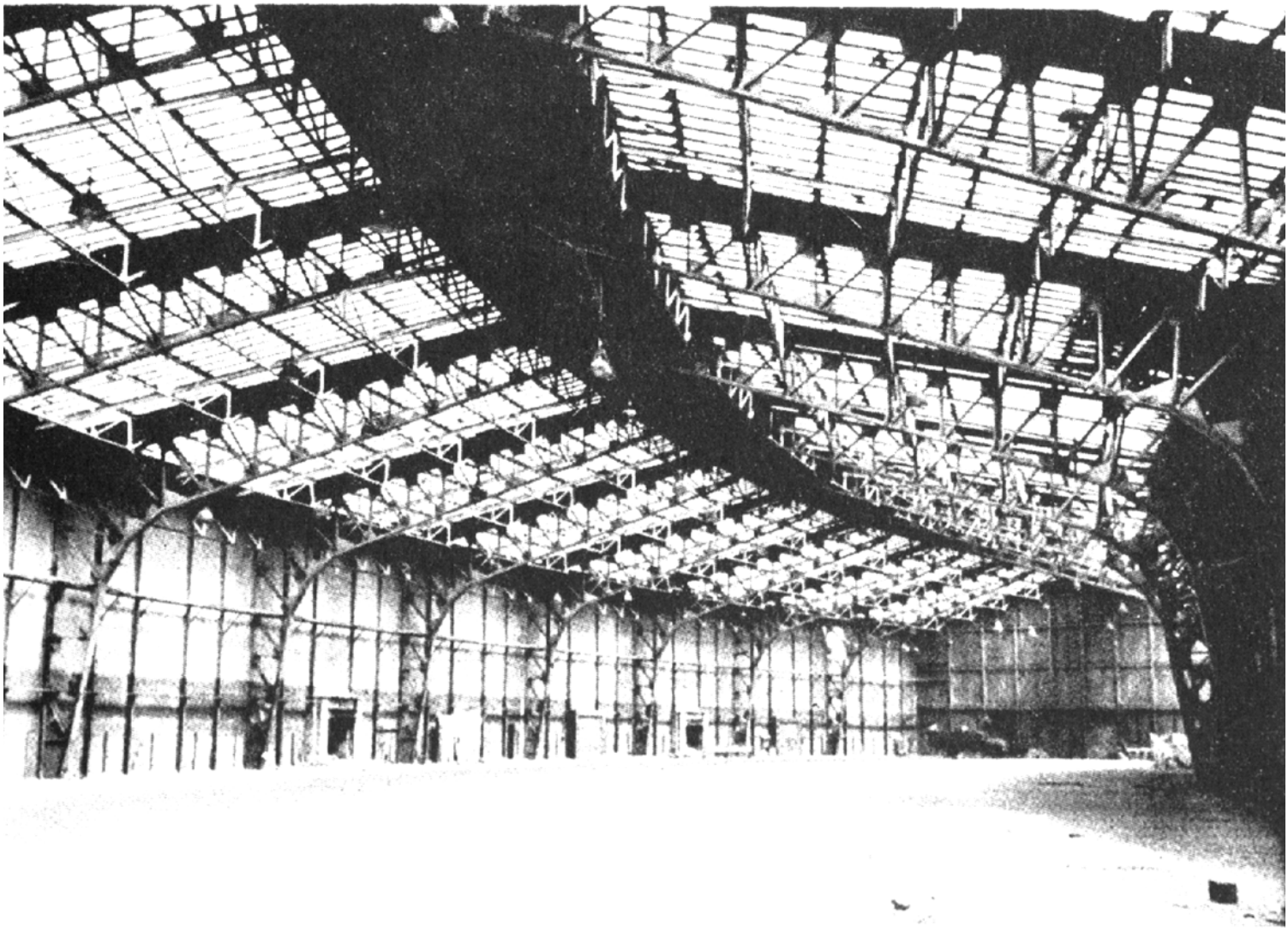

Palace of Fine Arts
Engineering + Use Study

PHASE I:
existing conditions assessment
November 21, 2013

ehdd.

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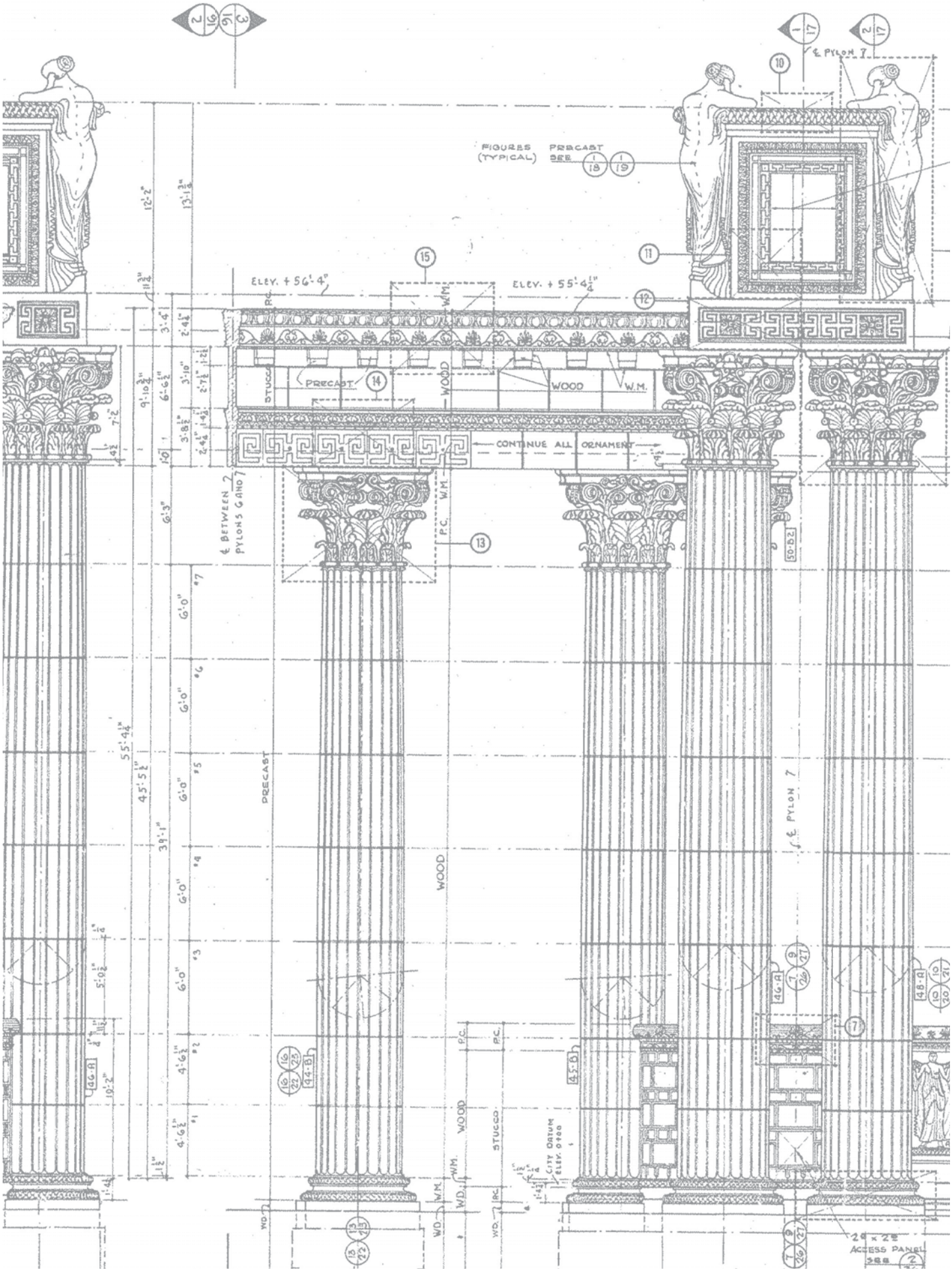

FIGURES PRECAST (TYPICAL) SEE 1/18 1/19
ELEV. + 56'-4"
ELEV. + 55'-4 1/4"
PRECAST
WOOD
W.M.
STUCCO
CONTINUE ALL ORNAMENT
℄ BETWEEN PYLONS 6 AND 7
℄ PYLON 7
CITY DATUM ELEV. 0.00
2'-0" x 2'-0" ACCESS PANEL

executive summary

The Palace of Fine Arts is owned by the City of San Francisco's Recreation and Park Department (RPD), while the Maybeck Foundation (MF), a non-profit organization dedicated to advancing the work of Bernard Maybeck, acts as its steward.

In the fall of 2011, EHDD and its team of engineers, estimators and economic/marketing advisors joined in collaboration with the Maybeck Foundation and the Recreation and Park Department. The task was to evaluate the current state of this iconic structure - including the building's infrastructure, utilities, structural and seismic systems, site/drainage issues, parking options and associated costs in preparing the building for future uses. This Phase I report lays the groundwork for Phase II, where new and appropriate uses will be proposed for this important San Francisco landmark.

Recent renovations stabilized the adjacent rotunda, colonnade or lagoon; this study does not provide a comprehensive review of these elements on the Project site.

The transportation, mechanical, plumbing, electrical and daylighting analyses that follow provide assessments of the existing conditions and suggestions for potential improvements when Phase II begins, however the work of these disciplines are highly dependent upon the future use or uses that will ultimately find homes within the Exhibition Hall. Structural, civil and historic consultants have distinct recommendations that can be implemented regardless of the future program.

Interior of the Palace of Fine Arts
(Courtesy SF Public Library)

Architectural (EHDD)

The Architectural assessment builds upon the fundamental integrity of Maybeck's original design as we look forward towards Phase II Use studies. It suggests reintroducing a central entry directly on axis with the rotunda (delineated by the three sets of monumental double wood doors) to reconnect the interior of the Exhibition Hall with the rest of the surroundings. Promoting and highlighting the historic truss frames while integrating sustainable strategies (such as daylighting and natural ventilation) are methods to bring scale and light to the space, while honoring the building's legacy.

The application of the California State Historic Building Code and upgrade of the sprinkler system throughout the building will provide the Project significant latitude with regards to: use and occupancy, fire protection, egress, accessibility, fire resistive construction, and other engineering disciplines. Accessibility upgrades will be required at some doors at the building perimeter if required for egress, but the restrooms are generally accessible.

It is further recommended that a hazardous materials assessment and a site survey with property line and utility locations be completed before Conceptual Design of a preferred use.

West Entry to the Palace of Fine Arts
(Courtesy SF Public Library)

Historic (Page & Turnbull)

The historic preservation assessment focuses on the Exhibition Hall building, which is deemed to be in good/fair condition. Issues raised include staining, plaster cracking, and deterioration of the wood doors and skylights. The periods of significance are from 1964-1967 and 1973 to 1974 when the exterior shell was reconstructed, although the steel trusses, fireplaces, and many of the doors are identified as part of the original Maybeck design.

Structural (Rutherford & Chekene)

The structural assessment identifies two code interpretation paths – one through the San Francisco Building Code and the other using the provisions of the California Historic Building Code. The former allows for consideration of the 1993 structural upgrades to be used to waive further upgrades to the building structure, provided that significant modifications are not made to the structure. While these conditions are expected to be met as part of any future work, structural recommends the voluntary implementation of the foundation improvements and upgrades to the existing truss frame system for the entire building.

Construction of the 3-hinge arch
(Courtesy SF Public Library)

Mechanical, Plumbing, and Fireproofing (Taylor Engineering)

The Theater mechanical and plumbing systems can generally remain in place if the Theater remains. Upgrades are recommended for the theater mechanical system to make the intake system code compliant. Within the Exploratorium space, the HVAC and plumbing systems are out of date, substandard and not worth saving.

For code compliance, a new automatic fire sprinkler system is recommended throughout the entire structure, even if the existing Theater remains.

Electrical (Cammisa & Wipf)

The Theater electrical system, including its main switchboard, could remain in place should the Theater remain. Most of the remaining electrical system is nearing 50 years old, is not code conforming, and is undersized for future needs. The rest of the building requires new 12kV service, new transformers in new vaults and new switchgear.

Original glass roof
(Courtesy SF Public Library)


Interior of the Palace of Fine Arts
(Courtesy SF Public Library)

Daylighting (Loisos & Ubbelohde)

The daylighting analysis considers a range of options to improve the amount of daylight in the space ranging from the existing conditions to restoring Maybeck's original design with the entire roof essentially opened by large skylights. Options illustrated range from minimal to significant interventions: (1) apply lighter, more reflective color of paint to the interior structure and surfaces, (2) replace some existing louvers in the central light monitor with glazing, and (3) add one pair of skylights in the current Exploratorium space to illustrate how the uniformity of daylight in the Hall could be significantly improved.

Civil (BKF)


Filling the lagoon at the Palace of Fine Arts
(Courtesy SF Public Library)

The primary issues raised in the civil assessment are site drainage and the age of the underground piping. While the structural and plumbing recommendations will improve some of the water issues, the recommendation is that a drainage study be undertaken to determine the storm water load on the site and confirm whether the capacity of the existing systems can accommodate the load. Underground piping should be video surveyed and replaced where needed.

Transportation (Nelson \ Nygaard)

Existing parking supply consists of 216 on-site (formerly 398 prior to the Doyle Drive construction) and 191 off-site spaces. Parking demand is highly variable with the current uses. Both transit and vehicular access is limited now due to the construction, but may be reconfigured once the work is complete. The impact of the Doyle Drive retrofit and the new Girard surface street is also discussed in terms of increase parking capacity and access. Off-site parking and bicycle access exist nearby, but access from these points onto the site is generally compromised by poor crossings, and lack of infrastructure

Cost Estimate (Plant Construction)

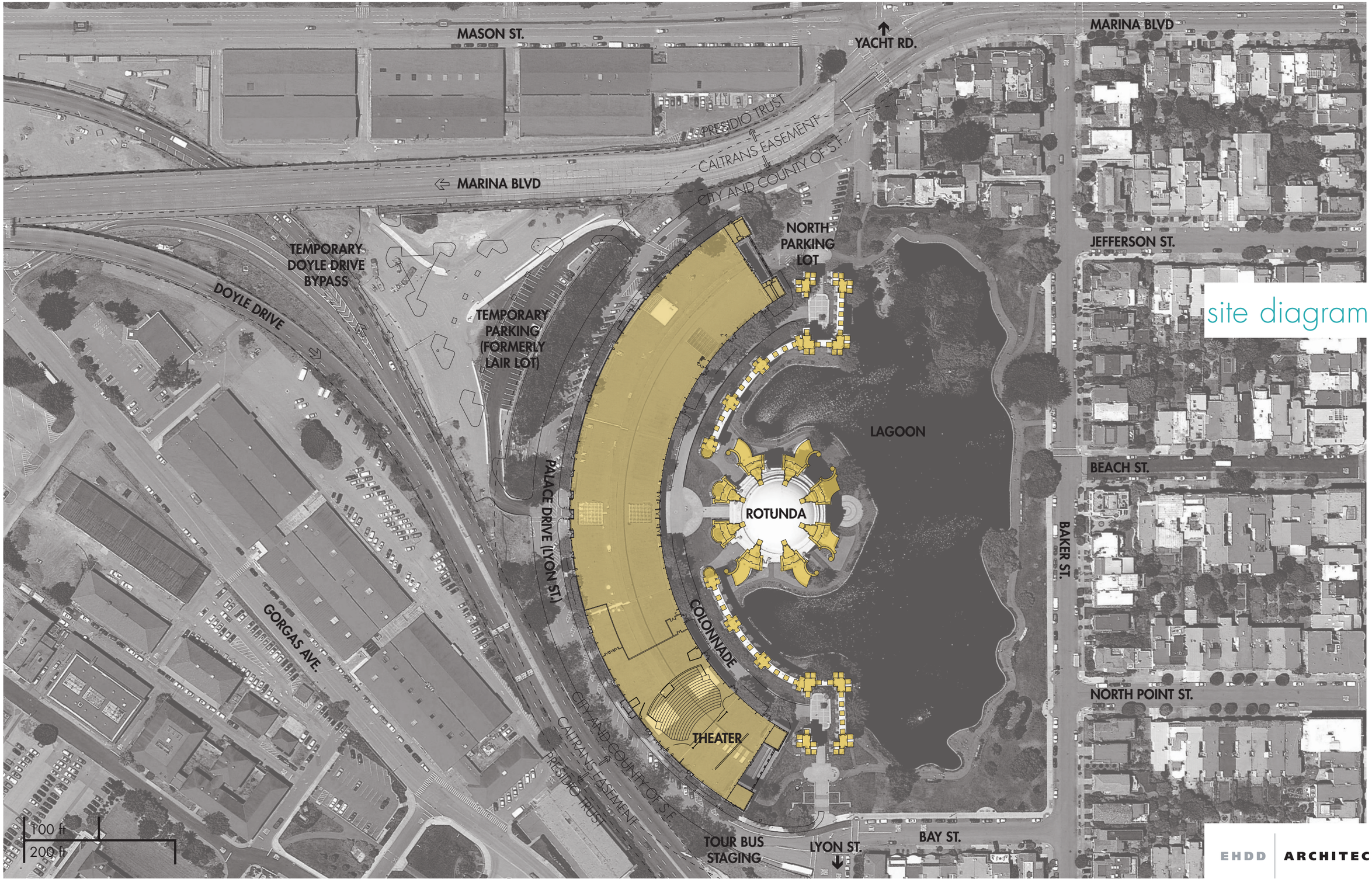
A set of Baseline Assumptions were defined to ensure the building exterior is preserved and maintained. Beyond this, two options – one keeping the PoFA Theater, while clearing out the Exploratorium space, and the second removing both the Theater and Exploratorium improvements in preparation for an occupation of the entire building – were also defined. Further, a series of Add Alternatives were defined by the Engineering team for additional upgrades recommended (secondary structural work and Theater Mechanical upgrades) or in preparation for Phase II studies (skylight pricing).

As is typical with most cost estimates, the information contained in this report describe "hard" construction costs only, and do not include any "soft costs" which include design team fees, permit fees, entitlement process or associated fees.

Demolition of the original plaster rotunda
(Courtesy SF Public Library)

Economic + Marketing (Sedway Consulting)

This analysis notes that culturally, the building is so significant within the context of the City that it actually "defines" its location, however, it is this very location also limits physically its future possibilities. A preliminary rental market analysis notes that the potential of this building is underutilized with the current tenants. Four potential use typologies are identified: (1) museum related uses, (2) location specific "living concepts", (3) incubator office space, and (4) conference and event center.



site diagram

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architectural analysis

EHDD Architecture

Site/Location Description

The existing Project site is located in the Marina District in San Francisco, at the edge of the Presidio of San Francisco, a former army post converted to a park. It is bounded by Baker Street to the east, Marina Boulevard to the north, Lyon Street (also called Palace Drive) to the west, and Bay Street to the South. It is also impacted by Doyle Drive to the west, a major onramp to Highway 101 heading north to the Golden Gate Bridge.

Potential Opportunities

Site Connection / Central Entry: What we see at the Palace of Fine Arts today is very different from Bernard Maybeck's original vision. For the Exposition, a bulk of the venue lay to the east, with the Palace as its axial terminus to the west. Maybeck situated the rotunda, colonnade and lagoon in front of the Exhibition Hall, to slow down and set the pace as the visitor entered the Hall to observe the artwork contained within. Walking around the lagoon alongside the colonnade one would enter the Hall via the triple set of double doors set in the middle of the Hall, directly on axis with the symmetry of the rotunda and the colonnade. The two short ends did not seem to be used for any type of entry.

Currently, the site conditions drop visitors at the short ends of the building to the South and North, where parking and vehicular access is located. With the entries into the building on the short north face (the Exploratorium) and on the west face (the Theater, set oddly in the southern third of the building), there is no sense of connection between the Exhibition Hall building with the rest of the site; the Hall acts more as a blank backdrop to the detail and beauty of the recently restored rotunda and colonnade.

We recommend reintroducing the central entry directly on axis with the rotunda (delineated by the three sets of monumental double wood doors) to reconnect the interior of the Exhibition Hall with the rest of the surroundings. This circulation flow will draw people into the site and create a more

full experience of the original vision.

Highlight the Structure: Once inside the structure, the space remains at a grand scale. While the original Maybeck design did not highlight the structural steel truss frames (they were hidden by the lower lay lights as noted in the Daylighting analysis that follows), they are now a dramatic part of the interior of the Hall. There is currently fireproofing on the lower portion of the truss frame legs and based upon preliminary code analysis, this protection can be removed. As one of the few remaining components of the original design, they are deemed historic and any future work should celebrate and highlight the structure.

Sustainability – Daylighting: The introduction of more natural daylight to the interior of the space is one way to achieve this focus. The interiors of both the Theater and the Exploratorium are perceived as enormous, cavernous space, partially due to the fact that the volumes of the spaces and the detail of the structure (which could act as a scale defining level of detail) are not enhanced, celebrated or integrated as part of the design of the spaces.
As part of this Phase I study, the daylighting engineers were asked to illustrate the potential impacts of adding one pair of skylights midway between the existing or replacing the roof monitor clerestory louvers with glazing. These simple moves already transform the perception of the structure and space.

There are potential drawbacks to adding more glazing and a balance must be struck amongst the desire to bring natural light into the space, cost implications, and the energy usage increases. There are also programmatic considerations, since some future uses being discussed (museum exhibition and storage) will not want increased levels of light, and in fact may want less light. These options will be further studied in Phase II as the potential uses are defined.

In general, the original design was inherently sustainable, by the use of natural daylighting and ventilation (via the louvers in the monitor at the roof peak), and it would be an incredible message to the City and the historic community if aspects of these features were reintegrated into the future re-use of the building.

Exterior Shell Improvements: At this point in time, it is the design team's recommendation that improvements for future uses remain free of the existing exterior shell and structure and be planned to be environmentally self-contained as volumes within the new construction. Modification of the existing exterior shell to achieve a climatically stable environment alone as a baseline assumption was not considered as part of this analysis, but will be further studied as part of Phase II.

Recommendations for Additional Study and Assessment

The Phase I work completed was based upon the documents listed in the List of Reference Documents. Notable missing documents are a hazardous materials assessment and a site survey with property line and utility locations. In addition, the Civil engineers have recommended a drainage study be undertaken to determine the storm water load on the site and confirm whether the capacity of the existing systems can accommodate the load; refer to Civil analysis for further description. The team recommends that these be completed prior to embarking on Conceptual Design of a preferred use, or earlier if possible.

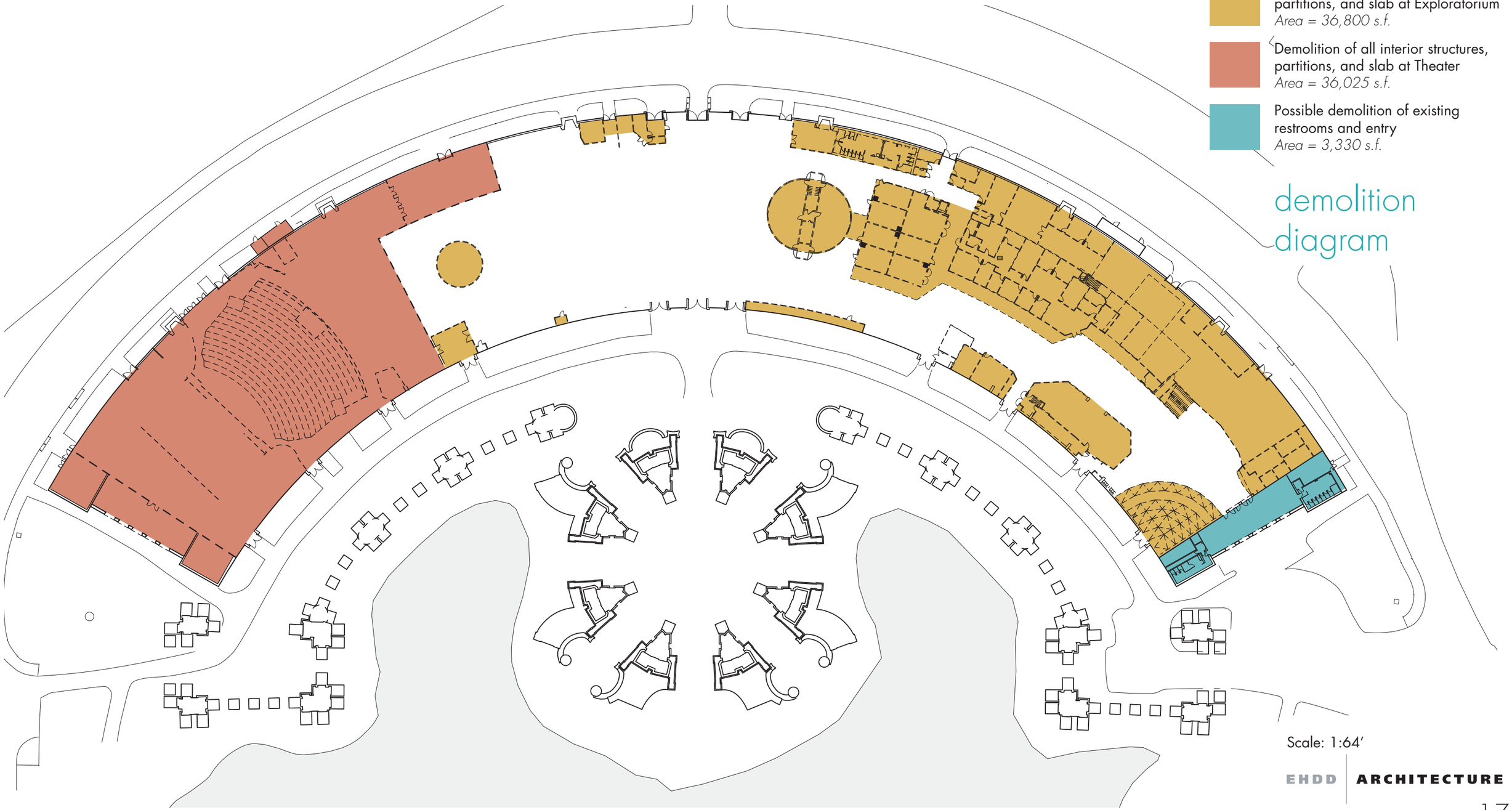
Demolition diagrams address architectural demolition for Baseline Conditions, see consultant narratives for more detailed descriptions of demolition required.

Demolition of all interior structures, partitions, and slab at Exploratorium
Area = 36,800 s.f.

Demolition of all interior structures, partitions, and slab at Theater
Area = 36,025 s.f.

Possible demolition of existing restrooms and entry
Area = 3,330 s.f.

demolition diagram



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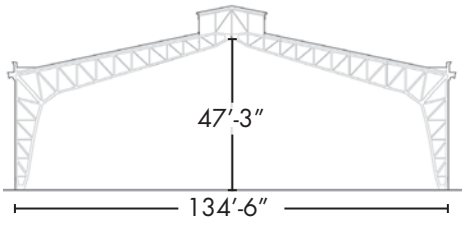
code summary

Overview

This code summary provides an overview of the San Francisco Planning and Building Codes and the California Historic Building Code as they impact future improvements at the Palace of Fine Arts (PoFA) Exhibition Hall, an existing structure. This document covers only the Exhibition Hall, the enclosed, curved building on the PoFA site; it does not include the adjacent Rotunda, Colonnade or Lagoon, recently restored under a separate project.

The building is a single story, free-span structure originally built in 1915 as part of the Panama Pacific Exposition. The exterior shell was reconstructed in 1963, and it currently houses a 963 seat theater in the southern end of the building, and the Exploratorium, a science museum to the north. The ground floor plate is 126,246 square feet, with 17,750 square feet in mezzanines in the Exploratorium space.

The floor slab is on grade with a truss system which is 47'-3" feet at its central peak. The trusses slope down towards the perimeter walls.



Planning Code

Applicable Planning Code: San Francisco Planning Code, effective September 15, 2011

Parcel information: 0916/002

Address:
3301 Lyon Street, San Francisco CA 94123
3601 Lyon Street, San Francisco CA 94123

Use Districts: Per Zoning Map Sheet Key diagram, the Project site is split between Zone 02 and the Presidio

Zoning District (per map ZN02): Public (Per SF Citywide Zoning Map of October 2011, Presidio is fully designated as Public)

Height and Bulk District (per map HT02): Open Space

Special Use District (per map SU02): none

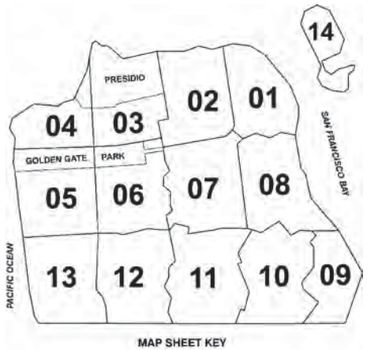
Preservation District (per map PD02): none

zoning diagram

PRESIDIO

ZONE 02

ZONE 03



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Building Code

The Palace of Fine Arts complex is listed on the National Register of Historic Places as a significant district, and as such falls under the CHBC's definition of a "qualified historic building".

It is assumed that the entire existing Exhibition Hall will be provided with an automatic sprinkler system.

The application of the CHBC and upgrade of the sprinkler system will provide the Project significant latitude with regards to standard building code requirements; the code specifically identifies accommodations in use and occupancy, fire protection, egress, accessibility, fire resistive construction, structural, mechanical, plumbing, electrical and selection of materials.

Applicable Codes

City and County of San Francisco Building Code (SFBC), 2010 edition
California Historical Building Code (CHBC), 2010 edition

Occupancy Classification

Potential future uses include:
A-1 for Theater with fixed seating
A-2 for Restaurants
A-3 for Assembly uses for amusement or entertainment
B for Business
M for Mercantile (Retail)
S for Storage

It is assumed that any Educational or high hazard uses will not be included. Once a use or mix of uses is determined, each space will be individually classified and may affect the fire resistive construction required to separate various occupancies.

Construction Type

If limited by the standard building code regulations, the construction type would be influenced by the occupancy or use contained within the building. Because this is a qualified historical building and the entire structure will be provided with an automatic sprinkler system, the Project will be allowed to have unlimited floor area without fire-resistive area separation walls (CHBC Section 8-302.4, Exception 1).

The existing height and number of stories of the building will remain the same as the original design, and therefore will not be limited based on Construction Type or Occupancy Type. Assume two (2) stories. (CHBC Section 8-302.5)

Per archived documents the Construction Type (as per SFBC Chapter 6) was assumed to be Type II Non-Rated under previous codes. Per the current SFBC, the Type is now considered Type IIB.

Fire Resistance Ratings

The existing building is set more than 30-feet away from any adjacent occupied building, so under standard building code requirements the exterior wall is not required to have a fire-resistance rating (as per SFBC Table 602).

Occupancy calculations

The complex's historic function was for "Recreation and Culture: Museum, Outdoor Recreation" and the assumed worst case scenario for future uses is similar as an A3 Assembly use, with an Occupant Load Factor (OLF) of 15 in the current code. OLF is a method of calculating the number of people that may be in an individual space at a given moment in time by dividing the area of that space by an amount of area per person.
The area of the total building interior (assumes removing the Theater) is 126,246 square feet. For these calculations, we remove approximately

one-third of this area to allow for circulation, support spaces and con struction, which results in approximately 85,000 SF. 85,000 square feet divided by 15 square feet per person results in approximately 5,700 occupants on the ground floor.

Egress Requirements

5,700 people would require approximately fourteen 60-inch wide double doors. Per standard building code requirements, in an Assembly occupancy, half of the people would need to exit the building via what could be considered the "front" or main entry doors.

The existing building has 32 openings for doors, the majority of which are double doors (6-feet wide or more); 20 of these door openings are considered historic. All of the door openings – both historic and non-historic – are well-distributed along the long extent of the building and will be able to provide adequate means of egress from a variety of interior use layouts.

Requirements for door and corridor widths may be relaxed when using existing historic doors, and where main entry doors are not swinging in the direction of travel, the doors will not need modification as long as there are other methods of getting all of the occupants out of the building. Special consideration would likely need to be discussed with the Building Department regarding the requirement to have half of the occupants leave the building via the "front" doors.

Plumbing Requirements

A detailed analysis of Plumbing Fixture requirements will be completed as part of the Phase II work as a future use or uses are defined. Again, taking the worst case scenario of an Assembly occupancy, the number of occupants is calculated differently per code for the required number of plumbing fixtures. The number of occupants for the entire footprint of the building (less circulation, support and interior construction allowances) is approximately 2,800 occupants, divided evenly between men and

women (1,400 men, 1,400 women). The number of fixtures required will be as follows:

	Toilets		Lavatories	
	Men	Women	Men	Women
Up to 400 occupants	6 toilets	6 toilets	5 lavatories	5 lavatories
Beyond 400	11 toilets	13 toilets	8 lavatories	9 lavatories

San Francisco Green Building Code

The San Francisco Green Building Code (SFGBC) is outlined in Chapter 13C of the San Francisco Building Code and further described in the Department of Building Inspection's Administrative Bulletin 093. If the future use in the building ends up being Business, Mercantile or Residential uses, and in aggregate exceeds 25,000 gross square feet, the SFGBC may be applicable to this Project only as it may be seen as a "major alteration" to an existing structure. The SFGBC is still relatively new and there are inconsistencies in the wording and implementation of the standards. Additional follow up with the City of SF will be required once the use is determined.

Business or Mercantile: The code chapter (SFBC Chapter 13C.5, Nonresidential Requirements) generally states that requirements apply to major alterations of B or M occupancies. It goes on to specifically state that new large commercial projects are required to meet LEED Gold standards, however, the chapter remains silent on specific requirements for major alternations. At the end of the chapter, it provides a methodology for Historic Resources to reduce the minimum number of LEED points required elsewhere in the chapter. Again, due to inconsistencies in the SFGBC, this item will require further follow up with the City of SF.

Based upon the guideline for point reduction, it appears that up to 10 point reduction may be possible based upon the retention of the following: exterior windows (skylights) and doors, exterior wall finishes and character defining elements of significant interior space (reference San Francisco Building Code Table 13C.5.104.A):

Residential: The code chapter (SFBC Chapter 13C.4 Residential Requirements) states the requirements for Major Alterations to an existing R occupancy. The requirement for achieving the LEED Gold point level and the possible reductions of the this point requirement are the same for the Nonresidential chapter.

Additional requirements for site development, energy efficiency, water efficiency and conservation, material conservation and resource efficiency, and environmental quality will need to be evaluated when the project proceeds into Design phases.

accessibility

Overview

Accessibility compliance appears to be slightly more restricted in the CHBC, as CHBC Chapter 8-6 indicates that "strict compliance with the regular code" should be done unless an element or feature that is historically significant is under threat or in danger of being destroyed. As one moves into a building, there are three major areas that typically need to be addressed with regards to accessibility – the building entry, the path of travel to the main function of the building and to public facilities (such restrooms, elevators) and the restrooms themselves.

Building Entry

The existing entrance to the Exploratorium consists of five pairs of glass doors fitted into the historic façade. They are currently treated as "nighttime security devices" and propped open during the day. To bring them up to current code they would need to be replaced or retrofitted with 10" kick plates, floor mounted closers, and at minimum one set would need an auto operator with push button entry pads. The Palace of Fine Arts Theater entry consists of two pairs of doors one of which is automated. This entry appears to meet current code.

Path of Travel

The path of travel starts exterior to the building at the accessible parking and loading zones, continues through the entrance to the main functions of the building. At the Exploratorium entrance there is an accessible loading zone, and four accessible parking spaces (one of which is a van spot) at the Theater entrance there is no loading zone, but five accessible parking spaces one of which is a van space. Depending on the reconfiguration of the parking, improvements could be made to the exterior accessibility (this number of spaces may not be sufficient). See the civil narrative for recommendations.

Once inside, the ground floor of the Exploratorium is accessible, and there is an accessible path of travel to the restrooms, and the elevator to the mezzanine. Within the Theater, there is an accessible path of travel from the entrance to the restrooms and to the accessible seating in row H, provided the second set of doors is propped open (which they are during performances). There is also currently the potential for all exterior doors to be accessible as these all discharge at grade.

Restrooms

The existing restrooms in both the Theater and Exploratorium are generally accessible as they have been upgraded. Once the future uses are more clearly defined, the quantity and best location for the facilities will be determined.

There are two sets of restrooms at the Exploratorium – one set located in the arcade, and the other midway down the length on the west side. Both sets of restrooms have the required accessible stall and sink. Minor modifications might have to be made to accessories, but they are generally accessible.

At the Theater there is one set of public restrooms located off the lobby, again generally accessible, with the required accessible stall in each these appearing to have been retrofit in 2004. There is also a set of restrooms in back-of-house for the use of the performers and staff. These do not appear to be accessible, but could be made so by reducing the fixture count.

Exterior Doors

In general, the existing doors can be made accessible as exits with revisions to the hardware, and the addition of a 10" push plate. The exception is the six oversize doors on either side of the central axis. These doors would need to remain "open" and new glazed systems be inserted to provide visual flow between interior and exterior as well as to be able to provide code-compliant entrance and exit.

All new and existing entrances or elevators to tenant or functional spaces will need to be made accessible. The interior slab of both the Theater and the Exploratorium space is uneven in areas due to poor materials, and the replacement or topping of the slab should be considered to mitigate this issue for future tenants. Site issues are described in the Civil report.

Diagram shows analysis of accessibility of (E) conditions.
*All conditions need to be field verified and minor revisions may be required.

Accessible Path of Travel

Requires Minor Modifications

Not Accessible - Glazed 'Open'

accessibility diagram

HC Parking
5 spaces

10 Toilets
1 Accessible
2 Ambulatory
4 Lavs

10 Accessible Seats
Row H (5 per side)

5 Toilets
0 Accessible
3 Lavs

4 Toilets
0 Accessible
5 Urinals
3 Lavs

3 Toilets
0 Accessible
3 Urinals
3 Lavs

10 Toilets
2 Accessible
2 Ambulatory
8 Lavs

4 Toilets
1 Accessible
5 Urinals
4 Lavs

1 Shower

(E) Elevator

8 Toilets
1 Accessible
5 Lavs

HC Parking
3 spaces

HC Loading

4 Toilets
1 Accessible
1 Urinal
2 Lavs

Scale: 1:64'

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historic preservation

Page + Turnbull

Draft Historic Preservation Assessment:

SIGNIFICANCE DIAGRAMS

The Palace of Fine Arts is listed in the National Register of Historic Places as a district consisting of a building and four structures in a park setting. The district consists of a lagoon, a rotunda, two flanking curvilinear colonnades, and a long curving exhibition building. The property is significant under Criterion A as an example of Conservation and the periods of significance are 1964-1967 and 1973- 1974.

This section provides an analysis of the relative zones of significance present at the Palace of Fine Arts. Utilizing accepted standards for the evaluation of historic resources in addition to the guidelines published by the City of San Francisco, the major historical features have been identified and visually documented within a series of significance diagrams.

