Fort Sumter
Fort Sumter National Monument

Historic Structure Report

Volume I



2015

for

Cultural Resources, Partnerships, and Science Division

Southeast Region, National Park Service

by

JOSEPH K. OPPERMANN – ARCHITECT, P.A.

539 N. Trade Street Winston-Salem, NC 27101

www.jkoa.net 336/721-1711

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Fort Sumter
LCS#: 000394

Battery Huger
LCS#: 000391

Cover image: "Bombardment of Fort Sumter, Charleston Harbor, April 12 and 13, 1861," hand-painted lithograph, Currier & Ives , 1861.

The historic structure report presented here exists in two formats. A traditional, printed version is available for study at the park, at the Southeast Regional Office of the NPS (SERO), and at a variety of other repositories. For more widespread access, the historic structure report also exists in digital format through the IRMA Portal, Integrated Resource Management Applications, including the NPS Data Store, accessed at <https://irma.nps.gov/App/Reference/Welcome>, a website of the National Park Service.

Fort Sumter
Fort Sumter National Monument
Historic Structure Report
2015

Approved by: _____ 17 MAY 2016
Superintendent, Fort Sumter National Monument — Date

Recommended by: _____ 6/2/2016
Chief, Cultural Resources, Partnerships, and Science Division, Southeast Region — Date

Recommended by: Daniel S. Eblen 6/3/2016
Deputy Regional Director, Southeast Region — Date

Approved by: Stan Austin 6/6/16
Regional Director, Southeast Region — Date

Foreword

We are pleased to make available this Historic Structure Report, part of ongoing efforts to provide comprehensive documentation for the historic structures and landscapes of National Park Service units in the Southeast Region. A number of individuals contributed to the successful completion of this work, but we would particularly like to thank Superintendent Timothy J. Stone and his staff at the Fort Sumter National Monument who assisted with the project by providing relevant documents from park files, logistical assistance and general editorial review. Special thanks go to Paul Hatchett, AIA, Tommy Jones, and Dr. Ali A. Miri, architect, National Park Service Southeast Regional Office, who provided helpful comments as part of their technical review and project oversight. Special thanks also go to the dedicated staffs of Joseph K. Oppermann—Architect, P.A., Building Conservation Associates, Inc., Bennett Preservation Engineering, Inc., Aaslestad Preservation Consulting, LLC, and Sarah Fick, Architectural Historian, for their outstanding work and responsiveness to the needs of Fort Sumter. We hope that this study will prove valuable to park management in ongoing efforts to preserve Fort Sumter and to everyone in understanding and interpreting its unique history and resources.

Dan Scheidt, Chief
Cultural Resources Division
Southeast Regional Office
2015

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Management Summary

Introduction

At the request of the National Park Service Southeast Regional Office (NPS-SERO), Joseph K. Oppermann – Architect, P.A. (JKOA) has developed this Historic Structure Report (HSR) for Fort Sumter, located near the mouth of Charleston Harbor just southeast of the city of Charleston in Charleston County, South Carolina. On page xvi is a map showing the location of the harbor in the state, and another showing the location of the fort in the harbor.

Project Scope & Methodology

The purpose of this HSR is to provide a comprehensive understanding of the fort's historical evolution and significance and its present condition, and to develop planning information for use in the repair, maintenance and preservation of this historically significant site. The National Park Service will use this report to inform and guide stewardship.

The HSR treats Fort Sumter and Battery Huger as two separate structures with both distinct and shared evolutionary histories after the addition of Battery Huger in the late nineteenth century. The HSR provides historical context and background information regarding the development of American coastal defense fortifications, and addresses specific history and construction chronology of this fort, the existing physical condition of the structures, and their historic significance.

Given the specialized nomenclature of coastal fortifications, a glossary is included as *Appendix A*.

The scope of documentary research and building investigation prescribed by SERO for this HSR was "limited," meaning "research in available published sources, usually of a secondary character; research in documentary sources if easily accessible and known to be of high yield; and brief interviews of readily available persons to answer specific questions." Further, all documentation was to be provided by the Park with no additional research outside the Park's own records. At the start of the project, an orientation meeting was held on-site that included the managing representatives of JKOA and each of the JKOA project team firms, and representatives of the Park and of NPS-SERO. Review and analysis of the documents provided by the Park began immediately.

Proceeding concurrently with the documentary research was the recording of the exposed wall faces of Fort Sumter with photogrammetric images. The inward-facing wall surfaces were shot from locations within the fort, while most of the outward-facing wall surfaces were shot from a Park boat, and the remainder from locations along the fort perimeter at low tide.

The photogrammetric images were overlaid with scaled drawings in AutoCAD to create high-resolution hybrid images of scaled drawing and photograph. These hybrid images supplement the 1991 Historic American Buildings Survey (HABS) drawings of Fort Sumter floor and roof plans, and are intended to supplement the previously completed NPS drawings of Battery Huger floor and roof plans provided by the Park. Together as a set, the three groups of drawings and hybrid images were anticipated to serve as baseline documentation for subsequent field assessments.

However, during the course of the compilation, we were informed that the 1991 HABS record drawings of Fort Sumter had been hand drafted, and therefore not available in AutoCAD. Hand drawings alone cannot provide precise measurements; dimensions retrieved from the drawings by hand scaling would be approximations. This would be a serious deficiency that would prevent accurate assessments.

Therefore, JKOA secured copies of the original HABS field measurements from the Library of Congress, then used these measurements to create

scaled drawings of the site, first floor, and roof plans in AutoCAD, a digital program that allows quick and accurate scaling of dimensions for future use.

Unfortunately, the AutoCAD drawings of Battery Huger on file at the Park were found to be inadequate; therefore the first-floor plan, second-floor plan, and roof plan of that structure were measured, drawn, and converted to AutoCAD drawings by JKOA.

The final AutoCAD drawings of both structures are in *Appendix B*.

When the document research had produced a significant body of relevant data, team members made an additional series of site visits. Field observations were documented with digital photographs, field notes, and annotations made on the baseline documents. For the purposes of the field survey, copies of historical photographs and construction drawings from Park archives were compared to existing conditions.

The historical context of Fort Sumter is included in Part IA. The chronology of construction and changes to the fort and Battery Huger, and of their uses, are in Part IB. The condition assessments of Fort Sumter and Battery Huger addressing the exteriors and primary interior spaces and features of both structures are included in Part *IC, Physical Condition*. The conditions found at both Fort Sumter and Battery Huger merited structural assessments, which are included in *Appendix C*. Annotated hybrid photogrammetric images and AutoCAD drawings are in *Appendix D*.

A group of historic photographs was and new photographs taken from the same approximate angles. The sets of photographs were then compared to help identify physical changes that have occurred over time. The pairs of comparative photographs are in *Appendix E*.

The Team also reviewed the Park's pertinent technical documents. The Park had previously prepared historic materials analyses and conservation studies, performed in 2010 and included in a draft 2011 Fort Sumter Historic Structure Report, unrelated to this 2015 HSR. These were peer-reviewed by a group of three independent conservation professionals specializing in historic masonry. Their review found that the studies were not performed according to industry standards, and that treatment recommendations were often made prematurely, without adequate research. As a result, the information collected to date on the historic materials at Fort Sumter is not able to serve as a sound basis for future decisions about repairs and treatments if there is a desire for this work to be done to meet current architectural conservation standards (See *Appendix F* for a full technical review of the 2010 materials testing and prior conservation recommendations.)

Following NPS protocol, this 2015 HSR is divided into two major segments, Part *I: Developmental History,* and Part *II: Treatment & Use*. Part I is organized into the three sections that address in sequence the historical background and context, the chronology of development and use specific to both structures, and the physical description of the exterior and interior of each on a room-by-room basis, concluding with a summary assessment of conditions.

Part II presents the recommended "Ultimate Treatment and Use" and examines alternatives for treatment and use as well as requirements applicable to treatment and use.

The report includes seven appendices as follows:

- Appendix A: Glossary
- Appendix B: Documentation Drawings
- Appendix C: Report on Structural Issues
- Appendix D: Exterior Elevation Conditions Drawings
- Appendix E: Comparative Photos, Historic and Current
- Appendix F: Technical Review Document
- Appendix G: Historic Drawings
- Appendix H: HABS Documentation 1991-92

Historical Overview

The HSR recognizes the prominent role of Fort Sumter in the nation's history. Following the British invasion of Washington, DC during the War of 1812, the U.S. government modernized its system of coastal defense and planned fifty new forts. Among the new "Third System" fortifications was Fort Sumter, designed to defend Charleston and built on a shallow sand bar at the entrance to Charleston Harbor.

Construction began in 1828. A stone foundation supported the massive, five-sided, fifty-foot-tall masonry fort with its central parade ground. Of the perimeter walls, four held two tiers of casemates serving as gunrooms, with open gun platforms on the third level. The fifth or "gorge" wall included the "sallyport" entrance, officers' quarters, and magazines, also with open gun platforms above. Three-story brick barracks were built adjacent to the casemates of the left and right flanks.

Designed to house 650 men and 135 cannon, the fort was neither complete nor fully armed when Abraham Lincoln was elected president on November 6, 1860. In response to his election, South Carolina seceded on December 20, 1860, and less than a week later a U.S. Army garrison of 85 soldiers under the command of Major Robert Anderson moved from nearby Fort Moultrie to occupy Fort Sumter, and began preparing for its defense. In April 1861, after negotiations failed between Anderson and Confederate Brig. Gen. P.G.T. Beauregard, the fort became the scene of the first shots of the Civil War when in the early hours of April 12 Confederate troops fired on the fort. The fort sustained significant damage, particularly on the interior. The fortification so well designed for water attacks from the harbor channel had been battered from land. The bombardment led to Anderson's surrender of Fort Sumter to the Confederates, who occupied the fort until the last days of the war.

The Confederates immediately began repairs and alterations. Over two years later, Union troops began a fierce bombardment in August 1863 that lasted seventeen days. On August 24, Union General Quincy A. Gillmore reported the "practical demolition of Fort Sumter. . .today a shapeless and harmless mass of ruins." The fort soon became a tourist destination.

Fort Sumter, and Charleston, became the object of the longest siege of the Civil War, lasting to February 1865. When Confederate forces evacuated, Fort Sumter was "an impregnable mass of rubble and earth," and became a popular subject for artists and photographers. Portions of only two outer walls retained their original height; other sections were leveled to about half the original 50-foot height, or destroyed nearly down to the foundation.

With the exception of inspections and engineers' reports, little work was done to the fort for several years after the war. That changed in the 1870s when the Army Corps of Engineers undertook an extensive program to clear ruined portions and rubble, and to partially rebuild the outer walls and other portions of the fort, using new and salvaged materials. The final redesign resulted in a fort less than half its original height.
For the next few years, the Corps' work at Fort Sumter intensified with excavation, erection of new buildings, structural rebuilding, and modernization of weapons systems. Many casemate gunrooms were replaced with heavy gun batteries, the basic element of updated coastal defense. By 1876, Fort Sumter was transformed. It was not garrisoned, but its lighthouse was important to the harbor, and the fort continued as a lighthouse station and popular tourist destination.

The run-up to the Spanish-American War gave urgency to a new "Endicott" system, large concrete batteries supporting heavy guns, and minimally visible from the water. Fort Sumter was garrisoned in 1897. Construction of an Endicott battery there began in 1898. Named Battery Isaac Huger, it extends about 270 feet across Fort Sumter's original parade ground. The poured-in-place concrete structure is two stories in height and about 90 feet wide, designed for two guns on the upper level and gun service rooms below. The introduction of Battery Huger required many of Fort Sumter's original casemates to be bricked up, filled, and covered; much of the remaining parade ground was also filled.

During World War II, the fort served principally as a navigation point, its beacon manned by Coast Guardsmen. In 1943 Battery Huger was deactivated and its two guns removed. Both Fort Sumter and Battery Huger were decommissioned in 1947. In 1948 both were transferred to the Department of the Interior and designated a National Monument.

Visitors had been attracted to the fort since the 1860s, with visitor facilities in place by 1871.
In the 1920s, a national focus on the Civil War brought more visitors; boat tours were formalized and war memorials were placed at Fort Sumter. Visitation grew with each decade and prompted corresponding amenities.

When management shifted to NPS in 1948, historical significance became the focus as the fort was converted from a former military base to an historical monument. The 1949 management report envisioned Fort Sumter "restored as a stabilized ruin of the 1860-65 period," without the post-Civil War accretions.

Changes began immediately. Eleven buildings were demolished. NPS then undertook a phased and extensive series of projects to excavate portions of the historic features and repair and stabilize what remained of the Civil War-era Fort Sumter. Staff and laborers removed much of the fill from a portion of the interior, along with the 1870s-era modifications. Remnants of barracks, officers' quarters, casemates and cannon were uncovered; repairs were made to casemate roofs, often with salvaged materials; walls and arches were stabilized and repointed; the esplanade and much of the parade ground were uncovered, and 1898-99 Endicott-era concrete magazines and cisterns were removed.

Faced with limited funding and the approaching Civil War Centennial, with no time to add a new building, NPS remodeled Battery Huger to house support services. In 1960, crews removed roof enclosures, constructed a new upper level for a museum where a gun emplacement had been, and converted lower spaces for restrooms, offices, and support facilities. The 1921 army dock was demolished and replaced with a new dock at the sallyport entrance. The fort that greeted the Centennial visitors is very much the fort that exists today.

Significance

The Fort Sumter National Monument established by Congress in 1948 included two distinctly separate structures, one built within the footprint of the other. The earliest is Fort Sumter, the five-sided brick and stone fortification constructed as a Third System design between 1828 and 1861, and severely damaged in the Civil War. The latter is Battery Huger, a formed-in-place concrete Endicott gun emplacement constructed within the walls of Fort Sumter in 1898-99. Other nearby fortifications and NPS structures were subsequently included in the National Monument designation. As a group, they are noted as significant in the areas of Architecture, Engineering, Military, and Political history. Both Fort Sumter and Battery Huger are also noted for their long service as part of the national coastal defense system.

Fort Sumter is historically significant at many levels, but is most recognized for its pivotal role in the Civil War, especially as the site of its opening battle. Later, as a Confederate stronghold that resisted overwhelming Union military superiority, it became a symbol of Southern defiance.

Summary of Existing Conditions & Major Threats

The current threats to Fort Sumter and Battery Huger are numerous and many are serious. Some are a matter of location. The site is in a heavily trafficked harbor. Climatic conditions are harsh on building materials, and conducive to destructive tropical storms and hurricanes. Serious threats are posed by the continuing rise in sea level due to global warming, and by the increasing size and frequency of wave action from container ship traffic. In addition, the buildings are at special risk from their location in an active earthquake zone. Further, the stability of Fort Sumter may be compromised by the loads that Battery Huger and earthen fill exert on the exterior walls of the fort.

The frequency of required maintenance is high, especially at the fort, where conserving building ruins is particularly challenging. Past choices for repair have not always been optimum and some repairs have exacerbated existing problems or created new ones. At Battery Huger, the deterioration of ferrous-based metal structural components and increasing damage to the associated concrete is a looming concern, which will require intervention.

The greatest need at both Fort Sumter and Battery Huger is a strategy to comprehensively document and understand the scope of the conservation needs, and to formulate, prioritize, and monitor appropriate repairs.

Treatment and Use

Both Fort Sumter and Battery Huger are historically significant structures. The now low

pentagonal walls of Fort Sumter are mostly capped, and what remains is preserved and interpreted for the public in a semi-ruinous state. Battery Huger has been remodeled to support visitor activities and Park operations. Both Fort Sumter and Battery Huger are expected to continue their respective uses for the foreseeable future.

The recommended overarching treatment for both structures is therefore *Preservation* in order to foster the continued protection of historically-significant, character-defining features of both structures, and to continue the much-needed visitor support and Park operations. A drawback of this treatment is that the Fort Sumter of Civil War acclaim, the period of primary significance, is difficult to understand as currently experienced.

A purpose of an HSR is to consider a wide range of options for treatment and use, unrestricted by current budget and administrative policies. While Fort Sumter will not likely vary from its current primary use commemorating the Civil War, the possible treatments fulfilling that role are diverse. Accordingly, a variety of alternative treatments are evaluated and compared.

A complicating factor in considering appropriate treatments for Fort Sumter and Battery Huger is the long-reported and still unresolved question of the degree of negative impact of Battery Huger on Fort Sumter. As early as 1931 it was reported that Battery Huger's "increased weight had evidently caused the island to settle to such a degree that the base rings were seriously out of level."[1] Clark and Wylie in their *Historic Structure Assessment Report (HSAR)* note that the article "clearly demonstrates that the fort was, and is sinking, both equally and differentially settling. This leveling of the base rings was also noted in the Records of the War Department, Report of Conditions at Fort Sumter."[2]

The engineering assessment conducted as part of this report made similar observations. Further analysis is critical to understanding the causes of the reported conditions. Completing these actions is a necessary step in determining proper treatments and repairs for this National Monument. These essential steps are outlined in Part *IID Recommendations for Treatment*. The ultimate treatment of Fort Sumter and Battery Huger should be based upon the findings of these structural assessments.

1. Maj. R. T. Gibson, "Leveling Base Rings at Fort Sumter," Coast Artillery Journal, Vol. 74, Sept-Oct, 1931, p 457.
2. Clark & Wylie, *HSAR,* p. III.01-19, footnote 31.

Recommended Actions by Priority

At the conclusion of the HSR are recommended actions organized by priority to facilitate the recommended *Preservation* of Fort Sumter and Battery Huger. Included are recommendations to address specific physical needs. Also included are several policy recommendations with far-reaching implications.

First Priority

- Establish a permanent Advisory Board and develop a peer review system that allows historical architects, historians, architectural historians, engineers, archaeologists, conservators, materials experts, and other professionals in the field of historic preservation to review all significant intervention efforts before implementation. This review should be performed for all large-scale efforts (e.g. documentation efforts, comprehensive repointing, application of water repellents, structural repairs, etc.). The purpose of this board is to ensure that interventions are fully vetted, unadvisable approaches are avoided, and that a "best practices" approach is being taken for each endeavor.

- Develop, with the participation of the Advisory Board, an overall preservation philosophy for the site and individual features. This philosophy, which will affect how the site is ultimately preserved and presented to the public, will guide all repairs and physical interventions.

- Once a preservation philosophy is in place and coupled with an interpretive plan, develop a maintenance and repair plan. This plan should include:
    - Baseline documentation for every space in the fort. This documentation could be based on the ortho-rectified photography already completed by Peter Aaslestad, supplemented

as necessary to create complete documentation of the site.

- A detailed conditions assessment using the baseline documentation, documenting both integrity of material as well as the most threatening conditions. This assessment should use consistent and clear "graphic language," i.e. patterns and colors for specific and relevant conditions.
- The conditions assessment should be overlaid with significant information related to the site's history, significance and interpretation.
- Using this information, each element of the site should be prioritized into different tiers of significance. This prioritization could be used to guide the phasing of treatments and repairs.

- Develop a targeted testing program to answer specific questions about the characteristics and performance of both historic and repair materials, as well as various types of deterioration. Such material analysis should be performed with a focused approach involving the use of select tests to answer specific questions. Any testing should comply with laboratory standards and best practices. Additional information on a recommended testing program is provided in the technical document review in Appendix F.

- Conduct condition assessments of all historic building fabric on a cyclical basis (every 5-10 years), and document for future reference any current or ongoing interventions being made to the historic fabric.

- Check regularly all bricks that are held in place only by tension or shear stress in the mortar for tightness of bond to the substrate. Photograph and remove all loose brick, label as to place of origin, and store in reserved spaces on site for use in future repair work.

- Monitor all cracks through Fort Sumter's cornice or around single or small groups of bricks for loosening.

- Block pedestrian access over all cisterns with fractured granite tops until appropriate strengthening has been accomplished.

- Minimize the wet/dry cycles that are exacerbating the deterioration of the brick masonry in the Left Face Casemates. This section of the fort has no roof protection and is exposed to regular wet/dry cycles each day (it is exposed to strong sunlight throughout much of the day on its interior face and significant wave action and wetting on the exterior face). Although a specific recommendation for correcting this condition is not being proposed, one possible solution might be to install a conceptual reconstruction of the casemate vault that would serve to shield the surviving historic masonry from extreme weather and temperature, while aiding in the interpretation and legibility of this section of the fort.

- Establish a long-term, routine monitoring system to evaluate the rate of brick damage. In addition, a comprehensive testing program should be designed to determine the primary causes of the exterior bricks' deterioration. Factors to be considered include wind, salt, inherent compositional flaws, incompatible mortar, wet/dry cycles and wave/riprap impact.

- Conduct regular maintenance of the site's drainage and water collection systems.

- Conduct a safety assessment of both structures and of the site features, with emphasis on achieving a balance between the preservation of character-defining features and improvement visitor and NPS personnel safety.

- Develop and implement a proactive program of regularly-scheduled safety briefings for park personnel by a designated park safety officer. Also consider providing safety briefings for park visitors.

- Conduct the following surveys and monitoring to assist in developing recommendations regarding both the structural movement of the salient, the two shoulder angles and the

two gorge angles, and to better understand the possible damage caused by Battery Huger and the earth fill east of it:

- Repeat the deformation surveys conducted in 2011 and 2012, reported by Peter Messier, PLS, PE in 2013.
- Repeat the 2006 settlement survey conducted by Michael Shulse, PLS.
- Trace the elevation of a single mortar joint completely around the fort.
- Install a network of very accurate (5 to 10 micrometer) electronic crack monitors, backed up by stainless steel or bronze cross-crack measurement points around Fort Sumter, with the monitoring system able to record crack widths to the Web on an hourly basis with the intention that the data be evaluated annually. Such monitors would provide information on structural movement of areas of distress in the roof of the museum, in Battery Huger and in the Third System brick masonry pentagon. Most importantly, it would, if installed in appropriate locations, measure movements created from a number of causes, including specifically: foundation settlement, unresisted thrust in the vaults, rising sea level and increased wave action from larger ships.

- Take the following actions to better understand the structural behavior of Fort Sumter:
  - Evaluate cracks and other signs of structural distress and monitor regularly (see recommendations on installation of monitors above) for indications of new structural distress.
  - Develop three planar structural models: a section perpendicular to the rampart, a section parallel to the scarp wall, and a third section through the filled area along the right flank.
  - Develop selected sections through the scarp that will aid in interpreting the structural movement of masonry walls.
  - Generate a three-dimensional structural model under the direction of Registered Professional Engineers who are legally able to do such work and have both the qualifications and the experience to make recommendations on the fort. We recommend that the model be focused on the right face, where the best and most applicable results can likely be attained. In order to sufficiently show the acting forces, this model should include the salient, half of the left face, right face, and half of the right flank. The physical properties modeled and the displacements imposed in any model should be more consistent with the reality of the measured movements and observed behavior of the fort than the current model reflects.

Each of the recommended studies discussed immediately above would contribute valuable information about Fort Sumter's structural behavior and integrity. Completing these studies is a necessary step in determining proper treatments and repairs for this National Monument.

- Assess the feasibility of options to repair the structural steel of Battery Huger. Estimate the cost of each option. While concrete around corroding embedded steel can be removed, the steel treated with rust inhibitive coatings or replaced, and the concrete repoured, in reality all of the embedded steel will eventually require treatment or replacement.

- Considering the distinct possibility that the Endicott battery and the associated earth fill is causing significant damage to the east flank of the pentagon, we recommend that continued maintenance of the Endicott battery be questioned and that its removal be, at the least, studied and considered. Even if the battery itself is not removed, the removal of the earth fill east of the battery should be carefully studied and, if adverse effects are found, acted upon. Removal of the fill to the east may also provide significant opportunity to uncover, study, and interpret the historic fabric of the fort below.

- Anticipate early failures of wheelchair lifts, as is typical of exposed mechanical equipment in salt-laden marine environments, and schedule replacements accordingly to prevent gaps in service.

Second Priority

- Once an appropriate replacement mortar and brick has been identified as part of the maintenance and repair plan mentioned in the First Priority category above, repoint severely eroded mortar joints on the scarp and replace severely deteriorated or missing bricks.

- Move permanently away from the exterior walls those granite blocks along the revetment that are in the immediate vicinity. Retain the stones as part of the revetment but well away from the Fort Sumter walls.

- Conduct further studies, including hydrological studies, before deciding whether to remove the revetment.
- Conduct archaeological investigations (including underwater archaeology) along the esplanade of the exterior Gorge Wall where much early building material is apparently deposited.
- Conduct archaeological investigations in the infilled portion of the right flank to identify and evaluate potential contents. This can include non-invasive documentation, such as ground-penetrating radar and other imaging, if removal of fill is impractical.

Third Priority

- Conduct paint and finish analyses for the exterior and interior of Battery Huger. In better understanding the building's condition, the nature and prevalence of coatings would be invaluable. The information would also be helpful to developing an interpretive plan.

- Consider interpreting a group of rooms in Battery Huger to illustrate the fortification's role in the coastal defense of Charleston and the larger national defense plan. Coating systems and color schemes could be incorporated into the interpretation, both on the interior and exterior.

- Explore new avenues of interpretation to enhance the visitors' experience of the Fort Sumter of historical importance. The exploration would include traditional solutions to better define and give a sense of scale to the historical boundaries. One approach might include construction of an outline frame in one area to define missing historical features. The exploration should also include opportunities of emerging technology, such as hand-held devices to digitally project overlay historical images on existing features.

- Conduct visitor surveys to gauge the success of current interpretive programs, and to guide enhancements.

Administrative Data

Locational Data

Building Name:	Fort Sumter
Location:	Charleston Harbor
County:	Charleston County
State:	South Carolina

Related NPS Studies

Documents published by NPS:

Allaback, Sarah. *Mission 66 Visitor Centers: The History of a Building Type*. Washington, D.C.: Cultural Resources Stewardship and Partnerships, Park Historic Structures and Cultural Landscapes Program, National Park Service, 2000.

Lee, James J. III, and Lauren Laham. *Battery Potter, Mortar Battery, and Battery Gunnison, Fort Hancock, New Jersey, Sandy Hook Unit, Gateway National Recreation Area, Historic Structure Report*. National Park Service, Northeast Region, 2007.

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Real Property Information

Acquisition Date: November 1841: Federal Government title first recorded
April 1861: Confederacy by capture
April 1865: Returned to Federal Government
August 1948: Established as a National Monument/ transferred to U. S. Department of the Interior

Numbering Information

LCS ID: Fort Sumter LCS # 000394

Battery Huger LCS # 000391

Size Information

Fort Sumter: Perimeter Footprint: 104,100 square feet

Battery Huger: Perimeter Footprint: 25,200 square feet
First Floor (Enclosed): 10,200 square feet
Second Floor (Enclosed): 3,500 square feet

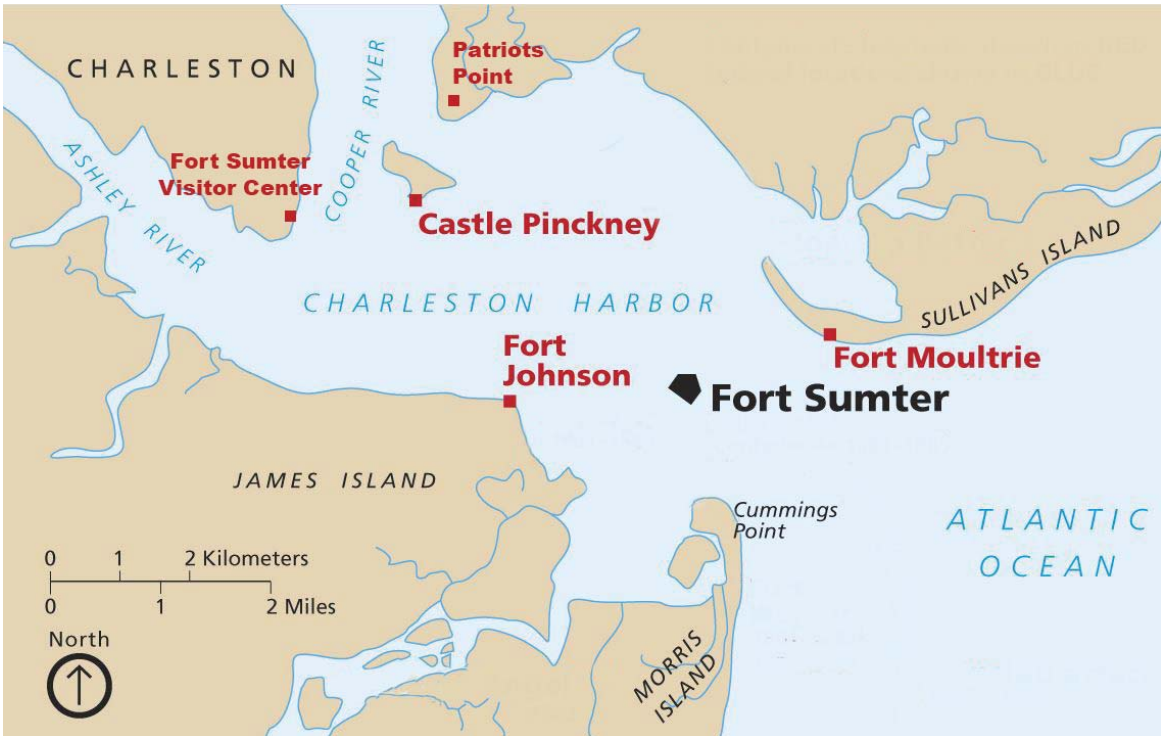
Cultural Resource Data

National Register Status: Administratively listed October 15, 1966
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Documentation accepted August 1, 1978
Boundary Increase and Additional Documentation accepted April 19, 2016

Proposed Treatment Preservation of Fort Sumter and Battery Huger



Map of South Carolina showing location of Charleston Harbor.



Map of Charleston Harbor showing location of Fort Sumter and related sites.

I.A Historical Background and Context

Section IA discusses events and policies associated with Fort Sumter. Section IB provides a history of the physical development and uses of the fort. Section IC gives a physical description of the components of the fort today.

Fort Sumter was a component of the "Third System," one in a series of national programs intended to fortify the United States against coastal attack. The first of these efforts began in 1794; the last ended after World War II. The history of American coastal defense has been well documented elsewhere; a brief summary of Fort Sumter's role is included in this Historic Structure Report of the fort.[3]

3. A broad overview is found in Emanuel Raymond Lewis' *Seacoast Fortifications of the United States: An Introductory History* (second edition). Articles and documents of the Coast Defense Study Group (CDSG) are online at http://cdsg.org/old/reprint%20PDFs/CACorg2011.pdf.

Colonial Defenses of Charleston Harbor

The first permanent English settlement in South Carolina was located at the point of the peninsula formed by the confluence of the Ashley and Cooper rivers.[4] This spot was naturally defensible, with the channel into the harbor passing between James Island and Sullivan's Island, the latter named for Captain Florence O'Sullivan who was placed in charge of a signal cannon there in 1674. For years afterward, lookouts watched the water from O'Sullivan's vantage point.[5]

4. The English settled first in 1670 on the west bank of the Ashley River, then moved ten years later to the peninsula with its deepwater harbor. The temporary settlement was known as Old Town, and in the 1970s became the Charles Towne Landing State Park. The city was originally called Charles Towne, then Charlestown, and incorporated as Charleston in 1783.
5. Edwin C. Bearss, *The First Two Fort Moultries. A Structural History* (NPS, June 1968), pp. 1-2.



Figure I.A-1. Gascoyne map of 1682, showing approach to Charles Towne. Joel Gascoyne, "A new map of the country of Carolina." (Library of Congress, www.loc.gov/item/99446166/)



Figure I.A-2. Portion of 1711 Crisp map showing Fort Johnson at Windmill Point. Edward Crisp, "*A Compleat Description of the Province of Carolina in 3 parts.*" (Library of Congress, www.loc.gov/item/2004626926/)



Figure I.A-3. Portion of 1775 Mouzon map showing the Charleston peninsula (upper left) protected by Johnson's Fort (L) and Fort Sullivan, Henry Mouzon, "An accurate map of North and South Carolina … from actual surveys by Henry Mouzon and others," London, 1775. (Library of Congress, www.loc.gov/item/74692510/)

With the outbreak of the War of Spanish Succession in 1701, the fear of attack from Spanish Florida sharpened. In late 1704, Governor Nathaniel Johnson implemented a plan for a ring of waterfront defenses around Charleston. The fortified city was tested in 1706, when a French and Spanish fleet appeared in Charleston Harbor. The invasion was repelled, but it gave impetus to construction of a new fort, built in 1708 at Windmill Point on the northeastern edge of James Island. The triangular earthwork was named Fort Johnson in honor of the governor.[6]

When the European powers went to war again in 1754 (Seven Years War), British officials at Charles Towne determined to strengthen the city's defenses. Governor James Glen hired William Gerard de Brahm, a German-born engineer, to design a large-scale defensive plan. Under this plan, waterfront defenses were rebuilt and linked by a new work, named Lyttleton's Bastion after Glen's successor as royal governor. These urban fortifications were generally neglected after 1760.[7]

After the Revolutionary battles of Lexington and Concord, the Provincial Congress of South Carolina raised the First and Second Regiments of South Carolina infantry in June, 1775. Several companies of these regiments, led by William Moultrie, colonel of the Second Regiment, were ordered to capture Fort Johnson in September, 1775. The British guard surrendered without a fight, though the fort again came under British control in 1780.

A few months later in February 1776, South Carolina Governor Edward Rutledge ordered a fort built across the harbor at the west end of Sullivan's Island to defend the approaches to Charleston. Moultrie of the Second Regiment went there in early March to command the force of men, including soldiers and a "great number of mechanics and negroe laborers" who were building the fort. Intended for use by as many as 1,000 men, this new work would be Charleston Harbor's key defense.[8] In June, Moultrie's forces, posted behind the uncompleted palmetto and sand walls of the fort, repulsed a strong British Navy squadron. The following month, South Carolina's assembly named the fort in Moultrie's honor.[9]

Early in 1780, it became clear that the returning British would attack the Charleston peninsula from

6. Nic Butler, "Remembering Fort Johnson, 1708-2008," http://www.charlestoncurrents.com/issue/08.1208.htm December 8, 2008.
7. *Rediscovering Charleston's Colonial Fortifications; A Weblog for the Mayor's "Walled City" Task Force,* http://walledcitytaskforce.org/educational-resources/time-line/ (February 4, 2014).
8. The 1775 Mouzon map (*Fig. 3*) shows "Fort Sullivan," suggesting a previous structure or anticipation of the new. Bearss, First Two Fort Moultries, pp. 3-4.
9. Ibid., pp. 5-10, 12.



Figure I.A-4. "View of Charles-Town, the capital of South Carolina," Thomas Leitch, London, ca. 1774. (Library of Congress, www.loc.gov/pictures/item/2004678927/)

the south and west. Between February and April, Major General Benjamin Lincoln and William Moultrie, now a brigadier-general, prepared for the coming attack with a new series of defensive works, a belt of waterfront fortifications "formed of earth and palmetto wood, judiciously placed and mounted with heavy cannon." After a long siege, the city capitulated in May and was occupied by the British until December, 1782. Charleston's fortifications were again neglected for more than a decade.[10]

Fort Moultrie was damaged by a hurricane in 1783, but with the Revolutionary War over and American independence recognized internationally, it was not repaired. To the contrary, private citizens dismantled the fort further to salvage brick and palmetto logs. By 1791 it was effectively a wreck.[11]

Sullivan's Island's location in the harbor served both military and public health needs. A 1706 yellow fever epidemic in Charleston prompted construction of quarantine stations, or "pest (pestilence) houses" on the island to control the spread of contagious diseases. Those entering Charleston who were seen as a disease risk, both free and slave, were sent to the pest houses. Ultimately, a 1740s law required slave ships to land at Sullivan's Island for inspection of all slaves, making the island the largest slave port in the colonies. Pest houses were not an uncommon public health strategy in the colonies and eastern Canada, where "fever sheds" were built for Irish immigrants. The last pest house on Sullivan's Island closed in 1796 as the international slave trade peaked before being abolished in 1808.[12]

America's First System of Coastal Defenses, 1794-1799

In 1794, when another war with Great Britain appeared imminent, Congress appropriated money for coastal defenses. This program of national defensive construction later became known as the First System.

Great Britain and France had gone to war in 1793, and American mercantile and shipping interests were soon caught between the two nations. Because French ships could not safely travel between France and the French West Indies, France opened the trading route to the United States as a neutral party. Britain then declared a blockade, outlawing all trade with the French West Indies. British interests began to seize American vessels in the Caribbean; a great many were condemned and taken. Britain's warships entered American harbors and towns openly, demanding goods, services, and courtesies.[13]

10. William Moultrie, "A Return of the Number of Cannon &c. in Charlestown, at the Surrender, on the Twelfth of May, 1780, in the Batteries," *Memoirs of the American Revolution* (New York, 1802; rep. ed. Arno Press, 1968). Carl P. Borick, *A Gallant Defense, The Siege of Charleston*, 1780 (University of South Carolina Press, 2003).
11. Bearss, *First Two Fort Moultries*, p. 19. The eighteenth-century Fort Moultrie is now referred to as "Fort Moultrie No. 1." The location was determined in 1973; Stanley South, *An Archaeological Evolution* (Springer Science and Business Media, 2006), pp. 274, 276-78.
12. "The 'Pest Houses' of Sullivan's Island," http://inzanouts.com. Jason King, "The Remembrance of Irish Famine Migrants in the Fever Sheds of Montreal," http://www.academia.edu/9221589/.
13. Bearss, *First Two Fort Moultries*, pp. 24-27.

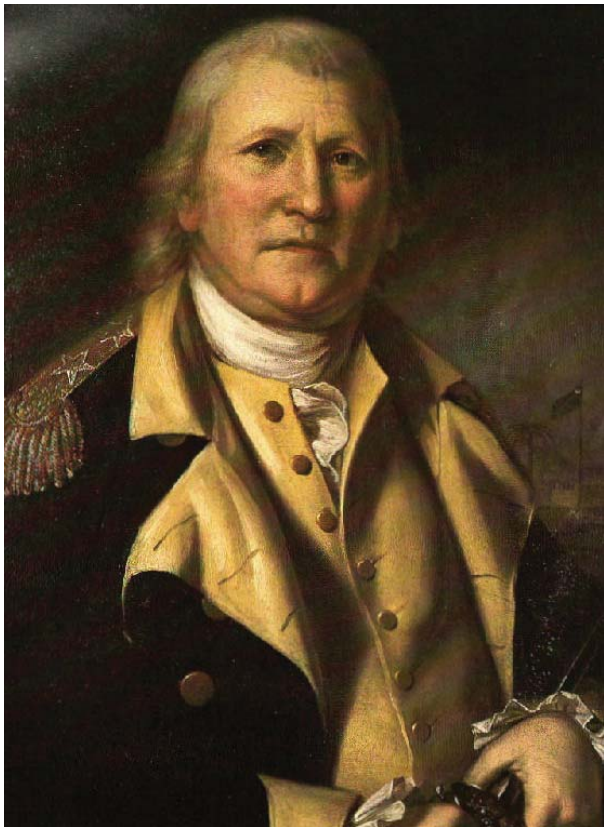
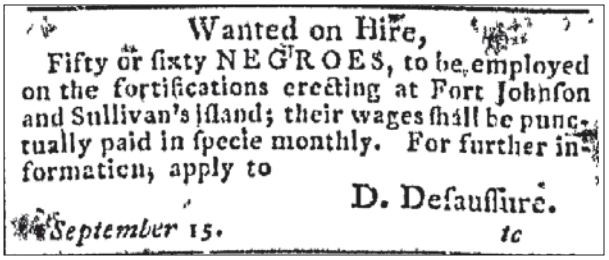


Figure I.A-5. Governor William Moultrie. (NPS, www.nps.gov/fosu)



Wanted on Hire,
Fifty or ſixty NEGROES, to be employed on the fortifications erecting at Fort Johnſon and Sullivan's iſland; their wages ſhall be punctually paid in ſpecie monthly. For further information, apply to
D. Deſauſſure.
September 15. tc

Figure I.A-6. Daniel DeSaussure's newspaper advertisement, *Charleston City Gazette and Daily Advertiser*, 1794.

On December 3, 1793, President George Washington addressed the nation's need for coastal defenses. In February, 1794, his Secretary of War reported to Congress on the harbors that should be "put in a state of defense," with an estimate of the costs for improving sixteen ports and harbors with earthen fortifications, armaments, and troops to garrison the works. Charleston Harbor would be fortified with three sets of batteries and redoubts, where seventy-two guns would be emplaced. Next to New York, Charleston would be the most heavily fortified city in the United States.[14]

The work was approved by an Act of Congress in March, 1794. Secretary of War Henry Knox engaged eight French-born military engineers. Paul Hyacinthe Perrault was given responsibility for the works at Charleston. His instructions were to erect earth and timber parapets, with barracks if needed, and to build airtight magazines.[15]

When Perrault reached Charleston in May, 1794, he found Gov. William Moultrie's engineer already constructing fortifications in two locations, a small work at Fort Johnson, and a waterfront battery downtown, on the site of the 1757 Fort Lyttleton. Perrault believed that four fortifications would be required to secure Charleston harbor. Gov. Moultrie concurred, and designated the locations: Fort Moultrie, Fort Johnson, the downtown battery, and a sand bank near Shute's Folly in the harbor.[16]

By this time, the 1770s Fort Moultrie of the American Revolution had disappeared. In August, 1794, foundation work began on the new Fort Moultrie (now known as Fort Moultrie No. 2), not long before a British fleet arrived off Charleston and began harassing American and French shipping, impressing sailors and interfering with privateers. Perrault's local agent Daniel DeSaussure, who managed purchases and labor contracts, intensified the pace of work on Fort Johnson and Fort Moultrie. In September, he advertised to hire "fifty or sixty Negroes, to be employed on the fortifications erecting at Fort Johnson and Sullivan's Island."[17]

The downtown battery underway when Perrault arrived, which had largely been paid for by local "mechanics" (artisans and builders), was completed and given to Governor Moultrie in November 1794. The governor named the work Fort Mechanic.[18]

With ratification of the Jay Treaty with Britain in 1795, the threat to American ports by British vessels diminished.[19] Congress was unwilling to commit additional funds to defensive fortifications, and work on Fort Moultrie was suspended. The foundation had been laid, but was directed to be "left as it was." Fort Johnson's garrison made necessary repairs there, but the proposed

14. Ibid., p. 29.
15. Ibid., pp. 30-33.
16. Ibid., pp. 34-36, 44.
17. Ibid., pp. 42-44.
18. Ibid., p. 34.
19. John Jay negotiated the treaty with Great Britain.

fortification near Shute's Folly was not begun. Under a congressional appropriation in 1797, work resumed on Charleston's defenses, perhaps limited to Fort Johnson, where the area's only garrison was posted.[20]

Although the Jay Treaty eased tensions with Great Britain, it worsened relations between the U.S. and France. By mid-1798, there were even calls for war with France. The War Department recommended several steps to protect American trade and to oppose French aggression on the high seas. These included adding men and fortifications at principal forts. Congress soon passed additional appropriations bills, and before the end of the year, significant progress was made in the work of fortifying Charleston Harbor.[21]

Lt. George Izard of the United States Artillery and Engineers ordered the highest priority be given to completing Fort Moultrie and to the new earth-and-timber battery on Shute's Folly in the harbor. The latter fortification was hurriedly built; by September, it was designated Fort Pinckney and its guns were mounted. Fort Moultrie was completed between July and November, 1798, as an enclosed five-sided earthwork surrounded by a ditch and glacis.[22] By that time, however, the threat of war with France was diminishing, and peace was restored in 1800. Although the late-eighteenth century appropriations acts had called for increasing the size of the U. S. Army, these plans were reversed and by 1802 army manpower was reduced.[23]

Activities at Fort Moultrie reflected the turbulence of the years between 1798 and 1802. Sixteen guns were mounted beginning in December 1798, and a regular unit was posted as early as May 1799. From 1799 to 1805, federal expenditures on all three of Charleston's forts – Moultrie, Johnson, and Pinckney – were minute: $48.68.[24]

An 1803 hurricane damaged Fort Moultrie. In a worse storm in 1804, Forts Moultrie, Johnson, and Pinckney were effectively left in ruins.[25]

20. Bearss, *First Two Fort Moultries*, pp. 47-48, 53-56.
21. Ibid., pp. 51-52, 58-59.
22. Ibid., pp. 62-64. Roger W. Young, "Castle Pinckney, Silent Sentinel of Charleston Harbor," *The South Carolina Historical and Genealogical Magazine,* Vol. XXXIX, No. 1, January 1938.
23. Bearss, *First Two Fort Moultries*, pp. 70-71.
24. Ibid., pp. 67-72.
25. Ibid., pp. 69, 72-75. Young, "Castle Pinckney, Silent Sentinel of Charleston Harbor."
26. Edwin C. Bearss, *Fort Moultrie, No. 3; Fort Sumter National Monument, Sullivan's Island, South Carolina* (National Park Service, December 30, 1968), pp. 2-3,17-18.
27. Ibid., pp. 3-4.
28. Bearss, *First Two Fort Moultries*, p. 75. Bearss, *Fort Moultrie, No. 3*, pp. 10-11.
29. Bearss, *Fort Moultrie, No. 3*, pp. 13-18.

The Second System of Coastal Defenses, 1807-1810

The United States remained neutral during the Napoleonic Wars, but with the expiration of the Jay Treaty in 1806, the British again began harassing American shipping traffic. Fear rose that coastal cities might come under attack. Congress responded in 1807 by authorizing funds for the nation's "Second System" of coastal defenses, enabling the design and construction of permanent fortifications. These were enclosed works of masonry construction.[26] The Second System defenses of Charleston Harbor relied on the same locations as the earlier fortifications: James Island (Fort Johnson), Shute's Folly (Fort Pinckney), peninsular Charleston (Fort Mechanic), and Sullivan's Island (Fort Moultrie).

When the Second System was funded, planning for improvements to Charleston Harbor's fortifications had already been underway for several years. In 1805 South Carolina granted to the United States full title to the land reserved for Forts Moultrie, Johnson and Pinckney. (Fort Mechanic's ownership was more complicated and its title was never conveyed to the state or federal governments.)[27]

In April 1807, Lt. Col. Jonathan Williams of the U.S. Army Corps of Engineers visited Charleston and found Fort Moultrie "heaps of rubbish, of no other value than the brick which might come in use again ...." He recommended a new fort be built at the same location, about 100 yards from the shipping channel into the harbor.[28]

The Corps of Engineers returned to Charleston in August 1807 with orders to work with local militia units to strengthen harbor defenses. They built temporary fortifications at four forts (Moultrie, Shutes Folly [Pinckney], Mechanic, and Johnson) and placed new guns at Fort Johnson. After Congress funded the Second System in November 1807, construction began under a plan which would be implemented over five years.[29]

During construction of the new fortifications, guns and ammunition shipped into Charleston were stored in a new federal arsenal. By the end of 1808, Fort Johnson was complete and armed, and construction was underway at Moultrie and Pinckney. Those forts, and Fort Mechanic downtown, were completed in 1809; the Shutes Folly fortification was completed and named Castle Pinckney. In March 1810, the Corps of Engineers ceased all work on Charleston's defenses.[30]

Third System, 1816-1867

The War of 1812 (1812-1815) proved the inadequacy of American coastal defenses. In 1815 President James Madison recommended to Congress the improvement of the nation's maritime security, with a board of engineers created to develop a new system of harbor defenses. Fortifications were an essential component of the initiative, which became known as the Third System. Developing the program during peacetime, with professional engineers overseeing the design and construction of coastal fortifications, allowed for significant standardization in their design.[31]

Madison's Board of Fortifications was headed by Simon Bernard (1779-1829), a French military engineer. In 1821, Bernard's board recommended to Congress the construction of masonry fortifications to defend the nation's seaports, with Charleston Harbor among forty proposed locations. A revised report in 1826 listed Charleston among the first-priority locations.[32]

The Third System forts were far more advanced than earlier defensive works. They were enclosed polygons, with two or three tiers of arched casemates (gunrooms) at three or more sides. The masonry construction generally relied on brick, or on stone where readily available. Within the walls



Figure I.A-7. French general and engineer Simon Bernard. (Casemate Museum, Fort Monroe, and www.hq.usace.army.mil/history/vignettes)

of a fort were parade ground, barracks, and service buildings for military purposes as well as to support the men living at the fort. Although Third System fortifications were built over several decades, their design and construction remained consistent, following Bernard's goal of withstanding a siege for fourteen days.[33]

Forty-two forts were actually built, though not all were completed. They were similar but not identical in construction. Construction of many Third System forts was supervised by American military engineer Joseph G. Totten, a graduate of West Point who began working with Bernard at the formation of the board in 1816, and took over the leadership role when Bernard returned to France in 1831. He became Chief of the U.S. Army Corps of Engineers in 1838, and played an ever increasing role in the technology and construction of all coastal fortifications. He would also supervise construction of Fort Sumter.

30. Bearss, *First Two Fort Moultries*, p. vi. Bearss, *Fort Moultrie, No. 3*, pp. 20-24.
31. Stephen M. Clark and James H. Wylie, *Fort Sumter Historic Structure Assessment Report (HSAR)* (Fort Sumter National Monument, National Park Service, November 1992), p. III.01-1. "The Third System," Fort Pulaski National Monument, http://www.nps.gov/fopu/historyculture/the-third-system.htm (December 20, 2013).
32. Heath L. Pemberton, Jr., "Fort Sumter: Chronological Construction History with Architectural Detail" (Charleston: Fort Sumter National Monument, September 1959).
33. John R. Weaver II, *A Legacy in Brick and Stone – The American Coastal Defense Forts of the Third System 1816-1867* (Maclean, Virginia: Redoubt Press, 2001).

The first of the Third System fortifications to be completed was Fort Monroe, Virginia, on Point Comfort at the mouths of the James and Elizabeth rivers. Built between 1819 and 1834, it was the largest stone fort constructed. An irregular polygon with large corner bastions, it guarded the deep natural harbor at Hampton Roads, Virginia.[34]

Fort Adams in Narragansett Bay (Newport), Rhode Island, was begun in 1825. Completed in 1857, it was built of shale and granite in the form of an irregular pentagon with corner bastions.[35]

A smaller Third System work was Fort Macon, North Carolina, which guarded Beaufort Inlet and Beaufort Harbor. Brick with stone trim, Fort Macon was in the shape of a pentagon with truncated angles. Construction began in 1826, and the fort was completed and garrisoned in 1834.[36]

In 1827, site preparation began for Fort Pulaski, Georgia, a river fortification guarding Savannah. Constructed between 1829 and 1847, it was a two-tier hexagonal structure built of brick.[37] Lt. Robert E. Lee, recently graduated from West Point, was in charge of the drainage canals and earthworks.

Fort Pickens, Florida, was built to defend Pensacola Bay and the navy yard there. The brick masonry fort was begun in 1829, and completed in 1834 as a regular pentagon with corner bastions.[38] Fort Warren, Massachusetts, a pentagonal star fort, stands on Georges Island at the entrance to Boston Harbor. The two-tier granite structure was built from 1833 to 1861, being completed shortly after the Civil War began.[39]

Fort Delaware protected the ports of Philadelphia and Wilmington from Pea Patch Island in the Delaware River. Built as a star fort between 1819 and 1823, it burned in 1831. Excavation and site preparation began on a new Fort Delaware in 1836, but a legal dispute regarding ownership of the island delayed construction for several years. The polygonal granite-and-brick fortification with corner bastions was essentially built between 1848 and 1859, and finally completed in 1868.[40]

34. "War of 1812," Fort Monroe National Monument, http://www.nps.gov/fomr/historyculture/1812.htm. "Fort Monroe National Monument," http://www.nps.gov/fomr/index.htm (December 20, 2013). Fort Monroe is a new unit of the National Park Service.
35. "Fort Adams History."
36. "Fort Macon State Park – History," http://www.ncparks.gov/Visit/parks/foma/history.php (December 20, 2013).
37. "The Third System," Fort Pulaski National Monument.
38. "Fort Pickens," Gulf Islands National Seashore, http://www.nps.gov/guis/planyourvisit/fort-pickens.htm (December 20, 2013).
39. "Island Facts: Georges Island," Boston Harbor Islands National Recreation Area, http://www.nps.gov/boha/historyculture/facts-geor.htm (December 20, 2013).
40. "Timeline," Fort Delaware State Park, http://www.destateparks.com/PARK/fort-delaware/civil-war/timeline.asp (December 20, 2013).



Figure I.A-8. Fort Macon. (http://www.northcarolinahistory.org/images/uploaded/posts/screen_447d8a40edd37.jpg)



Figure I.A-9. Fort Pulaski. (http://stayinsavannah.com/blog/savannah-events/)



Figure I.A-10. Aerial view of Fort Jefferson from the west. (http://www.nps.gov/media/photo/gallery.htm?id=89404A1F-1DD8-B71C-07C25C8631876288)

Fort Zachary Taylor, Key West, Florida, was built about 1,000 feet off the tip of the island between 1845 and 1860, and finally completed in 1866. The trapezoidal three-tier brick fort had corner bastions.[41]

Fort Jefferson, in the Gulf of Mexico west of the Florida Keys, was a four-tiered hexagonal fortification with corner bastions, positioned to defend the deep water harbor of the Dry Tortugas. Intended to protect American shipping in the Gulf of Mexico and Straits of Florida, construction began in 1846. Although it was never finished to the original plans, it is the largest brick structure in the Americas.[42]

Fort Clinch, Florida, was built on Amelia Island at the entrance to St. Mary's River. The pentagonal fort with corner bastions was begun in 1847, and nearly complete by 1861.[43]

Third System forts were soon put to use, but with designs predating improvements in artillery. During the Civil War, the newly-developed rifled guns allowed attackers to mount a successful siege from a greater distance than was possible with the earlier smoothbore guns. The garrisons of two Confederate-held Third System forts, Pulaski and Macon surrendered in April 1862, both after being bombarded by rifled guns for less than twenty-four hours. The loss of these forts is seen by historians as proof that the Third System's enclosed, casemated masonry fortifications were obsolescent by the 1860s.[44]

Fort Sumter, 1828-1861

By 1826, Charleston Harbor had been surveyed and plans were underway to locate a new fortification on a shallow shoal in the harbor opposite Fort Moultrie. Together the two forts would command all channels into the harbor. Preparatory plans for a "Casemated Battery designed for the shoal opposite Fort Moultrie, Charleston Harbour [*sic*], S. C." were drawn up, and in 1827 Secretary of War John C. Calhoun approved the construction of the Third System fort, a pentagonal, three-tiered, brick fort with truncated angles.[45]

Congress made the first appropriation for the Charleston fort's construction in 1828. Lieutenant Henry Brewerton of the Corps of Engineers was appointed supervisory engineer. The 27-year-old West Point graduate had most recently served as assistant engineer in the construction of Fort Adams (Rhode Island). Arriving in Charleston, Brewerton established his headquarters at Fort Johnson on James Island.

In 1832, after stone was delivered from the North, Brewerton began construction of Fort Sumter's foundation "mole," a circular construction laid on the sandbar. Nearly two years later, work was suspended while a citizen's claim to the underwater tract was investigated. Building resumed in January 1841, under the management of Captain A. H. Bowman, and the foundation was complete in 1846. Building the walls of locally-made "Carolina grey" brick finally began, almost twenty years after Fort Sumter was designed.[46]

In 1855, while still under construction, the new fort provided a location for a lighthouse tower, a 5th-order Fresnel fixed white light placed fifty-one feet above mean high water. This "front" light in the harbor, together with a "rear" light in the steeple of St. Philip's Church downtown, marked a range line that guided marine traffic from the Charleston Light Vessel through the main harbor channel. (The lightship, which was placed in service in 1854, was moored about eight and one-half miles from Fort Sumter. Its beacon guided ships clear of Rattlesnake Shoal at the mouth of Charleston Harbor.)[47]

41. A Navy dredging project in the 1960s landlocked the fort. "History," Fort Zachary Taylor State Park, http://www.fortzacharytaylor.com/history.html. "Florida; Fort Zachary Taylor," http://www.nps.gov/NR/travel/geo-flor/50.htm (December 20, 2013).
42. "Fort Jefferson," Dry Tortugas National Park, http://www.nps.gov/drto/historyculture/fort-jefferson.htm (December 20, 2013).
43. "Fort Clinch" National Register nomination, 1972. "Fort Clinch State Park," Florida State Parks, http://www.floridastateparks.org/history/parkhistory.cfm?parkid=66 (December 20, 2013).
44. "Fort Pulaski, CWSAC Battle Summaries," The American Battlefield Protection Program, http://www.nps.gov/hps/abpp/battles/ga001.htm. "Fort Macon State Park – History."
45. Heath L. Pemberton, Jr., "Fort Sumter: Chronological Construction History with Architectural Detail" (Charleston: Fort Sumter National Monument, September 1959), www.uscg.mil/history.
46. Ibid., pp. 5-9. James N. Ferguson, *An Overview of the Events at Fort Sumter, 1829-1991* (Historic American Buildings Survey [HABS] 1991), p. 9.
47. U.S. Coast Guard Historian's Office, "Coast Guard History" and "Lightship Station Index;" www.uscg.mil/history; accessed 17 May 2012.

By the end of 1860, Fort Sumter was essentially complete. Although barracks for the soldiers were habitable, many embrasures were unfinished and only fifteen guns were mounted.[48]

In August and September 1858, before the fort was put to use, it served as short-term internment for about 300 Africans. The overseas slave trade had been abolished in 1808; nevertheless, a number of "pirates" brought slaves from Africa for trafficking to Brazil. A US patrol boat captured a slave ship, the *Echo*, near Cuba with a cargo of 300 Africans taken from the mouth of the Congo. The Africans were brought to Charleston and quarantined in the city jail for a day before being taken into the custody of a U.S. marshal. They were removed from the city and taken to Fort Sumter, a property of the federal government, for protection. The *Echo's* captain and crew were jailed to stand trial for piracy.[49]

48. Frank Barnes, "Fort Sumter, December 26, 1860" (Charleston: Fort Sumter National Monument, February 21, 1950).
49. HABS, "Fort Sumter Written Historical and Descriptive Data," No. SC-194, 1992, pp. 16-17, citing Roberson, pp. 5-6.

The Africans were the sole inhabitants of Fort Sumter. From different tribes, they spoke different languages, were dressed in traditional garb, and congregated in their groups. And they were seen as oddities. People of the city took paid boat trips to Fort Sumter to watch them paraded on the fort's esplanade. They also saw that the Africans were weak, diseased, and reduced "to the merest skeletons" from their manacled 35-day ocean crossing, and many, including slaves, donated clothes, blankets, bacon and rice.

About thirty-five died of disease while at the fort, mainly of yellow fever. President James Buchanan gave responsibility for the group to the Society for the Colonization of Free People of Color, an organization created in 1816 to repatriate ex-slaves to Liberia. On September 21, the frigate USS *Niagara* carried the Africans on a 5,000-mile voyage to Liberia.[50]

Northern editors and politicians followed the incident and the highly-charged subsequent trial,

50. M. Patrick Hendrix, *A History of Fort Sumter: Building a Civil War Landmark* (History Press, 2014), pp. 32-36.



Figure I.A-11. "Fort Sumter, Seen From the Rear, at Low Water." (*Harper's Weekly Magazine,* January 26, 1861)

where the captain and slavers were found not guilty by a Charleston court. The *Cleveland Plain Dealer* noted,

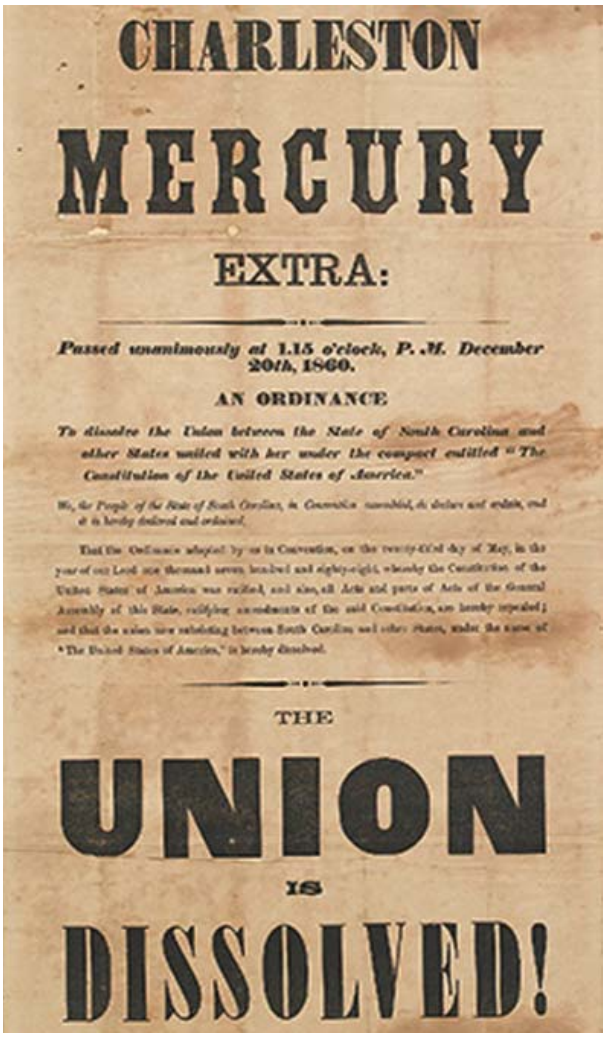
> At both ends of this Confederacy the Union splitters are at work.... A slave trader is caught in the very act of piracy upon the high seas. She is taken into a Southern port, her crew arrested, tried by a Southern jury and acquitted...thus the work of disunion goes on.[51]

The Civil War and Fort Sumter, 1861-1865

The Confederate bombardment of Fort Sumter on April 12, 1861, marks the outbreak of the Civil War. Local and national events had been leading toward an impasse for more than a year; the underlying disagreements were much older. The causes of the Civil War have been well documented and debated elsewhere; only a brief summary of preceding events is warranted in this report.

Key political events leading to the Civil War took place in Charleston in 1860. In April, the national Democratic Party met there to select a presidential nominee. Senator Stephen A. Douglas of Illinois, the favored candidate of northern delegates, was unacceptable to southern delegates because he endorsed limiting slavery in the western territories. Delegations from ten southern states walked out on April 30, and the divided convention adjourned to reconvene in Baltimore six weeks later. There Douglas was nominated as the Democratic Party's presidential candidate. The southern delegation, however, assembled in Richmond and chose a different Democratic candidate, John C. Breckinridge. The Republicans had already selected the Illinois lawyer Abraham Lincoln as their candidate. With the Democrats bitterly divided, Lincoln won the national election.

Lincoln also favored limiting the expansion of slavery. Upon his election, several federal officials in Charleston resigned their positions. A large public meeting in Charleston on November 9 was dominated by calls for secession, and the next day the General Assembly in Columbia called for a secession convention. The convention first met in Columbia on December 17, but adjourned due to fear of a smallpox epidemic and reconvened


CHARLESTON
MERCURY
EXTRA:

Passed unanimously at 1.15 o'clock, P. M. December 20th, 1860.

AN ORDINANCE

To dissolve the Union between the State of South Carolina and other States united with her under the compact entitled "The Constitution of the United States of America."

THE
UNION
IS
DISSOLVED!

Figure I.A-12. "The Union is Dissolved," *Charleston Mercury's* announcement of South Carolina's secession, December 20, 1860 (Library of Congress, www.loc.gov/item/scum000241/).

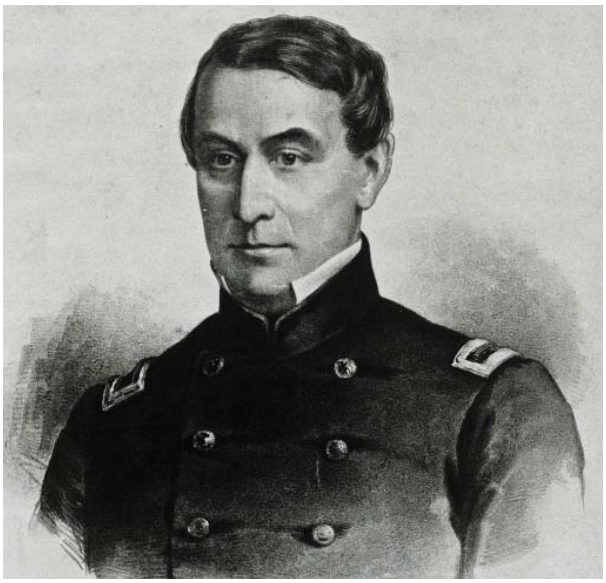


Figure I.A-13. Lithograph of Major Robert Anderson. (*Harper's Weekly Magazine,* January 12, 1861)

51. *Cleveland Plain Dealer,* May 23, 1859.



Figure I.A-14. "Interior of Fort Sumter, from the Parapet. Drawn by an officer of Major Anderson's Command." (*Harper's Weekly Magazine,* January 26, 1861)

in Charleston the next day. On December 20, 1860, the state of South Carolina voted to secede from the United States, and delegates signed the Ordinance of Secession in Charleston that evening.

When South Carolina seceded, the only group of United States troops in Charleston Harbor was at Fort Moultrie under the command of Major Robert Anderson (1805-1871), who in 1860 had been placed in command of Fort Moultrie, and later of all forts surrounding Charleston Harbor.[52] Believing he would not be able to hold Moultrie if attacked, Anderson quietly pulled his small garrison out and moved to Fort Sumter on December 26, 1860. The next day, a battalion of Charleston Artillery and thirty riflemen took over Fort Moultrie, claiming it for the State of South Carolina.[53]

Governor Francis W. Pickens had ordered all Federal positions except Fort Sumter to be seized for South Carolina, so a detachment of South Carolina Militia took a small steamboat from Charleston to Castle Pinckney and took possession of that fort. A small working party under Union Lt. R. K. Meade made no resistance, and departed to join Anderson's men at Fort Sumter.[54] State troops also captured Fort Johnson on James Island and the U. S. Arsenal on the Charleston peninsula, but Anderson's occupancy of Fort Sumter was not directly challenged by South Carolina forces.

On January 9, 1861, *Star of the West,* a merchant steamship hired by the United States War

52. Small numbers of troops were at the US Arsenal, Castle Pinckney, and Fort Sumter. Fort Sumter was still a construction site under the jurisdiction of Captain John G. Foster, U.S. Army Corps of Engineers.
53. Bearss, *Fort Moultrie, No. 3,* pp. 157-164.
54. Roger W. Young, "Castle Pinckney, Silent Sentinel of Charleston Harbor," *The South Carolina Historical and Genealogical Magazine,* Vol. XXXIX, No. 2 (April 1938).



Figure I.A-15. Portion of Perry map of January 18, 1861, showing the defenses of Charleston Harbor before the Civil War (circles indicate Fort Sumter at the center, Johnson to the west, Morris island to the south, Moultrie to the east, and Castle Pinckney near the Charleston peninsula). George T. Perry, "Part of Charleston Harbor, embracing forts Moultrie, Sumter, Johnson, and Castle Pinckney, also Sullivan, James & Morris islands; and showing the position of the *Star of the West*, when fired into from Morris Island." (Library of Congress, www.loc.gov/item/99448818/)

Department to transport troops and supplies to Fort Sumter, approached Charleston Harbor. The Morris Island battery fired on the unarmed ship, her captain abandoned the mission, and the vessel returned to New York. Major Anderson remained at Fort Sumter while South Carolina's Governor Pickens and federal authorities in Washington negotiated the disposition of Forts Sumter, Moultrie, Pinckney, and Johnson, as well as the federal arsenal.

Soon after the *Star of the West* incident, George T. Perry published a map of defenses in Charleston Harbor. Less than three months before the Civil War, his description of the new Fort Sumter emphasized its impenetrable design.

> "Fort Sumpter [*sic*] (under the command of Major Anderson,) is built in the water, one thousand yards from the land. It can only be attacked, therefore, from water craft. It is just finished and is one of the strongest works in the world; mounted with thirty-two-pound cannon, and supplied with one hundred rounds of ammunition per gun. It is covered bomb-proof and can only be attacked by the embrasures, which an attacking force must crawl through one at the time, and hence two men at one of these could defend it against five hundred."

The attack on the *Star of the West* signaled to many that a "bloody conflict" was inevitable, and Anderson asked Governor Pickens to allow a

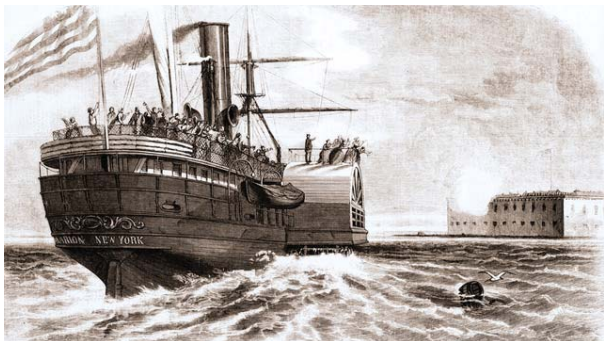


Figure I.A-16. "The steamship Marion on her way to New York with the wives and children of the soldiers in Fort Sumter," February 1, 1861. *Frank Leslie's Illustrated Newspaper,* February 23, 1861, p. 212. (http://www.loc.gov/pictures/resource/)

safe evacuation of the soldiers' families from Fort Sumter. On February 1, forty-two women and children boarded a steamer and sailed for New York.[55]

Hardening political positions increased the sectional tensions among the states. In February 1861, a congress of seven seceding states approved a constitution and elected Jefferson Davis president of the new Confederate States of America. On March 4, Abraham Lincoln was inaugurated president of the United States of America. In early April, Lincoln notified Governor Pickens of his intention to re-supply the Union garrison at Fort Sumter. Confederate Brig. Gen. P. G. T. Beauregard, in command of the provisional Confederate forces at Charleston, was in turn directed to take the measures necessary to prevent reinforcements from reaching Anderson.[56]

On April 11, 1861, after telegraph communications with Confederate Secretary of War L. P. Walker, Beauregard demanded the evacuation of Fort Sumter's garrison in a letter delivered by messenger:

> HEADQUARTERS PROVISIONAL ARMY, C. S. A.,
> Charleston, S. C., April 11, 1861.
> SIR: The Government of the Confederate States has hitherto forborne from any hostile demonstration against Fort Sumter, in the hope that the Government of the United States, with a view to the amicable adjustment of all questions between the two Governments, and to avert the calamities of war, would voluntarily evacuate it.
> There was reason at one time to believe that such would be the course pursued by the Government of the United States, and under that impression my Government has refrained from making any demand for the surrender of the fort. But the Confederate States can no longer delay assuming actual possession of a fortification commanding the entrance of one of their harbors, and necessary to its defense and security.
> I am ordered by the Government of the Confederate States to demand the evacuation of Fort Sumter. My aides, Colonel Chesnut and Captain Lee, are authorized to make such demand of you. All proper facilities will be afforded for the removal of yourself and command, together with company arms and property, and all private property, to any post in the United States which you may select. The flag which you have upheld so long and with so much fortitude, under the most trying circumstances, may be saluted by you on taking it down.
> Colonel Chesnut and Captain Lee will for a reasonable time, await your answer.
> I am, sir, very respectfully, your obedient servant,
> G. T. BEAUREGARD,
> Brigadier-General, Commanding.
> Maj. ROBERT ANDERSON,
> Commanding at Fort Sumter, Charleston Harbor, S.C.



Figure I.A-17. Brig. Gen. P.G.T. Beauregard, painted by George Peter Alexander Healy, 1861. (National Portrait Gallery)

55. Samuel Wylie Crawford, *The Genesis of the Civil War: The Story of Sumter, 1860-1861* (New York: Charles L. Webster and Company, 1887).
56. Robert Rosen, *Confederate Charleston, An Illustrated History of the City and the People During the Civil War* (Columbia SC: University of South Carolina Press, 1994), pp. 64-68.

Major Anderson refused:

> FORT SUMTER, S. C., April 11, 1861.
> GENERAL: I have the honor to acknowledge the receipt of your communication demanding the evacuation of this fort, and to say, in reply thereto, that it is a demand with which I regret that my sense of honor, and of my obligations to my Government, prevent my compliance. Thanking you for the fair, manly, and courteous terms proposed, and for the high compliment paid me,
> I am, general, very respectfully, your obedient servant,
> ROBERT ANDERSON,
> Major, First Artillery, Commanding.
> Brig. Gen. BEAUREGARD,
> Commanding Provisional Army.[57]

Before dawn on April 12, after further warning to Anderson, Confederates opened fire on Fort Sumter from Fort Johnson and artillery batteries surrounding the harbor. The bombardment lasted about thirty-four hours with no loss of life. Anderson finally capitulated in the early afternoon of April 13, on condition that he and his men be evacuated, taking their "private property," with a proper gun salute to the United States flag as it was lowered. Beauregard agreed. On Sunday, April 14, Anderson and his garrison marched out of the fort after a brief ceremony that was marred by the premature discharge of a cannon, which killed a Union artillerist.[58]

The news of the attack on Fort Sumter galvanized Americans, both in the Union and in the Confederate States. Popular periodicals sent correspondents and artists to Charleston and ran regular stories and views of the bombardment.

57. *"The Official Records of the Union and Confederate Armies,"* (National Archives and Records Administration [NARA]).
58. Bearss, *Fort Moultrie, No. 3*, pp. 165-167. "Fort Sumter." http://www.nps.gov/hps/abpp/battles/sc001.htm (July 18, 2012).



Figure I.A-18. "Negroes mounting Cannon in the works for the attack on Ft. Sumter 1861 – Morris Island," pencil drawing by William Waud, 1861. (Library of Congress, http://www.loc.gov/pictures/item/2004661246/)

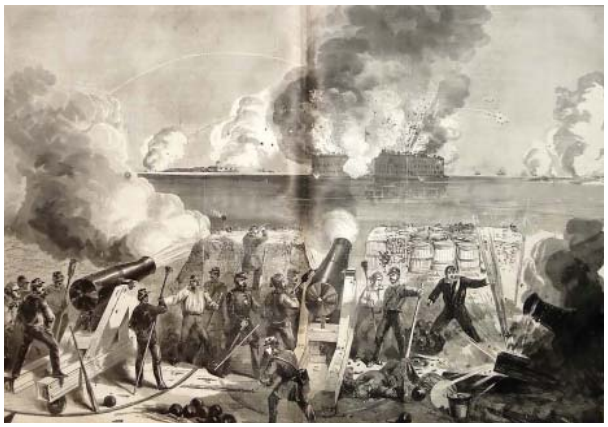


Figure I.A-19. "Bombardment of Fort Sumter by the batteries of the Confederate states," *Harper's Weekly Magazine,* April 27, 1861, pp. 264-265. (Library of Congress, http://www.loc.gov/pictures/item/96524550/)

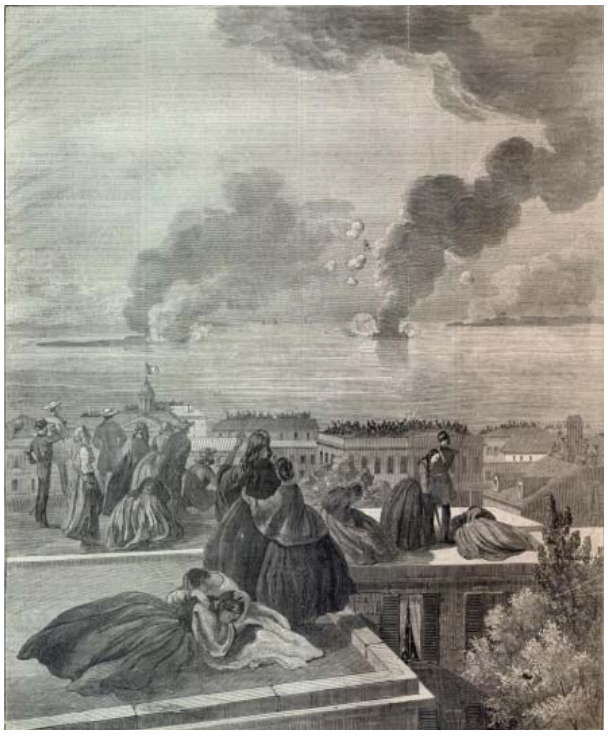


Figure I.A-20. "The Housetops in Charleston During the Bombardment of Sumter," *Harper's Weekly Magazine,* May 4, 1861, p. 273. (Library of Congress, http://www.loc.gov/pictures/item/99614190/)

With federal troops forced out of Fort Sumter, all harbor fortifications were in Confederate hands. During the summer, while Confederates improved their coastal defenses, the federal navy began blockading southern ports. In November 1861, a large federal fleet under Capt. Samuel F. DuPont successfully attacked Port Royal Harbor,



Figure I.A-21. "Confederate flag flying. Ft. Sumter after the evacuation of Maj. Anderson," Alma A. Pelot, photographer, April 16, 1861. (Library of Congress, www.loc.gov/pictures/item/2011645052/)

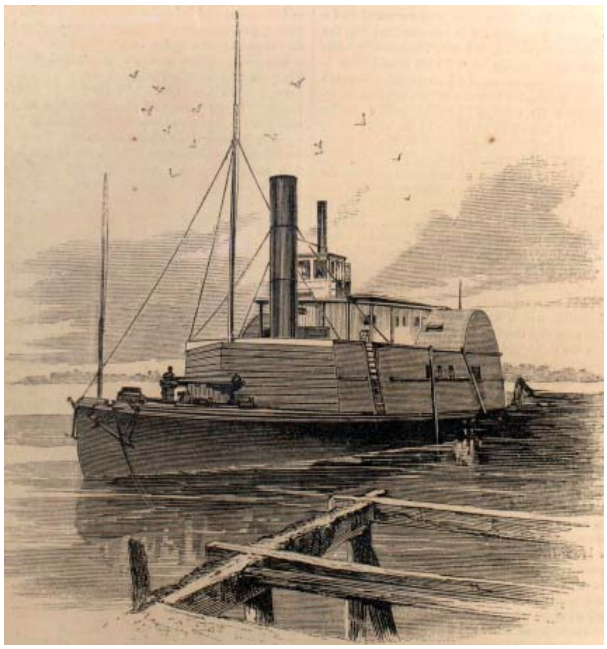


Figure I.A-22. The gunboat *Planter. Harper's Weekly Magazine*, June 14, 1862, p. 372. (Library of Congress, www.loc.gov/pictures/item/97512451/)

less than one hundred miles south of Charleston, allowing federal forces to occupy Beaufort and the surrounding islands (an area referred to generally as "Port Royal.") White plantation owners had fled, leaving behind as many as 10,000 slaves. Several hundred flocked to Union camps, prompting officers to request guidance on official policy.[59]

In January 1862, Union General Thomas W. Sherman called for Northern teachers to come South to educate them, and the Port Royal Experiment was formally organized a few months later. The "Experiment" brought religious missionaries, doctors, and teachers to South Carolina, resulting in the formation of the Penn School (St. Helena Island) and the independent town of Mitchelville (Hilton Head Island), and made about 2,000 acres of land available for purchase by freedmen.[60]

Charleston was recognized by both North and South as the "Seat of the Rebellion," and Fort Sumter symbolized Charleston. The fort was again in national news reports when, in May 1862, Robert Smalls, a skilled Charleston harbor pilot who was a slave, commandeered the Confederate steamer *Planter*. He smuggled his own family and twelve other slaves aboard, and left the downtown wharf under cover of darkness. Sounding the correct signals as he passed Fort Sumter, Smalls steamed directly toward the blockading federal squadron, and surrendered his party and their vessel. Smalls soon entered Union service as a pilot, and was hailed in the northern press as a national hero.[61]

The federal occupation of the Beaufort area provided a base for operations against Charleston. In June 1862, Union troops advanced north from Port Royal toward Charleston. Marching across James Island, they attacked Confederate defenses near the village of Secessionville. Despite the disparity in forces (about 6,600 federals and 2,000 Confederates), the Battle of Secessionville was a resounding victory for the Confederates.[62] The next attack on Charleston would come by water.

As he promised in September 1862, on January 1, 1863, United States president Abraham Lincoln signed the Emancipation Proclamation. Under this proclamation, he freed all slaves in any state "in rebellion against the United States." This included

59. During the time of slavery, the term "slave" referred to enslaved people of African descent, and is used in this report for clarity. "Freedmen" were people who had formerly been held in slavery, while "free people of color" and "free blacks" were older terms for individuals who were not enslaved.
60. This period was later called a rehearsal for Reconstruction. Willie Lee Rose, *Rehearsal for Reconstruction, The Port Royal Experiment* (Indianapolis: Bobbs-Merrill, 1964).

61. Smalls' story and its association with the already famous Fort Sumter was widely reported, including articles in *Harper's Weekly Magazine*, June 14, 1862, p. 372, with sketches; and in the *New York Times*, October 3, 1862 and previously. The story received national attention again in 1864 when Smalls was ordered from a Philadelphia streetcar.
62. Rosen, *Confederate Charleston,* pp. 99-102.

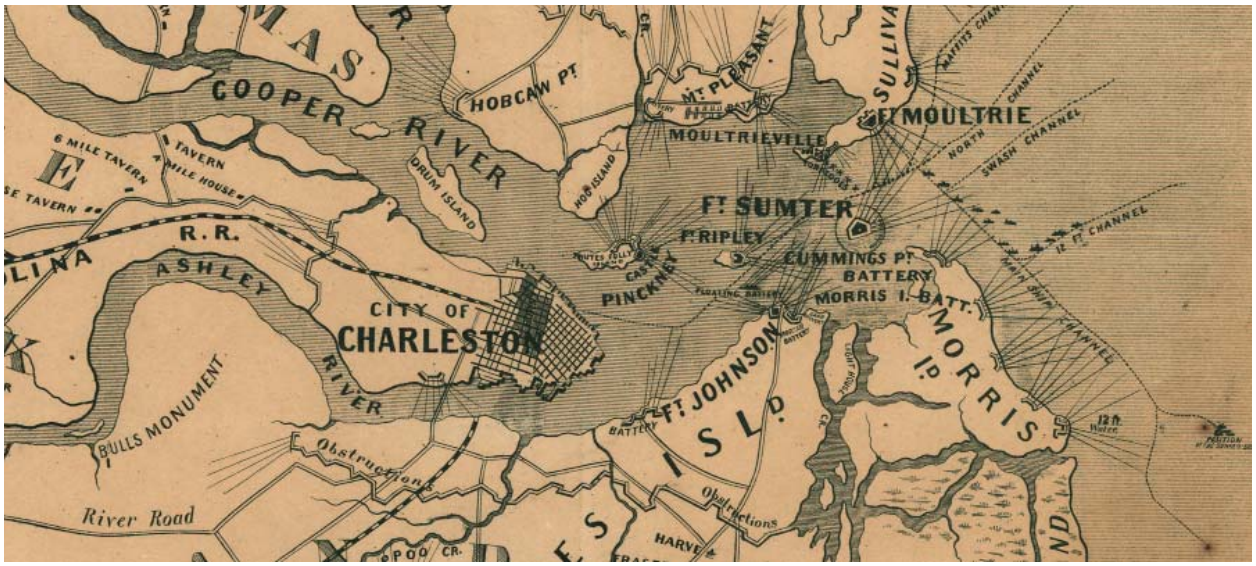


Figure I.A-23. Map of Charleston Harbor, 1863, showing fortifications and their fields of fire. George W. Tomlinson, "New map of Charleston Harbor, showing the scene of the great naval contest between the iron clad monitors and the Rebel batteries, also the lines of fire, forts, obstructions, inlets, princl. plantations, & e.t.c." Boston: J. Mayer & Co.,1863. (Library of Congress, www.loc.gov/item/99448820/)

virtually the entire Confederacy, except those areas controlled by the Union army. The states of Maryland, Kentucky, and Missouri, where Union sentiment was strong even though slavery was legal, were excluded, and slavery remained legal wherever the U. S. government had authority.

The areas where Lincoln declared slaves to be free, which was most of the South, were not effectively under the authority of the president of the United States or his proclamations. Nevertheless, the Emancipation Proclamation influenced the course of the war. Not only could slaves escape to Union camps, but former slaves and free blacks could enlist in the United States Colored Troops and fight against the Confederacy. In the final two years of the war, it is estimated that more than 180,000 troops of African descent served with the Union forces.[63]

Securely in control of the Port Royal/Beaufort area, Union officers planned an attack on Fort Sumter. The island fortification was vital to protecting Charleston, and the Confederates were determined to hold it; the Union was equally determined to take it. In early April 1863, a large fleet commanded by Rear Admiral S. F. DuPont steamed from Port Royal for Charleston Harbor. As the line of Union ships approached, the 1st South Carolina Regular Infantry Regiment at Fort Moultrie fired on the ironclads. The battle lasted less than three hours.

Despite their iron cladding, the Union ships were vulnerable to cannon fire, and unable to draw close enough to inflict heavy damage on the Confederate positions. DuPont called off the attack. One of the ironclads, the *Keokuk*, was struck by Fort Sumter's guns at close range dozens of times; the crippled vessel sank off Morris Island the next day, and the Confederates salvaged its guns.[64]

63. "The Emancipation Proclamation," Antietam National Battlefield, http://www.nps.gov/resources/story.htm?id=235 (February 4, 2014). "Robert Gould Shaw and the 54th Regiment," Boston African American National Historic Site, http://www.nps.gov/boaf/historyculture/shaw.htm (February 4, 2014).

64. DuPont was relieved of his command for his failure to get past Charleston Harbor's fortifications. Bearss, *Fort Moultrie, No. 3,* pp. 169-170. Rosen, *Confederate Charleston,* pp. 99-102.



Figure I.A-24. "The Bombardment of Fort Sumter, April 7, 1863," *Harper's Weekly Magazine*, May 2, 1863, p. 285. (Library of Congress, www.loc.gov/pictures/item/97516939/)

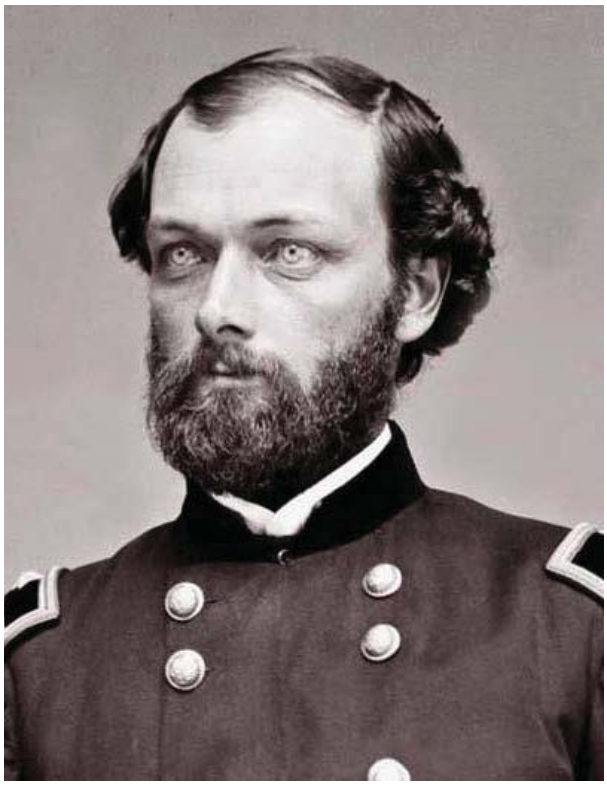


Figure I.A-25. Union General Quincy A. Gillmore. (Library of Congress, http://loc.gov/pictures/resource/cwpb.07353/)



Figure I.A-26. Charleston Harbor fortifications, showing positions on Morris Island for the actions of July 1863. Robert Knox Sneden, "Map of Charleston Harbor showing Union and Rebel Batteries &c. Septr. 1863." (Library of Congress, www.loc.gov/item/gvhs01.vhs00153/)

Fort Sumter, and Charleston, then became the object of the longest siege of the Civil War, lasting from July 10, 1863, to February 18, 1865. Union General Quincy A. Gillmore and Rear Admiral John A. Dahlgren developed a plan to take Morris Island and its Confederate stronghold Battery Wagner. From there, Union troops could attack Fort Sumter. Gillmore's men moved north from Folly Island toward Morris Island. They took most of the island on July 10, 1863, but the Confederates' powerful Battery Wagner withstood the bombardment and artillery attacks for more than a week. Finally, on the night of July 18, Gillmore sent a direct assault against Battery Wagner. The regiment chosen to lead the charge was one of the Union's first black regiments, the 54th Massachusetts. Organized in Boston, the regiment had been in South Carolina with their white commander, Colonel Robert Gould Shaw, for several weeks.[65]

The federal attack on Battery Wagner was a disaster for the Union, with more than 1,500 federal troops killed, wounded, or listed as missing. Of these, 180 men of the Massachusetts 54th were wounded or killed and ninety-two were listed as missing. Despite being a military failure, as one of the first Civil War engagements involving the Colored troops it received widespread attention as proof that black soldiers were willing and able to fight.[66]

A month later, on August 17, a fierce bombardment from Union ships and Union batteries on Morris Island began pounding Fort Sumter, and continued for seventeen days. Walls were breached and broken, and the Confederate defenders removed stores and ammunition to Fort Moultrie. On August 24, Gillmore reported the "practical demolition of Fort Sumter . . . today a shapeless and harmless mass of ruins."[67]

On August 22, Union troops on Morris Island began shelling Charleston with the "Swamp Angel," a Parrot rifled gun. Two days of intense shelling caused many in Charleston to evacuate the lower part of the city, which reduced the number of

65. "Robert Gould Shaw and the 54th Regiment." Boston African American National Historic Site. http://www.nps.gov/boaf/historyculture/shaw.htm (February 4, 2014)

66. Rosen, *Confederate Charleston,* pp. 105-110.
67. Ibid., pp. 115, 118. *New York Times,* August 29, 1863.



Figure I.A-27. Portions of Fort Sumter were in ruins even before the bombardment of October and November. "Interior view of Fort Sumter … taken by a Confederate photographer [George S. Cook]," September 8, 1863. (Library of Congress, www.loc.gov/pictures/item/2013651626/)

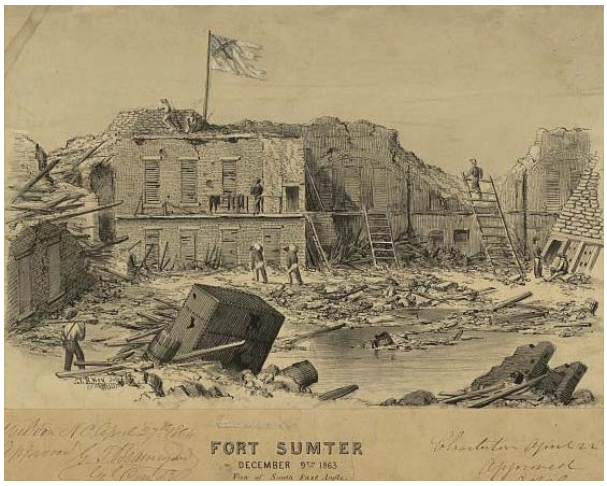


Figure I.A-28. "Fort Sumter, December 9th 1863, View of South East Angle," ink drawing by John Ross Key. (Library of Congress, www.loc.gov/pictures/item/2004661294/)



Figure I.A-29. Cannon at Fort Johnson with Fort Sumter in the Distance, 1865. "Water Battery of Fort Johnson, James Island, S. C." George N. Barnard, photographer. (Library of Congress. www.loc.gov/pictures/item/2011648451/)

civilian casualties.[68] Anticipating a possible attack on Sullivan's Island, Fort Moultrie's Confederate defenders strengthened their fortification. On September 7, 1863, five Union monitors and the *New Ironsides* moved into the channel and fired heavily on Moultrie. For the next few weeks, Confederate troops and enslaved men working under their orders continued to repair and improve Fort Moultrie and Fort Sumter.[69]

The Confederates refused to give up Fort Sumter, but did evacuate their Morris Island positions, Battery Wagner and Battery Gregg, in September 1863. The federals moved into these positions and on October 26 began a forty-one day bombardment of Fort Sumter. The Confederate garrison dug a series of tunnels in the rubble to protect their movements within the fort, using the tunnels for living quarters as well as storage space, until the Union fire tapered off in early December. Withstanding intermittent Union fire during the next few months, the Confederates made some repairs to Fort Sumter, and even built a temporary barracks. Finally, on May 1, 1864, most of the federal forces on Morris Island departed for Virginia. A last prolonged bombardment against the fort between July 7 and September 4, 1864, had little effect. By this time, Fort Sumter "was an impregnable mass of rubble and earth."[70]

Even near the end of the war, many in the North fervently hoped, as many in the South fearfully believed, that General W. T. Sherman's march from Savannah would take him to Charleston. Sherman instead went to Columbia, the capital of the rebel state. In February 1865, his men began their march north through the interior of South Carolina. On February 17, Columbia surrendered to Sherman; the same day, Confederate forces evacuated Fort Sumter, as well as the city of Charleston, Fort Moultrie, and the other fortifications in Charleston Harbor. On February 18th, the day the United States flag was once more raised over Fort Sumter and Fort Moultrie, Charleston's mayor Charles Macbeth surrendered the city to Lt. Col. A. G. Bennett of the 21st U. S. Colored Troops.[71]

68. Rosen, *Confederate Charleston,* pp. 114-122.
69. Bearss, *Fort Moultrie, No. 3,* pp. 170-176.
70. Ferguson, *Overview* (HABS).
71. Frank Barnes, "Fort Sumter, February 17, 1865" (Charleston: Fort Sumter National Monument, February 21, 1950). Ferguson, *Overview* (HABS). Bearss, *Fort Moultrie, No. 3,* pp. 178-179.



