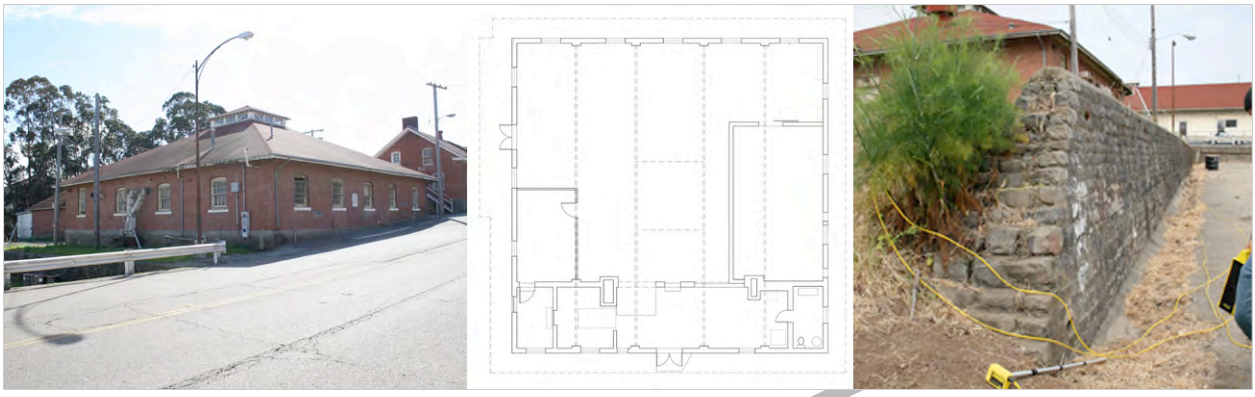

Presidio of San Francisco
BUILDING 228

Historic Structure Report

Prepared for
The San Francisco County Transportation Authority and
The Federal Highway Administration

Prepared by
Garavaglia Architecture, Inc
June 2010

Innovating Tradition

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EXECUTIVE SUMMARY

Building 228 was historically used as a military bakery for the Main Post. Over the course of Army occupation, it was converted into a dry cleaner then a warehouse. Most recently it has served as a maintenance shop and storage facility. At the time of its construction in 1909 it was considered a state-of-the-art military baking facility and was part of a general building campaign that transformed the Presidio from a military outpost, to a permanent, highly strategic command post. Soon after the bakery's construction, it was used to augment coursework for the Army School of Cooks and Bakers, one of only four such institutions in the country at the time.

The building's utilitarian purpose and poor siting have resulting in a history of settlement issues and poor repairs. Only three months after construction ceased, cracks were recorded in the west wall. Today, this wall exhibits a series of major and minor cracks that have been either improperly repaired or left unaddressed. Exploratory excavations near the worst of the cracking indicated settlement and poor soil compaction is the likely cause of damage. Other areas of concern are the many through-wall penetrations on the north wall that lack waterproofing. In many cases, these holes are left open and exposed to the elements, allowing weather and animals to freely enter and exit the building.

A large amount of unused dry-cleaning equipment was being stored in the building. This material was cataloged by ICF International in August 2009 and then removed by the Presidio Trust into storage elsewhere within the Presidio. This allowed for a more detailed assessment of interior conditions, including the advanced settlement of the concrete slab in the northwest quadrant of the building. As of October 2009, the building remains unoccupied and largely empty of loose equipment and materials.

In general, the building is poorly maintained and requires some level of stabilization to bolster its ability to withstand the anticipated vibrations impacts from nearby and adjacent construction activities. At a minimum, Garavaglia Architecture, Inc. recommends:

- Selective repointing of the interior and exterior walls
- The installation of braces to support select roof trusses to prevent further slippage from joist pockets and reduce stress on the framing members, and
- Continual monitoring of cracks and wall alignments throughout the building during construction
- Completion of geotechnical studies to determine more precisely the site-specific soil conditions. This will inform the development of any foundation stabilization measures should they be needed
- Additional, more invasive measures may be necessary if there is further soil settlement as a result of construction activities
- Additional consideration of potential changes to the roadbed elevation of Halleck Street will be required as the design is more firmly established

The retaining wall to the north has rotated out of vertical over the years. It is uncertain whether this condition is caused by water trapped behind the wall, or by settlement of the soils over time. Based on anticipated construction activities and vibrations, no actions beyond monitoring this wall during construction are recommended at this time.

CHAPTER 1: INTRODUCTION

HSR PROJECT DESCRIPTION & GOALS

Building 228 is a recognized contributor to the Presidio of San Francisco National Historic Landmark District (PNHLD). It is also within the project Architectural Area of Potential Effect (APE) for the proposed reconstruction of Doyle Drive. The Final Environmental Impact Statement/Report (FEIS/R), certified by the San Francisco County Transportation Authority Board of Commissioners on December 16, 2008, identified Building 228 as a cultural resource within project APE because of its status as a contributing building to the PNHLD. The Built Environment Treatment Plan (BETP), dated August 2008 specifically calls for an historic structures report (HSR) to be prepared for Building 228 as part of measures to mitigate impacts from the construction of Doyle Drive. Garavaglia Architecture, Inc. has been contracted to prepare the HSR for Building 228, for the purposes of developing stabilization strategies that address anticipated impacts from construction in the immediate vicinity. This document augments work carried out as part of the Historic American Buildings Survey (HABS), Historic American Engineering Record (HAER) and Historic American Landscapes Survey (HALS) mitigations also stipulated in the BETP.

This HSR relies on historical information provided by ICF International, the Presidio Trust and pubic documents related to the development of the Presidio of San Francisco and its historical significance. Stabilization recommendations are based on Doyle Drive project-related documents provided by ICF International, Caltrans and other Doyle Drive mitigation and construction team members. Preliminary analysis of Building 228 was completed by Garavaglia Architecture, Inc. in 2006 as part of the initial DEIR/S feasibility studies related to the proposed Presidio Parkway Alternative of the Doyle Drive replacement project. Under this alternative, a proposed tunnel in the vicinity of Halleck Street would require regrading Halleck Street, resulting in a higher elevation for the roadbed along Buildings 201 and 228. Current designs indicate Halleck Street will be raised along the length of the west wall of Building 228. Depending on the exact level of grade change in the final design further analysis of impacts may be required. This portion of the Doyle Drive construction work is part of Contract 5.

The goal of this HSR is to present a concise and accurate planning document for the purposes of stabilizing and preserving Building 228 during construction activities. It includes a summary of the building's historical context and construction chronology, a detailed conditions assessment that supplements similar efforts undertaken by other mitigation team members, and recommendations for protecting the building and its immediate physical context during and after construction of Doyle Drive. It follows the general format recommended by the National Parks Service in *Preservation Brief 43: The Preparation and Use of Historic Structure Reports*. However, it is focused more on the evaluation of existing conditions and development of recommendations, than in documenting the history of the building or its setting. This is in direct response to the needs of the Project.

As stipulated in the BETP, all work contained in this document has been prepared by, or directly supervised by professionals meeting or exceeded the Secretary of the Interior's Professional Qualification Standards for History and/or Architectural History. The minimum requirements for History are a graduate degree in history or closely related field; or a bachelor's degree in history or closely related field plus one of the following:

1. At least two years of full-time experience in research, writing, teaching, interpretation, or other demonstrable professional activity with an academic institution, historic organization or agency, museum, or other professional institution; or
2. Substantial contribution through research and publication to the body of scholarly knowledge in the field of history.

The minimum requirements for Architectural History are a graduate degree in architectural history, art history, historic preservation, or closely related field, with coursework in American architectural history, or a bachelor's degree in architectural history, art history, historic preservation or closely related field plus one of the following:

1. At least two years of full-time experience in research, writing, or teaching in American architectural history or restoration architecture with an academic institution, historical organization or agency, museum, or other professional institution; or
2. Substantial contribution through research and publication to the body of scholarly knowledge in the field of American architectural history.

DOYLE DRIVE CONSTRUCTION PROJECT DESCRIPTION[1]

The existing south access road to the Golden Gate Bridge, known as Doyle Drive or Route 101, is structurally and seismically unsafe and must be replaced. The roadway is facing the same problem that threatens other parts of our nation's infrastructure – the ravages of time and continual use. Originally built in 1936, Doyle Drive has reached the end of its useful life. The Presidio Parkway was unanimously identified as the Preferred Alternative for the Doyle Drive replacement. Approval of the Presidio Parkway as the Preferred Alternative to replace Doyle Drive comes after many years of collaborative work. As early as 1955, the State of California recommended the reconstruction of Doyle Drive to handle increasing congestion. The proposal called for an eight-lane highway; however, due to public objection, not only was it dropped, but the California legislature passed a bill prohibiting the widening of Doyle Drive to more than six lanes.

In 1991, the San Francisco Board of Supervisors revisited the reconstruction of Doyle Drive and established the Doyle Drive Task Force. The Task Force considered design options and made recommendations that were approved by the Board of Supervisors in 1993. In 1994, the National Park Service released the Final General Management Plan Amendment (GMPA) identifying the main objectives for Doyle Drive improvements which focus on maintaining the historic value of the surrounding areas, minimizing noise and pollution impacts and enhancing the Presidio entrance and the circulation features.

The San Francisco County Transportation Authority (Authority) developed the Doyle Drive Intermodal Study in 1996, which supports the Doyle Drive Task Force and the GMPA recommendation to make multi-modal and direct vehicular access into and out of the Presidio a central feature of the design.

Preparation of the environmental assessment began in 2000 and the Draft Environmental Impact Statement/Report (DEIS/R) was released in 2005. On September 26, 2006, the

[1] This project description is excerpted from information provided on the following project-related websites: http://www.presidioparkway.org/about/, http://www.presidioparkway.org/about/history.aspx and http://www.presidioparkway.org/features/.

Authority's Board of Commissioners unanimously selected the Presidio Parkway as the Preferred Alternative. The Presidio Parkway will replace the existing Doyle Drive with a new parkway-type roadway that includes short tunnels, new access and improved views from within the Presidio of San Francisco. Working with stakeholders and resource agencies, the project team refined the Parkway Alternative to minimize or eliminate potential impacts to the natural environment, cultural resources, the Presidio, and community resources. The input received during the comment period, as well as refinements to the Preferred Alternative, is reflected in the Final EIS/R that was circulated in October 2008 and certified on December 16, 2008.

Key design refinements are:

- Raise the original profile of the southbound lanes to preserve the cultural landscape and retain the cultural relationship between the upper and lower portions of the Presidio.
- Revise the landscaping of the Main Post tunnels to recreate the bluff north of the tunnels.
- Realign the low causeway to create greater separation between the roadways over the future marsh expansion area to increase light penetration and to improve the wildlife corridor. The road curvature introduced by this refinement also calms traffic by reducing traffic speeds before reaching city streets.
- Reconfigure the Girard Road interchange to preserve the Gorgas Avenue streetscape adjacent to the historic warehouses and to improve views to the Palace of Fine Arts.
- Modify the Gorgas Avenue/Richardson Avenue intersection to improve pedestrian connections, provide consolidated transit access and deter cut-through traffic.
- Restore the top portion of Building 201 in the original location to preserve the historic Halleck streetscape and historic bluff.
- Treat roadway pollutant runoff with passive, low impact measures to the maximum extent practicable to improve the water quality

The design and construction of Doyle Drive ahs been divided into eight (8) contracts. Building 228 is in the vicinity of Contract 5, for which final details relating to implementation, locations, engineering and design are under consideration and may be subject to changes. Therefore, the information and recommendations presented in this HSR may require further analysis as the larger Project progresses. For more information on the latest Project and Construction progress, consult http://www.presidioparkway.org.

PROJECT DATA

Location & Setting
The Presidio of San Francisco is located along the eastern edge of the tip of the San Francisco peninsula. It encompasses 1,491 acres of landscapes and built features spanning from Mexican military encampments in 1776 through United States Army activities ending in 1994. It was declared a National Historic Landmark District in 1966 for its importance to colonial Spanish settlement and United States Army history. It operates today as a self-contained management district containing a mix of private enterprise, public spaces, residences and educational facilities. Building 228 is near the Main Post, the heart of the early development of the American-era military outpost. It is included in the National Register Landmark District

nomination update (1992) as part of the Nationalistic Expansion (1891-1914) period of development.[2]

Halleck Street is a short connector road that links Lincoln Boulevard and the Main Post area of the Presidio, to Mason Street, Crissy Field and the waterfront. The land slopes gently down to the bay along Halleck Street. A series of retaining walls, small overlooks and staircases step down in intervals in these areas. They mark the location of the eastern edge of the Presidio's historic bluffs. Building 228 is located on the upper edge of these elevation changes, in an area where the hillside has been filled to create level ground.

Building 228 is located immediately adjacent to Halleck Street in the Main Post planning district of the Presidio of San Francisco. Halleck Street flanks the west side of Building 228. On the other side of Halleck Street, the white, wood-frame one-story Building 201 is also immediately adjacent to the roadbed. To the north of Building 228 is a small swath of grass, approximately 10-feet wide. Beyond this, a rustic stone retaining wall stands approximately 6-feet high where the grade drops sharply to a historic marsh area that was filled and converted into a fuel storage and dispensation area. All buildings and tanks in this area were supposedly removed and remediated circa 2007. 250-feet further to the north is the elevated southbound lane of Doyle Drive (this section is also known as Marina Drive) and a parking area located below the Doyle Drive deck. Building 603, a restored lagoon and San Francisco Bay are visible beyond Doyle Drive. To the east stands Building 229, another former army bakery building. The Wayburn Redwood Grove and a seasonal creek stand immediately beyond Building 229. On the south side of Building 228 are two one-story rectangular roughly contemporary former quartermaster storehouses. All of the buildings in this area of the Presidio are predominately surrounded by asphalt parking surfaces.

Related studies/work
This HSR is part of a larger mitigations project related to the construction of Doyle Drive (State Highway 101) through the Presidio. These mitigations include general conditions assessments of 69 buildings in the APE. These assessments are being conducted by Caltrans and ICF International representatives. Historic American Buildings Survey (HABS) projects are being undertaken for 6 buildings and the entire APE is being recorded as part of Historic American Landscape Survey (HALS) documentation. Additionally, Historic American Engineering Record (HAER) documentation is being produced for the existing Doyle Drive. As of June 1020, all of these efforts are currently in various stages of completion.

Building 228 and its related landscape features (retaining wall) were included as part of these studies. Where feasible, this information has been incorporated into this HSR and augmented with further assessment and recordation by Garavaglia Architecture, Inc.

Statement of Significance
Building 228 is significant as a part of the grouping of Quartermasters' buildings constructed during a period of major expansion at the Presidio. This period of expansion marked the transition from the installation from a regional outpost to a strategically important part of the United States' Pacific expansion. The size and importance of military bakeries was paramount to the continued success of any military base. Building 228 was a state-of-the-art facility that epitomized the new stature of the Presidio within the U.S. Military. As part of this grouping of

[2] *Presidio of San Francisco National Historic Landmark District National Register Nomination* (San Francisco, California: Department of the Interior, National Parks Service Western Regional Office, 1992.), p. 7-42.

Quartermasters' buildings, it represents what was the heart of day-to-day operations at the Presidio during this critical expansion period. As such, the period of significance for Building 228 is 1909-1945, representing its construction through the approximate end of its service as a military bakery.

METHODOLOGY

The complex nature of overlapping mitigation measures related to the construction of Doyle Drive has resulted in a variety of data gathering strategies. For the purposes of this HSR, the methodology section is divided into two parts, each representing a different focus of the document: Research and Conditions Assessment.

Research

Team efforts

The initial historical research was conducted by ICF International as part of the Historic American Buildings Survey (HABS) work for six buildings identified in the Final Environmental Impact Statement/Report (FEIS/R) for Doyle Drive. (This included Building 228.) This work began with review of the National Park Service Archive and Record Center at the Calvary Stables at the Presidio of San Francisco. ICF International then scanned relevant material for conversion to electronic files. This included building plans, memos and notes for Building 228. The ICF International team then made these files available to Garavaglia Architecture, Inc.

Material reviewed

The archival materials were reviewed as they were received. They were augmented by various environmental documents, previously prepared project reports and other materials not held at the NPS archives. This material included, but was not limited to:

- Relocation Feasibility Study: Presidio of San Francisco National Landmark District, Buildings 201, 204 and 228 (2006)
- National Register Landmark District nomination update (1992)
- National Register Landmark District nomination update DRAFT (2008)
- Doyle Drive planning and mitigation documentation
- Preliminary draft reports completed concurrently with this document
- Correspondence between and from Caltrans and the Presidio Trust regarding determination of appropriate vibrations thresholds based on site-specific empirical data collected as mandated in the Built Environment Treatment Plan (BETP)

Review of this documentation provided a basis for assessing previously gathered historical and construction-related information. Much of this information has been incorporated in to this report. Where additional historical background was needed, further research was conducted.

Additional work

Additional research for Building 228 included web-based and primary research pertaining to military bakeries, their role in general, their placement and evolution at the Presidio and any particular architectural features associated with turn-of-the-century commercial baking operations. Please see the bibliography at the end of this document for a complete list of sources sited.

Limited research was conducted to determine the evolution of the land just north of Building 228, including construction of the stone retaining wall. This research was primarily limited to maps of the Presidio and related record searches as material was made available.

Conditions Assessment
A preliminary conditions assessment for Building 228 was conducted by the ICF International team simultaneously with the Garavaglia Architecture, Inc. team. The former were concerned with noting general conditions for the purposes of recording the pre-construction building site. The latter team was focused on a more detailed assessment for the dual purposes of developing stabilization recommendations to limit additional damage caused by adjacent construction and creating a more comprehensive baseline for comparison of any changes during these construction activities.

Building 228 was also recorded via laser scanning technology by Caltrans in Spring 2009. These scans were used to record conditions in the field for future reference. The nature of these scans made it impractical to use them as base illustrations for conditions recordation, however they have been included with the Conditions Assessment for Building 228 completed by ICF International for comparison with post-construction conditions. To facilitate creation of construction drawings for stabilization work and conditions assessment, Garavaglia Architecture, Inc. created measured drawings executed in CAD. Additionally, digital field photography was used at each site visit to augment the drawings and basic field notes. The resulting combination of digital documents (photos) and field notes represents the primary conditions recordation documentation presented in this HSR.

Site Access
Access to Building 228 was arranged for multiple dates. The initial site survey took place on February 10, 2009. At this time, the team documented the major issues and noted what areas required further investigation and where additional measurements were necessary to clear debris for unobstructed access. A site meeting was held on March 11, 2009 to discuss additional testing necessary for development of stabilization recommendations. At this time, soils remediation work by the Presidio Trust was discussed. It was agreed at this meeting, that the scope of work for this HSR should be expanded to include the retaining wall north of Building 228. It was also agreed that where possible, work should be coordinated between agencies to recognize project efficiencies. This is particularly true between the Presidio Trust's soils remediation team and implementation of any stabilization recommendations for Building 228 and the retaining wall.

Shortly after this meeting, a list of preliminary recommendations for further investigation and for stabilization of Building 228 was issued by Garavaglia Architecture, Inc. to stimulate discussion and coordination between agencies. This work included

- Clearance of unused, loose dry cleaning equipment from the interior of Building 228
- Removal of the lumber storage racks from the interior of Building 228
- Installation of temporary trenches on the north and west of Building 228 to facilitate investigation of the foundation system and
- Eventual relocation of maintenance activities from Building 228 to a nearby building to enable implementation of stabilization recommendations.

The next site visit took place on May 19, 2009 to monitor investigatory trenches being dug adjacent to the building. Because no historic drawings showing foundation construction could

be verified, these trenches were requested by Garavaglia Architecture, Inc. to facilitate verification and inspection of the building's foundations. The next site visit was conducted on June 9, 2009 to verify conditions drawings and to supplement the photographic record prior to submission of this draft document. On August 20, 2009, Becky Urbano met with Ed Yarbrough and an Archeologist with ICF International to document the remaining equipment in situ prior to its removal to another location at the Presidio. Material testing, consisting of shear tests and mortar sampling took place from September 18 – 22, 2009. This was the last site visit to the building conducted by Garavaglia Architecture, Inc.

Historical prioritization
Beyond historic document research, specific steps were carried out in order to compile data necessary to develop architectural preservation recommendations, these included:

- Architectural research to determine construction chronology;
- Determination of interior and exterior character-defining elements;
- Analysis of historic interior and exterior building configurations;
- Identification of materials and finishes; and
- Analysis of methods of construction.

After completion of the above steps, a list of prioritized character-defining features was developed. Each feature was given a ranking within a *premier-important-contributing-non-contributing* framework. (Please see Chapter 3 for further details regarding the prioritization scales used.) The same was done with each space within the building.