For the purposes of this analysis, Page & Turnbull surveyed the building, including all exterior façades and interior spaces. The facades, spaces and elements were evaluated in terms of their relative contribution to the significance of the building by categorizing them as "Significant," "Contributing," or "Non-Contributing."

It should be noted that features that are considered character-defining are categorized as "Significant" or "Contributing," depending on their level of importance in conveying the significance of the building. Character-defining features, if removed, would decrease the building's historic integrity and its ability to convey its significance. Thus, the categories below divide the character-defining features, and those that are not character-defining, into more specific definitions relating to their individual integrity and importance.

These categories are defined as follows:

Significant (Red)

Definition: Spaces, elements or materials characterized by a high degree of architectural significance and a high degree of historic integrity. An example of a significant feature is the tripartite composition of the building.

Preliminary Guideline: Significant exterior and interior features and materials should be retained and preserved, or where alterations have occurred, be restored. Deteriorated materials should be repaired rather than replaced. Where replacement is necessary due to extensive material deterioration or failure, replacement materials should match the original materials and forms. The rotunda and colonnade are rendered in red because they are faithful representations of the original structures designed for the Panama-Pacific International Exposition in 1913 by Bernard Maybeck. Certain features of the exhibition building are original to the Maybeck design, including the chimneys, some doors, and the steel structure. These are also depicted in red.

Contributing (Yellow)

Definition: Elements characterized by a lesser degree of architectural significance, yet retain a high degree of historic integrity, or historically important, yet altered elements.

Preliminary Guideline: Contributing elements should be retained wherever possible, but are not essential to the building's ability to convey its overall significance. Where required, alterations and additions should be designed to be compatible with the existing elements and materials. New materials and assemblies at reconstructed areas should be similar to the original. The exhibition building walls, though dating to the period of significance, are rendered in yellow because they were not a faithful reconstruction of the original.

Non-Contributing (Blue)

Description: Non-Contributing elements are generally non-historic elements or elements that have been altered to the extent that their original character is absent.

CONDITIONS ASSESSMENT and REPAIR RECOMMENDATIONS

This section records the existing conditions of the property as surveyed in December, 2011 and January, 2012. Architectural elements of the Palace of Fine Arts are categorized by exterior materials and assemblies. Significant features are the primary focus of this assessment.

The purpose of the investigation is to:

- Document and assess the condition of the existing buildings;
- Identify areas of immediate concern;
- Identify areas where further investigation is required.

Conditions Assessment Methodology

The Rotunda, Colonnade and the Exhibition Building was surveyed by a Page & Turnbull materials conservator and documented through digital photography during the weeks of December 19th, 2011 and January 9th, 2012. The survey was primarily conducted from ground level with additional access being provided to the roof of the Exhibition Building. Interviews with the maintenance staff as well as a former contractor were conducted and are further discussed within this section. No hazardous materials testing, including lead paint and asbestos, was conducted.

The Rotunda and Colonnade were not the main focus of the investigation and are described here only to identify future maintenance concerns. Additionally, the condition of the structural steel framing of the Exhibition Building, while a significant feature, is addressed by the Structural Engineers report within this document.

Conditions Definitions

The building elements conditions are described on a good, fair, poor rating system, defined as:

Good (G)

The building element/feature is intact, structurally sound, and performing its intended purpose. The component needs no repair or rehabilitation, but only routine or preventative maintenance.

Fair (F)

The building element/feature is in fair condition if either of the following conditions is present:

a) There are early signs of wear, failure, or deterioration though the component and its features are generally structurally sound and performing their intended purpose; or
b) There is failure of a feature or component.

Poor (P)

The building element/feature is in poor condition if any of the following conditions is present:

a) The features are no longer performing their intended purpose; or
b) Features are missing; or
c) Deterioration or damage affects more than 25% of the component; or
d) The component or features show signs of imminent failure or breakdown.

Unknown (U)

The assembly or feature was not accessible for assessment or not enough information is available to make an evaluation.

Summary of Existing Conditions
In general the Rotunda and Colonnade are in good condition, while the Exhibition Building is in good/fair condition. Both the Rotunda and Colonnade were recently stabilized and cleaned. A summary of that project is described within this section. With that project completed recently, both the Rotunda and Colonnade suffer from minor staining, due to bird infestation. The Exhibition Building exhibits cracking of the cement plaster walls, water staining/organic growth and minor water infiltration at the roof.

The cement plaster at chimney 5 on the west facade poses a concern due to severe cracking (see Figure 01 for key plan). Assessment by the structural engineer and review of past project drawings, the cracking is believed to be caused by corrosion of the steel strap, installed to brace the chimney.

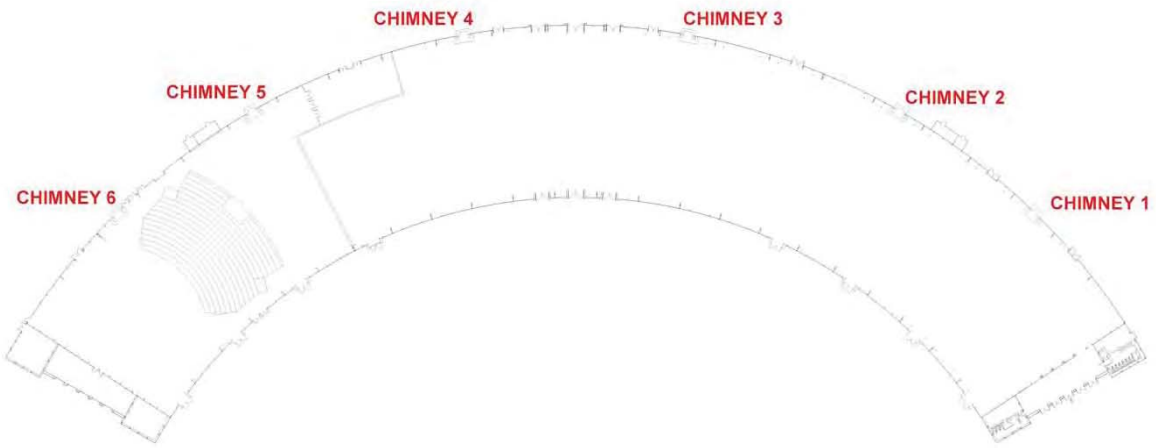


Figure 01: Chimney key plan.

Rotunda and Colonnade Stabilization Project
This conditions assessment does not include a full study of the various projects completed since 1993. However a brief summary of a recent project to stabilize ornamentation at the Rotunda was completed in 2008 and is described below. The project was designed by Carey & Company and work was partially conducted by the contractor Sullivan Thompson Masonry & Restoration. Page & Turnbull contacted Deborah Blake, President of Sullivan Thompson to obtain a summary of that work.

The scope of work for the stabilization included the following:

- General washing of the exterior of the rotunda and colonnade;
- Spall repairs to cast concrete, including design of a mix with integral color to match the existing cast concrete color;
- Structural pinning of ornamental figures and coffered ceiling of the rotunda. All pinning was done from the interior side of the rotunda and holes were plugged with a matching mortar;
- A parge coat was installed at all horizontal ledges, in an effort to keep water from entering the wall system.

In addition to this scope, Exploratorium staff explained that work was also conducted at the roofs of the storage rooms at the rotunda. The roofs were replaced, waterproofed, and planters

re-installed. This has arrested water infiltration at the interior storage spaces.

Conditions Assessment of Rotunda & Colonnade

Cast Concrete – Good
Spalls and structural pinning of the cast concrete were completed, as described in the summary of the 2008 stabilization project. Spall patches and plugs for the pins are a close match to the original concrete. There are several that stand out due to the discoloration of the existing concrete. Industry standard is to match to clean concrete and not stained or dirty concrete, allowing the patch to weather and eventually blend. A future project should follow this same standard. Currently the concrete only suffers from minor staining due to bird droppings. A future project should consider a bird management plan to arrest roosting habits on the structure.


Figure 02: Rotunda arch showing plugs from pining.

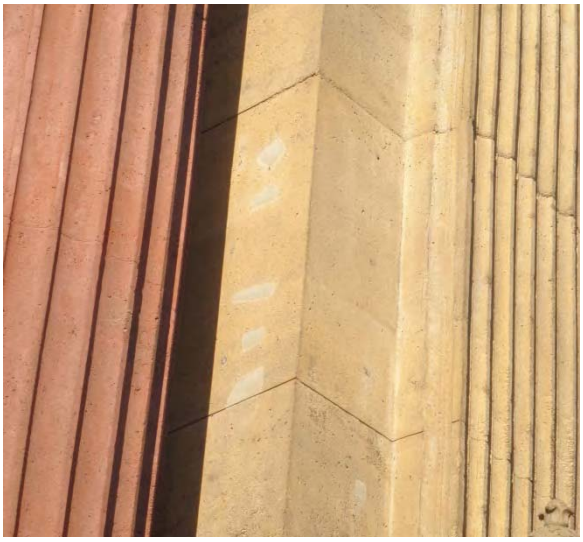


Figure 03: Spall patches.

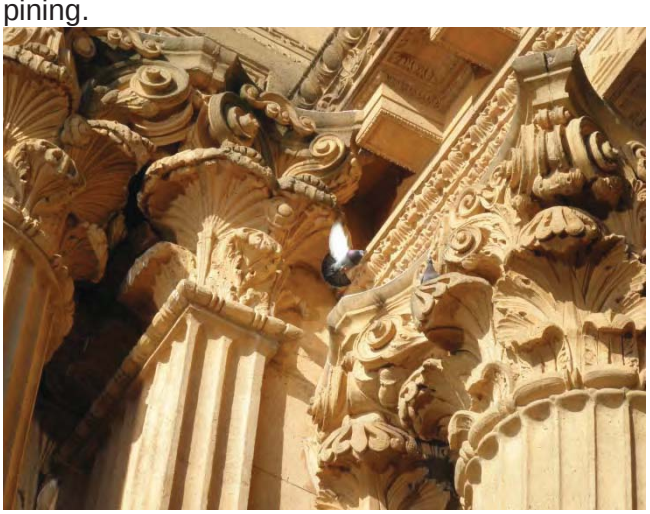


Figure 04: Pigeons roosting at Colonnade.


Figure 05: Bird droppings staining concrete.

Rotunda Ceiling & Dome – Good
The recent 2008 project included a parge coat at all horizontal ledges of the rotunda in an effort to mitigate water infiltration. Damaged plaster was repaired and painted. No signs of water infiltration were visible from the ground level. Additional investigation and access to the space above the ceiling are recommended to assess the condition of elements not accessed during this survey and to advise on repairs.


Figure 06: Parge coat installed at horizontal surfaces.

Cast Ornamentation – Good
The ornamentation was also stabilized and cleaned during the 2008 project. Bird droppings and roosting is also an issue and a plan to arrest roosting habits should be considered.

Doors – Good
The doors to the storage rooms located at the rotunda and colonnade are non-contributing and are in good condition.

Conditions Assessment of Exhibition Building

Cement Plaster Walls – Good/Fair
The cement plaster is in good condition with the exception of cracking at several chimneys. The plaster also exhibits extensive water staining, organic growth, and painting that does not match the integral color of the cement plaster, presumably painted to cover graffiti.

Vertical cracks in the cement plaster occur regularly at the upper corners of west façade doors and extend up to the cornice. These cracks are primarily hairline (a crack partially through the plaster section and less than 1/16-inch in width) and likely result from the lack of control joints which allow for some expansion and contraction of the plaster system. Calculations should be conducted to determine if the number of existing control joints can withstand the movement within the wall. At several chimneys the plaster cracking is more severe. For example, the cracks noted at chimneys 4, 5 & 6 (see Figure 01) show signs of failure of the cement plaster attachment to the chimney structure. As previously mentioned the condition is likely the result of corrosion of a steel strap installed to brace the chimney. This action is known as “rust jacking”. When steel corrodes it can expand up to ten times its size, exerting a significant amount of stress on the surrounding plaster material. A future project should remove the plaster for inspection of the steel. Where steel in is sound condition, corrosion should be removed and

all surfaces primed with a zinc rich primer. Where corrosion of the steel has resulted in a substantial loss of section, compromising its structural integrity, the steel strap should be replaced. New plaster should match the existing in composition, color, texture, and finish.

Figure 07: Painting of façade.

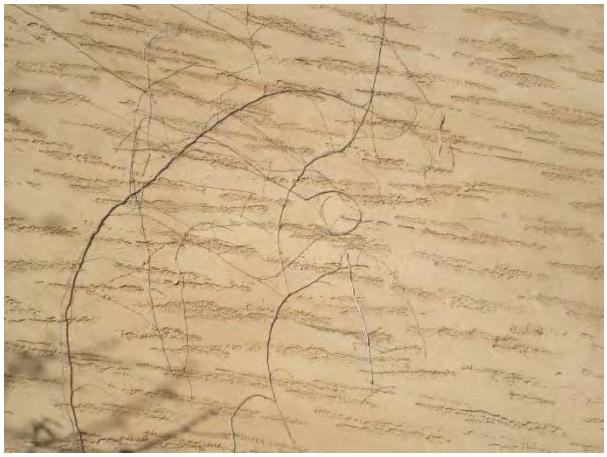


Figure 08: Old ivy organic growth at east façade.

Figure 09: Vertical crack at door on west façade.

Figure 10: Severe cracking at chimney located second in from the south edge of the west façade.

Figure 11: Horizontal cracking at chimney.

Figure 12: Typical minor cracking at chimney.

The extensive water staining and organic growth is primarily a result of the failure of the downspouts to properly shed water from the roof, forcing water through the overflow scuppers. When water is shed through the overflow scuppers it cascades down the exterior façade of the building. This provides a wet environment that is ideal for organic growth to blossom and grow. Currently the downspout drains are clogged with debris of the nearby redwood trees and should be cleaned. Additional organic growth can be found at the cornice of the east façade. A future project should consider the following:

- Study the ability of existing downspouts to handle the volume of water shed from the roof. Provide additional interior downspouts where needed;
- Scope existing downspouts to determine if blockage exists deeper within the system;
- Clean organic growth stains from cement plaster using mild detergent and natural fiber brush;
- Consider trimming/removing redwood trees.

Figure 13: Example of water staining and organic growth at overflow scupper location.

Figure 14: Area of severe staining and organic growth.

Figure 15: Example of clogged downspout and scupper at roof.

Figure 16: Clogged leaderhead and resulting staining and organic growth.

Historic Doors and Hardware – Fair

The historic doors are in fair condition and little has changed since the 1993 Historic Structure Report (HSR) description of their condition. Exploratorium maintenance staff state that their shop has maintained the doors and that the doors were rehung when they started to sag due to their weight. The stress on the hinges also requires staff to fashion new pins and periodically rehabilitate the hardware as a whole. According to maintenance personnel, approximately half of the doors at the Exploratorium space are operational. The large central door on the west façade is opened annually for an event. The door adjacent and south of the central door on the east façade is also operational. This door provides access to the Exploratorium exhibit storage within the Rotunda, and the door is used frequently to bring exhibits in and out of the building. Additionally many of the doors at the west façade are operational and used as staff entrance, loading and unloading, and fabrication shop access.

In general the historic wood doors suffer from wood decay, paint delamination, minor abrasions, inappropriate alterations and operational issues (especially those that have not been opened in recent years). A future project should restore the historic wood doors. Doors may be fixed shut should the program not require them to be operable, so long as it is done in a reversible manner. A project should also consider retrofitting the doors with weatherstipping. Currently the doors do not properly seal at the perimeter and pairs of doors do not seal at the center, allowing air infiltration.

Original door hardware does exist. The 1993 HSR should be referenced for its location. As previously noted the hinges generally are in need of repair. All original hardware should be rehabilitated to proper working order and cleaned to remove paint and corrosion. Where hardware is not code compliant for door use, consider relocating the hardware to a door to be fixed in place and provide proper documentation of the change.

Figure 17: Typical historic door at west façade.

Figure 18: Typical door at east façade. Also note staining of plaster.

Figure 19: Plywood and metal kick plate at base of historic doors on west façade.

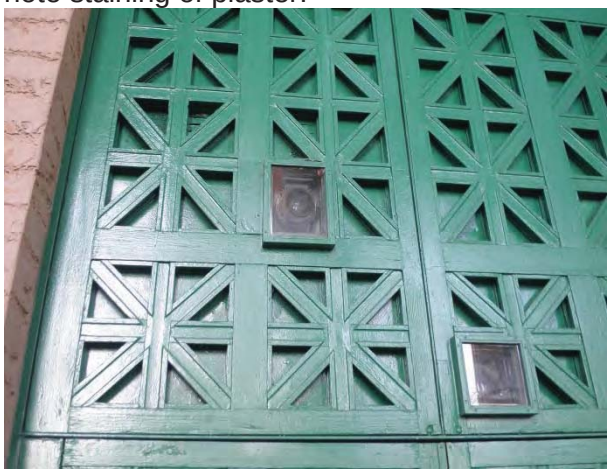


Figure 20: Inappropriate alteration of historic doors on east façade.

Roof and Skylights - Fair:
The roofing membrane is non-contributing and therefore was not assessed for its condition. However, maintenance staff believes it has outlived its useful life. The skylights date to the reconstruction. Of the six skylights in place, one had its glazing replaced in the 1990s (according to Exploratorium staff), two at the theater space are painted over and unable to be assessed for their condition and the remaining three were in fair condition. The original wire glass at the other skylights is in poor condition. Approximately 50 percent of the glass is cracked and has been sealed at the exterior side with a bituminous tape. The bedding of the glass shows signs of failure. Staff states the leaks are not at the muntins; however, the muntins have been covered at the exterior with a bitunimus tape to address past leaks at these locations. Skylights do currently leak at the perimeter curb. According to staff the city repairs the leaks at least one per year.

A future project should consider full rehabilitation of the skylights. Those that have been painted over at the theater space should be further assessed once the coating is removed. The project should assume replacement of all glazing. However, if enough wire glass can be salvaged from the existing skylights, consider filling one entire skylight with the wire glass and replacing all

others with tempered glass. If the roof is replaced as part of a future project the flashing system at the skylight curb should be replaced.

Figure 21: Skylight with replaced glazing.

Figure 22: Skylight with cracked glazing and bituminous tape.

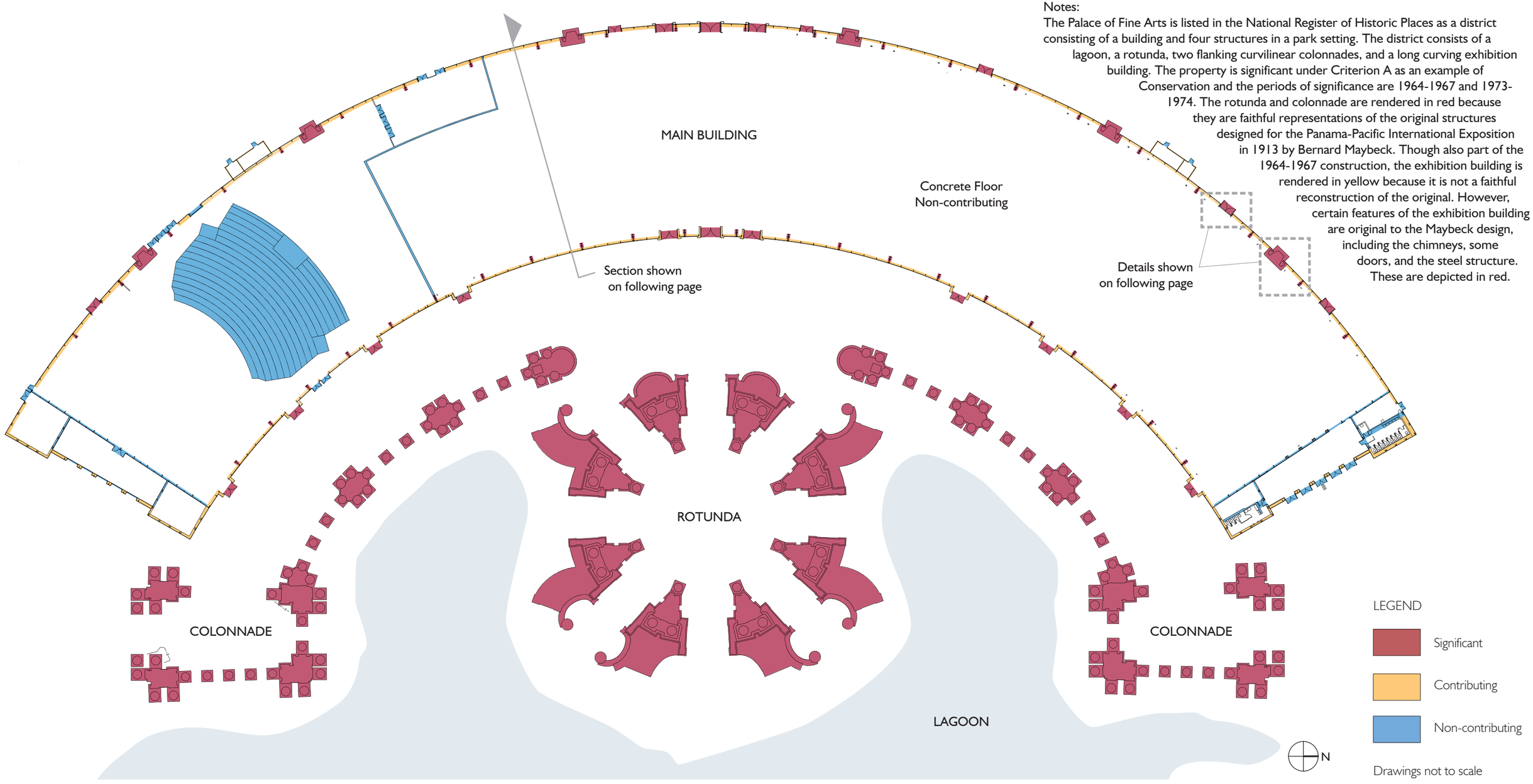
Figure 23: Skylight painted over.

Chimneys – Good

The original stone of the chimneys can be observed from the interior, with the exception of one which is furred over and not accessible for assessment. The stone work is in good condition with some general soiling due to soot. Only the theater lobby fireplace is currently in operation. Chimney caps were observed from the roof and are in various states of disrepair. Caps should be replaced as part of a future project. Should a future project wish to make chimneys operational, it is recommended they be cleaned (swept) and inspected.

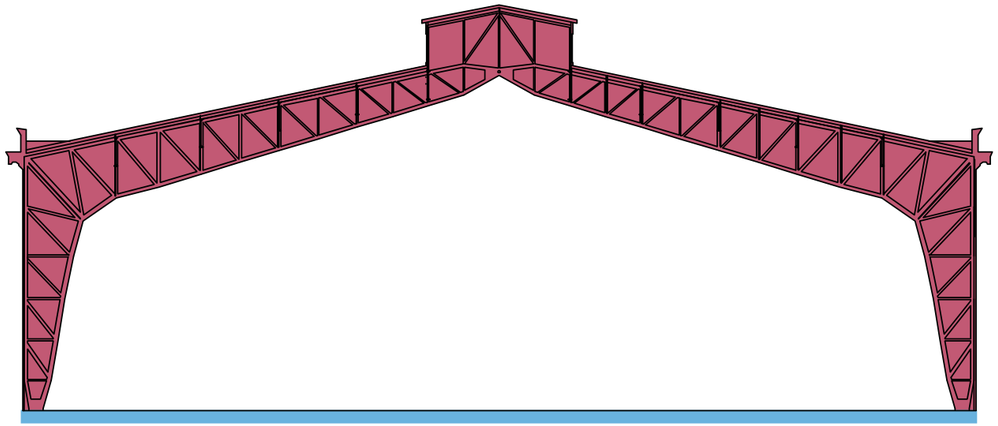
Figure 23: Fireplace at theater lobby still in operation.

Figure 24: Chimney cap in disrepair.

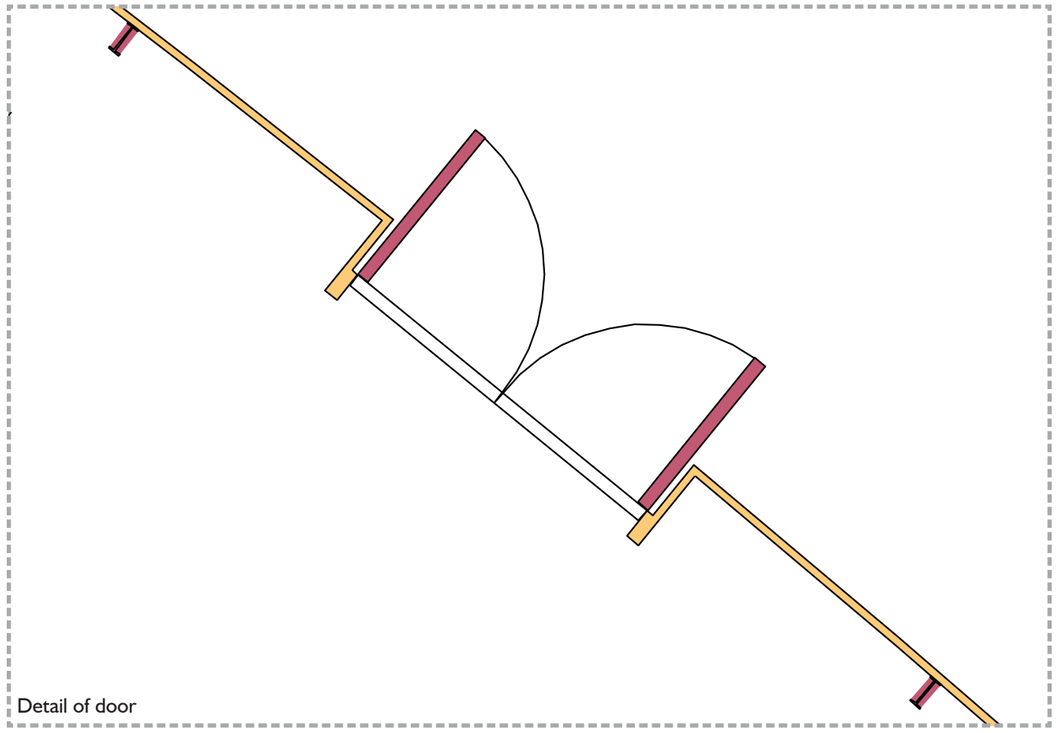


Notes:
The Palace of Fine Arts is listed in the National Register of Historic Places as a district consisting of a building and four structures in a park setting. The district consists of a lagoon, a rotunda, two flanking curvilinear colonnades, and a long curving exhibition building. The property is significant under Criterion A as an example of Conservation and the periods of significance are 1964-1967 and 1973-1974. The rotunda and colonnade are rendered in red because they are faithful representations of the original structures designed for the Panama-Pacific International Exposition in 1913 by Bernard Maybeck. Though also part of the 1964-1967 construction, the exhibition building is rendered in yellow because it is not a faithful reconstruction of the original. However, certain features of the exhibition building are original to the Maybeck design, including the chimneys, some doors, and the steel structure. These are depicted in red.

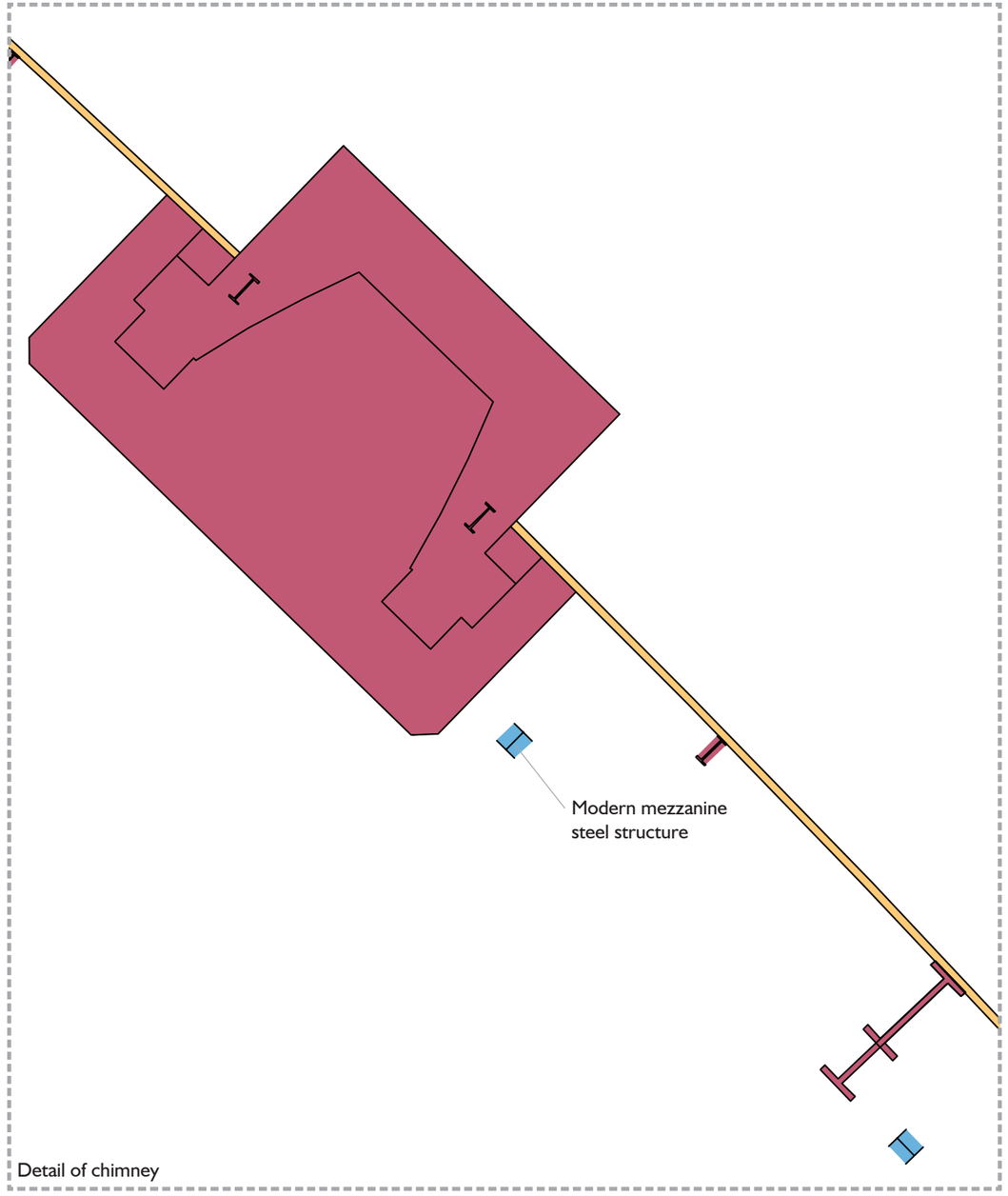
Significance Diagram: Floor Plans



Section



Detail of door



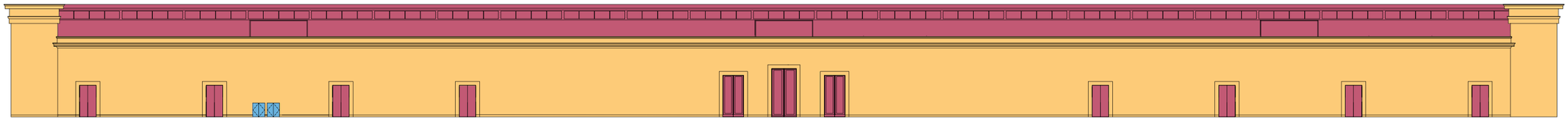
Detail of chimney

LEGEND

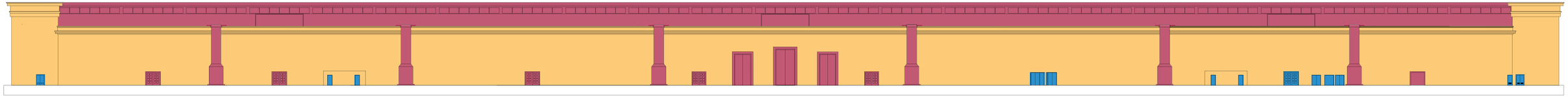
- Significant
- Contributing
- Non-contributing

Drawings not to scale

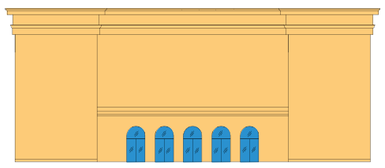
Significance Diagram: Details of Significant Elements



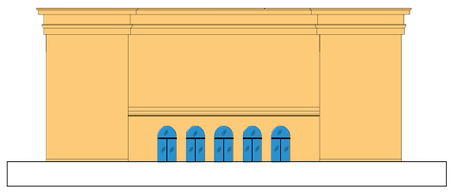
East Elevation (Main Elevation)



West Elevation



North Elevation



South Elevation

LEGEND

- Significant
- Contributing
- Non-contributing

Drawings not to scale

Significance Diagram: Elevations

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structural analysis

Rutherford & Chekene

Palace of Fine Arts

PHASE 1

EXECUTIVE SUMMARY

This report summarizes our condition assessment and seismic evaluation of the existing Palace of Fine Arts building. Overall the condition of the building is good and if maintained will continue to be serviceable. The building was seismically retrofitted in 1993 and thus in accordance with the San Francisco Building code can be renovated to a large extent without further seismic evaluation. Though the building structure meets the building code we recommend two structural modifications to increase confidence in the building's performance in a major seismic event.

STRUCTURAL GENERAL CONDITION ASSESSMENT

Rutherford & Chekene's condition assessment of the structural components of the Palace of Fine Arts building is based on a review of the drawings and reports listed in the Reference Section of this report, and observations made during two visits. Site observations were limited to conditions that were readily observable; we did not employ lifts to make detailed up-close visual observations, or remove finishes to view concealed elements. Material tests were not performed.

1. Historic Shell

1.1. Soils

In 2000 Rutherford & Chekene[1] authored a geotechnical investigations report describing site soils and site development. That report notes that historic maps show a lagoon marsh under the south half of the building that was later filled, and a sand bar under the north half of the building. The investigation borings agree with the historic map, and describe a soil profile that can be generally summarized as fill material over organic silt and clay (the bottom of the marsh) over older bay mud at the south end of the building, and sand over older bay mud at the north end of the building. Underlying the entire site between elevations (approximately) -30' to -60' is a layer of dense sand. The entire site is subject to liquefaction.

The report notes finding groundwater in all ten exploratory borings ranging from 1.5 to 10 feet below grade, and that the deeper groundwater depths were expected to rise and stabilize at two to three feet below grade given time. (Borings covered almost the full length and width of the building.) It further notes that groundwater elevations are likely higher in the rainy season (borings were made in June 2000). One boring near grid 7 west of the building encountered an artesian groundwater condition and engineering staff measured groundwater elevation in the drill stem extending out of the hole at three feet above the surrounding grade. (Artesians are reported in a 1961 Dames and Moore report discussed below.) This high water table will need to be considered when planning the building's future use.

1.2. Foundations

The trussed steel frame that forms the principal structure is founded on concrete pile caps supported by wood piles. The original pile caps were constructed of wood and were replaced sometime in the 1930's with concrete pile caps interconnected along the

building's radial axes by concrete grade beams. Construction documents for the concrete pile caps or grade beams were not available for our review, however, reports by Dames & Moore (1961) and Carey and Co. (1993) documents cite this reconstruction, and all construction drawings after the 1930's reference concrete foundation elements.

In 1961 Dames & Moore[2] studied foundation piles in anticipation of renovating the building. The study included inspecting the tops of piles for soundness. Several piles were reported to be "*rotten pulpy extensions of sound piles below*" in the upper zone of fluctuating ground water level. These piles were repaired during the mid-1960's renovation by removing and replacing rotted material with concrete pile caps. Repair details and the extent of piles repaired during the renovation were not included in the material available for review. Later investigations by Rutherford & Chekene[4] did not find evidence of pile repair or replacement and speculated that only piles identified as deteriorated were repaired.

In 1988 Kaplan[3] exposed one pile near bay 14 as part of a seismic assessment of the building and found no noticeable signs of decay. The pile to pile cap connection was not observed.

In 2000 Rutherford & Chekene[4] conducted further exploratory work to observe the condition of the existing wood piles and pile to pile cap connection. Work included eight observation pits located along the length of the east and west elevations, and core tests of twelve exposed piles. Observation pits were widely space to provide a large geography of pit locations. Observations noted good pile to pile cap connections with no noticeable gaps between foundation elements, and tests showed piles to be in excellent to good condition.

The 1961 Dames and Moore report also focused on determining the compression and tension capacities of the piles and included load testing of three piles, and extracted three piles to determine installed lengths. Piles were extracted from northeast quadrant of the Rotunda and from the now demolished Colonnade along the building's east elevation near grids 2 and 22. The pile extracted from the Rotunda measured 17 feet, the pile extracted pile at the south end of the building near grid 2 measured 26 feet, while the pile extracted at the north end near grid 22 measured nine feet. Based on their investigation of soil conditions underlying the site and the extracted piles, in combination with analysis of pile load test results and recorded settlements, Dames and Moore concluded that piles in the north end of the building were likely shorter than their original specified length. Dames and Moore concluded that the building foundations were capable of supporting the reconstructed and somewhat heavier building provided that some allowance for differential settlement between trusses was accepted in the building's northern end, due to shorter piles. This conclusion has been proven out; based on our site observations of the structure and in particular the brittle exterior plaster walls, we see no signs of pile or foundation distress such as significant differential settlement and large cracks in the plaster walls.

The 2000 Rutherford & Chekene report noted that the suspected short piles founding the northern half of the building likely reached refusal at such short lengths due to the underlying sand bar comprised of denser sands at a shallow level. The shorter piles at the northern half of the building are founded in this dense sand layer which is underlain by a liquefiable soil layer. In comparison, the upper strata of southern half of the building soils is fill over lagoon marsh with denser soils found at lower elevations. At the southern half of the building longer piles extend pass through the liquefiable soil layer

under the building and are founded in non-liquefiable dense sands. Seismic induced liquefaction can significantly impact a building's performance and is discussed in greater detail in the Recommended Retrofit Measures section of this report.

1.3. Slab on Ground

The building floor consists of a slab on ground and is not part of the building's foundation system. Slab construction varies between the area of the building housing the Exploratorium and that housing the Theater. At the Exploratorium the slab is concrete of unknown age, thickness, or reinforcement. Sub-slab conditions are equally unknown, including provisions, if any, against moisture migration through the slab into interior spaces. The slab surface is uneven, cracked, and patched in various locations. Lacking appropriate sub-grade preparation, undulating and cracking slabs can be expected based on the site soil conditions.

The slab at the theater seating and orchestra pit is concrete, constructed in 1970, but of unknown thickness and reinforcement. The concrete slab in the seating area is in good condition, with no evidence of significant cracking. The orchestra pit extends approximately three feet below grade and Theatre staff reports water leaks at cracks and where penetrations have been made for below grade utilities. (Theater staff reported ground water level can rise to match the floor elevation when storms occur during high tides.) Other areas within the Theatre are paved in asphaltic material of unknown thickness and age and these areas noticeably undulate.