Figure I.A-30. Three days after Charleston's surrender, another Colored Regiment marched in the city: "Marching on! The 55th Massachusetts Colored Regiment singing John Brown's Marching in the Streets of Charleston, February 21, 1865." *Harper's Weekly Magazine*, March 18, 1865. (Library of Congress, www.loc.gov/pictures/item/92515015/)



Figure I.A-31. "Crowd Inside Fort Sumter Awaiting the Flag Raising," April 14, 1865. Library of Congress, www.loc.gov/pictures/item/cwp2003000790/pp/)

Confederate General Robert E. Lee surrendered to the Union Army on April 9, 1865. Robert Anderson, now a Brigadier General, returned to Fort Sumter to raise his old garrison flag over the fort in a celebration on April 14. Military men, politicians, and private citizens described the event as a symbolic reconciliation of the two warring sides. Addressing the crowd of spectators brought down from New York, Henry Ward Beecher spoke of the flag almost as a religious icon, asking "that it may cast out the devil of discord; . . . that it may win parted friends from their alienation. . . heal all jealousies, unite all policies, inspire a new national life . . . and make this people great and strong." The explicit hope was that Fort Sumter would be transformed from the symbol of disunion to the symbol of union.[72]

The severity of damage to Fort Sumter was captured by photographers and artists not only during the war but for years after. Fort Sumter was not the only fort of interest to the public. In 1870 Congress commissioned a series of paintings of the nation's fortifications. Seth Eastman, a West Point graduate, produced several canvases depicting the stark contrast of Fort Sumter before and after the war.

72. Frank Barnes. *Fort Sumter National Monument, South Carolina.* (Historical Handbook Series No. 12. National Park Service, 1952, reprint 1961).



Figure I.A-32. "Fort Sumter, South Carolina (before the war)," Seth Eastman, painted 1871. (History.house.gov)



Figure I.A-33. "Fort Sumter, South Carolina (after the war)," Seth Eastman, painted 1870. (History.house.gov)

Modernizing the Defenses of Charleston, 1865-1876

Coastal defenses remained a national concern after the Civil War. The Army Corps of Engineers realized that Second and Third System masonry fortifications were obsolete. Improvements in naval warfare, especially the development of steam-powered ironclad warships, combined with innovations in efficient long-range weaponry, made the existing coastal fortifications entirely vulnerable.[73] Charleston Harbor's fortifications would not be repaired or rebuilt for several years.

No new guns were mounted at Castle Pinckney. Shute's Folly, the island on which it stood, was transferred to the Light House Board (part of the U. S. Treasury Department) in 1878. While the fort continued to deteriorate, a harbor light with associated buildings and structures appeared on the island.[74] Fort Johnson, too, went unrepaired. The State of South Carolina established a quarantine station there in 1872, which was later transferred to the U.S. Department of Public Health.[75] In January 1868, Quincy Gillmore, now a major in the Army Corps of Engineers, reported that Fort Sumter presented "the same general appearance as at the close of the war."[76] (However, the range light had been rebuilt in 1866.[77])

When Congress passed a Fortifications Bill in March, 1871, planning for coastal defenses reflected concepts developed during the Civil War. Rifled guns became the norm, and the battery, with large gun emplacements set on stone or concrete platforms and solidly-built magazines protected by earth and concrete, was the basic element of the defensive fortification. Fort Moultrie and Fort Sumter were both updated. Construction and modernization of weapons systems proceeded simultaneously until June 1876, when federal funding for improvements to coastal fortifications ended.[78] Fort Sumter's range light had been moved several times as work progressed, finally being returned to its original position on the right face, where it had been photographed in 1870.

At the same time the appropriations for fortifications were cut off, work began on a significant new project in Charleston Harbor, the improvement of the shipping channel. Quincy Gillmore, still with the Army Corps of Engineers, had designed a pair of jetties to line the channel from a spot off Morris Island, and from the west end of Sullivan's Island. Tides would flow strongly between these stone jetties, scouring the harbor floor and deepening the channel from its low-water depth of twelve to thirteen feet. The federally-funded project began in 1878, and surveys in 1881 showed the channel already deeper. Work on the jetties continued into the late 1890s.

Fort Sumter was still important to Charleston Harbor because of its use as a lighthouse station. A hurricane in 1893 destroyed a wharf and lighthouse facilities, which were replaced by a new wharf and a light and keeper's structures.[79] Two searchlights were also installed at Fort Sumter, one mounted on a tower, the other on the fort wall.

The Endicott System, 1886-1910

During the late nineteenth century, the design and construction of heavy ordnance advanced rapidly, particularly in Europe. Developments such as rifled breech-loading guns made the American harbor defenses of the 1870s obsolete. In 1885, President Grover Cleveland appointed a Board of Fortifications which became known as the Endicott Board for its chairman, Secretary of War William C. Endicott. Similar to the earlier Bernard Board, the Endicott Board was charged with studying coastal defenses nationally, and recommended a massive construction program to allow the latest weaponry to be used at coastal locations nationwide. The program advocated fortifications built of reinforced concrete, and the installation of large caliber breech-loading artillery – typically disappearing guns – and mortar

73. Stokely, *Fort Moultrie: Constant Defender,* pp. 54-58.
74. Young, "Castle Pinckney, Silent Sentinel of Charleston Harbor."
75. Doug Bostick, "Fort Johnson, James Island, South Carolina," http://www.sciway.net/james-island/fort-johnson.html (December 20, 2013).
76. John Babington, "Fort Sumter: 1876" (Charleston: Fort Sumter National Monument, March 1, 1954). Rock L. Comstock, "Fort Sumter, 1899" (Charleston: Fort Sumter National Monument, June 8, 1954).
77."Coast Guard History."
78. Stokely, *Fort Moultrie: Constant Defender,* pp. 54-58. John Babington, "Fort Sumter: 1876" (Charleston: Fort Sumter National Monument, March 1, 1954). "Fort Moultrie," Fort Sumter National Monument, http://www.nps.gov/fosu/historyculture/fort_moultrie.htm (February 4, 2014). Clark and Wylie, *HSAR,* p. III.02-7.
79. Charles W. Snell, "Battery Isaac Huger (1891-1941) Historic Structure Report, Historical Data Section" (Draft, NPS, Denver Service Center: October 19, 1977), p. 49. "Coast Guard History." Ferguson, *Overview* (HABS), p. 50.

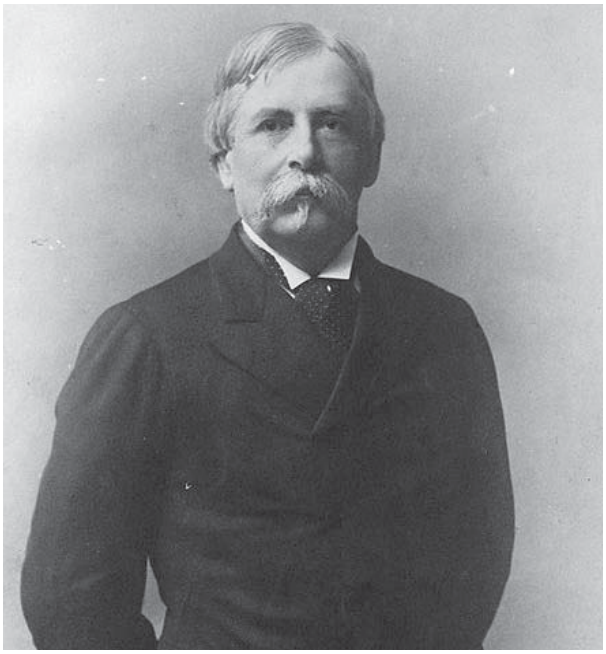


Figure I.A-34. William C. Endicott (1826-1900), Secretary of War, photographed in 1886. (Library of Congress, loc.gov/pictures/resource/cph.3c00784/)



Figure I.A-35. Battery Payne, the 1904 Endicott battery at Fort Pickens, Florida. (2010 photograph)



Figure I.A-36. Battery Torbert, the 1894 Endicott battery at Fort Delaware. (2010 photograph)

batteries. Endicott batteries were built within the walls of several Third System forts, including Adams, Delaware, Pickens, Zachary Taylor, and Sumter.

The three principal features of the Endicott system were heavy guns mounted on disappearing carriages, to keep an enemy fleet at a safe distance; underwater mines in shipping channels to prevent the enemy from running past the guns and into the harbor; and batteries of small rapid-firing guns. The Endicott Board's first report, in 1886, placed Charleston Harbor thirteenth on the priority list, because the channel was not deep enough for vessels of more than a fourteen-foot draft to easily enter the harbor without pilots or navigational buoys.[80]

The estimated cost of the Endicott Board's recommended improvements, from manufacturing modern weapons to constructing new batteries to support them, was higher than Congress would support. After two years without appropriations, in 1888 the government made funds available. The Charleston Harbor defenses would include a mining casemate at Fort Sumter, heavy guns at Fort Sumter and on Sullivan's Island, and artillery near Fort Moultrie.[81] The first Charleston projects under the Endicott Defense Plan were a torpedo room and cable to submarine mines.

Plans for a battery at Fort Sumter began in 1895, but were delayed because of concerns about stability of the structure on the sand island. The 1898 Spanish-American War prompted new appropriations for a battery at Fort Sumter and construction began in May. The new Endicott battery was named for Revolutionary War hero Isaac Huger of Charleston, completed in December 1899, and turned over to the Coast Artillery.[82]

Extensive Endicott construction also took place at Fort Moultrie. In 1898, the Army had purchased a large tract of land extending east and north of Fort Moultrie, which became the Fort Moultrie Military

80. Snell, "Battery Isaac Huger," pp. 7-10. (By 1893, as the jetties neared completion, the Corps of Engineers projected an entrance depth of twenty-one feet at mean low water.)
81. Snell, "Battery Isaac Huger," pp. 7-9.
82. Ferguson, *Overview* (HABS), p. 50. Rock L. Comstock, "Fort Sumter, 1899" (Charleston: Fort Sumter National Monument, June 8, 1954). Snell, "Battery Isaac Huger," pp. 21-22.



Figure I.A-37. Isaac I. Huger, for whom Battery Huger was named. (www.carolana.com/SC/Revolution/Images/Isaac_Huger.jpg)

Reservation. Battery Jasper, outside the early-nineteenth century fort, and the Battery Bingham, the first of three batteries to be built within Fort Moultrie, were completed in 1898. Work continued with Battery McCorkle (1901) and Battery Lord (1903). The Army also purchased sites on Sullivan's Island where other Endicott-era fortifications were placed: Batteries Thomson, Gadsden, Logan, Pierce Butler, and Capron.[83]

Construction of Battery Huger began in 1898, but first required significant changes to the fort. Casemates were sealed and buried and quantities of fill were brought into the parade ground. Primary Endicott system construction at Fort Moultrie and Fort Sumter was generally completed by 1903, but improvements continued until about 1910. In 1915, the Army assessed Battery Huger's potential to withstand the penetrating power of modern naval ordnance, which was much improved over the weaponry available in the 1890s, and determined the concrete and earth cover were sufficient to protect the guns and magazines.[84]

83. "Sullivan's Island Historic District" National Register nomination, http://www.nationalregister.sc.gov/charleston/S10817710180/S10817710180.pdf. "Fort Moultrie Quartermaster and Support Facilities Historic District" National Register nomination, http://www.nationalregister.sc.gov/charleston/S10817710178/S10817710178.pdf.
84. Snell, "Battery Isaac Huger," pp. 37-38.



Figure I.A-38. Battery Huger seen in aerial photograph taken after support structures demolished. (postcard; personal collection)

For the Army's staffing purposes, Sumter was treated as a sub-post of Fort Moultrie,[85] In the early twentieth century, the only garrison was a small force of Coast Artillerymen. In 1905, for example, there were usually seven to eleven enlisted men of the Coast Artillery, with one noncommissioned officer (NCO), garrisoned at Fort Sumter.[86] By 1913 there were no enlisted men; the garrison comprised one or two NCOs.[87] The fort was manned by a small garrison of Coast Artillery Corps troops during World War I, by August 1917 a company of 114 men, but saw no action.

Charleston and Fort Sumter had long been popular destinations for visitors, and mementos and postcards of the sites were popular. Between the World Wars, the rise in automobile tourism brought thousands of travelers to the city; their interest led to the establishment of commercial harbor tours.

After years of loosely organized visitation, the first daily commercial harbor tour to Fort Sumter began in 1926. Under several entrepreneurs, seasonal excursion boats operated around the harbor and out to the fort. The locally-owned Thompson

85. Rock L. Comstock, "Fort Sumter, 1899" (Charleston: Fort Sumter National Monument, June 8, 1954).
86. In 1907, Congress split Field Artillery and Coast Artillery into separate branches, creating a separate Coast Artillery Corps (CAC) with sixteen harbor defense regiments. Fort Sumter was under the guidance of the 13th Coastal Artillery Regiment assigned to defend Pensacola, Charleston, Key West, and Galveston.
87. "Fort Sumter, South Carolina, from a survey made under the direction of Capt. J. C. Sanford, Corps of Engineers, July 23-August 10, 1901," sheet No. 1 (copy in FOSU Map File, Drawer C, Folder FS-10). "Documented Narrative," pp. 65-66. "Garrison of Fort Sumter, 1905-1914;" typescript, FOSU Drawer 23. Clark and Wylie, *HSAR,* p. III.01-19.

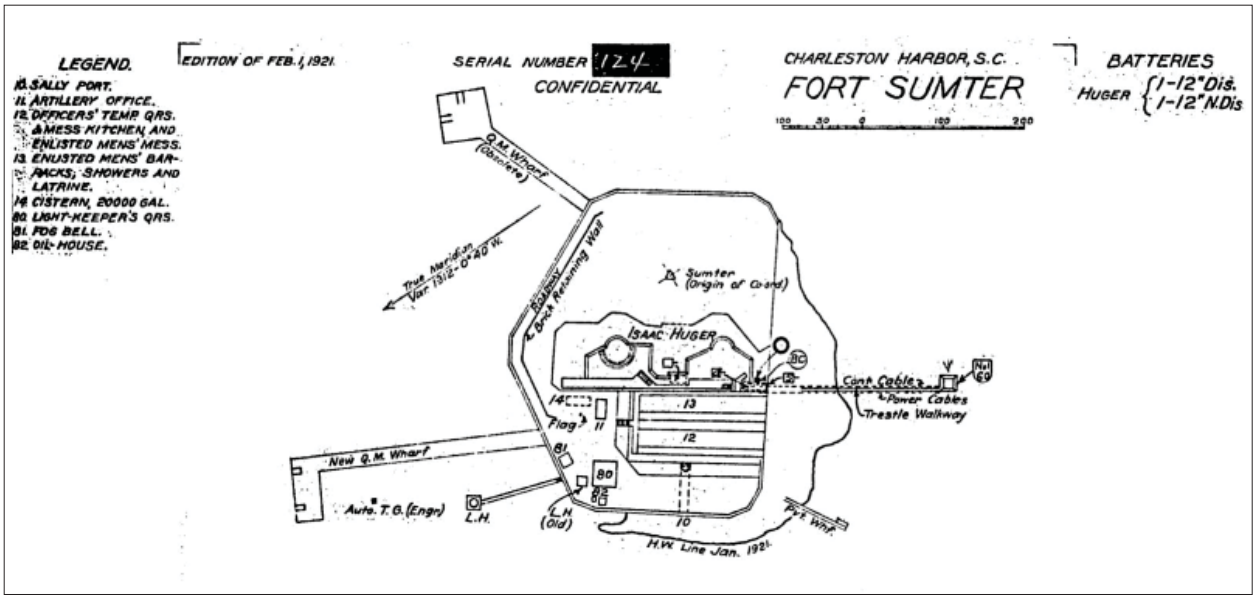


Figure I.A-39. 1921 plan showing World War I temporary barracks and new wharf. (National Archives and Records Administration [NARA])

Transfer Company became an affiliate of a national company, Gray Line Tours, in 1931, and bought a power boat for the Fort Sumter route in 1933. Until World War II, business was brisk enough that the Gray Line, as it was known, and a competing firm flourished, both operating from piers off White Point Garden at the tip of the Charleston peninsula. Visitation increased from under one thousand in 1934 to nearly 5,000 people going ashore at Fort Sumter during 1941.[88]

This coincided with a national focus on commemorating the sites, events, and heroes of the Civil War. Two Third System forts were designated National Monuments between the wars. By proclamation of President Calvin Coolidge, Fort Pulaski was declared a National Monument in 1924 and was transferred from the War Department to the National Park Service in 1933, though it was temporarily returned to military use during World War II. Fort Jefferson was designated a National Monument in 1935.

Fort Sumter remained a military property. Army and Coast Guard staff took responsibility for the safety of the civilian visitors and built a new brick latrine "primarily for use of the hundreds of visitors that were now coming to view the old fort.[89]

88. Comstock, *Short History.*
89. Snell, "Battery Isaac Huger," pp. 49-51.

Coastal Defenses During World War II

For more than a year before the United States entered World War II, defense experts warned that the American coast might come under attack, particularly from the German U-boats (submarines) which were making frequent strikes on merchant ships bound for Britain. On November 5, 1940, the Chief of Naval Operations presented to the Commandants of the Naval Districts a harbor defense program to facilitate prompt action against air, submarine, and surface craft that threatened the port or shipping in the area. A Harbor Entrance Control Post (HECP) was the center of the defense system. In September, 1941, the HECP for Charleston Harbor was established at Fort Moultrie.[90]

For the duration of the war, military communications were managed from Sullivan's Island, first at a temporary HECP, then at a new HECP/Harbor Defense Command Post (HDCP) built at Fort Moultrie for joint use of the Army and Navy.[91] At the opposite side of the harbor, the Coast Guard maintained an anti-aircraft training facility and listening post at Fort Johnson, and a detachment of Coastal Artillery was stationed at Fort Sumter.[92]

90. Edwin C. Bearss, *Special History Study; Fort Moultrie HECP-HDCP (*Fort Sumter National Monument, South Carolina, National Park Service, May 1974).
91. Ibid.
92. Doug Bostick, "Fort Johnson, James Island, South



Figure I.A-40. Postcard, 1910-1915, "Fort Sumter from the Battery, Charleston SC." (personal collection)

On December 9, 1941, two days after the Japanese attack on Pearl Harbor, the German navy proposed sending submarines to the American coast. By December 25, five U-boats had put to sea. In January, 1942, Germany sent a second wave of U-boats. A British passenger steamer was sunk east of Cape Cod, and by the end of the month, a dozen vessels – tankers, cargo ships, freighters – had been torpedoed between New York Harbor and Cape Hatteras. In early March, the focus of the U-boat offensive appeared to be shifting southward. The defense force for the Sixth Naval District at Charleston was immediately organized. Beach patrols and airplanes looked for U-boats, and the Navy laid anti-submarine netting in the harbor.

German submarines in American waters sank more than 360 merchant ships, but defensive measures such as varying routes, strengthening patrols, and developing a convoy system forced the U-boats to focus on the sea lanes between Great Britain and North America. There they grouped into "wolf packs" to harass convoys far out at sea.

There were several U-boat scares in Charleston Harbor in the summer of 1942. Twice, ships and planes were called out in response to sightings. Then at the end of July, reports of a submarine at the entrance to the harbor resulted in surface and air craft converging on the area. Sightings continued even after the Germans redeployed the U-boat fleet to the North Atlantic. In September, the commander of the Port of Charleston received word of a mine detonation near the harbor. He closed the port for a week, diverting inbound traffic to Savannah while minesweepers located and detonated mines.

Third System forts had become obsolete years before World War II, but some proved useful in harbor defenses during the war. Fort Macon, which guarded Beaufort and Beaufort Harbor, had become a North Carolina state park, but the Army leased it for the use of Coast Artillery Corps troops between 1941 and 1944.[93] Fort Clinch, a Florida state park, served as a communications and security post during World War II.[94] Fort Sumter, with its beacon light manned by Coast Guardsmen, served Charleston Harbor principally as a navigation point.

In 1943 Battery Isaac Huger was deactivated and its two 12" rifled guns were removed. To replace

Carolina," http://www.sciway.net/james-island/fort-johnson.html (December 20, 2013).

93."Fort Macon State Park – History."
94. Fort Clinch nomination.

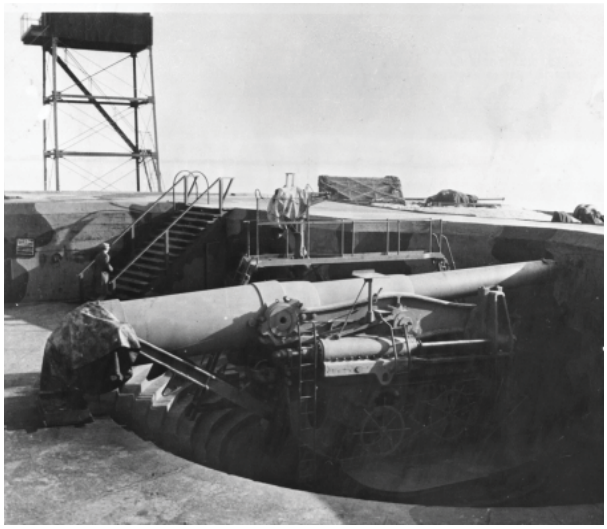


Figure I.A-41. Disappearing rifle at Battery Huger, ca. 1943. (U. S. Army photograph, copy in FOSU file)

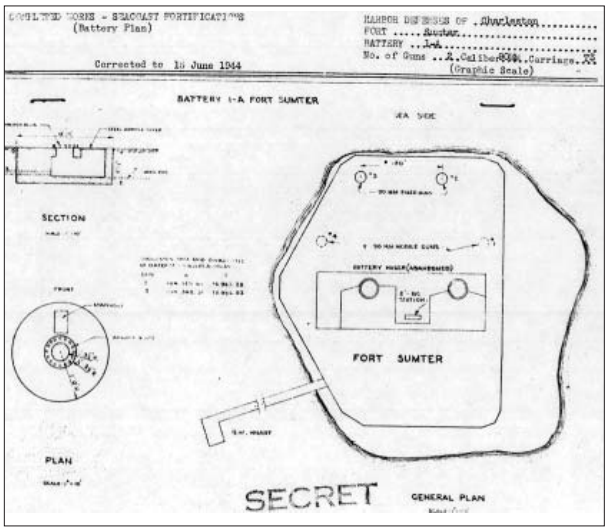


Figure I.A-42. Battery Huger, 1944 plan showing AMTB position. (NARA)

them in defending against torpedo boats and aircraft, a new two-gun battery was installed. The AMTB (Anti Motor Torpedo Boat) battery had two mounted guns and mounts for two mobile guns stored at Fort Moultrie until needed. The Army transferred the AMTB to the Coastal Artillery in July 1943, and deactivated it in 1946.

Post-War Developments, 1945-1955

After World War II, Third System forts that had been temporarily returned to military use were restored to their civilian agencies, and others were decommissioned permanently. Fort Pickens, deactivated by the Army in 1947, was part of a Florida state park until 1971, when Gulf Islands National Seashore was created. NPS repaired the fort, and reopened it in 1976.[95] In 1948, the Army turned over Fort Moultrie Military Reservation to the State of South Carolina.

The federal government planned to dispose of Fort Sumter through a War Assets Administration sale. In March 1947, U. S. Senator (and former mayor of Charleston) Burnet R. Maybank introduced a bill calling for the establishment of Fort Sumter National Monument, declaring that to sell Fort Sumter would be "like selling the Statue of Liberty."[96] On April 21, 1948, Congress passed a joint resolution authorizing the transfer of Fort Sumter to the Interior Department, directing that it would be a "public national memorial commemorating historical events at or near Fort Sumter," to be managed and preserved by the National Park Service. President Truman established Fort Sumter National Monument on April 28, 1948.[97]

When NPS took over Fort Sumter, the first tasks were to begin research and documentation, and develop interpretive plans. In 1948, Superintendent William W. Luckett organized the first office space for the new Fort Sumter National Monument in the dining room of his Sullivan's Island home. That December, NPS staff from Richmond visited the site and made recommendations for developing the park. Their preferred plan was for NPS to uncover the brick fort, remove "extraneous buildings and construction of recent periods," and restore the first-tier casemates and parade ground. The goal was to restore Fort Sumter "as a stabilized ruin of the 1860-65 period."[98]

In February 1949, Luckett and his small staff moved into an office at 50 Broad Street, where Charleston's Chamber of Commerce was

95. "Fort Pickens." Gulf Islands National Seashore, http://www.nps.gov/guis/planyourvisit/fort-pickens.htm (December 20, 2013).

96. Comstock, "Short History," p. 20, citing *Charleston News & Courier,* 30 March 1947.
97. Ibid. "Joint Resolution to establish the Fort Sumter National Monument in the State of South Carolina (62 Stat. 204)" April 28, 1948.
98. W. E. O'Neil, Jr., Regional Engineer, "Report on Fort Sumter National Monument," January 3, 1949, pp. 1, 5.



Figure I.A-43. The park moved its office to 50 Broad Street in 1949, at that time the Chamber of Commerce building.



Figure I.A-44. Interpretive panels installed in Battery Huger's exhibit room in 1951. (FOSU vertical file, Photo Drawer 3)

headquartered. The downtown location was selected so the park superintendent could continue to consult with leaders of the preservation community, particularly the Charleston Museum, the Preservation Society of Charleston, and Historic Charleston Foundation. All these groups, as well as the Chamber of Commerce and the city-sponsored Historical Commission of Charleston, had enthusiastically endorsed NPS acquisition of Fort Sumter.[99]

Charleston's preservation, tourism, and business interests were supportive of the work program laid out in the 1949 NPS report. NPS would remove all buildings not associated with the Coast Guard (which still required Fort Sumter for a navigation beacon), remove a former beacon light, and lay a power cable to the fort. By late summer 1949, eleven buildings and towers had been razed. In 1950, the Coast Guard moved the radio beacon to the Sullivan's Island Lifeboat Station.[100]

In 1950 and 1951, as part of management for increased visitation, NPS installed an electric plant, introduced telephone service, and improved the drinking water. NPS-sponsored daily tours of Fort Sumter began in 1950, and an exhibit room was opened. In March 1952, Superintendent Luckett prepared a "Park Operation Prospectus." He proposed installing permanent facilities within Battery Huger to include exhibits, lecture room, comfort station, field office and work room, lighting and heating plants, heavy equipment room, tool room/workshop, and three storerooms for hardware, lumber, and the like.[101]

The earlier decision to remove "construction from recent periods" remained a constant policy in long-range planning in the 1950s, while at the same time, contradictory plans were underway for retaining Battery Huger for museum and utility purposes.[102] A series of projects from 1951 to 1959 had the goal of exposing the components of Fort Sumter that pre-dated the 1870s renovations. Large-scale excavations removed concrete structures of the 1870s as well as the tons of rubble and sand that concealed the parade ground and brick casemate structures of the fort's original plan.

Equally important was documentary research to understand the fortification's physical history. By February 1950, Fort Sumter historian Frank Barnes had completed four construction studies.[103]

99. Comstock, *Short History.*
100. Clark and Wylie, *HSAR,* p. III.02-15. Comstock, *Short History,* pp. 27-28. "Coast Guard History."

101. W. W. Luckett, *Master Plan Development Outline, Fort Sumter National Monument, South Carolina,* "Park Operation Prospectus" (FOSU: March 1952), p. 5.
102. John T. Willett and Rock L. Comstock, Jr., "Interpretation in Luckett, *Master Plan Development Outline,"* p. 2. William W. Luckett, "Report on excavations along Fort Sumter's left flank interior, August 7 to October 18, 1951, and May 6 to June 20, 1952." Rock L. Comstock, "Excavation Report: Fort Sumter National Monument, June 17-30, 1955." Horace J. Sheely, Jr. "Excavation Report: Fort Sumter National Monument, May 7 – June 21, 1956." Sheely, "Excavation Report: Fort Sumter National Monument, March 27 – May 28, 1958." "Excavation Report: Fort Sumter National Monument, December 29, 1958 – May 13, 1959."
103. Frank Barnes, "Fort Sumter, December 26, 1860,"

Historians John Babington and Rock Comstock produced two more studies in 1954, and in 1959, the year of the last excavation project, Heath Pemberton completed the structural research through the 1950s.[104]

Even while work was underway, visitation increased: between 1948 and 1956, the number of visitors to Fort Sumter soared from 9,000 to 31,000 annually. By 1955, the excavation of Fort Sumter was about half completed, and NPS had constructed a new tour-boat landing, placed interpretive signage, and installed stairs and handrails for visitors' use.[105]

Mission 66 and Later Plans

The year 1956 marked a watershed in NPS management and interpretation. Parks nationwide were overcrowded, and funds for maintenance and staffing were insufficient. Endorsed by President Eisenhower and Congress, the result was Mission 66, a ten-year $1 billion program to improve visitor services by the fiftieth anniversary of the Park Service in 1966. Improvements included new roads, trails, campgrounds, utilities, and care of historic structures. Essential to the program was a new concept, a Visitor Center in each park. With organized parking, services, interpretation, and access to vistas, each Visitor Center would improve the visitors' experience while reducing damage to natural and historic features. Between the years 1956 to 1966, more than one hundred new visitor centers and additions to existing museums were commissioned.[106]

Individual park managers were charged with planning for development and operations. Superintendent Luckett faced a situation at Fort Sumter different from those presented to many park managers: a shortened timeframe due to the upcoming Civil War centennial, and inaccessibility coupled with incomplete removal of the rubble that covered the historic site.

Luckett prepared the park's Mission 66 Prospectus during 1955-56. It stated the primary aim of preserving, developing, and operating Fort Sumter National Monument "so that the visitor may understand to the fullest degree the significance of Fort Sumter." By completing excavations, installing exhibits and markers, and providing necessary facilities, NPS would preserve the physical remains of the fort and provide interpretation. Most important was enhancement of the visitors' experience by improving docking facilities and sanitation. Next in importance was uncovering the fort ruins, and preserving the site.[107]

Superintendent Luckett's prospectus did not include constructing a stand-alone visitor center, the building type at the heart of Mission 66 planning goals. Instead, portions of Battery Huger were altered to house offices and museum facilities.[108]

After Fort Moultrie was added to Fort Sumter National Monument in 1960, NPS moved administrative offices from downtown Charleston into the bombproofs and principal magazine there.

The next year began the 100th anniversary of the Civil War, which was recognized at NPS Civil War sites nationwide and spanned five years. The first of five annual commemorative stamps was issued on the April 12 anniversary of the "first shot." Reenactments, erection of monuments, and commemorative items marked the events, the first focused on Fort Sumter.

The centennial brought an influx of new visitors to the park. Work in the decade of the 1960s enhanced the visitors' experience, improved systems, and protected the historic site. A replacement dock was built and walkways, a septic system, and improved interpretation were added.

(November 23, 1949), "Fort Sumter, April 12, 1861," (November 23, 1949), "Fort Sumter, April 7, 1863," (February 21, 1950) and "Fort Sumter, February 17, 1865" (February 21, 1950).
104. John Babington, "Fort Sumter: 1876" (March 1, 1954). Rock L. Comstock, Jr., "Fort Sumter: 1899" (June 8, 1954). Heath L. Pemberton, Jr., "Fort Sumter: Chronological Construction History with Architectural Detail" (September 21, 1959).
105. William W. Luckett, "Mission 66 Prospectus, Fort Sumter National Monument," April 19, 1956.
106. Sarah Allaback, *Mission 66 Visitor Centers: The History of a Building Type* (Washington, D.C.: Cultural Resources Stewardship and Partnerships, Park Historic Structures and Cultural Landscapes Program, National Park Service, 2000, Appendix III). Anne Mitchell Whisnant and David E. Whisnant, "Centennial Initiative: It's No Mission 66" *National Parks Traveler* (April 2007).
107. Letter, Luckett to Director, November 7, 1955. Luckett, "Mission 66 Prospectus."
108. Luckett, "Mission 66 Prospectus." FOSU, "Completion Report, Battery Huger Development."

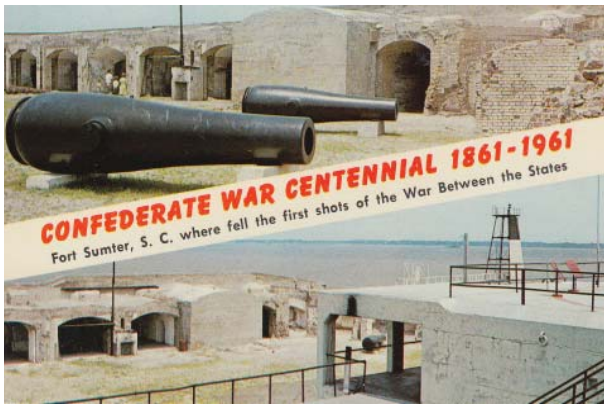


Figure I.A-45. Commercial license: 1961 postcard commemorates the "Confederate War" Centennial. (personal collection)



Figure I.A-46. Commemorative stamp issued April 12, 1961. Charles R. Chickering, designer. (Smithsonian National Postal Museum)

In 1970, the Park's offices were moved again, leaving the bombproofs for the World War II-era Harbor Entrance Command Post.[109] Construction of the Fort Moultrie Visitor Center in 1974 provided an auditorium and observation area for visitors, as well as staff office space.

An updated Master Plan for the fort was prepared in 1974. Like the 1949 Master Plan, it called for the removal of Battery Huger to help interpret the fort as a "slice of time," a "singularly significant period during the 200 years of coastal fortifications that is found in the history of the Civil War at Charleston." The broad scope of coastal defense would be covered in interpretation of Fort Moultrie.[110]

In 1992, a detailed assessment of Fort Sumter's historic features and conditions made recommendations for treatment. A structural analysis was conducted the same year by the Army Corps of Engineers to investigate the feasibility of Battery Huger's removal. The Corps determined that the removal would cause no significant damage to Fort Sumter.[111]

In 1995, a working group of NPS Southeast Region staff (SERO) developed a prioritization system to determine the appropriate level of treatment for each of the Second and Third system fortifications within the Southeast Field Area. Sites considered were Forts Moultrie, Sumter, Jefferson, Pulaski, and the group within Gulf Islands National Seashore: Pickens, Barrancas, Advanced Redoubt, and Massachusetts. All were Third System sites except Fort Moultrie (Second System).[112]

Recommendations were to preserve Forts Moultrie and Sumter in their current state. "No action/ No preservation treatment" was appropriate for Endicott batteries, but Isaac Huger and Pensacola (within Fort Pickens) should receive the same level of treatment as the associated masonry fort. The SERO report notes that to preserve historic fabric and prevent more costly future repairs, low-cost temporary measures must be taken in some cases to address critical situations, that sometimes minimum stabilization is the only economically feasible treatment.

The group recommended that site planners meet park needs by using historic structures before undertaking new construction, while balancing that consideration against the reality that coastal forts do not lend themselves to adaptive use. "When the fort is the park's primary resource, there must be no inappropriate use of the significant historic resource."[113]

A new General Management Plan (GMP) for Fort Sumter prepared in 1998 responded to administrative changes affecting staffing requirements and capabilities. The focus of the GMP is on properly preserving the existing

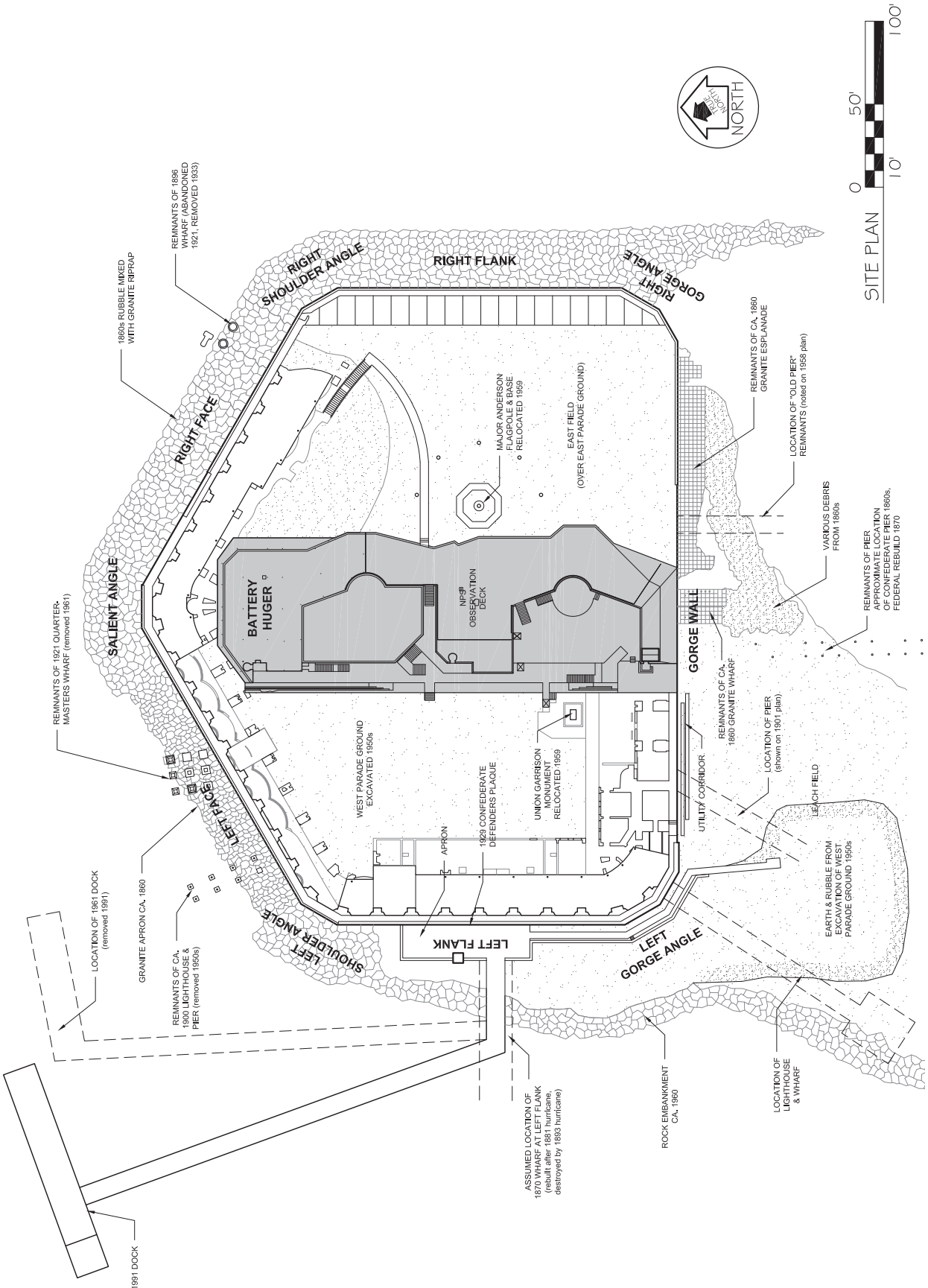
109. Bearss, *Special History Study.*
110. *Fort Sumter National Monument Master Plan* (NPS, 1974), p. 2.
111. Clark and Wylie, *HSAR. Fort Sumter National Monument General Management Plan Environmental Assessment (*NPS, Southeast Regional Office [SERO], 1998), p. 73.
112."Preservation Prioritization for Southeast Coastal Fortifications," SERO, 1995.
113. Ibid.

structures by setting forth basic strategies to guide the park for the next ten or fifteen years: an explicit management framework for reaching the objectives of resource protection and visitor experience goals. No significant changes in present conditions are proposed, and the GMP suggests that Battery Huger not be removed "at this time" because of budget constraints.[114]

At properties beyond the Third System fortification, Fort Sumter National Monument (FOSU) has been enlarged several times. The Sullivan's Island Coast Guard Station was used by FOSU as a storage and work facility beginning in 1973, when the Coast Guard opened a new station in downtown Charleston. In 1990, the Coast Guard transferred the site, except the 1962 lighthouse (Charleston Light, also known as the Sullivan's Island Lighthouse), to NPS.[115] In 2008, ownership of the Charleston Light was transferred to NPS.

To relocate from the docking facility at Charleston's Municipal Marina, on the Ashley River at the west side of the downtown peninsula, a parcel of land on the Cooper River waterfront was selected as the new embarkation point for tour boats to Fort Sumter. The parcel was acquired by NPS in 1986, and the Fort Sumter Visitor Education Center opened there in August 2001. The focal point of the interior exhibit is Fort Sumter's U. S. garrison flag, taken to New York by Major Anderson, returned to the War Department by the Anderson family in 1905, and transferred to the Park Service in 1954.[116]

114. *Fort Sumter National Monument General Management Plan Environmental Assessment (*NPS, SERO, 1998), pp. 14-15, 25, 37, 73.
115."Coast Guard Base to Close," *Charleston News and Courier,* March 13, 1973. Christopher T. Zeigler, Rick Dorrance, and Sandy Pusey, "The Sullivan's Island U. S. Coast Guard Historic District" (FOSU: May 8, 2006), p. 4.
116. Carlin Timmons and Sandy Pusey, "Fort Sumter National Monument's New Facility at Liberty Square," in *CRM* No. 4-2002, pp. 40-41. *Courier, the National Park Service Newsletter* (Washington, DC, July 1986, Vol. 31, No. 7), p. 7. NPS exhibit text.



Labeled Site Plan, 2014. Enlarged copy is in Appendix B.

I.B Chronology of Development and Use

The historic plans shown in this report were originally produced in very large format. The quality of the surviving drawings varies, with details often not legible in reduced versions. Images in this report help illustrate the text. Appendix G contains 11x17 sheets, still considerably smaller than the originals.

Fort Sumter was built in the mid-nineteenth century as part of the nation's continuing system of defense. The pentagonal fort, with substantial three-story buildings inside its walls, took decades to build and was only about ninety percent complete when Civil War bombings reduced it to ruins. By the end of the war it was an "impregnable mass" of masonry and rubble.

Fort Sumter was recognized as a symbol of the Civil War even before the war's end, and became an important commemorative site only days after Lee's surrender.

The fort remained in service after the Civil War, undergoing substantial rebuildings, alterations, additions, and removals. It was modernized in the 1870s. Again obsolete two decades later, the fort was significantly altered in 1898-99 when the massive Endicott-designed Battery Huger was built in its center. Barracks and other frame buildings were constructed and new artillery installed for the two World Wars, and a century-long succession of lighthouses and beacons took advantage of the fort's central location in the harbor.

Deactivated after World War II, the fort was transferred to the Interior Department in 1948 as a public national memorial.

Although visitors had been attracted to the fort since the 1860s, tourism boomed with the rise in automobile in the 1920s and has increased rapidly over the decades. Beginning in the 1950s, NPS has modified the fort and updated interpretive efforts to address the continuing growth in tourism.

Building Fort Sumter, 1829-1860

Congress made the first appropriations for the Charleston fort's construction in 1828. The new fort was named for Thomas Sumter (1734-1832), Revolutionary War hero who represented South Carolina in the U.S. House of Representatives and Senate. The design, drawn in 1827, was typical of Third System fortifications: a pentagonal, three-tiered, masonry fort with truncated angles. Fort Sumter's was a symmetrical, but otherwise irregular, pentagon with its front, or salient angle facing northeast towards the harbor channel. (For the purposes of this report, the salient angle is called north.) The five sides were made up of two diagonal walls forming the salient angle (face walls), two parallel walls (flank walls), and the



Figure I.B-1. Thomas Sumter, painting by Rembrandt Peale, 1796.

long rear "gorge" wall at right angles to the flanks. The faces and flanks were designed for three tiers of guns with enlisted men's barracks on the flanks. The gorge was designed for officers' quarters and powder magazines with guns on the third tier. These were the "scarp walls," the sloped solid masonry exterior walls of the fort. Inside the fort was a pentagonal parade ground.

The fort's design was typical of Third System fortifications, adapted for its water site. The foundation was to be stone, with the five-foot thick walls above specified as locally-made "Carolina grey" brick. The wall core was to be concrete rubble.[117] Inside the scarp walls were two tiers of arched casemates, small rooms usually serving as gunrooms. Along the rear gorge wall at the base of the pentagon, the casemates were designed for officers' quarters. Casemates at the other four sides, forty-one at each level, were designed as gunrooms. Another fifty-three gun positions were at the parapet level above the casemates, for a planned total of 135 guns. The "parade" or parade ground, the level area used for drills and assemblies, comprised most of the area inside the scarp walls.

On the interior side of the left face and right face wall, the platform arches of the first and second tiers formed a passageway. At ground level, three-story barracks buildings extended alongside the parade, parallel to the casemates at right and left flanks. Open to the casemates at two levels, with a rear wall structure only at the third level, these buildings had solid brick walls, with brick-faced concrete piers forming a portion of the parade-side long elevations. Each barracks had two kitchens, one at each end, with fireplaces and brick hearths.

117. Available sources are limited in details of construction.

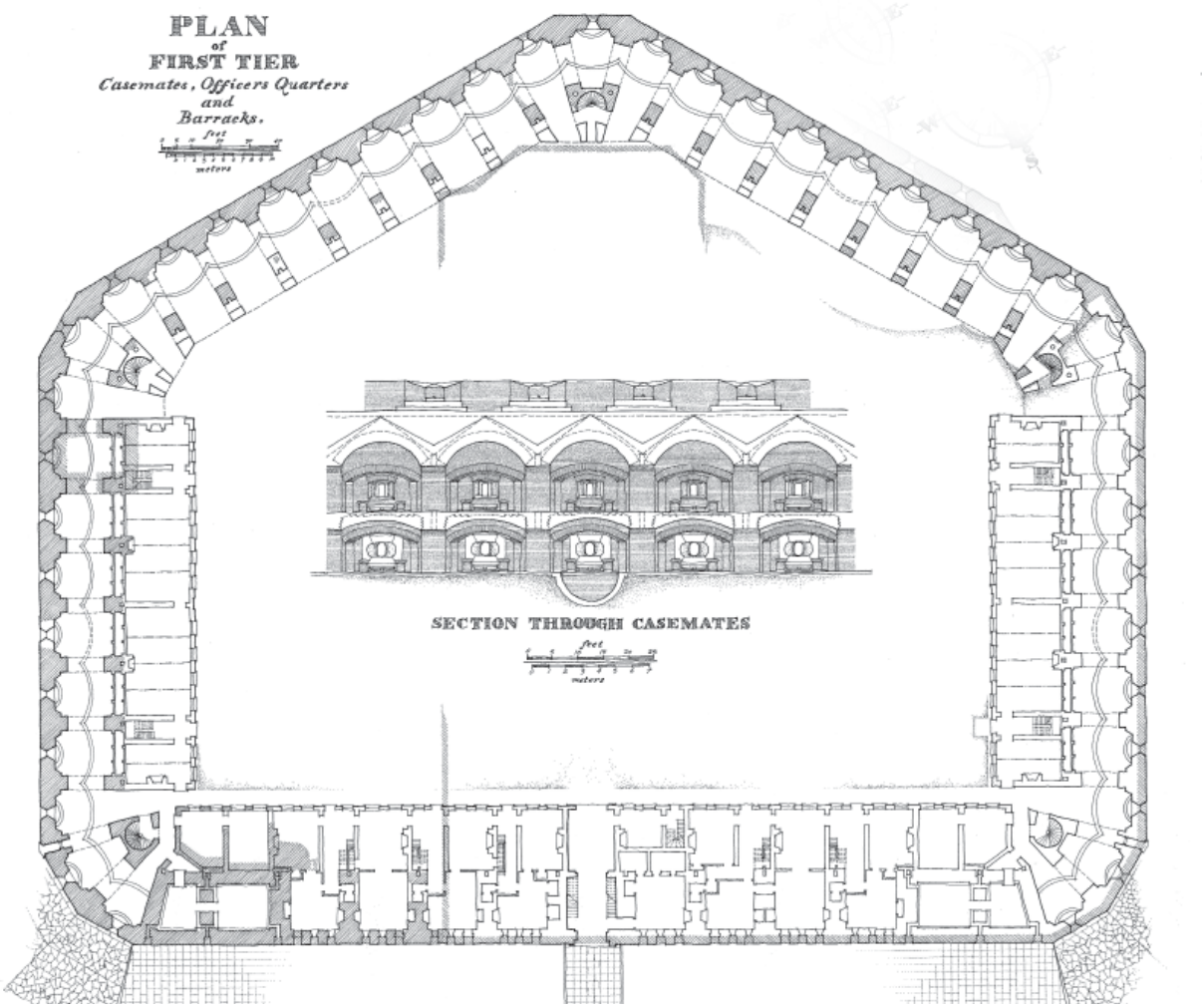


Figure I.B-2. Conjectured "Plan of First Tier; Casemates, Officers' Quarters and Barracks." (Historic American Buildings Survey [HABS], "Fort Sumter Recording Project," SC-194, sheet 23, 1991.) Twenty-four sheets of HABS drawings are found in Appendix H.

The officers' quarters extended between magazines (powder storage rooms) at each end of the rear gorge wall. These quarters were three-story apartments for officers and their families, with storage rooms and private water closets built into the casemate piers. Verandas facing into the parade ground and fenced "gardens" on the esplanade outside the gorge wall were planned but never executed. (The esplanade was the walkway parallel to and outside the gorge wall.) The powder magazines of the gorge were ventilated with multiple openings to keep the powder dry.[118]

Construction

The Secretary of War informed Congress that construction would await the end of the northern building season, when an engineer would be reassigned to Charleston. Lieutenant Henry Brewerton of the Army Corps of Engineers, a 27-year-old West Point graduate, was appointed supervisory engineer for the construction. Upon his arrival, Brewerton established his headquarters at Fort Johnson, about one-and-one-half miles to the west on James Island.[119]

Before building the fort itself, Brewerton had to create an island or "mole" on the underwater shoal. The mole was to be wide and thick and made of stone. The size of the fort was small relative to other Third System forts, and the strong mole would provide the support necessary for the high wall and their three tiers of heavy cannon.[120]

No natural stone is found in coastal South Carolina, so between 1829 and 1831, Brewerton negotiated with northern suppliers for delivery of the tons of stone required for the mole. Large quantities began arriving in 1832, and by the end of 1833, 38,500 tons, mostly irregular granite, had been laid.[121] By late autumn 1834, the mole stood about two feet above low water, the foundation bearing level. Work was then suspended when William Laval, a private citizen, claimed that a land grant he had received gave him ownership of the shoal where the fort was being built.[122]

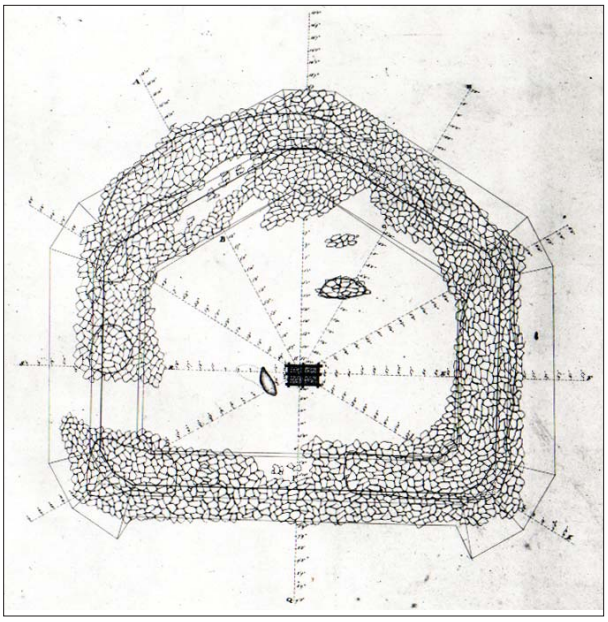


Figure I.B-3. Foundation Construction Progress as of September 1833. (NARA; copy in FOSU vertical file, Photograph Drawer 2) See larger drawing in Appendix G.

After several years of construction inactivity, the State of South Carolina found Laval's claim invalid and in 1840 conveyed to the federal government the land on which Fort Sumter's mole was built, a 125-acre tract, most of it under water. When Alexander H. Bowman, captain in the Army Corps of Engineers, replaced Brewerton and took charge of operations in January 1841, his first order of business was to construct a stone wharf for ships to deliver materials – most importantly, additional granite, and brick for the fort walls. The granite-flagged wharf was centered at the rear gorge wall at its sallyport entrance; along the water side of the wall ran a 25½-foot-wide granite-flagged esplanade.[123]

In contrast to the rough stone of the underwater mole, the foundation between the levels of low and high water was formed of cut granite blocks, three

118."Documented Narrative accompanying Historical Base Maps," pp. 40-44, in William W. Luckett, "Mission 66 Fort Sumter National Monument," April 19, 1956; HABS, p. 14; FOSU vertical file, Drawer 23 (1890-present).
119. Heath L. Pemberton, Jr., "Fort Sumter: Chronological Construction History with Architectural Detail" (September 21, 1959), p. 4, citing Lieut. A. Mordicai to Lieut. Henry Brewerton, 23 April 1829. Peter Buell Porter was Secretary of War.
120. Pemberton, "Fort Sumter," pp. 4-6.
121. Sources do not provide the total amount of stone needed for the mole, though over 74,000 tons may have been delivered by 1841. Pemberton, "Fort Sumter," pp. 4-6, citing American State Papers, Military Affairs, vol. V, pp. 387, 463-464, and citing Laval to the U. S. Engineer at Fort Johnson, 3 November 1834.
122. The underwater shoal was not among the Charleston area properties that had long been federally-owned.
123. Pemberton, "Fort Sumter," pp. 5-7, citing March 1841 plat showing conveyance of the land, and citing Bowman to Col. J. G. Totten, 18 January, 25 March, 16 June, and 3 December 1841.

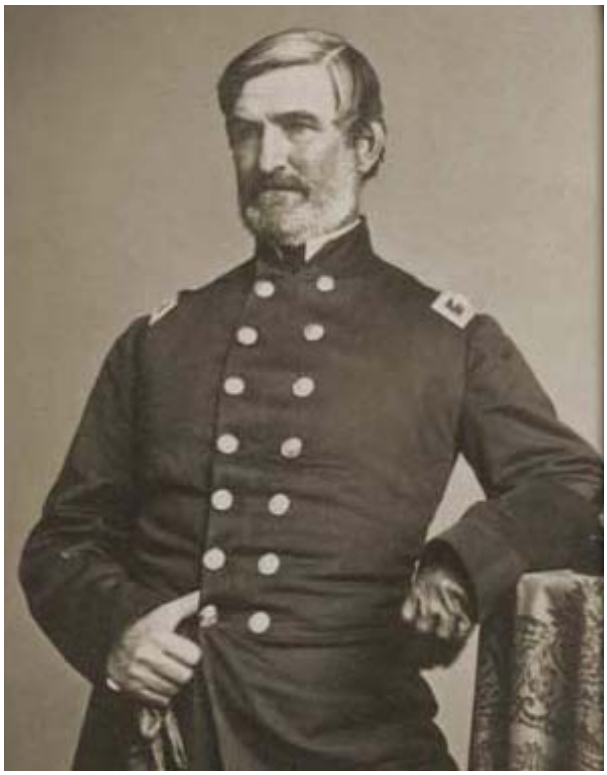


Figure I.B-4. Captain Alexander H. Bowman, captain in the Army Corps of Engineers. (Photographed in 1862. (moultrie.battlefieldsincommon.com)



Figure I.B-5. Colonel Joseph G. Totten. (Society for the Preservation of Historic Cements, Inc. http://www.naturalcement.org)

courses each measuring two feet thick, laid without mortar or cement. Bowman made the decision to increase the height of the mole, and found that suitable granite could be obtained from several northern quarries, "where it exists in strata of great uniformity of thickness, and is easily quarried in masses of any required shape or size." The granite-block stonework above the ordinary high water mark was to be laid in cement mortar and terminate 2'-9" above that level.[124]

Bowman's supervisor, Colonel Joseph G. Totten, Chief of the Corps of Engineers, advised Bowman in great detail about laying the foundation. After each course was laid, "it should be covered with sand in excess and left, for many tides, to the wash of the water; to give the sand more time to seek out every interstice in the joints and under the bed of the stones; the foundation should be constructed by proceeding with a course entirely around the whole work, covering with sand as you go, and filling with sand both in the parade & between the piers, to the height of the top of the course. . . . Use shells next [*sic*] the outside to prevent the sand washing out, but no more than necessary, as they do not compare with sand in solidifying the mass."[125]

For the third or upper course of granite blocks, Totten instructed Bowman to "lay granite stretchers end to end, each 18 inches high by 2 feet wide. Then raise the mass of sand against these stones and elsewhere to the height of their top, placing the general surface at the level of high water. In the coffers formed by these granite stretchers, place two well-rammed layers of concrete, each 9" high, the second formed immediately on the first, moving in small distances, laying the second before the first has hardened, so that the two layers become one."

The brick masonry of the fort would rest upon this concrete and granite foundation. Each course of brick would be slightly offset from the course below, creating a tapered shape, "all being arranged so that the superstructure has an upper offset of only two inches."[126]

Bowman's September 1841 report to Colonel Totten summarizes his management of the work.

124. Bowman to Totten, 25 March 1841.

125. Totten to Bowman, 10 April 1841.
126. Totten to Bowman, 16 June 1841.

"Whenever the tide allowed, laborers leveled the foundation to receive the masonry of the superstructure. During the summer, they used the lighters [barges] to transport shells and sand to fill the parade. The neighborhood of the fort furnishes an abundance of these materials at a cheap rate. Bricks of an excellent quality may be made upon the streams flowing into this harbor."[127]

According to Totten's instructions, the rear gorge wall foundation was the first to be laid. The gorge wall was positioned away from direct enemy fire; the opposite front salient angle faced the harbor channel. As the cut-granite foundations of the gorge casemates and piers were being completed, Bowman requested permission to commence the remaining faces from a point one foot above low water. Noting that the rough stone mole already stood more than a foot above low water, and was cemented by oysters, he cited the labor to be saved by not removing material to lower the foundation's height, and went on to comment that much of the previous autumn had been wasted, as the tide rarely receded enough to permit work on the gorge.[128]

Contracts were signed with a variety of suppliers during the early to mid-1840s. Some of these are documented. Rough granite was supplied by the Staten Island Company from quarries on Staten Island and "near Port Richmond," and by G. Mish. & Co. of Fort Deposit, Maryland, and C. B. Eddy, G. W. Chase, and B.W. Miller of Fall River, Massachusetts. Messrs. Ellis and Mayo of Boston shipped granite blocks from their quarry on the Penobscot River in Maine. Bowman found lime, cement, shells, and brick on the open market: lime and cement in New York, shells and brick from Charleston area sources. One Charleston supplier, Charles Graves, alone delivered 160,000 bricks in 1843, and agreed to deliver brick during the next year "in every way equal in size and quality to a sample of eight brick supplied by Graves and kept in Bowman's office."[129] Available correspondence between Corps of Engineers officers does not identify all local brick suppliers, or the northern sources of bluestone, "red stone," or other construction materials.

127. Totten to Bowman, 30 September 1841.
128. Bowman to Totten, 9 February 1843.
129. 2nd Lt. J. D. Kurtz, Asst. to Bowman, to Totten, 30 September 1843; George L. Welcker, Lt. of Engineers, to Bowman, 23 September 1844; Bowman to Totten, 30 September 1844.



Figure I.B-6. Sandstone embrasure and bluestone-flagged flooring at left face, 1991 view. (HABS SC,10-CHAR.V,3-128)

The records are also vague about the men whose labor built Fort Sumter. Fort Sumter National Monument (FOSU) historians conducting research at the National Archives and Records Administration (NARA) have made copies of vouchers and payroll records. These include tables such as "Payroll of Extra Laborers … Fort Sumter, August 1839," which list names of employees and the amount they were paid. The FOSU search for records is ongoing, and not all the copies have been transcribed, so analysis of the labor force is not yet complete. Most local employees enumerated in the records transcribed to date were white, including masons and other skilled tradesmen as well as common laborers. Of the "colored" laborers on the list, most show surnames, but the documents give no indication of whether they were enslaved or free. Many of the workers, white or colored, marked payroll receipts with an "X" rather than signing their names.[130] With the Lowcountry's large population of Gullah slaves, it is likely that a sizeable number worked on construction of the fort. Some may have been "rented" out by their owners, while others were not included in payroll records.[131]

130. Richard W. Hatcher, FOSU historian, personal communication.
131. Gullah was the name of the South Carolina Lowcountry population of African descent, while Geechee, at first a negative word, referred to those in Georgia. "Sapelo Island," "Geechee and Gullah Culture," www.georgiaencyclopedia.org.

During the summer of 1843, a force of about forty was on site, enough hands to keep two derricks in operation. They included twelve masons to dress and lay foundation blocks, with twelve laborers assisting them, six brick masons with six assistants, and six short-term laborers to mix and ram concrete. The "laborers and mechanics [skilled tradesmen] are under the immediate direction of a local superintendent always on the work during the hours of labor." Captain Bowman's year-end report for fiscal 1844 commented that "work has been conducted for the past year, as during the preceding ones, by hired labor."[132]

Availability of labor was a consideration in contracting for construction materials. In 1845, it seemed advisable to order brick from the lowest bidder "for as many as he can deliver in the course of the summer, and in the fall of each year when northern mechanics would not be afraid to venture south on account of the climate, to issue new proposals for the additional quantity required."[133]

Correspondence regarding an epidemic among the laborers and their families reveals their living conditions. Most of the workers stayed in a shanty encampment at Fort Johnson one and one-half miles across the harbor on James Island. In August 1846 the "congestive fever" then prevalent on the island broke out in the settlement, killing several people. The fever first appeared in the Cruse family, four adults and three children sharing a shanty. Dr. Robert Lebby, a local physician contracted to provide medical services at Fort Johnson, wrote to Totten that "Such a number of people crowded together, must render the place unhealthy, especially where there are intemperate women in the number."

In three shanties were ten adults and six children; the McDonald family – husband, wife, four children – shared a single room, sixteen feet by eighteen, where they slept, cooked, and kept two boarders. In all, Dr. Lebby counted the laborers' family members as sixteen Irish women and eighteen children. Many of the workmen had sent their families away, and two of the men had left the area.

132. Kurtz to Totten, 30 June 1843 and 30 September 1843; Bowman to Totten, 30 September 1844.
133. Welcker to Bowman, 21 June 1845.

Although James Island had a number of summer houses, they were fully occupied. The crowded shanties were the only option for the laborers who had travelled south to build Fort Sumter.[134] It is unclear whether a workmen's barracks building was erected at the fort. Totten instructed Bowman to do so, but a later letter from Bowman's assistant says that it was too late to build quarters for this season. "I hope he may give me different directions" is the final comment found in the correspondence files.[135]

As construction continued during the 1840s, Capt. Bowman's regular year-end reports summarize construction progress. When the lighters belonging to Fort Sumter were not carrying stone, they hauled in sand. Although sand was an ineffective fill under the casemates, being quickly washed away, workers steadily built up the large interior parade with sand. Shells instead were loaded under the casemates, where they compacted to form a retaining wall for the sand of the parade. Shells were readily available and could be delivered at a cost not much more than sand, and they began to also be used as parade fill. Shells "of the best description" for concrete were also plentiful, and material previously used as ballast in ships could be obtained and used for the same purpose.[136]

The locally-made brick continued to prove satisfactory, and freshwater sand of good quality for mortar and concrete (used in the interior of the scarp and other heavy walls) was readily obtained. Although the workers were able to make lime from shells on-site, it was "found preferable to procure the material from Northern states, the small quantity used not making it worthwhile to experiment between the two kinds." Cement also was purchased from northern suppliers.[137]

In September 1845, an "Annual Drawing" was made to show the progress of work during the year. One year later a drawing of "plan, sections, and elevations" shows the conditions in September 1846 (*Figs. I.B-7, 8*). In that year, Army engineers

134. Dr. Robert Lebby to Bowman, 27 August 1846; Lebby to Totten, 19 August 1846; Kurtz to Totten, 20 August 1846.
135. Totten to Bowman, 17 August 1846; Kurtz to Totten, 31 August 1846.
136. Bowman to Totten, 30 September 1844.
137. Kurtz to Totten, 30 September 1843; Bowman to Totten, 30 September 1844 and 30 September 1845. Suppliers are not identified.

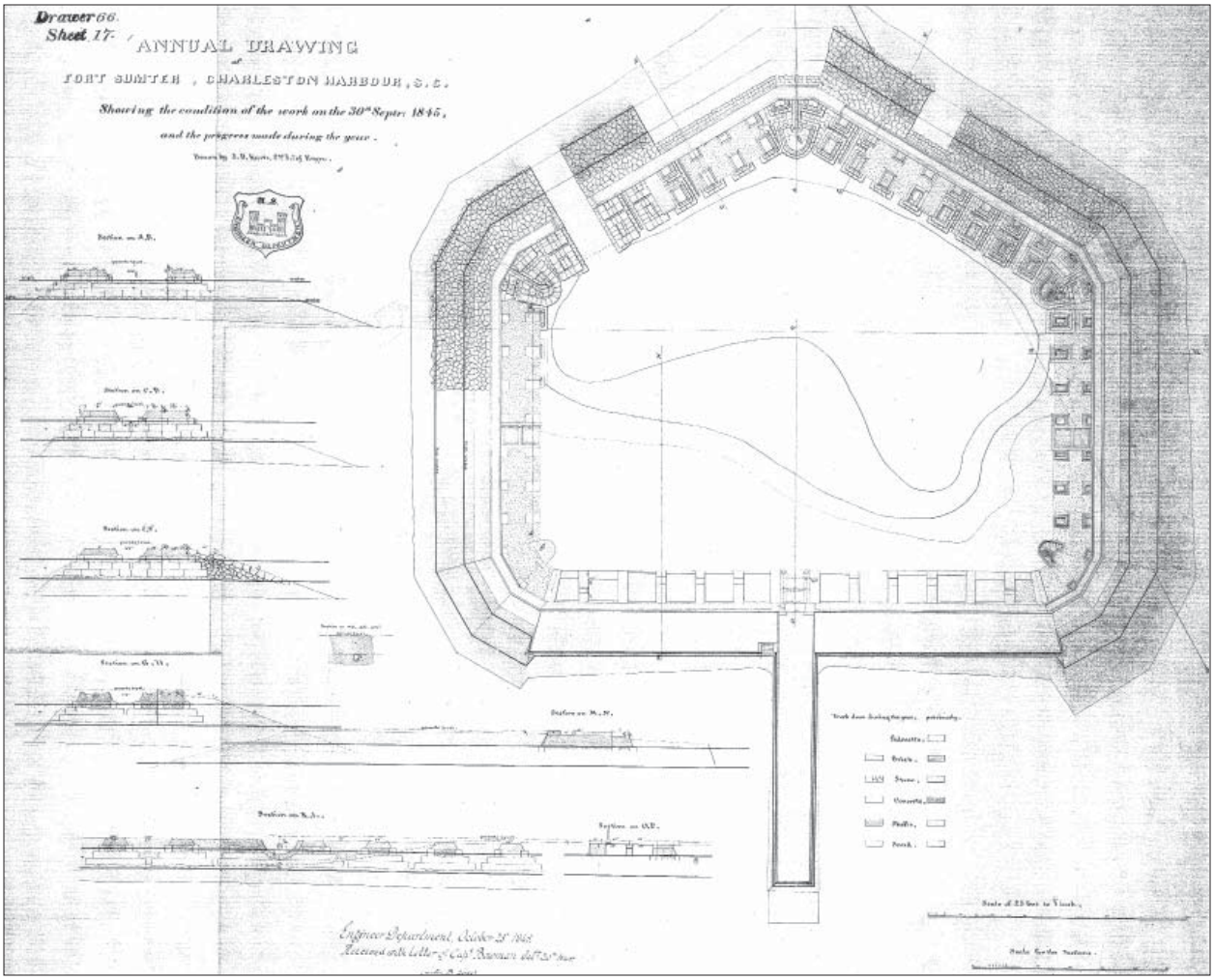


Figure I.B-7. "Annual Drawing of Fort Sumter, Charleston Harbour, S. C., showing the condition of the work on the 30th Septr: 1845 and the progress made during the year. Drawn by J.D. Kurtz, 2nd Lt of Engrs." (NARA; copy in FOSU map files) See larger drawing in Appendix G.

found that subsurface oyster growth had bound the rough stones of the "enrockment" together. The engineer in charge recommended against adding sand to the mole. He doubted that it would be more erosion-proof than the oysters, and believed that covering the structure with sand would "kill millions of these fish, which now encrust almost every stone, and will, I feel confident, in a few years bind the whole mass firmly together."[138]

The foundation was completed by autumn 1845, allowing construction of the brick masonry casemate piers and scarp walls to begin. Their design provided for the men who would live there. In each of the piers nearest the parade, a recess for drain pipes, one foot wide by eighteen inches deep, was formed. The pipes were to carry water from the terreplein (upper gun platform) and roofs to cisterns beneath the first-tier floors. After completion of the granite and concrete foundation, the interior parade was raised above high water with the sand and shell fill. Five 10,000-gallon cisterns, one beneath each center casemate, were probably completed in 1847. Faced with brick, the cisterns rested on concrete beds.[139]

Bowman periodically studied the level of the foundation in an effort to detect any settling. As granite blocks were placed on the mole, subsidence tests of the mole's load-bearing capacity found no perceptible settling. Settling was a particular concern in casemates where arches were to be turned (constructed). Totten instructed Bowman to "weight the piers in the lower casemate tiers

138. Capt. A. H. Bowman to Col. J. G. Totten, 27 February 1846. (Transcriptions and photocopies of Army Engineers correspondence are in FOSU vertical file, Drawer 21.)

139. "Documented Narrative," pp. 36, 39.

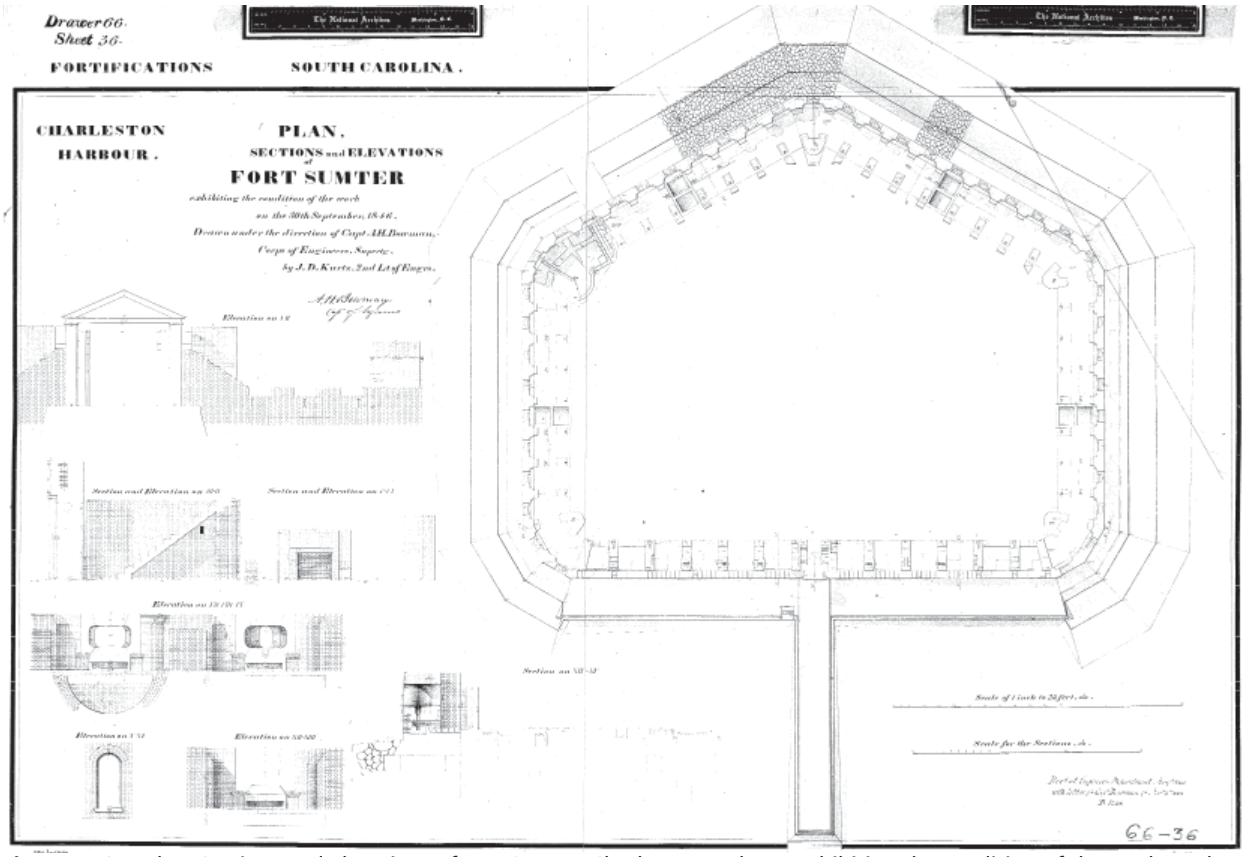


Figure I.B-8. "Plan, Sections and Elevations of Fort Sumter, Charleston Harbour, exhibiting the condition of the work on the 30th September: 1846. Drawn under the direction of Capt A.H. Bowman, Corps of Engineers, Supertg, by J.D. Kurtz, 2nd Lt of Engrs." (NARA; copy in FOSU map files) See larger drawing in Appendix G.

with brick to be used in adjacent areas, leaving them for one season at least – pile bricks there as they are received. Keep the weight until all motion has ceased, then turn casemate arches. Don't turn gorge casemate arches until the piers have been loaded for some months."[140]

Forty-one embrasures (openings in casemate walls for firing cannon) on the first-floor faces and flanks were completed by September 1847. The tapered openings were angled to be wider on the inner side of the wall than on the water side to provide protection and a wider firing angle, and lined on both sides. The outside surfaces were faced with concrete plaster. According to a 1949 NPS report, "what appears to be a concrete facing is in reality brick and shell rubble with some concrete plaster on outside surface (*Fig. I.B-9*)."[141]

Embrasure interiors were faced with four stone blocks that extended fifteen inches into the opening, held in place by iron clamps extending through the stones into the concrete. Cast-iron fastening cylinders were run through openings in the sill at each embrasure, and through granite blocks above and below the tongue hole (the recess beneath the embrasure that accommodated



Figure I.B-9. Exterior of embrasure showing facing, 1948 view. ("Report on Fort Sumter National Monument," January 3, 1949, in FOSU vertical file, Drawer 23, 1890-present)

140. Totten to Bowman, 17 May 1842; Bowman to Totten, 30 September 1844.
141. Luckett, "Report on Fort Sumter National Monument," January 3, 1949.

the tongue of the gun chassis).[142] Because this work required a great deal of stone cutting, some breakage was anticipated. Bowman was instructed to use "free stone – say the red stone of New York of the best quality." Small brick arched recesses at each side of the tongue hole accommodated the corners of the gun chassis as it turned.[143]

Totten's priority during 1846-47 was construction of the casemates to be used as gunrooms at flanks and faces. The casemate flooring at both faces was flagged with bluestone, and the granite traverse circles, which rested on eighteen-inch-thick concrete beds, were completed in the first-tier casemates by 1851. (The granite "circles" were arc segments that supported the iron traverse rails on which gun carriages were rotated.) By December 1860, two sets of traverse irons had been laid in the circles at each embrasure; however, the flank casemate flagging was still incomplete. The concrete underflooring remained exposed; areas beneath the underflooring, and between the main scarp and piers, were filled with oyster shell.[144]

142. U.S. Army Ordnance Department, *The Ordnance Manual for the Use of the Officers of the United States Army* (Washington: J. and G.S. Gideon, Printers, 1841), p. 284. A tongue hole is also called a rotating slot.
143. Ferguson, *Overview* (HABS), p. 13. "Documented Narrative," p. 37; Totten to Bowman, 15 February 1846.
144. "Documented Narrative," p. 37.



Figure I.B-10. Casemate in left face, 1992 view showing embrasure (now enclosed), granite block above tongue hole, and granite traverse circle with traverse iron. (HABS SC,10-CHAR.V,3-139)

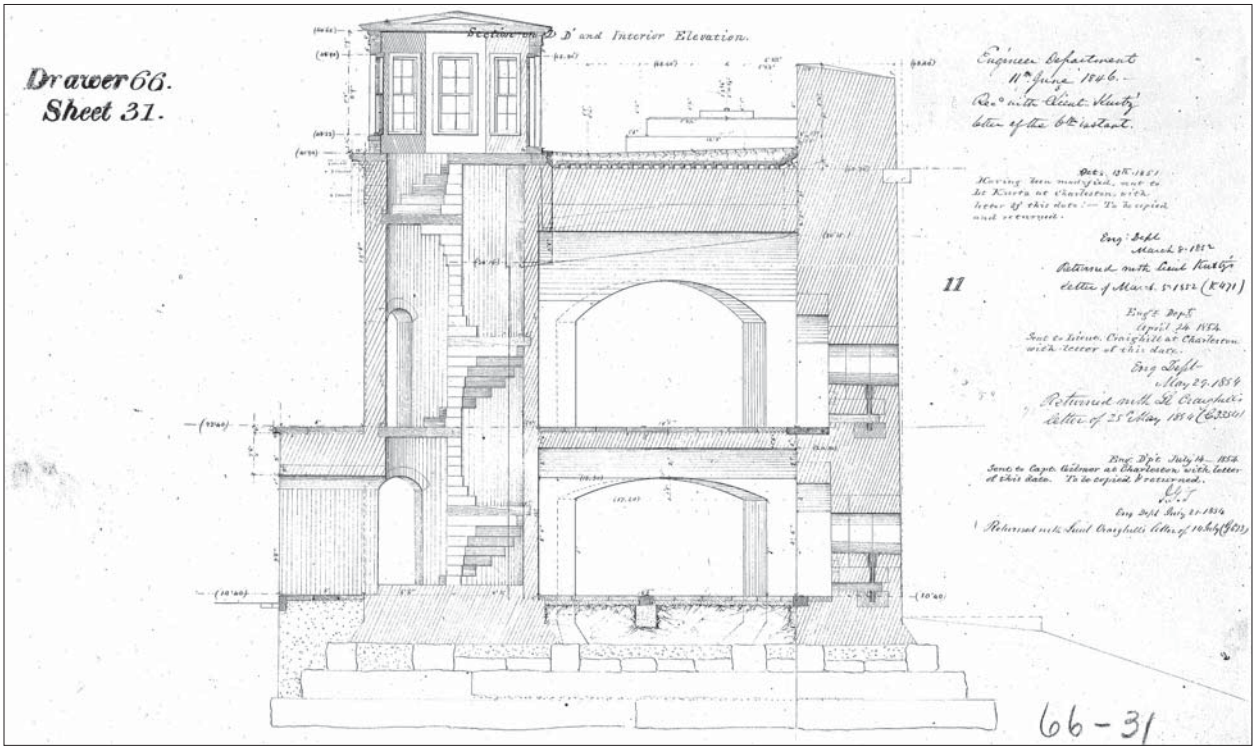


Figure I.B-11. Section through stair tower and casemate elevation, dated June 11, 1849 with annotations through July 21, 1854. (NARA; copy in FOSU map files) See larger drawing in Appendix G.

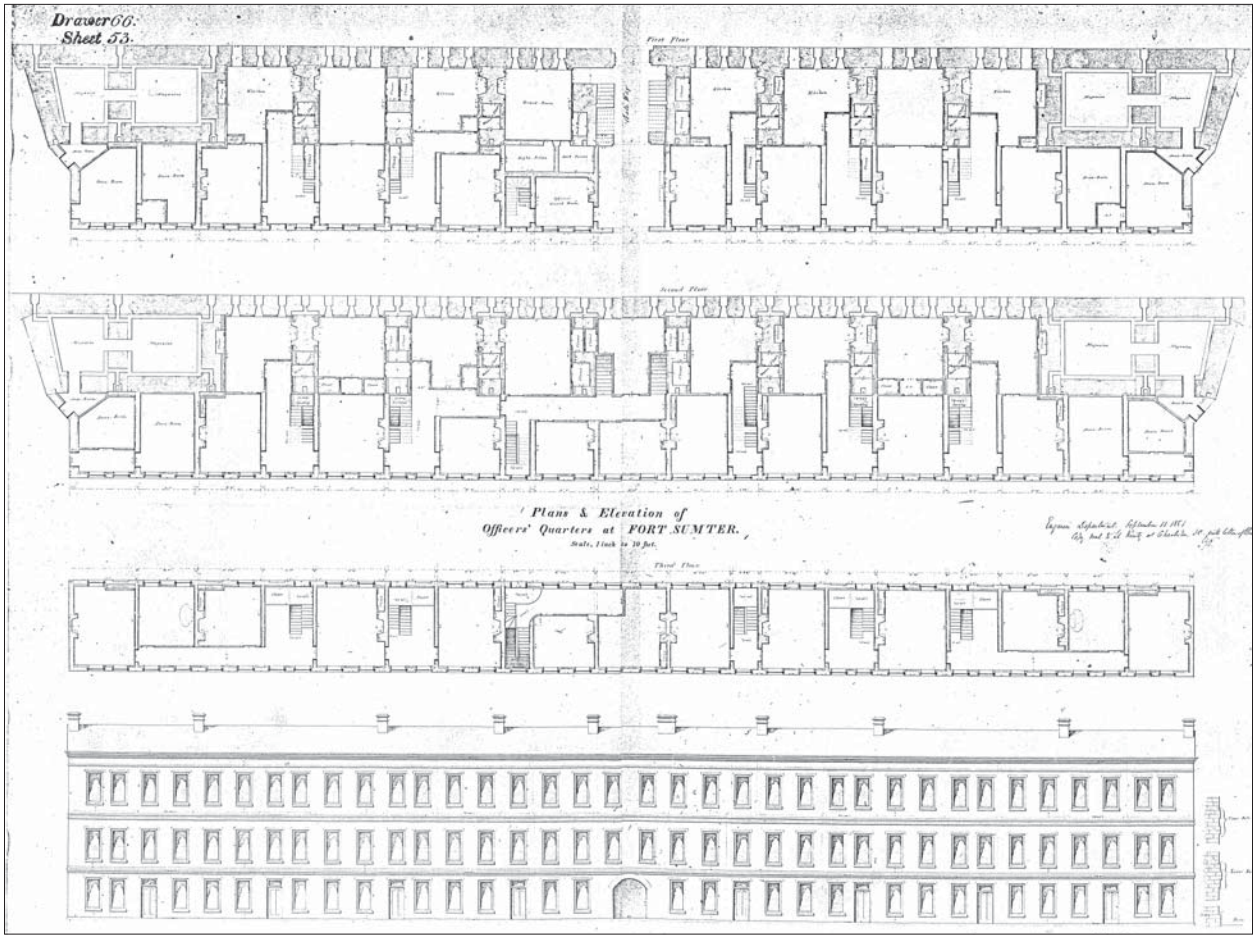


Figure I.B-12. Plans and elevation of Officers' Quarters at interior gorge wall with sallyport, September 11, 1851. (NARA; copy in FOSU map files) See larger drawing in Appendix G.

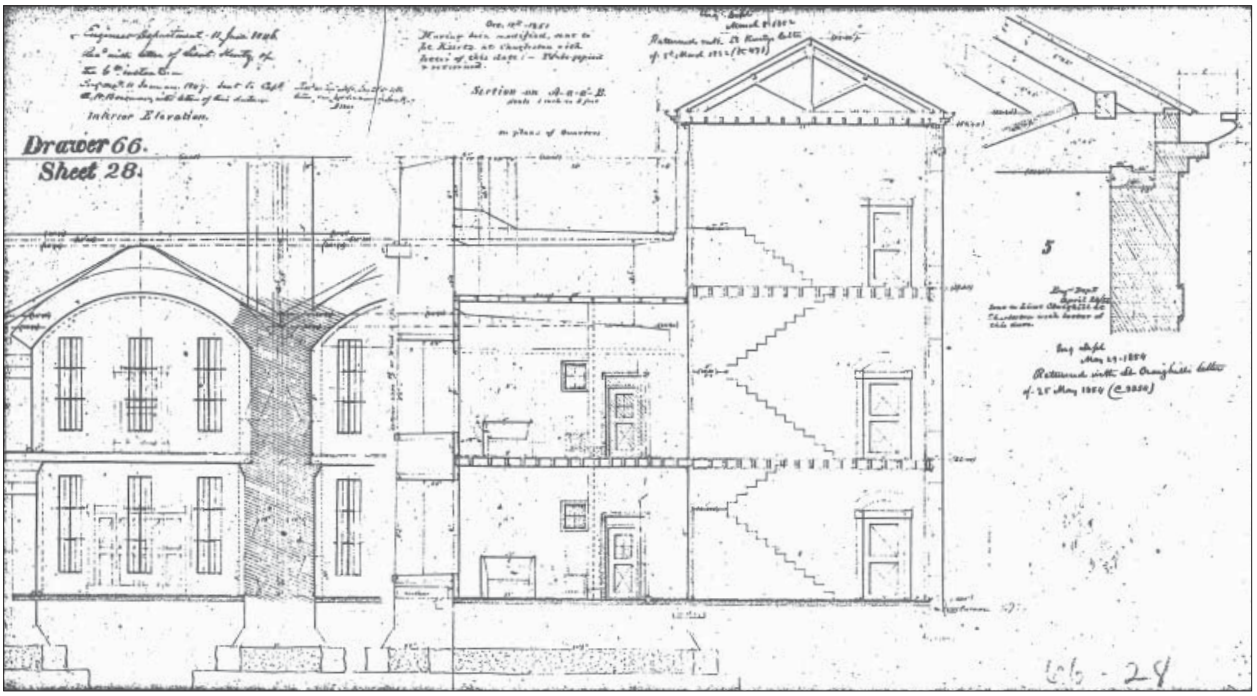


Figure I.B-13. Section dated June 11, 1846 with annotations through May 29, 1854. (NARA; copy in FOSU map files) See larger drawing in Appendix G.

Some of the first-tier casemate arches were completed in 1847. These were hard brick arches with horizontal layers of concrete rammed into the core to the level of the roof surface.

In 1848 the piers were being raised to a height above the second-tier flooring, the springing point for the upper casemate arches.[145] Along the rear gorge wall, first-tier windows and ventilators for the magazines were complete, but those at the second tier were not. Transverse walls separating the two magazines at each end of the gorge, and transverse walls separating magazines from gunrooms, were built to a height just over twenty-two feet above low water. Brick partition walls and brick-and-concrete transverse walls were raised to about twenty-one feet above low water – just below the level of the second-tier floor – but it is not clear whether ceilings of the first tier were completed.[146]

The main or sallyport entrance, centered at the gorge wall, was completed in 1847, a nine-by-ten-foot opening with a pediment, possibly granite, above. By the mid-1850s, two gates had been hung at the sallyport, the parapet was at full height around much of the fort, and two barracks buildings were under construction.[147]

In 1855, while still under construction, the new fort provided a location for a lighthouse tower and range light. This structure was placed on the right face (*Fig. I.B-15*).[148]

In 1858, finishes and flooring were completed in the officers' quarters, two guard rooms, three jail cells, and most barracks. By the end of 1860, Fort Sumter was close to complete, and the barracks were habitable. However, not all floors had been flagged, and the second-tier embrasures were unfinished, some of their openings closed with brick or boards, some half-closed with brick, some entirely open. More importantly for a fort, only fifteen of 135 guns were mounted, eleven on the first tier.[149]

145. Pemberton, "Fort Sumter," pp. 9-12, citing Kurtz to Totten, 1 October 1848.
146. "Documented Narrative," pp. 38-39.
147. Pemberton, "Fort Sumter," pp. 10-18, 20.
148. U.S. Coast Guard Historian's Office, "Coast Guard History" and "Lightship Station Index;" www.uscg.mil/history.
149. Pemberton, "Fort Sumter," p. 19, citing Cullum

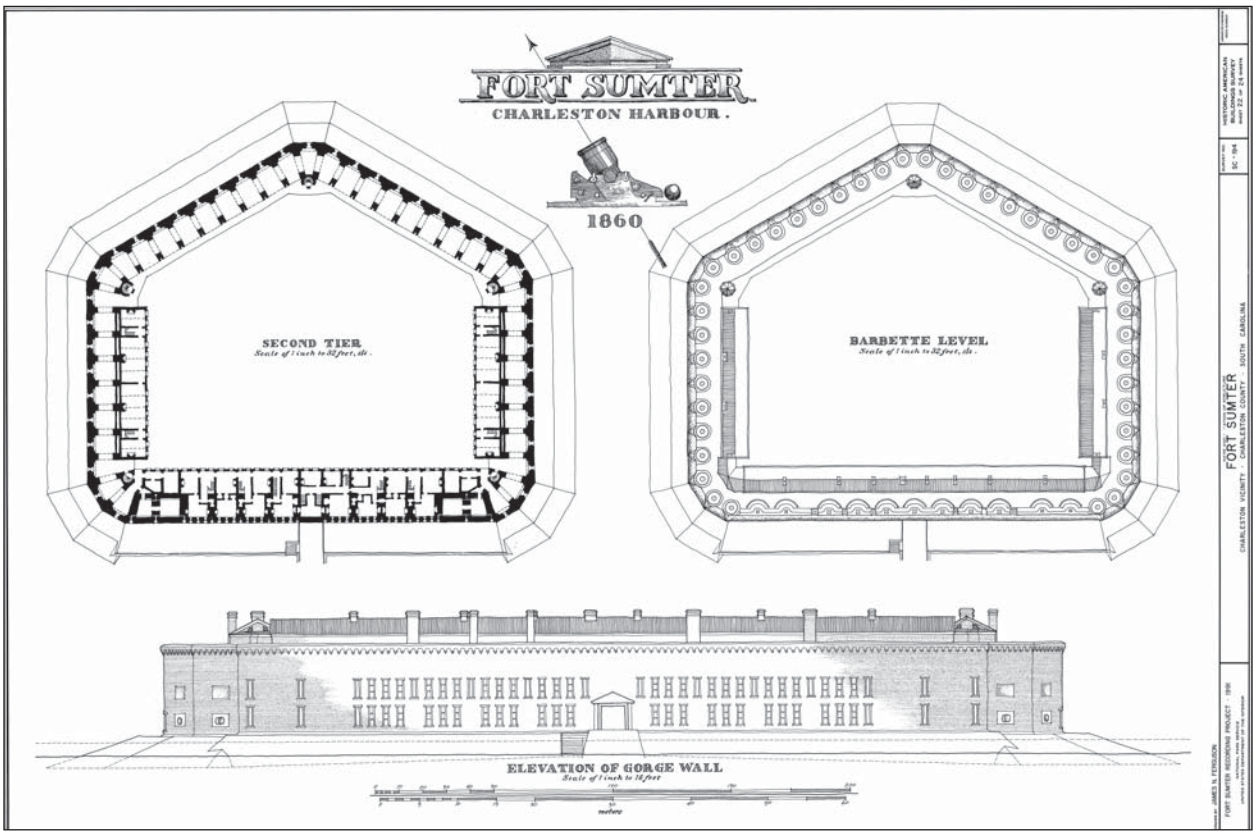


Figure I.B-14. Conjectured Plan of Second Tier, Barbette Level, and Gorge elevation. (Historic American Buildings Survey (HABS), "Fort Sumter Recording Project," SC-194, sheet 22, 1991.) Twenty-four sheets of HABS drawings are found in Appendix H.

