

Project Name and Sponsor				
Project Name:	Cable Car Barn Rehabilitation			
Implementing Agency:	SFMTA			
Prop L Expenditure Plan Information				
Prop L Program:	06- Muni Transit Maintenance, Rehabilitation, and Replacement			
Prop L Sub-Program (if applicable):	N/A			
Second Prop L Program (if applicable):				
Project Information				
Brief Project Description for MyStreetSF (80 words max):	The purpose of the project is to make critical capital improvements to the center of cable car operations, including 12kV electrical power upgrades, maintenance crane upgrades, accessibility improvements, office and work area renovations, elevator replacement, roof replacement, seismic retrofitting, and exterior repairs. The facility is in need of rehabilitation to efficiently and safely maintain and continue operations of the cable car service in the future.			
Project Location and Limits:	The Cable Car Barn is located at 1201 Mason Street and is bounded by Jackson Street, Washington Street, Taylor Street, and Mason Street in the Nob Hill neighborhood of San Francisco.			
Supervisory District(s):	Citywide			
Is the project located on the 2022 Vision Zero High Injury Network ?	No	<table border="1"> <tr> <td>Is the project located in an Equity Priority Community (EPC)?</td> <td>No</td> </tr> </table>	Is the project located in an Equity Priority Community (EPC)?	No
Is the project located in an Equity Priority Community (EPC)?	No			
Which EPC(s) is the project located in?	N/A			
Detailed Scope (may attach Word document): Please describe in detail the project scope, any planned community engagement, benefits, considerations for climate adaptation and resilience (if relevant), and coordination with other projects in the area (e.g. paving, Vision Zero).	<p>The Cable Car Barn (CCB) and the cable car fleet it houses are each registered as historic landmarks, both nationally and in the State of California; and work must conform to the Secretary of the Interior’s Standards for Treatment of Historic Properties. The building was originally built in 1888 but was severely damaged in the 1906 Great Earthquake. The most recent rehabilitation in 1984 included substantial renovations and additions. After four decades, the facility is in need of rehabilitation to efficiently and safely maintain and continue operations of the cable car service in the future.</p> <p>The purpose of this project is to complete a variety of critical capital improvements that are needed at the historic CCB. This project will replace obsolete, critical electrical equipment, and modernize the electrical infrastructure of the cable car fleet. Rehabilitation will improve working conditions at the facility including the CCB Museum. After a series of scoping meetings were held with internal stakeholders in June and July</p>			

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Project Information Form (PIF) Template**



	<p>of 2019, it was concluded that conversion to 12kV electrical power is the top priority at the facility. The 12kV has reached the end of its useful life which is in its 4th decade of operation where typically main switchgears are estimated to be serviceable for 25-30 years. Other critical capital improvements include, but are not limited to, crane replacement, restroom and office upgrades, accessibility improvements, passenger and freight elevator replacement, roof replacement, and seismic retrofitting. The project work is planned across eight phases which allows the contract work to be completed concurrently or sequentially.</p> <p>This project is directly related to the following SFMTA Strategic Plan Goals:</p> <ul style="list-style-type: none"> • Goal 5 Deliver reliable and equitable transportation services • Goal 9 Fix things before they break, and modernize systems and infrastructure • Goal 10 Position the agency for financial success <p>Outreach will be conducted during the design and construction phases of the project to both notify the CCB operations team, transit operators, and the public of upcoming improvements, and to provide an opportunity for input as well as coordination regarding the facility upgrades and need for cable car shutdowns. Additionally, the scope of work includes electrical power upgrades that will affect the Cable Car operations. While power shutdowns are anticipated for non-revenue hours, the SFMTA staff, transit planning, transit operators, and the public will be made aware of potential service outages, delays, and alternative means of transportation.</p>
<p>Attachments: Please attach maps, drawings, photos of current conditions, etc. to support understanding of the project.</p>	<p>Attachment 1: Final Cable Car Barn Master Plan Report, May 2023 - with Appendix (comprehensive report including existing conditions memo, photos of existing conditions, conceptual cost estimates, conceptual phasing, and Historic Resource Evaluation, by Architectural Resources Group (ARG)</p> <p>Attachment 2: SFMTA Citizen's Advisory Council (CAC) - Engineering, Maintenance, and Safety Committee (EMSC) Meeting, February 22, 2023</p>
<p>Type of Environmental Clearance Required:</p>	<p>Categorically Exempt, TBD</p>
<p>Coordinating Agencies: Please list partner agencies and identify a staff contact at each agency.</p>	<p>SFMTA Environmental Review Team, SF Planning Department, NEPA Region 9 (environmental clearance), SF Department of Building Inspections (DBI), SF Public Utilities Commission, Pacific Gas & Electric (PG&E), SF Public Works - Site Assessment and Remediation (SAR), SF Department of the Environment, and the local community neighborhood groups through SFMTA Public Outreach and Engagement Team (POET).</p>

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Project Delivery Milestones	Status	Work	Start Date		End Date	
Phase	% Complete	In-house - Contracted - Both	Quarter	Fiscal Year (starts July 1)	Quarter	Fiscal Year (starts July 1)
Planning/Conceptual Engineering	80%	In-house and Contracted	Q3-Jan-Feb-Mar	2019/20	Q1-Jul-Aug-Sep	2023/24
Environmental Studies (PA&ED)	0%	Contracted	Q2-Oct-Nov-Dec	2023/24	Q2-Oct-Nov-Dec	2024/25
Right of Way	0%	TBD				
Design Engineering (PS&E)	0%	In-house and Contracted	Q1-Jul-Aug-Sep	2023/24	Q2-Oct-Nov-Dec	2024/25
Advertise Construction	0%	In-house	Q3-Jan-Feb-Mar	2025/26		
Start Construction (e.g. Award Contract)	0%	TBD	Q4-Apr-May-Jun	2026/27		
Operations (i.e. paratransit)						
Open for Use	0%	TBD				
Project Completion (means last eligible expenditure)	0%				Q3-Jan-Feb-Mar	2032/33

Notes

The PIF has a combined PLN & CER (equiv. to MTA's PER) phase. Understanding the Prop L must be with a Phase that has not begun, the justification in the Milestone date and Cash Flow is to have a combined phase (PER with Detailed Design = CTA's Design Engineering) to ensure no phase has started. MTA's Planning / Pre-Development Phase culminating with a Pre-Development Report (PDR) will be completed before the Preliminary Engineering (PE) Phase begins. The schedule is tied to finish to start dates.

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Prop L Supplemental Information Please fill out each question listed below (rows 2-8) for all projects.	
Project Name	<i>Cable Car Barn Rehabilitation</i>
Relative Level of Need or Urgency (time sensitive)	<p>The historic Cable Car Barn (CCB) requires a variety of critical capital improvements that are needed to improve employee working conditions at the facility - including the CCB Museum, replace obsolete, critical electrical equipment, and modernize the electrical infrastructure of the cable car fleet. The recommendation of the Master Plan concluded that conversion to 12kV electrical power is the top priority at the facility after four decades in use since the 1984 major renovation.</p> <p>All the electrical equipment, including the main medium voltage(MV) service entrance switchgear, medium voltage transformer, switchboards, motor control center, distribution panels, step-down transformers, sub-panels, and disconnect switches are mostly original components installed during the 1984 facility renovation. The equipment was made by Federal Pacific which is no longer in business. For example, if the main MV service entrance switchgear fails, there are no replacement parts.</p>
Prior Community Engagement/Level and Diversity of Community Support (may attach Word document):	<p>The Cable Car Barn (CCB), located on Nob Hill of San Francisco, is not located in the Equity Priority Community (EPC). The cable car service does not emit greenhouse gases by its historic technological use of cables below the streets to power (pull) the cars through the city. Little did the forefathers of the cable car technology know it would be a harbinger of today's Transit First Policy and transportation sustainability goals.</p> <p>SFMTA's Public Outreach and Engagement Team (POETs) has performed extensive outreach to the community and neighborhood over the years due to the historic nature of and civic decorated functions at the Cable Car Barn. Some recent outreach includes Cable Car Gearbox Project, Quick Implementation (QI) Project for the historic barn door replacement, and now outreach to commence for the Cable Car Barn Rehabilitation project. This current CCB project was presented to representatives of the SFCTA Citizens Advisory Committee (CAC) to the Engineering, Maintenance, and Safety Committee (EMSC) in February 2023.</p> <p>The Public Outreach and Engagement Team (POET's) Plan for CCB will be included in the Appendix of the Pre-Development Report (PDR) when the PDR is completed. The estimated time frame on the approval of the PDR is September of 2023.</p>
Benefits to Disadvantaged Populations and Equity Priority Communities	<p>While the Cable Car Barn Rehabilitation Project is not located in an Equity Priority Community, a robust cable car system benefits disadvantaged communities in San Francisco. Specifically, the 3 different cable car lines provide important transit access throughout the northeast section of the City, including the Financial District, popular tourist attractions such as Fisherman's Wharf, and Chinatown that is home to many low-income and elderly residents. By ensuring that the Cable Cars are effectively running, the Cable Cars maintain increased mobility to all residents living in the area or that need to visit the area for employment, recreational, and other opportunities that improve their well-being. Without this diverse mode of public transportation, residents have less independent and safe transportation choices to reach their destination.</p>
Compatibility with Land Use, Design Standards, and Planned Growth	Yes
San Francisco Transportation Plan Alignment (SFTP)	Economic Vitality, Safety and Livability

**Prop L Sales Tax Program
Project Information Form (PIF) Template**



[Argument for PIF](#)

As the only City in the United States that uses cable cars for public transportation, cable cars are considered national landmarks and an iconic symbol of San Francisco. The 3 different cable car lines provide enjoyable transit access to popular tourist attractions such as Fisherman's Wharf, Chinatown, Union Square, and Ghiradelli Square. The distinct ringing of the bells, the vintage wooden interiors, and the breathtaking views of the City make riding a cable car a quintessential San Francisco experience for many tourists. As tourism ramps back up in San Francisco, the cable cars play a vital role in the City's economy, attracting both tourists and residents. This project is critical to ensure that the facility that houses the cable cars is in a state of good repair.

**Prop L Sales Tax Program
Project Information Form (PIF) Template**



The next section includes criteria that are specific to each Expenditure Plan program. The questions that are required to be filled out for each program will auto-populate once the Prop L program is selected on the Scope & Schedule tab.

06- Muni Transit Maintenance, Rehabilitation, and Replacement	
Safety	<p>The rehabilitation of the historic Cable Car Barn has a variety of critical capital improvements that are needed to improve Muni employee working conditions and work efficiencies at the facility, including the CCB Museum. The scope of work includes replacement of obsolete electrical equipment, crane replacement, restroom and office upgrades, accessibility improvements, passenger and freight elevator replacement, roof replacement, and seismic retrofitting.</p> <p>The replacement of obsolete 12kV switchgear equipment particularly is critical to ensure the safety and reliability of cable car operations. Upgrades to the 12kV electrical infrastructure will bring required clearances around electrical equipment into code compliance and improve the electrical service at the CCB for new equipment necessary to perform operations maintenance and repair of the cable cars.</p> <p>The rehabilitation project in general will ensure that the facility is safe for employees working in the office to the repair floor to the employee workspace at the Barn. It ensures safety of personnel, protection of equipment and vehicles, and safe movement of cable cars.</p>
Need (Asset Useful Life) (Vehicles Sub-program)	N/A
Improves Efficiency of Transit Operations (Vehicles Sub-program)	N/A
Need (Asset Useful Life) (Facilities and Guideways Sub-program)	<p>The Cable Car Barn is considered the crown jewel of the SFMTA system. It is admired and a destination visit to out-of-towners adding to the City's tourism industry. In order to sustain this, existing facilities in the CCB have to be brought up to a State of Good Repair (SoGR). As equipment and systems reach the end of their serviceable life expectancy, new replacements will create efficiencies and improve safety in the workplace for Muni's employees.</p> <p>The 12kV has reached the end of its useful life which is in its 4th decade of operation when typically main switchgears are estimated to be serviceable for 25-30 years. The bridge cranes need to be upsized to be more efficient to handle weights of material that the existing cranes are now deficient in conveying. Parts storage is spread throughout the CCB and the inventory system is antiquated, but if replaced by new containerized compact parts storage will take less footprint and will be more efficient in storing and retrieving parts. Passenger and freight elevators need to be replaced to comply with current standards (and accessibility for the passenger elevators) and programmatic functional requirements.</p>

**Prop L Sales Tax Program
Project Information Form (PIF) Template**



Improves Efficiency of Transit Operations (Facilities and Guideways Sub-program)	The new power upgrade will reduce breakdowns that would interrupt the cable car service. The Cable Car is an economic vital revenue stream and its ancillary benefits to the local economy to the CCSF as a tourist attraction as well as one of the few or last operating historic landmark operating transit system still in service in the country. The 12kV has reached the end of its useful life which is in its 4th decade of operation where typically main switchgears are estimated to be serviceable for 25-30 years. In closing, the new power upgrade will provide cable car service resiliency in maintaining its operational use.
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GENERAL CONTRACTORS

TUTOR-SALIBA CORPORATION

TUTOR-SALIBA CORPORATION
GENERAL CONTRACTORS

**SAN FRANCISCO CABLE CAR BARN
AT
1201 MASON STREET
SAN FRANCISCO, CA**

**ROM CONSTRUCTION COST ESTIMATE
(AN OPINION OF PROBABLE CONSTRUCTION COSTS)
BASED ON
Final Master Plan Documents**

Owner:
SAN FRANCISCO MUNICIPAL TRANSPORTATION AGENCY
Attention:
Email:

Prepared for
SAN FRANCISCO PUBLIC WORKS
Attention: EunJoo Cho, RA, NCARB, LEED BD+C
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Date: 07/22/2022 Final

**SAN FRANCISCO CABLE CAR BARN
 ROM ESTIMATE OF PROBABLE CONSTRUCTION COST
 (AN OPINION OF PROBABLE CONSTRUCTION COSTS)
 BASED ON FINAL MASTERPLAN DOCUMENTS**

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**SAN FRANCISCO CABLE CAR BARN
ROM ESTIMATE OF PROBABLE CONSTRUCTION COST
(AN OPINION OF PROBABLE CONSTRUCTION COSTS)
BASED ON FINAL MASTERPLAN DOCUMENTS
1.0 BASIS OF ESTIMATE**

Date: 07/22/2022 Final

1.0 Outline

- 1.1 The purpose of this estimate is to provide a preliminary opinion of probable construction costs based on the Master Plan documents as a budget guideline for further study. The procedure we followed in developing this estimate is consistent with industry standards.
- 1.2 The preliminary construction cost estimate, which represents our opinion of probable construction costs, is comprised of the following integral parts:
- A) Basis of Estimate
 - B) Estimate Summaries
 - C) Estimate Details

2.0 Documents used for the Estimate

- 2.1 This Estimate is based on the following documents:
- 1 2022-0328_Cable Car Barn Draft Master Plan - DPW MTA 1708 CCB Cp,,emts _EW_EC_FINAL
 - 2 2022-0615_CCB Master Plan Report
 - 3 2022-0616-CCB_A summary of changes for Cost Estimator_All
 - 4 Werner Quote _5.2.22
 - 8 Crane & Hoist Service Quote _5.6.22

3.0 Scope

- 3.1 The general scope of work called out on drawings listed above including:

Phase 1A:

12KV Electrical Upgrade

Phase 1B:

20ton Bridge Crane Upgrade

Phase 2:

Office improvements

Phase 3A:

Programming Restructuring

Phase 3B:

Carpentry Improvements

Phase 4:

Roof Improvements

Phase 5:

Seismic Improvements

Exterior Improvements

Winding Motors

- 3.2 Items specifically excluded from the estimate:

Hazmat abatement, except where noted

Legal fees and finance costs

**SAN FRANCISCO CABLE CAR BARN
ROM ESTIMATE OF PROBABLE CONSTRUCTION COST
(AN OPINION OF PROBABLE CONSTRUCTION COSTS)
BASED ON FINAL MASTERPLAN DOCUMENTS
1.0 BASIS OF ESTIMATE**

Date: 07/22/2022 Final

Permit & plan check fees
Utility connection fees
Owner's administration costs
Design services
Survey services, materials lab
Project/Construction management
Other soft costs
Construction Contingency
Project contingency

It is assumed that the above items, if needed, are included elsewhere in the owner's overall project budget.

4.0 Assumptions and Qualifications

4.1 The estimate is based on estimated prices current as of July 2022, with a minimum of four responsible and responsive bids under a competitive bidding environment for a fixed price lump sum contract (a fair market condition).

Note: Experience indicates that fewer bidders may result in higher bids, and conversely more bidders may result in more competitive bids. Therefore it is important to obtain as many bids as possible.

The following table provides a general guideline for probable impacts due to number of bids:

1 bid	+20% to +50%
2-3 bids	+10% to +20%
4-5 bids	0% to +10%
6-7 bids	0% to -10%
8 or 10 bids	-10% to -20%

4.2 Working hours and phasing

The estimate is based on all work to be performed during regular working hours. No overtime or weekend hours are included.

The estimate is based on all work being done concurrently. The estimate summary includes a rough cost impact for phasing the work.

4.3 Allowances have been used for items which are required but are not able to be defined at this time.

4.4 The unit prices used in the direct cost section are composite unit prices which include costs for material including tax, labor, equipment and subcontractor's/supplier's mark-ups.

4.5 The following markups have been included at the estimate summary level

**SAN FRANCISCO CABLE CAR BARN
ROM ESTIMATE OF PROBABLE CONSTRUCTION COST
(AN OPINION OF PROBABLE CONSTRUCTION COSTS)
BASED ON FINAL MASTERPLAN DOCUMENTS
1.0 BASIS OF ESTIMATE**

Date: 07/22/2022 Final

-
- a) GC's General Conditions and General Requirements
 - b) Market factor
 - b) GC's OH&P
 - c) Bonding and Insurance
 - d) Design Development Estimating Contingencies due to the conceptual nature of the scope. This amount will be gradually reduced as design progresses and more detail can be captured within the direct costs
 - e) Cost Escalation, see escalation section for details
- 4.6 Items potentially affecting the cost estimate include, but are not limited to, the following:
Modifications to the scope of work included in this estimate.
Unforeseen sub-surface conditions.
Special phasing requirements.
Restrictive technical specifications or excessive contract conditions.
Any specified item of equipment, material, or product that cannot be obtained from at least three different sources.
Any other non-competitive bid situations.
- 4.7 Client acknowledges that our estimating service is consistent with and limited to the standard of care applicable to such services, i.e. we provide our services consistent with the professional skill and care ordinarily provided by consultants practicing in the same or similar locality under the same or similar circumstances. The estimate is intended to be a determination of fair market value for the project construction. Since we have no control over market conditions, costs of labor, materials, equipment and other factors, which may affect the bid prices, we cannot and do not warrant or guarantee that bids or ultimate construction costs will not vary from the cost estimate. We make no other warranties, either expressed or implied, and are not responsible for the interpretation by others of the contents herein the cost estimate.
- 4.8 It should also be noted that the cost estimate is a "snapshot in time" and that the reliability of this opinion of probable construction cost will inherently degrade over time.
- 4.9 Please note that the estimate has been based on very preliminary information and it only serves as a general guideline for more specific and detailed studies in the future. This estimate should be updated when more design or scope information is available.
- 5.0 **Terminology**
Please note that:
- 1) Direct Cost = Estimated construction cost at working contractor's level/trades level.
 - 2) Base Construction Cost = Estimated construction bid submitted by general contractor to Owner, including general contractor's markups and contingency

**SAN FRANCISCO CABLE CAR BARN
ROM ESTIMATE OF PROBABLE CONSTRUCTION COST
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BASED ON FINAL MASTERPLAN DOCUMENTS
1.0 BASIS OF ESTIMATE**

Date: 07/22/2022 Final

6.0 Abbreviations used in the estimate:

CF = cubic foot
CY = cubic yard
(E) = existing
EA = each
GSA = Gross Square Area
GSF = Gross Square Feet
LB = pound
LF = linear foot
FLT = flight
LOC = location
LS = lump sum
(N) = new
NIC = not in contract
OFCI = owner furnished contractor installed
PR = pair
ROM = rough order of magnitude
SF = square foot

**SAN FRANCISCO CABLE CAR BARN
ROM ESTIMATE OF PROBABLE CONSTRUCTION COST
(AN OPINION OF PROBABLE CONSTRUCTION COSTS)
BASED ON FINAL MASTERPLAN DOCUMENTS
1.1 ESCALATION CALCULATION**

Date: 07/22/2022 Final

PHASE 1

Date of Estimate Pricing	7/1/2022
Start construction	10/1/2025
End construction	10/1/2030
Duration, days	1826 Days
Duration, months	61 Months
Date of estimate pricing to start To Mid-point of construction period	1188 Days 2101 days 70 months
Mid-point of construction	4/1/2028

Annual escalation rate is estimated at 8% till 12/31/2023, and 4% thereafter to midpoint of construction

Total escalation **32.63%** to Summary

PHASE 2

Date of Estimate Pricing	7/1/2022
Start construction	10/1/2025
End construction	10/1/2030
Duration, days	1826 Days
Duration, months	61 Months
Date of estimate pricing to start To Mid-point of construction period	1188 Days 2101 days 70 months
Mid-point of construction	4/1/2028

Annual escalation rate is estimated at 8% till 12/31/2023, and 4% thereafter to
Total escalation **32.63%** to Summary

**SAN FRANCISCO CABLE CAR BARN
ROM ESTIMATE OF PROBABLE CONSTRUCTION COST
(AN OPINION OF PROBABLE CONSTRUCTION COSTS)
BASED ON FINAL MASTERPLAN DOCUMENTS
1.1 ESCALATION CALCULATION**

Date: 07/22/2022 Final

PHASE 3

Date of Estimate Pricing	7/1/2022
Start construction	10/1/2025
End construction	10/1/2030
Duration, days	1826 Days
Duration, months	61 Months
Date of estimate pricing to start To Mid-point of construction period	1188 Days 2101 days 70 months
Mid-point of construction	4/1/2028

Annual escalation rate is estimated at 8% till 12/31/2023, and 4% thereafter to
Total escalation **32.63%** to Summary

PHASE 4

Date of Estimate Pricing	7/1/2022
Start construction	10/1/2025
End construction	10/1/2030
Duration, days	1826 Days
Duration, months	61 Months
Date of estimate pricing to start To Mid-point of construction period	1188 Days 2101 days 70 months
Mid-point of construction	4/1/2028

Annual escalation rate is estimated at 8% till 12/31/2023, and 4% thereafter to
Total escalation **32.63%** to Summary

**SAN FRANCISCO CABLE CAR BARN
ROM ESTIMATE OF PROBABLE CONSTRUCTION COST
(AN OPINION OF PROBABLE CONSTRUCTION COSTS)
BASED ON FINAL MASTERPLAN DOCUMENTS
1.1 ESCALATION CALCULATION**

Date: 07/22/2022 Final

PHASE 5

Date of Estimate Pricing	7/1/2022
Start construction	10/1/2025
End construction	10/1/2030
Duration, days	1826 Days
Duration, months	61 Months
Date of estimate pricing to start	1188 Days
To Mid-point of construction period	2101 days 70 months
Mid-point of construction	4/1/2028

Annual escalation rate is estimated at 8% till 12/31/2023, and 4% thereafter to
Total escalation **32.63%** to Summary

EXTERIOR IMPROVEMENTS

Date of Estimate Pricing	7/1/2022
Start construction	10/1/2025
End construction	10/1/2030
Duration, days	1826 Days
Duration, months	61 Months
Date of estimate pricing to start	1188 Days
To Mid-point of construction period	2101 days 70 months
Mid-point of construction	4/1/2028

Annual escalation rate is estimated at 8% till 12/31/2023, and 4% thereafter to
Total escalation **32.63%** to Summary

**SAN FRANCISCO CABLE CAR BARN
ROM ESTIMATE OF PROBABLE CONSTRUCTION COST
(AN OPINION OF PROBABLE CONSTRUCTION COSTS)
BASED ON FINAL MASTERPLAN DOCUMENTS
1.1 ESCALATION CALCULATION**

Date: 07/22/2022 Final

WINDING MOTORS

Date of Estimate Pricing	7/1/2022
Start construction	10/1/2025
End construction	10/1/2030
Duration, days	1826 Days
Duration, months	61 Months
Date of estimate pricing to start	1188 Days
To Mid-point of construction period	2101 days 70 months
Mid-point of construction	4/1/2028
Annual escalation rate is estimated at 8% till 12/31/2023, and 4% thereafter to	
Total escalation	32.63% to Summary

**SAN FRANCISCO CABLE CAR BARN
ROM ESTIMATE OF PROBABLE CONSTRUCTION COST
(AN OPINION OF PROBABLE CONSTRUCTION COSTS)
BASED ON FINAL MASTERPLAN DOCUMENTS
2.0 KEY QUANTITIES**

Date: 07/22/2022 Final

Program Areas

	<u>SF</u>	<u>Footprint</u>	<u>FI-FI</u>	<u>Perimeter</u>	<u>Exterior Enclosure</u>
1.1 Phase 1A 12KV Switchgear Upgrade					
1.2 Total	<u>846</u>				
1.3 Level 1		846	15	616	9,240
2.1 Phase 1B: Bridge Crane Upgrade	<u>SF</u>	<u>Footprint</u>	<u>FI-FI</u>	<u>Perimeter</u>	<u>Exterior Enclosure</u>
2.2 Total	<u>4,434</u>				
2.3 Level 1 Mezzanine		2,539	15	616	9,240
2.4 Level 1		1,895	15	616	9,240
3.1 Phase 2: Office Improvements	<u>SF</u>	<u>Footprint</u>	<u>FI-FI</u>		
3.2 Total	<u>10,471</u>				
3.3 Level 2 Mezzanine		5,603	15	616	9,240
3.4 Level 2		962	15	616	9,240
3.5 Level 1 Mezzanine		579	15	616	9,240
3.6 Level 1		3,327	15	616	9,240
4.1 Phase 3A: Program Restructuring	<u>SF</u>	<u>Footprint</u>	<u>FI-FI</u>	<u>Perimeter</u>	<u>Exterior Enclosure</u>
4.2 Total	<u>7,766</u>				
4.3 Level 2		700	15	616	9,240
4.4 Level 1 Mezzanine		1,462	15	616	9,240
4.5 Level 1		5,604	15	616	9,240
5.1 Phase 3B: Carpentry Improvements	<u>SF</u>	<u>Footprint</u>	<u>FI-FI</u>	<u>Perimeter</u>	<u>Exterior Enclosure</u>
5.2 Total	<u>3,440</u>				
5.3 Level 2		3,440	15	616	9,240
6.1 Phase 4: Roof Replacement	<u>SF</u>	<u>Footprint</u>	<u>FI-FI</u>	<u>Perimeter</u>	<u>Exterior Enclosure</u>
6.2 Total	<u>33,770</u>				
6.3 Roof		33,770	15	616	9,240

**SAN FRANCISCO CABLE CAR BARN
 ROM ESTIMATE OF PROBABLE CONSTRUCTION COST
 (AN OPINION OF PROBABLE CONSTRUCTION COSTS)
 BASED ON FINAL MASTERPLAN DOCUMENTS
 2.0 KEY QUANTITIES**

Date: 07/22/2022 Final

	<u>SF</u>	<u>Footprint</u>	<u>FI-FI</u>	<u>Perimeter</u>	<u>Exterior Enclosure</u>
7.1 Phase 5: Seismic Improvements					
7.2 Total	<u>20,700</u>				
7.3 5.2.1		700	15	616	9,240
7.4 5.2.2		5,000	15	616	9,240
7.5 5.2.3		5,000	15	616	9,240
7.6 5.2.4		5,000	15	616	9,240
7.7 5.2.5		5,000	15	616	9,240
8.1 Exterior Improvements	<u>SF</u>				
8.2 Brick masonry exterior wall	15,579				
8.3 Exterior windows	3,350				
8.4 Exterior clerestory windows	510				
9.1 Winding Motors	<u>SF</u>				
Winding motors	600				

**SAN FRANCISCO CABLE CAR BARN
ROM ESTIMATE OF PROBABLE CONSTRUCTION COST
(AN OPINION OF PROBABLE CONSTRUCTION COSTS)
BASED ON FINAL MASTERPLAN DOCUMENTS
3.0 BASE CONSTRUCTION COST ESTIMATE SUMMARY**

Date: 07/22/2022 Final

ELEMENT / LOCATION	CONCURRENT		PHASED		CONCURRENT		PHASED	
	BASE CONSTRUCTION COST	CONSTRUCTION COST, ESCALATED TO MID POINT \$	BASE CONSTRUCTION COST	CONSTRUCTION COST, ESCALATED TO MID POINT \$	GSF	\$/GSF Escalated to Midpt	GSF	\$/GSF Escalated to Midpt
ESTIMATE SUMMARY:								
1 3.1 PHASE 1A: 12KV SWITCHGEAR UPGRADE	\$5,197,046	\$6,893,049	\$5,716,750	\$7,582,354	846	\$8,148		\$8,963
2 3.2 PHASE 1B: 20TON BRIDGE CRANE UPGRADE	\$5,958,724	\$7,903,292	\$6,554,596	\$8,693,621	4,434	\$1,782		\$1,961
3 3.3 PHASE 2: OFFICE IMPROVEMENTS	\$14,945,861	\$19,823,289	\$16,440,447	\$21,805,618	10,471	\$1,893		\$2,082
4 3.4 PHASE 3A: PROGRAMMING RESTRUCTURING	\$7,341,126	\$9,736,827	\$8,075,238	\$10,710,509	7,766	\$1,254		\$1,379
5 3.5 PHASE 3B: CARPENTRY UPGRADES	\$4,737,994	\$6,284,190	\$5,211,793	\$6,912,609	3,440	\$1,827		\$2,009
7 3.6 PHASE 4: ROOF REPLACEMENT	\$7,803,323	\$10,349,857	\$8,583,655	\$11,384,842	33,770	\$306		\$337
8 3.7 PHASE 5: SEISMIC IMPROVEMENTS	\$12,136,957	\$13,429,514	\$13,350,653	\$14,772,466	20,700	\$649		\$714
9 3.8 EXTERIOR IMPROVEMENTS	\$8,435,058	\$11,187,753	\$9,278,564	\$12,306,529	15,579	\$718		\$790
10 3.9 WINDING MOTORS	\$3,200,050	\$4,244,354	\$3,520,056	\$4,668,790	600	\$7,074		\$7,781
1-10 TOTAL ESTIMATED BASE CONSTRUCTION COST	\$69,756,139	\$89,852,125	\$76,731,752	\$98,837,338				
TOTAL ESTIMATED BASE CONSTRUCTION COST	\$69,756,000	\$89,852,000	\$76,732,000	\$98,837,000				

Notes:

- 1) Excludes softcost
- 2) Excludes O&M costs
- 3) For a complete scope of the estimate including assumptions & qualifications, it is important to read the attached "Basis of Estimate" and "Estimate Details"
- 4) Note that both concurrent and phased construction options are currently assuming the same construction schedule. This should be confirmed and verified.

SAN FRANCISCO CABLE CAR BARN
ROM ESTIMATE OF PROBABLE CONSTRUCTION COST
(AN OPINION OF PROBABLE CONSTRUCTION COSTS)
BASED ON FINAL MASTERPLAN DOCUMENTS
3.1 PHASE 1A: 12KV SWITCHGEAR UPGRADE

Date: 07/22/2022 Final
846 GSF

Ref.	Section		Total Cost	\$/GSF	%	Comments
A10	SUBSTRUCTURE					
A1010	TRADE DEMOLITION		13,590	16.06	0.20	
	SUBSTRUCTURE		13,590	16.06	0.20	
C10	INTERIOR CONSTRUCTION					
C1010	PARTITIONS		55,205	65.25	0.80	
C1020	INTERIOR DOORS		40,500	47.87	0.59	
	INTERIOR CONSTRUCTION		95,705	113.13	1.39	
C30	INTERIOR FINISHES					
C3010	WALL FINISHES		10,007	11.83	0.15	
C3020	FLOOR FINISHES		8,460	10.00	0.12	
C3030	CEILING FINISHES		21,150	25.00	0.31	
	INTERIOR FINISHES		39,617	46.83	0.57	
D15	MECHANICAL					
D1520	PLUMBING		8,272	9.78	0.12	
D1530	HVAC			0.00	0.00	
D1540	FIRE PROTECTION		293,800	347.28	4.26	
	MECHANICAL		302,072	357.06	4.38	
D50	ELECTRICAL					
D5010	ELECTRICAL DISTRIBUTION		2,342,725	2769.18	33.99	
D5030	COMMUNICATION & SECURITY		20,304	24.00	0.29	
	ELECTRICAL		2,363,029	2793.18	34.28	
	TOTAL DIRECT COSTS		2,814,013	3326.26	40.82	
	ADD MARKUPS (CUMULATIVE)					
	GENERAL CONDITIONS AND REQUIREMENTS	20.0%	562,803	665.25	8.16	
	MARKET FACTOR	5.0%	168,841	199.58	2.45	
	OVERHEAD AND PROFIT	10.0%	354,566	419.11	5.14	
	BONDING AND INSURANCE	2.5%	97,506	115.25	1.41	
	DESIGN CONTINGENCY	30.0%	1,199,318	1417.63	17.40	
	BASE CONSTRUCTION COST (Unescalated)		5,197,046	6143.08	75.40	
	ESCALATION - PHASE 1	32.6%	1,696,003	2004.73	24.60	
	BASE CONSTRUCTION COST (Escalated)		6,893,049	8147.81	100.00	
	CONSTRUCTION COST (Escalated)		6,893,049	8147.81	100.00	

**SAN FRANCISCO CABLE CAR BARN
ROM ESTIMATE OF PROBABLE CONSTRUCTION COST
(AN OPINION OF PROBABLE CONSTRUCTION COSTS)
BASED ON FINAL MASTERPLAN DOCUMENTS
3.2 PHASE 1B: 20TON BRIDGE CRANE UPGRADE**

**Date: 07/22/2022 Final
4,434 GSF**

Ref.	Section		Total Cost	\$/GSF	%	Comments
A10	SUBSTRUCTURE					
A1010	FOUNDATIONS		201,390	45.42	2.55	
	SUBSTRUCTURE		201,390	45.42	2.55	
B10	SUPERSTRUCTURE					
B1010	FLOOR CONSTRUCTION		1,383,158	311.94	17.50	
	SUPERSTRUCTURE		1,383,158	311.94	17.50	
C10	INTERIOR CONSTRUCTION					
C1010	PARTITIONS		218,518	49.28	2.76	
C1020	INTERIOR DOORS		71,750	16.18	0.91	
C1030	SPECIALTIES		102,476	23.11	1.30	
	INTERIOR CONSTRUCTION		392,744	88.58	4.97	
C30	INTERIOR FINISHES					
C3010	WALL FINISHES		34,241	7.72	0.43	
C3020	FLOOR FINISHES		38,085	8.59	0.48	
C3030	CEILING FINISHES		50,780	11.45	0.64	
	INTERIOR FINISHES		123,106	27.76	1.56	
D15	MECHANICAL					
D1530	HVAC		295,615	66.67	3.74	
D1540	FIRE PROTECTION		53,208	12.00	0.67	
	MECHANICAL		348,823	78.67	4.41	
D50	ELECTRICAL					
D5010	ELECTRICAL DISTRIBUTION		229,000	51.65	2.90	
D5020	LIGHTING & BRANCH WIRING		133,020	30.00	1.68	
D5030	COMMUNICATION & SECURITY		106,416	24.00	1.35	
D5040	AUDIO VISUAL SYSTEM		22,170	5.00	0.28	
	ELECTRICAL		490,606	110.65	6.21	
E10	EQUIPMENT					
E1059	OTHER EQUIPMENT		275,390	62.11	3.48	
	EQUIPMENT		275,390	62.11	3.48	
E20	FURNISHINGS					
E2010	CASEWORK		11,217	2.53	0.14	
	FURNISHINGS		11,217	2.53	0.14	
	TOTAL DIRECT COSTS		3,226,434	727.66	40.82	
	ADD MARKUPS (CUMULATIVE)					
	GENERAL CONDITIONS AND REQUIREMENTS	20.0%	645,287	145.53	8.16	
	MARKET FACTOR	5.0%	193,586	43.66	2.45	
	OVERHEAD AND PROFIT	10.0%	406,531	91.68	5.14	
	BONDING AND INSURANCE	2.5%	111,796	25.21	1.41	
	DESIGN CONTINGENCY	30.0%	1,375,090	310.12	17.40	
	BASE CONSTRUCTION COST (Unescalated)		5,958,724	1343.87	75.40	
	ESCALATION - PHASE 1	32.6%	1,944,568	438.56	24.60	
	BASE CONSTRUCTION COST (Escalated)		7,903,292	1782.43	100.00	
	CONSTRUCTION COST (Escalated)		7,903,292	1782.43	100.00	

**SAN FRANCISCO CABLE CAR BARN
ROM ESTIMATE OF PROBABLE CONSTRUCTION COST
(AN OPINION OF PROBABLE CONSTRUCTION COSTS)
BASED ON FINAL MASTERPLAN DOCUMENTS
3.3 PHASE 2: OFFICE IMPROVEMENTS**

