Cable Car Barn

1201 Mason Street

Master Plan Report

Master Plan Report

June 30, 2022

PREPARED FOR:
SAN FRANCISCO MUNICIPAL TRANSIT AGENCY

AUTHORED BY:
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Introduction

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Abbreviations

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

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

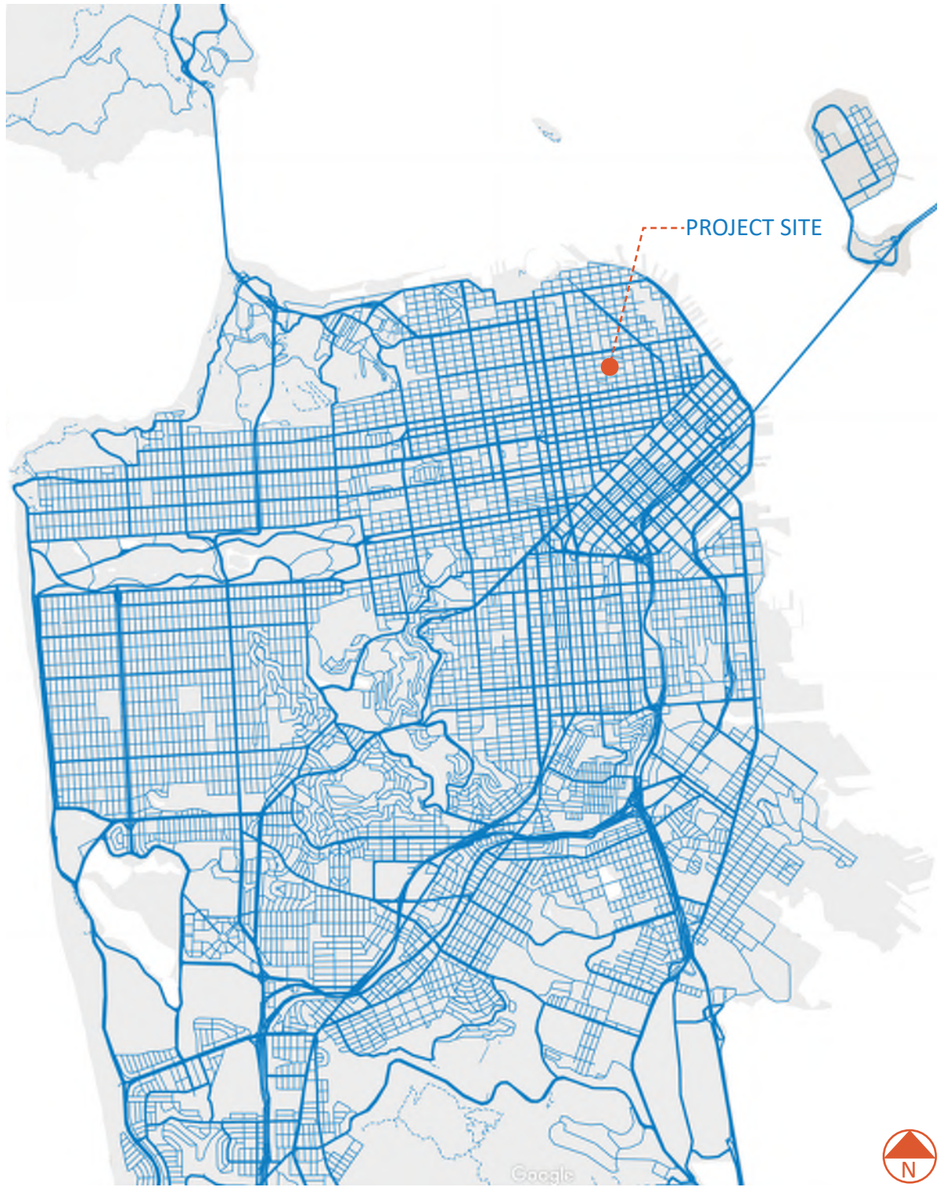
Project Description and Background

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.

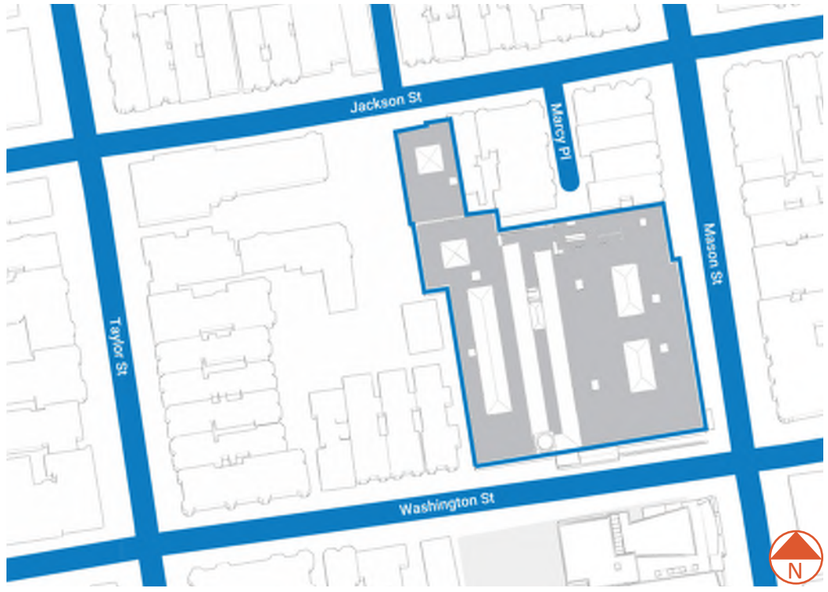
The SFMTA requested Public Works to provide space planning and program validation services at the Cable Car Barn in advance of commencing planning for major capital improvements at the site including the 12kV electrical power upgrade. The SFMTA goals for the project are to: document staff and equipment 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.



Cable Car Barn at Mason Street and Washington Street



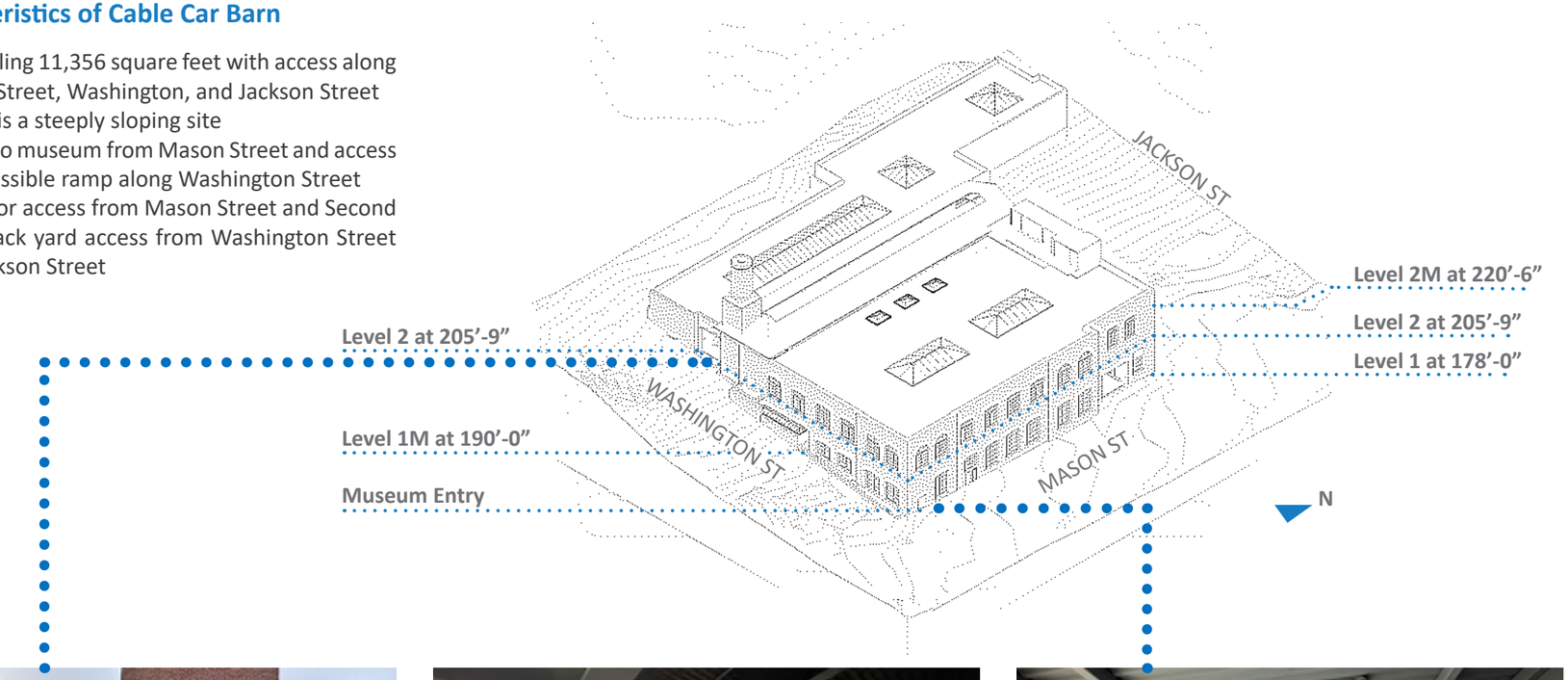
Project Scope

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
	A-3 (Accessory to F)	B	F-1	Total	B	Total
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
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 ll 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

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

Construction Type

Existing and Proposed Construction Type

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

Fire-Resistance Rating Requirements for Building Elements

	UBC 1973	UBC 1973	CBC 2019
Building Elements	TYPE lll 1 HR	TYPE lll N	TYPE llB
Primary Structural Frame	1	N	0
Bearing Walls - Exterior	2	2	0
Interior	1	N	0
Nonbearing Walls and partitions -Exterior	1	1	
Interior	1	N	0
Floor construction and associated secondary members	1	N	0
Roof construction and associated secondary members	1	N	0
Shaft Enclosure	1	1	
Exterior Doors and Windows	¾ hr < 20'; no opening < 5'	¾ hr < 20'; no opening < 5'	

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

Fire Sprinkler System

Yes (installed in 1984)

Fire Alarm

Yes

Separated or Non-Separated Occupancies

Non-Separated Occupancies

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.

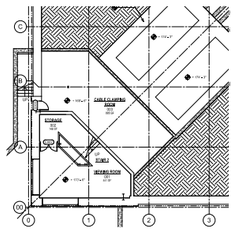
First Floor

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.

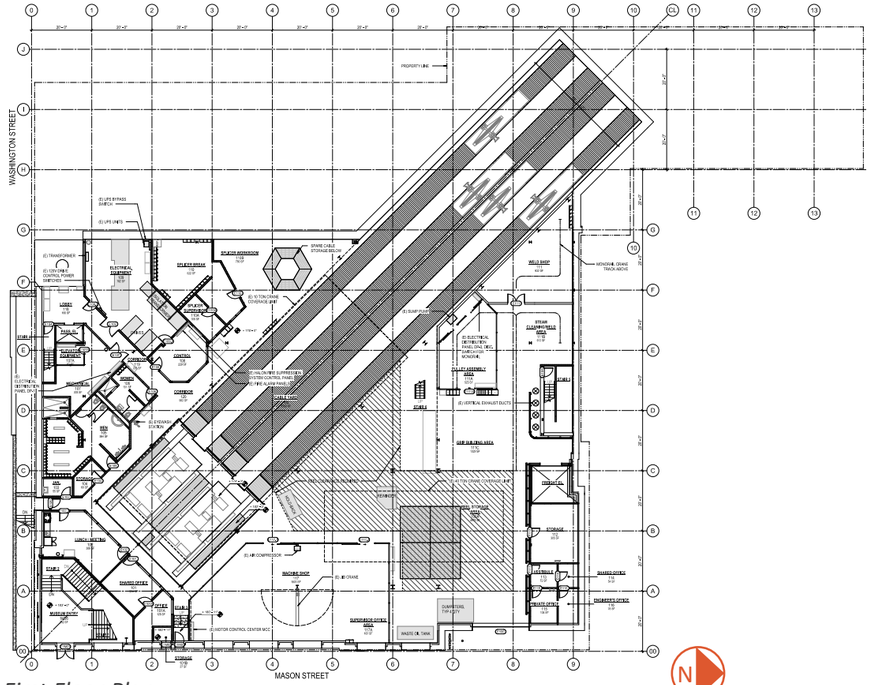
The main electrical room and control room are located on the southwest corner. The project will upgrade the fire panels, relocate the electrical room to the second floor, and upgrade electrical service for 12kV. This floor also includes several maintenance shops such as machine shop, weld shop, pulley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

First Floor Mezzanine

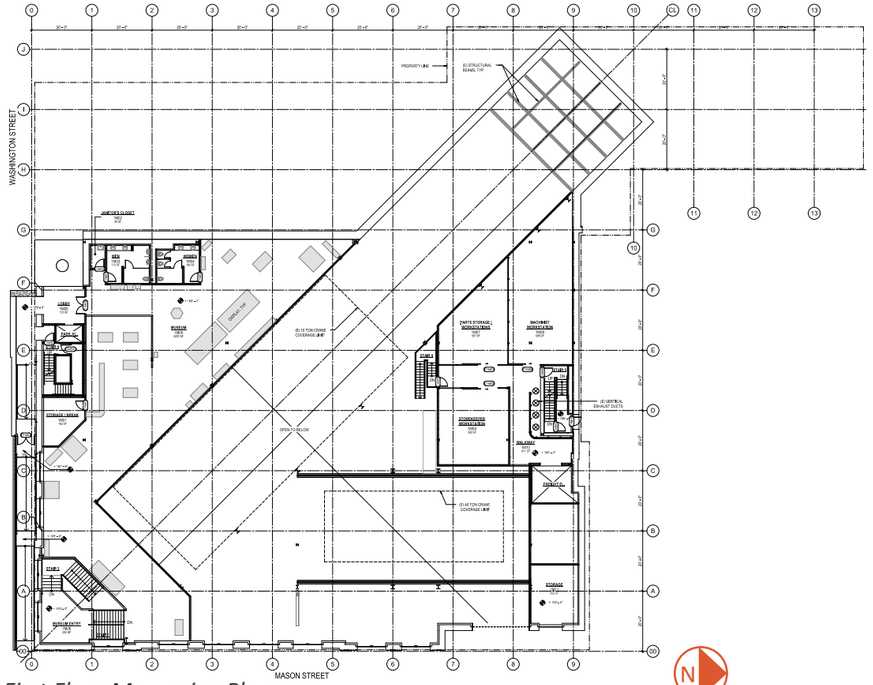
The Cable Car Museum is located on the first floor mezzanine and houses a collection of historic cable cars, photographs, mechanical displays and a gift shop. The museum entrance for the public is located on the ground level of Mason Street and an accessible ramp is located on Washington Street side 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.



