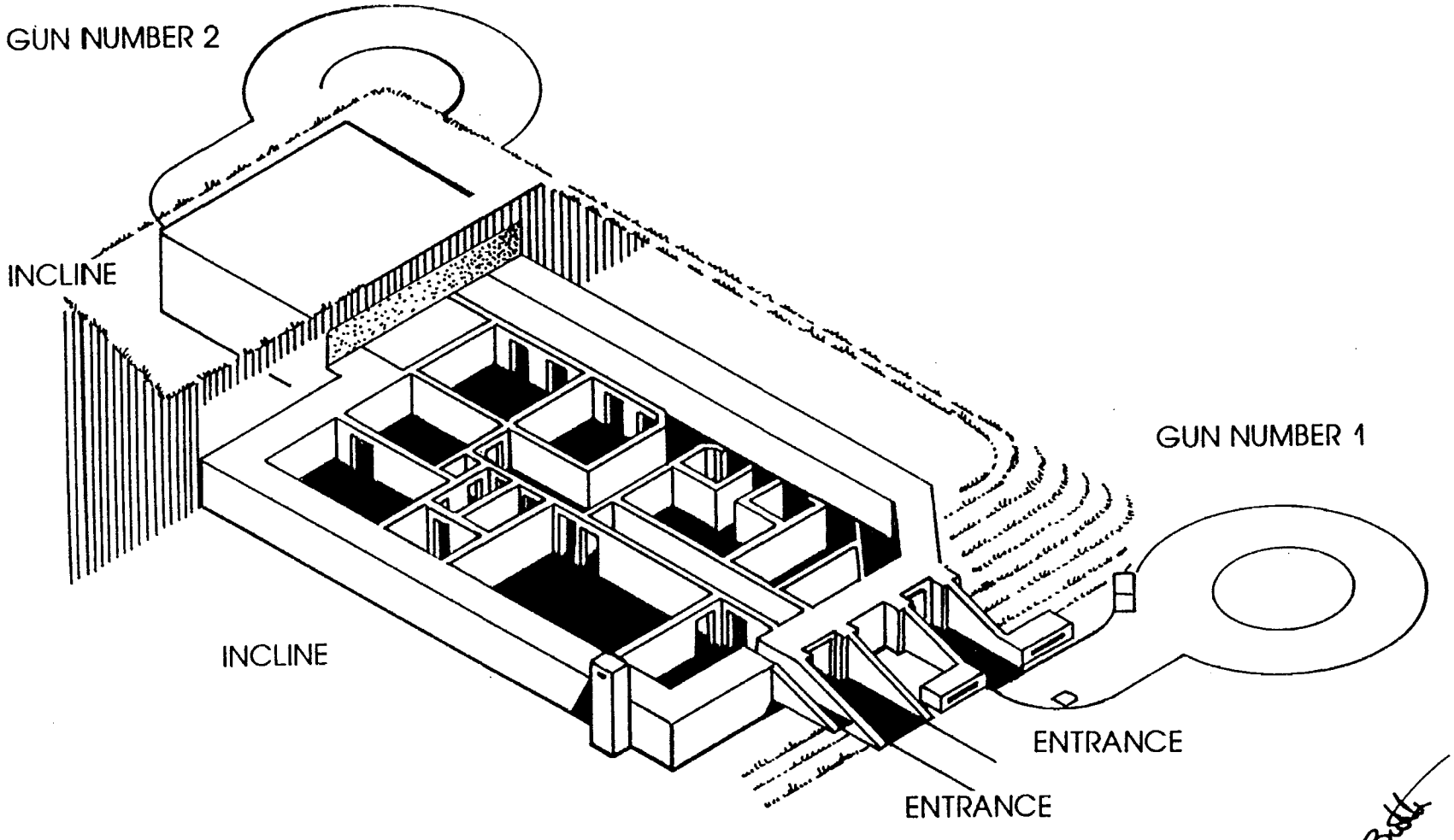


FOURTH SERIES (BATTERY 223 AND OTHERS)
(LAST)



