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Golden Gate National Recreation Area



Evolution of a Treatment Program

The Seacoast Fortifications

at

Golden Gate National Recreation Area

San Francisco, California

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Resources and Significance

- The oldest dated fortress cannon in the United States
- Only Third-system fort on the Pacific Coast
- Unique island modified to be a defensive work
- First 12-inch gun completed and armed in the United States
- Prototype 16-inch casemated gun emplacement
- Best preserved Nike missile site in the country
- No.1 priority for seacoast defense on the Pacific Coast
- No. 2 priority in the nation.
- Extraordinary range of themes from Spanish colonial era to the Cold War
- The history of San Francisco Bay reflects key milestones for the U.S. as a trans-continental nation and as a world power
- Eleven former coast defense posts comprise the heart of the original park lands

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Pre-millennial program management: planned and site-specific

- Historic Resource Study by Erwin N. Thompson, 1979.
- General Management Plan, 1980.
- Restoration of Battery Chamberlin and mounting of 6-inch rifle on disappearing carriage.
- Excavation of West Battery at Fort Mason and mounting of 10-inch Rodman.
- Restoration of Nike Site SF-88L.



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Pre-millennial program management: reactive

- Repair of doors and window openings.
- Welding openings shut.
- Painting or replacement of railings.
- Graffiti removal and over-painting.
- Cleaning of accumulated refuse.
- Repainting of simple camouflage schemes.



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Post-millennial Program Management

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Post-millennial program management: proactive & holistic

- Research
- Condition survey
- Prioritization
- PMIS and the CCM funding cycle
- Materials testing
- Contracting
- Inspection and reevaluation
- Recording and updating
- Developing volunteer stewardship

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The Four Horsemen of the Apocalypse:

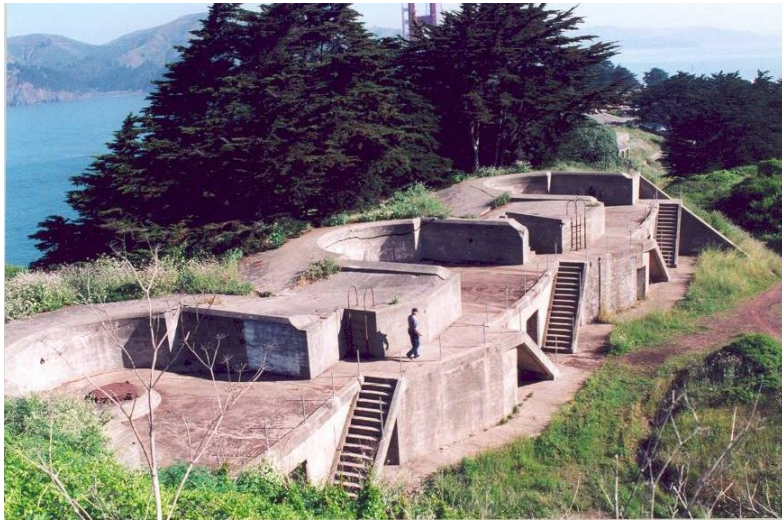
1. Vegetation management
2. Concrete repair
3. Graffiti management
4. Drainage maintenance and repair

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Vegetation Management

- Cracks in concrete and masonry
- Damage to drainage systems
- Loss of viewsheds and visitor understanding
- An important use of CCM funds

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Battery Duncan, Fort Baker

- Monarchs and Mission Blues
- Landscape Stabilization
- Marin Conservation Corps



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An Evolving Parkwide Preservation Program begins in 1999 with:

- An overall assessment
- A Preservation and Treatment Guide
- A Parkwide condition survey

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Seacoast Fortifications
Preservation Manual
Golden Gate National Recreation Area
San Francisco, California



By
Joe C. Freeman, AIA
Stephen A. Haller
David M. Hansen
John A. Martini
Karen J. Weitze

*"Winner of the California
Preservation Foundation's
2000 Design Award."*

National Park Service and KEA Environmental
Golden Gate National Recreation Area
San Francisco, California