Sub Floor Plan



First Floor Plan



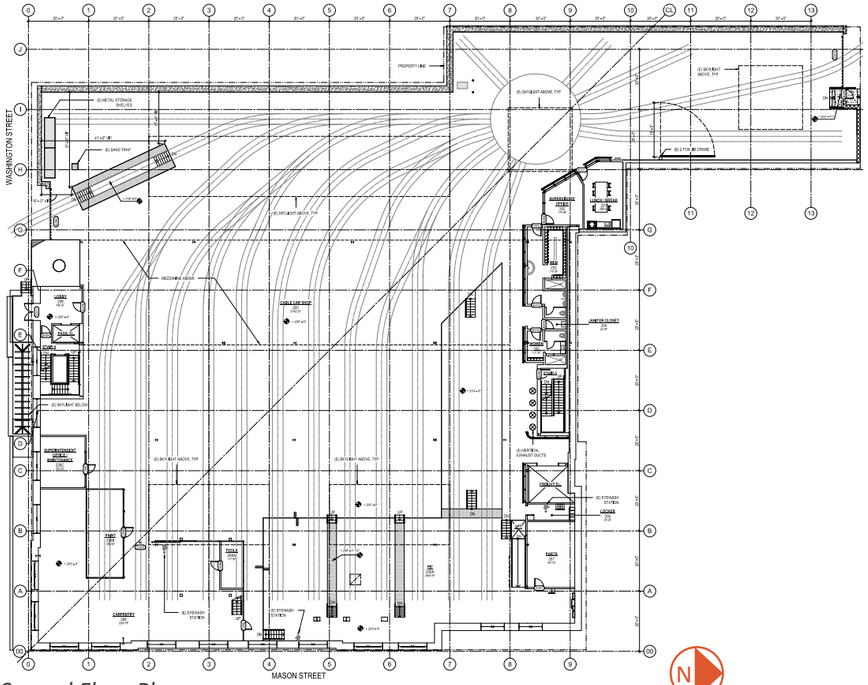
First Floor Mezzanine Plan

Second Floor

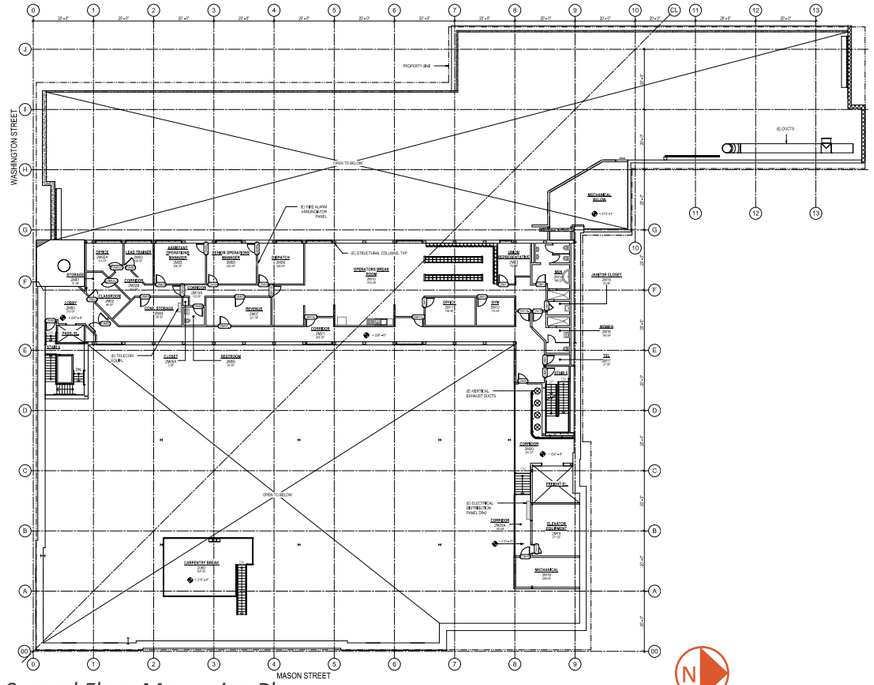
The second floor includes vehicle maintenance shops and pit areas with numerous tracks for vehicle maintenance team. The tracks are located throughout the entire floor and connected to each maintenance shop via a pull-in door, including the carpentry shop and maintenance pit areas, and finally to a pull-out 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.



Second Floor Plan



Second Floor Mezzanine Plan

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 12kV 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.

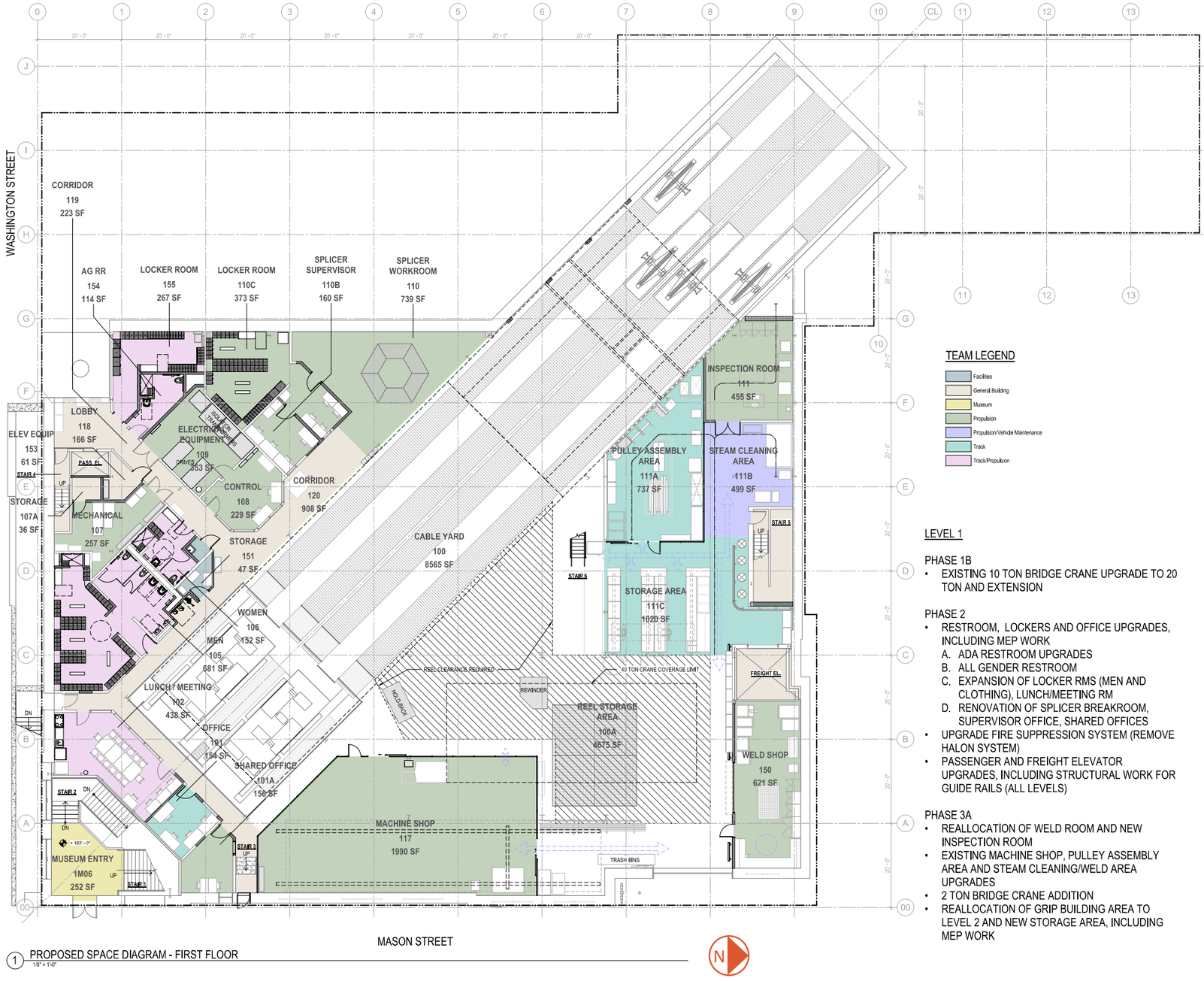
A new MRL passenger elevator and a vertical lift for equipment replace the existing hydraulic passenger elevator and freight elevator.

<u>Team</u>: Propulsion and Track teams

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

<u>Other Spaces</u>: Offices, Break Rooms, Locker Rooms

<u>BOH</u>: Elevators, Restrooms, All-Gender Restroom, Janitor Closet, Storage



1 PROPOSED SPACE DIAGRAM - FIRST FLOOR
1/8" = 1'-0"

LEVEL 1

PHASE 1B
- EXISTING 10 TON BRIDGE CRANE UPGRADE TO 20 TON AND EXTENSION

PHASE 2
- RESTROOM, LOCKERS AND OFFICE UPGRADES, INCLUDING MEP WORK
  - A. ADA RESTROOM UPGRADES
  - B. ALL GENDER RESTROOM
  - C. EXPANSION OF LOCKER RMS (MEN AND CLOTHING), LUNCH/MEETING RM
  - D. RENOVATION OF SPLICER BREAKROOM, SUPERVISOR OFFICE, SHARED OFFICES
- UPGRADE FIRE SUPPRESSION SYSTEM (REMOVE HALON SYSTEM)
- PASSENGER AND FREIGHT ELEVATOR UPGRADES, INCLUDING STRUCTURAL WORK FOR GUIDE RAILS (ALL LEVELS)

PHASE 3A
- REALLOCATION OF WELD ROOM AND NEW INSPECTION ROOM
- EXISTING MACHINE SHOP, PULLEY ASSEMBLY AREA AND STEAM CLEANING/WELD AREA UPGRADES
- 2 TON BRIDGE CRANE ADDITION
- REALLOCATION OF GRIP BUILDING AREA TO LEVEL 2 AND NEW STORAGE AREA, INCLUDING MEP WORK

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.

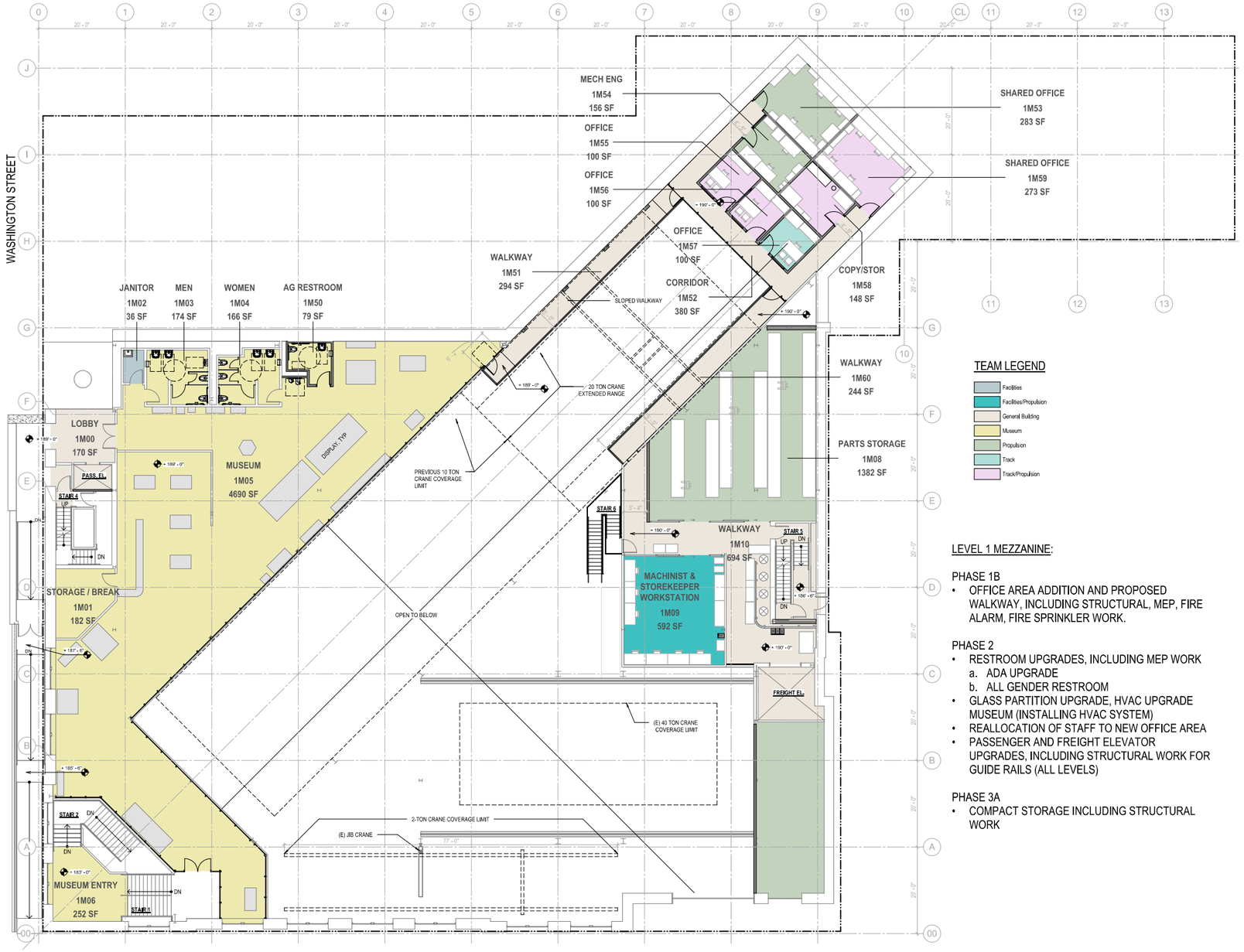
Team: Propulsion and Track teams

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

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

Other Spaces: Offices

BOH: Elevators, Janitor Closet, Storage



1 PROPOSED SPACE DIAGRAM - FIRST FLOOR MEZZANINE
1/8" = 1'-0"

LEVEL 1 MEZZANINE:

PHASE 1B
- OFFICE AREA ADDITION AND PROPOSED WALKWAY, INCLUDING STRUCTURAL, MEP, FIRE ALARM, FIRE SPRINKLER WORK.

PHASE 2
- RESTROOM UPGRADES, INCLUDING MEP WORK
  a. ADA UPGRADE
  b. ALL GENDER RESTROOM
- GLASS PARTITION UPGRADE, HVAC UPGRADE MUSEUM (INSTALLING HVAC SYSTEM)
- REALLOCATION OF STAFF TO NEW OFFICE AREA
- PASSENGER AND FREIGHT ELEVATOR UPGRADES, INCLUDING STRUCTURAL WORK FOR GUIDE RAILS (ALL LEVELS)

PHASE 3A
- COMPACT STORAGE INCLUDING STRUCTURAL WORK

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.

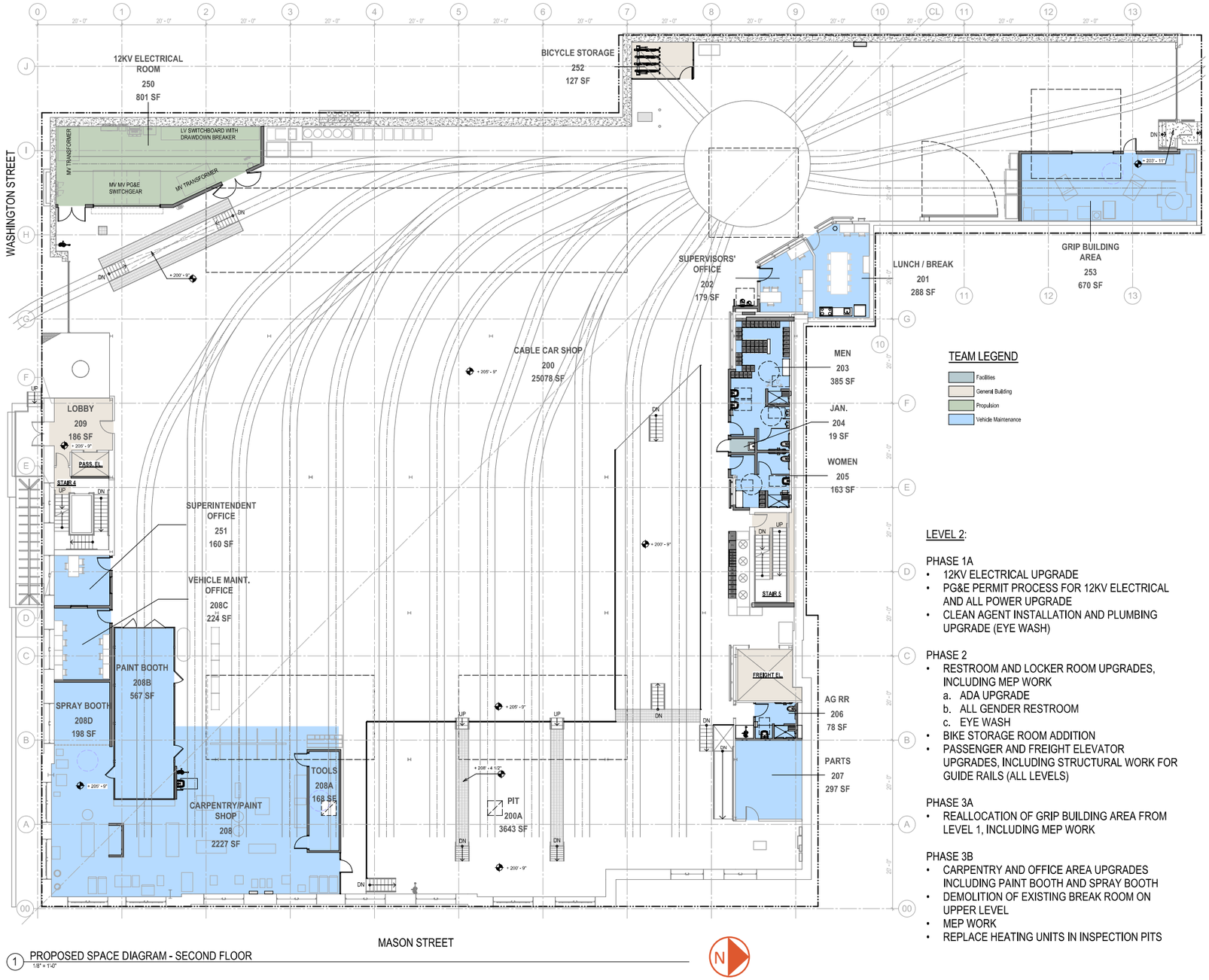
The existing offices and breakrooms are renovated with new finishes. The existing restrooms are upgraded to be fully accessible and code compliant, including accessible showers and drinking fountains. A new all-gender restroom is added, taking the existing locker room on the north wall and the west portion 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



1 PROPOSED SPACE DIAGRAM - SECOND FLOOR
1/8" = 1'-0"

LEVEL 2:

PHASE 1A
- 12KV ELECTRICAL UPGRADE
- PG&E PERMIT PROCESS FOR 12KV ELECTRICAL AND ALL POWER UPGRADE
- CLEAN AGENT INSTALLATION AND PLUMBING UPGRADE (EYE WASH)

PHASE 2
- RESTROOM AND LOCKER ROOM UPGRADES, INCLUDING MEP WORK
  a. ADA UPGRADE
  b. ALL GENDER RESTROOM
  c. EYE WASH
- BIKE STORAGE ROOM ADDITION
- PASSENGER AND FREIGHT ELEVATOR UPGRADES, INCLUDING STRUCTURAL WORK FOR GUIDE RAILS (ALL LEVELS)

PHASE 3A
- REALLOCATION OF GRIP BUILDING AREA FROM LEVEL 1, INCLUDING MEP WORK

PHASE 3B
- 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

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-translucent 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

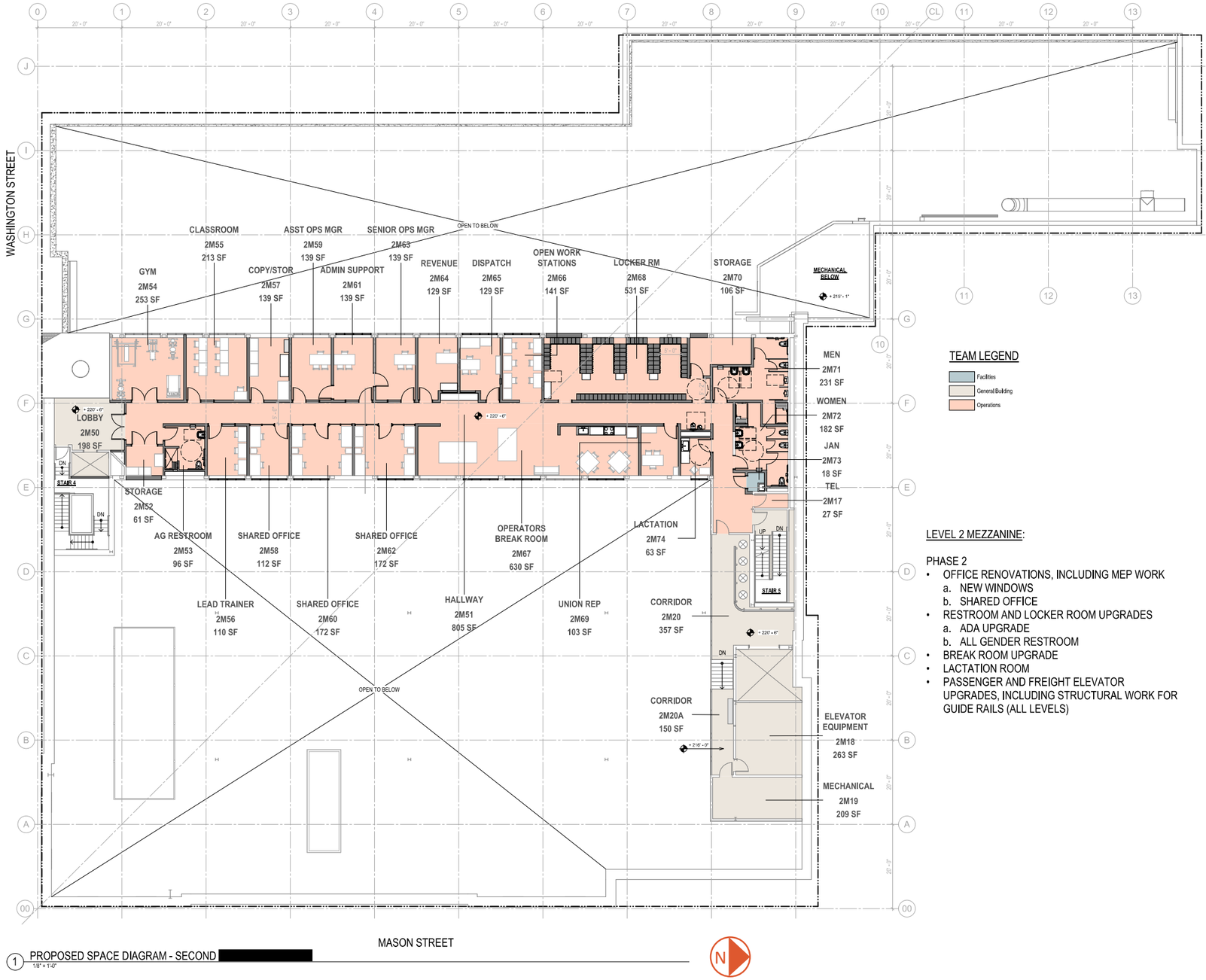
Other Spaces: Offices, Gym, Classroom, Break room, Locker room, Lactation

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.



1 PROPOSED SPACE DIAGRAM - SECOND [redacted]
1/8" = 1'-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

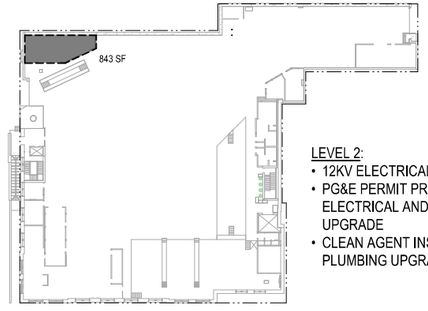
Other scope

Exterior improvements:

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

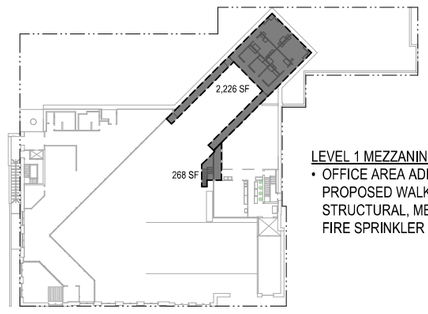
Winding motors upgrade (optional):

See Appendix A13 - Cost Estimate for details

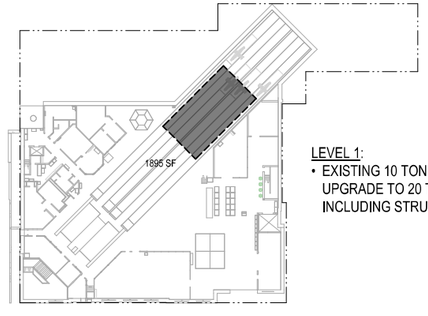


LEVEL 2:
- 12KV ELECTRICAL UPGRADE
- PG&E PERMIT PROCESS FOR 12KV ELECTRICAL AND ALL POWER UPGRADE
- CLEAN AGENT INSTALLATION AND PLUMBING UPGRADE (EYE WASH)

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

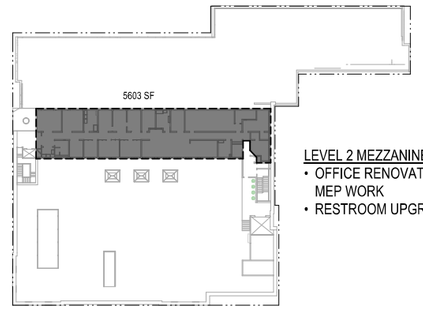


LEVEL 1 MEZZANINE:
- OFFICE AREA ADDITION AND PROPOSED WALKWAY, INCLUDING STRUCTURAL, MEP, FIRE ALARM, FIRE SPRINKLER WORK.

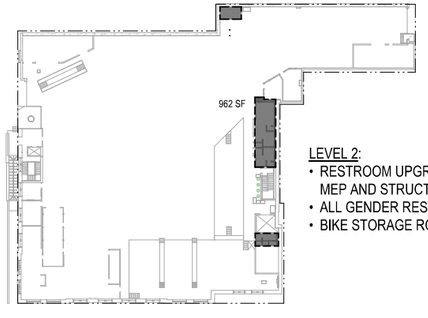


LEVEL 1:
- EXISTING 10 TON BRIDGE CRANE UPGRADE TO 20 TON AND EXTENSION, INCLUDING STRUCTURAL WORK

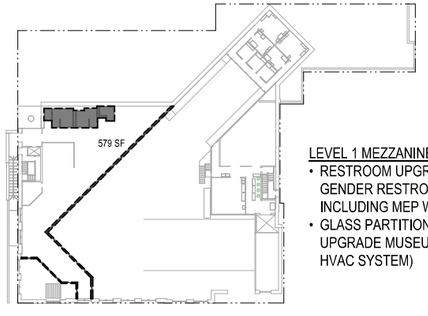
1B PHASE 1B | BRIDGE CRANE UPGRADE
1" = 40'-0"



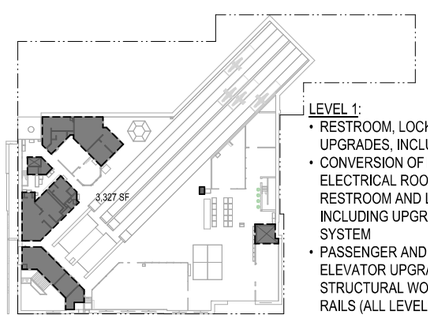
LEVEL 2 MEZZANINE:
- OFFICE RENOVATIONS, INCLUDING MEP WORK
- RESTROOM UPGRADES



LEVEL 2:
- RESTROOM UPGRADES, INCLUDING MEP AND STRUCTURAL WORK
- ALL GENDER RESTROOM ADDITION
- BIKE STORAGE ROOM ADDITION



LEVEL 1 MEZZANINE:
- RESTROOM UPGRADES AND ALL GENDER RESTROOM ADDITION, INCLUDING MEP WORK
- GLASS PARTITION UPGRADE, HVAC UPGRADE MUSEUM (INSTALLING HVAC SYSTEM)



LEVEL 1:
- RESTROOM, LOCKER AND OFFICE UPGRADES, INCLUDING MEP WORK
- CONVERSION OF EXISTING ELECTRICAL ROOM TO ALL GENDER RESTROOM AND LOCKER ROOM, INCLUDING UPGRADE CLEAN AGENT SYSTEM
- PASSENGER AND FREIGHT ELEVATOR UPGRADES, INCLUDING STRUCTURAL WORK FOR GUIDE RAILS (ALL LEVELS)

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:

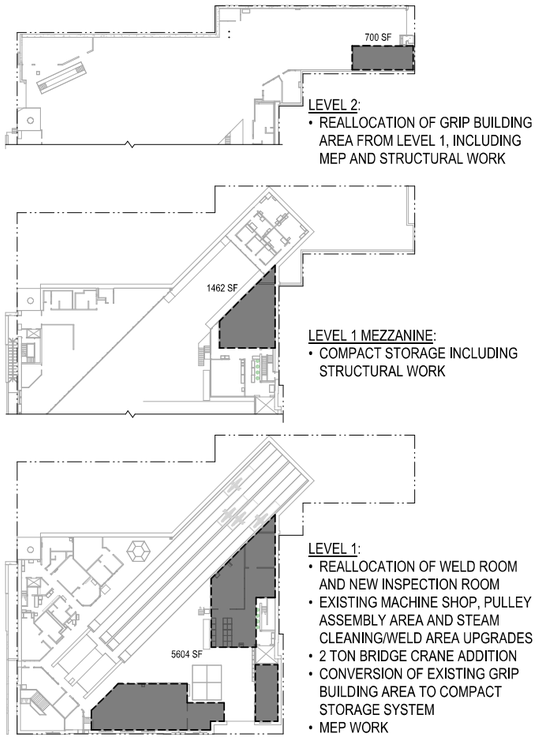
See Appendix A7- Exterior Conditions Memo & A13 - Cost Estimate for details

Winding motors upgrade (optional):

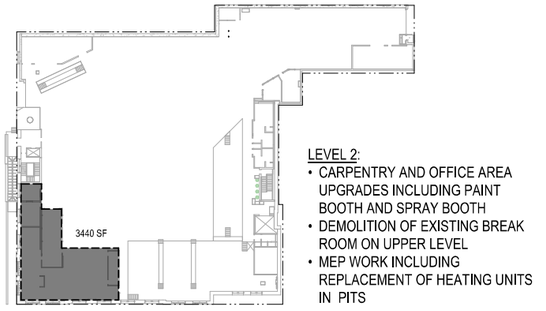
See Appendix A13 - Cost Estimate for details

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

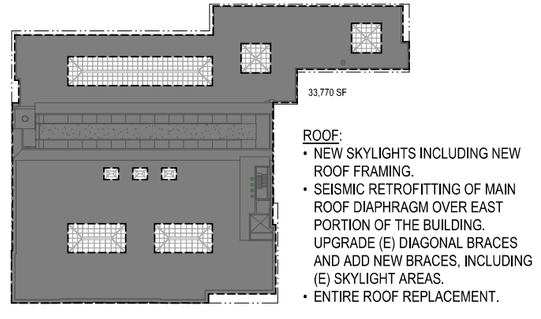
*A full modernization/upgrade to the aging electrical infrastructure such as switchgear, transformers, switchboards, motor control center, panels, disconnect switches. New lighting installation, existing lighting replacement and control upgrade per latest code requirement. Provide power to newly added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



3A PHASE 3A | PROGRAM RESTRUCTURING
1" = 40'-0"



3B PHASE 3B | CARPENTRY UPGRADES
1" = 40'-0"



4 PHASE 4 | ROOF REPLACEMENT
1" = 40'-0"

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
125fpm 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 MONOSPACE500 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

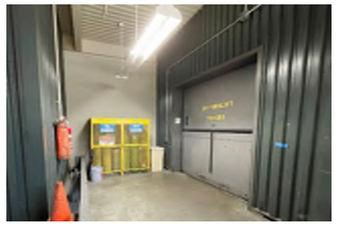
Replace existing traction freight elevator, controllers and door equipment with new equipment vertical lift (capacity 10,000 lb.). (PFLOW Industries, M Series Mechanical, or equal.)

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")

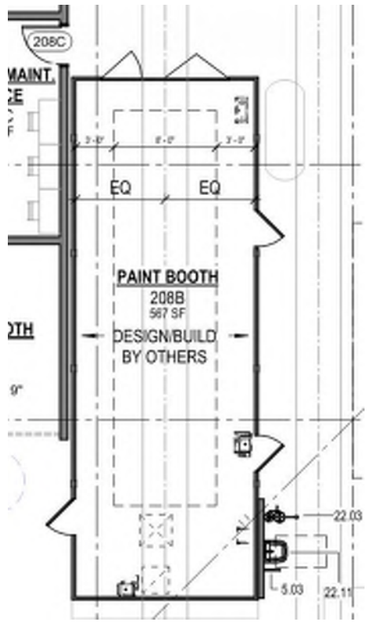
Additionally, anchor the wall panel floor tracks using powder actuated or equivalent pin anchors at 36" increments. (Example: Remington 3/4" to 1 1/2" Low Velocity Power Fastener or Hilti 1" Sheet Metal Fastener)

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.

Drinking Water Container Storage

Access to bottled drinking water is a union requirement for CCB Staff. For space efficiency purposes, we recommend using a high density, modular water jug storage system like the PSI ProStack Modular Rack with storage capacity for (20) 5-gallon water jugs. The unit can be purchased with or without the pallet base. The 24”W x 20”D x 60.5”H module is sufficiently compact to fit within the first floor Break Room 102.

Material:
High density polyethylene with ultraviolet stabilizers.

Assembly:
(5) 24.5 lb. units stacked vertically (122.5 lb. total)

Manufacturer:
Polymer Solutions International (PSI) 2 Pocket Pro Stack, or equivalent.

Locker Design

The following SFMTA locker standards were used to develop CCB locker room layouts on the first floor, second floor and second floor mezzanine. Actual locker sizes and configurations as designed may deviate from these standards due to limitations of existing conditions and requirements to maintain certain locker quantities requested by MTA Operations.

2021-0525_MTA Space Standards Locker Sheets
2021-0618_SFMTA Facility Space Planning Standards

Mechanic (Maintenance) Staff Lockers:
Men 105, Women 106, Men 203, Women 205, Locker Rm 110C
12”W x 18”D x Single Tier Lockers with 5’ minimum clearance between lockers

Operator Staff Lockers
Locker Room 2M68
12”W x 18”D x Double Tier Lockers with 5’ minimum clearance between lockers

Uniform Lockers(with Vendor Service)
Locker Rm 155, Locker Rm 110C, Level 2 Hallway
Sizes based on existing lockers
5’-6’ minimum clearance between lockers
Shirts & Pants: 8”W x 21”D x double tier, 2-compartment wide lockers
Coveralls: 13”W x 21”D x six-tier lockers
Used Clothing: 26”W x 21”D x single tier lockers

See Appendix A1 proposed floor plans for locker layouts.