SIDE ELEVATIONS ILLUSTRATING BURSTER, ROOF AND WALL VARIATIONS
(NOT TO SCALE)

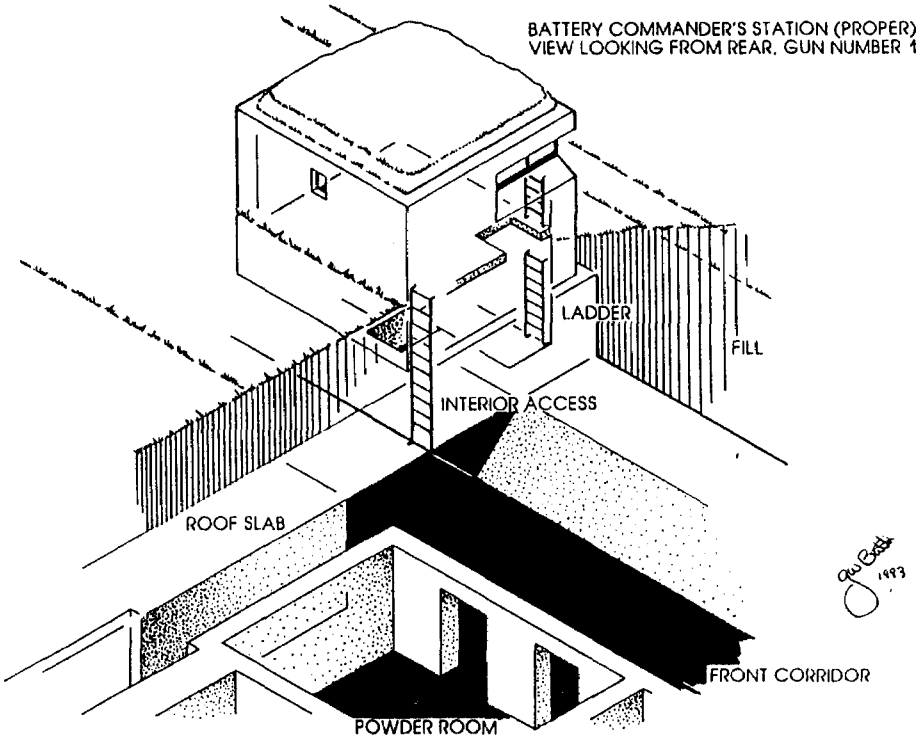
Figure 6



SIDE-ENTRANCE, OR FOLDED, BATTERY
BATTERY NUMBER 246

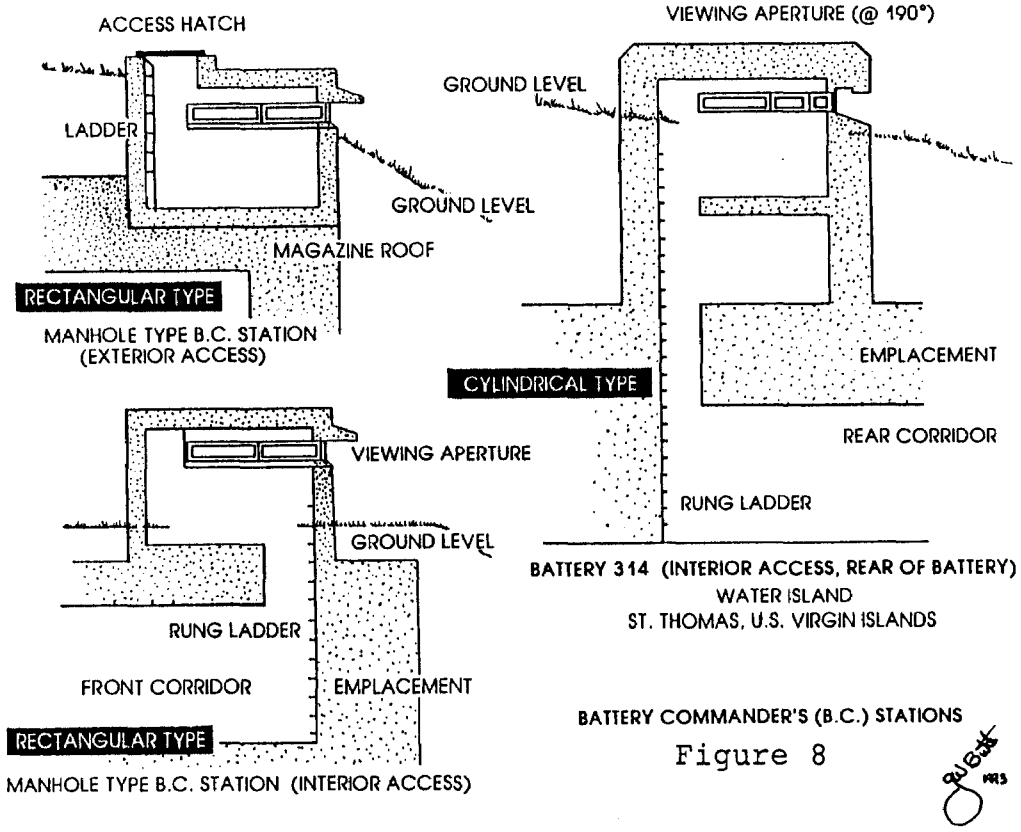
FORT COLUMBIA, WASHINGTON

Figure 7



INTERIOR ACCESS, BATTERY COMMANDER'S STATION
BATTERY NUMBER 204

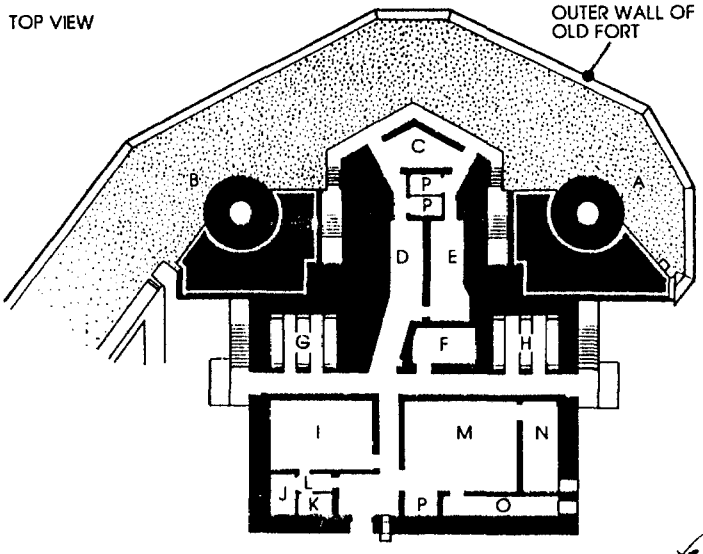
FORT DEARBORN, NEW HAMPSHIRE



BATTERY 314 (INTERIOR ACCESS, REAR OF BATTERY)
WATER ISLAND
ST. THOMAS, U.S. VIRGIN ISLANDS

BATTERY COMMANDER'S (B.C.) STATIONS

Figure 8



KEY TO ROOMS

A GUN NUMBER 1
B GUN NUMBER 2
C SHELLROOM (400 ROUNDS, HE)
D SHELLROOM (400 ROUNDS, AP)
E SHELLROOM (400 ROUNDS, AP)
F AIR COMPRESSOR AND MOTOR GENERATOR ROOM
G POWDER ROOM (600 CHARGES)
H POWDER ROOM (600 CHARGES)
I PLOTTING ROOM
J LATRINE
K C.W.S. ROOM
L AIR LOCK
M POWER ROOM
N WATER COOLER ROOM
O MUFFLER GALLERY
P STORE ROOM

NOTE: CENTER POINTS OF GUNS MEASURE 105 FEET

BATTERY GATES (229)
FORT WOOL, VIRGINIA
(CONVERTED FROM 6-INCH D.C. BATTERY)