Conditions ranking
Each character-defining feature and space was then evaluated for its relative condition. This followed a conditions ranking scale of *excellent-good-fair-poor* to denote level of deterioration. (Please see Chapter 3 for further details regarding the conditions ranking scales used.) Major structural and visual conditions deficiencies were noted on drawings in the field and transferred to drawings by hand for ease of reference.

CHAPTER 2: HISTORIC PRESERVATION OBJECTIVES AND REQUIREMENTS

FEDERAL (SECTION 106)[3]

The preparation of this HSR is conducted in compliance with Section 106 of the National Historic Preservation Act (NHPA) and its implementing regulations, 36 CFR Part 800, as amended in 1999. Section 106 requires that federal agencies, and entities that they fund or license, consider the effects of their actions on properties that are listed in the National Register of Historic Places (NRHP), or that may be eligible for such listing. To determine whether an undertaking could affect NRHP-eligible properties, cultural resources, including archaeological, historical, and architectural properties, must be inventoried and evaluated. Although compliance with Section 106 is the responsibility of the lead federal agency, others can conduct the work necessary to comply.

Additionally, because the Presidio is a National Historic Landmark, it is a statutory requirement under Section 110(f) of the NHPA that the agency official, to the maximum extent possible, undertake such planning and actions as may be necessary to minimize harm resulting from an undertaking.

In compliance with Section 106 of the NHPA, FHWA developed and executed a Programmatic Agreement (PA) to resolve adverse effects that will result from this Undertaking. The PA identifies that the FHWA, as lead federal agency, has the primary responsibility to ensure that the provisions of the PA are carried out; Caltrans and the SFCTA are operating as an integrated team to jointly design and implement construction and mitigation measures for the Undertaking. Caltrans is ultimately responsible to FHWA for the appropriate and timely implementation of mitigation commitments.

The NHPA defines an effect as an alteration to the characteristics of a historic property that qualify it for inclusion in or eligibility for the NRHP. Effects can be found adverse or not adverse. Adverse effects are defined by the *Criteria of Adverse Effect* as outlined in 36 CFR 800.5(a)(1). An adverse effect is found when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify that property for inclusion in the NRHP in a manner that would diminish the integrity of that property's location, design, setting, materials, workmanship, feeling, or association. In applying the criteria of adverse effect, regulations require that consideration be given to all qualifying characteristics of a historic property, including those that may have been identified subsequent to the original evaluation of the property's eligibility for the NRHP. Adverse effects may include reasonably foreseeable effects caused by the undertaking that may occur later in time, be farther removed in distance or be cumulative. Examples of adverse effects on historic properties include, but are not limited to:

1. Physical destruction of or damage to all or part of the property;

2. Alteration of a property, including restoration, rehabilitation, repair, maintenance, stabilization, hazardous material remediation, and provision of handicapped access, that is not consistent with the Secretary's Standards for the Treatment of Historic Properties and

[3] SFCTA and FHA, *South Access to the Golden Gate Bridge, Doyle Drive Built Environment Treatment Plan* (Oakland, California, Caltrans District 4, August 2008), p. 3-1.

applicable guidelines;

3. Removal of the property from its historic location;

4. Change of the character of the property's use or of physical features within the property's setting that contribute to its historic significance;

5. Introduction of visual, atmospheric or audible elements that diminish the integrity of the property's significant historic features;

6. Neglect of a property which causes its deterioration, except where such neglect and deterioration are recognized qualities of a property of religious and cultural significance to an Indian tribe or Native Hawaiian organization; and

7. Transfer, lease, or sale of property out of Federal ownership or control or conditions to ensure long-term preservation of the property's historic significance. CEQA requires the lead CEQA agency to assess the effects of the project on historical and archaeological resources. These resources are defined as buildings, sites, structures, objects, or districts (as well as cultural landscapes) - each of which may have historical, architectural, scientific, archaeological, cultural, or engineering importance.

STATE (CEQA)[4]

The California Environmental Quality Act (CEQA) (Section 15064.5) requires the lead CEQA agency, in this case the San Francisco County Transportation Authority (SFCTA,) to assess the impacts of the project on cultural resources. Cultural resources are defined as buildings, sites, structures, or objects, each of which may have historical, architectural, archaeological, cultural, or scientific importance. Before the level of significance of impacts can be determined and appropriate mitigation measures developed, the significance of cultural resources must be determined. The application of Section 106 is considered to adequately address the requirements of CEQA for the purposes of this Undertaking.

[4] Ibid, 3-2.

PART 1 - DEVELOPMENTAL HISTORY

CHAPTER 3: HISTORICAL BACKGROUND AND CONTEXT

HISTORY

Bakeries were an important part of the day-to-day functionality of any military post in the early 20th century. In this era before the widespread use of processed and packaged foodstuffs, bread was part of the daily rations provided to every soldier. Military leaders recognized that if the food, and in particular the daily ration of bread, was sub-par, the organization's health and spirit would suffer. Therefore, the ability to supply fresh baked bread every day was a high military priority. Building 228 represents an expansion in baking capabilities at the Presidio during a time of rapid growth. Its size was relatively large compared with similar facilities at other posts, and its construction in brick symbolized the permanent nature of the Presidio expansion. Together with Building 229, an earlier, smaller bakery building, and nearby storehouses, Buildings 223 and 227, Building 228 represents the heart of the supply and daily management at the Presidio as administered by the Quartermaster General.

Presidio of San Francisco
The Presidio of San Francisco has a long and colorful history that spans three centuries and three occupying nations. It has been called one of the Army's most beautiful posts and remains today as an architectural record of many periods of expansion, representing a continuum of state-of-the-art military design and organization. It's buildings and landscapes chronicle the history of California and have become treasured pieces of local and national heritage.

The Presidio's origins date to 1776 when Captain Juan Bautista de Anza claimed the headlands at the tip of the San Francisco peninsula in the name of the King of Spain. During the following winter, his Lieutenant, Jose Joaquin Moraga, supervised the construction of a military camp and named it the Presidio of San Francisco in honor of Saint Francis de Assisi, the patron saint of the newly established mission several miles south. Part of the original duties of this camp were to provide protection for the Mission, its inhabitants and its property.

In 1793, as English and Russian traders and settlers pushed ever closer to Spain's new holdings, the Spanish Governor Jose Joaquin Arrillaga authorized the construction of improved fortifications at the present-day site of Fort Point. At the time, this was over a mile from the adobe fortifications that constituted the Presidio of San Francisco. The military outpost received intermittent orders in the next decade as Spain's attention was directed more completely on its rebellious colonies in the Americas and other troubles in Europe. When Mexico finally won its independence in 1821 it was only a matter of time before the Presidio became an official Mexican military post. By 1822, the Mexican flag flew over the adobe fort at the Presidio and the fortifications at Fort Point.

This Mexican period at the Presidio was relatively short-lived as the United States made moves to acquire Alta California to complete its westward expansion. The U.S. was assisted by a small band of settlers, led by Lieutenant John Fremont who established an independent Republic of California in 1846. They marched on the nearly vacant Presidio and spiked the cannons. Later that year, the United States declared war on Mexico and set up and official occupation of the site and set about repairing the adobe buildings and expanding the fortifications. This marked the beginning of American ownership of the Presidio. The earliest constructions from this period included the construction of the brick fortress at Fort Point (1853).

The U.S. took a more active interest in the Presidio as the Gold Rush drew thousands of people to San Francisco on their way to the gold fields further east. The post expanded, primarily through the addition of modest wood-framed buildings. As the Civil War loomed, troop strengths were increased and the Presidio became an important installation on the rapidly developing western coast. Additional fortifications were constructed throughout the Bay Area as the strategic importance of San Francisco Bay became more evident.

A series of western and Pacific-focused military operations only underscored the importance of a well-maintained and well-equipment western military installation. The Spanish-American War, Philippine-American war, western frontier policing, including Indian uprisings, and the ever-increasing flood of foreign immigrants into the area all resulted in various building campaigns within the Presidio. Part of this included a massive beautification project undertaken in the 1880s. These efforts created the architectural and landscape features that today define large sections of the Main Post.

Greater changes were in store as the United States grew into a world military power during World War I and World War II. The Presidio became home to an early military airfield (Crissy Field) and served as a major embarkation point for soldiers heading out to fight in the Pacific campaigns. This marked the last great period of expansion when the Presidio largely took on the form that exists today. This included the various barracks and posts, as well as coastal artillery batteries and intelligence operations. Following World War II, the Sixth U.S. Army headquartered in the huge barracks on the main parade and assumed responsibility for the Army's operations in the western third of the United States.

Congress voted to close the Presidio in 1989. A five-year period of reduced operations followed and resulted in the eventual transfer of the property to the National Parks Service in 1994. At the time of its closure, the Presidio was the oldest continuously operating military base in the country and contained a National Historic Landmark District with hundreds of historically significant buildings. In 1996, the Presidio Trust was created with the mandate to bring the Presidio into self-sufficiency by 2013. Today, the Presidio Trust manages the protection, rehabilitation and development within this nationally significant former-military installation.

Nationalistic Expansion, 1891-1914
Building 228 was constructed during the period known as "Nationalistic Expansion." The following is quoted from the National Landmark Nomination update:

> During this period, the Presidio, which already had a sizeable garrison of some 35 officers and 500 enlisted men, increased its strength more than fourfold. Correspondingly, the landscape and architecture of the reservation, as well as the supporting transportation and utility systems, were intensely developed… Major new programs for the construction of buildings were released as well, including a large new hospital complex and prominent groups of new barracks and other housing in the area of the Main Post. Just prior to the turn of the century, the east Cantonment and adjacent West Cantonment emerged as two new areas of occupation on Post. Starting in 1909-1910, a new parade ground and extensive complex of buildings were created, which would be known as Fort Winfield Scott. The sum of improvements carried out in this period very much changed the character of the reservation. Much of the physical environment of the Presidio as it exists today relates to the Post's turn-of-the-century and early twentieth-century development.

> In Post architecture, the period was marked by the first appearance of the 'Colonial Revival' and then the 'Spanish Colonial Revival' style (then called the 'mission style') and by the introduction of reinforced concrete as a common material and method of construction for housing and other buildings. While wood-frame construction continued as well, the use of wood as an exterior cladding, which was standard during the preceding periods of development, became far less common; brick or stucco became the exterior material of choice. Stone appeared as well at the Presidio, usually in combination with brick and serving as foundations or as other architectural elements—e.g., sills, lintels, or keystones…
>
> …The events of 1906 slowed new construction at the Presidio only briefly. By 1908, building activities resumed in several areas of the Post, including Letterman complex, Fort Point, and the area south of Fort Point, which became known as Fort Winfield Scott…
>
> …Several major groups of buildings from this period exist today and generally possess a high degree of integrity. Also, a second central parade ground, created early in this period, remains essentially intact as the focal open space of the Main Post; the ground itself, however, has been paved extensively for parking. This parade ground (No. 94) was laid out in the mid-1890s at a site west of the earlier main parade ground, which had been established during the Civil War period. The 1895-1897 erection of a whole new row of five identical brick barracks (Nos. 101-105) provided an imposing 'streetscape' along the new parade ground's northwest border. These large, identical barracks replaced a row of flimsy laundresses' quarters and were designed with formal symmetry and placed in a uniform line along Montgomery Street.
>
> Also early in this period, several buildings were constructed in the area northeast of the newly established parade ground, along or near Halleck Street. These included two simple buildings of wood construction, built in 1896 and serving originally as early exchange stores for the Post (Nos. 201 and 204), two warehouses (Nos. 223 and 227) and a bakery (No. 229), all of which were constructed of brick in 1897. Through the first decade of the twentieth century, several similar buildings (Nos 222, 225, 226 and 228) were added to this group along Halleck Street, and the whole stands today as an intact turn-of-the-century 'streetscape' of quartermaster, ordnance, and commissary buildings.

Military Bakeries

Bread has long been considered a dietary staple. As far back as at least the 18th century, there are records of armies being sent into battle with bakers and field ovens to supply bread to the troops. Training of military bakers was a viewed as a critical aspect to the continued health and vitality of a successful military force. Major General Winfield Scott is quoted as saying,

> "Bread and soup are the great items of a soldier' s diet in every situation: to make them well is an essential part of his instruction. Those great scourges of camp, scurvy and diarrhea, more frequently result from want of skill in cooking than from any other cause whatever. Officers in command, and more immediately,

> regimental officers, will, therefore, give strict attention to this vital branch of interior economy."[5]

As such, one of the earliest recorded organized military bakers' training in the United States dates back to the beginning of the nation during the Revolutionary War. Shortages of trained bakers within the ranks of the Continental Army raised the issue of quality bread provisions to a top priority for General George Washington. At his personal request, Congress approved the establishment of a Superintendent of Bakers. In 1777, Christopher Ludwick, a Hessian turned revolutionary was named to the post. He became known as the "Baker General" by the troops as he traveled between encampments recruiting and training bakers.[6]

Establishment of a functioning post bakery was viewed as an important milestone in the capabilities and importance of any United States military installation. Only "permanent" posts contained bakeries, indicating a level of status and strategic importance.[7] Provisioning for the bakeries was handled by two different army bureaus: the Quartermaster Department and the Subsistence Department. The former handled construction and provisioning of equipment for all military buildings, including the bakeries. They "furnished all brooms, utensils, and furniture authorized, excepting ovens, and paid fuel expenses whenever bakery requirements exceeded savings from the fuel allowances to the troops otherwise used."[8] The Quartermaster of each post was expected to frequently visit the post bakery to inspect conditions and verify quality of all supplies. Any failure in such duties could directly impact the health of all the troops as bad bread was a frequent occurrence.

The Subsistence Department was in charge of each soldier's rations, or in many cases, the money allotted for such rations. By 1896, these rations included 18 ounces of flour for the purposes of making bread. However, the daily ration of "soft bread" was also 18 ounces. Because it took less than 18 ounces of flour to make an 18 ounce loaf of bread, the excess flour was authorized for sale. Proceeds from these sales were deposited back into the bakery fund. This fund was expected to cover all the expenses of the bakery, including extra pay for the bakers (up to $.50 for a chief baker at an installation like the Presidio, and up to $.35 for each assistant), extra fuel, supplies and extra utensils.[9] Besides flour, the Subsistence Department supplied salt, lard, ovens, and until the bakeries were electrified, candles, lamps and oil.

Besides baking bread for all those on the post, the bakery maintained its own storehouse for both perishable and non-perishable supplies. In the western climates, proper storage of the perishable items such as flour and lard proved to be a difficult task. Maintaining usable ingredients as well as proper sanitary conditions was highly unscientific and was largely dependent on the local climate, conditions, and quality of building and insulating materials. Bad bread was not uncommon because of these difficulties, and because the bakers themselves were often poorly trained and/or self-taught.[10] On top of these managerial and climatic

[5] Sally Johnson Ketchum, "Fort Laramie: Historic Furnishing Plan for the Bake House," Fort Scott National Historic Site, Post Bakery, http://www.nps.gov/.
[6] "Early Baking Schools and Bakery Training," American Institute of Baking, https://www.aibonline.org/about/history/#history01.
[7] *Regulations for the Army of the United States, 1895* (Washington, D.C.: Government Printing Office, 1901), 34.
[8] Ketchum.
[9] *Regulations for the Army*, 24, 41-43.
[10] Ketchum.

complications, by 1910, the Chief Baker was required to live at the bakery to tend the ovens and manage the stores.[11]

To address the growing inadequacies and inconsistencies of bakers and baking facilities in the armed services, the Army established a formal Bakers and Cooks training programs at Fort Riley, Kansas in 1905.[12] Sometime in the next five years, a similar school was opened at the Presidio.[13] In 1911, the Army issued its first Army Cooks Manual as a further step towards regulating the varying quality and training of its bakers and cooks. [14] By 1917, two other formal training schools had been established for a total of four (4) Army schools for Cooks and Bakers. Each had a 100-student capacity that proved to be inadequate as the United States ramped up operations prior to World War I. At this time, the program was greatly expanded throughout the country to train men for work in permanent installations as well as for field food preparation.[15]

Building 228
Building 228 was not the first bakery constructed at the Presidio. In 1897, Building 229 was built for this purpose. Before that, a number of small wood-frame buildings served the troops in various parts of the post. However, Building 228 marked an important step in the establishment of the Presidio as a major military installation. Its construction coincided with a renewed sense of urgency surrounding the training of quality food provision officers. This happened through the establishment of formal programs as well as through the standardization of texts and procedures regarding the operations of bakeries and food preparation facilities throughout the Army.

When constructed, Building 228 was considered a state-of-the-art facility. In 1909, the Presidio of San Francisco was one of only four (4) army installations nationwide that housed a School for Bakers and Cooks. This training school wandered throughout the Presidio, being housed in a variety of buildings. While not explicitly stated, Building 228 was likely used as part of this training as it was one of the largest military bakery facilities on the west coast. When the Presidio sought a permanent home for its School for Bakers and Cooks in 1934 (Building 220), it was purposely located so that it would be close to the post baking operations.[16]

Based on foundations drawings dated to 1938, there were a series of interior foundations constructed near the center of the building. These indicate the presence of several large ovens, such as those found in commercial bakeries at the time. According to the *1917 Army Baking Manual*, the typical permanent baking ovens used by the Army were "generally built of solid brick… weighing as much as 50 tons."[17] They went by the manufacturing brands of Simpkins, Clauss, Duhrkop, Peterson, Werner and Pfleiderer, and were generally "draw plate" type

[11] *Regulations for the Army*, 43.
[12] Henry G. Sharpe, *The Quartermaster Codrps: In the year 1917 in the World War* (New York: The Century Company, 1921), 108.
[13] Ibid.; *War Department Annual Reports, 1909, Volume III (*Washington, D.C.: Government Printing Office, 1909), 129.
[14] *Lucius R. Holbrook*, U.S. Army: Fort Bragg, http://www.bragg.army.mil/history/Commanders/Commanders%20Pages/Holbrook/holbrook.htm.
[15] *Manual for Army Bakers* (Washington, D.C.: Government Printing Office, 1917), 119.
[16] After continually relocating throughout the Presidio for over 20 years, in 1934, the school's assistant commandant wrote that the school, the 3d Bakery Company, and the post bakery staff all needed a permanent building. When WPA funds became available, Building 220 was constructed to house kitchens, classrooms, and barracks for the students. It would later serve as post headquarters. Erwin N. Thompson and Sally B. Woodbridge, "Special History Study: Presidio of San Francisco, An outline of its evolution as a U.S. Army Post, 1847-1990" (Denver, Colorado: Department of the Interior, National Parks Service Denver Service Center, 1992), 111.
[17] *Manual for Army Bakers*, 64.

ovens. This meant that they utilized an arrangement of removable baking plates within the oven chamber. Instead of a peel (wooden board with a long handle), there is a plate, on wheels, that can be withdrawn from the oven, quickly loaded with bread, and returned to the oven. The downside for this arrangement was the need for extra space to accommodate the plates. To address this, they were often constructed with double decks to maximize space.[18]

These draw-plate type ovens were common in Army bakeries at the time and would require the sorts of foundations shown on historic drawings for Building 228. While the exact number of ovens is unknown, it is likely that at least two and as many as three such ovens were once installed in Building 228.[19] These ovens were has fuel fed from the rear, necessitating access along a corridor at the back of the ovens, as demonstrated in the presence of the narrow, lower level area along the east side of Building 228.

In addition to the ovens, portable equipment such as racks, mixing machines, proofing tables and the like would have been stored in the building. Regulations from the time required that each bakery have dedicated shower and restroom facilities to maintain health standards. Evidence of a concrete shower pan near the existing restroom remains even though the fixtures have long since been removed. This feature is represented on drawings from at least 1938 and is believed to be an original feature of the building.

Additionally a "room" and office are indicated on the 1938 plan. Because it was required for the head baker to quarter at the bakery, this room may have been a sleeping chamber or it could have been used for storage. The near-by Building 227 was used as Quartermasters' storage so most supplies were likely held in here or the other adjacent storage buildings.[20] There was a sink of the west side of the building, beneath the second window from the northern corner of the building along the west wall. The wall connection is still visible. In the northwest corner was the mixing machine and in the southwest corner was the cutting machine for processing dough during its proofing (or rising) period. No ovens are specifically detailed or labeled in this drawing.

Building 228 served as the main bakery from its construction in 1909 up through the early 1940s. The exact date of the end of baking in the building is unknown. Because no specific period of significance has been formally established for Building 228, Garavaglia Architecture, Inc. recommends a period of significance for the building from 1909 through 1945, based on the information presented herein.[21]

[18] Emil Braun, *The Baker's Book: A practical handbook of the baking industry in all countries, Volume II (*New York: D. Van Nostrand Company, 1903), 640.
[19] An undated, later drawing showing conversion of the building to a dance hall, depicts two chimneys and four flues. This could support multiple ovens. However, the 1938 drawing only indicates a single flue.
[20] Map of the Presidio of San Francisco, 1909.
[21] Many of the individual buildings within the National Historic Landmark District have specific periods of significance that are drawn from their historical associations rather than purely from their dates of construction. Within the nomination, most buildings are categorized by their location and dates of construction only, therefore a building specific period of significance is useful when considering appropriate rehabilitation plans.