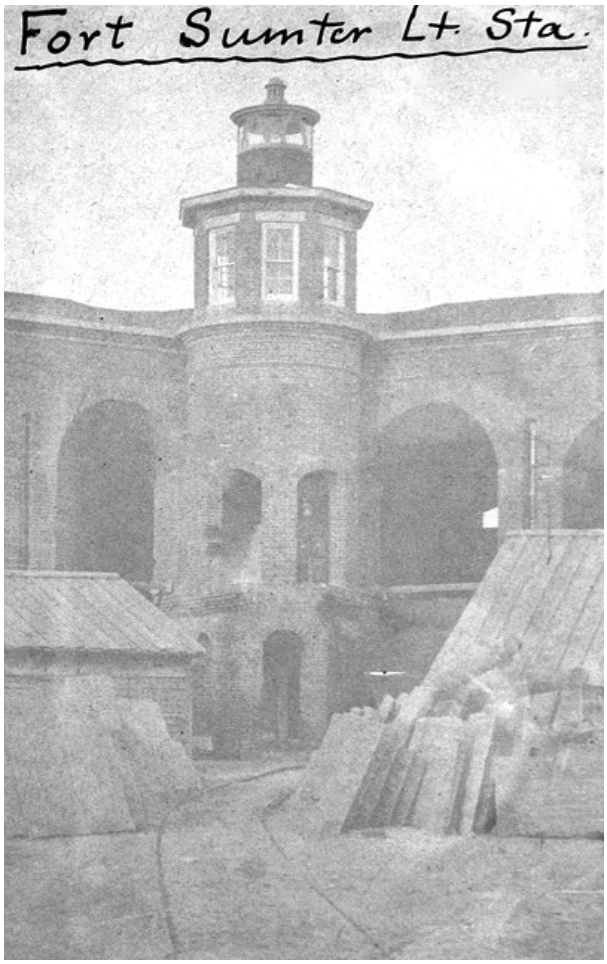


Figure I.B-15. Lighthouse tower and range at right face. (National Archives, lighthousefriends.com)

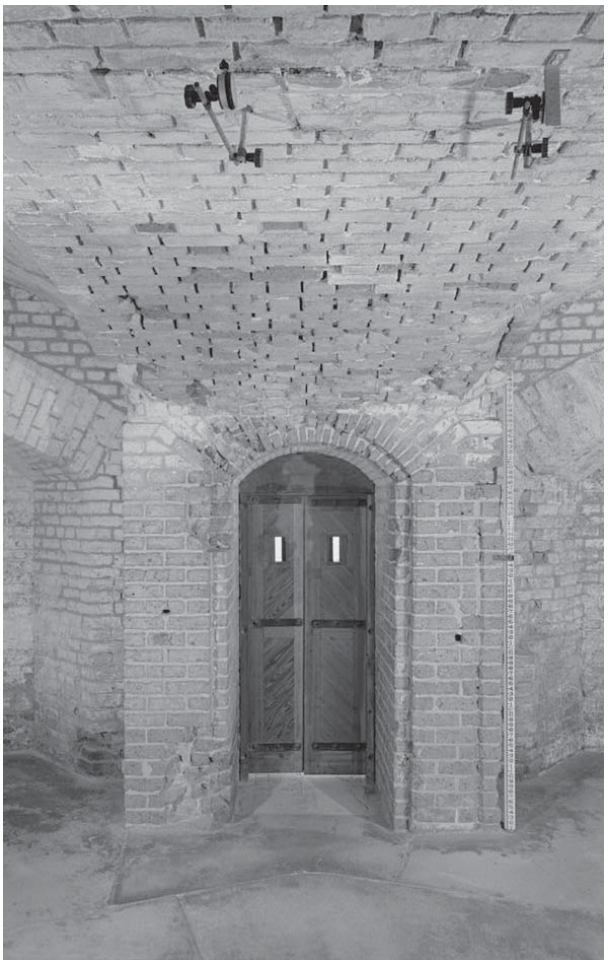


Figure I.B-16. Interior view, left flank postern, 1992. (HABS SC,10-CHAR.V,3-111)

Major Robert Anderson and the Confederate Bombardment, 1860-1861

Just days after South Carolina's secession, United States Army Major Robert Anderson moved his forces from Fort Moultrie to the stronger Fort Sumter. Before leaving, they hammered metal spikes into the touch-holds of the Fort Moultrie guns to make them unusable if seized by Confederate forces. The move was made quietly during the night of December 26, 1860 (*Figs. I.B-17, 18*). With their arrival, all construction not directly related to defense of the fort was suspended. The local workers were dismissed, but thirty-eight workmen and two cooks whom Capt. John G. Foster of the Corps of Engineers had brought from Baltimore were kept on the job while the Union garrison remained at Fort Sumter.[150] Forty-five women and children brought from Fort Moultrie were housed in the officers' quarters, along with the entire garrison, while the hired workmen stayed in the right flank barracks.[151]

When Anderson arrived at the unfinished fort, the fifteen guns were mounted, the majority on the lower level and only three on the second tier, where the embrasures were not yet set. Work began slowly. The men covered or infilled the incomplete embrasures and those without guns, fortifying other embrasures and casemates with bluestone that had been stockpiled for flagging.

From the time of Anderson's arrival until April 12, 1861, forty-five more guns were mounted. As

to Col. S. Thayer, 19 August 1858. Frank Barnes, "Fort Sumter, December 26, 1860" (Charleston: Fort Sumter National Monument, 21 February 1950).

150. Pemberton, "Fort Sumter," pp. 24-26, citing Report of Capt. J. G. Foster, 1 October 1860, and *Official Records of the War of the Rebellion, Series I, Vol. 1.*

151. The families were evacuated safely in February, 1861, and the workmen were released in mid-March. Ferguson, *Overview* (HABS), pp. 24, 26-27, 31.

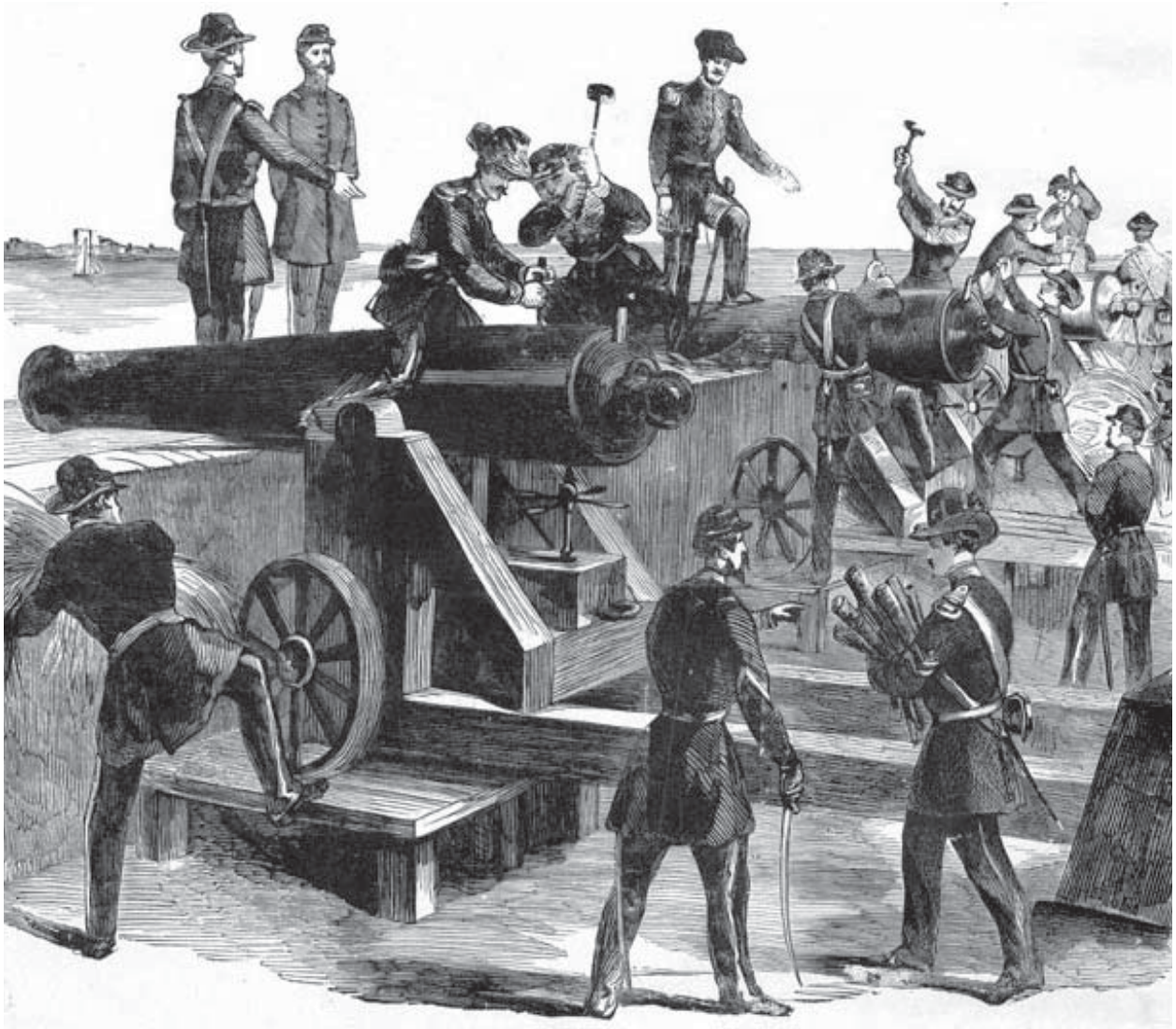


Figure I.B-17. U.S. forces under Army Major Robert Anderson prepare to pull out of Fort Moultrie for the stronger Fort Sumter, depicted here spiking the guns to make them unusable if seized by Confederate forces . (Engraving, "Striking the Guns of Fort Moultrie by Major Anderson, Before its Evacuation, December 26th, 1860." *Frank Leslie's The Soldier in Our Civil War*. civilwarmonitor.com/photo-essays)



Figure I.B-18. Anderson moving his troops from Fort Moultrie on Sullivan's Island to Fort Sumter in the dark of night of December 26, 1860. (Engraving, *Frank Leslie's Illustrated Newspaper*, NPS online photo gallery)

work continued on strengthening the fort, the sallyport was encased in brick and stone, and other gorge openings were sealed with brick and stone. Workmen also sealed windows and ventilators along the gorge wall with masonry, enlarged one first-tier embrasure on the left flank wall to receive supplies, and mined the esplanade and wharf.[152]

By April 12, two hot shot furnaces were on the parade ground near the right and left shoulder angles. (Hot shot were cannon balls heated to start fires when they struck a target.) The sixty guns were mounted: twenty-five in the first-tier casemates, twenty-seven *en barbette* (on the top, third tier), five on the parade, two near the sallyport, and one in the sallyport. The muzzle of the sallyport gun was trained through a hole in the 3'6" high wall of brick and stone recently laid in the sallyport opening. The posterns (small entries set beside the flank casemates closest to the gorge angle) were filled with three-foot-thick brick walls.[153] National publications sent illustrators and journalists to report the improvements, and published engravings of the fort's new guns and improvements (*Figs. I.B-19, 20*).

152. Ibid., pp. 24-26; HABS, p. 23.
153. "Documented Narrative," pp. 47-48.



Figure I.B-19. Fort Sumter parade ground with gun added by Anderson. (*Harper's Weekly*, February 16, 1861)

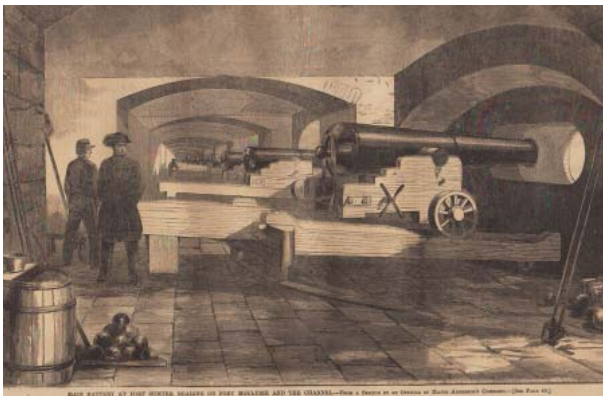


Figure I.B-20. Main battery interior. (*Harper's Weekly,* January 26, 1861)



Figure I.B-21. Cutaway model showing the fort in early 1861. (NPS exhibit panel)

In the early morning of April 12, 1861, Confederate forces opened fire on Fort Sumter. The bombardment began with a shot from a mortar battery near Fort Johnson, followed by artillery fire from Morris Island, Sullivan's Island, and Mount Pleasant (*Fig. I.B-24*). The bombardment lasted about thirty-four hours, thrilling civilians who watched from Charleston's rooftops. On April 13, after shells damaged the officers' quarters, Confederate hot shot caused the quarters to erupt into flame. The blaze spread to the barracks. Shelling continued until by noon the fort was almost uninhabitable. Major Anderson capitulated, and on April 14, he and his garrison



Figure I.B-22. "Bombardment of Fort Sumter, Charleston Harbor, 12th and 13th of April, 1861," Currier and Ives lithograph, n/d. (Library of Congress, www.loc.gov/pictures/resource/ppmsca.19520/)



Figure I.B-23. Citizens watch the battle from the battery on the Charleston peninsula. "The civil war in America: Attack by the Federal ironclads on the harbour defences of Charleston, three p.m. of the 7th of April." (*Illustrated London News*)



Figure I.B-24. Detail of *Map of Charleston Harbor, 186-?*. Circles indicate Fort Sumter (1), Fort Johnson (2), Fort Moultrie (3), Castle Pinckney (4), Morris Island identified as "Lighthouse Island" (5). Charleston peninsula at upper left. Bowen and Co. Philadelphia. (Library of Congress, www.loc.gov/resource/g3912c.cw0371000/)

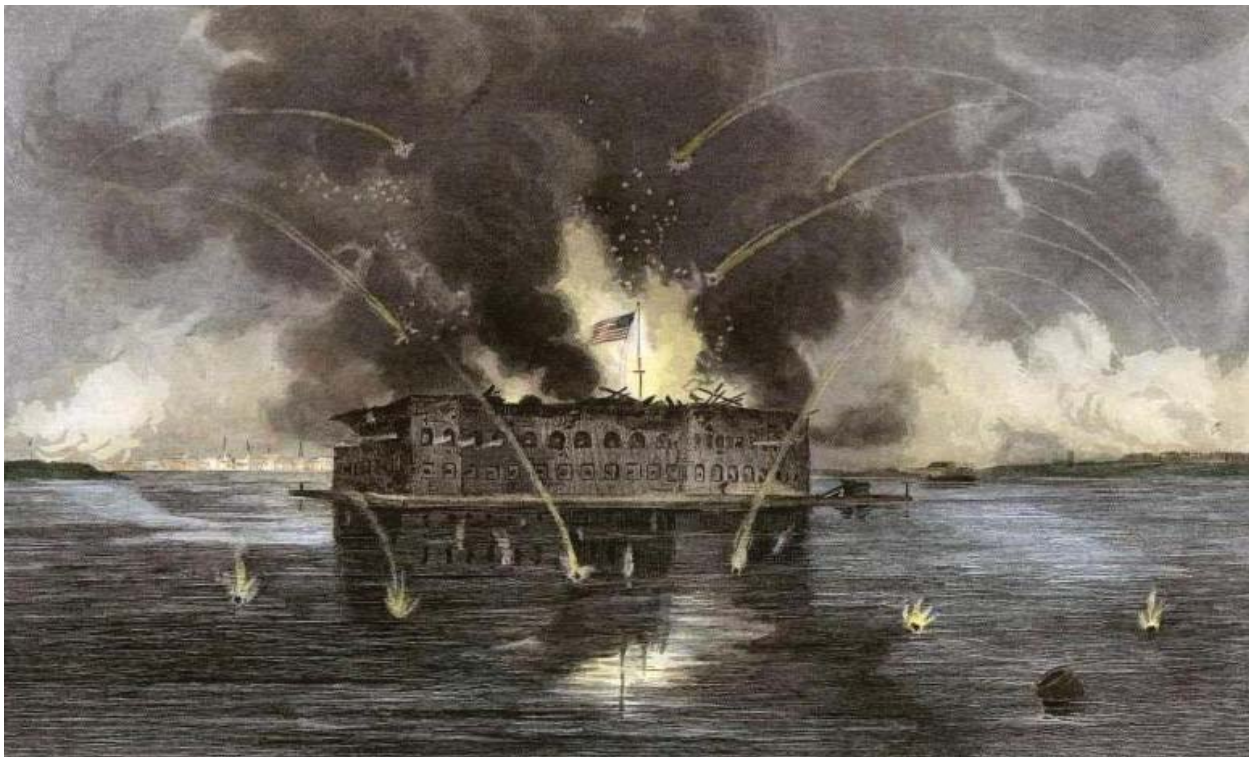


Figure I.B-25. Bombardment of Fort Sumter by Confederates, April 12, 1861, George Edward Perine, Engraved Image. (Getty Images)

marched out of Fort Sumter to join the Union fleet outside Charleston Harbor.[154]

The fort sustained significant damage, especially to the interior. The gorge wall facing Fort Johnson and Morris Island had taken heavy fire, and the interior of the officers' quarters was "riddled down to the first story." The right gorge angle stair and magazine were badly damaged, but the left gorge angle stairtower and magazine were in ruins.

154. Rosen, *Confederate Charleston*, pp. 68-72.

Terreplein copings were shattered in several places, particularly at the left face; chimney tops were broken; gun carriages at the barbette level and the roofs of both barracks had burned.[155] The fort so well designed for water attacks from the channel had been battered by improved artillery from land. National and international publications increased their coverage of the events, producing numerous drawings and photographs with widespread distribution.

155. Barnes, "Fort Sumter, April 7, 1863," pp. 1-2. Clark and Wylie, *HSAR*, pp. III.01-7, III.02-3.



Figure I.B-26. Interior face of gorge, showing sallyport and Officers' Quarters, April 15, 1861. (FOSU collection)



Figure I.B-27. Left Flank Barracks, April 1861 (FOSU collection)



Figure I.B-28. Composite of three photographs showing damage to the gorge wall from Confederate guns, April 1861. Sallyport is at center.



Figure I.B-29. Gorge terreplein showing chimneys of Officers' Quarters and guns *en barbette*, April 1861 (FOSU collection)



Figure I.B-30. "Interior of Fort Sumter in April 1861 after its surrender by U. S. Garrison" showing the damage to this part of the interior of the fort. The sallyport is at far left. The collapsed walls beyond the damaged flag pole are part of the ordnance rooms and hospital. (Osborn & Durbec. Library of Congress)

Confederates Hold Fort Sumter, 1861-1865

Confederate troops immediately occupied Fort Sumter and began repairs and alterations. Unlike the fort's construction and post-Civil War improvements, the reconstruction and additions undertaken by the Confederates between April 1861 and April 1863 were not documented in engineers' plans and reports. Some invoices from local contractors, primarily involving construction materials provided during April 1861, have been cataloged and transcribed by FOSU staff.[156] The Confederates partially rebuilt the officers' quarters, retaining the gutted outer rooms at all levels as galleries (roofed areas open except at the back wall). Casemated sections were "made tenable again." They also rebuilt both enlisted men's barracks and installed new slate roofs. Lower than the scarp parapet, the new roofs were also lower in height than the original gable roofs that had burned.[157]

The Confederates finished three casemates at the second-tier salient angle facing the channel, and armed them with guns on traverse rails. On the upper casemates where embrasures had not been completed, they filled in the openings with brick masonry, leaving only a narrow loophole. A concrete traverse faced with brick was built at the right shoulder angle's terreplein to protect the

156. Hatcher, personal communication.
157. John Johnson, *The Defense of Charleston Harbor, including Fort Sumter and the Adjacent Islands, 1863-1865* (Charleston, 1890), pp. 19-20; HABS, p. 25. See also Clark and Wylie, *HSAR,* pp. III.02-3,4; Ferguson, *Overview* (HABS), pp. 35-36; Barnes "Fort Sumter, April 7, 1863, pp. 3-7.



Figure I.B-31. Confederate dignitaries visit the captured fort after the bombardment. At the center is the hot shot furnace; the three-story barracks and nine-over-nine sash are to the right. (FOSU collection)

right face barbette guns. At both ends of the gorge wall, ten- to twelve-foot-thick stone "counterforts" at the exterior of the wall buttressed the first-tier magazines.

By April 7, ninety-five guns and mortars had been put in place. The Confederates also restored both hot shot furnaces on the parade, and provided gasworks, bakery, forge, fire-engine, a shoe factory, and a salt-to-freshwater conversion machine to supplement the cisterns. They also established a telegraph connection, by way of James Island, to their headquarters in Charleston.[158] Much of the manual labor was carried out by enslaved workers whose wages the Confederate army paid to their masters.[159]

The Confederates defended Fort Sumter against Union ironclad ships on April 7, 1863. The battle lasted less than three hours, and inflicted little damage to the fort.[160] When the unsuccessful Union fleet pulled out of Charleston Harbor on April 12 to return to Port Royal, the Confederates were already strengthening Fort Sumter's most vulnerable points – the right face, terreplein, and magazines – with sandbags.[161] With the original sallyport at the gorge wall unusable from attacks, and to create a less exposed entrance, in July they converted the last casemate of the left flank near the shoulder angle for use as a sallyport. A new timber wharf was built at the left flank at the same time, the two projects completed quickly.[162]

Most of Fort Sumter's garrison were engaged in preparing their guns for the next action. A few members of the garrison, men from other regiments ordered to the fort to assist with the work, and a "force of one hundred and thirty blacks, together with a gang of white mechanics" carried out the heavy labor.[163]

The April 7 naval attack left Fort Sumter almost unscathed, but the Union's next effort was terribly destructive. A fierce bombardment erupted August 17, 1863, when General Quincy A. Gillmore's troops began shelling Fort Sumter from eight batteries on Morris Island. Warships and guns pounded steadily for seventeen days. The gorge wall and both flank walls were breached and broken, and the Confederate defenders removed stores and ammunition to Fort Moultrie.[164] They removed all guns from the right flank wall, and strengthened a portion of the gorge wall by loading wet cotton bales and sand into the officers' quarters; they then sandbagged the wall itself. As federal fire became more regular, the men reinforced first- and second-tier casemates and scarp walls with more sand (robbed from the parade ground), corncobs, and cotton cribbing.[165] By August 23, Fort Sumter had no serviceable guns.

On August 24, Gillmore reported the "practical demolition of Fort Sumter . . . today a shapeless and harmless mass of ruins."[166]

158. Johnson, *Defense of Charleston Harbor,* pp. 19-20; HABS, p. 25. See also Clark and Wylie, *HSAR,* pp. III.02-3,4; Barnes "Fort Sumter, April 7, 1863, pp. 3-7.
159. Hatcher, personal communication. Such notes as "one negro died from heart disease, August 1863" are found among telegrams, miscellaneous records, and journal entries in Q. A. Gillmore, *Supplementary Report to Engineer and Artillery Operations Against the Defences of Charleston Harbor in 1863* (Professional Papers, Corps of Engineers, U. S. A. No. 16. New York: 1868). The NARA records group "Slave Rolls" includes Corps of Engineers (CSA) accounts for laborers employed on the defenses of Charleston Harbor; these records have not yet been analyzed.
160. Bearss, *Fort Moultrie, No. 3,* pp. 169-170. Rosen, *Confederate Charleston,* pp. 99-102.
161. Johnson, *Defense of Charleston Harbor*, pp. 76-78.
162. Barnes, "Fort Sumter, February 17, 1865," p. 4. FOSU staff communications.
163. Johnson, *Defense of Charleston Harbor*, p. 80.
164. Rosen, *Confederate Charleston,* pp. 115, 118.
165. Clark and Wylie, *HSAR,* pp. III.02-3,4. FOSU staff communication.
166. Rosen, *Confederate Charleston,* pp. 115, 118. *New York Times,* August 29, 1863.



Figure I.B-32. "Gillmore at Charleston Harbor, 1863." (Illustration from General Quincy A. Gillmore's Engineer and artillery operations against the defences of Charleston Harbor. (New York: D. Van Nostrand, 1865)

The gorge wall was mostly down and the terrepleins at the right face and right flank had collapsed; the right flank wall was nearly demolished, but the Confederates refused to give up Fort Sumter. They continued hauling in palmetto logs, sand, earth, and gabions (heavy baskets to hold earth, sand, or rubble) to revet the ruined walls.[167]

Union forces began a new bombardment from Morris Island on October 26, 1863, and continued for forty-one days. The fort was already a shambles. The Confederate garrison made a series of tunnels in the rubble to protect their movements within the fort, and used the tunnels and left flank second-tier casemates for living quarters and storage space. They also mounted a three-gun battery on the right face wall.[168]

On December 11, 1863, after federal firing ended, the powder magazine at Fort Sumter's left gorge angle exploded. The resulting fire raged through

167. Clark and Wylie, *HSAR,* p. III.01-8, III.02-4,5.
168. Ferguson, *Overview* (HABS), p. 39. FOSU staff communication.



Figure I.B-33. Interior of the fort showing exploding shell during bombing of September 8, 1863. (Library of Congress, George S. Cook, Charleston photographer, "Interior Views of Fort Sumter taken by a Confederate photographer")



Figure I.B-34. Hot shot furnace at right shoulder angle, September 8, 1863. (Library of Congress, George S. Cook, Charleston photographer, "Interior Views of Fort Sumter taken by a Confederate photographer")



Figure I.B-35. Interior showing hot shot furnace from different angle, September 8, 1863. (Library of Congress, George S. Cook, Charleston photographer, "Interior Views of Fort Sumter taken by a Confederate photographer")

the rubble tunnels for several days. Withstanding intermittent Union shelling during the next few months, the defenders repaired fire damage in the fort and installed new stairs and heavy timber roofing at the stair tower. They also built a frame storehouse on the parade ground near the left gorge angle, and a temporary barracks, sided in heavy timber, between the right flank and the parade ground.[169]

After several months of relative inactivity, Union Major General John G. Foster, then in command, began a final prolonged bombardment of Fort Sumter on July 7, 1864. Although the barrage continued until September 4, it had little effect. By this time, Fort Sumter was "an impregnable mass of rubble and earth."[170]

A rare personal memoir of a former South Carolina slave explains that Fort Sumter's labor force survived the shelling by staying under cover during the day, and working at night when guns went silent. Born into slavery on a cotton plantation east of Columbia, Jacob Stroyer and nine others from his home plantation were gathered "from their masters to carry off to work on the fortifications and to wait on officers" in 1863. He spent a year on Sullivan's Island, returned home briefly, then was sent back to Fort Sumter in 1864. Stroyer was wounded one evening in July when a shell burst over a "little lime house near the southwest corner." He wrote that about ten of his fellow slave laborers were killed, though that is not reflected in official records.[171]

In February 1865, Union General William. T. Sherman began his march north from Savannah through the interior of South Carolina. On February 17, the day Sherman reached Columbia, Confederate forces evacuated Fort Sumter, as well as the city of Charleston and the other fortifications in Charleston Harbor. Federal troops moved into Charleston the next day, and once again the United States flag flew over Fort Sumter.

169. Rosen, *Confederate Charleston,* p. 125. Clark and Wylie, *HSAR,* p. III.02-5. Barnes, "Fort Sumter, February 17, 1865," pp. 5, 7-8.
170. Ferguson, *Overview* (HABS), p. 40.
171. Jacob Stroyer, *1849-1908, My Life in the South* (Salem, MA: Salem Observer Book and Job Print, 1885). FOSU staff communication.

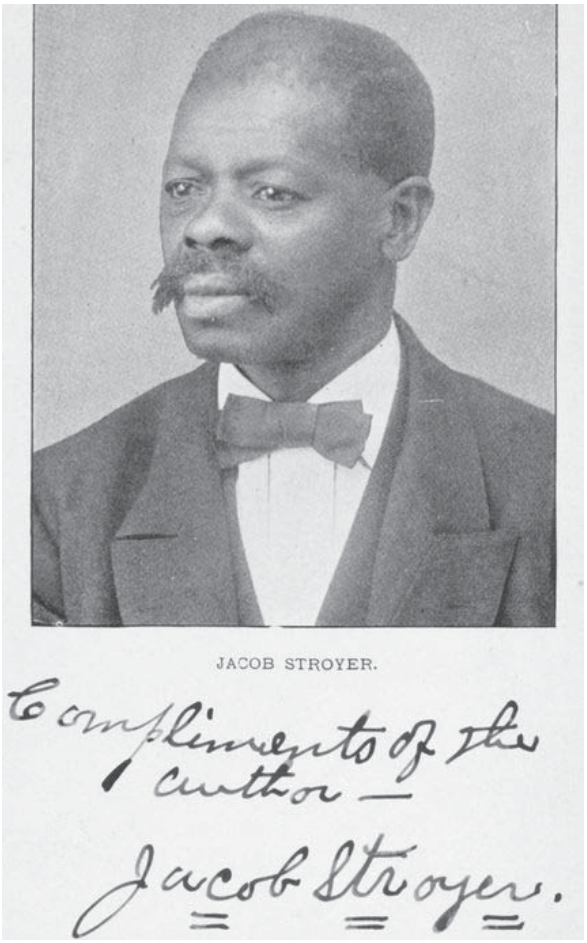


Figure I.B-36. Jacob Stroyer, from the frontispiece of his memoir, *1849-1908, My Life in the South* (1885).

The Union Returns to the Fort

When the Confederates evacuated Fort Sumter in February, 1865, only portions of the walls remained. The exterior scarp wall retained its original height only at a portion of the right face near the shoulder angle, and the south half of the left flank. The rest of the left flank wall was leveled off at about twenty-five feet above low water, generally the height of the second-tier loopholes, and most of the right face stood about thirty-three feet above low water. The height of the left face wall was irregular, between twenty-two and thirty feet above low water. All its first-tier embrasures were bricked up, two of them covered by stone buttresses, and the casemates were reinforced with heavy timbers and wood. The gorge and right flank walls existed as rubble fields that sloped toward the water from a height of about thirty feet. Their proximity to Morris Island made it a popular viewpoint for artists and photographers.[172]

172."Documented Narrative," pp. 49-50. Barnes, "Fort

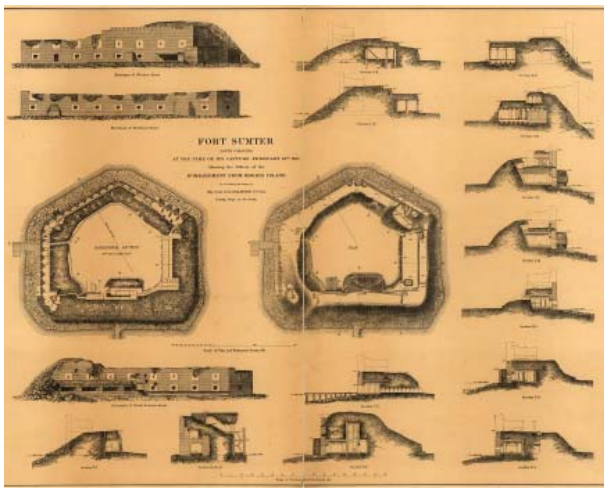


Figure I.B-37. "Fort Sumter, South Carolina, at the time of its capture February 18th, 1865," drawings and elevations prepared for Q. A. Gillmore's report, November 1, 1865. (NARA; copy in FOSU map files) See larger drawing in Appendix G.

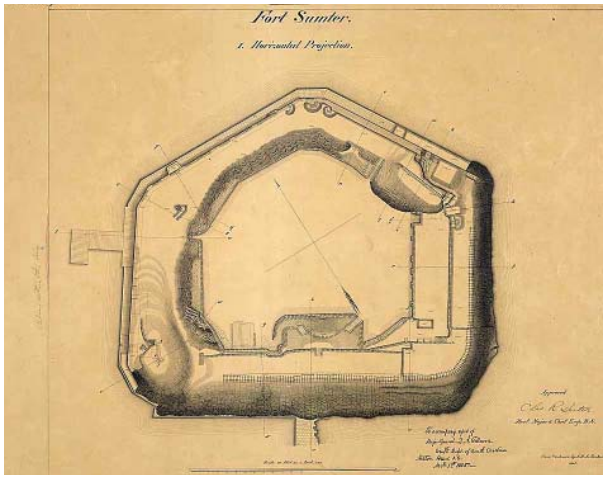


Figure I.B-38. Inset plan February 18, 1865, among drawings for Gillmore's report, November 1, 1865. (NARA; copy in FOSU map files) See larger drawing in Appendix G.



Figure I.B-39. "Outside view" from the sandbar, March 1865, George N. Barnard, photographer. (Library of Congress, www.loc.gov/pictures/)



Figure I.B-40. "Outside view, n. east face," showing Confederate outhouse and palmetto reinforcements against damaged walls, March 1865 stereocard, George N. Barnard, photographer. (Library of Congress, www.loc.gov/pictures/item/2005677494/)



Figure I.B-41. Interior of Fort Sumter showing wicker gabions in foreground and lining the parapet behind chimneys. (Library of Congress, www.loc.gov/pictures)



Figure I.B-42. "Inside view looking S.E. across south western front;" gabions and bombproofs at gorge wall (center) and left flank (right), March 1865 stereocard, George N. Barnard, photographer. (Library of Congress 2005681101)

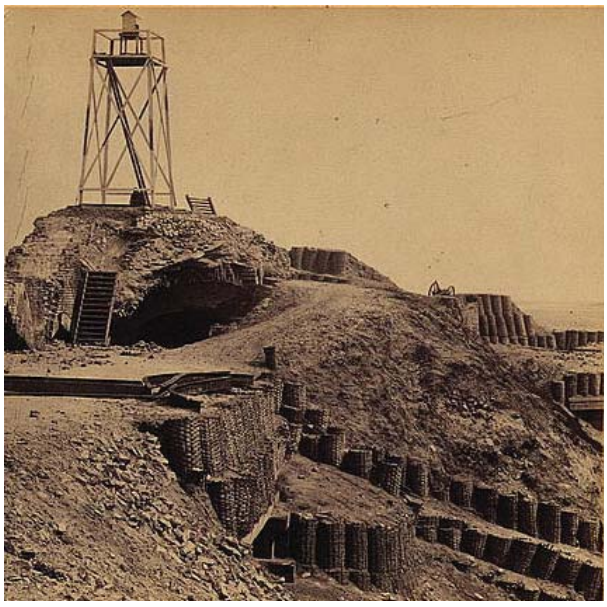


Figure I.B-43. "Inside view, showing beacon on the parapet and gabions used as reinforcements in the interior of the fort," March 1865 stereocard, George N. Barnard, photographer. (Library of Congress 2005677499)



Figure I.B-44. "View of the east face of Fort Sumpter," [*sic*] showing damaged brick walls, March 1865 stereocard, George Stacy, photographer. (Library of Congress, www.loc.gov/pictures/resource/stereo.1s02588/)

With Charleston occupied by Union troops, the Lincoln administration saw an opportunity to transform Fort Sumter from a symbol of Confederate defiance into a symbol of American unity. Secretary of War Edwin M. Stanton ordered a ceremony to be held on April 14, 1865, the anniversary of the Union garrison's 1861 evacuation. Robert Anderson, now a brevet major general, would be guest of honor. Invitations quickly went out to northern leaders in politics, religion, and the press. By April 12, Fort Sumter's parade ground was cleared of debris, and a review stand was set up for the ceremony to raise Anderson's original garrison flag (*Fig. I.B-45*).[173]

On April 9, General Robert E. Lee surrendered his Army of Northern Virginia at Appomattox. The next day, as Lee and Grant discussed the terms of surrender, sixty-one passengers, among them Henry Ward Beecher, William Lloyd Garrison, and General Anderson with his wife and four children, embarked from New York en route to Charleston. At Fort Monroe, Virginia, dozens of dignitaries from Washington joined them on board.

Thousands more traveled to Charleston for the flag raising, filling the hotels and reception halls. The *New York Times* sent a reporter, who covered the celebration in great detail. Ferrying all the visitors to Fort Sumter took most of the morning, but by noon the audience was assembled. The New York correspondent reported varying estimates, stating in one place that at least 3,000 people, "one-sixth being ladies," were present. His figure varied when he wrote that Captain Robert Smalls, the former slave whose 1862 capture of the Confederate steamboat *Planter* brought him international fame and a commission in the U. S. Navy, transported "between 2,000 and 3,000 of the emancipated race, of all ages and sizes," to Fort Sumter for the ceremony. Hundreds of naval and army personnel

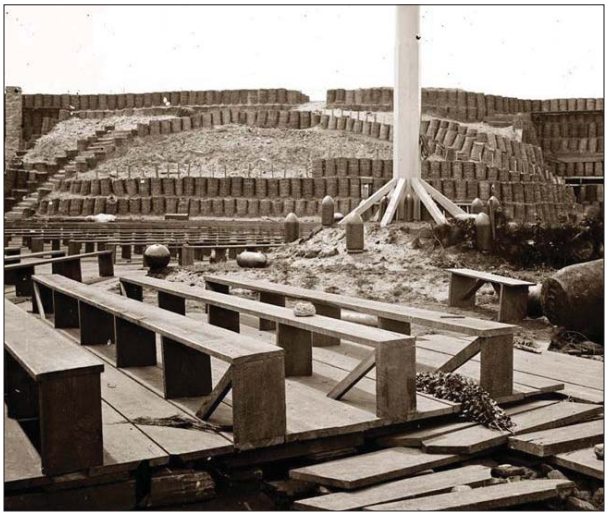


Figure I.B-45. Flagpole and seating in place for the April 14 celebration, with bombproofs and gabions in background. (FOSU photograph files)

Sumter, February 17, 1865," pp. 2-3; see also Ferguson, *Overview* (HABS), p. 42.
173. Ferguson, *Overview* (HABS), p. 42.

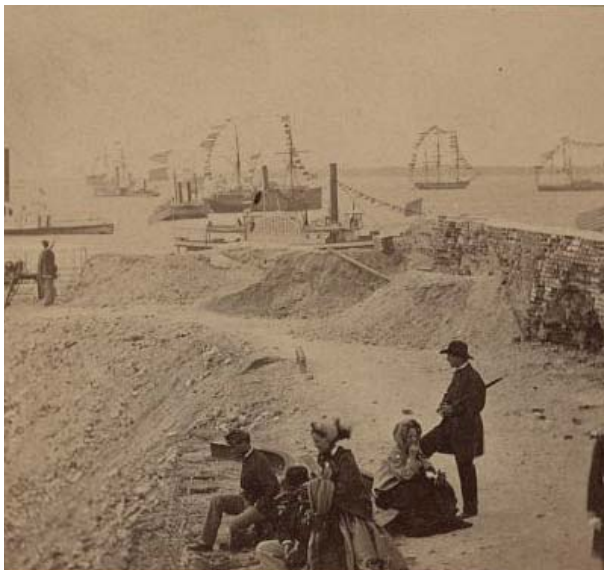


Figure I.B-46. "View from the parapet of Fort Sumpter, [*sic*] Charleston Harbor, S. C., during the raising of the old Flag, April 14th, 1865." (Library of Congress)

attended, as did detachments of white and colored U. S. troops. Naval ships decorated with red, white, and blue bunting filled the harbor, and as Anderson's flag was raised, their guns joined the salutes from Fort Moultrie and all points that shelled Fort Sumter in April 1861.[174] Further news coverage of the event was quickly overshadowed by Lincoln's death the next day.

Conditions after the War

Major-General Quincy Gillmore, Army Corps of Engineers, took over supervision of Charleston Harbor's fortifications in April 1865. He inspected Fort Sumter in January 1868, and reported that it presented "the same general appearance as at the close of the war."[175] A new lighthouse had been built on the right face in 1866 by the U.S. Light-House Board, but its construction and operation were separate from the Army's work at the fort (*Figs. I.B-48, 49*).[176]

Gillmore reported that the right flank was destroyed nearly down to the foundation, as was the east (right) half of the gorge wall. Left of the sallyport, the gorge wall stood as high as the second-tier loopholes. The left flank was in fairly good condition: 120 linear feet still at full height, with second-tier casemates extant two-thirds of its length. About half the casemates at the left face were in salvageable condition, and first- and second-tier casemates remained at the salient.[177]

174. Smalls piloted the *Planter* for the Union Navy, as well as other vessels including the ironclad *Keokuk*. The *Planter* was transferred to the Army in the fall of 1862; Smalls was transferred to the Army in 1863, after which he was appointed captain of the *Planter* by the Army. After the war he piloted the *Planter* for the Freedmen's Bureau. Rosen, *Confederate Charleston,* pp. 122, 150-153. "Fort Sumter: Departure of the *Arago*. The Old Flag on Board," "Fort Sumter – 1861-1865. Historical Sketch of the Bombardment and Surrender of Fort Sumter in April, 1861," and "Fort Sumter. Restoration of the Stars and Stripes." *New York Times, 10* April, 14 April, 18 April, 1865.

175. John Babington, "Fort Sumter: 1876," (Charleston: Fort Sumter National Monument, March 1, 1954). Rock L. Comstock, "Fort Sumter, 1899" (Charleston: Fort Sumter National Monument, June 8, 1954).

176."Coast Guard History."

177. Clark and Wylie, *HSAR,* p. III.02 - 6, citing Maj. Q. A. Gillmore to Brig.-Gen. A. A. Humphreys, 31 January 1868.



Figure I.B-47. 1866 lighthouse and right face. "View of Fort Sumter, Charleston, S. C., from the east." (NYPL Digital Gallery, New York Public Library)



Figure I.B-48. 1866 lighthouse and right flank, 1870. (Brady Collection, NARA. Copy in FOSU vertical file)

In August, 1868, Capt. William Ludlow found that the west (left) side of the gorge was sound up to the height of the sallyport lintel.[178]

Except inspections and engineers' reports, however, little work was done at Fort Sumter.

178. Babington, "Fort Sumter: 1876," pp. 4-5.



Figure I.B-49. View of right flank and gorge shows the Confederates' plank boardwalk and timber wharf. "View of Fort Sumpter [*sic*], Charleston Harbor, S.C., taken from the sand bar," 1865 stereocard, George Stacy, photographer. (Library of Congress 1s01828)

In his 1869 annual report, Gillmore noted that Charleston's defenses generally "remain very much as they have for several years past. Nothing beyond some cleaning away of the rubbish has been undertaken."[179] The Board of Engineers for Fortifications drew up a reconstruction plan, but without significant federal funding, work was limited to excavation, debris removal, and small-scale construction.[180]

Despite Fort Sumter's condition, civilian visitation was constant. The *Charleston City Guide* (written 1871, published 1872) informed tourists that "Relic hunters can reach the Fort, any day, in sail boats from Southern Wharf.... The fort is at present in charge of Ordnance Sergeant James Kearney, who offers every facility to strangers."[181]

179. Young, "Castle Pinckney, Silent Sentinel of Charleston Harbor."
180. Babington, "Fort Sumter: 1876," p. 8. Comstock, "Fort Sumter, 1899"; copy in FOSU vertical file, Drawer 23 (1890-present).
181. J. C. Prentiss, *The Charleston City Guide* (Charleston, 1872).

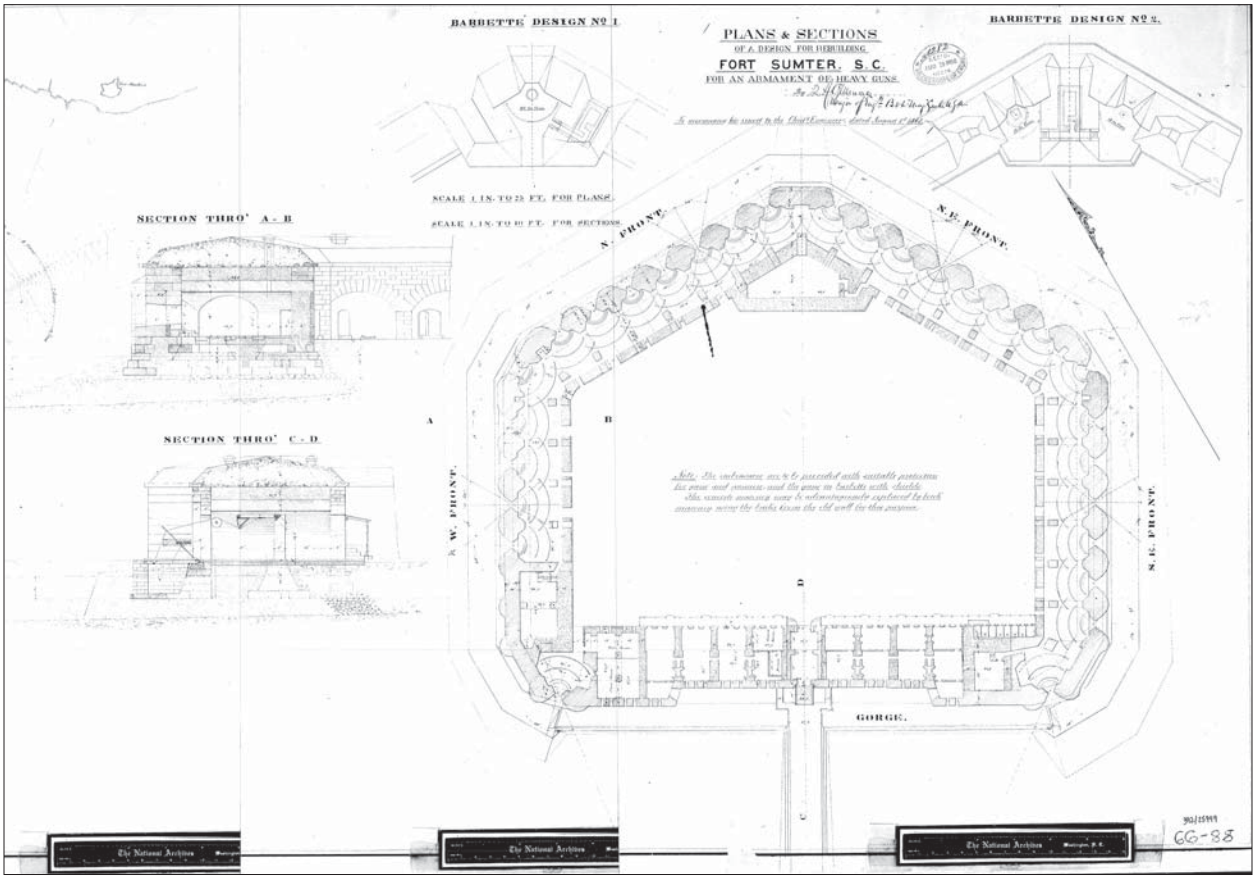


Figure I.B-50. "Plans & Sections of a Design for Rebuilding Fort Sumter, S.C. for an Armament of Heavy Guns," August 1, 1868. (NARA; copy in FOSU map files) See larger drawing in Appendix G.

Partial Reconstruction of the Fort, 1870-1876

In the 1870s the Army Corps of Engineers undertook an extensive program of work under plans prepared in 1868 and 1870 (*Figs. I.B-50, 51*). They cleared ruined portions and rubble, and partially rebuilt the outer walls of the fort and the right flank. The Corps began early in 1870 by clearing the gorge and right flank walls, disposing of cotton bales, gabions, and wooden bombproofs, and salvaging brick and timbers for reuse. They also built a new forty-two-man barracks, and continued earlier efforts to rebuild the Confederates' wharf at the left-flank sallyport as a new dock.[182]

By March 1871, when Congress passed a Fortifications Bill, new concepts dominated planning for coastal defenses. The Third System's reliance on casemate gunrooms made way for heavy gun batteries that featured depressing carriages, which allowed men to lower guns behind a parapet wall to reload safely. With large gun emplacements set on stone or concrete platforms and solidly-built magazines protected by earth and concrete, the battery was the basic element of new defensive fortifications.[183]

Early in 1872, Captain William Ludlow of the Army Corps of Engineers received authorization to erect buildings for quarters, office, and storehouses at Fort Sumter.[184] In the spring of that year, four Parrott rifles and two Rodman guns were received. They were positioned on two wooden gun platforms laid on the left face.[185] Work intensified, and for the next few years, excavation, erection of new buildings, structural rebuilding, and modernization of weapons systems proceeded simultaneously.

182. Babington, "Fort Sumter: 1876," pp. 10-13, citing Capt. William Ludlow to Q. A. Gillmore, 29 March 1870.

183. Jim Stokely, *Fort Moultrie: Constant Defender* (US Department of the Interior, 1985), pp. 54-58.

184. Babington, "Fort Sumter: 1876," citing T. L. Casey to Q. A. Gillmore, 14 February 1872.

185. Ibid., pp. 24, 27. NPS research in federal archives regarding Fort Sumter is incomplete for the 1870s, 1880s, and 1890s. While some documentation appears to have been lost, much more information remains to be collected and analyzed. Hatcher, personal communication.

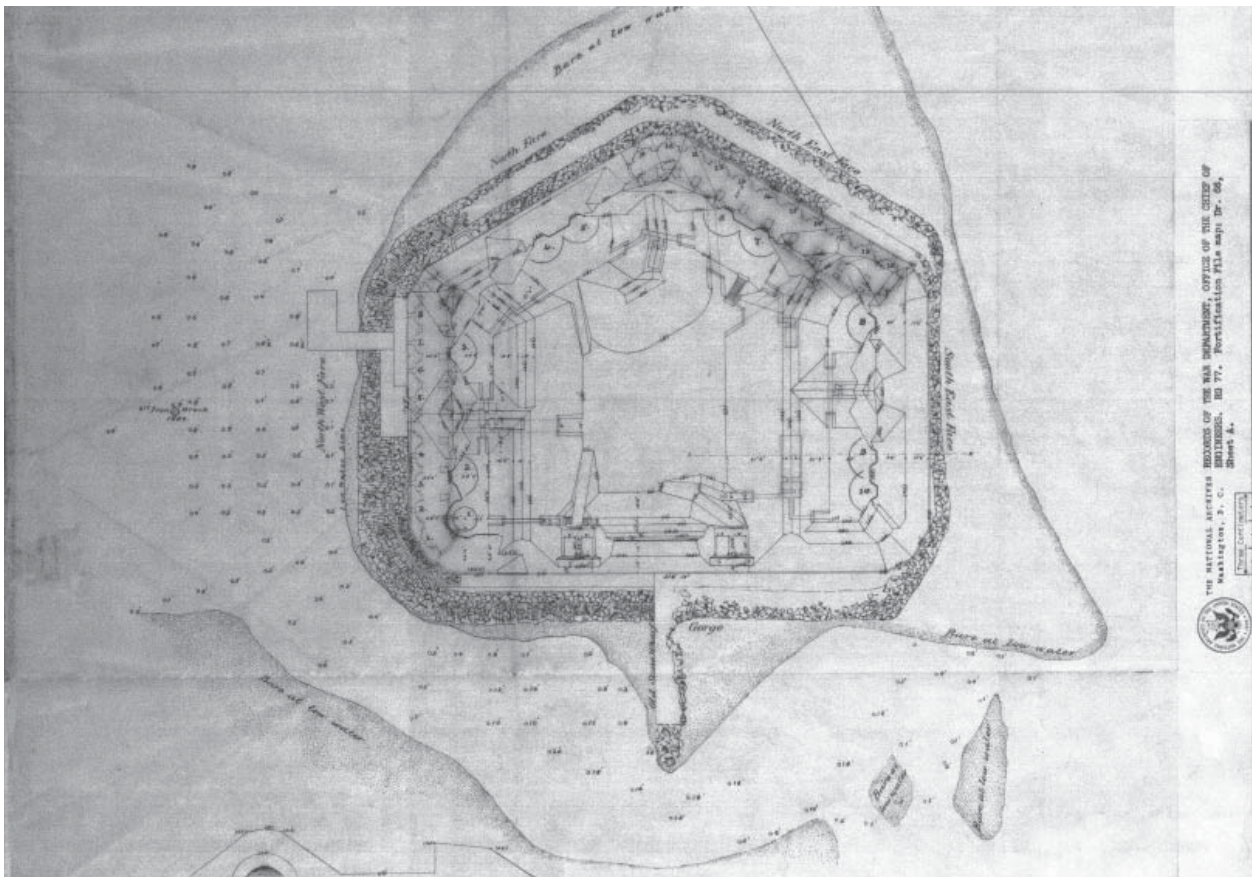


Figure I.B-51. "Fort Sumter, as proposed by The Bd. of Engrs. 1870-71" (recorded July 1887). (NARA; copy in FOSU map files) See larger drawing in Appendix G.

In May and June 1872, Ludlow had the left terreplein prepared for barbette gun positions by removal of the shattered arches and back-filling the casemates with sand.[186] Before the end of the year, the east (right) half of the gorge and the right flank had been reconstructed except for coping the walls.[187] At the left face, where Ludlow hoped to build a service magazine, the scarp was cut down to 18', and barbette gun mounts were prepared. Broken arches in the right gorge angle were removed, the area cleared out, and a new service magazine built in the angle. To prepare the right face for armament, sand was shoveled out of the casemates, their tops and rear (parade side) excavated, second tier casemates removed and the scarp taken down to the level of the recess arch.[188]

As casemates were excavated, their arches and piers were repaired.[189] Early in 1873, the flagging was removed from the second tier of the right face casemates, and the concrete "topping" removed from the first tier casemates. Buttresses were built and piers repaired at the right face, a new arch was turned over one of the casemates, and skewbacks cut into the piers for new retaining walls. The next tasks at this face, conducted in March, were to rebuild ninety linear feet of the scarp, partially rebuild four casemate arches, and build three retaining walls to retain the massive new piles of fill that would support the new gun emplacements. Strengthening arches were then built over two casemates, and a retaining wall was completed.[190]

Brick taken from the second-tier casemates and scarp walls was reused, either as fragments used in concrete or as masonry units for the scarp wall (at the gorge only).[191] To facilitate the work at the right face, in 1873 the lighthouse was moved to the left gorge angle where a remaining second-tier casemate served as a platform. In May 1873, a service magazine was completed at the right face,[192] and the Ordnance Sergeant's Quarters building was dismantled and re-erected at the gorge wall.[193]

186. Clark and Wylie, *HSAR,* p. III.02 - 7.
187. Ibid. These walls were concrete faced with brick on the exterior side. Babington, "Fort Sumter: 1876," p. 24.
188. Clark and Wylie, *HSAR,* p. III.02 - 7. Babington, "Fort Sumter: 1876," p. 27.
189. Babington, "Fort Sumter: 1876," pp. 27-30.
190. Clark and Wylie, *HSAR,* p. III.02 - 10. FOSU staff communication.
191."Documented Narrative," pp. 56-57; *Clark & Wylie, HSAR*, pp. III.01-16, 17.
192. Clark and Wylie, *HSAR,* p. III.02 - 9.
193. Ibid.

Before June, 1873, the obsolete hot shot furnace was removed from the parade ground.[194]

The Corps of Engineers' 1873 *Report of Operations* provides information on some of the work. By May 1873, laborers were making blocks of "Artificial Stone Coping;" the April 25 entry also reports laborers making artificial stone. Citing the Corps' *Report*, the 1992 *HSAR* first references the use of these stones in May 1874. The May 3 entry references the use both of Portland cement coping and of artificial stone, the Portland cement for the coping of the scarp wall [location unspecified], and the artificial stone laid on the "south wall," at the right shoulder angle, and on the northeast wall, or right face.[195] Two months later on July 13, 1874, the entry reports that the scarp wall face was repaired and raised for receiving artificial stone coping.

These entries suggest that the artificial stone blocks were a different material from the Portland cement blocks, and that both were used. The *HSAR* submits that "the artificial stone was nothing more than Rosendale Cement, water, and sand mixed together to form a concrete stone."[196] The coping stones were anchored with lead sleeves.[197]

Other work included the removal of four casemate arches from the left face in the spring of 1873, the scarp wall (except embrasures) repaired, and the scarp wall built up at the salient angle.[198] By June 1873, the left and right face scarp walls were cut down to heights of twenty feet and twenty-four feet, respectively, and prepared for coping. Four barbette pieces, two Rodmans on the left face and two Parrotts on the right flank, were mounted on wood platforms.[199]

Continuing work in the summer of 1873 included revetments at the left face, pointing the brick scarp from the right face to the left shoulder angle, demolishing three shattered casemate arches at the left face and placing revetments.[200] At the left flank, three shattered casemate arches were demolished, the remnant part of the second-cut embrasure cut out, and the scarp repaired and finished with brick coping.[201]

194. Babington, "Fort Sumter: 1876," pp. 27-30.
195. Clark and Wylie, *HSAR,* pp. III.02 – 9, 10, 11, cites National Archives Record Center, Corps of Engineers Records, *Report of Operations*, 1873, 1874.
196. Clark and Wylie, *HSAR,* p. III.01 – 27.
197. Ibid., pp. III.01-16, 17.
198. Ibid., p. III.02 - 9.
199. Babington, "Fort Sumter: 1876," pp. 27-30.
200. Clark and Wylie, *HSAR,* p. III.02 - 9.
201. Ibid.



Fort Sumter, South Carolina (after the bombardment) **by Seth Eastman, 1870–1875.**

Figure I.B-52. Even while rebuilding progressed, artists memorialized the devastation of the bombardments. "Fort Sumter, South Carolina (after the bombardment)," Seth Eastman, 1870-1875. (history.house.gov)



Figure I.B-53. The 1874-75 sallyport, shown in 1948 with board infill to reduce the size of the opening. (FOSU vertical file)

By the end of 1873, the right face casemate arches were repaired, embrasures repaired, new flagging laid and the original traverse irons replaced to accommodate the new gun chassis.[202] In December, eleven 100-pounder Parrott guns were emplaced in the right face casemates.[203] Although most attention turned to other areas in 1874, there was some continuing work at the right face: three casemate arches were strengthened again, the scarp wall raised in height, embrasures repaired, and concrete backing with drains and spouts installed.[204]

At the close of 1873, "Mr. Gould" was authorized to purchase pipes for draining the casemates, selecting cast iron, galvanized iron, or earthen pipes at his discretion. These were installed as casemate repairs were completed, beginning in February 1874 when leaders were installed from the right face casemates to the cistern.[205]

By June 1874, much of the reconstruction plan had been completed. A "gallery," or covered walkway, was under construction, leading from the new left flank sallyport to the parade ground through the earth berm. Masons were reconstructing Fort Sumter's right flank.[206] By the end of the year, the section at the gorge angle was topped with artificial stone.[207]

202. Ibid.
203. Ibid., p. III.02 - 10. Mike Ryan, "The Historic Guns of Forts Sumter and Moultrie," May 1997, p. 58.
204. Clark and Wylie, *HSAR*, p. III.02 - 11.
205. Ibid., p. III.02 - 10.
206. Ferguson, Overview (HABS), p. 30.
207. Clark and Wylie, *HSAR,* p. III.02 – 10.

A new sallyport at the left flank was constructed between 1874 and 1875, trimmed with granite and with a flat arch (*Fig. I.B-53*). The casemate was excavated in April 1874, and work completed by June 1875.[208] This work forced the return of the lighthouse from the left gorge angle to its original location on the right face. It was relocated again in 1876.[209] Four casemates north of the new sallyport were repaired in preparation for the new artificial stone coping, and nine casemates prepared for concreting and asphalt topping.[210]

A storm in the fall of 1874 damaged much of the new work; the parade ground was covered with eight feet of water, most of the temporary frame structures were destroyed, and the parapet of the newly-built right flank wall was damaged.[211]

Quincy A. Gillmore as a Union general during the war helped in the "practical demolition" of Fort Sumter, as he termed it. After the war, it was Gillmore who served as chief in charge of the reconstruction of the fort for the Corps of Engineers. His 1875 "Report of the Chief" tells much of the work carried out during these years.[212]

By June 1875, gun positions at four sides (right flank, right face, left face, and left flank) were taking shape. After completion of the new

208. Ibid., pp. III.02 – 10-11; HABS, p. 4.
209. Babington, "Fort Sumter: 1876," pp. 22-23, 30-31.
210. Clark and Wylie, *HSAR,* p. III.02 - 11.
211. HABS, p. 30.
212. The well-known civil engineer authored several books and articles on cements and other structural materials.

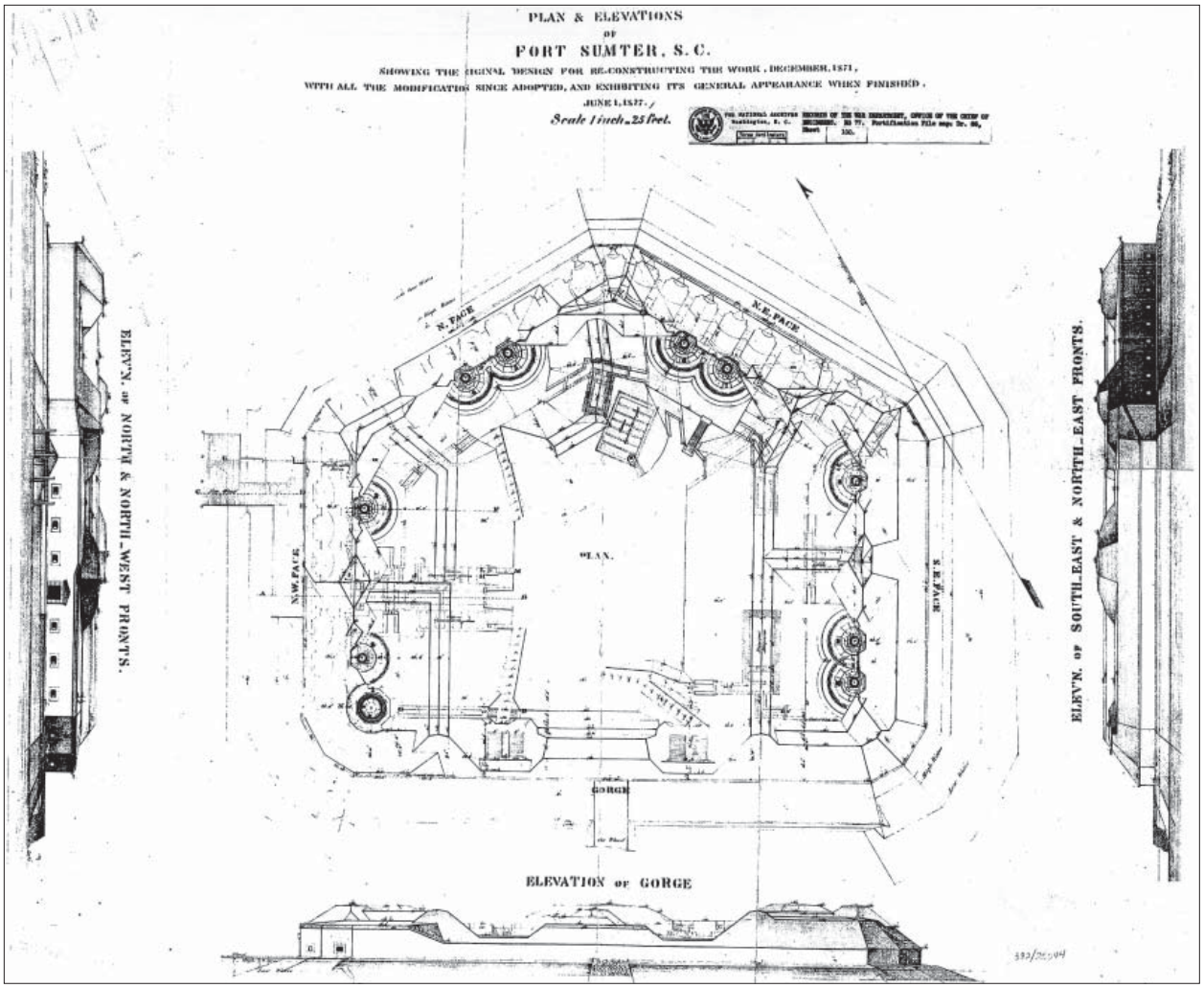


Figure I.B-54. "Plans and Elevations of Fort Sumter, S.C. Showing the original design for reconstructing the work, December, 1871, with all the modifications since adopted, and exhibiting its general appearance when finished. June 1, 1877." (NARA; copy in FOSU map files) See larger drawing in Appendix G.

retaining walls and fill, gun emplacements were fabricated, with some near the left gorge angle and behind the right shoulder angle.[213]

The tops of the casemate arches, which were the base of the barbette level, were asphalted. Casemates at the left flank and gorge angle were cleaned and repaired, with interiors plastered, as guard rooms. Brick retaining walls were built in the rear of the left flank casemates, and traverses on the left and right faces were complete. Two service magazines were in place north of the sallyport gallery.[214]

Gillmore wrote that two cisterns were constructed, "…one north and the other south of the sally-port gallery, having a capacity of 10,000 gallons each… and connected by drainpipes with the roofs of casemates, northwest front. These cisterns are each supplied with an overflow-pipe that leads to the cistern under the sally-port. This cistern has also been repaired."[215]

By June 1876, when funding ended, Fort Sumter had been transformed. The two ruined walls had been rebuilt and the other three leveled. The rebuilt casemates were topped and backfilled with sand. Concrete gun emplacements, magazines, a new sallyport, and quarters, office, and storehouse buildings had been completed.[216]

213. Babington, "Fort Sumter: 1876," p. 38.
214. Ibid., pp. 36-39; see also Ferguson, *Overview* (HABS), pp. 46-47.
215. Report of Quincy A. Gillmore, in U.S. Army Corps of Engineers, *Report of the Chief of Engineers* (U.S. Government Printing Office, 1875), pp. 21-22.
216."Documented Narrative," pp. 56-57; Clark and Wylie, *HSAR*, pp. III.01-16, 17. For detailed chronology of repairs and construction, see Clark and Wylie, *HSAR,* pp.

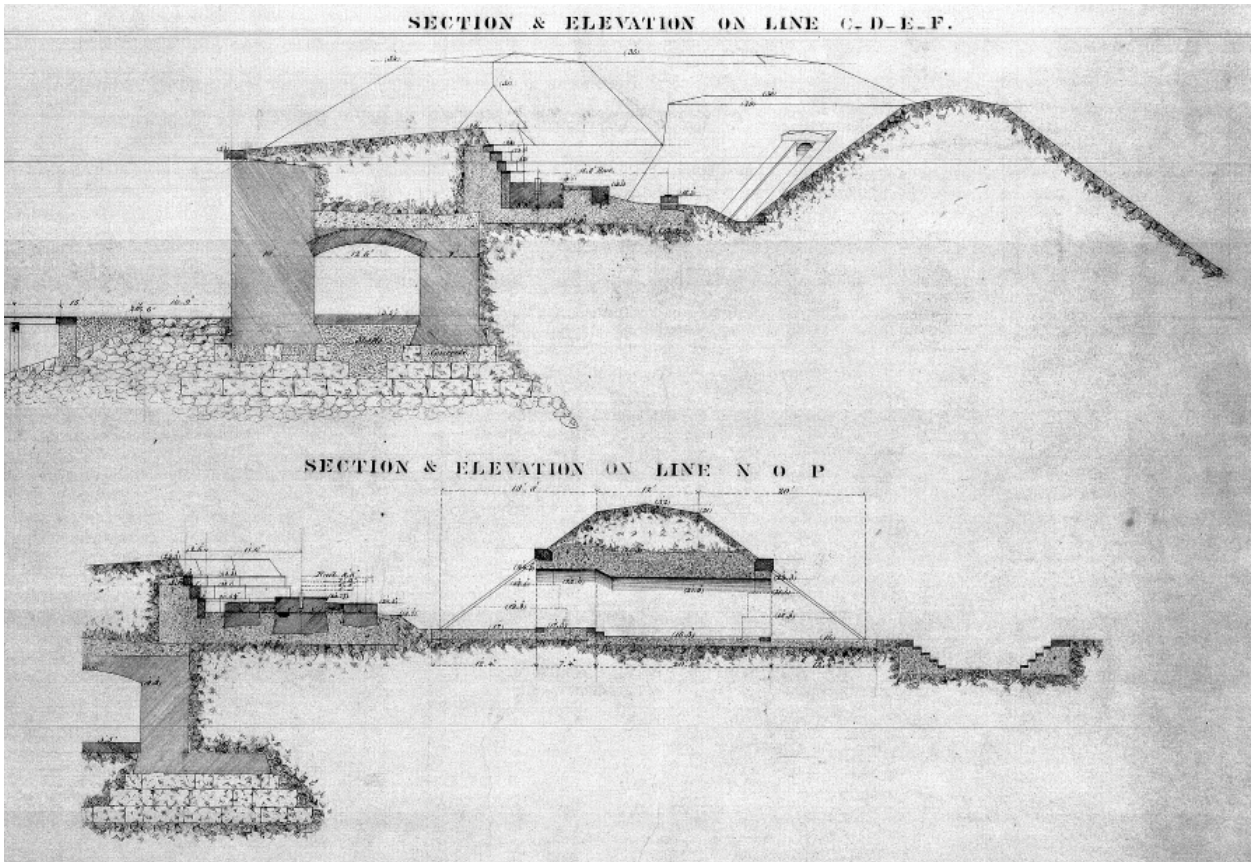


Figure I.B-55. 1877 sections and elevations. (NARA; copy in FOSU map files) See larger drawing in Appendix G.

No further reconstruction work was conducted after June 1876, and the Army did not garrison Fort Sumter until 1897. A severe hurricane that struck the area in 1881 did great damage in Charleston and on Sullivan's Island, but newspaper accounts do not mention the storm's effects on Fort Sumter.[217] Nevertheless, some portion of the wharf at the left flank was swept away, and there was damage to the scarp wall and parapets.[218] In 1881, the Army's caretaker requested an extension to the wharf, "so that the fort's many visitors could land in safety." Whether repair or replacement is not clear.[219]

In 1883 Fort Sumter's serviceable armament comprised four Parrotts and two Rodmans *en barbette*, and eleven Parrotts in casemates (nine at right face, one each at the salient and the adjacent left face).[220] However, in 1884, Gillmore was told that the guns were rusted and the platforms rotted. None of the barbette guns was safe to fire.[221]

A major storm in August 1885 washed away much of the exterior slope and coping of the right face, tore away the sallyport gate and the deck of the wharf, and damaged quarters. A large amount of sand was deposited in the casemates, and the parade was flooded with five feet of water, setting afloat anything movable there.[222]

Repairs extended for most of a year but much damage remained. The Chief Engineer noted in his June 30, 1886 annual report, "No appropriations having been made, no work was done at this fortification during the last fiscal year beyond its protection, preservation, and repair."[223]

Given the condition of Fort Sumter in August 1886, when the Charleston earthquake rocked the Lowcountry, it is difficult to assess the effect on the fort. According to a report prepared by the Corps

III.02-8 through III.02-10.
217. *Charleston News and Courier,* August 29, 1881, et. seq.
218. Babington, "Fort Sumter: 1876," p. 13.
219. Rock L. Comstock, *Short History, Fort Sumter* (June 1956).
220. Comstock, "Fort Sumter, 1899", p. 3, citing Lt. Thomas V. Bailey to Col. Q. A. Gillmore, 6 June 1883.
221. Ibid., pp. 3-4, citing Bailey to Gillmore, 9 December 1884.
222. Snell, "Battery Isaac Huger," pp. 1-2.
223. Ibid., pp. 1-2.

of Engineers, titled "The condition of Fort Sumter on December 31, 1886," cracks in the archways leading to the right face and at the concrete gallery leading to the sallyport, which had been observed for several years, might have worsened. "It seems that these cracks have opened a little since the earthquake of August 31, 1886."[224]

Otherwise, the masonry was found generally in fair order, but the earth slopes, except the parapet and the exterior slope of the right flank, were "badly defaced by rainstorms." The service magazines of the barbette were in fair condition, although the surface of the concrete passage to the principal magazine at the right flank was disfigured, patches of concrete having fallen out.

On the barbette level of the three channel fronts (left face, right face, right flank) were five wooden front-pintle platforms for 15" Rodman guns, and two for smaller caliber. These platforms and the wooden revetments in their front were badly decayed; the revetment in front of the two small-caliber gun platforms had been replaced by a substantial marsh sod wall. The "permanent" platforms and breast-height walls of the left flank barbette were all in serviceable order.

The masonry work of the nineteen gun casemates was in fair condition, but the eight on the left flank were not provided with traverse irons. The rails

224. The earthquake is estimated to have measured between 6.6 and 7.3 on the Richter scale, and caused structural damage in several states.

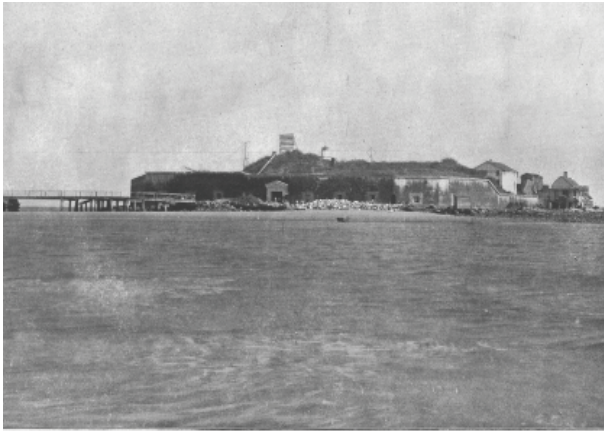


Figure I.B-56. "Since the war Fort Sumter has been regarded as a national landmark, and has been gazed upon with very varying feelings by people of all sections..." Caption in newspaper clipping of undated photograph showing range light and buildings, ca. 1894. (FOSU vertical file, Drawer 23)



Figure I.B-57. Fort Sumter lighthouse and fog bell tower photographed in 1893. (National Archives, lighthousefriends.com)

were in place on the left and right faces, but the eleven 100-pounder Parrot rifles mounted on them could not be traversed because of the rust noted in the 1884 report to Gillmore. There were no working shutters at the embrasures, so salt water frequently "dashed through" them.[225]

Later reports, filed in 1887, detail more earthquake damage. The sallyport casemate arch was cracked; the cistern there and the Ordnance Sergeant's house were damaged. Eleven casemates were found cracked and leaking, and the iron postern door was "rusted away."[226]

Fort Sumter was still important to Charleston Harbor because of its use as a lighthouse station. A hurricane in 1893 crushed the right flank wall and inboard emplacements, and destroyed the wharf at the left flank sallyport, the range light's support tower (lighthouse), and the lightkeeper's residence (*Fig. I.B-57*).[227]

Endicott System and Battery Huger, 1898-1899

Fort Sumter's location in the harbor was chosen for construction of an Endicott fortification known as Battery Isaac Huger, an imposing concrete emplacement for two long-range rifled cannons. In 1888 the federal government made funds

225. "Records of the Office of the Chief of Engineers" (Record Group 77, Drawer 66, NARA).
226. Clark and Wylie, *HSAR,* p. III.02-12.
227. Comstock, "Fort Sumter, 1899," pp. 5, 23; p. 4, citing Capt. Frederick V. Abbot to Brig. Gen. Thomas L. Casey, 9 September 1893. FOSU staff communication.



Figure I.B-58. Frederic V. Abbot. (http://theworldsmilitaryhistory.wikia.com/wiki/Chief_of_Engineers)

available for beginning the work. The Charleston Harbor defenses were also to include a mining casemate and heavy guns at Fort Sumter.[228]

Work began several years later. First was construction of a submarine mining control center, approved during the 1891 fiscal year.[229] The left flank casemate of the brick fort, second south of the shoulder angle, was rebuilt for use as a torpedo mining room, housing a detonator and its associated power plant, and the cable apparatus connecting to the underwater mines. The arch and piers were removed, and the casemate reinforced with concrete. With the embrasure modified to provide an exterior opening, the minefield was managed from this "mining casemate."

Four years later, in 1895, engineer and captain Frederic V. Abbot of the Charleston District, Army Corps of Engineers, began plans for the new Battery Huger, to be built on the central portion of the fort. His soundings and test borings taken in August 1895 indicated that the site could not support such a heavy battery if it rested on piles,[230] and the engineers "decided that any battery built on this site must be floated on the surface soil." This caused funds under the existing appropriation to be reallocated to a mortar battery on Sullivan's Island.[231] Nevertheless, the Army Corps of Engineers still intended to place a new battery on the sand island of Fort Sumter.

The Army Engineers built a new timber wharf in 1896, extending from the right face at the shoulder angle and bridging the scarp wall (*Fig. I.B-62*). The right flank wall had again suffered damage in the latest storm and was repaired with the addition of a concrete retaining wall along its interior ("inboard") surface and portions of the gorge wall.[232] During the same period, the Light-House Board replaced the destroyed lighthouse, building a new steel skeleton framework on the left shoulder angle, and placed a new lightkeeper's residence near the left gorge angle.[233] Two searchlights were also installed at Fort Sumter, one mounted on a tower south of the original esplanade (outside the fort) and one set atop the salient angle.[234] A 455-foot artesian well was sunk in the parade ground.[235]

The Spanish-American War gave urgency to the need for strong coastal defenses, and new congressional appropriations included Battery Huger. Construction of Fort Sumter's Endicott battery began on May 3, 1898 with the platform for the base ring of the northernmost of the two gun emplacements. The second emplacement was soon started, and by June 30 the foundations of the north emplacement were complete, and most of the walls and parapet were raised to the level of the roof.[236] During that summer, the torpedo mining casemate remained in active use, creating difficulties in material storage and in coordinating use of the wharf and a derrick barge, which both crews required.[237]

228. Snell, "Battery Isaac Huger," pp. 7-9.
229. Ibid., p. 8.
230. Frederic V. Abbot, "Diagram showing Borings at Fort Sumter, S. C., in August and September 1895," National Archives Record Group 77, Drawer 66, cited in Snell, "Battery Isaac Huger," p. 16. Clark and Wylie, *HSAR,* p. III.01-17
231. Snell, "Battery Isaac Huger," p. 17.
232. Ferguson, *Overview* (HABS), p. 31. FOSU staff communications.
233. Ibid., "Coast Guard History." Comstock, "Fort Sumter, 1899," p. 26.
234."Coast Guard History."
235. Ferguson, *Overview* (HABS), p. 48.
236. Snell, "Battery Isaac Huger," pp. 18-19.
237. Ibid., p. 20.

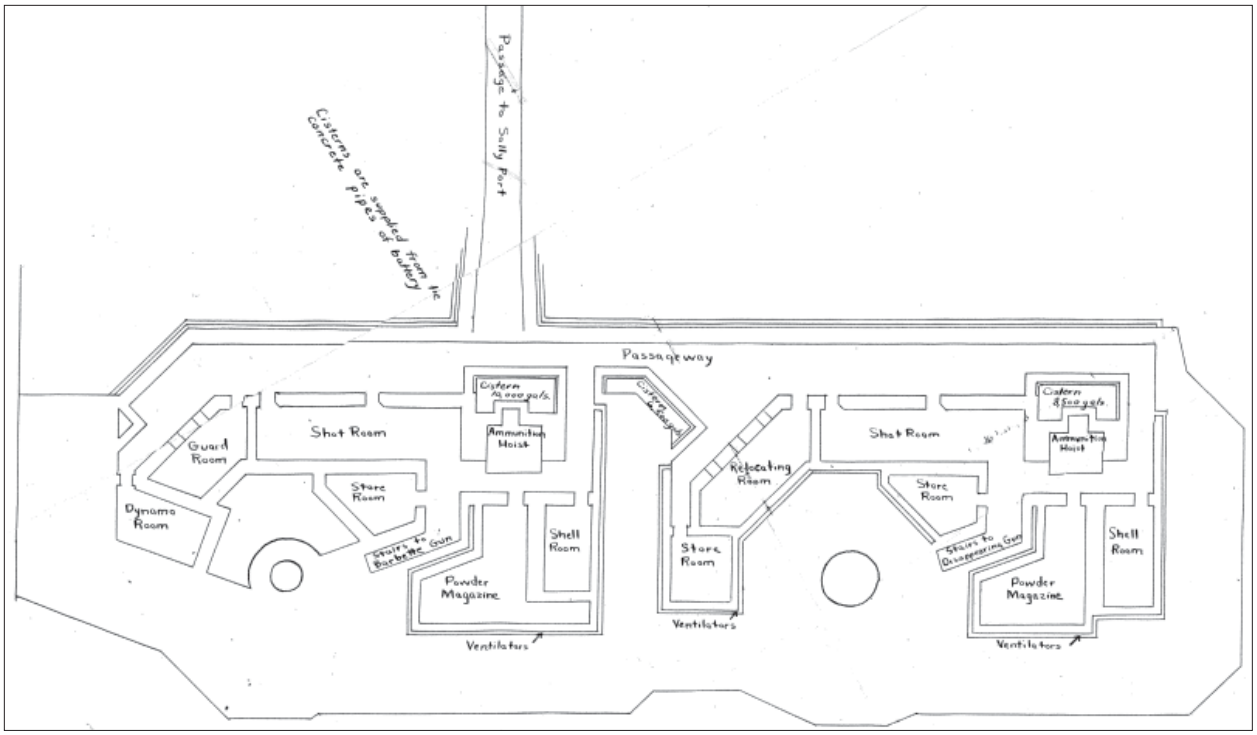


Figure I.B-59. Ground floor plan, Battery Huger, 1901. (Copy of Drawing 66-109-11, Sheet 2. FOSU vertical file, Drawer 23) See larger drawing in Appendix G.

When completed, Battery Huger was a steel-reinforced open-topped concrete battery two stories in height with guns on the upper level. The massive structure extended about 270 feet across Fort Sumter's original parade ground, generally south to north from the middle of the gorge wall nearly to the salient angle, and entailed significant changes to the pentagonal fort and its interior.

Construction was complex. The building was supported above the parade ground by a grillage of steel beams that "formed the tension members of a truss, of which the concrete itself forms the web and compression members."[238]

238. Ferguson, *Overview* (HABS), p. 49, quoting Frederic Abbot's 1895 report. Comstock, "Fort Sumter 1899," p. 6.

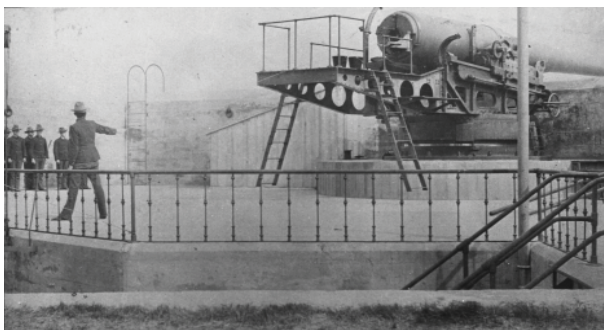


Figure I.B-60. Battery Isaac Huger, Gun #1. (Undated, FOSU photograph files)

The foundation was a level solid slab of concrete five feet thick, cast in place and reinforced by the steel I-beams.[239] This supported two levels, one being a functional roof level. The first floor was designed as two units, north and south, each with a similar grouping of rooms serving one of the guns above. This provided, for each gun emplacement, an associated shot room,

239. "Documented Narrative," pp. 55-62.

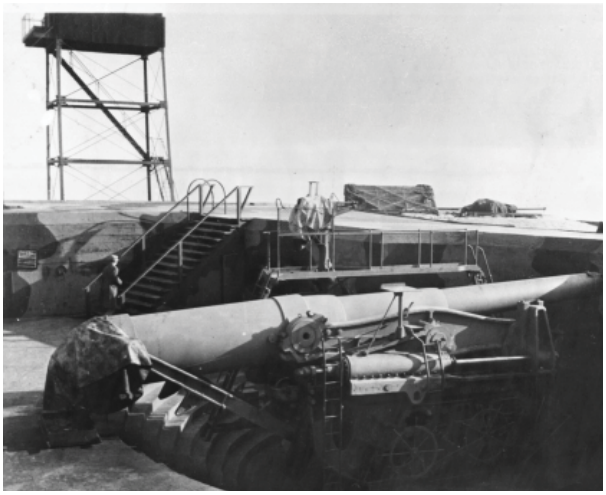


Figure I.B-61. Battery Huger, Gun #2, disappearing rifle. U. S. Army photograph in "Harbor Defenses of Charleston, S.C.," January 1944. (Copy in FOSU vertical file, Photograph Drawer 3)

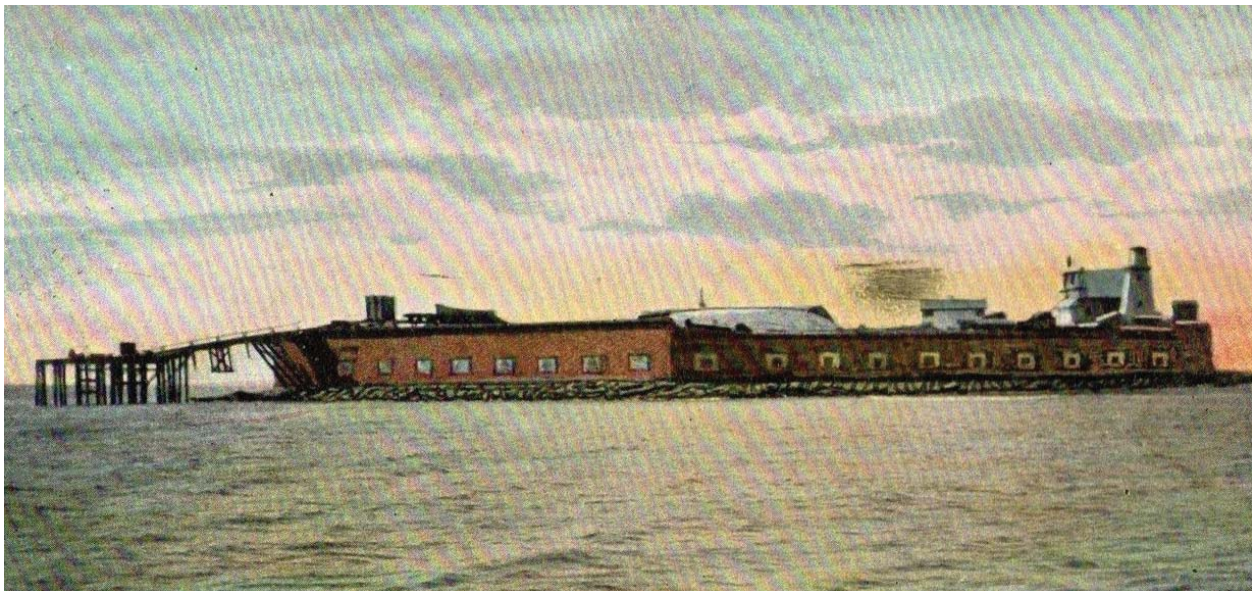


Figure I.B-62. Postcard mailed 1904 shows the replacement 1896 wharf and the ramp leading to Battery Huger, the top of Battery Huger, lighthouse and various frame buildings. (personal collection)

ammunition hoist (elevator), powder room, and shell room. Just south of center was the main 10,000-gallon cistern; other cisterns were placed near the center of the west side and at the north end. All three were supplied by concrete pipes from the roof of the battery.

Besides the cisterns, only a few common areas (dynamo room and guard room at the south end; relocating room north of the middle cistern; three storerooms) were not immediately related to the function of the guns.

The upper-level gun emplacements were concrete platforms. The northern gun emplacement held a disappearing gun, the southern a non-disappearing barbette gun. The disappearing rifle was mounted on a carriage that raised the gun for firing, then was lowered by recoil energy for concealment and safe reloading. It was set in a six-foot depression, with semicircular concrete steps leading from floor level to the platform area. The non-disappearing barbette gun rested on a concrete platform, its radius 11'10", that was elevated nearly three feet above floor level and also accessed by concrete steps.

Beside each gun was a concrete shed that served as a receiving station for shells hoisted from the lower level. On the concrete roof were two cylindrical lookout posts that provided an eastward view toward the sea approaches to Charleston Harbor. These were placed above the ammunition hoists, and accessed by iron ladders from the roof. Four other ladders along the east side of the battery also connected the second level with the roof.[240]



Figure I.B-63. Later aerial view showing location of the completed Battery Huger on the former parade ground. By the time of this photograph, all lighthouses and frame buildings had been demolished.

The introduction of Battery Huger required major alterations to most of Fort Sumter's right face casemates, which had been rebuilt in the 1870s. The embrasures of the first five casemates (beginning at the salient angle) were sealed, holes were drilled in the tops of the casemates, and sand poured in to fill casemates and bury cannons, their carriages and chassis. The sixth casemate was partially buried.[241] That work took more than a year and was completed in December 1899.

240. Ibid., pp. 58-62.
241. Clark and Wylie, *HSAR,* p. III.01-18.



Figure I.B-64. Barracks and Ordnance Sergeant's Quarters, facing southeast from Battery Isaac Huger. (NARA, copy in FOSU photograph files)

During construction of Battery Huger, thirty-eight torpedoes were in place in the harbor. In the summer of 1899 after the war with Spain had ended, seven torpedoes were safely destroyed to give a wider channel for navigation (one was damaged, and disposed in deep water). This was followed by "complete removal of all mines, cables, anchors, etc.," and safe storage. The five men of the Engineer Battalion left Fort Sumter in September; the torpedo casemate at Fort Sumter had proven "in many ways unsatisfactory, being damp and low and difficult of access."[242] In 1899, therefore, Fort Sumter's mining casemate was deactivated and a new casemate constructed in a magazine at Fort Moultrie.[243]

The Light-House Board facilitated construction of the Army's Battery Huger and its support buildings by relocating the lightkeeper's house (built after the 1893 storm) from the gorge to the left shoulder angle. In 1899, the Army began constructing a new two-story frame barracks for fifty men in the area of the left gorge angle, separate from the complex of lighthouse buildings at the left shoulder angle (*Fig. I.B-64*). The barracks was completed in 1901; however, Fort Sumter was treated as a sub-post of Fort Moultrie, and was turned over to the Coast Artillery Corps.[244] In 1901 the only garrison posted at the fort was a small force of Coast Artillerymen. As late as 1905, there were usually seven to eleven enlisted men with one non-commissioned officer (NCO).[245]

Early Twentieth Century

In 1901, the condition of the east half of Fort Sumter was in sharp contrast to that of the newly-constructed Battery Isaac Huger. Portions of three 1870s concrete magazines and the concrete passageways leading from the two service magazines to their guns remained, along with remnants of gun platforms, breast-high walls, guns and carriages. There were also remnants of the cement shed, with its runway from the wharf, that had supplied Battery Huger's builders.[246]

A 1901 survey of Fort Sumter shows the main wharf at the right shoulder angle and a smaller wharf off the left end of the gorge. Associated with Battery Huger were the fifty-man barracks and a smaller two-story ordnance sergeant's quarters, which were set near the left flank and gorge wall. In the left shoulder angle was a two-story quarters for the keeper of the Fort Sumter Lighthouse Station. Atop the left shoulder angle was the frame lighthouse building; a bell tower was situated on the left face and a bell signal on the right flank wall.[247]

Final work on Battery Huger was completed between 1900 and 1902, but improvements continued until 1910. Its electric light plant was powered from a boiler house, separate from the lighthouse service's power system. In 1903 the existing frame boiler house was replaced by a

242. *Annual Reports of the War Department for the Fiscal Year ended June 30, 1899* (Washington, GPO, 1899), pp. 864-65.
243. Comstock, "Fort Sumter, 1899," p. 28. Edwin C. Bearss, *Fort Moultrie, No. 3. Fort Sumter National Monument, Sullivan's Island, South Carolina* (National Park Service, December 30, 1968), pp. 2-3. Snell, "Battery Isaac Huger, pp. 14-16.
244. Ferguson, *Overview* (HABS), p. 50. Comstock, "Fort Sumter, 1899." Snell, "Battery Isaac Huger," pp. 21-22.
245. Comstock, "Fort Sumter, 1899," pp. 26-27. "Garrison of Fort Sumter, 1905-1914;" typescript, FOSU Drawer 23. Clark and Wylie, *HSAR,* p. III.01-19.
246. Comstock, "Fort Sumter, 1899," pp. 23-24.
247. Image too faint for reproduction. "Fort Sumter, South Carolina, from a survey made under the direction of Capt. J. C. Sanford, Corps of Engineers, July 23-August 10, 1901," sheet No. 1 (copy in FOSU Map File, Drawer C, Folder FS-10).

brick boiler room external to the battery, on the parade ground side near the gorge wall, and in 1904 the Army built a new brick latrine on the parade.[248]

During this time, about 120 feet of the artificial stone block coping was removed from the right and left face scarp walls, whose height was being raised to protect the battery. Two Rodman guns, their carriages, and two Parrott rifles were buried in a washed-out area of the former parade ground between the battery and the right flank. To combat further erosion, the scarp wall was strengthened, and a sloping field of concrete, stretching twenty feet from the right scarp walls toward the battery, was laid. The artificial stone coping blocks and concrete salvaged from the scarp walls and from demolition of the 1870s magazines and breast-high walls in the area were placed outside the walls as riprap. At several places along the exterior fort walls, breaks were repaired by cutting out damaged sections of masonry and rebuilding with new brick and Portland cement.[249]

During World War I, Fort Sumter was manned by only the small garrison of Coast Artillery Corps troops. It had been lightly manned after completion of Battery Huger, with no enlisted men in 1913 and only one or two Coast Artillery NCOs. The small army garrison was posted to the fort in 1917. Casemates at the left flank were altered to serve as additional barracks, and temporary barracks were erected close to Battery Huger (*Fig. I.B-65*).