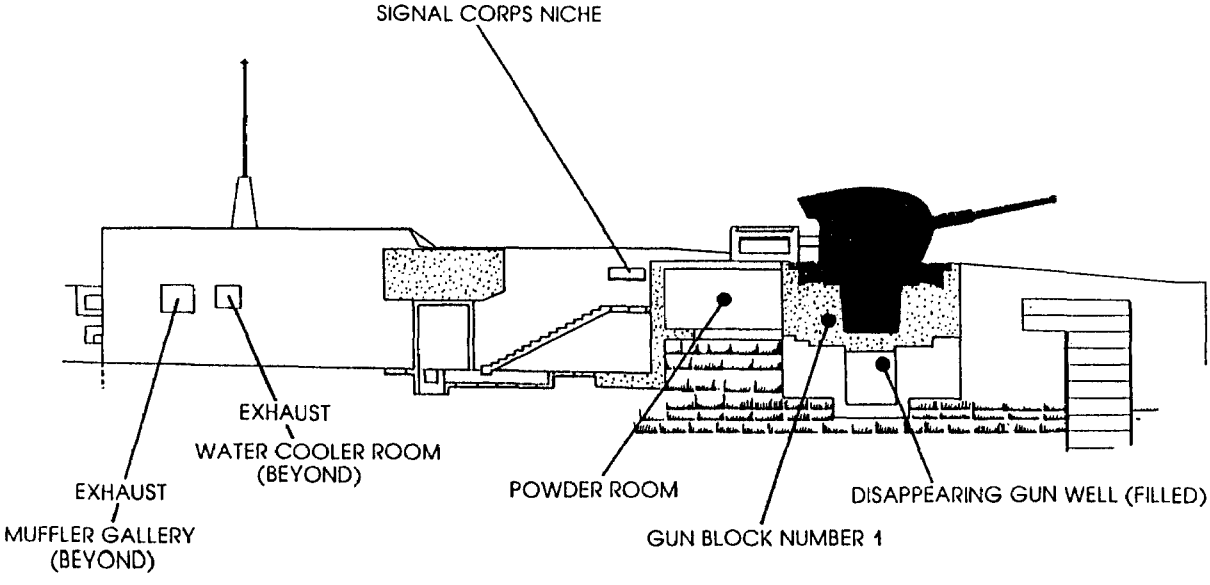
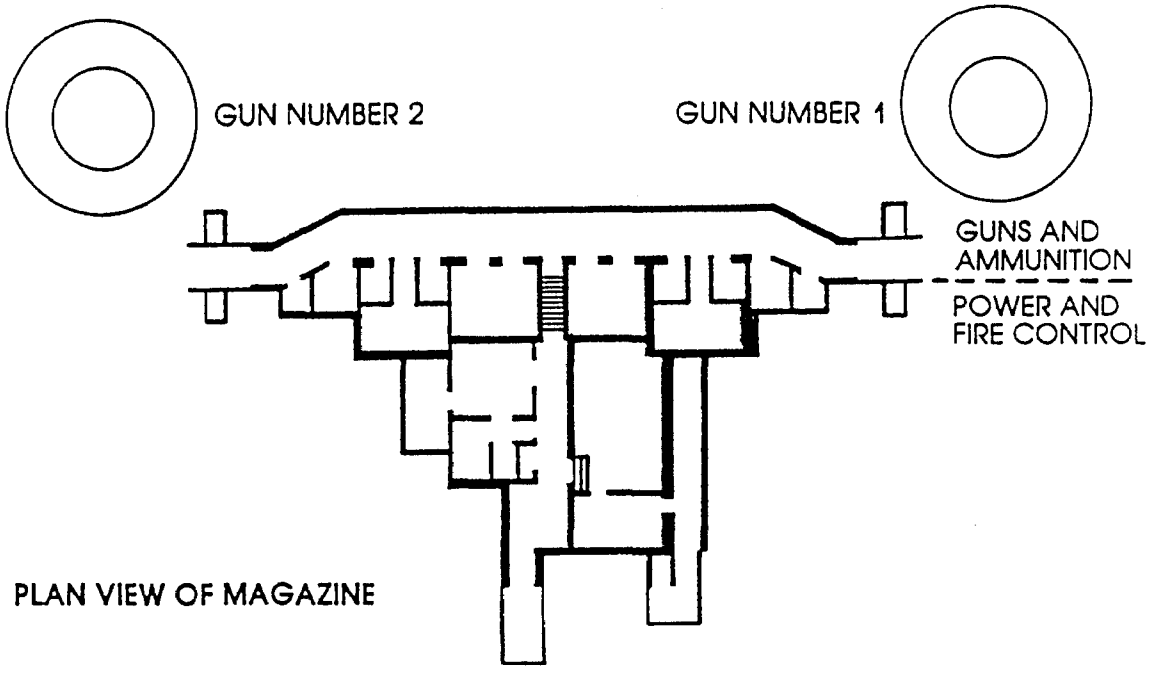