The slab on ground is a nonstructural element, the foundation pile caps and interconnecting grade beams form the foundation system for the building and do not reply on the slab. Decisions regarding the slab need only consider functional and visual requirements.

1.4. Superstructure

The building is framed using a primary structural system that is common to elongated rectangular exhibition halls with column free interiors. A series of steel truss frames clear span across the full 135 feet width of the building and provide both vertical support for the roof and lateral resistance to wind and seismic loads. The truss frames are spaced at 38 feet on-center measured along the building's central axis. Because the building is semi-circular in shape and the truss frames are arranged along radial lines of the circle, the on-center spacing is greater or lesser at the facades. The frames are configured in a classical structural profile known as a three-hinged arch that is deep at the knees where the exterior walls and roof intersect, and tapers to pins (or hinges) at the bases of the frame and at the ridge.

The truss frames are generally unaltered from the original construction and are constructed from riveted steel angles. We did not observe signs of structural distress in the frames, such as bowing or twisting of members or movement of members relative to their connections, structurally significant deterioration, or modifications that may have compromised their load carrying capacity.

Beams and trusses spanning between the primary truss frames support the roof. A horizontal truss along each facade laterally braces the exterior walls back to the main frames. We did not observe sings of structural distress in these secondary framing members.

The original roof design included, at each bay, a large skylight opening on either side of the central elevated roof monitor. The remaining area was constructed with a proprietary system of wire lath reinforced cementitious material. The 1960's reconstruction removed most of the skylights and replaced areas with deteriorated cementitious material with steel deck. In the 1980's steel deck was installed in the remaining areas of original roof construction. The present roof is constructed essentially throughout with steel deck.

Vertical steel strong-backs spanning between the foundation and roof at approximately 12 feet on-center support transverse walls at each end of the main space. Pavilions extend out an additional 30 feet beyond these walls. Pavilions have a low concrete roof slab at approximately 16ft above grade at their centers. Flanking the low roof on each side are high roof areas that rise approximately 55 feet above grade. The high roofs are constructed with concrete filled steel deck supported by steel framing. The original walls consisting of a thick section of wire reinforced cement plaster appear to be the only lateral force resisting elements for the pavilions.

In 1993, a full seismic retrofit of the building was completed. Based on the construction documents by the San Francisco Bureau and HKA Associates[11] dated July 15, 1993, the work included the following.

- replacing original rod bracing that occurred along the curved facades with much more substantial tubular steel braced frames (12 bays total).
- adding bracing at the north south pavilions' end walls and side walls.
- adding bracing to improve the connection between the roof diaphragm and braced frames at the walls.

- adding bracing at the monitor.
- adding angle bracing to complete the load path between the roof deck and the brace frames.

We observed many of the above noted elements and surmise that all have been constructed.

We did not observe notable paint flaking. Prior to making modifications to steel framing, hazmat reports for painting materials should be reviewed as lead has historically been incorporated in such coatings.

1.5. Exterior Elements

Exterior walls are constructed with a full 2-1/2 inch thick layer of cement plaster supported by a grid of cold formed steel channels that are attached to 10 inch deep steel I beams that span between the floor and roof. The cement plaster dates from the 1960's reconstruction when all of the exterior was replaced. In general, the walls are structurally adequate and are in quite good condition. The east facade evidences very little cracking overall. The west facade shows some vertical cracks at the corners of doors on the northern portion of the building. We judge this cracking as typical of plaster construction and not indicative of excessive foundation settlement or inadequate structural support framing.

Six original stone fireplaces all appear extant. Only one fireplace, located in the theater, is visible at the building interior. The others are covered by finishes or otherwise hidden

from view. Three of the chimneys, located at grid lines 5, 9 and 13, have wide cracks in the stucco plaster applied to their exterior. Of particular note is a horizontal crack at the eave line of the structure. The chimney at grid 2 also shows a small horizontal crack at the eave line that may have been patched. Photos of these chimneys are included in Appendix A. The 1963 building renovation drawings show a steel angle with expansion anchors bracing the chimney to the roof diaphragm at the eave line. This steel member, and possibly additional steel connection members, may be rusting and causing stucco cracking. This would not be a primary structural concern but a maintenance item; the area should be explored and remedial action taken to repair deteriorating steel members and patch the plaster.

2. Ancillary Structures

2.1. Theater Construction

The Theater was constructed in 1970 with only minor modifications since. The sloped seating area is slab on ground over the lower two thirds of its area. The upper portion of the seating area is framed with concrete slab supported by concrete block walls, according to an available architectural drawing.

The proscenium arch is placed directly under the building's steel truss frame along grid 2. Significant structural alterations were made to the truss frame to accommodate the proscenium including adding steel diagonal and vertical columns, and deepening the truss with new members under the existing truss bottom chord. The alterations appear to be reversible if the arch construction is removed for another use of the space.

A light steel catwalk and sound baffles are hung over the seating area from the structure above. A steel grid iron was hung from the original roof structure above the stage in later years. Miscellaneous lighting, mechanical and other lightweight theater equipment are hung from the original structure over and behind the stage areas. There are no obvious signs of distress or deterioration of the theater structures or of the original roof framing due to theater loads.

2.2. Exploratorium Construction

The Exploratorium has two single-story mezzanine structures that are independent of the existing building structure as well as many small enclosures scattered throughout the space. We understand that the small enclosures will likely be demolished or moved with the Exploratorium.

No drawings of the mezzanines were available for review. According to Carey & Co.[8] the larger mezzanine was constructed in 1979. Based on our observations, the larger mezzanine is constructed with concrete filled deck supported by conventional steel beams and steel pipe columns, with steel pipe braces providing lateral resistance. A smaller circular shaped structure of masonry block is connected to the larger mezzanine via a small bridge.

The 2000 R&C report identifies that the two mezzanines are supported on shallow foundations. There are no obvious signs of structural distress of the mezzanine structures due to foundation settlement.

CODE ANALYSIS OF THE EXISTING STRUCTURES

The governing code for the existing historic building is the 2010 San Francisco Building Code (SFBC), which adopts the 2010 California Building Code (CBC) with Amendments. The building is eligible to use the structural provisions of the California Historic Building Code (CHBC) for renovation work, when such work is mandated by the local jurisdiction.

Buildings in San Francisco constructed prior to the 1971 San Fernando Earthquake were designed for much lesser requirements for earthquake resistance than mandated by present building codes. Since the early 1990's building regulations have mandated seismically retrofitting the most hazardous building types, specifically unreinforced masonry buildings and soft-story residential buildings. For other building types, seismic retrofit is not mandatory, except when triggered by one of the following events:

1. Adding new area to the structure (connected mezzanines, vertical additions).
2. Structural modifications that reduce the seismic force resisting capacity of the structure (removing braces, removing diaphragm rod bracing, etc.).
3. An increase seismic mass of the structure by more than 10% of its original seismic mass (heavy equipment, extensive heavy ceilings, new ornamentation – all mass added from the original construction date is considered).
4. An "increase" in the building occupancy (, hospital, police fire station or other emergency response occupancy)
5. Major renovation of nonstructural components affecting more than 2/3 of the building area. In general, it is considered that the major cost of making seismic improvements is associated with displacement of occupants and reworking of systems and finishes, making retrofit much more feasible when undertaken in combination with major renovation. (slab on ground replacement, ceilings, partitions, new openings through the existing plaster walls, reopening some of the roof skylights or the monitor).
6. Use as a public school with permitting under Department of State Architect.

Discussion, events 1, 2, & 3
Though we deem it unlikely, should events 1, 2,or 3 occur, the code would require evaluating the entire building's lateral force resisting system and retrofitting any items found deficient. The entire system would include the roof diaphragm, roof chords and collectors, primary force resisting elements (braces of transverse trusses) and the foundations. The code compliance path follows the California Historic Building Code and its stipulated lateral force levels, which are reduced from the CBC levels. The CHBC also allows a fair amount of engineering judgment in evaluating the lateral force resisting system.

Discussion, event 4
The current and historic occupancy of public assembly is a structural Occupancy Category III. The structural occupancy categories are somewhat different from the architectural designations and are listed from Category I (least hazardous) to Category IV (most hazardous or important emergency response). Any change in occupancy for the new tenancy that is similar or less hazardous to life to the current occupancy would not trigger a code mandate to seismically evaluate and strengthen the structure. However if the structure's occupancy should include a change to Occupancy Category IV (event 4 above), for example, a hospital, police fire station or other emergency response occupancy, the code would require seismically evaluating and

strengthening all deficiencies in the entire building's lateral force resisting system. In this case the CHBC could not be used and the more rigorous CBC code would govern.

Discussion, event 5
We anticipate that the Palace of Fine Arts will undergo substantial renovation of building systems and interior architecture to accommodate future tenants (event 5). This work may include slab on ground replacement, new ceilings and partitions, new openings through the existing plaster walls, and reopening some of the roof skylights or the monitor. A combination of these items can be expected to trigger SFBC section 3404.7.1 which requires that any building or structure with substantial changes to nonstructural elements must comply with SFBC section 3401.8. This code section requires that the building meet the lateral force requirements of SFBC section 1604.11. Section 1604.11 in turn specifies the minimum lateral forces to use for seismic evaluation and retrofitting, that, in the case of the Palace of Fine Arts, would be 75% of current CBC prescribed force levels. Section further states that "*an existing building or structure that has been brought into compliance with the lateral force resistance requirements of the SFBC in effect on or after May 21, 1973 shall be deemed to comply with this section*." As the building was seismically retrofitted in 1993 that retrofit should bring the building into compliance with the post-1973 SFBC and thus in accordance with the 2010 SFBC section 1604.11. The building can then be deemed to comply with the current code and no further seismic evaluation or retrofit is necessary.

Discussion, event 6
If the occupancy of the building were to include a K-12 or community college public education facility, the building would fall under the jurisdiction of the Department of State Architect. Part 1 of Title 24 section 4-307 (a) requires that the building be seismically evaluated and that a retrofit design be developed to address seismic deficiencies; both the evaluation and retrofit are to comply with the provisions of Sections 3417 through 3423 of Part 2, Title 24. We would anticipate that the results of the seismic evaluation would require seismically strengthening the building.

Based on our code-analysis, we expect that future use of the building will not cause the S.F. Building Department to mandate seismic improvements to the building, baring uses discussed in events 1,2, 3, 4, and 6 above. On this basis, any improvements that will be made should be considered to be "voluntary" and from a regulatory standpoint will only be required to be demonstrated to not be harmful to the seismic resistance of the building.

Lastly, with respect to the ancillary structures, the Theater and two main mezzanine structures can continue to be utilized with no modifications. Should modifications to the theater include any of the five items described above it would need to be evaluated and retrofit. This would be true for the mezzanines as well, with the same exception to item 5 as has the main building, as having been built in 1979 (or later) they comply with a post-1973 building code.

RECOMMENDED RETROFIT MEASURES

The preceding section analyzed conditions that mandate seismically evaluating and retrofitting the structure. In this section we discuss seismic performance and retrofit measures. Seismic retrofitting should be considered voluntary and would be implemented with the goal of improving structural performance or reliability in a major earthquake.

Foundations - Earthquake Induced Liquefaction

The 2000 R&C Geotechnical Investigation report identified that *"the presence of saturated, very loose to semi-compact sand at the site, coupled with the possibility of strong ground shaking, results in a high probability of liquefaction at the site."* Surface settlement estimates were on the order of three to nine inches for the various borings, and estimates were more a function of soil profile than earthquake magnitude. The same degree of settlement can be expected for any earthquake that can initiate liquefaction, as can be expected for a major earthquake. They identify a primary consequence of the settlements as loss of support for piles founded above a liquefiable soil layer. The report also identified that lateral spreading may occur at the site. Estimates varied from six to twelve inches for a moment magnitude 7 earthquake, and between one and three feet for a moment magnitude 8 earthquake. A subsequent geotechnical study by Treadwell and Rollo[10] also identifies settlement and lateral spreading due to liquefaction at the site though to a lesser degree.

Both phenomena, liquefaction induced settlements and lateral spreading, add uncertainty to the building performance as these effects are not explicitly considered in design. For this particular building structure the consequences of localized settlements and possible pile plunging is likely to cause extensive local damage to the nonstructural and structural elements. Lateral spreading of the site is more uncertain in how the movement interacts with the foundations of the structure. Shearing of the piles and forces pulling the foundations in opposite directions or pushing them together can occur. These foundation movements and forces on the foundations translate up into the building and could wrack and damage the structure.

To address settlement and loss of bearing capacity caused by liquefaction buildings are frequently founded on piles that extend below liquefiable soil layers. Piles at the southern half of the building are understood to pass through the liquefiable soil layer and as such address liquefaction settlement concerns. In contrast, short piles are known to found the northern half of the building, and that these piles do not pass through the liquefiable layer to the sound soils below. (We should note that it is not know if all of the piles in the north half of the building are short, or only some of the piles. Logically all piles corresponding with the extent of a historic sand bar potentially could be short.) Rutherford & Chekene's 2000 geotechnical report recommends installing micropiles, a drilled small diameter steel pipe pile that is well suited to installation at existing buildings, to support the truss frames to the north of grid line 9 to assure the reliability of the foundations, and we concur with this recommendation.

The micropiles would be approximately 40 feet long and founded in the dense sands below the liquefiable soils. At a preliminary level, we suggest adding two micropiles at the base of each truss frame and four micropiles at the truss frames connected to braces. The micropile pile caps would surround and be doweled into the existing concrete pile caps, extend below the existing caps, and be interconnected with new concrete grade beams that would run along the base of the exterior walls.

Whether or not a site has liquefaction potential, new buildings that are pile supported are required to interconnect the pile caps with tie elements, commonly in the form of grade beams. The pile caps of this building are in fact tied with a concrete grade beam in the curved direction and a concrete encased steel tie in the radial direction. The existing steel tie can serve to interconnect the pile caps in the radial direction. The existing 1930's era curved concrete grade beam has not been investigated in detail as part of this study. Our experience with this age of concrete construction would indicate that these elements are in fact not capable to tie the pile caps, thus we recommend the addition of new reinforced concrete grade beams. These grade beams will tie the pile caps of the building together to better resist movements and forces from lateral spreading. Sketches illustrating this retrofit recommendation are included in Appendix B.

The building slab and existing improvements constructed within the building shell, including the various mezzanines, are supported on shallow foundations. These features are likely to be damaged due to liquefaction inducement settlements. If mezzanine construction is intended to remain, we recommend consideration of compaction grouting of underlying soils to reduce the amount of liquefaction induced settlement that may occur.

Foundations for new construction interior to the building will require geotechnical recommendations for mitigating liquefaction; we expect micropile foundations or soil improvement under shallow foundations, interconnected with grade beams in both cases, will be recommended.

Superstructure Retrofit

The 1990's seismic hazard analysis and retrofit of the building was performed in accordance with the governing code provisions at that time. In the analysis, the building's three hinged arch trussed frames were considered as conventional moment resisting frames. The Code prescribed that the frames be evaluated for a lateral seismic force equal to 15% of the building weight for this system, and the frames were analyzed accordingly and found to be adequate.

A conventional moment resisting frame consists of a steel beam flange welded to steel columns. When subjected to large lateral forces, the beam flexes near its ends or breaks the beam flange-to-column weld. In either case, the frame remains standing and continues to support gravity load. Force levels used to evaluate the capacity of such a frame recognize the inherent ductility of the system, and are accordingly low.

In the three-hinged arch, the frame behaves similarly for resistance to lateral seismic forces. However, this system remains stable for support of gravity loads (the roof) only when the knee joints of the frame remain intact. If the "knee" of the frame is overloaded by seismic forces and frame members at the knee buckle, the arch looses stability and the roof may fall. On this basis, it is our opinion that the system should more appropriately be classified as an "Ordinary Concentric Braced Frame with Braces Supporting Gravity Load" and be evaluated at a force level that reflects the risk of collapse should a member fail.

We have assessed the truss frames, assuming a lateral force level that we believe reflects the consequence of a knee member buckling, that level being 75% of the building's weight. We found that the frames possess substantial strength to resist seismic forces, and the lateral system provides a similar level of safety, or conversely risk to occupants, as other seismically retrofitted existing structures. However, the reliability of the system against collapse could be substantially improved by reconstructing the center pin of the truss frames to permit relative vertical movement (i.e. one side or arm of the truss frame could move vertically relative to the adjacent side or arm of the truss) at large horizontal displacements, while maintaining the

current "pinned" condition at smaller horizontal displacements. A second retrofit option would be installing of a system of cable ties at the roof that would serve to as a secondary tie to ensure that the weight of the roof is supported against collapse in the event that the "knee" of the frame is compromised in an earthquake. Both options are illustrated in Appendix C of the report.

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11. San Francisco Bureau of Architecture and Hratch Kouyoumdjian & Associates, Consulting Engineers, July 13, 1993, Construction Drawings titled "Seismic Renovation Main Building, Palace of Fine Arts".

Appendix A

Photos of chimney conditions.

Top of Chimney Near Grid 9

Chimney Near Grid 5

Appendix B

The following sketches are provided for cost estimating purposes.

Sketch 1. Plan View of Foundation Level

Sketch 2. Detail of New Pile Cap

Sketch 3. Detail of New Grade Beam

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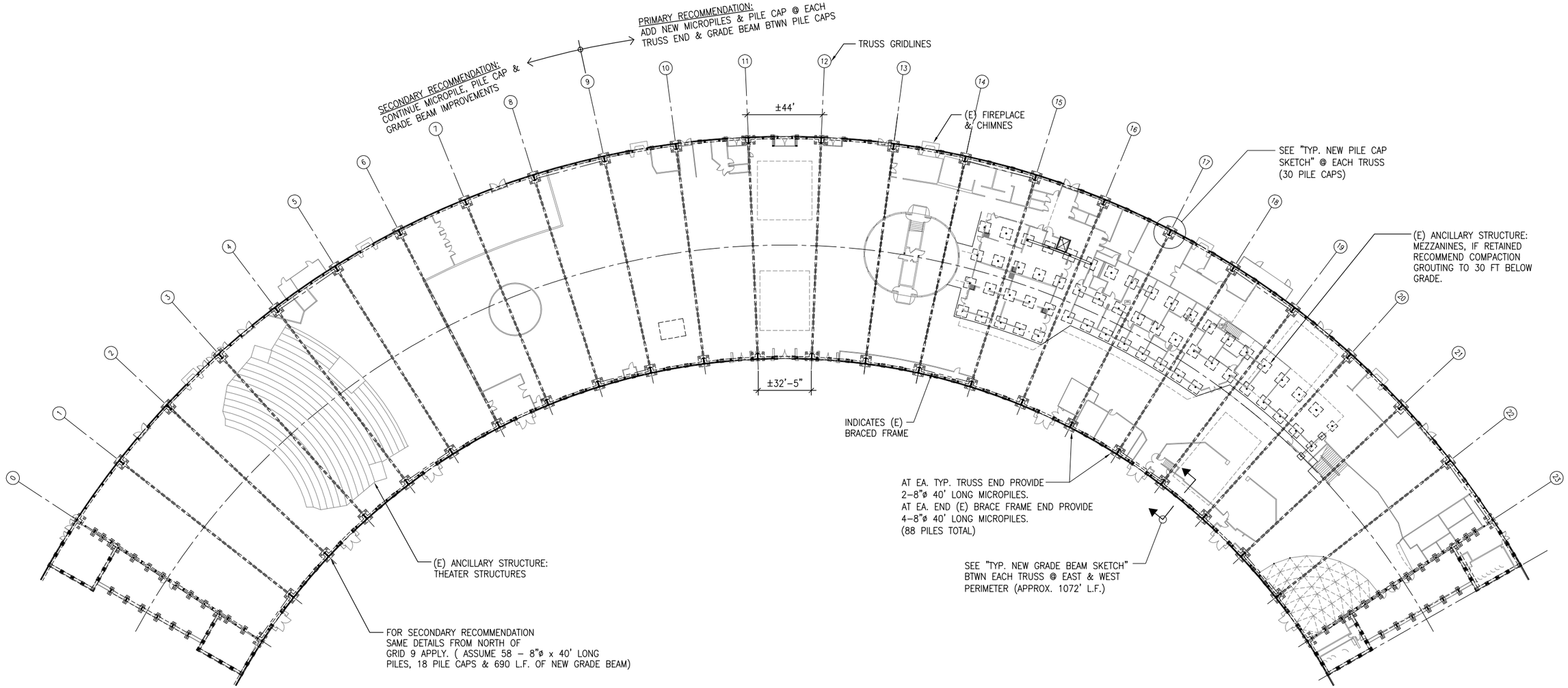

GROUND LEVEL FOUNDATION PLAN

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PALACE OF FINE ARTS
PRELIMINARY RECOMMENDATION
FOR COST ESTIMATION PURPOSES

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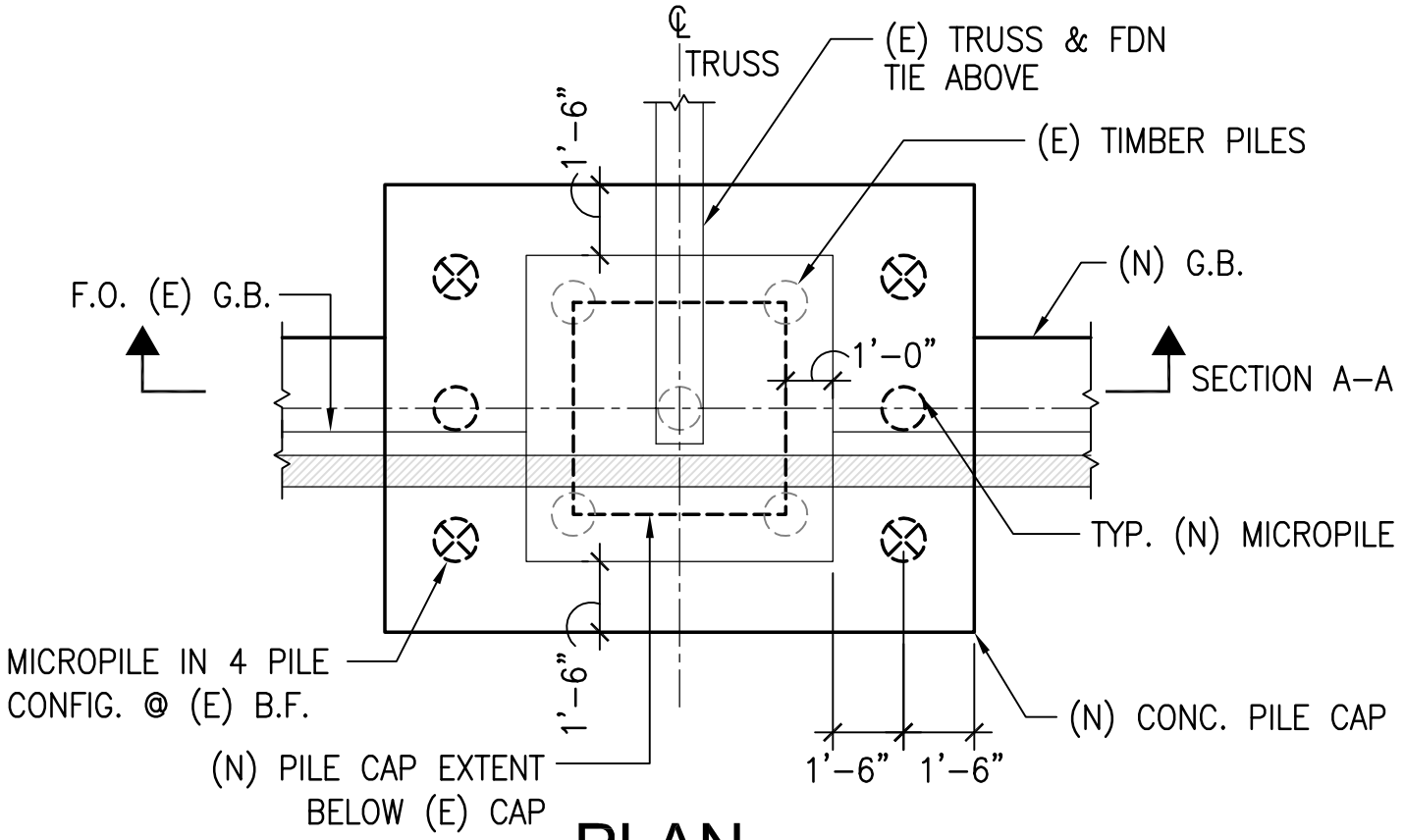
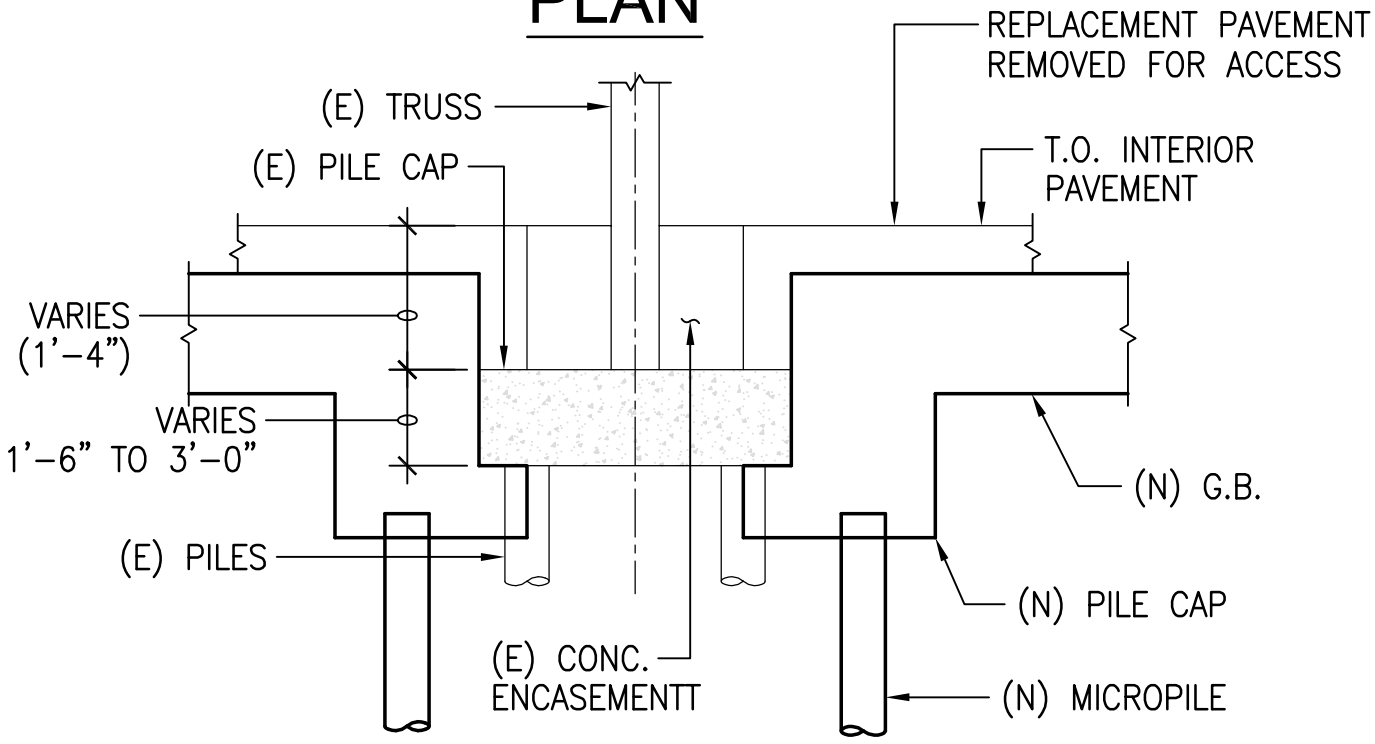


PLAN



SECTION A-A

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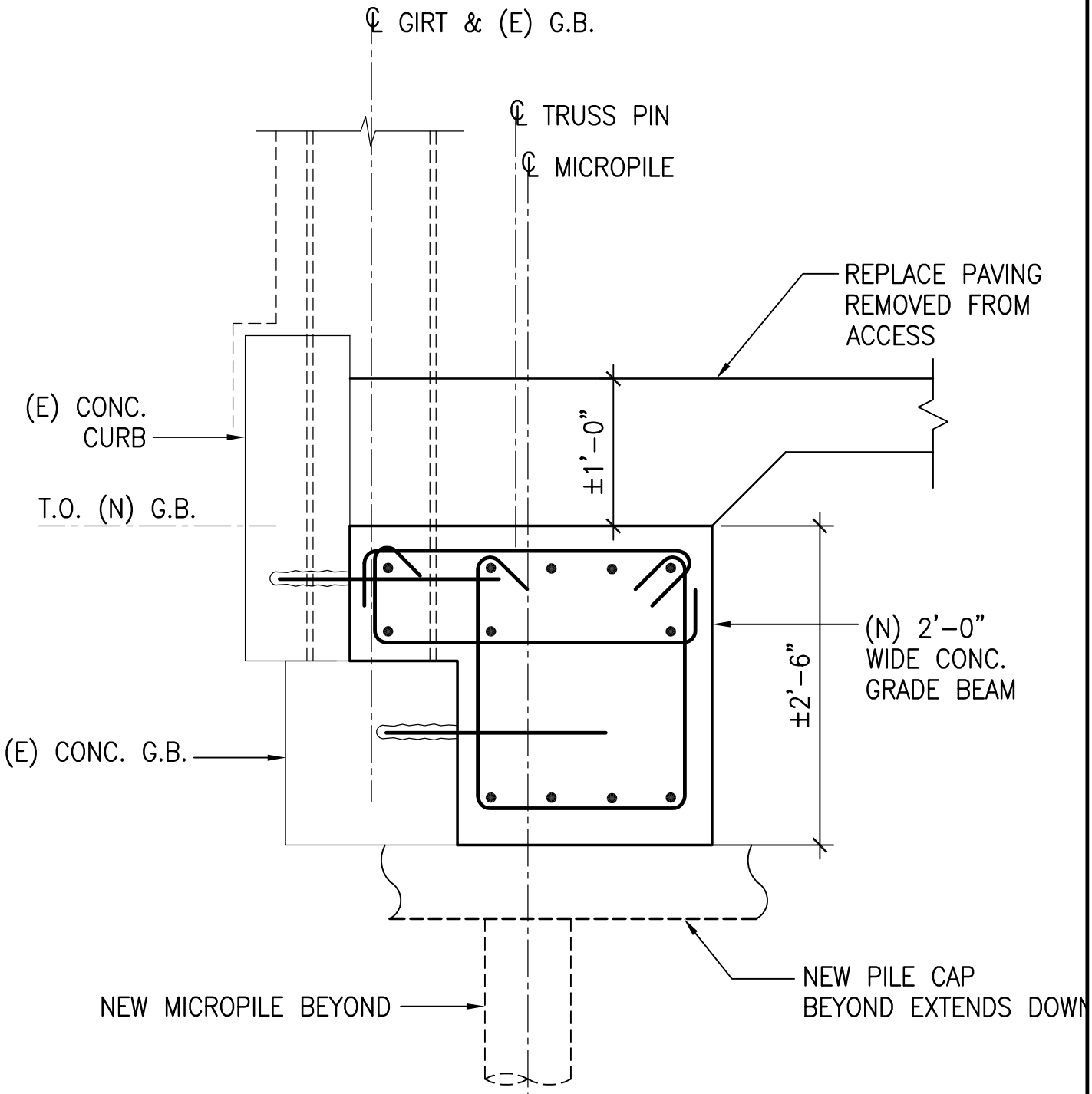

TYP. NEW GRADE BEAM @ PERIMETER WALL BTWN NEW CAPS SKETCH

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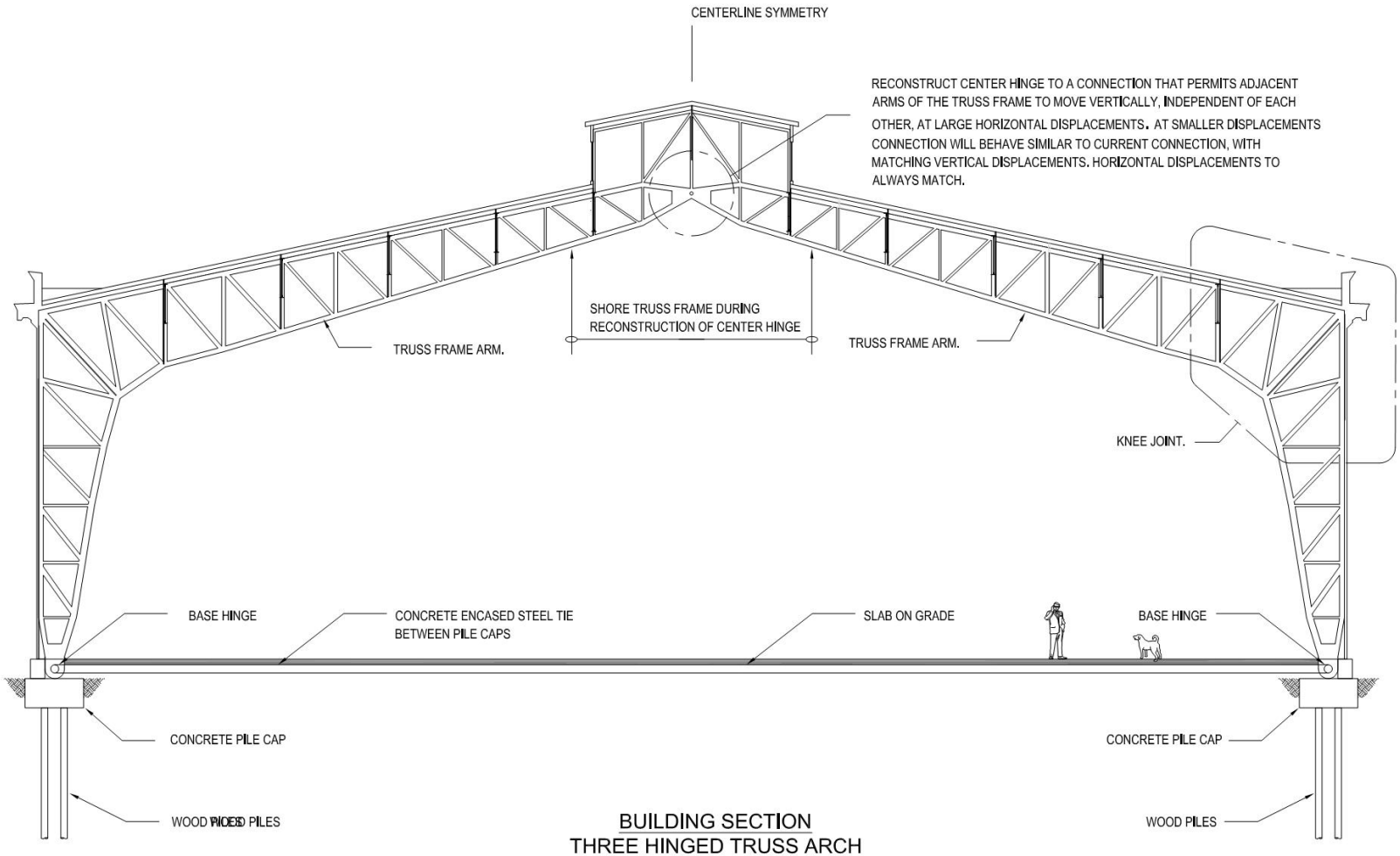
JOB No.: 2011108S	BY: CSM	SCALE: 1"=1'-0"	DATE: JAN. 12 2012

Appendix C

The following sketches are provided for cost estimating purposes.

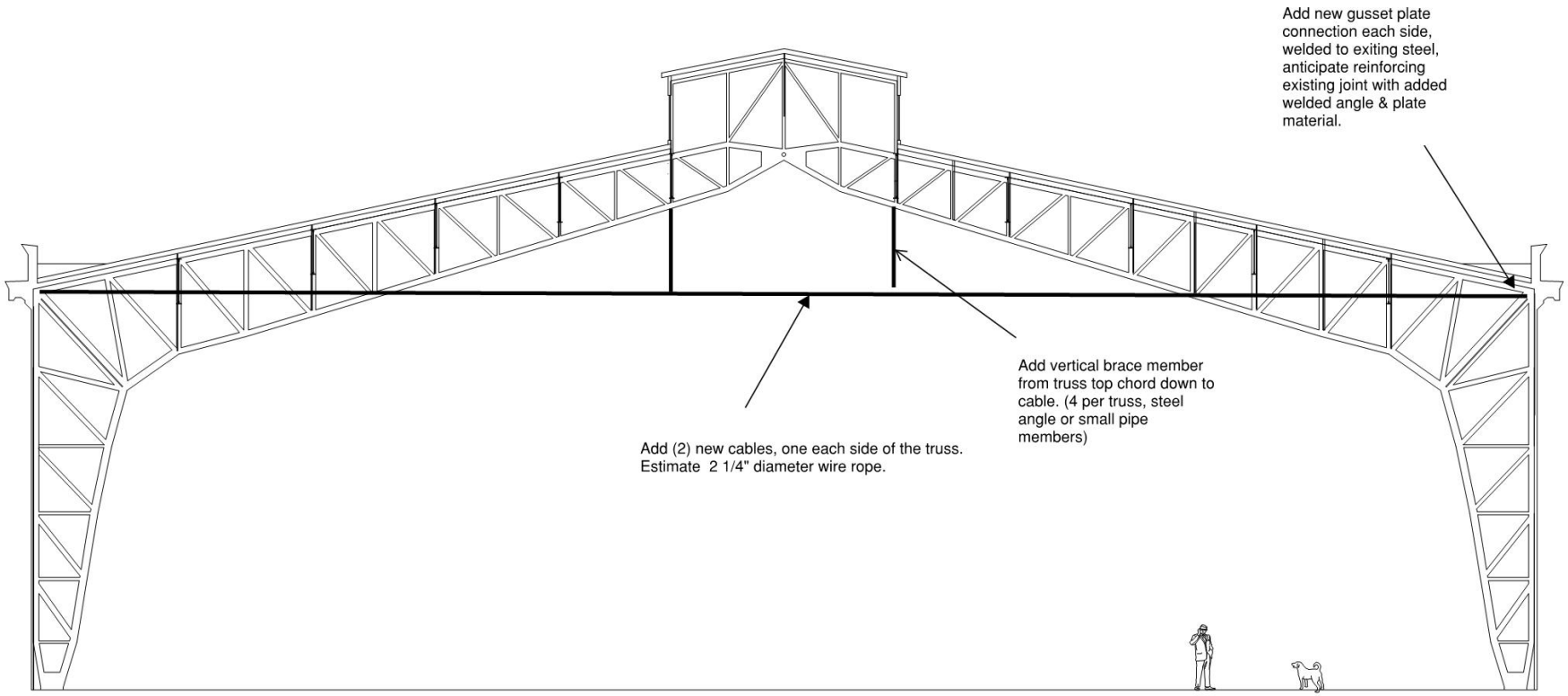
Sketch 1. Building Cross Section, Reconstructed Center Pin Seismic Improvement

Sketch 2, Building Cross Section, Cable Tie Seismic Improvement



BUILDING SECTION
THREE HINGED TRUSS ARCH
RECONSTRUCTED CENTER PIN SEISMIC IMPROVEMENT CONCEPT

SKETCH 1



BUILDING SECTION
THREE HINGED ARCH
CABLE TIE SEISMIC IMPROVEMENT CONCEPT

SKETCH 2

mechanical, plumbing, and fireproofing

Taylor Engineering

HVAC SYSTEMS FEASIBILITY NARRATIVE

Building Summary:

The Palace of Fine Arts building is an existing historic structure that currently houses the Exploratorium Science Museum as well as a large theater. The building, though large, is essentially a single story throughout. Building gross area per San Francisco Recreation and Parks Department documents is 120,797 square feet.