By August, the garrison was one company of 114 men. Forty-five were quartered in the barracks, the remainder in the left flank casemates until two new barracks buildings were erected on the parade between 1918 and 1919 . These were wood-frame buildings with wood sheathing covered with galvanized iron, corrugated iron roofing, and concrete floors (*Fig. I.B-66*).[250] In 1915, the 1896 range light was removed and the range on Fort Sumter was discontinued. In 1921, a new Quartermasters Wharf was built at the left face, and the 1896 wharf was abandoned.[251]

248. Snell, "Battery Isaac Huger," pp. 23-25. Clark and Wylie, *HSAR,* p. III.02 – 14.
249. Clark and Wylie, *HSAR*, pp. III.01 - 18-19, III.02 – 13-14. Comstock, "Fort Sumter, 1899."
250. Snell, "Battery Isaac Huger," pp. 43, 50-51. "Documented Narrative," pp. 65-66.
251. Snell, "Battery Isaac Huger," p. 49.



Figure I.B-65. Tent barracks, ca. 1917. (FOSU photograph files)



Figure I.B-66. Aerial view taken after construction of the 1921 dock at left face, and before 1933 demolition of the 1896 wharf at right shoulder angle. Range towers and World War I barracks are visible.

One of the barracks buildings was taken down in January 1925, and all but 30 feet of the other was removed in 1928. The remaining barracks portion was removed in 1933.[252]

The rise in tourism in the Charleston area coincided with a national focus on commemorating the events and heroes of the Civil War. Organized boat tours to the fort began in 1926, and several memorials were placed at Fort Sumter between 1928 and 1932. The first was the Major Anderson Flagpole and Base, designed by Simons and Lapham Architects of Charleston and erected under a bequest of Major Robert Anderson's daughter, Eba Anderson Lawton. The inscription at the base reads: "In honor of Major Robert Anderson and the 128 men of his command who for 34 hours April 12-13, 1861, withstood the destructive bombardment of Fort Sumter and withdrew with the honors of war. The War of Secession began here."

252. Ibid., pp. 50-51.



Figure I.B-67. Postcard drawing made after installation of the Anderson flagpole in 1928 and before the 1950 demolition program, showing radio beacons, light towers, the flagpole, and a cable crossing warning sign painted on left flank wall. (personal collection)

In 1929, the Charleston Chapter of the United Daughters of the Confederacy placed a marble plaque honoring Fort Sumter's Confederate Garrison (*Fig. I.B-68*). It reads "In reverential memory of the Confederate garrison of Fort Sumter who during 4 years of continuous siege and constant assaults from April 1861 to February 1865, defended this harbor without knowing defeat or sustaining surrender."

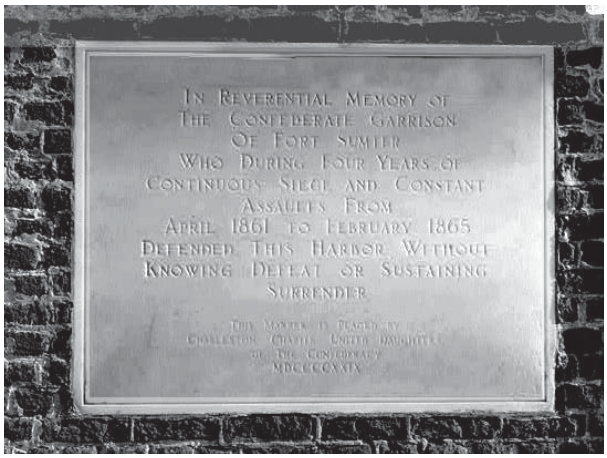


Figure I.B-68. Confederate Garrison Plaque on the left flank wall, just north of the sallyport, seen in 1992 view. Placed in 1929 by the United Daughters of the Confederacy. (HABS SC,10-CHAR.V,3-40)

Finally, in 1932, the United States government erected the Union Garrison Monument "in memory of the garrison defending Fort Sumter during the bombardment April 12-14, 1861." The roster of the original garrison is listed on the tablet (*Fig. I.B-69*).

Activities at the fort continued. In 1930, the Bureau of Light-Houses laid an underwater cable from Fort Johnson to Fort Sumter, probably to improve communications.[253] At about the same time (in March 1930), the Army Coast Artillery Officer at Fort Sumter reported that the Battery Command station was too small, as it also controlled Searchlight #1, and should be doubled in size. This would require workers to "remove its upper portion and to remove a portion of the old concrete from the top of the battery to obtain space." The work was completed by January 1932.[254]

In 1931 during that project, Fort Sumter was transferred from the Army Corps of Engineers

253. The Light-House Board became the Bureau in 1910.
254. Comstock, *Short History*, p. 30. Snell, "Battery Isaac Huger," pp. 47-48.



Figure I.B-69. Photograph taken 1948 shows the 1932 Union Garrison Monument in its original location. (FOSU photograph files)

to the Army's Harbor Post Command. The Post Command made several alterations. It may have been at this time that they removed granite traverses in the casemates along the left flank and replaced original bluestone flooring flags with poured concrete, though the date is unclear and may have been after World War II. A parapet wall was added at two sections of the left scarp walls, at the left shoulder angle and left flank, and from the salient angle for a short distance along the left face wall.[255]

An article the same year in the *Coast Artillery Journal* found that Battery Huger's "increased weight had evidently caused the island to settle to such a degree that the base rings were seriously out of level."[256] Clark and Wylie in their *Historic Structure Assessment Report (HSAR)* note that the article "clearly demonstrates that the fort was, and is sinking, both equally and differentially settling. This leveling of the base rings was also noted in the Records of the War Department, Report of Conditions at Fort Sumter."[257]

In June 1933, the Secretary of War granted permission to demolish the remaining portion of the 1918 barracks, described as having "a wood

255. Clark & Wylie, *HSAR,* pp. III.01-19, III.02-14. FOSU staff communications.
256. Maj. R. T. Gibson, "Leveling Base Rings at Fort Sumter," Coast Artillery Journal, Vol. 74, Sept-Oct, 1931, p. 457.
257. Clark & Wylie, *HSAR,* p. III.01-19, footnote 31.

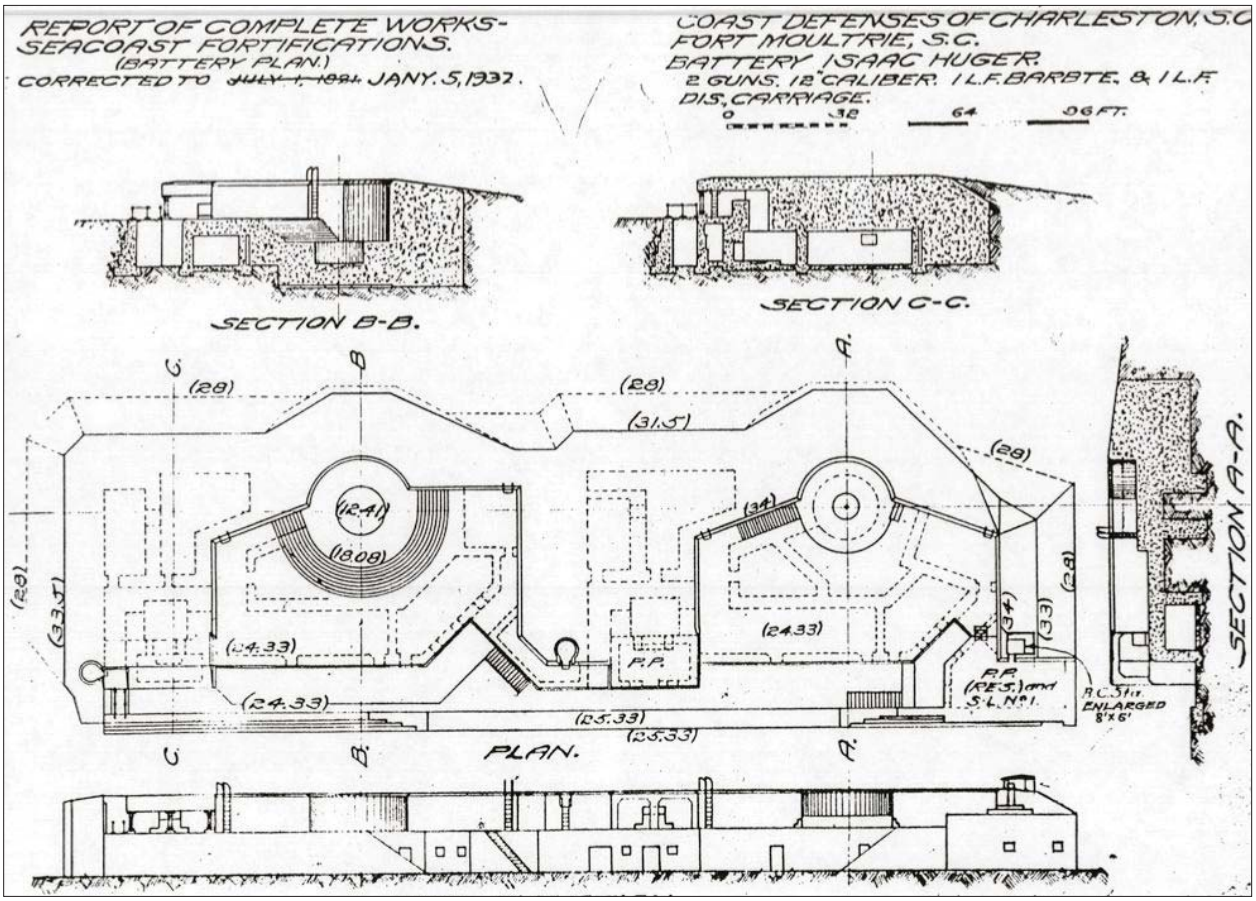


Figure I.B-70. Battery Huger, 1937 plan. (NARA) See larger drawing in Appendix G

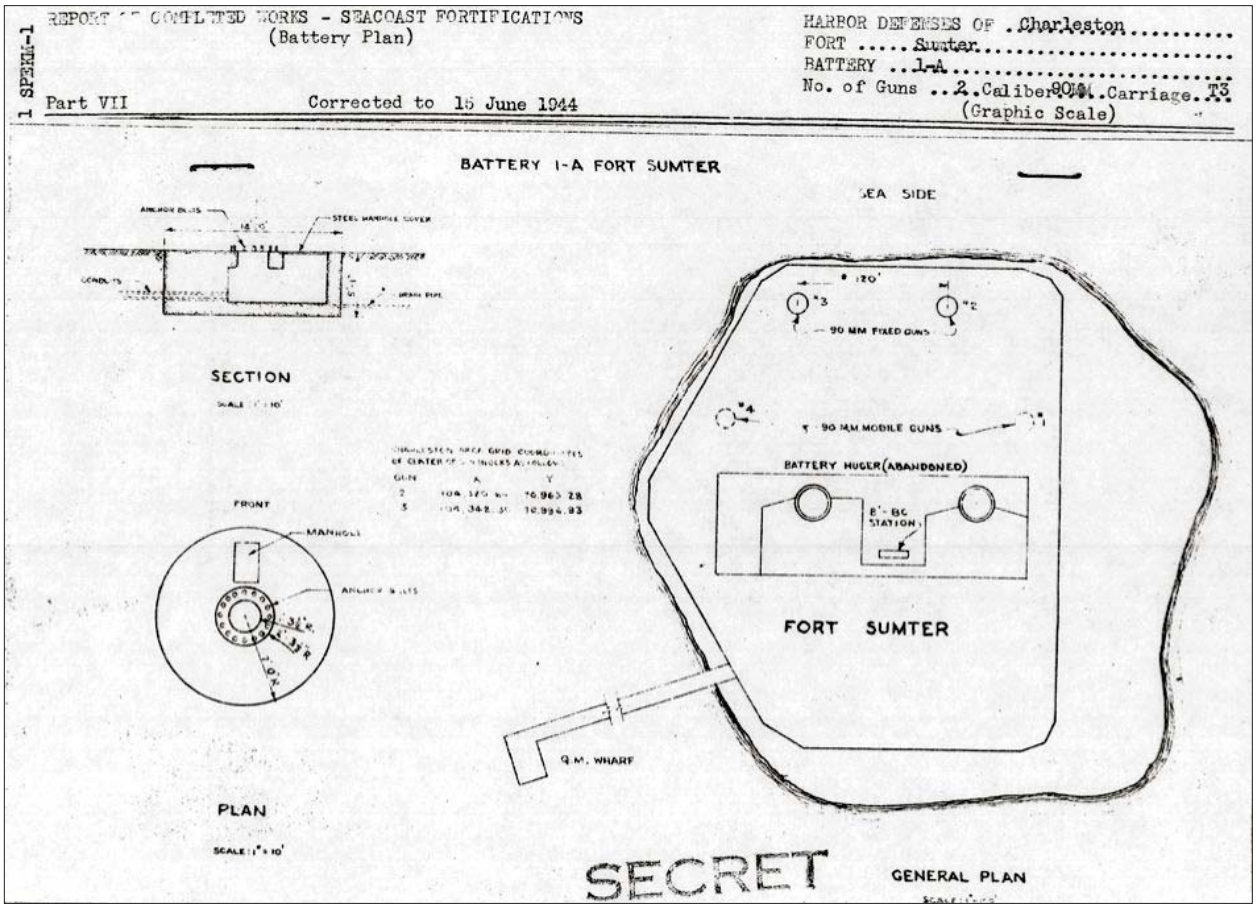


Figure I.B-71. 1944 plan showing AMTB position, with notation that Battery Huger is "abandoned." (NARA) See larger drawing in Appendix G.

frame and wood sheathing covered with galvanized iron."[258] A new brick latrine was built in its place "primarily for use of the hundreds of visitors that were now coming to view the old fort." The 1896 quartermaster's wharf abandoned in 1921 was removed from the right face.[259]

During World War II, Fort Sumter, with its beacon manned by Coast Guardsmen, served principally as a navigation point.[260] In 1940 a stone breakwater was replaced, and in 1941 the Army erected a new searchlight, #2, on a forty-foot steel tower with concrete foundation, and a detachment of Coastal Artillery was stationed at the fort.[261]

Nevertheless, German U-boats and underwater mines posed a real threat to shipping in Charleston Harbor. Restrictions ordered by the U.S. military beginning in the summer of 1942 brought an end to the Fort Sumter tour boat business, and the fort was off-limits to tour boats for the duration of the war.

In 1943 Battery Huger was deactivated and its two 12" rifled guns removed. A 1944 plan labels Huger abandoned. To replace the earlier guns in defending against torpedo boats and aircraft, a new two-gun battery was installed near the right shoulder angle and right flank wall. The AMTB (Anti Motor Torpedo Boat) battery had two mounted guns and mounts for two 90-mm mobile guns kept in storage at Fort Moultrie until needed. These mobile guns could also be used against aircraft. The AMTB was unique in that the two 12" guns were mounted on different types of carriages, disappearing and barbette. The Army transferred the AMTB to the Coastal Artillery in July 1943, and deactivated it in 1946.

Tourism in Charleston resumed quickly after the war. Gray Line Tours reopened service to Fort

258. Snell, "Battery Isaac Huger," p. 44, cites Entry A50-23, Box 19C, file 660K, "Records for the Defense of Charleston, S.C," (Record Group 77, Federal Record Center, Suitland, MD).
259. Snell, "Battery Isaac Huger," pp. 49-51.
260. Comstock, *Short History*.
261. Snell, "Battery Isaac Huger," pp. 51-52.

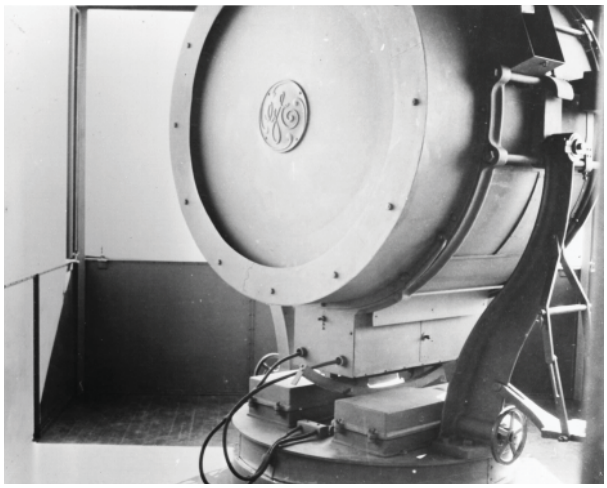


Figure I.B-72. Searchlight erected by the Army in 1941. (FOSU photograph files)



Figure I.B-73. 1940s workroom in Battery Huger. (FOSU photograph files)



Figure I.B-74. Left face and pier, 1948. View shows Anderson Flagpole Monument in its original location (it was moved east of Battery Huger in 1959), with Coast Guard buildings and structures at left face and left shoulder angle. (Figure 10 in "Report on Fort Sumter National Monument, January 3, 1949." FOSU vertical file, Drawer 23)

Sumter in March 1946, and by the end of that year had ferried 6,647 passengers across the harbor. Although there were no regular or official tours of the fortification itself, the boat crews were knowledgeable about Charleston Harbor, Fort Sumter, and the events of the Civil War. Their informal tours were occasionally supplemented by retired military personnel who had served at Fort Sumter.[262]

National Park Service Documentation and Planning, 1948-1959

The fort's Civil War fame attracted visitors from the start. The celebratory flag raising in April 1865 brought people from near and far, and men who had served in the war were among the frequent visitors in succeeding decades. Facilities for visitors were in place by 1871; in 1881 the fort's caretaker requested more improvements for the "many visitors."

Visitation grew with each decade and prompted changes to the fort. Between 1948 and 1956, the number of visitors to Fort Sumter soared from 9,000 to 31,000 yearly. When the National Park Service (NPS) took over Fort Sumter in 1948, the first tasks were research and documentation, site clearing, installing stairs and handrails for visitor use, and developing interpretive plans.

Planning began immediately. Luckett arrived on October 31, 1948, followed by a six-man inspection team gathered "to obtain information concerning the present condition of Fort Sumter and to prepare recommendations on policy of development and a work program."[263]

In January 1949 the Park Service completed its Plan for converting Fort Sumter from a former military base to an historical monument for public visitation. The superintendent and staff of the Region One office in Richmond, Virginia conducted the study.[264] The plan states in part,

262. Comstock, *Short History*, pp. 9-11.
263. Ibid., p. 26, cites 1949 "Report on Fort Sumter."
264. Ibid., p. 58, fn 67. "Report on Fort Sumter National Monument, January 3, 1949, made by Regional Engineer W.E. O'Neil, Jr.; Regional Landscape Architect Stanley W. Abbott; Regional Archaeologist J.C. Harrington; and Regional Historian Roy E. Appleman.

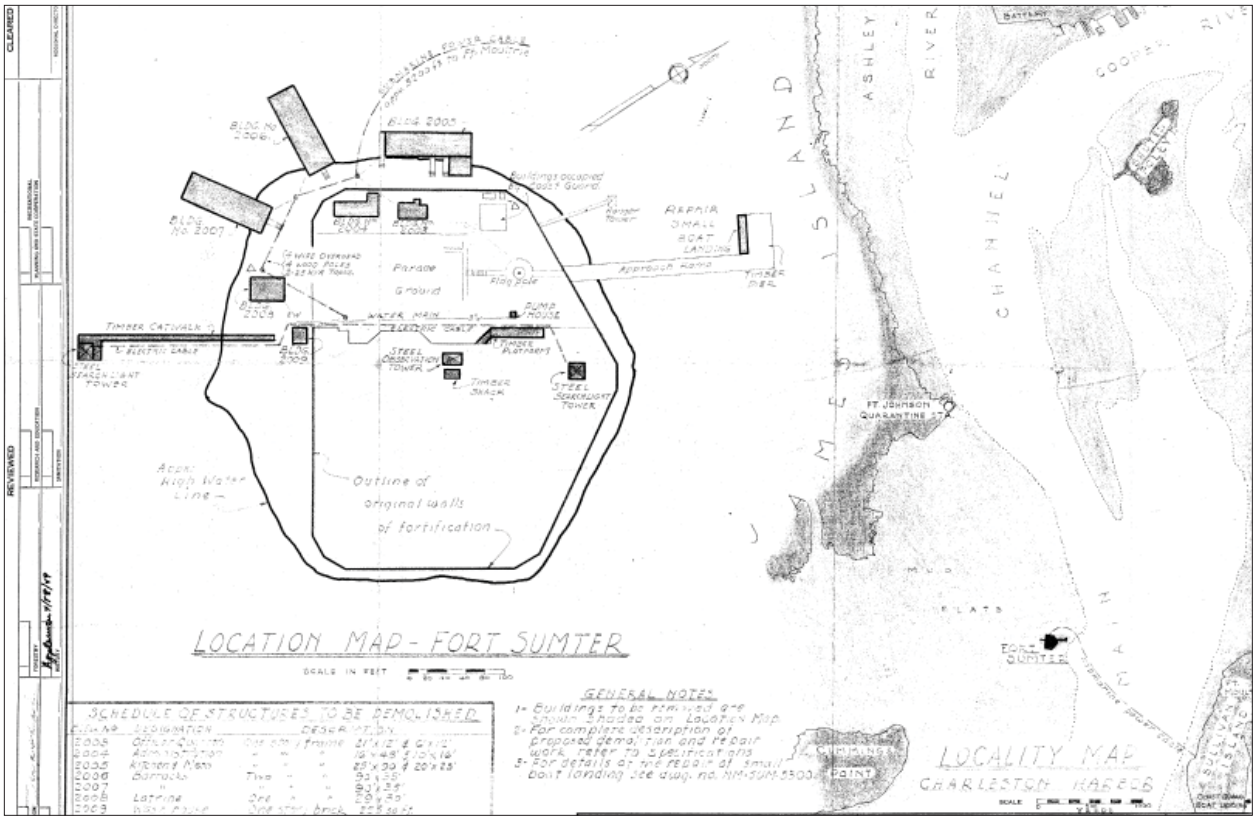


Figure I.B-75. 1949 plan showing locations of proposed demolitions, "General Demolition and Repairs, 1949." (FOSU vertical file, Map Drawer C, Folder FS-3) See larger drawing in Appendix G.

> It is the recommendation of the group that Fort Sumter be restored as a stabilized ruin of the 1860-65 period...the old fort will have to be uncovered and exposed, and extraneous buildings and construction of recent periods removed.
>
> The physical structure of the fort...and the parade ground, should be restored so far as is practicable.... To permit the presence of major intrusions in the fort differing materially from the 1860-65 period would be to make very difficult a clear presentation of the 1860-65 story to the visitor....

The report describes some of the buildings then on site:

> Fort Sumter...presents very little of the 1860-65 picture.... approximately one-half of the old fort was converted into... modern fortifications .... This involved a great amount of heavy concrete work [and] underground concrete ammunition storage rooms.... Concrete and steel gun mounts [and] World War II, anti-aircraft gun mounts were erected. There are six frame buildings [and] one small brick structure.
>
> Added to this are the one sizable structure and two or three small structures used by the U.S. Coast Guard, ...searchlight mounts...[and] radio antennae.... All of these structures, except those used by the Coast Guard, can be demolished and removed immediately.
> Inside the fort the parade ground, if it may be called that, extends over about one-half (the west half) of the original parade. As stated above, the east side has been occupied by concrete and steel installations, and by fill beyond this to the outer walls of the old fort.[265]

Although the Coast Guard was not scheduled to vacate Fort Sumter until 1952, NPS hoped for an earlier departure:

> It is the unanimous recommendation of the group that the National Park Service seek the complete removal of the Coast Guard from Fort Sumter at the earliest practicable date. . . . There has been some suggestion that the Coast Guard building might be retained and used as quarters for a guard or employee of the Service. This group recommends against that. Retaining the structure would be contrary to the general policy as stated above for restoring the fort to Civil War appearance.

The committee's Report guided the work at Fort Sumter and was the basis for the 1951 Master Plan.[266] The Master Plan included a detailed Historical Base Map, drawn in 1951, of "Fort Sumter as it Existed (April 12, 1861)."

265. Luckett, "Report on Fort Sumter," 1949.
266. Comstock, *Short History*, p. 33.

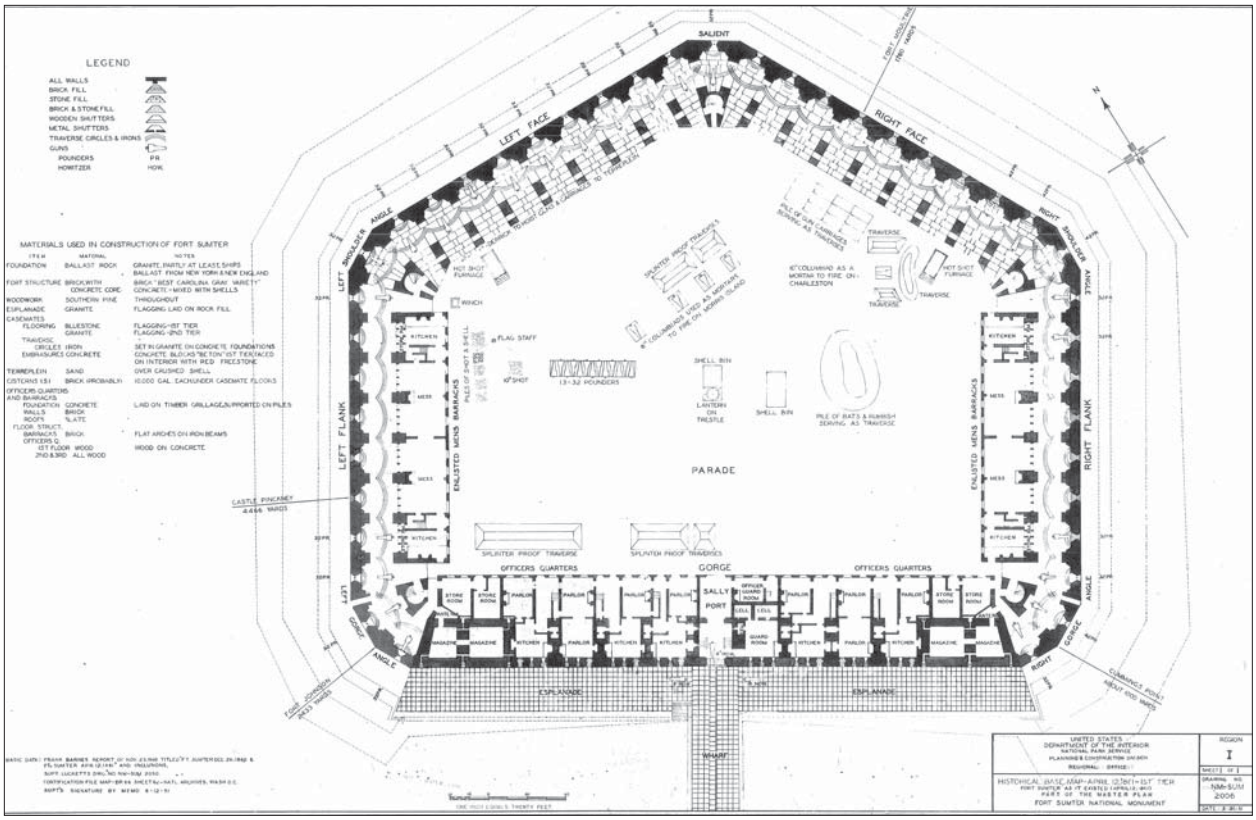


Figure I.B-76. "Historical Base Map- April 12, 1861-1st Tier, Fort Sumter as it Existed. Part of the Master Plan," May 31, 1951. (FOSU map files) See larger drawing in Appendix G.



Figure I.B-77. 1949 view looking southwest across parade ground before the 1950s projects, showing temporary structures of World Wars I and II. (FOSU photograph files)



Figure I.B-78. 1949 view looking north across the parade ground before the 1950s projects. The white buildings were occupied by the Coast Guard. The small temporary frame structure against the embankment provided an entrance into casemates. (FOSU photograph files)

Changes to the fort began immediately. Eleven buildings were demolished to reduce the twentieth-century character of the complex. The Army's early-twentieth-century barracks buildings and associated structures were removed. The lighthouse keeper's residence was removed, leaving only the lighthouse and those support structures used by the Coast Guard. In 1950, the Coast Guard moved the radio beacon from the left shoulder angle to the Sullivan's Island Lifeboat Station.[267]

Also in 1949, NPS recognized Gray Line Tour's position as the only harbor tour service in the area, and issued the firm a special use permit for landing at the fort. The Park began sponsoring daily tours in early 1950, and later that year installed eleven cast-aluminum interpretive markers. An orientation circle was created atop Battery Huger,

267. Luckett, "Mission 66." Clark and Wylie, *HSAR,* p. III.02-15. Comstock, *Short History,* p. 28. U.S. Coast Guard, "Historic Light Station Information," http://www.uscg.mil/history/weblighthouses/LHSC.asp. Also known as Lifesaving Station and Coast Guard Station.



Figure I.B-79. Steel searchlight tower in March 1950 before demolition. The tower was cut into short lengths and piled on the adjacent timber catwalk. (FOSU photograph files)



Figure I.B-80. Tower in March 1950 after removal; pieces of the tower are stacked on end of catwalk. (FOSU photograph files)

with a small footprint of the pentagonal fort in the center and informational signs describing the view in each direction.

A temporary location for a museum was needed, with casemates and Coast Guard buildings considered. A room in Battery Huger was selected, 12' by 40' in size and "about 7 feet high," and opened in July 1951, its central feature being six exhibit panels prepared by NPS interpretive staff (see discussion and photographs in previous chapter).[268] The space was far from ideal: "the destructive dampness inside the battery taught lesson after lesson...Photographs were preserved between glass plates sealed with waterproof Mystic Tape;..labels [received] a coat of shellac..." By 1955, the small museum housed "artifacts found in excavations, several narrative and pictorial wall displays on Sumter history, and the Anderson colors."[269]

The "colors" refers to Fort Sumter's U.S. Garrison flag and storm flag, transferred to the Park Service in 1954. After much discussion of placement, and concern that a "room might be found that could be kept dry with a dehumidifying unit, and the flags could then be seen by the thousands of visitors who came to Fort Sumter," the flags were displayed in the temporary museum.[270]

In 1953, a raised model of the fort was placed on the footprint on Battery Huger; however, the orientation circle was later removed.[271]



Figure I.B-81. Orientation Circle with aluminum interpretive markers. (FOSU vertical file, Photograph Drawer 3)



Figure I.B-82. Postcard showing the model of Fort Sumter added to the orientation circle in 1952. (personal collection)

268. Comstock, *Short History,* p. 37.
269. Ibid., p. 25.
270. Leslie D. Jensen, "Fort Sumter Flags; A Study in Documentation and Authentication; the Historical Report" (Harpers Ferry Center, National Park Service, March 1982), p. 248.
271. "Contract for Signs," 1949, in *Fort Sumter*



Figure I.B-83. 1940s view showing condition of Battery Huger. (FOSU photograph files)

In October 1948 when NPS staff arrived at the fort, they found it cluttered not only with dilapidated buildings and worn-out equipment, but also with "thousands of feet of cable, pipe, wiring, and telephone and power poles – everywhere." At some point before deactivating Fort Sumter in 1946, the Army laid a cable between Fort Moultrie and Fort Sumter. Years earlier in 1930, the Bureau of Light-Houses laid an underwater cable from Fort Johnson to Fort Sumter for either electric power or communications. Superintendent Luckett arranged for a salvage contractor to remove the mile of cable between Forts Moultrie and Sumter, and reclaimed a 15K VA diesel generator abandoned by the Army. The power lines serving Battery Huger were repaired and activated.[272]

In January 1949 in his "Report," Luckett recommended a joint project with the Coast Guard to install a new submarine power cable from Fort Johnson, "rather than across the main ship channel where it has been impossible to maintain service in the past." NPS relied on site-generated power for several years more. In 1950-51 as the tour program began, diesel generators were installed in Battery Huger, "inside one of the Battery rooms," and electrical connections were repaired or provided for all rooms. In the spring of 1951,



Figure I.B-84. 1949 view while Army barracks building is demolished (lower left). (FOSU photograph files)

Developments, 1949-1969; FOSU library.
272. Luckett, "Report on Activities at Fort Sumter National Monument during the past 10 Months," April 20, 1950. Luckett's report provides no further information on the Army's cable.



Figure I.B-85. Excavating the parade ground, 1951. Left flank casemates are in the background. "The reduction of the parade ground to its original level, and the removal of massive 1870s concrete structures." (Luckett, "Report on excavations 1951-1952")

a short-wave radio was set up for contact between the fort and NPS headquarters, at that time in downtown Charleston, and a few months later the 1930 submarine cable was reworked for telephone service, which replaced the radio.[273] In late 1953, NPS still relied on a gasoline-driven generator to light the interior of Battery Huger.[274]

In the 1950s, NPS undertook a series of large projects to remove fill from Fort Sumter, excavate portions of the historic features, and repair and stabilize the structure. During the first excavation, in 1951, staff and laborers removed much of the fill from the interior of the left face and left flank, and removed some 1870s features (two granite gun emplacements and a brick archway/gallery). They stabilized the roofing over the first-tier casemates using stone salvaged from the fill and from the features being removed, and repointed the arches and walls on the left flank.[275]

A new excavation began in 1955, its objective to uncover remnant walls and flooring in the left flank barracks. The upper three feet of the fill covering the area was found to be a sand-earth mix; the lower two to three feet comprised brick bats, stone, broken iron pieces, and other rubble. Excavations the next year along the gorge west of Battery Huger uncovered two magazines and portions of seven other rooms. Walls were repointed, and the

273. Luckett, "General Information," January 1952.
274. Letter, Regional Landscape Architect O'Neil to Director, November 18, 1953.
275. Repointing is the replacement of the outer ("pointing") mortar of masonry joints. William W. Luckett, "Report on excavations along Fort Sumter's left flank interior, August 7 to October 18, 1951, and May 6 to June 20, 1952." FOSU vertical file, Drawer 23.



Figure I.B-86. Interior of left flank casemates, 1950. (FOSU photograph files)

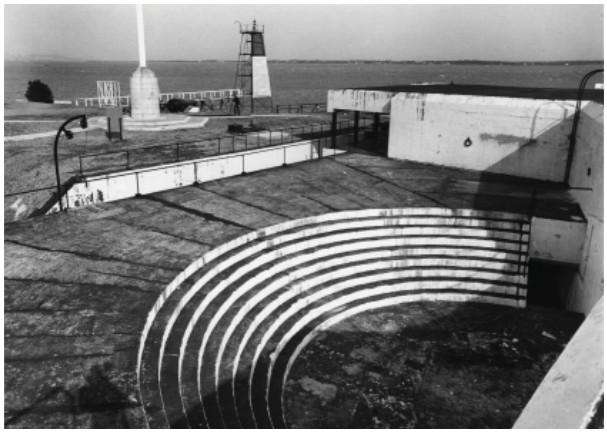


Figure I.B-87. View looking north from Battery Huger, showing ranger tower and base of Anderson flagpole, 1951. (FOSU photograph files)



Figure I.B-88. West face of Battery Huger in 1952. (FOSU vertical file, Photograph Drawer 3)



Figure I.B-89. Excavating at left shoulder angle, 1955. (Comstock, "Excavation Report: Fort Sumter National Monument, June 17-30, 1955." FOSU vertical file, Drawer 23)

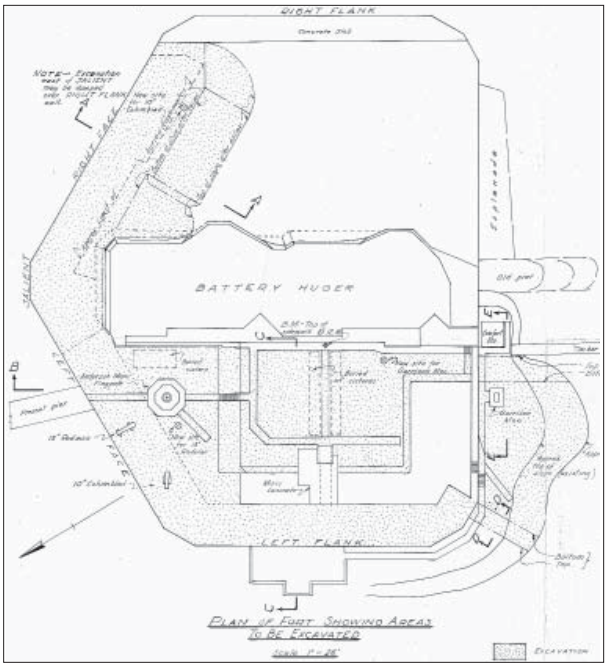


Figure I.B-92. 1958 plan of Fort Sumter showing areas to be excavated, original and new sites for Union Garrison Monument, locations of buried cisterns, slope locations, and dump sites for excavated material. (FOSU vertical file, Map Drawer C, Folder FS-7) See larger drawing in Appendix G.



Figure I.B-90. Fireplace in Officers' Quarters seen in 1958 view. In an 1845 letter, Totten had advised Bowman that "the jambs and faces of the fireplaces in both stories should be laid in the handsomest brickwork, the backs of fire bricks." (HABS SC,10-CHAR.V,3-21)



Figure I.B-93. Right face casemate, seen beyond steps in 1992 view. (HABS SC,10-CHAR.V,3-164)



Figure I.B-91. The 1874-75 sallyport in May 1958 after removal of the board infill. Confederate Garrison Plaque is mounted on wall at left. (HABS SC,10-CHAR.V,3-9)

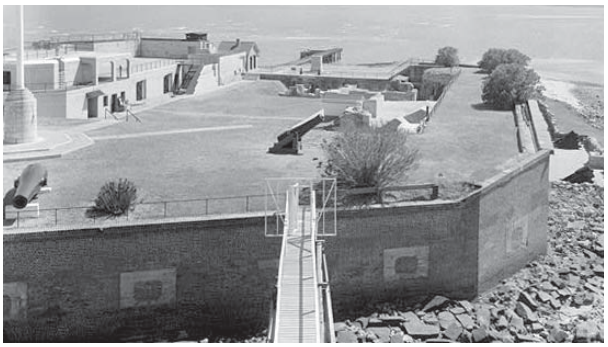


Figure I.B-94. View looking north from the ranger tower, 1958. On the left are the Anderson flagpole and west face of Battery Huger. Straight ahead are the Union Garrison Monument on its original site, and the timber catwalk to the searchlight tower. (FOSU photograph files)

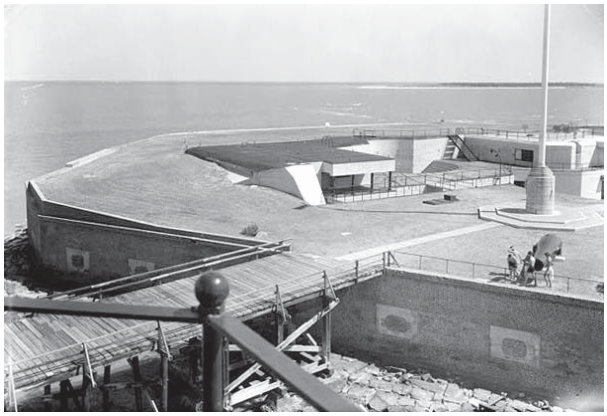


Figure I.B-95. View looking northwest from the ranger tower, 1958. In foreground is the 1921 dock at left face. (FOSU photograph files)



Figure I.B-98. Gorge wall and remains of officers' quarters and powder magazine in 1963 after excavations. (HABS SC,10-CHAR.V,3-5)



Figure I.B-96. East half of the esplanade and original wharf head after being cleared of debris. (FOSU photograph files)



Figure I.B-99. Left face casemates, seen in 1970s view. (HABS SC,10-CHAR.V,3-136)



Figure I.B-97. Worker shoveling sand during 1959 excavations at left gorge angle. ("Excavation Report: Fort Sumter National Monument, December 29, 1958 – May 13, 1959." FOSU vertical file, Drawer 23)



Figure I.B-100. Union Garrison Monument on the west parade ground, where it was relocated in 1959. Seen in 1992 view. (HABS SC,10-CHAR.V,3-78)

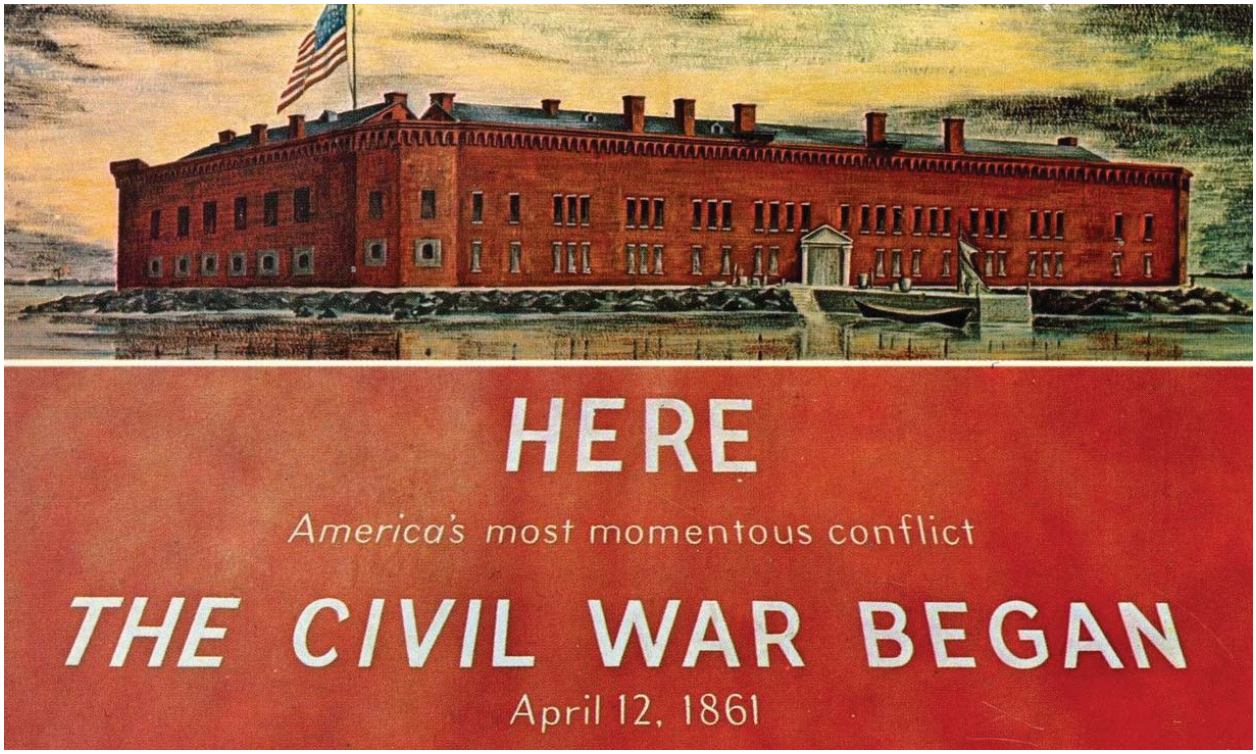


Figure I.B-101. Centennial postcard, announcing "Here the Civil War Began, America's most momentous conflict." (personal collection)

parade ground was sloped and sodded. In 1957, excavation continued in the left flank barracks. Brick flooring, fireplaces, and remnants of walls were uncovered.[276]

The final and largest excavations were made in 1959, designed to remove the rest of the fill from the west parade and expose the right face. The esplanade outside the gorge wall was uncovered, casemates at the right face and salient angle were unearthed, and the masonry retaining walls behind them removed. Many buried cannon and mounts were salvaged, but much of the material removed from these areas was "disposed of" seaward of the right flank wall.[277]

Holes in the casemate roofs, made in 1898-99 when the casemates were filled with sand for construction of Battery Huger, were patched with concrete. The last of the 1898-99 concrete magazines and cisterns were removed, as was the concrete gallery leading from the sallyport toward Battery Huger. The Anderson Flagpole Memorial and Union Garrison Monument were moved to their present locations; a 15-inch Rodman and a 10-inch Columbiad were also relocated.[278] Masonry work carried out in 1959 used salvaged brick to patch eight unspecified areas as needed. Item 22 of the contract specifications stipulated that "Old brick which match existing brick will be available to the contractor for installation where replacement of brick is necessary."[279] The source of the brick is not identified.

276. Comstock, "Excavation Report: June 17-30, 1955;" FOSU vertical file, Drawer 23. Horace J. Sheely, Jr. "Excavation Report: Fort Sumter National Monument, May 7 – June 21, 1956." Sheely, "Excavation Report: Fort Sumter National Monument, March 27 – May 28, 1958;" FOSU vertical file, Drawer 23.
277. Work began on December 31, 1958.

278."Excavation Report: Fort Sumter National Monument, December 29, 1958 – May 13, 1959." "Completion Report of Construction Project. Begin December 1958, End May 1959;" FOSU vertical file, Drawer 23.
279."Masonry Repairs." 1959; in *Fort Sumter Developments, 1949-1969.*



Figure I.B-102. Visitors seen in 1959 entering the fort from the 1921 dock directly onto Battery Huger. (FOSU photograph files)

Visitor Center and Continuing Improvements, 1960-present

As superintendent at Fort Sumter, Luckett prepared the park's Mission 66 Prospectus over several months during 1955-1956. As discussed in the previous chapter, Mission 66 was a ten-year NPS program to improve visitor services by 1966. Essential to the program was a Visitor Center in each park, but Luckett's task was under a tighter schedule than most parks. As others planned for a 1966 completion, he had only a few years to prepare, his deadline being 1961 when thousands would attend activities of the Civil War Centennial. There was little time to build a Visitor Center.

To manage Fort Sumter without adding a new building, Luckett's plan proposed that Fort Sumter's "visitor center will be the fort, itself." Offices and museum facilities would need to be housed within Battery Huger, despite earlier recommendations.[280]

280. Letter, Luckett to Director, 7 November 1955.

The Prospectus explains that "Battery Huger will house offices and provide museum facilities... The uncovered left half [of the brick fort] will provide opportunity to examine the structure and understand better the aims for its building and the purposes it served during the war."[281]

The adaptive use plan for Battery Huger was carried out in 1960 in large part to prepare for the Centennial. Demolition and remodeling included removal of an existing "comfort station" and two rooftop enclosures, filling of the gun pits and the spaces left by removal of gas tanks, and leveling the fill in the area of the former comfort station to the grade of the surrounding terrain. New aluminum doors and aluminum window walls replaced the systems along the west (left) side. Staff offices were created on Battery Huger's upper level. In March, work began on construction of

Luckett, "Mission 66."
281. Ethan Carr, *Mission 66. Modernism and the National Park Service Dilemma,* (Amherst: University of Massachusetts Press, 2007), p. 3-13, 175-197. Luckett, "Mission 66 Prospectus," April 19, 1956. FOSU, "Completion Report. Battery Huger Development."



Figure I.B-103. "Pouring one section of Battery Huger retaining wall" during 1960 redevelopment. ("Completion Report. Battery Huger Development. PCP B-4-07;" in *Fort Sumter Developments, 1949-1969*. FOSU library)

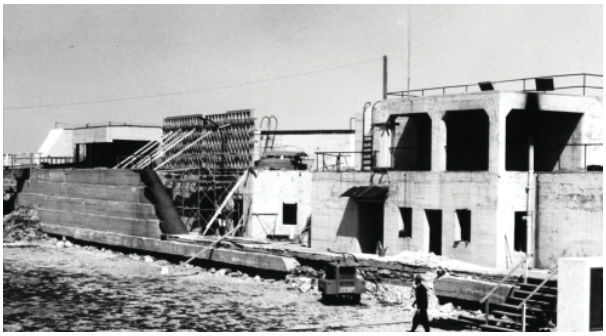


Figure I.B-105. West face of Battery Huger showing scaffolding in place for 1960 redevelopment. (FOSU photograph files)



Figure I.B-104. "Pouring new concrete fill in museum as a leveling course over 4' thick existing concrete floor." ("Completion Report. Battery Huger Development. PCP B-4-07;" in *Fort Sumter Developments, 1949-1969*. FOSU library)



Figure I.B-106. "View of northern end of Battery Huger featuring completion of window wall units and workers installing window units in Superintendent's office" during 1960 redevelopment. ("Completion Report. Battery Huger Development. PCP B-4-07;" in *Fort Sumter Developments, 1949-1969*. FOSU library)

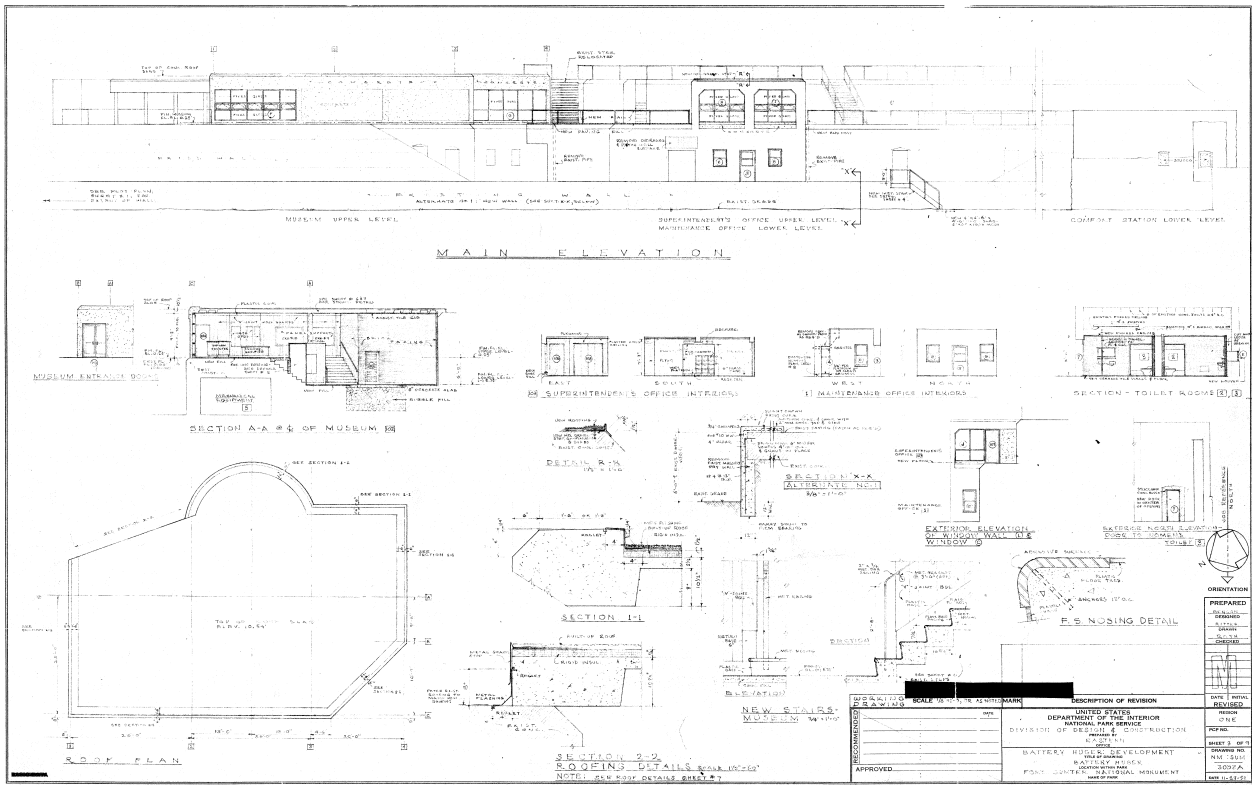


Figure I.B-107. "Battery Huger Development, Elevations & Roof Plan," November 23, 1959. (FOSU map files) See larger drawing in Appendix G.



Figure I.B-108. New concrete pier and dock at left flank, built in1961. (FOSU photograph files)



Figure I.B-109. Pre-1970 aerial photograph showing 1961 dock at new location, Anderson flagpole at new location (moved 1959), Battery Huger roof, and excavated west parade ground and casemates. (Postcard)

a new museum, creating a new roofed enclosure in the disappearing gun position. A concrete slab continuous with the level of the museum floor was poured over part of the steps down the disappearing rifle pit. New public restrooms, a maintenance office, and HVAC and plumbing installations were fit into the lower level.[282] Work was completed in mid-December.[283]

Access to the fort was also improved. A 1959 photograph shows visitor access at that time, entering the fort from the 1921 Army dock at the left face, then stepping directly onto the roof of Battery Huger (*Fig. I.B-102*). In 1961 as the Centennial began, the old dock was demolished and replaced with a long concrete dock on new location, leading to the left flank and entering the fort at the sallyport (*Figs. I.B-108, 109*).

The year 1964 saw construction of concrete walkways at the right shoulder angle and Battery Huger. The next year, NPS reworked the openings

282. "Battery Huger Development Specifications." NPS, 1959. "Completion Report. Battery Huger Development. PCP B-4-07;" in *Fort Sumter Developments, 1949-1969.*
283. Clark and Wylie, *HSAR*, p. III.02-15.

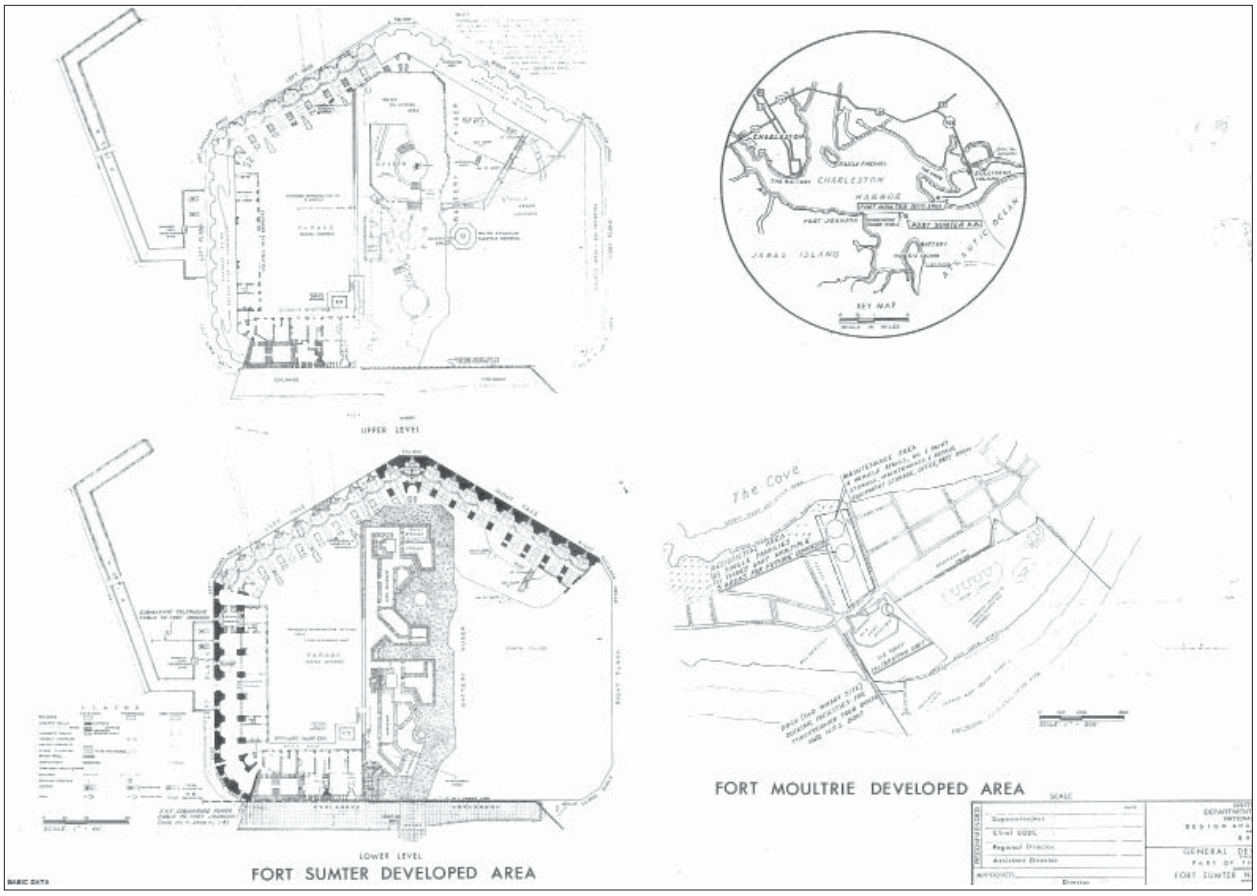


Figure I.B-110. "General Development Plan, Part of the Master Plan," May 1965. (FOSU map files) See larger drawing in Appendix G.

along the left flank, installing a new sallyport door, a postern gate, and cypress shutters for the gun embrasures.[284]

Dramatic increases in visitation to Fort Sumter led to several modernization projects. In 1968, new cisterns were added at Battery Huger, and a septic tank and leach field were laid outside the left gorge angle. In 1969, the HVAC system at Battery Huger was upgraded. Interpretative changes were made in 1970 when five flagpoles were placed around the Anderson Monument.[285]

Efforts were also made to protect the fort. Erosion control projects were conducted around the exterior of Fort Sumter in 1971 and 1972, including the installation of new riprap.[286]

The 1974 Master Plan for Fort Sumter National Monument addressed interpretive and preservation goals. The interpretive goal was clear: Fort Sumter would be maintained and interpreted as a "slice of time:" the history of the Civil War at Charleston. The Master Plan proposed an archaeological/ engineering study to assess the feasibility of removing Battery Huger and much of the right field fill. Removing the concrete battery would serve two purposes, making more of Fort Sumter available to visitors, and improving the "appreciation of the structure much as one would have found it during the period 1863-1865."

The plan also suggested developing a new interpretive center in the officers' quarters area,

284."Specifications. Construction of New Dock, Demolition of Existing Dock. Fort Sumter National Monument" and "Invitation for Bids. Concrete Walk and Steps;" in *Fort Sumter Developments, 1949-1969. Fort Sumter HSAR*, p. III.02-16.

285. Clark and Wylie, *HSAR,* p. III.02-16. "Specifications. Heating and Air Conditioning Rehabilitation. Battery Huger Visitor Center, Fort Sumter National Monument." 1969; in *Fort Sumter Developments, 1949-1969. Fort Sumter National Monument Master Plan* (NPS, 1974). Ferguson, *Overview* (HABS), p. 61. *Fort Sumter National Monument General Management Plan & Environmental Assessment (*NPS, SERO, 1998), *p. 31.* Robert M. Utley, "The Flags of Fort Sumter" (National Park Service, 2004).

286. Clark and Wylie, *Fort Sumter HSAR*, p. III.02-16.

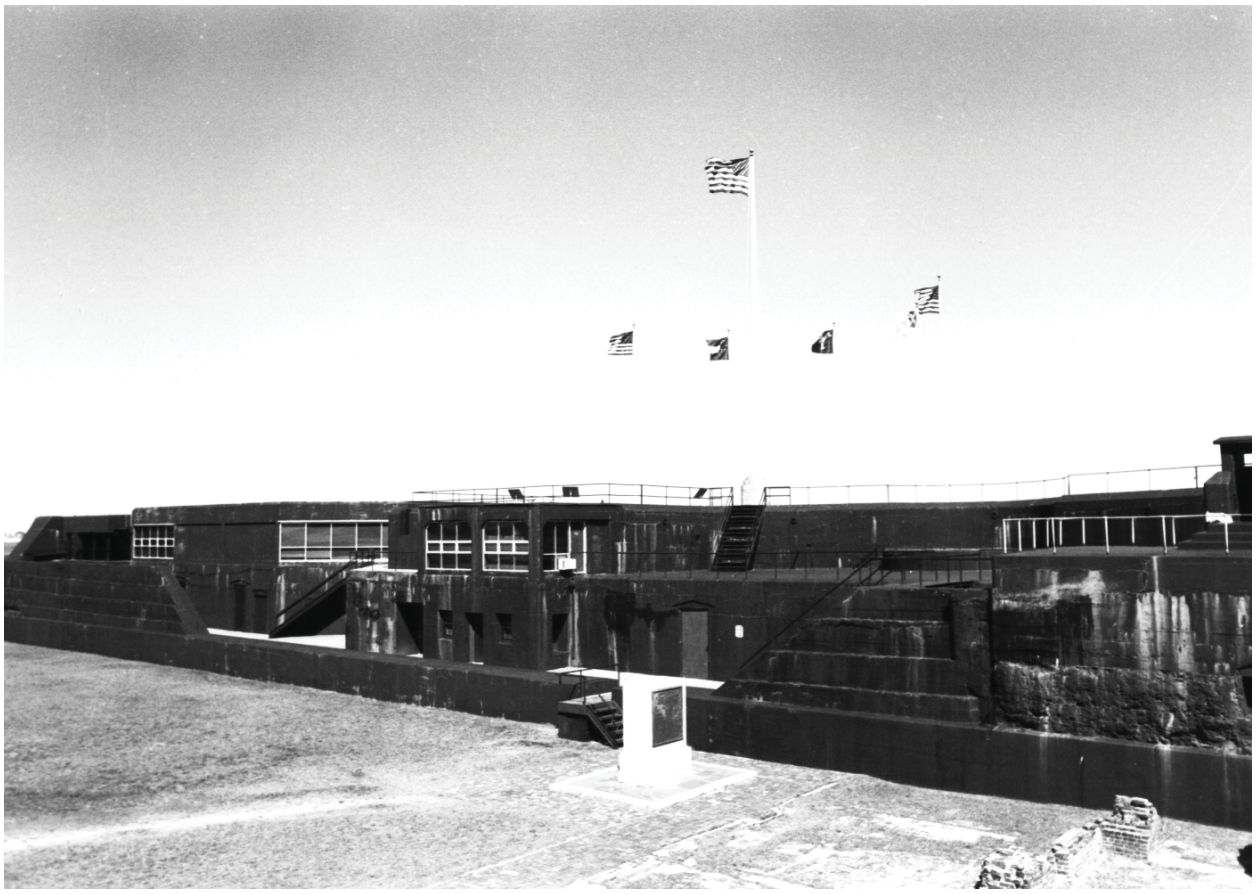


Figure I.B-111. Condition of the west face of Battery Huger later in the 1970s. The new flagpoles are in the background. (FOSU photograph files)

which could be made accessible by restoring the original sallyport.[287] The 1974 Master Plan guided operations at Fort Sumter for nearly a quarter-century.[288]

On September 21, 1989, Hurricane Hugo destroyed the underwater electric cable to Fort Sumter, damaged the dock and leach field, as well as many small-scale features including signs, shutters, and doors. The damaged 1961 dock was replaced in 1991 with a new dock. It retained the same landing location at the left flank and sallyport, but the dock was built west of the existing dock, allowing it to remain in use during construction.

In the summer of 1991, the Historic American Buildings Survey (HABS) conducted a recording project of Fort Sumter that included twenty-one sheets of measured drawings of existing conditions and three interpretive sheets, all addressing only the brick fort (see Appendix H). The project included a written historical overview. Documentary photographs taken by Jack E. Boucher also included only the brick fort. These were among the last hand-drawn measured drawings made by HABS before moving to digital drawing programs. Field notes, drawings, written history, and photographs are archived at the Library of Congress (HABS No. SC-194).

Improvements in interpretation at Fort Sumter continued. In 1991 a portion of the second floor of Battery Huger was remodeled for installation of a bookstore. The next year, a metal stair from the parade to the restroom area was built beneath the museum, a wooden security wall was built atop the west section of the gorge wall, and three wheelchair platform lifts were installed.

In 1992, Stephen M. Clark and James H. Wylie prepared a detailed assessment of Fort Sumter's historic features, the *Fort Sumter Historic Structure Assessment Report* (*HSAR*), to investigate conditions

287. *1974 Master Plan*, pp. 1-2, 18, 45.
288. *Ibid.*, p. 2.



Figure I.B-112. 1970s aerial view showing Anderson flagpole and 1970 circle of flags, 1961 dock with "Fort Sumter Tours" boat. (Postcard, personal collection)

and recommend preservation treatments. They commented on problematic aspects of site management, particularly those associated with the effects of wind and water. Importantly, they point out that casemate roofs were not designed as roofs, and as such have never had waterproof integrity. They note that modifications for better waterproofing would possibly destroy some of the 1870s historic fabric, but would protect the more important original construction. They recommended, nevertheless, that cracks should be sealed, roof surfaces should be coated, and precipitation should be routed to all drains.[289]

Also in 1992, a structural analysis was conducted by the Army Corps of Engineers to investigate the feasibility of Battery Huger's removal. The Corps determined that "no significant movement of the walls and other structures to remain at Fort Sumter would be expected from the removal of Battery Huger." The report noted that the selected removal method should create as little vibration as possible, and gave recommendations for the process.[290]

In 1993 after Hurricane Hugo, staff replaced the Battery Huger museum roof, installing a Hypalon waterproof membrane covered with Styrofoam sheets and loose-laid brick.[291] The museum was renovated in 1994 with the goals of providing handicap accessibility, protecting artifacts from sunlight, and bringing the exhibit in line with current scholarship. A metal stair was constructed at the museum's rear exit, and display areas were reconfigured.[292]

A series of management plans has guided the work at Fort Sumter since the first Master Plan in 1949. These are also discussed in Section IA, *Historical Background and Context*, above. The fort currently operates under the 1998 General Management Plan and Environmental Assessment,

289. Clark and Wylie, *HSAR,* p. I.01 – 4.
290. U.S. Army Corps of Engineers Charleston District, "Battery Huger Foundation Investigation, Report of Investigation and Analysis, Fort Sumter National Monument, South Carolina." (September 1, 1992), pp. 1, 7.
291. Ferguson, *Overview* (HABS), p. 61. "Hugo Damage Assessment Report;" FOSU Headquarters. Contract files at FOSU Headquarters.
292. Carlin Timmons and Sandy Pusey, "Fort Sumter National Monument's New Facility at Liberty Square," 2002; in CRM No. 4-2002, pp. 40-41, crm.cr.nps.gov/archive/25-04/25-04-12.



Figure I.B-113. Aerial view showing 1991 dock, shoals at low tide, Morris Island and the Atlantic Ocean beyond.

which addresses administrative aspects of the park, especially staffing and visitation, as well as the park's approach to the structures. The plan proposes no changes that would physically affect the historic fabric, and, because of budget limitations, suggests that Battery Huger not be removed "at this time." The removal alternative was rejected as infeasible not only because of the cost of removing the structure and fill, but also because it would require relocation and redesign of the museum, and structures to house restrooms and storage. The plan repeats the 1992 conclusion that removal would cause no significant damage to Fort Sumter.[293]

The 1998 GMP finds that preserving the ruins of the brick fort is least disruptive on the resource, and provides interpretive opportunities. The plan proposes continuous monitoring and repointing of Fort Sumter's exposed masonry as a priority management action. Further, the GMP outlines several studies that are needed: resource changes since 1956 and their causes; Historic Structure Assessment Report (HSAR) for Battery Huger; amendment to Fort Sumter HSAR to include parade ground; and a structural foundation study and HSAR for riprap and underwater resources, to include the effect the riprap might be having on the masonry fortification, and any deterioration that might be caused by water and wave action. The GMP finds these studies urgent to an understanding of the impacts of the marine environment on the fort.[294]

Repointing the historic masonry is a recurring maintenance requirement at the fort.[295] The scope of two projects in 1983 was to repoint 7,000 square feet of the scarp walls at the right face, right shoulder angle, right flank, and right gorge angle, and 3,900 square feet at the left face and left shoulder angle.[296] Another 6,400 square feet of the left flank, left gorge angle, and gorge wall were repointed in 1984. That project also included

293. 1998 GMP, pp. 14-15, 25, 37, 73.

294. *Fort Sumter General Management Plan*, pp. 24, 28, 41-45, 73.

295. Repointing is the replacement of the outer ("pointing") mortar of masonry joints.

296. The mortar specification was one part white Portland, four parts "Type S" lime, twelve to fifteen parts sand, and one part shell.



Figure I.B-114. A container ship enters the harbor. Damage to the fort from an increase in cruise and container ship traffic is of concern.

resurfacing eleven gun embrasures at the salient, left face and left shoulder, and nine casemates at left flank and left gorge angle.[297]

More recently, repointing was carried out in 1998 for an unidentified 3,500 square feet at the exterior right face, right gorge angle and right flank. (The bid documents also called for stuccoing nineteen embrasures, repointing an additional unidentified 7,000 square feet, and brick repairs at 1,200 square feet, but the contractor defaulted and it is uncertain what portion of this work was accomplished.) In 1999 plans called for repointing an unidentified 2,300 square feet at the right face casemates, 3,500 square feet at exterior right face wall, and 3,500 square feet of interior masonry. Forty surface brick were replaced, and 2,000 loose brick were salvaged from the exterior of the fort.[298]

The 1999 work also included replacing stucco on nineteen exterior embrasures and repointing 2,300 square feet on the right face parapet walls and piers.[299] The contractor repaired clay drains and replaced 125 linear feet of metal downspouts and ten cast iron drain caps. A bituminous coating was removed from the right face casemate roofs, cracks sealed on 4,900 square feet, and a new Acrymax brand roof sealing system installed.[300]

In 1999 or 2000, NPS also applied a black Acrymax elastomeric coating on Battery Huger; however, not only the roof but all exterior concrete surfaces, including walls, were covered.

In 2002-03, NPS carried out the same work on the left flank casemate roofs. Failing stucco was removed and cracks dug out and filled with mortar. The roof was then recovered with stucco before the "reinforced elastomeric composite membrane system" was placed on top. The same coating was used on Battery Huger, in an attempt to combat continuing moisture problems in the museum and restrooms.[301]

Brick walkways were laid at the right face casemate gallery and enlisted men's barracks in 2001.[302] Spot repointing of unidentified areas of the gorge wall was undertaken in 2006, and spot repointing of unidentified interior areas around the left flank casements and officers' quarters was undertaken in 2007.[303] Areas of the right shoulder angle and right flank wall were repaired and repointed in 2008.[304]

297. Contract files at FOSU Headquarters.
298. Ibid. Mortar specification for the 1988 and 1999 work was two parts gray Portland cement, four parts lime, eight parts red sand, eight parts brown sand, two parts oyster shell.
299. Stucco specifications: one part gray Portland, two parts lime, five parts sand, one-half part oyster shell.
300. Contract files at FOSU Headquarters.
301. Behre, Robert, "Fort Sumter Now Defends Against March of Time," *Charleston Post and Courier*, April 4, 2003. http://news.google.com/newspapers?nid=2482&dat=20030414&id=HCJaAAAAIBAJ&sjid=2UsNAAAAIBAJ&pg=5693,6421622.
302. Contract files at FOSU Headquarters.
303. The 2006 mortar specification was one part Portland cement, four parts lime, thirteen parts red sand and oyster shell. The 2007 work used a mortar specified as "eight parts custom-mixed lime putty, one part Rosendale cement."
304. Contract files at FOSU Headquarters.

The three wheelchair lifts were replaced in 2005, although none are in service today and there is no wheelchair access to the museum, bookstore, restrooms, or observation level. The restrooms were rehabilitated in 2009.[305]

In 2010, a program of materials analysis and conservation testing was undertaken by NPS with the goal being to generate information to guide the various repairs to historic fabric being performed at the fort, in particular the frequent repointing. This research was an integral part of the 1998 GMP, as it was intended to develop a strategy for the conservation of the fort's historic building materials. The results of this testing program were included in the text and as a series of appendices in a draft 2011 Fort Sumter Historic Structure Report unrelated to this 2015 HSR. The 2011 document was prepared for the Cultural Resources Division of the NPS Southeast Regional Office. The primary HSR team consisted of NPS staff persons from Fort Sumter National Monument, Liollio Architecture, Clemson University's National Brick Research Center, and Environmental Resources Management.

That 2011 draft document provides an overview of the history of Fort Sumter and attempts to describe the physical structure and its existing conditions. A substantial portion of the document is dedicated to an evaluation of the fort's building materials and the perceived threats to which these materials are subjected. The draft HSR was canceled by NPS before it was completed. However, the technical studies contained therein became part of the park's conservation strategy for mortar and other materials, warranting a comprehensive review as part of this 2015 HSR. Accordingly, the technical information included in the cancelled 2011 draft HSR was reviewed, evaluated, and found wanting. Our evaluation of the material analysis contained in the cancelled 2011 draft HSR is in *Appendix F* of this 2015 HSR, with recommendations for remedial actions contained in Part *II.D: Recommendations for Treatment*.

305. Ibid. NPS website states, "The museum, restrooms, bookstore, and top level of Fort Sumter are only accessible by climbing stairs."

Timeline

1670		English colonists initially settle on west bank of Ashley River.
1674		Manned signal cannon placed on island at harbor entrance.
1680		Colonists relocate to create permanent settlement, Charles Towne, on peninsula.
1704		War of Spanish Succession in 1701 and fear of Spanish attack prompt plan for ring of waterfront defenses around city and harbor.
1706		French and Spanish ships repelled from entering harbor.
1708		Fort Johnson built at point on James Island.
1754		Seven Years War prompts new bastion added to city's waterfront defenses.
1775	June	SC regiments capture Fort Johnson from British.
1776		First Fort Moultrie (later known as No. 1) built at west end of Sullivan's Island.
1780	May	Peninsula's waterfront fortifications built of "formed earth and palmetto wood. . .and mounted with heavy cannon." Nonetheless, city surrenders to British.
1783		City of Charleston incorporated.
1794		Congress approves improvement of fortifications at 16 ports. Work underway at three in Charleston area: Fort Johnson; a new Fort Moultrie (No. 2); and new battery downtown, Fort Mechanic. Funding ends with 1795 Jay Treaty with Britain.
1798		Earth-and-timber Fort Pinckney built in Charleston Harbor.
1804		Hurricane leaves in ruins Forts Moultrie, Johnson, and Pinckney.
1805		SC grants U.S. government full title to Forts Moultrie, Johnson, and Pinckney.
1807		Congress authorizes "Second System" of coastal defenses; Forts Moultrie, Johnson, Pinckney, and Mechanic completed in 1809.
1808		Overseas slave trade abolished.
1815		Inadequacy of Second System in War of 1812 prompts President Madison to call for new "Third System" of harbor defenses.
1816		Board of Fortifications formed; 42 Third System forts subsequently built.
1821		Charleston among 40 seaports selected for new Third System masonry forts.

1826	Charleston chosen as one of first-priority ports for new fortification; new fort on shoal proposed.
1827	Plans approved for "Casemated Battery designed for the shoal opposite Fort Moultrie, Charleston Harbour [sic], S.C."
1828	Congress makes first appropriations.
1829	Lt. Henry Brewerton appointed supervisory engineer, establishes Corps of Engineers headquarters at Fort Johnson. Advertisements in Northern newspapers request stone for foundation mole.
1832	Construction of stone mole begins.
1834	Work suspended when citizen claims title to shoal.
1840	Claim found invalid; governor conveys site to Federal government.
1842	Stone wharf completed; gorge foundation begins.
1845	Foundation complete. Subsidence test of mole shows no perceptible sinking or settlement. Construction of walls using locally-produced Carolina Gray brick commences.
1846	Gale damages esplanade; brick cisterns under construction; some piers and portions of scarp wall complete.
1847	Esplanade raised; sallyport complete; 5 cisterns installed (one beneath sallyport, others beneath center casemates); 41 first-tier embrasures completed.
1848	Recess arches over embrasures completed.
1850	Foundation settlement decreasing despite increased weight of superstructure.
1851	Cisterns made watertight; first-tier embrasures completed; first traverse circles laid; lower shutters hung; parapet completed; arches turned; gutters built, sallyport gates hung; right flank barracks pilings driven. Construction begins on gorge pilings.
1852	Barracks foundation complete.
1854	Storm damages wharf; gorge foundation complete.
1855	Some roofs capped with concrete and asphalt; barracks roofs slated; range light erected.
1856	Traverse circles laid; octagonal structures erected above three stair towers; brick banquette shelves built at parapet wall; officers' quarters substantially completed.
1857	Masonry gun platforms laid; upper battery nearly complete.
1858	Parapet complete; interior work continues.
Aug.- Sept.	Some 300 Africans freed from slave ship are interred at Fort Sumter; subsequently transported to Liberia.

1860	New wharf under construction at left flank sallyport; work continues on casemates, barracks, and officers' quarters.
Dec. 20	South Carolina votes to secede.
Dec. 26	Union Major Robert Anderson moves garrison from Fort Moultrie to Fort Sumter; suspends construction not related to defense. Only 15 guns mounted by year's end.
1861	Work focuses on securing sallyport, gates, shutters, and openings; additional 45 guns mounted; esplanade and wharf mined.
Jan. 9	Citadel cadets fire on civilian merchant vessel bringing supplies and troops to Union garrison at Fort Sumter.
Feb. 4	Congress of six seceded states and one in the process approves constitution for Confederate States of America.
April 10	President Lincoln states Federal ships en route to Fort Sumter are bringing only supplies, not troops.
April 12	At 4:30 a.m., Confederate troops begin bombardment of Fort Sumter; fires cause extensive damage.
April 14	Federal troops evacuate; join Union fleet outside harbor; Confederates immediately take over fort; engineers begin repairs and alterations.
	Fort Sumter becomes popular with visitors, news correspondents and artists.
1862 April	Two Third System forts (Pulaski and Macon) surrender after one-day bombardment, confirming that Third System fort design was obsolete by 1860s advent of rifled guns.
Sept. 22	Lincoln warns he will issue emancipation proclamation if slave-holding states do not end rebellion by January 1, 1863.
1863 Jan. 1	Lincoln issues Emancipation Proclamation.
April	Union bombardment causes little damage to fort, unlike August and October bombardments and December explosion and fire. Repairs continue.
1864 July	Bombardment has little effect as fort is already "an impregnable mass of rubble and earth." Repairs continue.
1865 Feb.	Union General W. T. Sherman begins march from Savannah across South Carolina.
Feb. 17	Sherman reaches Columbia, SC capital; Confederates evacuate Fort Sumter, other harbor fortifications, and the city. Federal troops enter city the next day. Only part of three walls remain at the fort.
April 10	General Robert E. Lee discusses terms of surrender with Grant at Appomattox. Northern dignitaries, including General Anderson, travel to Fort Sumter for flag raising on April 14 anniversary of 1861 Union evacuation. Several thousand attend.
April 15	Lincoln dies after shot by assassin the night before.

1866	Lighthouse constructed at right face.
1868	Corps of Engineers declares the damaged Fort Sumter presents "the same general appearance as at the close of the war." Some walls destroyed nearly down to foundation; some at second-tier loopholes; others at full height.
1869	Reconstruction plan for Fort Sumter; insufficient funding limits work to excavation, debris removal, small-scale repairs.
1870	Corps of Engineers clears ruined portions of fort and salvages brick for reuse. Some walls rebuilt; new barracks repaired; Confederates' wharf repaired.
1871	Fortifications Bill approves new concepts for coastal defenses: heavy gun batteries with depressing carriages.
1872	Corps continues excavations, construction of new buildings, repairs. Rebuilds structural systems; modernizes weapons systems.
1873	Repair and rebuilding continues. Lighthouse moved; eight cannon mounted; eleven 100-pound Parrott guns installed.
1874	Repairs continue. Construction begins on magazines, new sallyport and gallery; guns mounted; lighthouse returned to original location. Hurricane floods parade ground, destroys most frame structures, damages parapet.
1875	New sallyport completed. Repairs continue; some interiors plastered; new retaining walls, magazines, and cistern added.
1876 June	Funding ceases. Fort Sumter has been transformed, though no garrison posted for two decades.
1881	Hurricane damages walls, destroys part of wharf.
1884	Guns and platforms determined unsafe.
1885	Storm destroys portions of wall, sallyport gate; damages wharf and quarters; deposits sand in casemates.
1886	Earthquake near Charleston causes little damage to fort. 1886 and 1887 Corps investigations report masonry cracks, extensive wood rot and rusting metal.
1888	Federal authorization of funding for Endicott defense system.
1891	Casemate remodeled as submarine mining control room.
1893	Hurricane damages right flank wall and inboard gun emplacements; destroys wharf range light tower, light keeper's quarters.
1895	Preliminary studies for the new Battery Huger.
1896	Corps builds timber wharf; Light House Board builds new light tower and new light keeper's residence. Three searchlights installed; 455-foot artesian well dug. Repairs made to right flank wall and right gorge angle.

1897	Garrison posted to fort.
1898	Work begins on Battery Huger, requiring alteration of most right face casemates, which had been rebuilt in 1870s. Five casemates filled with sand.
1899	Battery Huger is completed. Light House Board moves light keeper's house. Army begins construction of barracks; 1891 torpedo room discontinued.
1901	50-man barracks is completed; houses smaller garrison.
1902	Height of some walls is increased to protect battery; salvaged materials placed as riprap; walls patched with new brick.
1903	Brick boiler house replaces earlier frame boiler house.
1903	Light-House Board transferred to Department of Commerce and Labor.
1904	New brick latrine constructed on parade ground.
1907	Coastal Artillery Corps (CAC) is created.
1910	Light-House Board becomes the Bureau of Light-Houses.
1915	The 1896 range light is removed.
1917	Garrison of Coast Artillery Corps troops posted to Fort Sumter; temporary barracks erected; some casemates modified as barracks.
1919	Two new barracks completed.
1921	New wharf constructed at left face; 1896 wharf at right face abandoned.
1925	One barracks building demolished.
1926	Organized boat tours to Fort Sumter begin.
1928	Most of second barracks building demolished. Anderson flagpole and base erected.
1929	Confederate plaque placed.
1930	Bureau of Light-Houses lays cable from Fort Johnson to Fort Sumter.
1931	Fort Sumter transferred from U.S. District Engineers to Army's Harbor Post Command/ Harbor Defense Commanders.
1930s or 40s	Bluestone flagging and granite traverses of left-flank casemates replaced with concrete flooring.
1932	Union Garrison Monument is placed.
1933	Last section of barracks removed; brick latrine built for tourists; 1896 wharf demolished.
1939	Bureau of Light-Houses is merged into the Coast Guard.

1940	Stone breakwater replenished.
1941	New search light erected. Detachment of Coastal Artillery stationed at the fort.
1942	Tour boat operations cancelled during WWII; Fort Sumter off-limits to visitors.
1943	Battery Huger deactivated, its two guns removed. AMTB battery (Anti Motor Torpedo Boat) transferred from Army to Coastal Artillery.
1946	Gray Line Tours reopens service with 6,647 passengers the first year. AMTB deactivated.
1947	Fort Sumter is decommissioned.
1948	Fort Sumter, including Battery Huger, designated as National Monument, transferred from Army to National Park Service.
1949	Master Plan completed for management and interpretation; 11 buildings demolished; lighthouse and Coast Guard structures remain. NPS issues special use permit to Gray Line tour boats; landing dock constructed.
1950	Four Historic Structure Reports completed, each describing the fort on a particular day in the 1860s. Diesel generator installed in Battery Huger; interpretive signs installed on roof.
1951	Short-wave radio, then telephone system installed; temporary museum room created in Battery Huger; excavations of interior fill begin; some gun emplacements removed; repairs and repointing underway.
1952	Model of fort placed atop Battery Huger.
1953	Gasoline generator supplies power to Battery Huger.
1955	Excavations uncover remnant walls and flooring.
1956	Mission 66 Prospectus discourages construction of new building, proposes Battery Huger to house offices and museum facilities. Features of original officers' quarters uncovered; cleaning and repointing continues; parade ground sloped and sodded.
1959	Remaining fill excavated from west parade and right face; esplanade outside gorge wall uncovered. Casemates and cannon unearthed; much material is "disposed of" over right flank wall; remaining 1898-99 concrete magazines, cisterns, and gallery removed. Anderson Flagpole Memorial, Union Garrison Monument, and two guns relocated. Masonry repair underway using salvaged brick in some areas. Another Historic Structure Report completed.
1960	Battery Huger remodeling commences.
1961	Boat dock demolished and new dock constructed near left flank sallyport.
1964-69	Concrete walkways constructed; sallyport door, postern gate, embrasure shutters installed; underwater power cable replaced; Battery Huger cistern constructed; septic system installed south of the gorge wall; Battery Huger HVAC system upgraded.

1970	Five flagpoles installed at Anderson Monument.
1971-73	Additional riprap placed to combat erosion.
1978	Pier remnants parged.
1983-87	Repointing studies conducted; Accessibility lifts installed at Battery Huger; thermal window glass installed at museum and rangers' office.
1989	Hurricane Hugo destroys the electrical cable, damages dock, leach field, and small features.
1990-92	Leach field repaired; replacement dock constructed; electric cable replaced. At Battery Huger, bookstore opens, metal stair added from parade to first-floor level, wheelchair lifts installed. Wood security wall added atop gorge wall. HABS team conducts field recording documentation project. Historic Structure Assessment Report (HSAR) assesses historic features and conditions, recommends treatments. Corps of Engineers structural analysis concludes Battery Huger removal would cause no significant damage.
1993	New Hypalon museum roof installed beneath styrofoam panels and loose-laid brick.
1994-95	Museum renovated; windows infilled to reduce sun infiltration; display areas reconfigured; metal staircase installed at rear of exhibit area; water line replaced.
1998-99	Repointing at right face, right gorge angle, and right flank; 19 embrasures parged; brick repairs, stucco work, brick replacement underway; clay drains repaired; downspouts installed; casemates coating removed, roofs sealed with Acrymax waterproofing system.
2001-02	Brick walkways installed at right face casemate gallery and enlisted men's barracks; brick compressive strength testing conducted; additional casemate roofs sealed; repointing and stucco repair continue; bookstore and restroom roofs sealed.
2005	Three wheelchair lifts replaced.
2006-08	Flagpoles replaced; leach field modified. Spot repointing of gorge wall, left flank casemates, officers' quarters; repairs and repointing at right shoulder angle and right flank wall.
2009	Battery Huger restrooms renovated.
2015	Fort Sumter Historic Structure Report completed.

I.C Physical Description

This portion of the report is introduced by a general description of the fort and its setting. It is followed by four sections that address man-made features associated with the evolution of the original Fort Sumter. The first inventories significant man-made site features outside the perimeter walls of the original fortification. At some locations the features are intact and clearly visible. At other locations, remnants of the features are only partially or occasionally visible, as when the feature is submerged. And still other locations are noted because of their potential for containing unseen but valuable features. The second section contains an in-depth assessment of what remains of the accessible architectural fabric of Fort Sumter. The third section inventories significant non-architectural site features in the open spaces within the perimeter fort walls. And the fourth section is an in-depth assessment of Battery Huger, the added late-nineteenth century fortification that extends north-south across the original central open space of the fort. Each section ends with a *Summary of Conditions & Concerns*. Cumulatively, the man-made features addressed in the four sections provide a compelling inventory of many aspects of this National Historic Monument that merit consideration by park administrators.

An important product of an Historic Structure Report is a scaled set of digitized drawings of the subject buildings. Not only are accurate drawings necessary to document the location and scope of extant features and the physical conditions being assessed, they are essential to subsequent phases of monitoring, programming, and design. Unfortunately, we were informed that the 1991 Historic American Buildings Survey (HABS) drawings of the perimeter fort were drawn by hand and not on computer aided drafting software. Many but not all dimensions of elements in the drawings are specified. And though a scale is included on the drawings, the hand-drawn plans cannot provide precise measurements; the width of a hand-drawn ink line is not a single point as it is on a computer-generated drawing. Instead, the hand-drawn line when measured could account for more than a few inches, especially for buildings as large as Fort Sumter.

Recognizing this deficiency, our team of assessors took steps to acquire copies of the archived field notes of the HABS recording team from the Library of Congress. We used those field measurements to create digitized floor plans and site plan in AutoCAD, which is the preferred construction industry software for drawings. Battery Huger was not included in the 1991 HABS documentation effort. Therefore, our team measured that building in order to create the digitized floor plans in this report.

General Description

Locale

Fort Sumter is located in Charleston Harbor where the Ashley and Cooper rivers meet. The fort is strategically positioned at the harbor entrance, which is flanked by barrier islands.

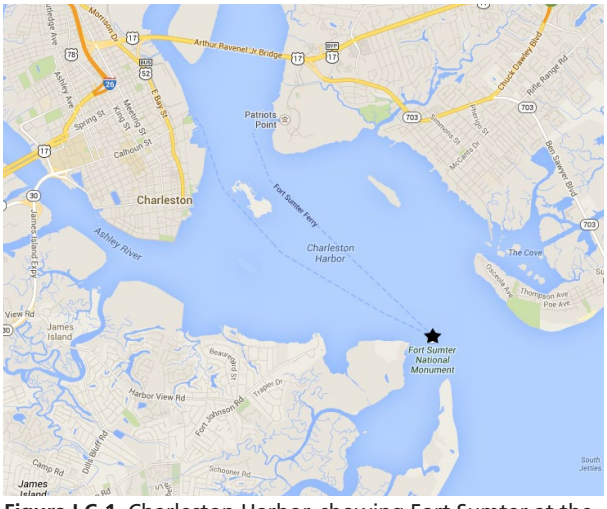


Figure I.C-1. Charleston Harbor, showing Fort Sumter at the mouth of the harbor. (Google maps)

Climate

Charleston has a subtropical climate with mild winters, hot humid summers, and significant rainfall year-round. Hurricanes and tropical storms are major threats to the coastal areas during the summer and early fall. Periods of unusually high tides raise the harbor's water level well up on the perimeter masonry walls of the fort. The average water level is expected to rise due to global warming.

Seismic Activity

Fort Sumter is located in an active seismic zone where earthquakes are a constant threat. Charleston suffered considerable damage from a major earthquake in 1886.