Figure 9

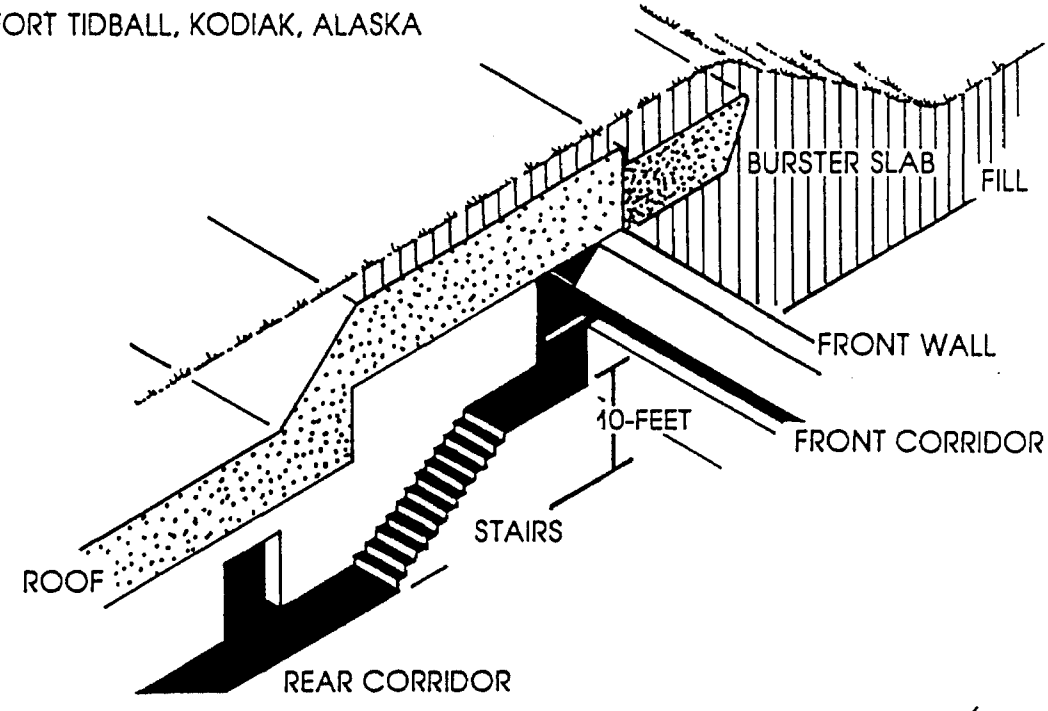
SIDE VIEW OF BATTERY
LOOKING TOWARD GUN NUMBER 1

BATTERY GATES (229)
FORT WOOL, VIRGINIA
(CONVERTED FROM 6-INCH D.C. BATTERY)