CHRONOLOGY OF DEVELOPMENT AND USE[22]

Almost immediately after construction, problems with cracking were noted on the building's exterior.[23] No cause was specifically sited but suppositions were made regarding the stability of the fill used to level the area prior to construction. The building was constructed on 10-15 feet of fill that was used to level out the slope. It is likely that this fill was improperly compacted and that the building showed immediate signs of settlement. A 1910 drawing shows the proposed installation of a grid of steel I-beams to support the foundation beneath the sandstone coursing at the base of the north and west exterior walls. Trenching in select areas indicates some of this was carried out at the northeast corner but it did not extend to the west wall as shown in the drawings.

After the cessation of baking activities, there were few major alterations to the building. These were mostly limited to the removal of the ovens, the opening of the interior brick wall between the two building floor levels and the construction of the concrete block room against the north wall. Based on available plans, the openings were made sometime around 1946. These openings, and the resulting riven steel I-beam headers pre-date the construction of the concrete block partition. The materials used in the construction of this wall do not appear to be contemporary with original construction and the existing laundry-related equipment appears to have been installed simultaneously with the partition and associated ceiling construction. Therefore, the partition appears to date to conversion of the building to a laundry and dry cleaning use, sometime after 1946.

Other changes to the building include the installation of the Kawanee boiler, again sometime after 1946 and the installation of the aluminum and glass entry door. Overhangs of various constructions have been added to both the south and east entry doors. Up until at least 1993, one chimney remained above the roofline. The dates of its removal are unknown. Also unknown are the dates of the removal of the second chimney.

1909	Constructed as a Post Bakery for $11,554.76.
1910	Building foundation is partially stabilized with a grid of steel I-beams along the north wall. The full extent of this work is unknown but it was not carried out exactly as indicated on the associated drawings.
1911	Building is electrified
1930	Bake ovens converted from oil to gas
1933	Steam boiler added – later plans suggest that this is NOT the KAWANEE boiler currently installed in the building.
1935	Dough-mixing machine with a sifter is added. Historical drawings dated 1938 show this piece of equipment located in the northwest corner of the building.
1938	Dough-mixing machine removed
	New lavatory installed

[22] All information is from the Presidio Physical History Report Building Inventory, dated September 17, 1992 and provided by the Presidio Trust. Where possible this information has been verified from secondary sources. No primary materials were available during the course of this assessment.
[23] Robert R. Stevens, Dept. of California, June 28, 1909, memo for the Adjutant General, Dept. of California, OQMG, General Correspondence 1890-1914, RG 92, NA. As sited in Thompson (1992), 84.

c.1938	Building supposedly converted to a warehouse. This use is noted on 1938 drawings. Portable bakery equipment is still shown on the plan but no ovens are indicated.
1940	Tonnage racks, benches, trusses and the ceiling were painted. Panes of glass were replaced and the window screens removed.
1942	Used domestic water heater added to the building
1938-1950	Interior brick wall opened up and steel I-beams installed
1946-1950	Bakery building becomes proposed site of the "Colored Enlisted Men's Club." A mezzanine is proposed. There is no indication that this plan was ever executed.
Post-1946	Converted to a laundry and dry cleaner new aluminum frame front door installed[24] Concrete block partition constructed
Post-1993	Chimney removed down to roof line
Unknown	Slate shingle roof replaced with red composition shingles Removal of southern chimney down to roof line Galvanized and fiberglass extension constructed over front door Wood frame shed roof constructed over door, east wall Installation of iron tie-backs on north wall

EVALUATION OF SIGNIFICANCE

Building 228 is currently listed on the National Register as a contributing building to the Presidio of San Francisco National Historic Landmark District for its association with the period of Nationalistic Expansion (1891-1914). It played an important role in the everyday operations of the Army post by providing the basic rations of bread to the troops. At this period in history, bread was still a staple of the Army diet. When Building 228 was constructed in 1909, the Army was in the beginning phases of transforming from field units to a uniform, codified system of management. The bakery facility was considered state-of-the-art after its construction and was used as part of the newly established Army School for Bakers and Cooks by 1911.

Together with Buildings 223, 227 and 229, Building 228 represents the Quartermaster General's area of operations for the Presidio. This highly intact grouping has had few modifications and continues to represent a typical turn-of-the-century supply and storage facility.

[24] It is suspected that this is when it was modified into post drycleaners "by the addition of a new door, but no major interior changes were made. *Presidio of San Francisco National Historic Landmark District National Register Nomination* (San Francisco, California: Department of the Interior, National Parks Service Western Regional Office, 1992), 7-83.

CHAPTER 4: PHYSICAL DESCRIPTION AND ANALYSIS

CURRENT APPEARANCE

Site and Setting

Building 228 is located near the Lower Presidio, between the Main Post and Crissy Field. Until completion of the 1915 Panama-Pacific International Exposition, this area of the Presidio was largely unused and swampy. At that time, Building 228 sat at the edge of the Main Post, near the cavalry stables. Today Halleck Street serves as a connector between the Main Post and Crissy Field areas of the Presidio.

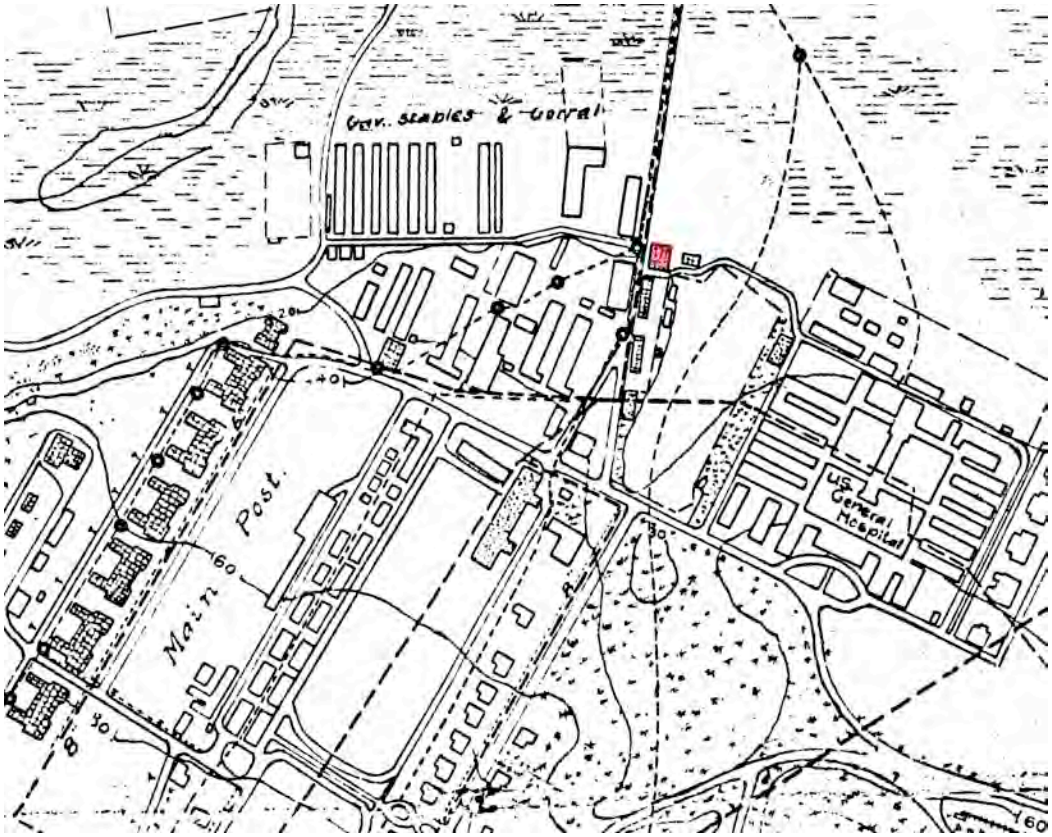

Figure 4.1. Detail of the Main Post area from the 1912 prepared by J. Hanson. Building 228 is highlighted in red. Image courtesy of the Presidio Park Archives.

Building 228 sits at the northern edge of a small bluff. Across the street and to the west is Building 201, a long rectangular wood frame building. To the south and east are several similarly sized one-story red brick buildings. This grouping was once part of the daily operations at the Main Post, collectively housing bakeries, warehouses and a commissary. Below the bluff, a stone retaining wall supports the hillside and faces a large asphalt-covered lot. This area recently housed a service station, which was removed in 2007. Beyond the empty lot sits a portion of the Doyle Drive viaduct over a small parking lot. Looking further north, the Crissy Field lagoon and San Francisco Bay are partially visible from the north side of Building 228. There are no trees or landscaping near Building 228, although a small strip of green grass

spans the distance between the building and the retaining wall. Tennessee Hollow and the Wayburn Redwood Grove are partially visible to the east.

Exterior materials and finishes
Building 228 is a square plan, red common-bond brick building with a pyramidal red asphalt shingle roof. A square arrangement of monitor windows caps the point of the roof. The exposed rafter tails have been left cut into an "S" shape and extend approximately 24-inches from the face of the wall. Most of the windows are eight-over-eight wood double-hungs and are protected by iron security bars. There are only two working exterior doors; a modern aluminum and glass storefront door on the south and a pair of solid wood panel doors on the east. A third door, a single-leaf solid door on the south side, has been fixed shut. A rock-faced sandstone watertable is visible along the north and east sides. Along the north side of the building, the foundation is constructed of a concrete base that extends from just below grade, down approximately four-feet, topped with several courses of rough-hewn sandstone, and finished with a concrete cap that varies in width. This concrete cap is visible along the east and north sides of the building only. A grid of small steel I-beams have been inserted along the north wall at the northeastern corner. The extent of this support structure is not known but is suspected to extend only along the eastern half of the north wall. Along the east side of the building the foundation consists only of sandstone coursing with no concrete or steel support structures.

While simple in construction, Building 228 has several decorative details of note. The first, as noted above, are the scalloped rafter tails in the exposed eaves. This detail matches similar details found on neighboring buildings, including Building 201. The rafter ends, soffit, windows, and door and window trims are painted white. This paint layer is failing in most cases. Above each of the doors and windows is an exposed brick header arch. At grade for each of the suspected original doors, a stone threshold is visible. All window openings seem to be original, or modified from original openings. A narrow, vertical opening has been filled in with brick on the south side. It too has an arched header and stone threshold. However, it is much narrower than the other suspected original entries and its use is undetermined at this time.

The south elevation serves as the primary entrance for the building. The aluminum and glass pair of doors have been retrofitted into an earlier opening at an unknown date. Replacement bricks are clearly discernable by their lighter color, smoother texture and very white mortar. A partially removed wood and corrugated plastic roof extension provides a limited amount of additional weather protection from the door to the western corner. The mysterious narrow filled opening is near the center of the elevation and a fixed wood door marks the eastern end. Three eight-over-eight wood windows are placed, one each between the door and former door openings.

On the east the sandstone foundation becomes more prominent as the grade slopes down to the east and to the north. This feature appears to have once been painted. Only traces of a whitish coating remain on the raised mortar joints and several, isolated stones. Near the center of this elevation is a set of double-leaf wood panel doors that open onto a set of stone steps that have been fitted with a concrete cap to form a small landing. Many of the windows on this side have been slightly modified to accommodate pipes and vents for the various dry cleaning and laundry-related equipment. A twisted metal awning rests over the door and concrete landing. It is partially detached from the wall and hangs along the wall surface.

The north elevation has had the most modification, mostly to enable equipment venting and transportation of chemicals from the storage tanks buried adjacent to the north side of the

building. It has four arched window openings fitted with square sash, similar to those found elsewhere on the building. The easternmost window is slightly taller and narrower than the others. This was the location of the lavatory and restroom facilities. Iron wall tiebacks are visible here. This is the only wall that exhibits these features. Four holes have been cut into the brick walls for pipes. Two of these are currently fully exposed. The other two are still fitted with ducts. Three utility poles are spaced equidistant along the façade.

The west side of Building 228 faces Halleck Street. This elevation exhibits the least amount of modification and the most severe condition issues. It has five windows, placed equally along the elevation. The sloped grade leaves only the northern half of the foundation exposed.

The stone retaining wall to the north of Building 228 is constructed of roughly-hewn coursed stone with a concrete cap. The wall is 126 feet long and varies in height from approximately six- to seven-feet. A shallow concrete trough is integrated into the base of the wall to direct water to a storm drains at the base of the wall. Iron pipes, spaced at random distances help to drain the hillside between Building 228 and the wall. The mortar has been partially weathered away and moss and lichen cover the joints and stone face along the western half of the wall. This more deteriorated section roughly corresponds to the width of the north wall of Building 228, suggesting that water management beneath Building 228 is not as successful as that near Building 229.

Interior materials and finishes
The interior of Building 228 reflects its utilitarian past. The simple square brick building has a largely open floor plan that has changed little over the course of its years of service. Most of the surfaces lack any finish beyond several coats of white paint and the framing system is visible from most interior spaces. The building interior is divided into two sections, each at a different level. The main section occupies the western 75% of the building and is divided into 3 rooms. The secondary section is approximately 18-inches lower and is composed of the eastern 25% of the building width. All floors are unfinished scored concrete that appears to date to the construction of the building. However several areas have been patched or replaced since. Originally constructed as a bakery, the building has also served as a laundry and dry cleaners and most recently housed a Presidio Trust maintenance woodworking shop. As of December 2009, the building is vacant.

Roof framing
The roof is clad in red asphalt shingles over a straight sheathed diaphragm. The framing below is exposed in all interior spaces except those within the concrete block room and the small storage rooms to the south. Everywhere else, it is painted white and is fully visible. The roof is framed with four wood trusses approximately 13-feet apart. There are 3-1/2" x 11-1/4" wood members perpendicular to the trusses at approximately 9-feet on center that supports 2x rafters and the straight sheathing. The length of the trusses is about 62-feet, 10-inches and they are supported on each end by a masonry pilaster. "X" bracing and diagonal bracing is found on the trusses that edge the monitor opening. The trusses are held together with large iron bolts and are strung with a series of pipes, pipe supports and ductwork.

Main workshop
The south entry opens into the main works space. The area immediately inside the entrance, between the south wall and the first roof truss, has a drop ceiling and a 12-inch square beige vinyl tile floor finish applied over the concrete. To the left is a wood lumber rack that occupies the space between the door and the western wall. To the right is a surface-mounted electrical

panel between the door and a window. A wood partition wall extends approximately eight-feet from the south wall and forms part of the division between the main workspace and a small, enclosed storage room.

Moving further into the room, the ceiling opens up to expose the roof framing and the floor transitions to exposed concrete. Additional wood lumber storage racks rest along the west wall, occupying three window bays. A large woodworking table occupies the area directly beneath the roof monitor and to the right, the room opens up to the lower-floor section of the building. The floor transition between these two spaces is via a concrete ramp or a set of two steps. All the walls in this main space are exposed brick, painted white. The roof framing is also painted white, as is the wood tongue-and-groove ceiling and ceiling trim. An additional workbench is located further north, against a concrete block wall.

The small space that forms the "el" of this room historically housed a sink and pressing equipment. A bank of electrical panels still remains against the north wall in this corner of the building, as do several capped water pipe connections. The floor in this area slopes to the north to a small floor drain.

Laundry boiler room
The main workspace is oddly shaped because of the later addition of two concrete block partition walls. The result is a separate room located in the center of the northern wall. The walls are of differing construction types. The north wall is brick and is an exterior wall. The east wall is partially brick up to the former chimney, then concrete block. The south and east walls are entirely concrete block. A large crack splits the south wall near its center and the east wall has a large gap at the ceiling line.

This room has a lowered ceiling and a highly irregular concrete floor. A series of pipes, painted red, run along the ceiling but are no longer connected to the decommissioned boilers along the north wall. A full inspection of this room was inhibited by the large amount of loose debris, equipment parts and abandoned equipment stored in the area.

Eastern aisle
The lower section of the building is a narrow sliver that runs north-south along the eastern wall. It originally provided access to the rear of the bakery ovens and was likely used as a storage area for ingredients and equipment. At its north end is a lavatory and at the south end is the boiler room and a small storage room. The floor in this area is scored concrete that is interrupted along its edges with a series of concrete equipment pads and forms. Just outside the lavatory is a shallow concrete basin that once served as a shower for the bakery staff. Beneath the northern window in this aisle is what appears to be a later concrete pad for laundry drying equipment. Across from this pad is a partial wood wall that forms a barrier between the upper floor and the lower floor areas. This opening was once a solid brick wall. This was likely done when the building was converted from a bakery to a laundry c. 1945.[25] The original arched door opening and steps are roughly centered in this room and continue to provide access between the two floor levels. Further south, a concrete ramp has been installed to provide more ready circulation for supplies between the two levels.

[25] This date is based on the approximate date that the bakery use was changed to the laundry/dry cleaning use as well as the instance of riveted connections. Welding largely replaced riveting by the onset of World War II.

The lower portion of the original chimney is still extant, although it has been removed above the roofline. It stands between the shower pan and a large wall opening to the left.

Lavatory
The lavatory is located at the northern end of the eastern side of the building. According to building records, this bathroom was added in 1938. There is evidence of modifications from a 2-stall restroom to the current single occupancy with industrial sink configuration. Unused piping has been capped. The window in this room is narrower than those in the other spaces, suggesting a different use from the general bakery activities. It was common for military bakeries to have a dedicated bathroom and shower space for the workers and it is likely that this area has always served this purpose in some capacity.

Immediately outside the entrance to this room is a concrete shower pan.

Boiler room
The boiler room is almost entirely filled with the Kawanee Portable Boiler. This piece of equipment was installed after construction and is suspected to date to the 1940s after the building was converted to a dry cleaner. The walls are all brick and heavily painted. Much of the painted surface has blackened from the heat of the boiler. The roof framing is exposed and is also blackened above the boiler. (It is painted white elsewhere in the building.) The concrete floor is broken where the boiler has been bolted to it. Along the south wall is a door opening and a paneled wood door. This door opens into a small storage room (formerly a restroom) at the southeast corner of the building, but is blocked by a large bookcase from the other side.

Storage rooms
Two storage rooms are located along the south wall of the building, to the east of the main entry. The first is the largest and has been recently constructed of 2x4 studs and plywood to secure tools and parts associated with maintenance activities at the Presidio. Its south and east walls are brick with the south wall being an exterior wall and the east wall an interior brick wall both original to the building. At the southeast corner of this room, is a door opening to a second, smaller storage room. This room is two steps down, on the same level as the eastern 1/3 of Building 228. It originally had a door opening to the current boiler room as well as an exterior door. A bookcase blocks the boiler room door and the exterior door has been covered on the exterior with plywood. Both original wood panel doors remain. Stubs for a sink are visible along the east wall but all fixtures have been removed.

CHARACTER-DEFINING FEATURES AND SPACES

Assessment of various features and spaces is done according to a double evaluation system. First, each of these elements is assigned a priority rating to create a sense of the relative historical importance of these spaces and features. In assessing the historic importance of each feature, a rating scale of "Premier-Important-Contributing-Non-Contributing" is used. In general, this system allows for the analysis of the structure as a whole to guide what types of work should be done, and where such work could be completed with the least damage to the historical integrity of the resource. The application of this scale to features and spaces differs slightly and is discussed in greater detail in the appropriate sections below. The second phase of evaluation, conditions assessment, follows in the next chapter.

Prioritization of Spaces
For Building 228, the prioritization of spaces takes into consideration a number of factors, including documented original intent, function of spaces, modifications to and evolution of the spaces, material integrity and current condition. All impact the eventual determination of significance for a given space. For Building 228, the general hierarchy of prioritization criteria was as follows.

Premier (Red)
Premier areas are those areas that are directly associated with the identified period of significance and whose contribution to the interpretation and communication of the historic resource is of primary importance. Loss of these features / spaces would significantly impact the resource and may result in a loss of integrity that would delist it as a contributor to the Presidio National Historic Landmark District. For these reasons, when developing mitigation plans for project-related work, all areas labeled "premier" should not be altered in any fashion. Failing to do so could result in a significant impact to the resource.

For Building 228, Premier spaces were categorized as such because they fell into one or more of the following:

- They are critical to the historical interpretation of Building 228 as a military bakery;
- They retain a high degree of material integrity and readily communicate their historical appearance, function and period of development.