July 1999

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Condition Assessments

COAST DEFENSE RESOURCE CHECKLIST

FORT: _____ STRUCTURE: _____ STRUCTURE NO.: _____
 LCS NO.: _____ NAMES: _____ DATES: _____
 PREPARED BY: _____ PURPOSE: _____

PERIOD: Post-Civil War Endicott-Taft WWII Cold War
 MATERIALS: Concrete Brick/Masonry Iron/Steel Frame Earth
 TYPE: Battery Fire Control Structure Mine Casemate Mine Structure
 Magazine Emplacement Searchlight Shelter Power Plant
 Dependent Structure Other

MISCELLANEOUS: _____
 PRE-FIELD DATA: _____

I. CHARACTER-DEFINING FEATURES	YES	NO	COMMENTS	SCORE
A. SITE				
1. Earthen Berms/Parados/Parapets	<input type="checkbox"/>	<input type="checkbox"/>	_____	(0)
2. Roadways/Walks	<input type="checkbox"/>	<input type="checkbox"/>	_____	(5)
3. Stairways/Ramps	<input type="checkbox"/>	<input type="checkbox"/>	_____	(5)
4. Retaining Walls	<input type="checkbox"/>	<input type="checkbox"/>	_____	(5)
5. Remnants of Historic Vegetation	<input type="checkbox"/>	<input type="checkbox"/>	_____	(5)
6. Historic Viewshed	<input type="checkbox"/>	<input type="checkbox"/>	_____	(5)
B. MATERIALS				
1. Concrete Surfaces Marked in Flags	<input type="checkbox"/>	<input type="checkbox"/>	_____	(5)
2. Concrete Vertical Surfaces Smooth	<input type="checkbox"/>	<input type="checkbox"/>	_____	(5)
3. Narrow Mortar Joints in Brickwork	<input type="checkbox"/>	<input type="checkbox"/>	_____	(0)
4. Graded Earth Slopes/Earth-Covered	<input type="checkbox"/>	<input type="checkbox"/>	_____	(5)
5. Iron or Steel Doors/Shutters/Sash/Ladders	<input type="checkbox"/>	<input type="checkbox"/>	_____	(5)
6. Wood Doors/Shutters/Windows	<input type="checkbox"/>	<input type="checkbox"/>	_____	(5)
C. STRUCTURE				
1. Additions such as Splinterproofs or Platform Extensions	<input type="checkbox"/>	<input type="checkbox"/>	_____	(0)
2. Windows in Rear Walls	<input type="checkbox"/>	<input type="checkbox"/>	_____	(0)
3. Technological Features	<input type="checkbox"/>	<input type="checkbox"/>	_____	(5)
4. Decorative Details	<input type="checkbox"/>	<input type="checkbox"/>	_____	(5)
5. Interior or Finishing Elements	<input type="checkbox"/>	<input type="checkbox"/>	_____	(5)
6. Round/Arched Interior Spaces	<input type="checkbox"/>	<input type="checkbox"/>	_____	(0)
7. Historic Paint Schemes (In/Out)	<input type="checkbox"/>	<input type="checkbox"/>	_____	(5)
8. Camouflage Fixtures, Fittings, or Elements	<input type="checkbox"/>	<input type="checkbox"/>	_____	(5)
9. Historic Signage	<input type="checkbox"/>	<input type="checkbox"/>	_____	(5)

Sub-total of item I:



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II. DETERIORATION/CHANGE

A. SITE

1. Gutters Plugged, Surface Drainage Inadequate
2. Soil Eroded
3. Soil Unstable or Sloughing
4. Vegetation Overgrown or Intrusive
5. Native Vegetation Issues
6. Trails Inadequate or Inappropriately Placed
7. Routine Maintenance Inadequate
8. Hazard Issues Present

YES NO

COMMENTS

@ rear

@ north

?