Terrain & Vegetation

Fort Sumter is constructed atop a manmade island built on a shoal, or sandbar, which was initially without vegetation. The terrain within the fort walls is generally flat. Native grasses, tolerant of salty or brackish conditions, are present on the parade ground inside the fort walls and in the leach field area outside the walls to the southwest.



Figure I.C-3. Native grasses outside fort walls.



Figure I.C-4. Aerial photograph.

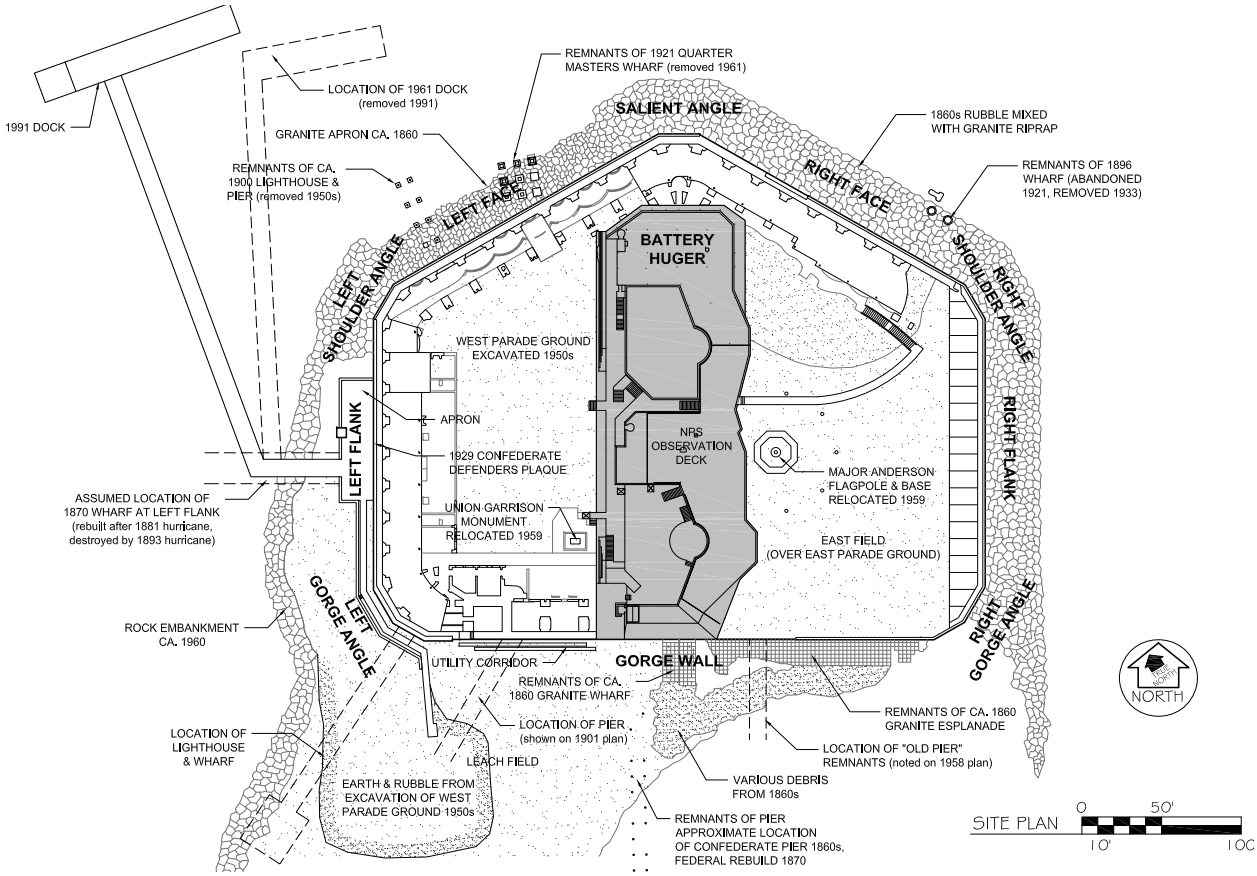


Figure I.C-2. Site plan of Fort Sumter.

The Fort Complex

Orientation & Location on the Site

The salient angle of the pentagonal fort is oriented approximately north-northeast, but for the purposes of this report is referred to as north.

Fort Sumter occupies nearly the entire island. An accessible area of land wraps the southwest corner of the fort walls. Large pieces of granite riprap, added over time, surround the perimeter walls on the north, east, and west sides.

Major Design Components & Spatial Interrelationships

The design components of Fort Sumter are in four areas: those outside the walls, the walls themselves, the open space within, and Battery Huger at the center of the original fort.

Man-made Site Features Outside the Fort Walls

Outside the fort walls are the remains of early site features essential to the multi-generational operation of a military installation as well as features and remnants of features associated with early and current tourism. Significant features identified include piers, wharfs, riprap, war rubble, lighthouses, utility service corridors, leach field, walkways, and esplanade. The site features outside the fort walls are discussed in Part A of the *Components of the Fort Complex* section immediately following.

Perimeter Fortification: Fort Sumter

The perimeter masonry walls of the original three-tiered pentagonal fort are primarily constructed of brick. The walls have undergone multiple phases of damage, modification, and repair. Today, the remaining perimeter walls stand between one-and-a-half and two stories tall.



Figure I.C-5. Southwest oblique from the top of the Gorge Wall.



Figure I.C-6. Casemate along a perimeter wall.



Figure I.C-7. Exterior view of sallyport doors at Left Flank wall.

Within the walled structure are casemates (vaulted gun emplacement chambers), which run the full length of four of the five walls. A wall opening for cannon, or embrasure, faces out to sea at each casemate of the Left Flank, Left Face, and Right Face walls. The Right Flank wall is rebuilt and its casemates are infilled with sand and earth, and remain inaccessible.

Today, the primary entrance to the fort is through the sallyport centered on the Left Flank wall. Wood double doors, set in a pedimented surround of stone, secure the entryway.

Ruins of the early commissary, medical spaces, etc., are exposed along the western half of the Gorge Wall at the south end of the fort. The east section of the officers' quarters is inaccessible, buried beneath the fill that forms the east field.



Figure I.C-8. Southeast oblique of the officers' quarters ruins.



Figure I.C-10. Walkways and displays on west parade ground.



Figure I.C-9. Looking west toward the enlisted men's barracks ruins.



Figure I.C-11. East parade ground looking west toward Battery Huger.

Ruins of enlisted men's barracks are exposed east of the Left Flank casemates. The enlisted men's barracks at the Right Flank is inaccessible, buried beneath the fill that forms the east field.

The perimeter fortifications and ruins are discussed in Part B of the *Components of the Fort Complex* section below.

Minor Man-made Site Features Inside the Fort Walls

Inside the fort walls, walkways and observation areas with "wayside" displays guide visitors around the small fort rooms and the open grounds where monuments and cannon are on display.

The parade ground west of Battery Huger is connected to the higher infilled area east of Battery Huger by modern walkways and stairs. The major site features inside the fort walls are discussed in Part C of the *Components of the Fort Complex* section below.

Battery Huger

Battery Huger was built in 1898-99 to modernize Fort Sumter with new artillery. The monolithic concrete facility was cast in place at the center of the original fort. It extends approximately 278 feet from Fort Sumter's south Gorge Wall to its casemates at the north Salient Angle of the pentagon.



Figure I.C-12. Southeast oblique of Battery Huger from west parade ground.

The massive addition physically divides the earlier complex horizontally into halves, the open field to the east and the relatively small-scaled rooms and parade ground of the original fort to the west. It also divides the site vertically, the roof-level observation deck of Battery Huger and adjacent east field separated by flights of stairs from the lower west parade ground and adjacent fort rooms of the original Fort Sumter. Battery Huger is discussed in Part D of the *Components of the Fort Complex* section below.

Design Organization, Materials, Style, Time Periods

The perimeter fortifications and what remains of the original fort design are distinct from the later Battery Huger in their materiality. The antebellum perimeter fort walls are typical of Third System fortifications and are largely constructed of brick. In contrast, the late-nineteenth-century Battery Huger is formed of cast-in-place concrete, typical of Endicott fortifications.

Utilities Services

NPS has updated many of the utilities at Fort Sumter in recent years. Much of the infrastructure is housed on the island perimeter outside the fort walls; in the southwest corner are three utility pits, a leach field, and a fire hydrant. Along the south side of the Gorge Wall is a utility corridor installed in 2009 for electrical and wastewater.

Mechanical System

Select rooms inside Battery Huger, including the museum space, the rangers' office, the bookstore, and the break room, are mechanically heated and cooled. The mechanical units for these spaces are described in the *Battery Huger* section below.



Figure I.C-13. Utilities in the southwest corner include a fire hydrant and utility pits.

Electrical System

Electricity is supplied to Fort Sumter through an underground line that runs east from Fort Johnson (on James Island). It enters the site through the modern utility corridor at the Gorge Wall. The three-phase commercial electrical service is provided by South Carolina Electric and Gas (SCE&G), a SCANA Corporation.

The electrical service also provides power to one of the two range lights. The light is located on a platform approximately three hundred yards from the fort in open water.

Plumbing System

Charleston Water System provides fresh water to Fort Sumter through a supply line running from Charleston to Sullivan's Island and connecting to a 24"-diameter underwater main. A water supply



Figure I.C-14. Water supply shut-off valve and water meter in west parade ground.



Figure I.C-15. Modern utility corridor outside of the Gorge Wall.

shut-off valve and water meter are located in the parade ground just west of Battery Huger.

Wastewater from Battery Huger runs through the modern utility corridor at the Gorge Wall, into a septic tank, and empties into a leach field outside the fort walls to the southwest. The septic system and leach field were updated in 2004.

Fire Protection & Suppression System
A fire hydrant is located outside the fort walls at the southwest corner of the site.

A fire suppression system is installed at Battery Huger to protect the museum. A backflow preventer and fire main are housed on the first floor. The fire suppression system is described in the *Battery Huger* section below.

Security System
A security system is in place.

Primary and Secondary Access
Access to Fort Sumter is by boat, primarily tour boats operated by concessioners under contract with NPS. These tour boats depart from Liberty Square in downtown Charleston and from Patriot's Point in Mt. Pleasant.

Private boats are permitted to dock at the site any day between 9 am and 5 pm. The perimeter fort walls are secured daily by NPS staff, including the embrasure openings, the sallyport doors in the Left Flank wall, and a small doorway in the southwest corner at the left gorge angle.



Figure I.C-16. Tour boat docked at Fort Sumter.



Figure I.C-17. Doorway at left gorge angle.

Components of the Fort Complex

A. Man-made Site Features Outside the Fort Walls

Methodology

The team surveyed this area to identify cultural resources that merit consideration in park management, as well as to inventory more recent features important to park operation. The area contains significant features from the 1840s to current day (see Site Plan, *Appendix B sheet B-1*).

The field surveys of this area were conducted over several extended site visits, and with wide variance in weather and water conditions. The on-site surveys were completed in December 2013.

Prior to the visits, early maps, photographs, and text records were reviewed for information about the evolution of the site. The HABS drawings prepared in 1991 were especially helpful, particularly the site plan with notations identifying remnants of early cultural features.

In addition to features in the HABS drawings, we noted the scattered artifacts of the fort's original construction that were recovered from the water in 2009 and deposited on the esplanade, where they remain.

During field investigations, the survey team used binoculars, tape measure, and digital cameras to record findings. Notations were recorded on a pre-prepared site plan and later converted by the architectural team to an AutoCAD drawing of the final site plan showing the locations of these significant features and resources.

Noted on the site plan (*Appendix B*) are the locations of significant features that no longer have visible remnants. Also noted are the locations of modern systems including a utility service corridor and leach field.

Description

ca. 1860 Granite-Paved Wharf

A portion of a ca. 1860 granite-paved wharf is exposed south of the Gorge Wall. The wharf is approximately twenty feet wide and aligns with the central north-south axis through the fort and site. The wharf was exposed during the excavations of 1959 (*Fig. I.C-a1*).

ca. 1841 Granite-Paved Esplanade

A twenty-five-foot-wide granite-paved esplanade running along the south side of the fort's Gorge Wall was under construction by 1841. It was damaged by a storm in 1846 and raised two feet the following year. Like the ca. 1860 granite-paved wharf at the Gorge Wall, the esplanade was exposed during the excavations of 1959. Today, remnants of this esplanade are exposed along the eastern half of the Gorge Wall.



Figure I.C-a1. Remnants of ca. 1860 granite-paved wharf.



Figure I.C-a2. Remnants of ca. 1860 granite-paved esplanade.

1840s Riprap & 1860s Building Rubble

During construction of the fort, blocks of granite rocks were placed as riprap along the fort walls. By 1865 when the Confederates evacuated Fort Sumter, the fort walls were substantially reduced by the years of bombardment. Rubble from the walls, mixed with the early granite riprap, remain today. The HABS team noted an especially rich deposit of 1860s building fragments adjacent to the east section of the Gorge Wall. New stone was added to replenish the riprap in 1972.

Remnants of 1893 Wharf at Right Shoulder Angle

Submerged masonry bases for piers of an 1893 wharf are visible in the water off the right shoulder angle. The wharf was abandoned in 1921 and demolished in 1933.

Remnants of ca. 1900 Lighthouse

Some masonry bases for the piers of the ca. 1900 lighthouse are visible extending out into the water off the Left Face wall. Arranged in parallel rows, these elements are distinct from the blocks of granite riprap and masonry rubble (*Fig. I.C-a5*).



Figure I.C-a3. 1860s building rubble at perimeter walls of the fort.



Figure I.C-a4. Remnants of 1893 wharf piers at right shoulder angle.

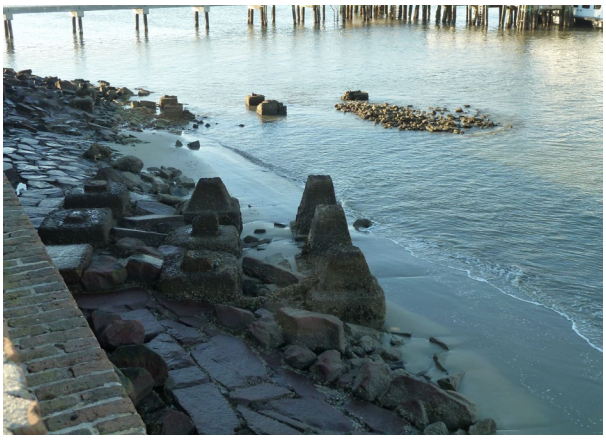


Figure I.C-a5. Remnants of ca. 1900 lighthouse piers (background) and 1921 quartermasters wharf (foreground) at Left Face.



Figure I.C-a6. Remnants of wooden pier south of Gorge Wall.

Remnants of 1921 Quartermasters Wharf

Remnants of masonry bases for the piers of the 1921 quartermasters wharf are visible extending out into the water off the Left Face wall. They are located just east of the ca. 1900 lighthouse remnants.

Remnants of Wooden Pier South of Gorge Wall

Remnants of a wooden pier are located south of the Gorge Wall, just west of the ca. 1860 granite-paved wharf. HABS identified the pier remnants as dating to ca. 1930. This is also the approximate location of a pier built by the Confederates in the 1860s which the Federals rebuilt in 1870.

Material from 1950s Excavation of Parade Ground

Sand, earth, and building rubble of various periods were removed from the west parade ground and



Figure I.C-a7. Remains of material excavated from west parade ground and discarded southwest of fort walls.



Figure I.C-a9. Northwest oblique of 1991 boat dock and approach.



Figure I.C-a8. Salvaged building material outside fort walls at esplanade.



Figure I.C-a10. Southeast oblique of apron outside sallyport with concrete walkway beyond. Note pooling water.

casemates during the 1950s excavations. Much of the excavated material was deposited outside the fort walls to the southwest where it remains today.

1961 Visitor Landing

A dock and approach landing were constructed outside the Left Flank wall in 1961 to accommodate visitors. That visitor landing was damaged by Hurricane Hugo in 1989 and removed in 1991.

Salvaged Building Materials

NPS pulled large pieces of original building material out of the water at the east end of the Gorge Wall in 2009. Today, the salvaged material remains along the granite-paved esplanade.

Circulation

Today, a modern dock, approach, and walkways provide handicap-accessible circulation for staff and visitors from the boat to the fort entrance.

1991 Boat Dock and Approach

In 1991 NPS constructed a new boat dock and approach to replace the damaged ca. 1961 visitor landing. The dock measures approximately 130 feet long by 20 feet wide. The concrete approach is approximately 315 feet long by 11 feet wide with a metal guardrail on both sides.

Apron Outside of Sallyport

The 1991 approach terminates at a modern concrete apron at the Left Flank wall sallyport. The apron measures approximately 20’ deep by 77’ wide. The apron is wrapped on the north, west, and south sides by a low rubble stone retaining wall. There is a drain in the exterior sallyport apron; however, after a combination of heavy rain and high tide, the drain backs up and the apron floods.

A modern concrete walkway extends from the south side of the apron and wraps around the



Figure I.C-a11. Northeast oblique of apron outside sallyport.



Figure I.C-a12. Concrete walkway with steps at left gorge angle.



Figure I.C-a13. Brick path south of Gorge Wall.

southwest corner of the fort. At the left gorge angle, aligned with the small doorway in the wall, are three steps to the top of the retaining wall (*Fig. I.C-a12*).

The top step is a piece of salvaged granite. The concrete walkway terminates at a dry-laid brick path that leads to an informational display plaque.

To the north and east of the fort walls are mostly riprap and rubble rock, and not intended for public access.

Summary of Conditions & Concerns – Man-made Site Features Outside the Fort Walls

The areas around the fort have both historic cultural resources and modern site features important to the operation of the site as a tourist destination. The areas are generally well maintained.

There are some concerns. Some are inherent to the site, while others are aspects that can be addressed. The concerns are as listed below:

- This is a sensitive area strewn with fragments of historic cultural artifacts. The potential for damage to these artifacts is high through activity in their immediate vicinity. There is also a potential for gaining information about these artifacts through recordation and study.
- Surging tides at various times have moved riprap closer to the perimeter walls of the original Fort Sumter, sometimes battering the walls.
- The wake from ever larger ships and the increase of shipping and cruise activity will increase the threat of riprap and other objects battering the perimeter fort walls, other cultural artifacts, and site features.
- The paved apron in front of the sally port is low and inadequately graded to allow drainage. With even minor rainfall and at times of high tide, water pools at the sally port entrance, impeding access to the fort.
- The continuing rise of sea level due to global warming poses a significant threat to access to the site, to circulation about the site, and to the cultural artifacts, especially the architectural fabric.

B. Perimeter Fortification: Fort Sumter (ca. 1840- ca.1865)

Unless otherwise indicated, photographs in this section were taken by Building Conservation Associates, Inc. (BCA) in 2013.

Methodology

The existing architectural fabric of Fort Sumter, which is predominantly masonry, will be discussed in the following section of this report. In addition, the current condition of these historic materials will also be addressed. For the purpose of discussion, the fort has been divided into separate groupings based on location, as well as similarity of materials, construction and conditions. The fort is divided into the following distinct groups and are discussed below according to these classifications: Gorge Wall Stabilized Ruins (indicated in pink in *Fig. 1.C-b1* below), Left Flank Casemates (indicated in orange), Mining Casemates (indicated in red), Left Face Casemates (indicted in tan), and Right Face Casemates (indicated in green). The Right Flank is also discussed, although the discussion is limited to the exterior walls because the interior spaces have not yet been excavated. Each report section begins with a general description of the building components along with prevalent conditions for that portion of the building, followed by a detailed description of the exterior and interior elements. Interior descriptions include a review of the following features: roof & rainwater collection; flooring; walls; ceiling; doorways; windows; and finishes. At the end of each interior description, individual spaces (such as casemates and rooms within the stabilized ruins) are discussed with descriptions of their unique elements and conditions.

BCA completed an on-site survey of the fort in December 2013. At the outset of the site visit, a standard methodology was developed for the survey of each of the spaces discussed in this section of the report. In the interior survey, casemates and rooms within the stabilized ruins were labeled to be consistent with the terminology developed in the 1991 Historic American Buildings Survey (HABS) documentation of the site. The fort was divided into the groupings described above and each representative interior grouping of the fort was surveyed to determine typical materials, construction types and conditions for that area. Once general conditions were noted, a more in depth survey of each individual space was completed to document specific components and conditions.

The goal of BCA's survey was to assess the condition of the masonry components of Fort Sumter, making an effort where possible to determine periods of construction and to correlate existing conditions with specific causes. The survey also considered the rate of deterioration for the masonry materials at Fort Sumter. Many historic images, taken throughout the twentieth century, were identified and re-taken in their original locations for comparison to present day conditions. This juxtaposition of images allowed for an evaluation of the rate of deterioration in areas where the photographs were taken. These photographic comparisons are included in *Appendix E*.

Prior to arrival on site, previous documentation (including historic images, drawings and photogrammetric images taken by Peter Aaslestad in March 2013) was consulted. During the field investigation, the survey team prepared documentation sheets for each of the spaces and utilized binoculars, a tape measure, digital camera, color and measurement scales (for photography) and a digital tablet (HP Touchpad) to assess and record findings. Site-specific terms were developed for unique fort features throughout the survey. These terms are defined in the included glossary (*Appendix A*).

For the exterior survey, each wall was assessed and recorded both graphically through the use of a digital tablet and through written notations on

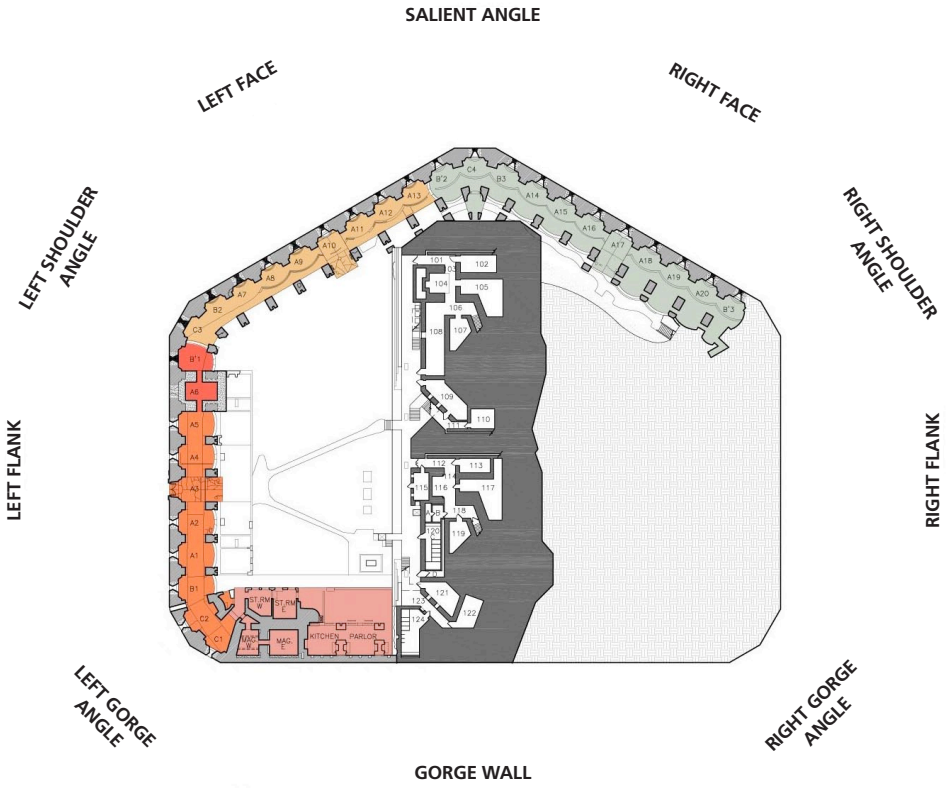


Figure I.C-b1. Ground Floor Plan of Fort Sumter, with the different colors highlighting the various classifications described in this report: Gorge Wall Stabilized Ruins (indicated in pink), Left Flank Casemates (orange), Mining Casemates (red), Left Face Casemates (tan) and Right Face Casemates (green).

the prepared recordation forms. Photographs of specific conditions were also taken and logged on the recordation form. The exterior walls of the Right Flank (east wall), Left Face (northwest wall), Salient Angle and Right Face (northeast walls) were surveyed by boat. The exterior survey of the Left Flank (west wall) and Gorge Wall (south wall), as well as all interior surveying, was completed from the ground. Throughout this section, please refer to the annotated ortho-rectified photographs of the interior and exterior of Fort Sumter for reference, included as *Appendix D*.

Gorge Wall Stabilized Ruins

This area is located at the south end of the fort and includes the Gorge Wall and stabilized ruins within. It suffered intensive fire during the Civil War, at which time these spaces served as administrative facilities (medical facilities, commissary, etc.). Unlike other areas of the fort, this section represents a small fragment of nineteenth century residential life at the fort presented in a semi-ruinous form.

The historic materials are fairly uniform throughout this section of the fort. The walls are built with gray brick with a core of tabby (a masonry material used extensively throughout coastal South Carolina that typically consists of a mixture of lime-based mortar and mollusk shells). The flooring throughout the area is dirt. It is not clear if the original flooring has been removed or if it has yet to be excavated. Traces of stone (marble and granite) windowsills and door thresholds



Figure I.C-b2. Lauren Drapala (BCA) shown surveying one of the casemates on the Left Face.



Figure I.C-b3. View of the stabilized ruins along the northern portion of the Gorge Wall, taken from the top level of Battery Huger.



Figure I.C-b4. View of the right gorge angle.



Figure I.C-b5. View of the left gorge angle, with cast concrete coping stones visible along the easternmost parapet.

are visibly intact in many of the former openings. There are also a variety of different fireplace hearth materials remaining, including brick and stone. Evidence of vertical slit windows are visible on the interior face of the Gorge Wall, indicating that portions of the ca.1860 era wall construction remain intact despite the heavy reconstruction of the Gorge Wall on the exterior.

The prevalent masonry conditions in this area of the fort are related to the ruinous state in which many of the built elements currently exist. The interior walls are in a compromised state, with inconsistent heights that do not reflect their original configuration (*Fig. 1.C-b3*). The remaining masonry also lacks protection from environmental factors. Without roofing or adequate water drainage, many of the wall remnants are cracked and have open mortar joints. Where necessary, the ruins of this area have been stabilized with re-pointing campaigns and the installation of cast-in-place reinforced concrete supports, such as in the Service Magazine.

Exterior

The south Gorge Wall spans from the exterior wall of the stabilized ruins, past Battery Huger, to the western promenade, which currently covers unexcavated archaeological remnants beneath. The wall is composed of a combination of brick, concrete and wood. The Gorge Wall is laid in English bond, with alternating courses of headers and stretchers.

On the westernmost and easternmost corners of the exterior wall, the brick masonry wall is two levels high (*Fig. 1.C-b4*). There is no evidence of windows on the exterior face of the wall and there is limited evidence of the former sallyport entrance, outlined by construction seams where modern poured-in-place concrete has been used to infill the historic brick masonry wall. This opening is also delineated in the threshold stone that still remains on the esplanade (*Fig. 1.C-b10*). The parapet of the western edge of the wall preserves its late-nineteenth century cast concrete coping stones. These copings continue along the top of the wall, sloping to one level at the center of the wall adjacent to the archaeological ruin (*Fig. 1.C-b5*). A wooden post-and-board wall was installed in 1992 along the top of the brick masonry in the center of the wall, presumably for security purposes. Where the wall meets the edge of Battery Huger,



Figure I.C-b6. View of the Gorge Wall, with modern wooden post-and-board security wall in the forefront and the top tiers of Battery Huger beyond.



Figure I.C-b7. The archeological remains of the historic esplanade along the Gorge Wall.

the brick masonry wall remains at a single level, with an additional one-and-a-half levels of poured concrete on the upper portion of the wall. The poured-in-place concrete extends across the full height of the building at the location of the former sallyport entrance. The concrete used in the upper portions of the wall continues east to approximately halfway between Battery Huger and the easternmost corner, at which point it steps down to meet the remaining upper portions of the wall constructed of brick masonry. At this point, the roofline gradually slopes down to two levels at the easternmost edge The parapet edge of this wall is built with brick, and not the cast concrete coping stones installed at the opposite edge of the wall (*Fig. 1.C-b4*).

Much of the historic fabric from the mid-nineteenth century esplanade is still present under the water along the eastern portion of the wall. Granite pavers remain along the abutment parallel to the Gorge Wall and also extend into the surrounding water perpendicular to the Gorge Wall, in the location of the original sallyport entrance. There is also evidence of white marble architectural elements, brick masonry units and other historic material scattered around the area, which may have been part of the historic construction of the fort (*Fig. 1.C-b7*). Underwater archaeology could yield important information about the history of the site, as well as the construction of this important historic feature (*Fig. 1.C-b7*).

Many portions of the exterior face of the Gorge Wall contain eroded surfaces and deteriorated or open mortar joints. While surface damage is prevalent across the wall, open joints are particularly prevalent at the lower portions that are in regular contact with the seawater (*Fig. 1.C-b8*). Without a natural or man-made barrier to break incoming waves on the southeast portion of the wall, waves batter the bottom of the southeast wall in particular. The masonry in this area is in poor condition, in contrast with the western portion of the wall that is more protected at the base. In addition, because this wall faces south, it gets a significant amount of sunlight and therefore undergoes frequent cycles of wetting and drying. The latter condition can exacerbate deterioration mechanisms, such as those associated with soluble salts.

There are several cracks in the brick masonry visible on the exterior face of the wall, none of which are particularly significant but all of which will require repair. The most significant crack was observed at the top of the masonry wall to the east of where the sloped portion ends (*Fig. 1.C-b11*). This crack appears to correspond with the installation of the wooden wall directly above, which likely places stress on the wall at its point of attachment. Vertical cracks were also observed at the top of the brick masonry wall where it begins to slope down to the archaeological ruin portion (*Fig. 1.C-b9*) and at the lower portion of the slope in the brick wall. In addition, there are intersecting vertical and horizontal cracks in the mortar joints just west of the intersection between the lower masonry wall and Battery Huger. These smaller cracks appear to be related to years of differential movement between the materials and construction of the exterior and interior walls.

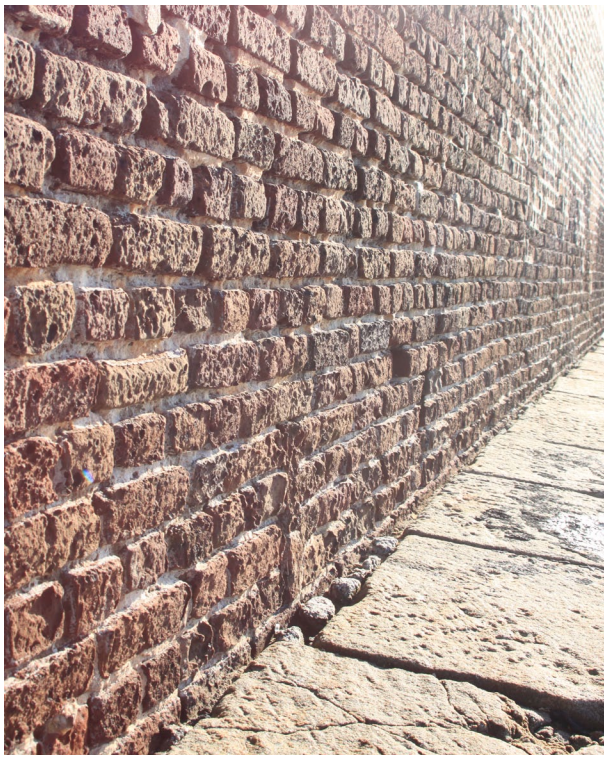


Figure I.C-b8. Eroded brick surfaces at the lower courses of the Gorge Wall.



Figure I.C-b9. Vertical crack where a metal brace has been installed, at the westernmost area of the Gorge Wall before the slope into the archeological ruins.



Figure I.C-b10. An area of concrete infill at the prior Battery Huger entrance (also the location of the historic pre-Civil War sallyport entrance).



Figure I.C-b11. The lower portion of the Gorge Wall, beneath the wooden security wall. This area shows evidence of cracking in the masonry combined with inconsistent repairs, severe erosion at the bottom courses and corroded metal fasteners for previously installed pipe.

Unique features for the exterior Gorge Wall

- Two small sections of brick replacement using modern brick were observed at the top of the wall.
- Metal fasteners remain at the bottom of the brick wall from a previous pipe installation (*Fig. 1.C-b11*).

Interior

The interior spaces are not uniform in this grouping, as each room served different functions in the fort's history. The entire grouping is in a ruinous state and has lost a significant amount of physical material and, therefore, interpretive understanding. The following subsections include physical descriptions of the materials and conditions that are typical of each room in the Gorge Wall Stabilized Ruins. Refer to the *Individual Interior Spaces* section for features that are unique to each individual space.

Roof & Rainwater Collection

The rooms in this portion of the fort no longer have roof structures to protect them from the environment, nor do they have a defined water collection or drainage system (*Fig. 1.C-b3*).

Flooring

Much of the original flooring no longer exists in these rooms, either because it has been removed or because further excavation is required to expose it (*Fig. 1.C-b3*).

Walls
The tops of the walls, which are composed of gray brick with tabby (mortar/mollusk shell) cores, are exposed and in varying states of intactness. Because of the lack of roofs or other means of protection, water is allowed to enter into the core of these masonry ruins. While the brick portions of the wall tops appear to be somewhat compromised in terms of their condition, the tabby cores seem relatively intact. Although materials analysis was not performed as part of this assessment, the intact condition of the tabby core suggests a binder other than pure high-calcium lime.

There has been displacement of entire wall sections, some of which have been stabilized with reinforced poured-in-place concrete supports. The corners of the brick walls throughout this section of the fort are particularly vulnerable, with many open joints and loose bricks. Fireplaces and hearths still exist and are discussed below, in their respective locations in the *Individual Interior Spaces* section.

Ceiling
There is no evidence of interior ceilings in this portion of the fort.

Doors
Although no doors remain in this portion of the fort, evidence of doorways and thresholds can be discerned amongst the ruinous forms (as discussed below in the *Individual Interior Spaces* section). It is unclear if the current doorways remain in their original locations or if their placement is the result of reconstruction of this portion of the fort.



Figure I.C-b12. The remnants of two granite windowsills and a granite door threshold along the north wall of the Kitchen.

Windows
As with the doors, no windows remain in this section of the fort. However, window openings are visible on the interior wall along the Kitchen and Parlor spaces, some of which retain a stone sill. In some cases, the stone sills appear to have been salvaged from elsewhere and are most likely not in their original location. Like the doors, it is unclear if the window openings are in their original locations or if their placement is the result of reconstruction.

Finishes
There is no evidence of finishes in this portion of the fort.

Individual Interior Spaces
The materials and conditions described in the previous section are relevant for all of the spaces in the Gorge Wall Stabilized Ruins. The following section of the report contains features that are unique to each individual room.

Officers' Quarters
The administrative facilities are defined as the area between the stone footprint of the walls that formerly enclosed the space. This section of the grouping can be accessed from the parade ground, though it is currently not accessible to visitors from the general public.

- Stone fragments in the ground mark the footprints of previous walls in this space.

Parlor
This space measures 18'-0" east-west and 18'-9" north-south, and is accessible through a doorway opening into the Officers' quarters ruins.

- There are two granite windowsills intact along the south wall (*Fig. 1.C-b14*).

Kitchen
This space measures 18'-0" east-west and 18'-9" north-south, and is accessible through a hallway connected to the Parlor room, and a doorway opening leading into the Officers' quarters ruins.

- There are extant remnants of two granite windowsills and a corresponding granite door threshold on the north wall of the room (*Fig. 1.C-b12*).
- There are three granite windowsills intact along the south wall (*Fig. 1.C-b14*).



Figure I.C-b13. Herringbone brick hearth in the Kitchen fireplace.



Figure I.C-b14. Small opening underneath the brick arch on the north side of the Kitchen/Parlor fireplaces. Also note the window openings on the Kitchen and Parlor south interior walls.



Figure I.C-b15. Overview of East Magazine, with the stepped foundation visible on the right, just below the vertical slit on the northwest wall.

- The southeast corner of the room has a herringbone brick hearth at the fireplace (*Fig. 1.C-b13*). There is also a small opening at the bottom middle portion of the north side of the fireplace in the Kitchen/Parlor spaces (*Fig. 1.C-b14*). The opening, approximately 6" wide by 12" tall, is located three brick courses underneath a brick arch. Seams in the mortar joints indicate that there would have previously been an opening that corresponded to the entire width of the area underneath the brick arch.

East Magazine

This space measures 18'-0" east-west and 16'-0" north-south, and is only accessible through a vaulted passageway from the Service Magazine to the west.

- The west wall is leaning towards the northwest at the top and is cracked. There is a large vertical crack through the vaulted passageway (*Fig. 1.C-b15*).
- Overall, the bricks on the south wall are more eroded than the other walls in the space. This might be related to the wall being in shade for much of the day, allowing it to stay wet for an extended period of time.
- A stepped foundation is visible on the north and south walls, with the top step of these courses situated at the same level as the granite threshold leading into Service Magazine.



Figure I.C-b16. Overview of Service Magazine, with poured-in-place concrete stabilization.

- There are four opposing vertical slits on the west and east walls, whose heights also correspond to the stepped foundation noted above. These vertical slits are continuous through the wall into the rooms to the east and west (*Fig. 1.C-b15*).
- There is a bricked-in niche to the right of the arched passageway on the west wall. This wall also has a "shelf", which is more clearly defined on the south wall.

Service Magazine

This magazine measures 16'-0" north-south on the east wall, 16'-4 ½" north-south on the west wall, 10'-4 ½" east-west on the north wall and 14'-0 ½" east-west on the south wall. It is accessible through a narrow connecting passageway from the Left Flank casemates (*Fig. 1.C-b16*).

- The walls in this space have been stabilized with a reinforced poured-in-place concrete frame.

Storage Room West and Storage Room East

The two storage rooms are incomplete, with the east, south and west walls generally intact and the location of the north wall outlined by a stone footprint in the grass. These rooms can be accessed from the parade ground, though it is currently not accessible to visitors from the general public.

Left Flank Casemates

This portion of the fort is located along the west wall of Fort Sumter and includes casemates C1, C2, B1, A1, A2, A3, A4 and A5. The west wall is adjacent to solid ground, and serves as the main entrance for visitors to the fort. As referenced earlier in the report, the walls were leveled to their existing height, just above the first tier of casemates, in the 1870s. This section of the fort is the only area that contains rooms whose embrasures have been re-opened to allow air from the exterior to enter the building. The latter condition results in significant condensation, which is affecting the condition of the masonry in this portion of the fort.

The historic materials are fairly uniform throughout this section of the fort. The walls are composed of gray brick with a tabby core. The flooring throughout the area is poured concrete with inner and outer wrought iron cannon traverses. The exception is Casemate A3, which retains its original granite flooring (*Fig. 1.C-b75*). There is also the footprint of a previously installed rear wall, marked by a brick outline in the rear portion of the flooring (*Fig. 1.C-b55*). The previous existence of a rear wall is further substantiated by evidence of angled notches at the ends of the casemate side walls that would have "received", or tied into, the rear wall (*Fig. 1.C-b69*). Each room along the west wall contains an embrasure. Each room has a brick vaulted ceiling, along with arched openings running east-west that serve to support the ceiling as well as delineate each casemate space.

The masonry of this portion of the fort is affected by extensive water infiltration and condensation. At the time of BCA's field survey, flooding was observed in the morning after high tide, along the exterior entrance to the building at the west wall (*Fig. 1.C-b18*). Because time on site was limited, the frequency of this flooding could not be



Figure I.C-b17. Interior of the fort, taken from the parade ground. The Left Flank casemates are in the central portion.



Figure I.C-b18. Flooding in front of the west wall of Fort Sumter.



Figure I.C-b19. Condensation forming on the brownstone embrasure of Casemate C4 along the Left Flank.



Figure I.C-b20. Detail of disaggregated concrete coping stones above the English bond brick at the west wall (Left Flank).

determined. However, if such flooding occurs on a regular basis, it could be a problem for adjacent historic masonry. While the flooding dissipates over the course of the day, the bottom portions of the walls along the Left Flank become saturated. In addition to flooding, condensation results in water pooling on the concrete floors inside the casemates in this portion of the fort. The open embrasures and the fort's entrance allow warm, moist air from the harbor to enter the interior of the Left Flank, which is much colder because it is shielded by the roof. When the warm moist air meets the cold masonry and metal surfaces inside these casemates, condensation forms. As a result, the walls in this area are wet most of the time. This leads to increased biological growth on the surface of the brick and increased delamination and disaggregation of the brownstone embrasures (*Fig. 1.C-b19*). There are also cracks, some of which are quite wide, running through the center of the ceiling vaults in all of the Left Flank casemates. This is a typical condition that will be discussed in subsequent descriptions of the casemates (*Fig. 1.C-b76*).

Exterior

The Left Flank exterior wall is composed mainly of brick laid in an English bond, with alternating courses of headers and stretchers (*Fig. 1.C-b20*). The wall on the northernmost side stands approximately two levels tall, sloping to approximately one and a half levels tall at Casemate A4. The main sallyport entrance is located at Casemate A3, as indicated by a granite door surround and pediment. The entire length of this wall has historic late-nineteenth century cast concrete coping stones at the parapet level.

The upper portion of the wall, beginning at the middle of Casemate B'1 to northern edge of Casemate A5, was re-pointed with a "de facto stucco" application, in which mortar was applied both in the joints and partially on the surface of the brick, resembling a stucco treatment (*Fig. 1.C-b21*). There are cracked joints throughout this re-pointing campaign, as well as in the coping stones directly above. In general, the coping stones in this area are very badly eroded (*Fig. 1.C-b20*).

There are several cracks in the brick masonry visible on the exterior face of the wall, some of which are considered potentially serious and will require repair. The most significant conditions are vertical cracks stretching from the top corners of the embrasure openings to the parapet level (*Fig. 1.C-b21*). These cracks are prevalent on the openings to Casemates B'1, A4, A1, B1 and C1. All of the cracks correspond to open joints in the coping stones of the parapet, and are likely a result of water infiltration into the wall at these locations. In general, there are many cracks through the brick, as well as cracked mortar joints, on the lower courses of the wall surrounding the embrasure openings. The brick surface across the wall is fairly eroded, but isolated areas on the upper courses of the western edge of the wall have a dramatically different surface and are more intact (*Fig. 1.C-b22*). This difference in condition might be a result of protection from erosion in these areas, or they may be areas where replacement brick was used.

The corners of the two west walls have the worst damage to their brick surfaces. The pronounced damage at the corners may be the result of wind erosion, as these projecting corners are particularly exposed to wind and any moisture or airborne



Figure I.C-b21. Vertical crack on embrasure opening for Casemate A4, with area of loss at the ground level and "de facto stucco" application of mortar at the upper wall.



Figure I.C-b22. Differing areas of surface erosion on the brick on the west wall (Left Flank).

particles (such as sand) that the wind carries with it. The upper courses of the walls (both W-1 and W-2) exhibit drip stains and traces of salt on the brick surface. The source of the salts and drip marks is not apparent (*Fig. 1.C-b23*).

There are nine window openings, or embrasures, that correspond to Casemates B'1, A6, A5, A4, A2, A1, B1, C1 and C2. Each opening is framed by four blocks of brownstone on the interior and a cast-in-place, early concrete-like material on the exterior composed of mortar, pieces of brick



Figure I.C-b23. Damage to the brick surfaces at the corners of the west and southwest walls (Left Flank).



Figure I.C-b24. Incipient spall at the south end of the lintel over the main entrance to Fort Sumter.

and shells. The latter material is covered with a layer of stucco on the exterior only. Portions of the stucco covering the embrasure openings have deteriorated, exposing the brick pieces and shells used as aggregate in the early concrete, such as in Casemates B'1 and A5. The stucco deterioration often coincides with cracked mortar joints between the brownstone pieces that comprise the embrasure openings.

The current main entrance to the fort, which opens into Casemate A3, is delineated by a pedimented granite surround (*Fig. 1.C-b26*). There is another, smaller, arched door opening where the southwest and west walls of the Left Flank casemates meet. (*Fig. 1.C-b27*). In general, the granite is in stable condition, however, there is an incipient spall at the south end of the lintel that is considered a safety hazard. It should be addressed immediately (*Fig. 1.C-b24*).

Unique features for the Exterior Left Flank

- There is a section of missing bricks at the ground level, underneath Casemate A4 (*Fig. 1.C-b21*).

Interior

The following subsections include physical descriptions of the materials and conditions that are typical of all casemates in the Left Flank. Refer to the Individual Casemates section for features that are unique to each individual space.

Roof & Rainwater Collection

The top surface of the brick vaults of the Left Flank casemates are covered with a modern, liquid-applied waterproofing membrane that is white in color. The membrane appears to be in good condition except at the back of the parapet wall, where several cracks and areas of alveolar erosion from wind were noted. Cracks were also observed where the roof meets the back of the parapet wall, a condition that is undoubtedly contributing to moisture on the interior of the casemates. There is also extensive biological growth on this membrane at the back of the parapet wall. In addition, this bright white, modern roofing material has a pronounced visual impact that is incongruous with the surrounding historic masonry.

There are consistent vertical "cut-outs" in the center of the parade ground piers to accommodate terra cotta pipes, historically used to carry rainwater off of the roofs and into cisterns below grade. These piers have tabby cores, which are currently exposed. Looking towards the embrasure wall, the downspouts in the "cut-out" sections of the parade ground piers extend from the top of the casemate vault into the ground. Many of these drainage systems combine historic terracotta downspout with more modern metal pipes. Unlike the Right Face casemates, this area does not appear to have any evidence of buttress piers. As discussed in later sections, the buttress piers supported the rear casemate walls and provided a semi-arched passageway through the rear of the casemates.

Flooring

The floors in this area are made of poured concrete, with the exception of Casemate A3, which has its original granite floor over an underground cistern. Casemates A2 and A4 have restored cannon configurations, with wrought iron inner and outer traverses installed on the poured concrete floor.

The outer portion of flooring between the casemates and parade ground area is brick, with traces of earlier building elements on the northern side of the walkway.



Figure I.C-b25. Cracking through the center of the separation arches and vaulted ceiling in the Left Flank casemates.

Walls

The casemates are primarily constructed of gray brick with brownstone embrasures on the interior faces of the northwest wall. The embrasure openings are supported by granite lintels with brick niches on both sides of the opening. The embrasure walls and openings are generally intact and retain the metal apparatus for the reaction block system for the cannons.

At the time of BCA's field survey, the embrasure walls were generally very wet throughout the Left Flank, with water condensing on the surfaces of the cannons and window openings and pooling on the floor. Because time on site was limited, the frequency of the occurrence of such condensation could not be determined. However, it is an important condition to monitor. The sallyport entrance and window openings on the west wall of the fort (Casemates A2, A3 and A4) create circumstances conducive to the creation of



Figure I.C-b26. Sallyport to Fort Sumter, showing one of the two wooden doors installed at the entrance as seen from the exterior, 2013.



Figure I.C-b27. Set of wood double doors at the opening between Casemates B1 and C2, as seen from the interior.



Figure I.C-b28. Arched wooden door leading into Casemate A6.

condensation in the Left Flank casemates: warm, wet air comes in through these openings and, when it meets the cold concrete floor and metal, forms condensation. As a result, there is increased biological growth on the surface of the brick and increased delamination and disaggregation of the brownstone embrasures.

There are traces of previously installed rear walls in the flooring near the parade ground area, as well as angled notches in the casemate walls where the rear walls would have been tied in. The angled notches generally measure approximately 22" wide by 12" deep. The rear faces of the casemate ceiling vaults also have a line of mortar demarcating the point of intersection between the arch and the adjacent roof, which is possible trace evidence of the rear wall at the casemates.

Ceiling

The ceilings are constructed of the same gray brick used on the surrounding casemate walls. There is a semi-continuous crack that runs through the ceilings of the Left Flank casemates (*Fig. 1.C-b25*). There is typically brick and mortar loss along the crack.

Doors

There are several different door types present in the Left Flank casemates. A set of modern double wood doors are installed at the sallyport entrance to Fort Sumter (*Fig. 1.C-b26*). There are three hinges on each of the doors, with two square "lookout" holes on each of the doors at eye level. Another set of smaller wood double doors enclose the opening between Casemates B1 and C2 (*Fig. 1.C-b27*). This door set mimics the sallyport entrance, with three metal hinges and one square "lookout" hole in the door. There is a large, single, arched wooden door separating Casemate A5 from Casemate A6, which is part of the Mining Casemates section (*Fig. 1.C-b28*). The door is constructed with diagonal tongue-and-groove boards and is installed to hinge on the right side of the door with two large metal strap hinges.

Windows

This portion of the fort is used by the National Park Service for interpretation and represents the starting point for all tours. Modern wood panels have been installed on the interior of the embrasure (*Fig. 1.C-b46*). They have been installed



Figure I.C-b29. Detail of iron saddle for the reaction block and tapered embrasure opening in the Left Flank casemates.



Figure I.C-b30. Steps leading from the rear of Casemate C1 towards the magazine storage rooms.

in a way so that they do not require fastening to the existing historic fabric. The embrasures are opened everyday and closed when the park is no longer open.

All of the embrasures are tapered towards the exterior. The interior face of each embrasure consists of a brownstone surround constructed of four large blocks of stone (*Fig. 1.C-b46*). These stones sit atop a large block of granite that serves as a lintel for the opening below, where the cannon is secured to the reaction block. This opening is flanked by two brick arched niches. The exterior portion of the embrasure surround is composed of brick and stucco. Between this exterior portion and interior brownstone is historic concrete with brick aggregate.

The brownstone embrasure surrounds are generally in poor condition. Much of the stone is disaggregating and fractured along deep cleavage cracks related to its natural bedding planes. All embrasure components are intact despite their



Figure I.C-b31. Ferrous metal attachment on the northwest wall when exiting Casemate C1.

weathered condition. This is the only area of the fort where the iron saddles for the cannon reaction block are visible because all of the other embrasures are enclosed (*Fig. 1.C-b29*).

Finishes

White finishes are visible on the surface of the brick on the interior of the casemates, with the most intact finishes on the vaulted ceiling and along the upper portions of the embrasure arch and wall. These white finishes were identified as lime wash by current National Park Service staff, although no analysis was performed by BCA to confirm this. The parade ground piers and corresponding casemate walls have experienced more loss of finishes overall due to their exposed location.

Individual Casemates

The materials and conditions noted in the previous Interior section are relevant for all of the spaces in the Left Flank casemates. The following section of the report contains more detailed information that relates to the unique features within each individual space.



Figure I.C-b32. Loss of brick at the rear of the west wall in Casemate C1.



Figure I.C-b35. Detail of yellowed material used for masonry stabilization.



Figure I.C-b33. White finish over messy pointing mortar and brick in Casemate C1.



Figure I.C-b36. Evidence of red and white finishes on the embrasure opening side of Casemate C1. There is also prevalent salt damage and biological growth on the right portion of the embrasure opening.



Figure I.C-b34. Cracking on the vaulted ceiling of Casemate C1, with evidence of a yellowed material used for masonry stabilization.



Figure I.C-b37. Black biological growth on the roof above Casemate C1.

Casemate C1

This space measures 16'-8" (across the embrasure wall) by 20'-6 ½" (between the embrasure wall and rear floor termination), and is currently accessible through the rear and Casemate C2.

- There is no evidence of a previously enclosed rear wall; instead, there is an arched opening at the rear of the casemate with steps that lead down directly into the magazine storage rooms to the south (*Fig. 1.C-b30*).
- There is a ferrous metal attachment in the brick wall to the left in the corridor that might have served as a hinge attachment for a metal door/ gate (*Fig. 1.C-b31*).
- The corridor leading into the magazine storage areas appears to have once been enclosed by vaulted ceiling that is no longer extant. Supporting piers for the vaulted ceiling are located approximately 6' to 7' behind the end of the casemate.
- The west wall is solid brick, with a large portion of brick loss at the junction of the casemate wall and rear parade ground pier extension (*Fig. 1.C-b32*). The extensive moisture in this area, exacerbated by a lack of drying due to limited sun exposure, has resulted in active biological growth in this section of brick loss.
- There is missing brick on the lower courses of the separation pier on the embrasure side.
- The ceiling vault in the casemate retains its white finish, with poorly-applied pointing underneath (*Fig. 1.C-b33*).
- In addition to the center crack that is apparent in all the casemates, there is a significant crack that telegraphs from the center of the separation arch towards the embrasure on the west wall (*Fig. 1.C-b34*). A yellow material,



Figure I.C-b38. Leaky corroded downspout located on the rear wall of the parade ground pier between Casemates C1 and C2.



Figure I.C-b39. Displaced and eroded brick faces on the underside of the separation arch between Casemates C1 and C2.



Figure I.C-b40. Modern light-colored repointing mortar used on the interior faces of the separation arch.

presumed to be an epoxy or polyester resin injection treatment, is visible dripping down from the cracks in the ceiling (*Fig. 1.C-b35*), evidence of a previous stabilization treatment for the extensive cracking in this area.
- The lowest course of brick is missing under the left corner of the granite reaction block support.
- Brick is also missing from the lower right section of the north niche (right).
- The concrete with brick infill has evidence of white and red finishes on its surface (*Fig. 1.C-b36*).
- Salt damage is visible on the top and upper right portions of the brownstone embrasure. On the corresponding area above on the roof, there is a pronounced film of black biological growth (*Fig. 1.C-b40*).

Casemate C1 to Casemate C2

- There is a light-colored, modern repointing mortar at the middle sections of both of the interior faces of the piers that support the separation arch (*Fig. 1.C-b38*).
- An "exterior" downspout located in the parade ground pier is leaking at the scupper, as the downspout has corroded and is no longer connected to the scupper (*Fig. 1.C-b39*).
- The bricks along the interior separation arch and piers are damaged and displaced on the underside (*Fig. 1.C-b40*).

Casemate C2

This space measures 7'-5" (across the embrasure wall) by 18'-12" (between the embrasure wall and rear floor termination), and is currently accessible through Casemates C1 and B1.

- The rear wall is intact, with a strong circular footprint at the floor level, tapering at the roofline. The construction suggests that this enclosure was added after the staircase enclosure, which is no longer in its original circular wall formation (*Fig. 1.C-b41*). The granite stair treads are still present at the first two steps of the first floor level, along with two steps at the upper right reaches of the extant circular wall (*Fig. 1.C-b42*).
- A corroded metal downspout currently runs through the intact upper stair treads.
- The flooring in this section is weathered light gray granite, similar to the embrasure wall granite (*Fig. 1.C-b43*).



Figure I.C-b41. Rear wall of Casemate C2, from the parade ground.



Figure I.C-b42. Detail of intact granite stair treads at the rear staircase of Casemate C2.



Figure I.C-b43. Granite floor and granite stair tread at the rear staircase of Casemate C2.

- The northern side of the staircase wall is cracked parallel to the surface, with a depth approximately one wythe.
- There are open joints along the lower brick courses of the rear wall, with modern brick used as infill at the center of the wall (*Fig. 1.C-b44*).
- As the rear wall approaches the ceiling, there are portions of brick loss, with eroded surfaces and extensive cracks that extend from both separation walls in the rear.



Figure I.C-b44. Interior face of the rear wall of Casemate C2.



Figure I.C-b45. Crack telegraphing from the separation pier, following the underside of the embrasure arch in Casemate C2.

- There are three salvaged marble remnants that currently sit against the interior wall in Casemate C2. It is unclear whether these stone fragments are from the site (*Fig. 1.C-b44*).
- In addition to the cracks along the rear wall, there is another crack following the embrasure side opening of the separation arches across the vault. There is brick loss on both sides of the separation arch that corresponds to this crack.
- At the westernmost separation pier, a vertical crack has telegraphed down the pier, to a depth of approximately one wythe towards the embrasure wall (*Fig. 1.C-b45*).
- There is brick loss at the angled walls on either side of the embrasure at ground level. There is also severe brick loss at the bases of the granite lintel at both corners (*Fig. 1.C-b46*).
- There is brick loss at the face and underside of the embrasure arch.
- The granite lintel is displaced on the right side, along a deep crack that also extends into the bottom of the brownstone embrasure. There are three smaller cracks that run through the granite on the left side of the stone.
- An iron fixture is embedded within the infill concrete on the left side of the embrasure opening (*Fig. 1.C-b47*).

Casemate C2 to Casemate B1

- There is moderately high brick damage from historic artillery fire on the underside of the interior separation arch, approaching the door entrance (*Fig. 1.C-b48*). Many of the bricks in this section have lost their fire skin as a result of the historic damage, with extensive loss on the western portion of the doorway.



Figure I.C-b46. Overview of brick loss on the embrasure wall of Casemate C2.



Figure I.C-b47. Detail of iron fixture embedded within the infill concrete of the embrasure opening in Casemate C2.



Figure I.C-b48. Displaced and eroded brick faces on the underside of the separation arch between Casemates C2 and B1.



Figure I.C-b49. Detail of corroded metal shrapnel on the western portion of the doorway between Casemates C2 and B1.

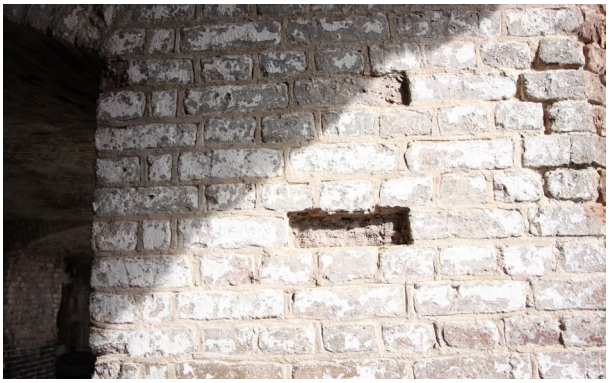


Figure I.C-b50. Detail of missing brick face on the north rear wall of Casemate B1.



Figure I.C-b51. Cracking through the brownstone embrasure and granite lintel in Casemate B1.



Figure I.C-b52. Loss of material integrity on the angled embrasure wall at the northwest corner of Casemate B1.



Figure I.C-b53. Underside of the separation arch, looking towards the embrasure wall in area between Casemate B1 and A1.

- There is evidence of a corroded projectile in the lower left portion of the arch (*Fig. 1.C-b49*).
- Reconstructed wooden doors are used for the door opening in this area (*Fig. 1.C-b27*).
- There is an isolated band of white finish on the surface of the interior face of the opposing pier.

Casemate B1

This space measures 15'-9 ½" (across the embrasure wall) by 20'-9" (between the embrasure wall and rear floor termination), and is currently accessible through the rear and Casemates C2 and A1.

- The evidence of the rear wall at the roofline of the casemate vault does not have a "clean" break, as the vaulting system appears to have been integral to the staircase construction wall to the southwest.
- There has been isolated loss of the brick face on the north casemate rear wall, which also corresponds with a small crack running through that portion of the wall (*Fig. 1.C-b50*).
- Historic damage has resulted in the loss of bricks in the niche arches, as well as a loss of integrity on the southern angled embrasure wall and northern angled wall and embrasure arch at the north corner (*Fig. 1.C-b52*).
- Vertical cracks run through the separation arch and connecting piers, parallel to the arch face through the entire span. The embrasure arch crack corresponds with a loss of material in the northern arch and angled wall. This condition is very similar to what was found in Casemate C2.
- The brownstone embrasure is heavily deteriorated, and appears to be related to a historic or "pre-existing" failure in the stone. The stone has separated into "blocks," with separation fractures breaking the stone into multiple pieces. A vertical crack runs through the center of the brownstone embrasure and granite lintel. The lintel is also cracked at the lower left portion (two cracks) and upper right corner, with a loss of material also at the lower right corner (*Fig. 1.C-b51*).
- The brick face has eroded at the top right corner, where the embrasure wall meets the ceiling vault. This condition also correlates with open joints at the top corner of the separation pier.



Figure I.C-b54. Historic terracotta piping matches up to the modern black downspout in the "cut-out" in exterior face of parade ground pier in area between Casemate B1 and A1. Also note the change in floor height between the two casemates.



Figure I.C-b55. There is a slight step up from the brick pavement into the rear of the casemate room, of approximately 4". Missing brick face at the backside of the vaulted ceiling for Casemate A1.



Figure I.C-b56. Metal fastener in the ceiling of Casemate A1.

Casemate B1 to Casemate A1

- The underside of the separation arch and the interior faces of the opposing piers are damaged at the brick face (a condition similar to what was found between Casemates C2 and B1). A white finish has been applied over the damage, indicating that the damage has existed for a long period of time.
- The mortar in the portion of the room is in fairly good condition, while the brick damage is especially severe on the embrasure side pier, the underside of the arch, and the interior face of the parade ground pier (*Fig. 1.C-b53*).
- The "cut-out" on the exterior face of the parade ground pier has two sections of a terracotta pipe remnant connected to a more modern metal downspout. Macroflora is growing in the exposed seashell concrete backing behind the downspout, which may indicate that the drainage is not working properly and leaving the surface moist enough to support vegetation.
- There is a level change in the flooring between Casemate B1 and Casemate A1 (*Fig. 1.C-b54*).

Casemate A1

This space measures 15'-6" (across the embrasure wall) by 19'-0" (between the embrasure wall and rear floor termination), and is currently accessible through the rear and Casemates B1 and A2.

- The vaulted arch has a "clean" break from where it previously met the rear wall, but there is damage to the center of the arch at the rear wall plane (*Fig. 1.C-b55*).



Figure I.C-b57. Corroded metal portion of the reaction block embedded in the floor of Casemate A1.



Figure I.C-b58. Fractured granite lintel and lower portions of the brownstone embrasure in Casemate A1.



Figure I.C-b59. Cracked seam between the ceiling vault and embrasure arch in Casemate A1.

- Erosion of the brick face is evident on the embrasure walls, at the southwest angled wall and northern angled wall at the embrasure.
- There is brick loss at the niche arches, and damage at the north corner of the embrasure arch. The southwest casemate wall at the corner has also lost an extensive amount of its original brick and there are traces of a white finish that has been applied atop the damage. This same condition corresponds to the condition noted in space between casemates B2 and A1.
- Two metal fasteners are visible on the surface of the ceiling and floors in this casemate. There is one corroded metal fasteners in the center of the casemate ceiling vault, (*Fig. 1.C-b56*) and a metal piece, perhaps part of the reaction block system, that has been embedded in the modern concrete flooring (*Fig. 1.C-b57*).
- The granite lintel has lost much of is surface, with fractured, rough edges (*Fig. 1.C-b58*). A white finish has been applied to some of these fractured edges.
- The brownstone embrasure is heavily deteriorated (perhaps in the worst condition of the embrasure openings in this section). All of the pieces have fractured, with evidence of previous repair attempts, i.e. pointing mortar and white finishes along the cracks.
- There is a prevalent crack at the junction between the embrasure wall and the ceiling vault (*Fig. 1.C-b59*). This crack indicates that there is movement between the embrasure wall and the exterior wall.

Casemate A1 to Casemate A2

- The underside of the separation arch and the interior faces of the opposing piers are damaged at the brick face, and a white finish has been applied over the areas of damage (*Fig. 1.C-b60*).
- There is a vertical crack that extends from the top of the separation arch to the floor, approximately one wythe in from Casemate A1. Surface loss of the brick face continues throughout the underside of the separation arch.
- There are multiple archaeological remnants at the rear of these casemates, which indicate that there were prior related structures previously installed in this location. Within the brick pavement, there is a bluestone capstone, approximately 22 ¾" by 53" (*Fig. 1.C-b61*).



Figure I.C-b60. Damaged face of historic damage on the interior faces of the separation arch piers in Casemate A1 looking towards the embrasure wall. There is a visible separation approximately one wythe in from the left (Casemate A1).



Figure I.C-b61. Bluestone capstone embedded within modern brick flooring behind the junction of Casemates A1 and A2.



Figure I.C-b62. Remnant of a granite stone door threshold at the rear of Casemate A1 looking towards the embrasure.



Figure I.C-b63. Interpretative signage installed in a removed section of the rear wall footprint of Casemate A2.



Figure I.C-b64. Modern brick infill has been used to close historic rectangular openings in the brick walls.



Figure I.C-b65. Extensive damage and cracking to brick surface on underside of embrasure arch in Casemate A2.



Figure I.C-b66. Former ceiling treatment to compensate loss of brick material in the vaulted ceiling of Casemate A2.



Figure I.C-b67. Extensive fracturing and displacement of the brownstone embrasure in Casemate A2.



Figure I.C-b68. Contour scaling of the brownstone and prolific cracking in the granite lintel in Casemate A2.

Beyond the brick pavement there is another wall parallel to the rear of the casemate with a remnant of a granite door threshold still intact on the southwest portion of the opening (*Fig. 1.C-b62*).

- The "cut-out" on the exterior face of the parade ground pier has one preserved section of a terracotta pipe remnant connected to a more modern black downspout.

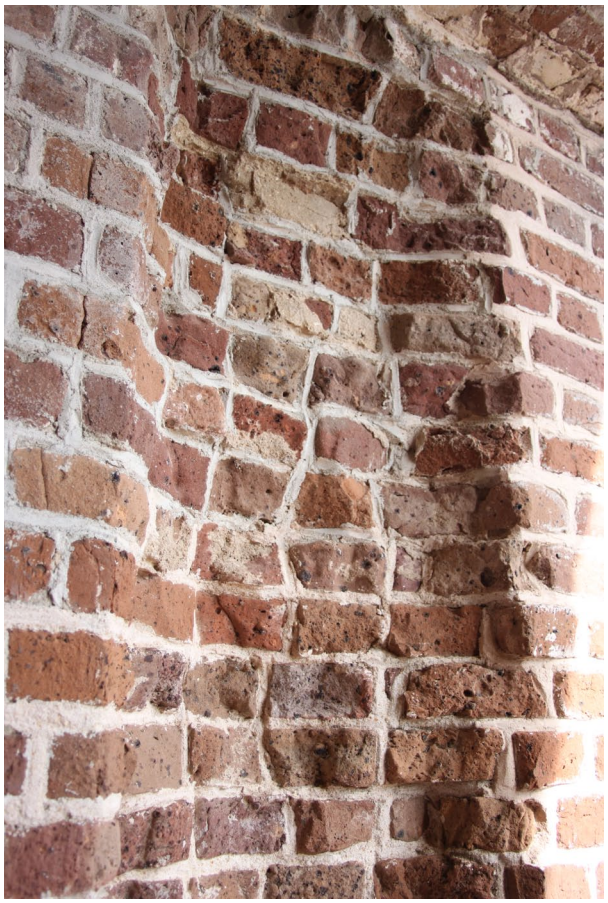


Figure I.C-b69. Rounded notch in the rear wall of Casemate A2, which previously served as an attachment point for the rear wall.

Casemate A2

This space measures 16'-6" (across the embrasure wall) by 19'-0" (between the embrasure wall and rear floor termination), and is currently accessible through the rear and Casemates A1 and A3.

- Many changes have been made to this area of the fort to allow modern interpretation of the site. An interpretative panel is installed at the rear wall floor. Where the sign has been installed, the brick rear wall delineation has been removed and concrete poured to support the sign (*Fig. 1.C-b63*).
- Inner and outer cannon traverses have also been re-installed in the poured concrete floor, with a corresponding cannon for interpretation.
- There are two small corresponding openings at the rear casemate walls that have been filled in with modern brick. Each opening measures to roughly 10" by 9" wide (*Fig. 1.C-b64*).
- There is extensive loss to the brick face of the embrasure wall, with significant damage in the southern and northern angled walls, the underside of the embrasure arch and the top right portion of the embrasure arch.



Figure I.C-b70. Cracking through the brick face on the west separation arch pier between Casemates A2 and A3.



Figure I.C-b71. Cracking through the interior parapet wall surrounding a corroded downspout above Casemate A2.



Figure I.C-b72. Stucco has been used to compensate for brick loss at the rear of the ceiling vault in Casemate A3.

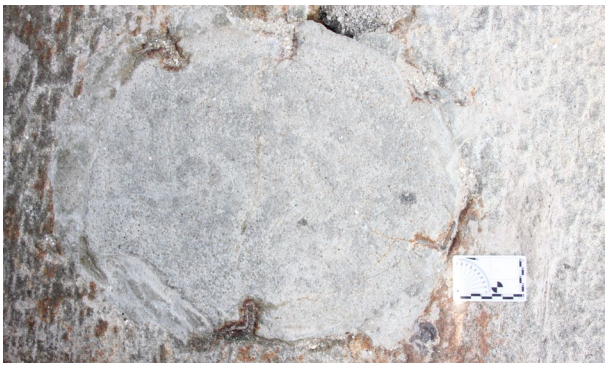


Figure I.C-b73. Northern Cap for a cistern in the flooring in Casemate A3.

Casemate A2

This space measures 16'-6" (across the embrasure wall) by 19'-0" (between the embrasure wall and rear floor termination), and is currently accessible through the rear and Casemates A1 and A3.

- Many changes have been made to this area of the fort to allow modern interpretation of the site. An interpretative panel is installed at the rear wall floor. Where the sign has been installed, the brick rear wall delineation has been removed and concrete poured to support the sign (*Fig. 1.C-b63*).
- Inner and outer cannon traverses have also been re-installed in the poured concrete floor, with a corresponding cannon for interpretation.
- There are two small corresponding openings at the rear casemate walls that have been filled in with modern brick. Each opening measures to roughly 10" by 9" wide (*Fig. 1.C-b64*).
- There is extensive loss to the brick face of the embrasure wall, with significant damage in the southern and northern angled walls, the underside of the embrasure arch and the top right portion of the embrasure arch.
- There is cracking and displacement of brick at the underside of the embrasure arch (*Fig. 1.C-b65*).
- A large crack was observed behind the first wythe at the separation arch at the southwest pier, which runs parallel to the embrasure arch (approximately two wythes deep), along the entire span of the arch and wall. This condition is of particular concern and efforts should be made to address this as soon as possible.
- There are missing brick masonry units in both niche arches.
- Smeared concrete patches have been applied to the ceiling vault to compensate for brick loss, in the portion of the ceiling closest to casemate A1, towards the middle of the separation arch (*Fig. 1.C-b66*).
- The brownstone embrasure has fractured into completely separate pieces on all sides, and many of the fractured pieces have become displaced (*Fig. 1.C-b67*). Contour scaling and surface erosion can be observed throughout the surface of the brownstone sill.
- The granite lintel is cracked and displaced in many directions (*Fig. 1.C-b68*). The reaction block system is fully intact in this casemate.



Figure I.C-b74. Southern Cap for a cistern in the flooring in Casemate A3.



Figure I.C-b75. Filled in grooves in the flooring of Casemate A3, 2013.



Figure I.C-b76. Crossed cracking on the vaulted ceiling of Casemate A3.



Figure I.C-b77. Cracking and loss of mortar and brick on the vaulted ceiling through the separation arch looking towards Casemate A2 from A3.



Figure I.C-b78. Seam between the embrasure wall and vaulted ceiling, coupled with intense biological growth in the north corner of Casemate A3.

- At the rear north casemate wall, the wall notch to receive the previously installed rear wall is very rounded, and the brick appears particularly fractured or broken for later wall construction (*Fig. 1.C-b69*).
- There is vertical cracking through the brick on the north rear casemate wall.

Casemate A2 to Casemate A3

- The embrasure side separation pier has an abundance of vertical cracking throughout the brick face, specific to this pier. This condition was not noted in other places in the section, and it most severe on the casemate A2 side (*Fig. 1.C-b70*).
- The drainage system has resulted in several water infiltration and cracking issues. The "cut-out" on the exterior face of the parade ground pier has a modern black downspout installed. On the roof level, there is a significant crack running from the exterior parapet through the parging into the upper portion of the embrasure on the southwest side (*Fig. 1.C-b71*). The pipe goes through to the front of the building and has cracked the masonry on the front face.

Casemate A3

This space measures 15'-6" (across the embrasure wall) by 20'-9" (between the embrasure wall and rear floor termination), and is currently accessible through the main sallyport entrance, parade ground and Casemates A2 and A4.

- Joint tooling is present in the mortar on the vault. This is one of the best examples of historic ribbon pointing in the structure.
- There is brick loss at the center of the vault arch that corresponds with stucco/cement compensation at the rear casemate wall.
- The parade ground side of the casemate walls has suffered a severe loss of brick. The surface is very uneven and loss has been compensated in some areas with stucco/cement (*Fig. 1.C-b72*).
- The granite floor is intact throughout, though it is fragmented across the floor. There are two openings for the cisterns underneath. The northern opening is capped with a smooth tan concrete patch with iron braces (Fig. 1.C-b73). The southern opening has been capped with poured gray concrete with slightly large aggregate (*Fig. 1.C-b74*). A corresponding channel to this opening has been filled with concrete and asphalt.
- Two grooves in the flooring that are parallel to the embrasure wall have been filled with poured concrete. The groove closest to the embrasure wall measure 4 ½" thick, while the groove closest to the parade ground measures approximately 3" (*Fig. 1.C-b75*).
- While there are various cracks throughout the ceiling in this space, the two intersecting cracks are of the most concern. The ceiling vault has evidence of a thick separation along the center of the arch (from the exterior wall to the parade ground) that has been filled with mortar. This fracture forms a cross with the typical crack that runs through the center of each of the casemates through the center of the separation arches and presents the potential of further displacement (*Fig. 1.C-b76*).
- There is also severe cracking and loss of brick and mortar through the center of the separation arches on either side of the room. These cracks are active, as they have continued to form after prior repointing interventions (*Fig. 1.C-b77*). It should also be noted that cracking continues across the ceiling and is visible through the middle of the parade ground piers.



Figure I.C-b79. Deliberate brick removal on north portion of the embrasure wall in Casemate A3.



Figure I.C-b80. Interior face of the embrasure side separation pier shows evidence of a thick black biological growth film on the right, and long vertical crack approximately one wythe in from Casemate A3.



Figure I.C-b81. Traces of bluestone pavers in front of the parade ground pier separating Casemates A3 and A4.



Figure I.C-b82. Vertical crack at the northwest side of the rear vaulted ceiling arch of Casemate A4.



Figure I.C-b83. Traces of bluestone pavers in front of the parade ground pier in Casemate A4.



Figure I.C-b84. Concrete patch in the flooring adjacent to the electrical box in Casemate A4.



Figure I.C-b85. Infilled opening at the rear southern casemate wall in Casemate A4.



Figure I.C-b86. Infilled opening at the rear northern casemate wall in Casemate A4.

- There has also been separation of the embrasure wall from the vaulted ceiling, with vertical cracking from the separation pier into casemate A2 and the angled SW wall at approximately one wythe depth.
- The north corner of the wall has extensive cracked mortar, with pervasive biological growth (*Fig. 1.C-b78*).
- Brick loss is also visible on the north portion of the embrasure wall, though it appears to be deliberate, perhaps for a former hinge (*Fig. 1.C-b79*).
- This room exhibited some of the most severe cracking throughout mortar joints and should be monitored and considered for stabilization efforts in the near future.
- There is also a metal fastener in the left corner of the embrasure arch.

Casemate A3 to Casemate A4

- The underside of the separation arch has extensive damage throughout the brick face, with the worst damage of the casemate sides.
- The interior face of the embrasure side pier is very wet, with black biological growth film across the brick's surface.
- There is extensive brick loss towards casemate A4, and a large vertical crack measuring approximately one wythe deep from casemate A3 (*Fig. 1.C-b80*).
- The "cut-out" on the exterior face of the parade ground pier has only the more modern black downspout.
- There is an extant piece of bluestone in front of the pier on the parade ground side (*Fig. 1.C-b81*).

Casemate A4

This space measures 15'-6" (across the embrasure wall) by 19'-0" (between the embrasure wall and rear floor termination), and is currently accessible through the rear and Casemates A3 and A5.

- There is damage to the surface of the brick face at the right side of the vaulted arch at the rear wall, with a vertical crack running at the side of the arch (*Fig. 1.C-b82*).
- Bluestone pavement fragments are embedded in the ground next to the parade ground pier towards the portion of the room closest to Casemate A3 (*Fig. 1.C-b83*).
- Traces of stucco/mortar from the rear wall are evidence on the underside of the vault arch.



Figure I.C-b87. A series of cracks parallel to the embrasure wall across the vaulted ceiling of Casemate A4.



Figure I.C-b88. Vertical cracks and displacement of brick, related to extensive cracking in the embrasure arch above, located underneath the electric box on the southeast angled wall of Casemate A4.



Figure I.C-b89. Separation cracking between the embrasure wall and vaulted ceiling at the northwest corner of Casemate A4.

- The poured concrete flooring is extended into the brick "foundation" of the rear casemate arch area to accommodate a footing for interpretative signage.
- There is a concrete patch from the floor to the electrical box at the southwest angled embrasure wall (*Fig. 1.C-b84*).
- Inner and outer cannon traverses are installed in the poured concrete floor, with a corresponding cannon.
- There are two small corresponding openings at the rear southern (*Fig. 1.C-b85*) and northern (*Fig. 1.C-b86*) casemate walls that have been filled in with modern brick.



Figure I.C-b90. View of the cracking and displacement of historic brick masonry surrounding the embrasure opening, looking towards the southernmost angled wall in Casemate A5.



Figure I.C-b91. Loss of material of the face of the parade ground side of the brick underside of the separation arch between Casemates A4 and A5.



Figure I.C-b92. Reconstructed fireplace, made with yellow and gray bricks, in front of the parade ground pier between Casemates A4 and A5. Vertical crack at left of vaulted arch of Casemate A5 is also visible.

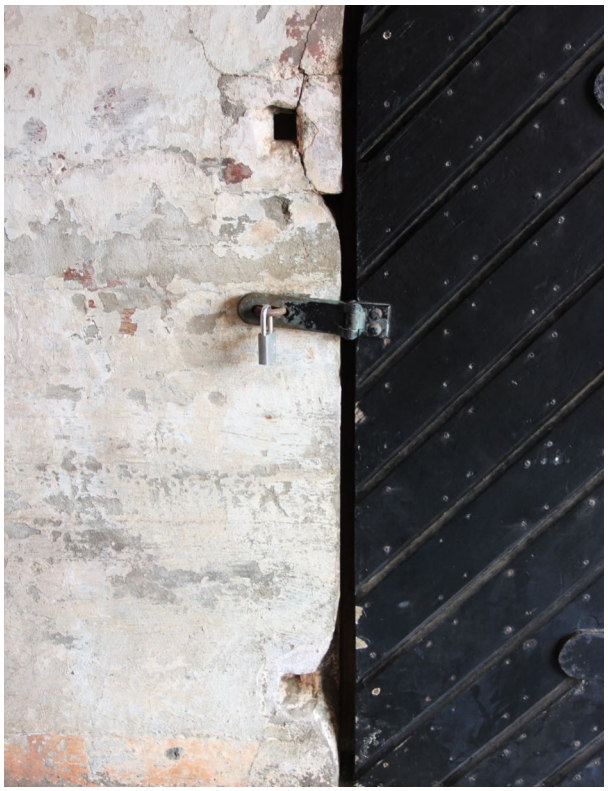


Figure I.C-b93. Evidence of previous hinge installation for Mining Casemate door in Casemate A5.



Figure I.C-b94. Two infilled openings on the southern rear casemate wall in Casemate A5.

- Intensive cracking is visible throughout the vaulted ceiling, (through roughly the center of the rear casemate walls, the center of the separation arches approximately 3" from the center of the separation arch towards the embrasure, and at the parade ground edge of the separation arch (*Fig. 1.C-b87*).
- There is a crack running approximately one wythe deep into the embrasure arch from end to end, with a second crack appearing just underneath the electrical box, along with displacement of the brick (*Fig. 1.C-b88*).
- There is separation cracking between the embrasure wall and the vaulted ceiling, with a concentration of moisture in the northwest corner with evidence of biological growth on the northern edge of the embrasure and separation arches (*Fig. 1.C-b89*).
- The embrasure opening is very wet, along with the flooring from Casemate A4 to Casemate A2 (*Fig. 1.C-b19*).
- There are intact bluestone elements in the flooring underneath the niche arches, with cracking and displacement in the brick of the southwest niche arch. Half of the brick remains as "flooring" underneath the granite lintel.
- There are two vertical cracks through the granite lintel (left and center).

Casemate A4 to Casemate A5

- The brick face on the embrasure side pier is heavily eroded, with less damage on the underside of the separation arch.
- The biggest loss of material is on the parade ground side of the arch, (*Fig. 1.C-b91*) and there are open joints at the bottom of the interior face of the parade ground pier.
- On the parade ground side, of the rear pier, there is a brick fireplace reconstruction made with lighter yellow bricks on the interior face and gray brick on the exterior, with a concrete capping. This area was a remnant retained from when the it was installed in the rear wall of Casemate A5 during the areas use as an Enlisted Men's Barracks (*Fig. 1.C-b92*).

Casemate A5

This space measures 15'-6" (across the embrasure wall) by 19'-0" (between the embrasure wall and rear floor termination), and is currently accessible through the rear and Casemate A4.

- A vertical crack extends from the left vault arch to the roof through the infill stucco at the rear wall (*Fig. 1.C-b92*).
- The northeast casemate wall is in line with a projected, poured-in-place concrete wall.
- The north wall has been covered in a layer of stucco, and has a large door opening in the center of the wall (*Fig. 1.C-b28*). This wall was enclosed in the 1920s as a mining casemate. Many finishes are visible on this wall, and it would be recommended to sample this area for paint analysis.
- Along the north wall, there are vertical cracks approximately 2 feet from the door opening towards the parade ground. There is also extensive fractured cracking on the embrasure side of the door opening.
- Evidence of a previously installed hinge is visible on the embrasure side of the wall (*Fig. 1.C-b93*).
- There are two small openings that have been filled with modern brick at the south rear casemate wall. It is likely that these openings would have had corresponding openings on the north wall, but it is not readily visible due to later alterations and the topmost stucco layer (*Fig. 1.C-b94*).
- There are also open mortar joints prevalent on the southwest rear casemate wall.
- There are several cracks throughout the vaulted ceiling, embrasure arch and separation piers that have resulted in displacement of the brick masonry. These cracks include one that begins at the rear separation arch junction and extends across the ceiling into the north stuccoed wall, as well as parallel vertical cracking at the separation pier and embrasure arch and angled walls, with displacement at the embrasure arch (*Fig. 1.C-b90*).



Figure I.C-b95. View of the roof above Casemate B'1.



Figure I.C-b96. Brick flooring in Casemate B'1.



Figure I.C-b97. Archeological evidence in the area in front of Casemate B'1.



Figure I.C-b98. Archeological evidence in the area in front of Casemate B'1.



Figure I.C-b99. Archeological evidence in the area in front of Casemate B'1.

- Severe erosion of the brick face is apparent on the embrasure wall, both above and below the arch.
- The separation pier on the southwest side is very wet with an eroded surface and many cracked mortar joints.
- The brownstone is delaminating in sheets, with a deep crack at the upper right corner.
- Red finishes are extant on the concrete infill at the embrasure opening.
- The granite lintel has extensive horizontal cracking and is missing its bottommost component (*Fig. 1.C-b90*).

Mining Casemates

This portion of the fort is located along the west wall of Fort Sumter and includes Casemates A6 and B'1. These two spaces are modified mid-nineteenth century cannon casemates that currently serve as storage space. This area is at the junction of the Left Flank and Left Face, and abuts the ground on its exterior face. This portion of the building is the only space in the original fort that is fully enclosed. It was modified in the 1920s to become a mining casemate for mines installed throughout Charleston Harbor.

The historic materials differ in the two casemates. Casemate B'1 is comprised of the same gray brick with a tabby core that is used in many of the casemates in the Left Flank, Right Flank and Right Face. There are curved brick walls installed on the rear and north of Casemate B'1, separating the space from Casemate C3. The rear wall has a doorway opening with a temporary gate used for security. The northwest wall contains a brownstone embrasure opening composed of four separate pieces that sit atop a granite lintel that is supported by two brick arched niches. Each room has a vaulted ceiling and arched openings running east-west that support the ceiling and also serve to delineate each casemate space. The brick floor throughout casemate B'1 and the poured concrete floor in Casemate A6 are both twentieth century alterations. Casemate A6 is entirely rebuilt, with only the exterior wall preserving the embrasure opening of its former 19th century configuration. The room is completely enclosed in solid, thick, poured-in-place concrete walls on all four sides. The west concrete wall abuts the original exterior Left Flank wall.

The predominant condition throughout this portion of the fort is salt damage due to extensive moisture infiltration from the roof above and prolonged exposure to seawater at the exterior walls. The most concerning condition is the prolific cracking and displacement of the vaulted ceiling in Casemate B'1. Many of the cracks along this ceiling intersect and present a significant safety concern.

Exterior

For a description of walls, refer to the Left Flank Casemates section.

Interior

The following subsections include physical descriptions of the materials and conditions that are typical of all of the Mining Casemates. Refer to section Individual Casemates for features that are unique to each individual space.

Roof & Rainwater Collection

The tops of the brick (Casemate B'1) and concrete (Casemate A6) vaults of the Left Flank casemates are covered with a white modern, liquid-applied waterproofing membrane (*Fig. 1.C-b95*). The membrane appears to be in good condition except at the back of the parapet wall, where several cracks and areas of alveolar erosion from wind were noted. Cracks were also observed where the roof meets the back of the parapet wall, a condition that is undoubtedly contributing to moisture on the interior of the casemates. There is also extensive biological growth on this membrane at the back of the parapet wall. This bright white, modern roofing material has a pronounced visual impact that is incongruous with the surrounding historic masonry.

Flooring

The flooring in Casemate B'1 dates to the 20th century and is made of gray brick, (*Fig. 1.C-b96*) while the flooring in Casemate A6 is entirely composed of concrete. The outer portion of flooring between the casemates and parade ground area is brick, with traces of previous construction elements. On the parade ground side of Casemate A6, there are various archaeological fragments embedded in the ground. There is an assemblage of bricks in the northwest corner of the rectangular area that appears to have been a fireplace (*Fig. 1.C-b97*). Similarly, there is evidence of a granite threshold (*Fig. 1.C-b98*), brick walls and bluestone pavers in the ground (*Fig. 1.C-b99*).

Walls

The walls are built with different materials between the two rooms.

Ceiling

The ceiling in Casemate A6 is composed of poured-in-place concrete, while the ceiling in Casemate B'1 is built with gray brick and stabilized in areas with a poorly-applied concrete fill material.

Doors

A large, single, arched wooden door separates Casemate A5 (Left Flank casemates) from Casemate A6 (*Fig. 1.C-b28*). The door is constructed with diagonal tongue-and-groove boards and installed to hinge on the eastern side of the door with two large metal straps. A vaulted ceiling lines the corridor approaching both Casemates A5 and B'1 from Casemate A6. A modern temporary wooden gate separates Casemate B'1 from the parade ground.



Figure I.C-b100. Detail of leached white salts on the exterior surface of the east poured-in-placed concrete wall of Casemate A6.



Figure I.C-b101. One of the pipes leading to the roof in the ceiling of Casemate A6.



Figure I.C-b102. Macroflora growing into the masonry of the southwest wall of Casemate A6, at the junction with Casemate B'1.



Figure I.C-b105. Common bond coursing at the top of the interior rear wall of Casemate B'1, above the door lintel.



Figure I.C-b103. Interior east, common bond-coursed brick wall of Casemate B'1.



Figure I.C-b106. Exterior stucco application, and cracking along the top edges of the rear wall of Casemate B'1.



Figure I.C-b104. The exterior face of the wall shown in Figure I.C-b103, taken from Casemate C3.



Figure I.C-b107. Wall openings on the north rear casemate wall.



Figure I.C-b108. Embrasure wall in Casemate B'1.



Figure I.C-b109. A portion of the ceiling in Casemate B'1 that has been filled with large aggregate concrete and severe cracking in the vault parallel to the embrasure wall.



Figure I.C-b110. Overview of the Left Face casemates along the north wall of Fort Sumter.

Windows

There is one enclosed embrasure window in Casemate B'1. The opening is completely infilled and inaccessible from the exterior of the building.

Finishes

Traces of white finish are extant on the interiors of both casemates.

Individual Casemates

The materials and conditions noted in section Interior are relevant for all of the spaces in the Mining Casemates. The following section of the report contains more detailed information that relate to features that are unique to each individual space.

Casemate A6

This space measures 11'-6" wide by 20" long, and is currently accessible through a corridor leading from Casemate B'1. This area, formerly the mining casemate, is currently used for storage of historic masonry materials, paint, and other material supplies.

Casemate A6 is entirely rebuilt, with only the exterior wall preserving the embrasure opening of its former 19th century configuration. The room is composed of solid, thick poured-in-place concrete walls on all sides.

- The exterior wall on the parade ground face was constructed with poured-in-place concrete, with visible lifts. Cracks are prevalent at areas between lifts, and at these cracks there is strong evidence of salt-leaching (*Fig. 1.C-b100*).
- There is also tan staining associated with the salt leaching and there are pockets across the surface where aggregate is exposed.
- There is a prominent crack across the top of the wall that follows the roofline.
- The interior walls in this space are generally very wet, but there was no evidence of mold growth.
- There are two pipes in the ceiling that extend to the roof that might be contributing to the moisture issues in the space (*Fig. 1.C-b101*).

Casemate B'1

This space measures 15'-6" (across the embrasure wall) by 19'-6" (between the embrasure wall and rear floor termination), and is currently accessible

through a doorway opening at the rear of the room. This area is currently used for the storage of equipment.

The space is primarily constructed with gray brick, with a brownstone embrasure on the interior face of the Left Flank wall. The embrasure is supported by a granite lintel with brick side niches on both sides of the opening. The embrasure wall and openings are generally intact, with open brick niches, an open area below the granite lintel and an intact metal apparatus for the reaction block system.

- Macroflora is growing in the mortar joints of the southwest wall of Casemate A6, at the junction with Casemate B'1 (*Fig. 1.C-b102*).
- This room has a brick floor (*Fig. 1.C-b96*), with more modern brick used closer to the entrance and older brick used further into the room.
- Both exterior walls of Casemate B'1 have been rebuilt. The wall enclosure to the north is composed with older bricks at the lower courses with modern brick after the 13th course from the bottom. The entire wall is coursed in common bond (*Fig. 1.C-b103*). The exterior of this wall (also, the west wall of Casemate C3) has a modern, smooth concrete stucco application, with an earlier stucco at the top of the wall (*Fig. 1.C-b104*). The rear wall of Casemate B'1 has also be reconstructed with modern brick (Fig. *1.C-b105*), and is coursed with common bond, with an exterior, modern, smooth concrete stucco applied to its wall surface.
- The southwest wall is covered with an application of modern, smooth concrete stucco applied on the wall surface. There is cracking along the top portions of the parade ground face of the exterior wall (*Fig. 1.C-b106*).
- There are two openings in the brick on the north rear casemate wall (*Fig. 1.C-b107*). The corresponding openings could not be located on the south wall, but it is possible that the southwest wall was reconstructed at a later date.
- The embrasure window is fully enclosed (*Fig. 1.C-b108*). The granite and brownstone in the embrasure wall are in good condition, and the space is configured similarly to the Left Flank casemates, except that the left niche arch and portion under the granite lintel are currently enclosed with brick.
- There is a large portion of the center of the ceiling that has been patched with large aggregate concrete. There is cracking at the junction of concrete and brick ceiling and should be monitored and evaluated to ensure the structural stability of the roof/ceiling.
- There is also severe cracking and displacement at the north corner of the room where the vault meets the end of the separation arch. This crack is very concerning, and spans the entire span of the vault (*Fig. 1.C-b109*).



Figure I.C-b111. Exterior wall face of the northwest wall of Fort Sumter.



Figure I.C-b112. The top portion of the parapet wall, with signs of wind erosion in the mortar joints.



Figure I.C-b113. Cross-section of the embrasure wall in Casemate A7 showing three wythes of brick outside of the tabby core.

Left Face Casemates

This portion of the fort is located at the northwest wall of Fort Sumter and includes Casemates C3, B2, A7, A8, A9, A10, A11, A12 and A13. The northwest wall abuts the water and has a low level of riprap installed along the surface to protect the exterior from wave action. The interior portion of this section was heavily damaged during the Civil War, and there are no longer any intact separation walls, roofs or rear walls.