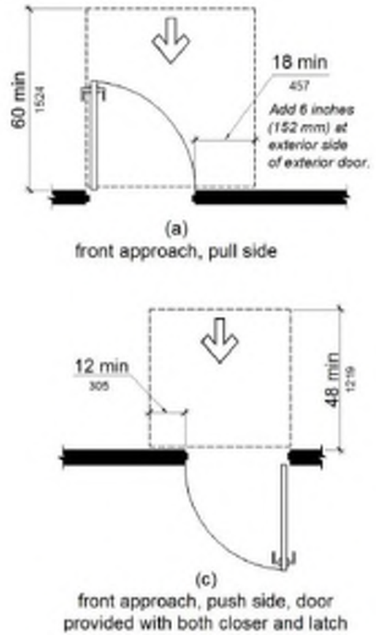
SFMTA 2021-0525_MTA Space Standards Locker Sheets

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.



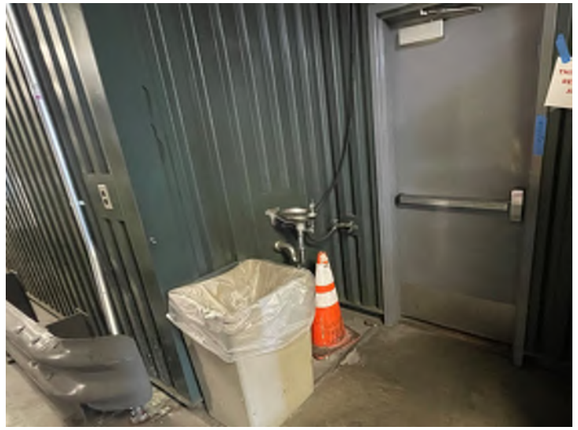
Example of required door maneuvering clearances.

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.

Non-compliant museum entry ramp.



Non-compliant drinking fountain (Second Floor Walkway).

Non-compliant lavatory (Women 106).

Non-compliant lavatory and shower (Men 203).

Lactation Room

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

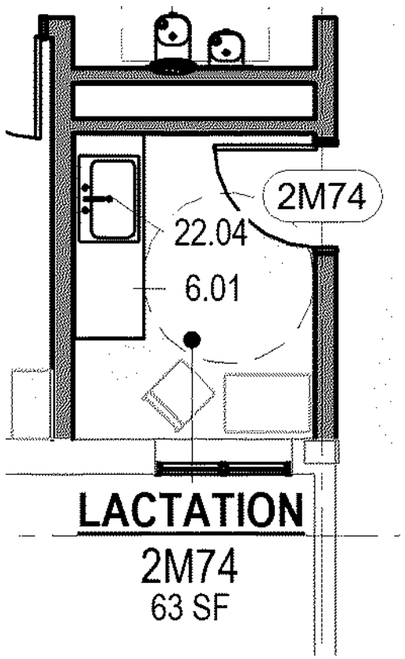
SF Ordinance 131-17
San Francisco Building Code, Section 1209.5
Lactation Rooms (Local Amendment)

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

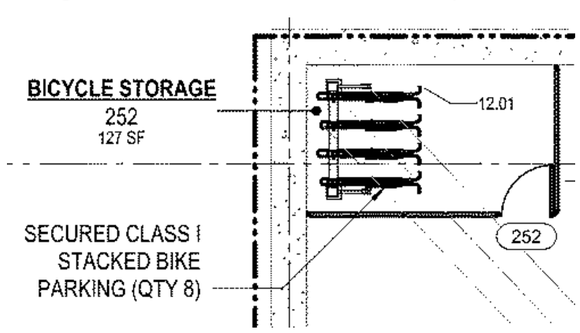
Bicycle Parking and Storage

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 155.1-2
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:

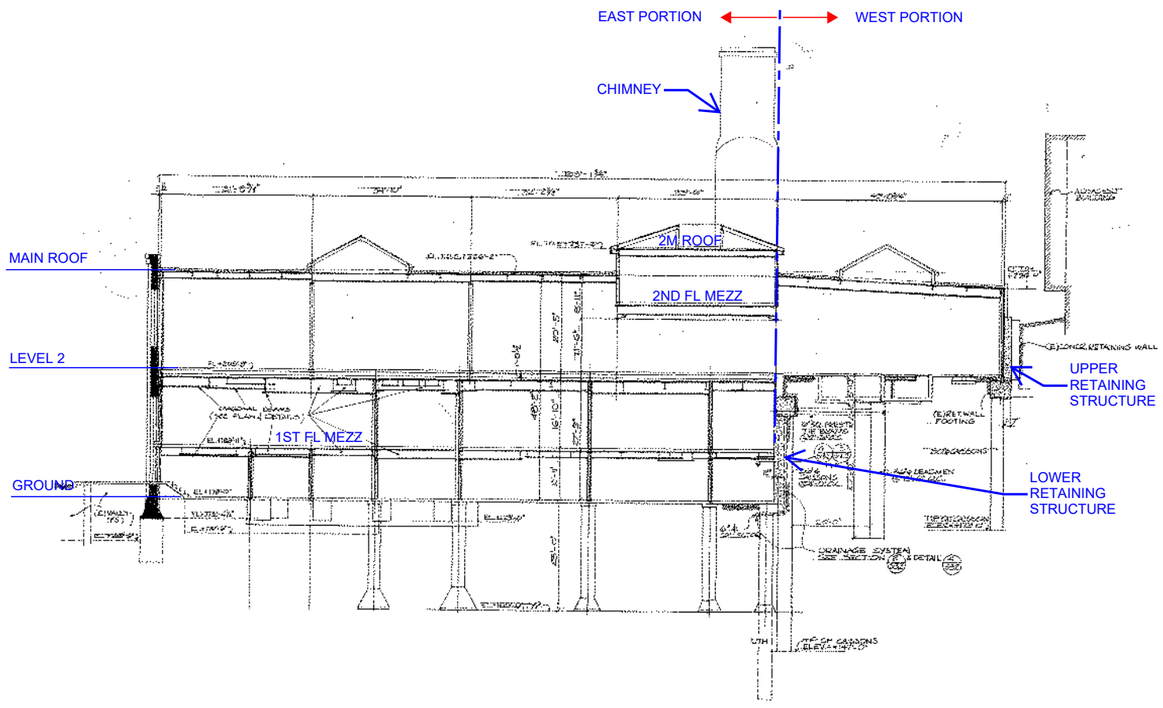
- Seismic reinforcement of existing masonry walls
- Rebuilding interior gravity load carrying system
- Adding second floor mezzanine and elevated mezzanine roof
- Enclosing existing yard on the west side
- Renovation of below ground structures
- Renovation of operation equipment

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.

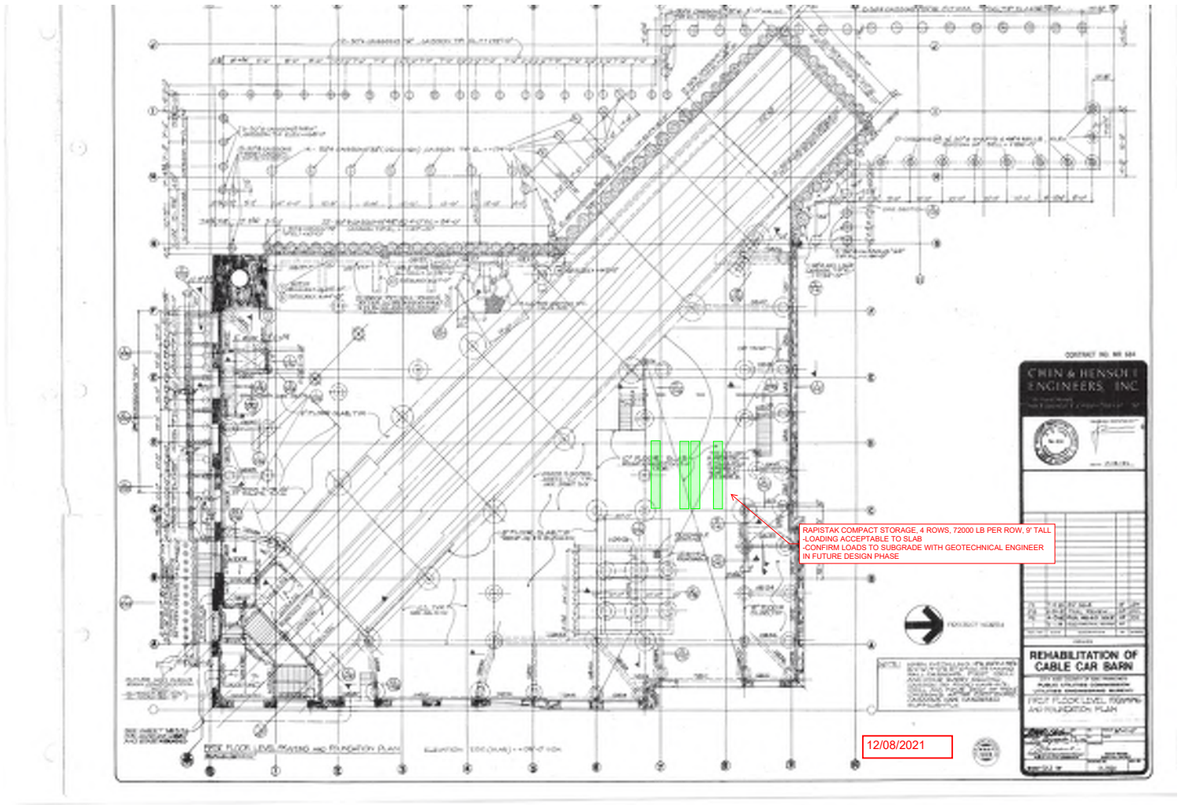
Seismic Evaluations

- 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

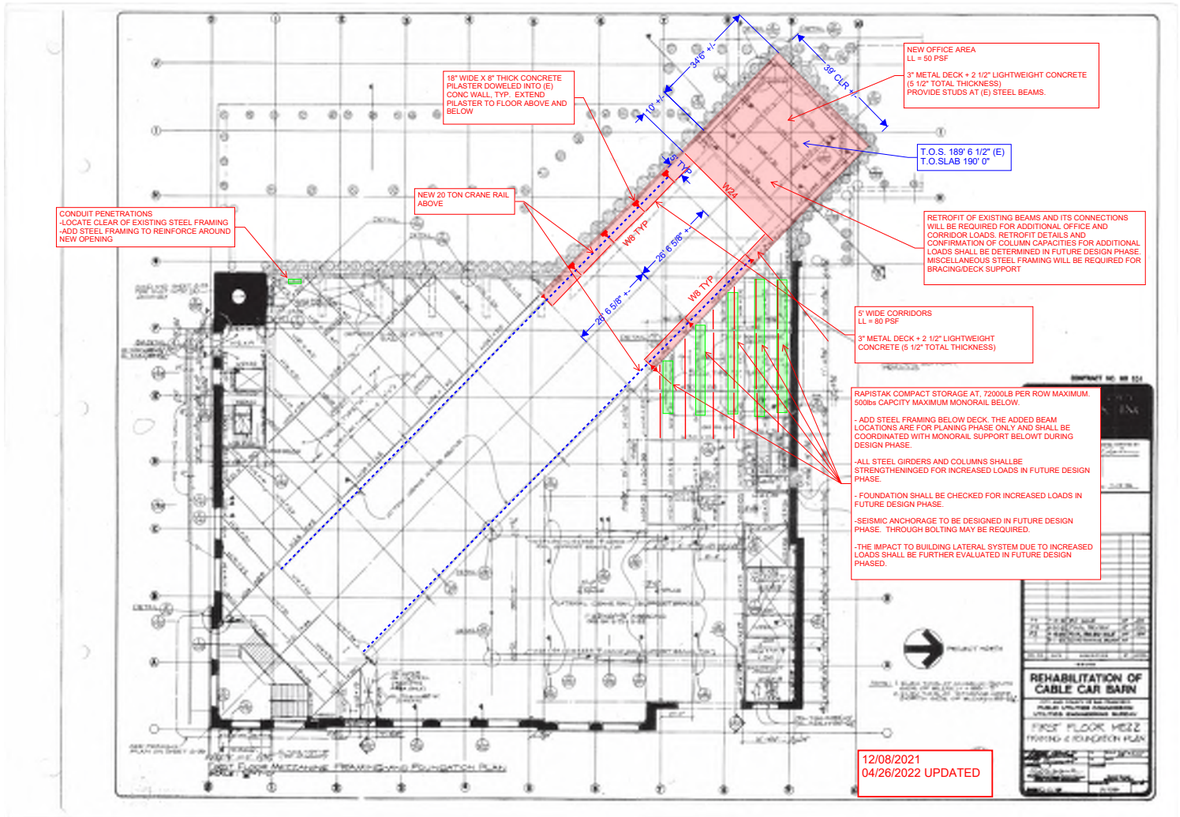
The compact storage shelves on the first level were proposed in the master plan. The structural strengthening requirements are summarized in the sketches below.



First Floor Plan

First Floor Mezzanine

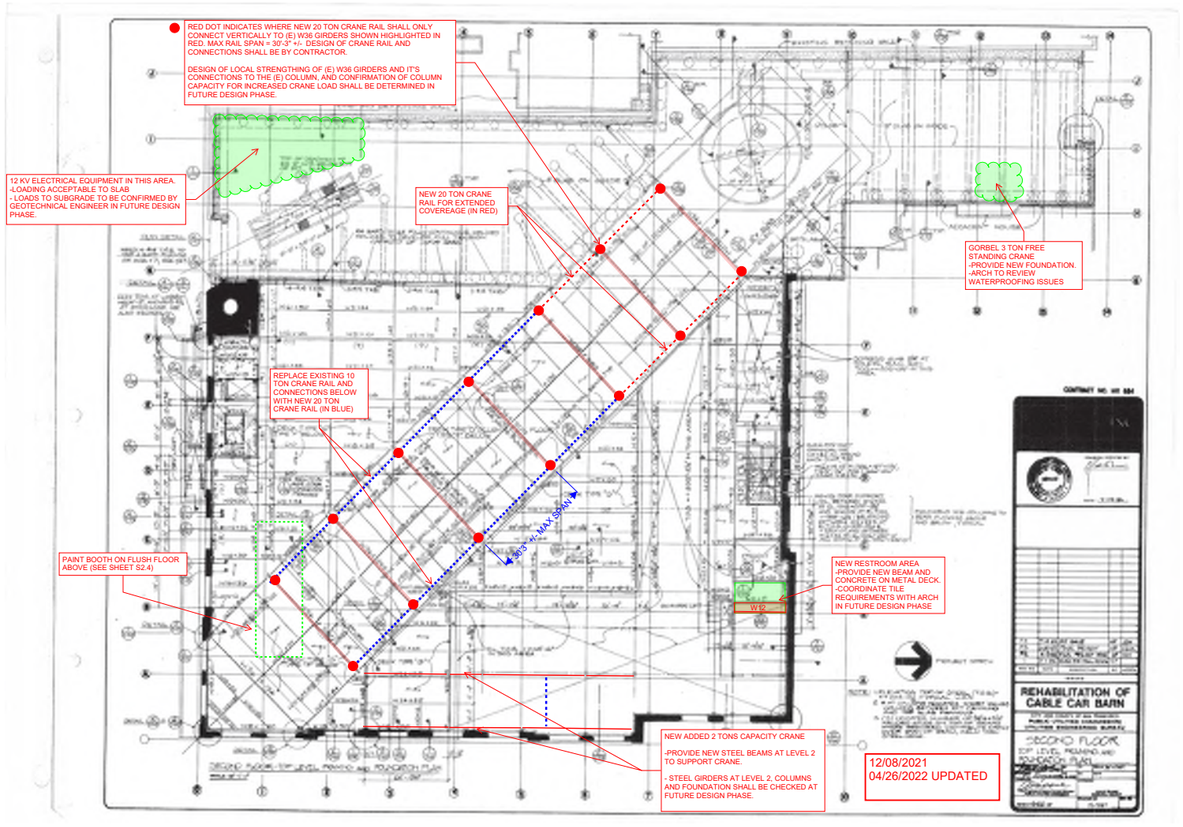
A new walkway and office area were added to the 1M floor and the compact storage shelves on the 1M floor were proposed in the master plan. The proposed structural strengthening is summarized in the sketch below.