B. MATERIALS

1. Metal Elements Embedded in Concrete, Rusted or Corroded
2. Rusted or Corroded Reinforcing Steel Forcing Spalls or Cracks in Concrete
3. Reinforcing-Steel Inappropriately Placed, Concrete Inappropriately Mixed/Placed
4. Concrete Surface Deteriorated
5. Concrete Marked by Structural Cracks or by Separation
6. Wood Doors, Windows, Deteriorated
7. Routine Maintenance Inadequate

spalling @ splinterproof columns & beams.

@ platform

Missing sash; vandalised doors.

C. STRUCTURE

1. Drains Plugged, Surface Drainage Inadequate
2. Vegetation Overgrown or Intrusive
3. Interior Spaces Inadequately Vented
4. Handrails Inadequate
5. Graffiti Present
6. Trash and Debris Present
7. Routine Maintenance Inadequate

@ stair adjacent to each gun pit.

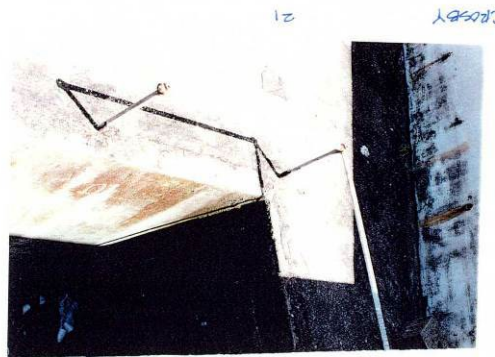
Historic guard rails removed; only new posts in place

POST-FIELD COMMENTS/ASSESSMENT: 1 large Monterey cypress removed. Need to rebuild door. New safety fence to follow existing fence line outside edge of earthworks. Replace historic railing @ rear platform.

PHOTOGRAPHIC NOTES

Roll and Frame No.:

Direction of View:



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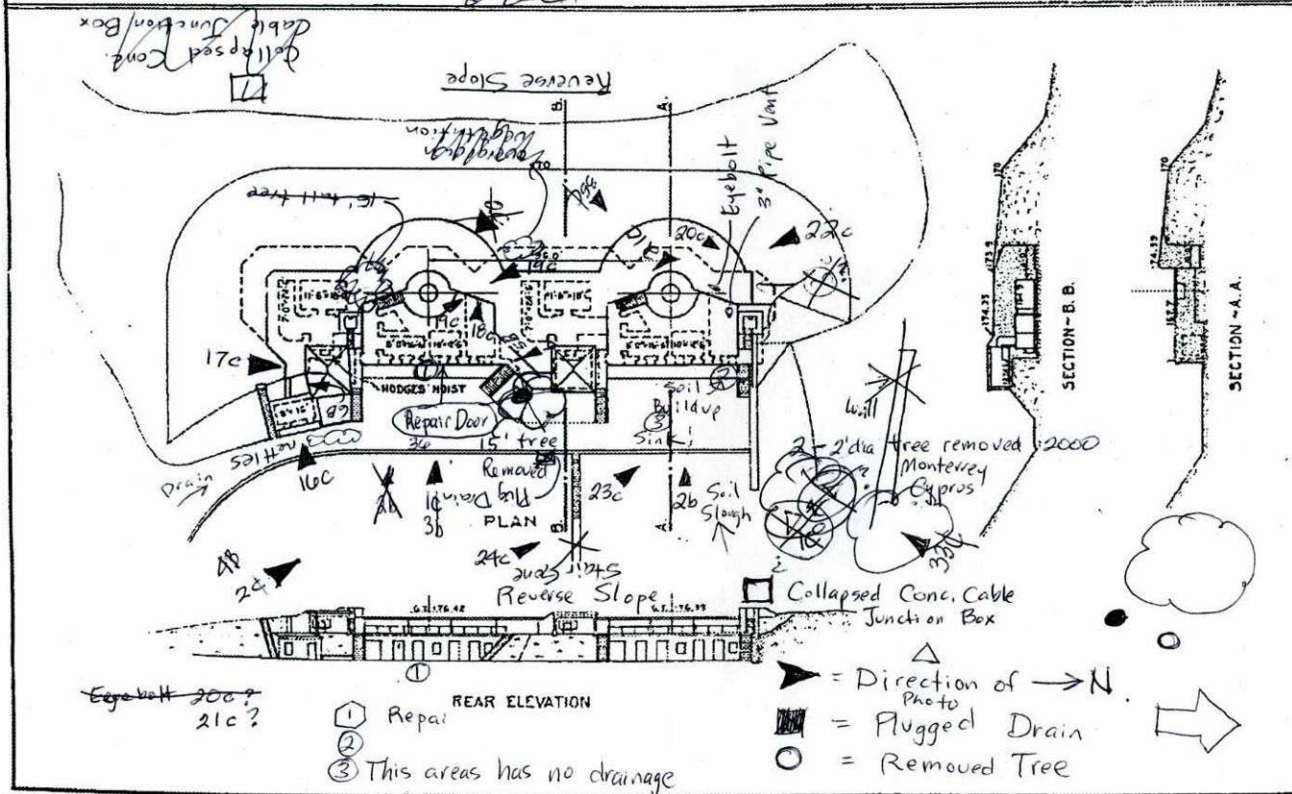
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REPORT OF COMPLETED WORKS - SEACOAST FORTIFICATIONS
(BATTERY PLAN)