The historic materials are fairly uniform throughout this section of the fort. The walls are composed of gray brick with a tabby core. The flooring throughout the area is generally a mix of bluestone and granite pavers, with fragments of the original inner and outer wrought iron cannon traverses. There is no longer a footprint of the rear edge of the casemates, as much of the original flooring has been covered with modern brick pavement and grass from the parade ground area. Ruinous fragments of the rear casemate walls (also referred to as the parade ground piers) are the only remaining delineations of the rear casemate spaces. Each room along the northwest wall contains a brownstone embrasure opening composed of four separate pieces that sit atop a granite lintel, which is supported by two brick arched niches.

The problematic conditions observed throughout this portion of the fort are related to the area's semi-ruinous state and its location within the fort. Many of the major structural supports for the casemate's vaulted arch system are no longer intact, and as a result, there is nothing to support the embrasure wall and prevent it from delaminating from the exterior wall. The top portions of these walls are also open to the elements, exposing the tabby cores to rainwater and sunlight. And lastly, this area is particularly susceptible to extreme cycles of wet and dry due to its location within the fort, as the exterior walls stay moist from constant bombardment from sea waves while the exposed interior walls (with no roof to moderate temperatures) are heated throughout the day by direct sunlight.

Exterior

The Left Face exterior wall is composed mainly of brick laid in an English bond, with alternating courses of headers and stretchers. The wall stands one-level high with a brick cornice, which slopes upward as it meets the Left Flank wall. The cornice remains at the same horizontal level as it approaches the Right Face wall, but the parapet wall above the cornice slopes upwards as it approaches the salient angle. The parapet has its intact, late nineteenth century, cast concrete coping units across the first level, with a brick roofline that slopes past the parapet towards the Salient Angle (*Fig. 1.C-b111*).

There are several cracks in the exterior wall of the Left Face, many of which are minor, but all of which will require repair. The most concerning crack is located at the upper left corner of the wall underneath the brick cornice, radiating around the junction between the Salient Angle and Northwest wall. There are two more minor vertical cracks, one of which originates at the top left corner of the embrasure opening for Casemate A2 and the other follows the right side of the embrasure opening for Casemate B1 into the upper wall.
The stucco applied to the brownstone embrasures is generally intact throughout the elevation.
The exception is the area corresponding to the embrasure opening of Casemate A13, where missing lower portions of the brownstone embrasure have been filled with brick and the stucco is delaminating and cracking. The top half of the wall appears to have been recently repointed and is in good condition, but the lower brick courses underneath the embrasure opening for Casemate A4 appear to be bulging outward. The lower portion of this wall is completely exposed to the seawater and there is no riprap to protect the surface from wave impact. There is very little remaining of the brownstone embrasure opening for Casemate A1, which has been mostly infilled with brick.

There are ten window openings that correspond to the embrasures for Casemates C3, B2, A7, A8, A9, A10, A11, A12, A13 and B'2. Each embrasure openings is composed of four pieces of brownstone that have been filled with a combination of brick and historic concrete and covered with layers of stucco. There is no evidence of doors or gates in this portion of the building.

Unique features of the exterior Left Face:

- A scupper opens at the brick cornice level above the left side of the embrasure opening for Casemate A12.



Figure I.C-b114. Staircase remnants at parade ground pier between Casemates B'1 and C3.



Figure I.C-b115. Early concrete repair and metal tie in the parapet of Casemate C3.



Figure I.C-b116. Detail of the brownstone's current condition in Casemate C3.

Interior

The following subsections include physical descriptions of the materials and conditions that are typical of all casemates in the Left Face casemates. Refer to section Individual Casemates for features that are unique to each individual space.

Roof & Rainwater Collection

Roofs over these casemate spaces no longer exist. The second tier level at the parapet is damaged from heavy wind erosion at the mortar joints; a condition unique to this wall and possibly related to a prevailing southwest wind (*Fig. 1.C-b112*). Casemates C3 to A13 no longer have intact ceiling vaults or arched openings dividing the casemates. Only Casemates A7 and A8 have remnants of where the casemate arch originally met the exterior wall. Remnants of the northwestern corners of the walls are still intact on the extant parade ground piers.

Flooring

Bluestone paving has been installed from the casemate wall to the outer edge, with brick pavers separating the area between the casemate and the parade ground.

Walls

The casemates are primarily constructed with gray brick, with a brownstone embrasure on the interior face of the Left Flank wall, supported by a granite lintel with brick side niches on both sides of the opening. The embrasure wall and openings are generally intact. They have open brick niches, an open area below a granite lintel and an intact metal apparatus for the reaction block system. The historic concrete infill for the brownstone embrasure is generally flush with the interior face of the brownstone. As observed in Casemate A7, there appear to be three wythes of interior brick in front of the historic concrete core of the wall (*Fig. 1.C-b113*). In general, there is cracking throughout the brick in areas of historic damage. There is also typically mortar residue where the casemate vault meets the embrasure wall.

Ceiling

There is little evidence of this feature remaining in this portion of the building.



Figure I.C-b117. Detail of the orange mortar used in the embrasure opening of Casemate C3.



Figure I.C-b118. Vertical groove detail in the separating arch pier between Casemates C3 and B2.



Figure I.C-b119. Detail of historically damaged brick on the separating pier between Casemates C3 and B2.

Doors

There is no evidence of this feature in this portion of the building.

Windows

All windows are filled in these casemates. The embrasure openings are flanked by four pieces of brownstone that have been filled with a combination of brick and historic concrete with brick and seashell aggregate.

Finishes

There are traces of white finishes that are still extant on protected portions of the embrasure wall. A modern paint, reportedly epoxy-based, has been applied to the metal elements of the cannon traverses.

Individual Casemates

The materials and conditions noted in the Interior section are relevant for all of the spaces in the Left Face casemates. The following section of the report contains more detailed information that relate to features that are unique to each individual space.

Casemate B'1 to Casemate C3

- Evidence of an extant staircase exists in the parade ground ruins, including a granite base fragment and pieces of granite in the stair tread remnants (*Fig. 1.C-b114*).
- A downspout runs through the wall and extends through the roof of B'1 to the eastern wall of Casemate A6. Cracking through the stucco follows the exposed downspout (horizontally portion), parallel to the roofline.

Casemate C3

This space measures 14'-10 ½" (across the embrasure wall) by 16'-3" (between the embrasure wall and the interior corner of the parade ground pier). The space is currently accessible from every direction, with the exception of Casemate B'1 which is separated by a brick wall.

- The embrasure wall has evidence of previous repairs and stabilization attempts across its surface.
- There is evidence of mortar from where the casemate vault (now missing) would have met the embrasure wall.

- The top of the parapet has many individual bricks that might be loose with a lot of open mortar joints. It should be noted that these bricks appears to be evidence of a later reconstruction and are generally grayer in tone.
- There is at least one visible early concrete repair on the top right of the parapet in this casemate, and a bolt tie attached just to the left of the concrete patch (*Fig. 1.C-b115*).
- The brownstone embrasure and granite lintel elements appear to be in good condition. There are visible signs of weathering and some surface loss, but there is no active deterioration (*Fig. 1.C-b116*).
- Multiple mortar campaigns are visible throughout the wall. There is some erosion of the mortar joints, but overall, they appear to be in good condition.
- One of the prevalent mortar types used for the infill pointing mortar in the embrasure opening is orange in color with pronounced shell fragments. It is different from the mortar in the rest of the wall (*Fig. 1.C-b117*).
- There is brick loss in the niches on either side of the embrasure, which may have exposed evidence of an early mortar in the western niche.
- The bluestone flooring is laid in broken fragments, with no indication of the historic cannon placement.

Casemate C3 to Casemate B2

- There are at least three re-pointing campaigns, one of which appears to date to the 20th century, at the top half of the wall.
- The mortar is in relatively good condition, with some erosion of the surface at the joints.
- The same orange mortar noted in Casemate C3 is seen in the embrasure infill.
- There is evidence of a smoothing mortar on the top edge of the separating arch pier where the arch dividing Casemates C3 and B2 would have met the wall.
- There is evidence of a vertical groove on the separating arch pier, which appears to have been related to a prior wall construction. It is unclear if there is also a corresponding horizontal groove on the same pier, as the masonry is badly deteriorated (*Fig. 1.C-b118*). This unique feature is also visible in the Right Face casemates, between Casemate C4 and Casemate B4.
- There appears to be earlier, historic damage at the bottom third of the wall. The bricks appear very eroded and have lost their fire skin (*Fig. 1.C-b119*).
- The parade ground pier (*Fig. 1.C-b120*) lacks historic integrity. Its east wall has voids and some deep cracks.

Casemate B2

This space measures 14’-9 ½” (across the embrasure wall) by 15’-0” (between the embrasure wall and the interior corner of the parade ground pier). The space is currently accessible from every direction.

- The inner traverse cannon track is intact at the wall, with a preserved remnant of the iron track. The bluestone paving on the floor is partial and the pieces are fragmentary with patching mortar used to compensate loss. Brick is used as flooring on the parade ground side.
- On the northwest wall, the orange mortar with shell inclusions (similar to Casemate C3) is used in the embrasure infill and underneath the granite lintel, where bricks have been used to close the opening. The infill is flush with the interior face of the brownstone. The bricks used in the embrasure infill are extended on the west end.
- The masonry contains many voids from mechanical damage above the embrasure arch, through the west end, center and east edges of the embrasure arch.
- The western angled wall of the embrasure has extensive historic damage.
- The west niche on the embrasure wall has been bricked in, while the east is still open.
- There is also evidence of an early crack monitoring system above the arch fragment in

Casemate B2 to Casemate A7

- On the separating arch pier, the brick masonry is in poor condition. There is vertical cracking through out the pier, radiating from where the arch used to connect to the pier down to the floor level. There are multiple cracks (13-15 courses) through the brick and cracks through the mortar the entire length of the pier. The outer two wythes of brick on the western edge of the northwest wall are delaminating/ detaching, and the bulk of the center and eastern portion of the pier has approximately 50% loss of brick (Fig. 1.C-b123).



Figure I.C-b120. Ruinous condition of the parade ground pier between Casemates C3 and B2.



Figure I.C-b123. The separation arch pier is in poor condition between Casemates B2 and A7.



Figure I.C-b121. Detail of early crack monitoring system above the arch fragment in the west corner.



Figure I.C-b122. Separation of the separation arch pier from the embrasure wall between Casemates B2 and A7.



Figure I.C-b124. Parade ground pier between Casemates B2 and A7.



Figure I.C-b125. Flooring in Casemate A7.



Figure I.C-b126. Lower embrasure wall in Casemate A7.



Figure I.C-b127. Fracturing of the western underside of the brownstone embrasure in Casemate A7.

- Visible from the upper tiers of the parapet, much of the damage on the face of the pier is related to the separation of the pier from the embrasure wall. The seam between the two elements is dramatically widening and should be addressed with future interventions (*Fig. 1.C-b122*).
- The parade ground pier has a "cut-out" (18" deep by 13" wide) on its south wall in the center of the pier that originally housed a downspout (*Fig. 1.C-b124*). There is a brick base foundation that sits approximately eight courses up from the ground, at which point the tabby core is integrated into the pier (approximately 49" tall). The north faces of the pier are generally in better condition than the south faces.



Figure I.C-b128. Separation of the embrasure arch and separation pier with the embrasure wall in Casemate A7.

Casemate A7

This space measures 15'-6" (across the embrasure wall) by 15'-0" (between the embrasure wall and the interior corner of the parade ground pier). The space is currently accessible from every direction.

- The flooring is two-thirds bluestone paving, mainly in large rectangular pieces with some small fragmented pieces and one-third of the floor is brick pavement (*Fig. 1.C-b125*).
- Portions of the outer cannon traverse are visible underneath the brick flooring in a small section at the east end of the room.
- The lower portion of the embrasure wall has been heavily altered also a result of historic damage to the area and subsequent stabilization efforts (*Fig. 1.C-b126*). The tabby core is visible behind the brick, exposed on the western angled wall, west of the embrasure (*Fig. 1.C-b113*).



Figure I.C-b129. South wall of the parade ground pier between Casemates A7 and A8.

- The brownstone sill is missing, and brick infill has been used to both enclosure the embrasure opening and to stabilize the lower wall. The brick infill in the opening of the embrasure is flush with the interior face of the brownstone and has many open joints that are very deep.
- The eastern edge of the brownstone embrasure is cracked and has damage and loss. There are cracks throughout the top piece of the brownstone emanating from two abandoned iron anchors, as well as extensive cracking and loose brownstone on the western portion underside (*Fig. 1.C-b128*).
- Water infiltration is visible on the underside of casemate vault arch, resulting in many cracks and open joints.
- A continuous horizontal crack has formed in the arch parallel to the underside of the embrasure arch, along with the separation of the casemate arch from the embrasure wall. This condition is also visible in the separation arch piers (*Fig. 1.C-b128*).
- The parade ground pier has a cutout in its south face with its exposed tabby core visible



Figure I.C-b130. Northwest corner damage on the parade ground pier between Casemates A7 and A8.



Figure I.C-b131. Flooring, along with lower embrasure wall in Casemate A8.



Figure I.C-b132. Salt deposition below the granite lintel in Casemate A8.

(55” tall by 12 wide). A remnant of a clay downspout is intact at ground level (12” diameter-outer), (*Fig. 1.C-b129*) There is brick loss at the top of the southeast corner, the east wall has deep, open mortar joints at the lower right wall, with vertical cracking through the brick, and the northwest corner has large brick loss at the corner with open joints, which could possibly be historic damage (*Fig. 1.C-b230*).

Casemate A7 to Casemate A8

- The pier on the embrasure-side wall is generally in good condition with some minor cracking.

Casemate A8

This space measures 15’-6” (across the embrasure wall) by 15’-0” (between the embrasure wall and the interior corner of the parade ground pier). The space is currently accessible from every direction.

- The flooring to the outer cannon traverse is of large, rectangular pieces of bluestone (*Fig. 1.C-b131*). Flooring past the traverse is of brick, with a dramatic distinction between the two materials. There is grass between parade ground piers slope from exterior to outer traverse.
- There are many open joints in the embrasure arch and at the bottom of the wall, as well as separation of the casemate arch from the embrasure wall.
- The opening at the lower portions of the granite lintel appears intact, although half of the granite lintel is missing. A crack has formed through the entire height of the stone in the center (*Fig. 1.C-b131*).
- Salt deposits have formed in the brick opening below the granite lintel, possibly related to the deposit of salts from the sea water on the exterior wall, and fast drying cycles on the southern exposure of the embrasure wall. (Fig. 1.C-b132)
- There is no longer physical evidence of the brick niche to the left of the embrasure opening, most likely due to past stabilization efforts.
- There is a prevalent loss of material on the lower left jamb and sill of the brownstone embrasure, along with open joints in the brownstone surround. Signs of alveolar erosion are present on the top left corner of the brownstone embrasure, (Fig. 1.C-b133) along with delamination throughout the stone surface, especially in the left jamb where the delamination is parallel to the face of the stone and resulting in heavy cracking throughout the element. (Fig. 1.C-b134)



Figure I.C-b133. Alveolar erosion on the top left corner of the brownstone embrasure in Casemate A8.



Figure I.C-b134. Delamination in the left jamb of the brownstone embrasure in Casemate A8.

- There is an intact historic projectile (100 pdr. Or 6 in. Parrott shell or solid shot) in the northwest wall to the left of the embrasure opening. The artifact is exhibiting signs of corrosion and efforts should be made to preserve this important artifact (*Fig. 1.C-b135*).
- Infill in the opening of the embrasure is flush with the interior face of the brownstone. There is evidence of an early concrete with brick pieces (at the side of the embrasure infill) that has been applied with a coat of parging (*Fig. 1.C-b136*).

Casemate A8 to Casemate A9

- The separation pier has moderate to high integrity, with cracked mortar joints at the top of the north pier.
- The parade ground pier is in a ruinous state. The south face has a centered "cut-out" for a downspout has an exposed tabby core, with a remnant of clay pipe (*Fig. 1.C-b137*). The pier is stable but incomplete, and has very low integrity.

Casemate A9

This space measures 15'-6" (across the embrasure wall) by 15'-0" (between the embrasure wall and the interior corner of the parade ground pier). The space is currently accessible from every direction (*Fig. 1.C- b138*).

- The flooring is composed of rectangular pieces of bluestone, some of which have fragmented. The granite is well preserved, both on the lintel and on the inner and outer traverses.
- There is impact damage throughout the embrasure wall, notably in the embrasure arch, with historic brick loss at the western edge of the embrasure arch and thorough, large circular loss of the western angled wall where the tabby core is exposed.
- The granite lintel and opening underneath are largely intact, though the lintel is missing its lower left corner.
- A portion of the bricks lining the opening under the granite is missing.
- The infill in the embrasure has the previously noted orange mortar, flush with brick at the top with open deeper joints towards the bottom.
- There is evidence of mud wasps on the underside of the top embrasure piece.
- The surface of the brownstone is weathered and has low friability, with evidence of alveolar erosion on the sill front and delamination at the right corner.



Figure I.C-b135. Historic projectile in the northwest wall of Casemate A8.



Figure I.C-b136. Early concrete used in embrasure infill of Casemate A8.



Figure I.C-b137. Ruinous separation pier between Casemates A8 and A9.



Figure I.C-b138. Overall view of Casemate A9.



Figure I.C-b139. Delamination of one wythe of brick in the east separation pier of Casemate A9.



Figure I.C-b140. Vertical cracking through the upper wall above the embrasure arch in Casemate A9.



Figure I.C-b141. Granite block installed along the parapet with the inscription "15 Guns" at Casemate A9.

- There is separation cracking between the northwest wall and piers. One wythe of brick is delaminating from the surface of the eastern pier (*Fig. 1.C-b139*) and there is a vertical crack all the way through the upper wall, above the embrasure arch on the eastern side (*Fig. 1.C-b140*).
- Visible from the rooftop, there is a granite block installed in the parapet with the inscription "15 Guns" (*Fig. 1.C-b141*).

Casemate A9 to Casemate A10

- The north pier of the embrasure side is overall in good condition, with separation approximately one wythe of brick in from the western edge. There is a corresponding loss of material on the east edge.
- The lower wall has been repointed with the previously mentioned orange mortar with deep, open joints and deteriorated mortar at the top of the wall.
- The parade ground pier is in low to moderate condition, with a "cut-out" in the center of the south facing wall. There is a tabby core in the center with a remnant of a historic clay downspout. The tabby core is not exposed behind the downspout and it just in the core of the pier. The north and south corners of the east wall have open joints. There are a few vertical cracks in the bricks.

Casemate A10

This space measures 15'-6" (across the embrasure wall) by 25'-10 ½" (between the embrasure wall and the outer/parade ground edge of the granite pavement). The space is currently accessible from every direction.

- The flooring is bluestone at the embrasure wall with a granite inner traverse. Large granite slabs cover the cistern opening (*Fig. 1.C-b142*).
- There is partial evidence of the wrought iron tracks on the outer traverse, and only bolts are present in the inner traverse.
- The granite flooring is cracked at the opening to the cistern.
- Historic damage was found at the bottom of the wall, especially at the area west of the embrasure where the tabby core is exposed. There is also damage at the arch over the embrasure (*Fig. 1.C-b143*) and there are open joints and cracked bricks at the areas of historic loss.



Figure I.C-b142. Granite flooring over Cistern in Casemate A10.



Figure I.C-b145. Separation arch pier is half missing between Casemates A10 and A11.



Figure I.C-b143. Extensive damage to the embrasure arch in Casemate A10.



Figure I.C-b144. Loss of right corner and historic damage to the granite lintel in Casemate A10.



Figure I.C-b146. Flooring in Casemate A11, with missing portions of the outer granite traverse.

- The niches on the embrasure wall are partially damaged.
- Horizontal cracks run parallel to the underside of the embrasure arch.
- A separation crack has formed between the pier and embrasure wall.
- There is a large hole in the area of loss in the west side of the embrasure opening, measuring approximately 10” diameter.
- The infill on the brownstone embrasure is further backset with the brick concrete (closer to the water). Aveolar erosion is particularly pronounced on the west and bottom pieces, and there is some delaminaton of the sill piece parallel to the top of the sill, with low friability to the surface.
- The granite lintel is in poor condition, partially due to corroded iron from the reaction block. There has been loss at the right corner and significant cracking throughout, both perpendicular and parallel to the face, through the stone (*Fig. 1.C-b144*). There is also salt evidence underneath the granite lintel opening.

Casemate A10 to Casemate A11

- The north pier on the embrasure wall is half missing (*Fig. 1.C-b145*). There are cracked bricks at the top with losses at both sides.
- The parade ground pier is in a ruinous state, with open joints on the east side at the lower corner. Vertical cracking is visible through the bricks on the south face. There is a “cut-out” on the south face, with a clay downspout remnant. The tabby core is visible at the back of the pipe. The west and east faces have cracks forming along the outer wythes.

Casemate A11

This space measures 15’-6” (across the embrasure wall) by 15’-0” (between the embrasure wall and the interior corner of the parade ground pier). The space is currently accessible from every direction.

- The flooring is composed of bluestone to the outer traverse, rectangular square pieces, half of which are fragmented. Brick was used for the remainder of the floor. The inner traverses maintains its granite, while the wrought iron track and remnants of the bolts are no longer extant. The outer traverse maintains its granite, with portions missing in the center, possibly underneath the brick paving (*Fig. 1.C-b146*).



Figure I.C-b147. Significant damage to the west side of the embrasure wall in Casemate A11.



Figure I.C-b148. Vertical and horizontal cracking throughout the embrasure arch in Casemate A11.



Figure I.C-b149. Buttress pier fragments between Casemates A11 and A12.



Figure I.C-b150. A historic projectile in the western portion of the embrasure wall in Casemate A12.



Figure I.C-b151. Significant loss of material on the west side of the embrasure wall in Casemate A12.



Figure I.C-b152. Traces of red and white finishes in the embrasure opening in Casemate A12.

- The northwest wall has suffered significant damage and loss at the west side of the embrasure and has its tabby core is exposed (*Fig. 1.C-b147*).
- Historic projectile is embedded in the wall.
- Historic damage is also visible on the embrasure arch, including the loss of outer wythes of brick for roughly one-third of the arch.
- There is a horizontal crack in the embrasure arch, parallel to the underside of the arch, along with a crack in the arch close to center, at the underside of the embrasure arch (*Fig. 1.C-b148*).
- Vertical cracking through the brick is prolific on the lower portion of the east angled embrasure wall.
- The infill in the brownstone embrasure is backset, closer to the water.
- The brownstone embrasure is in poor condition, with large parts of both the west and bottom pieces missing and the remaining elements cracked and delaminating. Both pieces also have alveolar erosion at the surface, with low friability on the surface.
- The granite lintel is also in poor condition, with a very corroded pin in the reaction block and has multiple cracks in the vertical direction.
- Vertical and horizontal cracking throughout the embrasure arch in Casemate A11, 2013.

Casemate A11 to Casemate A12

- The north pier is missing, except for the lower 8 to 10 courses.
- Vertical cracking is visible at the east and west corners of the embrasure wall, where it would have met the separating arch pier.
- The parade ground pier has a cutout in its south face wall and a remnant of a clay pipe. The tabby core back is exposed behind the pipe (extended to approximately 40” from the top of the existing downspout. The south face is in the worst condition, and while the entire pier is in stable condition, there are many open joints in the bricks above the downspout. This pier is the tallest of the piers in the Left Face.
- The buttress pier remnant appears at the northwest corner of Battery Huger, and is embedded into the foundations of the later building (Fig. 1.C-b149).



Figure I.C-b153. Alveolar erosion on the left corner of the brownstone embrasure in Casemate A12.



Figure I.C-b154. North separation pier between Casemates A12 and 13.



Figure I.C-b155. Bluestone flooring remnant between Casemates A12 and A13.



Figure I.C-b156. Buttress pier fragment has been incorporated into the foundations of Battery Huger between Casemates A12 and 13.

Casemate A12

This space measures 15'-6" (across the embrasure wall) by 15'-0" (between the embrasure wall and the interior corner of the parade ground pier). The space is currently accessible from every direction.

- The flooring is composed mainly of rectangular blue pavers, with approximately 25% of them cracked, extended to the outer traverse. Brick pavement is used for the flooring outside of the outer traverse to the parade ground.
- The west side of the embrasure and embrasure arch have lost a significant amount of material, with its tabby core exposed (*Fig. 1.C-b151*).
- A historic projectile is embedded in the wall west of the embrasure (*Fig. 1.C-b150*).
- There are cracked bricks and horizontal cracks in the area of loss in the embrasure arch, with horizontally cracking and deep open mortar joints prevalent on the east angled wall.
- There are many smaller areas of smaller brick masonry damage, primarily small voids that are presumed to be historical.
- The infill portion of the embrasure appear to be damp, and is further backset and closer to the water, with embedded iron fasteners in the mortar.
- Minimal lime wash residue survives on the protected portions of the wall, with red and white finishes found on the concrete of the infill (*Fig. 1.C-b152*).
- There is also significant alveolar erosion on the brownstone sill piece, along with significant loss at the left corner and bottom half of the left piece (*Fig. 1.C-b153*). In general, the brownstone surface is very friable, cracked and delaminated with alveolar erosion.

- The granite lintel suffered a large loss and has active cracking on the right side, and the brick support for the right side is also missing.

Casemate A12 to Casemate A13

- The north pier on the embrasure wall is missing half of its pier, with damage at both bottom corners of the pier (*Fig. 1.C-b154*).
- The parade ground pier is a partial remnant, and has a cutout on the south face with a remnant of clay downspout. There is no exposed tabby core behind the pipe. The flooring is bluestone paver south of the outer traverse at the transition between A12 and A13 (*Fig. 1.C-b155*). The buttress pier is under Battery Huger, with many cracks and open joints (*Fig. 1.C-b156*).

Casemate A13

This space measures 15'-6" (across the embrasure wall) by 15'-0" (between the embrasure wall and the interior corner of the parade ground pier). The space is currently accessible from every direction.

- The flooring is bluestone to the outer traverse and is almost entirely fragmented (*Fig. 1.C-b157*). Brick composes the outer portion of the flooring towards the parade ground. Approximately half of the inner traverse track survives, and there is approximately three-quarters of the outer traverse track intact.
- The northwest wall has evidence of historical damage at the west side of the embrasure and part of the embrasure arch and small areas of damage over the arch.
- There is evidence of dead macroflora (ferns) in the masonry above the embrasure arch, which appears to have been treated with an herbicide.
- Minimal traces of an earlier white finish survive on the protected brick surfaces.
- Several brick units on the underside of the embrasure arch are unstable (*Fig. 1.C-b158*).
- There are vertical cracks in the brick masonry above the embrasure arch, and the mortar joints are very recessed, wet and friable with voids.
- The infill in the brownstone embrasure is unique and extends from the top of the embrasure framing to the floor, beyond the granite lintel.
- The brownstone sill is completely missing, with major loss at the west piece (Fig. 1.C-b158).



Figure I.C-b157. Fragmented bluestone flooring in Casemate A13, 2013.



Figure I.C-b158. Heavy deterioration of the embrasure wall in Casemate A13, 2013.



Figure I.C-b159. Remnants of the casemate vaulted ceiling on the east wall of Casemate A13, 2013.



Figure I.C-b160. East wall of Casemate A13.



Figure I.C-b161. South walls of the parade ground and buttress piers between Casemates A13 and B'2.



Figure I.C-b162. Loose 19th century cast-concrete cornice elements on the parapet of the Right Face (northeast) wall.

The west piece is cracked, delaminated and eroded.

- There is also salt evidence on the upper west piece of the brownstone embrasure and the surface is moderately friable.
- The granite lintel is almost completely missing, with the only remnants remaining at the east and west sides of the embrasure opening.
- There are no longer intact supports for the granite lintel and brick niches, and the east niche has suffered significant loss and has open mortar joints.
- The east wall has approximately 7 to 8 courses of brick remaining from the casemate vault (*Fig. 1.C-b159*). There is a crack that goes through the entire remnant that is visible from the roof level on the south end and is a serious life safety risk. The top courses at the roof level are new brick.
- There is a later rounded infill wall constructed between Casemate A13 and Casemate B2 (*Fig. 1.C-b160*). It is built with brick, with a stucco layer on the exterior surface. There is diagonal step crack on the southside of the door opening and hour cracks emanating from the lintel. There are loose pieces of stucco around the lintel, and the iron lintel strap is heavily corroded. The stucco at the door surround appears to be made with a modern, harder cement than the rest of the wall. Significant horizontal cracking has occurred at the mortar joints suggests there has been serious structural movement.
- The parade ground pier on the south facing side has an extensive vertical crack between the vaulted arch and wall. There is a loss of bricks at the top of the parade ground pier. Three pieces of terracotta pipe survive as remnants in the cutout of the parade ground pier. The tabby core is exposed at the backing and is 34" tall. The buttress pier is in a partial and ruinous state, but it is in stable condition and retains a triangular shape, especially at its south end (*Fig. 1.C-b161*).

Right Face Casemates

This portion of the fort is located at the north and northeast walls and includes Casemates B'2, C4, B3, A14, A15, A16, A17, A18, A19, A20 and B'3. Eight of the eleven casemates were filled with sand and debris when Battery Huger was

first built in the late 19th century. The National Park Service excavated this section of casemates in the mid-twentieth century. This section of the fort is particularly intact and provides the most accurate depiction of the historic appearance and configuration of the first level casemates, particularly the casemates at the east end of this section.

The historic materials are fairly uniform throughout this section of the fort. The walls are composed of gray brick with a tabby core. The bricks are laid in an English bond. The flooring throughout the area is primarily historic bluestone, flanked by brick perimeters at the cannon traverses and rear wall. There is also the footprint of a previously installed rear wall, marked by a brick outline in the rear portion of the flooring and angled notches along the rear walls of the casemates. Each room along the east wall contains a brownstone embrasure opening composed of four separate pieces that sit atop a granite lintel flanked by two brick arched niches. Each room has a brick vaulted ceiling and arched wall openings that run east-west, which serve to support the ceiling and also delineate each casemate space.

Deleterious conditions observed in this portion of the fort are related to the prior excavation. There are large holes (now filled) in the vaulted ceilings of the eight casemates that were used to fill the casemates with sand, in order to support the foundation for the construction of Battery Huger in the late nineteenth century. There are also structural cracks throughout the vaults that suggest potentially serious structural movement in this portion of the fort. That said, many of the materials in these spaces are in good condition, and appear to be well maintained. This area is susceptible to extreme moisture from sea wave bombardment, which results in prolonged periods of moisture exposure, and water infiltration through the roof. However, unlike the Left Face casemates, this area is shielded from the sun and, as such, dries at a much slower rate than any other section of the fort. This affords the area some protection from the potentially damaging cycles of wetting and drying that are recognized as problematic for masonry.

Exterior

The Right Face exterior wall is composed mainly of brick laid in an English bond, with alternating courses of headers and stretchers. At the easternmost edge, the wall stands one level high with a brick cornice that slopes upward to one-and-a-half levels high as it approaches the salient angle. The cornice follows the roofline except at the salient angle wall (NE-4), where the parapet wall above the cornice slopes downwards to meet the Left Face exterior wall. Traces of the late nineteenth cast concrete coping units survive on the central portions of the Right Face exterior wall, but these elements are loosely secured and should be more securely attached to the wall (Fig. 1.C-b162). The rest of the wall has a brick cornice at the roofline.

There are generally many open and deteriorated mortar joints at the lower portions of the wall and at the brick cornice. The upper right portion around the corner of the wall has been significantly rebuilt and repointed, and is in good condition. There is a different quality of brick from the edge of the east wall to Casemate A18.

Cracks are prevalent throughout the northeast and east walls. Many of these cracks can likely be attributed to the dramatic change in lateral loads related to the filled and excavated periods of the Right Face. There are cracks in both the lower left and right corners, radiating out from the corner junctions of the walls. There is also a series of vertical cracks through the wall, one of which extends from the corners of the embrasure opening of Casemate B'3, A19, A18 to the top of the wall. There are two cracks at the Salient Angle; one stems from the upper right corner of the embrasure opening for Casemate C4 to the brick cornice and the other travels diagonally from the brick cornice to the junction of the Salient Angle and the Northeast Wall. Some of these aforementioned cracks are related to the corrosion of four exposed metal bolts at the brick cornice on the upper left corner of the northeast wall.

There are ten window openings that correspond to the embrasures for Casemates B'2, C4, A14, A15, A16, A17, A18, A19, A20 and B'3. The embrasure openings are composed of four pieces of brownstone that have been filled with a combination of brick and historic concrete with brick and seashell aggregate, covered with layers of stucco. The stucco over the embrasure openings is generally in poor condition. There is replacement brick visible in missing portions of the brownstone

embrasure openings for Casemates A14 and B3. There is a rectangular opening that has been filled with cement, along with the typical infill found in the embrasure openings at the Salient Angle (Casemate C4). There is no evidence of doors on the Right Face exterior wall.

Interior

The following subsections include physical descriptions of the materials and conditions that are typical of all casemates in the Right Face casemates. Refer to section Individual Casemates for features that are unique to each individual space.

Roof & Rainwater Collection

The roof is a painted, liquid-applied waterproof membrane over brick masonry (*Fig. 1.C-b163*). In several locations, cracks in the membrane were observed on the roof. Some of the cracks (most notably those located at the juncture between the roof and the back of the parapet wall) have been filled with sealant, which has now failed. The parade ground piers separating each of the casemates between B'2 and B'3 each have downspouts fed by scuppers at the roof level. Puddling was observed around most of these scuppers, suggesting poor drainage of the roof. In addition, several downspouts were detached, missing or leaking.

A potentially dangerous condition was observed at the roof level of casemate B2. A remnant of the vaulted ceiling is detaching from the west wall of the casemate. A large separation crack between the springline of the vault and the wall is visible from the roof. This condition should be examined by a structural engineer immediately.

Flooring

The flooring is consistent throughout the casemates. The inner and outer granite traverses survive throughout the interior, with the inner tracks predominantly intact and many of the outer tracks suffering greater deterioration including loss of portions of the track(s). Bluestone pavers are used from the embrasure wall to the outer traverse. The portion of the flooring between the outer traverse and parade ground is a mixture of granite and bluestone pavers. Brick and parging exists where a rear wall to each of the casemates had previously been installed.



Figure I.C-b163. Roofing on the Right Face casemates.



Figure I.C-b164. Separation of the embrasure arch from the pier that supports the vaulted ceiling.



Figure I.C-b165. Typical cracking throughout the vaulted ceilings of the Right Face casemates.



Figure I.C-b166. Detail of typical structural cracking throughout the vaulted ceilings of the Right Face casemates.



Figure I.C-b167. Detail of potential area of failure along structural cracks.



Figure I.C-b168. Parging of brownstone sill in Casemate B'2.

Walls

The casemates are primarily constructed with gray brick. They also have brownstone embrasures on the interior face of the Left Flank wall, which are supported by a granite lintel with brick side niches on both sides of the opening. The embrasure wall and openings are generally intact, with open brick niches, open area below granite lintel, intact metal apparatus for reaction block system. A warm-colored mortar that is believed to be original or very early (because of its characteristic ribbon joint) is generally visible throughout the casemates. There is a minimal amount of historical damage and, where it does exist, it is localized and is generally less than a foot square. There is evidence of water soaked masonry on the floor and also around the embrasure, both on the brownstone and granite. The mortar seems to be deteriorated as a result of moisture and the brownstone is friable. The granite lintel is in good condition. Generally, the embrasures have been filled with brick from the outside, with a tapered concrete with brick aggregate used to fill spaces between the brownstone. The interior face of the brick infill is parged. There is a separation between the embrasure arch and the pier that supports the vaulted ceiling (*Fig. 1.C-b164*).

Ceiling

The ceilings are arched vaults constructed with gray brick. Holes made in the ceilings for pouring sand into the casemates during Battery Huger's construction have been filled with cement mortar or concrete. There are structural cracks through most of the vaults that typically occur at the center (*Fig. 1.C-b165*), parallel to the face of the exterior wall and ranging in size from ½" to 1" (*Fig. 1.C-b166*), and in line with the interior face of the parade ground piers. Most of the vaults have two to three of these types of cracks in the ceiling. There are many pieces of loose brick and mortar at the cracks in the vault that present a public safety hazard (*Fig. 1.C-b167*).

Doors

Although there are no doors in this portion of the fort, there is a doorway at the west wall of casemate B2. The area around the opening has been previously patched with a dense Portland-cement based mortar, which is separating from the brick masonry and represents a public safety hazard. This condition should be addressed immediately.

Windows

The embrasure openings are composed of four pieces of brownstone that have been infilled with a combination of brick and historic concrete with brick and seashell aggregate, and covered with stucco. All windows are filled in these casemates. In most of the infilled embrasure openings, there is a discrete line between the upper, intact portion where the finishes are retained, and the middle and lower portions of the opening. This might be a result of the stucco having been applied in sections, or perhaps it was an area where the cannon rubbed against the sides of the opening and indicates wear.

Finishes

A white finish is predominantly intact in the ceiling vaults, and to a lesser extant on the walls. The finish appears to be a tanner color on the walls. Finishes become less intact when approaching the Right Flank and towards the parade ground. There are traces of stucco on almost every brownstone embrasure. Traces of a red finish are also visible on inside the embrasure on the sections of deep concrete infill with brick aggregate.

Other

Many of the embrasures appear to have intact iron saddles, along with many other metal pieces of the reaction block. The metal strap between the reaction block and the chassis of the cannon is intact throughout this section, with the exception of casemates A18, B'2 and C4. The parade ground piers have most likely been re-pointed more than other parts of the casemates. At the rear of each casemate, there is evidence of an angled notch in the wall, approximately 12" deep and 21" wide.

Individual Casemates

The materials and conditions noted in the Interior section are relevant for all of the spaces in the Right Face casemates. The following section of the report contains more detailed information that relate to features that are unique to each individual space.

Casemate B'2

This space measures 16'-2" (across the embrasure wall) by 17'-11" (between the embrasure wall and rear floor termination), and is currently accessible through the door opening into Casemate A13, or through Casemate C4.



Figure I.C-b169. Salt deposition on the modern brick replacement ceiling in Casemate B'2.

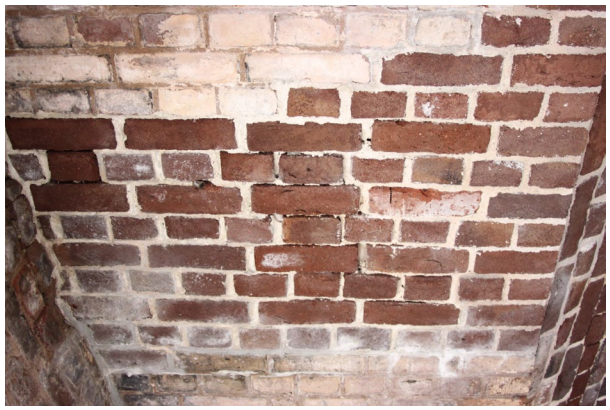


Figure I.C-b170. Detail of modern brick replacement used in the center portions of the separation arches in Casemate B'2.



Figure I.C-b171. Deteriorated rear walls of Casemate B'2, with extensive vertical cracking and traces of a previously installed rear wall.



Figure I.C-b172. Overview image of the archeological ruin of the former staircase between Casemates B'2 and C4, 2013. Note the drainage output at the top of the staircase wall which releases water directly onto the ruin.



Figure I.C-b175. Evidence of stucco on the exterior rear wall of Casemate C4.



Figure I.C-b173. Circular granite base to the former staircase at the rear of Casemate C4.



Figure I.C-b176. Unusual herringbone pattern on the floor of the former staircase at the rear of Casemate C4.



Figure I.C-b174. Intact granite stair treads on east wall of former staircase at the rear of Casemate C4.



Figure I.C-b177. Cracked corner of the granite lintel in Casemate C4.



Figure I.C-b178. T-shaped groove that corresponds to the flooring between Casemates C4 and B3.

- The red finish on the embrasure opening is largely intact.
- The lower brownstone sill section and granite are covered with parging (*Fig. 1.C-b168*).
- The vaulted ceiling in the room was replaced with modern brick.
- There is extensive salt damage along the edges of the vaulted ceiling, where it meets the historic brick (*Fig. 1.C-b169*). There is also replacement modern brick in the center portions of the casemate separation arches (*Fig. 1.C-b170*).
- Where there is evidence of a rear wall junction on the west wall, the new brick is fairly deteriorated (*Fig. 1.C-b171*).
- The interior of the rounded wall noted in Casemate A13 telegraphs the cracking observed on the exterior, as described in section 1.4.2.1 Individual Casemates: Casemate A13 of this report.
- There are large vertical cracks in the parade ground pier (west).



Figure I.C-b179. Intact niches from the former second tier casemates that would have sat above Casemate B3.



Figure I.C-b180. Loss at left corner of the separation arch in Casemate B3.



Figure I.C-b181. Detail of wind eroded mortar joint in the interior face of the parade ground pier between Casemates B3 and A4.



Figure I.C-b182. Green crystalline salts on the surface of the northern separation pier wall, leading into Casemate B3.



Figure I.C-b183. Parade ground pier with modern drainage installation between Casemates B3 and A14.



Figure I.C-b184. Rear wall of the vaulted ceiling arch of Casemate A14. Note the cracked mortar joints and distinct horizontal band across the arch.

Casemate B'2 to Casemate C4

- A downspout is visible at the western top portion of the staircase remnant (*Fig. 1.C-b172*). This downspout allows water to drip directly onto the staircase ruin, allowing increased water exposure to an already fragile element.

Casemate C4

This space measures 16'-4" across the embrasure wall by 16'-5" between the embrasure wall and the interior corner of the separation pier, and is accessible through Casemates B'3 and B3.

- This casemate stands at the salient angle.
- In the rear of the casemate, the remnants of rounded staircase stand with a circular granite base fragment (*Fig. 1.C-b173*) and intact fragments of granite stair treads on the east side of the curved wall (*Fig. 1.C-b174*).
- There is evidence of stucco on the exterior wall of the rear casemate (*Fig. 1.C-b175*).
- The brick floor in this area is a fragmented herringbone pattern (*Fig. 1.C-b176*).
- There appears to be possible original pointing mortar in the ceiling and vault on the underside of each of the casemate separation arches.
- The granite sill is cracked on the right side (*Fig. 1.C-b177*).

Casemate C4 to Casemate B3

- The north wall pier has a t-shaped groove that corresponds to a groove in the floor extending to the outer embrasure (*Fig. 1.C-b178*).

Casemate B3

This space measures 16'-2" (across the embrasure wall) by 19'-0" (between the embrasure wall and rear floor termination), and is currently accessible through the rear and Casemates C4 and A14.

- There is an open, deteriorated mortar joint on the right ride of the embrasure.
- There is a patched hole in the ceiling of the vault that indicates where the casemate was filled with sand during the building of Battery Huger.
- On the roof level, there are intact niches for the second level casemates that have been parged (*Fig. 1.C-b179*).



Figure I.C-b185. The eastern angled embrasure wall appears particularly saturated in Casemate A14.



Figure I.C-b186. Long crack, telegraphing from the vaulted ceiling into the east pier, looking into Casemate A15.

Casemate B3 to Casemate A14

- The embrasure wall pier between the casemates is particularly wet, with friable mortar and deep open mortar joints.
- The interior of the parade ground pier has a crack at the junction of the separation arch and the pier wall, with a loss at the left corner (*Fig. 1.C-b180*).
- The mortar is deteriorated, possibly a result of wind erosion; this pier is not wet in contrast to the pier on its opposing face (*Fig. 1.C-b181*).
- The northeast wall of the pier into Casemate B3 is particularly "crusted" with green crystalline salts on its surface (*Fig. 1.C-b182*).
- The exterior face of the parade ground pier appears to have been reconstructed. It does not contain an opening for the downspout and is constructed the same as the pier at Casemate B'3 (*Fig. 1.C-b183*).
- The buttress pier is freestanding and retains its shape.

Casemate A14

This space measures 15'-6" (across the embrasure wall) by 19'-0" (between the embrasure wall and rear floor termination), and is currently accessible through the rear and Casemates B3 and A15.

- The back of the casemate has open joints where the bricks of the roof meet at the top of the arch. There is a distinct horizontal line of mortar across the face of the arch (*Fig. 1.C-b184*).
- There is a patched hole in the ceiling of the vault that indicates where the casemate was filled with sand during the building of Battery Huger.
- The eastern angled wall appears more saturated than the rest of the walls and as a result is wet and heavily deteriorated (*Fig. 1.C-b185*).
- There are cracks in the casemate vault, approximately 2' from the embrasure wall. This long crack spans the entire width of the casemate (*Fig. 1.C-b186*) and telegraphs into each pier on either side of the casemate.
- Approximately half of the vaulted ceiling retains its historic ribbon mortar pointing, on the portion closest to the embrasure wall.

Casemate A14 to Casemate A15

- The exterior face of the parade ground pier has been reconstructed.



Figure I.C-b187. Patched hole where sand was poured in during the building of Battery Huger in Casemate A15.

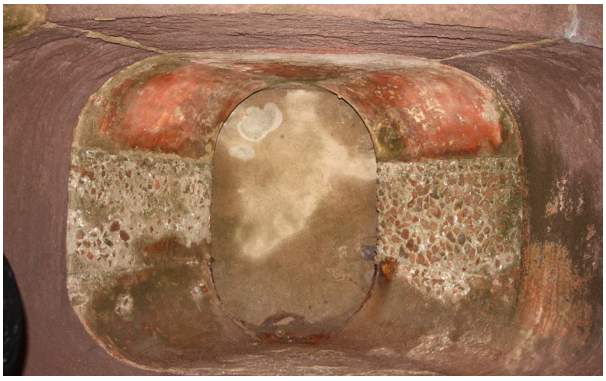


Figure I.C-b191. Segmented embrasure infill in Casemate A16.



Figure I.C-b188. Corroded downspout, leaking water onto the parade ground pier between Casemates A15 and A16.



Figure I.C-b192. Salt deposition on the surface of historic damage on ceiling by the embrasure wall in Casemate A17.

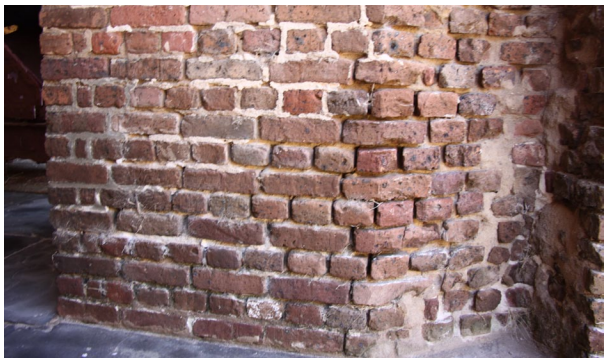


Figure I.C-b189. Eroded mortar joints on the rear casemate piers of Casemate A16.



Figure I.C-b190. Different brick type inserted into the northern notch of the west separation wall in the rear of Casemate A16.



Figure I.C-b193. Angled notch in the buttress pier between Casemates A17 and A18, 2013.

- The first course of brick on the separation arch has lost its brick face where it meets the east wall pier on the embrasure side of the wall.
- The buttress pier evidence is not clearly visible, but there is a concrete brick mass, likely the remnant of the pier, embedded the foundation of Battery Huger.

Casemate A15

This space measures 15'-6" (across the embrasure wall) by 19'-0" (between the embrasure wall and rear floor termination), and is currently accessible through the rear and Casemates A14 and A16.

- There is a patched hole in the ceiling of the vault that indicates where the casemate was filled with sand during the building of Battery Huger. This hole has exposed metal elements that were originally applied for reinforcement (*Fig. 1.C-b187*).
- Air ventilation enters this portion of the fort through Casemate B'3. The four western casemates are shaded by Battery Huger.
- Approximately half of the vaulted ceiling retains its historic ribbon mortar pointing, on the portion closest to the embrasure wall.
- On the roof level, there is no evidence of the casemate wall, in contrast to the other casemates.

Casemate A15 to Casemate A16

- The exterior face of the parade ground pier has a downspout that is heavily corroded and has detached from the wall. As a result, the water drains directly onto the top of the pier (*Fig. 1.C-b188*).

Casemate A16

This space measures 15'-6" (across the embrasure wall) by 19'-0" (between the embrasure wall and rear floor termination), and is currently accessible through the rear and Casemates A15 and A17.

- The mortar is very eroded on both rear casemate piers (*Fig. 1.C-b189*).
- A different brick type of is visible in the northern notch of the west separation wall in the rear portion of the casemate (*Fig. 1.C-b190*).
- There are clear lines in the infill of the brick concrete sides of embrasure (*Fig. 1.C-b191*).
- There is a patched hole in the ceiling of the vault that indicates where the casemate was filled with sand during the building of Battery Huger.



Figure I.C-b194. Enclosed drain pipe "cut-outs" in the parade ground pier between Casemates A17 and A18, 2013.



Figure I.C-b195. Intersecting cracks and displacement on the vaulted ceiling in Casemate A18, 2013.



Figure I.C-b196. Intersecting cracks and displacement at the rear of the vaulted ceiling in Casemate A18, 2013.

- Approximately half of the vaulted ceiling retains its historic ribbon mortar pointing, on the portion closest to the embrasure wall. On the roof level, there is minor evidence of the casemate wall pier.

Casemate A16 to Casemate A17

No conditions of concern were noted.

Casemate A17

This space measures 15'-6" (across the embrasure wall) by 25'-10" (between the embrasure wall and rear floor termination), and is currently accessible through the rear and Casemates A16 and A18.

- There is a patched hole in the ceiling of the vault that indicates where the casemate was filled with sand during the building of Battery Huger.
- There is evidence of historic damage on the ceiling by the embrasure on the west side. A white finish had been applied over the damage, and there is also extensive salt damage over this area (*Fig. 1.C-b192*). The flooring in this room is composed completely of large granite blocks.
- The room sits over the original cistern.
- The vaulted ceiling retains its historic ribbon mortar pointing.

Casemate A17 to Casemate A18

- There is a "cut-out" niche, measuring 8" tall by 8" wide by 6" deep in the south wall of the casemate in the rear parade ground pier interior, entering Casemate A18.
- The complete buttress passageway begins at this casemate and extends to Right Flank (concluding at Casemate B'3).
- The outline of the previously installed rear wall of the casemate visible on the floor and in the angled notches in the rear casemate walls, appears to be set back into the buttress piers and not at the rear casemate walls in this section (*Fig. 1.C-b193*).
- Downspout channels are enclosed on the rear edges of the casemate walls (*Fig. 1.C-b194*).

Casemate A18

This space measures 15'-6" (across the embrasure wall) by 27'-3" (between the embrasure wall and rear floor termination), and is currently accessible through the rear and Casemates A17 and A19.



Figure I.C-b197. Metal bolts installed in the upper right portion of the brownstone embrasure in Casemate A18.



Figure I.C-b198. Corroded metal fastener in the upper right portion of the brownstone embrasure in Casemate A19.



Figure I.C-b199. Cracked stucco surface surrounding embrasure in Casemate A19.



Figure I.C-b200. Historic graffiti on the granite flooring alongside the west rear casemate wall in Casemate A19.



Figure I.C-b201. Detail of historic graffiti described in Figure 200. The inscription appears to say "Mushmount."



Figure I.C-b202. Pronounced green biological growth prevalent in Casemates A19 to B'2.

- There is a potentially hazardous condition where the large cracks in the ceiling vault intersect and have resulted in the displacement of the brick (Fig. 1.C-b195).
- Another potentially serious crack is located at the rear of the vault. There is also a crack stemming from the junction of the buttress to the parade ground pier (this does not continue into Casemate A17). The crack is visible in both the horizontal and vertical sections of the junction (*Fig. 1.C-b196*).
- The right side of the rear wall of the vaulted ceiling arch is cracked through to the roof. A smaller vertical crack stems from the junction of the buttress pier and the casemate wall.
- There are iron bolts installed on the upper corners of the brownstone embrasure (*Fig. 1.C-b197*).
- There is also evidence of a former rear wall construction in this area.
- Approximately half of the vaulted ceiling retains its historic ribbon mortar pointing, on the portion closest to the embrasure wall.

Casemate A18 to Casemate A19

- The downspout is missing in this section and water is dripping.
- From the roof, there are open joints in the parapet above.
- There is a large crack at the south side of the embrasure.

Casemate A19

This space measures 15'-6" (across the embrasure wall) by 27'-3" (between the embrasure wall and rear floor termination), and is currently accessible through the rear and Casemates A18 and A20.

- There is a corroded iron fastener intact in the upper right portion of the embrasure (*Fig. 1.C-b198*).
- The stucco on the embrasure is particularly cracked, but largely intact across the embrasure (*Fig. 1.C-b199*).
- There is an inscription, possibly historic graffiti, on the granite flooring alongside the west casemate rear wall (*Figs. I.C-b200-201*).
- There is a crack along the vertical joint in the embrasure arch, and evidence of salt on the underside of the embrasure arch.
- There is also a prevalent dark green biological growth in this section. It becomes more pronounced in the casemates toward Casemate B'3 (Fig. 1.C-b202).

- At the rear ceiling vault, there is a crack stemming from the junction of the buttress to the west casemate wall.

Casemate A19 to Casemate A20

- There is a leaky downspout at the rear pier of this casemate.

Casemate A20

This space measures 15'-6" (across the embrasure wall) by 27'-3" (between the embrasure wall and rear floor termination), and is currently accessible through Casemate A19.

- The rear wall of the casemate is intact and serves as a retaining wall for infill.
- The stucco is intact on the exterior of this wall, and would be a good place for future sampling (*Fig. 1.C-b203*).
- There is prevalent biological growth and dampness on the interior of this space.
- There are two very corroded iron fasteners in both upper corners of the brownstone embrasure.
- There is very visible moisture on the brownstone side pieces (*Fig. 1.C-b204*).
- The vaulted ceiling retains its historic ribbon mortar pointing.
- There is evidence of the rear wall at the passageway, proving that there was once some form of construction along the rear wall of the casemate.
- The vaulted ceiling retains its historic ribbon mortar pointing.

Casemate A20 to Casemate B'3

- The two facing piers that support the separation arch between the two casemates have openings that are parallel to one another. The opening on the east pier measures 10" by 9" by 10" deep (*Fig. 1.C-b206*), and the parade ground pier has an opening that measures 10" by 8 ½" by 7" deep (*Fig. 1.C-b205*).
- The parade ground pier is very wet with visible moisture and biological growth in the surface.

Casemate B'3

This space measures 14'-9 ½" (across the embrasure wall) by 31'-3" (between the embrasure wall and rear floor termination), and is currently accessible through Casemate A20.



Figure I.C-b203. Intact exterior rear wall, with its stucco application, in Casemate A20.



Figure I.C-b204. Visible moisture on the surface of the brownstone embrasure in Casemate A20.



Figure I.C-b205. Opening on interior face of parade ground pier between Casemates A20 and B'3.



Figure I.C-b206. Opening on interior face of the east separation arch pier between Casemates A20 and B'3.



Figure I.C-b207. Cracking and biological growth on the brownstone embrasure and granite lintel in Casemate B'3.



Figure I.C-b208. Salt damage at the south edge of the embrasure in Casemate B'3.



Figure I.C-b209. Cracking and displacement of the brick embrasure arch in Casemate B'3.



Figure I.C-b210. Intact rear wall in Casemate B'3.



Figure I.C-b211. Entrance to the stair tower into the Right Flank in Casemate B'3.



Figure I.C-b212. Two distinct building periods are evidenced in the ceiling over the entrance to the stair tower into the Right Flank.

- Salt damage is very prevalent on the south edge of the embrasure and extends into the south pier and south wall corner (*Fig. 1.C-b208*).
- The granite lintel on the embrasure wall is cracked vertically through the stone (*Fig. 1.C-b207*).
- The wall is fully enclosed on the south wall.
- There is deformation in the brick and cracking in the embrasure arch, with areas of displacement (*Fig. 1.C-b209*).
- The granite flooring extends into the portion between the outer and inner cannon traverses, and this is the only casemate where that occurs.
- The rear wall of the casemate is intact (*Fig. 1.C-b210*).
- The vaulted ceiling retains its historic ribbon mortar pointing (*Fig. 1.C-b211*).

There is an entrance to a stair tower at the entrance to the Right Flank. The original stair to step into the stair tower is preserved (*Fig. 1.C-b212*). The vault in the ceiling represents two different construction campaigns. There are clear seams between the different campaigns (stepped line) (*Fig. 1.C-b213*).

Right Flank

This section of the fort is located along the east and southeast walls and has been buried since the construction of Battery Huger. None of the 19th century portions of the fort in this area have been excavated. This area currently serves as a turf promenade for visitors to the site, with commemorative monuments installed in the landscape.

Exterior

The Right Flank exterior wall is composed mainly of brick laid in an English bond, with alternating courses of headers and stretchers. The wall stands two levels high uniformly throughout the area's span. The cornice is entirely brick and follows the roofline.

The lower half of the southeast wall has an eroded brick surface with open and deteriorated mortar joints that worsen when approaching the southwestern edge. The top portions of the wall have a different brick surface from the lower portions of the wall, and this difference is apparent at a distinct level. Portions of the walls appear to have depressions due to brick movement and erosion of the surface.

There are three vertical cracks along the upper left portion of the southeast wall. The crack closest to the south corner telegraphs into a horizontal crack that has visible displacement at the corner. There are large vertical cracks approximately 30' from each other across the expanse of the southeast wall. The fracture closest to the center of the wall is coupled with an intersecting horizontal crack. There is a crack approximately 50' from the eastern corner that has visible displacement, with a depression on the right side of the crack that extends the entire height of the wall. A crack visible on the easternmost portion of the wall follows the left side of a white colored repointing campaign.

There is no evidence of windows, doors or gates on the exterior Right Flank wall of the building.

Interior

The interior has not been excavated, and this space was inaccessible during the time of the survey. However, one can assume that the fill

material (soil) that is banked against this wall is likely holding moisture against it. In addition, the fill may be placing stresses on the brick walls and contributing to the cracks visible on the exterior walls. This phenomenon is discussed in greater detail in the structural assessment presented in *Appendix C*.

Summary of Conditions & Concerns – Perimeter Fortifications

The preliminary assessment of the fort's masonry performed as part of this report yielded information on general, non-structural conditions prevalent throughout the fort, as well as the possible causes of these conditions (see *Appendix C* for a discussion of structural conditions). This assessment also identified unique conditions that are a problem for only certain locations within the fort, most typically associated with location-specific phenomenon. The condition assessment, coupled with comparison of historic and present day photographs, also produced information about the rate of deterioration of the fort's masonry.

For the most part, the condition of the fort's interior masonry appears to have changed very little since the 1950s and 1960s, as evidenced by the striking photographic comparisons presented in Appendix E. These photographic pairings show little apparent change to the interior brickwork, particularly with regard to loss of fabric. While many deleterious conditions were observed as part of the current survey, they appear to have also existed in the 1950s and 60s and are typically not new conditions. This observation suggests that some of the current conditions, such as damp walls and open mortar joints, are chronic. Present day structural cracks are also typically present in the same location as illustrated in the historic photos, although the degree to which these cracks have worsened is not addressed in this section of the report. Regardless, although some of these chronic conditions may have worsened over time, they have not resulted in loss of fabric in a significant way. There has been more apparent change to the historic fabric due to twentieth century reconstruction than from natural deterioration processes.

While these observations are true for the interior brickwork, they are not necessarily true for the interior brownstone of the embrasures. In many locations, such as the Left Flank and Left Face casemates, the condition of the brownstone has gotten worse over the past fifty to sixty years. There has been loss, as well as increased delamination and cracking, in much of the brownstone in these sections of the fort.

The rate of deterioration for the exterior of the fort could not be fully evaluated, as there are far fewer historic photographs of the exterior of the fort available for comparison. In addition, many portions of the exterior walls have been reconstructed with replacement brick, preventing direct visual comparisons. For the exterior walls in particular, understanding their rate of deterioration is critical, as there is significant apparent loss of material on these faces of the brick walls. Even if an understanding of the rate of deterioration over the past fifty to one hundred years is not possible because of a lack of detailed photographic evidence, a method for evaluating the rate of deterioration for these vulnerable surfaces should be implemented going forward.

Although the rate of deterioration may not be particularly pronounced for the interior masonry surfaces, problematic conditions do exist that will require some degree of remediation. This fact is also true of the exterior walls. Several conditions were observed that require immediate action, as well as additional evaluation to better understand their causes.

The most problematic conditions were observed in areas where masonry is subjected to frequent cycles of wetting and drying, such as the bottom portions of exterior bricks walls that are subjected to fluctuations in sea water level and also the partial casemates of the Left Face section. In the latter location, the exterior brick masonry (which faces north) is continually damp while the interior is exposed to the sun the majority of the day and therefore heated and dried. The brownstone in this section has deteriorated significantly over the past fifty years. The separation cracks (or delamination) between the embrasure partition walls and the exterior walls in this location are also quite large and may be exacerbated by the differential occurring between the damp exterior and dry interior masonry.

The condensation occurring inside the Left Flank casemates as the result of the regularly opened

embrasures also exposes the interior masonry in this location to prolonged periods of moisture and then drying. This area may also subjected to regular water infiltration at the exterior wall, as it was observed during the survey that water collects outside on the concrete slab outside the current sallyport entrance at high tide.

The bottom portion of almost all of the exterior brick walls is in poor condition, with significant mortar loss and surface erosion. This damage is most likely related to the cyclical wetting and drying of the brick and mortar, which is particularly problematic if soluble salts are present. Given the direct exposure of these walls to salt water, one can assume that salts are present in the bottom of the walls. A better understanding of the salts present in the masonry, their sources, and the extent that they are causing damage needs to be more thoroughly understood for this site. Soluble salts (salts that dissolve in water) are a concern for porous masonry like brick because of damage caused by two different phenomenon, crystallization and hydration, both occurring on the micro-scale inside the pores of the masonry. When a salt in solution reaches its point of evaporation inside the pore, it comes out of solution and forms a crystal. The crystal occupies a larger volume than the original liquid salt solution and therefore puts pressure on the walls of the pore. In the case of hydration, pressure is also generated inside the pores of the masonry, but by the absorption of moisture by a hygroscopic salt. The absorption of moisture (hydration) also exerts pressure on the surrounding masonry. Different salts have different degrees of solubility and different propensities for crystallization and hydration. In addition, the dissolution and crystallization of salt is dependent on moisture content and temperature variations, with repeated cycles of dissolution and crystallization as one would get through frequent wet/dry cycles causing the majority of the damage.

In addition to damage from wet/dry cycles, the exterior brick at Fort Sumter is also impacted by wave action and wind erosion. The Left Gorge Angle, as well as the western portion of the Gorge Wall, exhibits damage from wind erosion. This area is more susceptible to wind erosion than other exterior walls of the fort because it is exposed to prevailing winds coming from this direction, blowing across the sand bar. The result is a combination of wind and wind-driven sand that erodes the brick masonry.

In addition to damage from wet/dry cycles and wind, the bottom portion of the exterior walls are also damaged through constant wave action in locations where there is no rip rap or earthen embankment. Of course, walls adjacent to the rip rap are also damaged through abrasion of the rip rap, as it is tossed around by wave action. In general, the bottom portion of the exterior walls are subjected to a variety of external factors that affect their condition. In addition, because of their accessibility, these portions of the walls typically get re-pointed more frequently than the upper portions of the walls. Where inappropriate re-pointing mortars have been used, such as those based primarily on Portland cement, additional damage to the brick has occurred and additional soluble salts (e.g. sulfates) have likely been introduced into the masonry.

By contrast, the Right Face casemates are generally in good condition. These casemates, which are the most intact and which are protected from sun, wind and rain, stay damp and do not experience the wet/dry cycling experienced by the other casemates at the fort. Although there is pronounced biological growth, there are few problematic masonry conditions aside from structural cracking. The latter condition is significant, however, as discussed in Appendix C of this report.

Although more of a structural concern, the separation of the exterior walls from the perpendicular casemate partition walls is a typical condition seen in the brick masonry of the casemates throughout the fort. Similarly, cracks running through the center of the casemate vaulted ceilings were also ubiquitous. Although these conditions are structural in nature, they are mentioned in this section because they constitute a prevalent masonry condition at the fort.

The Right Face casemates are also impacted by the poor condition of the water conduction system emanating from their roofs and traveling down the back (interior) side of these spaces. Many of the downspouts are detached or leaking, introducing rainwater into the masonry assembly. In addition, the roofs do not drain properly and puddling is visible on the roof tops after rain events.

In summary, the primary non-structural masonry conditions present at the fort are as follows: delamination of brick wythes at the exterior walls; surface loss of exterior brick due to a combination of frequent wet/dry cycles (salt crystallization/ hydration), wave action and wind erosion; mortar loss at the base of exterior walls due to wave action and frequent wet/dry cycles; damage to interior brownstone from frequent wet/ dry cycles and the presence of soluble salts; the presence of incompatible repair materials; poorly maintained water conduction system (downspouts, scuppers).

There are additional, general concerns indirectly related to the physical fabric that should be mentioned as part of this assessment. These include:

- potential impact of harbor dredging and increased wave action;
- lack of a comprehensive, detailed assessment of conditions throughout the entire fort;
- lack of a prioritized approach to repair or treatment interventions;
- need for targeted materials analysis to answer specific questions, particularly related to the presence and impact of soluble salts;
- lack of coordination amongst various conservation and repair efforts;
- lack of monitoring or documentation program to assess material loss over time.

Recommendations addressing these various concerns and conditions are included in *Part II* of this report.

C. Man-made Site Features Inside the Fort Walls

Methodology

The team surveyed this area to identify significant cultural resources as well as features important to park operation. The latter include circulation, open spaces, and memorials.

The on-site survey was conducted over several extended site visits in a variety of weather conditions. The surveys were completed in December 2013.

Prior to the visits, early maps, photographs, and text records were reviewed for information about the evolution of the site. Current NPS brochures and other interpretive material were consulted.

The team prepared a preliminary site plan for use in the field. During initial investigations, the team used tape measures, a Leica Disto laser distance meter, and digital cameras to locate and record findings. Field notes were later converted by the architectural team into an AutoCAD drawing of the final site plan showing these significant features and resources (*Sheet B-1 of Appendix B*).

Description

Circulation

Inside the perimeter walls of the fort, walkways of various materials cross the parade grounds to provide circulation for staff and visitors. There is no directed route; visitors are free to roam. The brick, concrete, and shell walkways are lined with "wayside" display panels. The walkways are described in the *Parade Ground* sections below.

Parade Ground – West of Battery Huger

The west section of the parade ground is a flat mostly grass-covered area west of Battery Huger. Its grade is approximately three feet below the first floor of Battery Huger. On the parade are display panels, cannon, and walkways.



Figure I.C-c1. Cannon and display panels on west parade ground.



Figure I.C-c2. Cannon and brick walkway at Right Face.

Paving of mostly modern brick laid in a sand bed delineate the east edge of the ruins of the enlisted men's barracks at the Left Flank Casemates. Some handmade Charleston grey bricks are included in the paving. The early bricks range in size from 8¼" to 8¾" long by 3¾" to 4" wide by 2¼" to 2½" tall. They range in color from grayish-tan to dark tan-red and some are spotted with iron deposits. Two rectangular bluestone sections, possibly hatch covers for cisterns, one at each end of the walkway, sit flush with the brick pavers. Each section of stone measures approximately 3'-6" by 1'-10".

At the south end of the parade ground a modern brick path dry-laid in sand with a mortared border runs east-west from the Left Flank Casemate to Battery Huger. This path sits 6" above the brick paving at the enlisted men's barracks ruins. The modern bricks are stamped with the year of



Figure I.C-c3. Brick pavers and sections of bluestone at walkway.



Figure I.C-c4. Modern brick paving.



Figure I.C-c5. Shell pathways across west parade ground.

installation, 2001, and approximate the color and texture of the historic brick. These modern bricks measure 8¼" by 3¾" by 2¾".

Two un-edged crushed-shell pathways run east-west across the parade ground connecting the brick pad at the enlisted men's barracks ruins to the access stairs at Battery Huger.

Four cannon are on display at the north end of the parade ground, each with a display panel.

Several additional panels are arranged around the parade ground, one at the officers' quarters ruins and three west of Battery Huger. The Union Garrison Monument in the southeast corner of the west parade ground is described below in the *Memorials* section.

East Field – East of Battery Huger

The east field is a grassy area atop the infill that covers what was the east parade ground. On its west side the east field is level with the second-floor roof and observation deck of Battery Huger. It gradually slopes down to the east to the top of the partially reconstructed Right Flank wall of Fort Sumter. It slopes dramatically to the north to the first-tier level of the Right Face Casemates.

The east field is accessed from two locations. The first is the roof-level observation deck of Battery Huger. The second is a modern concrete staircase in the northeast corner of the field. These stairs connect to the first-tier level of the Right Face Casemates and, via a modern brick walkway, to the west parade ground west of Battery Huger.

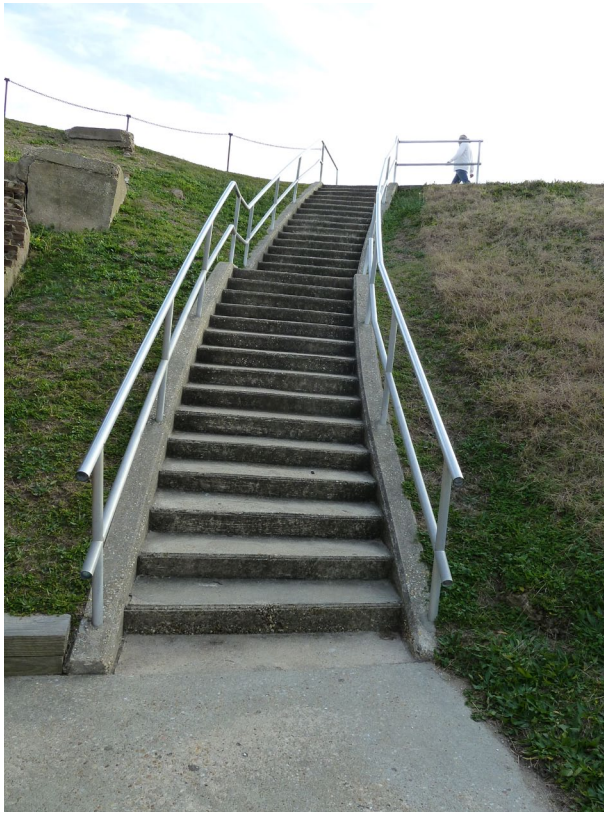


Figure I.C-c6. Concrete staircase leading to east field.



Figure I.C-c7. Brick path at north end of Battery Huger.

From the top of the staircase, a curving concrete walkway leads to the roof-level observation deck of Battery Huger and to a concrete walkway at the top of what was Fort Sumter's Right Flank wall. The walkway above the Right Flank wall measures approximately fifteen feet wide (*Fig. I.C-c9*). Fixed metal posts with chain railing delineate the perimeters of the east field and deter visitors from approaching the edge.

A cannon sits at the northeast corner of the field where the grass embankment begins its drop to the lower grade (*Fig. I.C-c8*). Another cannon is at the southeast corner (*Fig. I.C-c10*). Several display panels are strategically placed on the east field.

The Major Anderson Flagpole and Base is located centrally on the east field and is partially circled on the east by five additional flagpoles. The memorial is described below.



Figure I.C-c8. Concrete walkway across east field at top of staircase.



Figure I.C-c10. Cannon at southeast corner of east field.



Figure I.C-c9. Southeast oblique of east field.



Figure I.C-c11. Flagpoles at east field.

Memorials

Major Anderson Flagpole & Base

The Major Anderson Flagpole and Base, designed by Charleston Architects Simons and Lapham, was erected in 1928. The memorial was moved to its current location in 1959. Its cylindrical base rises from an octagonal stone platform approximately 27 feet across at the longest dimension. The platform has a 6" wide grey granite band with bluestone infill; it steps up from grade approximately 8". A second step, 5½" tall, also has a 6" wide grey granite band with bluestone infill.



Figure I.C-c12. Major Anderson Flagpole and Base on octagonal platform.



Figure I.C-c13. Inscription on Major Anderson Flagpole and Base.



Figure I.C-c14. Portrait of Major Anderson.

The cylindrical flagpole base measures 8'-8" tall and is made up of seven courses of granite blocks. The flush joints are pointed with hard Portland cement mortar. The base is topped by four additional courses of granite stepped back at each course.

A 12" galvanized steel cleat on the south side of the base secures the flagpole rope. A stone bas-relief portrait of Major Anderson is on the west side of the base.

Confederate Defenders Plaque

The Confederate Defenders Plaque, erected in 1929 by the United Daughters of the Confederacy, is mounted on the outside face of the Left Flank wall just north of the sallyport. The white marble tablet mortared into place measures 3'-2" tall by 4'-2" wide.



Figure I.C-c15. Confederate Defenders Plaque at Left Flank wall.

Union Garrison Monument

The Union Garrison Monument was erected in 1932 and relocated in 1959 to its current location in the southeast corner of the west parade ground. The monument sits on a bluestone-paved pad that measures 9'-10" in the north-south direction by 12'-10" in the east-west direction. A 10"-wide band of granite circles the perimeter.

The granite of the monument itself is a different type from the granite banding of the platform. Rectangular in shape, the monument is mounted on a two-tiered base. The lower base is 9" tall and measures 3'-6" in the north-south direction by 6'-0" in the east-west direction. The base above is 1'-8½" tall and steps in 1" from the lower base. The large upper portion of the monument is 5'-10" tall and measures 2'-9½" in the north-south direction by 5'-3½" in the east-west direction. A bronze plaque is attached with screws to the south side of the monument. It measures 4'-9" tall by 4'-5" wide with lead sealing the corners.



Figure I.C-c16. Southwest oblique of Union Garrison Monument.



Figure I.C-c17. Bluestone-paved pad with granite band at base of Union Garrison Monument.



Figure I.C-c18. Southeast oblique of Union Garrison Monument.

Summary of Conditions & Concerns – Man-made Site Features Inside the Fort Walls

The area is well maintained, in general. However, the needs for maintenance in a harsh environment are considerable, as is typical of maritime facilities. One site condition that is a potential hazard was noted.

The concerns are as noted below:

- Cracks in the granite atop the cistern near the Left Face indicate a possibility of localized failure; visitors and others currently are able to cross over or gather on this cistern.
- The wheelchair lift that connects the parade ground to the west walkway and leads to the public restrooms, museum, bookstore, and observation deck is out of operation.

D. Battery Huger (1898-1899)

Methodology

The assessment survey of Battery Huger was designed to comprehensively document the building components, their age if known, their approximate age if unknown, and their condition. The further purpose was to correlate diminished condition with specific causes.

On-site investigations took place during several extended visits and were completed in December 2013. During the initial survey, the team identified the types and locations of architectural materials and building systems, and conducted a preliminary review of the deterioration of various building materials.

At the onset, large scale images of the exterior and interior were prepared using digital cameras. The building was measured using measuring tape, carpenter ruler, and a Leica Disto laser distance meter. Field measurements were then converted by the architectural team to scaled AutoCAD drawings. Room numbers were assigned using a system based on the original room configuration with their subsequent subdivisions of rooms. These updated floor plans were used for recording data during subsequent field surveys.

The subsequent surveys focused on details of each building feature and the specific components of each interior space. A standard assessment methodology was developed for the condition survey of each exterior feature and each interior room. Visual observation of surface conditions supplemented with a 20-power magnification loop and Protimeter BLD 2000 moisture meter were the means of assessment. Tape measure and digital cameras were used to record the size and location of components and conditions.

Information gathered was supplemented with findings concurrently prepared by Bennett Preservation Engineering (*Appendix C*), and in previous reports.

Architectural Description

Exterior Organization & Characteristics

The monolithic concrete form of Battery Huger is typical of Endicott fortifications. The two-story-with-roof-deck structure is unadorned, approximately 280 feet long by 90 feet wide, and occupies the center of the Fort Sumter pentagon. Both the horizontal and vertical surfaces are covered in a black elastomeric coating. The long



Figure I.C-d1. West elevation from the sallyport.

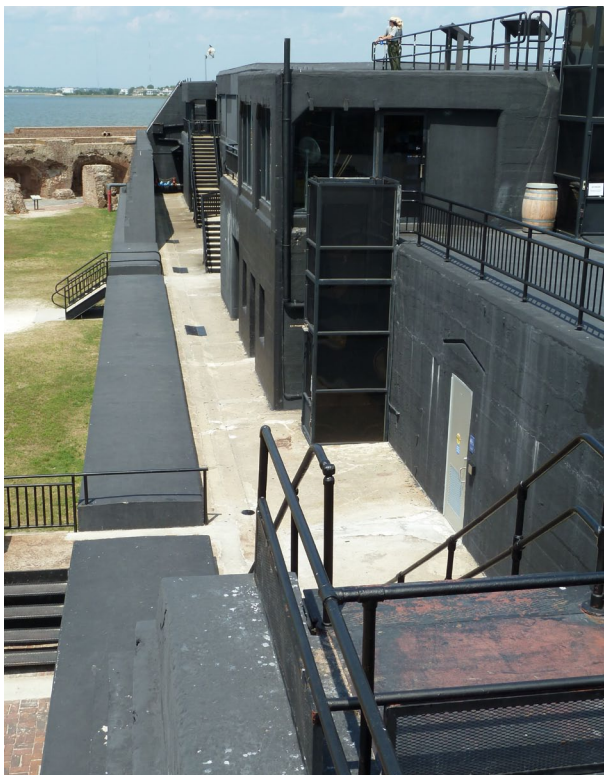


Figure I.C-d2. Looking north along the west side of Battery Huger.

axis of Battery Huger aligns approximately north-south, parallel to the Left and Right Flank walls of the fort.

The long west side is the primary elevation and is visible upon entry from the sallyport. Behind a low wall is an irregular complex of one- and two-story spaces and upper and lower roof decks.

The front wall was constructed in 1960. It is a low, six-foot-thick concrete knee wall that separates the building from the parade ground approximately three feet below the first-floor elevation (*Figs. I.C-d3 & I.C-d4*). At the first-floor level, an open-air concrete walkway runs along the entire west side of the structure. In the 1970s, NPS cut two openings into the knee wall and added a metal staircase at each. One opening is near the center of the wall and the other approximately sixty-five feet to the south. All first-floor corridors and rooms are accessed from the walkway.



Figure I.C-d3. Open-air walkway looking north; on the left is the knee wall.



Figure I.C-d4. Southeast oblique seen from the west parade ground.

Three exterior metal staircases lead from the walkway to the second-floor rooms and roof decks. The south roof deck holds the south gun emplacement. The north gun emplacement and its associated roof deck have been converted to an enclosed museum space. An open-air walkway leads from the central staircase to the museum.

The east side of Battery Huger is in striking contrast to the west. The east field over the parade ground infill is approximately level with the roof.



Figure I.C-d5. Northwest oblique of Battery Huger roof deck from the infilled east field.



Figure I.C-d6. Exposed east elevation of Battery Huger from the north end of the east field.

Only a portion of Battery Huger's east elevation is visible, where the grade falls sharply at the north end of the field. Here, the exposed walls are unadorned cast concrete (*Fig. I.C-d6*).

A roof deck above the second-floor level is on this east side. It can also be accessed by exterior metal staircases from the west-side second-floor deck and walkway.

The narrow north elevation is a two-story solid concrete wall. Similarly, the south elevation, which abuts the Gorge Wall of the fort, is a two-story solid concrete wall, although it is visible only from outside the fort walls.

Interior Organization & Characteristics

There are two levels of interior rooms at Battery Huger. The first floor has twenty-four rooms, many of which are irregular in shape. The eleven rooms at the north end are similar in size and configuration to those at the south end, with two additional south rooms that have been modified. The two groups of rooms (north and south) were originally constructed as service spaces for the two gun emplacements above.

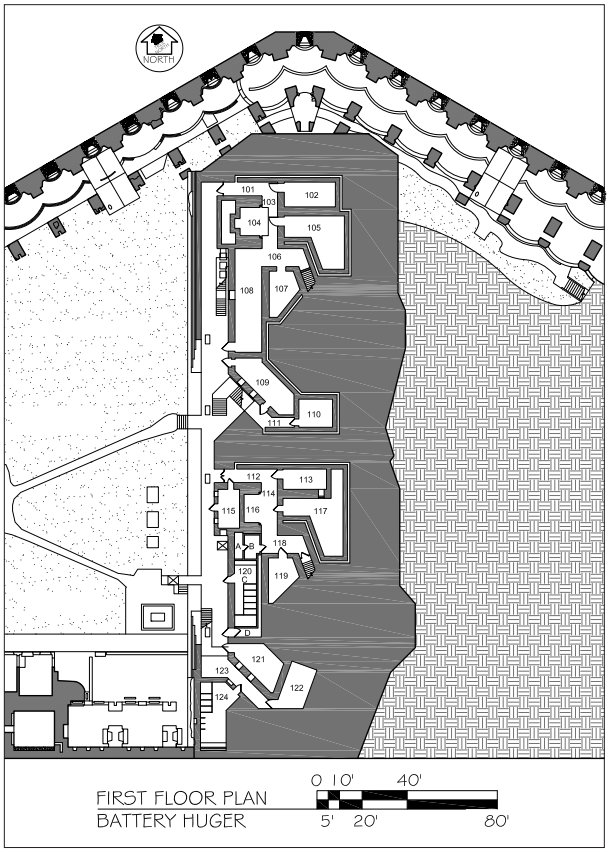


Figure I.C-d7. First-floor plan of Battery Huger.

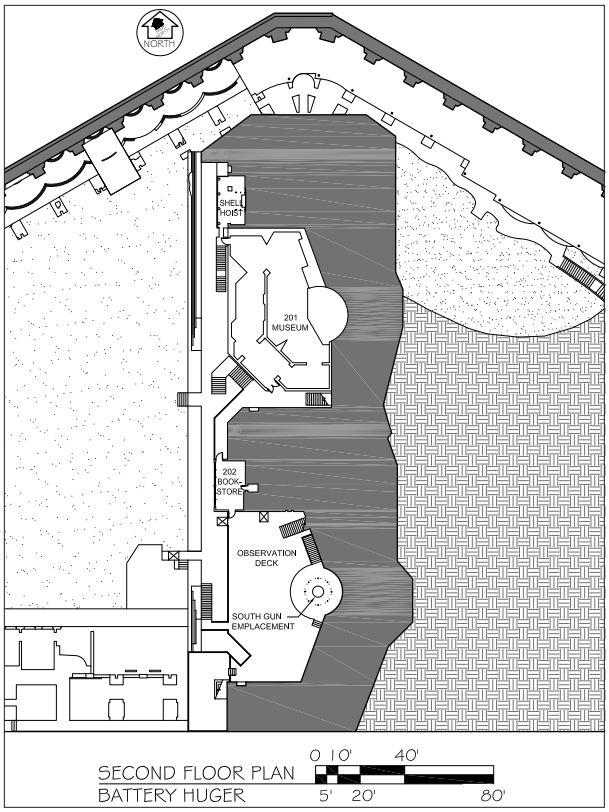


Figure I.C-d8. Second-floor plan of Battery Huger.

In contrast, there are only two rooms on the second floor, now used as a bookstore (Room 202) and a museum (Room 201). Neither was originally enclosed. The bookstore, located at the center of Battery Huger, was built as the shell hoist for the south gun emplacement. The museum occupies what was originally the north gun emplacement.

Structural Systems

Foundation

According to historical records, Battery Huger was to be constructed on a five-foot-thick slab of concrete reinforced with steel. However, the



Figure I.C-d9. Base of north wall cast on top of rubble brick.

foundation is inaccessible and prevents verification of actual construction. At the north end, it appears that Battery Huger was cast directly onto rubble bricks that remained from the Fort Sumter casemate walls. Concrete masonry units may have been added beneath the northwest corner during the 1950s excavations.

Exterior Walls & Cross Walls

The exterior and cross walls of Battery Huger are made of cast-in-place concrete. There is no evidence of steel reinforcement. The walls at the west side of the structure vary in thickness from two feet to three feet and were cast in short lifts, approximately one foot in height, that are continuous from the first level to the top level. The east side of Battery Huger acts as a retaining wall for the fill material beyond, and the wall thickness cannot be confirmed.

Flooring System

The cement floor surface at first-floor level is presumably the top of the original cast-in-place concrete slab foundation.

The second-level flooring system is a combination of steel I-beams and cast-in-place concrete. The I-beams used as girders vary in depth from 10” to 12” and those used as joists measure 6” deep. The concrete that spans the joists was formed with corrugated galvanized metal pans; the pans have corroded away or been removed in most locations, but the imprinted corrugation pattern is visible from the underside of the floor.

Roofing System

The structural system of the roof matches that of the second-floor flooring system, a combination of steel I-beams and cast-in-place concrete. The concrete spans the steel I-beams and was formed with corrugated galvanized metal pans; most of the pans are no longer in place.



Figure I.C-d10. I-beams and corrugated concrete of the second-level flooring.

Utility Systems

Mechanical System

The museum (Room 201) is the only room of Battery Huger that is heated, cooled, and ventilated by a ducted mechanical system. Three condensing units at the building’s west side near Room 108 and three air handling units on the first floor inside Room 108 provide mechanically heated and cooled air to the museum by way of large ducts that pass through the first-floor ceiling to the second level. The exterior condensing units were manufactured by Tempstar in 2009. The three air handling units were manufactured by International Comfort Products LLC in 2009 and were installed by Custom Climate.



Figure I.C-d11. Condensing units located outside of Room 108.



Figure I.C-d12. Air handling unit and ductwork of Room 108.

Window air conditioning units heat and cool the rangers' office (Room 115) and the bookstore (Room 202). The unit in Room 115 was manufactured by Whirlpool and the unit in Room 202 was manufactured by Comfort Air.



Figure I.C-d13. Window air conditioning unit of Room 202.



Figure I.C-d14. Fujitsu split-type mechanical unit on the second-floor roof deck.

The break room (Room 117) is heated and cooled by a ductless split-type mechanical unit. The Halcyon Inverter air conditioning unit is manufactured by Fujitsu. The interior unit is surface mounted on the ceiling of Room 117; the exterior unit sits on the second-floor roof deck just above Room 117 (*Fig. I.C-d14*).

Passive Ventilation System

A passive ventilation system integrated into the concrete structure of Battery Huger allows fresh air intake to the interior rooms even when all door and window openings are sealed closed. Ventilation is provided through a narrow, approximately twelve-inch wide, shaft, which is formed into the concrete structure and wraps around Battery Huger beyond the walls of the first-floor rooms.

Four of these vent shaft openings serve the first-floor rooms. Rooms 101, 111, and 112 each have one 12"-wide vertical opening; these connect directly to the vent shaft that wraps around the perimeter of the rooms. Room 102 has a two-foot square opening, which connects to a 1'-6"-diameter cylindrical shaft that runs vertically to the roof above second-floor level (*Fig. I.C-d16*). The vertical shaft appears to have been cored into the concrete. A 1'-10" square hatch at roof level provides access to the Room 102 ventilation shaft.



Figure I.C-d15. Vent shaft opening in Room 112 for passive ventilation system.



Figure I.C-d16. Cylindrical vent shaft and hatch at roof level.

Electrical System

Three main utility rooms are at Battery Huger; Rooms 108, 120a, and 121. Each contains electrical panels that distribute power across Battery Huger. The panels are described in detail in the *Room-by-Room* descriptions below.

All electrical distribution systems, both early and modern, are surface mounted on the concrete walls and ceilings. The remnants of early, if not original, threaded flexible metal cable and metal lamp bases are intact in some locations, but no longer connected to electrical power. Only one lamp base, in Room 122, retains both its early, probably original 7”-tall wire cage and its glass jelly jar globe. Modern rigid metal conduit and PVC wrapped cable are currently used for electrical distribution.

Modern lamp bases, some of metal and some made of ceramic, are surface mounted on the ceilings throughout most of the first-floor rooms of Battery Huger. In some spaces new fluorescent light

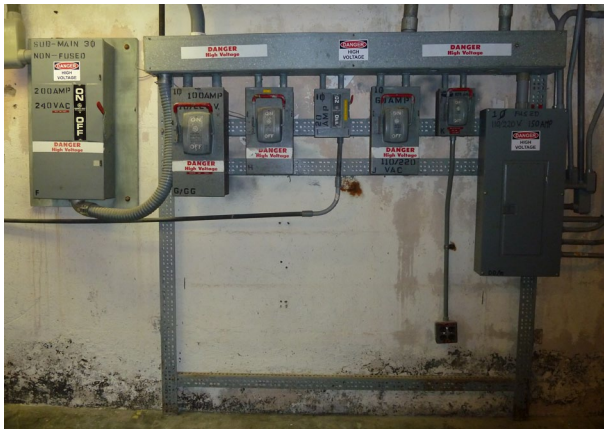


Figure I.C-d17. Electrical panels in utility room, Room 108.



Figure I.C-d18. Intact original lamp base, wire cage, and glass jelly jar globe of Room 122.



Figure I.C-d19. Typical modern metal lamp base.



Figure I.C-d20. Typical modern track lighting of second-floor rooms.

fixtures have been installed. The museum (Room 201) and bookstore (Room 202) spaces of the second floor have modern track lighting.

Three exterior electric handicap lifts were installed by NPS ca. 2005. The lift near the south staircase provides access from the west parade ground to the first floor. Another lift provides access from the first floor to the second-floor roof deck of the south gun emplacement. The third lift provides access from the second-floor roof deck to the roof deck above the second floor. All three are 22-amp, 230-volt lifts manufactured by National Wheel-O-Vater Co., Inc. None is currently in service.



Figure I.C-d21. Handicap lift at first-floor level no longer in service.



Figure I.C-d22. Diesel-powered generator in Room 121.



Figure I.C-d23. Electrical transformers in Room 121.

An emergency diesel-powered generator is stored in Room 121. The light commercial generator was manufactured by Cummins Onan and installed ca. 2010.

Three electrical transformers are located in Room 121 and are secured behind a metal cage wall.

Plumbing System

Before fresh water was piped to Fort Sumter in the 1970s, two cisterns at Battery Huger collected water. The cistern and most of its associated



Figure I.C-d24. Collection box connected to parapet drain once used for water supply.

piping at the north gun emplacement remain intact; a parapet drain in the north wall of Battery Huger connects to a collection box on the north wall of Battery Huger. From there, water was piped into the cistern, an enclosed concrete room west of Room 104. The cistern at the south gun emplacement has been converted to occupiable space, now used as the rangers' office (Room 115).

Today, Charleston Water System provides fresh water to Battery Huger by way of an underwater main from Charleston.

A modern wastewater line runs south from Battery Huger through a new, ca. 2009, utility corridor at the Gorge Wall and empties into a leach field outside the fort walls. The leach field was rehabilitated in 2004.

Plumbing fixtures at Battery Huger are modern. Refer to the *Room-by-Room* descriptions below for plumbing in the following rooms: Room 102b, Room 120c, Room 120d, and Room 124.

Fire Protection & Suppression

Fire protection at Battery Huger includes smoke and heat detection, strobe lights, and a fire alarm system. A smoke/heat detector is surface mounted on the ceiling of most rooms. A fire hydrant is located outside the fort walls to the south.

A fire suppression system protects the museum (Room 201). A backflow preventer along the north wall of the first-floor walkway is connected to the fire main, which is located in Room 104, by a 4"



Figure I.C-d25. Typical smoke detector at Battery Huger.



Figure I.C-d26. Backflow preventer for fire suppression system.

diameter pipe. The pipe continues through the corridors (Rooms 103 and 106) then turns up into the ceiling to the museum above. The fire main is described in the *Room-by-Room* section below.

Security System

Battery Huger is equipped with an alarm system. In addition, most rooms of Battery Huger are secured from the exterior with padlocks on the doors.