Building Thermal Envelope:

The exterior is painted concrete with multiple large metal doors and a metal roof. There is no thermal insulation evident on the exterior walls or metal roof. There are large existing skylights that consist of metal frames and single-glazing. The thermal envelope for the building is poor.


Existing Single-Pane Skylight

The floor of the building is slab-on-grade.

Six large wood-burning open fireplaces are equally spaced along the north wall of the building. Building operators report that the fireplaces are occasionally used and remain in decent operational condition. The fireplace in the Theater area is the one that is used most frequently. Visual inspection did not reveal any flue-dampers located in the chimneys.

Existing open wood-burning fireplace

Theater Building Elements:

The theater has a box office, lobby, theater and backstage area. The theater contains 962 fixed seats.

Theater Seating

Theater HVAC Systems:

The Theater area is heated and ventilated with eight Trane XE80 gas fired vertical furnace units with ducted distribution and ducted outside air. These units were installed approximately in 2000. No cooling is provided in the Theater HVAC systems.

The furnaces are organized into two banks of four furnace units that are controlled as a single air-handling unit. One of these banks is located at the northeast corner of the Theater and the other at the southeast corner. Each bank only has a small outdoor air ducted connection. For the 962 seats in the theater, a total quantity of 962 people x 15 cfm/person = 14,430 cfm of outdoor air should be capable of being provided to the Theater house area. The outdoor air duct connections appear much too small to be able to handle this quality of air, so it does not appear that the equipment meets current ventilation standards.

Theater System Outdoor Air Duct

Bank of Four Gas Furnaces that serve the Theater

Theater system does not have an economizer and is controlled via a residential-style thermostat. There is no demand-controlled ventilation control in place. Theater furnace units are constant volume airflow units.

Theater backstage areas are served by ceiling-hung natural-gas fired unit heaters.

Theater Back-Stage Unit Heater

Exploratorium Building Elements:

The Exploratorium program areas consist of multiple free-standing “structures” built inside the shell of the building. Exploratorium spaces include offices, administration areas, exhibit areas, small “dome” theater, workshops, classrooms, etc.

Exploratorium Open Exhibit Areas

There is a dining and light-duty food preparation area for Exploratorium visitors.

Kitchen / Dining Area

Exploratorium HVAC Systems:

The open exhibit area is heated by suspended gas-fired infrared unit heaters. There are approximately 28 units and they all appear greater than 20 years of age (perhaps substantially more). No central mechanical ventilation system exists to provide fresh-air to building visitors. The building envelope appears quite leaky and outdoor air infiltration rates are certainly high. The radiant heaters did not provide an effective heating system and during our site visit the space temperature was in the mid to low 60s. Most visitors were wearing their outdoor jackets inside.

Enclosed office and classroom areas are served by a number of small residential-style or packaged- units located on the roof. All equipment appears to be constant volume with local electronic thermostatic controls. Thermostats are residential style without the ability to independently schedule the fan separate from the heating/cooling functions. As such, the units cannot be controlled to provide code-required ventilation for occupants.

Heating/cooling single-zone unit serving an office suite

Residential-Style thermostats

“Outdoor” condensing units are located indoors

HVAC System Work Needed

At a high level, the HVAC systems for the Theater are marginally acceptable and could be retrofitted to remain in use for that space. At a minimum the units would need to be reviewed by an HVAC service contractor to check on the condition of their heat exchangers. At approximately 11 years old, this equipment is toward the end of its expected life roughly 15 years for this type and quality of equipment.

The quantity of fresh air provided by the system to the Theater will need to be reviewed and likely corrected. New unit controls will need to be installed consistent with current code requirements and good-practice for energy efficiency and indoor air quality.

For the building areas currently housing the Exploratorium, the HVAC systems can be completely removed. The current systems are not of a commercial style or quality and their configuration does not make them flexible enough to be retained for future re-use. Whatever program moves into the building, it will very likely make the most sense to install a new commercial-style HVAC system designed, installed, and controlled as appropriate for the new building functions.

PLUMBING & FIRE SPRINKLER SYSTEMS FEASIBILITY NARRATIVE

Theater Plumbing & Fire Sprinkler Systems:

The Theater area is without fire sprinklers; fire sprinklers are only in the lobby and restrooms. There are fire hose cabinets at the perimeter walls.

There are reported high water table issues in this space. There is a sump pump installation in the orchestra pit for ongoing flooding issues in this area.

Roof drainage is collected from perimeter gutters with vertical piping drops down to below slab. Exact piping routes below slab on grade are unknown. Age or condition of this piping is unknown

Theater area includes natural gas to serve gas fired vertical furnace units. Piping runs along perimeter

Theater includes plumbing fixtures and associated piping systems for restrooms. Age of the below slab waste piping from the restrooms is unknown. Piping is routed to the sewage grinder pumps noted below

Theater includes a duplex sewage pump assembly with column type grinder pumps. These pumps are appear to be in reasonable condition and are still serviceable now. There is no emergency power available for these pumps.

Exploratorium Plumbing & Fire Sprinkler Systems:

The area is with fire sprinklers at the suspended ceilings. There are fire hose cabinets at the perimeter walls.

Roof drainage is collected from perimeter gutters with vertical piping drops down to below slab. Exact piping routes below slab on grade are unknown. Age or condition of this piping is unknown

There is a dining and light-duty food preparation area for Exploratorium visitors with above grade plumbing piping and plumbing fixtures.

Exploratorium includes plumbing fixtures and associated piping systems for restrooms. Age of the below slab waste piping from the restrooms is unknown. Piping is routed to an exterior duplex sewage pump assembly. These pumps are appear to be in reasonable condition and are still serviceable now. There is no emergency power available for these pumps.

Existing gas piping is serving overhead unit heaters and to roof mounted HVAC units

Phase 1 Plumbing & Fire Sprinklers System Work Needed

Roof drainage connections at perimeter gutters should all be checked for water leakage

All existing below slab storm drain piping and sanitary sewer waste piping should be scoped, cleaned and include a report on the location, depth, condition of the existing piping below the floor slab.

Whatever program moves into the building, it will very likely make the most sense to remove all the existing above floor piping and install all new plumbing systems and plumbing fixtures.

The entire building will require complete automatic wet pipe fire sprinkler protection since current building does not have complete protection at this time.

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electrical

Cammisa & Wipf

ELECTRICAL FEASIBILITY NARRATIVE

1. Introduction

The Palace of Fine Arts (PFA) will need to upgrade their building systems in order to permit new tenants to occupy the building; the Electrical System is one of those systems.

The Electrical System, and its components, presently existing through the majority of the building, are nearly 50 years old, well past their useful lifetime, replacement parts and components are hard to obtain or are no longer available, are generally not code conforming, and most importantly do not provide for the electrical service and distribution necessary going forward to be able to serve future building tenants.

The purpose of this study is to relate the work that will be necessary to upgrade the building Electrical System to properly serve future tenants.

2. Our study is based on the following assessments:

A. Information obtained and documented in our surveying and report from our original investigation of the PFA back in 1999 with EHDD.

B. Surveying and observation performed in December 2011 as part of this present study.

C. Existing documents and reports of the PFA building.

3. Existing Service:

A. Normal Electrical Power – PG&E Service

1) There are two PG&E services to the Palace of Fine Arts (PFA) Building. One service is at the North Electrical Vault: it includes 3 – 100 kVA 12 kV – 208Y/120 Volt oil filled transformers. The second service is at the South Electrical Vault: it includes 3 – 100 kVA 12 kV – 208Y/120 Volt oil filled transformers. One or both of the sets of transformers may have been upgraded to their new present rating around 1989 when upgrade of the electrical equipment at the South Vault was performed in order to separate service to the Palace of Fine Arts Theater (which is a separate tenant from the Exploratorium).

The PG&E Vaults are adjacent to but separated by a concrete wall from the respective PFA Main Switchboard Electrical Vaults.

B. Main Electrical Vaults (North Vault and South Vault)

1) North Vault

The North Vault houses a Main Switchboard (1,000A – 120/208 Volt) which was installed in 1963/64 during the rehabilitation project. The switchboard is nearing 48 years old, which puts it past its useful rated lifetime. It is obsolete and parts are not readily available. It does not offer

proper distribution for today's electrical services and will not be capable of serving any proposed remodeled building.

2) South Vault

The South Vault houses a Main Switchboard and a Distribution Switchboard. The main circuit breaker in the Main Switchboard appears to be old and obsolete. The Distribution Switchboard was installed in 1989 when the Palace of Fine Arts Theater was separated from the Exploratorium electrical service. The equipment in this room is old, obsolete, and does not offer proper distribution for today's electrical services, and will not be capable of serving any proposed remodeled building.

3) Both of the North and South Vaults are small and do not provide the necessary space and access for upgrading of the PFA. These vaults will need to be abandoned and will not be usable for new electrical equipment.

C. Emergency Power

1) There is no emergency power unit (emergency generator) that serves the building, either the Exploratorium or the PFA Theater spaces.

2) There are battery powered emergency lighting units that serve both the Exploratorium and the PFA Theater.

D. Power and Lighting

1) The existing power and lighting components are old and obsolete and would not be re-usable.

E. Fire Alarm

1) The Fire Alarm System is minimal at best, old, obsolete, and non-compliant.

4. Demolition

A. With the exception of the 1989 installed Main Switchboard serving the PFA Theater, all of the electrical equipment and components throughout the entire building, both the Exploratorium's TI space and the Theater TI space, are well past their useful lifetime, old, obsolete, and are not capable of serving any proposed remodel/upgrade of the PFA building and therefore must be removed and discarded.

B. The above is true with all other electrical systems within the building: lighting, power, fire alarm, telecommunications, etc.

5. New Electric Service:

A. Normal Power

1) Utility Service

a.) Obtain utility power at 12kV (High Voltage) from the local utility.

b.) This will mean that all electrical distribution downstream of the utility meter will be owned and maintained by PFA.

c.) Provide a 12kV High Voltage outdoor non-walk-in NEMA 3R enclosure substation with the following:

1. Incoming utility metering section.

2. Switchgear line-up with 1200 Amp bus.

3. Main vacuum circuit breaker.

4. Two feeder vacuum circuit breakers; one to serve the north half of the building and one to serve the south half of the building.

d.) This substation would be located on the west side of the building.

2) Provide two (2) outdoor pad mounted transformers as follows:

a.) One pad mounted transformer will be located at the north portion of the building and serve the north portion Main Electrical Room – “MS-N”.

b.) One pad mounted transformer will be located at the south portion of the building and serve the south portion Main Electrical Room – “MS-S”.

3) Provide indoor Main Switchboards as follows:

a.) Exploratorium Space – Provide a 4000A-277/480V Main Switchboard “MS-N” to serve the north portion of the building.

b.) PFA Theater As-Is: Maintain the indoor PFA Theater electrical service and distribution as-is. This will be re-fed from the new south pad mount transformer.

c.) Entire Building Shell: Provide a 4000A-277/480V Main Switchboard “MS-S” to serve the south portion of the building.

d.) Provide for metering within Main Switchboard for multi-tenants within the building.

4) Provide electrical rooms throughout the building for distribution of power as identified here in after.

B. Emergency Power

1) Provide a 250 kW diesel engine driven Emergency Power Unit (EPU) in an outdoor sound attenuated enclosure, Tier 4 compliant to conform to all EPA, CARB and Bay Area Air Quality Management District requirements.

2) Emergency Power will supply Life Safety loads such as egress lighting, exit signs, Fire Alarm System, emergency evacuation communications systems, as well as Optional Stand-By power for selected loads including Server Rooms and telecommunications equipment and systems.

3) This EPU would serve the entire building and be distributed as necessary to accommodate all building emergency loads.

6. Power Distribution

A. Main Electrical Rooms

1) PFA Theater As-Is/Exploratorium Shell:

a.) Provide one Main Electrical Room “MS-N” with service from the north pad mounted transformer. Locate room approximately center of the north building portion at the west perimeter wall.

b.) Maintain the existing electrical room at the PFA Theater with no modifications.

2) Entire Building Shell:

a.) Provide one Main Electrical Room “MS-N” with service from the north pad mounted transformer. Locate room approximately center of the north building portion at the west perimeter wall.

b.) Provide one Main Electrical Room “MS-S” with service from the south pad mounted transformer. Locate room approximately center of the south building portion at the west perimeter wall.

B. Satellite Electrical Rooms:

1) PFA Theater As-Is/Exploratorium Shell:

a.) Provide three (3) satellite electrical rooms along the length of the building for distribution of power to equipment loads, including that area of the south portion of the building which is not part of the PFA Theater. These rooms will be served from Main Switchboard “MS-N”.

2) Entire Building Shell:

a.) Provide two (2) satellite electrical rooms along the length of the north building portion served from the North Main Electrical Room “MS-N”.

b.) Provide two (2) satellite electrical rooms along the length of the south building portion served from the South Main Electrical Room “MS-S”.

C. Branch Circuit Wiring:

1) The majority of branch circuit runs will be run overhead to serve equipment and areas.

2) There will be selected areas throughout that will contain power and signal floor boxes within the concrete floor topping slab to accommodate power and signal requirements. These floor boxes will be laid out typically in a grid pattern at some predetermined spacing.

D. Provide 277/480 Volt distribution equipment to serve lighting equipment and mechanical equipment with motor ratings ½ HP and larger and resistance type equipment rated higher than 1.5 kW.

E. Provide naturally ventilated dry type transformers to step the 480 Volt System down to 208Y/120 Volts and associated distribution equipment to serve lighting equipment and general use power. Transformers shall be two winding, self-cooled with ratings as shown on drawings. Transformers shall be designed with 220°C insulation system for continuous full load operation at 115°C in a 40°C maximum ambient with a 30°C average ambient over 24 hours. Transformers shall have energy efficiencies that meet or exceed the latest requirements of the California Code of Regulations Title 20 and Title 24, NEMA TP-2. Transformers shall be Energy Star labeled.

F. Power Capacity: Provide to support all loads in accordance with applicable codes. Distribution equipment shall be sized so that the normal operating loads do not exceed 70 percent of the equipment ratings and peak demands do not exceed 80 percent of the equipment ratings.

G. Equipment:

1) Motors will generally be served from adjustable frequency drives furnished in the Mechanical work. Refer to the Mechanical narrative.

2) Control wiring: 120 Volt (line voltage) will be provided in this DIVISION. Low voltage and Building Management and Temperature Control System wiring is provided in the Mechanical work.

7. Lighting:

A. General:

1) Lighting will be halogen incandescent, fluorescent, induction, LED or high intensity discharge to suit functional requirements. Most energy-efficient combination of light source and ballast will be used where compatible with function or activity.

2) Fluorescent, induction, LED and HID lighting will generally be served at 277 volts. Halogen incandescent lighting will generally be served at 120 volts except 277 volt service will be used where wiring and control conditions permit.

3) Energy saving solid-state electronic ballasts will be used for all fixtures requiring ballasts.

4) 3500 degree Kelvin, T8 or T5 linear or compact fluorescent lamps will be used in fluorescent fixtures, unless other sources and color temperatures are required for function or activity.

5) Maintained illuminance levels will generally be in accordance with IES guidelines.

6) Lighting fixture construction will be compatible with environmental conditions encountered.

7) Custom designed fixtures will be used in selected public spaces as directed by Architect.

8) Emergency and egress lighting shall be provided as required at exits, in stairwells, and in other selected areas.

9) Switching control for general lighting will be designed for dual level lighting intensities where applicable. Occupancy sensors will be used in administrative and service areas where applicable.

10) A lighting control system will be provided with fully programmable web based control of interior and exterior lighting fixtures.

11) Exit lights: LED type with stencil face.

12) Exterior Pathways: Fluorescent, induction or LED type, corrosion resistant fixtures.

8. Life Safety Systems:

A. There are numerous Life Safety Systems that will be required by code for this building. A brief list of those are as follows:

1) Fire Alarm System, building wide, for detection of and annunciation of a fire alarm condition. Because of its length and occupancy, this building will be treated much like a “high rise” building on its side. A full and complete Fire Alarm System will be required and additional Vesda type smoke detection will most likely be required at the trusses at the underside of the Roof.

2) Emergency Power Unit (EPU) (Emergency Generator) will be required for service to the entire building. It will provide code required “Emergency” and “Standby” power for the following, but not limited to, functions:

a.) Egress Lighting.

b.) Exit Signage.

c.) Fire Alarm System.

d.) Sump Pumps.

e.) Sewage Ejection Pumps.

f.) Building Automation System.

g.) Elevators (selected).

h.) Security System.

i.) Roll Up Doors (selected).

j.) Exhaust Fans (selected).

9. Fire Alarm System:

A. A Fire Alarm System will need to be provided that would serve the entire building.

1) PFA Theater as is/Exploratorium Shell – A new building wide Fire Alarm System will be installed which would serve the Exploratorium Shell space and would need to pick up the as-is PFA Theater. Required fire alarm devices would need to be installed within the PFA Theater in order for the entire building to be protected by the Fire Alarm System and be acceptable to the Fire Marshal.

2) Entire Building Shell – A new building wide Fire Alarm System would be installed throughout the shell space. Since it would be a shell space only those devices required for the shell space portion would initially be installed. Capacity would be built into the Fire Alarm System to be able to pick up and serve all devices required to be added to the tenant spaces as they are built out.

B. Provide a Fire Alarm System consisting of a Fire Alarm Control Panel (FACP) for monitoring and control of all devices. Provide programming of all functions. Multiple stand alone panels communicating as a network will be provided at various locations throughout the building.

C. Provide Remote Annunciator Panels at locations as required to conform to SF Fire Department fire fighting requirements and to facilitate the building engineer in locating an alarm condition.

D. Provide speakers (audio) and strobe lights (visual signals) for coverage throughout the facility. Each and every enclosed room or space will have a speaker and strobe installed. Alarm signal circuits shall be fully supervised by circuit.

E. Provide alarm initiating devices, each individually addressable and supervised. Provide a local annunciator at the FACP and Remote Annunciator location with annunciation as follows:

1) Manual Pull Stations, at selected locations only.

2) Waterflow by flow switch.

3) Fire Protection Valve Tamper by Valve.

4) General Ceiling mounted fire detectors by Building Section and Floor. Special locations shall be individually annunciated.

5) Fan duct detectors by fan.

6) VESDA smoke detection system at selected areas at trusses in lieu of spot smoke detectors.

10. Telecommunications (Voice/Data) rough-in:

A. Provide all necessary raceways to accommodate the Telecommunications cabling provided in another Division of work.

B. Site Utilities – Provide conduit from 5 feet beyond the building property line to the Telecommunications Main Point of Entry (MPOE) Room within the building.

C. Provide cable trays along selected pathways of the building for routing of Telecommunications cabling. Also provide cable tray offshoots from the main cable tray to accommodate cabling running from the main cable tray out to areas within the building.

D. Provide cable trays from the Server Rooms and the IDF Rooms to the cable trays for routing of Telecommunications cabling throughout the building.

E. Similar to power floor boxes, there will be flush telecom (signal) floor boxes in the floor concrete topping slab at selected open areas. These floor boxes will be laid out typically in a grid pattern at some predetermined spacing.

F. Where telecom is served overhead, provide conduit from the telecommunications outlet to cable tray.

11. Audio/Visual (Audio, Projection and Video) System rough-in:

A. Provide rough-in including conduit, junction boxes, terminal cabinets, outlet boxes and speaker backboxes.

B. Provide power for Audio/Visual equipment.

12. Security System:

A. Provide rough-in including conduit, junction boxes, terminal cabinets and outlet boxes.

B. Provide power for Security System equipment.

13. Basic Electrical Materials and Methods:

A. Raceways shall be steel, except PVC-40 shall be used for below grade conduits and in concrete enclosed duct banks outside of the building lines.

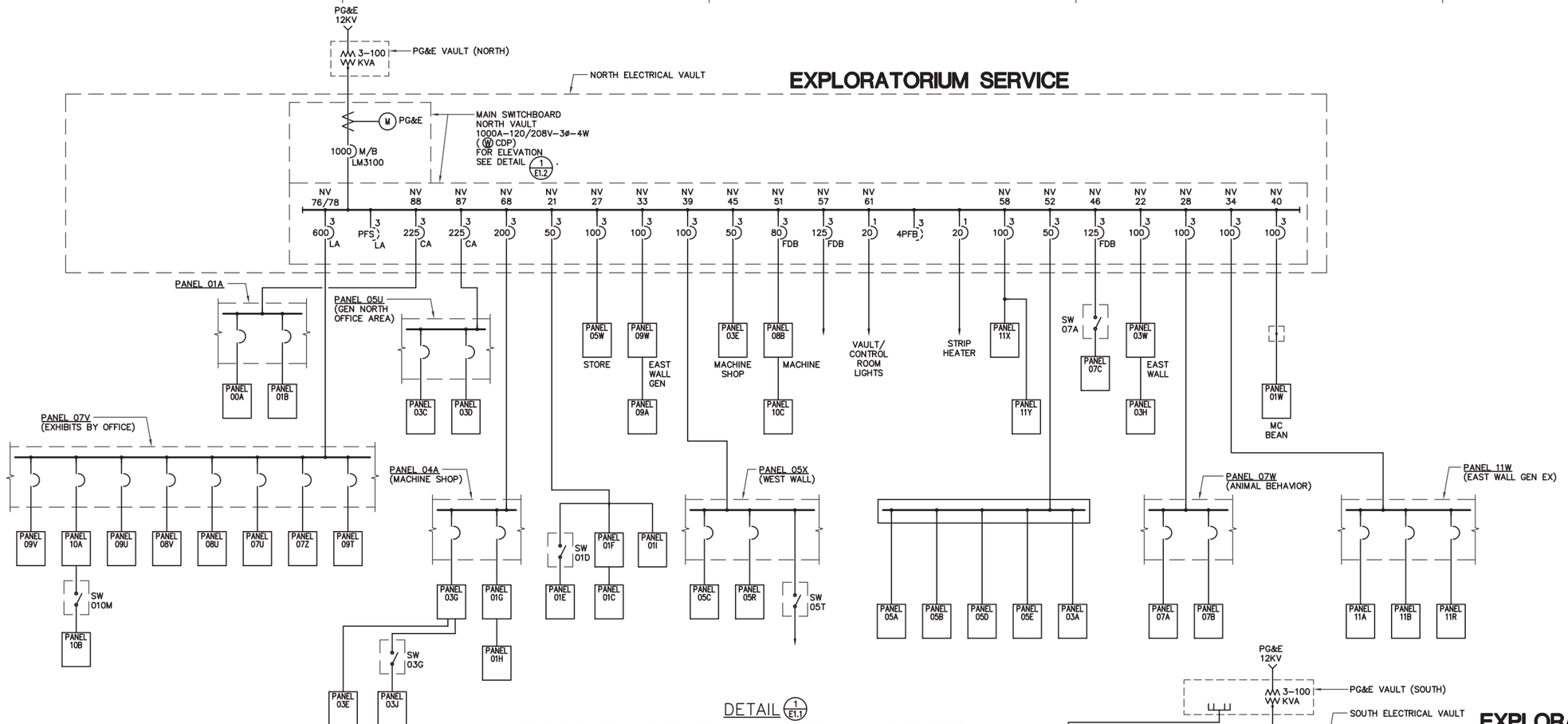
B. Fire Alarm System shall be run in metal raceways.

C. Telephone and data systems “Telecommunications” wiring from local outlets shall run in conduit to the nearest terminal or cable tray. Cable and jacks for all telecommunications will be provided in another DIVISION of work.

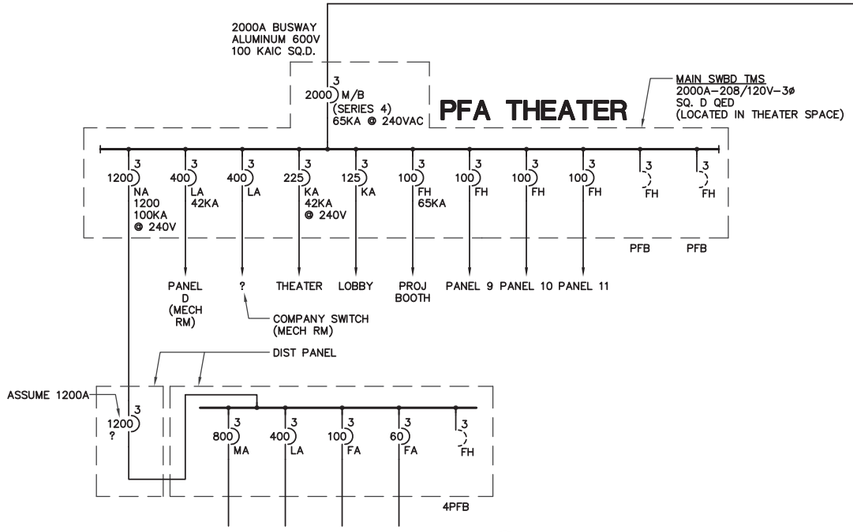
D. Branch circuit wiring for general lighting and power (receptacles, etc.) will be run in metal raceways (EMT, rigid or intermediate conduit). Wiring for receptacles will include an equipment ground conductor.

E. A ground system will be provided for grounding of the Electrical System transformers and equipment and for Telecommunication equipment. Ground buses will be provided in all 120/208 volt panelboards.

END



DETAIL 1/E1.1
PART ONE LINE DIAGRAM – NORTH VAULT ELECTRICAL
(EXISTING CONDITIONS)
NO SCALE



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PART ONE LINE DIAGRAM – THEATER
(EXISTING CONDITIONS)
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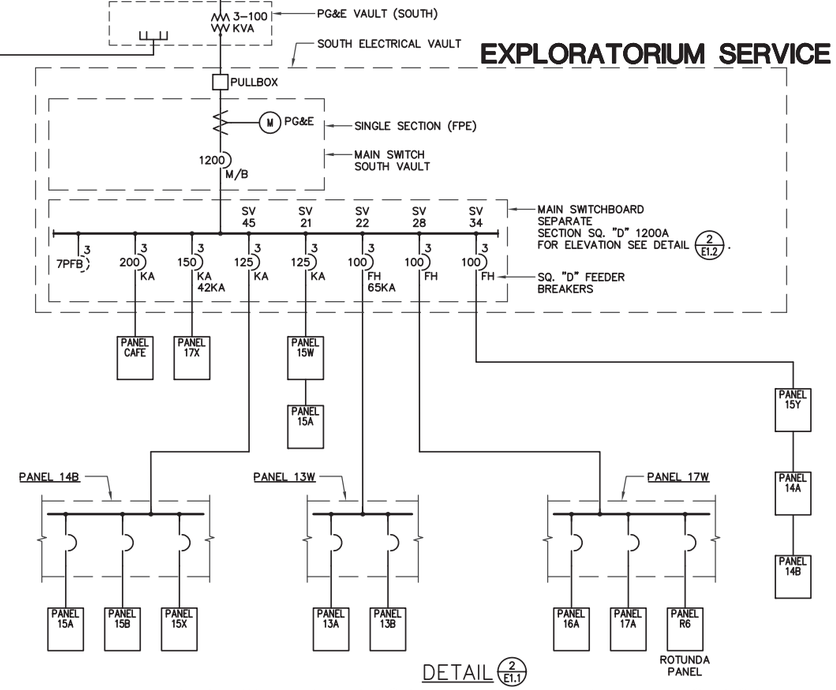

DETAIL 2/E1.1
PART ONE LINE DIAGRAM – SOUTH VAULT ELECTRICAL
(EXISTING CONDITIONS)
NO SCALE

OWNER

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ELECTRICAL ENGINEER
Cammisa + Wipf
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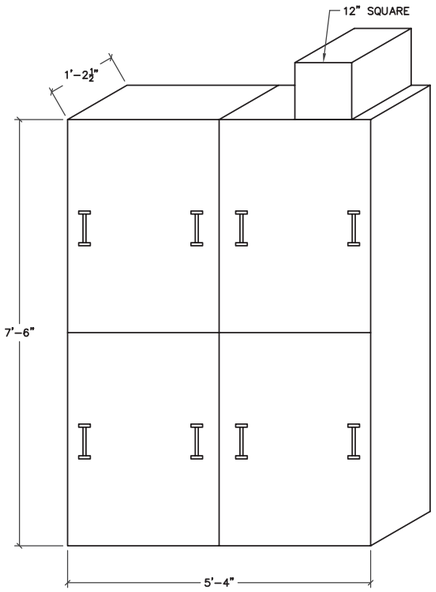
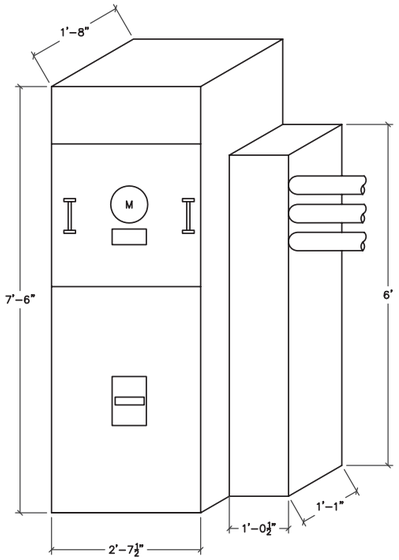
SHEET TITLE
EXISTING ONE LINE DIAGRAM

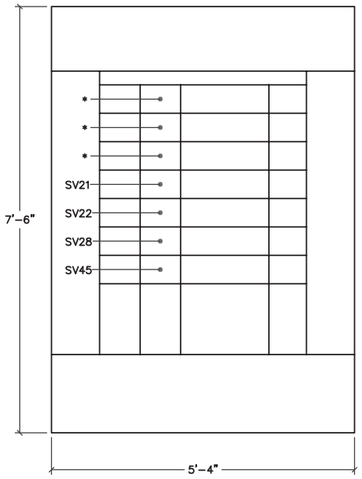
DATE
SCALE NONE
DRAWN BY NL
JOB NUMBER .
SHEET NUMBER
E1.1



PULL CABINET

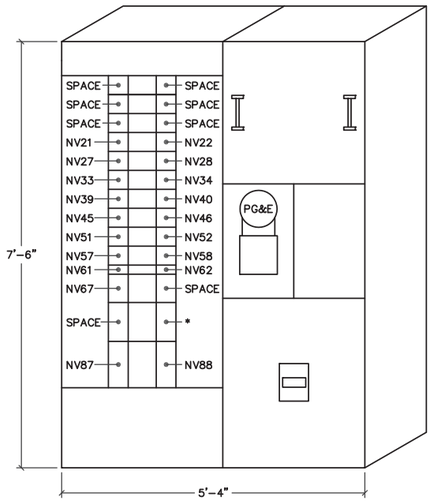


MAIN SWITCH



MAIN SWITCHBOARD

DETAIL (2 / E1.2)
SOUTH VAULT ELEVATIONS (EXISTING CONDITIONS)
NO SCALE



MAIN SWITCHBOARD

DETAIL (1 / E1.2)
NORTH VAULT ELEVATIONS (EXISTING CONDITIONS)
NO SCALE

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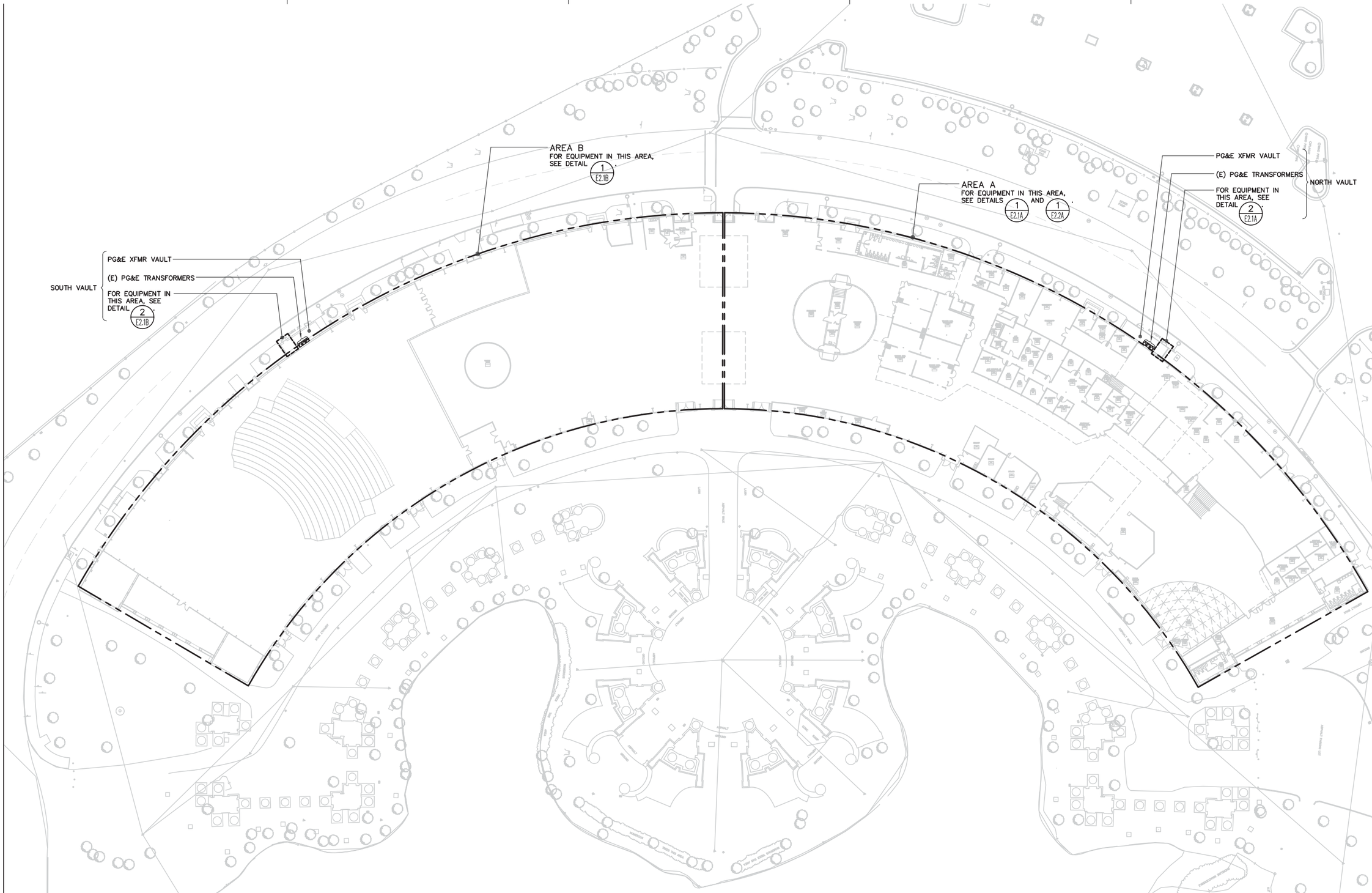
SHEET TITLE
EXISTING EQUIPMENT ELEVATIONS

DATE
SCALE **NONE**
DRAWN BY **NL**
JOB NUMBER **.**
SHEET NUMBER
E1.2



DETAIL 1/E2.0

LOCATION PLAN – EXISTING CONDITIONS

1/64"=1'-0"

NORTH

OWNER

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SHEET TITLE

LOCATION PLAN EXISTING CONDITIONS

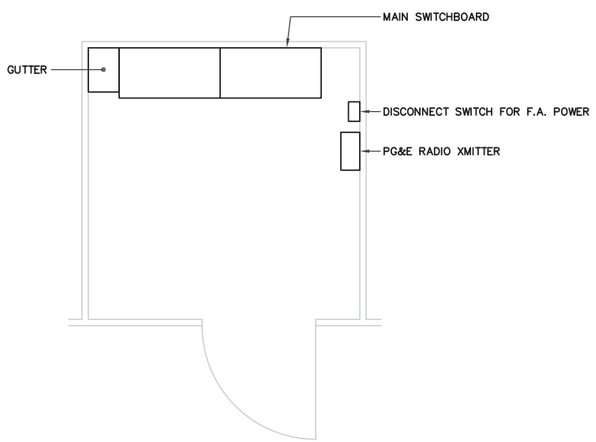
DATE	-
SCALE	**AS NOTED**
DRAWN BY	**NL**
JOB NUMBER	.