COAST DEFENSES OF SAN FRANCISCO, CAL.
FORT WINFIELD SCOTT
BATTERY CROSBY
NO. OF GUNS 2 - CALIBER 6" - DISAPPEARING CARRIAGE

CORRECTED TO DEC. 1919

FORM-7



1002-0002 Battery Crosby, Fort Winfield Scott

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Golden Gate Fortifications Survey, June 2000.

Data sorted by "TOTAL"

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	A	B	C	D	E	F	G	H
1	STRUCTURE	CHARACTER (80)	CONDITION (110)	SUBTOTAL-A	SIGNIFICANCE (15)	PROGRAM (25)	SUBTOTAL-	TOTAL
2	Kirby	85	80	165	15	15	30	195
3	Godfrey	70	90	160	15	10	25	185
4	Mendell	60	100	160	10	10	20	180
5	Guthrie	65	90	155	5	5	10	165
6	Yates	80	65	145	10	10	20	165
7	Spencer	60	70	130	10	15	25	155
8	Crosby	55	85	140	5	5	10	150
9	Boutelle	55	80	135	10	5	15	150
10	Sherwood	65	70	135	5	5	10	145
11	Duncan	60	70	130	5	10	15	145
12	129	55	65	120	10	15	25	145
13	Wallace	60	60	120	10	15	25	145
14	Marcus Miller	60	60	120	15	10	25	145
15	Chester	60	65	125	10	5	15	140
16	Orlando Wagner	55	65	120	10	5	15	135
17	Alexander	60	55	115	5	15	20	135
18	Townsley	60	50	110	15	10	25	135
19	Chamberlain	70	50	120	10	20	10	130
20	Baldwin	40	80	120	5	5	10	130
21	Saffold	60	60	120	5	5	10	130
22	Cavallo	60	45	105	15	10	25	130
23	O'Rourke	35	80	115	5	5	10	125
24	Livingston	55	40	95	15	10	25	120
25	McKinnon	45	50	95	10	10	20	115
26	Davis	35	55	90	15	10	25	115
27	Battery East	35	50	85	10	15	25	110
28	243	30	45	75	10	5	15	90
29	Rathbone	40	35	75	5	5	10	85
30	Kirby Beach	15	30	45	10	5	15	60