Important (Blue)
Important areas for Building 228 are directly associated with the identified period of significance and inform the interpretation and communication of the historic resource but to a lesser degree than those with a premier ranking. These areas help to define the physical and historical context for the space but do not independently represent the historical significance of the resource. These spaces differ from premier areas because they embody historic aspects of the resource, but to a lesser degree. Sometimes they are secondary mechanical features connected to the operation of the building but were not directly involved in the primary function - baking.

The loss or significant alteration to these spaces would still allow the historic nature of the space to be discerned, but the overall experience would be severely impacted. Other times they are associated with lesser aspects of the period of significance.

Important spaces were designated because they were designed to influence the experience of the space. They could include:

- Spaces used for bakery functions but that have a lower threshold of integrity;
- Items that do not have a clear function but date to the period of significance.

Contributing (Yellow)
Contributing areas for Building 228 are part of the physical or historical context for the resource but are not directly associated with the main historical themes or areas of significance. They serve as visual connectors between Building 228 and the rest of the Presidio and provide the immediate setting for the resource.

These areas help to further enhance the resource through several means. Potential alterations in these areas would impact the resource, but loss of any one area or element may or may not be of consequence to the historical integrity of the resource. However, cumulative loss in these areas is of concern, therefore they are included for further consideration. How these spaces are treated will impact the setting for the resource.

In general, contributing spaces augment the interpretation of historic significance but do not hold a high level of historic value themselves. They could be areas that have been previously compromised, more modern intrusions that have acquired historic significance through continued use by the Army, areas that were installed after the period of significance but still display high artistic or cultural value, or areas that are simply related to the period of significance but not of primary historic importance. The loss of, or modification to, contributing areas lessens the overall level of integrity of the historic resource but not to a level where its interpretation of significance or historical importance is severely compromised. However, loss of all contributing areas would severely impact the resource. It is the cumulative impact that must be analyzed when modifications are made within contributing areas.

Contributing spaces in Building 228 are those that:

- Have been modified during the period of significance,
- Are not directly attributed to the original design but have become important features of the building and/or site over time.

Non-Contributing (Grey)
Non-Contributing areas for Building 228 are defined as being from outside the period of significance, of poor quality or not related to the period of significance or any figures or events associated with the historic interpretation of the resource.

Any space shaded grey should be considered non-contributing to the setting for Building 228. When possible, all alterations and modifications should be undertaken with designs that only effect non-contributing areas, or that limit their disruptions to mostly non-contributing spaces. Careful consideration of the impacts on all these areas will retain the maximum level of historic integrity and result in the least amount of damage and disruption to the resource as a whole.

At Building 228, non-contributing areas are mostly comprised of areas that:

- Have no clear historical function,
- They historically served as storage and utility spaces, or
- Are associated with activities and uses that are not historically important, such as dry cleaning or laundry uses or other, unknown interim uses.

A Space Prioritization Diagram follows to illustrate how the various spaces intersect and inform the more general planning and programming considerations.

Figure 3.2. Space priority diagrams for Building 228. This image is not to scale.

Character-Defining Features (CDF) [26]
As with character-defining spaces, it is often helpful to prioritize the character-defining features that make up a historic resource. For Building 228, these features include items both on and within the resource, as well as site features in the immediate vicinity that are critical to the structural stability of the building. The hierarchy for prioritization is similar to that used for spaces (primary, important contributing and non-contributing) but the definitions are more specific.

Premier
A premier rating is given to those features that are directly associated with the identified period or periods of significance and whose contribution to the interpretation and communication of a historic resources is of primary importance. If these features are removed, the historic integrity of the resources is highly compromised. Depending on the size, scale, and relationship of these items with the period of significance, historic integrity could be lost altogether. For these reasons, when developing mitigation plans for project-related work, all elements labeled, "premier" should not be altered in any fashion and should be protected to the highest degree. Failing to do so could result in significant impacts to the resource.

For Building 228 premier <u>exterior</u> features include:

- Building form, silhouette
- Brick walls
- Common-bond brick pattern with headers every fifth row
- Sandstone foundation/water table with beaded mortar, top course of stone has concrete finish
- Segmental arch door and window openings
- Hip roof with monitor
- Proximity to Building 229

Premier <u>interior</u> features include:

- Interior brick wall partitions
- Exposed roof structure/trusswork
- Extant wheels, rods, and gears of window opening system for clerestory windows of monitor roof

Important
Features given a rating of important are also directly associated with the identified period or periods of significance and they also inform the interpretation and communication of the historic resource. These elements differ from premier elements because they embody, to a lesser degree, historic aspects of the resource. Sometimes they are secondary decorative elements, which if removed or altered would affect the space, but still allow the historic nature of the space to be discerned, even if in a more limited way. Other times they are associated with lesser aspects of the period of significance.

[26] The identification and prioritization of character-defining features presented here builds upon information developed by the Presidio Trust and expanded upon by Garavaglia Architecture, Inc.

For Building 228 important exterior features include:

- Tinted mortar
- Original, paired historic doors, wood frame, four panel, east wall
- Granite window and door sills
- Three-light wood-frame windows in monitor roof
- Eight-over-eight double-hung windows
- Decorative rafter tails
- Proximity to Halleck Street
- Proximity to Buildings 202, 223, 227
- Northern retaining wall

Important interior features include:

- Scored concrete floor
- Any extant bakery equipment

Contributing
Contributing elements augment the interpretation of historic significance but do not hold a high level of historic value themselves. They could be items that have been previously compromised, modern replacements for original items, been installed after the period of significance but are still of a high artistic or cultural value, still available for replacement in kind, or simply related to the period of significance but not of primary historic importance. The loss of contributing elements lessens the overall level of integrity of the historic resource but not to a level where its interpretation of significance or historical importance is severely compromised.

For Building 228, contributing exterior features include:

- Iron security grills
- Red composition shingle roof – It is the color of the roof more than the roof material that is a contributing feature.
- Cream painted accents (doors, window frames and sash, foundation, etc.)

Contributing interior features include:

- Paint finish on brickwork
- Shower pan
- Lavatory location

Non-Contributing
These elements are typically from outside the period of significance, are of poor quality, are still commercially available or are not related to the period of significance or any figures or events associated with the historic interpretation of the resource. When possible, all alterations and modifications should be undertaken with designs that only effect non-contributing elements, or that limit their disruptions to mostly non-contributing elements. Such designs will retain the maximum level of historic integrity and result in the least amount of damage and disruption to the resource as a whole.

For Building 228, non-contributing exterior features include:

- Exterior pipes, vents and flues
- Door awnings (south and east)
- Gutters and downspouts
- Aluminum and glass entry doors
- Metal roof penetrations
- Utility poles (north)

Non-contributing interior features include:

- Concrete block partition (north)
- Electrical panels
- Piping suspended from the roof framing (dates to dry cleaning use)
- Storage room wood-frame partitions
- All laundry equipment
- All maintenance-related equipment and supplies
- Kewanee boiler – added to increase water heating capacity for laundry functions

CHAPTER 5: CONDITION ASSESSMENT

Building 228 has several significant conditions issues that may require some form of mitigation prior to construction on Halleck Street. Some appear to be chronic problems that first manifested themselves shortly after construction. Others are more recent and are the results of poor treatment and deferred maintenance. Generally, the follow types of conditions can be found on all the exterior elevations, as well in many of the interior spaces.

GENERAL CONDITIONS

- **Settlement cracks**. There are a number of significant cracks in the exterior walls. Most are found in the west exterior wall. Historical documents note that some cracking was noticed within three months of construction in 1909. The same documents also note that the building was constructed on fill. Recent fill data compilation mapping indicates that this area has been raised more than 20 feet both around and under Building 228. In addition to the original sub-standard soils, former uses in the building may have added to the soil instability, such as when areas immediately adjacent to the building were disturbed to accommodate buried chemical tanks.

- **Wall penetrations.** Installation of dry cleaning equipment required more through-wall penetrations than originally provided for in the building's design. Unfortunately, when these holes were created, they were not properly flashed or sealed, allowing water to freely enter the building. This has only been made worse by the removal of some of the vents and piping. Where there might have been spaces between the pipes and the wall, there are now large open holes where the pipes have been removed.

- **Poor repairs and deferred maintenance**. As a utilitarian building, repairs to Building 228 have been hastily executed without regard for long-term viability or appropriateness. Repointing has been done with mortar that differs in color, composition and hardness from the original. Replacement bricks have different surface textures and compressive strengths. Currently, the awnings are badly damaged. Instead of repair, these awnings have been removed in sections as needed or left in a damaged state.

NARRATIVE OF CONDITION, ELEVATION BY ELEVATION

Figure 5.1 – Damaged awning

South (front)

- Damaged awning. Building 228 is surrounded by a relatively deep roof overhang that is supported by rafter tails carved into a scroll-like pattern. On the south elevation, these rafter tails have been sistered to 2x4 boards that support a corrugated fiberglass and wood awning. Sections of the fiberglass have been removed, leaving the wood frame exposed. At the time of the site survey, one section of fiberglass was loosely hanging from the wood frame (see Figure 5.1.)

Figure 5.2 – Missing mortar.

Figure 5.3 – Damaged Brick.

Figure 5.4 – Insensitive alterations.

- Missing mortar. The original tinted mortar is still extant on much of the building. However at the southwest corner of the building, there is a large section where the mortar is deteriorated and can readily be raked from the joint with a finger. While no bricks appeared loose during the survey, the probability of further deterioration is very high (see Figure 5.2.)

- Damaged brick. Where attachments to the building have been hastily or forcibly removed, damage to the surrounding brick has resulted (see Figure 5.2 and Figure 5.3.)

- Insensitive alterations. The addition of a new entry sometime after 1948 was completed in a design that is inconsistent with the building architecture and historical details. Additionally, the installation resulted in replacement of most of the bricks surrounding the new door frame (see Figure 5.4.)

- Inappropriate material repairs. Modern brick has been used for repairs throughout the south elevation. Around the entry door, these bricks are directly contrasted with the original brick. Differences in texture, color and strength are apparent. The mortar used to bed the bricks is a different color than the original mortar and is much harder. This has resulted in hairline cracking, moisture retention and staining of the historic brick where it immediately abuts the repair materials (see Figure 5.4.)

- Loose and flaking paint. The entire soffit is experiencing finish failure. Several layers of white paint are flaking from the wood surface. Given the age and history of Building 228, it is likely that some of these layers are a lead-based paint (see Figure 5.5.)

West (Halleck Street)

- Cracking. The cracking along the west elevation is severe. Generally the cracks radiate from the corners of the windows, up to the top of the wall or down to grade. These

Figure 5.5 – Loose and flaking paint.

Figure 5.6 – West wall cracking.

Figure 5.7 – West wall cracking.

Figure 5.8 – Efflorescence.

cracks have been repaired several times in the past to no avail. All range from hairline to approximately 1/4-inch to an inch or more in width and go all through the wall. The cracks are allowing moisture to penetrate the wall, loosen and degrade mortar, and undermine the integrity of the wall itself (see Figure 5.6 and Figure 5.7.)

- Efflorescence. The center of the wall, just above an area of loose brick, is covered in a white film of efflorescence. While not as severe as that seen on the interior of the building, it is a sign that moisture is entering the wall and leaching out elements in the mortar (see Figure 5.8.)

- Improper management of storm water. The downspout at the southern corner is not connected to a rain leader. Any water draining off the roof in this location exits the leader directly at the base of the wall and runs downhill, along the length of the wall (see Figure 5.6.)

- Missing mortar. As a result of rain coming into contact with the base of the wall at the southern corner of the elevation, much of the mortar in this location has been washed away. On the interior, this corner exhibits advanced efflorescence. This indicates significant mortar loss on the interior of the wall that can undermine the integrity of the assembly (see Figure 5.6.)

North (rear)

- Cracking. There are significant cracks around the second window from the eastern corner of the wall. The cracks extend almost the full length of the wall, along the western edge of the window. Overall, the crack is fairly linear, through bricks and mortar joints equally, and through bricks, concrete and stone. This suggests that this is a structural failure and not the cause of seismic activity. A smaller, though still visible crack extends from the east side of the sill to the water table (see Figure 5.9.)

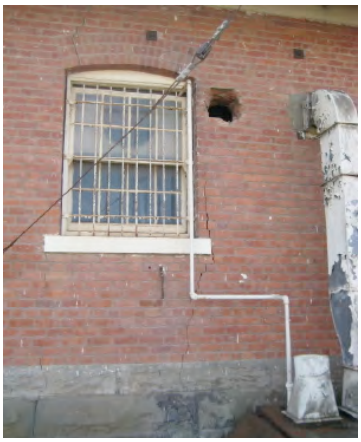

Figure 5.9 – Cracking, north wall.

Figure 5.10 – Through wall penetrations.

Figure 5.11 – Through wall penetrations.

Figure 5.12 – Utility poles.

- Through wall penetrations. There are a number of through wall penetrations made to vent interior machinery to the exterior. In several cases, ducting extends through the wall and connects to more equipment placed adjacent to the exterior of the north wall. None of this equipment is currently used. None of these penetrations appear to be properly sealed to prevent moisture infiltration. Currently, there is a large void (approximately six-inches in diameter) near the cracks noted above. Two other ducts protrude from the wall and are open at their ends. The remainders are small pipes or ducts connected to equipment (see Figure 5.10.)

  A wide, but shallow opening is at grade in the sandstone foundation. This opening appears to be intentional as the stone is property dressed around its edges. The purpose of this opening is unknown (see Figure 5.11.)

- Proximity of utility poles. Three utility poles are currently installed along the north wall between Building 288 and the retaining wall. Two are separated from Building 228 by five or more feet. However, the third is immediately adjacent to the building and is attached at the eave to the roof. The soil beneath these poles is soft and prone to settlement as water continues to move through. This is evidenced by the near constant stream of water exiting the retaining wall at the installed pipe drains. Strong winds, unstable soils and anticipated remediation work will further endanger the stability of these poles. There is a high probability of them falling and causing further damage to Building 228 and/or the retaining wall (see Figure 5.12.)

- Improper management of storm water. The gutters are damaged along the eaves on the north side of Building 228. Water is draining directly off the roof to the area near the sandstone watertable. This side receives little sun and is almost constantly moist during the wet season. This has caused the sandstone to chip, flack and generally deteriorate. While this condition is seen elsewhere on the

Figure 5.13 – Unmaintained storm water drain.

Figure 5.14 – Improper storm water drainage.

Figure 5.15 – Sandstone deterioration.

Figure 5.16 – Improper storm water drainage.

building, it is most pronounced on the North wall (see Figure 5.13 and Figure 5.14.)

East

- Deteriorating sandstone. Like elsewhere on the building, the sandstone watertable on the east wall is deteriorating. Part of the deterioration may be caused by inherent flaws in the stone, by improper quarrying techniques or improper orientation of bedding planes. However, these flaws are made worse by improper maintenance of the building. This sandstone was once painted white. Some traces of this paint are still visible on the stone and in the raised joints on the east elevation. Paint generally traps moisture within a material. Because sandstone is a highly porous building material, water is easily absorbed. If it has no way to evaporate out of the stone, it will cause the surface to crumble as the water becomes trapped behind the paint layer. This, in combination with improper management of storm water, has resulted in sandstone with a flaking and very soft surface. Loss of detail is evident on the stone surface where the chiseled quarry face has been smoothed out by loss of surface material (see Figure 5.15.)

- Improper management of storm water. There are gutters on along the East roofline, however grass and plants are growing in these gutters. Their presence of plants in the gutters suggests that they are full of organic debris and no longer along water to flow off the roof to designated drainage locations. Where the gutters are functional, they drain to downspouts that deposit the water immediately adjacent to the building. These areas show moisture damage in the form of stained brick and stone and loss of mortar (see Figure 5.16.)

- Brick damage. The brick header above the small window to the south of the east entry has been worn into a curved surface profile. This may be the result of earlier modifications to accommodate a pipe or vent in this

Figure 5.17 – Brick damage.

location. The size and shape of this window and its sill differs significantly from others on the building, suggesting that it originally served a different purpose or was located in an area with particular requirements for adjacent venting or lighting. Care should be taken to prevent this compromised brick surface from further deterioration (see Figure 5.17.)

NARRATIVE OF CONDITION, INTERIOR

The interior of Building 228 is primarily one large semi-enclosed space with several small storage rooms along the south wall. Most interior walls are three wythes thick. A north storage area is partially enclosed with concrete block partitions and one east storage room is partially enclosed with a 2x4 and plywood wall. The floor is a scored concrete slab.

The main room shows significant mortar loss along the west exterior wall, particularly along the southern half of the wall. The southwest corner has efflorescence the full height of the wall with concentration of salt formation near grade. Cracks in this corner, at window sill and header edges and in the floor area also plainly visible in spite of the debris obscuring some areas. Near the center of the wall, at the location of the worst settlement cracks on the exterior, the floor slab has dropped by approximately two-inches near the wall. No other walls exhibit such intense cracking or deterioration.

The concrete block partition is unstable. At the western end, near the open entry, a gap of several inches between the top of the wall and the ceiling is visible. In the center of the longest wall, the south wall, is a wide, full-height crack. This appears to indicate settlement of the slab beneath the wall. There is concern that this wall will collapse during seismic activity.

Much of the interior ancillary spaces were difficult to survey due to large quantities of materials stored on the floor and up against walls. In general, all conditions noted on the exterior were manifested in the corresponding locations on the interior. This indicated any failures of the wall matrix appear to be thru-wall conditions and will require structural solutions.

STRUCTURAL EVALUATION

While the exterior walls are generally stable, there are some locations that show noticeable erosion of the grout infill. It is also evident that the grout has been repointed in several locations. There is typical cracking of the walls near door and window openings. The area that has sustained the most damage is on the west wall. On this side of the building there is a substantial amount of cracking and crumbling. It is speculated that this damage has resulted from settlement of the perimeter foundation. A level survey of the building indicated that the northwest corner is approximately 2″ lower than the southwest corner, and that the center of the west wall is an additional 2″ lower than the northwest corner. The conclusion is that the

building has settled unevenly and this has resulted in a noticeable sag in the center of the west wall. What is uncertain at this time is how much of this settlement is historic and how much represents an active condition.

There is cracking along the joints of the interior brick partition walls. The more recently constructed concrete block wall has experienced some significant damage and warping. The cracking and warping of the interior walls is a result of the settlement of the interior slab on grade. The extreme settlement of the slab on grade is visually apparent.

The roof trusses have experienced some deformation as well. There are several gaps in the chord members and connections. There is a major crack in the bottom chord of the outermost truss on the north side. There is also noticeable warping of the roof diaphragm. This warping is in the form of bowing, sagging and rippling, which can be seen from outside the building. This is also most likely the result of uneven settlement of the perimeter foundation. Again, more investigation is required in order to determine the degree of the settlement.