SHEET NUMBER

E2.0

UNMARKED PANEL
PANEL 08B
PANEL 08A
PANEL 07V
PANEL 07Z
PANEL 10A
PANEL 10B
PG&E XFMR VAULT
NORTH VAULT
(E) PG&E TRANSFORMERS
MAIN SWITCHBOARD NORTH VAULT ROOM. FOR EQUIPMENT IN THIS AREA, SEE DETAIL 2/E2.1A
PANEL 04B
PANEL 04A
PANEL 03E
PULLBOX
PANEL 03I
DISCONNECT SWITCH
PANEL 03J
PANEL 03G
PANEL 05U
PANEL 11A
PANEL 11W
PANEL 09W
PANEL 09A
PANEL 07W
PANEL 07A
PANEL 07B
PANEL 03C
PANEL 03D
PANEL 05A
PANEL 05B
PANEL 05E
PANEL 05W
PANEL 05D
PULLBOX 05
PANEL 01C
PANEL 01I
DISCONNECT SWITCH 01D
PANEL 01E
PANEL 01F
PANEL 01H
PANEL 01G
PANEL 03W
PANEL 03H
FIRE ALARM CONTROL PANEL
PANEL 00A
PANEL 01W
MAIN TELEPHONE TERMINAL BOARD
PANEL 101B
PULL BOX
AREA B, SEE SHEET E2.1B
MATCHLINE

DETAIL 1/E2.1A
LEVEL 1 – AREA A – EXISTING CONDITIONS
1/32" = 1'–0"



DETAIL 2/E2.1A
NORTH MAIN SWITCHBOARD VAULT – EXISTING CONDITIONS
1/4" = 1'–0"

OWNER

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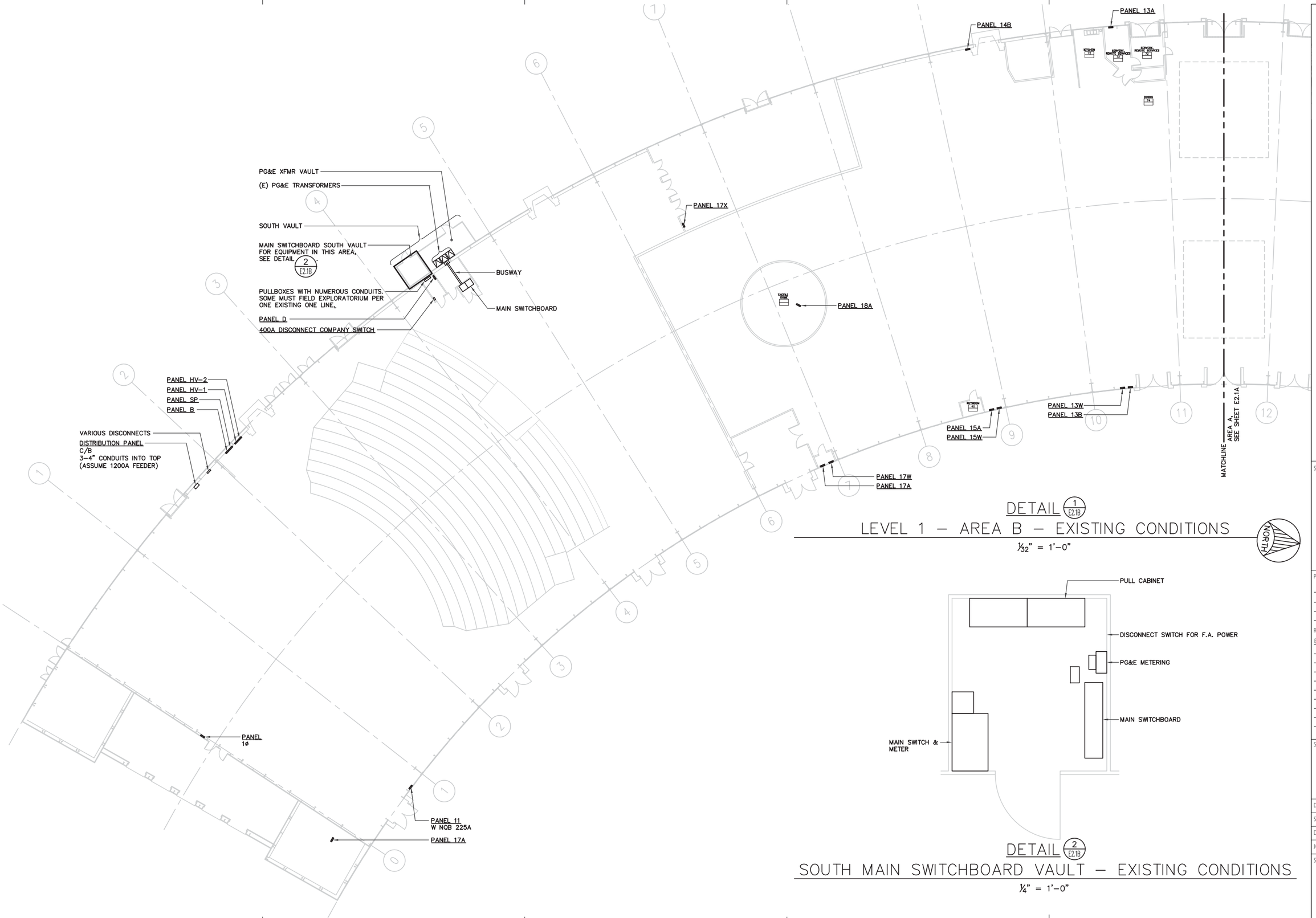
SHEET TITLE
LEVEL 1 AREA A EXISTING

DATE
SCALE AS NOTED
DRAWN BY NL
JOB NUMBER .
SHEET NUMBER
E2.1A



DETAIL 1 E2.1B

LEVEL 1 – AREA B – EXISTING CONDITIONS

1/32" = 1'-0"

NORTH

DETAIL 2 E2.1B

SOUTH MAIN SWITCHBOARD VAULT – EXISTING CONDITIONS

1/4" = 1'-0"

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LEVEL 1 AREA B EXISTING

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SCALE	AS NOTED
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SHEET NUMBER

E2.1B

DETAIL 1 / E2.2A

LEVEL 2 – AREA A – EXISTING CONDITIONS

1/32" = 1'-0"

NORTH

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LEVEL 2 AREA A EXISTING

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JOB NUMBER **.**

SHEET NUMBER
E2.2A

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daylighting

Loisos + Ubbelohde

DAYLIGHTING FEASIBILITY NARRATIVE

Introduction

This study is the first part of a set of explorations on the ability to use daylight for future uses of the building once the Exploratorium moves out of the space. In this part we will explore the original lighting design intent, the existing conditions and what lighting conditions we can expect from the addition of skylights and clerestory glass. In the next phase we will explore other options that address the lighting we can achieve if we expand the possibilities based on the existing structure with minor modifications (new windows, skylights or both). It is our hope this will provide insight on proposed future uses while reactivating the daylighting.

The Palace of the Fine Arts was designed and built at a time when the primary lighting source of building illumination was daylight. Consequently it has the requisite infrastructure to illuminate almost any future program. Due to practical and programmatic issues most of the skylights have been covered up, creating a dark cave-like interior. This suits the Exploratorium use, but it is less than ideal for many other uses. In its original form, as a fine arts gallery, the building used a “Lay Light” approach that used a glazed panel incorporated in the ceiling about ten feet lower than the underside of the skylight. A photograph of this appears in the Historic Structures Report by Carrey and Company published on August 6, 1993 on page 48 and reproduced here below:

Figure 38 - One of the French Galleries, probably #18, c. 1915
Courtesy of the San Francisco Public Library

This arrangement produced even light that was perceived as appropriate for a gallery, although the floor was much brighter than the walls, and modern curatorial standards were probably not met. Another result of this arrangement is that the occupant does not

perceive any major variability in the direction of daylight.

The building has a number of features that make it valuable from a (day) lighting perspective. The structure of the building itself is beautiful, so if that is well lighted and painted the occupant has a good visual reference (something to give scale). In addition the curved plan offers the possibility of differing lighting patterns based on location in the arc, giving location reference or orientation for the observer.

The image below gives a hint of what the space looked like when all skylights were open. Note that the plaster covers for the structure are absent.

Figure 3 - Main Bldg. as Construction Shop
Courtesy of the San Francisco Public Library

In a future build out we would not advocate this quantity of glass since even in this location the air-conditioning loads would be overly excessive. For this study we explore what the space can do in its originally intended state; with the existing apertures as well as higher surface reflectances; the addition of easily restored intermediate skylights; and the addition of clerestory lights . As discussed, we will also be exploring other options in the next phase.

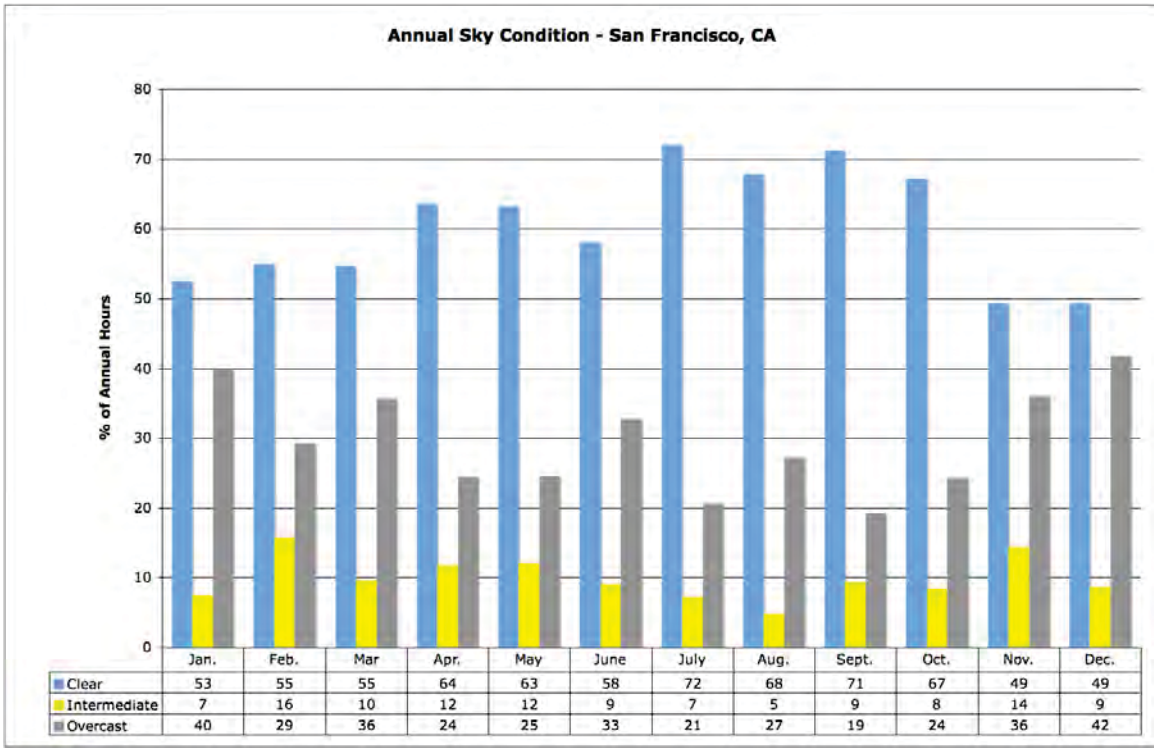
The images that follow show the luminance distributions within the space under two typical conditions: the darker skies in December, and the clear skies of June. These studies show that depending on the eventual use of the building the lighting can be adjusted by selecting the appropriate quantity and distribution of apertures.

Daylight Analysis:
The space was modeled and analyzed under both clear and overcast sky conditions with several different glass configurations, including both the current and original skylight layout from 1914. Higher surface reflectances for both walls and ceiling were also modeled and can be compared against the existing finishes.

Modeling Assumptions Existing and Original Building:
Building location: 37.80 N Lat, 122.43 W Long
VLT Clear Skylight Glass: 62%
VLT Clear Clerestory Glass: 68%
Existing Floor Reflectance: 30%
Existing Wall reflectance: 50%
Ceiling Reflectance: 20%

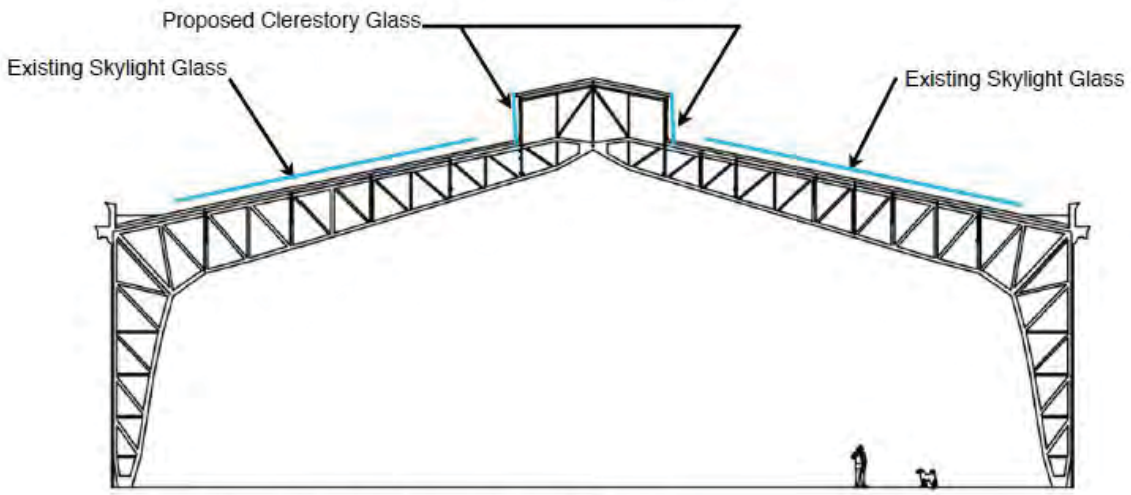
Modeling Assumptions Parametric Runs:
VLT Clear Skylight Glass: 62%
VLT Clear Clerestory Glass: 68%
Floor Reflectance: 30%
Wall Reflectance: 70%
Ceiling Reflectance: 70%

Annual Sky Conditions For San Francisco:
Annual sky conditions are characterized by clear and overcast days throughout the year with persistent coastal status and fog in the summer and rain laden clouds in the winter.

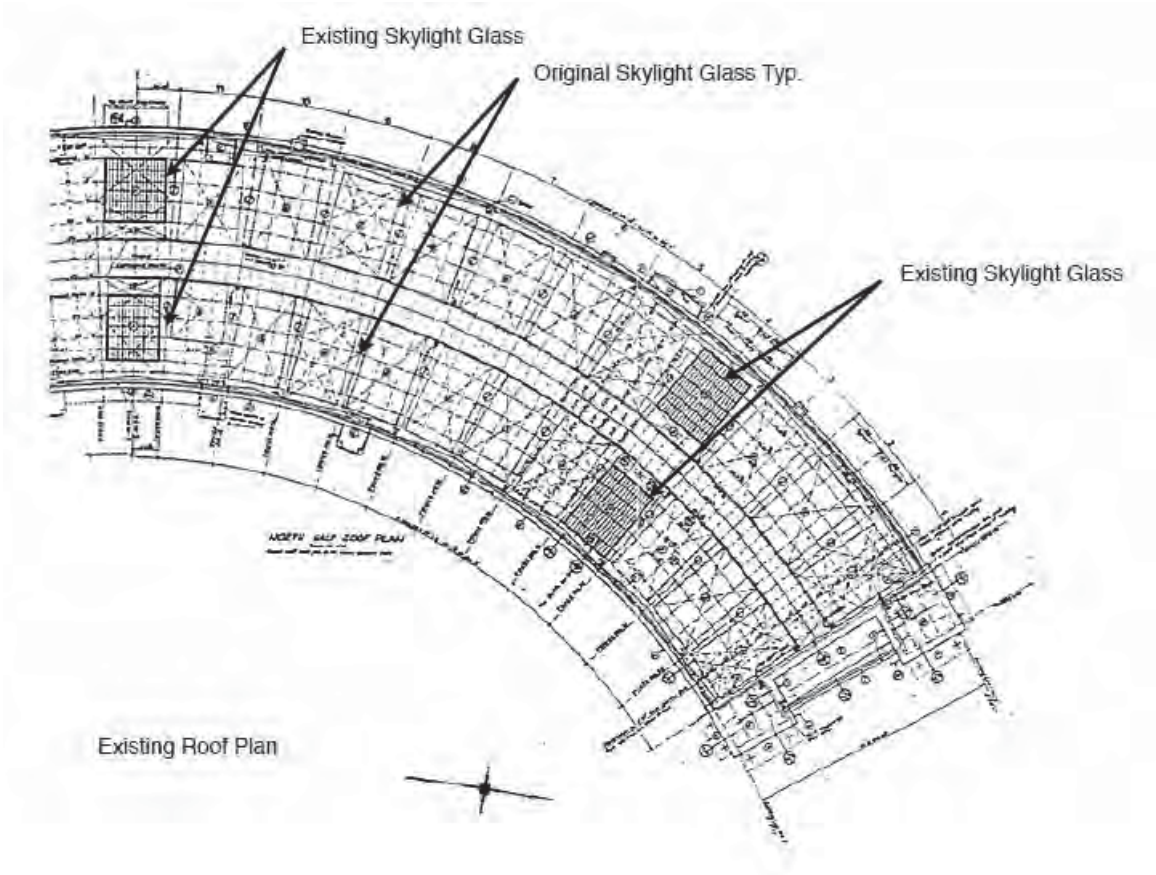


	Jan.	Feb.	Mar	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Clear	53	55	55	64	63	58	72	68	71	67	49	49
Intermediate	7	16	10	12	12	9	7	5	9	8	14	9
Overcast	40	29	36	24	25	33	21	27	19	24	36	42

Annual San Francisco Sky Conditions by Month
Source: San Francisco Airport



Existing Showing Existing and Proposed Glass Locations

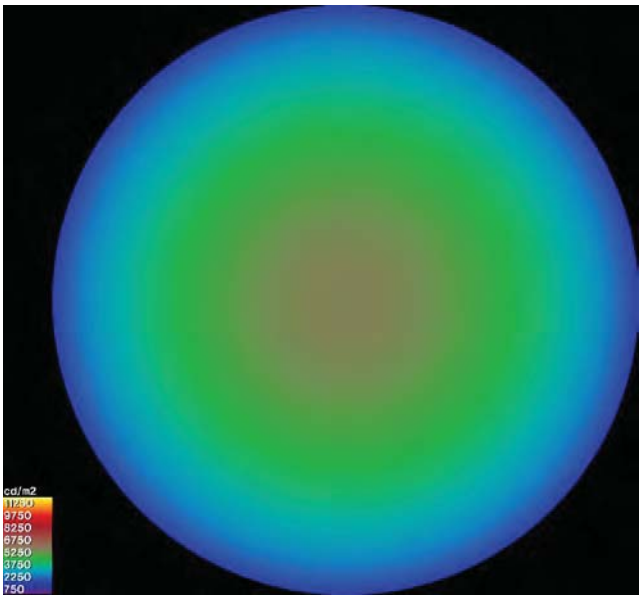


Existing Roof Plan

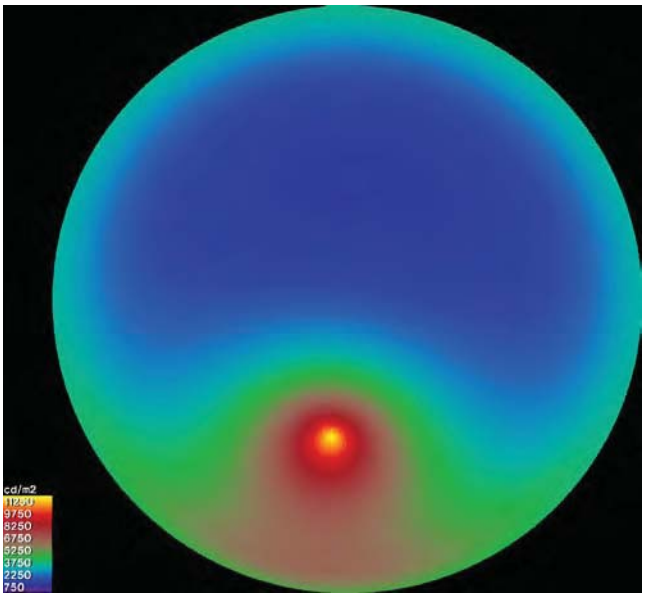
December – June Daylighting Runs

The images following this page show the visual brightness (luminance) of the space for a given glass and material reflectance configuration under both a typical overcast sky in December and a typical clear sky in June. The images have been post-processed to mimic human visual perception in order to provide an appearance similar to the experience one might have in the actual space.

Under an overcast sky available daylight is predominantly diffuse with the brightest part of the sky being at the zenith and the darkest at the horizon. Under a clear sky the available daylight is both diffuse and direct with the brightest part being the circumsolar region at the sun's position in the sky. The darkest part of the sky is approximately 90 degrees opposite the sun's position.



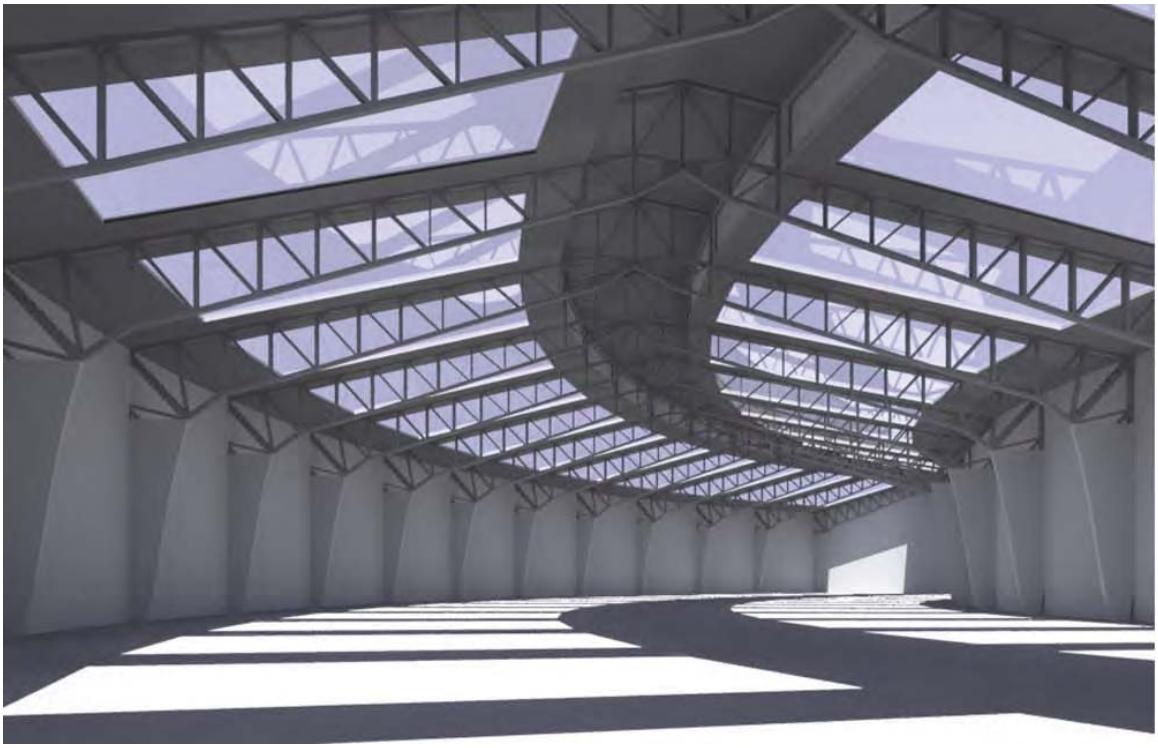
180 degree, false color, fisheye view looking up at a typical overcast sky



180 degree, false color, fisheye view looking up at a typical clear sky at 12:00 PM

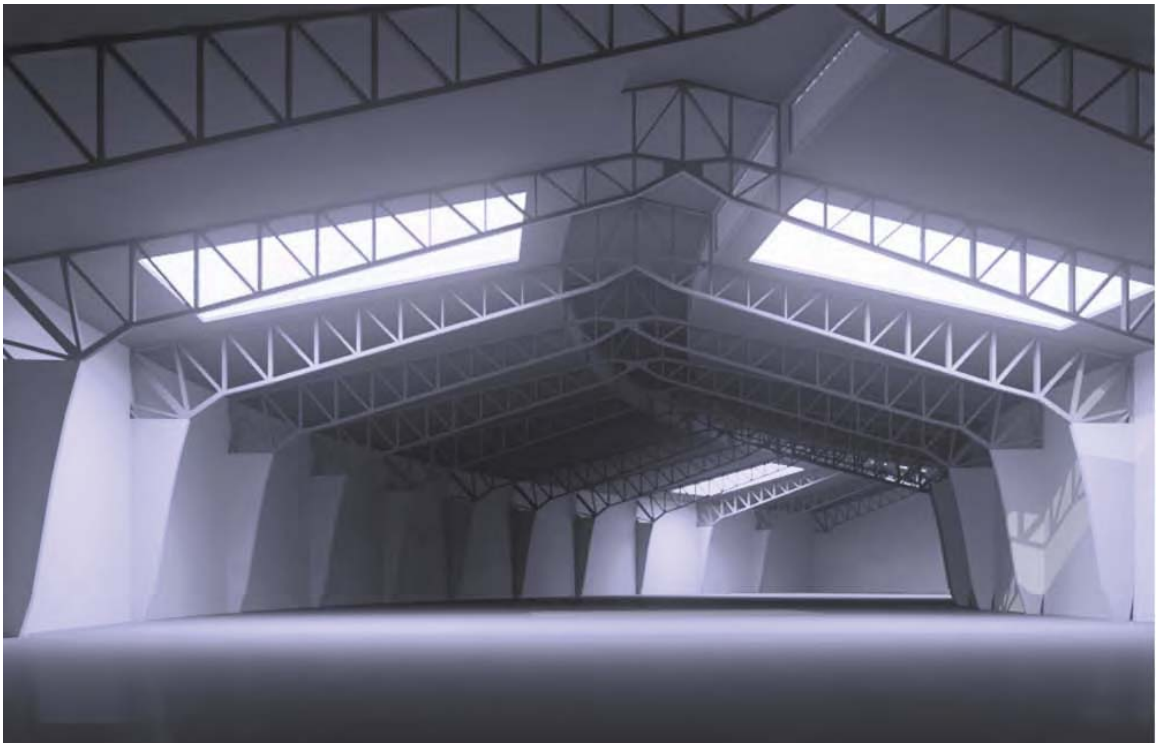
Original Conditions- Clear Skylight Glass

Overcast skies



Clear Skies

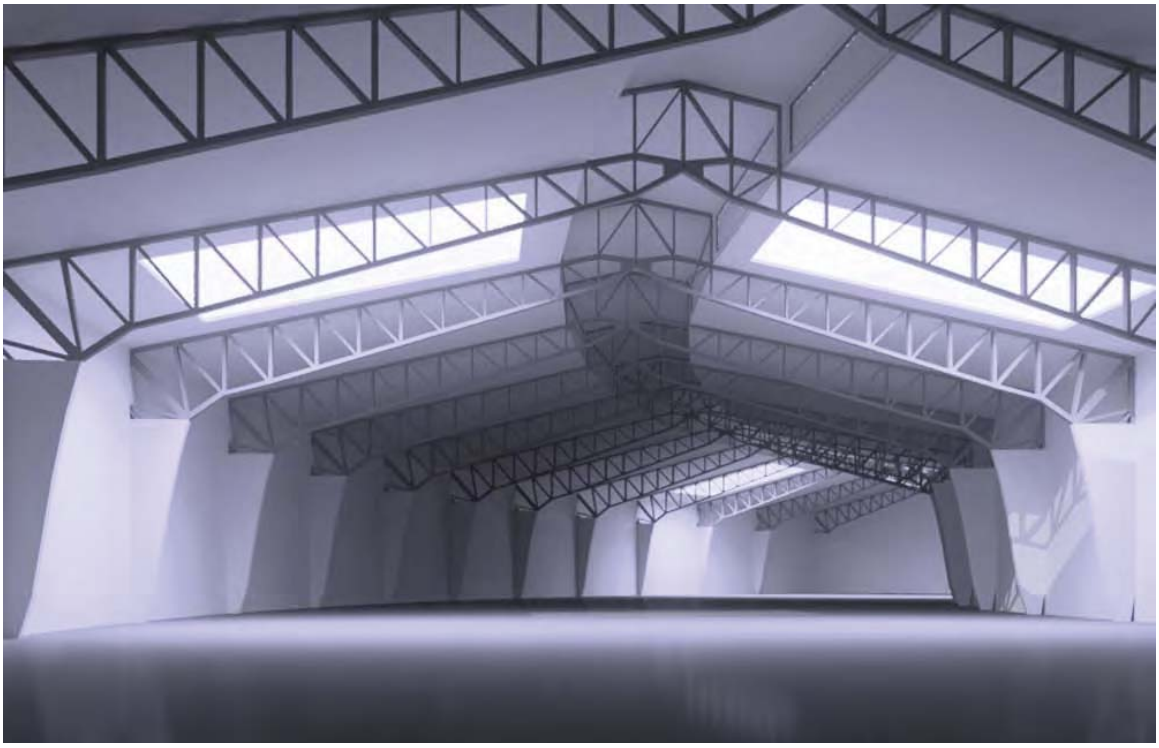
Existing Conditions- Clear Skylight Glass



Overcast Skies

Clear Skies

Existing Conditions with Higher Wall and Ceiling Reflectances



Overcast Skies

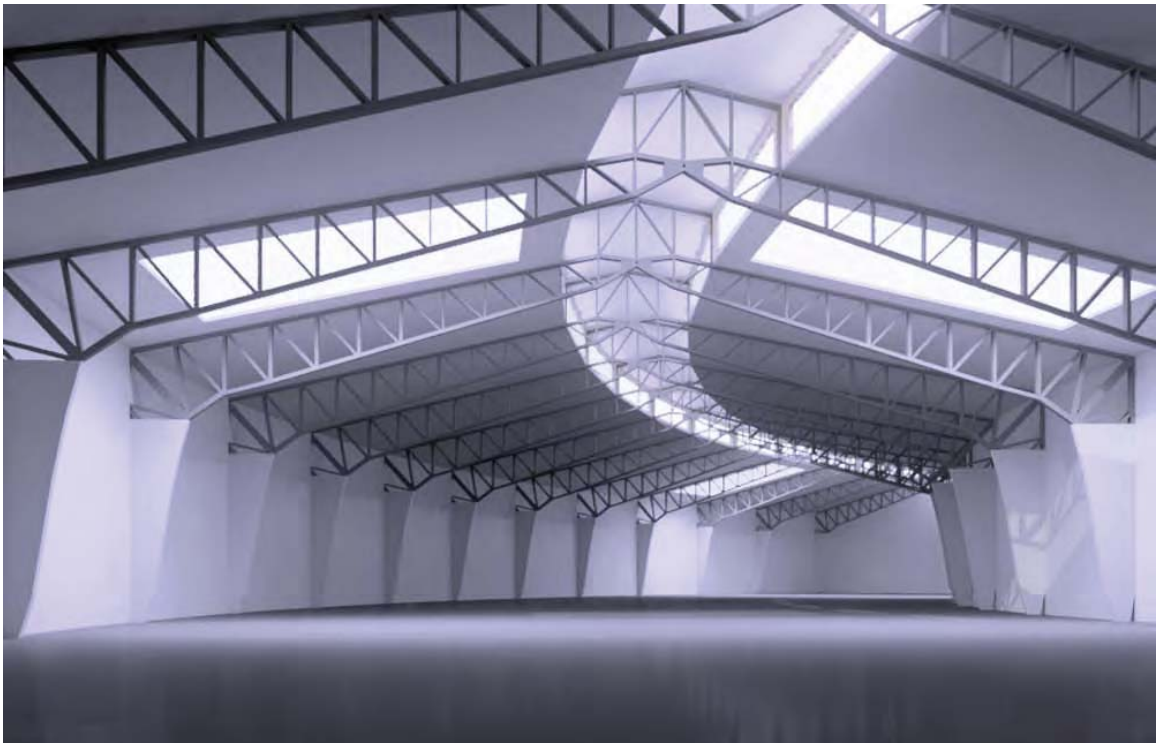
Clear Skies

Existing Conditions + New, Intermediate Skylights w/ Higher Wall & Ceiling Reflectances

Overcast Skies

Clear Skies

Existing Skylights + New Clerestory w/ Higher Wall & Ceiling Reflectances



Overcast Skies

Clear Skies

civil

BKF Engineers

Civil Narrative

Palace of Fine Arts

February 15, 2012

BKF Engineers Project 20115151

Existing Utility and Drainage Assessment

This assessment is based on observations made during a field visit on the rainy morning of November 11, 2011 (the City of San Francisco received ~0.5 inches of rain that day) and reviews of the following drawings and documents:

- San Francisco Department of Public Works' General Area Sewer Map and Plans A-25024, B-31784 & 785, and Plans 41682, 683 & 690, and 55441 thru 55450
- As-Built Drawings for the 1963 building renovation
- Civil drawings prepared in 1999 and 2000 to support a planned renovation (that was never implemented)
- The Exploratorium Renovation Project Corrosion Study, by Kennedy/Jenks Consultants, dated 16 August 1999
- The Exploratorium Geotechnical Investigation Final Report, by Rutherford and Chekene Consulting Engineers, dated 22 February 2000
- Site Survey of the Exploratorium of San Francisco, by Meridian Surveying Engineering, Inc., dated April 1999
- Sewer System Improvement Program Report (DRAFT Report for San Francisco Public Utilities Commission Review), originally dated 27 July 2010 (Revised August 10, 2010)
- Electronic Mail dated 3 February 2012 from Greg Braswell in the Infrastructure Division of the San Francisco Department of Public Works

A. Stormwater Infrastructure Overview

1. Existing System: Stormwater run-off is discharged from the site through the "Wet Weather Pump Station" (WWPS) to a manhole in the sidewalk on the east side of Lyon Street, where it enters the City's combined (carrying both sanitary and stormwater flows) sewer system. WWPS is located near the driveway to Doyle Drive at the northeast corner of the property. Portions of the site, including Palace Drive and the parking area in front of the Exploratorium entrance, drain directly to the pump station through what appears to be the original vitrified clay pipes. The rest of the site, including the roof of the main building, drains first to the lagoon. The western side of the building drains through roof leaders that are connected to cast iron soil pipes beneath the structure before entering the lagoon. The lagoon discharges to the WWPS through a 12-inch drain line.

The WWPS was originally constructed by the San Francisco Department of Public Works (SFDPW) in the late 1950's to intercept dry weather wastewater flows and redirect them to the City's newly constructed wastewater treatment facilities. During wet weather, the much higher combined stormwater and wastewater flows exceeded the capacity of the pump and overflowed into the original (circa 1915) combined sewer outfall to the Bay. It does not appear that the WWPS was designed to convey all of the run-off from what would now be considered a "design storm event." From the original drawings in 1958, it appears that only a single pump was installed, so no redundancy was provided in the event the pump fails.

Over the years, SFDPW has made two major modifications to the system:

a. In 1966, they sponsored a project that added a second pump to the station and re-plumbed the site to isolate wastewater so that the majority of stormwater run-off bypassed the pump and flowed by gravity to the Bay. This would have greatly reduced, if not eliminated, incidents of untreated wastewater discharging directly to the Bay, however, it may have led to some other adverse conditions on-site. When large rainfall events occurred concurrently with high tides, a flap gate forced run-off from the lagoon to overflow to the pump well which would have likely overwhelmed the station. In these instances, a mixture of stormwater and wastewater would have either (it is not possible to determine conclusively from the record drawings) discharged directly to the Bay; or it may have backed up into the lagoon, the lower-lying catch basin inlets in the northeastern parking lot, and/or the building.
b. In 1993, they sponsored a project where a second pump station, now referred to as the Dry Weather Pump Station (DWPS) was installed near the Exploratorium entrance. The DWPS receives and pumps to pump wastewater flows only as no stormwater flows either directly or indirectly (in overflow conditions) to this Station. DWPS includes two pumping units which provide a level of redundancy in the event that one fails. Another component of the 1993 project plugged the original outfall to the Bay through which storm water overflowed when the WWPS was overwhelmed.

As a result of the 1993 project, it appears that the site does not have positive drainage release to any public right-of-way or gravity storm line. It appears that the lagoon itself may act as a detention facility when run-off rates exceed the capacity of the pump. Based on the size of the WWPS (designed to convey dry weather sanitary sewer flows), we suspect that the system may not protect the structure from a 100-year storm event.

Additionally, because the site is at the foot of a hill, it may be possible that public storm run-off enters the site in instances where the City's public infrastructure near the project is overwhelmed. Greg Braswell in the Department of Public Works Infrastructure Division indicated that the area, in general, does not have a record of extreme flooding problems and thus, the City has not done substantial review of ov

2. Flooding: A review of the site survey indicates that the finished floor is approximately 1-foot above the estimated 100-year tide level[1], which is -2.5 San Francisco City Datum.

3. Pipe Condition: With respect to pipe conditions, it appears from our review of the drawings that most of the storm drain system was installed at the time of the initial building construction in 1915. The system consists of steel roof leaders that discharge to cast iron soil pipe beneath the structure and vitrified clay pipe outside the structure. We expect that all of the original storm drain piping is at or near the end of its useful life of 100-years.

Stormwater Infrastructure Recommendations

1. A drainage study should be conducted prior to any overall schematic design that determines the site's overall tributary shed area and rainfall characteristics and relates them to how much storage capability there is on the site, and the rate at which the wet weather pump can discharge the water to determine:
    a. what level of storm event the system currently discharges
    b. The stormwater ponding level that could be reached before a particular event could be discharged and its relationship to the building
    c. what various improvements and their corresponding costs would be to bring the system into compliance with current generally accepted practice, which is to protect structures from inundation during an event with a 1% probability of occurring in any given year (commonly referred to as the "100-year storm").

    The process of determining the site's overall tributary shed area should include an analysis of offsite overland flows that may be tributary to the site in the event that the City's underground infrastructure is overwhelmed. Greg Braswell with the City's Department of Public Works, Infrastructure Division indicated that the area has not had a history of extreme flooding problems, so the City has not been compelled to perform extensive studies or generate data on nearby overland flows, though they are doing some work citywide that may be useful near the end of summer, 2012.

    Potential mitigations could include modifications and/or expansions of the existing pump station(s), additional pump stations, a new on-site gravity system that bypasses the pumps and flows directly to a facility on Broderick Street, grading near the lagoon to allow more detention capacity or grading to direct potential for offsite overflows during large events away from the site. The study should be completed prior to conceptual design so that the mitigation costs can be factored into the overall project budget.

[1] San Francisco Bay Tidal Stage vs Frequency Study, U.S. Army Corps of Engineers, San Francisco District, October 1984, Plate 1 and Table 4

B. Wastewater Infrastructure Overview

1. Existing System: Wastewater generated in the building is discharged through five (5) four laterals on the Palace Drive face of the building (the western branch), and two (2) laterals at the northern face of the building adjacent to the Exploratorium Entrance (the eastern branch). The western branch consists of a 6-inch gravity line and a lift station (LS) and was installed in the 90's to serve new restroom facilities. The eastern branch consists of a 12-inch vitrified clay pipe that was installed in 1993 with the City of San Francisco Department of Public Works' Palace of Fine Arts Flooding Control Project. Both of these branches enter the "Dry Weather Pump Station" (DWPS), also installed with the 1993 Public Works Project. The DWPS pumps wastewater through a 4-inch ductile iron (DIP) force main to a manhole in the sidewalk on the east side of Lyon Street, where it enters the City's combined (carrying both wastewater and stormwater flows) sewer system.
2. Pipe Condition: With respect to pipe conditions, it appears from our review of the drawings that much of the wastewater collection system was installed at the time of the initial building construction in 1915, though it is not possible for us to tell from the various as-built drawings how much may have been replaced over the years. We expect that all of the original wastewater piping is at or near the end of its useful life of 100-years.

Wastewater Infrastructure Recommendations

1. A video survey should be conducted of all gravity pipes that are accessible to determine their condition. Of particular concern are the pipes under the building that convey roof run-off from the west side of the building to the lagoon. Re-routing of these lines around the building should be considered so future repairs that may be needed do not disrupt building operations.

   Potential mitigations could include replacement of gravity sewer lines on the site. The survey should be completed prior to conceptual design so that the mitigation costs can be factored into the overall project budget.

C. Water System

1. Existing System: Water is served to the site by the San Francisco Public Utilities Commission through 6- meters at the southernmost corner of the building. There is also a Post-Indicator Valve and a Fire Department Connection nearby. From our review of the 1963 Palace of Fine Arts Renovation Drawings, we were unable to determine which portions of the water system, if any, were replaced in 1963.