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	API	CRV	DM	FCIbefore	FCIafter	NAME	FMSS #	NEAR	MID	LONG	TOTAL 1	PMIS \$	TOTAL2
	100	6903490.000	1578.240	0.000	-0.015	Chamberlain	38172	\$177,250	\$39,600	\$66,000	\$216,850	\$108,425	\$282,850
	93	6935031.000	240066.520	0.035	0.018	Godfrey	38174	\$179,700	\$49,200	\$425,250	\$228,900	\$114,450	\$654,150
	87	101786065.000	130000.610	0.001	0.000	Wallace	40789	\$229,200	\$3,600	\$9,000	\$232,800	\$116,400	\$241,800
	80	4466964.000	268672.440	0.060	0.027	Marcus Miller South	38177	\$285,465	\$10,300	\$8,500	\$295,765	\$147,883	\$304,265
	80	7952221.000	149902.270	0.019	0.003	Marcus Miller Nouth	38176	\$245,030	\$3,500	\$17,200	\$248,530	\$124,265	\$265,730
	80	1967357.000	2692.320	0.001	-0.028	Boutelle	38169	\$90,400	\$25,950	\$63,400	\$116,350	\$58,175	\$179,750
	80	8827478.000	646946.000	0.073	0.070	Duncan	42093	\$48,000	\$3,300	\$3,500	\$51,300	\$25,650	\$54,800
	80	18013733.000	305694.390	0.017	0.016	Cavallo	42092	\$11,150	\$21,750	\$18,550	\$32,900	\$16,450	\$51,450
	70	17871799.000	12347.000	0.001	-0.019	Mendel	40785	\$467,190	\$219,550	\$101,550	\$686,740	\$343,370	\$788,290
	70	17836316.000	3821.470	0.000	-0.013	Rathbone McIndoe	40787	\$166,150	\$313,100	\$69,950	\$479,250	\$239,625	\$549,200
	70	1014300.000	7948.280	0.008	-0.123	Kirby	40784	\$177,125	\$88,350	\$24,050	\$265,475	\$132,738	\$289,525
	70	21467449.000	0.000	0.000	-0.006	Construction 129	40781	\$244,650			\$244,650	\$122,325	\$244,650
	70	14895137.000	0.000	0.000	-0.007	Smith-Guthrie	40783	\$203,845	\$13,800	\$115,300	\$217,645	\$108,823	\$332,945
	70	2885982.000	0.000	0.000	-0.034	O'Rourke	40786	\$152,100	\$42,300	\$37,700	\$194,400	\$97,200	\$232,100
	70	8066557.000	121366.960	0.015	0.004	Yates	42095	\$171,400	\$3,750	\$21,600	\$175,150	\$87,575	\$196,750
	70	23951286.000	0.000	0.000	-0.003	Wagner	42094	\$148,795	\$750	\$32,950	\$149,545	\$74,773	\$182,495
	45	307523.000	0.000	0.000	-0.325	Alexander	40779	\$155,920	\$43,800	\$70,250	\$199,720	\$99,860	\$269,970
	45	323293.000	0.000	0.000	-0.067	West	38178	\$43,500			\$43,500	\$21,750	\$43,500
	35	1665891.000	0.000	0.000	-0.078	Crosby	38173	\$244,095	\$14,300	\$21,000	\$258,395	\$129,198	\$279,395
						AntiAircraft		\$15,000			\$15,000	\$7,500	\$15,000

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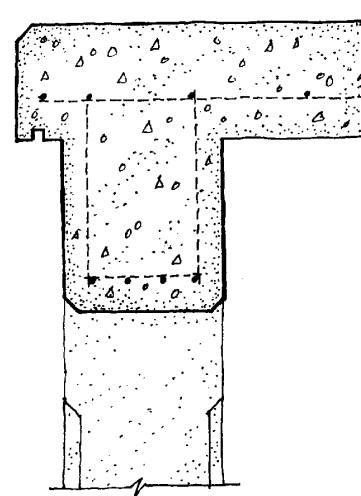
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Concrete Repairs