SUMMARY OF EXISTING CONDITIONS

Exterior

Character-Defining Feature/Space	Priority Ranking	Condition	Notes	Photo #
building form & silhouette	P	G	Building form has remained unchanged	A1
brick walls	P	F	Brick is good in spite of cracks	A1
common bond brick pattern with headers every fifth row	P	F		
sandstone foundation/water table with beaded mortar, top course of stone has concrete finish	P	P	spalling, flaking, generally soft, quarry finish largely lost	
segmental arch door and window openings	P	F	most windows have cracks in headers	A2
hip roof with monitor	P	F		A3
proximity to Building 229	P	G	unchanged since construction	A4
tinted mortar	I	F	intact except where repairs have been made or at infill locations	
original, paired historic doors, wood frame, four panel, east wall	I	F	functional although not used	A5
Granite window and door sills	I	G	Paint removal needed to discern exact material	A2
three-light wood frame windows in monitor roof	I	P	Intact, if not entirely operable	A6
eight-over-eight double hung windows	I	P	several have been modified to accommodate pipes and ducting	A2
decorative rafter tails	I	F	paint layer deteriorated	A7
proximity to Halleck Street	I	G	unchanged since construction	A1
proximity to Buildings 202, 223, 227	I	G	unchanged since construction	A2
northern retaining wall	I	G	See below	A8

Iron security grills	C	F	Oxide jacking cracking brick	A2
Red composition shingle roof	C	F		A3
Cream painted accents (doors, window frames and sash, foundation, etc.)	C	P	paint condition varies by location	A1, A2, A5
Exterior pipes, vents and flues	NC	F	not property sealed	A9
Door awnings (south and east)	NC	P	east awning fell/removed, 2009	A10
Gutters and downspouts	NC	P	blocked by organic debris	A11
Aluminum and glass entry doors	NC	F		
Metal roof penetrations	NC	F	Vents	A3
Utility poles (north)	NC	F	very close to building	A8

Interior

Character-Defining Feature/Space	Priority Ranking	Condition	Notes	Photo #
Interior brick wall partitions	P	G	main room partition modified	A12
exposed roof structure/trusswork	P	F	trusses pulling from pockets	A13, A14
extant wheels, rods, and gears of window opening system for clerestory windows of monitor roof	P	F	operability not tested	A15
exposed brickwork walls	P	F		A16
scored concrete floor	I	P	cracked and uneven in places	A17, A18
paint finish on brickwork	C	F	mostly intact in spite of moisture damage	A16
Kewanee boiler	NC	F	functionality not verified	A19
Shower pan	C	F	used for storage	A20
Lavatory fixtures	NC	P	not original	A21
concrete block partition (north)	NC	P	large cracks, unstable	A22, A23
electrical panels	NC	F	various vintages	A24
piping suspended from the roof framing (dates to dry cleaning use)	NC	F	securely fastened but not functional	A25, A26
storage room wood-frame partitions	NC	G	newly constructed	A27
all laundry equipment	NC	UN	now removed to storage	
all maintenance-related equipment and supplies	NC	F	now removed to another location	

Retaining Wall

Character-Defining Feature/Space	Priority Ranking	Condition	Notes	Photo #
Rough hewn stone	P	G	biogrowth west of crack, east of crack is fairly clear	A28
Large aggregate mortar	P	G	hard and stable	A28
Concrete cap	I	F	cracked and repaired in spots	A29
Concrete gutter	I	G	blocked by small debris	A30
Drainage pipes	C	F	oxidized by stable, random locations and sizes	A30

MATERIALS TESTING

The obvious structural deficiencies found throughout Building 228 warranted further investigation through selective material testing. The goal of these testing procedures was to establish more firmly the ability of Building 228 to withstand potential increased stresses as a result of adjacent construction and changes in use of Halleck Street and nearby properties. Shear tests were conducted to inform discussions related to the integrity of the brick matrix of the exterior and interior masonry walls. Mortar samples were also collected at this time to inform discussions of the strength of the material and to develop appropriate repair recommendations. Shear tests were conducted by Smith-Emery Company from September 18 – 22, 2009. Equipment failures and difficulty prepping sample locations accounted for the lengthy test period. Mortar samples were also collected at this time from shear test locations 2 (interior brick wall), 8 (exterior north wall) and 10 (exterior west wall). Petrographic and chemical analyses were performed according to procedures outlined in ASTM C1324-05 and ASTM C856-04 to determine continuant materials, develop recommendations for an appropriate repair mortar and provide parameters for selection of repair materials.

Shear test results
Ten shear tests were conducted in September 2009. Tests 1 and 2 were on the interior brick wall, alternating sides. Tests 3 (west) and 4 (south) were on the interior of the building perimeter walls. Test 5 was on the exterior of the south wall. Tests 6 and 7 were on the exterior of the east wall. Tests 8 and 9 were on the exterior of the north wall. Test 10 was on the exterior of the west wall. Tests 1-5 and 10 gave fairly positive results with PSI measurements above 100. Tests 6-9 were less successful, ranging from a low of 23 psi to 91 psi. This may be the result of moisture damage from non-functioning gutters and downspouts (efflorescence and mortar deterioration are particularly of concern at the southwest corner), poorly executed repairs, or areas of inferior original construction.

Mortar analysis results.
The mortar samples from Building 228 consisted of well-graded, uniformly distributed siliceous sand, Portland cement and hydrated lime. This is to be expected for a building constructed in the early 20th century. All samples had relatively high levels of hydrated lime, which would indicate a weaker general mortar matrix. However, the samples exhibited higher than expected strength properties. In general the mortars appeared to be a fairly consistent mix of 1 part by volume of Portland cement to approximately 2 parts by volume of hydrated lime and an average of 7.5 parts of sand by volume.

PART 2 - TREATMENT AND WORK RECOMMENDATIONS

CHAPTER 6: PROJECT IMPACTS ON BUILDING 228

DESCRIPTION OF SITE-SPECIFIC CONSTRUCTION

Construction near Building 228 will be in several phases. Approximately 50 feet south of the building, Halleck Street serves as a dividing line between two phases of construction. To the west of Halleck the "Main Post Tunnel" will be constructed.[27] To the east of Halleck, the roadway will continue along a below-grade causeway. Halleck Street will be closed during construction of these two elements. After completion, Halleck Street will be rerouted over the end of the Main Post Tunnel.

Immediately below Building 228, just north of the retaining wall, the current asphalt parking lot will be excavated and Building 230 will be deconstructed to accommodate construction of a new Gorgas Avenue offramp for the new southbound Doyle Drive roadway. Girard Road will be extended to meet the new offramp and will serve as a new connector between the Presidio and Doyle Drive. This section is referred to as the "low causeway," and is designed to accommodate the new north- and southbound lanes of Highway 101.[28]

To accommodate these two below-grade sections of roadbed, Halleck Street will be raised, beginning at the southwest corner of Building 228 and peaking at some point north of the northwest corner of the building. The exact nature of the roadbed alterations, including heights relative to existing grade, slope and necessary modifications to the area immediately adjacent to Building 228 have yet to be determined. This document will be revised at a future date to more precisely address the scope of this related construction and possible impacts on Building 228.

Staging
Construction around Building 228 is primarily part of the middle stages of the project. However, there are several aspects of construction that will occur as part of the early and later stages of construction. Changes to circulation along Halleck Street and the order of Doyle Drive construction activities near Building 228 are as follows:[29]

- Construction near Building 228 during the early phases is concerned with installing the offline portions of the permanent northbound and southbound Doyle Drive roadway. These sections will be constructed without disruption of existing Doyle Drive traffic but may result in disruption of local traffic on Halleck Street and near Building 228. This is particularly true of the proposed southbound offramp to Girard Road and Gorgas Avenue, which will be constructed as part of this first phase. Demolition of the PX Building, Building 230 and Building 231 are included in this phase. The anticipated timeframe for this work is late 2010 – early 2011.

- Traffic will then be shifted onto the completed detour portions of Doyle Drive and onto temporary at-grade roadways to facilitate construction of the Main Post tunnel and low causeway sections of the project. The current Doyle Drive viaduct will be removed, Building 204 will be demolished, and Building 201 will be temporarily relocated. Halleck

[27] Ibid.
[28] *Doyle Drive Preferred Alternative: Presidio Parkway map*, Doyle Drive Project Interactive Map, http://www.presidioparkway.org/flash/map/.
[29] This information is according to the project website: http://www.presidioparkway.org/construction_info/construction_areas.aspx and supplemented with undated staging drawings provided by Caltrans on October 14, 2009.

Street will be closed during this phase. The anticipated timeframe for this work is early 2011 – late 2012.

- In the final stages of construction, traffic will be shifted onto the permanent Doyle Drive sections, including the Girard Road access and interchange. The temporary at-grade roadway will be removed and Halleck Street will be reconstructed over the end of the Main Post Tunnel. Portions of Building 201 will be returned to its original location after Halleck Street reconstruction has been completed. The anticipated timeframe for this work is late 2010 – late 2012.

ANTICIPATED IMPACTS

Construction-related impacts considered as part of this study are:

- Vibrations from deconstruction activities
- Vibrations associated with construction activities – both single event (blasting, pile driving, etc.) and continuous sources (construction equipment, soil tamping, paving, excavation, etc.)
- Potential alterations to groundwater levels as a result of construction activities
- Potential alterations to site drainage as a result of the change in roadbed grade immediately adjacent to Building 228
- Potential alterations to site circulation as a result of the change in roadbed grade immediately adjacent to Building 228
- Potential for further soil settlement under Building 228 and behind the stone retaining wall
- Alterations to traffic patterns around the building
- Potential damage from errant debris related to construction activities
- Potential impacts resulting from alterations to Halleck Street. This street is proposed for a grade change of up to 9-feet in the immediate vicinity of Building 228.

Also of note is the potential presence of an artisanal spring near the center of the parking lot below (west) of Building 228 and its retaining wall. There is visual evidence of continual water drainage through the surface of the retaining wall. This indicates saturated soil beneath and/or adjacent to Building 228. This may be part of the reason the west wall is settling at a different rate than the rest of the building. Construction activities, especially excavation, could disrupt the water table beneath Building 228, further destabilizing the soils and foundation.

Vibrations Standards
Anticipated impacts from this work are primarily limited to vibrations caused from single-event activities, such as blasting. The following is quoted from page 7-2 of the BETP (emphasis added):

> The Final addendum FOE (December 2005) addressed the potential for construction-related vibration to cause adverse effects to historic properties, including the Palace of Fine Arts and contributors to the PNHLD. This analysis was based on the findings of the *Noise and Vibration Study, South Access to the Golden Gate Bridge* (NVS) prepared by Environmental Science Associates in December 2004.

> The NVS used a standard employed for ruins and historic monuments for analysis of buildings on the Presidio as the upper level of vibrations to which historic buildings, particularly those of masonry construction, should be subjected. It was determined that these standards, .08 inch per second of peak particle velocity (PPV) at a 200-foot distance, was conservative but an appropriate limit to apply to buildings of historic interest that are more susceptible to damage. The NVS also noted that wood-frame buildings are less susceptible to damage by vibration than masonry buildings.
>
> The NVS stated that this standard is very conservative in terms of structural damage risk, particularly for intermittent events, including sustained pile driving. The NVS concluded that the use of bulldozers and earthmoving equipment used for tunnel excavation, jackhammers used to break-up reinforced concrete, and truck movements will not likely cause structural damage to historic buildings on the Presidio. The buffer zone for worst-case ground-borne vibrations could be less for equipment that would cause less vibration, such as a small bulldozer, which the NVS stated could operate as close as 25 feet from a fragile historical building without exceeding the ruins and monuments vibration standard.

Section 7.1.2 of the BETP goes on to state:

> Appropriate construction-vibration limits will be incorporated in the construction documents. The recommended ground-vibration limits are a PPV not exceeding 0.2 in/sec adjacent to the closest facades of wood-framed historical buildings in good condition and a PPV not exceeding .08 inch/second adjacent to the closest facades of historical buildings more susceptible to damage including buildings of masonry construction and wood-frame buildings in poor structural condition.

And Section 7.1.3 states:

> Vibration measurements and recording will be conducted before construction activities begin to establish a baseline, and during construction activities that may generate high levels of ground vibration within 200 feet of historic buildings.

The 2004 *Transportation- and Construction-Induced Vibration Guidance Manual* used by Caltrans notes several standards developed by various parties over the last 30 years for various types of buildings. It cites a vibrations limit of 0.5 PPV for repeated exposure if the building is old and in relatively poor condition.[30] The Swiss Association of Standardization noted in its vibration damage criteria several categories of buildings. Their Class II buildings contained concrete or masonry foundations and walls and their Class III buildings included concrete or masonry foundations with wood-frame ceilings and walls. Building 228 has a concrete foundation and masonry walls and has obvious structural deficiencies. This categorizes it as a Class IV structure. Therefore, according to this study, a continuous source vibration exposure limit of 0.08 PPV is most appropriate.

[30] Yong S. Chae, "Design of Excavation Blasts to Prevent Damage," *Civil Engineering, ASCE,* (Vol. 48, No. 4, 1978).

Other, more recent studies cited in the Caltrans report focused on the probably of certain types of damage occurring in historic and sensitive buildings. For each type of damage they provide a range of exposure that is has a certain likelihood causing an impact. For instance, the report draws upon the American Association of Highway and Transportation Officials (AASHTO) 1990 report, which provides the following maximum exposure guidelines:

Type of Situation	**Limiting Velocity (in/sec)**
Historic sites or other critical locations	0.1
Residential buildings, plastered walls	0.2 – 0.3
Residential buildings in good repair with gypsum board walls	0.4 – 0.5
Engineered structures, without plaster	1.0 – 1.5

This data became the basis for the threshold limits recommended in the 2004 report and subsequent used by Caltrans for construction project near historic buildings. These recommendations are summarized as follows:

	Maximum PPV (in/sec)	
Structure and Condition	**Transient Sources**	**Continuous/Frequent Intermittent Sources**
Extremely fragile historic buildings, ruins, ancient monuments	0.12	0.08
Fragile buildings	0.2	0.1
Historic and some old buildings	0.5	0.25
Older residential structures	0.5	0.3
New residential structures	1.0	0.5
Modern industrial/commercial buildings	2.0	0.5

Note: Transient sources create a single isolated vibration event, such as blasting or drop balls. Continuous/frequent intermittent sources include impact pile drivers, pogo-stick compactors, crack-and-seat equipment, vibratory pile drivers, and vibratory compaction equipment.

Vibrations Analysis
To date, Caltrans has provided the following documentation related to construction around Building 228. This includes several Caltrans reports and articles of correspondence related to the potential for impacts, specifically from ground vibrations caused by construction activities.

- Vibration calculations for Building 228 (1 page, .pdf)
  - Concluded anticipated vibrations would be 0.074 in/sec PPV at Building 228
- Doyle Drive Vibrations spreadsheet showing anticipated vibrations from various construction activities at the locations of 22 buildings. (15 pages, .pdf)
  - Building 228 is not specifically shown in the spreadsheet
  - Equations used to formulate PPV measurements at each building are given
  - Includes September 29, 2009 internal Caltrans memo justifying viability of a soil attenuation factor of n=1.4. This is applicable to "weak or soft soils" and represents a worst-case scenario for Caltrans calculations.
  - Includes excerpts (pages 14-19) from Caltrans *Transportation and Construction-Induced Vibrations Guidance Manual*, outlying parameters for determining impacts and thresholds for vibrations on different building types under differing environmental conditions. Within these documents, the values for PPV for historic structures range

from 0.3 – 0.5 in/sec PPV for a single blast and 0.1 - 0.5 in/sec PPV for repeated or continuous events.

- Doyle Drive Staging Plans – undated (10 pages, .pdf)
  - Briefly describe construction timeline and stages of construction
- Caltrans letter to the Presidio Trust, dated July 2, 2009 (2 pages, .pdf)
  - Presents recommendations to increase the vibrations threshold from 0.08 in/sec PPV for historic masonry buildings (agreed upon in the BETP) to 0.3 in/sec.
- Internal Caltrans correspondence presenting case for adjustment of the vibrations threshold from 0.08 in/sec to 0.3 in/sec PPV, dated June 14, 2009 (6 pages, .pdf)
  - Sites current conditions of buildings as relatively sound
  - Assumes stabilization of unsound buildings to a level to withstand the 0.3 in/sec PPV upper limit
  - Sites Caltrans studies of ambient vibrations around various buildings with results that often exceed the 0.08 in/sec PPV as a general environmental condition
- Internal Caltrans correspondence presenting a summary of known soils information, dated November 16, 2009 (3 pages, .pdf)
- Excavation profiles for the area north of Building 228 (4 pages, .pdf)

All of the above documents have been used to determine more precisely recommended vibrations threshold for specific buildings within the Doyle Drive Project APE. They are the result of studies conducted as mandated in the Programmatic Agreement (PA) between Caltrans, the Presidio Trust and other stakeholders. In the PA, and subsequent Built Environment Treatment Plan (BETP), a vibrations threshold of 0.08 in/sec PPV was established based on a body of previously published empirical and theoretical data. Provisions were made to more specifically determine an appropriate threshold for the unique soils, material types, conditions and construction activities found as part of the Presidio of San Francisco and the Project. As a result of these further measurements and calculations, Caltrans has suggested, "that the maximum PPV allowed can be raised from 0.08 in/sec. This PPV should be raised to [suit] the structures on site. Most of the structures onsite are in good condition, being either originally in good condition or have been seismically retrofitted or have been, or currently being, upgraded by the Presidio. Buildings 106, and 228, which are in poor conditions or are close to the proposed construction, will be stabilized before construction begins. [Caltrans] therefore recommend[s] that the maximum allowable PPV be increased to 0.3 in/sec measured at the building, in accordance with the Swiss Association of Standardized Vibration Damage Criteria."[31]

Based on the information provided and independent observations of existing conditions, Garavaglia Architecture, Inc. and Duquette Engineering support the recommendation that the vibrations threshold be raised to 0.3 in/sec PPV provided the buildings receive an appropriate level of shoring prior to the commencement of construction activities.

It should be noted that the language used in the June 14, 2009 letter refers to the seismic retrofit of the buildings. Based on field observations and analysis done to date, full seismic retrofit of the buildings does not appear to be necessary. However, some level of stabilization is required bring the buildings into a state where the 0.3 in/sec PPV can be universally applied. Building 228 has had no retrofit or other stabilization measures implemented. Therefore, some level of work will be required prior to the commencement of construction to enable it to be subject to the 0.3 in/sec PPV vibrations threshold.

[31] Meg Scantlebury, Caltrans. *Letter to Rob Thompson, Presidio Trust*, 6.

Building 228 is in fair-to-poor condition. The south and east exterior walls appear relatively sound and plumb with few cracks and only minor material damage (spalling sandstone, modified windows, deteriorated gutters, etc.) However, the north and west walls exhibit more extensive damage from improper repairs, lack of maintenance and settlement. The north wall has several through-wall penetrations that are not sealed, including one void where ducting has been removed. The west wall has several large cracks, including a triangular arrangement of cracks at the base of the center of the wall. This area appears to be a flex point for settlement. The interior of the building is a combination of masonry and wood-frame walls, with a single large open space occupying most of the northwest section of the building. Cracking along the west wall is evident and the concrete floor slab has dropped by approximately 2-inches along the center of the west wall. A CMU interior partition has also cracked and is currently unsupported at its base. At least one roof truss is cracked and is pulling away from its bearing point along the west wall. The building is not level, with a drop of nearly 2-inches at the center of the west wall.

Exploratory trenches were dug adjacent to the east exterior corner of the north wall and adjacent to the center of the west wall to investigate the nature of the below-grade foundations. The north trench revealed a concrete foundation topped with a grid of small steel beams that extended approximately 6-inches beyond the face of the wall into the surrounding soil, topped with sandstone coursing that extended above grade. Water filled the trench at a depth of approximately 3-feet below grade. The west trench revealed only sandstone coursing placed on soil. A large crack extended from the brick wall down through the first 2-feet of stone coursing. While damp, no standing water was encountered in this area.

Shear tests were conducted in September 2009 with relatively positive results overall. However, there were four specific areas that performed more poorly than expected (with psi measurements less than 100.) This may be the result of moisture damage from non-functioning gutters and downspouts (efflorescence and mortar deterioration are particularly of concern at the southwest corner), poorly executed repairs, or areas of inferior original construction.

Measurements and calculations conducted by Caltrans indicate ambient vibrations levels of up to 0.074 in/sec PPV in the vicinity of Building 228. This level approximates the previously agreed upon threshold for historic masonry buildings (0.08 in/sec PPV.) At this ambient level, Building 228 appears to be stable. This is based on crack monitoring over the past 6 months which show no expansion of select cracks on the north and west elevations.

Even though construction-related vibration levels are not anticipated to exceed the recommended 0.3 in/sec PPV threshold, the current condition of Building 228 may require some pre-construction stabilization work to prevent potential damage.

CHAPTER 7: WORK RECOMMENDATIONS AND ALTERNATIVES

The overall mandate for the Doyle Drive project, with respect to cultural resources, is to inflict no damage on the buildings. To quantify what damage may or may not be the result of construction activities, as well as to determine what stabilization methods are necessary to maintain the current state of the potentially impacted structures, a pre-construction conditions assessment was made to establish a baseline for comparison. After completion of construction, any damage determined to be a result of construction activities will be addressed to the extent required to return the buildings to their pre-construction condition. The one exception to this is Building 201, which is called out in the BETP for rehabilitation at the conclusion of construction.

TREATMENT APPROACH

As part of a National Historic Landmark District, any work on Building 228 should follow the Secretary of the Interior's Standards for the Treatment of Historic Properties. Therefore, it is important that these guidelines be included as a vital part of the planning and implementation processes. The Secretary of the Interior has developed a series of Treatments and Guidelines for dealing with historic properties. There are four types of treatments, each with their own very specific definitions, standards and guidelines for implementation: Preservation, Rehabilitation, Restoration and Reconstruction. Of these four treatments, preservation is the most appropriate for dealing with construction-related stabilization of Building 228.

Preservation
Preservation is defined as "the act or process of applying measures necessary to sustain the existing form, integrity, and materials of an historic property." This includes measures implemented to protect and stabilize the property and focuses on maintenance and repair over replacement with new materials. Additional constructions, such as additions, are not included under this treatment option. However, limited systems upgrades can be considered a preservation measure if it is appropriate to the resource and its functionality.

There are eight standards to govern the implementation of Preservation treatments.

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.

As a treatment, preservation is the most appropriate treatment when the project goals are to stabilize the resource against future damage. It is a minimally invasive treatment that seeks to address structural deficiencies in a highly sensitive manner. New uses are generally not introduced under this treatment approach. As such, Preservation is the guiding treatment philosophy for the stabilization of Building 228 against construction impacts.