2. Pipe Condition: With respect to pipe conditions, it appears from our review of the drawings that much of the water system was installed at the time of the initial building construction in 1915. We expect that all of the original water piping is at or near the end of its useful life of 100-years.

Water System Recommendations

1. Any site water lines that were installed with the original construction would now be nearly 100-years old. Original water lines should be identified and replaced.

A. Surface Drainage and Miscellaneous Overview

1. Existing System. In addition to the discussions above, the following issues were noted at the site and/or through a review of the topographic survey:
    a. Along Palace Drive, a driveway or walkway cut into the sidewalk allows stormwater to escape the gutter on the east side of the road and flow toward one of the service doors of the theatre area.
    b. At the main driveway to the Exploratorium at Doyle Drive and Lyon Street, which is higher than the site, there is no drainage facility to keep run-off that is in the public street from running onto the site.
    c. There is no curb along the western edge of Palace Drive and at the time of my visit, several cars were parked with their front wheels in the mud.
    d. The front parking lot does not appear to meet current Americans with Disabilities Act requirements.
    e. Based on discussions with staff, the interior of the building is subject to inundation from groundwater rising from below the building. The 2000 geotechnical report indicated that they encountered an artesian groundwater condition in a boring near the western theatre entrance, which supports staff's theory that occasional inundation within the building is due to rising groundwater.

Surface Drainage and Miscellaneous Recommendations

1. A "French Drain" system that surrounds the building should be considered to mitigate the effects of high groundwater in the building. The San Francisco Public Utilities Commission should be consulted on this approach, as operators of wastewater treatment plants generally try to minimize the volume of groundwater that is directed to their facilities. Also, this approach may not be necessary if the asphaltic floor is replaced with a waterproof, reinforced concrete foundation that can withstand hydrostatic pressure.

2. Portions of the sidewalk on Palace Drive should be modified to direct run-off away from the building.
3. A curb should be installed on the west side of Palace Drive.
4. The parking lot near the current Exploratorium entrance should be renovated as needed to remove barriers to accessibility in accordance with the Americans with Disabilities Act, and to mitigate against run-off from entering the building.

transportation

Nelson\Nygaard

NELSON NYGAARD

MEMORANDUM

To: Kelly Ishida Sloan, EHDD

From: Jeremy Nelson and Michael Alba

Date: January 19, 2012

Subject: Palace of Fine Arts Engineering and Uses Study: Transportation Analysis

PURPOSE OF THIS MEMO

This technical memo documents existing site transportation, parking, and access conditions for the Palace of Fine Arts as part of Phase 1 of the Palace of Fine Arts Engineering and Uses Study. The memo includes the following sections:

- **Summary of the Project Physical Plan and Site:** A general description of the Palace of Fine Arts as it relates to transportation conditions and travel demand.
- **Parking Analysis**: A description of current parking supplies, facility regulations, observed demand, and access issues.
- **Vehicular Access**: A description of vehicular access points, including private vehicles and private tour buses.
- **Transit Access**: A description of key transit routes, route frequencies, opportunities, and constraints.
- **Bicycle and Pedestrian Access**: A description of existing bicycle and pedestrian infrastructure, amenities, opportunities, and constraints.

Each section also discusses planned or proposed changes to the transportation system in the immediate vicinity that could affect existing transportation, parking, and access conditions.

EXISTING CONDITIONS

OVERVIEW OF PROJECT TRAVEL DEMAND FACTORS

The Palace of Fine Arts, a monumental structure originally built as part of the Panama Pacific Exposition in 1915, is a famous San Francisco landmark. Its picturesque rotunda, duck pond, and park make it a popular site destination for both residents and tourists.

It is located close to San Francisco Bay, along one of the main access routes to the Golden Gate Bridge. The site is located just east of the Presidio of San Francisco, a former army base that is now one of the largest parks in the city and a large recreational and tourist draw, offering historical architecture, forest hikes, hillside views, and beach access. Nearby trip generators include the Marina Green, the Saint Francis Yacht Club, Crissy Field, and the Letterman Digital Arts Center headquarters. East of the site along Marina Boulevard lies Fort Mason Center, a former army port site that has become home to arts and cultural organizations including theaters, museums, workshops, restaurants, and shops.

Currently, the Palace of Fine Arts is a mix of a tourist attraction, a museum and a theater. Located within a dense urban neighborhood with limited parking availability, driving to the site cannot be the only mode of access so providing sufficient, multi-modal access to the site is essential to ensuring the success of future uses and to limiting impacts to the surrounding neighborhood.

PARKING ANALYSIS

Existing Parking Supply

The Palace of Fine Arts provides free on-site parking at facilities along Palace Drive and two connected surface parking lots. Located within San Francisco's Marina District, free and paid off-site parking exists in both on-street and off-street facilities. Existing parking supplies and regulations are summarized in Figure 1 below.

Figure 1 Parking Inventory and Regulations by Type

Type	Inventory	Regulation	Notes
On-Site	216	Free, 4 Hours Only	Formerly 398 (before construction of Presidio Parkway); 15 reserved for the disabled
Off-Site (On-Street Only)	191	Free, 2 Hours Only, M-F 8AM-6PM	Residential Permit Zone

On-Site

On-site parking at the Palace of Fine-Arts exists along Palace Drive and two connected surface parking lots. On-site parking is time restricted; vehicles are only permitted to park for four hours at a time. In total, approximately 398 spaces on-site spaces are provided. However, construction of Presidio Parkway removed 182 spaces from on-site facilities, leaving the site with only 216 on-site spaces during the construction. Parking wayfinding at the Palace of Fine Arts encourages patrons to park in free off-street lots in the neighborhood when on-site parking is full, including large public lots across Marina Boulevard at Crissy Field and near the Saint Francis Yacht Club.

Off-Site

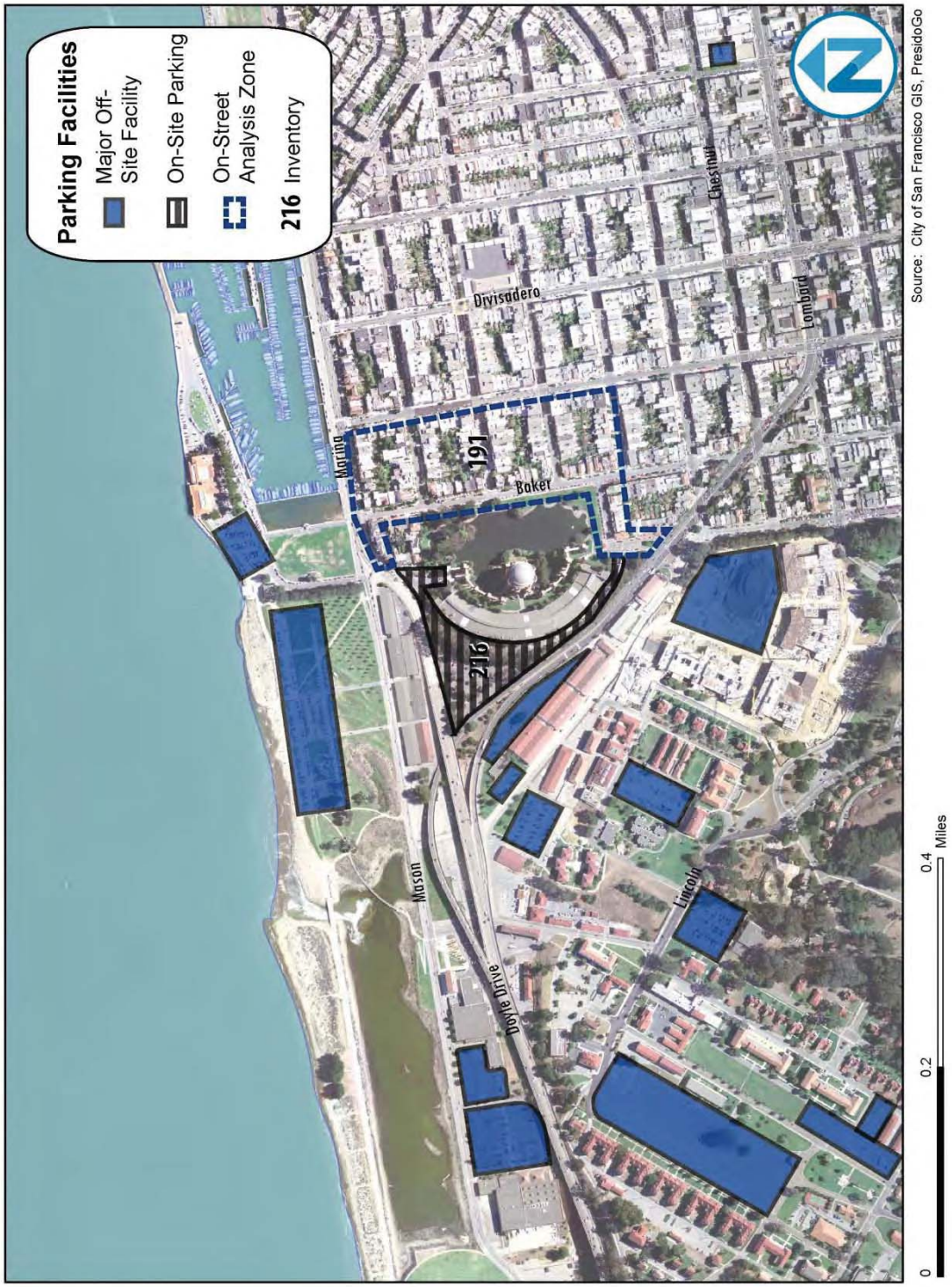
On-Street

Within immediate vicinity of the site (one block in every direction), 191 on-street spaces exist, all of which are within San Francisco's Residential Permit Parking Area "M." Vehicles without a permit can park in these spaces for no longer than two hours Monday through Friday, 8AM to 6PM. Residents of established Residential Permit Parking areas are eligible to purchase four permits per single address.

Off-Street

As seen in Figure 2, many large off-street facilities exist in proximity to the Palace of Fine Arts, most of which are within the Presidio of San Francisco. These lots include public facilities at Crissy Field and near the Saint Francis Yacht Club (both of which are being utilized for overflow capacity at the Palace of Fine Arts during Presidio Parkway construction), and on-site parking facilities at various public and private uses within the Presidio. There is also a large for-pay public garage at Pierce and Chestnut, approximately six blocks away from the site. These off-street facilities are not included in this document's parking inventory analysis.

Figure 2 Existing Parking Facilities



Observation of Parking Demand

As mix of a tourist attraction, a museum and a theater, demand for parking at the Palace of Fine Arts varies significantly throughout the day and year. As non-standard land uses[1], the visitation patterns are not well documented in national parking demand manuals or databases, and are usually derived by observing existing parking demand based on typical and peak demand visitation for each use.

Considerations with Observed Parking Demand

It should be noted that this is not an observation of a "typical" day at the Palace of Fine Arts, which would be expected to have a much lower demand for parking than that reported in this observation.

Image filename: empty lot.jpg

Caption: A more typical day with much lower demand than observed in this report.

Although not independently observed, demand during theater events is likely similar to the worst case scenario that was observed and reported in this document. It is possible that evening theater events generate a great deal of parking demand that spills over into the surrounding neighborhood. This may present a demand scenario worse than observed and reported in this document because of the increased residential demand for parking at the time of a high demand for Palace of Fine Arts parking. Residents likely identify these occurrences as their concern with any changes of the uses at the Palace of Fine Arts.

Normal night time conditions were not observed but without theater events, the Palace of Fine Arts is not expected to generate much demand. According to our early morning observation

[1] Standard uses include residential, commercial, and office.

(below), parking in the neighborhood is likely heavily occupied by residents and doesn't provide much opportunity for spillover parking capacity.

Nelson\Nygaard was scoped to provide a high-level parking demand analysis based on field observations. Due to the decidedly varied visitation rates and associated parking demand at the Palace of Fine Arts, Nelson\Nygaard endeavored to observe a "worst case" parking scenario by choosing a day for field observations expected to have high demand. For this reason, demand observations were conducted on the morning of Veteran's Day, Friday November 11, 2011 between 8:00 am and 12:00 pm. School was not in session and it was a rainy and cold day, making attendance at the Exploratorium particularly high.

Image filename: busy.jpg

Caption: Long queue for the Exploratorium on the day of the parking observation.

The following reporting of observed demand is also under a heavily constrained parking capacity. Due to the timing of this project, demand was not observed prior to the Presidio Parkway construction which reduced on-site parking supply by roughly 182 spaces.

The following parking demand observations were made:

- Around 9 am
  - On-site facilities as a whole were nearly empty (9 out of every 10 spaces available)
    - Front door spaces were fully occupied but Palace Drive and the main lot were nearly empty (*note: construction activities, such as cones, potentially impacted early observed demand, yet by the second observation period, these spaces were also occupied*)

Image filename: front door.jpg

Caption: Full front door lot.

Image filename: early drive.jpg

Caption: Available parking.

- Surrounding streets were heavily occupied including the spaces in front of driveways (1 out of every 10 legally designated spaces available)

Image filename: early neighborhood.jpg
Caption: Surrounding neighborhood largely occupied in the early morning.

- Around 11 am
  - On-site facilities as a whole were nearly fully occupied with very little turnover (1 out of every 20 spaces available)
    - Front door spaces were fully occupied, the main lot was fully occupied and nearly all of the Palace Drive spaces

Image filename: drive parking.jpg
Caption: Heavy demand.

Image filename: full lot.jpg
Caption: Fully occupied lot.

  - Surrounding streets were slightly less heavily utilized and spaces in front of driveways were no longer occupied (2 out of every 15 legally designated spaces available)

Image filename: neighborhood.jpg

Caption: Some availability in the surrounding neighborhood.

Parking Accessibility

Field observations revealed the following issues regarding existing accessibility of parking facilities:

- On-Site Facilities:
  - Recent construction activity has improved access to the main parking lot with a newly painted crosswalk over Lyon Street and new ADA compliant curb ramps.

Image filename: curb ramps.jpg
Caption: Newly installed ADA ramp and crossing for the redesigned main lot.

  - At present, the access within the lot is severely limited due to a fenced off sidewalk that veers off to serve the new Doyle Drive by-pass rather than easy access to the

parking facility. This forces visitors to walk within the vehicle space resulting in potential pedeatrian accessibility and circulation concerns.

Image filename: fence.jpg
Caption: Blocked access and poor pedestrian circulation design in the new main lot.

- Off-Site Facilities:
  - Small wayfinding signs direct drivers to additional off-site parking facilities at the Saint Francis Yacht Club and Crissy Field

Image filename: parking directions.jpg
Caption: Small sign directing drivers to off-site parking facilities.

  - Access to and from the off-site parking is difficult and requires pedestrians to cross at least 9 lanes of traffic to get to the Palace of Fine Arts site from the Saint Francis Yacht Club parking and as many as 11 lanes from Crissy Field parking.

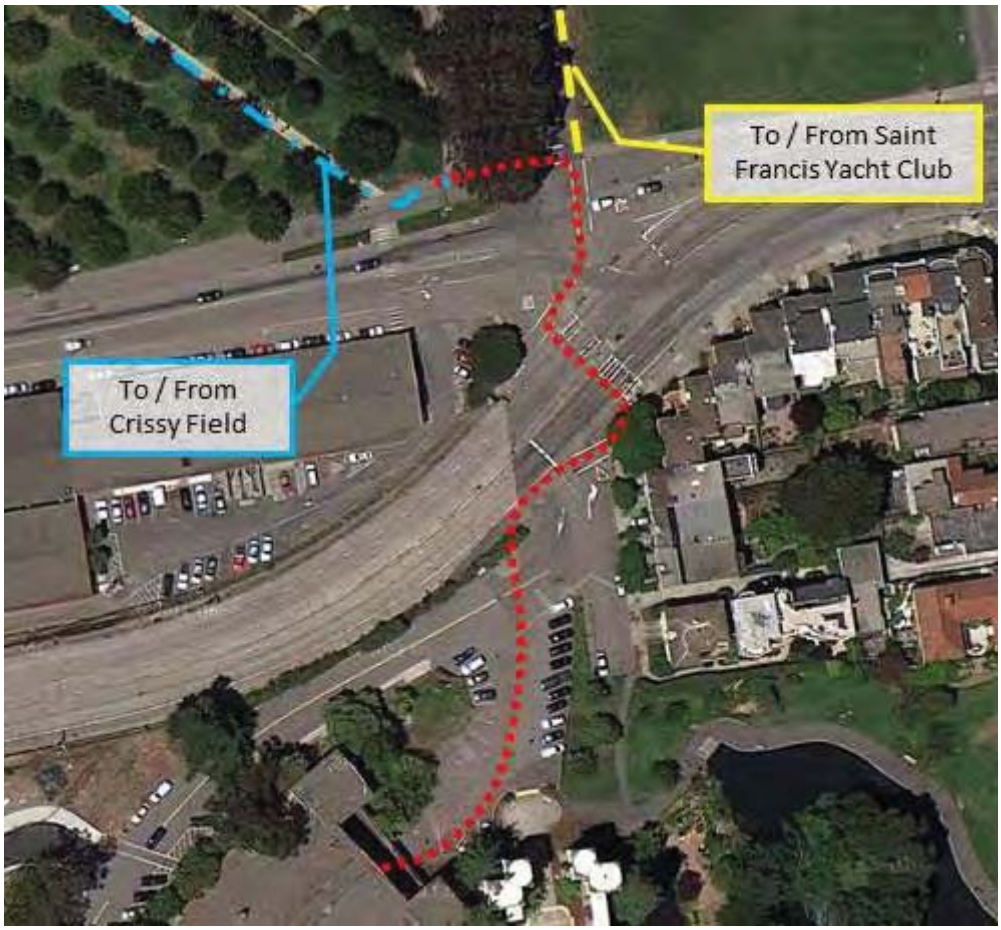


Image filename: lane crossings.jpg
Caption: Obstacles to use of the nearby off-site parking options.

– Additionally, once the visitor has crossed the 9 to 11 lanes of traffic, there is no pedestrian access from the crossing to the building, causing visitors to walk within the vehicle space.

Nightime conditions

The night time parking conditions were not individually observed but it can be assumed that onsite demand during an evening event would mimic the (worst case scenario) conditions observed for this report. The neighborhood parking appears to be nearly at capacity in the evenings and this would remain true during an event at the Palace of Fine Arts, thereby not providing space for overflow parking. In addition to the lack of overflow parking in the adjacent neighborhood, the current overflow parking at Crissy Field and the Saint Francis Yacht Club would be significantly less attractive due to security concerns presented by walking any distance at night.

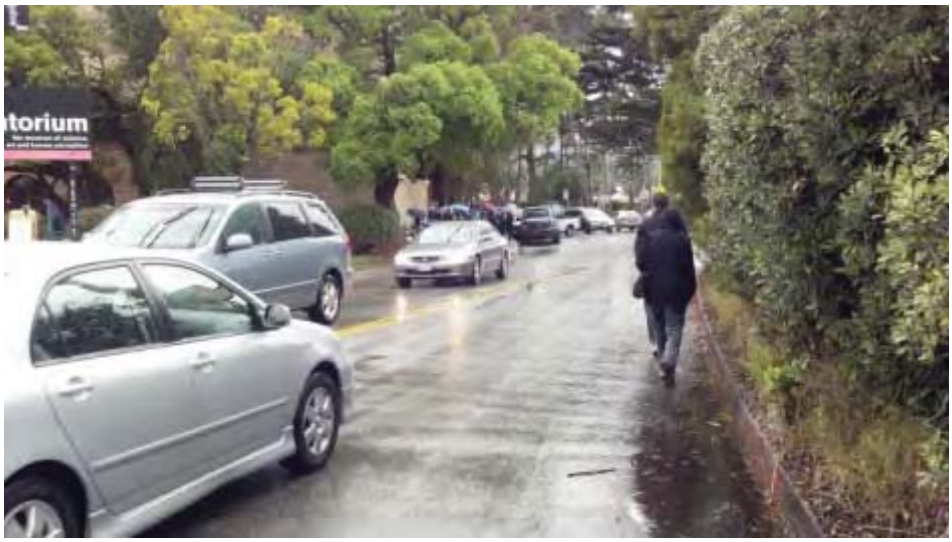


Image filename: ped conflict.jpg

Caption: Lack of road to front door pedestrian access.

- Adjacent Neighborhood:
  - The adjacent neighborhood has pedestrian crossing curb ramps at nearly every corner although there are virtually no pedestrian crosswalk markings, likely due to SFMTA crosswalk marking standards.[2]

Image filename: stroller.jpg

Image filename: no xwalk.jpg

Caption: Lack of marked crossings in the surrounding neighborhood.

VEHICULAR CIRCULATION AND ACCESS

The following vehicular circulation and access observations were made:

- Passenger Vehicles
  - The main access routes to the Palace of Fine Arts is provided by Doyle Drive / Richardson Avenue (US 101) from the south and Marina Boulevard from the north
  - The Palace of Fine Arts site is directly served by Palace Drive on the western side of the building

[2] Under California law, pedestrians have the right-of-way at all intersections, whether crosswalks are marked or unmarked. However, marked crosswalks have been shown in many contexts to reduce vehicle speeds and increase pedestrian comfort and visibility.

- Prior to the Presidio Parkway construction, Palace Drive was two-way for the full length of the Palace of Fine Arts
- During the Presidio Parkway construction, Palace Drive is one-way in the northbound direction for the length of roadway between the main parking lot entrance and exit

Image filename: vehicle circulation.jpg

Caption: Vehicular circulation on-site and in the surrounding neighborhood.

- Tour Buses
  - Tour buses (vehicles with seating for more than 8 people) are prohibited from entering the adjacent neighborhood streets and so are restricted to Palace Drive for accessing the Palace of Fine Arts. It is unclear how consistently this prohibition is adhered to and/or enforced.

Image filename: tour bus sign.jpg

Caption: Buses are prohibited from the neighborhood.

– The buses are provided with a small staging area at the southern end of Palace Drive.

Image filename: tour bus circulation.jpg

Caption: Buses are only allowed on the Palace of Fine Arts site.

TRANSIT

Existing Services

Transit services in the Palace of Fine Arts area are provided by the San Francisco Municipal Transit Agency (Muni), PresidiGo shuttle services, Golden Gate Transit, and the San Francisco Double Decker Tour Bus. Figure 3 shows existing transit routes within the vicinity of the site.

Muni

Seven Muni routes serve the Palace of Fine Arts with varying frequencies, providing regular service to downtown, the Marin Headlands, Daly City, and points in between. The most frequent and closest routes are the **30** Stockton and **30X** Marina Experss, which have stops within a block of the site (at the intersection of Broderick and Beach streets, just to the east), taking slightly varying routes through Chinatown and North Beach into the South of Market area. The frequencies of these two routes vary between 5 and 15 minutes throughout most of the day. In addition, the **28** 19th Avenue, which runs every 12 to 20 minutes, stops at Richardson and Lyon streets, just south of the site. This route runs from the Marina into the Presidio and then south through Golden Gate Park all the way to Daly City.

Other nearby routes include the **43** Masonic and the **76** Marin Headlands, which run along Lombard (the **43** Masonic every 10 to 20 minutes, heading south along Masonic Avenue into Daly City, and the **76** Marin Headlands from downtown to the Marin Headlands on Sundays and

holidays only). Finally, the **41** Union and the **45** Union-Stockton terminate at Lyon Street and Greenwich, about four blocks south of the Palace of Fine Arts. The **41** Union carries passengers along Union Street to Downtown about every 7 to 8 minutes during peak hours. The **45** Union-Stockton travels a similar route every 8 to 20 minutes.

PresidiGo Shuttle

Weekday service: The Presidio Park shuttle (*PresidiGo Shuttle)* offers a weekday route to downtown. The stop closest to the Palace of Fine Arts is at Lombard and Richardson. This loop runs every 15 to 60 minutes weekdays between 5:45 AM and 8:30 PM. No passes are needed between 9:30 AM and 4 PM and after 7:30 PM; however, during commute hours riders must have a valid Muni pass to board.

Weekend service: The PresidiGo Shuttle has two nearby stops (one, at Richardson and Lyon, is a transfer point to Golden Gate Transit and Muni Route 28). This loop runs weekends only, every hour between 11 AM and 6 PM, and is free for all riders.

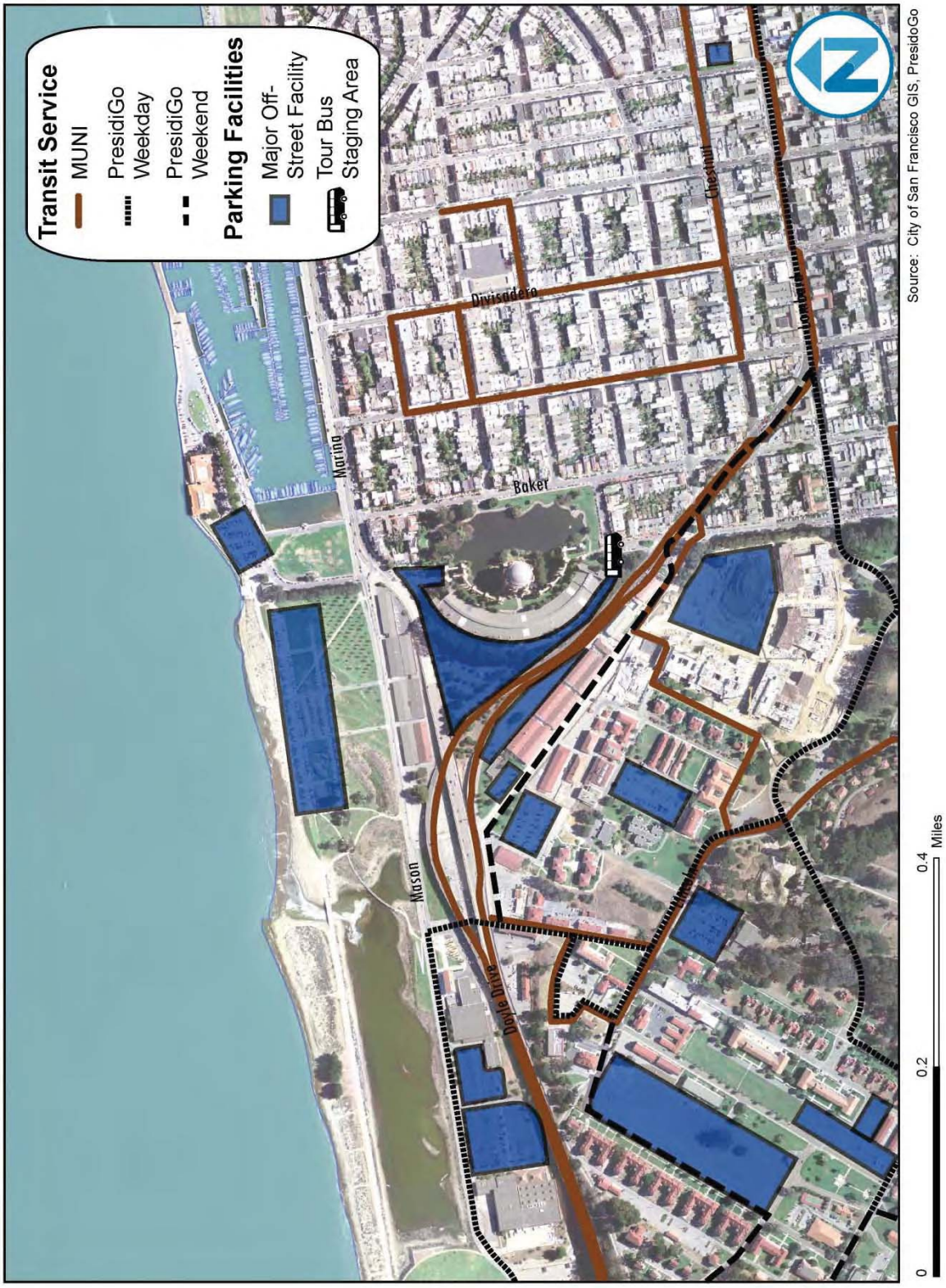
Golden Gate Transit

Golden Gate Transit brings commuters and visitors from Marin into San Francisco, traveling along Doyle Drive. There are almost 20 different Golden Gate Transit routes that pass by the intersection of Francisco and Lyon or Richardson streets, just south of the Palace. Most of the routes run on an hourly schedule, and one (the 93) is a commute-hours only route. Inbound Golden Gate Transit buses will stop to pick up and drop off passengers heading into downtown San Francisco, and outbound buses stop to collect passengers with destinations in Marin County.

Tour-Bus shuttles

The *San Francisco Double Decker* tour bus, which has daily departures every half hour from 9:00 AM to 5:00 PM, includes a stop at the site's bus staging area, located at the corner of Lyon and Richardson streets, just south of the Palace of Fine Arts. San Francisco Shuttle Tours offer a five-hour tour itinerary that includes a stop at the Palace of Fine Arts, twice per morning weekdays and weekends.

Figure 3 Existing Transit and Parking Facilities



BICYCLE AND PEDESTRIAN ACCESS

Existing Infrastructure

Bicycles are an increasingly popular mode of travel, especially in the Fishermen's Wharf area, where bikes are available to rent for tourists who want to ride across the Golden Gate Bridge. The route from Fishermen's Wharf takes bicyclists past the Palace of Fine Arts along the Marina on a separated Class I (off-street) bicycle path. Although the Palace of Fine Arts is somewhat visible from the route, currently no wayfinding signage exists to point bicyclists and pedestrians traveling along Marina Boulevard to the site. Bicyclists and pedestrians must also cross Marina Boulevard at a wide, busy intersection with unclearly marked crosswalks to reach the site. This intersection serves as the ramp to Highway 101 resulting in relatively high traffic speeds.

Other bicycle facilities, both Class II (on-street bicycle lanes) and Class III (on-street signed bicycle route), exist along Mason Street and other streets within the Presidio, as seen in Figure 4. Limited bicycle parking currently exists at the north entrance to the Palace of Fine Arts, at Palace Drive. This bicycle parking is suboptimal design that does little to prevent theft of most bikes with "quick release" tires; the bike parking should be updated to best practice design.

Image filename: bike parking.jpg

Caption: Existing bicycle parking at the front door of the Exploratorium.

For example, traffic calming measures along Marina and Richardson Boulevards will improve conditions for visitors getting on and off transit vehicles, as well as bicyclists and pedestrians. Traffic calming measures, including reduced lane and shoulder widths, a landscaped median, and enhanced pedestrian connections will improve current conditions, where high vehicle speeds, unclearly marked crosswalks, and poor pavement conditions impede convenient and safe access to the Palace of Fine Arts.

Figure 4 Existing Bicycle and Parking Facilities

OPPORTUNITIES AND CONSTRAINTS

Off-Site Parking Feasibility Analysis

The on-street parking facilities within immediate vicinity (within 1 block) of the Palace of Fine Arts are limited to two hour parking for automobiles without a residential permit. As such, use of these facilities by future tenants of the Palace of Fine Arts would be limited to shorter visits, such as shopping and/or dinning. It should be noted that some paid on-street parking exists along Divisadero, Lombard, and Chestnut Streets. These spaces are part of the SF Park Pilot project, whose prices are based upon demand. The goal of the SF Park Pilot project is to ensure an 85% occupancy rate, meaning that if the free on-street spaces directly adjacent to the Palace of Fine Arts were occupied, visitors of the future uses of the Palace of Fine Arts could seek paid on-street parking three blocks to the east. Depending on the future uses of the site, this supply is unlikely to absorb a significant amount of parking demand.

As seen in Figure 3 on page 14, many large off-street facilities exist in proximity to the Palace of Fine Arts, most of which are within the Presidio. These lots include public facilities at Crissy Field and near the Saint Francis Yacht Club and on-site parking facilities at various public and private uses within the Presidio. There is also a large for-pay public garage approximately six blocks from the site.

These large off-street lots could be shared with future uses at the Palace of Fine Arts. Indeed, shared parking is one of the most effective tools in parking management. Because many different land uses (an apartment building and an office building, for example) have different periods of parking demand, they can easily share a common parking facility, thereby limiting the need to provide additional parking. Shared parking schemes allow parking spaces to serve multiple users or destinations, sharing facilities among multiple destinations or uses that exhibit different peak hours of demand. This ensures an efficient use of existing spaces across most times of a day.

Access to shared off-site facilities will be analyzed in Phase II of this study; however, strategies to improve access could include the following:

- **Valet and tandem parking**: Providing on-site valet services that utilize off-site facilities could streamline the parking system. Technology exists to make the car retrieval process customer-friendly, and valet parking schemes enable tandem parking, maximizing the number of cars that can park in an off-street facility.
- **Wayfinding**: Clear and consistent wayfinding signage would help orient visitors, shoppers, and residents alike, pointing them to parking facilities.
- **Pedestrian Improvements**: Providing a clear and safe pedestrian route from off-site parking to the Palace of Fine Arts is essential for off-site facilities within comfortable walking distance.
- **Shuttle service or an extension of existing PresidiGo service:** Reliable, convenient shuttle service to satellite parking facilities, or the extension of existing PresidiGo service, would increase access to shared parking facilities that are not within comfortable walking distance.

It should also be noted that the primary on-site parking lot at the Palace of Fine Arts (west of Palace Drive) is owned by the Presidio. A paid parking scheme is planned for the lot, which will eliminate the majority of free on-site parking. This could heighten the need for alternative access

options and shared off-site parking and will be an important consideration for the phase 2 study looking at opportunities for the future use of the Palace of Fine Arts.

Vehicular Circulation and Access Opportunities

Options for improving the vehicle circulation are limited at this stage. The current construction activities surrounding the Presidio Parkway construction necessitate the current configuration of both passenger vehicle and tour bus access and circulation. As the construction comes to a completion over the next few years, the entry points may be reconfigured for greater ease of access.

Transit Opportunities

Transit Effectiveness Project (TEP)

In December, 2011, Muni ended the public comment period on the scope of the environmental review for its Transit Effectiveness Project. The project's goal is to streamline Muni's existing system by eliminating service duplications and redundant stops, and increasing frequencies where warranted. The project is now entering the Environmental Review phase.

Proposed changes that might affect the Palace of Fine Arts include:

- Increased frequencies
  - **28** 19th Avenue,
  - **28L** 19th Avenue Limited, and
  - **30** Stockton;
- Increased service hours
  - **76** Marin Headlands to include Saturdays as well as Sundays (currently it only runs on Sundays).
- Proposed route changes
  - Terminating the **28** 19th Avenue at the Golden Gate Bridge during daylight hours, which would limit service to the Marina District from points south (service to Marina would be provided by **28L**; service to Fort Mason would be provided by Route **43**);
  - **28L** rapid, limited-stop service would extend beyond commute hours, and the route would be extended to Van Ness/North Point on Lombard St. and to Mission/Geneva via I-280, increasing access to SFSU and City College from Marina, Richmond, Sunset, and Excelsior neighborhoods;
  - **43** Masonic would be rerouted to loop around the Palace of Fine Arts along Marina/Richardson Boulevards, increasing the number of bus stops directly adjacent to the Palace of Fine Arts.
- Capital programs proposed:
  - Improving transfer point at Lyon Street and Richardson Avenue for the **28L** 19th Avenue Limited and Golden Gate Transit (GGT) services. This project would replace the transfer currently at the Golden Gate Bridge toll plaza, which the **28L** 19th Avenue Limited would no longer serve. **28** 19th Avenue (local service) customers would continue to transfer at the Golden Gate Bridge.

The proposed implementation timing of these proposals and projects varies; implementation of recommendations that require operational or capital expenditures will likely be postponed (e.g. additional service) due to Muni financial constraints, while recommendations that result in cost savings (e.g. service reductions) will likely be expedited.

Muni F-Line extension

Muni is considering plans to extend the **F** streetcar line along the Embarcadero from its current terminus at Fisherman's Warf to Fort Mason, utilizing an existing on-track tunnel between Aquatic Park and Marina Boulevard. Service could terminate at Fort Mason Center, in Marina Green, or, as part of a second phase to the extension, it could be extended further west and closer to the Palace of Fine Arts. This extension would improve overall transit access to the Marina District. Originally planned to be completion by 2014, the project has been delayed due to a lack of financing as well as objections from a local residents and public officials. Some Marina resident and merchants fear that auto commuters from Marin County would park in the Marina District and board the **F**-line to reach downtown, creating congestion and increasing parking scarcity, although this concern could be addressed with appropriate parking management strategies.

An extension of the **F**-line would likely increase visitors in the area, based upon changes to travel patterns when the **F**-line opened to the Wharf in 2000. Wildly popular with tourists and residents, the **F**-line averages over 25,000 daily boardings. However, as the proposed terminus of the extension is a full seven blocks away from the Palace of Fine Arts, immediate benefits could be limited without additional pedestrian and bus/shuttle improvements discussed in this memo. For example, a coordinated wayfinding or shuttle program extending from the **F**-line terminus would maximize new visitor traffic to the Palace of Fine Arts.

Bicycle and Pedestrian Opportunities

The San Francisco Bicycle Plan identifies Marina Boulevard, Francisco Street, and Greenwich Street as bicycle routes in need of minor future long improvements. The Bike Plan EIR included a program-level review of such improvements, and while the specific designs vary, all are intended to increase bicycle access and connectivity to the Palace of Fine Arts site. Bicycle and pedestrian amenities, such as improved crossings, secure or valet bicycle parking, and shower/locker room facilities would also improve conditions and encourage visitors to access the Palace of Fine Arts via bicycle or on foot.

Nearby Construction Opportunities

Doyle Drive

According to the project overview documents[3], the Presidio Parkway reconstruction will result in the Presidio Parkway becoming a raised causeway at the Girard Road Interchange, allowing east-west passage between the Palace of Fine Arts and the Presidio. As part of this plan, a new bike path will be built along Girard Road under the Presidio Parkway to connect Marina Boulevard to the Presidio. In addition to raising the

[3] Presidio Parkway Project Overview, October 2011 at http://www.presidioparkway.org/project_docs/files/shortoverview_oct2011.pdf. Accessed 1/10/12.

Presidio Parkway to allow east-west passage, the current elevated section of Marina Boulevard just north of the main lot will be rebuilt as a surface roadway with at grade intersections. The project description found in the Final Environmental Impact Statement Report[4] discusses improvements in both bicycle and pedestrian accessibility across this corridor.

Assuming the reconstruction successfully improves the bicycle and pedestrian environment, the quantity of parking within the 5 minute walking range of the Palace entrances will increase significantly. The following images depict the 5 minute walk range prior to the Presidio Parkway and after the reconstruction, assuming no delay at intersections. A thorough analysis of parking supply within walking distance should account for pedestrian delay at intersections, which would be significant on these large high volume roadways. Nonetheless, allowing east-west passage across the current Doyle Drive will certainly increase the parking supply potentially available to the Palace of Fine Arts visitors and tenants.