First Floor Mezzanine Plan

Second Floor

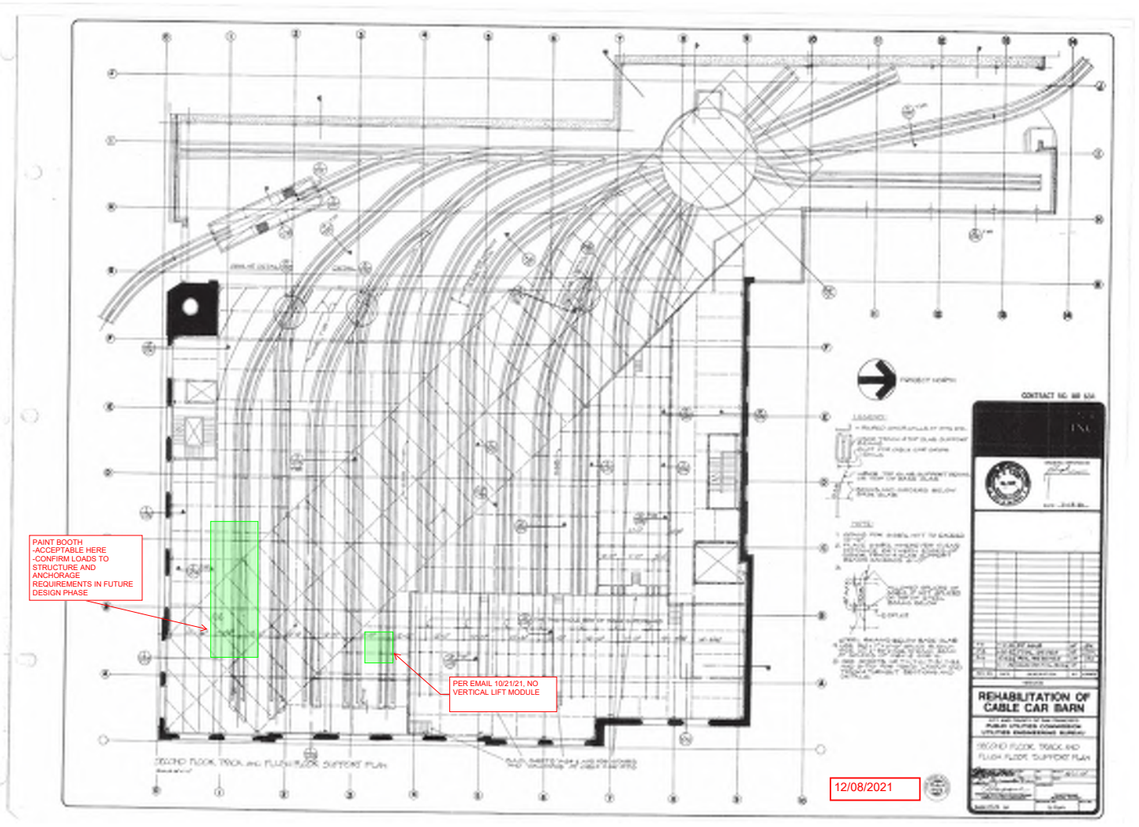
A new 20-ton crane was added and is supported by the second floor framing. 12 kV electrical equipment, a 1-ton free-standing crane, and a new restroom were added to the second floor. A new 2 tons capacity crane was proposed at first floor, east of grid line A, and supported by second floor framing. The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



Second Floor Plan

Second Floor, Track and Flush Support Plan

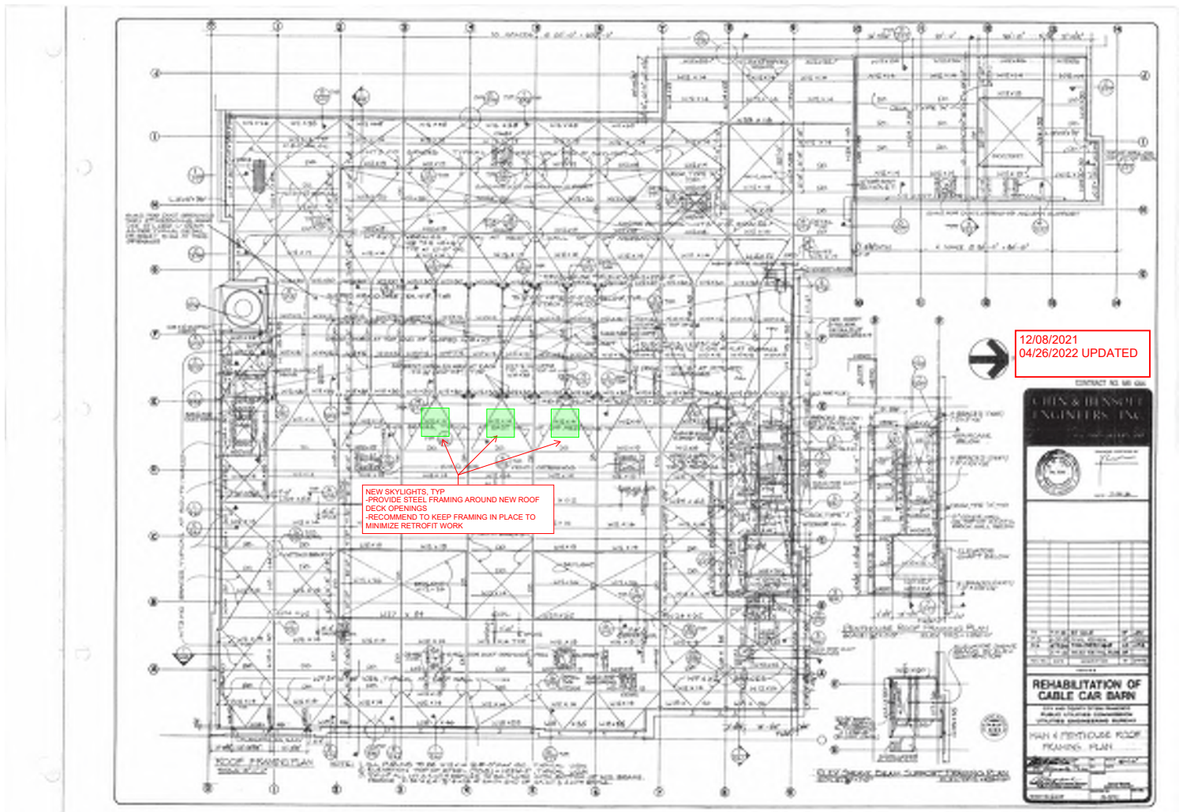
The Paint booth was added to the second floor, track and flush support plan. The proposed location and notes are summarized in the sketch below.



Second Floor, 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-1N	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	1	**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.
	2	**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.
Life Safety (L.S.)	3	**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.
Limited Safety	3	
Collapse Prevention (C.P.)	4	**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.
	4	

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.

Proposed Seismic Retrofitting

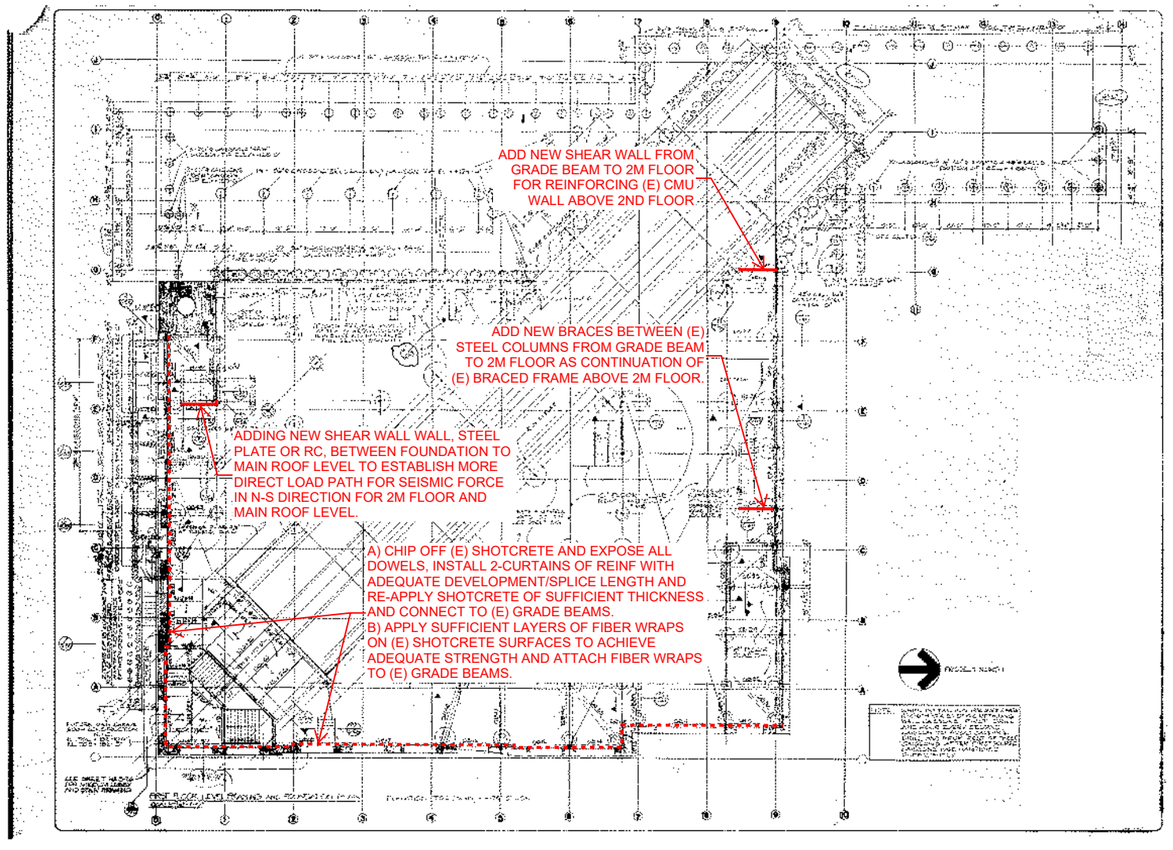
South and East Concrete Wall Strengthening

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.



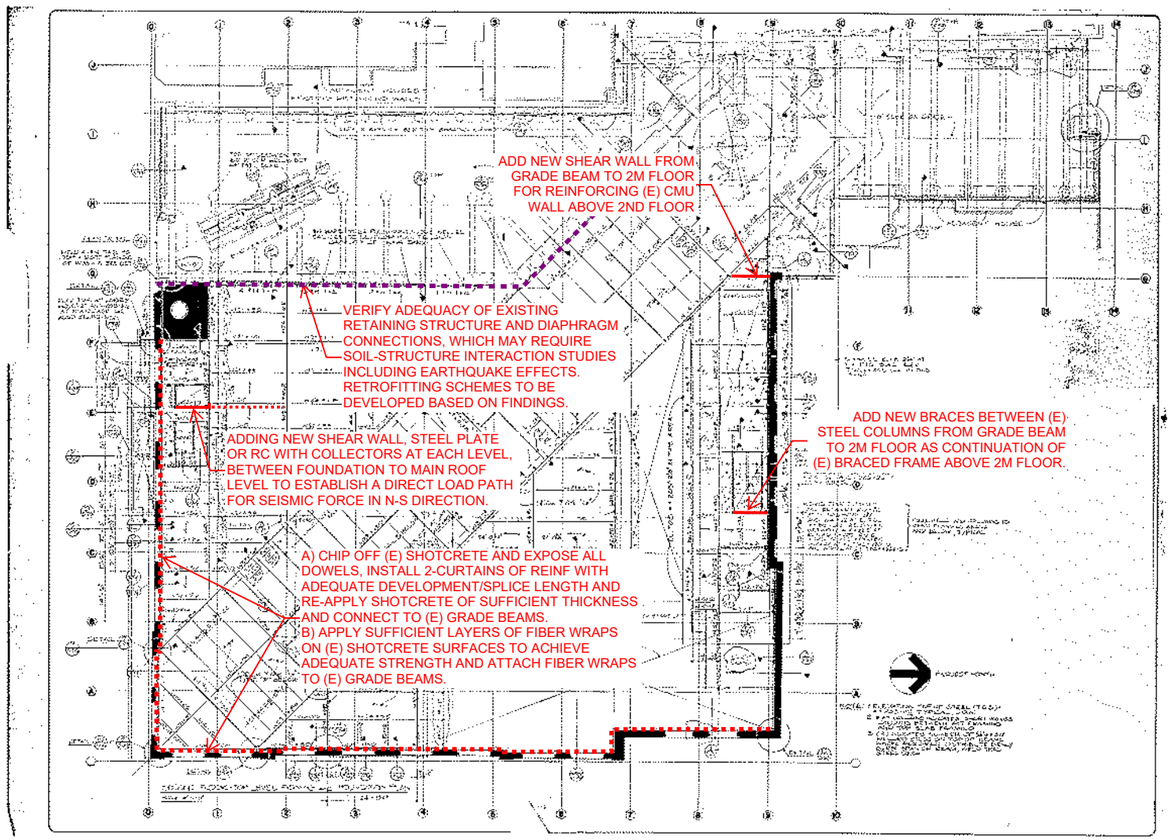
First Floor Plan

Addition of Brace to Stairs Next to North Wall

We propose adding new braces between the foundation level and the 2M floor as a continuation of the existing brace frame above the 2M floor.

Addition of Shear Wall to Grid line G

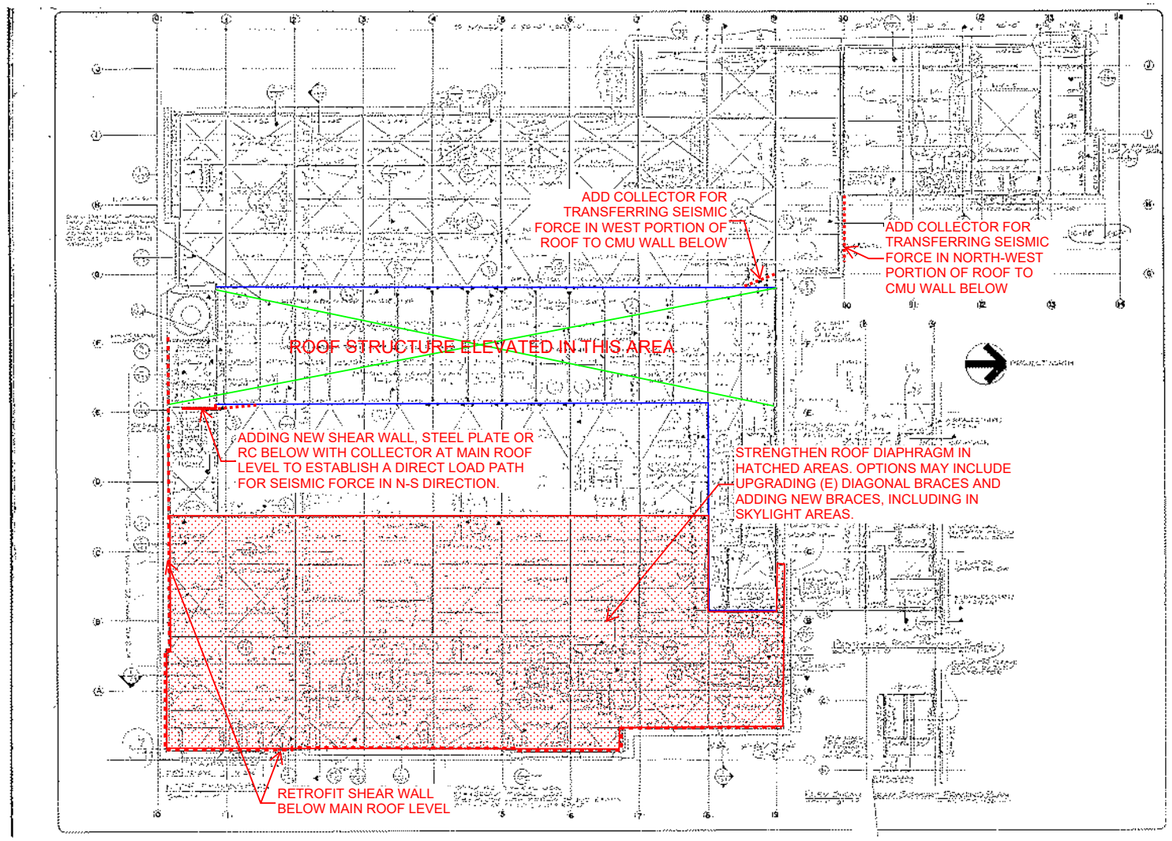
We propose adding a new shear wall from the foundation level to the 2M floor to reinforce the existing CMU wall above the second floor.



Second Floor Plan

Strengthening of Main Roof

Proposed roof diaphragm strengthening options may include upgrading existing diagonal braces and adding new braces, including in skylight areas.