RECOMMENDATIONS

The following recommendations are presented in a prioritized order. Implementation of any of these measures will increase the ability of the building to withstand potential construction-related damage as well as to improve the general material integrity of the resource. Also presented are optional upgrades that are typically required by code but may not be required as part of this project.

To develop the recommendations below, Garavaglia Architecture, Inc. and Duquette Engineering have reviewed a series of materials provided by the Presidio Trust, Caltrans, ICF International, and other data found during project research. These documents establish a conservative single-source event PPV threshold of 0.3 in/sec. This assumes that the building is a Class IV structure, defined as "construction very sensitive to vibration; objects of historical interest."[32] These definitions and numbers have been incorporated into the environmental planning documents produced for this project and have been used thus far to determine potential impacts on historic buildings.

Based on these criteria, and the information presented by Caltrans related to construction activities in the area, we feel that as a Class IV building, the anticipated vibration impacts from construction have the potential to remain within the thresholds quoted above. However, these vibrations thresholds assume some level of stabilization. Therefore, it is recommended that those areas that are of immediate concern and pose the highest potential threats with regard to life-safety issues at Building 228 be addressed prior to construction.

Note: This draft does not consider the impacts of, or present recommendations to address, the proposed alterations to the elevation of Halleck Street. Future drafts will be revised to more

[32] Jones & Stokes, *Transportation- and Construction-Induced Vibration Guidance Manual California Department of Transportation* (Sacramento, CA: California Department of Transportation, Noise, Vibration, and Hazardous Waste, June 2004), 16.

accurately represent this portion of the construction project, once the scope of construction is more firmly established.

Pre-Construction Recommendations
The following are intended to be executed prior to the start of any construction activities to stabilize areas of concern, such as the west wall, that have a high likelihood of exacerbation by adjacent construction activities. Several recommendations also serve to remove potential hazards that could cause damage by being indirectly triggered by construction activities. These recommendations are based on the findings of the materials reviewed related to anticipated construction-related vibration impacts, an understanding of the construction activities around each site, and analysis of known existing conditions.

The following are presented as baseline stabilization recommendations. The recommendations below will stabilize the structure and establish means and methods for monitoring any possible effects and impacts due to construction activities. The first item represents a minimum level of stabilization. Addition of subsequent recommendations will enhance the structural and material integrity of the building, providing a greater ability to withstand vibrations both below the 0.3 in/sec threshold and the occasional instances that may exceed this level.

1. Localized repointing to re-establish a weathertight building envelope and strengthen areas of known degradation. This includes visible cracks, areas of mortar loss/damage and repairs to wall voids on both interior and exterior services were required. These repairs are estimated at less than 30% of the interior and exterior walls. (This percentage will be further refined after additional site visits and detailed analysis of recently received shear test data.)

   All repointing should be executed with an appropriate mortar designed to be compatible with the historic materials. Samples were analyzed according to procedures outlined in ASTM C1324-05 and ASTM C856-04 to determine continuant materials, develop recommendations for an appropriate repair mortar and provide parameters for selection of repair materials. Based on the results of material sampling and analysis, the repair mortar should be composed of a mixture of Portland cement, hydrated lime and sand. The sand should be well-graded and should match the existing in color, particle size and shape. In general, the ratios of cement to lime should be approximately 1:2.5, with an overall composition of approximately 1 part Portland cement to 2.5 parts hydrated lime to 8 parts sand by volume.

   Any replacement brick should approximate the existing in color, size, compressive strength and texture.

2. Installation of temporary shoring to support the roof structure where necessary. The intent of the shoring is to remove some of the bearing weight from the exterior walls as well as to limit movement of the roof structure. Provided the building remains structurally sound at the completion of construction, this shoring should be able to be removed without causing further damage to the building.

   During construction, if any monitors indicate movement within the building, analysis should be done to determine what construction-related loads, if any, have been transferred to the supports. If loading of the bracing is detected, measures to stabilize the structure should be immediately undertaken to address the causes of loading. (Such measures are discussed below in greater detail.) Only once qualified professional have concluded that no

loads are being carried by any temporary support structures, should these elements be removed.

3. Installation of additional crack monitors to more closely track building movement is highly recommended. These monitors should be checked on a regular basis – once per week under current conditions and once per day during periods of peak construction in the area – to verify any movements in the building envelope. Monitors should be placed on all four elevations with multiple monitors on the west wall to track movements on all major cracks.

4. Installation of elevation monitors to track the vertical movement of the building is highly recommended. These monitors will indicate shifts in the building related to soil settlement or foundation failures. Monitors should be checked on a regular basis – once per week under current conditions and once per day during periods of peak construction in the area. Monitors should be placed on all four elevations. Multiple monitors should be placed on the north and west elevations – at wall ends and at center points – to monitor those areas of particular concern.

5. Geotechnical studies to establish soil parameters. The results of these tests will inform the necessity and nature of any foundation stabilization measures (see Contingency Plan Recommendations below.) Soil borings and analysis will be conducted to more accurately determine the need for any foundation or soil stabilization plan. If development of such measures is needed, they will be developed and presented to the Presidio Trust for approval.

Recommendations During Construction Periods

1. Equipment Testing
   As required in the BETP, testing of all equipment proposed for use within 200 feet of the buildings is recommended to determine actual vibrations levels and soil attenuation factors at each building prior to the beginning of construction. Most of this testing has been completed and has informed the development of this document. Any additional testing will be conducted according to the requirements of the BETP and the results will be used to refine these recommendations if required.

2. Continual monitoring
   As stated in the BETP, continual monitoring during construction is required.[33] Such monitoring should include vibration measurements and recording during construction activities that may generate high levels of ground vibration within 200 feet of historic buildings. These include pile-driving, excavation, hauling of dirt, placing of base material, compaction, and during paving operations or other significant activity. The vibration-monitoring-system equipment (seismograph) should undergo certified-laboratory calibration conformance at least once a year. The precise location of the monitoring equipment is contingent upon the final project design. It may be placed in or adjacent to buildings, structures, or between demolition/construction activities and buildings and structures. The locations should be identified by qualified professionals prior to the commencement of any demolition or construction activities and should be incorporated into construction contracts, plans, and specifications.

[33] *Built Environment Treatment Plan*, Chapter 7-2.

The seismograph sensors should be firmly set in undisturbed soil or firmly mounted on at-grade concrete slabs or asphalt pavement. After establishing baseline measurements prior to the start of construction activities, vibration measurements should be conducted for at least two hours at each location during a typical measurement day. The vibration monitoring should be carried out using calibrated seismographs that provide instant electronic or paper recordings of the maximum PPV recorded in each of three orthogonal directions, over intervals not exceeding one minute. The seismographs should be capable of activating immediate audible or visual alarms or electronic transmission to alert the contractor's representative and monitors if the vibration exceeds a preset limit. If the limits are exceeded, the construction work causing the overages should immediately cease. Before the work is permitted to resume, the contractor should investigate modifications to the construction procedures or alternative procedures that might reduce vibration to an acceptable level. Monitoring also assesses whether the best-practice standards are being successfully implemented to avoid vibration impacts.

3. Periodic 3D laser scans of the building and the retaining wall should be conducted every 2 weeks if the monitors indicate movement of more than 1/32". Periodic scanning should continue until movement has ceased. Scans should be processed as quickly as possible to document and support any other visible changes detected by other monitoring procedures.

4. Monitoring of vertical wall planes for rotation is recommended. The west wall already exhibits signs of rotation. This has resulted in decreased bearing surfaces for the roof trusses. If shifts of more than 1/8" are detected, all construction in the area will be temporarily suspended. The contractor will be notified that supplemental stabilization measures will be implemented to mitigate impacts on the building. The contractor at his option may chose to continue work via different means if those means do not cause additional impact to the building.

5. As mentioned above, weekly or/daily monitoring of crack movements is also recommended. If shifts are recorded more than 3 days in a row, or total more than 1/8", all construction in the area should cease until further stabilization measures are developed and implemented.

Retaining Wall

1. Monitoring of vertical wall planes for rotation is recommended. The west wall already exhibits signs of rotation. This has resulted in decreased bearing surfaces for the roof trusses. If shifts of more than 1/8" are detected, all construction in the area should cease until further stabilization measures are developed and implemented.

2. Monitoring of water flow through drainage pipes is recommended. The soil behind the retaining wall is known to have a high water table. Drainage of this water and any additional runoff from weather must be properly managed to maintain integrity of the wall. Changes in water flow could indicate blockages of the drainage pipes, changes in water table levels, or changes in potential spring flow under Building 228.

Contingency Plan Recommendations

Should any of the construction monitoring indicate destabilization of the building from its current state, implementation of one or more of the following contingency measures may be recommended. All may require additional work to develop into solutions that can be immediately implemented should they become necessary.

1. Installation of supplemental structural supports to realign the exterior walls and to support the existing trusses. These supports may be temporary in nature provided they adequately address the existing conditions of split members and separation of the trusses from bearing points along the exterior walls. If possible permanent solutions should be considered to more fully protect the building in the long-term.

2. Adequate attachment of the brick walls to the roof diaphragm in order to prevent out-of-plane failures.

3. Increase the roof diaphragm resistance to work in conjunction with the anchors implemented in item 2.

4. Stabilization of the foundation to mitigate settlement issues by means of soil remediation or underpinning.

5. Development and refinement of a foundation stabilization plan in accordance with the recommendations provided by geotechnical studies conducted in the pre-construction phase. This may consist of underpinning of the foundation or other soil stabilization measures as appropriate to the site-specific conditions.

Post-construction
After construction activities have finished, a conditions assessment should be conducted according to the methodologies used during the pre-construction phases. The results of this assessment should be carefully compared with pre-construction results and should include written conditions assessments, with photographs and drawing as necessary to form a set of documents that can be compared to the pre-construction and pre-stabilization states.

OTHER SUGGESTED WORK

Beyond the need to stabilize Building 228 to avoid construction-related damage, there are other areas of concern that were noted during the conditions assessment phase of this HSR. As a general course of action, it is recommended that these issues be addressed as part of any future building rehabilitation or planning project.

1. Moisture damage
   While gutters and downspouts are installed around portions of Building 228, none appear to be properly functioning. Some are clogged with plants and debris. Many downspouts terminate before reaching grade, allowing water to flow directly down the exterior walls. Installation and maintenance of a water management system is recommended. Gutters should be routinely cleaned and repaired to prevent overflow and leaks. Downspouts should extend to grade and be connected to leaders to direct water away from the building's foundations. Alternatively, the runoff can be directed in storm drains, provided the drains are operational.

2. Oxide jacking
   The existing iron security grills over the windows are in various states of deterioration. While all remain functional and sound, most exhibit some level of rusting where they are connected to the brick wall. As these bars oxidize, they exert tremendous pressure on the surrounding brick, causing cracking and spalls. The grills should be temporarily removed,

consolidated, repaired, primed and painted, and reinstalled. The brick should also be repaired prior to installation. Some units may require replacement while others can be filled with an appropriate brick repair grout designed to match the original material. Maintenance of the painted grill surface should be included in the building's regular maintenance schedule.

3. Site drainage
   Grading along Building 228 is a concern. Currently water drains directly adjacent to the building and this has caused, or worsened mortar and brick conditions in these locations. To limit the potential for moisture damage and retention, installation of drains, connection of downspouts to stormwater drainage systems, or regrading of the area between Building 228 and Halleck Street are highly recommended.

4. Settlement of interior slab
   Further investigation is needed to determine the causes of settlement of the interior floor slab. Once the causes for settlement, and conditions of the supporting structure is known, development of repair measures are recommended.

5. Repair to the floor
   There are numerous holes and uneven floor areas throughout the building. The worst locations are at the north where much of the laundry equipment was once directly attached to the floor. These holes should be carefully repaired to improve safety within the building as well as to allow for proper drainage of the floor slab. Care should be taken not to obscure any previous repair joints and these may indicate the former locations of the bakery ovens or other bakery-related equipment

6. Installation of permanent repairs to roof trusses
   The roof trusses are in various states of deterioration. Some are functioning properly, however several have pulled away from their wall support locations, are split, or have been compromised by previous alterations. Installation of permanent stabilization measures is recommended after construction has ceased to improve the long-term stability of the building, especially during a moderate-to-severe seismic event.

7. Repairs to the monitor windows
   The windows in the central monitor exhibit signs of deterioration that range from peeling paint to damaged frames. A detailed assessment of the windows' conditions was not conducted as part of this study. A window survey is recommended to more precisely determine the state of the windows and any necessary repairs to return them to a weathertight condition and restore some level of operability.

8. Pedestrian security
   The new roadbed could be up to approximately nine-feet higher than the existing. Currently, the height of Halleck Street along Building 228 is level with the sloping grade. As the road is raised, it is advisable that a space between the new roadbed and Building 228 be created. This will have the least impact on the west façade. However, it may require a short retaining wall or pedestrian barrier be constructed along Halleck Street to prevent mis-steps off the resulting grade differential.

CHAPTER 8: SUMMARY

In summary, Building 228 is in stable condition under the current environmental circumstances. The variety and types of construction anticipated in the immediate and surrounding vicinities will require some level of stabilization to the building to prevent further damage. Even though Building 228 currently experiences vibrations levels close to the more conservative recommended threshold for historic buildings, fluctuations in these levels due to construction-related activities are anticipated.

Construction around Building 228 will consist of excavation for the new Main Post tunnel immediately west of Halleck Street. In addition, excavation related to a below-grade causeway immediately east of Halleck Street is also anticipated. These activities are just beyond the 200-foot impact radius established in the BETP. Within the 200-foot radius are plans for excavation of the lot immediately north of the retaining wall. This soil has been determined to be contaminated and will be removed off-site for disposal. Halleck Street may be closed for most of this construction to thru-traffic.

Construction-related impacts considered as part of this study are:

- Vibrations from deconstruction activities
- Vibrations associated with construction activities – both single event (blasting, pile driving, etc.) and continuous sources (construction equipment, soil tamping, paving, excavation, etc.)
- Potential alterations to groundwater levels as a result of construction activities
- Vibrations from alterations to Halleck Street. This street is proposed for a grade change in the immediate vicinity of Building 228
- Potential alterations to site drainage as a result of the change in roadbed grade immediately adjacent to Building 228
- Potential alterations to site circulation as a result of the change in roadbed grade immediately adjacent to Building 228
- Potential for further soil settlement under Building 228 and behind the stone retaining wall
- Alterations to traffic patterns around the building
- Potential damage from errant debris related to construction activities

Given the current state of Building 228 and the north retaining wall, and the results of the testing performed to date related to the stability of the building and potential impacts from nearby construction, measures to supplement the current support structure of the building will be necessary to prevent further damage. To support the application of a 0.3 in/sec PPV upper threshold for construction related vibrations, the following pre-construction stabilization measures are recommended.

- Repointing of select interior and exterior locations to strengthen the brick-mortar matrix. The percentage of wall surface that requires repointing will be field verified prior to the start of construction
- Installation of temporary supports to reduce the bearing weight on the stressed roof trusses
- Installation of protection barrier on the north and west elevations
- Continual monitoring of cracks during construction
- Continual monitoring of wall planes (including the retaining wall) during construction

- Completion of geotechnical studies to more precisely determine soil conditions adjacent to Building 228
- Development of contingency measures should the monitoring result in evidence that the building is exceeding tolerances prescribed in this HSR.
- Implementation of contingency measures as necessary and needed

At the completion of construction, a post-construction conditions assessment should be conducted to verify the impacts of the project, if any, and to determine appropriate procedures to address damage should it occur.

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PROFESSIONAL QUALIFICATIONS

GARAVAGLIA ARCHITECTURE, INC.

Garavaglia Architecture is committed to providing innovative and cost-efficient solutions for a variety of architectural and planning needs and for a broad range of clients such as:

- Federal, state, and local agencies
- Private developers
- Non-profit groups
- Building owners

Since the establishment of the firm in 1986, we have developed expertise in providing clients with creative, technically competent solutions to their design needs, including:

- Historic preservation projects and reports
- Building renovations and upgrades
- Commercial and retail development
- Office and retail interiors, space planning
- Master-plan analysis

We approach each project as being unique to create a range of solutions that are developed to provide a positive design impact that respects the client's goals and budget as well as the historic character of the building and its site.

Garavaglia Architecture understands that truly innovative solutions are not achieved in a vacuum. We are committed to a collaborative approach to design, encompassing economic as well as aesthetic decisions that benefit the client and the community.

Knowledge of Standards, Regulations, Codes & Technology
Our projects keep us actively researching the UBC, State Historic Building Code, California Building Code, energy codes, accessibility regulations (including ADA), Secretary of the Interiors Standards for Rehabilitation and Preservation, and other applicable references. With this constant review and verification, we are very comfortable with the various aspects and applicability of the codes especially how they apply to existing buildings, relocation, change of uses and other upgrade "triggers".

Our work with historic structures keeps us in close contact with the spirit of the Secretary's Standards and how they apply to the various types of historic properties.

We have been involved with projects addressing the needs of NEPA/Section 106 Review, the California Environmental Quality Act and the laws impact on Historic Resources. We have provided input on the laws implications and made recommendations on its use. We also have a good working relationship with the State Historic Preservation Office as well as many local governmental agencies, planning and building departments, allowing us to coordinate reviews and work with these agencies to eliminate potential problems or delays. As a professional preservation architecture firm, our projects follow the guidelines set forth in the Secretary of the Interior's Standards for the Treatment of Historic Properties and employ a number of staff members that exceed the professional qualifications for Architectural History, Architecture and Historic Architecture.

DUQUETTE ENGINEERING

Duquette Engineering is a full service engineering company specializing in residential and small to mid-size commercial projects. Currently our staff consists of 1 structural engineer, 5 engineering assistants, 2 CAD drafters and 2 office support staff.

Duquette Engineering has a variety of experience working with architects, building owners, public agencies, and developers on a wide variety of projects, which include both residential and commercial buildings. We have twenty-five years of specialized experience in the rehabilitation, seismic retrofit, and modification of existing and historic residential and commercial structures. Our varied experience with both residential and commercial structures, new construction and historic preservation projects, gives Duquette Engineering a unique ability to provide the proper level of engineering to both large and small projects.

APPENDIX A: EXISTING CONDITIONS PHOTOGRAPHS

Figure A1. Northwest corner, looking south-east.

Figure A2. Southeast corner, looking north-west.

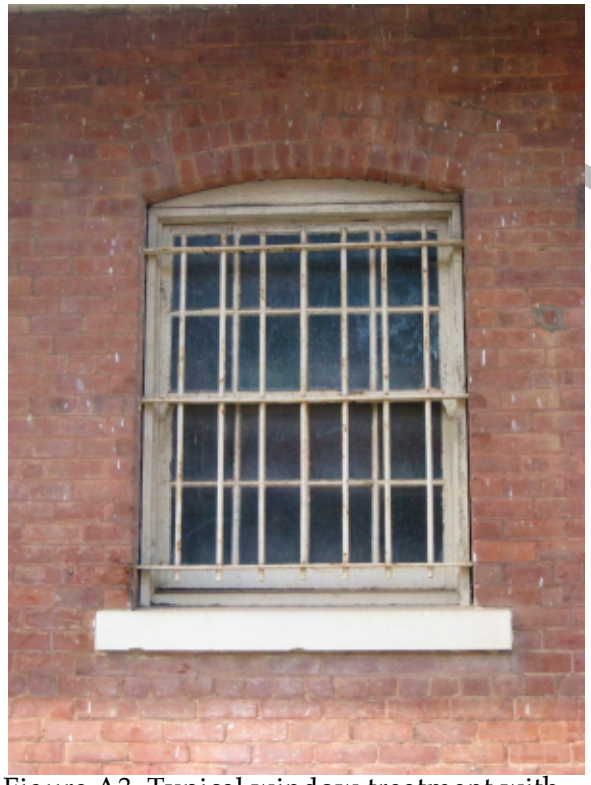


Figure A3. Typical window treatment with arched header, painted sill and iron grate.

Figure A4. East entrance with wood door and awning. The awning has since been removed.

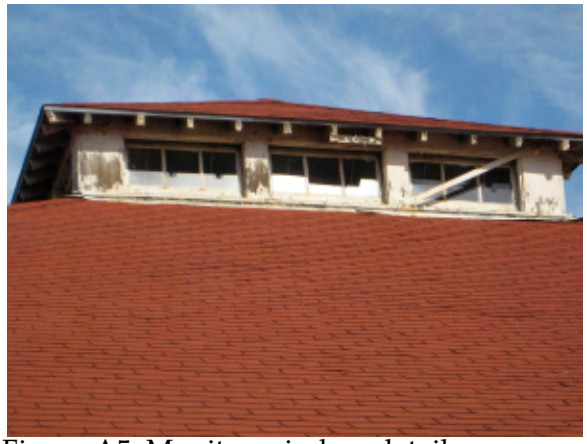


Figure A5. Monitor window detail.