[4] Final Environmental Impact Statement Report Chapter 2.5, found at http://www.presidioparkway.org/pdfs/feis/2_5.pdf. Accessed 1/12/12.

Current 5 Minute Walk

Potential 5 Minute Walk Post Construction

Intersection Redesigns

In its current configuration, the northern entrance from the Marina Boulevard/Mason Street/Yacht Road/Palace Drive intersection prohibits left turns from Marina Boulevard onto Palace Drive. The proposed redesign would pull back the stop line for the east bound Marina Boulevard traffic behind Palace Drive, allowing for left turns into Palace Drive. While this will likely improve circulation for vehicles, this further weakens the pedestrian experience at this intersection by increasing the potential conflict points. The redesign does nothing to improve the pedestrian crossing experience aside from updating the curb ramps to be compliant with ADA. The same number of lanes needs to be crossed, and the final leg still deposits people on an island to nowhere, leaving visitors to compete with traffic and parking searchers for space on Palace Drive and the front door lot.

The proposed redesign as shown in DPW documents[5]for the Lyon Street/Richardson Avenue intersection appears to have the same purpose: to move more vehicles. Unfortunately this is once again at the cost of pedestrian ease of access. The redesign introduces a new southbound left turn lane from Lyon Street to Richardson Avenue. This increases both the crossing distance and the number of conflict points for pedestrians traveling to/from the Presidio/Palace of Fine Arts. Nelson\ Nygaard believes that the scope of these proposed capital projects could be improved to provide expanded benefits in light of the proposed Palace of Fine Arts project. We would therefore like to get clarity on the implementation status and timeline of this project and, in conversation with the Department of Public Works, suggest potential changes that would better meet the goals of this project, especially as it relates to pedestrian convenience and comfort accessing satellite parking facilities.

Construction of the new C & D lots

As part of the mitigation agreement in the FEIS[6] for the Presidio Parkway, the main parking lot (directly across Palace Drive from the Palace of Fine Arts) is planned to be reconstructed to its pre-construction capacity. In addition to the main lot reconstruction, there are two new parking facilities planned to be opened early 2012. These lots (known as C & D) will be located just northwest of the Palace of Fine Arts' main lot across what is currently the elevated Marina Boulevard, as seen in Figure 1. These two lots will represent an additional roughly 200 spaces, although accessing these lots from the Palace of Fine Arts is still greatly limited by the current roadway configuration. Upon completion of the temporary Doyle Drive bypass, access to the facilities should be greatly improved for pedestrians, making them a feasible parking asset for events at the Palace of Fine Arts.

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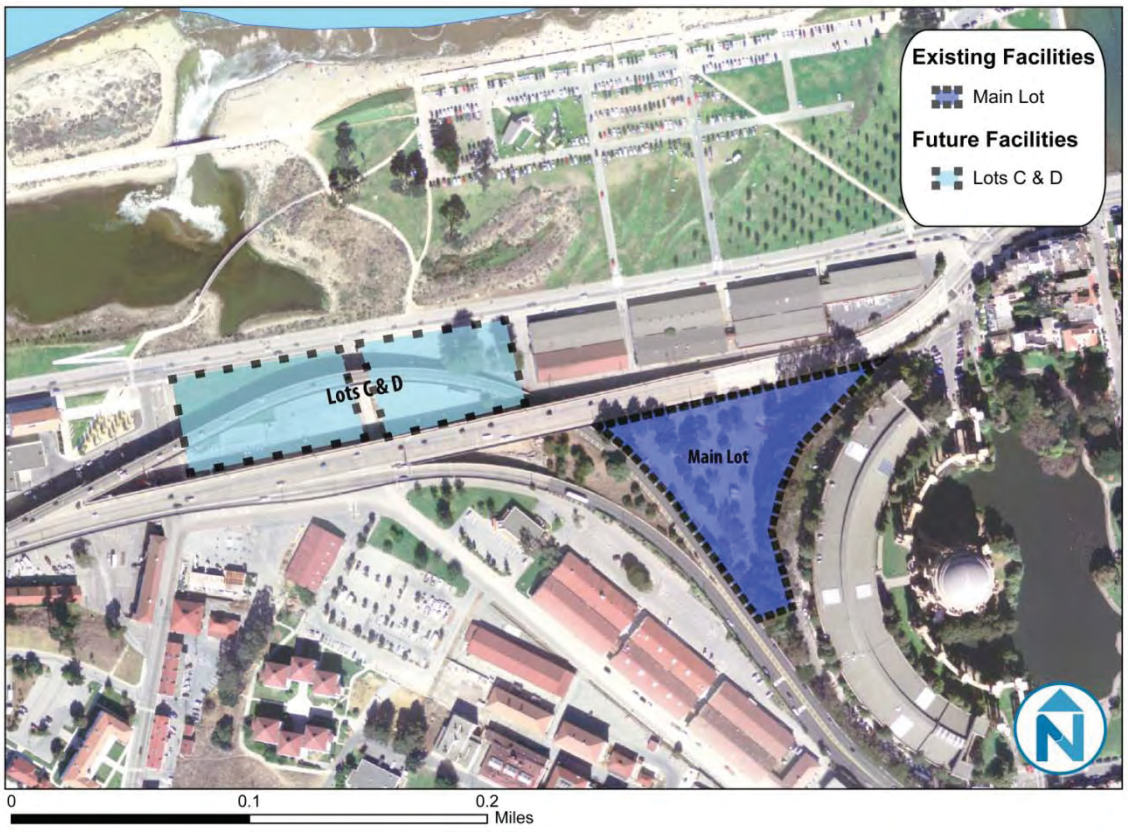
[5] San Francisco Department of Public Works, Palace of Fine Arts Parking Strategies, Job Order No. 3087V, November 2011.

[6] Final Environmental Impact Statement Report Chapter 2.5, found at http://www.presidioparkway.org/pdfs/feis/2_5.pdf. Accessed 1/12/12.

Figure 5 Existing Main Lot and New Lots



Parking Ownership

The Palace of Fine Arts owns the parking along Palace Drive but it does not control the management of its main parking facility (Labeled as “Main Lot” in Figure 1 above) because it is owned by the Presidio Trust. With the removal of the barrier that Doyle Drive has represented, the Presidio Trust appears to see this main lot as an important asset and plans to begin charging for parking. It may become an issue for the Palace of Fine Arts tenants if the demand for parking is intensified bringing the Palace tenants in conflict with the Presidio visitors. While the parking lot will eventually be reconstructed with the pre-construction capacity, the Palace of Fine Arts will need to enter discussions with the Presidio Trust to come to an arrangement on the use of the lot in the future. This discussion should involve coming to an arrangement by which the visitors of the Palace of Fine Arts will be allowed to share the main parking lot as well as the nearby Presidio parking facilities.

Nighttime conditions

The night time parking conditions were not individually observed but it can be assumed that onsite demand during an evening event would mimic the (worst case scenario) conditions observed for this report. The neighborhood parking appears to be nearly at capacity in the evenings and this would remain true during an event at the Palace of

Fine Arts, thereby not providing space for overflow parking. In addition to the lack of overflow parking in the adjacent neighborhood, the current overflow parking at Crissy Field and the Saint Francis Yacht Club would be significantly less attractive due to security concerns presented by walking any distance at night.

baseline assumptions

EHDD Architecture

Baseline Assumptions

Baseline Assumptions summarize the architecture and engineering team's assessments detailed earlier in this report and frame the cost estimate that follows from Plant Construction. Three options are defined to provide a range of possible avenues to take depending upon the project schedule, City objectives, and the future tenant.

The Baseline Assumptions are based on the following goals:

- Prevent further deterioration of the building shell and prevent ongoing water leakage to the interior;
- Bring the building into basic code compliance (where deficient, noted below);
- Provide a "cold shell" until future uses of the building are further defined; do not include any tenant improvements;
- Integrate select recommendations of the engineering assessment team.

Option 1: Cold Shell Exploratorium space

Assume the Palace of Fine Arts Theater remains in operation, in an "as-is" condition. Assume the Exploratorium space is shelled out including demolition, hazardous material abatement and a new slab on grade in the Exploratorium space only.

Option 2: Cold Shell Entire Building

Assumes both the Palace of Fine Arts Theater and the Exploratorium spaces are shelled out including demolition, hazardous material abatement and a new slab on grade throughout.

The following list of improvements forms the basis of both Option 1 and Option 2 estimates:

1. Code required upgrades to Theater HVAC (Mechanical);
2. Restoration and cleaning (Historic Architect);
3. New roofing for entire building, including rehabilitation of skylights and new glazing
4. Replace roof drains and leaders (Plumbing);

5. A video survey and repair of existing piping (Civil);
6. New fire protection for code compliance (Fire Protection);
7. Provide new emergency generator, transformer and power (Electrical);
8. Provide new continuous drain around building and new curb along westside of Palace Drive. Replace Palace Drive sidewalk on west side of building (Civil);

Add Alternates:
Structural: The voluntary structural recommendations include upgrades to the entire building; refer to Structural Analysis. Option 1 is more expensive because the contractor will need to demolish and repair slab and finishes for the foundation work, and the truss improvements will be more complex with the PoFA Theater seating and finishes (curtains) remaining in place. In Option 2, if the Theater interior improvements are removed, the structural upgrades can proceed in a more efficient and constructible sequence. These upgrades are identified and isolated as a separate scope in both the Project Cost Comparison Chart and in Plant Construction's cost estimate.

Daylighting:
Several options for increasing natural light into the space were illustrated in the Daylighting assessment; these can be integrated into a future design independently or in combination, depending upon future use and layouts. Associated costs are identified in Plant Construction's cost estimates only.

Project Cost Comparison Chart
The Project Cost Comparison Chart on page 52 summarizes Plant Construction's cost estimate in a side-by-side format and adds "soft costs" to complete the financial picture for the total project costs.
Cost information contained in Plant Construction estimates include "hard" construction costs, escalation at 4% per annum with a cumulative 12.5%, plus Contractor's overhead and profit. "Soft costs" including design team, management, permit, and entitlement fees, plus Owner testing, survey and report costs.
The comparison chart also isolates the costs to perform the voluntary structural improvements (hard and soft costs) independently. None of the daylighting alternates are included in the comparison chart, because they will be dependent upon the future use/tenant.

PROJECT COST COMPARISON

OPTION 1 **"Cold Shell" Exploratorium, PFA Theater remains as-is**

OPTION 2 **"Cold Shell" Entire Building**

	OPT 1	OPT 2	Struct Only
COLD SHELL UPGRADES			
HARD COSTS			
Cold Shell work to ensure building is preserved & maintained, preventing further deterioration of the shell or water leakage to the interior.	** $11.8 m	$14.0 m	
- Code required upgrades to Theater HVAC			
- Limited historic restoration and cleaning of exterior			
- Re-roof entire building, including rehabilitation of existing skylights and new glazing			
- Replace roof drains and leaders			
- Video survey and repair of existing piping			
- New fire protection (sprinkler system)			
- Provide new electrical emergency generator, transformer, & power to building			
- New continuous drain around building, new curb along west side of Palace Drive & replace sidewalk at west side of building on Palace Drive			
NO Tenant Improvements are included in any of these options.			
SOFT COSTS	$4.1 m	$4.9 m	
Architecture & Engineering Fees (14%)			
Project Management Fees (6%)			
Construction Management Fees (8%)			
Permits (1%)			
Testing & inspections (1%)			
Surveys, Geotechnical Report, Hazardous Materials Report, Misc (5%)			
PROJECT COSTS (Hard & Soft Costs for Cold Shell Upgrades)	$16.2 m	$18.9 m	
ADD ALTERNATE :			
HARD COSTS - Add Alt			
Recommended Structural Improvements - for entire building	** $5.9 m	$5.3 m	$5.9 m
- Micropiles at Exploratorium			
- Micropiles at existing Theater to remain			
- Improvements to 3-pin truss for entire building			
- Structural Work – foundation work (replace pile caps and new grade beam)			
SOFT COSTS - Add Alt	$2.1 m	$1.9 m	$2.1 m
PROJECT COSTS INCLUDING ADD ALTERNATE	$24.2 m	$26.1 m	$7.9 m
	OPT 1	OPT 2	Struct Only

** Additional costs are included in Option 1 associated with increased logistics, demo & finishes to modify structure in Theater

cost estimate

Plant Construction

ESTIMATE #6 *Revised*
CONCEPTUAL ESTIMATE

PLANT CONSTRUCTION COMPANY, L.P.
300 NEWHALL STREET
SAN FRANCISCO, CA 94124-1426
TEL 415.285.0500 FAX 415.550.1357
LICENSE NUMBER 830764
www.plantconstructioncompany.com

Date: November 21, 2013

To: EHDD Architecture
500 Treat Avenue, Suite 201
San Francisco, CA 94110

Attn: Kelly Ishida Sloan

Via: Email

Re: Palace of Fine Arts Building
3601 Lyon Street
San Francisco, California
PCCLP Project #2011176

SCOPE OF WORK

Rehabilitate the Palace of Fine Art Building in accordance with:

- 50% Electrical Feasibility Narrative by Cammisa and Wipf, dated 01/19/12.
- Civil Narrative Draft by BKF Engineers, dated 01/16/12.
- Phase 1 HVAC Systems Narrative, dated 01/09/12.
- Palace of Fine Arts Engineering and Uses Study by Nelson/Nygaard Associates, dated 1/6/12.
- Palace of Fine Arts Daylighting report by Loisos & Ubbelohde, dated 12/20/11.
- Structural General Condition Assessment by Rutherford & Chekene, dated 01/12/12.
- Conditions Assessment and Repair Recommendations by Page and Turnbull, dated 01/17/12.
- **Structural General Condition Assessment by Rutherford & Chekene, Revised dated 03/22/13.**

OPTION 1 - COLD SHELL EXPLORATORIUM (leave Theater in operation)

ESTIMATED AMOUNT: $11,527,000

ADD ALTERNATES to OPTION 1

1.	Structural Recommendations		
	a)	Micropiles at Exploratorium:	$ 1,268,000
	b)	Micropiles at existing Theater to remain:	$ 879,000
	c)	**Cable ties at 3-pin trusses at entire building:**	**$ 994,000**
	d)	**New pile caps and grade beams:**	**$ 2,742,000**
		Total Structural:	**$ 5,883,000**
2.	Added Glazing at Roof		
	a)	Replace monitor louvers with glazing - Exploratorium only:	$ 108,000
	b)	Add 1 pair of sloped skylights on roof: (assumes 2 skylights, each 1,038 square feet, includes roof seismic strengthening)	$ 463,000
	c)	Add 14 pairs of sloped skylights on roof: (assumes 28 skylights, each 1,038 square feet, includes roof seismic strengthening)	$ 6,482,000
		Total Added Glazing at Roof:	$ 7,053,000
3.	Code Upgrades to Theater		
	a)	Upgrade HVAC:	$ 273,000
		Total Theater Code Upgrades:	$ 273,000

OPTION 1 TOTAL INCLUDING ALL ALTERNATES: $24,736,000

OPTION 2 - COLD SHELL ENTIRE BUILDING

ESTIMATED AMOUNT: $14,021,000

ADD ALTERNATES to OPTION 2

1. Structural Recommendations

a)	Micropiles at Exploratorium:	$ 1,268,000
b)	Micropiles at vacant Theater space:	$ 749,000
c)	**Cable ties at 3-pin trusses at entire building:**	**$ 864,000**
d)	**New pile caps and grade beams:**	**$ 2,429,000**
	Total Structural:	**$ 5,310,000**

2. Added Glazing at Roof

a)	Replace monitor louvers with glazing:	$ 189,000
b)	Add 2 pairs of sloped skylights on roof: (assumes 4 skylights, each 1,038 square feet, includes roof seismic strengthening)	$ 926,000
c)	Add 20 pairs of sloped skylights on roof: (assumes 40 skylights, each 1,038 square feet, includes roof roof seismic strengthening)	$ 9,260,000
	Total Added Glazing at Roof:	$10,375,000

OPTION 2 TOTAL INCLUDING ALL ALTERNATES: $29,706,000

NOTES AND CLARIFICATIONS

1. Options 1 and 2

   Option 1 addresses core and shell work for these purposes:

   - To preserve and maintain the exterior shell of the entire building.
   - To prepare the north end (Exploratorium) for a future tenant.
   - To keep the Theater in business and perform code upgrades to it, as may be triggered by improvements for a new tenant in the Exploratorium space.

   Option 2 demolishes all the interiors including the Theater and prepares the entire building for future tenants.

2. Base Budgets vs Alternates

   In the base budgets for each option, we include the least scope that a prudent owner would undertake upon vacation of premises by the Exploratorium. The alternates are for voluntary scopes, desirable but not necessary.

3. Cold Shell vs Warm Shell

   Some of the consultant reports address scope for the vacated portions of building (satellite electrical rooms) that would be appropriate to a warm shell – defined here as a core and shell project that would tailor the building for a particular type of tenant. This building is so unique, and the tenanting possibilities so varied, that we cannot normally price the typical elements (toilet rooms, lobbies, base building HVAC equipment), so both the options take the building only to the level of improvement that is typically called "cold shell", without the items listed above, but stable structurally, being watertight and attractive, fully installed with fire sprinklers, with adequate services stubbed into the building, all interior improvements from former tenants removed, but with no new interior improvements. For a point of reference, taking a typical office building from cold shell to warm shell adds on the order of $25/square feet or approximately $3,000,000 for this building (both the Exploratorium and the Theater spaces).

4. Flooding and Water Intrusion

   The building has a history of water entry from both surface and subsurface sources. The fundamental problem is that it is sited barely above sea level so ground water is high and directing surface water away from the building with positive slope is fairly impractical. A secondary issue is that the municipal pumping system is barely adequate.

   - This estimate addresses a few of the local flooding and water intrusion issues, including sidewalk slope, a French drain, a membrane under the new slab on grade, however does not address the larger issues.

- We might consider raising the new interior slab by installing it above the existing slab at somewhat less cost than replacing the slab at its existing elevation, however, this solution introduces significant architectural issues.

5. Escalation

We include cost escalation from the first quarter of 2012 to a construction start in the first quarter of 2015 (3years). Using a 4% rate of escalation per year for the next three years (compounded annually), the overall mark-up to the total cost would be 12.5%.

INCLUSIONS

Option 1: Cold Shell Exploratorium, Leave Theater As-Is

B01 Site Preparation (Exploratorium only)

- Demolish slab (concrete/asphalt).
- Excavate below slab for new gravel sub-base and drainage.

B02 Interior Demolition (Exploratorium only)

- Interior tenant improvements – partitions, enclosures, etc.
- Mezzanines, staircase and handrails.
- HVAC equipment and distribution.
- Plumbing.
- Electrical distribution and fixtures.

B03 Hazardous Materials Costs (Exploratorium only)

- As the scope for hazardous material removal is currently unclear, this estimate includes an allowance for abatement.

C05 Reconstruction (Exploratorium only)

- New reinforced concrete slab on grade with water-proofing membrane and under-slab drainage lines.
- Repair severe cracking in chimney 5 – second in from south edge.

D01 Vertical Enclosure (Entire Building)

- Repair plaster cracks on chimney walls.
- Clean organic growth stains on external cement plaster walls using mild detergent and a fiber brush.
- Repair historic doors for paint delamination, minor abrasions and local wood decay.
- Replace chimney capstones.

D02 Horizontal Enclosure (Entire Building)

- Remove and replace building roofing, flashing and parapet waterproofing.
- Rehabilitate skylights – replace glazing.

E01 Interior Construction (Exploratorium only)

- Miscellaneous interior construction and finish repair.

H01 Plumbing

- Replace roof drains and leaders (entire building).
- Video survey and repair domestic sewer lines (Exploratorium only).

H02 Fire Protection

- Provide connection to sprinkler from street, main riser and backflow valves.
- Mains distribution piping for entire building.
- Consideration for knitting piping through existing finishes in the Theater.

H04 Electrical Systems

- Provide emergency generator.
- Provide new, privately owned high voltage transformer.
- Provide power to building.

S01 Site Improvements

- New curb and gutter along Palace Drive at theater.
- Modify entire sidewalk along Palace Drive (west of building).

S04 Site Utilities

- New domestic water line to building from street connection.
- Route storm drain lines outside the building to pump.
- French drain all around perimeter of building to relieve hydrostatic pressure.

Mark Ups: All add-ons below are added to the total cost in running percentage:

- General Expenses and Temporary Construction at 10%.
- Contractor's Fee at 4%.
- Insurance at 1%.
- Contingency at 10%.
- General Contractor's Bond at 0.75%.
- Escalation from 2012 to 2015 at 12.5% (4% compounded annually for 3 years).

Option 2: Cold Shell Entire Building

B01 Site Preparation (Entire Building)

- Demolish slab (concrete/asphalt).
- Excavate below slab for (n) gravel sub-base and drainage.

B02 Interior Demolition (Entire Building)

- Demolish interior tenant improvements –partitions, enclosures, stage, curtain assemblies, theater seating, raised slab and framing, etc.
- Demolish demising walls (between Exploratorium and Theater).
- HVAC equipment and distribution.
- Plumbing.
- Electrical distribution and fixtures.

B03 Hazardous Materials Costs (Entire Building)

- As the scope for hazardous material removal is currently unclear, this estimate includes an allowance for abatement.

C05 Reconstruction (Entire Building)

- New reinforced concrete slab on grade with water-proofing membrane and under-slab drainage lines.
- Restore the proscenium arch.
- Restore Chimney #5 for significant structural cracks (second in from south edge).

D01 Vertical Enclosure (Entire Building)

- Repair plaster cracks on chimney walls.
- Clean organic growth stains on external cement plaster walls using mild detergent and a fiber brush.
- Repair historic doors for paint delamination, minor abrasions and local wood decay.
- Replace chimney capstones.

D02 Horizontal Enclosure (Entire Building)

- Remove and replace roofing, flashing and parapet waterproofing.
- Rehabilitate skylights (use existing framing and replace with new glazing).

E01 Interior Construction (Entire Building)

- Miscellaneous interior construction and finish repair.

H01 Plumbing (Entire Building)

- Replace roof drains and leaders.
- Video survey and repair domestic sewer lines.

H02 Fire Protection (Entire Building)

- Provide connection sprinkler from street, main riser and backflow valves.
- Main distribution piping.

H04 Electrical Systems (Entire Building)

- Provide emergency generator.
- Provide new, privately owned, high voltage transformer.
- Provide power to the building.

S01 Site Improvements

- New curb and gutter along Palace Drive at theater.
- Modify entire sidewalk along Palace Drive (west of building).

S04 Site Utilities (Entire Building)

- New domestic water line to the building from the street connection.
- Route storm drain lines outside the building to the pump station.
- Provide a new French drain around the perimeter of the building to relieve hydrostatic pressure.

Mark Ups: All add-ons below are added to the total cost in running percentage.

- General Expenses and Temporary Construction at 10%.
- Contractor's Fee at 4%.
- Insurance at 1%.
- Contingency at 10%.
- General Contractor's Bond at 0.75%.
- Escalation from 2012 to 2015 at 12.5% (4% compounded annually for 3 years).

EXCLUSIONS

1. Architectural, engineering or other consultants' fees.
2. Cost of testing and inspection.
3. Cost of building permits.
4. Irrigation or landscaping, including work to redwood trees.
5. Signs or graphics.
6. Exterior lighting.
7. Work to the Rotunda or Colonnade.
8. Rehabilitation of the fireplaces (we include work to the flues as directed).

This is a conceptual estimate made in advance of final plans, specifications, subcontractors' bids, or review by the various city agencies. It is based on work proceeding at this time and is intended for preliminary budgeting purposes only.

PS:mbm

Enclosures

cc: Phoebe Schenker, EHDD Architecture
Si Durney, PCCLP
Jeff Gherardini, PCCLP
Jeff VanDeWyngaerde, PCCLP

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PLANT CONSTRUCTION COMPANY, L.P.

By _____
Prashant Sharma, As Agent

Client Itm	phase	item desciption	quantity		unit cost		total
00		Statistical information					
	5	Statistical Information					
		Ground floor - Exploratorium	*87,500.00*	*sffl*	*0.00*	*/sffl*	*0*
		Ground floor - Theater	*37,868.00*	*sffl*	*0.00*	*/sffl*	*0*
		Exploratorium Mezzanines	*17,839.00*	*sffl*	*0.00*	*/sffl*	*0*
		Area of roof and parapet	*135,000.00*	*sfr*	*0.00*	*/sfr*	*0*
		Length of exterior walls	*2,191.00*	*lfw*		*/lfw*	
		Exterior wall surfaces	*79,599.03*	*sfw*		*/sfw*	
		Job size without mezzanines	*125,368.00*	*sffl*		*/sffl*	
01		Option 1--Cold Shell Exploratorium, Leave Theater in Operation					
	B01	Site Prep	87,500.00	sffl	3.84	/sffl	336,250
	B02	Interior Demolition	87,500.00	sffl	3.04	/sffl	265,890
	B03	Hazardous Materials Costs	87,500.00	sffl	1.00	/sffl	87,500
	C05	Reconstruction	87,500.00	sffl	27.79	/sffl	2,431,250
	D01	Vertical Enclosure	87,500.00	sffl	7.07	/sffl	618,998
	D02	Horizontal Enclosure	125,368.00	sfr	18.64	/sfr	2,336,400
	E01	Interior Construction	87,500.00	sffl	1.50	/sffl	131,250
	H01	Plumbing	87,500.00	sffl	0.66	/sffl	57,500
	H02	Fire Protection	87,500.00	sffl	4.00	/sffl	349,946
	H04	Electrical Systems	87,500.00	sffl	10.07	/sffl	881,250
	S01	Site Improvements	87,500.00	sffl	1.37	/sffl	119,635
	S04	Site Utilities	87,500.00	sffl	4.41	/sffl	386,075
		01 Option 1--Cold Shell Exploratorium, Leave Theater in Operation	87,500.00	sffl	91.45	/sffl	8,001,944

Description	*Amount*	*Totals*	
		8,001,944	
Gen.Expenses + Temp.Construct	800,194		10.000 %
Contractor's Fee	352,086		4.000 %
Insurance	91,542		1.000 %
Contingency	924,577		10.000 %
Gen. Contractor's Bond	76,278		0.750 %
Cost Escalation	1,280,827		12.500 %
Partial Total		11,527,448	

desciption	quantity		unit cost		total
00 Statistical information					
5 Statistical Information					
Ground floor - Exploratorium	*87,500.00*	*sffl*	*0.00*	*/sffl*	*0*
Ground floor - Theater	*37,868.00*	*sffl*	*0.00*	*/sffl*	*0*
Exploratorium Mezzanines	*17,839.00*	*sffl*	*0.00*	*/sffl*	*0*
Area of roof and parapet	*135,000.00*	*sfr*	*0.00*	*/sfr*	*0*
Length of exterior walls	*2,191.00*	*lfw*		*/lfw*	
Exterior wall surfaces	*79,599.03*	*sfw*		*/sfw*	
Job size without mezzanines	*125,368.00*	*sffl*		*/sffl*	
01 Option 1--Cold Shell Exploratorium, Leave Theater in Operation					
B01 Site Prep					
Demo interior slab/asphalt paving	87,500.00	sf	2.00	/sf	175,000
Excavate below slab for gravel and drainage	2,150.00	cy	75.00	/cy	161,250
Site Prep	87,500.00	sffl	3.84	/sffl	336,250
B02 Interior Demolition					
Interior finishes and systems	87,500.00	sffl	1.00	/sffl	87,500
Mezzanines including finishes and systems	17,839.00	sffl	10.00	/sffl	178,390
Interior Demolition	87,500.00	sffl	3.04	/sffl	265,890
B03 Hazardous Materials Costs					
Misc abatement	87,500.00	sfff	1.00	/sfff	87,500
Hazardous Materials Costs	87,500.00	sffl	1.00	/sffl	87,500
C05 Reconstruction					
New slab on grade with WP membrane and underslab drainage	87,500.00	sffl	27.50	/sffl	2,406,250
Repair severe cracking in chimney 5 - second in from South edge	25,000.00	bud	1.00	/bud	25,000
Reconstruction	87,500.00	sffl	27.79	/sffl	2,431,250
D01 Vertical Enclosure					
Repair plaster cracking @ chimneys	4.00	ea	10,000.00	/ea	40,000
Repair plaster cracking @ chimneys	2.00	ea	10,000.00	/ea	20,000
Clean organic growth stains from cement plaster walls incl scaffold (ext surface)	51,661.26	sfw	2.50	/sfw	129,153
Clean organic growth stains from cement plaster walls incl scaffold (ext surface)	27,937.77	sfw	2.50	/sfw	69,844
Repair historic doors	30.00	lv	7,500.00	/lv	225,000
Repair historic doors	14.00	lv	7,500.00	/lv	105,000
Replace chimney capstones	4.00	ea	5,000.00	/ea	20,000
Replace chimney capstones	2.00	ea	5,000.00	/ea	10,000
Vertical Enclosure	87,500.00	sffl	7.07	/sffl	618,998
D02 Horizontal Enclosure					
Remove + replace roofing, flashing, insulation and parapet waterproofing	135,000.00	sfr	15.00	/sfr	2,025,000
Rehabilitate skylights	4,152.00	sfr	50.00	/sfr	207,600
Rehabilitate skylights	2,076.00	sfr	50.00	/sfr	103,800
Horizontal Enclosure	125,368.00	sfr	18.64	/sfr	2,336,400
E01 Interior Construction					

desciption	quantity		unit cost		total
E01 Interior Construction					
Misc interior construction and finish repair	87,500.00	sffl	1.50	/sffl	131,250
Interior Construction	87,500.00	sffl	1.50	/sffl	131,250
H01 Plumbing					
Replace roof drains and leaders	6.00	loc	5,000.00	/loc	30,000
Replace roof drains and leaders	4.00	loc	5,000.00	/loc	20,000
Video and repair domestic sewer lines	7,500.00	bud	1.00	/bud	7,500
Plumbing	87,500.00	sffl	0.66	/sffl	57,500
H02 Fire Protection					
New fire sprinkler service from the street	25,000.00	bud	1.00	/bud	25,000
New riser and backflow prevention valves	5,000.00	bud	1.00	/bud	5,000
Mains, distribution piping and heads	87,500.00	sffl	2.25	/sffl	196,875
Mains, distribution piping and heads	37,868.00	sffl	2.25	/sffl	85,203
Thread sprinkler piping through Theater finishes and systems	37,868.00	sffl	1.00	/sffl	37,868
Fire Protection	87,500.00	sffl	4.00	/sffl	349,946
H04 Electrical Systems					
Cold shell space including new generator	87,500.00	sffl	7.50	/sffl	656,250
Privately owned transformer inside building	225,000.00	bud	1.00	/bud	225,000
Electrical Systems	87,500.00	sffl	10.07	/sffl	881,250
S01 Site Improvements					
New curb and gutter along Palace Drive Theater	427.00	lf	75.00	/lf	32,025
Modify sidewalk west of Theater.	8,761.00	sf	10.00	/sf	87,610
Site Improvements	87,500.00	sffl	1.37	/sffl	119,635
S04 Site Utilities					
French drain all around perimeter of building to relieve hydrostatic pressure	2,300.00	lf	100.00	/lf	230,000
New domestic water line to building from street connection	1.00	ls	15,000.00	/ls	15,000
Route horizontal storm drain lines outside building to pump station	1,269.00	lf	75.00	/lf	95,175
Route horizontal storm drain lines outside building to pump station	612.00	lf	75.00	/lf	45,900
Site Utilities	87,500.00	sffl	4.41	/sffl	386,075
01 Option 1--Cold Shell Exploratorium, Leave Theater in Operation	87,500.00	sffl	91.45	/sffl	8,001,944

Description	*Amount*	*Totals*	
		8,001,944	
Gen.Expenses + Temp.Construct	800,194		10.000 %
Contractor's Fee	352,086		4.000 %
Insurance	91,542		1.000 %
Contingency	924,577		10.000 %
Gen. Contractor's Bond	76,278		0.750 %
Cost Escalation	1,280,827		12.500 %
Partial Total		11,527,448	

Client Itm	phase	item desciption	quantity		unit cost		total
1A1a		Micropiles for Exploratorium					
	C06	Seismic Bracing					
		Micropiles	88.00	pile	10,000.00	/pile	880,000
		Seismic Bracing	87,500.00	sffl	10.06	/sffl	880,000
		1A1a Micropiles for Exploratorium	88.00	pile	10,000.00	/pile	880,000

Description	Amount	Totals	
		880,000	
Gen.Expenses + Temp.Construct	88,000		10.000 %
Contractor's Fee	38,720		4.000 %
Insurance	10,067		1.000 %
Contingency	101,679		10.000 %
Gen. Contractor's Bond	8,388		0.750 %
Cost Escalation	140,857		12.500 %
Partial Total		1,267,711	

Client Itm	phase	item desciption	quantity	unit cost	total
1A1b		Micropiles for Theater			
	C06	Seismic Bracing			
		Micropiles	52.00 ea	10,000.00 /ea	520,000
		Remove and replace Theater finishes and systems for seismic work	18.00 loc	5,000.00 /loc	90,000
		Seismic Bracing	37,868.00 sffl	16.11 /sffl	610,000
		1A1b Micropiles for Theater	52.00 pile	11,730.77 /pile	610,000

Description	Amount	Totals	
		610,000	
Gen.Expenses + Temp.Construct	61,000		10.000 %
Contractor's Fee	26,840		4.000 %
Insurance	6,978		1.000 %
Contingency	70,482		10.000 %
Gen. Contractor's Bond	5,815		0.750 %
Cost Escalation	97,639		12.500 %
Partial Total		878,754	

Client Itm	phase	item desciption	quantity		unit cost		total
1A1c		Cable Bracing Leaving Theater Finishes in Place					
	C06	Seismic Bracing					
		Exploratorium cable bracing complete	15.00	frm	25,000.00	/frm	375,000
		Theater cable bracing complete	9.00	frm	25,000.00	/frm	225,000
		Thread cables through Theater finishes and systems	9.00	frm	10,000.00	/frm	90,000
		Seismic Bracing	125,368.00	sffl	5.50	/sffl	690,000
		1A1c Cable Bracing Leaving Theater Finishes in Place	24.00	frm	28,750.00	/frm	690,000

Description	Amount	Totals	
		690,000	
Gen.Expenses + Temp.Construct	69,000		10.000 %
Contractor's Fee	30,360		4.000 %
Insurance	7,894		1.000 %
Contingency	79,725		10.000 %
Gen. Contractor's Bond	6,577		0.750 %
Cost Escalation	110,445		12.500 %
Partial Total		994,001	

Client Itm	phase	item desciption	quantity	unit cost	total
1A1d		Pile Caps and Grade Beams Doweled Into Existing Caps and Beams			
	C06	Seismic Bracing			
		Pile caps	30.00 ea	20,000.00 /ea	600,000
		Grade beams	1,107.00 lf	350.00 /lf	387,450
		Pile caps	18.00 ea	20,000.00 /ea	360,000
		Grade beams	967.00 lf	350.00 /lf	338,450
		Demo and patch Theater slab on grade over pile caps and grade beams	967.00 lf	100.00 /lf	96,700
		Remove and replace Theater finishes and systems for seismic work	967.00 lf	125.00 /lf	120,875
		Seismic Bracing		/sffl	1,903,475
		1A1d Pile Caps and Grade Beams Doweled Into Existing Caps and Beams			1,903,475

Description	Amount	Totals	
		1,903,475	
Gen.Expenses + Temp.Construct	190,348		10.000 %
Contractor's Fee	83,753		4.000 %
Insurance	21,776		1.000 %
Contingency	219,935		10.000 %
Gen. Contractor's Bond	18,145		0.750 %
Cost Escalation	304,679		12.500 %
Partial Total		2,742,111	

Client Itm	phase	item desciption	quantity	unit cost	total
1A2a		Replace Exploratorium Vertical Monitor Louvers with Glazing			
	D01	Vertical Enclosure			
		Replace vertical monitor louvers with glazing (4' tall)	500.00 sfw	150.00 /sfw	75,000
		Vertical Enclosure		/sffl	75,000
		1A2a Replace Exploratorium Vertical Monitor Louvers with Glazing	427.00 lf	175.64 /lf	75,000

Description	Amount	Totals	
		75,000	
Gen.Expenses + Temp.Construct	7,500		10.000 %
Contractor's Fee	3,300		4.000 %
Insurance	858		1.000 %
Contingency	8,666		10.000 %
Gen. Contractor's Bond	715		0.750 %
Cost Escalation	12,005		12.500 %
Partial Total		108,044	

Client Itm	phase	item desciption	quantity	unit cost	total
1A2b		Add One Pair of Sloped Skylights on Roof			
	D02	Horizontal Enclosure			
		Add 1 set of sloped skylights on roof	2,076.00 sfr	150.00 /sfr	311,400
		Seismic strengthening of roof	1.00 sklt	10,000.00 /sklt	10,000
		Horizontal Enclosure		/sfr	321,400
		1A2b Add One Pair of Sloped Skylights on Roof	1,527.00 sf	210.48 /sf	321,400

Description	Amount	Totals	
		321,400	
Gen.Expenses + Temp.Construct	32,140		10.000 %
Contractor's Fee	14,142		4.000 %
Insurance	3,677		1.000 %
Contingency	37,136		10.000 %
Gen. Contractor's Bond	3,064		0.750 %
Cost Escalation	51,445		12.500 %
Partial Total		463,004	

Client Itm	phase	item desciption	quantity	unit cost	total
1A2c		Add Fourteen Pairs of Sloped Skylights on the Roof			
	D02	Horizontal Enclosure			
		Add 1 set of sloped skylights on roof	29,064.00 sfr	150.00 /sfr	4,359,600
		Seismic strengthening of roof	14.00 sklt	10,000.00 /sklt	140,000
		Horizontal Enclosure		/sfr	4,499,600
		1A2c Add Fourteen Pairs of Sloped Skylights on the Roof			4,499,600

Description	Amount	Totals	
		4,499,600	
Gen.Expenses + Temp.Construct	449,960		10.000 %
Contractor's Fee	197,982		4.000 %
Insurance	51,475		1.000 %
Contingency	519,902		10.000 %
Gen. Contractor's Bond	42,892		0.750 %
Cost Escalation	720,226		12.500 %
Partial Total		6,482,037	

Client Itm	phase	item desciption	quantity	unit cost	total
1A3a		Code Upgrades to Theater HVAC			
	H03	HVAC			
		Fresh air and new controls for Theater	37,868.00 sffl	5.00 /sffl	189,340
		HVAC		/sffl	189,340
		1A3a Code Upgrades to Theater HVAC	500.00 sfw	378.68 /sfw	189,340

Description	Amount	Totals	
		189,340	
Gen.Expenses + Temp.Construct	18,934		10.000 %
Contractor's Fee	8,331		4.000 %
Insurance	2,166		1.000 %
Contingency	21,877		10.000 %
Gen. Contractor's Bond	1,805		0.750 %
Cost Escalation	30,307		12.500 %
Partial Total		272,760	