Date: 07/22/2022 Final
10,471 GSF

Ref.	Section		Total Cost	\$/GSF	%	Comments
A10	SUBSTRUCTURE					
A1010	TRADE DEMOLITION		157,065	15.00	0.79	
	SUBSTRUCTURE		157,065	15.00	0.79	
B10	SUPERSTRUCTURE					
B1010	FLOOR CONSTRUCTION		193,800	18.51	0.98	
	SUPERSTRUCTURE		193,800	18.51	0.98	
C10	INTERIOR CONSTRUCTION					
C1010	PARTITIONS		1,340,143	127.99	6.76	
C1020	INTERIOR DOORS		259,750	24.81	1.31	
C1030	SPECIALTIES		325,931	31.13	1.64	
	INTERIOR CONSTRUCTION		1,925,824	183.92	9.71	
C30	INTERIOR FINISHES					
C3010	WALL FINISHES		137,074	13.09	0.69	
C3020	FLOOR FINISHES		157,065	15.00	0.79	
C3030	CEILING FINISHES		209,420	20.00	1.06	
	INTERIOR FINISHES		503,559	48.09	2.54	
D10	CONVEYING SYSTEMS					
D1010	ELEVATORS & LIFTS		315,000	30.08	1.59	
	CONVEYING SYSTEMS		315,000	30.08	1.59	
D15	MECHANICAL					
D1520	PLUMBING		1,773,689	169.39	8.95	
D1530	HVAC		1,155,266	110.33	5.83	
D1540	FIRE PROTECTION		271,552	25.93	1.37	
	MECHANICAL		3,200,507	305.65	16.15	
D50	ELECTRICAL					
D5010	ELECTRICAL DISTRIBUTION		762,845	72.85	3.85	
D5020	LIGHTING & BRANCH WIRING		366,485	35.00	1.85	
D5030	COMMUNICATION & SECURITY		439,782	42.00	2.22	
D5040	AUDIO VISUAL SYSTEM		52,355	5.00	0.26	
	ELECTRICAL		1,621,467	154.85	8.18	
E10	EQUIPMENT					
E1059	OTHER EQUIPMENT		118,210	11.29	0.60	
	EQUIPMENT		118,210	11.29	0.60	
E20	FURNISHINGS					
E2010	CASEWORK		57,213	5.46	0.29	
	FURNISHINGS		57,213	5.46	0.29	
	TOTAL DIRECT COSTS		8,092,645	772.86	40.82	
	ADD MARKUPS (CUMULATIVE)					
	GENERAL CONDITIONS AND REQUIREMENTS	20.0%	1,618,529	154.57	8.16	
	MARKET FACTOR	5.0%	485,559	46.37	2.45	
	OVERHEAD AND PROFIT	10.0%	1,019,673	97.38	5.14	
	BONDING AND INSURANCE	2.5%	280,410	26.78	1.41	
	DESIGN CONTINGENCY	30.0%	3,449,045	329.39	17.40	
	BASE CONSTRUCTION COST (Unescalated)		14,945,861	1427.36	75.40	
	ESCALATION - PHASE 2	32.6%	4,877,428	465.80	24.60	
	BASE CONSTRUCTION COST (Escalated)		19,823,289	1893.16	100.00	
	CONSTRUCTION COST (Escalated)		19,823,289	1893.16	100.00	

SAN FRANCISCO CABLE CAR BARN
ROM ESTIMATE OF PROBABLE CONSTRUCTION COST
(AN OPINION OF PROBABLE CONSTRUCTION COSTS)
BASED ON FINAL MASTERPLAN DOCUMENTS
3.4 PHASE 3A: PROGRAMMING RESTRUCTURING

Date: 07/22/2022 Final
7,766 GSF

Ref.	Section		Total Cost	\$/GSF	%	Comments
A10	SUBSTRUCTURE					
A1010	DEMOLITION		101,488	13.07	1.04	
	SUBSTRUCTURE		101,488	13.07	1.04	
C10	INTERIOR CONSTRUCTION					
C1010	PARTITIONS		111,935	14.41	1.15	
C1020	INTERIOR DOORS		62,100	8.00	0.64	
C1030	SPECIALTIES		40,596	5.23	0.42	
	INTERIOR CONSTRUCTION		214,631	27.64	2.20	
C30	INTERIOR FINISHES					
C3010	WALL FINISHES		21,308	2.74	0.22	
C3020	FLOOR FINISHES		116,490	15.00	1.20	
C3030	CEILING FINISHES		155,320	20.00	1.60	
	INTERIOR FINISHES		293,118	37.74	3.01	
D15	MECHANICAL					
D1520	PLUMBING		757,390	97.53	7.78	
D1530	HVAC		847,659	109.15	8.71	
D1540	FIRE PROTECTION		93,192	12.00	0.96	
	MECHANICAL		1,698,241	218.68	17.44	
D50	ELECTRICAL					
D5010	ELECTRICAL DISTRIBUTION		907,936	116.91	9.32	
D5020	LIGHTING & BRANCH WIRING		232,980	30.00	2.39	
D5030	COMMUNICATION & SECURITY		186,384	24.00	1.91	
D5040	AUDIO VISUAL SYSTEM		38,830	5.00	0.40	
	ELECTRICAL		1,366,130	175.91	14.03	
E10	EQUIPMENT					
E1059	OTHER EQUIPMENT		263,190	33.89	2.70	
	EQUIPMENT		263,190	33.89	2.70	
E20	FURNISHINGS					
E2010	CASEWORK		38,157	4.91	0.39	
	FURNISHINGS		38,157	4.91	0.39	
	TOTAL DIRECT COSTS		3,974,955	511.84	40.82	
	ADD MARKUPS (CUMULATIVE)					
	GENERAL CONDITIONS AND REQUIREMENTS	20.0%	794,991	102.37	8.16	
	MARKET FACTOR	5.0%	238,497	30.71	2.45	
	OVERHEAD AND PROFIT	10.0%	500,844	64.49	5.14	
	BONDING AND INSURANCE	2.5%	137,732	17.74	1.41	
	DESIGN CONTINGENCY	30.0%	1,694,106	218.14	17.40	
	BASE CONSTRUCTION COST (Unescalated)		7,341,126	945.29	75.40	
	ESCALATION - PHASE 3	32.6%	2,395,701	308.49	24.60	
	BASE CONSTRUCTION COST (Escalated)		9,736,827	1253.78	100.00	
	CONSTRUCTION COST (Escalated)		9,736,827	1253.78	100.00	

**SAN FRANCISCO CABLE CAR BARN
 ROM ESTIMATE OF PROBABLE CONSTRUCTION COST
 (AN OPINION OF PROBABLE CONSTRUCTION COSTS)
 BASED ON FINAL MASTERPLAN DOCUMENTS
 3.5 PHASE 3B: CARPENTRY UPGRADES**

Date: 07/22/2022 Final
 3,440 GSF

Ref.	Section		Total Cost	\$/GSF	%	Comments
A10	SUBSTRUCTURE					
A1010	DEMOLITION		43,000	12.50	0.68	
	SUBSTRUCTURE		43,000	12.50	0.68	
C10	INTERIOR CONSTRUCTION					
C1010	PARTITIONS		113,935	33.12	1.81	
C1020	INTERIOR DOORS		32,450	9.43	0.52	
C1030	SPECIALTIES		137,200	39.88	2.18	
	INTERIOR CONSTRUCTION		283,585	82.44	4.51	
C30	INTERIOR FINISHES					
C3010	WALL FINISHES		21,840	6.35	0.35	
C3020	FLOOR FINISHES		51,600	15.00	0.82	
C3030	CEILING FINISHES		68,800	20.00	1.09	
	INTERIOR FINISHES		142,240	41.35	2.26	
D15	MECHANICAL					
D1520	PLUMBING		327,969	95.34	5.22	
D1530	HVAC		529,726	153.99	8.43	
D1540	FIRE PROTECTION		61,920	18.00	0.99	
	MECHANICAL		919,615	267.33	14.63	
D50	ELECTRICAL					
D5010	ELECTRICAL DISTRIBUTION		702,006	204.07	11.17	
D5020	LIGHTING & BRANCH WIRING		103,200	30.00	1.64	
D5030	COMMUNICATION & SECURITY		82,560	24.00	1.31	
D5040	AUDIO VISUAL SYSTEM		17,200	5.00	0.27	
	ELECTRICAL		904,966	263.07	14.40	
E10	EQUIPMENT					
E1059	OTHER EQUIPMENT		261,727	76.08	4.16	
	EQUIPMENT		261,727	76.08	4.16	
E20	FURNISHINGS					
E2010	CASEWORK		10,320	3.00	0.16	
	FURNISHINGS		10,320	3.00	0.16	
	TOTAL DIRECT COSTS		2,565,453	745.77	40.82	
	ADD MARKUPS (CUMULATIVE)					
	GENERAL CONDITIONS AND REQUIREMENTS	20.0%	513,091	149.15	8.16	
	MARKET FACTOR	5.0%	153,927	44.75	2.45	
	OVERHEAD AND PROFIT	10.0%	323,247	93.97	5.14	
	BONDING AND INSURANCE	2.5%	88,893	25.84	1.41	
	DESIGN CONTINGENCY	30.0%	1,093,383	317.84	17.40	
	BASE CONSTRUCTION COST (Unescalated)		4,737,994	1377.32	75.40	
	ESCALATION - SEE GRAND SUMMARY	32.6%	1,546,196	449.48	24.60	
	BASE CONSTRUCTION COST (Escalated)		6,284,190	1826.80	100.00	
	CONSTRUCTION COST (Escalated)		6,284,190	1826.80	100.00	

SAN FRANCISCO CABLE CAR BARN
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BASED ON FINAL MASTERPLAN DOCUMENTS
3.6 PHASE 4: ROOF REPLACEMENT

Date: 07/22/2022 Final
33,770 GSF

Ref.	Section		Total Cost	\$/GSF	%	Comments
A10	SUBSTRUCTURE					
A1010	TRADE DEMOLITION		296,610	8.78	2.87	
	SUBSTRUCTURE		296,610	8.78	2.87	
				0.00	0.00	0.00
B10	SUPERSTRUCTURE					
B1020	ROOF CONSTRUCTION		1,334,745	39.52	12.90	
	SUPERSTRUCTURE		1,334,745	39.52	12.90	
B30	ROOFING					
B3010	ROOF COVERINGS		2,313,558	68.51	22.35	
B3020	ROOF OPENINGS		132,000	3.91	1.28	
	ROOFING		2,445,558	72.42	23.63	
D15	MECHANICAL					
D1520	PLUMBING		148,305	4.39	1.43	
	MECHANICAL		148,305	4.39	1.43	
	TOTAL DIRECT COSTS		4,225,218	125.12	40.82	
	ADD MARKUPS (CUMULATIVE)					
	GENERAL CONDITIONS AND REQUIREMENTS	20.0%	845,044	25.02	8.16	
	MARKET FACTOR	5.0%	253,513	7.51	2.45	
	OVERHEAD AND PROFIT	10.0%	532,377	15.76	5.14	
	BONDING AND INSURANCE	2.5%	146,404	4.34	1.41	
	DESIGN CONTINGENCY	30.0%	1,800,767	53.32	17.40	
	BASE CONSTRUCTION COST (Unescalated)		7,803,323	231.07	75.40	
	ESCALATION - PHASE 4	32.6%	2,546,534	75.41	24.60	
	BASE CONSTRUCTION COST (Escalated)		10,349,857	306.48	100.00	
	CONSTRUCTION COST (Escalated)		10,349,857	306.48	100.00	

**SAN FRANCISCO CABLE CAR BARN
 ROM ESTIMATE OF PROBABLE CONSTRUCTION COST
 (AN OPINION OF PROBABLE CONSTRUCTION COSTS)
 BASED ON FINAL MASTERPLAN DOCUMENTS
 3.7 PHASE 5: SEISMIC IMPROVEMENTS**

Date: 07/22/2022 Final
 20,700 GSF

Ref.	Section	Total Cost	\$/GSF	%	Comments
5.2.1	CHIMNEY SEPERATION				
	DIRECT COST	354,500	17.13		
	TOTAL COST W/MARKUPS	654,707	31.63		
	TOTAL COST W/ESCALATION	724,431	35.00		
	CHIMNEY SEPERATION	724,431	35.00		
5.2.2A	SOUTH AND EAST WALLS ALONG WASHINGTON/MASON STREET SHOTCRETE/DOWELS				Option A: For South/East Walls
	DIRECT COST	1,955,225	94.46		
	TOTAL COST W/MARKUPS	3,610,998	174.44		
	TOTAL COST W/ESCALATION	3,995,560	193.02		
	SOUTH AND EAST WALLS ALONG WASHINGTON/MASON STREET	3,995,560	193.02		
5.2.3	CONCRETE MASONRY UNIT WALL AT GRID LINE G				
	DIRECT COST	1,695,000	81.88		
	TOTAL COST W/MARKUPS	3,130,402	151.23		
	TOTAL COST W/ESCALATION	3,463,783	167.33		
	CONCRETE MASONRY UNIT WALL AT GRID LINE G	3,463,783	167.33		
5.2.4	ADDING NEW SEISMIC FORCE AT GRID LINES E				
	DIRECT COST	1,152,500	55.68		
	TOTAL COST W/MARKUPS	2,128,489	102.83		
	TOTAL COST W/ESCALATION	2,355,168	113.78		
	ADDING NEW SEISMIC FORCE AT GRID LINES E	2,355,168	113.78		
5.2.5	MAIN ROOF DIAPHRAGM				
	DIRECT COST	1,012,000	48.89		
	TOTAL COST W/MARKUPS	1,869,007	90.29		
	TOTAL COST W/ESCALATION	2,068,052	99.91		
	MAIN ROOF DIAPHRAGM	2,068,052	99.91		
5.2.6	OTHER ADDED ELEMENTS FOR SEISIMC FORCE				
	DIRECT COST	402,500	19.44		
	TOTAL COST W/MARKUPS	743,355	35.91		
	TOTAL COST W/ESCALATION	822,521	39.74		
	OTHER ADDED ELEMENTS FOR SEISIMC FORCE	822,521	39.74		
	TOTAL COSTS w/Option A and w/ Escalation	13,429,514	648.77		Cost Excludes Option B: Fibre Wrap

Alternate Cost Option

5.2.2B	SOUTH AND EAST WALLS ALONG WASHINGTON/MASON STREET FIBRE WRAP				Option B: Alternate cost to Shotcrete/Dowels
	DIRECT COST	3,540,800	171.05		
	TOTAL COST W/MARKUPS	6,539,309	315.91		
	TOTAL COST W/ESCALATION	7,235,730	349.55		
	SOUTH AND EAST WALLS ALONG WASHINGTON/MASON STREET	7,235,730	349.55		

SAN FRANCISCO CABLE CAR BARN ROM ESTIMATE OF PROBABLE CONSTRUCTION COST (AN OPINION OF PROBABLE CONSTRUCTION COSTS) BASED ON FINAL MASTERPLAN DOCUMENTS 3.8 EXTERIOR IMPROVEMENTS						Date: 07/22/2022 Final 15,579 GSF	
Ref.	Section		Total Cost	\$/GSF	%	Comments	
ESTIMATE SUMMARY:							
B20	EXTERIOR CLOSURE						
B2010	EXTERIOR WALLS		1,988,280	127.63	17.77		
B2020	EXTERIOR WINDOWS		1,274,500	81.81	11.39		
B2030	EXTERIOR DOORS		250,000	16.05	2.23		
EXTERIOR CLOSURE			3,512,780	225.48	31.40		
B30	ROOFING						
B3010	ROOF COVERINGS			0.00	0.00		
B3020	ROOF OPENINGS		1,054,500	67.69	9.43		
ROOFING			1,054,500	67.69	9.43		
TOTAL DIRECT COSTS			4,567,280	293.17	40.82		
ADD MARKUPS (CUMULATIVE)							
	GENERAL CONDITIONS AND REQUIREMENTS	20.0%	913,456	58.63	8.16		
	MARKET FACTOR	5.0%	274,037	17.59	2.45		
	OVERHEAD AND PROFIT	10.0%	575,477	36.94	5.14		
	BONDING AND INSURANCE	2.5%	158,256	10.16	1.41		
	DESIGN CONTINGENCY	30.0%	1,946,552	124.95	17.40		
	BASE CONSTRUCTION COST (Unescalated)		8,435,058	541.44	75.40		
	ESCALATION - PHASE 1	32.6%	2,752,695	176.69	24.60		
	BASE CONSTRUCTION COST (Escalated)		11,187,753	718.13	100.00		
CONSTRUCTION COST (Escalated)			11,187,753	718.13	100.00		

**SAN FRANCISCO CABLE CAR BARN
 ROM ESTIMATE OF PROBABLE CONSTRUCTION COST
 (AN OPINION OF PROBABLE CONSTRUCTION COSTS)
 BASED ON FINAL MASTERPLAN DOCUMENTS
 3.9 WINDING MOTORS**

Date: 07/22/2022 Final
 846 GSF

Ref.	Section		Total Cost	\$/GSF	%	Comments
D50	ELECTRICAL					
D5010	ELECTRICAL DISTRIBUTION		1,732,712	2048.12	40.82	
D5030	COMMUNICATION & SECURITY			0.00	0.00	
	ELECTRICAL		1,732,712	2048.12	40.82	
	TOTAL DIRECT COSTS		1,732,712	2048.12	40.82	
	ADD MARKUPS (CUMULATIVE)					
	GENERAL CONDITIONS AND REQUIREMENTS	20.0%	346,542	409.62	8.16	
	MARKET FACTOR	5.0%	103,963	122.89	2.45	
	OVERHEAD AND PROFIT	10.0%	218,322	258.06	5.14	
	BONDING AND INSURANCE	2.5%	60,038	70.97	1.41	
	DESIGN CONTINGENCY	30.0%	738,473	872.90	17.40	
	BASE CONSTRUCTION COST (Unescalated)		3,200,050	3782.57	75.40	
	ESCALATION - PHASE 1	32.6%	1,044,304	1234.40	24.60	
	BASE CONSTRUCTION COST (Escalated)		4,244,354	5016.97	100.00	
	CONSTRUCTION COST (Escalated)		4,244,354	5016.97	100.00	

SAN FRANCISCO CABLE CAR BARN
ROM ESTIMATE OF PROBABLE CONSTRUCTION COST
(AN OPINION OF PROBABLE CONSTRUCTION COSTS)
BASED ON FINAL MASTERPLAN DOCUMENTS
4.1 PHASE 1A: 12KV SWITCHGEAR UPGRADE

Date: 07/22/2022 Final

Floor Area: 846 GSF

Elem.	#	Description	Quantity	Unit	Unit Cost	Total
A1010	1	TRADE DEMOLITION				
	2					
	3	Remove existing metal shelving	20	LF	45.00	900
	4	Clear area as required for new work - allow	846	SF	15.00	12,690
	5					
	6	TRADE DEMOLITION				13,590
	7					
C1010	92					
	93	PARTITIONS				
	94					
	95	New fire-rated metal stud partition framing	915	SF	25.00	22,875
	96	Insulation at new interior partition	915	SF	5.00	4,575
	97	Gypsum board partition sheathing, taped and sanded	1,830	SF	7.50	13,725
	98	Gypsum board underlayment	1,830	SF	7.00	12,810
	99	Acoustic sealant	244	LF	5.00	1,220
	100					
	101	PARTITIONS				55,205
102						
C1020	103					
	104	INTERIOR DOORS				
	106	Hollow metal door in hollow metal frame with hardware, 90-minute fire rated, 6'-6" x 7'-0" pair	2	PR	8,000.00	16,000
	107	Overhead coiling door, 90-minute fire rated, 16'-0" x 9'-0"	1	EA	18,000.00	18,000
	108	Specialty hardware (panic, etc.) - allow	1	LS	2,500.00	2,500
	109	Card readers, etc. - allow	1	EA	4,000.00	4,000
	110					
111	INTERIOR DOORS				40,500	
112						
C3010	119					
	120	WALL FINISHES				
	121	Paint to walls	2,859	SF	3.50	10,007
	122					
	123	WALL FINISHES				10,007
124						
125						

**SAN FRANCISCO CABLE CAR BARN
 ROM ESTIMATE OF PROBABLE CONSTRUCTION COST
 (AN OPINION OF PROBABLE CONSTRUCTION COSTS)
 BASED ON FINAL MASTERPLAN DOCUMENTS
 4.1 PHASE 1A: 12KV SWITCHGEAR UPGRADE**

Date: 07/22/2022 Final

Floor Area: 846 GSF

Elem.	#	Description	Quantity	Unit	Unit Cost	Total
C3020	126	FLOOR FINISHES				
	127	Sealer to existing concrete flooring	846	SF	10.00	8,460
	128					
	129	FLOOR FINISHES				8,460
	130					
C3030	131					
	132	CEILING FINISHES				
	133	New fire-rated gypsum board ceiling, painted	846	SF	25.00	21,150
	134					
	135					
	136	CEILING FINISHES				21,150
	137					
D1010	138					
	139	ELEVATORS & LIFTS				
	140					
	141	See Phase 2				
	142					
	143	ELEVATORS & LIFTS				
	144					
D1520	145					
	158	PLUMBING				
	159					
	160	Industrial Fixtures				
	161	Eyewash, complete with in-line tepid water heater	1	EA	6,600.00	6,600
	162					
	163	Testing and sterilization				
	164	Testing and sterilization	2	HR	205.00	410
165						
	166	Miscellaneous Plumbing				
	167	Project requirements, project management, detailing, coordination, etc	1	LS	1,261.80	1,262
	168					
	169	PLUMBING				8,272
	170					
	171					

**SAN FRANCISCO CABLE CAR BARN
 ROM ESTIMATE OF PROBABLE CONSTRUCTION COST
 (AN OPINION OF PROBABLE CONSTRUCTION COSTS)
 BASED ON FINAL MASTERPLAN DOCUMENTS
 4.1 PHASE 1A: 12KV SWITCHGEAR UPGRADE**

Date: 07/22/2022 Final

Floor Area: 846 GSF

Elem.	#	Description	Quantity	Unit	Unit Cost	Total
D1540	178	FIRE PROTECTION				
	179					
	180	FM200 and control panel	846	SF	300.00	253,800
	181	Preaction double interlock system	1	LS	40,000.00	40,000
	182					
	183	FIRE PROTECTION				293,800
	184					
D5010	185					
	186	ELECTRICAL DISTRIBUTION				
	187					
	188	Main normal power				
	189	PG&E Metering				By PG&E
	190	12KV Vault	2	EA	18,000.00	36,000
	191	12KV-480V Electrical substation, 2,500KVA Quote Leadtime, 8-10 week drawings/shipment 54-60 weeks	1	LS	1,374,760.00	1,374,760
		Sales tax	8.63%	%	1,374,760.00	118,573
		Markups	15.00%	%	118,573.00	17,786
		Installation	160	HR	205.00	32,800
	197	12KV Feeders	100	LF	1,500.00	150,000
	198	Power monitoring	1	LS	25,000.00	25,000
	199	Grounding	846	SF	0.50	423
	200					
	201	Machine and equipment power				
	202	Winding Motors				AC/DC Later phase
	203	Isolation transformers				AC/DC Later phase
	204	Miscellaneous power connections	846	SF	1.50	1,269
	205					
206	User convenience power					
207	Receptacles				Existing	
208						
209	Trade demolition					
210	Remove existing electrical substation	960	HR	205.00	196,800	
211	Temporary power	1	WK	15,000.00	15,000	
212						
213	Miscellaneous electrical					
214	Arc Flash Study	1	LS	20,000.00	20,000	
215	Project requirements, project management, detailing, coordination, etc	1	LS	354,313.98	354,314	
216						
	217	ELECTRICAL DISTRIBUTION				2,342,725

**SAN FRANCISCO CABLE CAR BARN
 ROM ESTIMATE OF PROBABLE CONSTRUCTION COST
 (AN OPINION OF PROBABLE CONSTRUCTION COSTS)
 BASED ON FINAL MASTERPLAN DOCUMENTS
 4.1 PHASE 1A: 12KV SWITCHGEAR UPGRADE**

Date: 07/22/2022 Final

Floor Area: 846 GSF

Elem.	#	Description	Quantity	Unit	Unit Cost	Total
	218					
D5020	219					
	220	LIGHTING & BRANCH WIRING				
	221					
	222	Lighting				Existing
	223					
	224	LIGHTING & BRANCH WIRING				
	225					
D5030	226					
	227	COMMUNICATION & SECURITY				
	228					
	229	Telecommunications, including CAT6A cabling, conduit and outlets and WAPs				Not Required
	230	Fire alarm system, including new fire alarm panel and annunciator, fire alarm devices, conduit and cable	846	SF	18.00	15,228
	231	Security system, including access control, video surveillance monitoring, conduit and cable	846	SF	6.00	5,076
	232					
	233	COMMUNICATION & SECURITY				20,304
234						

**SAN FRANCISCO CABLE CAR BARN
ROM ESTIMATE OF PROBABLE CONSTRUCTION COST
(AN OPINION OF PROBABLE CONSTRUCTION COSTS)
BASED ON FINAL MASTERPLAN DOCUMENTS
4.2 PHASE 1B: 20TON BRIDGE CRANE UPGRADE**

Date: 07/22/2022 Final

Floor Area: 4,434 GSF

Elem.	#	Description	Quantity	Unit	Unit Cost	Total
A1010	1	TRADE DEMOLITION				
	2					
	3	Decommission existing 10-ton crane	1	LS	150,000.00	150,000
	4	Remove existing Stair #6 in its entirety	1	LS	7,500.00	7,500
	5	Miscellaneous selective demolition for new crane - allow	2,494	SF	10.00	24,940
	6	Miscellaneous selective demolition for new office addition - allow	1,895	SF	10.00	18,950
	7					
	8	TRADE DEMOLITION				201,390
	9					
B1010	34					
	35	FLOOR CONSTRUCTION				
	36					
	37	Bridge crane support min including new 8" x 18" pilasters - allow	75	TN	10,000.00	750,000
	38	Structural steel at 1M for Office Addition - allow 20#/SF	25	TN	10,000.00	250,000
	39	Metal deck at 1M Office Addition	2,539	SF	15.00	38,085
	40	Reinforced concrete fill at metal deck	2,539	SF	12.50	31,738
	41	Connection to existing structure - allow	238	LF	350.00	83,300
	42	New metal stair with associated guardrail and handrails (Stair #6)	1	FLT	65,000.00	65,000
	43					
	44	Miscellaneous				
	45	Intumescent fire proofing paint to steel - allow	2,539	SF	50.00	126,950
	46	Miscellaneous metals and rough carpentry - allow	2,539	SF	15.00	38,085
	47					
48	FLOOR CONSTRUCTION				1,383,158	
49						
C1010	86					
	87	PARTITIONS				
	88					
	89	New metal stud partition framing	3,167	SF	22.50	71,258
	90	Insulation at new interior partition	3,167	SF	5.00	15,835
	91	Gypsum board partition sheathing, taped and sanded	6,334	SF	7.50	47,505
	92	Patch and repair existing wall surrounding build-out - allow	2,300	SF	2.50	5,750
	93	Acoustic sealant	844	LF	5.00	4,220
94	Interior glazing	493	SF	150.00	73,950	

**SAN FRANCISCO CABLE CAR BARN
ROM ESTIMATE OF PROBABLE CONSTRUCTION COST
(AN OPINION OF PROBABLE CONSTRUCTION COSTS)
BASED ON FINAL MASTERPLAN DOCUMENTS
4.2 PHASE 1B: 20TON BRIDGE CRANE UPGRADE**

Date: 07/22/2022 Final

Floor Area: 4,434 GSF

Elem.	#	Description	Quantity	Unit	Unit Cost	Total
	95					
	96	PARTITIONS				218,518
	97					
C1020	98					
	99	INTERIOR DOORS				
	100					
	101	Hollow metal door in hollow metal frame with hardware, 3'-0" x 7'-0" single	6	EA	3,500.00	21,000
	102	Hollow metal door in hollow metal frame with hardware and half glass, 3'-0" x 7'-0" single	1	EA	4,250.00	4,250
	103	Aluminum glazed entry door, 3'-0" x 7'-1-1/4" single	3	EA	5,500.00	16,500
	104	Specialty hardware (panic, etc.) - allow	1	LS	15,000.00	15,000
	105	Card readers, etc. - allow	1	EA	15,000.00	15,000
	106					
	107	INTERIOR DOORS				71,750
	108					
C1030	109					
	110	SPECIALTIES				
	111					
	112	Interior code related signage - allow	1,895	SF	2.50	4,738
	113	Metal guardrail at new walkway	124	LF	750.00	93,000
	114	Miscellaneous interior fittings - allow	1,895	SF	2.50	4,738
	115					
	116	SPECIALTIES				102,476
	117					
C3010	118					
	119	WALL FINISHES				
	120					
	121	Paint to walls	9,783	SF	3.50	34,241
	122					
	123	WALL FINISHES				34,241
	124					
	125					

**SAN FRANCISCO CABLE CAR BARN
 ROM ESTIMATE OF PROBABLE CONSTRUCTION COST
 (AN OPINION OF PROBABLE CONSTRUCTION COSTS)
 BASED ON FINAL MASTERPLAN DOCUMENTS
 4.2 PHASE 1B: 20TON BRIDGE CRANE UPGRADE**

Date: 07/22/2022 Final

Floor Area: 4,434 GSF

Elem.	#	Description	Quantity	Unit	Unit Cost	Total
C3020	126	FLOOR FINISHES				
	127					
	128	New flooring and base at build-out - allow	2,539	SF	15.00	38,085
	129					
	130	FLOOR FINISHES				38,085
C3030	131					
	132	CEILING FINISHES				
	133					
	134					
	135	New ceiling finish at build-out - allow	2,539	SF	20.00	50,780
136						
137	CEILING FINISHES				50,780	
D1520	138					
	145	PLUMBING				
	146					
	147					
	148	Not Required				
D1530	149					
	150	PLUMBING				
	151					
	152	HVAC				
	153					
154						
155	Air handling units					
156	Recirculation fans	4,434	SF	8.00	35,472	
157						
158	Passive system					
159	Electric radiant heaters	4,434	SF	12.00	53,208	
160	Electric wall radiators	4,434	SF	14.00	62,076	
161						
162	Controls and instrumentation					
163	DDC controls	4,434	SF	12.00	53,208	
164						
165	Testing and balancing					
166	Testing and balancing	4,434	SF	3.00	13,302	
167	Commissioning assistance	4,434	SF	1.50	6,651	
168						

**SAN FRANCISCO CABLE CAR BARN
ROM ESTIMATE OF PROBABLE CONSTRUCTION COST
(AN OPINION OF PROBABLE CONSTRUCTION COSTS)
BASED ON FINAL MASTERPLAN DOCUMENTS
4.2 PHASE 1B: 20TON BRIDGE CRANE UPGRADE**

Date: 07/22/2022 Final

Floor Area: 4,434 GSF

Elem.	#	Description	Quantity	Unit	Unit Cost	Total
	169	Unit Ventilation				
	170	Exhaust fans	4,434	SF	6.00	26,604
	171					
	172	Miscellaneous HVAC				
	173	Project requirements, project management, detailing, coordination, etc.	1	LS	45,093.78	45,094
	174					
	175	HVAC				295,615
	176					
D1540	177					
	178	FIRE PROTECTION				
	179					
	180	Automatic wet sprinkler system - modify and reuse existing	4,434	SF	12.00	53,208
	181					
	182	FIRE PROTECTION				53,208
	183					
D5010	184					
	185	ELECTRICAL DISTRIBUTION				
	186					
	187	Main normal power				
	188	480V Distribution switchboard, 800A	1	LS	68,000.00	68,000
	189	Feeder conduit and wire	300	LF	180.00	54,000
	190	Power monitoring	1	LS	20,000.00	20,000
	191	Grounding	4,434	SF	0.50	2,217
	192					
	193	Machine and equipment power				
	194	Bridge crane 20 tons	2	EA	10,000.00	20,000
	195	Miscellaneous power connections	4,434	SF	1.50	6,651
	196					
	197	User convenience power				
	198	Receptacles				Existing
	199					
	200	Trade demolition				
	201	Demo existing	40	HR	205.00	8,200
	202	Temporary power	1	WK	15,000.00	15,000
	203					

**SAN FRANCISCO CABLE CAR BARN
 ROM ESTIMATE OF PROBABLE CONSTRUCTION COST
 (AN OPINION OF PROBABLE CONSTRUCTION COSTS)
 BASED ON FINAL MASTERPLAN DOCUMENTS
 4.2 PHASE 1B: 20TON BRIDGE CRANE UPGRADE**

Date: 07/22/2022 Final

Floor Area: 4,434 GSF

Elem.	#	Description	Quantity	Unit	Unit Cost	Total
	204	Miscellaneous electrical				
	205	Project requirements, project management, detailing, coordination, etc.	1	LS	34,932.24	34,932
	206					
	207	ELECTRICAL DISTRIBUTION				229,000
	208					
D5020	209					
	210	LIGHTING & BRANCH WIRING				
	211					
	212	New lighting and lighting controls	4,434	SF	30.00	133,020
	213					
	214	LIGHTING & BRANCH WIRING				133,020
	215					
D5030	216					
	217	COMMUNICATION & SECURITY				
	218					
	219	Telecommunications, including CAT6A cabling, conduit and outlets and WAPs				Not Required
	220	Fire alarm system, including new fire alarm panel and annunciator, fire alarm devices, conduit and cable	4,434	SF	18.00	79,812
	221	Security system, including access control, video surveillance monitoring, conduit and cable	4,434	SF	6.00	26,604
	222					
	223	COMMUNICATION & SECURITY				106,416
	224					
D5040	225					
	226	AUDIO VISUAL SYSTEM				
	227					
	228	A/V conduit only	4,434	SF	5.00	22,170
	229					
	230	AUDIO VISUAL SYSTEM				22,170
E10	231					
	232	OTHER EQUIPMENT				
	233					
	234	New 20-ton crane - allow	1	EA	250,000.00	250,000

**SAN FRANCISCO CABLE CAR BARN
 ROM ESTIMATE OF PROBABLE CONSTRUCTION COST
 (AN OPINION OF PROBABLE CONSTRUCTION COSTS)
 BASED ON FINAL MASTERPLAN DOCUMENTS
 4.2 PHASE 1B: 20TON BRIDGE CRANE UPGRADE**

Date: 07/22/2022 Final

Floor Area: 4,434 GSF

Elem.	#	Description	Quantity	Unit	Unit Cost	Total
	235	Miscellaneous equipment at Office Addition (AV, etc.)	2,539	SF	10.00	25,390
	236					
	237	OTHER EQUIPMENT				275,390
	238					
E20	239					
	240	CASEWORK				
	241					
	242	Built-in casework at 1M58	6	LF	600.00	3,600
	243	Miscellaneous fixed furnishings - allow	2,539	SF	3.00	7,617
	244					
	245	CASEWORK				11,217

**SAN FRANCISCO CABLE CAR BARN
 ROM ESTIMATE OF PROBABLE CONSTRUCTION COST
 (AN OPINION OF PROBABLE CONSTRUCTION COSTS)
 BASED ON FINAL MASTERPLAN DOCUMENTS
 4.3 PHASE 2: OFFICE IMPROVEMENTS**

Date: 07/22/2022 Final

Floor Area: 10,471 GSF

Elem.	#	Description	Quantity	Unit	Unit Cost	Total
A1010	1	TRADE DEMOLITION				
	2					
	3	Demolition as required - allow	10,471	SF	15.00	157,065
	4					
	5	TRADE DEMOLITION				157,065
	6					
B1010	31					
	32	FLOOR CONSTRUCTION				
	33					
	34	Structural upgrade at elevators - allow	1	LS	150,000.00	150,000
	35	Structural upgrade at new restroom - allow for new beam and concrete on metal deck	146	SF	300.00	43,800
	36					
37	FLOOR CONSTRUCTION				193,800	
38						
C1010	75					
	76	PARTITIONS				
	77					
	78	New metal stud partition framing	16,497	SF	22.50	371,183
	79	Insulation at new interior partition	16,497	SF	5.00	82,485
	80	Gypsum board partition sheathing, taped and sanded	32,994	SF	7.50	247,455
	81	Patch and repair existing interior partitions and wall surrounding build-out - allow	6,170	SF	2.50	15,425
	82	Wall infill at opening	132	SF	75.00	9,900
	83	Acoustic sealant	4,399	LF	5.00	21,995
	84	Interior glazing	854	SF	150.00	128,100
	85	Tempered glass wall installed behind existing guardrail - allow to 10' tall	2,300	SF	200.00	460,000
	86	Wire mesh partition at Bicycle Storage	24	LF	150.00	3,600
87						
88	PARTITIONS				1,340,143	
89						
C1020	90					
	91	INTERIOR DOORS				
	92					
	94	Hollow metal door in hollow metal frame with hardware, 3'-0" x 7'-0" single	35	EA	3,500.00	122,500
	95	Hollow metal door in hollow metal frame with hardware and half glass, 3'-0" x 7'-0" single	2	EA	4,250.00	8,500
96	Aluminum glazed entry door, 6'-0" x 7'-2" pair	1	PR	10,500.00	10,500	

**SAN FRANCISCO CABLE CAR BARN
 ROM ESTIMATE OF PROBABLE CONSTRUCTION COST
 (AN OPINION OF PROBABLE CONSTRUCTION COSTS)
 BASED ON FINAL MASTERPLAN DOCUMENTS
 4.3 PHASE 2: OFFICE IMPROVEMENTS**