Figure A6. Retaining wall and Building 229.

Figure A7. Sculpted rafter tails.

Figure A8. North elevation with retaining wall.

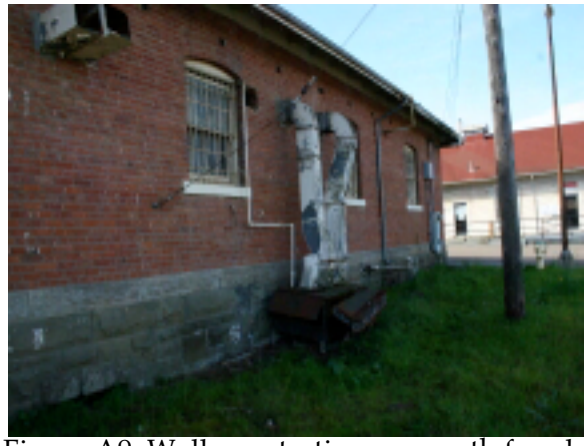


Figure A9. Wall penetrations on north facade.

Figure A10. East façade with awning.

Figure A11. East elevation biogrowth in the gutter.

Figure A12. Interior brick wall, modified.

Figure A13. Roof trusses in monitor section.

Figure A14. Roof truss at the west wall.

Figure A15. Roof trusses and pipes, looking west.

Figure A16. Painted brick exterior wall, typical, looking west.

Figure A17. Scored concrete floor at bathroom.

Figure A18. Scored concrete floor where slab has dropped at the center of the west wall.

Figure A19. Modern bathroom fixtures. Ghosting in the paint shows original locations.

Figure A20. Original concrete shower pan now used for paint storage.

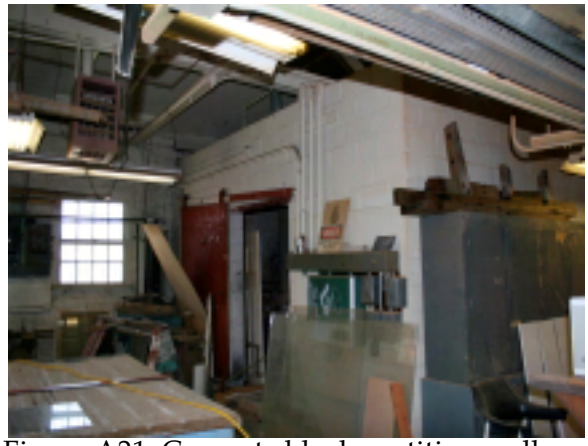


Figure A21. Concrete block partition wall, looking northeast.

Figure A22. Modern wood partition for maintenance storage room.

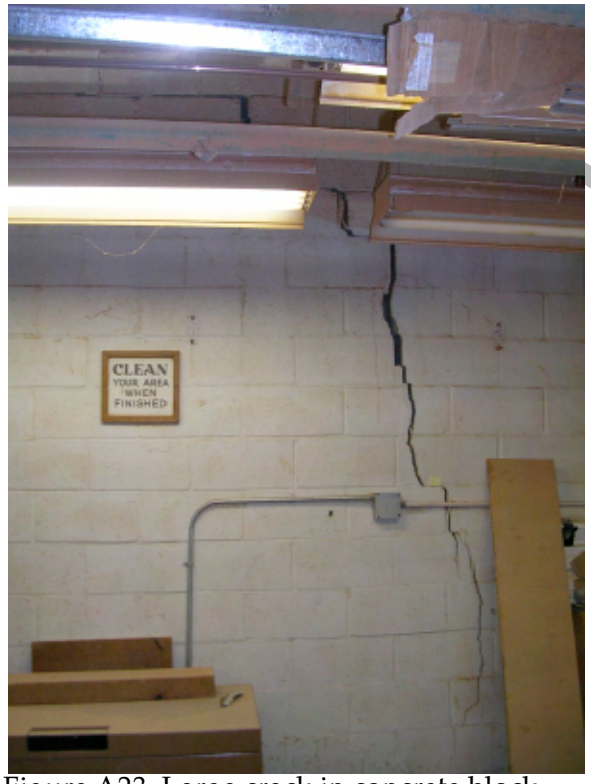


Figure A23. Large crack in concrete block partition wall, looking north.

Figure A24. Electrical panels, various eras.

Figure A25. Obsolete plumbing suspended in north concrete block room.

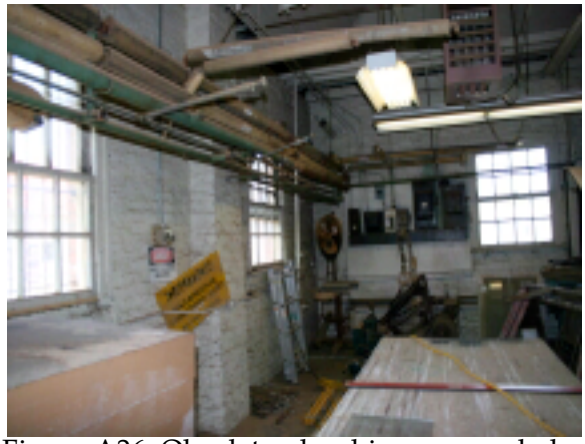


Figure A26. Obsolete plumbing suspended from roof trusses.

Figure A27. Kawanee boiler.

Figure A28. Stone retaining wall

Figure A29. Concrete cap on stone wall.

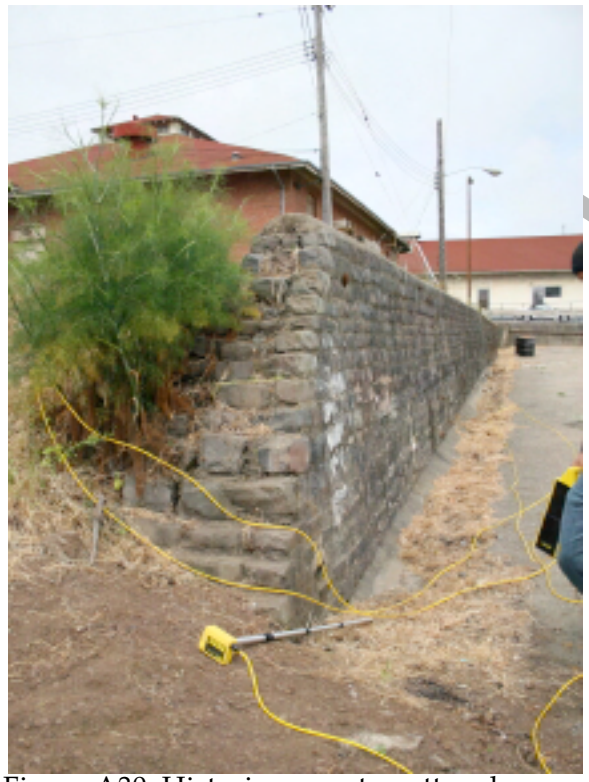
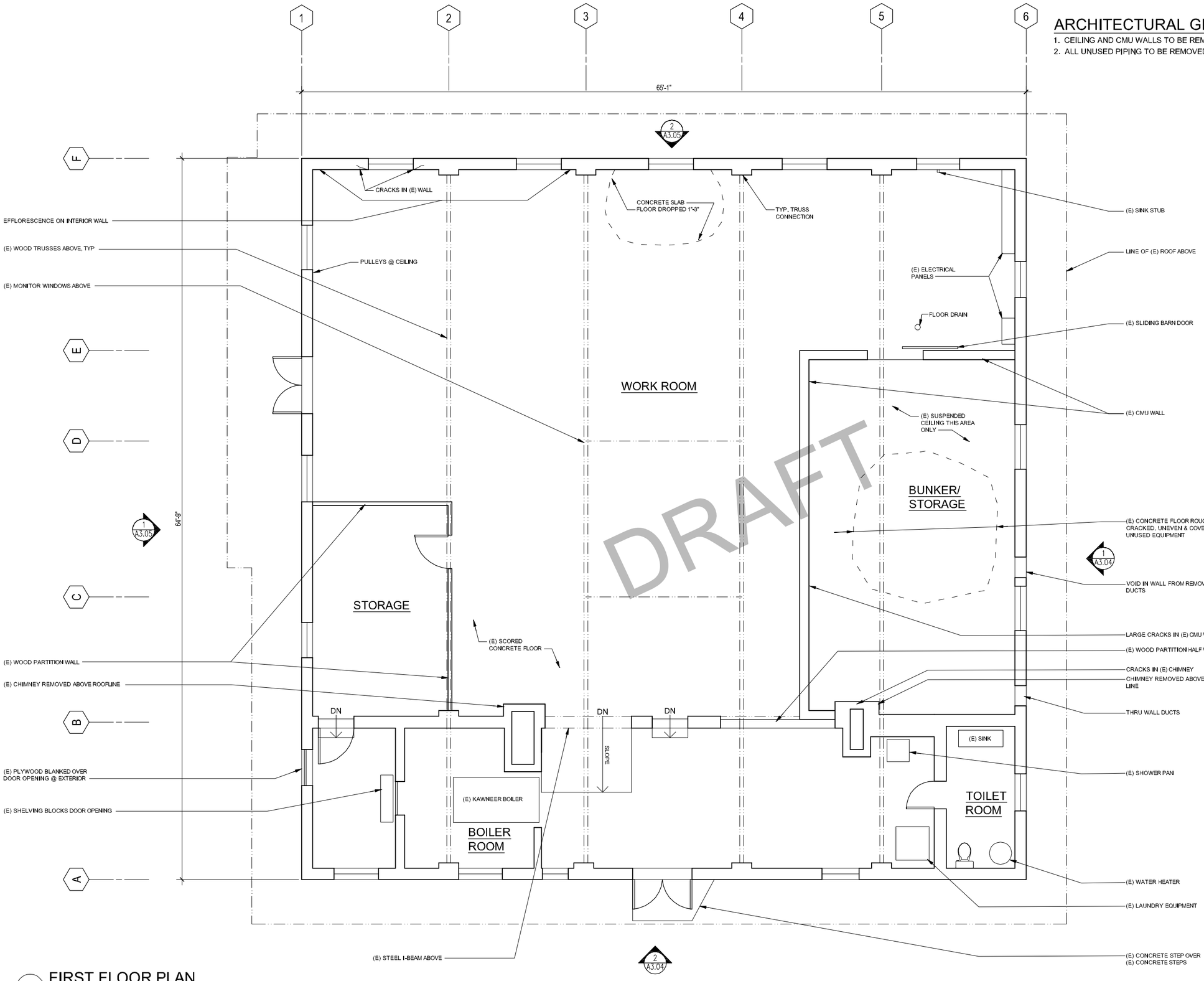


Figure A30. Historic concrete gutter along the retaining wall.

APPENDIX B: EXISITING CONDITIONS DRAWINGS



1 FIRST FLOOR PLAN
SCALE: 1/4"=1'-0"

ARCHITECTURAL GENERAL NOTES

1. CEILING AND CMU WALLS TO BE REMOVED
2. ALL UNUSED PIPING TO BE REMOVED

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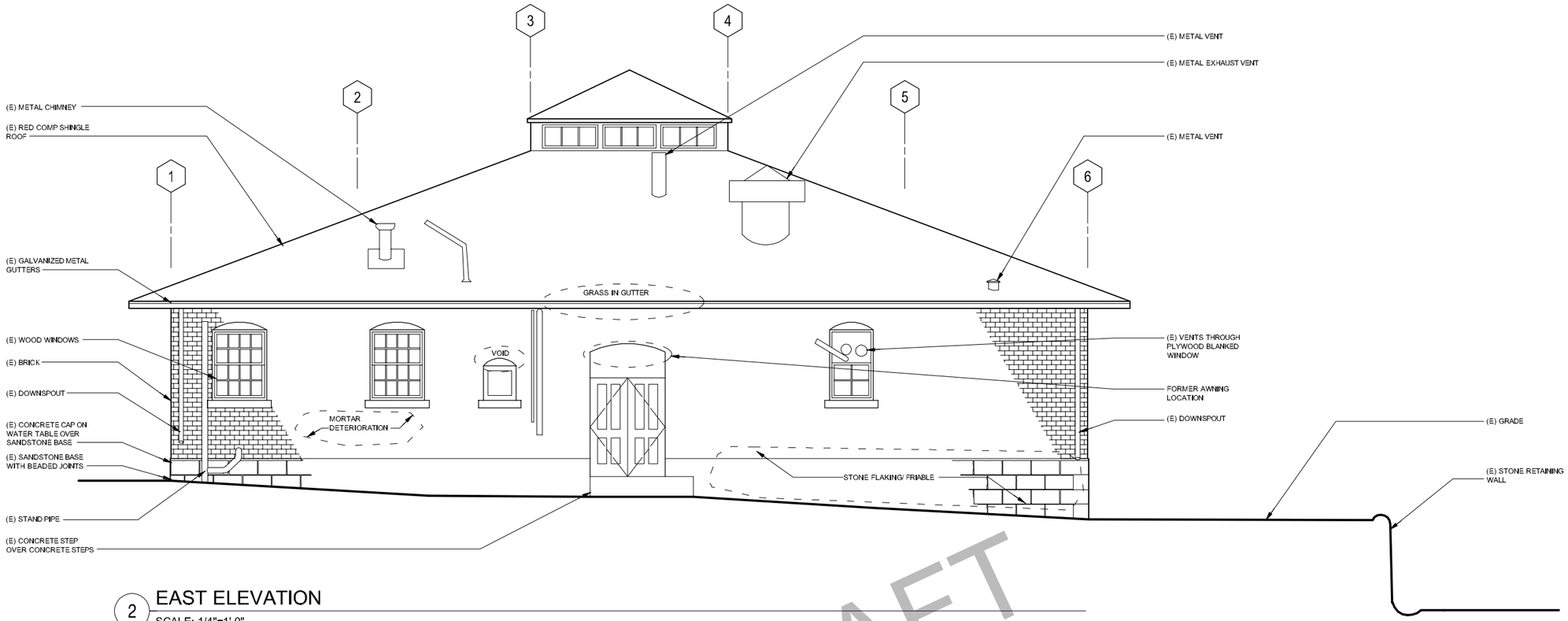
DOYLE DRIVE
REPLACEMENT PROJECT
SOUTH ACCESS TO THE GOLDEN GATE BRIDGE
SAN FRANCISCO, CA

FLOOR PLAN
BUILDING 228
(E) PLAN

PROJ. NO.	2009 - 028
SCALE	1/4" = 1'-0"
DATE	22 JUN 2009
PHASE	ELB
DRAWN	MS
CHECKED	CL

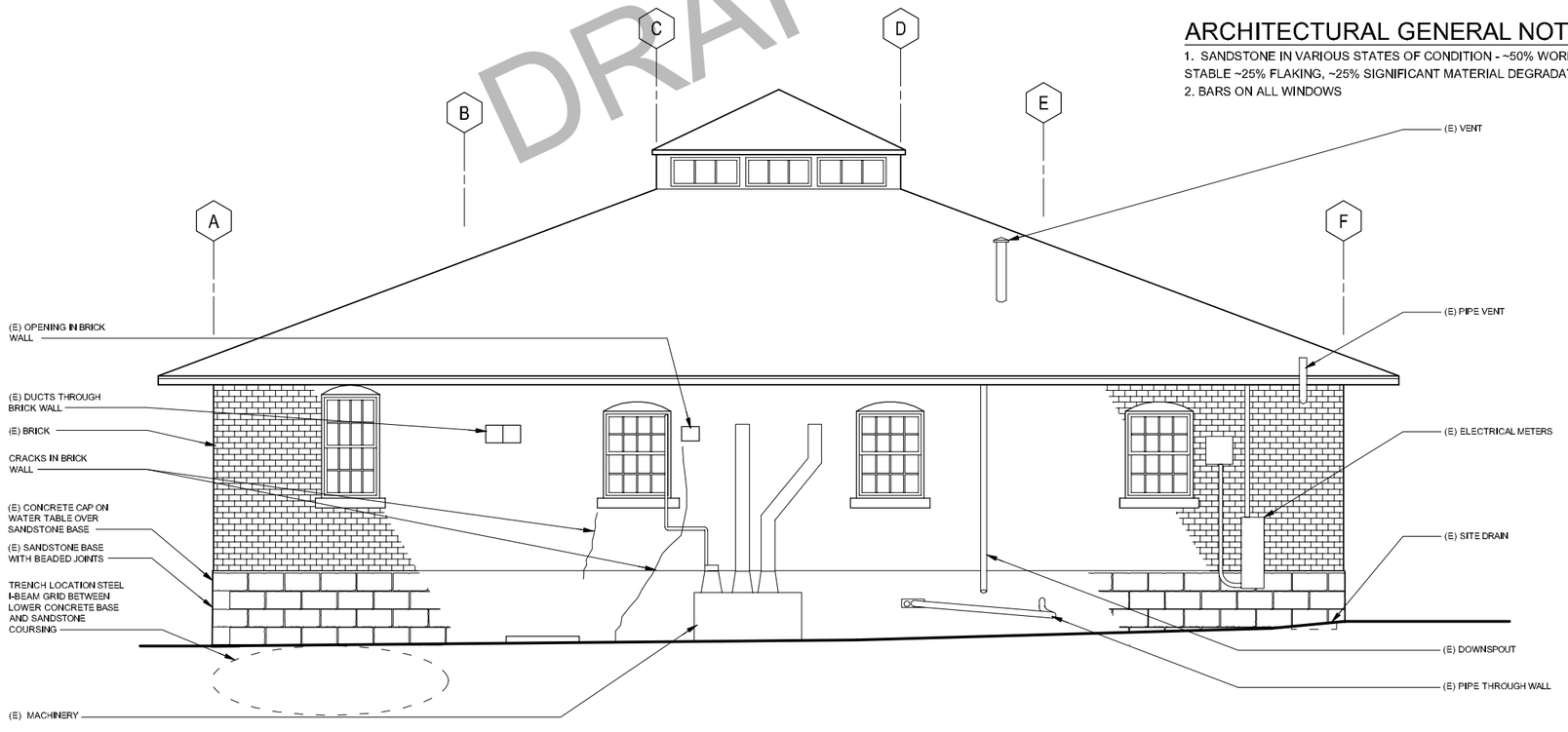
NO.	DATE	REVISION
	02 JUL 2009	ELB SUBMISSION

SHEET NO.
A-2.04



2 EAST ELEVATION

SCALE: 1/4"=1'-0"



1 NORTH ELEVATION

SCALE: 1/4"=1'-0"

ARCHITECTURAL GENERAL NOTES

1. SANDSTONE IN VARIOUS STATES OF CONDITION - ~50% WORN BUT STABLE ~25% FLAKING, ~25% SIGNIFICANT MATERIAL DEGRADATION.
2. BARS ON ALL WINDOWS

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DOYLE DRIVE
REPLACEMENT PROJECT
SOUTH ACCESS TO THE
GOLDEN GATE BRIDGE
SAN FRANCISCO, CA