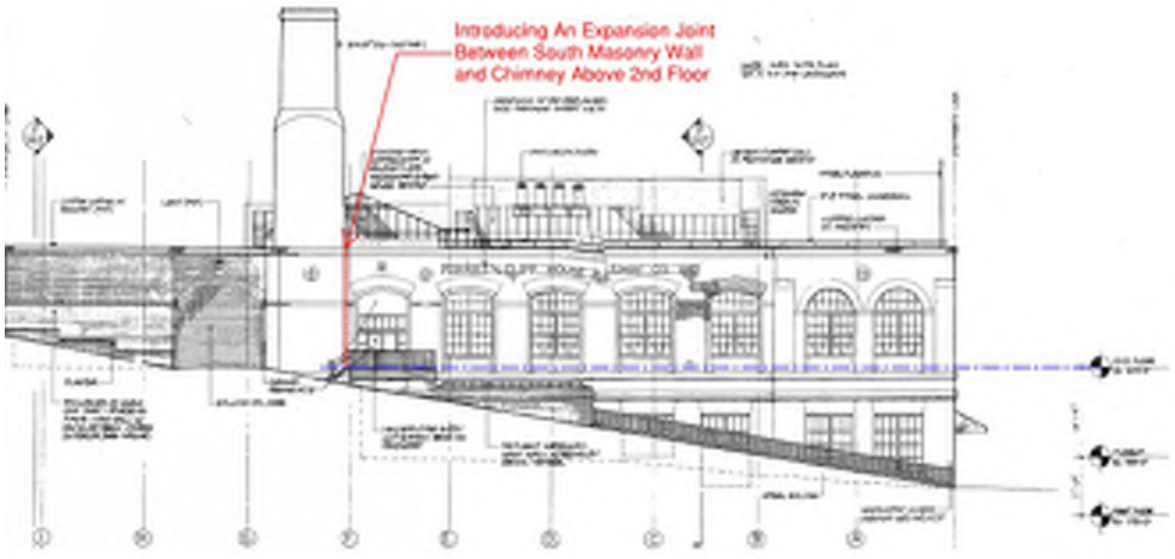
Main Roof Plan

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 as 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

Rooftop 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 heated include:
  1. Corridors/Walkways
  2. Restrooms/Showers
  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:

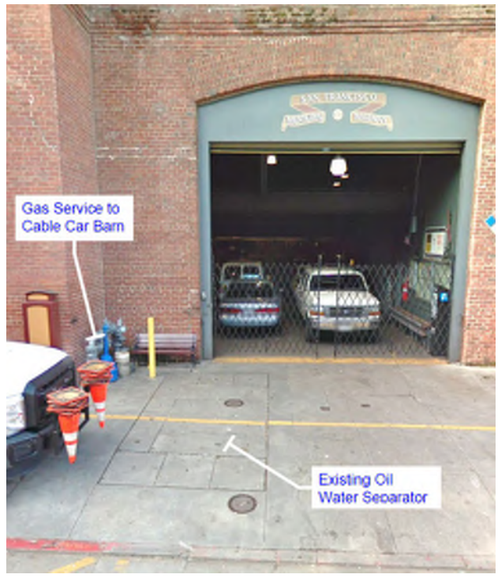
- California Building Code (CBC)
- California Mechanical Code
- California Plumbing Code
- California Fire Code (CFC)
- California Energy Efficiency Standards (Title 24)
- California Green Building Code

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.
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.

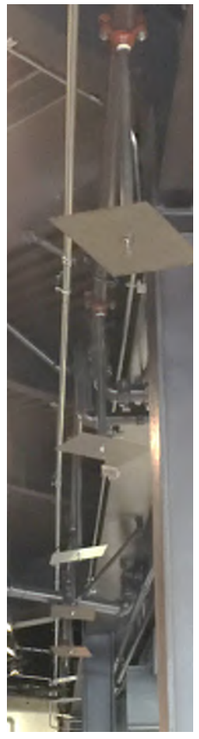
Existing Fire Protection Systems

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 accidently 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).

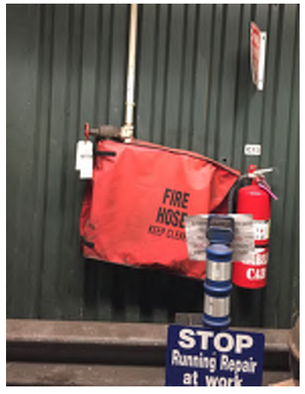
The building has two elevators: a passenger hydraulic elevator and a freight traction power elevator. Both elevators were installed in 1984. The passenger elevator has a sprinkler located at the bottom of the pit and on top of the elevator shaft. It is unclear whether the freight elevator has sprinkler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

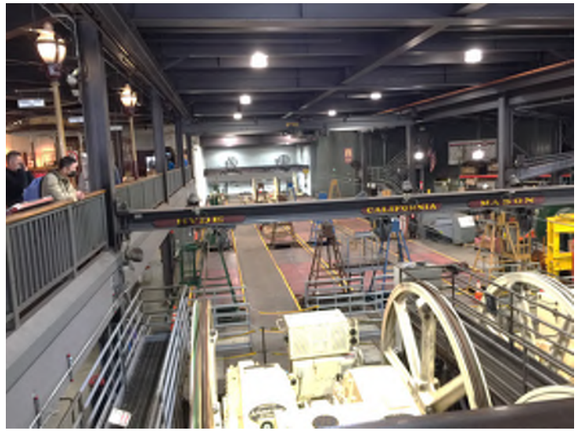
- The existing fire sprinkler system will need to be modified to suit new proposed interior layout changes and comply with the requirements of NFPA 13 and San Francisco Fire Department Administrative Bulletins. New non-electrical rooms and spaces will be protected by a wet-pipe sprinkler system. Coverage 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 SFFD. This issue will be discussed with SFFD during pre-application meeting with SFFD 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 Switchgear Room, Revenue Room (Room 2M60)

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 transformer, 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

Isolation Transformer

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

Distribution Panel, Step-Down Transformers, Sub-panels

Motor Control Center (MCC)

Low Voltage Switchboard

Disconnect Switches

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.

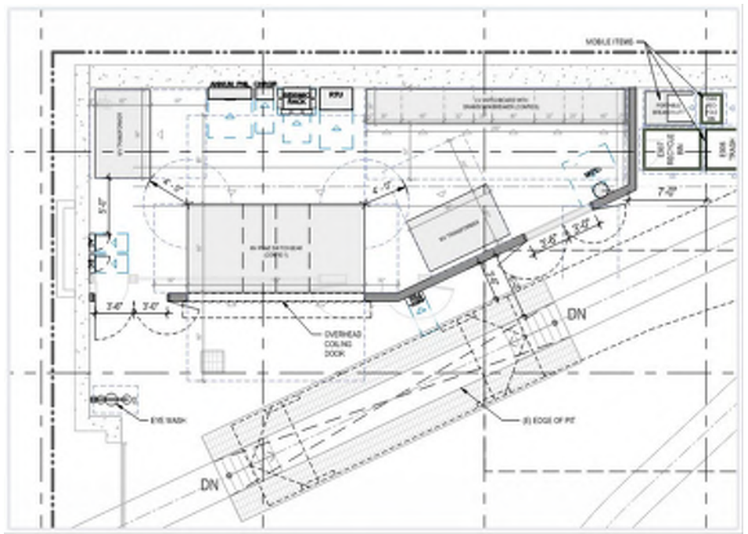
Phase one is to upgrade the main electrical distribution equipment and addition of office space on Level 1M. In order to minimize the impact to the operation of the facility, the project team proposes to construct a new electrical room to house the new service entrance equipment including main medium 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 1st floor
Space Heater/Electric Radiant Heaters	480 V	300,000	50 heaters on 2nd 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	1st floor (20 Ton)
New Grip Building Area	480/277 V	166,272	2nd floor including lighting and general power
EV and Forklift Battery Chargers	480 V 208 V 480 V 208 V	150,000 30,720 25,000 15,360	2nd floor 1st floor
Spray Booth	480/277 V	30,000	2nd floor including lighting
Compact Storage	480 V	54,038	1st floor (2) units and 1M level (3) units
Lighting	277 or 120 V	2,026.8	1M level
General Power	120 V	9,460	1M level
Bridge Crane for Machine Shop	460 V	23,902	1st floor
Elevator	N/A	N/A	The power requirement for the new elevators will not exceed the existing units
Total		1,299,778.80	

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.

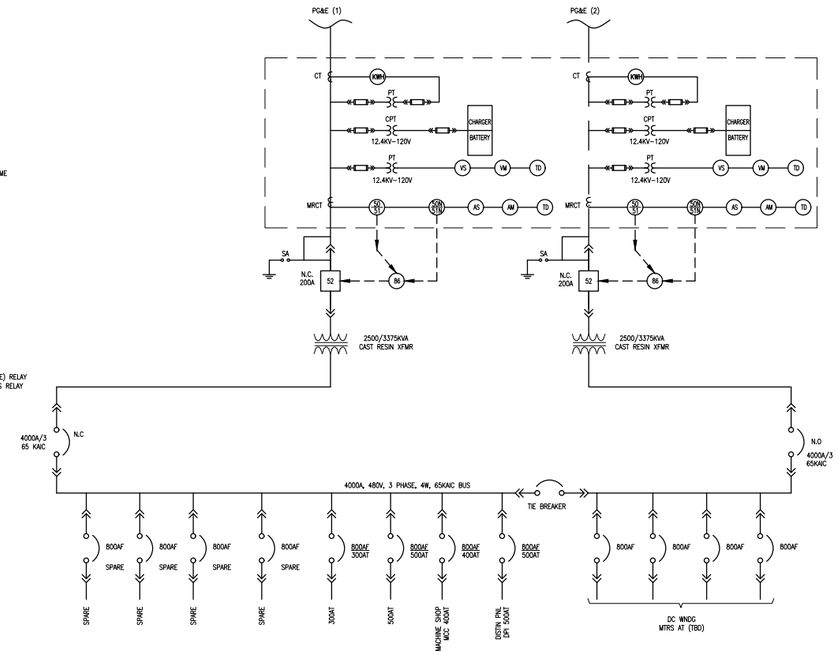
All network and communication systems equipment need to be on dedicated circuit and backed up by uninterruptable power supplies (UPS).

SYMBOLS:

- (A) AMMETER
- (V) VOLTMETER
- (AS) 3 PHASE AMMETER SWITCH
- (VS) 3 PHASE VOLTMETER SWITCH
- (UV) UNDERVOLTAGE TRIP
- (XX) PROTECTIVE RELAY; SEE ABBREVIATIONS FOR FUNCTION
- DRAWOUT ELEMENT
- FUSE
- 250AT 400AF MOLDED CASE CIRCUIT BREAKER AS SHOWN: 250A TRIP UNIT, 400A RATED FRAME
- DRAWOUT TYPE CIRCUIT BREAKER
- POWER TRANSFORMER (CONTROL POWER TRANSFORMER)
- CURRENT TRANSFORMER
- SA SURGE ARRESTOR
- (TD) TEST DEVICE

ABBREVIATIONS:

50/51	OVERCURRENT TIME AND INSTANTANEOUS (SHORT TIME) RELAY
50N/51N	AC NEUTRAL OVERCURRENT TIME AND INSTANTANEOUS RELAY
52	CIRCUIT BREAKER
86	OVER VOLTAGE RELAY
A	AMPERE
AIC	AMPERE INTERRUPTING CAPACITY
AF	FRAME AMPERE RATING
AT	TRIP AMPERE RATING
CPT	CONTROL POWER TRANSFORMER
CT	CURRENT TRANSFORMER
K	KILO
N.C	NORMALLY CLOSED
N.O	NORMALLY OPEN
PG&E	PACIFIC GAS & ELECTRIC
V	VOLT
VA	VOLT-AMPERE
XFMR	TRANSFORMER



NOTES:

1. XXXX

NO.	DATE	DESCRIPTION	REVISED	CHECKED	APPROVED

REVISIONS

BORDER REVISED 11/01/16

DESIGNED
DRAWN
CHECKED
REVIEWED
RECOMMENDED
APPROVED
DATE

CITY AND COUNTY OF SAN FRANCISCO
MUNICIPAL TRANSPORTATION AGENCY
APPROVED
for the DIRECTOR OF TRANSPORTATION

MUNI METRO SYSTEM
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CONTRACT XXXX
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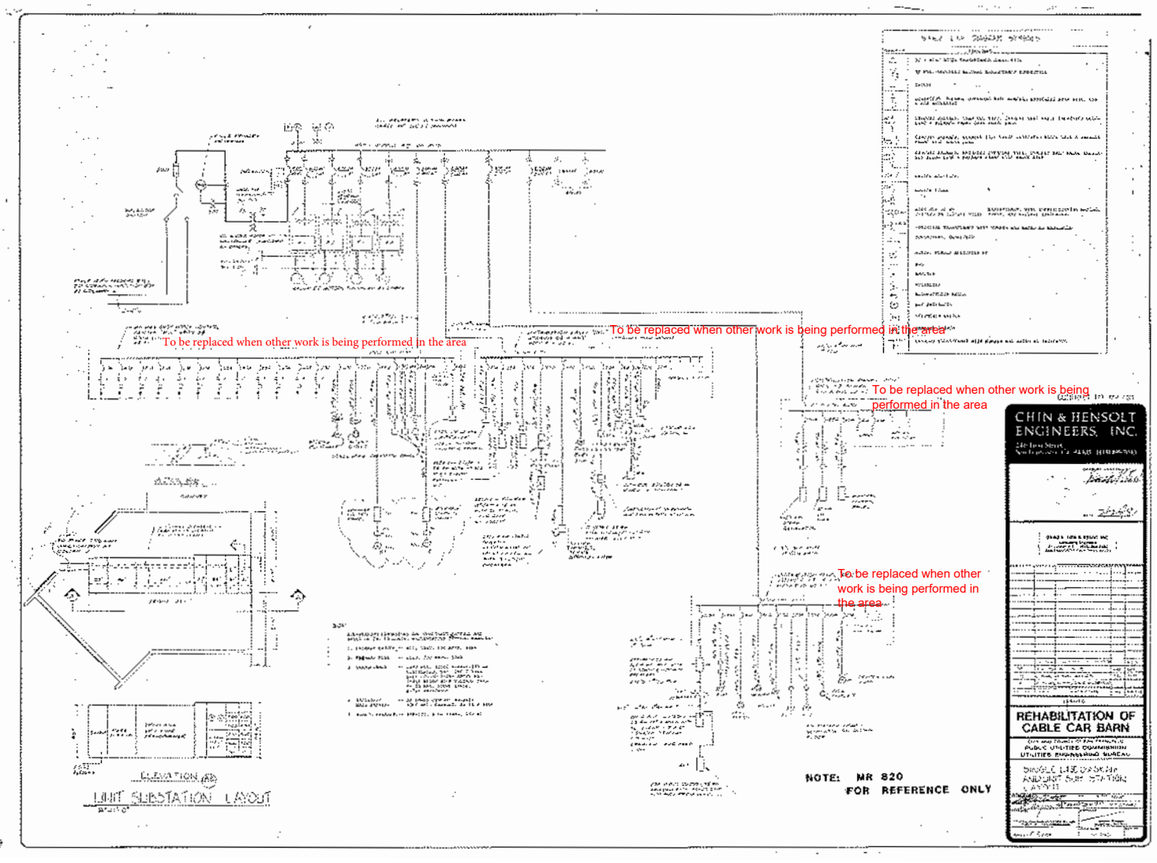

6 - Fire Alarm Design Narrative

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 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 exiting 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 underground 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 (1M09)

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 *Gorbel* (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.