Date: 07/22/2022 Final

Floor Area: 10,471 GSF

Elem.	#	Description	Quantity	Unit	Unit Cost	Total
	97	Aluminum glazed entry door, 3'-0" x 7'-2" single	3	EA	5,500.00	16,500
	98	Wire mesh pedestrian gate	1	EA	1,750.00	1,750
	99	Specialty hardware (panic, etc.) - allow	1	LS	50,000.00	50,000
	100	Card readers, etc. - allow	1	EA	50,000.00	50,000
	101					
	102	INTERIOR DOORS				259,750
	103					
C1030	104					
	105	SPECIALTIES				
	106					
	107	Interior code related signage - allow	10,471	SF	2.50	26,178
	108	Miscellaneous interior fittings - allow	10,471	SF	2.50	26,178
	109	Metal crash protection rail	7	LF	150.00	1,050
	110	Locker on curb	338	LF	550.00	185,900
	111	Locker room bench	25	LF	225.00	5,625
	112	Locker room bench, accessible	24	LF	300.00	7,200
	113	Toilet partition, accessible	8	EA	1,500.00	12,000
	114	Toilet partition, standard	7	EA	1,200.00	8,400
	115	Urinal screen	3	EA	850.00	2,550
	116	Sliding barn style partition at shower	2	EA	2,500.00	5,000
	117	Shower bench and accessories	9	EA	1,500.00	13,500
	118	Grab bar, pair	21	EA	350.00	7,350
	119	Toilet accessories - allow	1	LS	25,000.00	25,000
	120					
	121	SPECIALTIES				325,931
	122					
C3010	123					
	124	WALL FINISHES				
	125					
	126	Paint to walls	39,164	SF	3.50	137,074
	127					
	128	WALL FINISHES				137,074
	129					
	130					

**SAN FRANCISCO CABLE CAR BARN
 ROM ESTIMATE OF PROBABLE CONSTRUCTION COST
 (AN OPINION OF PROBABLE CONSTRUCTION COSTS)
 BASED ON FINAL MASTERPLAN DOCUMENTS
 4.3 PHASE 2: OFFICE IMPROVEMENTS**

Date: 07/22/2022 Final

Floor Area: 10,471 GSF

Elem.	#	Description	Quantity	Unit	Unit Cost	Total
C3020	131	FLOOR FINISHES				
	132					
	133	New flooring finish with base - allow	10,471	SF	15.00	157,065
	134					
	135	FLOOR FINISHES				157,065
	136					
C3030	137	CEILING FINISHES				
	138					
	139					
	140	New ceiling finish - allow	10,471	SF	20.00	209,420
	141					
	142	CEILING FINISHES				209,420
D1010	143					
	145	ELEVATORS & LIFTS				
	146					
	147	Elevator upgrades to existing passenger and freight systems	1	LS	315,000.00	315,000
	148					
	149	ELEVATORS & LIFTS				315,000
D1520	150					
	151					
	152	PLUMBING				
	153					
	154	Sanitary fixtures	63	FX		
	155	Waterclosets	18	EA	3,500.00	63,000
	156	Urinals	7	EA	2,000.00	14,000
	157	Lavatories	17	EA	2,800.00	47,600
	158	Kitchen sink	3	EA	3,500.00	10,500
	159	Sinks	1	EA	3,500.00	3,500
	160	Showers	9	EA	5,000.00	45,000
	161	Service sink	4	EA	6,000.00	24,000
	162	Drinking fountains/bottle fillers	4	EA	7,500.00	30,000
	163					
164	Sanitary waste, vent and domestic service piping					
165	Fixture rough-ins	63	EA	15,000.00	945,000	
166	Condensate drainage	10,471	SF	3.50	36,649	
167						

**SAN FRANCISCO CABLE CAR BARN
 ROM ESTIMATE OF PROBABLE CONSTRUCTION COST
 (AN OPINION OF PROBABLE CONSTRUCTION COSTS)
 BASED ON FINAL MASTERPLAN DOCUMENTS
 4.3 PHASE 2: OFFICE IMPROVEMENTS**

Date: 07/22/2022 Final

Floor Area: 10,471 GSF

Elem.	#	Description	Quantity	Unit	Unit Cost	Total
	168	Water treatment and storage				
	169	Electric water heaters	10,471	SF	4.00	41,884
	170					
	171	Gas distribution				
	172	None				
	173					
	174	Surface water drainage				
	175	None				
	176					
	177	Testing and sterilization				
	178	Testing and sterilization	95	HR	205.00	19,373
	179					
	180	Industrial Fixtures				
	181	Eyewash, complete with in-line tepid water heater	2	EA	6,600.00	13,200
	182					
	183	Industrial equipment				
	184	Compressed air and dryer				See Equipment
	185					
	186	Industrial distribution piping				
	187	Compressed air piping	10,471	SF	10.00	104,710
	188	Natural gas piping	10,471	SF	6.00	62,826
	189	Valves and specialties, including outlets	1	LS	41,884.00	41,884
	190					
	191	Miscellaneous Plumbing				
	192	Project requirements, project management, detailing, coordination, etc.	1	LS	270,562.68	270,563
	193					
	194					
	195	PLUMBING				1,773,689
	196					
	197					
D1530	198	HVAC				
	199					
	200	Piping, valves and specialties				
	201	Refrigerant piping, insulation valves and specialties	10,471	SF	8.00	83,768
	202					

**SAN FRANCISCO CABLE CAR BARN
ROM ESTIMATE OF PROBABLE CONSTRUCTION COST
(AN OPINION OF PROBABLE CONSTRUCTION COSTS)
BASED ON FINAL MASTERPLAN DOCUMENTS
4.3 PHASE 2: OFFICE IMPROVEMENTS**

Date: 07/22/2022 Final

Floor Area: 10,471 GSF

Elem.	#	Description	Quantity	Unit	Unit Cost	Total
	203	Air handling units				
	204	VRF Heat pump system, electric	10,471	SF	15.00	157,065
	205					
	206	Air distribution and return				
	207	Galvanized sheetmetal ductwork, volume dampers, duct insulation, sound traps	10,471	SF	18.00	188,478
	208					
	209	Diffusers, registers and grilles				
	210	Diffusers, registers and grilles	10,471	SF	3.00	31,413
	211					
	212	Passive system				
	213	Electric radiant heaters	10,471	SF	10.00	104,710
	214	Electric wall radiators	10,471	SF	14.00	146,594
	215					
	216	Controls and instrumentation				
	217	DDC controls	10,471	SF	12.00	125,652
	218					
	219	Testing and balancing				
	220	Testing and balancing	10,471	SF	3.00	31,413
	221	Commissioning assistance	10,471	SF	1.50	15,707
	222					
	223	Unit Ventilation				
	224		10,471	SF	3.00	31,413
		Galvanized sheetmetal ductwork, exhaust				
	225	Stainless steel ductwork, exhaust	10,471	SF	1.00	10,471
	226	Exhaust fans	10,471	SF	5.00	52,355
	227					
	228	Miscellaneous HVAC				
	229	Project requirements, project management, detailing, coordination, etc.	1	LS	176,227.02	176,227
	230					
	231	HVAC				1,155,266
	232					
D1540	233	FIRE PROTECTION				
	234					
	235					
	236	Automatic wet sprinkler system	10,471	SF	12.00	125,652
	237	Room 109				
	238	FM200 and control panel	353	SF	300.00	105,900

**SAN FRANCISCO CABLE CAR BARN
 ROM ESTIMATE OF PROBABLE CONSTRUCTION COST
 (AN OPINION OF PROBABLE CONSTRUCTION COSTS)
 BASED ON FINAL MASTERPLAN DOCUMENTS
 4.3 PHASE 2: OFFICE IMPROVEMENTS**

Date: 07/22/2022 Final

Floor Area: 10,471 GSF

Elem.	#	Description	Quantity	Unit	Unit Cost	Total
	239	Preaction double interlock system	1	LS	40,000.00	40,000
	240					
	241	FIRE PROTECTION				271,552
	242					
D5010	243					
	244	ELECTRICAL DISTRIBUTION				
	245					
	246	Main normal power				
	247	480V Distribution switchboard, 800A	1	LS	68,000.00	68,000
	248	Reuse existing panelboards				Existing
	249	Feeder conduit and wire	300	LF	1,250.00	375,000
	250	Power monitoring	1	LS	15,000.00	15,000
	251	Grounding	10,471	SF	0.50	5,236
	252					
	253	Machine and equipment power				
	254	Carpentry power				Existing
	255	Miscellaneous power connections	10,471	SF	1.50	15,707
	256					
	257	User convenience power				
	258	Receptacles	10,471	SF	6.00	62,826
	259					
	260	Trade demolition				
	261	Demo existing	10,471	SF	10.00	104,710
	262					
	263	Miscellaneous electrical				
	264	Project requirements, project management, detailing, coordination, etc.	1	LS	116,366.22	116,366
	265					
	266	ELECTRICAL DISTRIBUTION				762,845
	267					
D5020	268					
	269	LIGHTING & BRANCH WIRING				
	270					
	271	Lighting	10,471	SF	35.00	366,485
	272					
	273	LIGHTING & BRANCH WIRING				366,485
	274					
	275					

**SAN FRANCISCO CABLE CAR BARN
 ROM ESTIMATE OF PROBABLE CONSTRUCTION COST
 (AN OPINION OF PROBABLE CONSTRUCTION COSTS)
 BASED ON FINAL MASTERPLAN DOCUMENTS
 4.3 PHASE 2: OFFICE IMPROVEMENTS**

Date: 07/22/2022 Final

Floor Area: 10,471 GSF

Elem.	#	Description	Quantity	Unit	Unit Cost	Total
D5030	276	COMMUNICATION & SECURITY				
	277					
	278	Telecommunications, including CAT6A cabling, conduit and outlets and WAPs	10,471	SF	18.00	188,478
	279	Fire alarm system, including new fire alarm panel and annunciator, fire alarm devices, conduit and cable	10,471	SF	18.00	188,478
	280	Security system, including access control, video surveillance monitoring, conduit and cable	10,471	SF	6.00	62,826
	281					
	282	COMMUNICATION & SECURITY				439,782
D5040	283					
	284	AUDIO VISUAL SYSTEM				
	285					
	286	A/V conduit only	10,471	SF	5.00	52,355
	287					
288	AUDIO VISUAL SYSTEM				52,355	
E10	289					
	290	OTHER EQUIPMENT				
	291					
	292	Residential grade kitchen appliances - allow	1	LS	10,000.00	10,000
	293	Bicycle rack	1	LS	3,500.00	3,500
	294	Miscellaneous equipment (AV, etc.) - allow	10,471	SF	10.00	104,710
	295					
296	OTHER EQUIPMENT				118,210	
E20	297					
	298	CASEWORK				
	299					
	300	Built-in casework	43	LF	600.00	25,800
	301	Miscellaneous fixed furnishings - allow	10,471	SF	3.00	31,413
	302					
303	CASEWORK				57,213	
304						
305						

**SAN FRANCISCO CABLE CAR BARN
ROM ESTIMATE OF PROBABLE CONSTRUCTION COST
(AN OPINION OF PROBABLE CONSTRUCTION COSTS)
BASED ON FINAL MASTERPLAN DOCUMENTS
4.4 PHASE 3A: PROGRAMMING RESTRUCTURING**

Date: 07/22/2022 Final

Floor Area: 7,766 GSF

Elem.	#	Description	Quantity	Unit	Unit Cost	Total
A1010	1					
	2	TRADE DEMOLITION				
	3					
	4	Demolition as required - allow	8,119	SF	12.50	101,488
	5					
	6	TRADE DEMOLITION				101,488
	7					
C1010	60	PARTITIONS				
	61					
	62	New metal stud partition framing	1,794	SF	22.50	40,365
	63	Insulation at new interior partition	1,794	SF	5.00	8,970
	64	Gypsum board partition sheathing, taped and sanded	3,588	SF	7.50	26,910
	65	Patch and repair existing interior partitions and wall surrounding build-out - allow	2,500	SF	2.50	6,250
	66	Acoustic sealant	478	LF	5.00	2,390
	67	Wire mesh partition	172	LF	150.00	25,800
	68	Premium, removeable wire mesh partition	25	LF	50.00	1,250
	69					
	70	PARTITIONS				111,935
	71					
	C1020	72				
73		INTERIOR DOORS				
74						
75		Hollow metal door in hollow metal frame with hardware, 6'-0" x 7'-0" pair	1	PR	6,000.00	6,000
76		Hollow metal door in hollow metal frame with hardware, 3'-0" x 7'-0" single	1	EA	3,500.00	3,500
77		Hollow metal door in hollow metal frame with hardware and side narrow lite, 3'-0" x 7'-0" single	1	EA	3,850.00	3,850
78		Wire mesh pedestrian gate	2	EA	1,750.00	3,500
79		Wire mesh sliding gate	3	EA	3,500.00	10,500
80		Overhead coiling door, 10'-0" x 9'-0"	1	EA	11,250.00	11,250
81		Overhead coiling door, 12'-0" x 9'-0"	1	EA	13,500.00	13,500
82		Specialty hardware (panic, etc.) - allow	1	LS	5,000.00	5,000

**SAN FRANCISCO CABLE CAR BARN
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 (AN OPINION OF PROBABLE CONSTRUCTION COSTS)
 BASED ON FINAL MASTERPLAN DOCUMENTS
 4.4 PHASE 3A: PROGRAMMING RESTRUCTURING**

Date: 07/22/2022 Final

Floor Area: 7,766 GSF

Elem.	#	Description	Quantity	Unit	Unit Cost	Total
	83	Card readers, etc. - allow	1	EA	5,000.00	5,000
	84					
	85	INTERIOR DOORS				62,100
	86					
C1030	87					
	88	SPECIALTIES				
	89					
	90	Interior code related signage - allow	8,119	SF	2.50	20,298
	91	Miscellaneous interior fittings - allow	8,119	SF	2.50	20,298
	92					
	93	SPECIALTIES				40,596
	94					
C3010	95					
	96	WALL FINISHES				
	97					
	98	Paint to walls	6,088	SF	3.50	21,308
	99					
	100	WALL FINISHES				21,308
	101					
C3020	102					
	103	FLOOR FINISHES				
	104					
	105	New flooring finish with base - allow	7,766	SF	15.00	116,490
	106					
	107	FLOOR FINISHES				116,490
	108					
C3030	109					
	110	CEILING FINISHES				
	111					
	112	New ceiling finish - allow	7,766	SF	20.00	155,320
	113					
	114	CEILING FINISHES				155,320
	115					
D1520	123	PLUMBING				
	124					
	125	Sanitary fixtures	5	FX		
	126	Waterclosets	1	EA	3,500.00	3,500
	127	Urinals	1	EA	2,000.00	2,000
	128	Lavatories	1	EA	2,800.00	2,800

**SAN FRANCISCO CABLE CAR BARN
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 4.4 PHASE 3A: PROGRAMMING RESTRUCTURING**

Date: 07/22/2022 Final

Floor Area: 7,766 GSF

Elem.	#	Description	Quantity	Unit	Unit Cost	Total
	129	Sinks	1	EA	3,500.00	3,500
	130	Drinking fountains/bottle fillers	1	EA	7,500.00	7,500
	131					
	132	Sanitary waste, vent and domestic service piping				
	133	Fixture rough-ins	5	EA	15,000.00	75,000
	134	Condensate drainage	7,766	SF	3.50	27,181
	135					
	136	Water treatment and storage				
	137	Electric water heaters	7,766	SF	20.00	155,320
	138					
	139	Gas distribution				
	140	None	7,766	SF	2.50	19,415
	141					
	142	Surface water drainage				
	143	None	7,766	SF	5.00	38,830
	144					
	145	Testing and sterilization				
	146	Testing and sterilization	7,766	SF	2.50	19,415
	147					
	148	Industrial Fixtures				
	149	Eyewash, complete with in-line tepid water heater	7,766	SF	2.50	19,415
	150					
	151	Industrial equipment				
	152	Compressed air and dryer				See Equipment
	153	Vacuum pump	1	LS	35,000.00	35,000
	154					
	155	Industrial distribution piping				
	156	Vacuum piping	7,766	SF	8.00	62,128
	157	Compressed air piping	7,766	SF	8.00	62,128
	158	Natural gas piping	7,766	SF	8.00	62,128
	159	Valves and specialties, including outlets	7,766	SF	3.00	23,298
	160	Connection to existing	7,766	SF	3.00	23,298
	161					
	162	Miscellaneous Plumbing				
	163	Project requirements, project management, detailing, coordination, etc.	1	LS	115,534.08	115,534
	164					
	165	PLUMBING				757,390
	166					

**SAN FRANCISCO CABLE CAR BARN
 ROM ESTIMATE OF PROBABLE CONSTRUCTION COST
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 BASED ON FINAL MASTERPLAN DOCUMENTS
 4.4 PHASE 3A: PROGRAMMING RESTRUCTURING**

Date: 07/22/2022 Final

Floor Area: 7,766 GSF

Elem.	#	Description	Quantity	Unit	Unit Cost	Total	
D1530	167	HVAC					
	168						
	169						
	170		Piping, valves and specialties				
	171		Refrigerant piping, insulation valves and specialties	7,766	SF	6.00	46,596
	172						
	173		Air handling units				
	174		VRF Heat pump system, electric	7,766	SF	15.00	116,490
	175						
	176		Air distribution and return				
	177		Galvanized sheetmetal ductwork, volume dampers, duct insulation, sound traps	7,766	SF	18.00	139,788
	179		Diffusers, registers and grilles				
	180		Diffusers, registers and grilles	7,766	SF	3.00	23,298
	182		Passive system				
	183		Electric radiant heaters	7,766	SF	10.00	77,660
	184		Electric wall radiators	7,766	SF	14.00	108,724
	185						
	186		Controls and instrumentation				
	187		DDC controls	7,766	SF	12.00	93,192
	188						
189	Testing and balancing						
190	Testing and balancing	7,766	SF	3.00	23,298		
191	Commissioning assistance	7,766	SF	1.50	11,649		
192							
193	Unit Ventilation						
194	Galvanized sheetmetal ductwork, exhaust	7,766	SF	2.00	15,532		
195	Stainless steel ductwork, exhaust	7,766	SF	3.00	23,298		
196	Exhaust fans	7,766	SF	5.00	38,830		
197							
198	Miscellaneous HVAC						
199	Project requirements, project management, detailing, coordination, etc.	1	LS	129,303.90	129,304		
200							
201	HVAC				847,659		
202							
D1540	203	FIRE PROTECTION					
	204						
	205						

**SAN FRANCISCO CABLE CAR BARN
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 (AN OPINION OF PROBABLE CONSTRUCTION COSTS)
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 4.4 PHASE 3A: PROGRAMMING RESTRUCTURING**

Date: 07/22/2022 Final

Floor Area: 7,766 GSF

Elem.	#	Description	Quantity	Unit	Unit Cost	Total
	206	Automatic wet sprinkler system - modify and reuse existing	7,766	SF	12.00	93,192
	207					
	208	FIRE PROTECTION				93,192
	209					
D5010	210					
	211	ELECTRICAL DISTRIBUTION				
	212					
	213	Main normal power				
	214	480V Distribution switchboard, 800A	1	LS	68,000.00	68,000
	215	Reuse existing panelboards				Existing
	216	Feeder conduit and wire	300	LF	1,500.00	450,000
	217	Power monitoring	1	LS	15,000.00	15,000
	218	Grounding	7,766	SF	0.50	3,883
	219					
	220	Machine and equipment power				
	221	Carpentry power				Existing
	222	2 ton bridge crane	1	EA	85,000.00	85,000
	223	Miscellaneous power connections	7,766	SF	3.00	23,298
	224					
	225	User convenience power				
	226	Receptacles	7,766	SF	6.00	46,596
	227					
	228	Trade demolition				
	229	Demo existing	7,766	SF	10.00	77,660
	230					
	231	Miscellaneous electrical				
	232	Project requirements, project management, detailing, coordination, etc.	1	LS	138,498.66	138,499
	233					
	234	ELECTRICAL DISTRIBUTION				907,936
	235					
	236					

**SAN FRANCISCO CABLE CAR BARN
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 4.4 PHASE 3A: PROGRAMMING RESTRUCTURING**

Date: 07/22/2022 Final

Floor Area: 7,766 GSF

Elem.	#	Description	Quantity	Unit	Unit Cost	Total
D5020	237	LIGHTING & BRANCH WIRING				
	238					
	239	Lighting	7,766	SF	30.00	232,980
	240					
	241	LIGHTING & BRANCH WIRING				232,980
D5030	242					
	243					
	244	COMMUNICATION & SECURITY				
	245					
	246	Telecommunications, including CAT6A cabling, conduit and outlets and WAPs				Not Required
	247	Fire alarm system, including new fire alarm panel and annunciator, fire alarm devices, conduit and cable	7,766	SF	18.00	139,788
	248	Security system, including access control, video surveillance monitoring, conduit and	7,766	SF	6.00	46,596
D5040	249					
	250	COMMUNICATION & SECURITY				186,384
	251					
	252					
E10	253	AUDIO VISUAL SYSTEM				
	254					
	255	A/V conduit only	7,766	SF	5.00	38,830
	256					
E10	257	AUDIO VISUAL SYSTEM				38,830
	258					
	259	OTHER EQUIPMENT				
	260					
	261	Machine shop equipment				
	262	CNC Lathe	1	EA	15,000.00	15,000
	263	Lathe Bed	1	EA		Relocate Existing
	264	Manual Lathes	1	EA		Relocate Existing
	265	Vertical Mill - Haas	1	EA		Relocate Existing
	266	Vertical Mill - Bridgeport	1	EA		Relocate Existing
	267	Drill press	1	EA		Relocate Existing
	268	Gear head drill press	1	EA		Relocate Existing
	269	Hydraulic press	1	EA		Relocate Existing
270	Arbor Press	1	EA		Relocate Existing	
271	Hydraulic press	1	EA		Relocate Existing	
272	Vertical band saw	1	EA		Relocate Existing	
273	Horizontal band saw	1	EA		Relocate Existing	
274	Hydraulic ironworker	1	EA		Relocate Existing	

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(AN OPINION OF PROBABLE CONSTRUCTION COSTS)
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4.4 PHASE 3A: PROGRAMMING RESTRUCTURING**

Date: 07/22/2022 Final

Floor Area: 7,766 GSF

Elem.	#	Description	Quantity	Unit	Unit Cost	Total
	275	Floor sander	1	EA		Relocate Existing
	276	Parts washer	1	EA		Relocate Existing
	277	Drum-mounted parts washer	1	EA		Relocate Existing
	278	Sand blaster cabinet	1	EA		Relocate Existing
	279	Pedestal grinder	1	EA		Relocate Existing
	280	Drill sharpener	1	EA		Relocate Existing
	281	End Mill sharpener	1	EA		Relocate Existing
	282	CNC tooling carts	1	EA		Relocate Existing
	283	Jib crane 1.5 tons	1	EA	2,500.00	2,500
	284	Plasma cutter	1	EA		Relocate Existing
	285	Automatic surface grinder	1	EA	7,500.00	7,500
	286	Pipe storage	1	EA		Relocate Existing
	287	Relocate and move existing equipment	200	HR	125.00	25,000
	288					
	289	Weld Shop				
	290	Welder	1	EA		Relocate Existing
	291	Stick welder	1	EA		Relocate Existing
	292	Mig Cart	1	EA		Relocate Existing
	293	Welder - Miller	1	EA		Relocate Existing
	294	Oxygen/Acetylene Cart	1	EA		Relocate Existing
	295	Welding fume extractor	1	EA		Relocate Existing
	296	Pedestal grinder	1	EA		Relocate Existing
	297	Welding /Frame Table	1	EA		Relocate Existing
	298	Tool workstation	1	EA		Relocate Existing
	299	Desk workstation	1	EA		Relocate Existing
	300	Cabinet storage	1	EA		Relocate Existing
	301	Tool cabinet	1	EA		Relocate Existing
	302	Table workstation	1	EA		Relocate Existing
	303	Storage shelves	1	EA		Relocate Existing
	304	Smog Hog	1	EA		Relocate Existing
	305	Metal cart	1	EA		Relocate Existing
	306	Scrap metal storage area	1	EA		Relocate Existing
	307	Scape metal cart	1	EA		Relocate Existing
	308	Relocate and move existing equipment	144	HR	125.00	18,000
	309					
	310	New inspection room				
	311	Hardness tester	1	EA		Relocate Existing
	312	Measuring arm	1	EA		Relocate Existing
	313	Optical comparator	1	EA		Relocate Existing
	314	Tools storage	1	EA		Relocate Existing
	315	Granite block table	1	EA		Relocate Existing
	316	Spring compressor	1	EA		Relocate Existing

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4.4 PHASE 3A: PROGRAMMING RESTRUCTURING**

Date: 07/22/2022 Final

Floor Area: 7,766 GSF

Elem.	#	Description	Quantity	Unit	Unit Cost	Total
	317	Relocate and move existing equipment	48	HR	125.00	6,000
	318					
	319	Grip Building Area				
	320	Elevating platforms	2	EA		Relocate Existing
	321	Workstations	2	EA		Relocate Existing
	322	Tool cabinet	1	EA		Relocate Existing
	323	Parts washer	1	EA		Relocate Existing
	324	Scrap metal cart	1	EA		Relocate Existing
	325	Palette	1	EA		Relocate Existing
	326	Grip Washer	1	EA		Relocate Existing
	327	Relocate and move existing equipment	72	HR	125.00	9,000
	328					
	329	Steam Cleaning Area				
	330	Parts washer	1	EA		Relocate Existing
	331	Pressure washer	1	EA		Relocate Existing
	332	Steam cleaning bay	1	EA		Relocate Existing
	333	Hot pressure washer	1	EA		Relocate Existing
	334	Relocate and move existing equipment	32	HR	125.00	4,000
	335					
	336	Paint Group				
	337	Vehicle Duster	1	EA		Relocate Existing
	338	Air filtration	1	EA	3,000.00	3,000
	339	Parts washer	2	EA		Relocate Existing
	340	Air compressor	1	EA		Relocate Existing
	341	Shop vacuum	1	EA		Relocate Existing
	342	Bench buffer	1	EA		Relocate Existing
	343	Relocate and move existing equipment	56	HR	125.00	7,000
	344					
	345	Pulley Assembly Area				
	346	H Frame press	1	EA		Relocate Existing
	347	Pedestal grinder	1	EA		Relocate Existing
	348	Wheel racks storage	1	EA		Relocate Existing
	349	Depression work beam area	1	EA		Relocate Existing
	350	Sandblaster cabinet	1	EA		Relocate Existing
	351	Mobile cart	2	EA		Relocate Existing
	352	Tool workstation	1	EA		Relocate Existing
	353	LG pulley storage	2	EA		Relocate Existing
	354	Mobile shield	2	EA		Relocate Existing
	355	SM pulley storage	3	EA		Relocate Existing
	356	Tool box	1	EA		Relocate Existing
	357	Depression beam storage	1	EA		Relocate Existing
	358	Miscellaneous shelving	2	EA		Relocate Existing

**SAN FRANCISCO CABLE CAR BARN
 ROM ESTIMATE OF PROBABLE CONSTRUCTION COST
 (AN OPINION OF PROBABLE CONSTRUCTION COSTS)
 BASED ON FINAL MASTERPLAN DOCUMENTS
 4.4 PHASE 3A: PROGRAMMING RESTRUCTURING**

Date: 07/22/2022 Final

Floor Area: 7,766 GSF

Elem.	#	Description	Quantity	Unit	Unit Cost	Total
	359	Relocate and move existing equipment	152	HR	125.00	19,000
	360					
	361	Car Cleaning and Level 2 Storage				
	362	Shed	1	EA		Relocate Existing
	363	55 gallon drums	5	EA		Relocate Existing
	364	1 gallon Adran Jel-R	6	EA		Relocate Existing
	365	1 gallon SF Blue	6	EA		Relocate Existing
	366	Storage rack	1	EA		Relocate Existing
	367	Metal garbage bin	2	EA		Relocate Existing
	368	Recycling bin	1	EA		Relocate Existing
	369	Compost bin	3	EA		Relocate Existing
	370	Sand pallet	6	EA		Relocate Existing
	371	Relocate and move existing equipment	248	HR	125.00	31,000
	372					
	373	Compact storage	1	LS	25,000	25,000
	374					
	375	Residential grade kitchen appliances - allow	1	LS	10,000	10,000
	376	Miscellaneous equipment (AV, etc.) - allow	8,119	SF	10.00	81,190
	377					
	378	OTHER EQUIPMENT				263,190
	379					
E20	380	CASEWORK				
	381					
	382					
	383	Built-in casework	23	LF	600.00	13,800
	384	Miscellaneous fixed furnishings - allow	8,119	SF	3.00	24,357
	385					
	386	CASEWORK				38,157

SAN FRANCISCO CABLE CAR BARN
ROM CONSTRUCTION COST ESTIMATE
(AN OPINION OF PROBABLE CONSTRUCTION COSTS)
Final Master Plan Documents
4.5 PHASE 3B: CARPENTRY UPGRADES

Date: 07/22/2022 Final

Roof Area 3,440 GSF

Elem.	#	Description	Quantity	Unit	Unit Cost	Total					
A1010	1	TRADE DEMOLITION	3,440	SF	12.50	43,000					
	2										
	3										
	4	Demolition as required - allow									
	5										
	6	TRADE DEMOLITION				43,000					
	7										
C1010	94	PARTITIONS									
	95										
	96	New metal stud partition framing	2,370	SF	22.50	53,325					
	97	Insulation at new interior partition	2,370	SF	5.00	11,850					
	98	Gypsum board partition sheathing, taped and sanded	4,740	SF	7.50	35,550					
	99	Patch and repair existing interior partitions and wall surrounding build-out - allow	1,500	SF	2.50	3,750					
	100	Acoustic sealant	632	LF	5.00	3,160					
	101	Interior glazing	32	SF	150.00	4,800					
	102	Wire mesh partition	10	LF	150.00	1,500					
	103										
	104	PARTITIONS				113,935					
	105										
	C1020	106	INTERIOR DOORS								
107											
108											
109		Hollow metal door in hollow metal frame with hardware and half glass, 3'-0" x 7'-0" single	2	EA	4,000.00	8,000					
		Hollow metal door in hollow metal frame with hardware and narrow side glass, 3'-0" x 7'-0" single	2	EA	3,850.00	7,700					
111		Wire mesh pedestrian gate	1	EA	1,750.00	1,750					
112		Specialty hardware (panic, etc.) - allow	1	LS	7,500.00	7,500					
113		Card readers, etc. - allow	1	EA	7,500.00	7,500					
114											
115		INTERIOR DOORS				32,450					
116											
C1030	117	SPECIALTIES									
	118										
	119										
	120						Interior code related signage - allow	3,440	SF	2.50	8,600
	121						Removeable guardrail at Pits	240	LF	500.00	120,000
	122						Miscellaneous interior fittings - allow	3,440	SF	2.50	8,600
123											

**SAN FRANCISCO CABLE CAR BARN
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(AN OPINION OF PROBABLE CONSTRUCTION COSTS)
Final Master Plan Documents
4.5 PHASE 3B: CARPENTRY UPGRADES**

Date: 07/22/2022 Final

Roof Area 3,440 GSF

Elem.	#	Description	Quantity	Unit	Unit Cost	Total
	124	SPECIALTIES				137,200
	125					
C3010	126	WALL FINISHES				
	127					
	128					
	129	Paint to walls	6,240	SF	3.50	21,840
	130					
	131	WALL FINISHES				21,840
	132					
C3020	133	FLOOR FINISHES				
	134					
	135					
	136	New flooring finish with base - allow	3,440	SF	15.00	51,600
	137					
	138	FLOOR FINISHES				51,600
	139					
C3030	140	CEILING FINISHES				
	141					
	142					
	143	New ceiling finish - allow	3,440	SF	20.00	68,800
	144					
	145	CEILING FINISHES				68,800
	146					
D1520	147	PLUMBING				
	166					
	167					
	168	Sanitary fixtures	1	FX		
	169	Sinks	1	EA	3,500.00	3,500
	170					
	171	Sanitary waste, vent and domestic service piping				
	172	Fixture rough-ins	1	EA	15,000.00	15,000
	173	Condensate drainage	3,440	SF	3.50	12,040
	174					
	175	Water treatment and storage				
	176	Electric water heaters	3,440	SF	20.00	68,800
	177					

**SAN FRANCISCO CABLE CAR BARN
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Final Master Plan Documents
4.5 PHASE 3B: CARPENTRY UPGRADES**

Date: 07/22/2022 Final

Roof Area 3,440 GSF

Elem.	#	Description	Quantity	Unit	Unit Cost	Total
	178	Gas distribution				
	179	None	3,440	SF	2.50	8,600
	180					
	181	Surface water drainage				
	182	None	3,440	SF	5.00	17,200
	183					
	184	Testing and sterilization				
	185	Testing and sterilization	3,440	SF	2.50	8,600
	186					
	187	Industrial Fixtures				
	188	Eyewash, complete with in-line tepid water heater	1	EA	6,000.00	6,000
	189					
	190	Industrial equipment				
	191	Compressed air and dryer				See Equipment
	192	Vacuum dust collector	1	LS	35,000.00	35,000
	193					
	194	Industrial distribution piping				
	195	Vacuum piping	3,440	SF	8.00	27,520
	196	Compressed air piping	3,440	SF	8.00	27,520
	197	Natural gas piping	3,440	SF	8.00	27,520
	198	Valves and specialties, including outlets	3,440	SF	3.00	10,320
	199	Connection to existing	3,440	SF	3.00	10,320
	200					
	201	Miscellaneous Plumbing				
	202	Project requirements, project management, detailing, coordination, etc.	1	LS	50,029.20	50,029
	203					
	204					
	205	PLUMBING				327,969
	206					
D1530	207					
	208	HVAC				
	209					
	210	Piping, valves and specialties				
	211	Refrigerant piping, insulation valves and specialties	3,440	SF	6.00	20,640
	212					
	213	Air handling units				
	214	VRF Heat pump system, electric	3,440	SF	18.00	61,920
	215					
	216	Air distribution and return				

**SAN FRANCISCO CABLE CAR BARN
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Final Master Plan Documents
4.5 PHASE 3B: CARPENTRY UPGRADES**

Date: 07/22/2022 Final

Roof Area 3,440 GSF

Elem.	#	Description	Quantity	Unit	Unit Cost	Total
	217	Galvanized sheetmetal ductwork, volume dampers, duct insulation, sound traps	3,440	SF	18.00	61,920
	218					
	219	Diffusers, registers and grilles				
	220	Diffusers, registers and grilles	3,440	SF	3.00	10,320
	221					
	222	Passive system				
	223	Electric radiant heaters	3,440	SF	20.00	68,800
	224	Electric wall radiators	3,440	SF	15.00	51,600
	225					
	226	Controls and instrumentation				
	227	DDC controls	3,440	SF	12.00	41,280
	228					
	229	Testing and balancing				
	230	Testing and balancing	3,440	SF	2.50	8,600
	231	Commissioning assistance	3,440	SF	1.00	3,440
	232					
	233	Unit Ventilation				
	234	Galvanized sheetmetal ductwork, exhaust	3,440	SF	15.00	51,600
	235	Stainless steel ductwork, exhaust	3,440	SF	15.00	51,600
	236	Exhaust fans	3,440	SF	5.00	17,200
	237					
	238	Miscellaneous HVAC				
	239	Project requirements, project management, detailing, coordination, etc.	1	LS	80,805.60	80,806
	240					
	241	HVAC				529,726
	242					
D1540	243					
	244	FIRE PROTECTION				
	245					
	246	Automatic wet sprinkler system	3,440	SF	18.00	61,920
	247					
	248	FIRE PROTECTION				61,920
	249					
	250					

**SAN FRANCISCO CABLE CAR BARN
ROM CONSTRUCTION COST ESTIMATE
(AN OPINION OF PROBABLE CONSTRUCTION COSTS)
Final Master Plan Documents
4.5 PHASE 3B: CARPENTRY UPGRADES**

Date: 07/22/2022 Final

Roof Area 3,440 GSF

Elem.	#	Description	Quantity	Unit	Unit Cost	Total
D5010	251	ELECTRICAL DISTRIBUTION				
	252					
	253	Main normal power				
	254	480V Distribution switchboard, 800A	1	LS	68,000.00	68,000
	255	Reuse existing panelboards				Existing
	256	Feeder conduit and wire	300	LF	1,500.00	450,000
	257	Power monitoring	1	LS	15,000.00	15,000
	258	Grounding	3,440	SF	0.50	1,720
	259					
	260	Machine and equipment power				
	261	Carpentry power				Existing
	262	Miscellaneous power connections	3,440	SF	1.50	5,160
	263					
	264	User convenience power				
	265	Receptacles	3,440	SF	6.00	20,640
	266					
	267	Trade demolition				
	268	Demo existing	3,440	SF	10.00	34,400
	269					
	270	Miscellaneous electrical				
	271	Project requirements, project management, detailing, coordination, etc.	1	LS	107,085.60	107,086
	272					
	273	ELECTRICAL DISTRIBUTION				702,006
274						
D5020	275	LIGHTING & BRANCH WIRING				
	276					
	277					
	278	Lighting	3,440	SF	30.00	103,200
	279					
280	LIGHTING & BRANCH WIRING				103,200	
281						
D5030	282	COMMUNICATION & SECURITY				
	283					
	284					
	285	Telecommunications, including CAT6A cabling, conduit and outlets and WAPs				Not Required
	286	Fire alarm system, including new fire alarm panel and annunciator, fire alarm devices, conduit and cable	3,440	SF	18.00	61,920
287	Security system, including access control, video surveillance monitoring, conduit and cable	3,440	SF	6.00	20,640	