Exterior Features

Roofs & Rainwater Collection/ Dispersal

The roofs and roof decks at Battery Huger are flat and constructed of concrete. According to staff, between 2000 and 2004, NPS coated all exterior concrete building material, including walls, and roof surfaces, with a black elastomeric coating manufactured by Acrymax.[306] At horizontal surfaces, fabric was applied as a base application to reinforce the coating.

An early surface drainage channel runs north-south below the first-floor walkway along the west elevation. The channel collects surface runoff as well as water from floor drains located in most first-floor rooms, then transports it south. Round covered drains are spaced along the length of the walkway. Four metal hatches set flush with the walkway provide access to the pipes. The hatches measure approximately 2'-0" by 4'-0".



Figure I.C-d27. Hatch to access drainage channel below first-floor walkway.

306. Direct conversation with Rick Dorrance of NPS.



Figure I.C-d28. Brick pavers of museum roof with built-up parapet wall.

Unlike the first-floor walkway, the flat roof decks lack adequate drainage systems to remove rainwater. Several areas of pooled water remain long after rains subside. The elastomeric coating shows areas of cracking and failure, especially where metal pierces horizontal surfaces.

The roof above the museum (Room 201), installed in 1993, consists of a Hypalon waterproof membrane covered with Styrofoam panels; a layer of loose-laid brick pavers serves as roof ballast.

Visitor Observation Decks

Visitors to Battery Huger can access two observation decks, one at the second-floor level and one on the second-floor roof. As stated in the *Electrical System* section above, handicap lifts were installed to provide access to both levels; however, the lifts are no longer in service. Access is provided by exterior metal staircases and walkways installed by NPS in the 1970s; they are described below in the *Walkways and Stairs* section.

Second-Floor Observation Deck

The observation deck at second-floor level was built as the deck around the original south gun emplacement. Access is primarily from the south exterior staircase, though the public may also access the deck from the bookstore. A staircase from Room 118 is reserved for staff. The gun emplacement is a raised platform against the east wall of the deck; it is described below in the *Gun Emplacement* section.



Figure I.C-d29. Northeast oblique of second-floor observation deck.



Figure I.C-d31. Rainwater pooling at south end of observation deck.

The observation deck is open-air with a cast-in-place concrete floor. Fabric was applied as a base application to reinforce a black elastomeric coating. An 8'-8" tall concrete wall wraps the deck on the north, east, and south sides. The west side is open with only a modern metal guard rail. A 1970s-era exterior staircase in the northeast corner provides access to the roof deck above. South of the staircase, against the east wall, is another open-air staircase that provides access to the first-floor hallway (Room 118).

A drainage channel is cast into the concrete slab, but is not continuous around the deck; it runs parallel to the north and east walls and wraps around the west side of the staircase. The channel cuts vertically into the gun emplacement platform and terminates at the top. The channel is not sufficient to drain the deck, allowing pools of rainwater to form, especially around the base of the gun emplacement.

A staircase at the south end of the deck provides access to the observation tower above, which is described in the *Observation Tower and Observation Posts* section below.

Third-Floor Observation Deck

Another visitor observation deck is centrally located on the upper deck of the fort. Two exterior staircases flanking the center two-story section of Battery Huger provide access. The roof deck is open-air without walls. A guard rail runs along the west side of the deck, then turns to run east-west at the mid-point of the north gun emplacement, blocking visitor access to the north end of the roof. The deck is concrete, finished in a base application of fabric to reinforce a black elastomeric coating. There are no floor drains.

The east side of the roof deck has an irregular footprint. In some locations the slab has a squared-off edge where it meets the grade of the fill covering



Figure I.C-d30. Southwest oblique of observation deck.



Figure I.C-d32. Southwest oblique of third-floor observation deck.



Figure I.C-d33. East side of observation deck at east field.

the east parade ground, approximately 18" below. In other locations the slab tapers down to meet grade.

Gun Emplacement

The south gun emplacement is a circular raised platform at the east side of the second-floor visitor observation deck. The platform is approximately 23'-6" in diameter and 2'-8" above the roof deck. The platform is cast-in-place concrete finished in a base application of fabric to reinforce a black elastomeric coating. Metal bars, installed for the no longer extant, non-disappearing barbette gun system, project through the surface of the platform in a circular pattern. A drainage channel is cut into the northern half of the platform and runs vertically to the deck below.

An original concrete staircase with metal treads is located on the south side of the platform and provides access from the observation deck. The metal stairs have four 8" risers. The 11"



Figure I.C-d34. South gun emplacement.



Figure I.C-d35. Original staircase at gun emplacement.

treads are bolted to the stairs with brass screws. The top two treads are broken at the west side. There are no handrails.

Observation Tower & Observation Posts

Observation Tower

An observation tower and small open-air observation deck are at the southwest corner of Battery Huger. This deck sits approximately three feet above the second-floor observation deck discussed above. Five concrete steps, measuring 3'-0" wide, run east-west to connect the two decks.

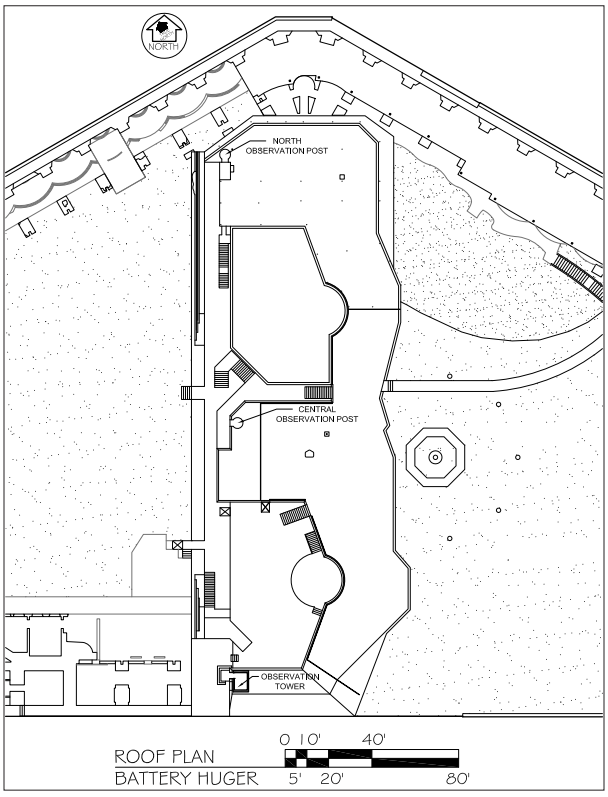


Figure I.C-d36. Roof plan of Battery Huger.



Figure I.C-d37. Southeast oblique of observation tower.



Figure I.C-d39. West elevation of observation tower.

The steps and the surface of the southwest deck are finished in a base application of fabric to reinforce a black elastomeric coating. A modern metal guard rail runs around the perimeter of the southwest deck.

The observation tower is a small room measuring approximately 9'-9" by 7'-1" in plan, and is located on the east side of the southwest deck. Three concrete steps lead to a small landing and doorway on the west wall; there is wood trim around the doorway, but no door. The walls, roof, and floor are cast-in-place concrete and all surfaces on the interior and exterior are finished in a black elastomeric coating. A horizontal window opening runs across the full east side of the observation tower and wraps around the northeast and southeast corners of the room. There is no glazing or window sash in the opening.

Observation Posts

There are two circular observation posts at Battery Huger. The north post, located north of the shell hoist, is accessed by a metal ladder bolted to the



Figure I.C-d38. Concrete steps to observation tower.



Figure I.C-d40. North observation post.

exterior north wall. The central post is located north of the bookstore (Room 202), which was originally the south shell hoist. The access ladder attached to the east wall has been removed.

Both observation posts are open-air and measure approximately 5'-0" in diameter. Their platforms are below the top roof level. This design allowed a standing observer to see above the top of the fort while still protected by the surrounding concrete walls. The walls and floor slabs of the observation posts are finished in a black elastomeric coating.

Shell Hoist

The shell hoist is located at the north end of Battery Huger at second-floor level and is associated with the north gun emplacement. The covered space measures approximately 23'-5" by 12'-8". The north exterior staircase provides access from the first floor.

The cistern associated with the north gun emplacement is located directly below the shell hoist's concrete floor slab. A hatch in the floor provides access to the water piping for the cistern. The metal hatch cover measures approximately 1'-11" by 1'-9". A shallow drainage channel runs diagonally across the floor to the west edge of the slab to drain surface water. The floor slab continues north of the shell hoist to the north wall of Battery Huger. A metal ladder mounted on the north exterior wall provides access to the north observation post above.

A full-height concrete wall wraps the east half of the north side, the east side, and the east half of the south side of the shell hoist. The west half of the space is open with only a modern guard rail along the perimeter of the open sides.

On the east side of the shell hoist, a screened area has been constructed with wood framing and wire mesh; it measures approximately 4'-8" by 8'-0". The screen prevents access by birds and animals to the metal hoist equipment and the ammunition hoist below.

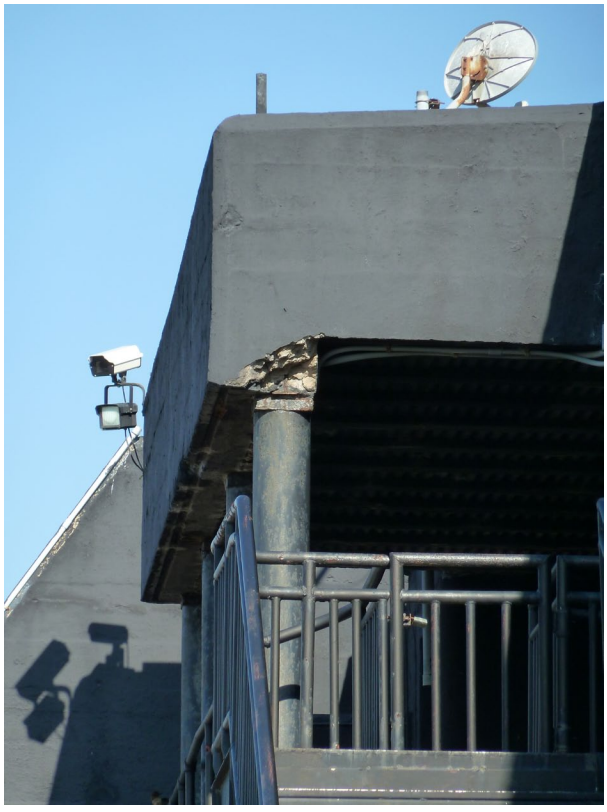


Figure I.C-d41. South elevation of shell hoist.



Figure I.C-d42. Hatch in shell hoist floor.



Figure I.C-d43. Screened area to protect hoist equipment.



Figure I.C-d44. Figure 45. Shell hoist looking south.

he ceiling is cast-in-place concrete formed with corrugated galvanized metal pans; the pans have all but rusted away. As elsewhere, the corrugations are ½" deep and are spaced 2½" apart. The concrete is supported by steel I-beams that run east-west at approximately 2'-0" on center. The beams are supported on the east side by the solid wall and on the west side by a girder spanning four 12"-diameter concrete columns.

The walls, floor, and ceiling are finished in a black elastomeric coating.

A second shell hoist was originally located in the center of the second-floor level for use with the south gun emplacement. The space was converted to what is now the bookstore (Room 202).

Walls

Like the roof decks, the exterior walls were finished in recent years with a black elastomeric coating manufactured by Acrymax. The paint has cracked or deteriorated in multiple locations, especially in the sections of west-facing exterior walls, near the top of the wall coping along at the perimeter of the museum (Room 201), and at those



Figure I.C-d45. Deterioration of wall finish material at west elevation.



Figure I.C-d46. Metal stair bolts penetrating exterior wall.

locations where the paint has been penetrated by a metal accessory. In addition, sounding reveals voids behind the paint. Rivulets of moisture are escaping through the elastomeric coating in numerous locations.

Windows

There are four original window openings at the first-floor level. Two are located in the west wall of Room 109, and two are located in the west wall of Room 121. The openings measure 2'-6" wide by



Figure I.C-d47. Original window openings with metal shutters.

3'-6" tall. Each is filled with a metal grille made up of five ½" vertical dowels and a ½" by 2" horizontal bar at mid-height.

Corrugated metal shutters, probably original with brass pintle and hinges, are mounted on the exterior of the window openings. The shutters each have two ½" diameter L-shaped pintle hinges.

There are two modern (ca. 1987) two-over-two light double-hung wood windows on the west wall \



Figure I.C-d48. Modern wood windows of the rangers' office.



Figure I.C-d49. Modern aluminum bookstore windows.

of the rangers' office (Room 115). The windows measure 2'-5" wide by 3'-6" tall. The openings are not original; they were cut into the concrete walls.

The second-floor bookstore (Room 202) has modern window openings on the west and south walls. The aluminum framed windows are 2'-0" wide by 1¾" thick. Two pairs of three ganged windows are on the west elevation, and two ganged windows are on the south elevation next to the glazed door.

Doors & Gates

Original door openings at Battery Huger vary in width and height, but all have been cast with rounded head and jamb openings. Most doorways retain an original corrugated sheet metal door; the vertically-oriented door construction typical throughout Battery Huger. The door frame, made up of a top, middle, and bottom rail and two stiles, is made of steel T pieces 1½" tall with a 1" flange. Two X braces at the top and



Figure I.C-d50. Original corrugated sheet metal doors and doorways.



Figure I.C-d51. Original door detail.

bottom halves of the door are made of the same steel Ts. Horizontal framing pieces are reinforced with ¼" by 1¼" steel trips. There are 6" square ¼"-thick plates at the center of the X braces, and 4" square ¼"-thick plates at the corners of the frame. The middle rail has 7" tall by 4" wide plates for reinforcing. All of the steel pieces are bolted together.

Most doors retain original hardware, which is discussed in the *Room-by-Room* description below.

The access corridor for the north gun emplacement (Room 101) and the access corridor for the south gun emplacement (Room 112) are secured with metal gates rather than the typical corrugated sheet metal door. The gates and their hardware are discussed in the *Room-by-Room* description below.

There are several modern doorways with doors throughout Battery Huger. At first-floor level, the rangers' office (Room 115) and the restrooms (Rooms 120a, b, c, and Room 124) have modern doors. At second-floor level, the museum (Room 201) and the bookstore (Room 202) have modern doors. The doors and hardware are discussed in the *Room-by-Room* description below.

Walkways & Stairs

Walkways

An exterior first-floor walkway paralleling the west elevation runs north-south along the length of Battery Huger and measures almost twelve feet in width. In addition to the pour joints in the concrete surface, the walkway has significant areas of cracking and patching. A continuous north-



Figure I.C-d52. Metal gates at access corridor (Room 112).

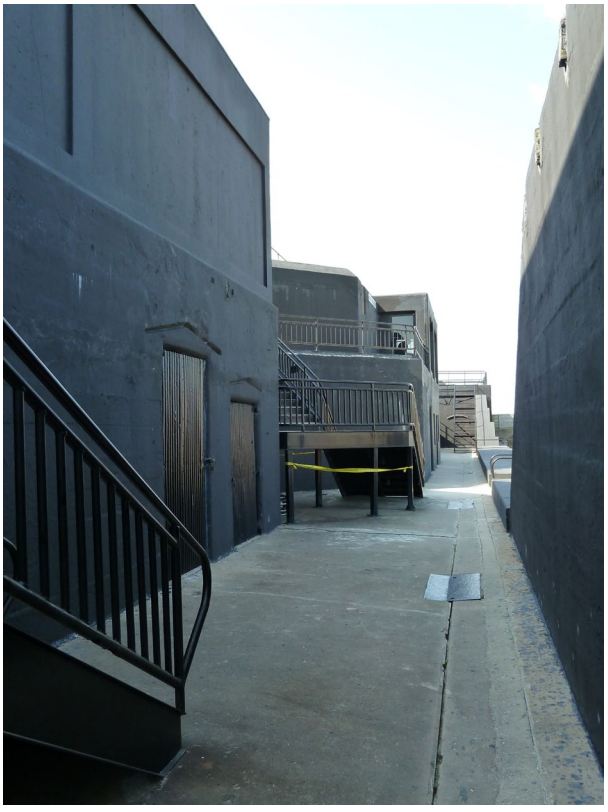


Figure I.C-d53. First-floor walkway looking south.

south concrete pour joint runs approximately 3’-0” east of the west wall. It aligns roughly with the center of the floor drain hatches described in the *Roofs & Rainwater Collection/ Dispersal* section above. Other concrete pour joints run east-west at various intervals along the length of the walkway.

While sporadic crazing of hairline cracks is found throughout the walkway surface, there are particular areas of extensive patching. The slab at the north end, just west of the cistern wall, has a large area of patching, as does the area around the south exterior staircase, west of Room 120C.

A second-floor exterior walkway provides access from the middle staircase to the museum (Room 201) and the bookstore (Room 202). The walkway is approximately six feet wide and wraps around the west and north sides of the center portion of Battery Huger. The concrete surface has significant cracking and areas of patching. The intersection of wall and slab is caulked along both sides of the east-west portion of walkway. A metal hatch sits flush with the walkway surface providing access to what was the south gun emplacement cistern. The hatch cover measures 20” by 22”.



Figure I.C-d54. Second-floor walkway looking north.



Figure I.C-d55. Cracking and caulking at second-floor walkway.

Stairs

Two ca. 1970 exterior staircases provide access from the west parade ground to the first floor of Battery Huger, which is approximately 3’-6” above grade. The south staircase is adjacent to a handicap lift. It runs north-south, parallel to the west wall of Battery Huger, and is 4’-1” wide. The staircase has open risers and four metal treads that measure 12” deep. The top landing is infilled with concrete. A modern 2” diameter metal railing is on the west side of the staircase.



Figure I.C-d56. South staircase and handicap lift at west parade ground.



Figure I.C-d57. Central staircase at west parade ground.

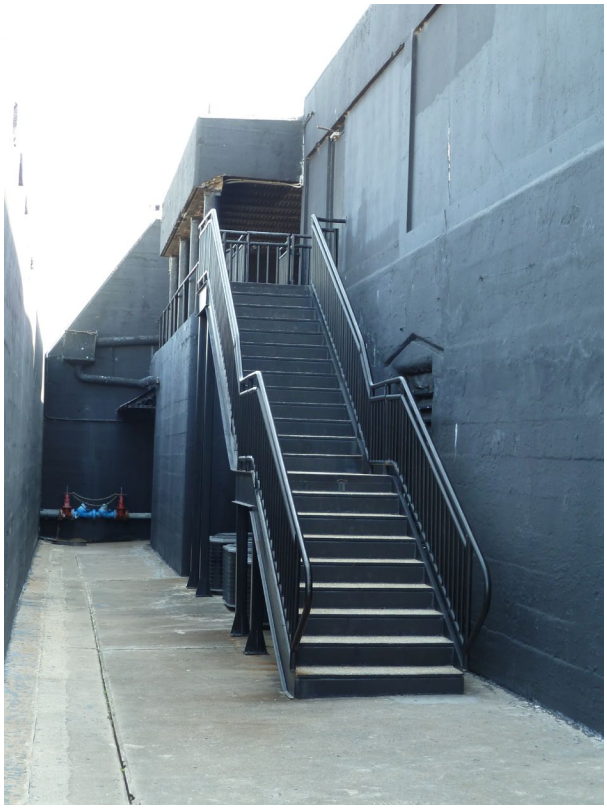


Figure I.C-d58. North staircase at first-floor.

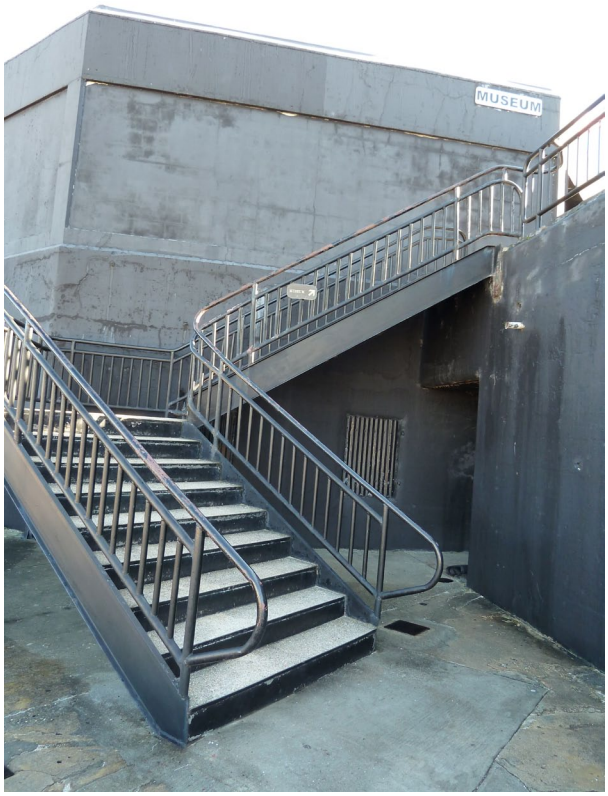


Figure I.C-d59. Central staircase at first floor.



Figure I.C-d60. South staircase at first floor.

The central staircase runs east-west, perpendicular to the west wall of Battery Huger, and is 6'-3" wide. It has six closed metal risers that measure 6½" tall and five concrete-filled treads that measure 11" deep. A modern 2" diameter metal railing is on each side of the staircase.

Four exterior staircases provide access from the first floor to the second floor. The north staircase (ca. 1994) runs north-south with one intermediate landing. It is 4'-3" wide with 6½" tall closed metal risers and 20 concrete-filled treads that are 11" deep. The staircase has a modern 2" diameter metal railing on each side.

The central staircase (ca. 1970) runs north-south to a landing, then turns nearly 180 degrees to run parallel to the west wall of Room 109. The staircase is 6'-3" wide with 6" to 6½" tall closed metal risers. The 19 concrete-filled treads are 11" deep. The staircase has a modern 2" diameter metal railing on each side.



Figure I.C-d61. Early 1960s handrail at south staircase.



Figure I.C-d63. North staircase at second floor.

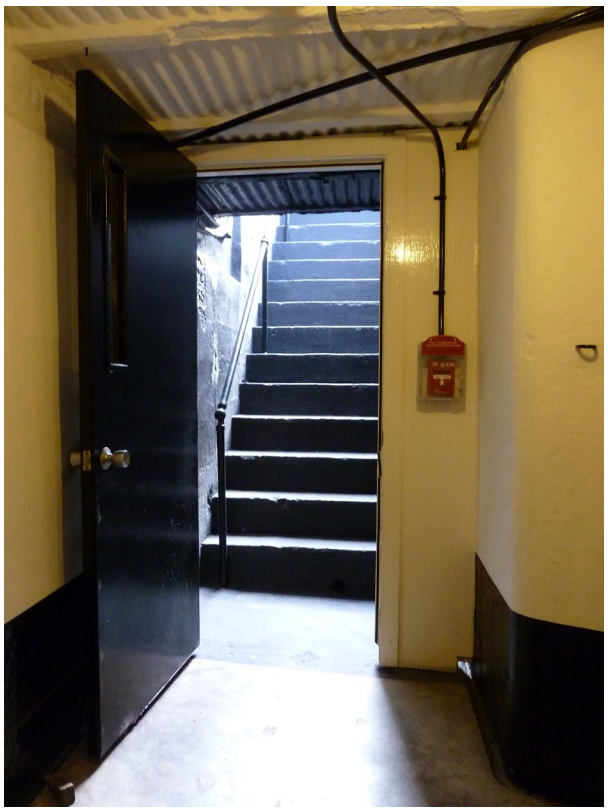


Figure I.C-d62. Staircase from interior hallway (Room 118).

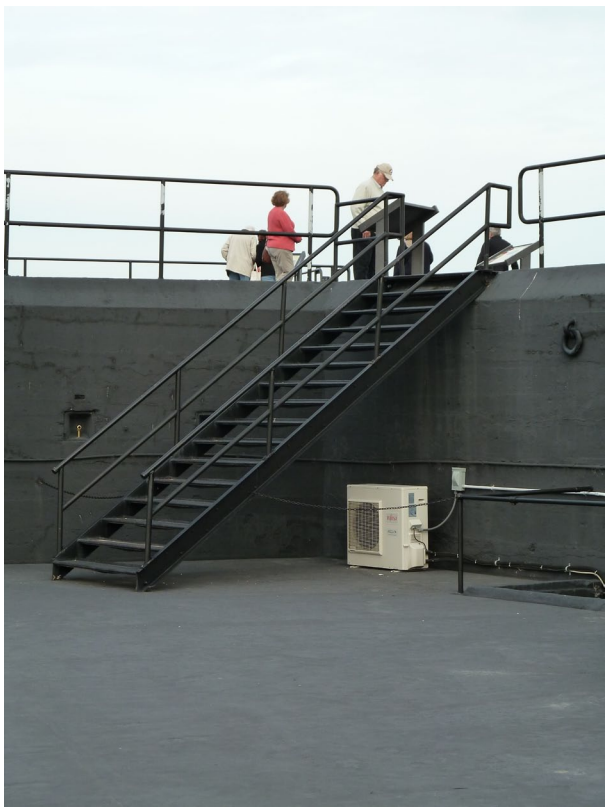


Figure I.C-d64. South staircase at south gun emplacement deck.

The south staircase (ca. 1960) runs north-south along the west wall of Battery Huger. The top landing is a four-foot wide metal bridge that runs east-west connecting the stair to the second-floor roof deck. The staircase is 4'-8" wide and has open risers that measure 6¾" to 7" tall. The 20 metal treads are 11" deep. The 1½" diameter metal railings are different from the modern railings at the other staircases; they appear to be original.

A fourth staircase provides access to the south gun emplacement from an interior hallway, Room 118. The staircase is open to the roof deck above. Measuring 4'-6" wide, the staircase has 10" tall risers and 19 treads that are 10" deep. A section of early metal railing along the east side of the staircase is 1¾" in diameter.

Two ca. 1970 exterior staircases provide access from the second floor to the roof decks above. The north staircase runs east-west just south of the museum (Room 201). This staircase is 5'-5" wide and has open risers that measure 7" tall. Its

14 metal treads are 10” deep. The staircase has a modern 2” diameter metal railing on each side.

The south staircase runs roughly east-west connecting the south gun emplacement deck with the roof deck above. The staircase is 5’-4½” wide and has open risers that measure 7½” tall. Its 15 metal treads are 10” deep. The staircase has a modern 2” diameter metal railing on each side.

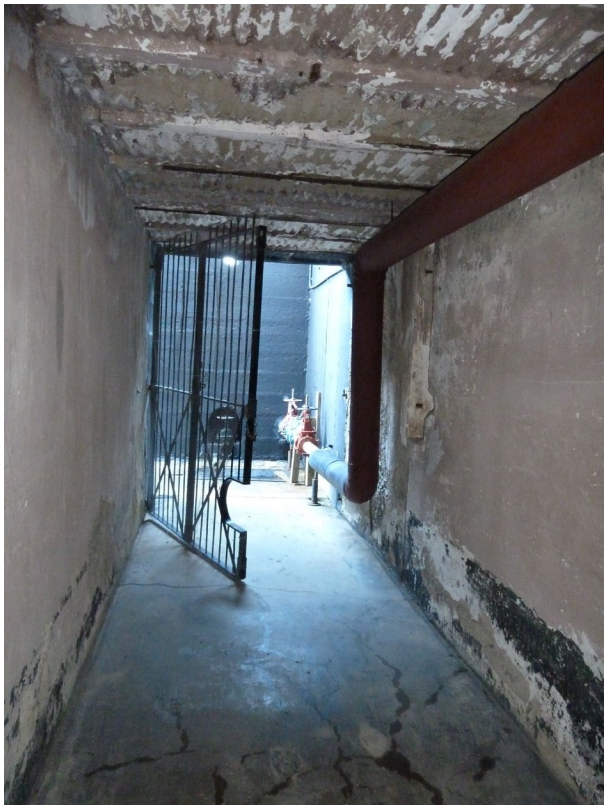


Figure I.C-d65. Hallway (Room 101) looking west.



Figure I.C-d66. Hallway (Room 101) looking east.

Room-by-Room Description

First-Floor Rooms

Room 101

This space is a hallway that runs east-west at the north end of Battery Huger. It provides access to the northern ammunition hoist and its associated rooms. The hallway is open to the exterior at the west end. It measures approximately 6’-1” by 24’-0” with a floor-to-ceiling height of 8’-0”.

Flooring

The floor is the original, made of cast-in-place concrete. There is no evidence of metal-bar reinforcement.

Cast-in-place drainage channels are set in the floor parallel to the north and south walls, presumably to direct condensation from the room. The channels drain into two apparently original clay pipes set into the floor flanking the doorway. The pipes have an interior diameter of 6”.

Sporadic crazing of hairline cracks is found throughout the floor surface. A larger crack in the floor runs north-south, approximately 8’-0” from the doorway; the west portion of the floor is slightly higher than the east. The crack roughly aligns with a vertical crack in the north wall at the location of a vent shaft.

Walls

The walls are made of cast-in-place concrete; the aggregate, where exposed, is large. The north wall was formed in short, approximately 1’-0” tall lifts. The south wall however, is unique; it was cast in



Figure I.C-d67. Exposed aggregate in north wall.



Figure I.C-d68. Vent shaft in north wall.

vertical sections rather than horizontal lifts, the only wall observed with this construction.

There is some loss of surface cement parging on both the north and south walls, especially near the floor and at the ceiling. The south wall has loss of surface material in a roughly two-foot-wide area near the entrance gate. A full-height crack at this location measures 1/16". There is buildup of calcification drips at the east end of the south wall.

The north wall has a great deal of surface loss near the doorway; here the aggregate is exposed. A vertical vent shaft in the north wall is typical of Battery Huger, with a 1'-0" wide shaft opening. The grille to cover the shaft opening is missing. There is spalling and a crack in the concrete at this location. The crack has a ¼" offset.

Ceiling

The ceiling is cast-in-place concrete formed with corrugated galvanized metal pans; the pans have all but rusted away, as in most rooms. The corrugations are ½" deep and are spaced 2½" apart. The concrete is supported by fourteen steel I-beams that run north-south at approximately 2'-0" on center. Wire mesh and parging was later added to the underside of the steel beams to protect the metal from corroding.

A great deal of finish material has eroded from the beam at the doorway. The north ends of the second, third and seventh beams from the west doorway have lost surface material as well as the full length of the fourth and sixth beams. There is some loss of surface cement parging in the first eight ceiling bays from the west doorway as well as bays twelve and thirteen.

Doorways

An original metal gate with added wire mesh secures the entrance to the hallway at the west end of Room 101. The gate is made up of two metal frames, each measuring 2'-10" wide by 7'-4½" tall, that are bolted together. The frames are made of steel straps that measure ½" by 2". The diagonal X bracing at the bottom half of the doors measures ⅜" by 1". Each gate has seven ½"-round pickets whose pointed tops extend 3½" beyond the top rails. The bottom half of one side has been modified so that the gate will close around a fire suppression pipe that enters the space through the doorway.



Figure I.C-d69. Original metal gate at hallway entrance.

The gate has three pintle hinges; the bottom pin has broken off. There is an original latch at the center of the two gate frames that is made up of two pieces bolted to the stiles. The hasp piece measures 3" by 2"; the loop piece is 3" tall and 1" in diameter.

The north side of the doorway has three early if not original pintles no longer in use. The bases of the pintles are 1" tall and 2" in diameter and the pins are ¾" in diameter by 1½" tall. The hardware has light corrosion.

Windows
As is typical of the original rooms throughout Battery Huger, there are no windows.

Finishes
The walls and ceiling are finished in what appears to be white limewash. On top of the limewash is a cream-colored paint with a reddish-brown paint as the top layer. Remains of a black painted horizontal band or dado are visible at the base of the walls, as can be seen throughout most of the building; the band measures 20" tall. The floor is unfinished.

Electrical System
There are no light fixtures in this space. On the north wall is a strobe light for emergency exit.

Passive Ventilation System
A vent shaft opening on the north wall connects to the north-side passive ventilation system. The shaft opening measures 1'-0" wide by 4'-6" tall; however, the shaft expands to a full 8'-0" tall beyond the opening (*Fig. I.C-d68*).

Fire Protection & Suppression
The back flow preventer for the fire suppression system is located on the walkway just west of the doorway to Room 101. Its 4" diameter pipe runs along the north wall of the hallway at approximately 1'-9" above floor level. The pipe rises to ceiling height just inside the entrance gate and turns to run south into the adjoining hallway (Room 103).

Room 102
This room is located in the northeast corner of Battery Huger and is accessed from the west through the hallway, Room 101. Its original rectangular plan is intact and measures approximately 11'-0" by 22'-8" with a floor-to-ceiling height of 8'-0". The room was originally identified as the Shell Room to reflect its use for storing live shells for the north gun emplacement. Today, it is used for storing miscellaneous materials, including firewood and other props for the historical reenactments conducted periodically.

Flooring
The floor is made of cast-in-place concrete with no evidence of steel reinforcement. From the north wall, the floor slopes up approximately two inches over a distance of 5'-6" to a level floor plane.

A cast-in-place north-south drainage channel is set in the floor at the doorway, presumably to direct condensation from the room.

Sporadic crazing of hairline cracks is found throughout the floor surface.



Figure I.C-d70. Motion detector and strobe light at north wall of Room 101.



Figure I.C-d71. Room 102 looking west.



Figure I.C-d72. Southeast oblique of Room 102.



Figure I.C-d73. Ventilation shaft opening in east wall.

Walls

The walls are made of cast-in-place concrete formed in short, approximately 1'-0" tall lifts. There is a 45-degree beveled edge in the south wall, approximately 6'-8" above the floor level. The wall is recessed 2" at the bevel line.

Some loss of surface cement parging is visible on all walls, with the south wall exhibiting the greatest loss. It has surface loss in horizontal striations and some cracking, especially at the lintel and sides of the wall opening. The south wall opening is original, with rounded corners; it measures 2'-6" square. The opening was filled with cast-in-place concrete when the adjacent room (Room 105) was converted to a cistern and filled with water in the 1960s. The extensive deterioration of the south wall was likely caused by the water stored in that room.

The east wall has some cracking, but a minimal amount of surface loss. An opening for a ventilation shaft is in this wall; it measures 2'-0" square and has three eroded round bars set vertically in the opening.

The north wall is intact, but has some cracking at the top near the ceiling. The west wall has some loss of parging up to approximately 3'-0" above floor level and approximately 2'-0" below the ceiling. There are two ⅝" diameter holes at the south end of the west wall about 6" below the ceiling that were probably created for electrical wiring.

Ceiling

The ceiling is cast-in-place concrete formed with corrugated galvanized metal pans; the pans have all but rusted away, as in most rooms. The corrugations are ½" deep and are spaced 2½" apart. At the east and south walls, small amounts of the metal formwork are still intact. The concrete is supported by thirteen steel I-beams that run north-south at approximately 2'-0" on center.

There is some loss of finish material at the last beam as well as the five bays closest to the east wall. There is a severe crack in the finish material of the twelfth beam from the west wall.

A steel track is mounted on the ceiling. It is made of a 6" deep I-beam with ¾" flanges. The track circles the room, entering and exiting above the doorway on the west wall. The track appears to be an original feature, part of the mechanism to carry cannon shell from this room to the ammunition hoist of Room 104.

Doorways

The door on the west wall is typical of the original doors throughout Battery Huger. Made of corrugated sheet metal that is set vertically, it measures 4'-0" wide by 7'-4" tall. The door frame, made up of a top, middle, and bottom rail and two stiles, is made of steel T pieces that are 1½" tall with a 1" flange. Two X braces at the top and bottom half of the door are made of the same steel Ts. The horizontal framing pieces are reinforced with ¼" by 1¼" steel trips. There are 6" square quarter-inch-thick plates at the center of the X braces and 4" square quarter-inch-thick plates at the corners of the frame. The middle rail has 7" tall by 4" wide



Figure I.C-d74. Original door of Room 102.

plates for reinforcing. All of the steel pieces are bolted together.

The door retains its original hardware. The three, three-knuckle hinges with pintles are 1¾" in diameter and 2½" tall. There is a 10" long hasp with a 1½" diameter loop. The hinges, pintles, hasp and loop are all made of brass.

Windows
There are no windows in this room.

Finishes
The walls and ceiling are finished in what appears to be white limewash. On each side of the door are remains of the ubiquitous black painted 20" tall dado at the base of the walls. The floor is unfinished.

Electrical System
Early threaded flexible metal cable runs east-west along the center of the ceiling connecting two early if not original metal lamp bases. The conduit measures 1¼" in diameter. The lamp bases are 3½" in diameter and their glass jelly jar globes and protective metal cages are missing.



Figure I.C-d75. Early conduit and lamp base on the ceiling.

Two modern 4½" diameter ceramic lamp bases are surface mounted at opposite ends of the ceiling. The lamps have plastic-coated cages and ½" rigid PVC conduit. A modern light switch is contained in a galvanized metal box with plate, surface mounted on the south wall of the doorway.

Passive Ventilation System
An added vertical ventilation shaft is close to the east wall. The cylindrical shaft, cored through the concrete superstructure, is approximately 1'-6" in diameter and runs directly to the top of the fort where it is now covered with a 1'-10" square metal hatch.

Fire Detection & Suppression
A smoke/heat detector is roughly centered on the ceiling. It has modern ½" rigid metal conduit.

A five-pound ABC type fire extinguisher is mounted on the west wall.

Room 103
This space is a hallway that runs north-south connecting the entrance hallway (Room 101) to the northern ammunition hoist (Room 104) and its associated rooms. There are no walls at the north or south ends, and the hallway is open to the ammunition hoist area on the west side. This room measures approximately 6'-10" wide by 23'-5" long with a floor-to-ceiling height of 8'-0".

Flooring
The floor is made of cast-in-place concrete with no evidence of steel reinforcement. At the center of the hallway is a raised platform, also of cast-in-place concrete, that extends from Room 104. It is



Figure I.C-d76. Southwest oblique of hallway (Room 103).



Figure I.C-d77. Steel pipe at north end of Room 103.

7” high and appears to have been the base for the ammunition hoist.

A cast-in-place north-south channel is set in the floor at the east wall, presumably to direct condensation from the room to the south.

Sporadic crazing of hairline cracks is found throughout the floor surface as well as an unknown oily substance coating the top surface.

Walls

The walls are made of cast-in-place concrete. At the west wall, flanking the opening, are two vertical 2’-10” diameter steel pipes that support the I-beams in the ceiling. The east wall was formed in short horizontal lifts, as is typical throughout much of Battery Huger. The west wall, however, is continuous from Room 101 and was cast in vertical sections rather than horizontal lifts.



Figure I.C-d78. East wall of hallway (Room 103).

On the east wall is extensive loss of surface cement parging, especially from floor level up to about 2’-0”. The top 16” of the east wall has sporadic surface loss and the south section has moderate loss.

The west wall has loss of surface cement parging at the bottom 10” at the north end. The south end of the wall has extensive surface loss at the bottom 3’-0” and sporadic loss at mid-height.

Ceiling

The ceiling is cast-in-place concrete formed with corrugated galvanized metal pans; the pans have all but rusted away. The corrugations are ½” deep and are spaced 2½” apart. The concrete is supported by twelve steel I-beams that run east-west at approximately 2’-0” on center.

There is some erosion of surface cement parging at the following beams: from the north end of the space, beam 3, the west end of beam 4, beams 5 and 6, the west ends of beams 7, 8, and 12, and the east ends of beams 7, 8, and 9. There is some loss of parging between beams in ceiling bays 1, 2, 3, 4, 5, 6, and 11.

Two apparently original steel tracks are mounted on the ceiling. They are continuous from the shell room (Room 102), reportedly used to carry shells to be loaded onto the ammunition hoist of Room 104. The tracks are rusted and a section of one is missing.

Doorways

An original doorway on the east wall connects to Room 105. The door is the typical corrugated metal

type used throughout Battery Huger. It measures 4'-0" wide by 6'-10" tall.

The door retains its original hardware. The three, three-knuckle hinges with pintles are 1¾" in diameter and 2½" tall. There is a 10" long hasp with a 1½" diameter loop. The hinges, pintles, hasp and loop are all made of brass.

Windows
There are no windows in this room.

Finishes
The walls and ceiling are finished in a cream-colored paint applied over white limewash. Remains of a black painted horizontal band are at the base of the walls, as is typical throughout most of the building; the band measures 20" tall. The floor is unfinished.

Electrical System
Early threaded flexible metal cable remains on the ceiling connecting to an early, if not original, metal lamp base. The conduit measures 1¼" in diameter. The lamp base is 3½" in diameter and its glass jelly jar globe and protective metal cage are missing.

A modern 4½" diameter ceramic lamp base is surface mounted on the ceiling. The lamp has a plastic-coated cage and ½" rigid PVC conduit that is continuous from Room 102. The conduit continues through the hallway into Room 105.

Additional PVC conduit that measures 5/4" runs across the top of the west wall and continues to the electrical panels in Room 108.

Fire Detection & Suppression
The 4" diameter pipe from the fire suppression system is continuous from Room 101. It runs along the west wall at approximately 1'-9" above floor level and then wraps around the opening into Room 104.

Room 104
This space is open to the hallway (Room 103) and was originally used as the ammunition hoist for the north gun emplacement. The floor is raised with a 7" tall concrete platform. An opening in the ceiling above the platform accesses a shaft that extends to the third floor; ammunition was lifted through the shaft to the gun emplacement above.



Figure I.C-d79. Ammunition hoist (Room 104) looking west.



Figure I.C-d80. Niche in west wall of Room 104.

The room measures approximately 9'-9" by 12'-6" and has a floor-to-ceiling height of 7'-3".

Flooring
The floor is made of cast-in-place concrete with no evidence of steel reinforcement. The floor is set on a 7" raised platform, also of cast-in-place concrete.

There is some surface erosion at the north and south edges of the raised platform, and the southeast corner is broken off. Some gouging is on the top surface of the platform.

Walls
The walls are made of cast-in-place concrete formed in short, approximately 1'-0" tall lifts. There is no wall on the east side of the room; it is open to the hallway, Room 103.

There is some loss of surface cement parging on all walls. The north wall has a small amount of surface loss, particularly near the top.



Figure I.C-d81. Ammunition hoistway in ceiling of Room 104.

A recessed niche centered in the west wall measures approximately 2'-5" deep by 4'-4" wide. The recess was associated with the cistern originally located in the adjacent enclosed space to the west. Today, a branch line of the fire suppression system runs through the wall at the back of the niche. There is a great deal of surface loss on the walls of the niche.

The west wall has some loss of surface cement parging, particularly near the top, approximately 3" down from the ceiling, and at the north and south ends.

The south wall has some loss of parging up to approximately 2'-0" above floor level, near mid-height, and near the top. There is buildup of calcification drips in the southwest corner of the room.

Ceiling
The ceiling is cast-in-place concrete formed with corrugated galvanized metal pans. The corrugations are ½" deep and are spaced 2½" apart. At the north, west, and south walls, small amounts of the metal formwork are still intact.

The ammunition hoistway, a vertical concrete shaft that extends to the top floor, is located at the center of the ceiling. The metal frame for the hoist is mounted at the top of the shaft. The shaft opening measures 5'-8" in the east-west direction by 6'-0" in the north-south direction. A 12" deep by 5" wide steel I-beam spans the opening running north-south. There is extensive rust on the metal hoist frame as well as extensive loss of finish material on the east wall of the shaft.



Figure I.C-d82. Control valve for fire suppression in Room 104.

Four steel I-beams that are 6" deep run east-west and are cut off at the shaft opening. The north beam has extensive erosion.

There is some erosion of surface cement parging in all ceiling bays.

Doorways
There are no doorways in this space.

Windows
There are no windows in this space.

Finishes
The walls and ceiling are finished in what appears to be white limewash. Beneath the limewash are remains of a cream-colored paint over a reddish-brown paint. Remains of a black painted dado are at the base of the walls, as is typical throughout most of the building; the band measures 20" tall. The floor is unfinished.

Electrical System
One early, if not original, metal lamp base remains mounted on the ceiling south of the ammunition hoist. The lamp base is 3½" in diameter and its glass jelly jar globe and protective metal cage are missing.

Fire Detection & Suppression
The 4" diameter pipe from the fire suppression system is continuous from Room 101 and Room 103. It runs along the north wall at approximately 1'-9" above floor level and then wraps around the west and south walls and connects to the control valve in the southeast corner of the room. The valve was manufactured by Potter and installed by Grinnell Fire Protection. From the control valve, the pipe runs to the ceiling and continues back into the hallway (Room 103).

Room 105
This space is accessed through the hallway (Room 103). Its floor plan is irregular with a diagonal wall that extends into roughly an L shape. It measures 26'-8" by 23'-8" in the longest direction and has a floor-to-ceiling height of 8'-0". The room was originally identified as the Powder Magazine to store gunpowder for the north gun emplacement.


Figure I.C-d83. Southeast oblique of Room 105.


Figure I.C-d84. Room 105 looking west.

In the 1960s the room was closed off from the rest of Battery Huger and converted to a makeshift cistern. NPS reopened this room in 2012 and today it is mostly used for storing miscellaneous materials, including metal railings.

Flooring
The floor is made of cast-in-place concrete with no evidence of steel reinforcement. The floor slopes down slightly away from the north and south walls creating a subtle drainage channel running east-west at the center of the room. The sloping floor directs water towards the entrance door in the west wall and into the drainage channel in the hallway (Room 103).

The floor has a brownish coating of unknown material.

Walls
The walls are made of cast-in-place concrete formed in short, approximately 1'-0" tall lifts. All wall surfaces have a hard, black coating used for waterproofing; this was likely applied in the 1960s when the room was converted to a cistern.

There is some loss of surface coating on the east, west, and south walls. The loss is moderate at the south and west walls, and minimal at the east wall.

Ceiling
The ceiling is cast-in-place concrete formed with corrugated galvanized metal pans; the pans have all but rusted away. The corrugations are ½" deep and are spaced 2½" apart. The concrete is supported by thirteen steel I-beams that run north-south


Figure I.C-d85. Ceiling of Room 105.

at approximately 2'-0" on center. A steel girder runs east-west where the south wall bends, and an additional five steel I-beams run east-west.

There is rust on all beams as well as some sporadic erosion of surface cement parging at the bays between the beams.

Doorways
There is a single original doorway in this room located at the west wall. The door and its hardware are described in the Room 103 section above.

Windows
There are no windows in this room.

Finishes
The walls are covered with a black coating, probably installed for waterproofing when the room was converted to a cistern in the 1960s. The wall finish is deteriorated throughout. The ceiling is finished in what appears to be white limewash. The floor has a brownish coating of unknown material.

Electrical System
There are no electrical fixtures or conduit in this room.

Fire Detection & Suppression
There are no fire detection and suppression systems in this space.

Security
The door can be padlocked on the hallway side.

Room 106
This space is a hallway that runs east-west. It is open to the hallway (Room 103) at the north end and to Room 108 at the west end. A staircase in the southeast corner originally provided access from the first level to the north gun emplacement at the second level. The staircase, partially blocked off with a CMU wall, now connects to the museum flagpit. The hallway measures approximately 8'-0" by 18'-2" and has a floor-to-ceiling height of 8'-0".

Flooring
The floor is made of cast-in-place concrete with no evidence of steel reinforcement. The floor slopes down slightly toward the west side of the room.



Figure I.C-d86. Room 106 looking east.



Figure I.C-d87. Drainage channel in floor of Room 106.

A 5"-wide cast-in-place drainage channel is set in the floor at the west end of the space. It runs diagonally from the southeast corner of Room 103 to the southwest corner of this hallway. Another cast-in-place drainage channel runs parallel to the south wall, presumably to direct condensation from the wall surface.

Sporadic crazing of hairline cracks is found throughout the floor surface as well as cracking that runs continuously from north to south.



Figure I.C-d88. Room 106 looking south.

Walls
The walls are made of cast-in-place concrete formed in short, approximately 1'-0" tall lifts. A modern CMU wall at the east end of the room blocks access to the stairway beyond. It was likely installed at the same time as the ductwork that runs through the space and to the museum (Room 201) above.

There is some loss of surface cement parging on the north wall.

The south wall has a small amount of surface loss. There is buildup of calcification drips at the east end of the doorway on the south wall.

Ceiling
The ceiling is cast-in-place concrete formed with corrugated galvanized metal pans; the pans have all but rusted away. The corrugations are ½" deep and are spaced 2½" apart. The concrete is supported by steel I-beams that run north-south at approximately 2'-0" on center. At the east end of the space the beams turn and run diagonally northeast-southwest.

A hole cut in the ceiling at the southeast corner of the room allows a mechanical duct to run to the museum (Room 201) above.

There is severe erosion of surface cement parging at the beams and bays at the east end of the room.

Doorways
There are two original doorways in this space. The doorway in the south wall provides access to Room 107, but the door has been removed. The east side of the doorway retains two of the three center portions of the original hinge hardware; the top hinge is missing.

The second doorway at the east end of the room separated the staircase from the rest of the space, but the door has been removed. The north wall retains the three center portions of the original hinge hardware.

Windows
There are no windows in this room.

Finishes
The walls are finished in a beige-colored paint applied over white limewash. Beneath the top layer of paint are remains of a black painted horizontal band at the base of the walls, as is typical throughout most of the building; the band measures 20" tall. The ceiling is finished in a cream-colored paint. The floor is unfinished.

Mechanical System
A large mechanical duct runs through the room just below the ceiling. The duct is connected to one of the three HVAC condensing units in Room 108 and carries heated and cooled air to the museum above (Room 201).

Electrical System
A modern 4½" diameter ceramic lamp base is surface mounted on the fifth beam from the west end of the room. The lamp has a plastic-coated cage and ¾" metal conduit, which is rusted. A metal junction box is mounted next to the lamp base. It has ½" schedule 40 rigid PVC conduit.

Fire Detection & Suppression
The 4" diameter pipe from the fire suppression system is continuous from Room 103. It runs into this space at ceiling height, then drops to approximately 1'-9" above floor level. The pipe

runs through the room and continues through the new CMU wall at the east end.

Room 107

This room is accessed from the hallway (Room 106). Its floor plan is irregular with the greatest dimensions measuring 10'-8" by 20'-6" and a floor-to-ceiling height of 7'-8". The room was originally identified as the Store Room and today it is used for storing miscellaneous materials such as ladders. A large mechanical duct occupies a good deal of space near the doorway and along the ceiling.

Flooring

The floor is made of cast-in-place concrete with no evidence of steel reinforcement. The floor slopes down slightly toward the entrance at the north side of the room.

A cast-in-place drainage channel is set in the floor at the west jamb of the doorway. It connects to the drainage channel that runs parallel to the south wall of the hallway (Room 106).

There is very little crazing throughout the floor surface; the floor is coated in a tan paint.

Walls

The walls are made of cast-in-place concrete formed in short, approximately 1'-0" tall lifts. There is a 45-degree beveled edge in the west wall, approximately 6'-8" above the floor level. The wall is recessed 2" at the bevel line.

Some loss of surface cement parging is on the north wall as well as some cracking, particularly around the doorway.

There is minimal surface loss on the east wall, but buildup of calcification drips is evident. At the south end of the east wall two pieces of steel rebar protrude from the ceiling. At the north end of the east wall approximately ten holes in the wall surface have been filled with wooden dowels.

The south wall has severe surface loss at the top 4" near the ceiling.

The west wall has very minimal surface loss. A severe crack runs the length of the wall just below the ceiling beams. There is buildup of calcification drips along the length of the west wall.

Ceiling

The ceiling is cast-in-place concrete formed with corrugated galvanized metal pans; the pans have all but rusted away. The corrugations are ½" deep and are spaced 2½" apart. The concrete is supported by eight steel I-beams that run east-west at approximately 2'-0" on center.



Figure I.C-d90. Room 107 looking north.



Figure I.C-d89. Room 107 looking south.



Figure I.C-d91. Cracking below ceiling and calcification drips at west wall.



Figure I.C-d92. Hole in ceiling for mechanical duct.

A hole in the ceiling at the southernmost bay was cut to allow a mechanical duct to run to the museum (Room 201) above. A smaller hole is cut in the second to last bay, likely for an earlier duct, though it is currently empty.

There is some erosion of surface cement parging at the fifth, sixth, and seventh beams from the doorway.

Doorways
There is a single original doorway in this room, located at the north wall. The door has been removed. What hardware remains is described in the Room 106 section above.

Windows
There are no windows in this room.

Finishes
The walls and ceiling are finished in a cream-colored paint applied over white limewash. The floor has a beige paint finish.

Mechanical System
A large mechanical duct enters this room through the doorway at the north end and runs below the ceiling to the south end. The duct turns and runs through the ceiling to the museum (Room 201) above.

Electrical System
A modern 4½" diameter ceramic lamp base is surface mounted in the northwest corner of the ceiling. The lamp has a metal cage and ½" rigid PVC conduit. A modern metal lamp base is surface mounted in the southeast corner of the ceiling. It also has a metal cage and ½" rigid PVC conduit.

A modern light switch in a galvanized metal box with plate is surface mounted on the north wall west of the doorway.

Fire Detection & Suppression
There are no fire detection and suppression systems in this space.

Room 108
This room is accessed from the hallway (Room 106) as well as from an exterior entrance on the west wall at the south end of the room. Its original rectangular plan is intact and measures approximately 11'-10" by 46'-0" with a floor-to-ceiling height of 8'-0". The room was originally identified as the Shot Room; today it houses most of the mechanical and electrical equipment for Battery Huger.

Flooring
The floor is made of cast-in-place concrete with no evidence of steel reinforcement. The floor slopes down slightly toward the east side of the room.

Cast-in-place drainage channels are set in the floor parallel to the east and south walls; they measure approximately 9" deep by 7" wide, larger than most in Battery Huger. The channels empty into a 6" diameter drain in the southwest corner of the floor.

There is a 6" raised cast-in-place concrete platform upon which the compressor sits (*Fig. I.C-d94*). It measures 3'-0" by 3'-9" and is located 1'-0" from the west wall and 9'-1" from the north wall.

There is a great deal of crazing, cracking, and patching throughout the floor surface. A large, ¼" crack runs east-west approximately 11'-9" from the north wall. Another ¼" crack runs east-west approximately 17'-0" from the south wall. A ⅛" crack runs north-south from the south wall at



Figure I.C-d93. Southeast oblique of Room 108.



Figure I.C-d95. Figure 95. Holes and patching in ceiling.



Figure I.C-d94. Room 108 looking north.

approximately the middle of the room. A patch in the floor covers two 1" diameter copper pipes approximately 23'-6" from the south wall.

Walls

The walls are made of cast-in-place concrete formed in short, approximately 1'-0" tall lifts. There is a 45-degree beveled edge in the east wall, approximately 6'-8" above the floor level. The wall is recessed 2" at the bevel line.

There is a moderate amount of surface cement parging loss on the north wall up to approximately 6'-0" as well as some cracking just below the ceiling.

The east wall has little to no loss of surface material, but some cracking below the ceiling. A full-height vertical crack is in the east wall approximately 13'-0" from the south wall.

The south wall has a small amount of surface material loss and cracking. An opening has been cut into the south wall for an air duct to the adjacent room. The opening measures 2'-8" tall by 2'-0" wide. There are multiple small penetrations in the south wall for electrical wiring.

There is some loss of surface material at the north end of the west wall and around the opening near the center of the wall.

Ceiling

The ceiling is cast-in-place concrete formed with corrugated galvanized metal pans; the pans have all but rusted away. The corrugations are ½" deep and are spaced 2½" apart. The concrete is supported by twenty-two steel I-beams that run east-west at approximately 2'-0" on center.

Between the second and fourth beams from the north end of the room is a hole cut in the ceiling to allow a mechanical duct to run to the museum (Room 201) above. A modern cement stucco-over-wire-mesh patch partially covers the hole.

Rust and erosion of surface cement parging is visible at the following beams: from the north end of the space, beam 1, the east end of beam 3, the west end of beam 10, and beams 12, 13, 20, 21, 22. There is some loss of parging between beams in ceiling bays 1, 2, 3, 4, the west ends of bays 5, 6, 10, 11, 12, 13, the two bays at the south end over the doorway.



Figure I.C-d96. Metal louvers in west wall doorway.

Two steel tracks are mounted on the ceiling at the south end of the room. The tracks enter the room through the south doorway.

Doorways
There are two original doorways in this room, both on the west wall. The doorway centered on the west wall has been infilled with operable metal louvers in a metal frame that measures 3'-0" wide by 7'-0" tall. The louvers are severely rusted. The south side of the jamb retains the three early if not original steel pintles no longer in use. The bases of the pintles are 1" tall and 2" in diameter and the pins are ¾" in diameter by 1½" tall.

The doorway at the south end of the west wall leads directly to the exterior. Though the interior door is missing, the south side of the jamb retains the three early if not original steel pintles no longer in use. The bases of the pintles are 1" tall and 2" in diameter and the pins are ¾" in diameter by 1½" tall. The door on the exterior side is the typical corrugated metal type used throughout Battery Huger. It measures 4'-0" wide by 8'-2" tall.

The southern door retains its original hardware. Two, three-knuckle hinges are secured with pintles



Figure I.C-d97. Ductwork for mechanical system.

that are 1¾" in diameter and 2½" tall; the middle, third, hinge is missing. There is a 10" long hasp with a 1½" diameter loop. The hinges, pintles, hasp and loop are all made of brass.

Windows
There are no windows in this room.

Finishes
The walls are finished in a beige paint applied over white limewash. Beneath the top layer of paint, are remains of a black painted horizontal band at the base of the walls, as is typical throughout most of the building; the band measures 20" tall. The ceiling is finished in a cream-colored paint. The floor is unfinished.

Mechanical System
The three air handling units in this room were manufactured by International Comfort Products LLC and installed by Custom Climate. The units have 208/230 volts and ¾ horsepower and were installed on December 16th, 2009. These units and the condensing units outside Room 108 provide heat and air conditioning to the museum (Room 201).

Electrical System
Three modern 4½" diameter ceramic lamp bases are surface mounted on the ceiling. The lamps have plastic-coated cages and ¾" rigid metal conduit.

A 4'-0" long fluorescent light fixture is hanging from the ceiling near the south end of the west wall.



Figure I.C-d98. Electrical panels on west wall.



Figure I.C-d99. Room 109 looking southeast.

Two modern light switches in galvanized metal boxes with plates are surface mounted on the west wall north of the doorway. A quadruplex outlet with a metal box and a duplex outlet with metal box are surface mounted on the west wall.

The eight electrical panels in this room are on the west wall. The panel in the northwest corner has 200 amps. Farthest south on the west wall is Panel F, mounted on a plywood board bolted to the wall. This panel is labeled "Sub-Main" and is 200 amps and 240 volts.

The other six panels are mounted on a metal frame bolted to the west wall just north of Panel F. Panel G/GG is the museum sub-panel with 110 amps and 110/220 volts. Panel H is labeled "live spair" and has 240 volts. Panel I controls lights in Room 108; it has 20 amps. Panel J has 60 amps and 110/220 volts. Panel K controls the outlets in Room 108 and has 20 amps and 240 volts. Panel DD/M controls the air handlers and fire alarm and has 150 amps and 110/220 volts.

Two wall-mounted breaker boxes at the north end of the room connect to the compressor. One is single-phase, 30 amps, 240 volts; the other is three-phase, 100 amps. The compressor was manufactured by North Star. The unit measures 2'-0" in diameter and has a 5 horsepower, 30 amp, 208/230 volt engine.

Fire Detection & Suppression

A five-pound ABC type fire extinguisher is mounted on the west wall near the doorway.



Figure I.C-d100. Room 109 looking northwest.

Room 109

This room has two exterior doors on the west wall and no access to other rooms of Battery Huger. It is roughly rectangular in plan, but the long axis of the room runs northwest-southeast, diagonal to most of the other spaces of Battery Huger. The room measures approximately 11'-3" by 27'-6" with a floor-to-ceiling height of 8'-0". The room was originally identified as the Relocating Room. Today it is used for storing miscellaneous materials; a mechanical duct that runs the length of the room occupies a large space at head height.

Flooring

The floor is made of cast-in-place concrete with no evidence of steel reinforcement. A joint between two concrete pours runs north-south across the width of the room and aligns approximately with the west jamb of the west window.



Figure I.C-d101. Room 109 looking north.



Figure I.C-d102. Figure 102. Hole in ceiling of Room 109.

Cast-in-place drainage channels are set in the floor parallel to the east and south walls and at the north doorway. The channels empty into a 6" diameter floor drain located at the south jamb of the north doorway.

A 6" raised cast-in-place concrete platform that measures 2'-11" by 3'-1" is located 1'-4" from the north wall and 5'-0" from the west wall (*Fig. I.C-d101*).

Sporadic crazing and divots are found throughout the floor surface. Two hairline cracks run north-south near the north doorway.

Walls

The walls are made of cast-in-place concrete formed in short, approximately 1'-0" tall lifts. There is a 45-degree beveled edge in the east wall and at the east end of the north wall, approximately 6'-8" above the floor level. The walls are recessed 2" at the bevel line.

There is some cracking near the ceiling at the east end of the north wall as well as vertical hairline cracks near the center of the wall. A diagonal crack at the east end of the north wall extends approximately 3'-6" and is about 5'-0" tall. An opening has been cut into the west end of the north wall for an air duct from the adjacent Room 108. The opening measures approximately 2'-8" tall by 2'-0" wide. There are multiple small penetrations in the north wall for electrical wiring. Some calcification staining is evident on the north wall.

There is some loss of surface cement parging as well as cracking near the ceiling on the east wall.

There is an 8" diameter penetration in the east wall for a duct.

The south wall is in moderate to poor condition with some loss of surface material, particularly near the floor. There is extensive cracking all along the south wall below the ceiling beams, which appear to be quite rusted, as well as above the doorway. Horizontal hairline cracking is visible at the lintels of both south windows. A crack runs from the west jamb of the west window to a pour joint in the concrete floor slab. Several anchors are installed along the surface of the south wall.

There is cracking in the west wall above the doorway and near the ceiling. Numerous anchors are installed along the surface of the west wall.

Ceiling

The ceiling is cast-in-place concrete formed with corrugated galvanized metal pans; the pans have all but rusted away. The corrugations are ½" deep and are spaced 2½" apart. The concrete is supported by eighteen steel I-beams that run northeast-southwest at approximately 2'-0" on center.

A portion of the last beam at the southeast end of the room was cut off; at the same time a hole was cut into the ceiling to install a mechanical duct to the museum (Room 201) above.

There is rust and deterioration of all beams, particularly at the south wall. There is sporadic erosion of surface cement parging throughout the ceiling; the loss of material is particularly bad in the last three ceiling bays at the southeast end of the room.



Figure I.C-d103. North window of west wall.

Doorways
The two original doorways on the west wall provide access directly to the exterior. The northern door is the typical corrugated metal type used throughout Battery Huger. It measures 4'-0" wide by 6'-6" tall and is mounted on the exterior side of the jamb.

The door retains its original hardware. It has three, three-knuckle hinges with pintles that are 1¾" in diameter and 2½" tall. There is a 10" long hasp with a 1½" diameter loop. The hinges, pintles, hasp and loop are all made of brass.

A metal gate mounted on the interior side of the jamb measures 3'-2" wide by 5'-4" tall and has eight vertical pickets that extend 4" beyond the top rail. The bottom half of the gate is supported by an X brace made of ½" by 1" steel.

The gate has three, three-knuckle hinges with pintles and an 8½" long hasp; the eye is missing.

The door at the south end of the room is also the typical corrugated metal type used throughout Battery Huger. It measures 4'-0" wide by 6'-0" tall and is mounted on the exterior side of the jamb.

The door retains its original hardware. It has three, three-knuckle hinges with pintles that are 1¾" in diameter and 2½" tall. There is a broken hasp with a 1½" diameter loop. The hinges, pintles, hasp and loop are all made of brass.

Windows
The two original window openings on the west wall measure 2'-6" wide by 3'-6" tall. Each is filled with a metal grille made up of five ½" vertical dowels and a ½" by 2" horizontal bar at mid-height.

A corrugated metal shutter is mounted on the exterior of each window opening. Both shutters have two ½" diameter L-shaped pintle hinges.

Finishes
The walls are finished in a beige paint applied over white limewash. The ceiling is finished in a cream-colored paint. The floor is unfinished.

Mechanical System
A large mechanical duct enters this room through a hole in the north wall and runs below the ceiling to the south end. The duct turns and runs through the ceiling to the museum (Room 201) above.

Electrical System
Two early, if not original, metal lamp bases are surface mounted on the ceiling; their glass jelly jar globes and protective metal cages are missing. They have early metal conduit.

Two modern 3½" diameter metal lamp bases are surface mounted on the ceiling. The east lamp is missing its plastic-coated cage and globe. A modern light switch is contained in a galvanized metal box with plate, surface mounted on the west wall near the doorway. The switch has ½" rigid PVC conduit.

A modern duplex outlet with a plastic plate is surface mounted on the north wall. It has ½" rigid PVC conduit.

Fire Detection & Suppression
A smoke/heat detector is surface mounted on the ceiling near the center of the room.

Other Features
A central vacuum system for use in the museum (Room 201) is wall-mounted in the northeast corner of the room. A pipe runs from the vacuum



Figure I.C-d104. Central vacuum system in Room 109.



Figure I.C-d105. Northeast oblique of Room 110.



Figure I.C-d106. Southwest oblique of Room 110.

unit through the ceiling above. The system was manufactured by Electrolux Corporation in Bristol, VA and has 13 amps and 120 volts.

Room 110

This room in the center of Battery Huger is accessed from an exterior hallway (Room 111). Its original rectangular plan is intact and measures approximately 12'-6" by 15'-0" with a floor-to-ceiling height of 7'-2". The room was originally identified as a Store Room.

Flooring

The floor is made of cast-in-place concrete with no evidence of steel reinforcement. The floor slopes up approximately 2" from the north and south walls forming a ridge that runs east-west. The floor-to-ceiling height at the top of the ridge is 7'-0".

Cast-in-place drainage channels are set in the floor parallel to the north, south, and west walls and across the doorway.

Sporadic crazing of hairline cracks is found throughout the floor surface.

Walls

The walls are made of cast-in-place concrete formed in short, approximately 1'-0" tall lifts. There is a 45-degree beveled edge in the north and east walls and the east portion of the south wall, approximately 6'-8" above the floor level. The walls are recessed 2" at the bevel line.

There is some loss of surface cement parging as well as cracking near the ceiling beams of the north and east walls.

The south wall has some loss of surface material near the ceiling beams as well as calcification staining at the middle of the wall. In the southeast corner is a diagonal crack that measures approximately 5'-6" long.

Moderate loss of surface material is visible at the middle of the west wall and near the ceiling beams. There is cracking above the doorway on the west



Figure I.C-d107. Cracking near ceiling of north wall.



Figure I.C-d108. Supply register in west wall.

wall. Several penetrations have been cut into the west wall for electrical conduit.

Ceiling
The ceiling is cast-in-place concrete formed with corrugated galvanized metal pans; the pans have all but rusted away. The corrugations are ½" deep and are spaced 2½" apart. The concrete is supported by seven steel I-beams that run north-south at approximately 2'-0" on center.

There is some rust and erosion of surface cement parging at the following beams: from the west end of the space, beams 1 and 4, especially at the north and south ends, beam 5, and beams 6 and 7, especially at the north and south ends. There is some loss of parging between beams at the doorway and in ceiling bays 5, 6, and 7; the loss is particularly bad near the north and south walls.

Doorways
The original doorway on the west wall provides access directly to the exterior. The door is the typical corrugated metal type used throughout Battery Huger. It measures 4'-0" wide by 6'-3" tall and is mounted on the exterior side of the jamb. Part of the bottom has rusted off.

The door retains its original hardware. It has three, three-knuckle hinges with pintles that are 1¾" in diameter and 2½" tall. There is a 10" long hasp with a 1½" diameter loop. The hinges, pintles, hasp and loop are all made of brass.

Windows
There are no windows in this room.

Finishes
The walls and ceiling are finished with what appears to be white limewash; the room appears to have gone several decades without reapplication. The floor is unfinished.

Mechanical System
A 6" by 12" supply register is located on the west wall. The supply duct branches off of the museum (Room 201) HVAC line and supplies the IT room with heat and air conditioning.

Electrical System
Two early, if not original, metal lamp bases are surface mounted on the ceiling. One retains its metal cage; both are missing their glass jelly jar globes. They have early rigid metal conduit.

Two modern 3½" diameter metal lamp bases are surface mounted on the ceiling. Both retain their plastic-coated cages and globes and have ½" rigid PVC conduit.

A modern light switch contained in a galvanized metal box with plate is surface mounted on the west wall north of the door jamb. The switch has ½" rigid metal conduit.

Two modern quadruplex outlets with plastic plates are surface mounted on the north wall. They have ½" rigid PVC conduit. A duplex outlet with a galvanized metal box and plate is surface mounted on the south wall and has ½" rigid metal conduit.

A Humid Alert humidity reader and an Enviro Alert thermostat are in this room. Both were manufactured by Winland Electronics, Inc.

Fire Detection & Suppression
The main fire alarm control panel for Battery Huger and three sub panels are located on the east wall of this room. The main panel is a Simplex 4010 manufactured by Altronix. A smoke/heat detector is surface mounted on the ceiling.

Room 111
This space is a hallway, open to the exterior, which provides access to the IT room (Room 110). The hallway measures approximately 6'-6" by 24'-9" with a floor-to-ceiling height of 7'-2".



Figure I.C-d109. Hallway (Room 111) looking east.



Figure I.C-d110. Southeast oblique of hallway (Room 111).

Flooring
The floor is made of cast-in-place concrete with no evidence of steel reinforcement. A joint between two concrete pours runs north-south across the doorway at the west side of the space.

There are two 6" diameter floor drains, one at the southwest corner of the doorway, the other near the intersection of the south wall and the diagonal west wall.

Sporadic crazing of hairline cracks is found throughout the floor surface.

Walls
The walls are made of cast-in-place concrete formed in short, approximately 1'-0" tall lifts.

There is sporadic loss of surface cement parging on the north and south walls.

There is a vertical vent shaft in the south wall.

Ceiling
The ceiling is cast-in-place concrete formed with corrugated galvanized metal pans; the pans have all but rusted away. The corrugations are ½"

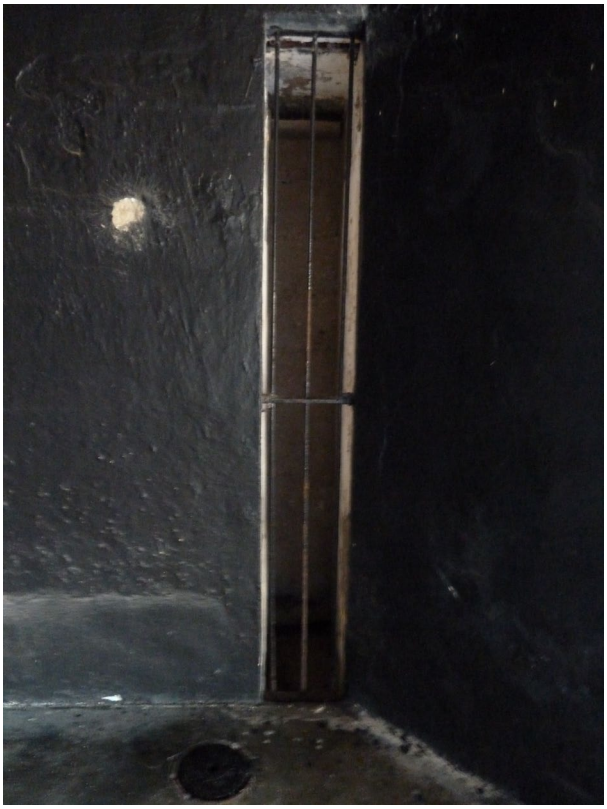


Figure I.C-d111. Vent shaft in south wall of Room 111.



Figure I.C-d112. Northwest oblique from hallway (Room 111).

deep and are spaced 2½" apart. The concrete is supported by twelve steel I-beams, approximately 2'-0" on center, that run perpendicular to the north and south walls, then bend and run diagonally.

There is some rust and erosion of surface cement parging at the following beams: from the west end of the space, beam 1 is completely rusted through and the steel is exposed, beams 2, 3, 4, 5, 6, 7, 8, and 12, particularly at the north and south ends. There is sporadic loss of parging between beams at all bays.

Near the east end of the space, a 2½" diameter steel pipe runs vertically through the ceiling and is broken off above head height; water drips from the pipe.

Doorways
This space provides exterior access to Rooms 109 and 110. The doors and their hardware are described in those respective sections above.

Windows
There are no windows in this space.

Finishes
The walls and ceiling are finished in a black elastomeric coating manufactured by Acrymax. The floor is unfinished.

Electrical System
Two early, if not original, metal lamp bases are surface mounted on the ceiling. They have early 1¼" diameter metal conduit which is continuous into the IT room (Room 110).

Passive Ventilation System
A vent shaft opening on the south wall connects to the passive ventilation system. The opening measures 1'-0" wide. The metal grille in the opening has three ½" diameter vertical pickets and three ½" by 2" horizontal braces (*Fig. I.C-d111*).

Fire Detection & Suppression
There are no fire detection and suppression systems in this space.

Room 112
This space is a central east-west hallway that provides access to the southern ammunition hoist and associated rooms. The hallway is open to the exterior at the west end. It measures approximately 6'-0" by 23'-6" with a floor-to-ceiling height of 7'-6".

Flooring
The floor is made of cast-in-place concrete with no evidence of steel reinforcement. A joint between two concrete pours runs north-south across the doorway at the west side of the space.



Figure I.C-d113. Entrance to hallway (Room 112) looking east.



Figure I.C-d114. Figure 114. Doorway at west end of south wall that is not original.



Figure I.C-d115. Figure 115. Original doorway at east wall.

Cast-in-place drainage channels are set in the floor parallel to the north and south walls. The channels empty into 6" diameter floor drains that flank the doorway at the west end of the space.

There is a great deal of crazing throughout the floor surface. A large crack runs north from the west end of the south wall.

Remnants of red paint are on the floor.

Walls

The walls are made of cast-in-place concrete formed in short, approximately 1'-0" tall lifts.

The north and south walls have some wall coating failure near the doorway. In the northeast corner on the north wall, is a diagonal crack that runs westward from ceiling height to approximately 5'-0".

A vertical vent shaft is in the north wall (*Fig. I.C-d15*).

Ceiling

The ceiling is cast-in-place concrete formed with corrugated galvanized metal pans; the pans have all but rusted away. The corrugations are ½" deep and spaced 2½" apart. The concrete is supported by fourteen steel I-beams that run north-south at approximately 2'-0" on center.

There is considerable rust and erosion of surface cement parging at the westernmost beam at the doorway. The other beams have a fresh coat of paint; however, some rust is leaching through. The second, third, and fourth beams from the west end of the space show a sporadic loss of surface material.

Two steel tracks are mounted on the ceiling at the east end of the room. The tracks enter from Room 113, to the east, and turn to run south into Room 114.

Doorways

Three doorways access this space. A pair of metal gates secures the doorway to the hallway at the west end of Room 112. The gates measure 2'-9" wide by 7'-0" tall. The frames are made of steel straps that measure ½" by 2". The diagonal X bracing at the bottom half of the doors measures ⅜" by 1". Each gate has seven ½"-round pickets whose pointed tops extend 3½" beyond the top rails.



Figure I.C-d116. Early metal lamp base and conduit on ceiling.



Figure I.C-d117. Water fountain mounted on south wall.

The gate has three pintle hinges. A latch at the center of the two frames is made up of two pieces bolted to the stiles. The hasp piece measures 3" by 2"; the loop piece is 3" tall and 1" in diameter.

The doorway at the west end of the south wall that provides access to Room 115 is not original. The jambs and head have square, rather than rounded corners, indicating they were cut into the concrete walls. A modern flush-panel door is set in a 2½" wide frame. The door measures 2'-8" wide by 6'-5" tall by 1⅝" thick.

The door hardware includes three five-knuckle 4½" steel hinges and brass plated knobs. There is a modern aluminum threshold.

The doorway at the east end of the hallway that provides access to Room 113 is original. The door is the typical corrugated metal type used throughout Battery Huger. It measures 4'-0" wide by 6'-9" tall. It is mounted to Room 113 side of the jamb.

The door retains its original hardware. It has three, three-knuckle hinges with pintles that are 1¾" in diameter and 2½" tall. There is a 10" long hasp with a 1½" diameter loop. The hinges, pintles, hasp and loop are all made of brass.

Windows

There are no windows in this space.

Finishes

The walls and most of the ceiling are finished in a fresh coat of white paint. The outer two ceiling bays are finished in the same black elastomeric coating used on the exterior surface of Battery Huger. A black painted horizontal band is continuous around the base of the walls, as is typical throughout most of the building; the band measures 20" tall. The floor is unfinished.

Electrical System

One early, if not original, metal lamp base is surface mounted on the ceiling. It has early 1¼" diameter metal conduit.

Plumbing System

A handicap-accessible water fountain is mounted on the south wall just west of the entrance gate. The fountain is made by Halsey-Taylor.

Passive Ventilation System
A vent shaft opening on the north wall connects to the passive ventilation system. The opening measures 1'-0" wide. The metal grille in the opening has three ½" diameter vertical pickets and three ½" by 2" horizontal braces.

Fire Detection & Suppression
A strobe light connected to the fire alarm system is surface mounted on the north wall.

Room 113
This room is located centrally in Battery Huger and is accessed from the west through the hallway, Room 112. Its original rectangular plan is intact and measures approximately 9'-0" by 19'-4" with a floor-to-ceiling height of 8'-0". Similar to Room 102, the room was originally identified as the Shell Room for storing live shells for the south gun emplacement. Today, it is used for storing merchandise for the bookstore.

Flooring
The floor is made of cast-in-place concrete with no evidence of steel reinforcement.

There is a minimal amount of crazing on the floor surface and a small crack near the doorway on the west wall.

There are remnants of paint on the floor; black paint is layered over red paint.

Walls
The walls are made of cast-in-place concrete formed in short, approximately 1'-0" tall lifts. There is a 45-degree beveled edge in the south and east walls approximately 6'-8" above the floor level. The walls are recessed 2" at the bevel line.

There is a small amount of surface cement parging loss on the north wall near the floor at the west end. At the east end of the north wall is an opening



Figure I.C-d118. Southeast oblique of Room 113.



Figure I.C-d119. Northwest oblique of Room 113.



Figure I.C-d120. Filled-in opening at north wall of Room 113.



Figure I.C-d121. Niche in south wall of Room 113.

in the concrete that has been filled with expanded foam. The opening measures approximately 2'-0" tall by 2'-6" wide. Some loss of surface material is visible below the opening.

Anchors for shelving are installed on the east and south walls.

A recessed niche in the south wall was likely an original through-wall opening, but was later infilled with a recessed CMU wall. The recess measures 2'-5" tall by 2'-6" wide and is 3'-0" deep.

Ceiling
The ceiling is cast-in-place concrete formed with corrugated galvanized metal pans; the pans have all but rusted away. The corrugations are ½" deep and are spaced 2½" apart. The concrete is supported by eleven steel I-beams that run north-south at approximately 2'-0" on center.

There is a small amount of erosion of surface cement parging around the northeast corner of the ceiling.

A steel track is mounted on the ceiling. The track circles the room, entering and exiting above the west doorway.

Doorways
The single original doorway is located at the west wall. The door and its hardware are described in the Room 112 section above.

Windows
There are no windows in this room.

Finishes
The walls and ceiling are finished in a cream-colored paint applied over white limewash. The floor is unfinished, but retains a small amount of red and black paint residue.

Electrical System
Two early, if not original, metal lamp bases are surface mounted on the ceiling. They have early threaded flexible metal cable.

There are two modern 3½" diameter metal lamp bases surface mounted on the ceiling. Both retain their plastic-coated cages and globes and have ½" rigid PVC conduit. A modern light switch in a galvanized metal box with plate is surface mounted on the west wall south of the door jamb. The switch has ½" rigid PVC conduit.

A duplex outlet with a galvanized metal box and plate is surface mounted on the north wall and has ½" rigid PVC conduit.

Fire Detection & Suppression
A smoke/heat detector is surface mounted on the ceiling.

Other Features
A dehumidifier manufactured by Whirlpool sits in the northeast corner of the room.

Room 114
This space is a hallway that runs north-south connecting the entrance hallway (Room 112) to the southern ammunition hoist and associated rooms. There are no walls at the north or south ends and the hallway is open to the ammunition hoist area (Room 116) on the west side. It measures approximately 7'-1" by 23'-5" with a floor-to-ceiling height of 8'-0".

Flooring
The floor is made of cast-in-place concrete with no evidence of steel reinforcement. A joint between two concrete pours runs east-west at the south end of the space.



Figure I.C-d122. Southeast oblique of Room 114.

A cast-in-place drainage channel is set in the floor parallel to the east wall, presumably to direct condensation from the room towards the south.

Sporadic crazing of hairline cracks is found throughout the floor surface. There are two larger cracks in the floor, one on each side of the east doorway. A north-south crack runs approximately down the center of the space and branches out near the steel columns of the ammunition hoist.

The west side of the floor near the ammunition hoist (Room 116) has a patch made with modern pressed brick that measures 8" by 3⅝" by 2⅛". The patch is continuous from Room 116.

Walls
The walls are made of cast-in-place concrete formed in short, approximately 1'-0" tall lifts. At the west wall, flanking the opening, are two vertical 2'-10" diameter steel pipes that support the I-beams in the ceiling.

There is a 45-degree beveled edge in the east wall approximately 6'-8" above the floor level. The wall is recessed 2" at the bevel line.

There is some cracking on the east wall, mostly near the doorway to Room 117 and at the south end of the wall near the ceiling.

Ceiling
The ceiling is cast-in-place concrete formed with corrugated galvanized metal pans; the pans have all but rusted away. The corrugations are ½" deep and are spaced 2½" apart. The concrete is supported by twelve steel I-beams that run east-west at approximately 2'-0" on center.

The beams and concrete ceiling are relatively free of surface erosion and are in fair condition.

A portion of a steel track is mounted on the ceiling. A pair of tracks enters the space from Room 113, joins into a single track, and terminates at the north end of the space.

Doorways
An original doorway on the east wall connects to Room 117 and has both an exterior and interior door. The exterior door is the typical corrugated metal type used throughout Battery Huger. It measures 4'-0" wide by 6'-0" tall.

The door retains its original hardware. It has three, three-knuckle hinges with pintles that are 1¾" in diameter and 2½" tall. There is a 10" long hasp with a 1½" diameter loop. The hinges, pintles, hasp and loop are all made of brass.

The interior door is a modern ⅜" plywood door that measures 2'-9½" wide by 6'-1½" tall. Its wood frame measures 1½" by 3½".

The door hardware includes modern 6" brass handles and three five-knuckle 3" butt hinges that are face mounted.

Windows
There are no windows in this room.

Finishes
The walls and ceiling are finished in a fresh coat of white paint. A black painted horizontal band is continuous around the base of the walls, as is typical throughout most of the building; the band measures 20" tall. The floor is unfinished.

Electrical System
Two early, if not original, metal lamp bases are surface mounted on the ceiling. They have early rigid metal conduit.

An early, if not original, light switch is surface mounted on the east wall. The switch is no longer connected to electricity but it has early rigid metal conduit.

There are two modern 3½" diameter metal lamp bases surface mounted on the ceiling. Both retain their plastic-coated cages and globes and have ½" rigid PVC conduit.



Figure I.C-d123. Early light switch on east wall of Room 114.



Figure I.C-d124. Electrical panel on west wall of Room 114.

A modern light switch in a galvanized metal box with metal plate is surface mounted on the east wall. On the same wall is a duplex outlet in a galvanized metal box with plate.

An electrical panel is surface mounted on the south end of the west wall. It runs electrical feed to the museum (Room 201) and the bookstore (Room 202).

Plumbing System

In the southeast corner of the room is an emergency eyewash station made by Speakman Company. The supply line comes from overhead and the drain line flows directly into the drainage channel parallel to the east wall.



Figure I.C-d125. Emergency eyewash station at east wall.



Figure I.C-d126. Ice machine in Room 114.

Fire Detection & Suppression
A five-pound ABC type fire extinguisher is mounted on the east wall.

Other Features
An ice machine manufactured by Ice O-Matic sits on the floor at the south end of the space.

Room 115
This room was originally the south cistern for Battery Huger. It has been modified by NPS to be used as the rangers' office. The office is accessed through both an exterior entrance on the west side and a hallway (Room 112) on the north side; both entrances have been cut into the concrete walls and are not original. The room measures approximately 9'-7" by 17'-3".

Flooring
The floor is finished in modern 8" square tiles with a cream glaze. Two tiles near the closet in the east wall are broken.

Walls
The walls are made of cast-in-place concrete formed in short, approximately 1'-0" tall lifts.

A new cabinet installed on the east wall measures 3'-9" wide by 5'-5" tall by 1'-10" deep. The cabinet has four shelves and a pair of flush panel doors. The doors measure 1'-10" wide by 5'-6" tall; each has a brushed aluminum knob and a pair of 4" butt hinges.

A concrete projection from the adjacent ammunition hoist room extends into this room near the junction of the east wall and ceiling.

None of the window and door openings in this room is original. The jambs have square, rather than rounded corners, indicating that they were cut into the concrete walls. The south window was infilled for installation of an air conditioning unit. There is a hairline crack in the south wall above the east jamb of the infilled window; the crack runs diagonally to the ceiling.

Ceiling
The ceiling is cast-in-place concrete formed with corrugated galvanized metal pans; the pans have all but rusted away. The corrugations are ½" deep and are spaced 2½" apart. The concrete is supported by eight steel I-beams that run east-west at approximately 2'-0" on center.



Figure I.C-d127. Rangers' office (Room 115) looking south.



Figure I.C-d128. Northwest oblique of rangers' office (Room 115).



Figure I.C-d129. Cabinet on east wall of Room 115.



Figure I.C-d131. Window unit in south window opening of Room 115.



Figure I.C-d130. Concrete projection from ammunition hoist at ceiling of Room 115.

An original hatch in the northeast corner of the ceiling was used when the room was a cistern. The hatch measures approximately 1'-6" by 2'-0" and is located 1'-8" from the east wall and 2'-0" from the north wall.

There appears to be a leak in the southwest corner of the ceiling, otherwise the beams and concrete ceiling are relatively free of surface erosion and are in fair condition.

Doorways

Neither the north nor the west doorways are original. The north door and its hardware are described in the Room 112 section above.

The west doorway has a modern flush-panel door that measures 3'-0" wide by 6'-8" tall by 1⅝" thick.

The door hardware includes three five-knuckle 4" brushed aluminum hinges made by Hager and a key-operated set of handles made by Best. The aluminum threshold is modern.

Windows

Two modern two-over-two-light double-hung wood windows are on the west wall. They measure 2'-5" wide by 3'-6" tall. The openings are not original, as indicated by the squared-off jambs and heads.

Finishes

The walls and the ceiling are finished in a fresh coat of white paint. A black painted horizontal band is continuous around the base of the walls, as is typical throughout most of the building; the band measures 20" tall. The floor is unfinished.



Figure I.C-d132. Fire alarm pull and fire extinguisher of Room 115.

Mechanical System
A heating and air conditioning unit is installed in the south window opening. Excess space in the opening has been infilled. The unit is manufactured by Whirlpool.

Electrical System
There are two 4'-0" long fluorescent light fixtures surface mounted on the ceiling.

A modern light switch in a galvanized metal box with metal plate is surface mounted on the west wall south of the doorway. It has rigid metal conduit.

A modern duplex outlet and a 220 volt outlet are surface mounted on the south wall. They have rigid PVC conduit.

Fire Detection & Suppression
A smoke/heat detector is surface mounted on the ceiling.

A Simplex fire alarm pull and control panel are surface mounted on the west wall south of the doorway.

A ten-pound ABC type fire extinguisher is mounted on the west wall.



Figure I.C-d133. Southwest oblique of Room 116.



Figure I.C-d134. Northwest oblique of Room 116.

Room 116
This space is open to the hallway (Room 114) and was originally used as the ammunition hoist for the south gun emplacement. In the ceiling is an open shaft used to lift ammunition to the upper gun emplacement. The space measures approximately 7'-8" by 12'-6" and has a floor-to-ceiling height of 8'-0".

Flooring
The floor is made of cast-in-place concrete with no evidence of steel reinforcement. At one time the floor had a raised platform, now removed, but probably similar to that in the north ammunition hoist of Room 104. The floor is patched with modern pressed brick, each measuring 8" by 3⅝" by 2⅛".

Walls
The walls are made of cast-in-place concrete formed in short, approximately 1'-0" tall lifts.



Figure I.C-d135. Brick patch in floor of Room 116.



Figure I.C-d136. Ammunition hoistway in ceiling of Room 116.

There is no wall on the east side of the room; it is open to the hallway, Room 114.

The walls appear to be in good condition.

Ceiling
The ceiling is cast-in-place concrete formed with corrugated galvanized metal pans; the pans have all but rusted away. The corrugations are ½" deep and are spaced 2½" apart.

The ammunition hoist, a vertical concrete shaft that extends to the top floor, is located at the center of the ceiling. The metal frame for the hoist is mounted at the top of the shaft. The shaft opening measures 5'-8" in the east-west direction by 6'-0" in the north-south direction. A 12" deep by 5" wide steel I-beam runs north-south to span the ceiling opening. A cast-in-place concrete slab has been constructed inside the shaft forming a floor at second-floor level; its steel rebar is exposed. CMU walls surround the slab.



Figure I.C-d137. Early metal lamp base and modern metal lamp base on ceiling of Room 116.

Six steel I-beams that are 6" deep run east-west and are cut off at the shaft opening.

There is some sporadic erosion of surface cement parging in all ceiling bays.

Doorways
There are no doorways in this space.

Windows
There are no windows in this space.

Finishes
The walls and the ceiling are finished in a fresh coat of white paint. A black painted horizontal band is continuous around the base of the walls, as is typical throughout most of the building; the band measures 20" tall. The floor is unfinished.

Electrical System
Two early, if not original, metal lamp bases are surface mounted on the ceiling. They have early rigid metal conduit.

There are two modern 3½" diameter metal lamp bases surface mounted on the ceiling. Both retain

their plastic-coated cages and globes and have ½" rigid PVC conduit.

A modern light switch in a galvanized metal box with metal plate is surface mounted on the north wall. It has rigid PVC conduit.

There are two modern duplex outlets; one is surface mounted on the north wall, the other on the west wall. They have rigid PVC conduit.

Fire Detection & Suppression
There are no fire detection and suppression systems in this space.

Other Features
A speaker mounted on the ceiling is manufactured by Motorola.

Room 117
This space is accessed from the hallway (Room 114). Its floor plan is irregular with a diagonal wall that extends southeast into roughly an L shape and a narrow bar of space that extends to the north. It measures 26'-8" by 38'-8" in the longest directions and has a floor-to-ceiling height of 8'-0". Similar to Room 105, the room was built as the Powder Magazine to store gunpowder for the south cannon. Today it is used as the break room for the rangers and other NPS staff.

Flooring
The floor is made of cast-in-place concrete with no evidence of steel reinforcement. A joint between two concrete pours runs east-west at approximately the middle of the room.

There is limited crazing of hairline cracks throughout the floor surface. One crack runs north-south approximately 9'-0" east of the doorway. A 2" square hole is located 4'-8" from the north wall and 9'-9" from the east wall.

Walls
The walls are made of cast-in-place concrete formed in short, approximately 1'-0" tall lifts. There is a 45-degree beveled edge in the south and east walls approximately 6'-8" above the floor level. The walls are recessed 2" at the bevel line.

A recessed niche in the north wall was likely an original through-wall opening, but was later infilled with a CMU wall. The recess measures 2'-5" tall by 2'-6" wide and corresponds with the recess in the adjacent Room 113.