Appendix

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A1 - Final Concept Plan Drawing Set

CABLE CAR BARN
MASTER PLAN PROJECT

CONCEPTUAL PLAN

SFMTA

BUREAU OF ARCHITECTURE

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FOR DBI USE ONLY

CONCEPT 10/29/2021

No.	Date	Revisions
	12/17/21	DRAFT MASTER PLAN
	06/30/22	FINAL MASTER PLAN

PM EunJoo Cho

PA EunJoo Cho

Drawn JD/KL

Checked Checker

NOT FOR CONSTRUCTION

Drawing Title

COVER SHEET

Sheet No. G 0.00

Scale: As indicated

Original Sheet Size: 30" x 42"

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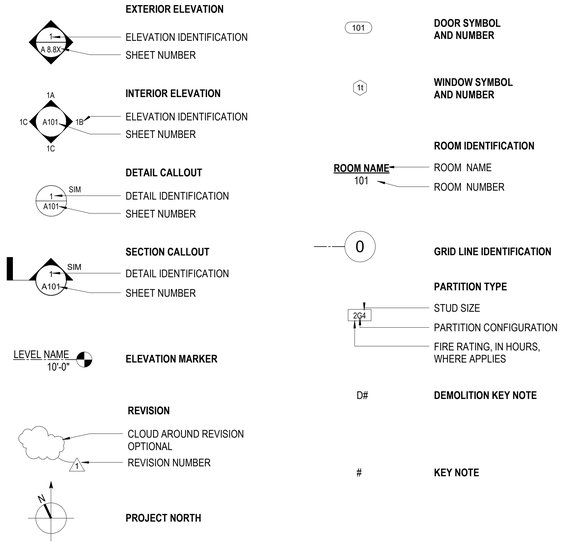
ABBREVIATIONS

AFF	ABOVE FINISH FLOOR
ACP	ACCESS PANEL
ACC	ACCESSIBLE
ACOUS	ACOUSTICAL
ACT	ACOUSTICAL CEILING TILE
ADDL	ADDITIONAL
ADJ	ADJUSTABLE
ALT	ALTERNATE
AL, ALUM	ALUMINUM
&	AND
>	ANGLE
ANOD	ANODIZED
APPROX	APPROXIMATE
ARCH	ARCHITECT, ARCHITECTURAL
AD	AREA DRAIN
@	AT
BIT	BITUMINOUS
BLKG	BLOCKING
BD	BOARD
BOT	BOTTOM
BLDG	BUILDING
CBC	CALIF BUILDING CODE
CL	CENTERLINE
CLR	CLEAR
CONC	CONCRETE
CONN	CONNECTION
CONST, CONS	CONSTRUCTION
CONT	CONTINUOUS
CSK	COUNTERSUNK
DET	DETAIL
DIA OR DIAM	DIAMETER
Ø	DIAMETER
DIM	DIMENSION
DN	DOWN
DWG	DRAWING
EA	EACH
EOS	EDGE OF SLAB
ELEC	ELECTRICAL
EL, ELEV	ELEVATION, ELEVATOR
ENCL	ENCLOSED / ENCLOSURE
EQ	EQUAL
EQMT	EQUIPMENT
(E)	EXISTING
EXP	EXPANSION
FOC	FACE OF CONCRETE
FOW	FACE OF WALL
FE	FIRE EXTINGUISHER
FEC	FIRE EXTINGUISHER CABINET
FIX	FIXTURE
FLG	FLOOR, FLOORING
FT	FOOT, FEET
GSM	GALVANIZED SHEET METAL
GA	GAUGE, GAGE
GL	GLAZING, GLASS
GND	GROUND
GB	GYPSUM BOARD
HDW	HARDWARE
HT	HEIGHT
HM	HOLLOW METAL
HSS	HOLLOW STRUCTURAL SECTION
HR	HOUR
ID	INSIDE DIAMETER
INSUL	INSULATION
INT	INTERIOR
LAM	LAMINATE
MFR	MANUFACTURER
MAX	MAXIMUM
MECH	MECHANICAL
MET, MTL	METAL
MIN	MINIMUM
MTD	MOUNTED
(N)	NEW
N/A	NOT APPLICABLE
NIC	NOT IN CONTRACT
NTS	NOT TO SCALE
NO	NUMBER
OC	ON CENTER
OPP	OPPOSITE
OD	OUTSIDE DIAMETER
O/	OVER
OD	OVERFLOW DRAIN
OFCI	OWNER FURNISHED CONTRACTOR INSTALLED
PT	PAINT
PTD	PAINTED, PAPER TOWEL DISPENSER
PERIM	PERIMETER
PLAS	PLASTIC
PLYWD	PLYWOOD
#	POUND, NUMBER
PDF	POWDER DRIVEN FASTENER
PT	PRESSURE TREATED
RAD	RADIUS
RWL	RAIN WATER LEADER
RCP	REFLECTED CEILING PLAN
RLV	REFLECTED LIGHT VALUE
REQD	REQUIRED
RD	ROOF DRAIN
SND	SANITARY NAPKIN DISPENSER OR DISPOSER
SCH, SCHED	SCHEDULE, SCHEDULED
SECT	SECTION
SCD	SEE CIVIL DRAWINGS
SED	SEE ELECTRICAL DRAWINGS
SLD	SEE LANDSCAPE DRAWINGS
SMD	SEE MECHANICAL DRAWINGS
SPD	SEE PLUMBING DRAWINGS
SSD	SEE STRUCTURAL DRAWINGS
SAF	SELF-ADHESIVE FLASHING
SHT	SHEET
SMS	SHEET METAL SCREW
SIM	SIMILAR
SD	SOAP DISPENSER
SPEC	SPECIFICATIONS
SFRM	SPRAY APPLIED FIRE RESISTIVE MATERIAL
SQ	SQUARE
SS, SST	STAINLESS STEEL
STD	STANDARD
STL	STEEL
STO	STORAGE
TEMP	TEMPERED, TEMPERATURE
TPH	TOILET PAPER HOLDER
TSCD	TOILET SEAT COVER DISPENSER
UON	UNLESS OTHERWISE NOTED
VIF	VERIFY IN FIELD
WRB	WEATHER RESISTIVE BARRIER
WO	WHERE OCCURS
WIN	WINDOW
W/	WITH
W/O	WITHOUT
WD	WOOD

LEGEND



GENERAL NOTES

1 ALL CONSTRUCTION AND INSTALLATION WORK SHOWN IN DRAWINGS OR INDICATED IN SPECIFICATIONS SHALL CONFORM TO ALL APPLICABLE CODES AND ORDINANCES OF GOVERNMENTAL AGENCIES HAVING JURISDICTION OVER THE PROJECT.

2 PROTECT ALL UTILITIES, IMPROVEMENTS AND STRUCTURES AND RESTORE TO NEW CONDITION AT NO ADDITIONAL COST TO THE CITY IF DAMAGED DURING THE COURSE OF WORK.

3 VERIFY THAT EXISTING CONDITIONS ARE AS INDICATED ON THE DRAWINGS. VERIFY ALL (E) BUILDING DIMENSIONS PRIOR TO STARTING CONSTRUCTION. NOTIFY THE CITY REPRESENTATIVE IMMEDIATELY OF VARIATIONS OR DISCREPANCIES. DO NOT PROCEED WITH AFFECTED WORK UNTIL THE VARIATIONS OR DISCREPANCIES ARE RESOLVED BY THE CITY REPRESENTATIVE.

4 ALL LARGE SCALE DRAWINGS TAKE PRECEDENCE OVER SMALLER SCALE DRAWINGS. DETAILS TAKE PRECEDENCE OVER ALL DRAWINGS.

5 PROVIDE SEISMIC BRACING AT ALL PARTITIONS, LIGHTING FIXTURES, AND CEILING CONSTRUCTION AS REQUIRED BY CODE.

6 ALL DIMENSIONS SHOWN ARE TO FACE OF STUD, U.O.N. ALL DIMENSIONS NOTED "CLEAR" OR "CLR." MUST BE STRICTLY MAINTAINED.

7 "SIMILAR" OR "SIM." MEANS HAVING COMPARABLE CHARACTERISTICS FOR THE CONDITIONS NOTED. VERIFY DIMENSIONS AND ORIENTATION ON PLAN AND/ OR ELEVATIONS.

8 WHEN PROJECT IS COMPLETE CLEAN AND POLISH ALL NEW GLASS, HARDWARE, RESILIENT FLOORING, CORK FLOORING, CERAMIC TILE AND OTHER SUCH ITEMS WITH FACTORY FINISH. REMOVE ALL DUST WITH TREATED DUST CLOTHS OR VACUUM CLEANERS.

9 PROVIDE AND MAINTAIN TEMPORARY BARRICADES, CLOSURE WALLS, ETC., AS REQUIRED TO PROTECT THE PUBLIC DURING PERIOD OF CONSTRUCTION.

10 INSTALL MANUFACTURED MATERIALS AND EQUIPMENT ACCORDING TO MANUFACTURER'S RECOMMENDATIONS AND INSTRUCTIONS, (U.O.N.)

11 WORK REQUIRED UNDER THIS CONTRACT INCLUDES ALL LABOR, MATERIALS, EQUIPMENT, ETC. NECESSARY TO COMPLETE THE PROJECT.

12 "TYPICAL" OR "TYP." SHALL INDICATE STANDARD FOR OTHER LIKE CONDITIONS THROUGHOUT THE WORK.

13 DO NOT SCALE DRAWINGS. USE DIMENSIONS SHOWN.

14 INSTALL ALL WORK PLUMB, LEVEL AND STRAIGHT.

15 ALL PARTITION LOCATIONS, DIMENSIONS, TYPES, ETC., AND ALL DOOR LOCATIONS SHALL BE AS SHOWN ON FLOOR PLANS. IN CASE OF CONFLICT, DISCREPANCIES SHALL BE RESOLVED BY THE ARCHITECT.

16 DOOR OPENINGS NOT LOCATED BY DIMENSION SHALL BE CENTERED IN WALL AS SHOWN OR SHALL BE LOCATED 4 INCHES FROM FINISHED WALL TO EDGE OF THE DOOR AT THE JAMB OPENING, UNLESS OTHERWISE NOTED.

17 ALL ASBESTOS CONTAINING MATERIAL WILL BE REMOVED BY CONTRACTOR BEFORE BUILDING DEMOLITION PHASE. REMOVAL AND DISPOSAL OF LEAD CONTAINING PAINT AS EXISTS ON BUILDING CONSTRUCTION TO BE DEMOLISHED SHALL BE PERFORMED BY THE GENERAL CONTRACTOR. HAZARDOUS ABATEMENT SUBCONTRACTOR(S) HIRED TO PERFORM SUCH WORK SHALL LICENSED PER THE REQUIREMENTS OUTLINED IN DIVISION 0 AND DIVISION 1 OF THE SPECIFICATIONS.

18 ALL WORK AS SHOWN BY THE NOTES ON THE DRAWINGS IS ASSUMED TO BE NEW WORK (N), UNLESS OTHERWISE INDICATED AS (E) OR EXISTING WORK TO REMAIN.

DEMOLITION NOTES

1 CONTRACTOR TO PROTECT REMAINING BUILDING SECTION STRUCTURE FROM DAMAGE DURING CONSTRUCTION AS INDICATED TO REMAIN ON PLANS.

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DESCRIPTION OF WORK

MASTER PLAN FOR RENOVATIONS TO HISTORIC CABLE CAR BARN AND POWERHOUSE (1885). SCOPE OF WORK INCLUDES:

- 12KV ELECTRICAL UPGRADE
- BRIDGE CRANE UPGRADES
- ADA COMPLIANCE UPGRADES
- RESTROOM AND LOCKER FACILITY UPGRADES
- ADDITIONAL MEZZANINE BUILD-OUT FOR OFFICES
- ELEVATOR UPGRADES
- SPACE PLANNING AND EQUIPMENT LAYOUT FOR REALLOCATION OF EXISTING SPACE

DRAWING INDEX

SHEET NO.	SHEET NAME	2021-0812 DRAFT CONCEPT	2021-1020 CONCEPT PLAN	2021-1217 DRAFT MASTER PLAN REPORT	2022-0630 FINAL MASTER PLAN REPORT
GENERAL					
G 0.00	COVER SHEET	●	●	●	●
G 0.10	PROJECT DATA, GENERAL NOTES, SHEET INDEX, ABBREVIATIONS	●	●	●	●
G 0.12	EXISTING & PREFERRED PROGRAM MATRIX	●	●	●	●
G 0.13	EXISTING & PREFERRED PROGRAM MATRIX	●	●	●	●
G 0.14	PROPOSED PROGRAM AND LOCKER MATRIX	●	●	●	●
G 0.15	CONSTRUCTION PHASING PLANS	●	●	●	●
G 2.11	OCCUPANCY, EGRESS & ACCESSIBLE PATH PLAN - SUB FLOOR & FIRST FLOOR	●	●	●	●
G 2.12	OCCUPANCY, EGRESS & ACCESSIBLE PATH PLAN - FIRST FLOOR MEZZANINE	●	●	●	●
G 2.13	OCCUPANCY, EGRESS & ACCESSIBLE PATH PLAN - SECOND FLOOR	●	●	●	●
G 2.14	OCCUPANCY, EGRESS & ACCESSIBLE PATH PLAN - SECOND FLOOR MEZZANINE	●	●	●	●
GENERAL: 10					
ARCHITECTURE					
A 0.01	SITE PLAN	●	●	●	●
A 0.10	EXISTING PLAN - SUB FLOOR	●	●	●	●
A 0.11	EXISTING PLAN - FIRST FLOOR	●	●	●	●
A 0.12	EXISTING PLAN - FIRST FLOOR MEZZANINE	●	●	●	●
A 0.13	EXISTING PLAN - SECOND FLOOR	●	●	●	●
A 0.14	EXISTING PLAN - SECOND FLOOR MEZZANINE	●	●	●	●
A 1.10	DEMOLITION PLAN - SUB FLOOR	●	●	●	●
A 1.11	DEMOLITION PLAN - FIRST FLOOR	●	●	●	●
A 1.12	DEMOLITION PLAN - FIRST FLOOR MEZZANINE	●	●	●	●
A 1.13	DEMOLITION PLAN - SECOND FLOOR	●	●	●	●
A 1.14	DEMOLITION PLAN - SECOND FLOOR MEZZANINE	●	●	●	●
A 2.10	FLOOR PLAN - SUB FLOOR	●	●	●	●
A 2.11	FLOOR PLAN - FIRST FLOOR	●	●	●	●
A 2.12	FLOOR PLAN - FIRST FLOOR MEZZANINE	●	●	●	●
A 2.13	FLOOR PLAN - SECOND FLOOR	●	●	●	●
A 2.14	FLOOR PLAN - SECOND FLOOR MEZZANINE	●	●	●	●
A 2.15	ROOF PLAN		●	●	●
A 3.10	EXTERIOR ELEVATIONS - SOUTH & EAST		●	●	●
A 3.11	EXTERIOR ELEVATIONS - NORTH & WEST		●	●	●
A 3.41	BUILDING SECTIONS	●	●	●	●
A 3.42	BUILDING SECTIONS MACHINE SHOP & OFFICE	●	●	●	●
A 3.51	3D VIEWS - EXTERIOR	●	●	●	●
A 3.52	3D VIEWS - INTERIOR		●	●	●
A 3.53	3D VIEWS - INTERIOR		●	●	●
A 5.00	DOOR & WINDOW SCHEDULES	●	●	●	●
ARCHITECTURE: 25					
EQUIPMENT					
EQ 0.10	EQUIPMENT LIST - MACHINE SHOP	●	●	●	●
EQ 0.11	EQUIPMENT LIST - INSPECTION ROOM & WELD SHOP	●	●	●	●
EQ 0.12	EQUIPMENT LIST - GRIP BUILDING AREA & PULLEY ASSEMBLY AREA	●	●	●	●
EQ 0.13	EQUIPMENT LIST - STEAM CLEANING AREA & CARPENTRY	●	●	●	●
EQ 0.14	EQUIPMENT LIST - PAINT, CAR CLEANING & LVL 2 STORAGE	●	●	●	●
EQ 2.11	EQUIPMENT PLAN - FIRST FLOOR	●	●	●	●
EQ 2.12	EQUIPMENT PLAN - FIRST FLOOR MEZZANINE		●	●	●
EQ 2.13	EQUIPMENT PLAN - SECOND FLOOR	●	●	●	●
EQUIPMENT: 8					
PRESENTATION					
PA 2.11	PROPOSED SPACE DIAGRAM - FIRST FLOOR		●	●	●
PA 2.12	PROPOSED SPACE DIAGRAM - FIRST FLOOR MEZZANINE			●	●
PA 2.13	PROPOSED SPACE DIAGRAM - SECOND FLOOR		●	●	●
PA 2.14	PROPOSED SPACE DIAGRAM - SECOND FLOOR MEZZANINE		●	●	●
PRESENTATION: 4					
TOTAL SHEET COUNT: 47					

PROJECT DATA

PROJECT NAME: CABLE CAR BARN

ADDRESS: 1201 MASON STREET
SAN FRANCISCO, CA 94108

CABLE CAR BARN AND CABLE CAR FLEETS ARE EACH REGISTERED AS NATIONAL HISTORIC LANDMARKS.