**SAN FRANCISCO CABLE CAR BARN
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4.5 PHASE 3B: CARPENTRY UPGRADES**

Date: 07/22/2022 Final

Roof Area 3,440 GSF

Elem.	#	Description	Quantity	Unit	Unit Cost	Total
	288					
	289	COMMUNICATION & SECURITY				82,560
	290					
D5040	291					
	292	AUDIO VISUAL SYSTEM				
	293					
	294	A/V conduit only	3,440	SF	5.00	17,200
	295					
	296	AUDIO VISUAL SYSTEM				17,200
	297					
E10	298					
	299	OTHER EQUIPMENT				
	300					
	301	Prefabricated Paint Booth				
	302	Garmat Frontier Spray Booth #46008	1	LS	134,393.55	134,394
	303	Duct package	1	LS	7,300.00	7,300
	304	Mechanical installation	1	LS	23,360.00	23,360
	305	Electrical/air line	1	LS	8,833.00	8,833
	306	Roof framing	2	EA	401.50	803
	307	Gas Plumbing	1	EA	803.00	803
	308	Fire sprinkler system - included				0
	309	Start-up	1	EA	1,533.00	1,533
	310	Rental	2	EA	802.50	1,605
	311	Freight	1	EA	5,000.00	5,000
	312	Permit Service	1	EA	3,750.00	3,750
	313	Permit Package	1	EA	3,125.00	3,125
	314	Tax	8.625%	%	141,694.00	12,221
	315	Anchoring				Included
	316	Slab on grade - existing				Existing
	317					
	318	Spray Room				
	319	No Equipment				
	321	Carpentry				
	322	Sliding miter saw	1	EA		Relocate Existing
	323	Dust extractor	1	EA		Relocate Existing
	324	Vertical bandsaw	1	EA		Relocate Existing
	325	Standing drill press	1	EA		Relocate Existing
	326	Bench grinder	1	EA		Relocate Existing
	327	Shop vac	1	EA		Relocate Existing
	328	Table saw	1	EA		Relocate Existing
	329	Dust collector	1	EA		Relocate Existing
	330	Band saw	1	EA		Relocate Existing

**SAN FRANCISCO CABLE CAR BARN
ROM CONSTRUCTION COST ESTIMATE
(AN OPINION OF PROBABLE CONSTRUCTION COSTS)
Final Master Plan Documents
4.5 PHASE 3B: CARPENTRY UPGRADES**

Date: 07/22/2022 Final

Roof Area 3,440 GSF

Elem.	#	Description	Quantity	Unit	Unit Cost	Total
	331	Jointer	1	EA		Relocate Existing
	332	Planer	1	EA		Relocate Existing
	333	Sander	1	EA		Relocate Existing
	334	Table workstation	1	EA		Relocate Existing
	335	Storage shelves	1	EA		Relocate Existing
	336	Smog Hog	1	EA		Relocate Existing
	337	Metal cart	1	EA		Relocate Existing
	338	Scrap metal storage area	1	EA		Relocate Existing
	339	Scape metal cart	1	EA		Relocate Existing
	340	Spindle sander	1	EA		Relocate Existing
	341	Router Table - Replace	1	EA	1,000.00	1,000
	342	Air filtration system - Ceiling Mount OFCI	1	EA	600.00	600
	343	Paint Shaker	1	EA		Relocate Existing
	344	Dust extractor (HEPA)	1	EA		Relocate Existing
	345	Relocate and move existing equipment	184	HR	125.00	23,000
	346					
	347	Miscellaneous equipment (AV, etc.) - allow	3,440	SF	10.00	34,400
	348					
	349	OTHER EQUIPMENT				261,727
	350					
E20	351	CASEWORK				
	352					
	353					
	354	Miscellaneous fixed furnishings - allow	3,440	SF	3.00	10,320
	355					
	356	CASEWORK				10,320

**SAN FRANCISCO CABLE CAR BARN
 ROM ESTIMATE OF PROBABLE CONSTRUCTION COST
 (AN OPINION OF PROBABLE CONSTRUCTION COSTS)
 BASED ON FINAL MASTERPLAN DOCUMENTS
 4.6 PHASE 4: ROOF REPLACEMENT**

Date: 07/22/2022 Final

Floor Area: 20,700 GSF

Elem.	#	Description	Quantity	Unit	Unit Cost	Total
A1010	1	TRADE DEMOLITION				
	2					
	3	Demo existing roof as required - allow	29,661	SF	10.00	296,610
	4					
	5	TRADE DEMOLITION				296,610
	6					
B1020	7					
	50	ROOF CONSTRUCTION				
	51					
	52	Seismic upgrade to roof as required	29,661	SF	45.00	1,334,745
	53					
54	ROOF CONSTRUCTION				1,334,745	
55						
B3010	80					
	81	ROOF COVERINGS				
	82					
	83	New membrane roofing system with red aggregate	29,661	SF	30.00	889,830
	84	Protection board	29,661	SF	8.00	237,288
	85	Rigid insulation	29,661	SF	10.00	296,610
	86	Sheetmetal and flashing including parapet cap	29,661	SF	25.00	741,525
	87	Caulking and sealants	29,661	SF	5.00	148,305
	88					
	89	ROOF COVERINGS				2,313,558
90						
B3020	91					
	92	ROOF OPENINGS				
	93					
	94	New skylight	240	SF	550.00	132,000
	95					
	96	ROOF OPENINGS				132,000
97						
D1010	134					
	135	ELEVATORS & LIFTS				
	136	See Phase 2				
	137					
	138	ELEVATORS & LIFTS				
139						
D1520	153	PLUMBING				
	154					

**SAN FRANCISCO CABLE CAR BARN
 ROM ESTIMATE OF PROBABLE CONSTRUCTION COST
 (AN OPINION OF PROBABLE CONSTRUCTION COSTS)
 BASED ON FINAL MASTERPLAN DOCUMENTS
 4.6 PHASE 4: ROOF REPLACEMENT**

Date: 07/22/2022 Final

Floor Area: 20,700 GSF

Elem.	#	Description	Quantity	Unit	Unit Cost	Total
	155	Roof drains/overflow drains, scuppers and drainage system	29,661	SF	5.00	148,305
	156					
	157	PLUMBING				148,305
	158					

**SAN FRANCISCO CABLE CAR BARN
 ROM ESTIMATE OF PROBABLE CONSTRUCTION COST
 (AN OPINION OF PROBABLE CONSTRUCTION COSTS)
 BASED ON FINAL MASTERPLAN DOCUMENTS
 4.7 PHASE 5: SEISMIC IMPROVEMENTS**

Date: 07/22/2022 Final

Floor Area:

0 GSF

Elem.	#	Description	Quantity	Unit	Unit Cost	Total
5.2.1	1	CHIMNEY SEPERATION				
	2	Terminate connection between chimney and masonry wall above 2nd floor				
	3	Terminate connection - allow	320	SF	75.00	24,000
	4	Reinforced effected area as required - allow	320	SF	150.00	48,000
	5	New connection between main roof diaphragm and chimney - allow	15	TN	10,500.00	157,500
	6	Miscellaneous metals and rough carpentry - allow	1	LS	90,000.00	90,000
	7	Patch and repair as required - allow	1	LS	35,000.00	35,000
	8					
	9	Total Direct Cost				354,500
	10					
	11	ADD MARKUPS (CUMULATIVE)				
	12	GENERAL CONDITIONS AND REQUIREMENTS	20.0%	%	354,500.00	70,900
	13	MARKET FACTOR	5.0%	%	425,400.00	21,270
	14	OVERHEAD AND PROFIT	10.0%	%	446,670.00	44,667
	15	BONDING AND INSURANCE	2.5%	%	491,337.00	12,283
	16	DESIGN CONTINGENCY	30.0%	%	503,620.43	151,086
	17	BASE CONSTRUCTION COST (Unescalated)			654,706.55	
	18	ESCALATION - PHASE 5	32.6%	%	213,657.00	69,725
	19	BASE CONSTRUCTION COST (Escalated)			724,431.32	0
	20					
	21	CHIMNEY SEPERATION				724,431
22						
5.2.2A	23	SOUTH AND EAST WALLS ALONG WASHINGTON/MASON STREET				
	24	SHOTCRETE/DOWELS				
	25	Remove existing shotcrete layer, protect existing rebar dowels to existing masonry wall in place - allow	16,610	SF	12.50	207,625
	26	Reinforced effected area as required - allow	16,610	SF	15.00	249,150
	27	Anchor new reinforcing into existing grade beam - allow	302	LF	500.00	151,000
	28	Foundation rework - allow	1	LS	150,000.00	150,000
	29	New shotcrete wall	16,610	SF	45.00	747,450
	30	Miscellaneous metals and rough carpentry - allow	1	LS	300,000.00	300,000
	31	Patch and repair as required - allow	1	LS	150,000.00	150,000
	32					
	33	Total Direct Cost				1,955,225
	34					
	35	ADD MARKUPS (CUMULATIVE)				
	36	GENERAL CONDITIONS AND REQUIREMENTS	20.0%	%	1,955,225.00	391,045
	37	MARKET FACTOR	5.0%	%	2,346,270.00	117,314
	38	OVERHEAD AND PROFIT	10.0%	%	2,463,583.50	246,358
	39	BONDING AND INSURANCE	2.5%	%	2,709,941.85	67,749
	40	DESIGN CONTINGENCY	30.0%	%	2,777,690.40	833,307
	41	BASE CONSTRUCTION COST (Unescalated)			3,610,997.52	
	42	ESCALATION - PHASE 5	32.6%	%	1,178,412.00	384,563
	43	BASE CONSTRUCTION COST (Escalated)			3,995,560.17	0
44						
45	SOUTH AND EAST WALLS ALONG WASHINGTON/MASON STREET				3,995,560	

**SAN FRANCISCO CABLE CAR BARN
ROM ESTIMATE OF PROBABLE CONSTRUCTION COST
(AN OPINION OF PROBABLE CONSTRUCTION COSTS)
BASED ON FINAL MASTERPLAN DOCUMENTS
4.7 PHASE 5: SEISMIC IMPROVEMENTS**

Date: 07/22/2022 Final

Floor Area:

0 GSF

Elem.	#	Description	Quantity	Unit	Unit Cost	Total
	46					
5.2.2B	47	SOUTH AND EAST WALLS ALONG WASHINGTON/MASON STREET				
	48	FIBER WRAPS				
	49	Apply fiber wrap (fiber reinforced polymer) on the interior surface of existing shotcrete walls - allow for (2) layers both horizontally and vertically	16,610	SF	180.00	2,989,800
	50	Attach to existing grade beam as required - allow	302	LF	500.00	151,000
	51	Foundation rework - allow	1	LS	150,000.00	150,000
	52	Miscellaneous metals and rough carpentry - allow	1	LS	100,000.00	100,000
	53	Patch and repair as required - allow	1	LS	150,000.00	150,000
	54					
	55	Total Direct Cost				3,540,800
	56					
	57	ADD MARKUPS (CUMULATIVE)				
	58	GENERAL CONDITIONS AND REQUIREMENTS	20.0%	%	3,540,800.00	708,160
	59	MARKET FACTOR	5.0%	%	4,248,960.00	212,448
	60	OVERHEAD AND PROFIT	10.0%	%	4,461,408.00	446,141
	61	BONDING AND INSURANCE	2.5%	%	4,907,548.80	122,689
	62	DESIGN CONTINGENCY	30.0%	%	5,030,237.52	1,509,071
	63	BASE CONSTRUCTION COST (Unescalated)			6,539,308.78	
	64	ESCALATION - PHASE 5	32.6%	%	2,134,036.00	696,421
	65	BASE CONSTRUCTION COST (Escalated)			7,235,729.50	0
	66					
	67	SOUTH AND EAST WALLS ALONG WASHINGTON/MASON STREET				7,235,730
	68					
5.2.3	69	CONCRETE MASONRY UNIT WALL AT GRID LINE G				
	70					
	71	New shear wall from grade beam to 2M floor	900	SF	1,500.00	1,350,000
	72	Foundation rework - allow	1	LS	50,000.00	50,000
	73	Miscellaneous metals and rough carpentry - allow	1	LS	250,000.00	250,000
	74	Patch and repair as required - allow	1	LS	45,000.00	45,000
	75					
	76	Total Direct Cost				1,695,000
	77					
	78	ADD MARKUPS (CUMULATIVE)				
	79	GENERAL CONDITIONS AND REQUIREMENTS	20.0%	%	1,695,000.00	339,000
	80	MARKET FACTOR	5.0%	%	2,034,000.00	101,700
	81	OVERHEAD AND PROFIT	10.0%	%	2,135,700.00	213,570
	82	BONDING AND INSURANCE	2.5%	%	2,349,270.00	58,732
	83	DESIGN CONTINGENCY	30.0%	%	2,408,001.75	722,401
	84	BASE CONSTRUCTION COST (Unescalated)			3,130,402.28	
	85	ESCALATION - PHASE 5	32.6%	%	1,021,575.00	333,381
	86	BASE CONSTRUCTION COST (Escalated)			3,463,782.78	0
	87					
	88	CONCRETE MASONRY UNIT WALL AT GRID LINE G				3,463,783
	89					

**SAN FRANCISCO CABLE CAR BARN
ROM ESTIMATE OF PROBABLE CONSTRUCTION COST
(AN OPINION OF PROBABLE CONSTRUCTION COSTS)
BASED ON FINAL MASTERPLAN DOCUMENTS
4.7 PHASE 5: SEISMIC IMPROVEMENTS**

Date: 07/22/2022 Final

Floor Area:

0 GSF

Elem.	#	Description	Quantity	Unit	Unit Cost	Total
5.2.4	90	ADDING NEW SEISMIC FORCE AT GRID LINES E				
	91					
	92	New shear wall from grade beam to 2M floor	600	SF	1,500.00	900,000
	93	Foundation rework - allow	1	LS	50,000.00	50,000
	94	Miscellaneous metals and rough carpentry - allow	1	LS	150,000.00	150,000
	95	Protect existing passenger elevator as required - allow	1	LS	7,500.00	7,500
	96	Patch and repair as required - allow	1	LS	45,000.00	45,000
	97					
	98	Total Direct Cost				1,152,500
	99					
	100	ADD MARKUPS (CUMULATIVE)				
	101	GENERAL CONDITIONS AND REQUIREMENTS	20.0%	%	1,152,500.00	230,500
	102	MARKET FACTOR	5.0%	%	1,383,000.00	69,150
	103	OVERHEAD AND PROFIT	10.0%	%	1,452,150.00	145,215
104	BONDING AND INSURANCE	2.5%	%	1,597,365.00	39,934	
105	DESIGN CONTINGENCY	30.0%	%	1,637,299.13	491,190	
106	BASE CONSTRUCTION COST (Unescalated)			2,128,488.86		
107	ESCALATION - PHASE 5	32.6%	%	694,610.00	226,679	
108	BASE CONSTRUCTION COST (Escalated)			2,355,167.70	0	
109						
110	ADDING NEW SEISMIC FORCE AT GRID LINES E				2,355,168	
111						
5.2.5	112	MAIN ROOF DIAPHRAGM				
	113					
	114	Upgrade existing diagonal bracing member and adding new diagonal bracing to enhance diaphragm capacity as required - allow	11,600	SF	55.00	638,000
	115	Miscellaneous metals and rough carpentry - allow	1	LS	150,000.00	150,000
	116	Foundation rework - allow	1	LS	50,000.00	50,000
	117	Patch and repair as required - allow	11,600	SF	15.00	174,000
	118					
	119	Total Direct Cost				1,012,000
	120					
	121	ADD MARKUPS (CUMULATIVE)				
	122	GENERAL CONDITIONS AND REQUIREMENTS	20.0%	%	1,012,000.00	202,400
	123	MARKET FACTOR	5.0%	%	1,214,400.00	60,720
	124	OVERHEAD AND PROFIT	10.0%	%	1,275,120.00	127,512
	125	BONDING AND INSURANCE	2.5%	%	1,402,632.00	35,066
126	DESIGN CONTINGENCY	30.0%	%	1,437,697.80	431,309	
127	BASE CONSTRUCTION COST (Unescalated)			1,869,007.14		
128	ESCALATION - PHASE 5	32.6%	%	609,931.00	199,045	
129	BASE CONSTRUCTION COST (Escalated)			2,068,051.86	0	
130						
131	MAIN ROOF DIAPHRAGM				2,068,052	
132						

**SAN FRANCISCO CABLE CAR BARN
 ROM ESTIMATE OF PROBABLE CONSTRUCTION COST
 (AN OPINION OF PROBABLE CONSTRUCTION COSTS)
 BASED ON FINAL MASTERPLAN DOCUMENTS
 4.7 PHASE 5: SEISMIC IMPROVEMENTS**

Date: 07/22/2022 Final

Floor Area:

0 GSF

Elem.	#	Description	Quantity	Unit	Unit Cost	Total
5.2.6	133	OTHER ADDED ELEMENTS FOR SEISIMC FORCE				
	134	East Wall of North Exit Stair				
	135	Add diagonal bracing elements from floor 2M to foundation between existing columns	900	SF	125.00	112,500
	136	Miscellaneous metals and rough carpentry - allow	1	LS	50,000.00	50,000
	137	Patch and repair as required - allow	1	LS	25,000.00	25,000
	138	Expansion Joint Separation at Roof Structure				
	139	Add collector for transferring seismic force in west portion of roof to CMU wall below - allow	10	LF	3,500.00	35,000
	140	Add collector for transferring seismic force in north-west portion of roof to CMU wall below - allow	20	LF	3,500.00	70,000
	141	Miscellaneous metals and rough carpentry - allow	1	LS	35,000.00	35,000
	142	Patch and repair as required - allow	1	LS	25,000.00	25,000
	143	Foundation rework - allow	1	LS	50,000.00	50,000
	144					
	145	Total Direct Cost				402,500
	146					
	147	ADD MARKUPS (CUMULATIVE)				
	148	GENERAL CONDITIONS AND REQUIREMENTS	20.0%	%	402,500.00	80,500
	149	MARKET FACTOR	5.0%	%	483,000.00	24,150
	150	OVERHEAD AND PROFIT	10.0%	%	507,150.00	50,715
	151	BONDING AND INSURANCE	2.5%	%	557,865.00	13,947
	152	DESIGN CONTINGENCY	30.0%	%	571,811.63	171,543
	153	BASE CONSTRUCTION COST (Unescalated)			743,355.11	
	154	ESCALATION - PHASE 5	32.6%	%	242,586.00	79,165
	155	BASE CONSTRUCTION COST (Escalated)			822,520.56	0
	156					
	157	OTHER ADDED ELEMENTS FOR SEISIMC FORCE				822,521
	158					

**SAN FRANCISCO CABLE CAR BARN
ROM ESTIMATE OF PROBABLE CONSTRUCTION COST
(AN OPINION OF PROBABLE CONSTRUCTION COSTS)
BASED ON FINAL MASTERPLAN DOCUMENTS
4.8 EXTERIOR IMPROVEMENTS**

Date: 07/22/2022 Final

Floor Area: 15,579 GSF

Elem.	#	Description	Quantity	Unit	Unit Cost	Total	
B2010	1	EXTERIOR WALLS					
	2						
	3						
	4		Clean masonry to remove general soiling, biological growth, efflorescence, and stains	15,579	SF	15.00	233,685
	5		Apply coating to masonry	15,579	SF	10.00	155,790
	6		Replace or repair existing brick as required - allow for 30% replacement	15,579	SF	65.00	1,012,635
	7		Replace deteriorated joints as required	15,579	SF	25.00	389,475
	8		Repair or replace metal parapet coping as required - see Phase 4	15,579	SF	0.00	0
	9		Install new joint sealant at base of building	584	LF	75.00	43,800
	10		Repair leaking pipes at East Elevation as required - allow	1	LS	25,000.00	25,000
	11		Exterior railings - clean, refinish and/or paint existing	100	LF	500.00	50,000
	12		Scaffolding	15,579	SF	5.00	77,895
	13						
	14		EXTERIOR WALLS				1,988,280
15							
B2020	16	EXTERIOR WINDOWS					
	17						
	18						
	19		Repair existing windows are required - replace cracked glass, replace missing or damaged hardware, clean, adjust or lubricate all sashes, paint all windows	3,350	SF	350.00	1,172,500
	20		Repair existing clerestory windows are required - clean, adjust or lubricate all sashes, install new sealants, paint all windows	510	SF	200.00	102,000
	21						
22	EXTERIOR WINDOWS				1,274,500		
23							
24							

**SAN FRANCISCO CABLE CAR BARN
 ROM ESTIMATE OF PROBABLE CONSTRUCTION COST
 (AN OPINION OF PROBABLE CONSTRUCTION COSTS)
 BASED ON FINAL MASTERPLAN DOCUMENTS
 4.8 EXTERIOR IMPROVEMENTS**

Date: 07/22/2022 Final

Floor Area: 15,579 GSF

Elem.	#	Description	Quantity	Unit	Unit Cost	Total
B2030	25	EXTERIOR DOORS				
	26					
	27	Refurbish all exterior doors as required - clean, adjust, or lubricate, install new sealants, paint or refinish	10	EA	25,000.00	250,000
	28					
	29	EXTERIOR DOORS				250,000
	30					
B3010	31					
	32	ROOF COVERINGS				
	33					
	34	New membrane roofing - see Phase 4				
	35					
	36	ROOF COVERINGS				
	37					
B3020	38					
	39	ROOF OPENINGS				
	40					
	41	Clean and refinish all existing skylight frames and replace all joint sealants	7,030	SF	150.00	1,054,500
	42					
	43	ROOF OPENINGS				1,054,500

**SAN FRANCISCO CABLE CAR BARN
 ROM ESTIMATE OF PROBABLE CONSTRUCTION COST
 (AN OPINION OF PROBABLE CONSTRUCTION COSTS)
 BASED ON FINAL MASTERPLAN DOCUMENTS
 4.9 WINDING MOTORS**

Date: 07/22/2022 Final

Floor Area: 846 GSF

Elem.	#	Description	Quantity	Unit	Unit Cost	Total
D5010	161	ELECTRICAL DISTRIBUTION				
	162					
	163	Main normal power				
	164	Machine and equipment power				
	165	Winding Motors	4	EA	150,000.00	600,000
	166	Isolation transformers	4	EA	120,000.00	480,000
	167	Feeder conduit and wire	800	LF	350.00	280,000
	168					
	169	User convenience power				
	170	Receptacles				Existing
	171					
	172	Trade demolition				
	173	Remove existing winding motors/transformers	480	HR	205.00	98,400
	174	Temporary power	1	WK	10,000.00	10,000
	175					
	176	Miscellaneous electrical				
	177	Project requirements, project management, detailing, coordination, etc	1	LS	264,312.00	264,312
	178					
179	ELECTRICAL DISTRIBUTION				1,732,712	
192						

M LEE CORPORATION

Construction Management & Consulting
Estimating & Scheduling
Since 1992

M Lee Corporation

M Lee Corporation was established in the San Francisco Bay Area in 1992 to provide quality construction cost estimating, scheduling and construction, program and project management support services. Since its incorporation, M Lee Corporation have provided professional construction services for over 1,400 projects with an estimated value of over \$40 billion, spanning all services and disciplines, scopes and sizes. Having worked in the San Francisco Bay Area over the last 29 years, our knowledge of the local construction market has proved to be a valuable asset to our clients.

Key Professionals

Martin Lee

Founding principal and chief estimator of M Lee Corporation, Martin is a professional civil engineer (PE), chartered quantity surveyor (CQS), and certified professional estimator (CPE)-Lifetime by ASPE with over 35 years of practical experience in construction cost management and consulting services in the San Francisco Bay Area. Prior to establishing M Lee Corporation, Martin gained extensive experience working with a renowned general contractor/construction management firm and an international cost consulting firm. Working on over 1,400 projects with an estimated construction value of over \$40 billion, Martin is knowledgeable of local construction practice and pricing. He enjoys and excels in construction cost and schedule management.

Franklin Lee

Principal and project manager/senior cost estimator of M Lee Corporation, Franklin is a professional civil engineer (PE), LEED accredited professional and certified estimating professional (CEP) by AACE. Franklin holds a B.S. in Civil and Environmental Engineering from University of California, Berkeley and a M.S. in Construction Engineering and Management from Stanford University. Prior to joining M Lee Corporation Franklin worked for a nationally renowned general contractor/construction management firm. Franklin has provided cost estimating, scheduling and project management services on over 500 projects in the San Francisco Bay Area over the past 10+ years.

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SFMTA

Cable Car Barn Rehabilitation and Upgrades

SFMTA Citizens' Advisory Council (CAC)

Engineering, Maintenance, and Safety Committee (EMSC)

February 22, 2023

Project Description

Location: 1201 Mason Street in the Nob Hill neighborhood.

Purpose: Critical improvements to improve working conditions and modernize electrical operations.

General Scope: Rehabilitate the Cable Car Barn, including substantial investments to upgrade the HVAC, Fire/Life Safety Systems, office spaces, roof, 10- and 40-ton cranes, cable rewinder and holdback machinery, restrooms, and other associated upgrades.

Project Status: Master Plan completed. Pre-Development (PLN) Phase *in-progress*.



Cable Car Barn & Museum | Exterior View
SFMTA Photograph, November 2022



Cable Car Barn Project Site: 1201 Mason Street
Master Plan | June 30, 2022

Standards for Rehabilitation

The Secretary of the Interior's Standards for Rehabilitation (36 CFR Part 67, 1990) which are included in the *Treatment Standards*

The Secretary of the Interior's Standards for the Treatment of Historic Properties (36 CFR Part 68, 1995) consists of four treatment standards—Preservation, Rehabilitation, Restoration, and Reconstruction—and are regulatory for NPS Grants-in-Aid programs.

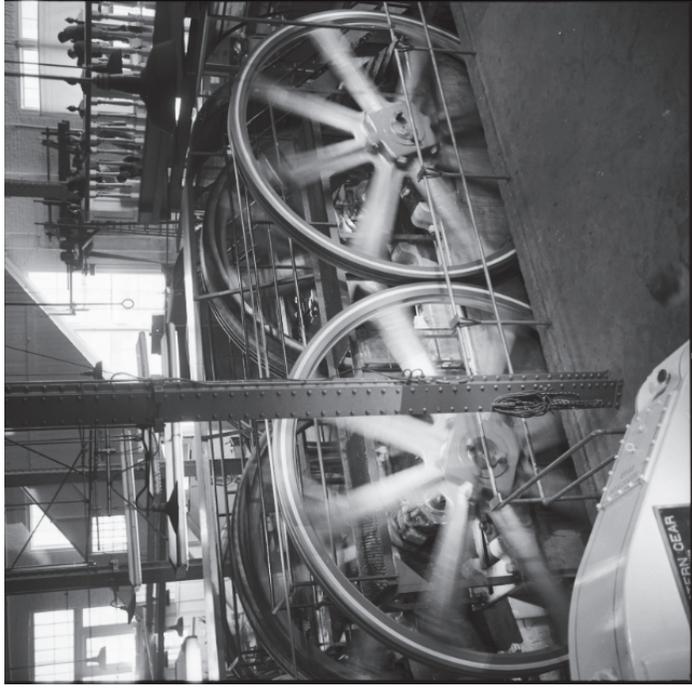
Rehabilitation is defined as the act or process of making possible a compatible use for a property through repair, alterations, and additions while preserving those portions or features which convey its historical, cultural, or architectural values. The Rehabilitation Standards acknowledge the need to alter or add to a historic building to meet continuing or new uses while retaining the building's historic character.

U00778

SFMTA Photo Archives: Destroyed Washington and Mason Car House & Powerhouse After 1906 Earthquake and Fire, May 7, 1906

Project Objectives

- **Electrical Modernization** – replacement of main switchgear and electrical equipment
- **Accessibility Improvements** – for SFMTA workplace and Public Visitors
- **Seismic Retrofitting** – make structurally safe & code compliant
- **Exterior Rehabilitation** – preserving Muni’s crown jewel
- **Improve Safety & Working Conditions for SFMTA Workforce**



Cable Machinery Winding Wheels, 1970
SFMTA Photo Archives M0817_1



Cable Car Barn Group Photo of Shop Staff, 2021
SFMTA Photo Archives 210819_CC_Barn_09_Comp

Electrical Modernization

Main driver of the rehabilitation and upgrade work

- Objective is to replace out of date and original equipment (1984)
- Existing equipment at lifecycle end – subject to increased fire hazard from panels and switchboards

Major Equipment Upgrades:

- Main Medium Voltage Service Entrance Switchgear
- Medium Voltage Transformer
- Low Voltage Switchboard
- AC and DC Electrical Panel
- Remote Terminal Units (RTU) and Supervised Control and Data Acquisition (SCADA)
- Transfer Switch and Emergency Generator Hookups



Medium Voltage Service Entrance Switchgear, 2.5 MW
Medium Voltage Transformer and 480 V Switchboard



Motor Control Center (MCC)

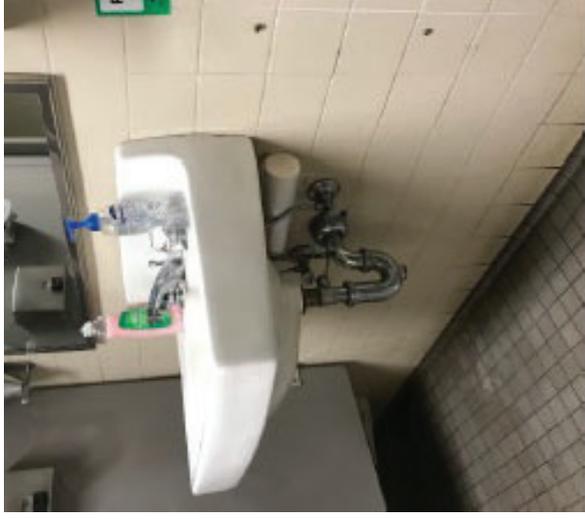
Accessibility Improvements

Accessibility compliance and improvements required for Cable Car Barn work staff and Museum patrons:

- Path of Travel Widening
- Doorway Widening
- Restroom Accessory Replacement
- Wayfinding Signage
- Locker and Office Space Renovations
- Entrance Ramp and Landing Slope Softening
- Handrail Refurbishment



Non-compliant lavatory and shower (Men 203).



Non-compliant lavatory (Women 106).

Seismic Retrofitting

Initial Seismic Evaluation - Structural and Non-Structural Life Hazard Issues

- Conceptual Seismic Improvements:
 - South and east concrete wall strengthening
 - Shear wall addition at the east side of the passenger elevator
 - Shear wall addition for 2nd Fl wall reinforcement
 - Stair bracing continuation next to the north wall
 - Roof strengthening including existing diagonal brace upgrades and new braces
 - Chimney separation through introduction of an expansion joint

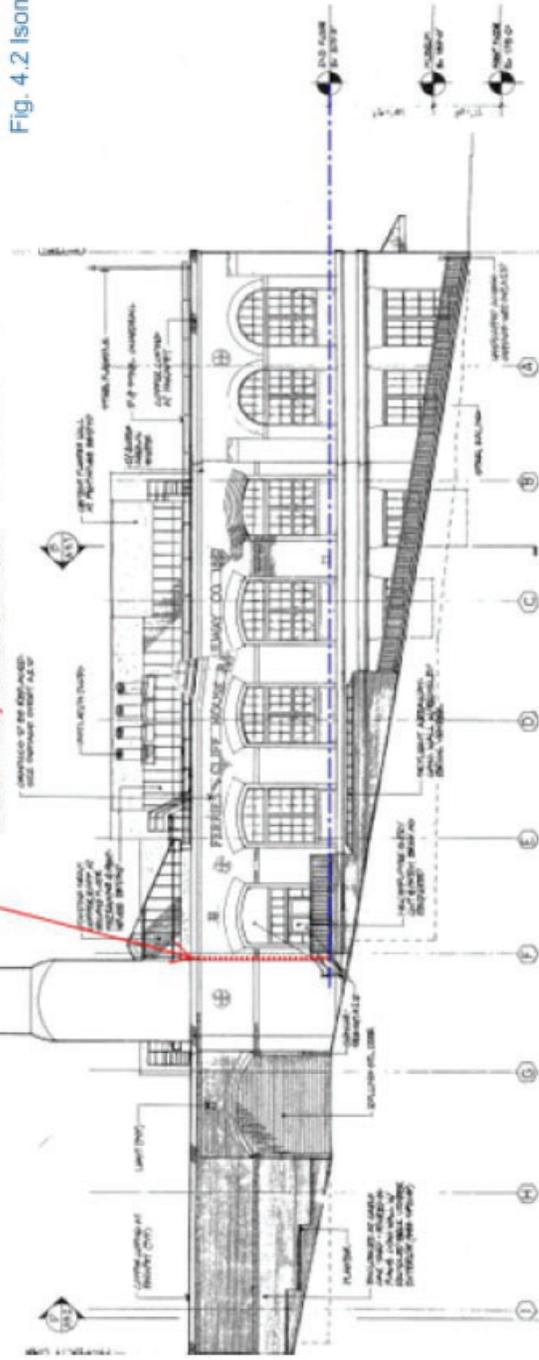
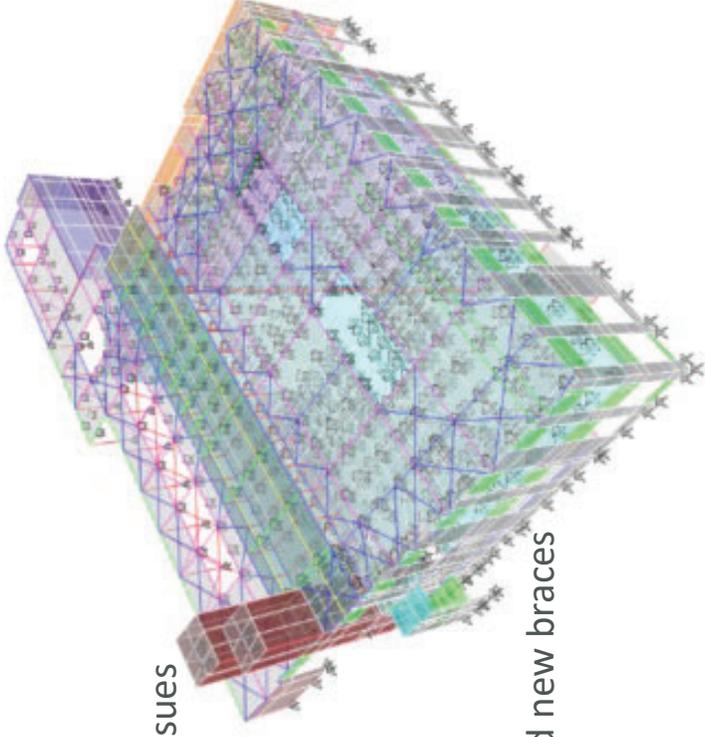


Fig. 4.2 Isometric 3D View of the ETABS Model

Chimney Separation

Exterior Rehabilitation

Brick Masonry

- Removal of general soiling, efflorescence, and stains
- Crack and spall repair
- Joints replacement
- Replace poorly matching masonry repairs and mortar joints for uniformity;
- Repair leaking pipes
- Repaint the brick masonry at the north lot line elevations
- Install sealant joints at the base of the building
- Repair metal parapet coping

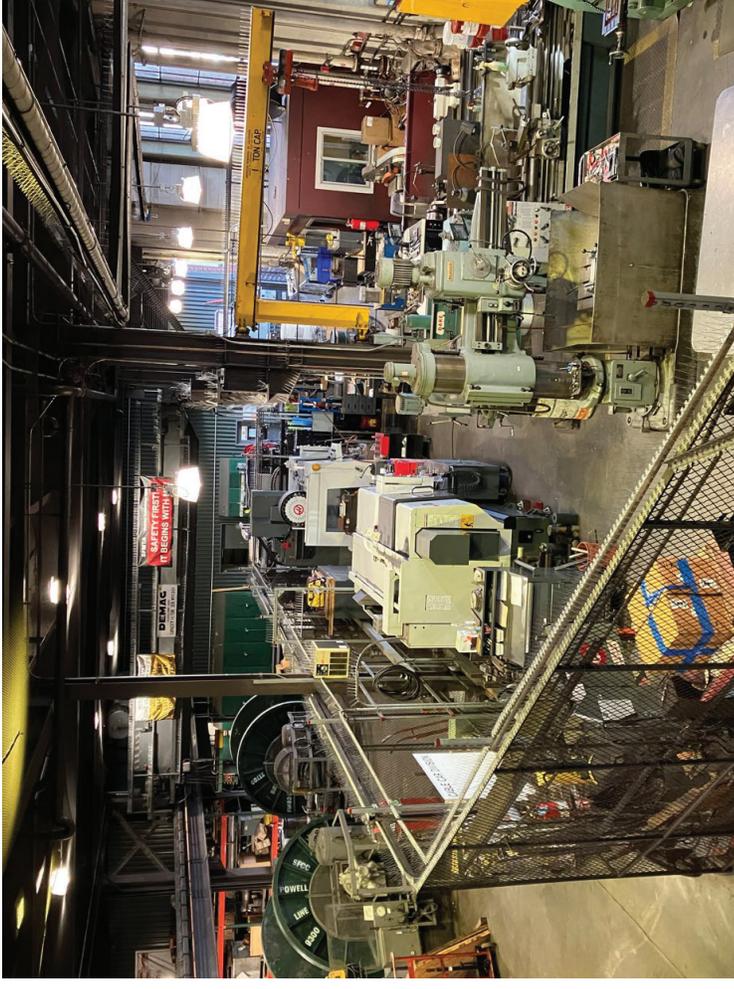
Roof

- Replace roof membrane, insulation, drains, flashing
- Installation of equipment roof curbs
- Refinish skylight frames
- Replace sealant joints



Improve Safety & Working Conditions for SFMTA Workforce and General Public

- 10-ton bridge crane to a 20-ton bridge crane with an extension
- Addition of a 3-ton free standing jib crane
- Addition of a 2-ton bridge crane
- Replacement of the passenger and freight elevators
- Replacement of the fire suppression system
- Upgrades to the heating, ventilation, and air conditioning (HVAC) system
- Upgrades to the weld room, inspection room, machine shop, carpentry area, paint booth, and assembly areas
- Installation of glass partitions for museum space
- Installation of EV chargers and shop compact storage units
- Addition of lactation room and bike storage room
- Additional facility electrical, plumbing, and structural work



Phasing Plan (Phases 1 thru 5)

Phasing Plans

Phase 1A

Level 2: 12kV electrical upgrade. PG&E permit process for 12kV electrical and all power upgrade. Clean agent installation and plumbing upgrade (eye wash)

Phase 1B

Level 1: Existing 10-ton bridge crane upgrade to 20-ton and extension, including structural work

Level 1M: Office area addition and proposed walkway, including structural, MEP, fire alarm, fire sprinkler work.