- **Treatment: Spalling Concrete**
- Removal of deteriorated or loose materials is easily accomplished with hand tools and small power tools. A hammer and masonry chisel will remove most loose or deteriorated concrete. Surface preparation requires removal of dust, dirt, grime, and mildew from surfaces to receive repairs. While wire brushing, washing, and similar measures may clean most surfaces, light gritblasting, limited to the affected area, may be required. When gritblasting, shield areas adjacent to the treatment area. After blasting wipe surfaces with solvent and immediately apply protective primer.
- Spalling that exposes imbedded reinforcing, clips, angles, or metal anchors requires removal of all exposed corrosion. Where surface corrosion is to be removed, either by brushing or sandblasting, the application of a seal coating over the cleaned metal is critical to the repair. Migrating rust inhibitors may be applied to the general area. Coordination of material compatibility is essential.
- Replacement of large areas of spalled concrete will require the use of steel dowels to anchor the epoxy, cement mortar or grout. The dowels should be inserted in holes drilled in the concrete in the area to be repaired.
- Application of spall repair mortars or grouts should be accomplished by laying up successive layers of material. For vertical and overhead applications, use only those epoxy adhesives recommended by the manufacturer for vertical or overhead applications.



Battery Marcus Miller: Detail view of spalling concrete. Spalling can be caused by expansive corrosion acting on reinforcing steel



Cross section through concrete showing profile, reinforcing bars, and articulated, chamfered corners and edges.

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Concrete: Treatment Overview

Standards:

Contemporary standards may not be directly applicable to historic concrete mixes. Comparison of historic materials to current standards is a useful basis for evaluation.

Comply with the provisions of the following minimum codes and standards:

American Concrete Institute (ACI) 301, *Specification for Structural Concrete for Buildings*.

American Concrete Institute (ACI) 318, *Building Code Requirements for Reinforced Concrete*.

Concrete Reinforcing Steel Institute (CRSI), *Manual of Practice*.

Materials:

Materials used in concrete repair and maintenance should conform to the following standards:

Portland Cement: ASTM C-150, Type I or II.

Reinforcing Bars: ASTM A-615, Grade 40 or 60

Welded Wire Fabric: ASTM A-185

Wire: ASTM A-82

Stainless Steel Rods: one-fourth inch to one-half inch diameter, smooth and threaded

Non-Shrink Grout: CRD-C-621, factory pre-mixed grout

Bonding Compound: compatible with patch

Epoxy Bonding Agent: epoxy resin type, MIL-B-19235

Epoxy Adhesive: ASTM C-881

Gravel Aggregate: local crushed stone to match existing

Sand Aggregate: local beach sand to match existing

Filler: molten sulfur

Non-Sag Mortar: one-component, polymer-modified, silica flume enhanced, passing ASTM C-884 (Modified)

Corrosion Inhibitor: two-component, polymer-modified, cementitious, trowel grade migrating mortar, passing ASTM C-884 (Modified)



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Approach to Concrete Repairs at Seacoast Fortifications

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Battery Kirby



Battery Mendell



A repair horizon for deterioration establishes the priority of repair, considering immediate public safety, expected rate of deterioration, and probable consequence of failure

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Battery Spencer Location



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Battery Spencer Concrete Repairs

(AUG 2007- FEB 2008)



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CCM Funded Repairs Evolution

- Repair horizon “near term”
- Overhead spalls & tripping hazards
- In-house labor
- Construction Contract with GC



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Technical Specifications

- Repair Guidelines establish repair horizons and basic construction details
- Proper preparation
- Structural details
- Concrete admixtures
- Material texture and color



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Improved Condition

- 90% near term repairs
- Safety hazards mitigated
- Repairs go unnoticed
- New technology tested