No wall cracks or loss of surface material is visible; however, it sounds as if there are voids created by the separation of materials between the finish and concrete structure. Moisture could be trapped in the voids.

Ceiling
The ceiling is cast-in-place concrete formed with corrugated galvanized metal pans; the pans have all but rusted away. The corrugations are ½" deep and are spaced 2½" apart. The concrete is supported by steel I-beams and girders arranged for the irregular shape of the room; they are spaced approximately 2'-0" on center. At the doorway are fifteen beams that run north-south. Girders flank the ends of these beams and support the seven beams that run east-west at the north end of the room and the six beams that run east-west at the south end of the room.

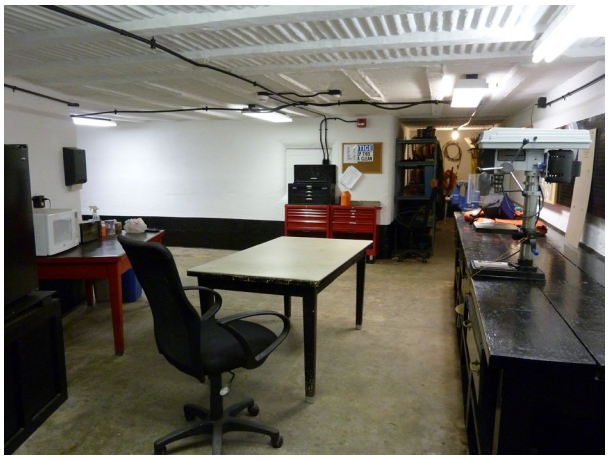


Figure I.C-d138. Room 117 looking north.



Figure I.C-d139. Southwest oblique of Room 117.

There is significant erosion of surface cement parging in the ceiling bays near the center of the room where the south wall bends and runs south.

Doorways
The single original doorway is located at the west wall. The door and its hardware are described in the Room 114 section above.

Windows
There are no windows in this room.

Finishes
The walls and the ceiling are finished in a fresh coat of white paint. A black painted horizontal band is continuous around the base of the walls, as is typical throughout most of the building; the band measures 20" tall. The floor is unfinished.

Mechanical System
Heat and air conditioning are supplied to this room by a split-type Halcyon Inverter 25-amp air conditioning unit manufactured by Fujitsu. The interior unit is surface mounted on the ceiling at the south end of the room. It measures approximately 5'-4" long by 2'-3" wide by 11" deep. The exterior unit sits on the second-floor roof deck just above Room 117.

Electrical System
A modern 3½" diameter metal lamp base is surface mounted on the northeast corner of the ceiling. It retains its plastic-coated cage and globe and has ½" rigid PVC conduit.

Four 4'-0" long two-bulb fluorescent light fixtures are surface mounted on the ceiling.

Two modern duplex outlets are surface mounted on the west wall, and two modern quadruplex outlets are surface mounted on the east wall. They have rigid PVC conduit.

Fire Detection & Suppression
A smoke/heat detector is surface mounted on the ceiling.

A strobe light connected to the fire alarm system is surface mounted on the north wall.

Room 118
This space was originally a hallway that ran east-west with a dogleg at the end, but has been subdivided as described below. At the west end of its north wall, the room opens to the north-south hallway (Room 114). A staircase in the southeast dogleg provides access from the first level to the south gun emplacement at the second level. The staircase is described in the above section *Walkways and Stairs*. The hallway measures approximately 8'-0" by 18'-4" and has a floor-to-ceiling height of 8'-0".

Flooring
The floor is made of cast-in-place concrete with no evidence of steel reinforcement. A joint between two concrete pours runs south from the east end of the north wall. The floor slopes up in the southwest corner to provide handicap access to the restroom (Room 120B).

A cast-in-place drainage channel is set in the floor parallel to the south wall, presumably to direct condensation from the room towards the south.



Figure I.C-d140. Room 117 looking south. Note air conditioning unit at ceiling.

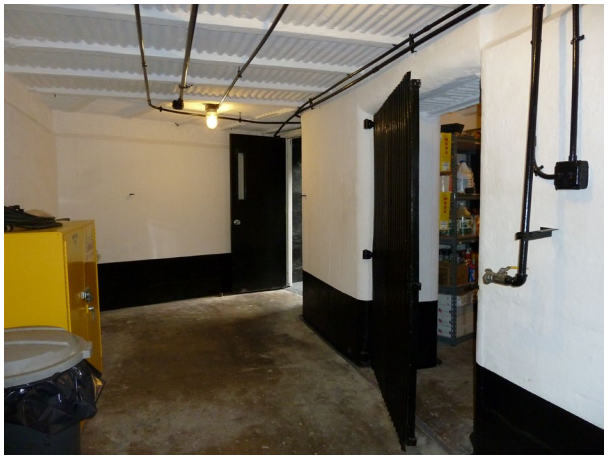


Figure I.C-d141. Southeast oblique of Room 118.

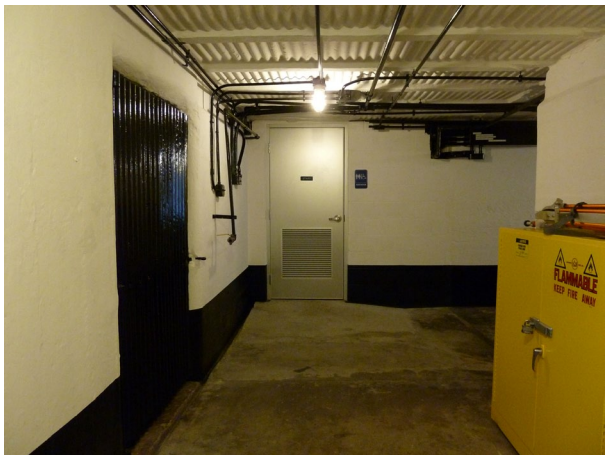


Figure I.C-d142. Room 118 looking west.

There is limited crazing of hairline cracks throughout the floor surface.

Walls

The north, south, and east walls are made of cast-in-place concrete formed in short, approximately 1'-0" tall lifts. There is a 45-degree beveled edge in the north and east walls and the west portion of the south wall, approximately 6'-8" above the floor level. The walls are recessed 2" at the bevel line.

There is significant loss of surface cement parging on the north and east walls below the ceiling beams. A diagonal crack extends from the north wall to the east wall at mid-height and is approximately 5'-0" long.

There are locations on the north, south, and east walls where it sounds as if there are voids created by the separation of materials between the finish and concrete structure. Moisture could be trapped in the voids.

A modern plywood panel wall with door has been constructed at the southeast corner of the room. The wall separates this room from the exterior staircase to the south gun emplacement above.

The west wall is newly constructed of CMU. It separates this room from the new-handicap accessible restroom (Room 120B).

Ceiling

The ceiling is cast-in-place concrete formed with corrugated galvanized metal pans; the pans have all but rusted away. The corrugations are ½" deep and are spaced 2½" apart. The concrete is supported

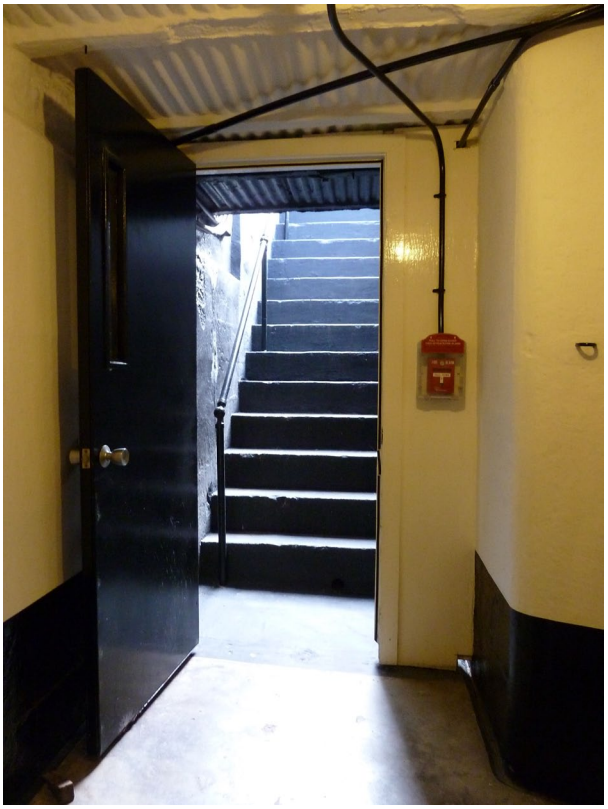


Figure I.C-d143. Doorway to staircase in southeast corner of Room 118.

by fourteen steel I-beams that run perpendicular to the north and south walls, then bend and run diagonally at approximately 2'-0" on center.

There is some sporadic erosion of surface cement parging in the ceiling bays near the north and west walls.

Doorways

There are three doorways in this space. The south doorway is original and provides access to Room 119. The door is the typical corrugated metal type used throughout Battery Huger. It measures 4'-0" wide by 6'-2" tall.

The door retains most of its original hardware. It has three, three-knuckle hinges with pintles that are 1¾" in diameter and 2½" tall. The hasp is missing but the 1½" diameter loop remains. The hinges, pintles, and loop are all made of brass.

The second doorway is in the southeast infill wall that separates the staircase from the rest of the space. The modern flush-panel door has a single vertical light that measures 4" by 2'-0". The door measures 2'-8" wide by 6'-7" tall by 1¾" thick.

The door casing is made of modern boards that measure ¾" by 3".

The door hardware includes three five-knuckle 3" butt hinges and brushed aluminum knobs with a key latch.

Just north of the infill wall, on the east wall, are two original pintles for an original door that is missing; the bottom pintle is also missing. The bases of the pintles are 1" tall and 2" in diameter and the pins are ¾" in diameter by 1½" tall.

The third doorway at the west end of the room is new. It provides access to the handicap-accessible unisex restroom (Room 120B). The modern aluminum door has a 2'-0" square louvered vent; the door measures 3'-0" wide by 7'-0" tall by 1¾" thick and has an aluminum frame and threshold.

The door hardware includes three five-knuckle 4¾" butt hinges, brushed aluminum key operated handles, and a door closer made by Sargent.

Windows
There are no windows in this room.

Finishes
The walls and the ceiling are finished in a fresh coat of white paint. A black painted horizontal band is continuous around the base of the walls, as is typical throughout most of the building; the band measures 20" tall. The floor is unfinished.

Electrical System
An early, if not original, metal lamp base is surface mounted on the ceiling at the east end of the room. It has early rigid metal conduit.

An early, if not original, base for a light switch is surface mounted on the south wall.

Two modern 3½" diameter metal lamp bases are surface mounted on the ceiling. They retain their plastic-coated cages and globes and have ½" rigid PVC conduit.

A modern double light switch in a galvanized metal box with plate is surface mounted on the south wall. It has ½" rigid PVC conduit.

A modern duplex outlet is surface mounted on the south wall. It has ½" rigid PVC conduit.

Fire Detection & Suppression
A fire alarm pull is surface mounted on the west side of the door jamb at the southeast corner of the room.

Room 119
This room is accessed from the hallway, Room 118. Its floor plan is irregular with the greatest dimensions measuring 10'-8" by 20'-2" and a floor-to-ceiling height of 7'-8". Similar to Room 107, this room was originally identified as the Store Room. Today it is used for storing miscellaneous maintenance and cleaning materials.

Flooring
The floor is made of cast-in-place concrete with no evidence of steel reinforcement. A joint between two concrete pours runs east-west at approximately the middle of the room.

A continuous cast-in-place drainage channel set in the floor parallels all four walls.



Figure I.C-d144. Electrical switches and conduit on the south wall of Room 118.



Figure I.C-d145. Southwest oblique of Room 119.



Figure I.C-d146. Northeast oblique of Room 119.

There is limited crazing of hairline cracks throughout the floor surface.

Walls
The walls are made of cast-in-place concrete formed in short, approximately 1'-0" tall lifts. There is a 45-degree beveled edge in the west wall approximately 6'-8" above the floor level. The wall is recessed 2" at the bevel line.

There are no visible cracks or loss of surface material on the wall, however, it sounds as if there are voids created by the separation of materials between the finish and concrete structure. Moisture could be trapped in the voids.

Ceiling
The ceiling is cast-in-place concrete formed with corrugated galvanized metal pans; the pans have all but rusted away. The corrugations are ½" deep and are spaced 2½" apart. The concrete is supported by nine steel I-beams that run east-west at approximately 2'-0" on center.

There is some erosion of surface cement parging in the ceiling beams and bays near the south end of the room.

Doorways
The single original doorway is in the north wall. The door and its hardware are described in the Room 118 section above.

Windows
There are no windows in this room.

Finishes
The walls and ceiling are finished in a fresh coat of white paint. A black painted horizontal band is continuous around the base of the walls, as is typical throughout most of the building; the band measures 20" tall. The floor is unfinished.

Electrical System
An early, if not original, metal lamp base is surface mounted on the ceiling. It is not connected to any conduit.

Two modern metal lamp bases are surface mounted on the ceiling. They retain their coated-plastic cages and globes and have ½" rigid PVC conduit.

A modern light switch in a galvanized metal box with plate is surface mounted on the north wall. It has ½" rigid PVC conduit.

There are two modern duplex outlets; one is surface mounted on the east wall, the other on the west wall. They have ½" rigid PVC conduit.

Fire Detection & Suppression
A smoke/heat detector is surface mounted on the ceiling.

Room 120-A, B, C, D
Originally this space was similar to Room 108 and was one large room, known as the Shot Room. In recent years it was divided into four separate spaces, which serve as an electrical closet (Room 120A), a unisex handicap restroom for staff (Room 120B), a public women's restroom (Room 120C), and a janitor's closet (Room 120D). Its original rectangular plan measures approximately 11'-10" by 46'-0" with a floor-to-ceiling height of 7'-3".

Room 120A

Flooring
The floor has a new cast-in-place concrete slab with a drain at the center.

Walls
The north and west walls are the original cast-in-place concrete formed in short, approximately 1'-0" tall lifts.

There is some sporadic loss of surface cement parging on the north and west walls.



Figure I.C-d147. Figure 147. Room 120A looking north.



Figure I.C-d148. Figure 148. Southwest oblique of Room 120A.

The east and west walls have been added recently. They are finished in an unknown, plastic-like material.

Ceiling
The ceiling is cast-in-place concrete formed with corrugated galvanized metal pans; the pans have all but rusted away. The corrugations are ½" deep and are spaced 2½" apart. The concrete is supported by five steel I-beams that run east-west at approximately 2'-0" on center.

There is a fresh coat of paint on the ceiling. The beams and concrete are relatively free of surface erosion and are in fair condition.

Doorways
A modern aluminum door on the east wall has a 1'-6" by 2'-0" louvered vent. The door measures 2'-6" wide by 6'-11" tall by 1¾" thick and has an aluminum frame and threshold.

The door hardware includes three five-knuckle 4¾" butt hinges and brushed aluminum key operated handles.

Windows
There are no windows in this room.

Finishes
The east and south walls and the ceiling are finished in a fresh coat of white paint. The north and west walls have an older paint finish. The south portion of the west wall is a cream color and the north portion of the west wall and the north wall are a beige color. Remnants of a black painted horizontal band are visible around the base of the north and west walls, as is typical throughout most of the building; the band measures 20" tall. The floor is unfinished.

Electrical System
Two electrical panels and a gas meter are mounted on the west wall (*Fig. I.C-d148*).

A 4'-0" long single-bulb fluorescent light fixture is surface mounted on the ceiling.

Two modern light switches with plastic plates are flush mounted on the east wall south of the door jamb. A modern double light switch with plastic plate is flush-mounted on the east wall north of the door jamb.

Plumbing System
An instant hot water heater system manufactured by Stiebel-Eltron is mounted on the north wall. It provides hot water to the handicap restroom, women's restroom, men's restroom, and janitor's closet. Various associated PVC water pipes run through the room and into the east and south walls.

A valve and supply line for the emergency eyewash station in Room 114 is located on the north wall.

Fire Detection & Suppression
There are no fire detection and suppression systems in this space.

Room 120B

Flooring
The floor is finished in modern 1" square tiles with a matte black finish. There are two drains, one at the shower, the other below the sink.

Walls
The walls are finished in modern subway tiles that measure 5¾" by 11¾". The lower half of the wall tiles have a matte black finish and the upper half of the wall tiles have a white finish. The tiles are installed over modern CMU walls.

Ceiling
The ceiling is continuous from Room 120A. It is cast-in-place concrete that was formed with corrugated galvanized metal pans; the pans have all but rusted away. The corrugations are ½" deep and are spaced 2½" apart. The concrete is supported by five steel I-beams that run east-west at approximately 2'-0" on center.

There is a fresh coat of paint on the ceiling. The beams and concrete are relatively free of surface erosion and are in fair condition.

Doorways
There are two doorways in this room, one on the east wall and one on the west wall. The east door and its hardware are described in the Room 118 section above; the west door and its hardware are described in the Room 120A section above.

Windows
There are no windows in this room.



Figure I.C-d149. Northeast oblique of Room 120B.

Finishes
The ceiling is finished in a fresh coat of white paint. The walls and floor have a tile finish.

Mechanical System
A round air vent is located in the south wall.

Electrical System
A 4'-0" long single-bulb fluorescent light fixture is surface mounted on the ceiling.

A modern combination light switch and duplex outlet is contained in a galvanized metal box designed for wet areas; it is surface mounted on the east wall. It has ¾" rigid PVC conduit.

A small electric radiant heater sits on the floor at the west wall of the room.

Plumbing System
A toilet and wall-mounted handicap-accessible sink are on the north wall. The sink has a PVC waste pipe. The toilet is manufactured by Toto.

There is a roll-in handicap-accessible shower on the south end of the room. The shower fixture is chrome and manufactured by Symmons.

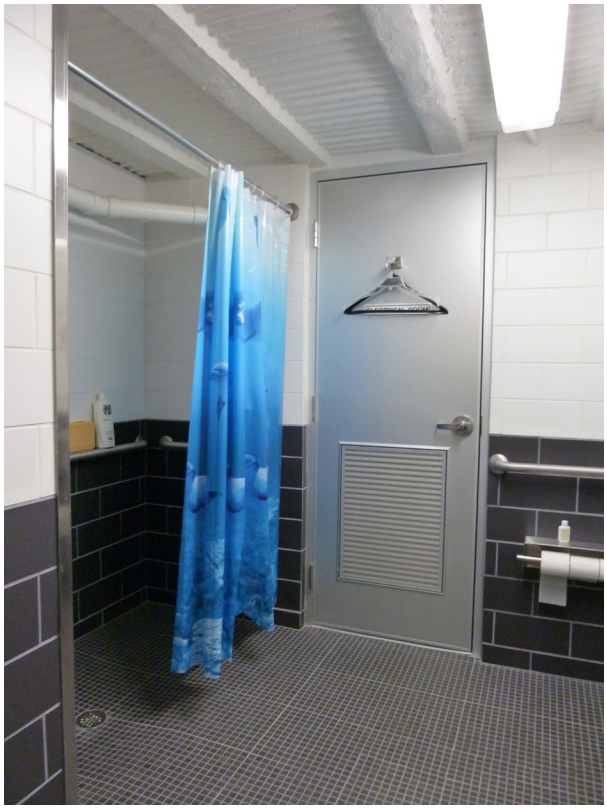


Figure I.C-d150. Southwest oblique of Room 120B.

Fire Detection & Suppression
A strobe light connected to the fire alarm system is surface mounted on the north wall.

Room 120C

Flooring
The floor is finished in modern 1" square tiles with a matte black finish. A drain is located roughly in the center of the room.

Walls
The walls are finished in modern subway tiles that measure 5¾" by 11¾". The lower half of the wall tiles have a matte black finish and the upper half of the wall tiles have a white finish. On the north, east, and south walls the tiles are installed over modern CMU walls; on the west wall the tiles are installed over the original concrete walls.

Ceiling
The ceiling is cast-in-place concrete formed with corrugated galvanized metal pans; the pans have all but rusted away. The corrugations are ½" deep and are spaced 2½" apart. The concrete is supported by fifteen steel I-beams that run east-west at approximately 2'-0" on center.



Figure I.C-d151. Southeast oblique of Room 120C.

There is a fresh coat of paint on the ceiling. The beams and concrete are relatively free of surface erosion and are in fair condition.

Doorways
The west doorway provides access to the women's restroom directly from the exterior. The doorway is original; however, the new door is smaller than the original opening and the wall has been filled in around it. The modern aluminum door has a 2'-0" square louvered vent; the door measures 3'-0" wide by 7'-1" tall by 1¾" thick and has an aluminum frame and threshold.

The door hardware includes a brushed aluminum handle on the exterior, a key operated lock, and a Gyro-Tech automatic handicap door opener and controls made by NABCO Entrances, Inc.

Windows
There are no windows in this room.

Finishes
The ceiling is finished in a fresh coat of white paint. The walls and floor have a tile finish.

Mechanical System
A round exhaust fan is located in the south wall.

Electrical System
Nine 4'-0" long two-bulb fluorescent light fixtures are surface mounted on the ceiling.

A motion sensor surface mounted on the ceiling is connected to the light fixtures.

Two modern duplex outlets in galvanized metal

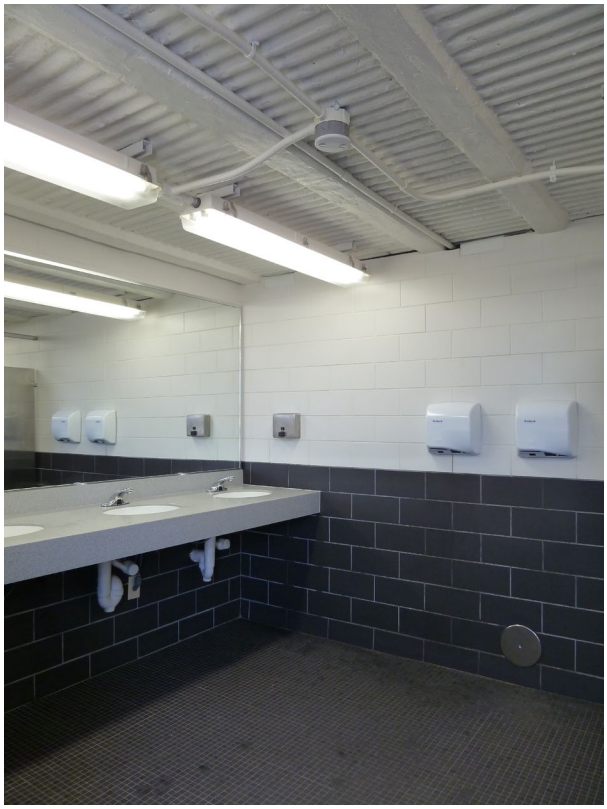


Figure I.C-d152. Northeast oblique of Room 120C.



Figure I.C-d153. Automatic flush toilet in bathroom stall.

boxes are surface mounted on the west wall. They have ¾" rigid PVC conduit.

An electric radiant heater on the floor at the west wall of the room measures approximately 10'-1" long by 5" deep by 7" tall.

Plumbing System
On the north wall are four sinks mounted below the counter top. The sinks have PVC waste pipes and automatic chrome faucets made by Sloan.

Along the east wall are seven toilet stalls with wall-mounted automatic flush Toto toilets. The stall dividers are stainless steel; the southernmost stall is handicap accessible.

Fire Detection & Suppression
A strobe light connected to the fire alarm system is surface mounted on the west wall.

Other Features
Two electric hand dryers manufactured by Bradley are on the east wall.

A baby changing station manufactured by American Specialties, Inc. is mounted on the west wall.

Room 120D

Flooring
A new cast-in-place concrete slab has been poured over the original floor.

Cast-in-place drainage channels are set along the south and east walls. The channels are cast into the original concrete slab as well as the new top layer of concrete. The channels empty into a 6" diameter floor drain in the southwest corner of the room.

Walls
The east and south walls are the original cast-in-place concrete formed in short, approximately 1'-0" tall lifts.

There is some sporadic loss of surface cement parging on the east and south walls.

The north wall is a modern CMU wall.

Ceiling
The ceiling is cast-in-place concrete formed with corrugated galvanized metal pans; the pans have all but rusted away. The corrugations are ½"



Figure I.C-d154. Room 120D looking east.



Figure I.C-d155. Metal gate at Room 120D.

deep and are spaced 2½" apart. The concrete is supported by two steel I-beams that run east-west at approximately 2'-0" on center.

There is sporadic erosion of surface cement parging throughout the ceiling beams and bays.

Doorways
An original west doorway provides access directly to the exterior. The door is the typical corrugated metal type used throughout Battery Huger. It measures 4'-0" wide by 8'-0" tall. It is mounted on the exterior side of the jamb.

The door retains its original hardware. It has three, three-knuckle hinges with pintles that are 1¾" in diameter and 2½" tall. There is a 10" long hasp with a 1½" diameter loop. The hinges, pintles, hasp and loop are all made of brass.

A metal gate is mounted on the interior side of the jamb. It measures 3'-8" wide by 6'-0" tall and has ten vertical pickets. The bottom half of the gate is supported by an X brace made of ½" by 1" steel.

The gate has three, three-knuckle hinges with pintles and a bolt lock.

Windows
There are no windows in this room.

Finishes
The east and south walls and ceiling are finished in a cream-colored paint applied over white limewash. Remnants of a black painted horizontal band are visible at the base of the east and south walls, as is typical throughout most of the building; the band measures 20" tall. The north CMU wall is unfinished, as is the floor.

Mechanical System
A round exhaust fan manufactured by Fantech is located in the north wall; it pulls air from the adjacent women's restroom (Room 120C).

Electrical System
A 4'-0" long two-bulb fluorescent light fixture is surface mounted on the ceiling.

A modern duplex outlet, a single light switch, and a double light switch, all contained in galvanized metal boxes designed for wet areas, are surface mounted on the north wall. They have ½" rigid PVC conduit.



Figure I.C-d156. Exhaust fan in north wall of Room 120D.



Figure I.C-d157. Janitor's sink and hose bib at north wall of Room 120D.

Plumbing System
A plastic janitor's sink sits on the floor against the north wall. It is a Utilitub made by EL Mustee & Sons, Inc. The basin measures 1'-8" wide by 2'-0" deep by 2'-9½" tall and has a chrome faucet.

At the east end of the north wall below a hose bib is a cast stone basin with concrete base. The basin measures 2'-0" wide by 2'-0" deep by 1'-0" tall.

Fire Detection & Suppression
There are no fire detection and suppression systems in this space.

Room 121
This room, which is accessed through an exterior door on the west side, has no direct access to any other room of Battery Huger. Its original trapezoidal plan is mostly intact. An added north-south concrete curb and metal cage divide the room roughly in half. At its greatest overall dimensions, the space measures approximately 13'-2" by 24'-0" with a floor-to-ceiling height of 8'-0". The room was originally identified as the Guard Room. Today, it stores the diesel generator and seven electrical panels, as well as three transformers that are stored on the far (southeast) side of the room, beyond the concrete curb and metal cage.

Flooring
The floor is made of cast-in-place concrete with no evidence of steel reinforcement. An 8" tall by 6" wide concrete curb runs north-south dividing the space into two.

Cast-in-place drainage channels are set in the floor parallel to the north and west walls. The channels empty into a 6" diameter floor drain near the south jamb of the doorway.

The floor is finished in an unknown brownish coating.

Walls
The walls are made of cast-in-place concrete formed in short, approximately 1'-0" tall lifts.

There is sporadic loss of surface cement parging on all walls. There is cracking on the north wall just below the ceiling beams.

A metal cage on the concrete curb divides the room roughly in half. The cage is made of 1" square wire mesh; it was manufactured by Miller Wireworks in Birmingham, Alabama.

Ceiling
The ceiling is cast-in-place concrete formed with corrugated galvanized metal pans; the pans have all but rusted away. The corrugations are ½" deep and are spaced 2½" apart. The concrete is supported by thirteen steel I-beams that run north-south at approximately 2'-0" on center.



Figure I.C-d158. Northwest oblique of Room 121.



Figure I.C-d159. Metal cage dividing Room 121 in half.

There is some erosion of surface cement parging in the five beams and bays at the south end of the room as well as minor loss of finish material at the north end of the room.

Doorways
An original doorway on the west wall provides direct access to the exterior. The door is the typical corrugated metal type used throughout Battery Huger. It measures 4'-0" wide by 7'-4" tall and is mounted on the exterior side of the jamb.

The door retains its original hardware. It has three, three-knuckle hinges with pintles that are 1¾" in diameter and 2½" tall. There is a 10" long hasp with a 1½" diameter loop. The hinges, pintles, hasp and loop are all made of brass.

A metal gate is mounted on the interior side of the jamb. It measures 3'-2" wide by 6'-0" tall and has eight vertical pickets that extend 4" beyond the top rail. The bottom half of the gate is supported by an X-brace made of ½" by 1" steel.

The gate has three, three-knuckle hinges with pintles and an 8½" long hasp.

Windows
Two original window openings are on the west wall. The openings measure 2'-6" wide by 3'-6" tall. Each is filled with a metal grille made up of five ½" vertical dowels and a ½" by 2" horizontal bar at mid-height.

A corrugated metal shutter is mounted on the exterior of each window opening. Both shutters have two ½" diameter L-shaped pintle hinges.

Finishes
The walls are finished in a beige paint. Remnants of a black painted horizontal band are visible at the base of the walls, as is typical throughout most of the building; the band measures 20" tall. The ceiling is finished in a cream-colored paint. The floor has a brownish coating of unknown material.

Electrical System
A 4'-0" long two-bulb fluorescent light fixture is surface mounted on the ceiling.

A modern light switch in a galvanized metal box with plate is surface mounted on the west wall south of the doorway. Two duplex outlets with metal boxes are surface mounted on the west wall.

Seven electrical panels are on the north wall. Farthest west on the west wall is Panel BB with 100 amps and 110/220 volts. Panel AA has 70 amps and 110/220 volts. Panel CD is three-phase, labeled "dock", with 60 amps and 240 volts. The panel mounted below panel CD is a cutoff for the lift pump. Panel B/E with 100 amps and 120/240 volts controls the staff electric room. Panel AF is three-phase, labeled "east end of Battery Huger", with 200 amps and 240 volts. The main panel is mounted farthest east on the wall. It is three-phase with 200 amps and 240 volts.

A transfer switch for the diesel generator is mounted on the north wall; it has 225 amps and 120/240 volts.

An electric meter is mounted on the metal cage wall.



Figure I.C-d160. Electrical panels on north wall of Room 121.



Figure I.C-d161. Southwest oblique of Room 121.

Fire Detection & Suppression
A ten-pound ABC type fire extinguisher is mounted on the west wall.

Other Features
Three electrical transformers are stored securely on the east side of the metal cage (*Fig. I.C-d23*).

A diesel-powered emergency generator is stored in this room. It is a light commercial generator manufactured by Onan Cummins (*Fig. I.C-d22*).

Room 122
This room at the south end of Battery Huger is accessed from an exterior doorway on the west wall. Its original roughly rectangular plan is intact. A low CMU knee-wall has been added in the northwest corner for the storage of diesel fuel. The room measures approximately 11'-10" by 18'-0" with a floor-to-ceiling height that varies from 7'-5" to 7'-10". Originally known as the Dynamo Room, today the space is used mostly for storage of the diesel fuel tank and other miscellaneous items.

Flooring
The floor is made of cast-in-place concrete with no evidence of steel reinforcement. The floor slopes up approximately 5" to a central ridge that runs north-south. A joint between two concrete pours runs north-south near the doorway.

Cast-in-place drainage channels are set in the floor parallel to the east, west, and south walls. The channels empty into a 6" diameter floor drain outside the doorway near the south jamb. The floor is damp in spite of the drainage channels.



Figure I.C-d162. Northeast oblique of Room 121.

Sporadic crazing of hairline cracks is found throughout the floor surface. A crack that runs east-west across the room has displaced the floor slab ⅛".

Walls
The walls are made of cast-in-place concrete formed in short, approximately 1'-0" tall lifts.

There is sporadic loss of surface cement parging on the north, east, and south walls.

Two 4" thick CMU knee walls were added near the west wall to contain the diesel fuel tank. The walls are 1'-5½" tall and capped with brown brick pavers that measure 3¾" by 7⅞" by 1¼". The walls form a rectangle that measures 5'-1½" by 7'-8". The westernmost wall is 3½" from the west wall of the room.



Figure I.C-d163. CMU knee walls for fuel tank.

Ceiling
The ceiling is cast-in-place concrete formed with corrugated galvanized metal pans; the pans have all but rusted away. The corrugations are ½" deep and are spaced 2½" apart. At the south end of the room the concrete is supported by six steel I-beams that run north-south at approximately 2'-0" on center. A steel girder runs east-west from the north jamb of the doorway and an additional eight steel I-beams run east-west supporting the north end of the ceiling.

There is rust and a good deal of erosion of surface cement parging at the six beams at the north end of the room as well as on the bays between the beams.

Doorways
An original doorway in the west wall provides direct access to the exterior. The door is the typical corrugated metal type used throughout Battery Huger. It measures 4'-0" wide by 7'-6" tall and is mounted on the exterior side of the jamb. Part of the bottom has rusted off near the south jamb. The top north corner of the door has been cut away to allow a conduit into the room.



Figure I.C-d164. Intact early light fixture of Room 122.

The door retains its original hardware. It has three, three-knuckle hinges with pintles that are 1¾" in diameter and 2½" tall; the bottom hinge is broken. There is a 10" long hasp with a 1½" diameter loop. The hinges, pintles, hasp and loop are all made of brass. A sign mounted on the door reads "Danger Flammable Liquids".

Windows
There are no windows in this room.

Finishes
The walls and ceiling are finished in a cream-colored paint applied over white limewash, though rust has leached through the paint in areas of the ceiling. Remnants of a black painted horizontal band are visible at the base of the walls, as is typical throughout most of the building; the band measures 25" tall. The floor is unfinished.

Electrical System
Two early, if not original, metal lamp bases are surface mounted on the ceiling. One remains fully intact with a 7" tall wire cage and its glass jelly jar globe. Both fixtures have early threaded flexible metal cable.

A third early light fixture is still wired for electricity. It has a 6" tall metal cage and ½" rigid PVC conduit.

A light switch in a galvanized metal box with plate is surface mounted on the west wall north of the door jamb. The switch has ½" rigid PVC conduit.

Fire Detection & Suppression
A smoke/heat detector is surface mounted on the ceiling.



Figure I.C-d165. Southwest oblique of Room 123.



Figure I.C-d166. Door at east end of hallway to Room 122.

Room 123

This space is a hallway, open to the exterior, which provides access to Room 122. The hallway measures approximately 5'-11" by 25'-3" with a floor-to-ceiling height of 7'-3".

Flooring

The floor is made of cast-in-place concrete with no evidence of steel reinforcement. A joint between two concrete pours runs north-south near the doorway at the west. The floor slopes down away from the pour joint toward the southeast corner of the space.

A 6" diameter floor drain is located near the doorway at the east end. The floor appears to be quite wet, especially in the morning hours.

Sporadic crazing of hairline cracks is found throughout the floor surface. A ⅛" crack runs approximately 4'-0" long near the south wall.

Walls

The walls are made of cast-in-place concrete formed in short, approximately 1'-0" tall lifts.

There is sporadic loss of surface cement parging on all walls. It sounds as if there are voids created by the separation of materials between the finish and concrete structure. Moisture could be trapped in the voids.

Ceiling

The ceiling is cast-in-place concrete formed with corrugated galvanized metal pans; the pans have all but rusted away. The corrugations are ½" deep and are spaced 2½" apart. The concrete is supported by seven steel I-beams that run north-south at approximately 2'-0" on center.

There is some erosion of surface cement parging on all ceiling bays.

Doorways

This hallway has two doors. The door and hardware to Room 122 are described in the above section.

The west doorway provides access to the men's restroom (Room 124). It is not original. The modern aluminum door has a 2'-0" square louvered vent; the door measures 3'-0" wide by 7'-1" tall by 1¾" thick and has an aluminum frame and threshold.

The door hardware includes a brushed aluminum handle on the exterior, a key operated lock, and a Gyro-Tech automatic handicap door opener and controls made by NABCO Entrances, Inc.

Windows
The two windows at the east wall are described in the Room 121 section above.

Finishes
The walls are finished in a black elastomeric coating manufactured by Acrymax. The ceiling appears to be finished in a black paint distinct from the elastomeric coating of the walls; it is likely a latex paint. The floor is unfinished.

Electrical System
An early, if not original, metal lamp base is surface mounted on the ceiling. It retains its glass jelly jar globe and early ⅞" diameter rigid metal conduit.

Fire Detection & Suppression
A five-pound ABC type fire extinguisher is mounted on the south wall.

Room 124
This room at the southwest corner of Battery Huger is accessed from an exterior doorway on the east side of the room. Originally known as the Guard Room, its original, roughly rectangular, floor plan has been modified in recent years to convert the space into a men's restroom. It measures approximately 28'-11" by 11'-5" with a floor-to-ceiling height of 8'-0".

Flooring
The floor is finished in modern 1" square tiles with a matte black finish.

Walls
The walls are finished in modern subway tiles that measure 5¾" by 11¾". The lower half of the wall tiles have a matte black finish and the upper half of the wall tiles have a white finish. The south wall tiles are installed over a modern CMU wall and the north, east, and west wall tiles are installed over the original concrete walls.

Ceiling
The ceiling is finished in acoustical panels set in a drop ceiling grid. The panels measure 2'-0" by 4'-0".



Figure I.C-d167. Room 124 looking north.

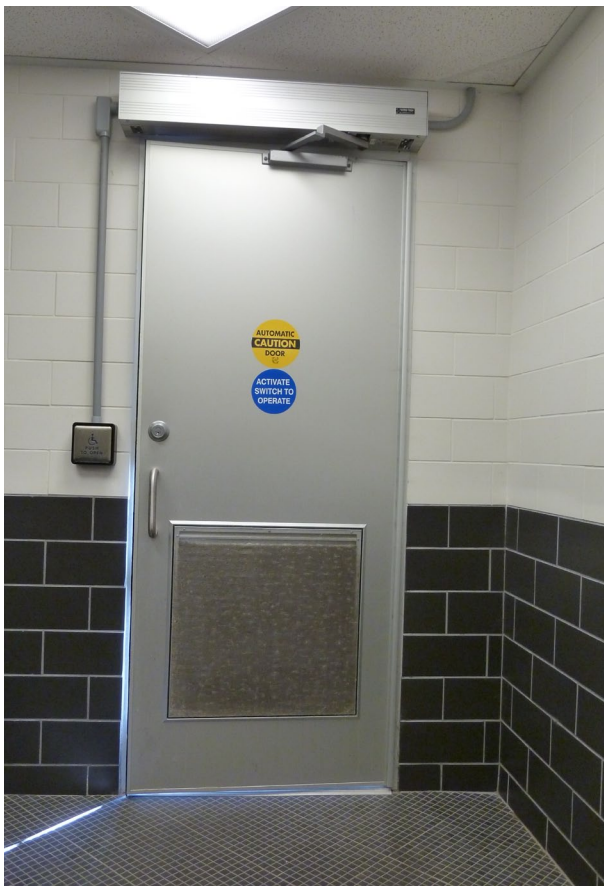


Figure I.C-d168. Door at east wall of Room 124.

Doorways
The east doorway provides access to the men's restroom. The door and hardware are described in the above section Room 123.

Windows
There are no windows in this room.

Finishes
The ceiling is finished in acoustical panels. The walls and floor have a tile finish.

Mechanical System
Two fresh air registers in the ceiling measure 22" by 22".

Electrical System
Seven ceiling light panels are flush-mounted in the drop panel ceiling. Each light panel has a 4'-0" long two-bulb fluorescent light fixture.

A modern duplex outlet in a galvanized metal box is surface mounted on the east wall. It has ¾" rigid PVC conduit.

An electric radiant heater on the floor at the east wall of the room measures approximately 10'-1" long by 5" deep by 7" tall.

Plumbing System
On the south wall are four sinks mounted below the counter top. The sinks have PVC waste pipes and automatic chrome faucets made by Sloan.

Along the west wall are four toilet stalls with wall-mounted automatic flush Toto toilets. The stall dividers are stainless steel; the northernmost stall is handicap accessible.

On the west wall, south of the toilet stalls, are three automatic flush Toto urinals.

Fire Detection & Suppression
A smoke/heat detector is mounted on the ceiling.

A strobe light connected to the fire alarm system is surface mounted on the east wall.

Other Features
Two electric hand dryers on the east wall were manufactured by Bradley.

A baby changing station manufactured by American Specialties, Inc. is surface mounted on the east wall.

Second-Floor Rooms

Room 201
This room is located on the second floor, in the space built to be the north gun emplacement. It was first enclosed by NPS in the 1960s to house a museum. In the 1990s the room was redesigned to its current configuration. The main access to the museum is through the double doors at the south end; an emergency exit is located at the top of the north stairs. The 1960s window openings have been filled in as solid walls. Partial-height display walls subdivide the interior space into galleries. The overall dimensions of the museum measure approximately 70'-4" by 42'-10" with a floor-to-ceiling height of 9'-4".

Flooring
The floor in the lobby of the museum is finished in 9" square tiles with a grey glaze.

The floor throughout the exhibit space is finished in commercial grade, short nap carpeting in varying shades of grey.

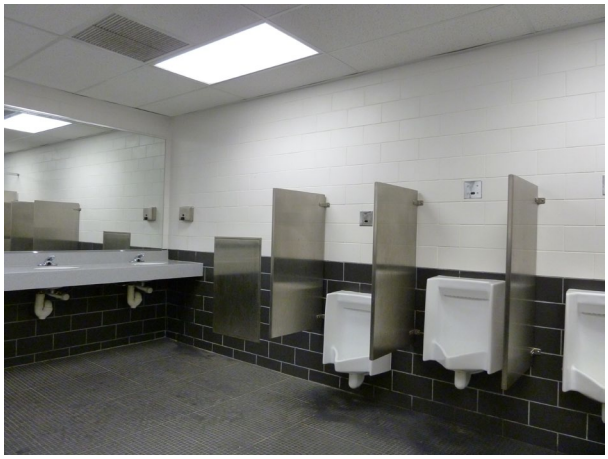


Figure I.C-d169. Southwest oblique of Room 124.



Figure I.C-d170. Northwest oblique of museum (Room 201) from lobby.



Figure I.C-d171. Southeast oblique of museum (Room 201) from lobby.



Figure I.C-d172. Recessed floor at east side of museum (Room 201).

At the east side of the museum is a semi-circular area where the floor drops approximately 7'-0" below the grade of the museum floor. This area corresponds with the location of the north gun emplacement, but today is used to display a large American flag.

Baseboards
Fiberboard baseboards that measure 1'-1½" tall by 1⅜" thick wrap the walls of the museum. The baseboards are painted dark blue and dark green.

Walls
The perimeter walls of the museum are finished in gypsum board, as are the display panels.

Ceiling
The ceiling in the museum is a concrete pan system constructed in the 1960s. The 8"-deep pans are laid to form a grid. Each pan measures 1'-9½" square.



Figure I.C-d173. South entrance to museum (Room 201).

Doorways
Two doorways access the museum. The main museum entrance to the south holds a pair of glazed doors with aluminum frames over an aluminum threshold. Each door measures 2'-6" wide by 6'-11" tall by 1¾" thick and has a fixed horizontal push bar at mid-height. The pair of doors has a key lock made by Best.

The north doorway holds an aluminum emergency exit door over an aluminum threshold. The door measures 3'-0" wide by 6'-11" tall and has an emergency exit push bar at mid-height.

Windows
There are currently no windows in this space; the 1960s window openings were infilled in the 1990s.

Finishes
The walls are finished in a cream-colored paint; the ceiling is finished in black paint. The lobby floor has a tile finish and the rest of the museum space is carpeted.

Mechanical System
An air curtain is mounted above the doors at the south museum entrance to help condition the



Figure I.C-d174. Emergency exit door at north end of museum (Room 201).

museum when the door is opened repeatedly. The unit was manufactured by Dayton.

Six supply air registers are centrally located to supply the museum space with heat and air conditioning. The registers are mounted in the top of a hexagonal display column, one per side. Each measures 6" by 14".

Five return air registers are placed below the ceiling throughout the museum. Four registers measure 12" by 36" each; the fifth measures 18" by 18".

At the east side of the museum, where the floor drops down approximately 7'-0", is a louvered opening in the wall at the lower grade. The opening might serve as a return air register. It measures 3'-0" wide by 7'-2" tall.

Electrical System

The museum is lit with canister lights mounted on ceiling tracks. The bullet-type lights are 7" long and 4" in diameter.

Modern duplex outlets with plastic plates are flush-mounted in the gypsum board walls throughout the museum.

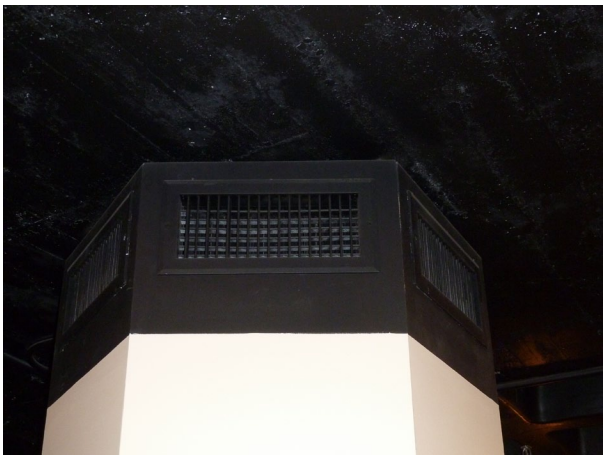


Figure I.C-d175. Supply air registers in the museum (Room 201).



Figure I.C-d176. Museum (Room 201) exhibit space looking south.

The three thermostats were manufactured by Robertshaw and are wall-mounted in different areas of the museum.

Fire Detection & Suppression

Three ceiling-mounted smoke/heat detectors protect the museum.

A strobe light and Simplex fire alarm pull are surface mounted on the east wall just north of the doors.

A two-light emergency exit sign, which is hard-wired with a battery back-up, is surface mounted on the ceiling in front of the doors.

A size II ABC type fire extinguisher is wall-mounted on the north side of the entrance door jamb.

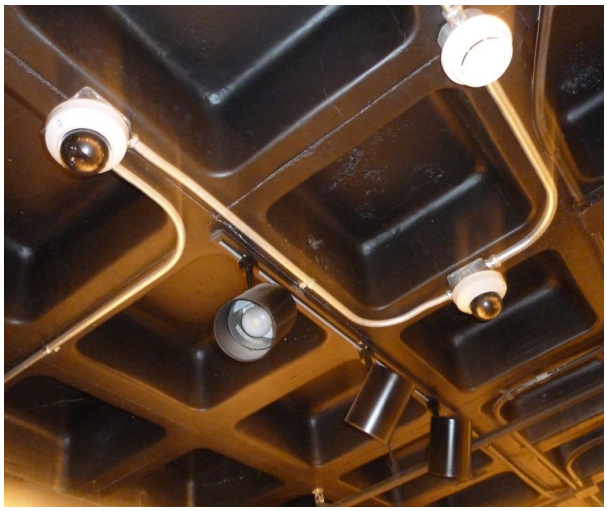


Figure I.C-d177. Figure 177. Canister lights and smoke/heat detector on museum (Room 201) ceiling.



Figure I.C-d178. Bookstore (Room 202) looking north.

Room 202

This room, originally the south shell hoist, is located centrally just north of the south gun emplacement. It is accessed from both the north and south sides. NPS renovated the room in 1991 to house a bookstore for the museum (Room 201). The room measures approximately 12'-6" by 22'-0" with a floor-to-ceiling height of 8'-1".

Flooring

The floor is finished in 8" square tiles with a reddish/brown glaze.

Baseboards

Grey laminate baseboards that measure 4" tall wrap the walls of this space.

Walls

The walls are finished in gypsum board.

Ceiling

The ceiling is not original; it is constructed of cast-in-place concrete. A single beam that measures 12" by 12" runs east-west in the center of the room.

Doorways

There are two doorways to this space, one at the north end and one at the south. Both have glazed doors with aluminum frames. Each door measures 3'-0" wide by 6'-11" tall by 1¾" thick.

Both doors have key locks made by Best, door closers made by Yale, fixed horizontal push bars at mid-height, and 5" aluminum thresholds.



Figure I.C-d179. Southeast oblique of bookstore (Room 202).

Windows

The west and south walls have modern window openings with aluminum-framed windows that are each 2'-0" wide by 1¾" thick. There are two pairs of three-ganged windows on the west elevation, and two-ganged windows on the south elevation next to the glazed door.

Finishes

The walls and ceiling are finished in a black paint. The floor has a tile finish.

Mechanical System

A heating and air conditioning window unit is installed in the south wall below the aluminum window. The unit is manufactured by Comfort Air.



Figure I.C-d180. South entrance to bookstore (Room 202).



Figure I.C-d181. Security camera in bookstore (Room 202).

Electrical System
Like Room 201, the bookstore space is lit with canister lights mounted on ceiling tracks. The bullet-type lights are 7" long and 4" in diameter.

Two modern light switches with plastic plates are flush-mounted on the gypsum board walls, one at each doorway.

Rigid metal conduit is exposed on the walls and ceiling.

Fire Detection & Suppression
A smoke/heat detector is surface mounted on the ceiling.

A strobe light for fire detection is mounted above the north doorway. Two Simplex fire alarm pulls are surface mounted, one next to each doorway.

A five-pound ABC type fire extinguisher is surface mounted on the east wall.

Summary of Conditions & Concerns – Battery Huger

Like Fort Sumter, Battery Huger was built in response to a perceived threat (the Spanish in the western hemisphere) and the location was chosen because of its strategic importance. And like Fort Sumter, it was a state-of-the-art design for a fortification.

Twenty years later, Battery Huger was modified in response to another perceived threat, this time World War I, known at the time as the Great War. Again, the location was chosen for its strategic advantage at the entrance to Charleston Harbor. And, again, the design reflected the military strategy of the period.

Twenty years later, Battery Huger was modified again in response to World War II. The location and design again were based on military considerations.

And again twenty years later, Battery Huger underwent significant modifications under the stewardship of NPS, this time in response to administrative concerns. Its location conveniently provides ancillary space for restrooms, museum, book store, and staffing areas for a tourist destination.

Battery Huger is part of the history of the site. However, the significance of its roles, first militarily and then administratively, are far overshadowed by the prominence of Fort Sumter's place in history and as a principal relic, even shrine, of the Civil War. The large monolithic concrete structure of Battery Huger also differs greatly in design from the rows of brick casemate arches of Fort Sumter. Battery Huger's presence is further emphasized by its placement across the center of Fort Sumter. It is a stark contrast than can be distracting, in a place that engenders solemnity.

Probably due in large part to its role of minor importance since its initial construction, Battery Huger has not been systematically or thoroughly documented through its many epochs of modification and reuse. There is a paucity of information that hindered the preparation of this current report. Government military records and NPS reports were very helpful in understanding the processes of initial construction, its sequence

of modification, and efforts to address its conservation needs since park service acquisition. However, historical documents and photographs are scarce for depicting the human dimension of life at Battery Huger. The general lack of historical photographs and documents addressing the interior spaces make it difficult to compare conditions from different periods and therefore to track the rates of deterioration.

Currently, a visitor will probably note first the streaks of white efflorescence against the black-painted backdrop of the building's exterior surfaces, recently assessed as more cosmetic than problematic (*Letter Report of October 6, 2010: Toy Poole, PhD*). Much less visible but much more a matter of concern are the patterns of cracks in the exterior walls suggesting the possible occurrence of structural issues and the possible impact on Fort Sumter (*Appendix C*).

Inside, the public spaces are generally well maintained. However, in the rooms not open to the public, there is extensive corrosion of ferric-based metal components, including columns, girders and joists. The result is corrosion jacking, damage to concrete resulting from the pressure exerted by expansive corrosion of reinforcement or other ferrous metal embedded in the concrete. These are matters of concern addressed in *Appendix C*. The problems will require significant intervention.

Environmental conditions are less than ideal for preserving a building of this design and materials. A marine environment in a subtropical zone puts great pressures on such a building. But, the greatest single threat is an earthquake.

In summary, the following is a listing of problematic conditions and other concerns:

- Charleston is in Seismic Zone 2. The building is susceptible to damage in the event of an earthquake.
- Global warming combined with the dredging and deepening of Charleston Harbor are expected to increase both harbor traffic and the size of vessels, resulting in increases in the frequency and intensity of wave action.
- The year-round high levels of humidity and salt-laden air promote corrosion in ferrous-based metals which can result in reduction of structural capacity due to material loss and also cause damage to adjacent masonry due to corrosive jacking. The frequent protective actions are time-consuming and not without expense.
- Charleston is susceptible to tropical disturbances. Sand borne in strong winds can be very abrasive, thus damaging some surfaces and especially applied coatings.
- Corrosion of the supporting steel is widespread throughout Battery Huger, occurring at columns, girders, and joists.
- The corrosion is largely inaccessible. Columns are partially embedded in the concrete while the girders and joists have significant portions embedded.
- The corrosion in some instances is causing major damage to the concrete through corrosion jacking. In addition, the steel members in the more exposed locations are suffering loss of section.
- Broken sections of concrete potentially pose a safety hazard to persons nearby.
- The metal connections that secure the modern exterior stair and walkway railing have extensive corrosion. The corrosion is jacking the concrete of the original Battery walls, allowing moisture to enter and subsequently causing further deterioration of the walls.
- The two-way concrete pan joist system of the museum roof has fractured at mid-sections, consistent with structural overload.
- Vertical fractures visible along the west wall suggest settlement of the middle section of the wall relative to the north and south ends. The weight of Battery Huger has the potential to cause settlement damage to the Third System brick masonry pentagon of the original Fort Sumter.
- There is currently no wheelchair access to Battery Huger. The wheelchair lift that connects the west parade ground to the first floor, where the only public restrooms are located, is out of service. The lift that connects the first floor to the second-floor bookstore, museum, and observation level is also out of operation, as is the one that connects the second level to the upper observation level.
- Fractures in the joints of the masonry that encloses the museum window openings are telegraphing through the exterior surface coating, indicating movement in the building material.

Character-Defining Features

The historic nature of significant buildings and structures is defined by their character, which is embodied in aspects of their physical features. Character-defining features can include the shape of a building; its materials, craftsmanship, interior spaces, and features; and the different components of its surroundings.[307]

The following lists identify both interior and exterior character-defining features which contribute to the historic character of Fort Sumter and Battery Huger respectively. The determination of whether each element is a contributing feature is made with reference to the period of significance.

Fort Sumter

- Remnants of the ca. 1860 granite wharf and esplanade.
- Remnants of the ca. 1860 granite apron outside the left face.
- Building debris ca. 1860 off the gorge wall and right face.
- Remnant bases for ca. 1900 pier and lighthouse off left face wall.
- Remnant bases for ca. 1921 quartermaster's wharf off left face wall.
- Remnants of the 1896 wharf off right face wall.
- Remnant pilings of pier off the gorge wall.
- Rip rap stretching from along the left flank clockwise to past the right gorge angle.
- The five-sided brick-and-stone perimeter wall.
- The 1874 sally port.
- All the exposed casemates regardless the level of ruin or deterioration.
- The exposed magazines.
- The accessible cisterns.
- The exposed ruins of the officers' quarters and enlisted men's west barracks.
- The exposed ruins of the stairs.
- The openness of the west section of the parade ground.
- The memorials, including the Confederate Defenders Plaque (1929), Union Garrison Monument (1959), and Major Anderson Flagpole and Base (1959).

Battery Huger

- The monolithic design composition of the poured-in-place concrete battery.
- A black painted exterior.
- The metal stairs leading from west side walkway to south gun emplacement.
- The raised concrete deck of the south gun emplacement and two sets of concrete steps.
- The concrete steps, now blocked, that connected the first floor rooms with the north gun emplacement.
- The early if not original corrugated metal-panel doors and window shutters and associated brass pintles and hasps hardware.
- The cast-in-place rounded face (lintels, jambs, and sills) of original window openings.
- The cast-in-place rounded face (lintels and jambs) of original door openings.
- The early if not original metal rod gates and associated brass pintles and hasps hardware.
- The sloping grass-covered fill to the east of the Battery.
- The observation tower, central observation post, and north observation post.
- The cast-in-place ventilation shafts of the original passive ventilation system.
- The north cistern.
- Remnants of the early electrical system including wire cable (disconnected), surface-mounted metal lamp base, and jelly jar globe.
- The early if not original lift equipment associated with the north magazine.
- The original cast-in-place concrete walls of the original battery, which often include the embossed imprint of the wood form.

307. Lee H. Nelson, FAIA, *Preservation Brief 17: Architectural Character: Identifying the Visual Aspects of Historic Buildings as an Aid to Preserving Their Character* (Washington, D.C.: National Park Service, Technical Preservation, Spring 1988).

- The cast-in-place concrete ceilings of the battery, which often include the embossed imprint of the wood form. The original cast-in-place concrete floors of the original battery, some with channels along perimeter walls to catch and drain condensation.

II.A Ultimate Treatment and Use

The Civil War years (1861-65) constitute Fort Sumter's period of greatest significance. The firing on Fort Sumter on April 12, 1861 by Confederate forces was recognized then and afterwards as the opening battle of the Civil War. Though heavily damaged during the war, the fort's role in the country's coastal defense operations did not end. The site at the entrance to Charleston Harbor remained of considerable strategic importance, and the planning for Fort Sumter in an updated defense system commenced quickly. The incomplete work was stopped in the 1870s. Another revised design, an Endicott-design Battery Huger, was constructed in 1898-99 in the Spanish-American War era. Further redesigns occurred in the first half of the twentieth century as military warfare continued to change. The fort was decommissioned in 1947.

In 1948 Fort Sumter, including Battery Huger, was transferred to the Department of the Interior and designated a National Monument. (Additional structures at nearby locations have since been added.) The stated purpose of the designation is to commemorate "historical events at or near Fort Sumter."

The initial NPS Master Plan, prepared in 1949, envisioned a more clearly identifiable Fort Sumter without Battery Huger or other later construction. Excavations in the 1950s re-exposed buried portions of Fort Sumter's building compartments and west section of the parade ground. Limited funding and the approaching centennial of the Civil War prompted the conversion of Battery Huger to museum, offices, work spaces and public restrooms.

The Park's General Management Plan (GMP) of 1974 again visited the strategy of removing Battery Huger to create a better experience and appreciation of the history of the Civil War at Fort Sumter. Again, there was limited funding. And there were questions of the technical feasibility of removing Battery Huger without damaging Fort Sumter. Subsequent studies in 1992 by the Army Corps of Engineers concluded removal of Battery Huger, though costly, is technically feasible and could be accomplished without damage to Fort Sumter.

Fort Sumter National Monument was administratively listed in the National Register of Historic Places on October 15, 1966, upon enactment by Congress of the National Historic Preservation Act.

Documentation for Fort Sumter was added to the National Register of Historic Places on August 1, 1978. The property includes two separate buildings, one built within the footprint of the other. The earliest is Fort Sumter, a five-sided, Third System, brick and stone fortification initially constructed between 1828 and 1861. The other is Battery Huger, a formed-in-place concrete, Endicott-era gun emplacement constructed in 1898-99 within the exterior walls of Fort Sumter, extending from the earlier fort's gorge wall through the center of the original parade ground. The two buildings are part of the Fort Sumter National Register historic district, which also includes the nearby Fort Moultrie and Battery Jasper.

In 2016, additional National Register documentation was accepted ("Boundary Increase and Additional Documentation"). All historic resources within the boundary of Fort Sumter National Monument, including Fort Sumter, Fort Moultrie, and the U.S. Coast

Guard Complex on the Sullivan's Island, are documented in the updated nomination. The 2016 documentation states that Fort Sumter is eligible for listing for national significance under criterion A in the areas of Military and Social History, and at the national level under Criterion D in the area of Archaeology.

The current GMP (1998) promotes the continued preservation of Fort Sumter while continuing the adaptive use of Battery Huger for operational spaces.

Today, Fort Sumter, the complex of two major buildings and assorted site features, more closely reflects the design created for the centennial celebrations of 1961 than an historic period. Nevertheless, Fort Sumter is a popular destination. It remains synonymous with the Civil War, the scene of its opening, and a symbol of Southern defiance. Sections of the early fort are open to public visitation and interpreted as representative of the Civil War era.

The history of Battery Huger is addressed in exhibits in the museum and in signage at various locations. However, the building's primary role is providing space for visitor support and park administration.

Future uses of Fort Sumter and Battery Huger are expected to be similar to their current functions of support and interpretation for visitors.

The U.S. National Park Service has developed definitions for the four major treatments that may be applied to historic structures: preservation, rehabilitation, restoration, and reconstruction. The four definitions are as follows:

> **Preservation** is defined as the act or process of applying measures necessary to sustain the existing form, integrity, and materials of an historic property. Work, including preliminary measures to protect and stabilize the property, generally focuses upon the ongoing maintenance and repair of historic materials and features rather than extensive replacement and new construction. New exterior additions are not within the scope of this treatment; however, the limited and sensitive upgrading of mechanical, electrical, and plumbing systems and other code-required work to make properties functional is appropriate within a preservation project.
>
> **Rehabilitation** is defined as the act or process of making possible a compatible use for a property through repair, alterations, and additions while preserving those portions or features which convey its historical, cultural, or architectural values.
>
> **Restoration** is defined as the act or process of accurately depicting the form, features, and character of a property as it appeared at a particular period of time by means of the removal of features from other periods in its history and reconstruction of missing features from the restoration period. The limited and sensitive upgrading of mechanical, electrical, and plumbing systems and other code-required work to make properties functional is appropriate within a restoration project.
>
> **Reconstruction** is defined as the act or process of depicting, by means of new construction, the form, features, and detailing of a non-surviving site, landscape, building, structure, or object for the purpose of replicating its appearance at a specific period of time and in its historic location.[308]

A complicating factor in considering appropriate treatments for Fort Sumter and Battery Huger is the long-reported and still unresolved question of the degree of negative impact of Battery Huger on Fort Sumter. As early as 1931 it was reported that Battery Huger's "increased weight had evidently caused the island to settle to such a degree that the base rings were seriously out of level."[309] Clark and Wylie in their *Historic Structure Assessment Report (HSAR)* note that the article "clearly demonstrates that the fort was, and is sinking, both equally and differentially settling. This leveling of the base rings was also noted in the Records of the War Department, Report of Conditions at Fort Sumter."[310]

308. The Secretary of the Interior's Standards for the Treatment of Historic Properties.
309. Maj. R. T. Gibson, "Leveling Base Rings at Fort Sumter," Coast Artillery Journal, Vol. 74, Sept-Oct, 1931, p 457.
310. Clark & Wylie, *HSAR,* p. III.01-19, footnote 31.

The engineering assessment conducted as part of this report made similar observations. Further analysis is critical to understanding the causes of the reported conditions. Completing these actions is a necessary step in determining proper treatments and repairs for this National Monument. These essential steps are outlined in Part IID Recommendations for Treatment. The ultimate treatment of Fort Sumter and Battery Huger should be based upon the findings of these structural assessments.

***Preservation*, which involves sustaining the building in its existing form, is most appropriate for Fort Sumter, given its significance. *Preservation* is also most appropriate for Battery Huger, given the park's operational need for ancillary service space and Battery Huger's rehabilitated 1960s-era form for that purpose.**

This approach would have the following advantages:

- The Recommended Treatment provides public benefit by continuing to retain and preserve Fort Sumter, a building associated with one of the pivotal events in the history of the country.
- The Recommended Treatment also provides public benefit by continuing to retain and preserve Battery Huger, an Endicott-design fortification which also has historical significance.
- The Recommend Treatment educates the public by continuing to present multiple eras of historical importance as represented by Fort Sumter and Battery Huger.
- The Recommend Treatment continues to enhance the public's experience by providing a handicapped-accessible on-site museum, bookshop, and public restroom.
- The Recommended Treatment continues to facilitate operational efficiency by using the on-site staff offices, workrooms, restrooms and other support facilities that already exist.
- The Recommended Treatment is relatively cost effective among treatment options.

This approach would have the following disadvantages:

- The Recommended Treatment does not address potential visitor confusion of simultaneously experiencing sections of buildings representing multiple historical periods, but which could be mitigated by better interpretation.
- The Recommended Treatment requires significant expenditure to correct the deterioration of structural elements of Battery Huger.
- The Recommended Treatment assumes that Battery Huger is not causing the man-made island to sink, or creating conditions threatening the structural integrity of Fort Sumter or itself.
- The Recommended Treatment does not alleviate the frequent breakdowns of wheelchair lifts caused by exposure to harsh maritime climate.

II.B Requirements for Treatment and Use

A number of laws, regulations, NPS policy, and functional requirements circumscribe treatment and use of the historic structures in our National Parks. In addition to protecting the cultural resource, these requirements also address issues of human safety, fire protection, energy conservation, abatement of hazardous materials, and handicapped accessibility. Some of these requirements may contradict or be at cross purposes with another if they are rigidly interpreted. Any treatment must be carefully considered to ensure that the historic fabric of the structure be preserved.

Laws and Regulations

National Historic Preservation Act

The National Historic Preservation Act of 1966 as amended (NHPA) mandates Federal protection of significant cultural resources, including buildings, landscapes, and archaeological sites. In implementing the act, a number of laws and authorities have been established that are binding on the NPS.

Section 106: A routine step in the park's planning process for the treatment of cultural resources is compliance with Section 106 of NHPA. This requires that prior to any undertaking involving National Register or National Register-eligible historic properties, Federal agencies "take into account the effect" of the undertaking on the property and give the Advisory Council on Historic Preservation "a reasonable opportunity to comment with regard to such undertaking." To satisfy the requirements of Section 106, regulations have been published (36 CFR Part 800, "Protection of Historic Properties") that require, among other things, consultation with local governments, State Historic Preservation Officers, and Indian tribal representatives. The entire point of Section 106 review is to ensure that interested parties have a voice in the preservation of our nation's cultural heritage.

To expedite the review process, a programmatic agreement between the Advisory Council for Historic Preservation, the National Council of State Historic Preservation Officers, and the NPS allows for a streamlined Section 106 review process. With certain conditions, routine repairs and maintenance that do not alter the appearance of the historic structure or involve widespread or total replacement of historic features or materials are not subject to review outside the NPS.

The Secretary's Standards: The Secretary of the Interior's Standards for the Treatment of Historic Properties are the Secretary's best advice to everyone on how to protect a wide range of historic properties. They provide a philosophy to underpin historic preservation that is widely understood and almost universally accepted in the United States. By separate regulation, the Secretary has required the application of the Standards in certain programs that the Secretary administers through the National Park Service. They have been widely adopted by state and local governments and by the private sector, and are intended to be applied to a wide variety of resource types, including buildings, sites, structures, objects, and districts. The Standards, revised in 1992, are codified as 36 CFR Part 68 in the 12 July 1995 Federal Register (Vol. 60, No. 133). The revision replaced the 1978 and 1983 versions of 36 CFR 68 entitled *The Secretary of the Interior's Standards for Historic Preservation Projects.*

The Standards are neither technical nor prescriptive, but are intended to promote responsible preservation practices that help protect our Nation's irreplaceable cultural resources.

For example, they cannot, in and of themselves, be used to make essential decisions about which features of the historic building should be saved and which can be changed. But once a treatment is selected, the Standards provide philosophical consistency to the work.

The Standards describe four broad approaches to the treatment and use of historic properties. These are, in hierarchical order:

- *Preservation*, which places a high premium on the retention of all historic fabric through conservation, maintenance and repair. It reflects a building's continuum over time, through successive occupancies, and the respectful changes and alterations that are made.

- *Rehabilitation,* which emphasizes the retention and repair of historic materials, but provides more latitude for replacement because it is assumed the property is more deteriorated prior to work. (Both Preservation and Rehabilitation standards focus attention on the preservation of those materials, features, finishes, spaces, and spatial relationships that, together, give a property its historic character.

- *Restoration,* which focuses on the retention of materials from the most significant time in a property's history, while permitting the removal of materials from other periods.

- *Reconstruction*, which establishes limited opportunities to re-create a non-surviving site, landscape, building, structure, or object in all new materials.

- Regardless of treatment approach, the Standards put a high priority on preservation of existing historic materials and not just the architectural form and style. Replacement of a column, for instance, even when replacement is "in kind," diminishes the authenticity of the building, since the physical changes resulting from the passage of time is fundamental to the authenticity of an historic structure. The Standards also require that any alterations, additions, or other modifications be reversible, i.e., be designed and constructed in such a way that they can be removed or reversed in the future without the loss of existing historic materials, features, or character.

Americans With Disabilities Act of 1990

The Americans With Disabilities Act of 1990 (ADA) establishes comprehensive civil rights protection for disabled Americans, both in employment and in their right to free, unaided access to public buildings. While people with restricted mobility have most frequently benefited from ADA, protection also extends to those with other disabilities, including impaired vision or hearing.

Requirements for full compliance with ADA regulations are extensive and easiest to apply to new construction. Full compliance for historic buildings is more difficult and sometimes would require significant alterations to the historic character of the property. Where that is the case, ADA authorizes a process for arriving at alternatives to full compliance that can preserve historic character while maximizing a disabled visitor's access to the historic building.

International Existing Building Code (IEBC), 2012

Building codes are generally applicable to all buildings whether they are historic or not. As a matter of policy, the NPS is guided by the International Building Code, but is self-regulating in terms of enacting and enforcing building code standards. Therefore, Fort Sumter National Monument is not legally subject to local or state building code requirements.

When undertaking repairs to buildings or structures, the National Park Service endeavors to have the work comply with model building code standards. Threats to public health and safety should always be eliminated, but alternatives to full code compliance are always sought where compliance would needlessly compromise the integrity of the historic building.

At this time, the 2012 IBC with Appendices (replacing Chapter 34 with the IEBC) is the model building code used by the NPS and is referenced by the NPS Denver Service Center for design and

construction. The NPS Denver Service Center also references the 2012 IEBC, with Appendices and Resource A.

With historic structures, attempts to achieve strict conformance with model building code standards that are intended for new buildings can lead to the destruction of historic fabric. For that reason, alternative compliance procedures have been developed, including Chapter 12 of the IEBC relating to historic buildings, and should be referenced in determining code compliance.

Also, the 2012 IEBC includes the following statement in paragraph 408.1, Historic Buildings:

> *The provisions of this code relating to the construction, repair, alteration, addition, restoration and movement of structures, and change of occupancy shall not be mandatory for historic buildings where such buildings are judged by the building official to not constitute a distinct life safety hazard.*

NFPA Code 914

The National Fire Protection Association (NFPA) has promulgated codes for historic buildings, most notably NFPA 909, "Code for the Protection of Cultural Resources Properties - Museums, Libraries, and Places of Worship," and NFPA 914, "Code for Fire Protection of Historic Structures."

NPS Policy

General Management Plan

The current GMP adopted in 1998 specifies that Fort Sumter is to be "preserved as a stabilized ruins." Further, Battery Huger, which has been remodeled to provide support for visitors and administrative areas for the site, including a museum, bookstore, handicapped-accessible public restrooms, observation deck, staff office, work room, restroom, storage areas, and other ancillary spaces.

NPS General Management Policies

Finally, the NPS General Management Policies (2006) guide overall management of historic properties, especially Chapter 5 "Cultural Resource Management." Based upon the authority of some nineteen Acts of Congress and many more Executive Orders and regulations, these policies require planning to ensure that management processes for making decisions and setting priorities integrate information about cultural resources, and provide for consultation and collaboration with outside entities. These policies also support good stewardship to ensure that cultural resources are preserved and protected, receive appropriate treatments (including maintenance), and are made available for public understanding and enjoyment.

Section 5.3.5, "Treatment of Cultural Resources," provides specific directives, including a directive that "the preservation of cultural resources in their existing states will always receive first consideration." The section also states that treatments entailing greater intervention will not proceed without the consideration of interpretive alternatives. The appearance and condition of resources before treatment, and changes made during treatment, will be documented. Such documentation will be shared with any appropriate state or tribal historic preservation office or certified local government, and added to the park museum cataloging system. Pending treatment decisions reached through the planning process, all resources will be protected and preserved in their existing states.

Executive Order 13514

Issued in 2009, this order directs all federal agencies to implement sustainable design and construction practices. For Fort Sumter, the relevant guidelines in this executive order require:

> . . . managing existing building systems to reduce the consumption of energy, water, and materials, and identifying alternatives to renovation that reduce existing assets' deferred maintenance costs . . . [and] ensuring that rehabilitation of federally owned historic buildings utilizes best practices and technologies in retrofitting to promote long term viability of the buildings.[311]

311. "Executive Order 13514 of October 5, 2009: Federal Leadership in Environmental, Energy, and Economic Performance" (Washington, D.C.: Federal Register 74, no. 194, October 8,2009).

II.C Alternatives for Treatment

One of the objectives of an HSR is to explore other options for treatment and use that are consistent with the four treatments defined by the Secretary of Interior's Standards: Preservation, Rehabilitation, Restoration, and Reconstruction. The charge is to give full consideration to a wide variety of physical and philosophical possibilities without the constraints of fiscal limitations and administrative policy.

Therefore, in addition to the Recommended Treatment discussed in Section II.B above, two alternative treatments are discussed in this section. Both assume that the recommended monitoring/ evaluation system and advisory board are in place.

Alternative #1: Remove Battery Huger, excavate the fill to its east, make repairs to stabilize the additional uncovered ruins of Fort Sumter, and preserve the capped walls of Fort Sumter essentially as found. This option is also similar to the vision of the initial NPS Management Plan of 1949.

The sinking of the site and its deleterious impact on the buildings has been noted since the 1930s and reconfirmed in engineering analysis conducted as part of this report. The sinking has been attributed at least in part to the combined weight of Battery Huger and the rubble and soil fill to its east. Further analysis critical to understanding the causes of the reported conditions are outlined in II.D Recommendations for Treatment. Depending on the results of further analysis, removal of Battery Huger and the rubble and soil fill to its east are not implausible recommended options.

This approach would have the following advantages:

- Enhances public benefit by exposing and preserving in their current configuration additional portions of Fort Sumter, a building associated with one of the pivotal events in the history of the country.
- Enhances public experience by addressing visitor confusion of simultaneously experiencing parts of multiple historical periods, and by presenting a more cohesive experience of Fort Sumter.
- Enhances public education by directing the public to more complete Endicott fortifications, such as nearby Fort Moultrie.
- Potentially eliminates the need for wheelchair lifts and the cost of frequent replacement.
- Eliminates the cost of continued maintenance and repair of Battery Huger which is sizable and increasing.
- Addresses the presence of Battery Huger and the fill to its east, which some believe are causing significant physical damage to Fort Sumter. The level of that threat should be examined. Such an analysis is among the recommendations in the last section of this report.

This approach would have the following disadvantages:

- Eliminates the public opportunity to simultaneously experience multiple eras of historical development as represented by Battery Huger.
- Eliminates upper level reviewing area, unless a new site feature is added.
- Diminishes the public's experience by eliminating on-site handicapped-accessible museum and bookstore.

- Diminishes the public's convenience of on-site handicapped-accessible public restrooms by relying on tour boat facilities.

- Diminishes facilities for park operation by eliminating on-site staff offices, workrooms, restrooms and other support facilities.

- Does not address the truncated top sections of the walls that would remain.

- Removal of Battery Huger, excavation of the fill to its east and stabilization of newly exposed ruins will be expensive.

- The removal of Battery Huger would mean the removal of remaining historic building fabric.

- Removal of Battery Huger would require expanded interpretive program for elements of Fort Sumter no longer present, including Battery Huger, the series of lighthouses, barracks, and Coast Guard buildings formerly on fort grounds.

Alternative #2: Remove Battery Huger, excavate the fill to its east, reconstruct portions of Fort Sumter in a ruinous state with sections of the reconstructed areas adapted for restrooms, museum, bookstore, staff offices, lecture rooms, exhibit rooms, and other ancillary spaces.

As in alternative #1, further analysis may attribute recorded damages of the buildings and site to the presence of Battery Huger and the rubble and soil fill to its east. Removal of Battery Huger and the fill may be an option, if not the only option for remediation.

This approach would have the following advantages:

- Enhances public benefit by exposing additional portions of Fort Sumter, a building associated with one of the pivotal events in the history of the country..

- Enhances public benefit by partially reconstructing portions of missing features of Fort Sumter, to read more clearly as a Civil War-era fort ruins, similar to the reconstruction of missing portions of the newly exposed Officers' Quarters after excavations in the 1950s.

- Enhances the public experience by addressing visitor confusion of simultaneously experiencing parts of multiple historical periods, and by reconstructing portions of the fort in a ruinous state to present a more cohesive experience of Fort Sumter at its time of greatest significance, the Civil War.

- Enhances public education by directing the public to Endicott fortifications with greater historic integrity, such as nearby Fort Moultrie.

- Enhances the public's experience by placing on-site handicapped-accessible museum and bookstore in potentially better designed and more accommodating locations.

- Enhances the public's convenience of on-site handicapped-accessible public restrooms in potentially better designed and more accommodating locations.
- Enhances park operation by placing on-site staff offices, workrooms, restrooms and other support facilities in potentially better designed and more accommodating locations.

- Eliminates wheelchair lifts exposed to the elements, and the cost of frequent replacement. Could potentially include a wheelchair lift within a reconstructed section which includes an upper level viewing area.

- Eliminates the cost of continued maintenance and repair of Battery Huger.

- Addresses the presence of Battery Huger and the fill to its east which some suspect are causing physical damage to Fort Sumter. The level of that threat should be examined. Such an analysis is among the recommendations in the last section of this report.

- Enhances public benefit if the repair and reconstruction process is conducted

in multiple phases, whereby NPS demonstrates to the public best practice techniques of preservation, interpretation, and adaptive use.

This approach would have the following disadvantages:

- Eliminates the public opportunity to simultaneously experience multiple eras of historical development as represented by Battery Huger.

- Removal of Battery Huger, excavation of the fill to its east, stabilization of newly exposed ruins, and the design and partial reconstruction of exposed sections of Fort Sumter adapted for new administrative functions, will be the most expensive of the examined treatment approaches.

- The removal of Battery Huger would mean the removal of remaining historic building fabric.

- Removal of Battery Huger would require expanded interpretive program for elements of Fort Sumter no longer present, including Battery Huger, the series of lighthouses, barracks, and Coast Guard buildings formerly on fort grounds.

II.D Recommendations for Treatment

Summary of Findings

The external threats to Fort Sumter and Battery Huger are diverse. Some are potentially quite serious. Several are increasing in severity. The capacity of each building to successfully respond to these threats is largely dependent upon the building's design and its physical condition. Regular maintenance is essential to keep the buildings in their optimum condition. The threats, building designs, and physical conditions are discussed in Section I.C and Appendix C.

Internal park operations are critical to maximizing each building's success in meeting these threats. During the preparation of this HSR a number of programmatic shortcomings were noted:

- The site lacks a prioritized maintenance and repair program. As a result, interventions do not always address the most critical conditions, such as safety concerns or structural issues. In addition, many of the treatments do not address the problems they are seeking to correct.

- Conservation treatments are implemented without adequate testing or understanding of their long-term impact on the historic materials (i.e. application of water repellent coatings on the cast concrete coping stones without cleaning and without a full testing protocol being performed in advance).

- Large-scale conservation and documentation efforts are initiated without an understanding of how they will fit into the overall preservation philosophy for the site, which is still yet to be established.

- Laboratory analyses performed in 2010 and included as appendices in a draft 2011 Fort Sumter Historic Structure Report, unrelated to this 2015 HSR, do not conform to professional standards and the results of these analyses are often misinterpreted. The analyses are also not designed to target specific questions, which affects the overall usefulness of the data generated. In addition, conservation treatments based on the results of these analyses were developed prematurely. See Appendix F for a full technical review of these prior material analyses.

- In several locations, problems with site drainage and water collection were observed. These ranged from leaking scuppers and downspouts to frequent tide-related flooding at the sallyport entrance, due to clogged or inadequately sized drains. Properly conducting the water away from the historic masonry should be a priority and the focus of routine maintenance.

- The Left Face Casemates and archaeological ruins in this area are particularly vulnerable to environmental conditions, as they lack cover or roof protection.

- There is no comprehensive understanding of the principal causes of exterior brick deterioration, nor of the rate of deterioration (including surface loss, full loss, and mortar deterioration). This level of understanding would require a system of long-term, routine monitoring. It would also require a carefully designed testing program to assess the causes of brick damage, examining factors such as wind erosion, wet/dry cycles, salts and wave/riprap impact.

- There are many visibly incompatible repairs and interventions resulting from the lack of a comprehensive preservation philosophy to guide such decisions.

- The physical fabric of Fort Sumter is not "legible." This lack of legibility obscures the ability of the visitor to fully understand the site, its significance and its story. Although making the site easier to understand for the visitor is largely an issue of interpretation, there are also implications of this approach on the fort's physical fabric. For instance, one approach to making the site convey its history and physical evolution more effectively might be the partial reconstruction of portions of the fort, in either a literal or referential way. If such an approach is considered, its impact on the existing historic fabric is paramount and should be carefully evaluated.

Recommendations

All recommendations were developed in accordance with The Secretary of the Interior's Standards for Preservation (37 CFR 68) and Guidelines for Implementation.

The Secretary of Interior's Standards for Preservation

1. A property will be used as it was historically, or be given a new use that maximizes the retention of distinctive materials, features, spaces, and spatial relationships. Where a treatment and use have not been identified, a property will be protected and, if necessary, stabilized until additional work may be undertaken.

2. The historic character of a property will be retained and preserved. The replacement of intact or repairable historic materials or alteration of features, spaces, and spatial relationships that characterize a property will be avoided.

3. Each property will be recognized as a physical record of its time, place, and use. Work needed to stabilize, consolidate, and conserve existing historic materials and features will be physically and visually compatible, identifiable upon close inspection, and properly documented for future research.

4. Changes to a property that have acquired historic significance in their own right will be retained and preserved.

5. Distinctive materials, features, finishes, and construction techniques or examples of craftsmanship that characterize a property will be preserved.

6. The existing condition of historic features will be evaluated to determine the appropriate level of intervention needed. Where the severity of deterioration requires repair or limited replacement of a distinctive feature, the new material will match the old in composition, design, color, and texture.

7. Chemical or physical treatments, if appropriate, will be undertaken using the gentlest means possible. Treatments that cause damage to historic materials will not be used.

8. Archeological resources will be protected and preserved in place. If such resources must be disturbed, mitigation measures will be undertaken.

Guidelines for Implementing Preservation

- Identify potentially sensitive archaeological areas prior to undertaking any work involving subsurface disturbance.

- Undertake all work in compliance with the *Secretary of the Interior's Standards for Preservation.*

- Retain the character of the historic buildings and environs by protecting significant building and site features.

- Ensure that proposed new elements or construction are compatible with the historic character, including both aesthetic and performance characteristics, of the buildings and the site.

- Protect adjacent natural resources during construction activities.

- Document through detailed as-built drawings, photographs, and written narrative all changes and treatments to the building and its immediate site. Maintain records of treatments and preserve documentation according to professional archival standards. Maintain a copy of records in park and regional NPS archives.

- Retain, to the greatest extent feasible, features and materials at both the exterior and interior of the buildings that survive from the period of significance.

- Incorporate sustainable design principles in all future projects that respect the preservation principles listed above.

Recommended Actions by Priority

First Priority

Park programs, coordinated studies and tests essential to the preservation of historic building fabric, and repairs related to structural stabilization, safety issues, and universal access.

- Establish a permanent Advisory Panel and develop a peer review system that allows architects, architectural historians, engineers, conservators and other practicing professionals in the field of historic preservation to review all significant intervention efforts before implementation. This review should be performed for all large-scale efforts (e.g. documentation efforts, comprehensive repointing, application of water repellents, structural repairs, etc.). The purpose of this panel is to ensure that interventions are fully vetted, unadvisable approaches are avoided, and that a "best practices" approach is being taken for each endeavor.

- Develop, with the participation of the Advisory Panel, an overall preservation philosophy for the site and individual features. This philosophy, which will affect how the site is ultimately preserved and presented to the public, will guide all repairs and physical interventions.

- Once a preservation philosophy is in place and coupled with an interpretive plan, develop a maintenance and repair plan. This plan should include:
    - Baseline documentation for every space in the fort. This documentation could be based on the ortho-rectified photography already completed by Peter Aaslestad, supplemented as necessary to create complete documentation of the site.

    - A detailed conditions assessment using the baseline documentation, documenting both integrity of material as well as the most threatening conditions. This assessment should use consistent and clear "graphic language," i.e. patterns and colors for specific and relevant conditions.

    - The conditions assessment should be overlaid with significant information related to the site's history, significance and interpretation.

    - Using this information, each element of the site should be prioritized into different tiers of significance. This prioritization could be used to guide the phasing of treatments and repairs.

- Develop a targeted testing program to answer specific questions about the characteristics and performance of both historic and repair materials, as well as various types of deterioration. Such material analysis should be performed with a focused approach involving the use of select tests to answer specific questions. Any testing should comply with laboratory standards and best practices. Additional information on a recommended testing program is provided in the technical document review in Appendix F.

- Conduct condition assessments of all historic building fabric on a cyclical basis (every 5-10 years), and document for future reference any current or ongoing interventions being made to the historic fabric.

- Check regularly all bricks that are held in place only by tension or shear stress in the mortar for tightness of bond to the substrate. Photograph and remove all loose brick, label as to place of origin, and store in reserved spaces on site for use in future repair work.

- Monitor all cracks through Fort Sumter's cornice or around single or small groups of bricks for loosening.
- Block pedestrian access over all cisterns with fractured granite tops until appropriate strengthening has been accomplished.

- Minimize the wet/dry cycles that are exacerbating the deterioration of the brick masonry in the Left Face Casemates. This section of the fort has no roof protection and is exposed to regular wet/dry cycles each day (it is exposed to strong sunlight throughout much of the day on its interior face and significant wave action and wetting on the exterior face). Although a specific recommendation for correcting this condition is not being proposed, one possible solution might be to install a conceptual reconstruction of the casemate vault that would serve to shield the surviving historic masonry from extreme weather and temperature, while aiding in the interpretation and legibility of this section of the fort.

- Establish a long-term, routine monitoring system to evaluate the rate of brick damage. In addition, a comprehensive testing program should be designed to determine the primary causes of the exterior bricks' deterioration. Factors to be considered include wind, salt, inherent compositional flaws, incompatible mortar, wet/dry cycles and wave/riprap impact.

- Conduct regular maintenance of the site's drainage and water collection systems.

- Conduct a safety assessment of both structures and of the site features, with emphasis on achieving a balance between the preservation of character-defining features and improvement visitor and NPS personnel safety.

- Develop and implement a proactive program of regularly-scheduled safety briefings for park personnel by a designated park safety officer. Also consider providing safety briefings for park visitors.

- Conduct the following surveys and monitoring to assist in developing recommendations regarding both the structural movement of the salient, the two shoulder angles and the two gorge angles, and to better understand the possible damage caused by Battery Huger and the earth fill east of it:
    - Repeat the deformation surveys conducted in 2011 and 2012, reported by Peter Messier, PLS, PE in 2013.

    - Repeat the 2006 settlement survey conducted by Michael Shulse, PLS.

    - Trace the elevation of a single mortar joint completely around the fort.

    - Install a network of very accurate (5 to 10 micrometer) electronic crack monitors, backed up by stainless steel or bronze cross-crack measurement points around Fort Sumter, with the monitoring system able to record crack widths to the Web on an hourly basis with the intention that the data be evaluated annually. Such monitors would provide information on structural movement of areas of distress in the roof of the museum, in Battery Huger and in the Third System brick masonry pentagon. Most importantly, it would, if installed in appropriate locations, measure movements created from a number of causes, including specifically: foundation settlement, unresisted thrust in the vaults, rising sea level and increased wave action from larger ships.

- Take the following actions to better understand the structural behavior of Fort Sumter:

    - Evaluate cracks and other signs of structural distress and monitor

regularly (see recommendations on installation of monitors above) for indications of new structural distress.

- Develop three planar structural models: a section perpendicular to the rampart, a section parallel to the scarp wall, and a third section through the filled area along the right flank.
- Develop selected sections through the scarp that will aid in interpreting the structural movement of masonry walls.
- Generate a three-dimensional structural model under the direction of Registered Professional Engineers who are legally able to do such work and have both the qualifications and the experience to make recommendations on the fort. We recommend that the model be focused on the right face, where the best and most applicable results can likely be attained. In order to sufficiently show the acting forces, this model should include the salient, half of the left face, right face, and half of the right flank. The physical properties modeled and the displacements imposed in any model should be more consistent with the reality of the measured movements and observed behavior of the fort than the current model reflects.

Each of the recommended actions discussed immediately above would contribute valuable information about Fort Sumter's structural behavior and integrity. Completing these actions is a necessary step in determining proper treatments and repairs for this National Monument.

- Assess the feasibility of options to repair the structural steel of Battery Huger. Estimate the cost of each option. While concrete around corroding embedded steel can be removed, the steel treated with rust inhibitive coatings or replaced, and the concrete repoured, in reality all of the embedded steel will eventually require treatment or replacement.
- Considering the distinct possibility that the Endicott battery and the associated earth fill is causing significant damage to the east flank of the pentagon, we recommend that continued maintenance of the Endicott battery be questioned and that its removal be, at the least, studied and considered. Even if the battery itself is not removed, the removal of the earth fill east of the battery should be carefully studied and, if adverse effects are found, acted upon. Removal of the fill to the east may also provide significant opportunity to uncover, study, and intrepret the historic fabric of the fort below.
- Anticipate early failures of wheelchair lifts, as is typical of exposed mechanical equipment in salt-laden marine environments, and schedule replacements accordingly to prevent gaps in service.

Second Priority

Work related to waterproofing or making the structures weathertight to prevent water infiltration and subsequent deterioration of building fabric, and to address conditions that may lead to continued deterioration and subsequent loss of historic fabric.

- Once an appropriate replacement mortar and brick has been identified as part of the maintenance and repair plan mentioned in the First Priority category above, repoint severely eroded mortar joints on the scarp and replace severely deteriorated or missing bricks.
- Move permanently away from the exterior walls those granite blocks along the revetment that are in the immediate vicinity. Retain the stones as part of the revetment but well away from the Fort Sumter walls.
- Conduct further studies, including hydrological studies, before deciding whether to remove the revetment.
- Conduct archaeological investigations (including underwater archaeology) along the esplanade of the exterior Gorge Wall where much early building material is apparently deposited.

- Conduct archaeological investigations in the infilled portion of the right flank to identify and evaluate potential contents. This can include non-invasive documentation, such as ground-penetrating radar and other imaging, if removal of fill is impractical.

Third Priority

Modifications necessary to allow continued use of the buildings, such as work required to meet code, for egress, to repair or restore interior finishes, to enhance interpretation, to upgrade building systems, or to address mitigation of hazardous materials such as lead-based paint.

- Conduct paint and finish analyses for the exterior and interior of Battery Huger. In better understanding the building's condition, the nature and prevalence of coatings would be invaluable. The information would also be helpful to developing an interpretive plan.

- Consider interpreting a group of rooms in Battery Huger to illustrate the fortification's role in the coastal defense of Charleston and the larger national defense plan. Coating systems and color schemes could be incorporated into the interpretation, both on the interior and exterior.

Other Considerations

Cyclical maintenance

Tasks such as inspection, painting of exterior wood and metal elements, repair or restoration of finishes, pointing of mortar joints, and other ongoing maintenance tasks, must be continually implemented to avoid damage to the historic building fabric and to reduce the need for large-scale repair projects in the future.

All work performed to the buildings and site features should be documented through notes, photographs, and measured drawings and/or sketches, or with as-built annotations to construction documents at project completion.

These records should be placed in Park and regional NPS archives as part of the permanent record of Fort Sumter National Monument, and to provide information for future repairs and ongoing maintenance. In addition, these records will facilitate the recognition of future observers as to which materials are historic.

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