Phase 2

Level 1: Restroom, locker and office upgrades, including MEP work. Upgrade fire suppression system (remove halon system)

Level 1M: Glass partition upgrade, HVAC upgrade museum (installing HVAC system), restroom upgrades, including MEP work.

Level 2: Restroom upgrades, including MEP work. Bike storage room addition

Level 2M: Office renovations including MEP work

All levels: Passenger and freight elevator upgrades, including structural work for guide rails (all levels)

Phase 3A

Level 1: Reallocation of weld room and new inspection room. Existing machine shop, pulley assembly area and steam cleaning/weld area upgrade. 2-ton bridge crane addition. MEP work.

Level 1M: Compact storage including structural work

Level 2: Reallocation of grip building area from level 1, including MEP work.

Phase 3B

Level 2: Carpentry and office area upgrades including paint booth and spray booth Demolition of existing break room on upper level. MEP work. replace heating units in inspection pits

Phase 4

Remaining MEP upgrade, new skylights and entire roof replacement

Phase 5

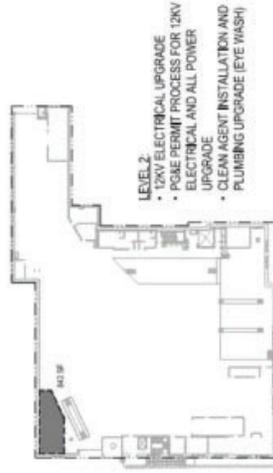
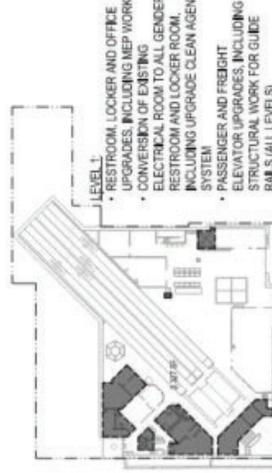
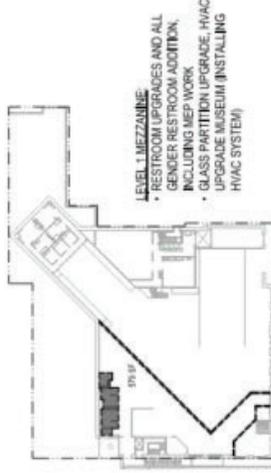
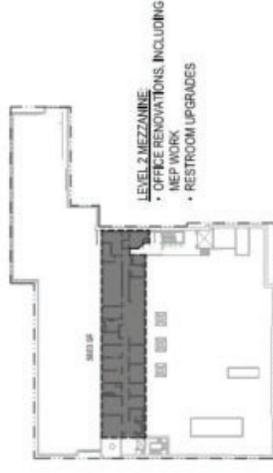
Seismic retrofit work

Other scope

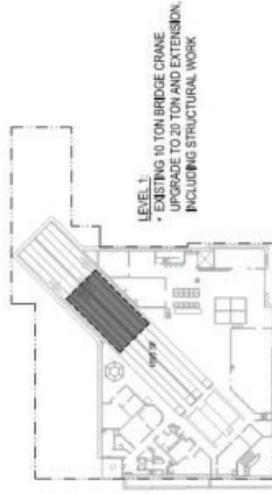
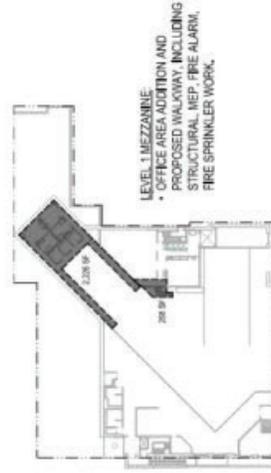
Exterior improvements:
See Appendix A7 - Exterior Conditions Memo & A13 - Cost Estimate for details

Winding motors upgrade (optional):

See Appendix A13 - Cost Estimate for details



(1A) PHASE 1A | 12KV SWITCHGEAR UPGRADE



(1B) PHASE 1B | BRIDGE CRANE UPGRADE

(2) PHASE 2 | OFFICE IMPROVEMENTS

Planning Schedule

Task	Begin Date	End Date	Duration (Months)
Planning Phase			
Master Plan and Pre-Development Reports	July 22, 2020	March 24, 2023	32
Preliminary Engineering Phase			
Environmental Clearance	March 25, 2023	March 27, 2024	12
Preliminary Engineering Report (30% design)	March 25, 2023	March 27, 2024	12
Detailed Design Phase			
Detailed Design (65% design)	March 28, 2024	November 29, 2024	8
Detailed Design (100% design)	November 30, 2024	September 30, 2025	9
Permitting	October 1, 2025	November 30, 2025	2
Contracting Phase			
Advertise Construction	December 1, 2025	March 6, 2026	3
Award Construction Contract	March 7, 2026	May 10, 2026	2
Construction Management Phase			
Construction Notice to Proceed	May 11, 2026		
Substantial Completion		May 20, 2031	61
Administrative Closure Phase			
Contract Closeout	May 21, 2031	August 19, 2031	3
Project Closeout	August 20, 2031	November 18, 2031	3

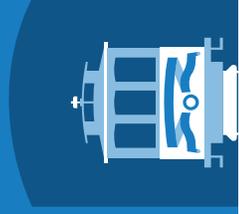
Thank you!

Questions?

Project Team

- Quon Chin (Project Manager)
- Christian Kalinowski (Deputy Project Manager)
- Eun Joo Cho (Project Architect)





Cable Car Barn

1201 Mason Street

Master Plan Report

Master Plan Report

June 30, 2022

PREPARED FOR:
SAN FRANCISCO MUNICIPAL TRANSIT AGENCY

AUTHORED BY:
SAN FRANCISCO PUBLIC WORKS,
BUREAU OF ARCHITECTURE



Building Design and Construction
Bureau of Architecture



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Introduction

Acknowledgments

The information presented in this design document was made possible through the efforts of many people, who took the time to meet, answer questions, guide site walk-throughs, and correspond with the project team. Thank you to the following individuals at SFMTA who contributed to this document.

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John Becker | Mechanical Systems Group Manager
Arne Hansen | Vehicle Maintenance Superintendent
Christopher Spain | Traction Power Group Manager
Richard Bernal | Auto Body and Fender Worker Supervisor (acting)

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Earl Gaffud | Associate Engineer
Alexis Ng | Junior Engineer

Abbreviations

ADA	Americans with Disabilities Act	MRL	Machine Room-Less
AG	All Gender	MTA	See "SFMTA"
AHJ	Authority Having Jurisdiction	MUNI	Municipal Railway
ASAP	Accelerated Sidewalk Abatement Program	MVA	Million Volt-Amps
ASCE	American Society of Civil Engineers	MW	Megawatt
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers	NEMA	National Electrical Manufacturers Association
ASME	American Society of Mechanical Engineers	NFPA	National Fire Protection Association
BAAQMD	Bay Area Air Quality Management District	OPS	Operations
BDC	Building Design & Construction	OSHA	Occupational Safety and Health Administration
BOA	Bureau of Architecture	PG&E	Pacific Gas & Electric
BOH	Back of House	RTU	Remote Terminal Unit
BSE	Basic Safety Earthquake	SAR	Site Assessment & Remediation
BTU	British Thermal Unit	SCADA	Supervisory Control and Data Acquisition
BTUH	British Thermal Units per Hour	SF	Square Feet
CBC	California Building Code	SFBC	San Francisco Building Code
CCR	Cable Car Barn	SFDBI	San Francisco Department of Building Inspection
CFC	California Code of Regulations	SFFDA	San Francisco Fire Department
CFM	California Fire Code	SFPW	San Francisco Municipal Transit Agency
DC	Cubic Feet per Minute	SHR	San Francisco Public Works
ENG	Direct Current	SIRP	Seismic Hazard Rating
EST	Engineering	SMACNA	Sidewalk Inspection and Repair Program
FT	Engineering-Structural Division	SOM	Sheet Metal and Air Conditioning Contractors' National Senior Operations Manager
EUSERC	Feet	SSI	Soil Structure Interaction
EV	Electric Utility Service Equipment Requirements Committee	Title 24	California Energy Efficiency Standards
FTE	Electric Vehicle	UL	Underwriters' Laboratories
FC	Full-time Employee	V	Volts
FPM	Foot Candles	VRF	Variable Refrigerant Flow
GSF	Feet per Minute	W	Watts
HAZMAT	Gross Square Feet	WDT	Wholesale Distribution Tariff
HP	Hazardous Materials		
HVAC	Horsepower		
ID	Heating, Ventilation, and Air Conditioning Identification		
IDC	Infrastructure Design & Construction		
IT	Information Technology		
KV	Kilovolt		
LED	Light-emitting Diode		
MAINT	Maintenance		
MCC	Motor Control Center		
MGR	Manager		

Project Overview

Executive Summary

SFMTA has commissioned Public Works Bureau of Architecture and Bureau of Engineering to develop the master plan for the Cable Car Barn located at 1201 Mason Street. The SFMTA's Cable Car Barn stores and powers the fleet of San Francisco's historic cable cars and houses staff to support and maintain the fleet's operations. The site is also home to a free museum open to the public, operated by Friends of the Cable Car Museum, Inc. under contract with the SFMTA.

This report presents a strategic master plan for capital improvements at the Cable Car Barn. The priority of the project is a major electrical upgrade to 12kV power at the facility, reallocation of program space from the electrical upgrade and identification of additional capital improvements to meet additional facility program need including existing bridge crane upgrade, reallocation of shop spaces, office space addition and overall existing facility upgrade. The project also provides seismic evaluation of existing structural conditions and recommendations for seismic retrofit work. Lastly, the master plan includes recommendations on phasing of future improvements to achieve the most optimal consolidation and grouping of construction activities in a way that aligns with the 12kV electrical upgrade as a top objective, limits repetitious impact on facility operations and achieves a balance between project cash flows and cost efficiencies of bundling phases.



Image Courtesy of the SFMTA Photo Archive | sfmta.com/photo

1 - Architectural Design Narrative

Project Background & Site Context

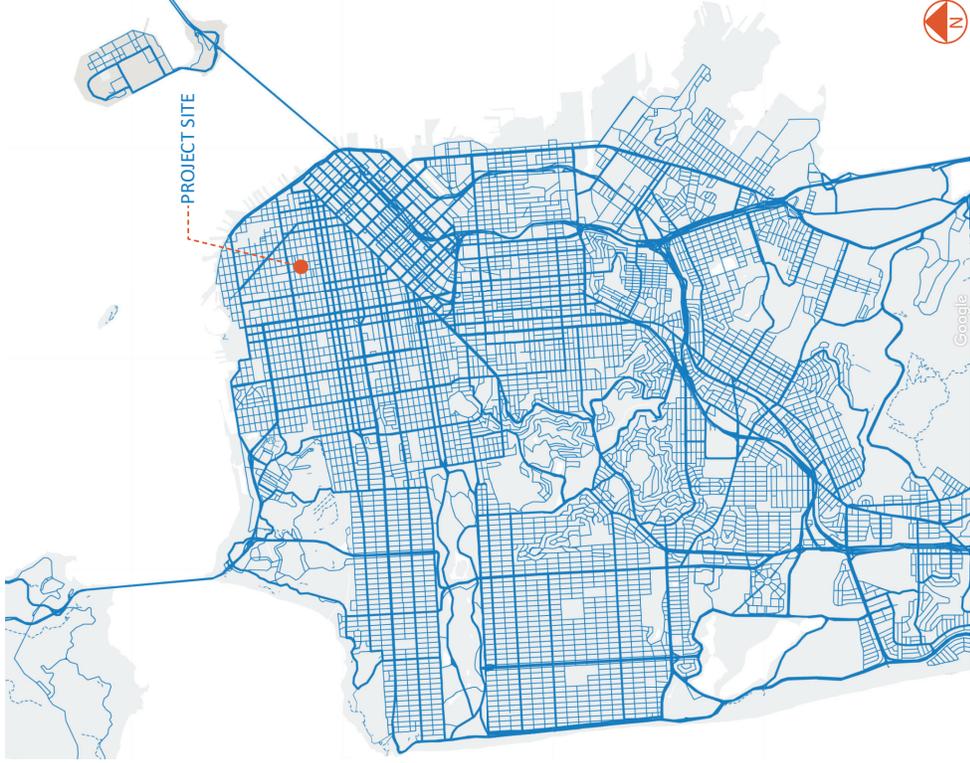
Project Description and Background

The Cable Car Barn and the cable car fleet it houses are each registered as historic landmarks, both nationally and in California and work must conform to the Secretary of the Interior's Standards for Treatment of Historic Properties. The building was originally built in 1888 but was severely damaged in the 1906 Great Earthquake. The most recent rehabilitation in 1984 included substantial renovations and additions.

The SFMTA requested Public Works to provide space planning and program validation services at the Cable Car Barn in advance of commencing planning for major capital improvements at the site including the 12KV electrical power upgrade. The SFMTA goals for the project are to: document staff and equipment requirements in the current space, identify underutilized spaces, and optimize space arrangements for the Cable Car Barn given upcoming capital improvements and additional facility programmatic needs.

A variety of critical capital improvements are needed at the Cable Car Barn to improve working conditions at the facility and modernize the electrical operations of the cable car fleet. The SFMTA has dedicated \$5.5 million to initial improvements, with \$1 million programmed for a master planning effort at the barn and the remaining \$4 million for short-term upgrades meeting more immediate needs at the facility. The SFMTA intends to procure full funding for larger capital improvements and estimated commencement of construction is July 2023 (TBD).

A series of scoping meetings were held with internal stakeholders in June and July of 2019 to prioritize Cable Car Barn capital improvements. The group concluded that conversion to 12KV electrical power will be the top priority at the facility. Implementing this conversion will require careful planning to mitigate disruption of the cable car service. Per SFMTA leadership, service must never be disabled for more than an eight-week period, given the historical significance and substantial ridership of the cable car system.



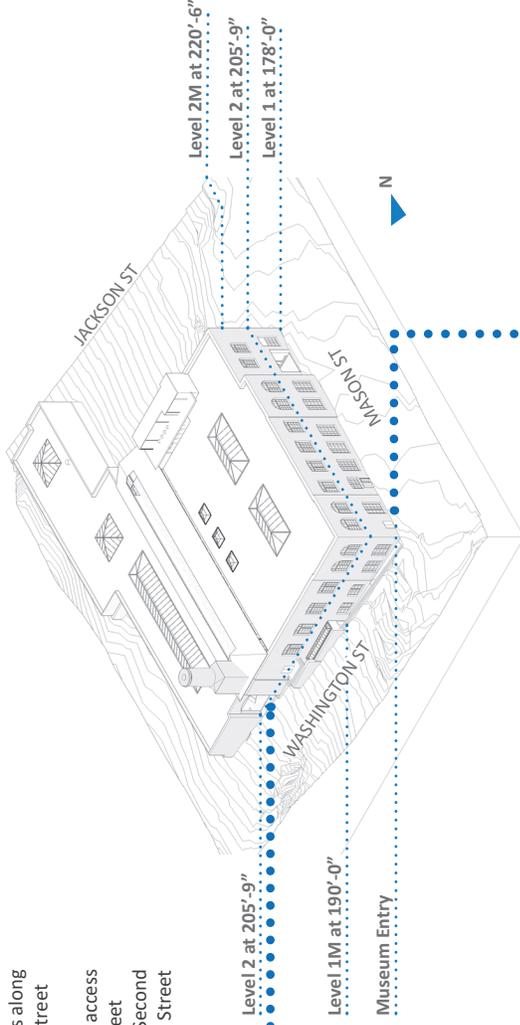
Project Scope

The project provides the strategic master planning, including a major electrical upgrade to 12kV power at the facility as the highest priority and other needed improvements to optimize the existing conditions within the constraints of the historic structure. The scope includes:

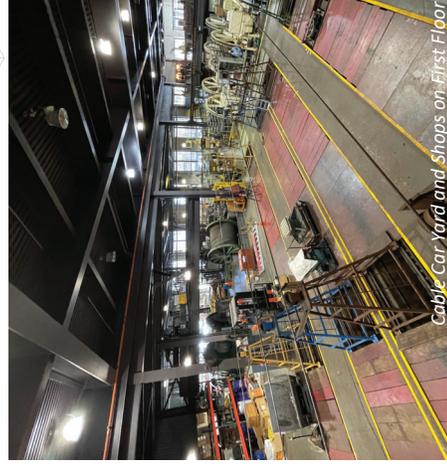
- Investigate the full scope and cost of 12kV conversion
- Identify risk factors and structural/mechanical/construction impacts of the necessary electrical work
- Develop seismic evaluation of existing building and provide recommendations for seismic retrofit work
- Upgrade existing bridge crane
- Explore the potential to compartmentalize work for minimal service disruption
- Incorporate, as much as feasible, additional facility upgrades to benefit frontline employees, such as creating and/or improving worker spaces, refreshing finishes and fixtures, replacing the roofing, and upgrading the building's HVAC system
- Develop conceptual construction schedule and phasing
- Identify and plan for potential impacts to the Cable Car Museum
- Ensure the upgrade's compliance with state and national historic guidelines, as well as relevant CEQA/NEPA requirements
- Provide an itemized cost estimate for the phased improvements

Site Characteristics of Cable Car Barn

- Lot totaling 11,356 square feet with access along Mason Street, Washington, and Jackson Street
- The lot is a steeply sloping site
- Access to museum from Mason Street and access via accessible ramp along Washington Street
- First floor access from Mason Street and Second floor track yard access from Washington Street and Jackson Street



Cable Car Exit Door on Washington Street



Cable Car Yard and Shops on First Floor



Museum Entrance on Mason Street

Codes & Standards

Applicable Codes and Regulations

- 2019 CA BUILDING CODE (CBC) WITH SF AMENDMENTS
- 2019 CA ENERGY CODE WITH SF AMENDMENTS
- 2019 CA ADMINISTRATIVE CODE (CAC)
- 2019 CA ELECTRICAL CODE (CEC) WITH SF AMENDMENTS
- 2019 CA MECHANICAL CODE (CMC) WITH SF AMENDMENTS
- 2019 CA PLUMBING CODE (CPC) WITH SF AMENDMENTS
- 2019 CA FIRE CODE (CFC) WITH SF AMENDMENTS
- 2010 DOJ ADA STANDARDS FOR ACCESSIBLE DESIGN

Project Data

Cable Car Barn 1201 Mason Street, San Francisco CA 94108
 Block/Lot No 0190/005
 Zoning District P-Public
 Plan Area Northeast / Nob Hill
 Height & Bulk District 65-A
 Parcel Area .91 Acres

Year Built / Major Renovation

1888, Renovated in 1984

Structural Systems

- Seismic Design Category D
- Exterior bearing walls are brick masonry
- Primary structural frame is steel without fireproofing
- Floor/ceilings are metal deck with concrete fill
- Roof/ceilings are metal deck with insulation
- Non-bearing interior partitions are metal stud

Occupancy Groups

Existing and Proposed Occupancy

Existing		Proposed
UBC 1973 Occupancy Designations Used on 1982 Permit Drawings	Equivalent Occupancy per CBC 2019	CBC 2019
G Cable Car Garage, Maintenance Area & Cable Machinery Area	F-1 Shops & Storages	No Change
B3 Public Area	A-3 Museum	No Change
F2 Administration Area	B Office	No Change

- The existing occupancy group is from the existing drawings (1982 Rehabilitation of Cable Car Barn Contract No. MR 684)
- The A-3 occupancy (Museum / L1 Mezzanine) is an accessory occupancy.
- The Level 1 Mezzanine is considered part of a single story with Level 1 and the area (3,512 SF A-3) is less than 10% of the total area of the Level 1 (L1 + L1 Mezzanine).
- As an accessory occupancy, no separation is required between the A-3 and F-1.

Project Areas

Existing and Proposed Area (Gross Square Feet)

Floor	Existing			Addition		Proposed Total
	A-3 (Accessory to F)	B	F-1	Total	B	
Basement				642		642
1		3,117	22,961	26,078		26,078
1-Mezzanine	3,512	482	6,422	10,416	2,226	12,642
2		1,710	34,981	36,691		36,691
2-Mezzanine		7,467	7,467	7,467		7,467
Total				81,294	2,226	83,520

Notes:

1. Gross Square Feet (GSF) is measured to exterior face of exterior wall.

2. Existing building area to remain unchanged except for office addition (B Occupancy) to the Level 1 Mezzanine.
3. The Carpentry Storage area on Level 2 Mezzanine is excluded from existing and proposed area calculations. This area is removed in the proposed plan.

Proposed Area of Alteration (GSF)

Floor	Alteration	Proposed	Percentage of Alteration
Basement	0		
1	10,826		
1-Mezzanine	2,309		
2	5,945		
2-Mezzanine	5,603		
Total	24,683	83,520	29.6%

The proposed area of alteration is 24,683 SF and this is less than 30% of the total area.

Mezzanines

The Level 1 and Level 2 Mezzanine areas are less than one-half of the total area of the Level 1 Story (L1+L1 Mezzanine) and the Level 2 Story (L2+L2 Mezzanine), respectively. The Mezzanines with sprinklered satisfy the CBC 2019 Code "Type II Mezzanine" requirements. Also, the CBC 2019 Code "Openness" to the Level below is not required since each Mezzanine space has two exits.

Building Height (in feet and stories)

Existing Building Height

54'-6" (measured to midpoint of sloping roof; elevator penthouse and mechanical are exempt)

Existing Number of Stories

Two stories (with mezzanines at Levels 1 and 2)

Proposed Building Height and Stories

No Change

Allowable Building Heights, Stories and Area

Occupancy	Sprinkler	Allowable Building Heights (FT)	Allowable Stories	CBC TYPE II-B (w/o area increase)	Allowable Area Factor (SF)
B	YES	75	4	4	69,000
F	YES	75	3	3	46,500

The existing construction type is from the existing drawings (1982 Rehabilitation of Cable Car Barn). We consider the 1973 designation as Type III-1hr as incorrect since the structural steel is not fireproofed. We propose that the 1973 Type III-NR is more appropriate, which is equivalent to current Type IIB designation.

Fire Sprinkler System

Yes (installed in 1984)

Fire Alarm

Yes

Separated or Non-Separated Occupancies

Non-Separated Occupancies

Construction Type

Existing and Proposed Construction Type

EXISTING		PROPOSED
UBC 1973	CBC 2019	CBC 2019
TYPE III One-hour, Fully Sprinklered	TYPE IIB w/o area increase	No Change

Fire-Resistance Rating Requirements for Building Elements

Building Elements	UBC 1973		UBC 1973	UBC 2019
	TYPE III 1 HR	TYPE III N	TYPE III N	TYPE IIB
Primary Structural Frame	1	N	N	0
Bearing Walls - Exterior	2	2	2	0
Interior	1	N	N	0
Nonbearing Walls and partitions -Exterior	1	1	1	
Interior	1	N	N	0
Floor construction and associated secondary members	1	N	N	0
Roof construction and associated secondary members	1	N	N	0
Shaft Enclosure	1	1	1	1
Exterior Doors and Windows	$\frac{3}{4}$ hr < 20'; no opening < 5'	$\frac{3}{4}$ hr < 20'; no opening < 5'	$\frac{3}{4}$ hr < 20'; no opening < 5'	

Programming Overview

Overview of Design Process

Public works developed the master plan design documentation through close engagement with MTA group. The design reflects input from stakeholders, workshops with the client and MTA operations, design coordination with the consultant teams, and user responses to questionnaires. SFMTA provided the existing & preferred program requirements in July and August 2020, and SFMTA Facility Space Planning Standards in June 2021. They are the key documents used to understand the current and future use and needs of the facility space. In addition, SFMTA provided the existing drawings dated from 1950 to 1990, which were used in assessing the existing conditions along with in-person site visits to the Cable Car Barn. The design also includes the complete scope of needed improvements based on the SFMTA 2016 Cable Car Barn – Facility Condition Assessment report. Lastly, the proposed design considers the facility's status as a State and Federal historic resource.

Existing Floor Plans

The 1982 and 1983 existing drawings include the major renovation work in 1984 and reflect the current building conditions most closely. Public works developed a Revit model to construct the existing building elements in 3D based on the 1982-83 drawings and site visits. However, our effort was limited to developing a conceptual plan for the master plan phase. All the existing building information in the model should be verified in field by contractor as part of any construction.

Basement (Sub Floor)

The basement has a viewing room for looking at the cable clamping room through a window and a storage room for the facility. The viewing room is part of the museum and is open to the public.

First Floor

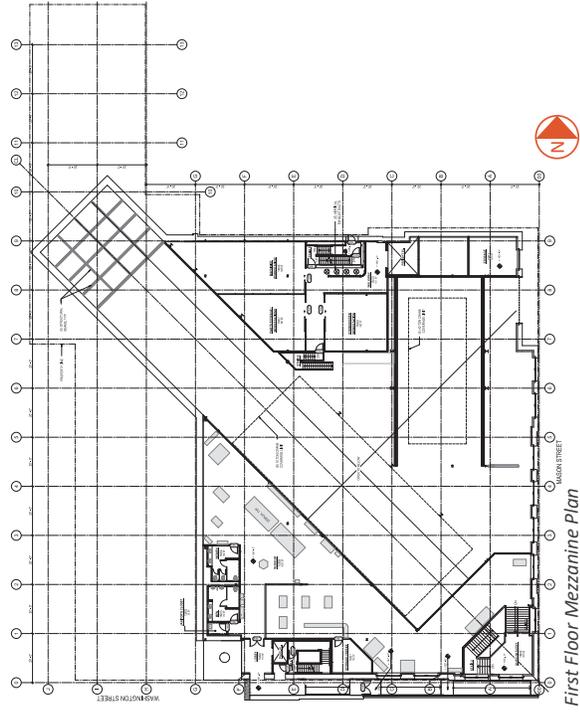
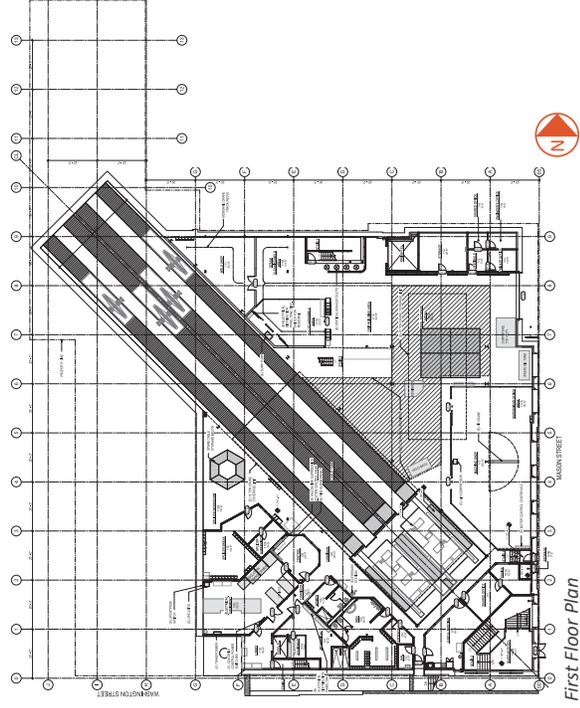
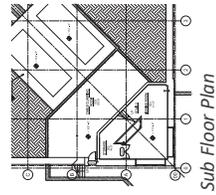
The first floor includes shops, work area, and offices, shared by propulsion and track teams. An employee entrance and an overhead door are located on Mason Street near Jackson Street and a museum entry door is on Mason Street near Washington Street. This floor includes the 8,565 sq. ft. cable yard and multiple maintenance tracks with underground pits for cable maintenance and 4,675 sq. ft. wheel storage area to store cable wheels in the underground.

The main electrical room and control room are located on the southwest corner. The project will upgrade the fire panels, relocate the electrical room to the second floor, and upgrade electrical service for 12kV. This floor also includes several maintenance shops such as machine

First Floor Mezzanine

shop, weld shop, pulley assembly area, grip building area, and splicer workroom. The project includes relocating the grip building area to the second floor and the weld shop to the current office area near Mason Street entry. There are multiple offices, restrooms, breakrooms, and common spaces shared by two teams. A passenger elevator and a freight elevator are located on the southwest corner and on the northeast corner, respectively. Both elevators run from the first floor to the second floor mezzanine.

The Cable Car Museum is located on the first floor mezzanine and houses a collection of historic cable cars, photographs, mechanical displays and a gift shop. The museum entrance for the public is located on the ground level of Mason Street and an accessible ramp is located on Washington Street side of the building. The museum space includes exhibit spaces, a souvenir shop, storage and restrooms. The north side of the mezzanine includes parts storage and machinist workstation for propulsion team and storekeeper workstation.

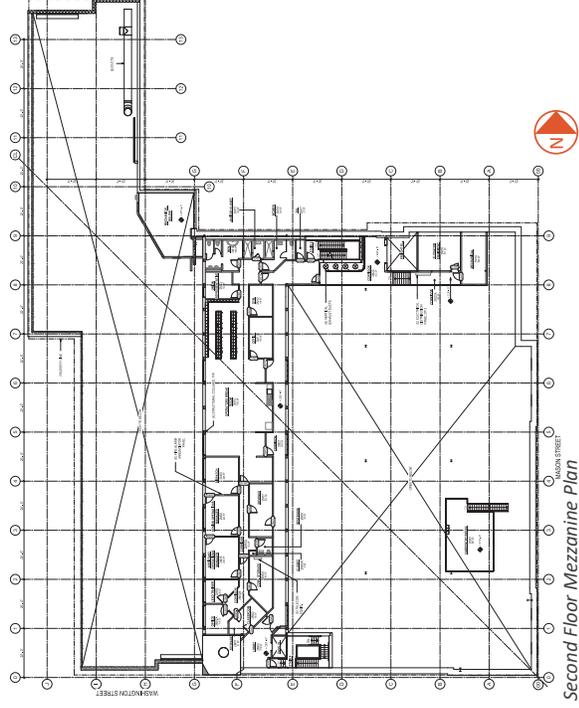
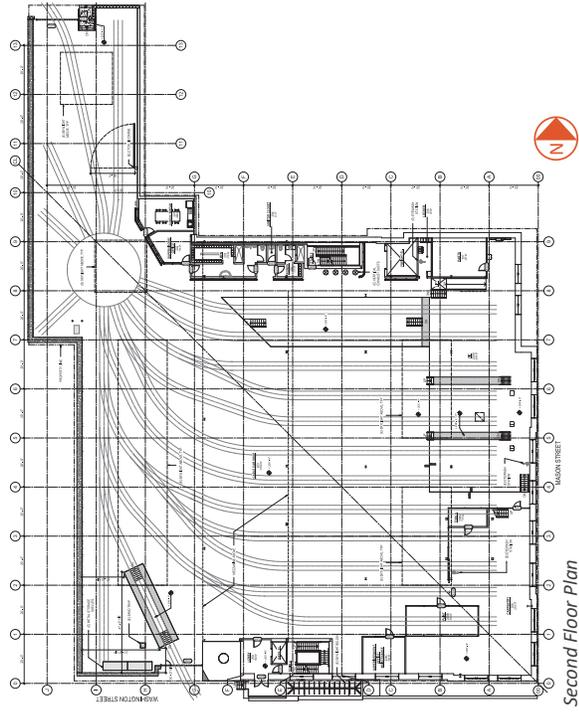


Second Floor

The second floor includes vehicle maintenance shops and pit areas with numerous tracks for vehicle maintenance team. The tracks are located throughout the entire floor and connected to each maintenance shop via a pull-in door, including the carpentry shop and maintenance pit areas, and finally to a pull-out door for departure. The pull-in door on Jackson Street is used for returning vehicles from the street, and the pull-out door on Washington Street is for departing vehicles. Offices, breakrooms, and restrooms for employees are located along the perimeter of the floor.

Second Floor Mezzanine

The second floor mezzanine houses offices, a breakroom, a locker room, and restrooms for operation team. A long corridor along the east side of the floor will be converted to office area.



Proposed Floor Plans

The project provides a strategic master plan for capital improvements. The goals are to optimize allocation of space in the Cable Car Barn for function and workflow, and ensure that all aspects of the space are structurally sound and architecturally appropriate for each function. The proposed floor plans identify the required capital improvements with a major electrical upgrade to 1.2kV power as the highest priority, and provide other improvements to optimize space use within the constraints of the historic status.

First Floor

The primary design change is the existing electrical service conversion to 12kV upgrade. The front half of the room remains as the electrical room, but the other half is removed and relocated to the second floor. This space is converted to new functions such as all gender restroom and locker room. Secondly, the existing bridge crane is upgraded to a 20-ton capacity and its travel distance is extended to cover the entire track length. Additionally, a 2-ton capacity bridge crane is added to the existing machine shop.

The existing offices and breakrooms are renovated with new finishes. The existing restrooms are upgraded to be fully accessible and code compliant, including accessible showers and drinking fountains. The existing locker rooms are updated to SFMTA Standards and additional locker room space is provided to meet the current and future staffing needs.

The two existing shops are moved: 1) grip building area is relocated to the second floor and 2) weld shop is moved to the northeast corner, replacing the existing office spaces. A new compact storage area is added, replacing the grip building area, to maximize storage space. Also, a new inspection room takes the old weld shop area. The other existing shops are upgraded with new equipment layout such as Pulley Assembly area, Steam Cleaning area, and Machine Shop.

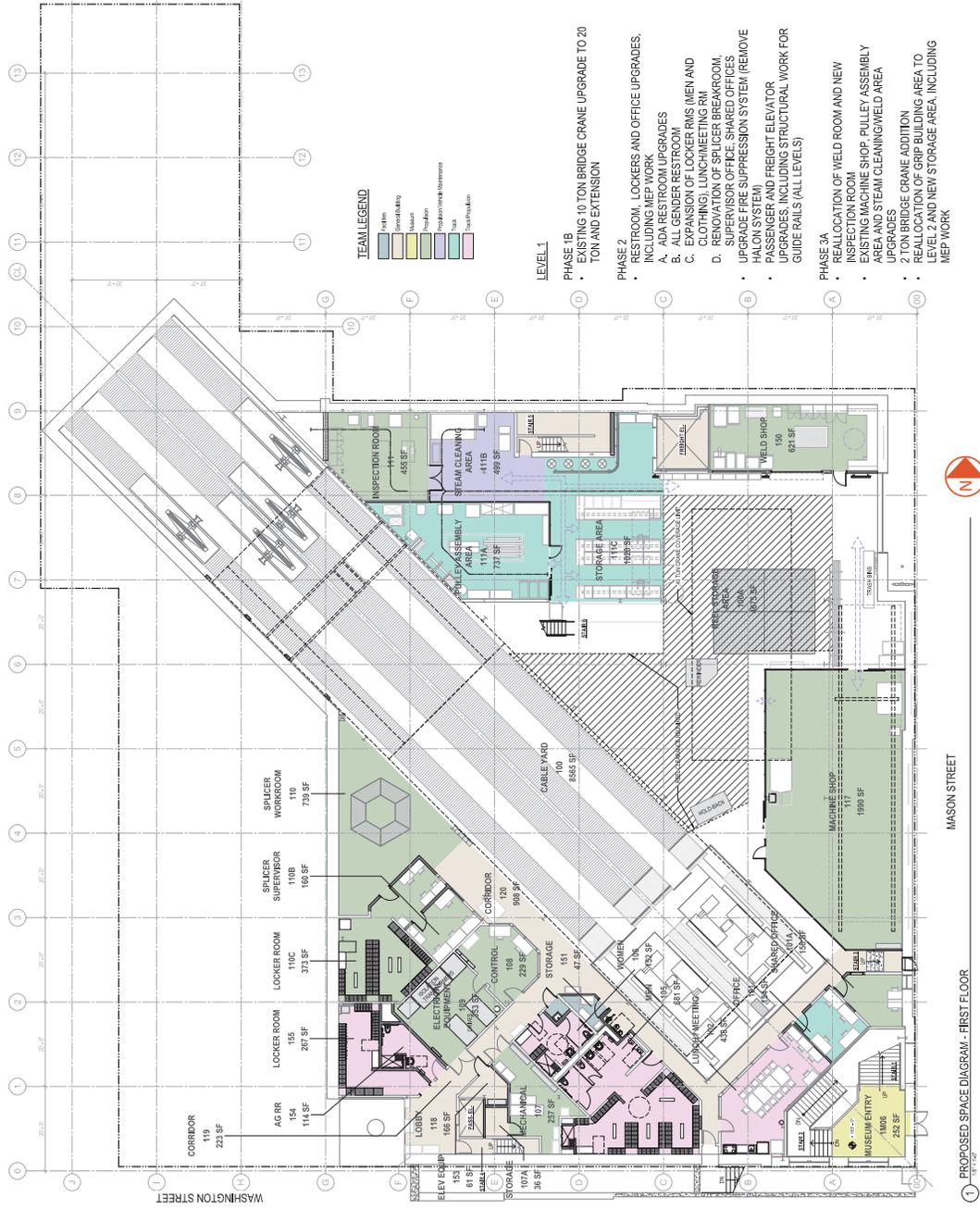
A new MRL passenger elevator and a vertical lift for equipment replace the existing hydraulic passenger elevator and freight elevator.