Client Itm	phase	item desciption	quantity		unit cost		total
00		Statistical information					
	5	Statistical Information					
		Ground floor - Exploratorium	*87,500.00*	*sffl*	*0.00*	*/sffl*	*0*
		Ground floor - Theater	*37,868.00*	*sffl*	*0.00*	*/sffl*	*0*
		Exploratorium Mezzanines	*17,839.00*	*sffl*	*0.00*	*/sffl*	*0*
		Area of roof and parapet	*135,000.00*	*sfr*	*0.00*	*/sfr*	*0*
		Length of exterior walls	*2,191.00*	*lfw*		*/lfw*	
		Exterior wall surfaces	*79,599.03*	*sfw*		*/sfw*	
		Job size without mezzanines	*125,368.00*	*sffl*		*/sffl*	
02		Option 2 - Cold Shell Entire Building					
	B01	Site Prep	125,368.00	sffl	4.30	/sffl	538,538
	B02	Interior Demolition	125,368.00	sffl	4.58	/sffl	574,425
	B03	Hazardous Materials Costs	125,368.00	sffl	1.00	/sffl	125,368
	C05	Reconstruction	125,368.00	sffl	27.90	/sffl	3,497,620
	D01	Vertical Enclosure	125,368.00	sffl	4.14	/sffl	519,499
	D02	Horizontal Enclosure	125,368.00	sfr	18.64	/sfr	2,336,400
	E01	Interior Construction	125,368.00	sffl	1.50	/sffl	187,779
	H01	Plumbing	125,368.00	sffl	0.52	/sffl	65,000
	H02	Fire Protection	125,368.00	sffl	2.49	/sffl	312,078
	H04	Electrical Systems	125,368.00	sffl	8.54	/sffl	1,070,590
	S01	Site Improvements				/sffl	119,635
	S04	Site Utilities	125,368.00	sffl	3.08	/sffl	386,075
		02 Option 2 - Cold Shell Entire Building	125,368.00	sffl	77.64	/sffl	9,733,007

Description	*Amount*	*Totals*	
		9,733,007	
Gen.Expenses + Temp.Construct	973,301		10.000 %
Contractor's Fee	428,252		4.000 %
Insurance	111,346		1.000 %
Contingency	1,124,591		10.000 %
Gen. Contractor's Bond	92,779		0.750 %
Cost Escalation	1,557,909		12.500 %
Partial Total		14,021,185	

desciption	quantity		unit cost		total
00 Statistical information					
5 Statistical Information					
Ground floor - Exploratorium	*87,500.00*	*sffl*	*0.00*	*/sffl*	*0*
Ground floor - Theater	*37,868.00*	*sffl*	*0.00*	*/sffl*	*0*
Exploratorium Mezzanines	*17,839.00*	*sffl*	*0.00*	*/sffl*	*0*
Area of roof and parapet	*135,000.00*	*sfr*	*0.00*	*/sfr*	*0*
Length of exterior walls	*2,191.00*	*lfw*		*/lfw*	
Exterior wall surfaces	*79,599.03*	*sfw*		*/sfw*	
Job size without mezzanines	*125,368.00*	*sffl*		*/sffl*	
02 Option 2 - Cold Shell Entire Building					
B01 Site Prep					
Demo interior slab/asphalt paving/re-position earth	37,868.00	sf	3.50	/sf	132,538
Excavate below slab for gravel and drainage	930.00	cy	75.00	/cy	69,750
Demo interior slab/asphalt paving	87,500.00	sf	2.00	/sf	175,000
Excavate below slab for gravel and drainage	2,150.00	cy	75.00	/cy	161,250
Site Prep	125,368.00	sffl	4.30	/sffl	538,538
B02 Interior Demolition					
Interior finishes and systems	37,868.00	sffl	7.50	/sffl	284,010
Demising walls separating Theater and Exploratorium (225 LF)	8,175.00	sfw	3.00	/sfw	24,525
Interior finishes and systems	87,500.00	sffl	1.00	/sffl	87,500
Mezzanines including finishes and systems	17,839.00	sffl	10.00	/sffl	178,390
Interior Demolition	125,368.00	sffl	4.58	/sffl	574,425
B03 Hazardous Materials Costs					
Misc abatement	37,868.00	sfff	1.00	/sfff	37,868
Misc abatement	87,500.00	sfff	1.00	/sfff	87,500
Hazardous Materials Costs	125,368.00	sffl	1.00	/sffl	125,368
C05 Reconstruction					
New slab on grade with WP membrane and underslab drainage	37,868.00	sffl	27.50	/sffl	1,041,370
Restore proscenium arch	25,000.00	bud	1.00	/bud	25,000
New slab on grade with WP membrane and underslab drainage	87,500.00	sffl	27.50	/sffl	2,406,250
Repair severe cracking in chimney 5 - second in from South edge	25,000.00	bud	1.00	/bud	25,000
Reconstruction	125,368.00	sffl	27.90	/sffl	3,497,620
D01 Vertical Enclosure					
Repair plaster cracking @ chimneys	4.00	ea	10,000.00	/ea	40,000
Repair plaster cracking @ chimneys	2.00	ea	10,000.00	/ea	20,000
Clean organic growth stains from cement plaster walls (ext surface)	51,661.26	sfw	1.25	/sfw	64,577
Clean organic growth stains from cement plaster walls (ext surface)	27,937.77	sfw	1.25	/sfw	34,922
Repair historic doors	30.00	lv	7,500.00	/lv	225,000
Repair historic doors	14.00	lv	7,500.00	/lv	105,000
Replace chimney capstones	4.00	ea	5,000.00	/ea	20,000
Replace chimney capstones	2.00	ea	5,000.00	/ea	10,000

desciption	quantity		unit cost		total
Vertical Enclosure	125,368.00	sffl	4.14	/sffl	519,499
D02 Horizontal Enclosure					
Remove + replace roofing, flashing, and parapet waterproofing	135,000.00	sfr	15.00	/sfr	2,025,000
Rehabilitate skylights	4,152.00	sfr	50.00	/sfr	207,600
Rehabilitate skylights	2,076.00	sfr	50.00	/sfr	103,800
Horizontal Enclosure	125,368.00	sfr	18.64	/sfr	2,336,400
E01 Interior Construction					
Misc interior construction and finish repair	37,686.00	sffl	1.50	/sffl	56,529
Misc interior construction and finish repair	87,500.00	sffl	1.50	/sffl	131,250
Interior Construction	125,368.00	sffl	1.50	/sffl	187,779
H01 Plumbing					
Video and repair domestic sewer lines	7,500.00	bud	1.00	/bud	7,500
Replace roof drains and leaders	6.00	loc	5,000.00	/loc	30,000
Replace roof drains and leaders	4.00	loc	5,000.00	/loc	20,000
Video and repair domestic sewer lines	7,500.00	bud	1.00	/bud	7,500
Plumbing	125,368.00	sffl	0.52	/sffl	65,000
H02 Fire Protection					
New fire sprinkler service from the street	25,000.00	bud	1.00	/bud	25,000
New riser and backflow prevention valves	5,000.00	bud	1.00	/bud	5,000
Mains, distribution piping and heads	87,500.00	sffl	2.25	/sffl	196,875
Mains, distribution piping and heads	37,868.00	sffl	2.25	/sffl	85,203
Fire Protection	125,368.00	sffl	2.49	/sffl	312,078
H04 Electrical Systems					
Cold shell space	37,868.00	sffl	5.00	/sffl	189,340
Cold shell space including new generator	87,500.00	sffl	7.50	/sffl	656,250
Privately owned transformer inside building	225,000.00	bud	1.00	/bud	225,000
Electrical Systems	125,368.00	sffl	8.54	/sffl	1,070,590
S01 Site Improvements					
New curb and gutter along Palace Drive Theater	427.00	lf	75.00	/lf	32,025
Modify sidewalk west of Theater.	8,761.00	sf	10.00	/sf	87,610
Site Improvements				/sffl	119,635
S04 Site Utilities					
French drain all around perimeter of building to relieve hydrostatic pressure	2,300.00	lf	100.00	/lf	230,000
New domestic water line to building from street connection	1.00	ls	15,000.00	/ls	15,000
Route horizontal storm drain lines outside building to pump station	1,269.00	lf	75.00	/lf	95,175
Route horizontal storm drain lines outside building to pump station	612.00	lf	75.00	/lf	45,900
Site Utilities	125,368.00	sffl	3.08	/sffl	386,075
02 Option 2 - Cold Shell Entire Building	125,368.00	sffl	77.64	/sffl	9,733,007

Description	*Amount*	*Totals*	
		9,733,007	
Gen.Expenses + Temp.Construct	973,301		10.000 %
Contractor's Fee	428,252		4.000 %
Insurance	111,346		1.000 %
Contingency	1,124,591		10.000 %
Gen. Contractor's Bond	92,779		0.750 %
Cost Escalation	1,557,909		12.500 %
Partial Total		14,021,185	

Client Itm	phase	item desciption	quantity		unit cost		total
2A1a		Micropiles for Exploratorium					
	C06	Seismic Bracing					
		Micropiles	88.00	ea	10,000.00	/ea	880,000
		Seismic Bracing	87,500.00	sffl	10.06	/sffl	880,000
		2A1a Micropiles for Exploratorium	88.00	pile	10,000.00	/pile	880,000

Description	Amount	Totals	
		880,000	
Gen.Expenses + Temp.Construct	88,000		10.000 %
Contractor's Fee	38,720		4.000 %
Insurance	10,067		1.000 %
Contingency	101,679		10.000 %
Gen. Contractor's Bond	8,388		0.750 %
Cost Escalation	140,857		12.500 %
Partial Total		1,267,711	

Client Itm	phase	item desciption	quantity		unit cost		total
2A1b		Micropiles for Theater					
	C06	Seismic Bracing					
		Micropiles	52.00	ea	10,000.00	/ea	520,000
		Seismic Bracing	37,868.00	sffl	13.73	/sffl	520,000
		2A1b Micropiles for Theater	52.00	pile	10,000.00	/pile	520,000

Description	Amount	Totals	
		520,000	
Gen.Expenses + Temp.Construct	52,000		10.000 %
Contractor's Fee	22,880		4.000 %
Insurance	5,949		1.000 %
Contingency	60,083		10.000 %
Gen. Contractor's Bond	4,957		0.750 %
Cost Escalation	83,234		12.500 %
Partial Total		749,103	

Client Itm	phase	item desciption	quantity		unit cost		total
2A1c		Cable Bracing With Theater Demolished					
	C06	Seismic Bracing					
		Exploratorium cable bracing complete	15.00	frm	25,000.00	/frm	375,000
		Theater cable bracing complete	9.00	frm	25,000.00	/frm	225,000
		Seismic Bracing	125,368.00	sffl	4.79	/sffl	600,000
		2A1c Cable Bracing With Theater Demolished	24.00	frm	25,000.00	/frm	600,000

Description	Amount	Totals	
		600,000	
Gen.Expenses + Temp.Construct	60,000		10.000 %
Contractor's Fee	26,400		4.000 %
Insurance	6,864		1.000 %
Contingency	69,326		10.000 %
Gen. Contractor's Bond	5,719		0.750 %
Cost Escalation	96,039		12.500 %
Partial Total		864,348	

Client Itm	phase	item desciption	quantity	unit cost	total
2A1d		Pile Caps and Grade Beams Doweled Into Existing Caps and Beams			
	C06	Seismic Bracing			
		Pile caps	18.00 ea	20,000.00 /ea	360,000
		Grade beams	967.00 lf	350.00 /lf	338,450
		Pile caps	30.00 ea	20,000.00 /ea	600,000
		Grade beams	1,107.00 lf	350.00 /lf	387,450
		Seismic Bracing		/sffl	1,685,900
		2A1d Pile Caps and Grade Beams Doweled Into Existing Caps and Beams			1,685,900

Description	Amount	Totals	
		1,685,900	
Gen.Expenses + Temp.Construct	168,590		10.000 %
Contractor's Fee	74,180		4.000 %
Insurance	19,287		1.000 %
Contingency	194,796		10.000 %
Gen. Contractor's Bond	16,071		0.750 %
Cost Escalation	269,853		12.500 %
Partial Total		2,428,677	

Client Itm	phase	item desciption	quantity	unit cost	total
2A2a		Replace Vertical Monitor Louvers with Glazing			
	D01	Vertical Enclosure			
		Replace vertical monitor louvers with glazing (4' tall)	500.00 sfw	150.00 /sfw	75,000
		Replace vertical monitor louvers with glazing (4' tall)	376.00 sfw	150.00 /sfw	56,400
		Vertical Enclosure		/sffl	131,400
		2A2a Replace Vertical Monitor Louvers with Glazing	427.00 lf	307.73 /lf	131,400

Description	Amount	Totals	
		131,400	
Gen.Expenses + Temp.Construct	13,140		10.000 %
Contractor's Fee	5,782		4.000 %
Insurance	1,503		1.000 %
Contingency	15,182		10.000 %
Gen. Contractor's Bond	1,253		0.750 %
Cost Escalation	21,032		12.500 %
Partial Total		189,292	

Client Itm	phase	item desciption	quantity	unit cost	total
2A2b		Add Two Pairs of Sloped Skylights on the Roof			
	D02	Horizontal Enclosure			
		Add 1 set of sloped skylights on roof	2,076.00 sfr	150.00 /sfr	311,400
		Add 1 set of sloped skylights on roof	2,076.00 sfr	150.00 /sfr	311,400
		Seismic strengthening of roof	1.00 sklt	10,000.00 /sklt	10,000
		Seismic strengthening of roof	1.00 sklt	10,000.00 /sklt	10,000
		Horizontal Enclosure		/sfr	642,800
		2A2b Add Two Pairs of Sloped Skylights on the Roof	1,527.00 sf	420.96 /sf	642,800

Description	Amount	Totals	
		642,800	
Gen.Expenses + Temp.Construct	64,280		10.000 %
Contractor's Fee	28,283		4.000 %
Insurance	7,354		1.000 %
Contingency	74,272		10.000 %
Gen. Contractor's Bond	6,127		0.750 %
Cost Escalation	102,889		12.500 %
Partial Total		926,005	

Client Itm	phase	item desciption	quantity	unit cost	total
2A2c		Add Twenty Pairs of Sloped Skylights on the Roof			
	D02	Horizontal Enclosure			
		Add 1 set of sloped skylights on roof	29,064.00 sfr	150.00 /sfr	4,359,600
		Add 1 set of sloped skylights on roof	12,456.00 sfr	150.00 /sfr	1,868,400
		Seismic strengthening of roof	14.00 sklt	10,000.00 /sklt	140,000
		Seismic strengthening of roof	6.00 sklt	10,000.00 /sklt	60,000
		Horizontal Enclosure		/sfr	6,428,000
		2A2c Add Twenty Pairs of Sloped Skylights on the Roof			6,428,000

Description	Amount	Totals	
		6,428,000	
Gen.Expenses + Temp.Construct	642,800		10.000 %
Contractor's Fee	282,832		4.000 %
Insurance	73,536		1.000 %
Contingency	742,717		10.000 %
Gen. Contractor's Bond	61,274		0.750 %
Cost Escalation	1,028,895		12.500 %
Partial Total		9,260,054	

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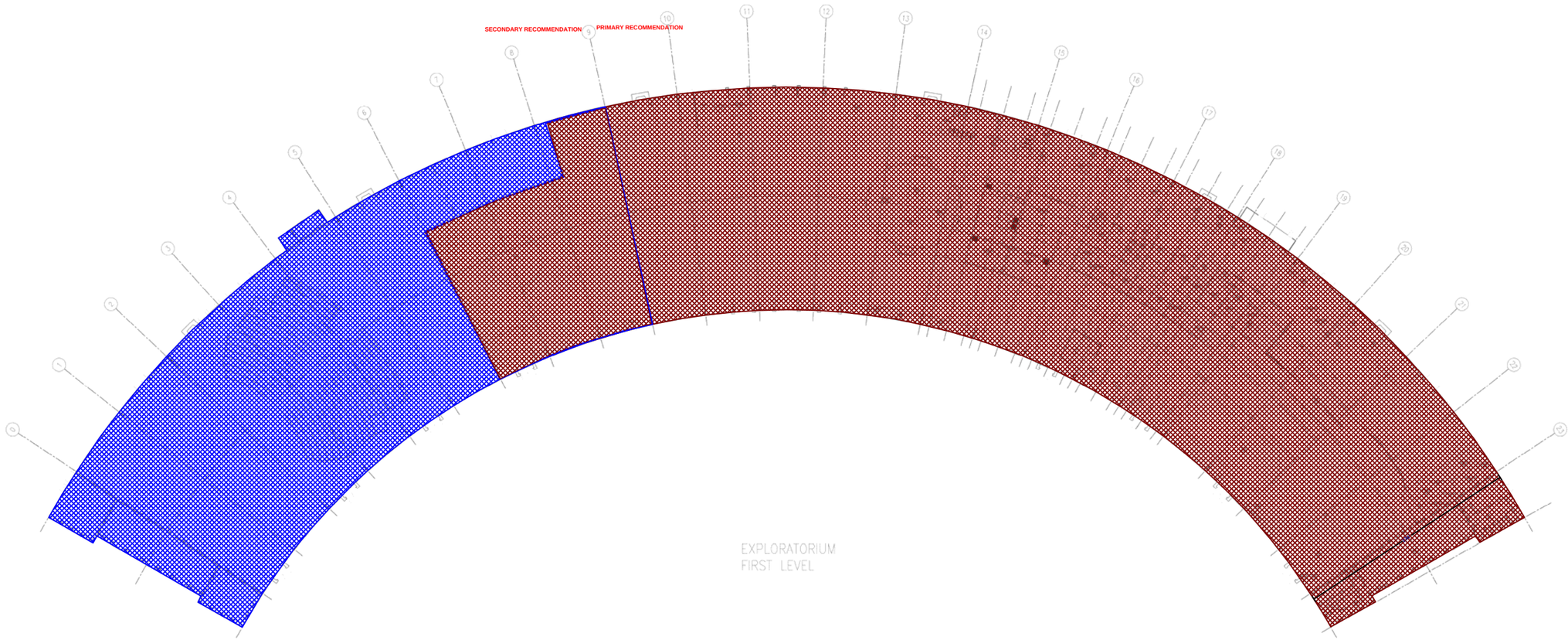
SECONDARY RECOMMENDATION
PRIMARY RECOMMENDATION
EXPLORATORIUM
FIRST LEVEL
Option 1 area 87,500 SF
Additional area for option 2 37,868 SF

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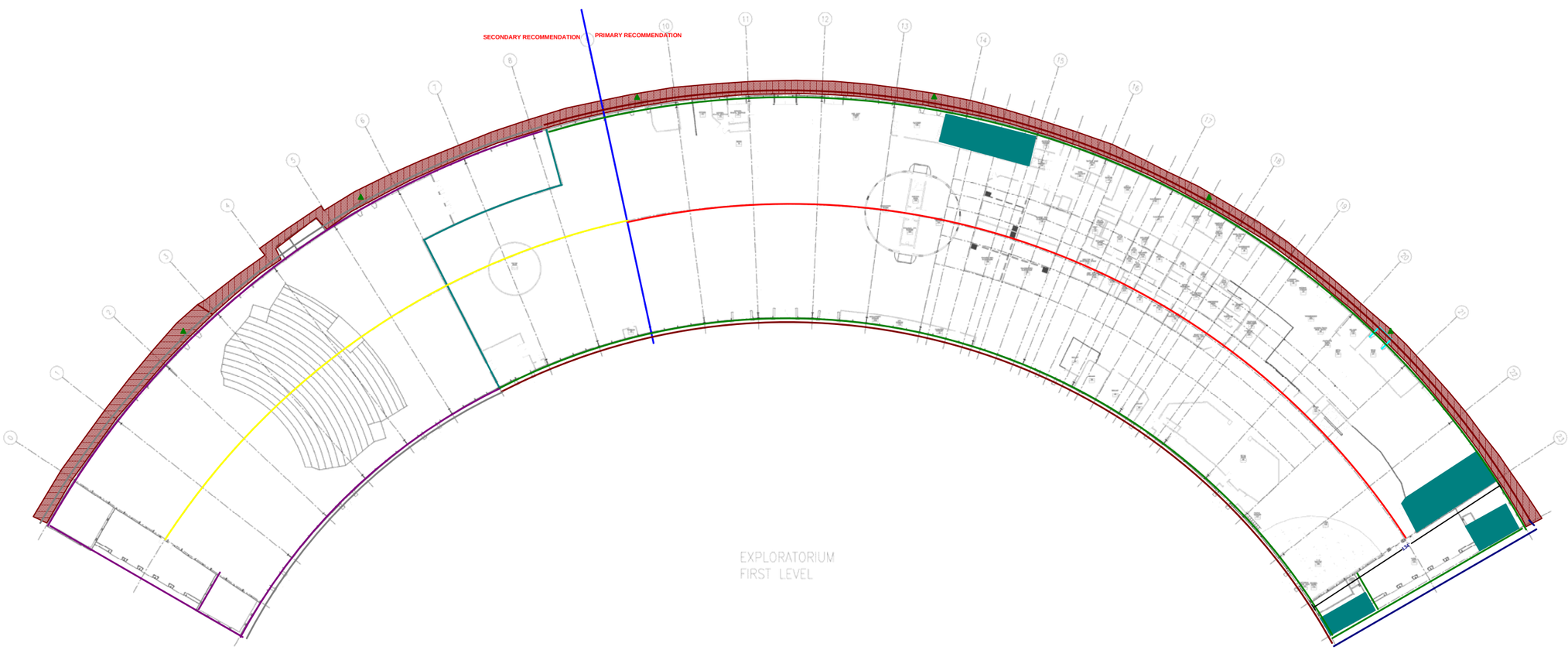

Grade Beam Theater 205 LF

Demising wall 225 LF
Roof length Exploratorium 538 LF
Roof length Theater 347 LF
Exploratorium restrooms 2,984 SF

New curb 146 LF
Existing chimneys - count 6 EA
Chimney area 26 LF
Exterior wall Exploratorium 1,422 LF
Exterior wall Theater 769 LF
Modify sidewalk 8,761 SF
Exploratorium: Horizontal storm drain outside building 1,269 LF
Theater: Horizontal storm drain outside building 612 LF

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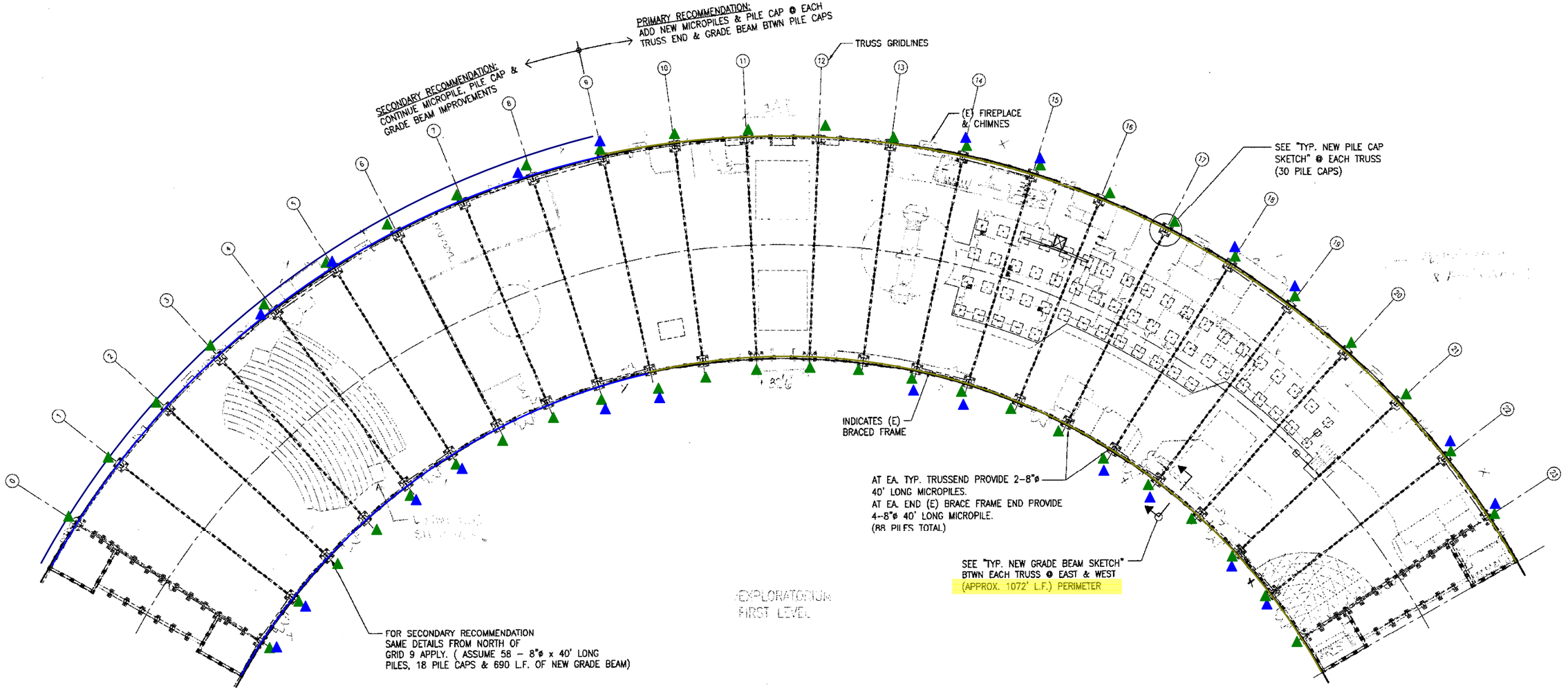

GROUND LEVEL FOUNDATION PLAN

- Pile cap count at truss ends 48 EA
- Grade Beam Theater 731 LF
- Pile cap count at brace ends 22 EA
- Grade beam exploratorium 1,108 LF
- New curb 427 LF

RUTHERFORD & CHEKENE
CONSULTING ENGINEERS
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www.ruthchek.com

PALACE OF FINE ARTS
PRELIMINARY RECOMMENDATION
FOR COST ESTIMATION PURPOSES

JOB No.: 2011108S	BY: CSM	SCALE: NONE	DATE: JAN. 12 2012

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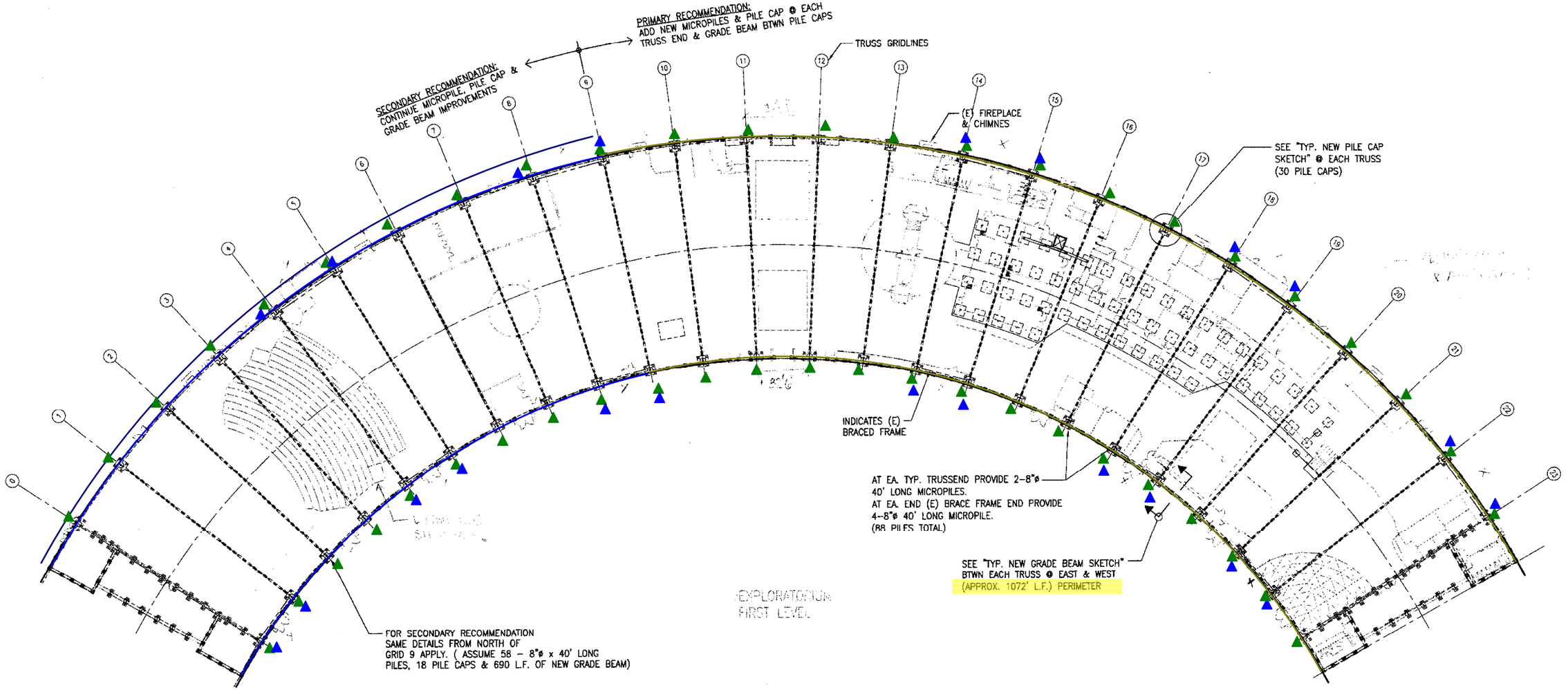

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economic + marketing

Sedway Consulting

Sedway Consulting
44 Montgomery Street Suite 3705
San Francisco CA 94104

SEDWAYCONSULTING
real estate & urban economics

January 26, 2012

Introduction

This interim memo is a brief summary of marketing opportunities and issues associated with the Palace of Fine Arts, as part of Phase I work. While Sedway Consulting's scope was primarily that of providing input and asking questions, this memo includes a summary of the marketing issues and opportunities, including the site and its advantages and constraints, possible uses, and general thoughts regarding supportable rent. The purpose of this analysis is to provide a very preliminary review of these considerations.

Location and Access

The Palace of Fine Arts is a major historic building of such importance that the building defines the location. Thus, the location description of everything for blocks around is "near the Palace of Fine Arts". This iconic historic structure is visible for some distance, and visitors and residents alike see it when en route to or from the Golden Gate Bridge and will continue to do so after the Doyle Drive redesign. Specifically, it is located on the west side of the Marina district. It is currently separated from the Presidio by several lanes of roadway which lead to and from the Golden Gate Bridge and areas of San Francisco.

Despite this visibility and proximity to major streets, the Palace of Fine Arts is in a primarily residential neighborhood surrounding by lovely single family homes and accessed by local streets. Public transportation is limited. Tour buses frequent the area with the Palace of Fine Arts the major attraction.

While prominent, the location places constraints on future uses. The neighbors are concerned about traffic and uses, plus resulting noise. There are few nearby commercial uses. Of considerable concern is the limited amount of parking. Owned by the Presidio Trust, one of the parking areas will be changed considerably by the improvements to Doyle Drive. At this time, the Presidio Trust's plans for the residual piece of land (is this the parking area above?) have not been explored.

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LSedway@Sedway.com

r.e. lic. 00788176

The Building

The building has many challenges, which will be assessed in the engineering reports. While having minimal interior light, the spaces appear to have some flexibility. The first floor footprint occupies roughly 87,671 square feet, and the mezzanine has a footprint of 17,735 square feet. In addition, the auditorium contains approximately 38,000 square feet with a seating capacity of 962 seats.

The current tenant is the Exploratorium which pays $500,496 per year, or about $4.75 per square foot per month if the lease includes all but the auditorium. Not included in the rent calculations are any tenant improvements which were paid for by the tenant. While this is not a direct comparison, research indicates nearby spaces of 10,000 to 20,000 square feet in historic, renovated buildings rent for approximately $20 - $22 per square foot, including rent and amortized tenant improvements.

There is no single occupant for the theatre. Fees for those who rent the theater range from $6800 to $16,000, depending on the number of hours, number of guests and non-profit vs. for profit user.

The space occupied by the Exploratorium is quite open, although there is certainly the potential to break it up and add a second floor.

There is potential for additional uses in the beautiful gardens and pond which are part of the property.

Potential Users

While this is a special building, the combination of the structure and the need for significant tenant improvements, its somewhat isolated location, and neighborhood issues limit potential uses. The following uses all may have some potential, alugh there is no perfect fit. The order of the presentation is random.

- Museum-related uses. The large spaces and high ceilings lend themselves to a museum use for large pieces of art. However, a word of caution is that many possible museums have had fiscal issues of their own, and this may not be the most logical location. A complementary use would be a sculpture garden on the grounds.
    - Branch of museum located elsewhere in the U.S. – eg. Luce Center at the Metropolitan Museum
    - Branch of local museum

  - Technology or Apple
    museum – there is a technology museum in San Jose
  - Other
- California or San Francisco Living Concept featuring, for example, food, wine and plants. We are a "foodie" capital, and the concept could include a focus on natural foods, wine, with related uses such as cooking classes (which have increased along with cooking groups (a la book club format), a small farmers' market and potentially a unique plant facility such as Flora Grubb. (A similar facility in Napa, Copia was unable to survive.)
- Incubator space for high tech, which could be a second floor use
- Conference Center and Event Center in the area of the auditorium

SF Parks & Recreation Dept.
Building Owner

501 Stanyan St,
San Francisco, CA 94117
p: 415.831.2700
www.sfrecpark.org

Maybeck Foundation
Client

1070 Martino Road
Lafayette, CA 94549
p: 510.599.4651
www.maybeck.org

project team

EHDD Architecture
Architectural Analysis

500 Treat Ave, Suite 201
San Francisco, CA 94110
p: 415.285.9193
www.ehdd.com

Page & Turnbull
Historic Preservation Report

1000 Sansome St, Suite 200
San Francisco, CA 94111
p: 415.362.5154
www.page-turnbull.com

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Structural Engineers

55 Second St, Suite 600
San Francisco, CA 94105
p: 415.568.4400
www.ruthchek.com

Taylor Engineering
Mechanical & Plumbing Engineers

1080 Marina Village Pky, Ste 501
Alameda, CA 94501
p: 510.749.9135
www.taylor-engineering.com

Cammisa & Wipf
Electrical Engineers

642 Harrison St, 4th Floor
San Francisco, CA 94107
p: 415.863.5740
www.cammisawipf.com

Loisos + Ubbelohde
Daylighting Consultants

1917 Clement Ave, Bldg 10A
Alameda, CA 94501
p: 510.521.3800
www.coolshadow.com

BKF Engineers
Civil Engineers

1646 N. California Blvd, #400
Walnut Creek, CA 95596
p: 925.940.2200
www.bkf.com

Nelson\Nygaard
Transportation Planning

116 New Montgomery St
San Francisco, CA 94105
p: 415.284.1544
www.nelsonnygaard.com

Plant Construction Company
Cost Estimators

300 Newhall St
San Francisco, CA 94124
p: 415.285.0500
www.plantconstructioncompany.com

Sedway Consulting
Economic + Market Analysis

44 Montgomery St, Suite 3705
San Francisco, CA 94104
p: 415.399.1119

Original Maybeck Sketch

Panama Pacific International Exposition

chronology

Abbreviated Chronology of the Palace of Fine Arts

1855	Site is sand bar and lagoon
1913	Palace of Fine Arts Construction Begins
1915	Panama Pacific Exposition Opens
1930	Wood pile caps replaced with concrete; footings added under walls; north half of building is leveled.
1963-1967	Rehabilitation of the Palace of Fine Arts
1969	Exploratorium Opens
1970	Palace of Fine Arts Theater built
1979	Exploratorium Mezzanine Project
1984	Concrete removed from roof, replaced with steel deck
1993	Seismic Renovation
2000	Design for major renovation of Exploratorium (unbuilt)
2004	Renovation commences on Rotunda and Lagoon
2006	Listed on National Register of Historic Places
2007	Renovation of Colonnades commences, work on Rotunda continues
2010	Landscape Improvements

Frank Oppenheimer in the empty shell

Palace of Fine Arts Theater

The current Exploratorium

*For complete Chronology prior to 1993 see Historic Structures Report.

list of referenced documents

Drawings of Existing Conditions

Rehabilition of the Palace of Fine Arts
William Gladstone and Merchant Assoc. Architects
Bureau of Architecture/City of San Francisco
General: A,L,M,E,S Main Bldg: A,S 8/15/63
(no rotunda or colonnade sheets)
Preliminary Drawings, 9/21/61 blueprints (b+w scans of)
12 Sheets

Maybeck Drawings
Misc. scans of b+w photos of blueprints

2000 Drawing Sets
DD & CD. A (EHDD), C (KJ), E (C+W), L (GLS), M (G+B), S (R+C)

2010 P of FA Phase 2C: Historic Landscape and Park Improvements,
A(Carey +Co.), C(AGS), E(FWA), L(City of SF DPW), R sheets

Other Documentation of Existing Conditions

Seismic Evaluation of City Buildings
Department of Public Works/City of San Francisco 1988

Historic Structures Report
Department of Public Works/City of San Francisco
Carey + Co. Architecture: 8/6/93

Exploratorium Renovation Project Schematic Design- Specifications: 1999

Schematic Design Report
by EHDD: 9/14/99

Executive Summary
by EHDD: 9/14/99

Doyle Drive Documents:
Connecting People and Park: 2/11
Final EIR
Construction Look Ahead 3/11
Guide to Future Presidio 10/10

Condition of Existing Electrical Distribution System
Cammisa and Wipf, 4/26/99

Foundation Investigation Report
Dames and Moore, 9/15/61

Roofing and Parts of Existing Roof Structure Investigation Report
William Kaplan, 8/31/82

Planning Report, Draft
Rutherford and Chekene, 4/18/84

Site Visit Report
Rutherford and Chekene, 4/7/99

Geotechnical Consultation Proposed Seismic Retrofit
Tanaka Design Group, 4/20/05

Geotechnical Investigation Final Report
Rutherford and Chekene, 2/22/00

Seismic Upgrade- Schematic Phase Report Vol 1
Hratch Kouyoumdjian & Assoc., 9/11/92

Seismic Upgrade- Schematic Phase Report Vol 2 - Calculations
Hratch Kouyoumdjian & Assoc., 9/11/92

GMPA- Final General Management Plan Amendment
Presidio of SF, July 1994 (scan of microfilm)

Visitor Use and Vehicle Parking Study
Operations Research Consulting Assoc., 3/4/98

COMET 4 Facility Executive Summary Report 9/16/10

National Register Nomination 2005.
Prepared by: William Marquand, AIA, Gray Brechin, PHD, Michael Corbett, Sara Shreve, and Valerie Garry (Through the Maybeck Foundation)