PLAN VIEW OF MAGAZINE

BATTERY NUMBER 296
FORT TIDBALL, KODIAK, ALASKA



CUTAWAY SHOWING VARIATIONS IN ELEVATION

Figure 10

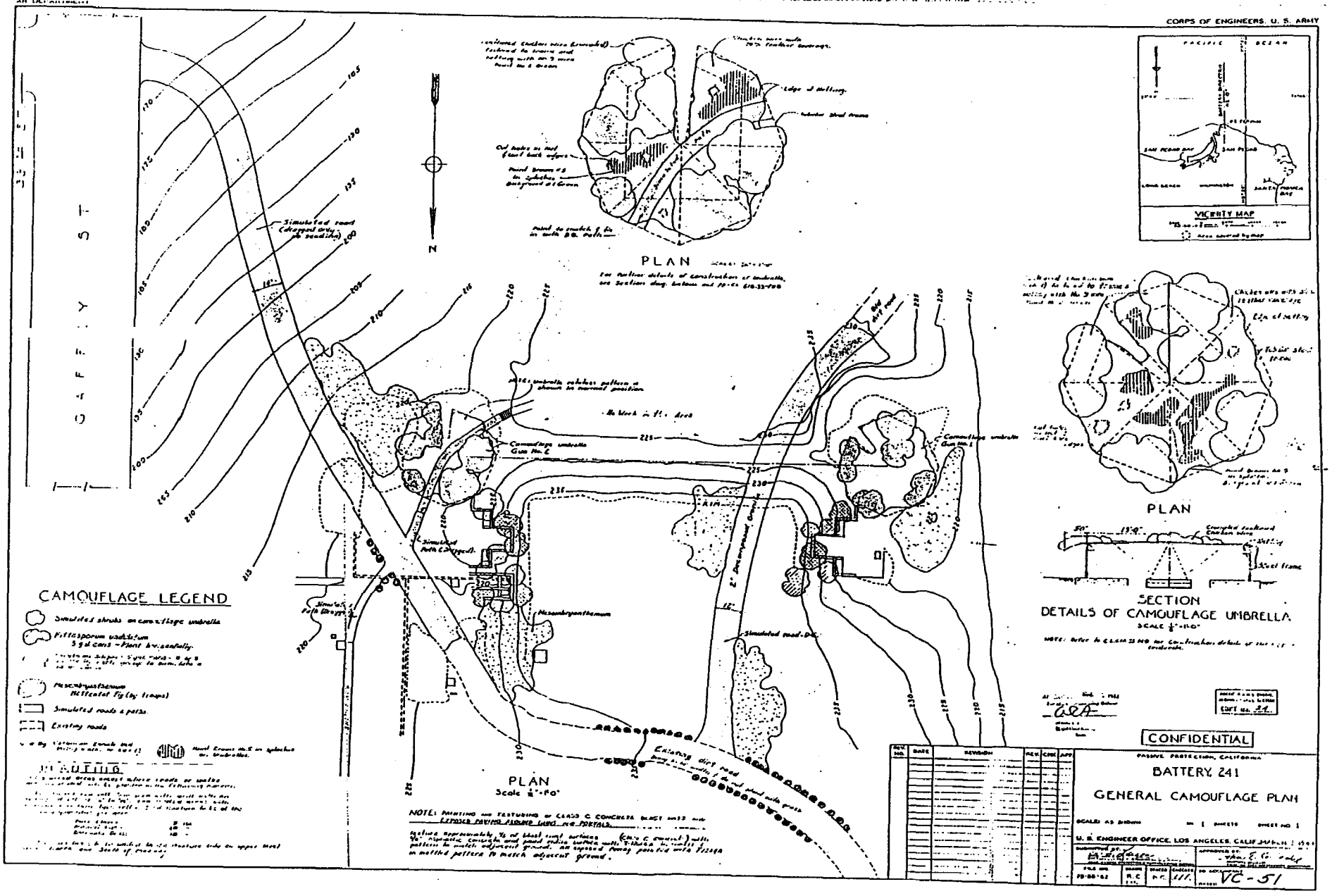

CORPS OF ENGINEERS, U. S. ARMY
PACIFIC OCEAN
VICINITY MAP
PLAN
SECTION
DETAILS OF CAMOUFLAGE UMBRELLA
CAMOUFLAGE LEGEND
PLAN
Scale 1"=40'
CONFIDENTIAL
BATTERY 241
GENERAL CAMOUFLAGE PLAN
U. S. ENGINEER OFFICE, LOS ANGELES, CALIF.
VC-51

Figure 11