Team: Propulsion and Track teams

Shops: Cable Yard, Splicer Workroom, Inspection Room, Pulley Assembly area, Steam Cleaning area, Compact Storage area, Weld Shop, Machine Shop

Other Spaces: Offices, Break Rooms, Locker Rooms

BOH: Elevators, Restrooms, All-Gender Restroom, Janitor Closet, Storage



First Floor Mezzanine

A new office area is added at the northwest corner of the floor and includes private offices for superintendents and managers, and shared offices for propulsion and track team. The staff from the first floor are relocated to this floor as a result of the first floor improvements. This space is connected to the Museum on the west side and the shop area on the east side by new elevated walkways. An accessible path of travel is provided through the Museum.

The Cable Car Museum shall be renovated with new finishes and the existing restrooms are upgraded to be fully accessible and code compliant. A new all-gender restroom is added along with drinking fountains. Full height glass partitions are provided along the guardrails to block the fumes and dust from the shop area below. Also, full height glass entry storefront system and partitions are added at the museum entry and stair perimeter walls to conserve energy for an upgraded HVAC system in the museum space.

The existing shops on the opposite side from the museum are upgraded with new compact storage systems. Also, a new code compliant stairway shall replace the existing interior stairway, connecting the first floor shop area to the first floor mezzanine.

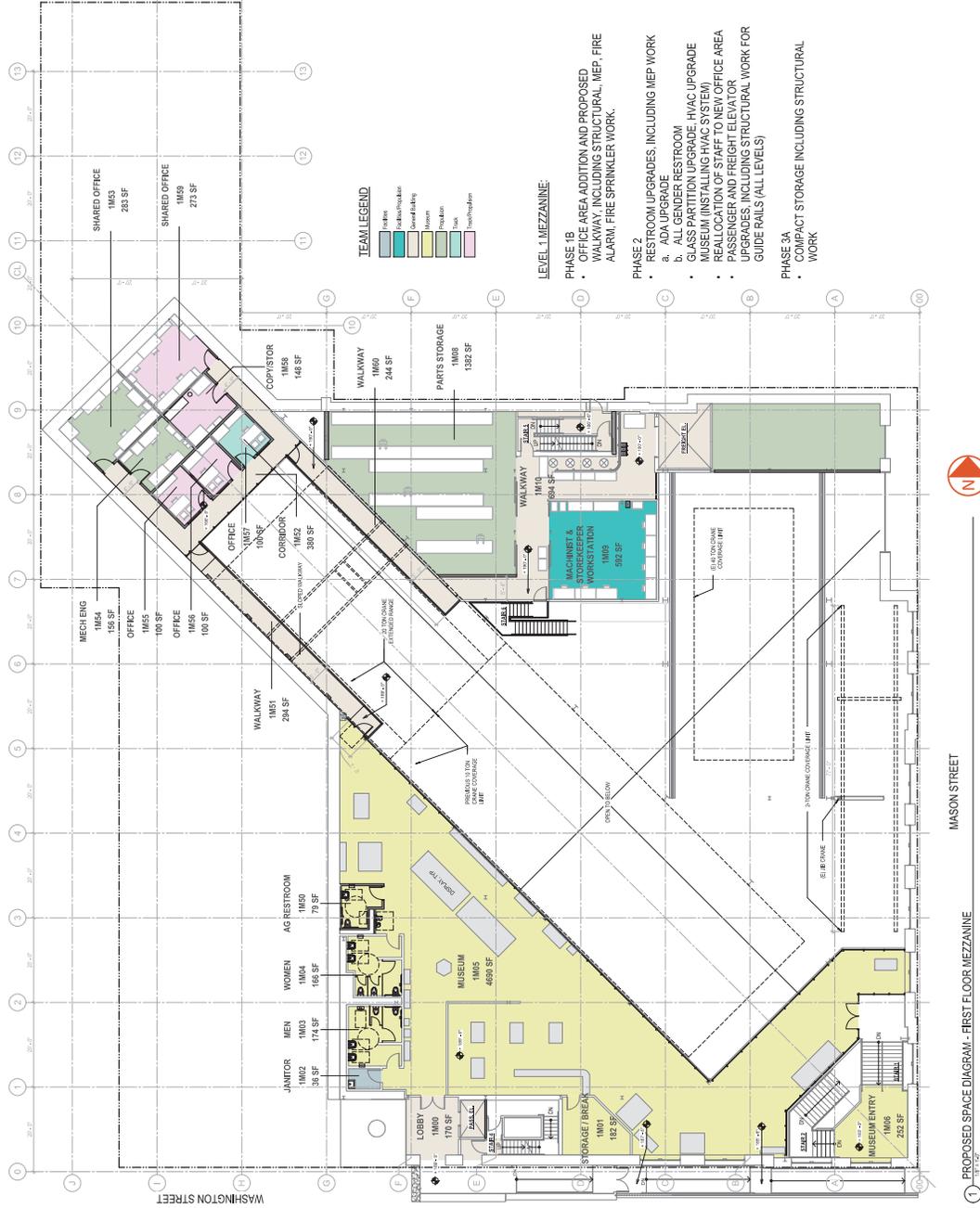
Team: Propulsion and Track teams

Public: Museum, Souvenir Shop, Restrooms, All-Gender Restroom

Shops: Machinist Workstation, Parts Storage/Workstations, Storekeeper Workstation.

Other Spaces: Offices

BOH: Elevators, Janitor Closet, Storage



Second Floor

A new 12KV electrical room, the top priority, is added on the southwest corner. This room contains the 12KV switchgear, medium-voltage transformer, low-voltage transformer, and wall mounted electrical panels. A clean agent system is proposed to protect the equipment in case of fire.

A new Grip Building room, moved from the first floor, is added at the northwest corner to improve workflow efficiency for vehicle maintenance team. The Carpentry/Paint shop shall be renovated with a new equipment layout and a new paint booth is added to offer a proper painting space with exhaust systems for lead-based paint jobs. Also, a spray booth area is placed adjacent to the paint booth for small parts paint jobs. The existing storage/staff break space on the mezzanine is removed due to its unstable structural condition and lack of accessible path.

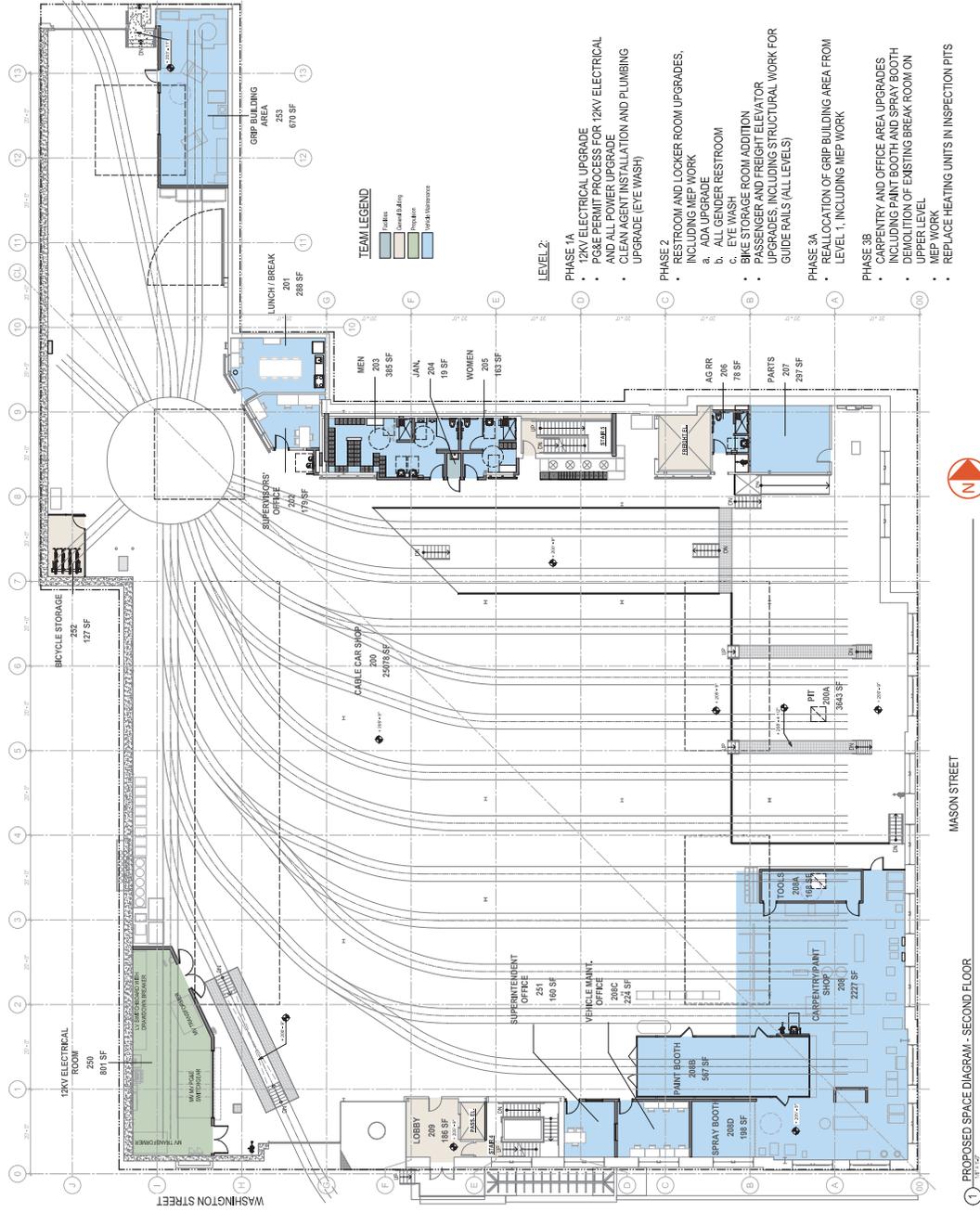
The existing offices and breakrooms are renovated with new finishes. The existing restrooms are upgraded to be fully accessible and code compliant, including accessible showers and drinking fountains. A new all-gender restroom is added, taking the existing locker room on the north wall and the west portion of the Parts room. The lockers are moved to the south side of the stair wall nearby. A new bicycle room and two EV charging stations are placed in accordance with City ordinances.

Team: Vehicle Maintenance team

Shops: Grip Building room, Carpentry/Paint shop, Paint Booth, Vehicle Maintenance Pits

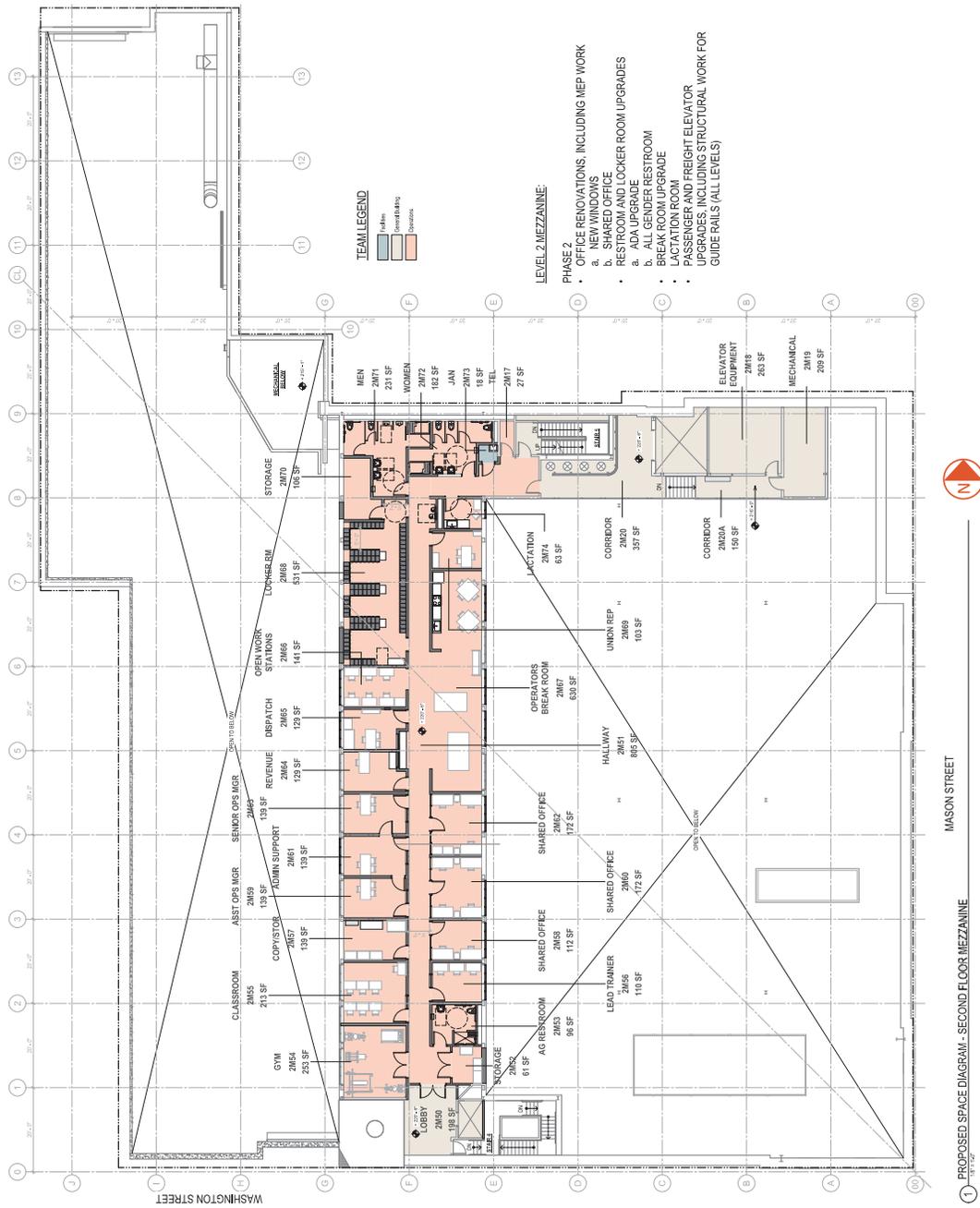
Other Spaces: Offices, Lunch/Break room

BOH: Elevators, Restrooms, All-Gender Restroom, Janitor Closet, Storage



MASON STREET

PROPOSED SPACE DIAGRAM - SECOND FLOOR
15-11-20



Second Floor Mezzanine

This project proposes a new interior layout throughout the entire second floor mezzanine for the operations team. A gym and a classroom are added adjacent to the elevator to allow staff a convenient access from the other floors. A large breakroom offers space for a table tennis and a pool table requested by the Staff Union, which also includes a kitchenette with lunch tables for staff. The existing locker room will be renovated with additional locker space to meet the current and future staffing needs. The new layout includes private offices for superintendents and managers and shared offices for operations staff. The Dispatch room is located on the west side of the floor to overlook the Cable Cars and staff activities on the second floor. The private offices for Senior OPS MGR and Assistant OPS MGR are located on the operation side along with the Revenue and Dispatch room. Semi-transparent glass partitions are added to the shared offices on the hallway side to maximize natural light but also provide privacy for Operations staff. The union representative's office is placed near the restroom side, separated from the operation side for private conversation. The existing restrooms are upgraded to be fully accessible and code compliant, including accessible showers and drinking fountains. A new all-gender restroom is added, replacing the existing single user restroom space.

Team: Operations team

Other Spaces: Offices, Gym, Classroom, Break room, Locker room, Lactation BOH: Elevators, Restrooms, All-Gender Restroom, Janitor Closet, Storage, Mechanical room, Elevator Equipment room

Roof

The entire roofing will be replaced and new skylights will be added to provide natural light to the vehicle maintenance area. New HVAC units and vents shall also be provided.

*See Appendix A1 - Final Concept Plan Drawing set for the complete scope.

Phasing Plans

Phase 1A

Level 2: 12KV electrical upgrade. PG&E permit process for 12KV electrical and all power upgrade. Clean agent installation and plumbing upgrade (eye wash)

Phase 1B

Level 1: Existing 10-ton bridge crane upgrade to 20-ton and extension, including structural work

Level 1M: Office area addition and proposed walkway, including structural, MEP, fire alarm, fire sprinkler work.

Phase 2

Level 1: Restroom, locker and office upgrades, including MEP work. Upgrade fire suppression system (remove halon system)

Level 1M: Glass partition upgrade, HVAC upgrade museum (installing HVAC system), restroom upgrades, including MEP work.

Level 2: Restroom upgrades, including MEP work. Bike storage room addition

Level 2M: Office renovations including MEP work

All levels: Passenger and freight elevator upgrades, including structural work for guide rails (all levels)

Phase 3A

Level 1: Reallocation of weld room and new inspection room. Existing machine shop, pulley assembly area and steam cleaning/weld area upgrade. 2-ton bridge crane addition. MEP work.

Level 1M: Compact storage including structural work

Level 2: Reallocation of grip building area from level 1, including MEP work.

Phase 3B

Level 2: Carpentry and office area upgrades including paint booth and spray booth Demolition of existing break room on upper level. MEP work. replace heating units in inspection pits

Phase 4

Remaining MEP upgrade, new skylights and entire roof replacement

Phase 5

Seismic retrofit work

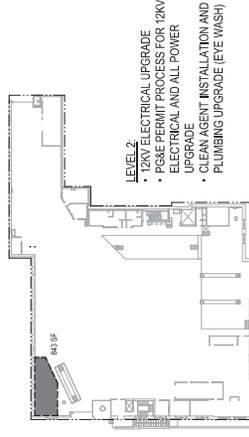
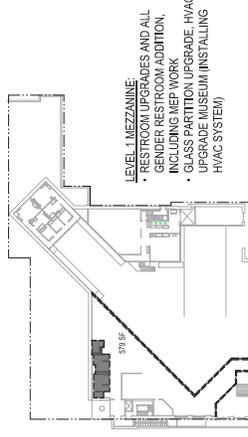
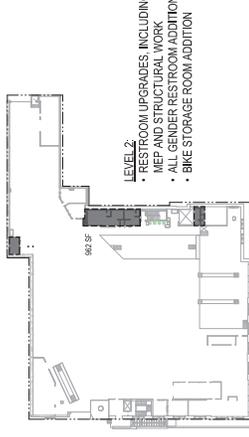
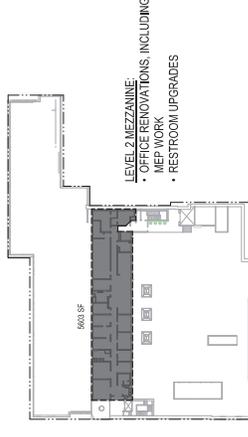
Other scope

Exterior improvements:

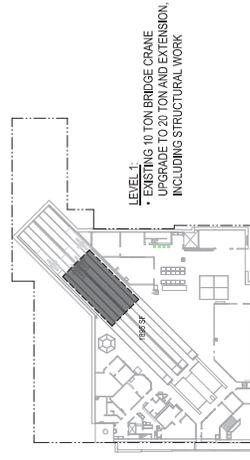
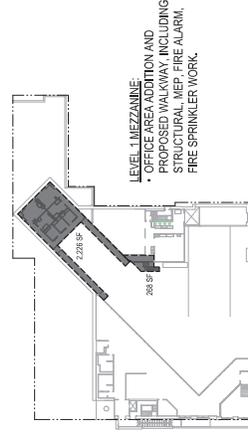
See Appendix A7- Exterior Conditions Memo & A13 - Cost Estimate for details

Winding motors upgrade (optional):

See Appendix A13 - Cost Estimate for details



1A PHASE 1A | 12KV SWITCHGEAR UPGRADE
1" = 40'-0"



1B PHASE 1B | BRIDGE CRANE UPGRADE
1" = 40'-0"

2 PHASE 2 | OFFICE IMPROVEMENTS
1" = 40'-0"

Phasing Plans

Phase 1A

Level 2: 12KV electrical upgrade. PG&E permit process for 12KV electrical and all power upgrade. Clean agent installation and plumbing upgrade (eye wash)

Phase 1B

Level 1: Existing 10-ton bridge crane upgrade to 20-ton and extension, including structural work
 Level 1M: Office area addition and proposed walkway, including structural, MEP, fire alarm, fire sprinkler work.

Phase 2

Level 1: Restroom, locker and office upgrades, including MEP work. Upgrade fire suppression system (remove halon system)
 Level 1M: Glass partition upgrade, HVAC upgrade museum (installing HVAC system), restroom upgrades, including MEP work.
 Level 2: Restroom upgrades, including MEP work. Bike storage room addition
 Level 2M: Office renovations including MEP work
 All levels: Passenger and freight elevator upgrades, including structural work for guide rails (all levels)

Phase 3A

Level 1: Reallocation of weld room and new inspection room. Existing machine shop, pulley assembly area and steam cleaning/weld area upgrade. 2-ton bridge crane addition. MEP work.
 Level 1M: Compact storage including structural work
 Level 2: Reallocation of grip building area from level 1, including MEP work.

Phase 3B

Level 2: Carpentry and office area upgrades including paint booth and spray booth Demolition of existing break room on upper level. MEP work. replace heating units in inspection pits

Phase 4

Remaining MEP upgrade, new skylights and entire roof replacement

Phase 5

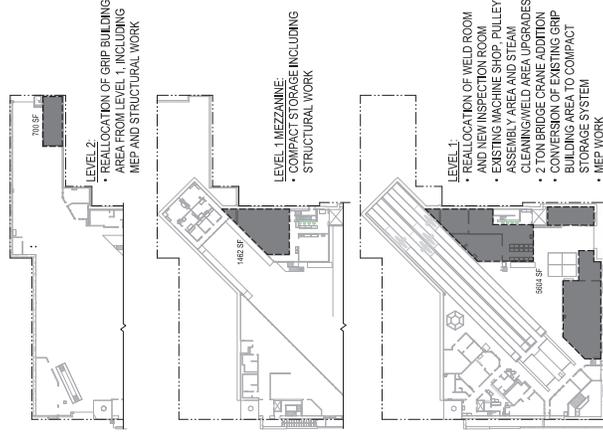
Seismic retrofit work

Other scope

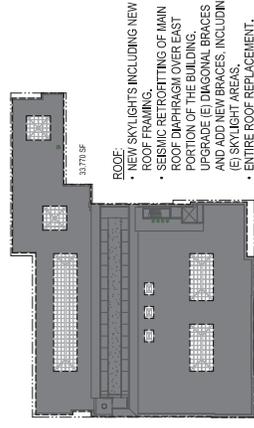
Exterior improvements:
 See Appendix A7- Exterior Conditions Memo & A13 - Cost Estimate for details
 Winding motors upgrade (optional):
 See Appendix A13 - Cost Estimate for details

* Cost estimator to provide cost breakdown both by concurrent work and by individual phase.

* A full modernization/upgrade to the aging electrical infrastructure such as switchgear, transformers, switchboards, motor control center, panels, disconnect switches. New lighting installation, existing lighting replacement and control upgrade per latest code requirement. Provide power to newly added equipment such as paint booth, HVAC, lighting fixtures and power receptacles.



3B | PHASE 3B | CARPENTRY UPGRADES
 1:1-4/20



4 | PHASE 4 | ROOF REPLACEMENT
 1:1-4/20

3A | PHASE 3A | PROGRAM RESTRUCTURING
 1:1-4/20

Design Research

Elevators

The current passenger and freight elevators at the Cable Car Barn were installed in 1984 by Montgomery Elevator. Montgomery Elevator has since been purchased by KONE. Due to Montgomery Elevator parts being increasingly hard to find and due to the equipment nearing 40 years of age, we recommend that both elevators be modernized, including the machines, controllers, door equipment and related parts. See Appendix A11 for existing elevator shop drawings.

We also recommend replacing the existing elevators as follows. See Appendix A11 for Stantec Elevator Assessment.

Existing passenger elevator information:

- State ID #07752
- Installed in 1984
- Hydraulic
- Montgomery Elevator
- 2500 lb. capacity
- 12.5fpm speed

Replace existing hydraulic passenger elevator, controllers and door equipment with Machine Room-Less (MRL) elevator with new structural support, including guide rails. (KONE, Model MONOSPAC500 Flex, or equal.) See Appendix A11 for KONE elevator layout drawings based on existing dimensions.

Update the existing elevator machine room (fenced chain link area) to new enclosed MRL control room with direct access door to the corridor per MTA request. See Appendix A1 for proposed first floor plan.

Existing freight elevator information:

- State ID #077624
- Installed in 1984
- Traction - basement machine with an adjacent overhead machine room
- Montgomery Elevator with Guilbert freight doors

- 8000 lb. capacity
- 150fpm speed

Replace existing traction freight elevator, controllers and door equipment with new equipment vertical lift (capacity 10,000 lb.). (PFLOW Industries, M Series Mechanical, or equal)

Update the passenger elevator within the fire and life safety systems including for main and alternate recall. Install a fire alarm initiating device in the machine room and every landing by the elevator.

The passenger elevator shall comply with accessibility standards per the California Building Code. See Accessibility Design Narrative.

MTA to discuss Machine Room-Less (MRL) elevators in the future for the final elevator selection and possible elevator code upgrade in California for MRL.



Existing passenger elevator.



Existing freight elevator.

Paint Booth

A dedicated paint room is needed to contain the fumes and dust generated by regular painting maintenance on the cable cars. Garmat USA has provided information and preliminary drawings for a design-build paint booth tailored to CCB's building constraints – see Appendix A12. The paint booth, which would be installed on the existing second floor deck around one of the car tracks, would include a heater to cure paint, sprinklers, lighting, and supply and exhaust fans which are designed to filter out 97% of particulate spray. Access to the paint booth includes a tri-fold door for vehicle entry and three person doors. Paint equipment would be brought into the room as needed to paint the cable cars. The Garmat USA paint booth is an ETL listed product.

Construction:

Double skin, fully insulated, powder coated white spray booth with side service doors. Provide a 4" gap between the paint booth and other built wall partitions.

Anchorage:

As recommended by Garmat USA. A structural engineer to review anchorage details as additional anchoring may be necessary based on local jurisdiction requirements.

Attach front and rear thresholds to the existing floor using 3/8" or greater x 3" to 4" concrete anchors at each of the holes provided. (Example: Simpson Strong-Tie Anchor Systems "Wedge All")

Additionally, anchor the wall panel floor tracks using powder actuated or equivalent pin anchors at 36" increments. (Example: Remington 3/4" to 1 1/2" Low Velocity Power Fastener or Hilti 1" Sheet Metal Fastener)

Level floors within 1/4".

Dimensions:

As shown on Appendix A1.

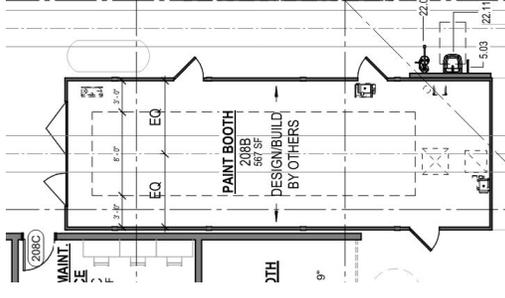
Electrical Requirements:

The booth can run on 208v / 230v / 480v

Lights can be either 120 or 277V
Assuming the provided electrical is 240v 3 phase, CCB would need 70 amps plus two 120v circuits for each of the lights.

Mechanical Requirements:

Garmat shall provide intake and exhaust caps and straight ducting sections only. All penetrations, flashing, curbs and offsets shall be provided by others and in compliance with local jurisdiction.



Paint booth plan by Garmat. See Appendix A12.

Accessibility Design

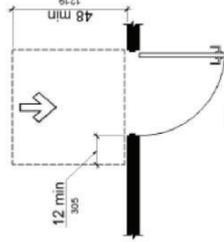
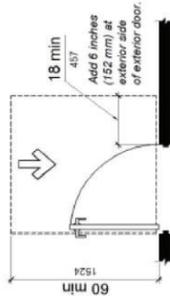
We assessed the existing path of travel elements and door accessibility for compliance with current accessibility standards:

2010 ADA Standards for Accessible Design
2019 California Building Code (CBC), Chapter 11B

Existing doors not in compliance with the maneuvering clearances established in the CBC Section are documented in Appendix A1 on the door schedule sheet. These doors, noted as “existing, non-conforming” will require further review to determine if they can be categorized as Technical Infeasibilities or if further modification to the existing building is required to achieve additional or full level of compliance.

We addressed the accessibility of Path of Travel elements, including entries, restrooms, locker rooms and drinking fountains, by modifying the layout and/or replacing plumbing fixtures and restroom accessories. We also added all-gender facilities to comply with local ordinances. At restrooms, provide all new plumbing fixtures and accessories, installed with code compliant clearances and new toilet/urinal partitions which will allow for compliant clearances as well.

Modify the ramped museum entry to apply code compliant slopes to all ramp runs and landings and ensure handrails are also in compliance. Relocate existing door actuators as described in Appendix A1 drawings to provide unobstructed and level clear floor space at both internal and external actuators. See 2-Accessibility Design Narrative for more information.



Example of required door maneuvering clearances.



Non-compliant drinking fountain (Second Floor Walkway).



Non-compliant lavatory and shower (Men 203).



Non-compliant lavatory (Women 106).



Non-compliant museum entry ramp.

Lactation Room

The existing CCB facility does not currently provide lactation accommodation as described in the following documents:

- SF Ordinance 131-17
- San Francisco Building Code, Section 1209.5 Lactation Rooms (Local Amendment)

Provide new Lactation Room. See Appendix A1 for layout of proposed Lactation Room on Level 2 Mezzanine. Some of the requirements for this room include but are not limited to:

- Minimum 50 square feet
- Solid door with privacy latch
- Refrigerator, such as small under counter model
- Two duplex receptacles for powering refrigerator and breast pump
- Counter or table
- Adjustable, washable, comfortable chair
- Sink w/ hot & cold water
- Sanitation requirements same as for kitchen – washable or readily cleanable floors, walls, ceilings
- Permanent signage (Room ID sign type), "LACTATION ROOM"

The following items are recommended but not required:

- Full-length mirror
- Microwave oven
- Locker(s) or place to store items
- One additional duplex receptacle for microwave



Proposed Lactation Room 2M74

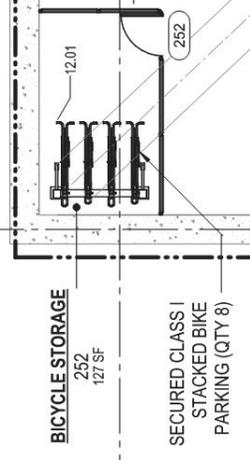
Bicycle Parking and Storage

The existing CCB facility does not currently provide sufficient Class I and Class II bicycle parking accommodations as required by the following documents:

- SF Ordinance No. 183-3
- SF Planning Code, Sections 155.1-1-2
- SF Planning Department, Bulletin No. 9

Class I Bicycle Parking (Interior)

The facility requires 8 total Class I bicycle parking spots. There is currently no dedicated bike parking that satisfies the requirements of SF Planning. We recommend providing a lockable wire mesh enclosure with 2-tier bike rack for space optimization. See Appendix A1 for location of Bicycle Storage Room 252 within the Cable Car Shop.



Bicycle Storage 252 (See Appendix A1)

Class II Bicycle Parking (Exterior)

The facility requires 7 total Class II bicycle parking spots. There are currently 2 existing bike racks located on the sidewalk on Mason Street. Provide 5 additional bike racks as indicated on the Site Plan in Appendix A1.



Existing bike racks located on Mason Street.

2 - Accessibility Design Narrative

Accessibility Assessment

The Cable Car Barn (CCB) houses a Cable Car museum and associated programs, services and activities administered by, and various administrative offices of, the San Francisco Municipal Transportation Agency (MTA). Each program made available to the public is also required to be accessible to persons with disabilities under the Americans with Disabilities Act (ADA). To meet "Title II Program Access" requirements, previous ADA barrier-removal projects mitigated most barriers to access the museum.

Employee Work Areas and Common Use Areas

As part of the MTA's master plan to upgrade employee work areas on all 4 levels of the CCB, any portion of the facility being altered in the future will need to comply with the accessibility standards within the building code in effect at the time of construction.

Future alterations of any Employee Work Areas and Common Use Areas will be subject to accessibility standards with Chapter 11B. An accessible route complying with Division 4 is required to be provided up to each workstation, but workstations themselves are exempted from most Chapter 11B requirements, except the following – accessible means of egress (11B-207.1); fire alarm systems and carbon monoxide alarm systems (11B-215.3); stable, firm, and slip resistant floor surfaces (11B-302); accessible changes in level (11B-303); electrical switches (11B-308.1.1); electrical receptacle outlets (11B-308.1.2); and door openings with 32" min. clear width (11B-404.2.3).

However, there are some common use circulation paths on the 1st and 2nd floors that are integral to Work Area Equipment and are not required to be on an accessible route; e.g. cable pulley system and similar large equipment on the 1st floor, with elevated walkways used for monitoring purposes that are physically part of the equipment. There are also some Limited Access Spaces and Machinery Spaces on the 1st and 2nd floors that are not customarily occupied or are otherwise accessed only by ladders – these spaces within CCB are also not required to be on an accessible route.

Path of Travel Elements

Based on the scope any future alteration, path of travel elements serving such areas of alteration will be triggered and consequently need to include an accessible route to the altered area(s) from such elements:

Primary and Secondary Building Entrances

The primary entrance to the museum is off Mason Street at the intersection of Washington Street – the slope at this entrance door exceeds 2% and would need to be corrected as part of any triggered sidewalk improvements to comply with SF Public Works Code Article 15 Section 706(a). However, the adjacent accessible entrance leading to the sole passenger elevator in the building is via a series of ramps along Washington Street – one exterior ramp up to the entrance doors and another interior ramp up to the elevator lobby. The double-leaf doors between these 2 ramps have low-energy power operators with high-low push plate actuators on either side – locations for which will need to be adjusted. Slopes on portions of the ramp runs and landings exceed code-maximums and will need to be corrected. Handrails are not continuous and lack edge protection.

If replaced, manual doors at secondary secured (employee) entrances and at grade exits will need to comply with 11B-404.

Restrooms & Drinking Fountains

Path of travel elements, such as restrooms, locker rooms and drinking fountains, serving employee work areas at each level will need to comply with the applicable accessibility requirements within the Building Code – these include:

- The restrooms on each floor, serving program spaces and employee work areas.
- Staff locker rooms, changing and shower facilities.

- Hi-lo drinking fountains with adequate pedestrian protection.

Parking, Passenger Loading Zone and Transit Stops

Each site arrival point, such as accessible parking spaces, passenger loading zones and public transit stops must be connected by an accessible route to the accessible building entrance.

Public parking is available on and around the surrounding streets – no on-street accessible space identified by a blue curb was located within the vicinity of the entrance. Staff park their personal vehicles on the 2nd floor of the building – this area is not designated for parking vehicles, but rather is used to store cable cars during hours of non-operation. There is a parking ticket vending machine in the elevator lobby on the 2nd floor with daily and monthly rates identified for MTA staff use.

On the south side of Washington Street, located directly across from the accessible entrance, is an on-street passenger loading space, which is marked with a white curb. While paratransit and other vehicles which deploy their lifts directly onto the sidewalk, patrons that arrive using other vehicles such as van-taxis with ramps at the rear would need to avail of the marked crosswalk and curb ramps at the intersection – the curb ramps at the north-west corner of this intersection will need to be upgraded as part of any future project.

Where two or more similar site arrival points, such as transit stops for 2 separate Muni lines, serve the same accessible entrance, both transit stops are required to be on accessible routes. The cable car stop for the downtown-bound Hyde-line is located at the intersection of Mason Street with a shelter located across Washington Street. The stops for the north-bound Hyde-line and the Mason-line on either direction are located on Mason Street at the intersection of Jackson Street. The sidewalk on Mason Street along the CCB building is part of the pedestrian

access route from these stops and is in a state of disrepair – it will need to be upgraded to comply with SF Public Works Code Article 15 Section 706(a).

These pedestrian access routes from the building entrance to the aforementioned MUNI stops will need to be documented as part of any future building alteration permit application.

Any deficient curb ramps serving crosswalks adjacent to the property en route to these MUNI stops will need to be upgraded as part of any future building alteration permit application. Any sidewalk deficiencies that are not adjacent to the CCB property are not required to be improved as part of the alteration project(s) but should be documented with the Sidewalk Inspection and Repair Program (SIRP) program and the Accelerated Sidewalk Abatement Program (ASAP) at the Bureau of Street Use and Mapping.

Egress, Signs & Additional Accessible Elements

Depending on the spaces or areas included in any future alteration project, it will likely trigger additional accessible elements to be brought into compliance with the building code. Examples include, but are not limited to:

- Tactile exit route and room ID signs along accessible routes serving the altered area
- Doors to altered areas or along to the accessible route (32" clear width, 43" max vision light, etc)
- Exit doors required by Chapter 10, and which are not more than 24 inches above grade
- Protruding elements in employee common use areas
- Operable parts in public use and employee common use areas
- Contrasting striping on stair treads and handrails at altered stairways

Fire Alarm Systems

An upgrade to the existing fire alarm system will trigger the requirement for visible alarms (strobes) in employee work areas and common use areas. Manual fire alarm boxes would need to be installed within accessible reach range.

Vertical Conveyance between Levels

There are two existing elevators that serve all 4 levels at CCB – however only one is a designated passenger elevator. Building permit applications for future alteration projects at CCB, will require that this existing passenger elevator is modernized to be in compliance with section 11B-407 of the building code in effect at the time of construction.