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Graffiti Management



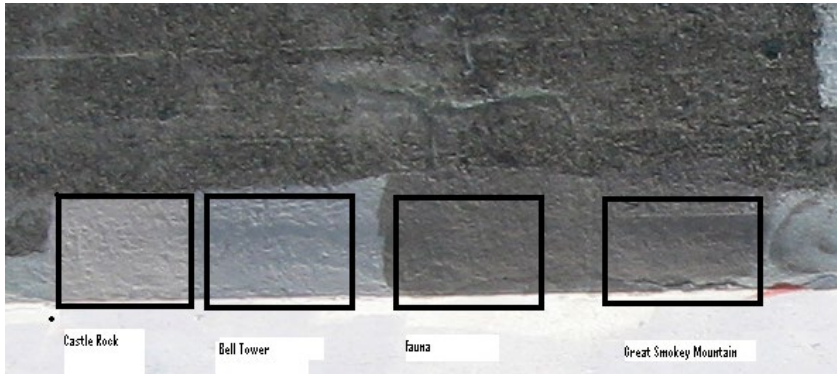
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Graffiti Management: Field Testing



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Battery Cavallo, Fort Barry, CA

ProSoCo Fast Acting Stripper, 1 application, 30-minutes dwell time, cold water rinse with fan-tip spray nozzle held 18-inches from the surface. Pressure at the gauge at 800 psi.

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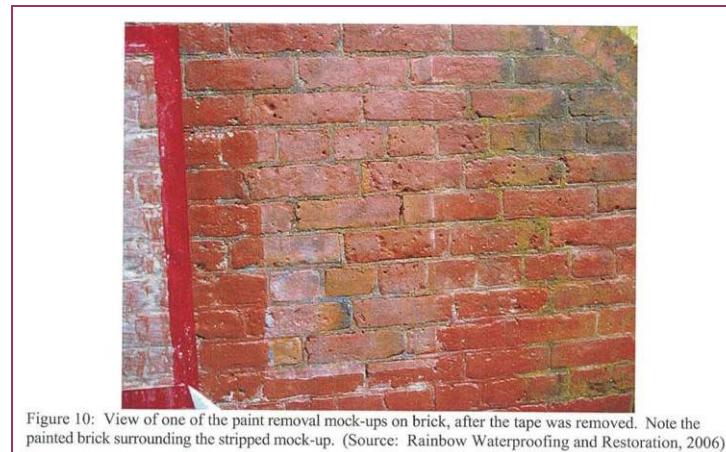
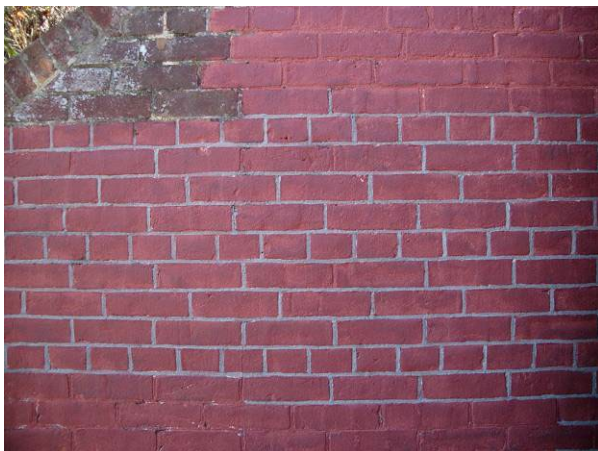
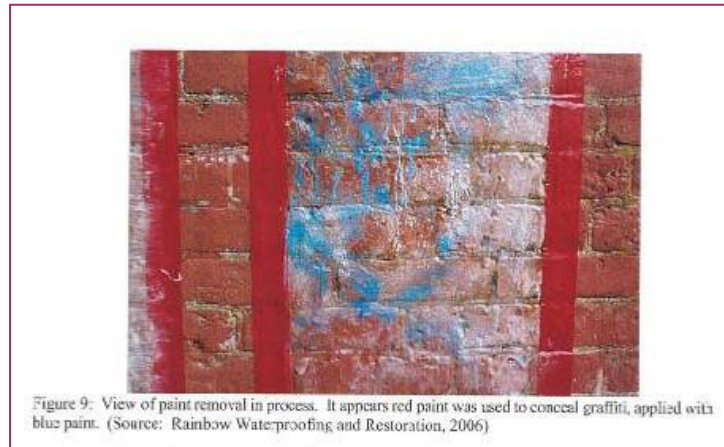
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Battery Cavallo, Fort Baker, CA

ProSoCo Sure Klean Heavy Duty Paint Stripper, dwell time 2-5 hours cold water rinse with fan-tip spray nozzle held 18-inches from the surface. Pressure at the gauge at 800 psi.