EXT. ELEVATIONS
BUILDING 228
(E) NORTH & EAST

PROJ. NO.	2009 - 028
SCALE	1/4" = 1'-0"
DATE	22 JUN 2009
PHASE	ELB
DRAWN	MS
CHECKED	CL

NO.	DATE	REVISION
	02 JUL 2009	ELB SUBMISSION

SHEET NO.
A-3.04

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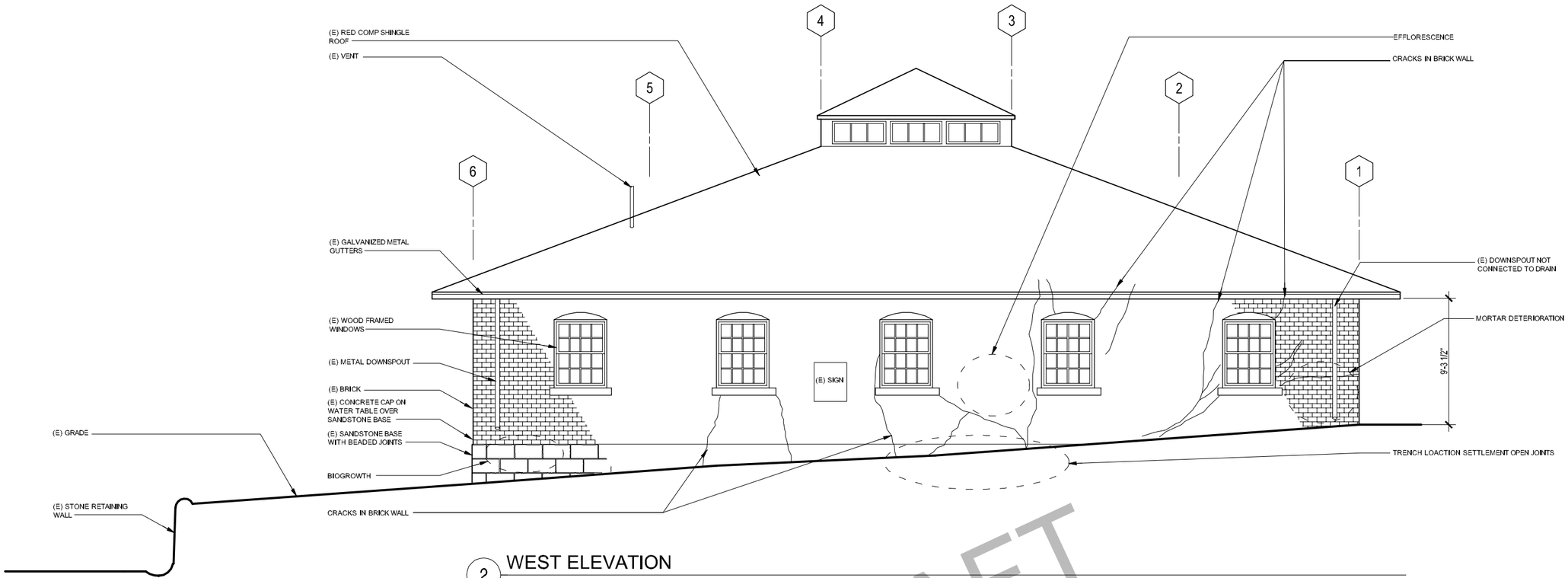
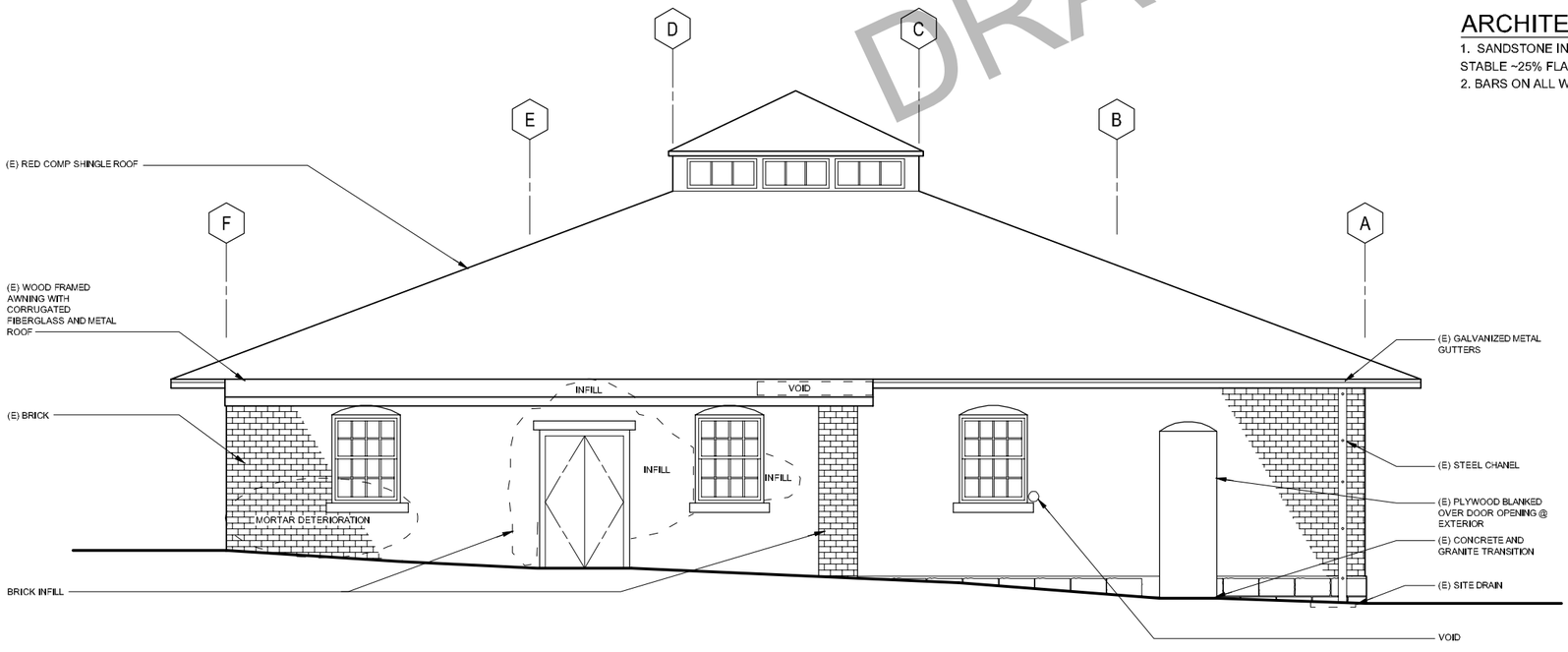


2 WEST ELEVATION

SCALE: 1/4"=1'-0"



1 SOUTH ELEVATION

SCALE: 1/4"=1'-0"

ARCHITECTURAL GENERAL NOTES

1. SANDSTONE IN VARIOUS STATES OF CONDITION - ~50% WORN BUT STABLE ~25% FLAKING, ~25% SIGNIFICANT MATERIAL DEGREDATION.
2. BARS ON ALL WINDOWS

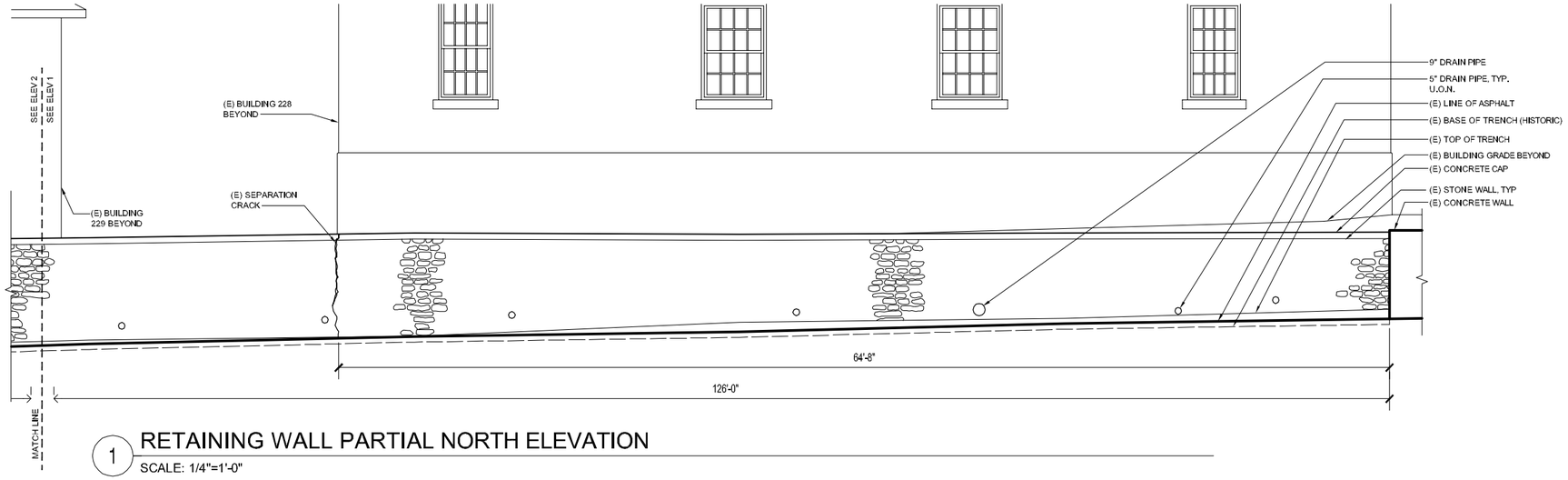
DOYLE DRIVE
REPLACEMENT PROJECT
SOUTH ACCESS TO THE
GOLDEN GATE BRIDGE
SAN FRANCISCO, CA

EXT. ELEVATIONS
BUILDING 228
(E) SOUTH & WEST

PROJ. NO.	2009 - 028
SCALE	1/4" = 1'-0"
DATE	22 JUN 2009
PHASE	ELB
DRAWN	MS
CHECKED	CL

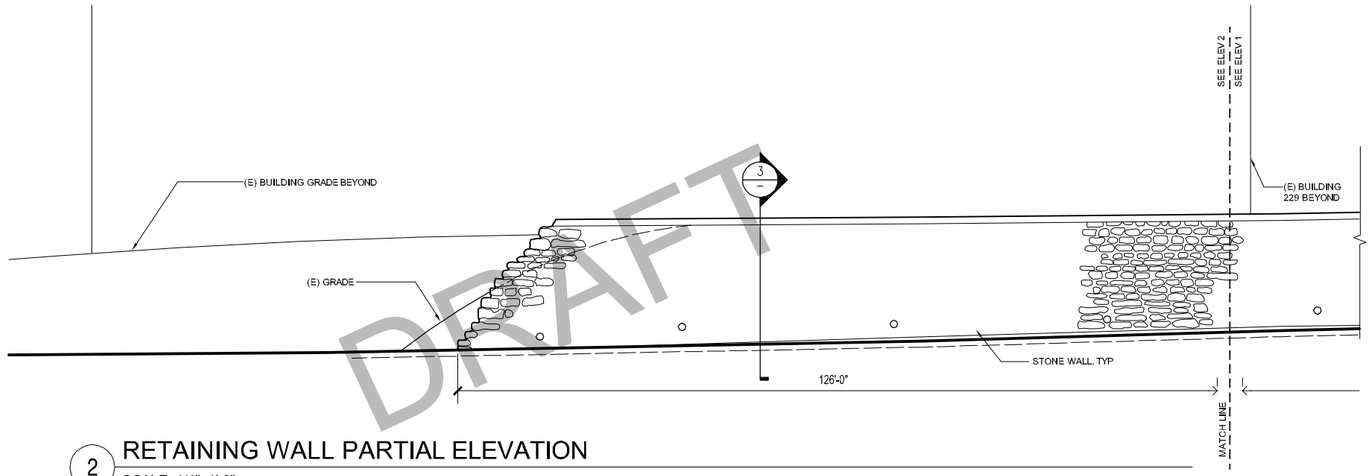
NO.	DATE	REVISION
	02 JUL 2009	ELB SUBMISSION

SHEET NO.
A-3.05



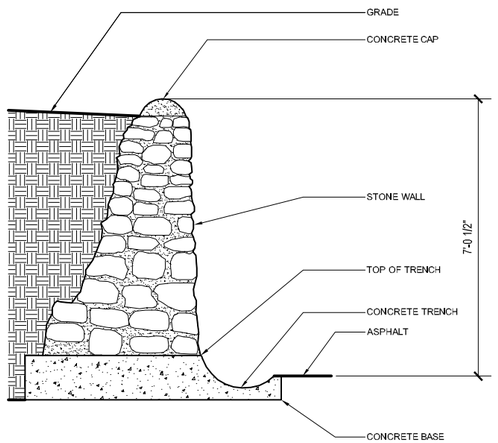
1 RETAINING WALL PARTIAL NORTH ELEVATION

SCALE: 1/4"=1'-0"



2 RETAINING WALL PARTIAL ELEVATION

SCALE: 1/4"=1'-0"



NOTE: SECTION FROM SITE VISIT PHOTOS TAKEN ON 6/9/2009

3 RETAINING WALL SECTION

SCALE: 1/2"=1'-0"

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DOYLE DRIVE
REPLACEMENT PROJECT
SOUTH ACCESS TO THE
GOLDEN GATE BRIDGE
SAN FRANCISCO, CA

EXT. ELEVATION
BLDG. 228
STONE RETAINING
WALL

PROJ. NO.	2009 - 028
SCALE	1/4" = 1'-0"
DATE	22 JUN 2009
PHASE	ELB
DRAWN	MS
CHECKED	CL

NO.	DATE	REVISION
	02 JUL 2009	ELB SUBMITTAL

SHEET NO.
A-3.06

APPENDIX C: MORTAR ANALYSIS REPORT

PETROGRAPHIC EXAMINATION AND CHEMICAL ANALYSIS OF MORTAR SAMPLES

Project: Doyle Drive
Buildings 106 and 228
Garavaglia Project No. 2009028

Report Prepared for:
Garavaglia, Inc.
1 Sutter St., Suite 910
San Francisco, CA 94101

November 17, 2009

Micro-Chem Laboratories Job No. C-5280-09

MICRO-CHEM LABORATORIES

635 Bret Harte Drive • P.O. Box 485 • Murphys, CA • 95247 • (209) 728-8200 • FAX 209-728-8251 • www.micro-chem.com

November 17, 2009

Garavaglia, Inc.
1 Sutter St., Suite 910
San Francisco, CA 94104

Job No. C-5280-09

Attn: Ms. Becky Urbano

Re: Petrographic Examination and Chemical Analysis of Mortar Samples
Project: Doyle Drive
Buildings 106 and 228
Garavaglia Project No. 2009028

In response to your request, six mortar samples were received for petrographic examination and chemical analysis. The samples were reportedly obtained from the above referenced project. The objectives of the analyses were to determine the portland cement content, hydrated lime, and sand contents, and evaluate the physical and mineralogical properties of the supplied mortar samples.

Test Methods

The six mortar samples were analyzed according to the chemical procedures described in ASTM C1324-05, "Standard Test Method for Examination and Analysis of Hardened Masonry Mortar." The mortar samples were examined according to ASTM C856-04, "Standard Practice for Petrographic Examination of Hardened Concrete." The samples were examined with a stereomicroscope to evaluate the physical properties of the mortar. Thin sections were prepared from epoxy-impregnated pieces and examined with a petrographic microscope to evaluate the mineralogy of the cementitious paste and sand and assess the degree of portland cement hydration. Air content and cementitious materials to sand ratio were estimated by petrographic methods.

Sample Descriptions

The following mortar samples were received.

Micro-Chem Sample No.	Mass, g[(1)]	Description
1	60.7	Bldg. 106, 9/17/09, 1, 1B, and 1C
2	66.4	Bldg 106, 9/17/09, 2, 2B, and 2C
3[(2)]	73.4	Bldg 106, 9/17/09, 3, 3B, 3C, and 3D
4	31.1	Bldg. 228, 9/25/09, 1
5	32.5	Bldg. 228, 9/25/09, 2
6	36.4	Bldg. 228, 9/25/09, 3

(1) includes bag
(2) comprised of two different samples

Chemical Analysis

The results of the portland cement, hydrated lime, and sand contents of the mortar samples by chemical analysis are presented in Table I.

Petrographic Examination

1. The mortar from all six samples consisted of siliceous sand, portland cement, and hydrated lime. The mortar from Sample 3 and 3B was distinctly different than the mortar from Sample 3C and 3D. The mortar from all of the samples was not air-entrained. The sand was composed primarily of quartz, feldspars, granite, chert, serpentine, shale, sandstone, felsite, limestone, and magnetite. Gradation of the sand was No. 30 sieve to No. 100 sieve. The sand was properly shaped, uniformly distributed, and hard.

2. The physical and mineralogical properties of the mortar samples are presented in Tables II and III.

Discussion and Conclusions

1. The results of the chemical analysis and petrographic examination for portland cement, hydrated lime, sand, and cementitious materials to sand ratio of the mortar samples are summarized as follows.

	Parts, by volume			Cementitious Materials:Sand Ratio	
Sample No.	Portland Cement	Hydrated Lime	Sand	Chemical Analysis	Petrographic Examination
1	1.0	2.3	8.8	1:2.6	1:3.0
2	1.0	3.5	12.2	1:2.7	1:3.0
3 and 3B	1.0	3.4	11.1	1:2.5	1:3.0
3C and 3D	1.0	0.3	4.7	1:3.6	1:4.0
4	1.0	1.8	5.4	1:1.9	1:2.0
5	1.0	2.5	10.0	1:2.8	1:2.0
6	1.0	2.5	7.3	1:2.1	1:2.0

2. Generally, the mortar from the supplied samples exhibited non-uniform strength properties with the exception of the mortar from Sample 3 and 3B. Considering the very high to moderately high hydrated lime contents among Samples 1, 2, 3C and 3D, 4, 5, and 6, the mortar had higher than anticipated strength properties by petrographic examination. The relict unhydrated portland cement clinker particles in the mortars were relatively large which was consistent with portland cement manufacturing greater than fifty years ago.

Should any questions arise concerning the findings of this report, please contact the undersigned.

Respectfully submitted,
MICRO-CHEM LABORATORIES

Robert C. O'Neill, P.G.
Senior Petrographer
RCON/jamc
C528009
Attachments

Sample Disposition: The samples will be stored for a period of one month and thereafter discarded. Charges for additional sample storage time and/or shipping of the samples will be billed to the client.

TABLE I

JOB NO. C-5280-09

CHEMICAL ANALYSIS OF MORTAR SAMPLES
ASTM C1324-05

Portland Cement, Hydrated Lime, and Sand Contents

Determined Values	Sample No. 1	Sample No. 2	Sample No. 3 and 3B	Sample No. 3C and 3D
CaO, *%*	13.33	12.57	13.23	12.74
SiO_2, *%*	2.01	1.50	1.61	3.66
MgO, *%*	0.17	0.14	0.15	0.36
Insoluble Residue, *%*	71.68	74.15	72.56	69.79
Loss on Ignition, *%*:				
110℃	0.78	0.38	0.53	1.77
550℃	2.15	1.78	1.78	2.31
950℃	7.99	8.16	8.47	6.08
Calculated, by Mass				
Portland Cement, *%*	9.58	7.15	7.65	17.43
Hydrated Lime, *%*	9.57	10.59	11.06	2.20
Sand, *%*	71.68	74.15	72.56	69.79
Parts, by Volume				
Portland Cement	1.0	1.0	1.0	1.0
Hydrated Lime	2.3	3.5	3.4	0.3
Sand	8.8	12.2	11.1	4.7
Cementitious Materials:Sand	1:2.6	1:2.7	1:2.5	1:3.6

TABLE I (con't.)

JOB NO. C-5280-09

CHEMICAL ANALYSIS OF MORTAR SAMPLES
ASTM C1324-05

Portland Cement, Hydrated Lime, and Sand Contents

Determined Values	Sample No. 4	Sample No. 5	Sample No. 6
CaO, *%*	17.37	12.51	15.50
SiO_2, *%*	2.97	1.81	2.25
MgO, *%*	0.23	0.19	0.25
Insoluble Residue, *%*	65.18	73.09	66.46
Loss on Ignition, *%*:			
110℃	0.60	0.48	0.73
550℃	2.59	1.84	2.36
950℃	10.99	8.17	10.69
Calculated, by Mass			
Portland Cement, *%*	14.17	8.63	10.71
Hydrated Lime, *%*	11.06	9.28	11.49
Sand, *%*	65.18	73.09	66.46
Parts, by Volume			
Portland Cement	1.0	1.0	1.0
Hydrated Lime	1.8	2.5	2.5
Sand	5.4	10.0	7.3
Cementitious Materials:Sand	1:1.9	1:2.8	1:2.1

TABLE II

JOB NO. C-5280-09

PETROGRAPHIC EXAMINATION OF STUCCO SPECIMENS
ASTM C856-04

Physical Properties of Mortar

Sample No.	Thickness, mm	Paste Hardness	Paste Color	Paste-Aggregate Bond	Air Content, %
1	˜8-11	Hard to fairly soft	Light brown-gray to light brown	None	2-3
2	˜4-12	Hard to very soft	White to light brown	None to very weak	2-3
3 and 3B	˜8-11	Hard to very hard	Medium brown to light brown	Moderate	10-15
3C and 3D	˜8-10	Very soft to fairly hard	White	None	2-3
4	˜4-15	Fairly hard to soft	White	None	1-2
5	˜9-15	Fairly hard to fairly soft	White	None	2-3
6	˜9-10	Fairly hard with hard and fairly soft areas	White	Very weak	2-3

TABLE III

JOB NO. C-5280-09

PETROGRAPHIC EXAMINATION OF STUCCO SPECIMENS
ASTM C856-04

Mineralogical Properties of Mortar

Sample No.	Unhydrated Portland Cement, %	Hydrated Lime Content	Cementitious Materials:Sand	Microcracks
1	<1-5	Very high	1:3.0	Very few to some random
2-Hard Layer	<1-2	Very high	1:3.0	Some random
2-Very soft Layer	3-5	Very high	1:3.0	Few to some random
3 and 3B	10-15	Very low	1:3.0	None to very few random
3C and 3D	<1-5	Very high	1:4.0	None to many
4	<1-2	Moderately high	1:2.0	None to very few random
5	<1	Very high	1:2.0	None to very few random
6	<1-3	Very high	1:2.0	None to very few random

SUPPLEMENTAL RECORD OF WORK PERFORMED (SECTION OFTEN ADDED LATER)

COMPLETION REPORT

TECHNICAL DATA (ON WORK COMPLETED)