Summary

This accessibility assessment of the CCB includes observations from a walk through conducted in November 2021 and provides broad-stroke recommendations for accessibility upgrades contingent on the scope of future alteration projects. As part of any future project scoping, it is recommended to conduct a detailed accessibility compliance study to identify deficiencies with respect to the accessibility standards within the building code in effect at that time.

3 - Structural Design Narrative

Structural Design Narrative

Existing Building Structural System

The Cable Car Barn was built in the late 1800s and rebuilt after the 1906 San Francisco earthquake.

The building was rehabilitated in 1982-1984 where the following work was performed:

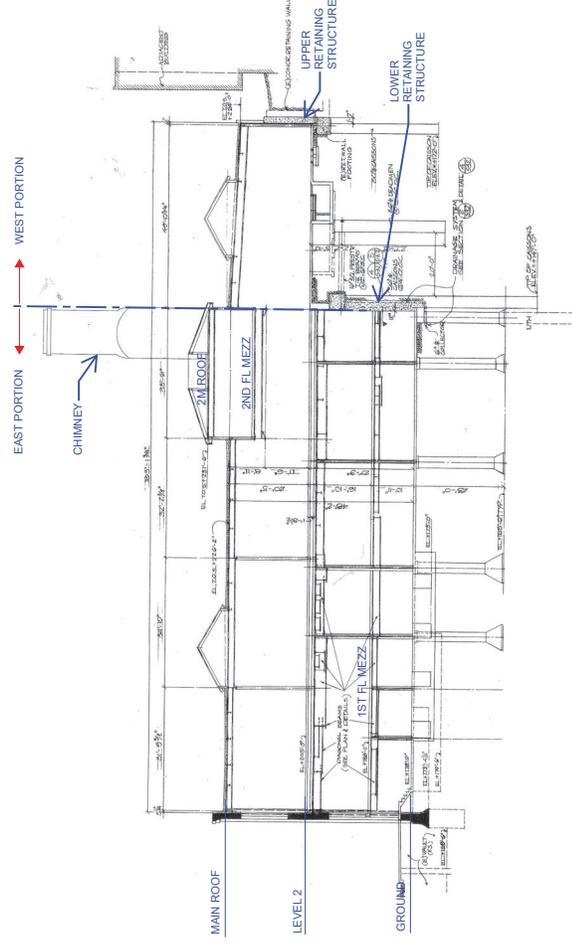
- Seismic reinforcement of existing masonry walls
- Rebuilding interior gravity load carrying system
- Adding second floor mezzanine and elevated mezzanine roof
- Enclosing existing yard on the west side
- Renovation of below ground structures
- Renovation of operation equipment

The 1982-1984 rehabilitation was based on the 1973 edition of the San Francisco Building Code.

The existing building can be described as having five main structural components:

- East Portion Building
- West Portion Building
- Chimney
- Lower Retaining System
- Upper Retaining System

The five structural components are shown in the section below:



Structural Work Scope

Master Plan

The project architect requested structural support for the proposed work in the master plan from the structural section of the SFPW Bureau of Engineering.

Structural input was requested for the following new items:

- New added 2 tons capacity crane at first floor, east of grid line A, and supported by second floor framing
- Compact storage shelves for first floor and 1M floor.
- Addition of new walkway and office area to 1M floor.
- Addition of new 20-ton crane supported by second floor framing.
- Addition of new 12KV electrical equipment to second floor.
- Addition of restroom to second floor.
- Addition of 3 tons free standing crane to second floor.
- Addition of new skylight to roof level.

Seismic Evaluation

Structus, an as-needed structural engineering consultant, performed building seismic evaluations using ASCE 41-17 Tier-1 screening and Tier-2 deficient based evaluation procedures. The foundation and existing basement are not included in the work scope.

The seismic evaluation report completed by Structus in October 2021 is included in this report as an appendix.

Structural Design Criteria

Master Plan Related Work

- All master plan related work shall conform to the 2019 San Francisco Building Code (SFBC) which comprises the 2019 California Building (CBC) and 2019 San Francisco Amendments.

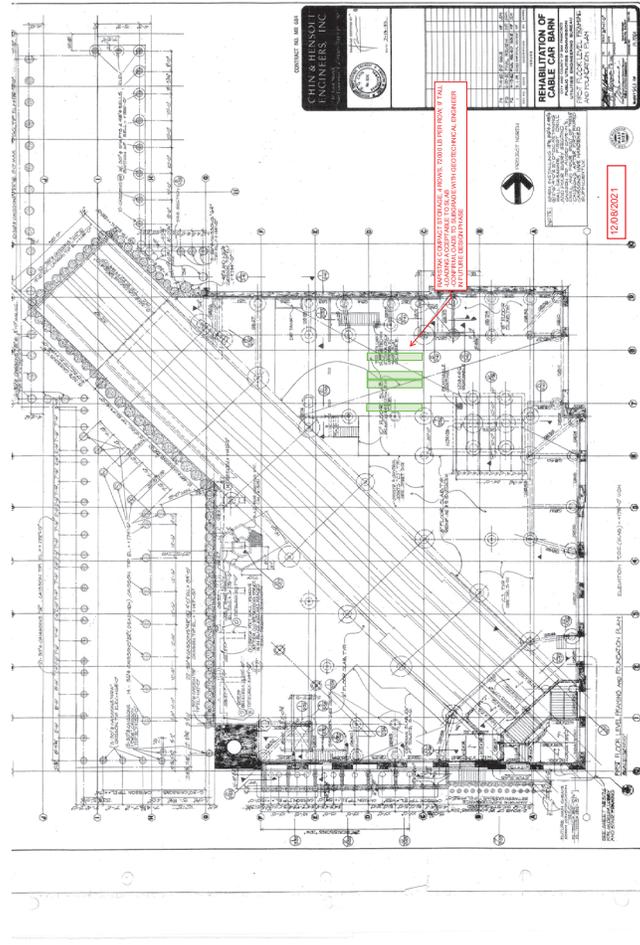
Seismic Evaluations

- The Cable Car Barn building seismic evaluation and retrofitting concept development followed ASCE 41-17 – Seismic Evaluation and Retrofit of Existing Buildings.

Structural Strengthening for Master Plan

First Floor

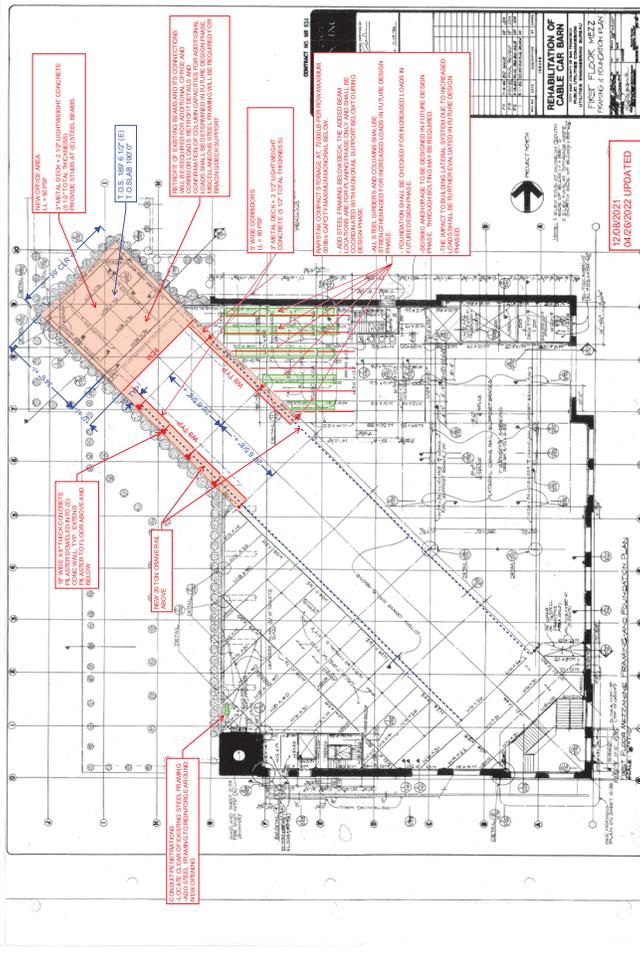
The compact storage shelves on the first level were proposed in the master plan. The structural strengthening requirements are summarized in the sketches below.



First Floor Plan

First Floor Mezzanine

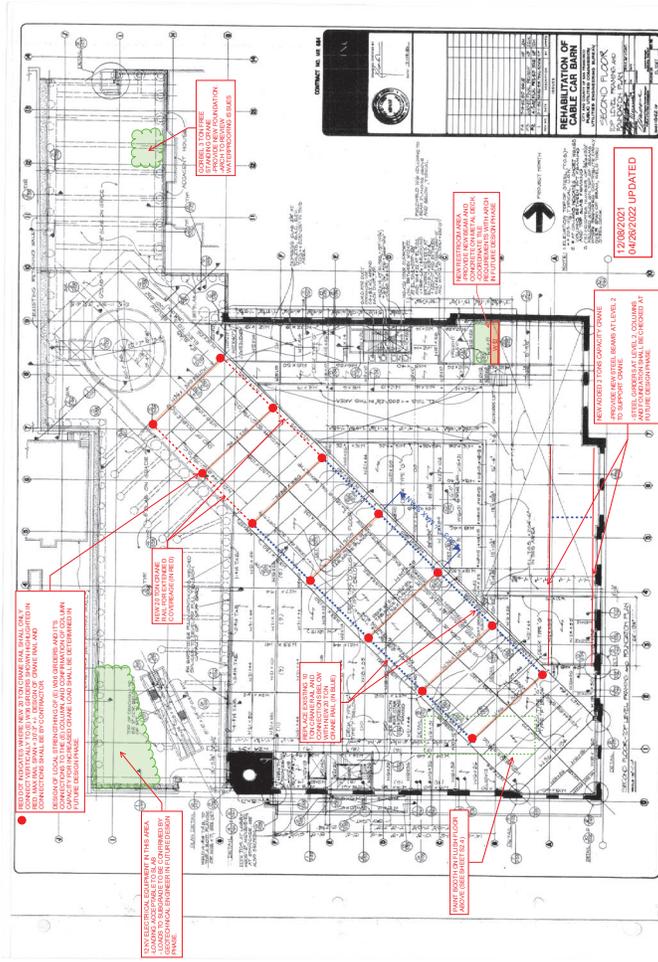
A new walkway and office area were added to the 1M floor and the compact storage shelves on the 1M floor were proposed in the master plan. The proposed structural strengthening is summarized in the sketch below.



First Floor Mezzanine Plan

Second Floor, Track and Flush Support Plan

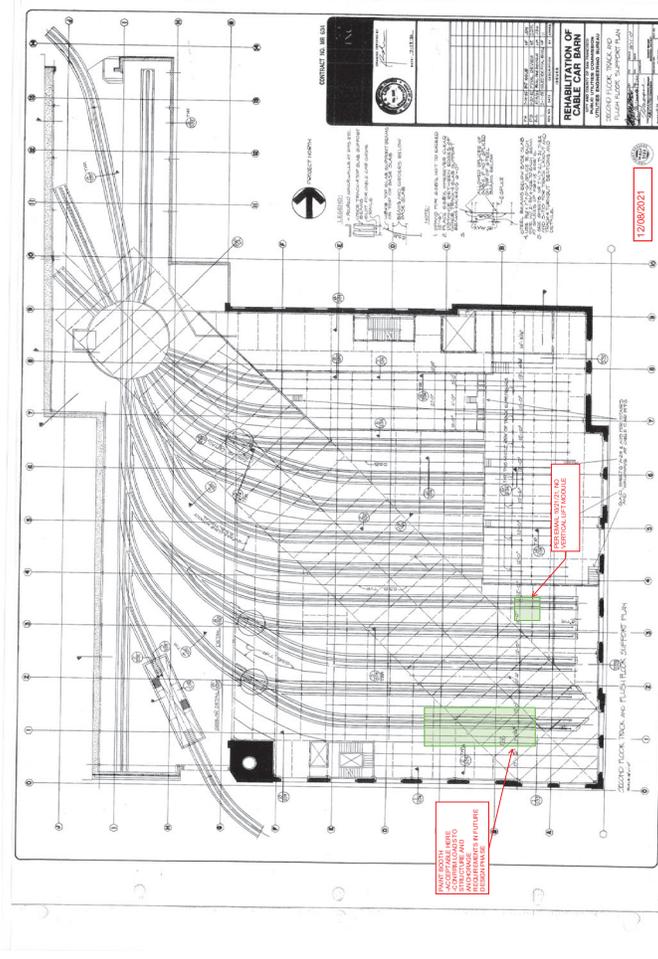
The Paint booth was added to the second floor, track and flush support plan. The proposed location and notes are summarized in the sketch below.



Second Floor Plan

Second Floor

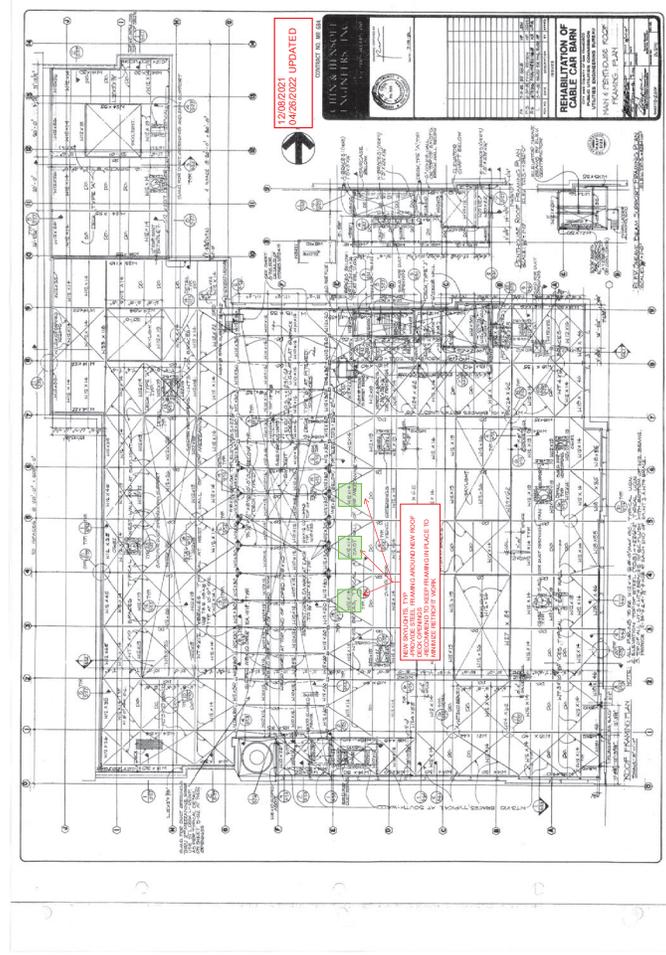
A new 20-ton crane was added and is supported by the second floor framing. 12 kV electrical equipment, a 1-ton free-standing crane, and a new restroom were added to the second floor. A new 2 tons capacity crane was proposed at first floor, east of grid line A, and supported by second floor framing. The proposed structural strengthening is summarized in the sketch below.



Second Floor, Track and Flush Support Plan

Main Roof Level

New skylights were added to the roof level. The proposed structural strengthening is summarized in the sketch below.



Main Roof Plan

Existing Building Seismic Evaluation Summary

Seismic Risk and Performance Objectives

The seismic evaluation is based on ordinary use for the building. This means the building is a non-essential facility and a non-emergency/natural disaster responding facility and does not house hazardous materials.

The evaluation is performed based on two levels of seismic hazards:

- BSE-1E earthquakes with an average return period of 225 years and a targeted structural performance of S-3, Life Safety.
- BSE-2E earthquakes with an average return period of 975 years and a targeted structural performance of S-5, Collapse Prevention.

Seismic Evaluation Approach

The Cable Car Barn seismic evaluation followed the ASCE 41-17 approach:

- Tier-1 screening
 - Tier-2 Deficiency-Based evaluation
- Building Seismic Deficiencies
- Inadequate seismic force resisting system for transferring seismic force in N-S direction from second floor mezzanine to foundation.
 - Inadequate main roof diaphragm capacity for seismic force resistance.
 - Inadequate strength in south and east walls, both on wall piers and spandrels.
 - Inadequate out of plane support in north wall near egress stairs.
 - A few other minor conditions which are included in Seismic Evaluation Report found in the appendix of this report.

Proposed Seismic Hazard Rating (SHR)

ASCE 41 Structural Performance Level at BSE-I-N	SHR	SHR Description
Immediate Occupancy (I.O.)	1	Negligible damage (very good performance). Minimal to no disruption to the building's function. Damage is so minor or negligible that repair is not necessary.
Damage Control	2	Minor damage (good performance). Some structural or nonstructural damage and/or falling hazards may occur, but these would pose minimal life safety hazards to occupants. The damage can be repaired while the building is occupied and with minimum disruption to functions. Buildings and structures with this rating represent an acceptable level of earthquake safety, and funds need not be spent to improve their seismic resistance to gain greater life safety.
Life Safety (L.S.)	3	Moderate damage (fair performance). Structural and nonstructural damage and/or falling hazards are anticipated which would pose low life hazards to occupants. The damage can be repaired while the building is occupied. Buildings and structures with this rating will be given a low priority for expenditures to improve seismic performance and/or falling hazards to the "good performance" level.
Limited Safety	4	Major damage (poor performance). Structural and nonstructural damage are anticipated which would pose appreciable life hazards to occupants. The building has to be vacated during repairs, or possibly cannot be repaired due to the extent and/or economic considerations. Buildings and structures with this rating will be given a high priority for expenditures to improve seismic performance and/or falling hazards to the "good performance" level, or would be considered for other abatement programs such as reduction of occupancy.
Collapse Prevention (C-P)	5	Partial/total collapse (very poor performance). Extensive structural and nonstructural damage, potential structural collapse and/or falling hazards are anticipated which would pose high life safety hazards to occupants. There is a high likelihood that damage repairs would not be feasible. Buildings and structures with this rating will be given the highest priority for expenditures to improve seismic performance and/or falling hazards to the "good performance" level, or would be considered for other abatement programs such as reduction of occupancy or vacation.

Proposed Seismic Retrofitting

South and East Concrete Wall Strengthening

We propose chipping off existing shotcrete and installing a new shotcrete wall with sufficient thickness and adequate detailed reinforcement.

Fiber wraps can be further evaluated as an option.

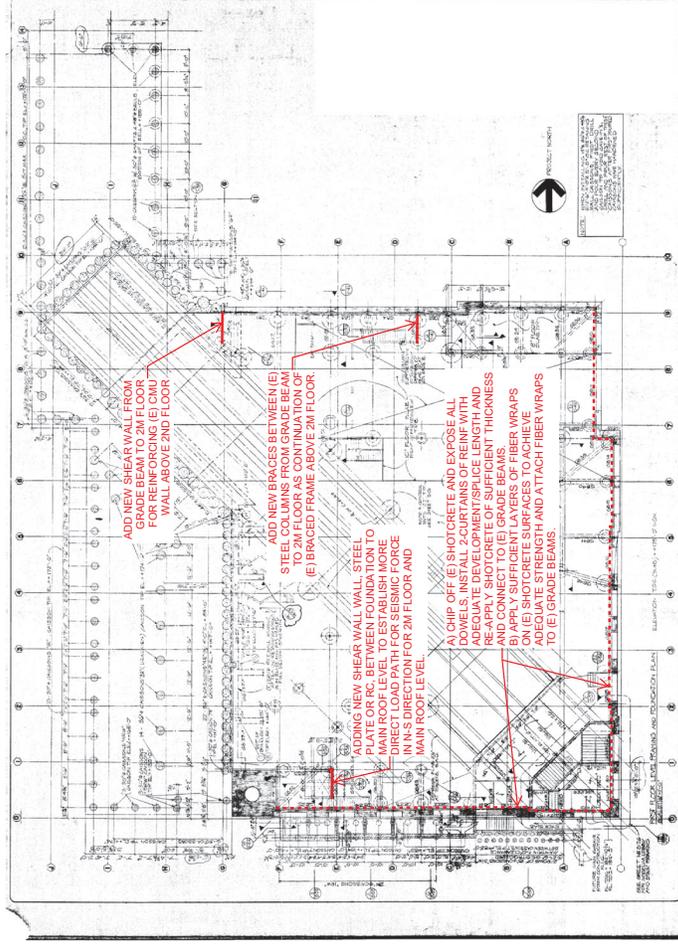
Added Shear Wall at East Side of Passenger Elevator

We propose adding a new concrete shear wall or steel plate shear wall to the east side of the passenger elevator from the foundation level to the main roof. This would establish a more direct load path for the seismic force resistant system in the N-S direction.

There are a significant number of seismic forces resisting elements and components having a demand to capacity ratio exceeding 1.0, with some exceeding 2.0.

The building expects damages to be significant or severe when experiencing BSE-2E level earthquakes. However, the probability of total or partial collapse is expected to be relatively low due to the existence of an independent gravity load carrying system.

The recommended SHR is 3.0.



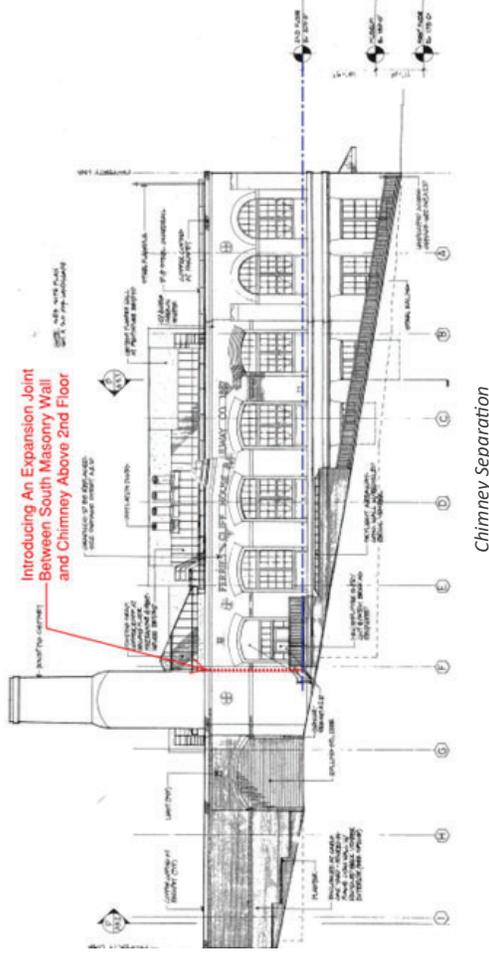
First Floor Plan

Chimney Separation

The seismic evaluation report, done by Structus, proposes introducing an expansion joint between the south masonry wall and the chimney above the second floor.

The proposed seismic retrofitting scheme is shown in the sketch below.

The foundation-related retrofitting is not included in the report and shall be evaluated in a future analysis and design phase.



Chimney Separation

Proposed Future Analysis and Exploration

Future Analysis

Based on the Cable Car Barn building profile and elevations, we propose a soil structure interaction analysis (SSI) for a future evaluation and analysis phase.

Further geotechnical study is recommended to validate soil conditions and to obtain on-site shear wave velocities so an SSI analysis can be performed and building foundation capacities can be evaluated.

The impact from heavy compact storage shelves on the 1M floor, next to the stair, shall be incorporated in the future seismic analysis. This was added after existing building lateral analysis was done and didn't include in the analysis.

Explorations

Field explorations may be needed to verify and confirm existing structural conditions.

Laboratory and field testing will be needed to verify some existing material properties.

4 - Mechanical, Plumbing, & Fire Protection Design Narrative

Mechanical Design Criteria

Codes and Standards

The latest edition of the following codes and standards, with applicable amendments for the City and County of San Francisco, shall be applied when designing the mechanical systems.

- California Building Code (CBC)
- California Mechanical Code
- California Plumbing Code
- California Fire Code (CFC)
- California Energy Efficiency Standards (Title 24)
- California Green Building Code

General Design Requirements

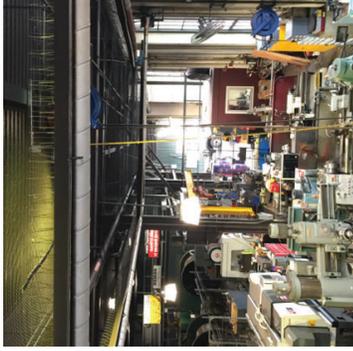
The mechanical systems for the Cable Car Barn will be designed and installed per the latest codes and standards.

Existing Heating and Ventilation Systems and Equipment

The existing Heating and Ventilation system consists of air ventilators, infrared radiant heaters, fan coil units, heat pumps, boiler, force air furnaces and exhaust fans. There is no cooling in the building except for at Splicer's Office (Rm 110) which has a split system with condensing unit located in Electrical Equipment Room (Rm 109). The split systems and HV systems for the facility appears to be in poor condition. According to the Facility Condition Assessment Report (February 1, 2016), "Approximately 90 percent of the equipment is original to its 1984 renovation."

First Floor

- Gas-fired infrared radiant tube heaters provide heating to open areas of the first floor: Machine Shop (Rm 117) and Cable Winding Area. The radiant heaters are mounted below ceiling beams at 18'-7" below the finished floor. There are holes in the tube which keep the heating system from functioning normally.



Radiant Heater with Bird Spikes located above Machine Shop

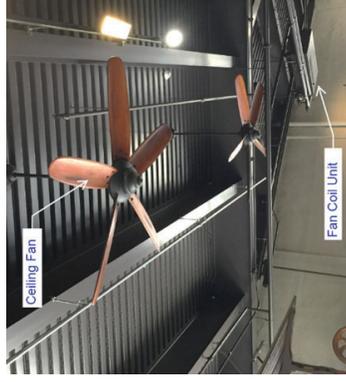
- Inline exhaust fans located on the second floor mezzanine level exhaust air from Weld Shop (Rm 111), Cable Winding Area below the slab, Steam Cleaning Area, and Pulley Assembly Area.
- Air Circulators are mounted on building columns and structural supports at First Floor Mezzanine Level to provide air circulation and cooling to Cable Car Winding Area.



Ventilation Equipment Mounted on Structural Support at First Floor Mezzanine

First Floor Mezzanine:

- Four two-pipe fan coil units provides 73,600 btu of heating to museum portion of the facility. The heating units are inoperable. The boiler providing water to the units was removed approximately 10 years ago and was never replaced. Overhead ceiling fans provide air movement at the museum.



Heating and Ventilation Equipment Serving the Cable Car Museum

Second Floor:

- Thirteen wall fin coil heating units provide heating to second floor area pit areas. Each two-pipe fin coil unit has a rating of 7,290 btuh, thus providing a total heating capacity of 102,960 btuh for the second floor pit areas. The boiler supplying hot water to the units was removed 10 years ago and was never replaced, thus making each unit inoperable.



Non-Functioning Fin Coil Unit in Cable Car Pits

- Ceiling mounted gas-fired infra-red tube heaters provide heating to the indoor open areas of Cable Car Storage Area, Yard Area, and Carpenter's Shop. There are holes in the tube which keep the heating system from functioning normally.
- The centralized exhaust system for the second floor is in poor conditions. The fans appear to be the original installed in the 1984 renovation.

Second Floor Mezzanine

- Air distribution is provided to supply air registers by ducts concealed above the ceilings in the office spaces and common areas in the second floor mezzanine level. The heating is controlled by thermostats.
- Restrooms and common areas are ventilated by mechanical exhaust fans. The systems consist of exhaust fans and network of sheet metal ducts.
- Two rooftop forced air gas-fired units HV-1 and HV-2 provides heating and ventilation to the second floor mezzanine administrative area. Each unit has total capacity of 75,000 cfm with output of 75,000 BTU. The systems have failed and are no longer in working condition.



Rooftop Units HV-1 and HV-2

- The boiler located in the Mechanical Room (2M19), which feeds the fan coil units and convention heaters in the first floor offices, Cable Car Museum and second floor cable car pits was removed and never replaced. Based upon discussion with Cable Car personnel and site visits, the heaters that are connected to the former boiler are no longer providing heating.
- The Mechanical Room itself is hot and is occupied by two 30-horsepower rotary screw air compressors. The roof-top exhaust fan in the room is not working, and portable industrial pedestal fan in the room provides inadequate cooling. See photos below.



Pedestal Fan located between Two Compressors



Roof-top Exhaust Fan

Heating, Ventilation and Air Conditioning (HVAC) Design Criteria

Based on the condition of the equipment and expected life of the HVAC equipment, it is recommended to demolish the equipment installed in 1983. Significant amount of equipment is no longer operational, and most of occupied rooms are provided with little or cooling. Shown below is the recommended HVAC upgrade.

Ventilation

- All enclosed areas shall be ventilated in accordance with the area requirements. Ventilation requirements for enclosed spaces shall be established in accordance with California Energy Efficiency Standards (Title 24), California Building Code and California Mechanical Code.
- The ventilation system for the new 12 KV Electrical Room shall provide filtered, 100 percent outdoor supply air to room. Exhaust air shall discharge to the outdoor. The air turnover rate is recommended at the design standard of 15 times per hour.

Heating

- Most enclosed and occupied areas shall be heated in the winter. Closets and unoccupied storage areas shall not be heated unless minimum temperature is necessary for product storage. Internal areas (without exterior walls), that are not continually occupied shall generally not be heated. Areas not occupied include:
 1. Corridors/Walkways
 2. Restrooms/Shower
 3. Mechanical Rooms
 4. Electrical Rooms
 5. Janitor Closets
 6. Bicycle Storage Room (Rm 252)
 7. Splicer Workroom (Rm 110)
 8. Tools Room (Rm 208A)
 9. Telephone Equipment Room (Rm 2M74)
 10. Steam Cleaning Room

- 11. Museum Entry
- Open work areas that are currently occupied will be heated like the Machine Shop, Carpenter's Shop, Cable Car Pits, Cable Car Storage Area, and Yard Area.

Air Conditioning (Heating and Cooling)

- Areas designated for air conditionings include:
 1. Offices
 2. Museum
 3. Conference Rooms
 4. Control Room
 5. Grip Area
 6. Lactation Room
 7. Lockers
 8. Revenue
 9. Dispatch
 10. Classroom
 11. Lunchroom
 12. Electrical Room (no A/C required if air ventilator option is available)

HVAC System Design

System design shall vary for the different areas involved. Each system or sub-system while capable of independent operation shall be designed as a functional unit of the entire facility. System design shall utilize combined elements for ventilation and exhaust where practicable. Heating systems shall be independent for many areas but combined with air conditioning when required. In accordance with San Francisco Environmental Code Section 706(d)(7), all indoor and outdoor space-conditioning and water heating for Major Municipal Renovation Project must be all-electric. The ordinance prohibits the installation of infrastructure, piping systems, or piping for distribution of natural gas or propane for such uses. Therefore, new HVAC equipment under the renovation project will be electrically operated.

Air Distribution

- For maintenance and similar areas, air distribution shall consist of uncooled fresh air for both winter and summer. All fresh air makeup to clean areas such as Electrical rooms shall be filtered before distribution. Distribution systems shall consist of internal fans and uninsulated ductwork. When applicable, roof mounted makeup units without ductwork shall be provided.
- The rooftop forced air gas-fired units will be replaced with rooftop packaged air-cooled heat pumps. The new units should be placed over the previous gas-fired units to minimize structural impact. The indoor consist variable refrigerant flow (VRF) system.
- Air circulators will be added to the first floor mezzanine area to assist with the movement of air on the first level Cable Winding Area, and other large open areas as needed.
- The paint booth shall include fresh air supply for workers during paint booth operation and use.
- Makeup air will be required for Mechanical Room containing air compressors.

Shop Heating Systems

- Shop and similar areas shall utilize unit heaters for area heating or for tempering of fresh air in the winter. The room air shall circulate back through unit heaters without the need for return air ducting.
- Ceiling mounted gas-fired infra-red tube heaters will be replaced with ceiling mounted electric infrared heaters. Electric heaters will provide heating to the indoor open areas such as the Cable Car Storage Area, Yard Area, Machine Shop and Carpenter's Shop.



Electric Infrared Heater

- Cabinet fans with heating coils shall be used where ducted delivery is warranted. Fresh air makeup shall be integral with these systems as shall return air filtering. Ducted heating systems shall be limited to those areas where circulation from the unit heaters is impractical.
- The inoperable fin coil units in the cable car pits will be replaced with an electric cabinet heater using fan forced heat.



Electric Cabinet Heater using Fan Forced Heat

Exhaust Fans

- Exhausted air shall be comprised of three general categories: continuous system exhaust, semi-continuous exhaust, and periodic exhaust. All exhaust quantities shall be in accordance with the recommendations of ASHRAE, OSHA, CCR Title 24, and the California Mechanical Code. Exhaust fans will be selected based on efficiency and noise level.
- The exhaust systems will be the most varied of the facility mechanical systems. Several shops and areas require specialized exhaust systems that shall operate in one or more of the above mentioned categories. Shops and areas requiring special systems include the following:

1. Welding
2. Painting
3. Steam Cleaning
4. Restrooms
5. Kitchen

- Semi-continuous exhaust systems shall be those that may run continuously during all or a portion of the work shift. These systems are used for such operations as painting. Special consideration shall be given to balancing fresh air makeup against the exhaust volume in order to maintain a relatively neutral pressure balance between indoors and outdoors.

- Periodic exhaust systems are utilized by such operations as welding, steam cleaning and kitchen exhaust. The same consideration for pressure

balancing exists with these systems as with the semi-continuous systems.

- All semi-continuous and periodic exhaust systems shall utilize specialized pickup points. Exhaust shall be through hoods, boxes, scoops and similar devices designed to capture all contaminants with the least practicable amount of room air. Where non-gaseous particulate matter is exhausted, cyclone cleaners and/or filters shall clean the air before it is released to the atmosphere.

Controls

- Each heating and air conditioning system shall have separate dedicated controls designed to automatically maintain room temperatures at preset levels. Systems that are not utilized on a 24 hour basis shall be time clock controlled for start-up and shutdown. Systems that run continuously shall be started and stopped from panel board switch controls.
- Air source heat pumps shall be either self-contained type for areas adjacent or close by exterior space is available otherwise split-type heat pumps shall be used. Split-type type heat pumps shall be used for the new offices located on First Floor Mezzanine Level.
- Any air conditioned areas using small packaged air conditioners may be excepted from the above considerations. Such equipment is seldom adaptable to economizer circuitry and self-contained controls are usually adequate. The overall facility design shall be developed to minimize these types of systems.
- Unit heater controls shall have localized fan shut-off switches to control local air circulation when that might be objectionable to operations. Zone temperature control shall use the standard method of thermostat initiated fan cycling.
- All heating, ventilating and air conditioning systems will be monitored and controlled by an

energy management system. The system will at a minimum, monitor all HVAC systems and report the operating parameters to a central location. The central system will allow for the modification of the systems to meet changing conditions of the facilities operations. The energy management system will be in an area/room to be specified by SFMTA Operations/Maintenance.

System Expansion

- System for comfort conditioning shall be designed to allow system expansion and/or addition.
- Provision for expansion or alteration of the systems serving the central core area, shops, and offices shall be included. Additional capacity shall be included in ductwork serving air conditioned spaces and in fan motors that service packaged air conditioning units.

Materials

- All materials shall be commercial or industrial quality chosen to provide long life and continuous service capability.
- Electrical equipment shall be furnished in accordance with UL and NEMA standards. Installation shall satisfy the requirements of the National Electrical Code and the California Safety Orders. The CCR Title 24 requirements and recommendations shall be followed unless design considerations dictate more stringent requirements.
- Vibration Isolation for rotating equipment shall have isolators when installed near areas that are acoustically sensitive. When required, equipment foundation shall be designed to counteract unbalanced forces set up by the equipment and prevent structural borne noise. Piping to isolated equipment shall have flexible connections and when necessary, shall be suspended on spring hangers or other type of isolation supports.

Ductwork shall be isolated from fans with flexible connections.

- Seismic restraint for piping and ductwork shall be provided where required by local code and when system integrity is critical. All equipment anchors shall be designed to California Building Code.
- Piping material and design shall comply with all applicable codes. Materials shall be selected to be compatible with the fluid handled. Insulation shall be provided for personnel safety, to reduce energy use, and to prevent sweating. Piping appurtenances shall match the piping duty requirements.
- Ductwork: Ductwork design and construction shall be in accordance with SMACNA recommendations for the service intended. Nonmetallic or corrosion resistive ductwork shall be limited to corrosive fume elimination.
- Equipment Selection: Equipment shall be selected to match its intended duty. Air conditioning equipment shall be commercial quality. Fume exhaust and similar systems shall be industrial quality. Dust collection fans shall be rated for severe duty. Explosion proof motors shall be provided as required.

Noise and Air Pollution

- Equipment, including paint booth, shall comply with requirements of the City and County of San Francisco and Bay Area Air Quality Management District (BAAQMD). BAAQMD regulations require painting to be performed in an enclosed space, and requires filter technology that can capture 98% of paint over spray.

Plumbing Design Criteria

Codes and Standards

The latest edition of the following codes and standards, with applicable amendments for the City and County of San Francisco, will be applied when designing the plumbing systems:

- California Building Code (CBC)
- California Mechanical Code
- California Plumbing Code
- California Fire Code (CFC)
- California Energy Efficiency Standards (Title 24)
- California Green Building Code

General Design Requirements

The plumbing systems for the Cable Car Barn will be designed and installed per the latest codes and standards.

Existing Plumbing Systems

The existing plumbing system consists of domestic cold water supply, domestic hot water supply, electric hot water heaters, sump pump, natural gas supply, compressed air, oil water separator, and distribution piping and accessories. The building sanitary sewer pipe gravity feeds into the sewer main. Gas, water, and sewer utilities to the building are from Mason Street.