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Developing Site Stewardship: Battery Townsley

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The New York Times



Guns on San Francisco Bay, and the Hiking Trails Left Behind

Across the Golden Gate Bridge at the Marin Headlands, moody war relics are paired with sweeping views. There is an eerie dissonance to this rocky shore, on which abandoned gun emplacements overlook beaches where surfers paddle out through blue-green waves.

A trail map from the Marin Headlands Visitors Center helps visitors drive and hike to sites like Battery Townsley, San Francisco's most secretive World War II fortification. In the 1940s, it held two massive battleship guns and housed more than 100 soldiers in a network of 26 underground rooms that stretched for 600 feet.

Long closed to public access, Battery Townsley opened to the public last month in an open house; visitors can now view the battery and the modest lengths of the tunnels. In the first days after Pearl Harbor, soldiers there improvised underground huts sheltering about 15 men each, using wood, scrap steel — “whatever soldiers could beg, borrow or steal so they could live near their guns,” said John Martini, a retired National Park Service ranger who has researched the site. The dwellings still exist. “Most of them get discovered by 12-year-old boys poking around,” Mr. Martini said.

Many Marin Headland fortifications are now rusted and graffiti-scarred. But looking out at the unobstructed Pacific view from inside them, it's easy to see why a hostile ship would have found their guns difficult to elude.

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Drainage maintenance and repair



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Research

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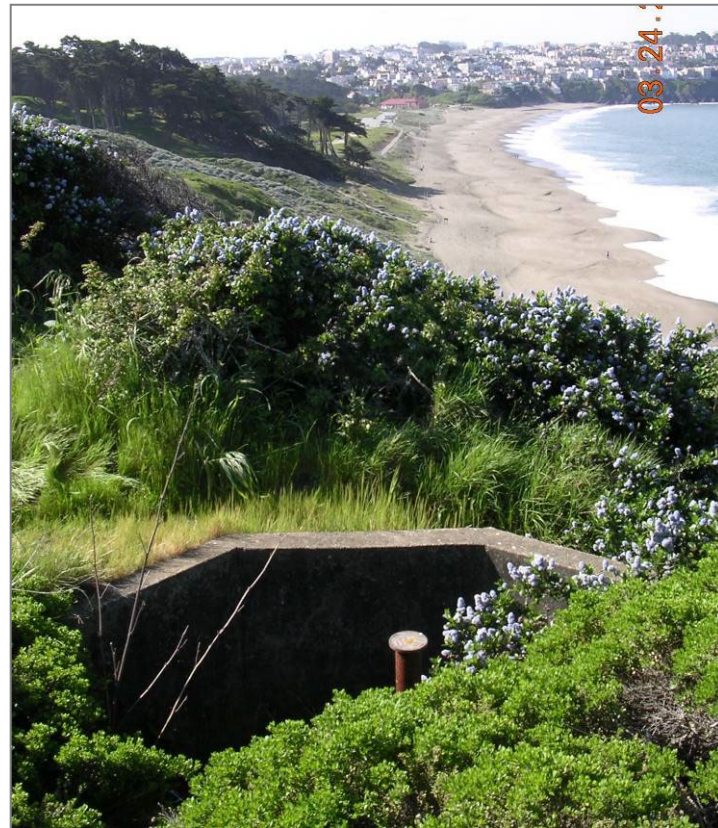


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Proactive & holistic program management is:

- Research based
- Informed by condition surveys
- Prioritized
- Coordinated with funding mechanisms
- Materials testing
- Contracting balanced with in-house work
- Inspection and reevaluation built-in
- Recording and updating is needed
- Volunteer stewardship adds value

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