Maintenance Entrance on Mason Street

In 1983, major plumbing renovation was done in rehabbing the Cable Car Barn. Based upon site visits and discussion with Cable Car personnel, the 1983 Cable Car Barn renovation plumbing drawings do not reflect all the major changes to date. The latter changes include the installation of an industrial waste pump located in a pulley assembly area (Rm 111A), removal of an industrial waste ejector pump near drum storage area near Mason Street, installation of oil water separator on Mason Street, and removal of boiler and expansion tank in Mechanical Room (Rm 2M19).

The existing oil water separator and industrial waste ejector pump were installed in early 1990s. As to date, there is no reported issues/problems regarding the oil water separator and industrial waste pump.

Plumbing Recommendations

Existing distribution piping will be modified to the new layout, which includes the new offices, restrooms, and shops. Plumbing systems will be provided for the for new areas/spaces as shown in Table P-1. The industrial waste pump, which sits on top of the sump at pulley assembly area, will be replaced.

In addition, drainage will be provided for condensate pipe from new HVAC units. No mechanical equipment drain shall be directly connected into any drain system. Indirect drain connectors with an air gap shall be used. New roof drains and overflow drains will be installed during roof replacement.



PG&E Gas Service to the Building



Industrial Waste Sump at Pulley Assembly Area

Proposed Plumbing Changes for New and Remodeled Rooms
Table P-1

Room No.	Room Name (Condition)	Cold Water	Hot Water	Drainage	Compressed Air	Natural Gas	Note
105	Men Restroom (Remodeled)	X	X	X			New toilets, lavatories, urinals, hose bibb
106	Women Restroom (Remodeled)	X	X	X			New toilet, lavatory, hose bibb
111A	Pulley Assembly Area			X			Replace industrial waste pump with new
117	Machine Shop (Remodeled)	X		X	X		Relocated/New machine equipment. Cold water is needed for Haas VF3 (E004) and Haas Lathe (E001). One bibb need to add water to other machines for coolant.
120	Corridor (Remodeled)	X		X			New drinking fountain, bottle water filling station, and eyewash
150	Weld Shop (New)				X		Welding equipment
154	All Gender Restroom (New)	X	X	X			New toilet, lavatory, shower, hose bibb and floor drain
156	Janitor (New)	X	X	X			New Sink and floor drain
1M04	Women Restroom (Remodeled)	X	X	X			New toilets, lavatories, hose bibb at Museum
1M05	Men Restroom (Remodeled)	X	X	X			New toilets, lavatories, and urinal at Museum
1M50	All Gender Restroom (New)	X	X	X			New toilet, lavatory, floor drain, hose bibb at Museum
200	Cable Car Shop	X		X			New drinking fountain and bottle filling station near Room 202
203	Men Restroom (remodeled)	X	X	X			New toilet, lavatories, urinals, and shower
204	Janitor Closet (New)	X	X	X			New sink and floor drain.

Room No.	Room Name (Condition)	Cold Water	Hot Water	Drainage	Compressed Air	Natural Gas	Note
205	Women Restroom (Remodeled)	X	X	X			New toilet, lavatory, and shower
206	All Gender Restroom (New)	X	X	X			New toilet, lavatory, shower, hose bibb and floor drain
208B	Paint Booth (New)	X	X	X	X	X	Sink and eyewash will be located outside room. Gas and air for paint equipment.
208D	Spray Booth (New)				X		New equipment (if required)
208	Carpentry/Paint Shop (Remodeled)				X		New equipment (if required)
250	12 KV Electrical Room (New)	X		X			New Eyewash serving 12 KV Room will be located outside Rm 250. Cold water and drainage pipe are located outside room.
253	Grip Building Area (New)	X			X	X	If needed for the Parts Washer or Grip Washer (to be confirmed with SFMTA Operation)
2M51	Hallway (New)	X		X			New drinking fountain and bottle filling station located outside Room 2M75
2M53	All Gender Restroom (New)	X	X	X			New toilet, lavatory, floor drain, shower, and hose bibb
2M67	Operator Break Room (New)	X	X	X			New kitchen sink
2M71	Men Restroom (New)	X	X	X			New toilets, lavatories, urinals, shower, floor drain, and hose bibb
204	Janitor Closet (New)	X	X	X			New mop sink and floor drain
2M74	Women Restroom (New)	X	X	X			New toilets, lavatory, shower, hose bibb, and floor drain
2M75	Lactation Room (New)	X	X	X			New accessible sink

Fire Protection Design Criteria

Codes and Standards

The latest edition of the following codes and standards, with applicable amendments for the City and County of San Francisco, will be applied when designing the fire protection systems:

- California Building Code (CBC)
- California Fire Code (CFC)
- NFPA 13, Installation of Sprinklers Systems
- NFPA 14, Standpipe and Hose Systems
- NFPA 2001, Clean Agent Fire Extinguishing System
- American Society of Mechanical Engineers, Safety Code for Elevators and Escalators (ASME A17.1)

General Design Requirements

The fire protection systems for the building will be designed and installed per the latest codes and standards. A 12" fire main located on Mason Street services the sprinklers in the building. It is anticipated, the project site can reuse the existing back flow preventer and connection from the street.

Existing Fire Protection Systems

The existing building has a full coverage fire protection system consisting of sprinkler piping, sprinkler heads, risers, valves, standpipes, 6-inlet fire department connection.

The Electrical Equipment Room (Rm 109) and Control Room (Rm 108) on the first floor are each protected by a halon system and sprinkler system. The halon systems were installed in the early 1980s. On September 9, 2021, the halon system in Electrical Equipment Room accidentally released into the room due to an aged release valve. Upon discharge of the fire suppression system, other automated safety systems were activated resulting in a loss of electrical power to the entire facility, including the propulsion system for the cable cars. After halon cylinder

was replaced, and system was inspected and tested, the halon suppression system was placed back into service.



Halon Cylinder in Electrical Equipment Room Prior to September 9, 2021 Discharge

The remaining first floor areas and Cable Car Museum were designed as light hazard occupancy per NFPA 13. The Cable Car Museum is separated by other areas by a deluge system. The spray nozzles are open, directional discharge nozzles with no fusible element. In 1999, sprinkler plans were submitted to San Francisco Building Department Inspection (SFDBI) to convert the existing deluge curtain system to a wet water curtain system. However, SFDBI records indicate the construction permit expired in 2000 and the work was not implemented.



Deluge Curtain at Museum

The second floor cable car storage area is classified as extra hazard occupancy as defined by NFPA 13. The system is designed based on a density flow rate of 0.30 gallons per minute over the most remote 4,000 square feet for extra hazard areas. Sprinkler coverage is 100 square feet per head. A dual tier system provides high and low level coverage for the building structure and contents (i.e., cable cars).

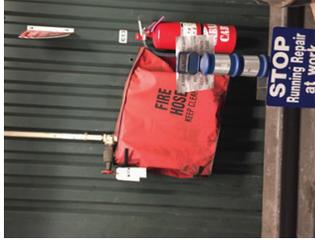
The building has two elevators: a passenger hydraulic elevator and a freight traction power elevator. Both elevators were installed in 1984. The passenger elevator has a sprinkler located at the bottom of the pit and on top of the elevator shaft. It is unclear whether the freight elevator has sprinkler protection.

Fire Protection Recommendations

All recommended work shown below will require approval of the San Francisco Fire Department. The approval will be obtained during the design and construction process. It is anticipated the existing fire service can be reused, and the capacity of the service will be adequate.

- The existing fire sprinkler system will need to be modified to suit new proposed interior layout changes and comply with the requirements of NFPA 13 and San Francisco Fire Department Administrative Bulletins. New non-electrical rooms and spaces will be protected by a wet-pipe sprinkler system. Coverage will be based upon the occupancy.
- Under the Masterplan, the existing Electrical Equipment Room will be converted to a new All Gender Restroom (Rm 154), Locker Room (Rm 153), and a smaller sized Electrical Equipment Room (Rm 109). A new 12 KV Electrical Equipment Room (Rm 250) will be installed on the 2nd Floor near the building vehicle entrance on Washington Street. The halon systems protecting the Electrical Equipment Room and Control Room will be removed. The existing Control Room, the newly retrofitted Electrical Equipment Room, and the new 12 KV Electrical Equipment Room will all be protected with a new clean agent fire extinguishing system (e.g., FM200 system) in accordance with NFPA 2001. (Note: A preaction sprinkler system will be provided for electrical rooms, only if required by SFED. This issue will be discussed with SFED during pre-application meeting with SFED in design phase of the project.)
- Class II standpipe system will be removed at four locations, where the existing system interferes with the installation of new equipment and rooms. The existing wet standpipe system located in new proposed Janitor Room (Room 151), 12 KV new proposed Room, Revenue Room (Room 2M60) Switchgear Room, will be removed.

and existing Freight Elevator Vestibule (2nd Floor) will be removed.



Class II Standpipe System

- The Master Plan includes adding a glass partition at Museum viewing area to physically separate the museum from the first floor located below. The fire suppression system for the Museum will be upgraded. The Museum sprinkler system upgrade involves replacing the deluge sprinklers with fusible links, modifying the sprinkler system to accommodate the new glass partition, and adding a sprinkler to the new All Gender Restroom (Rm 1M50) at Museum.



View of the First Floor from Museum Viewing Area

- The existing passenger hydraulic elevator and freight traction power elevator will both be replaced with a vertical lift traction power elevator. The elevators will be sprinkler in accordance with NFPA 13.

5 - Electrical Design Narrative

Electrical Design Narrative

Codes & Standards

The latest edition of the following codes and standards, with applicable amendments for the City and County of San Francisco, shall be applied when designing the electrical system:

- a. California Building Code 2019
- b. California Electrical Code 2019
- c. California Energy Efficiency Standards 2019
- d. California Green Building Code
- e. National Fire Protection Association Standards (National Electrical Code) 2017
- f. San Francisco Building Code 2019
- g. San Francisco Electrical Code 2019

Existing Electrical System

Power

SFMTA Cable Car Barn is located at 1201 Mason Street. The current electrical utility service is dual 12 KV, three phase power from PG&E with a manual transfer switch to switch the power from preferred side to the alternative side in case of power loss from the preferred side. The service entrance equipment including main medium voltage service entrance switchgear, medium voltage transformers and 480 V switchboard as well as isolation transformers and DC motor drives are located on the first floor in the electrical room. The distribution equipment such as switchboards, motor control center (MCC), distribution panels, step-down transformers, sub-panels and disconnect switches are located in the close proximity of the equipment they are serving.

All the electrical equipment including the main medium voltage service entrance switchgear, medium voltage transformer, switchboards, motor control center, distribution panels, step-down transformers, sub-panels and disconnect switches are mostly original components installed during 1984 facility renovation. They were products of Federal Pacific which is no longer in business (see Existing Single Line Diagram for the electrical equipment).



Medium Voltage Service Entrance Switchgear, 2.5 MW Medium Voltage Transformer and 480 V Switchboard



DC Motor Drive Speed Variator Power Unit Model 6V600F3036 – 510 HP, 480 Volts, 680 Amps, 60 Hertz, 3 Phase DC3064R Power Unit



Isolation Transformer



Distribution Panel, Step-Down Transformers, Sub-panels



Motor Control Center (MCC)



Disconnect Switches



Low Voltage Switchboard

Lighting

The existing light system consist of mainly retrofitted high bay metal halide fixtures with LED kits with a few of them (20 fixtures remaining) to be retrofitted to LED and fluorescent lights.



Elevator

The existing passenger elevator was installed in 1984. It's of Hydraulic type made by Montgomery Elevator with 2500lb capacity and 125fpm speed.

The existing freight elevator was installed in 1984 as well. It's of Traction type also made by Montgomery Elevator with Guilbert freight doors, with 8000lb capacity and 150fpm speed.

Network and Communication Systems

Network System

The Cable Car barn building has WiFi and wired internet currently. It is part of the SFMTA enterprise network system.

Radio System

As part of the SFMTA system wide radio replacement project, two (2) sets of control station equipment and two (2) roof top antennas and cables were installed at the Cable Car barn building. One set of the control station equipment is located in room 120, the control room and the other in room 2M08, the dispatcher's room.

Access Control System

The Cable Car Barn building has an access control system with card readers.

Security Camera System

The Cable Car Barn building is in the process of upgrading the current security camera system.

Rehabilitation Option

Power Distribution

Based on lifecycle analysis and the increased possibility that these panels and switchboards may become fire hazard, immediate/near term replacement of these equipment is high recommended.

The Cable Car Barn is a 24/7 facility. It is not possible to close down the entire building for an extended amount of time for rehabilitation. Therefore, the project decided to propose to go through phases to fully modernization/upgrade the aging and potential problematic upstream electrical infrastructure.

Phase one is to upgrade the main electrical distribution equipment and addition of office space on Level 1M. In order to minimize the impact to the operation of the facility, the project team proposes to construct a new electrical room to house the new service entrance equipment including main medium voltage service entrance switchgear, medium voltage transformer and low voltage switchboard and provide conduits and cables from the new electrical room to the existing electrical room to make the necessary connections. The new electrical room will also include equipment such as

- eye wash,
- FM-200 clean agent,
- AC electrical panel,
- battery & charger as well as DC electrical panel,
- 120 Volts, 20 Amps convenience receptacles,
- remote terminal unit (RTU) to communicate the status and control of the designated equipment to SFMTA power control's supervised control and data acquisition (SCADA) system via SFMTA enterprise network,
- and a transfer switch and an emergency generator hook up for a portable 20KW (to be verified in detail design) unit to provide the power needed for the new electrical room lighting, battery charger, HVAC and power receptacles in event of power loss from both PG&E incoming services to trouble shoot the equipment.

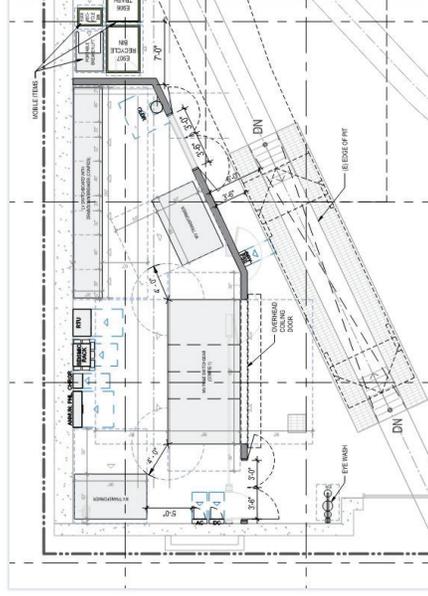
The team has obtained preliminary equipment dimensions from the vendor. The equipment capacity is based on very preliminary load calculation.

- main medium voltage service entrance switchgear, 12.47 KV, 3-phase, 3W, 1200 A NEMA 1 with EUSERC/PG&E compliant metering section per latest standards, main 750MVA rated 15 KV breakers complete with

automatic transfer scheme from 152 to 252 via SEL source transfer automation logic and local manual control.

- Two (2) medium transformer, 2500/3150 KVA cast resin transformer, 12 KV, 95 KV B.I.L.
- and low voltage switchboard, with two breakers and one tie breaker all rated at 4000 A, 480/277 V, 3-phase, 4W, 65000 A interrupt rating in NEMA 1 indoor enclosure.

Then, the project team studied various options with the stakeholders, facilities management and staff members, and most importantly is to follow PG&E Green Book rules and regulations as well as National Electrical Code to find the location to layout the equipment with sufficient clearances and egress pathways including doors. The PG&E Green Book has very strict requirement for work clearance in front and behind the main medium voltage service entrance switchgear and also the location of the electrical room has to be readily accessible. It was eventually concluded that a new electrical room can be built on the second floor of the building next to the garage roll up door to provide immediate access to PG&E when needed. The design also takes into account of the reliability, availability, flexibility, maintainability of the equipment to ensure quality service for the cable car system as well as building electrical system.



After the new equipment are all installed, tested and energized by PG&E, the building power will be cutover to new service. This cutover needs to be carefully planned with temporary power provided to power up essential equipment like lighting and communication equipment so the facility will not go completely "dark" during the process.

The existing single line diagram with depiction of work to be performed is attached to this report, see architecture drawings for the location of the equipment.

Apart from the main medium voltage service entrance switchgear, medium transformer and low voltage switchboard, other equipment such as

- motor control center,
- distribution panels,
- step-down transformers,
- sub-panels
- and disconnect switches

will be replaced in the subsequent phases when the equipment being powered are being replaced or when there is work in the vicinity of the electrical equipment.

The replacement of the isolation transformers, DC motor drives, DC motors and related control system will be the last phase of the improvement program.

This study is also to identify future loads for the building such as mechanical equipment including space heater, HVAC, eye wash, water heater, and other equipment and areas such as crane, new grip building area, electric vehicle (EV) chargers, spray booth, compact storage, interior/exterior lighting, general power (receptacle, low voltage systems), and elevators since this building will undergo an all-electric conversion. After all additional power requirements are identified, a new PG&E a wholesale distribution tariff (WDT) application will be filled out and submitted to PG&E via SFPUC.

Mechanical Equipment

The load for mechanical equipment including space heater, HVAC, eye wash, water heater were provided via a preliminary study. See Mechanical Narrative for the details and the load summary table on page 16.

Bridge Crane Upgrade 20 Ton

The existing 10 Ton bridge crane will be upgraded to 20 Ton. The power requirement is 480 V, 3-phase, 10 HP.

New Grip Building Area

New grip building area consists of jib crane, parts wash, new lighting fixtures, elevating platform, localized vacuum, compressed air line and receptacles for tools, workstations. 480/277 V, 3-phase, 200 A electrical panel, step down transformer and 208/120 V, 3-phase 100 A electrical panel shall be provided.

Electric Vehicle (EV) Charging Stations

According to San Francisco EV Ready Ordinance, new buildings and major renovations is required to be ready to deliver electricity for EV charging to any parking space by:

- Overall: Size electrical infrastructure (electrical service, panels, transformers, etc.) to simultaneously charge vehicles in 20% of parking spaces. With this capacity, innovative load management systems afford the option to install an EV charger in every parking space.
- Turnkey EV Readiness in 10% of parking spaces: Support today's EV market by installing full circuits to enable simple installation and activation of standard Level 2 chargers.
- All remaining spaces - EV Capable: To maximize opportunity for expansion, require project plans to indicate the path of future wiring to each parking space. Install conduit only in locations that are far more economical to access in new construction.
- Flexibility: Allow upgrading to "fast chargers" if desired.
- This ordinance applies to passenger vehicles and trucks or truck-based vehicles with both a payload capacity of 4,000 pounds or less, and a gross vehicle weight ratio of 14,000 pounds or less. Trucks does not include heavy duty vehicles, which are vehicles of any type with a gross vehicle weight ratio of more than 14,000 pounds as used herein.

The non-revenue vehicles that need to be converted to EV according to the San Francisco EV Ready Ordinance are as follows:

The first floor

- 1 Forklift

- 1 Small van
 - 1 Pickup
- The second floor
- 2 Forklifts
 - 2 Hybrid cars
 - 1 Small van
 - 1 Pickup truck
 - 1 Yard tug

Since this study is master planning for the future, the power requirement is estimated on 100% future ready. Therefore, on the first floor one 25 KW, 480 V forklift battery charger and two level 2 chargers 7.68 KW, 208V shall be planned; on the second floor two 50 KW, 480 V fast charger, two 25 KW, 480 V forklift battery charger and four level 2 chargers 7.68 KW, 208V shall be planned. Both floors need to have panels, transformers, conduits and wires.

Spray Booth

A new spray booth will be installed on the second floor of the building. It will require a total of 30 KVA of power. The equipment inside the booth will be powered by a 480V, 3-phase, 40 A circuit with a disconnect switch. The lights inside will require 3-277V single phase circuits.

Compact Storage

Compact storage will be provided at level 1M and 1st floor. There will be two (2) double aisle configurations on 1st floor and three (3) double aisle configurations on level 1M. Each double configuration requires 13 A at 480 V.

Lighting

New Light Emitting Diodes (LED) lighting will be installed to meet California Energy Code. The lighting controls shall also meet California Energy Code Title 24 Part 6. The concept exterior lighting is along the building face and exits.

The power consumption for both the interior and exterior lighting load is not expected to be increased, except for the newly added areas such as the offices and corridor addition on the 1st level and the new electrical room on 2nd level. The power watts per square foot is based on 2019 Building Energy Efficiency Standards, Table 140.6-C.

Primary Function Area	Allowed Lighting Power Density for General Lighting (W/SF)	Area (SF)	Power (W)
Electrical Rooms	0.4 +0.2 additional allowance	720	432
Walkway and Corridor Area	0.6	918	550.8
Office Area	0.7 +0.2 additional allowance	1160	1044
Total			2026.8

General Power

Convenience receptacles will be provided throughout the renovated spaces. The existing receptacles will be one to one replacement. This study is to identify the power in added area namely the offices and walkway/corridor addition on the 1st level and the new electrical room on 2nd level. Office space will have required control receptacles. The receptacle load was calculated based on National Electrical Code section 220.

Primary Function Area	Calculated based on 180 volt-amperes per outlet/receptacles	Area	Power (VA)
Electrical Rooms	One outlet on each side of the wall	5 sides	900
Walkway and Corridor Area	4 outlets on each	3 areas	2160
Office Area	One outlet on each side of the wall in offices with square footage less than 200. Two outlets on each side of the wall in offices with square footage greater than 200 (these are shared offices).	4 per office with 5 offices 8 per office with 2 shared offices	6400
Total			9460

Bridge Crane for Machine Shop.

There will be a new 2-ton bridge crane added for the machine shop. The power requirement is 460 V, 3-phase, 30 A.

Elevator

The existing passenger elevator will be replaced by a new hydraulic passenger elevator. The new passenger elevator will at most require a 30-HP motor, which is the same power requirement as existing.

The existing freight elevator will also be replaced by a new traction type freight elevator. The new freight elevator will at most require a 40-HP motor, which is the same power requirement as existing.

The lighting at the sill of each landing will also need to be a minimum of 10fc and cannot be on a timer or motion sensor.

Load Summary

Equipment Name	Voltage	Wattage	Note
Space Heater/Electric Radiant Heaters	480 V	54,000	9 heaters on 1 st floor
Space Heater/Electric Radiant Heaters	480 V	300,000	50 heaters on 2 nd floor
Electric Cabinet Heater	480 V	39,000	Inspection pits
HVAC	208 V 240 V	350,000 3,000	Waiting for data from mech
Eye Wash	208 V	25,000	Waiting for data from mech
Water Heater	480 V	12,000	All gender restroom
Bridge Crane	480 V	10,000	1 st floor (20 Ton)
New Grip Building Area	480/277 V	166,272	2 nd floor including lighting and general power

Network and Communication Systems

Network System

The workstations planned as part of rehabilitation project shall be provided with power and ethernet connection to SFMTA enterprise network.

Radio System

All radio system equipment including control stations, cables, antennas and grounding shall be protected from any damage during rehabilitation.

Access Control System

For the new areas planned as part of the rehabilitation project, card readers shall be added and connected to the existing system if access control is planned.

Security Camera System

Modification to the security camera system shall be planned during the rehabilitation project.

All network and communication systems equipment need to be on dedicated circuit and backed up by uninterruptable power supplies (UPS).

Equipment Name	Voltage	Wattage	Notes
EV and Forklift Battery Chargers	480 V 208 V	150,000 30,720	2 nd floor
Spray Booth	480 V 208 V	25,000 15,360	1 st floor
Compact Storage	480/277 V	30,000	2 nd floor including lighting
Lighting	480 V	54,038	1 st floor (2) units and 1M level (3) units
General Power	277 or 120 V	2,026.8	1M level
Bridge Crane for Machine Shop	120 V	9,460	1M level
Elevator	460 V	23,902	1 st floor
	N/A	N/A	The power requirement for the new elevators will not exceed the existing units
Total		1,299,778.80	

6 - Fire Alarm Design Narrative

Cable Car Barn Fire Alarm Narrative

Fire Alarm System – Existing Conditions and General Recommendations

Existing fire alarm system to be upgraded due to the age and insufficient number of initiating devices and notification appliances. The main fire alarm panel, Deluge fire system panel, and Halon fire system control panel are located inside the Control Engineer Office. The main fire alarm control panel and the Deluge fire system panel are Simplex 2001-8001s. The Halon fire system control panel is a Siemens System 3.

The main fire control panel and Deluge fire system panel shall be replaced. The fire alarm system currently creates many false alarms, and oftentimes when the fire alarm system is triggered, it will not send a signal to the fire department. Since the Halon fire system will be replaced with a clean agent fire suppression system, and its control panel has not been working for years now, the Halon fire system control panel shall be replaced with a new panel that is compatible with the new clean agent fire suppression system. The existing annunciator on Level 2M shall be removed and relocated to the new Dispatch room. The fire alarm/communication system for the elevators will need to be upgraded. New fire alarms shall also be installed in the 12kV electrical room. The museum consists of three main areas:

1. Machine Shop

Pull stations, alarm horns, and alarm bells for the Halon system are present but shall be replaced with compatible components for the Halon system replacement. Sprinklers and smoke detectors are also present but shall be replaced with compatible components for the main fire alarm control panel and Deluge fire system control panel replacements. Additional alarm bells and pull stations, strobes, and exit signs need to be added.

2. Museum

Smoke detector and an extinguishing system abort system station are present but shall be replaced

with compatible components for the main fire alarm control panel and Deluge fire system control panel replacements. Sprinklers, Strobes, alarm horns, pull stations, and exit signs need to be added.

3. Office

Sprinklers are present in the hallway and Alarm horn present in the common area but shall be replaced with compatible components for the main fire alarm control panel and Deluge fire system control panel replacements. Additional alarm horns need to be added as well as strobes, pull stations, smoke detectors, sprinklers, and exit signs.

The new fire alarm system shall be UL certified and monitored by a UL certified entity. The new fire alarm system shall also tie into power SCADA system. The new rooms and fire alarm system upgrade shall comply with current fire alarm requirements and codes listed below:

- NFPA 72 (2019 version)
- NFPA 70 NEC (2020 version)
- San Francisco Fire Code (2019 version)
- Other codes as required by Authority Having Jurisdiction (AHJ) and the fire department.

7 - Site Assessment and Remediation Narrative

Hazardous Materials

Building Materials

The building was constructed in 1900 and was renovated in 1984. Due to the age and construction of the building, hazardous materials such as lead and asbestos were likely used. In its current state, these materials would be associated with structural components and exterior coatings. All materials observed recently have been in good condition. Any disturbance of building materials that contain hazardous materials will be done so according to all applicable Federal, State and Local regulations. A comprehensive HAZMAT should be completed in the design phase and the results used to provide contract provisions to remove hazardous material prior to being impacted.



Exterior coating which likely contains lead



Exterior coating which likely contains lead



The paint and roofing material may be impacted with the replacement of these windows

8 - Industrial Equipment Design Narrative

Industrial Equipment

Introduction

In support of the Facilities Master Plan Upgrades at the Cable Car Barn, Stantec provided expertise on industrial equipment planning, programming, and functional layouts of the facility's maintenance working areas. Efforts included a cursory high-level inventory and assessment of existing equipment, identifying needed upgrades, recommending storage systems, space plan blocking diagrams, and coordination with the City's Structural, MEP, and Architectural teams. The CCB staff provided input throughout the planning efforts, and Stantec has developed an Equipment Inventory List and Equipment Plans, denoting changes to key areas on Level 1, Level 1M, and Level 2. These documents should be used in conjunction with this narrative.

Level 1 presents with the most significant plan changes. The existing conditions are cramped, inaccurately sized in some locations, and in need of industry-standard upgrades for more optimal operations for the staff. The Level 1 Equipment Plans show: 1) the existing Office Areas (by Mason St overhead door) converting to a new Weld Shop; 2) the existing Weld Shop to be converted to a New Inspection Room; 3) the Grip Building Area to be converted to a New High-Density Storage Area; 4) and the Pulley Assembly Area to enlarge its current footprint. The Steam Cleaning area and the Machine Shop are expected to remain relatively unchanged, with some small adjustments and equipment replacement, where necessary.

Level 1M maintenance storage spaces, will see High-Density Storage solutions in one dedicated storage room. The remainder of Level 1M is occupied by the museum or is being planned for future office area expansion – refer to BOA drawings and data for upgrades in these areas.

Level 2 will also see key floor plan changes, primarily with the addition of a New 12KV Electrical Room providing much-needed electrical infrastructure upgrades to the whole facility. The New Grip Building Room (near the Jackson St entrance) will be relocated from Level 1; and

the Carpentry Shop and Paint Shop areas will also see revised layouts.

Level 1 – New Weld Shop

As can be seen on Stantec's Equipment Plan EQ2.11, the existing office areas, storage room, and storage mezzanine (by Mason St) will need to be demolished to make room for a new Weld Shop. This room requires fire-rated partitions to underside of deck at Level 2 along the south and west interior walls. A new entry door and 12'-0" overhead coiling door – to move large objects in/out of the Weld Shop – will be introduced on the south wall. The existing equipment, storage cabinets, and carts can be reused and relocated here. The existing Welding Frame Table can be replaced with a new Welding Frame Table, anchoring the center of the room. The u-shaped workstation and overhead cabinets are new and designed to fit the space. There should be dedicated ventilation for this room to remove fumes produced by welding activities.

Level 1 – New Storage Area

The New Storage Area will accommodate a high-density storage stacking system; the basis-of-design for which is *Rapistak*, or similar pallet racking system. These are heavy-duty open storage racks that come equipped with an integrated lift for handling heavy, long-term, or bulky storage items. This area will also have a racking system for oil drum storage.

Level 1 – Steam Cleaning Area (Existing to Remain)

This location is slated for minimal updates. The existing steam cleaning bay can be deep cleaned and resealed (concrete walls/floors) as necessary. The Parts Washer and Pressure Washer in this area are expected to remain.

Level 1 – New Inspection Room

The New Inspection Room takes equipment from several areas of the existing plan and provides a dedicated room for inspection work. The door into the room (E111) will be demolished and shifted north of Gridline 8. A new wall along Gridline 8 is to be constructed. The granite block table for the Measuring Arm is existing. The equipment and storage items are also existing to be relocated. The countertops and workstations are new carpentry. The large central granite block table is also new.

Level 1 – Pulley Assembly Room (Expansion)

This space, in its current configuration is undersized, and storage items needed for this room are located outside of the chain-linked fence enclosure. Demolition will include the north and east fencing, the angled n/w existing gypsum wall, and the angled s/w fencing around the sump pump and electrical distribution panels (these are to remain). New fencing near Gridlines 8 and D will enclose the space. All equipment and storage are existing to be relocated. The "New CAD Workstation" is the only new addition to this rooms' function.

Level 1 – Machine Shop (Expansion)

The equipment in this area will remain unchanged, except for the highlighted equipment shown on Stantec's Equipment Plan EQ2.11 - these are replaced pieces of equipment. The chain-linked fence enclosure on the west side should be demolished from Gridline 5 to 6 and replaced with a removable fence design of 5'-0" removable lengths (posts & chain link panels). Per owner-request, a 2-ton bridge crane is desired, in addition to the existing jib crane over the east end of the Machine Shop. The MTA-preferred vendor, "GP Crane & Hoist Services" is providing drawing sketches and support of a bridge crane, in this area, to be closely coordinated with DPW structural engineering.

Level 1 – 20-Ton Underhung Bridge Crane (Upgrade)

Arguably, the most significant change to Level 1 is the replacement and upgrade of the existing 10-Ton underhung bridge crane with a new 20-Ton underhung bridge crane. The existing bridge crane provides a coverage distance of +/-80ft from the large cable wheels, tracing over the underhung cable yard to approximately Stair 6. The new bridge crane will need to be extended roughly an additional +/-50ft. A preliminary structural and seismic analysis was conducted by the structural engineering team to assess the feasibility and design requirements needed for this upgrade. The existing crane manufacturer is *Demag*; but no basis-of-design has yet been identified for the new crane. Considerations for manufacturers and suppliers include *Westmont Industries*, *Demag*, *Konecranes*, and *Whiting*. Additional information from Stantec about initial considerations is available in the "Bridge Crane Extension Assessment" Memo issued on 6/30/2021.

Level 1M – Machinist Workstation Room (1M08)

As noted previously, this levels hosts double-aisle configurations of a High-Density Stacking systems slated for the storage room on the west. An integrated hoist lift allows for easy management of pallet-stored goods to be lifted/lowered off the shelves without the need for wide aisles and forklifts. Once materials are on the floor, a simple pallet jack, hand truck, or cart can be used to move them around the facility. The basis-of-design manufacturer is *Rapistak*; or similar pallet racking system. The system will require power/data, for the integrated hoist lift and control panel – refer to the Electrical narrative for required upgrades. Additionally, creating a concentrated load here, required assessment by the Structural Team – please refer to their design studies and/or calculations to confirm impacts.

Level 1M – Storekeeper Workstation Room (1M109)

Unlike the New Storage Room to the west, the Storekeeper Workstation Room will not include any High-Density systems; but rather accommodate workstations and other office equipment and storage cabinets, as designed by BOA.

Level 2 – 12KV Electrical Room

The 12KV Electrical Room will be located in the S/W corner of Level 2, near the Washington St cable car exit. This room will house large pieces of electrical equipment, including a Medium-Voltage Switchgear per PG&E (192”W x96”D x95”H), two Medium-Voltage Transformers, and a Low-Voltage Switchboard. There are also some key wall-mounted pieces of equipment, as required per the Electrical Design. The room is fire-rated, as required by code – refer to Architectural drawings and assessment. And since the Switchgear is roughly 8’-0” tall, the height of the ceiling should be no lower than 12’-0” to accommodate the overhead cable tray runs required per Electrical Design.

Given the dimensions and clearances required for the Medium-Voltage PG&E Switchgear, there is an overhead coiling door along the east face for direct access and ease of future potential replacement. In addition to the overhead coiling door, there are two pairs of double doors into the 12KV room, that allow for the future repair/replacement of the other electrical equipment.

Level 2 – Open Storage Items and Car Cleaning Equipment

Due to the location of the 12KV room, some material and equipment storage was displaced. Some of these items, namely the trash/recycling, oil drum, compost bins, and seasonal sand pallets, are now stored adjacent to the 12KV Room, along the west wall of Level 2. These items have no special power or data requirements. However,

two (2) new heavy-duty storage racks (3’D x 12’W) should be utilized to maximize storage capacity in those areas.

The existing car cleaning shed was also displaced by the addition of the 12KV room. The shed itself can be retired from use; but the contents within the shed, can be relocated to the S/W corner of Level 2, near the New Grip Building Room, on racked shelving in lockable enclosures (as shown on EQ2.13).

Level 2 – New Grip Building Area

The New Grip Building Area is located near the Jackson St cable car entrance, in the N/W corner of Level 2. The function of this space has been relocated from Level 1, and enclosed to mitigate sound-transmission out of the room. The larger components/equipment of the room include a *Proseco Typhoon* Parts Washer at 11’-0” tall (selected by CCB staff), the Cable Grips at ~7’-0” (when stored/positioned upright), and the *Garbel* (B.O.D.) 1-Ton jib crane at 12’-0” top of steel. This requires a ceiling height of about 14’-0”, with an overhead coiling door height of 12’-0” to allow for the tallest pieces of equipment and machinery to be moved in/out of this space.

The workstations (E304 & E303) should be new carpentry desk space, with localized vacuum system ventilation to exhaust fumes from work being done on those workstations. The Parts Wash (306) should also be a new piece of equipment. Both the Parts Wash and the Grip Washer will require power and water connections. The tool cabinet, palette storage, and scrap metal cart can be repurposed/relocated from Level 1. And the Elevated Platforms will also require power and the embedded steel plate in the floor, as is current in the existing Level 1 Grip Building Area design.

Level 2 – New Paint Shop

The New Paint Shop area has been reconfigured to organize around new office space(s) and a specialty-

manufactured Paint Booth by *Garmat USA* (as required by CCB staff; and proposals tracked by BOA). The Paint Booth is premanufactured for paint activities requiring the full enclosure of a cable car.

Adjacent to this space is a smaller Spray Room, which allows for painting of smaller parts and components coming off the cable cars (refer to EQ2.13). This room requires a dedicated exhaust for paint fumes, gypsum walls/ceiling, and a simple ceiling track for a removable/rewashable curtain.

East of these enclosed rooms are several existing pieces of paint equipment and storage areas. The new items include: a dividing wall between the Paint Shop and Carpentry Shop, two(2) worksurfaces, and an 18” deep shelving unit for paint supplies.

Level 2 – New Carpentry Shop

The New Carpentry Shop is in the same location as the existing Carpentry Shop; but with reorganization and improved storage systems. The existing L2M mezzanine in this location will be demolished in favor of more compact storage solutions.

New items include a Lumber Carpentry Rack for large wood material storage, an adjacent Lumber Storage Rack for remnants, and a new worktable for the Miter Saw (E701), and two new worktables (near the Paint Shop).

A new Tools & Small Parts Storage Room allows for one long wall of dedicated and compact storage of peg-boards, shelving units, drawers, and cubbies for tools that require overnight charging. This wall has not yet been designed; but assumed to be some combination of wood-working and prefabricated tool storage systems. This room also allows for floor space along the south wall for mobile tool carts, as required.

The equipment in the center of the room and along the east wall are all “existing to remain.” The Dust Collector

(#708) has been positioned to be centrally located along the east wall. Currently, the ducts for this equipment are secured under the existing mezzanine. With its demolition, the duct branches would be supported from the roof above and drop-down over each piece of equipment, as required to collect sawdust.

And finally, along the premanufactured Paint Booth, there is a wing-wall with dedicated area sink and eyewash station.