BLOCK/LOT NO.: 0190/005
ZONING DISTRICT: P-PUBLIC
PLAN AREA: NORTHEAST/NOB HILL
HEIGHT & BULK DISTRICT: 65-A
PARCEL AREA: .91 ACRES

EXISTING BUILDING BUILT: 1888, RENOVATED 1984
EXISTING BUILDING HEIGHT: 54'- 6"(GRADE PLANE TO AVERAGE HT OF SLOPED ROOF)
EXISTING NO. OF STORIES: 2 (WITH MEZZANINES AT EACH FLOOR)

GROSS FLOOR AREA:

	EXISTING	PROPOSED
SUB FLOOR	642 GSF	642 GSF
FIRST FLOOR	26,078 GSF	26,078 GSF
FIRST FLOOR MEZZANINE	10,416 GSF	**12,642 GSF**
SECOND FLOOR	36,691 GSF	36,691 GSF
SECOND FLOOR MEZZANINE	7,467 GSF	7,467 GSF
TOTAL	81,294 GSF	**83,520 GSF**

PROPOSED AREA OF ADDITION:

FIRST FLOOR MEZZANINE 2,226 GSF

PROPOSED AREA OF ALTERATION:

SUB FLOOR	0 SF
FIRST FLOOR	10,826 SF
FIRST FLOOR MEZZANINE	2,309 SF
SECOND FLOOR	5,945 SF
SECOND FLOOR MEZZANINE	5,603 SF
TOTAL	24,683 SF

EXISTING OCCUPANCY: UBC 1973
B3 PUBLIC AREAS
F2 ADMINISTRATION AREA
G CABLE CAR GARAGE, MAINTENANCE AREA & CABLE MACHINERY AREA
CBC 2019
A-3 MUSEUM (ACCESSORY TO F)
B OFFICE
F-1 SHOP/STORAGE

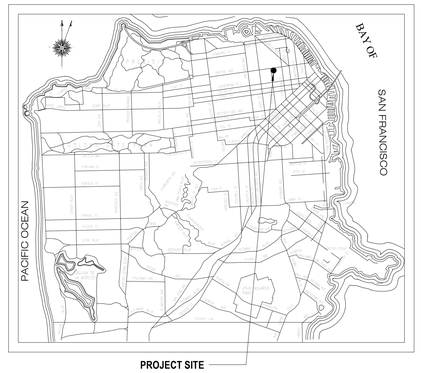
PROPOSED OCCUPANCY: NO CHANGE
PROPOSED BUILDING HEIGHT: NO CHANGE

TYPE OF CONSTRUCTION: UBC 1979
TYPE III ONE-HOUR, FULLY SPRINKLERED
CBC 2019
TYPE IIB EXISTING NON-CONFORMING

APPLICABLE BUILDING CODES:

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

LOCATION MAP



VICINITY MAP

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CONCEPT 10/29/2021

No.	Date	Revisions
	12/17/21	DRAFT MASTER PLAN
	06/30/22	FINAL MASTER PLAN

PM	EunJoo Cho
PA	EunJoo Cho
Drawn	JD/KL
Checked	Checker

NOT FOR CONSTRUCTION

Drawing Title

PROJECT DATA, GENERAL NOTES, SHEET INDEX, ABBREVIATIONS

Sheet No. G 0.10

Scale: As indicated

Original Sheet Size: 30" x 42"

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ROOM			EXISTING USE				PREFERRED USE			
								STAFFING		
ROOM NO.	ROOM NAME	AREA	TEAM	USER	FUNCTION	NOTES	NOTES	TOTAL	SHIFT	STAFF PER SHIFT
SUB FLOOR										
001	VIEWING ROOM	440 SF	Museum							
002	STORAGE	150 SF								
003	CABLE CLAMPING ROOM	885 SF								
FIRST FLOOR										
100	CABLE YARD	8570 SF								
100A	REEL STORAGE AREA	4675 SF				—9 cabinets				
101	SHARED OFFICE	205 SF	Propulsion/Vehicle Maintenance	Management Asst. Shop and Equip. Supervisor Cable Machinery Superint. Intern	Office	—3 occupants —3 workstations —Filing cabinets, shelves	—RELOCATE to new office space above Tension Carriages for Shop and Equipment Supt. and Management Assistant —Private Office —1 workstation —Desk, secure file storage —Lockers: 1-P1 (15"x18"x72")	1	Day	1
101A	OFFICE	130 SF	Track	Track Superintendent	Private Office	—1 occupant —1 workstation —Filing cabinets, shelves	—RELOCATE to new office space above Tension Carriages —1 workstation —Desk, secure file storage —Lockers: 1-L1 (12"x12"x22"), 10L2 (7.5"x21"x40"), 1-P1 (15"x18"x72")	1	Day	1
101B	STORAGE	25 SF	General Building			—Exterior door at street level				
102	LUNCH / MEETING	390 SF	Track/Propulsion		Break	—Kitchen (Cabinet for water jugs, Refrigerator, sink, stove, cabinets, Water dispenser) —2 workstations —11 chairs —1 parts inspection table/desk —1 break/meeting table —(No Lockers)	—4 workstations (in a shared space) —Lockers: 1xL1, 1xL2, 1xP1 per employee	40		17
103	JAN.	55 SF	Facilities		Storage		—Refer to MTA Facilities Dep't for custodian needs			
104	STORAGE	70 SF	Facilities		Storage	—1 electromechanical equipment cabinet —1 machinery lubricating oils cabinet —1 log books cabinet				
105	MEN	565 SF	Track/Propulsion		RR/Locker	—52 lockers —2 WC —2 urinals —1 large shared lavatory —2 showers	—Need more lockers and space	40		17
106	WOMEN	150 SF	Track/Propulsion		RR/Locker	—4 lockers —1 WC —1 lavatory —1 shower				
107	MECHANICAL	305 SF	Propulsion	Chief Stationary Eng.	Storage Workshop	—1 workstation —Fenced area —Machinery, storage —Elevator machineroom (in a fenced off portion) —Electrical panels, switchboards, water heater	—RELOCATE workspace. Ideally, this room dedicated only to storage, electrical equipment, elevator machinery, etc. and not at all utilized as an office. —1 workstation —Lockers: 1xL1, 1xL2, 1xP1 per employee —RELOCATE workspace. Ideally, this room dedicated only to storage, electrical equipment, elevator machinery, etc. and not at all utilized as an office.	2		1
107A	ELEVATOR EQUIPMENT	65 SF								
108	CONTROL	230 SF	Propulsion	Stationary Eng.	Storage Workshop	—1 workstation —Equipment/machinery motor controller, prognost HMI, security camera HMI, relays for safety circuit —Cabinet for radios	—Control Room upgrade —1 workstation —Lockers: 1xL1, 1xL2, 1xP1 per employee	9		3
109	ELECTRICAL EQUIPMENT	780 SF	Propulsion		Electrical	—Switchgear, Transformers, Motor Controllers, Back up power —Access safety circuit relays in control room —2 cabinets	—12kV Equipment Upgrade			
110	SPLICER BREAK	520 SF	Propulsion	Splicers (Wire Rope Mechanic and Trainee)	Break	—36 lockers —2 workstations	—Need more locker room space, 2 splicers/shift other than Grave —4 workstations (in shared space) —24 occupants (19 Mechanics and 5 Trainees) —Dedicated Wire Rope Repair Area, Materials and Tools Storage —Lockers: 1xL1, 1xL2, 1xP1 per employee	24	Grave	4
110A	SPLICER SUPERVISOR	105 SF	Propulsion	Splicer Supervisor	Office	—1 workstation	—Need more locker room space —Private office with valuables and storage —Lockers: 1xL1, 1xL2, 1xP1 per employee	1		
110B	SPLICER WORKROOM	780 SF	Propulsion	Splicers	Workshop	—2 locker cabinets, 8 lockers each	—Includes storage and workbenches			
111	WELD SHOP	630 SF	Propulsion	Welder	Workshop	—1 workstation —6 lockers —3 tables —Welding —Storage	—Weld Shop Upgrade /Relocation —Lockers: 1xL1, 1xL2, 1xP1 per employee —Desk, Multiple welding machines, 3 phase power, storage, ventilation, compressed air, 2 Welding Stations —Caged Off for Security	3	Grave	2

ROOM			EXISTING USE				PREFERRED USE			
								STAFFING		
ROOM NO.	ROOM NAME	AREA	TEAM	USER	FUNCTION	NOTES	NOTES	TOTAL	SHIFT	STAFF PER SHIFT
111A	PULLEY ASSEMBLY AREA	525 SF				—Fenced area —Pulleys; Rack in walkway —Large misc rack adj to grip repair —Large misc rack near tension run stairs to 1M	—Pulley Assembly Area Upgrade / Relocation			
111B	STEAM CLEANING/WELD AREA	610 SF				—Table in open floor —Sectioned off between depression beam repair area and room 111	—Steam Cleaning/Weld Area Upgrade / Relocation			
111C	GRIP BUILDING AREA	1030 SF				—Grip Repair Area —2 cabinets near freight elevator	—Cable Car has preference for moving the function (grip building and repair) of this space to the 2nd floor			
112	STORAGE	305 SF	Track		Storage	—Tall racks for storing depression beams —Overflow storage crowding the walkways in this room —Equipment/machinery/tools	—Need more storage space			
113	VESTIBULE	70 SF	Track		Storage	—Equipment/machinery/tools —Cabinets for batteries				
114	SHARED OFFICE	55 SF	Track/Engineering	Track Supervisor Track Maint. Worker Sup.	Office	—1 workstation —3 cabinets —Equipment/machinery/tools	—UPGRADE/RELOCATION: Room 114 does not have enough space to accommodate 4 people/workstations. If room remains as is, then 1 occupant should remain and the rest relocated. —4 workstations in Shared Offices for track workers —Lockers: 1xP1 per employee	4	Day	4
115	PRIVATE OFFICE	105 SF	Track	Track Supervisor Track Maint. Worker Sup.	Office	—1 workstation —4 storage units —Ladder	—2 workstations —Lockers: 1xL1, 1xL2, 1xP1 per employee —If room remains as is, then 1 occupant should remain and 2 occupants relocated.	5		1
116	ENGINEER'S OFFICE	80 SF	Propulsion	Mechanical Engineer (Full Engineer and Assistant Engineer)	Storage Workshop	—1 workstation —Equipment/machinery/tools —Drawing rolls, flat files —Networking equipment —Cabinets, shelves	—RELOCATE to new office space above Tension Carriages. If room remains as is, then 1 occupant should remain and the rest relocated. —Private Office —2 workstations —Flat File, Large Format Printer/Scanner, Secure Valuables Storage, Parts Rack —Lockers: 1xP1 per employee	2	Day	1
117	MACHINE SHOP	1805 SF	Propulsion	Machine Shop Sup. Machinist	Storage Workshop	—Fenced area —Equipment/machinery/tools —Parts rack —2 lockers —1 workstation —Optical comparator	—Machine Shop UPGRADE/RELOCATION —Need supervisor private office and machinist workstation —See 1M08 note below —Private Office —Rack for Parts/Equipment Storage —Lockers: 1xL1, 1xL2, 1xP1 per employee	5		4
117A	SUPERVISOR OFFICE AREA	185 SF	Propulsion	Machine Shop Sup.	Office					
118	LOBBY	165 SF				—1 ipad locker —1 cabinet for plumbing —2 tools & spare parts cabinets				
119	CORRIDOR	225 SF				—1 key locker				
120	CORRIDOR	960 SF								
S4	STAIR 4	70 SF								
S5	STAIR 5	200 SF								
FIRST FLOOR MEZZANINE										
1M00	LOBBY	170 SF			Circulation	—Passenger elevator lobby				
1M01	STORAGE / BREAK	180 SF	Museum		Break	—Storage	—Refer to MTA Facilities Dep't			
1M02	JANITOR'S CLOSET	35 SF	Museum		Storage		—Refer to MTA Facilities Dep't	2	Day	1
1M03	MEN	175 SF	Museum		Restroom	—1 WC —2 urinals —2 lavatories				
1M04	WOMEN	165 SF	Museum		Restroom	—2 WC —3 lavatories				
1M05	MUSEUM	5020 SF	Museum		Museum					
1M06	MUSEUM ENTRY	250 SF	Museum		Museum					
1M07	PARTS STORAGE / WORKSTATIONS	565 SF	Propulsion	Electronic Maint. Tech Electrician Electronic Maint. Tech PROP F	Workshop	—Fenced area —2 workstations —2 large cabinets —3 tool carts	—3 workstations total (shared space w/ Electrician - 4 Occupants) —Lockers: 1xL1, 1xL2, 1xP1 per employee	4 (Shift Excludes PROP F)	Grave	1
1M08	MACHINIST WORKSTATION	995 SF	Propulsion	Machinists	Workshop	—1 workstation	—See 117 Machine Shop note —Need new shared space - Same Floor As and Near/In Machine Shop —3 workstations (shared space in new space near Machine Shop) —Lockers: 1xL1, 1xL2, 1xP1 per employee —Employee owned toolboxes	1 (3 are included in 117)	Day	1
1M09	STOREKEEPER WORKSTATION	590 SF	Facilities	Storeroom keeper	Workshop	—1 workstation	—Refer to MTA Facilities Dep't	1	Day	1
1M10	WALKWAY	610 SF	Shared		Storage	—Caged flammable gas —6 cabinets				
1M11	STORAGE	300 SF	Track		Storage	—Access: Enter room 115 on first floor and walk up ladder/stair provision.				

NOTE: SEE SHEET EQ SERIES FOR EQUIPMENT LIST FOR SHOP AREAS

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No.	Date	Revisions

PM
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EXISTING & PREFERRED PROGRAM MATRIX

Sheet No.

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ROOM			EXISTING USE				PREFERRED USE			
								STAFFING		
ROOM NO.	ROOM NAME	AREA	TEAM	USER	FUNCTION	NOTES	NOTES	TOTAL	SHIFT	STAFF PER SHIFT
SECOND FLOOR										
200	CABLE CAR SHOP	27485 SF	Vehicle Maintenance	Electric Transit System Mechanic Transit Car Cleaner Transit Car Cleaner Assistant Supervisor	Workshop	—4 parts and tools cabinets near freight elevator used by vehicle mechanics —1 hazardous materials cabinet near turntable —1 hazardous materials cabinet next to freight elevator	—Need new shared spaces —See 202 function and note —3 workstations in shared space —2 shared workstations in shared space —Desk in Shared Office w/ other Assistant Supervisor —Lockers: 1xL1, 1xL2, 1xP1 per employee	36		22
200A	PIT	3645 SF				—9 tools cabinets				
201	LUNCH / BREAK	290 SF	Vehicle Maintenance		Break	—Water dispenser filtration system —Television —1 blank inspection/operations documents storage	—Kitchen sink, stove, refrigerator all against wall —1 workstation —1 break/meeting table			
202	SUPERVISORS' OFFICE	180 SF	Vehicle Maintenance	Vehicle Maint. Sup's	Office	—2 workstations	—See 200 function and note —Management Assistant —Dedicated desk in shared office —Desk in Shared Office w/ Car Cleaner Assistant Supervisor —Lockers: 1xL1, 1xL2, 1xP1 per employee	2	Day	1
203	MEN	320 SF	Vehicle Maintenance		Restroom	—1 WC —2 urinals —1 large shared lavatory —34 lockers —1 shower				
204	JANITOR CLOSET	20 SF	Vehicle Maintenance		Storage		—Refer to MTA Facilities Dep't			
205	WOMEN	105 SF	Vehicle Maintenance		Restroom	—1 WC —1 lavatory —1 shower —5 lockers				
206	LOCKER	85 SF	Vehicle Maintenance			—4 lockers (8qty, 12qty x2, 1qty; Uniform lockers) —Eye wash				
207	PARTS	345 SF	Vehicle Maintenance		Storage	—Equipment/machinery/tools				
208	CARPENTRY	2265 SF	Vehicle Maintenance	Carpenters	Workshop	—3 lockers	—UPGRADE Carpentry Shop —1 workstation —Tools and storage —Lockers: 1xL1, 1xL2, 1xP1 per employee	3	Day	3
208A	TOOLS	115 SF	Vehicle Maintenance	Management Assistant	Workshop	—Fenced area	—Need private office for Management Assistant —Lockers: 1xP1	1		1
208B	PAINT	365 SF	Vehicle Maintenance		Workshop	—Fenced area	—Need paint booth w ventilation —1 workstation —Tools and storage —Lockers: 1xL1, 1xL2, 1xP1 per employee	2	Day	2
208C	SUPERINTENDENT OFFICE / MAINTENANCE	250 SF	Vehicle Maintenance	Vehicle Maint. Sup.	Office	—1 workstation	—Private Office —Secure files storage, secure valuables storage —Lockers: 1xL1, 1xL2, 1xP1	1	Day	1
209	LOBBY	185 SF			Circulation	—Passenger elevator lobby				

ROOM			EXISTING USE				PREFERRED USE			
								STAFFING		
ROOM NO.	ROOM NAME	AREA	TEAM	USER	FUNCTION	NOTES	NOTES	TOTAL	SHIFT	STAFF PER SHIFT
SECOND FLOOR MEZZANINE										
2M00	LOBBY	210 SF			Circulation	—Passenger elevator lobby				
2M01	STORAGE	30 SF	Operations		Storage					
2M02	CLASSROOM	95 SF	Operations	Lead Trainer	Office	—2 workstations	—Dedicated Training Instruction Room fitted for at least 1 instructor and 4 people receiving training —Lockers: 1xP2 per employee	5		5
2M02A	OFFICE	115 SF	Operations		Office	—1 workstation	—Private Office, secure files storage —Lockers: 1xP2 per employee	2		1
2M02B	CORRIDOR	115 SF	Operations		Circulation					
2M03	LEAD TRAINER	105 SF	Operations	Lead Trainer	Office	—1 workstation —1 cabinet	—Locate close to Classroom; see 2M02 —3 desks in shared Trainers office —Lockers: 1xP2 per employee	3	Day	3
2M04	CONF. STORAGE	185 SF	Operations		Storage	—6 cabinets				
2M05	ASSISTANT OPERATIONS MANAGER	230 SF	Operations	Asst. Operations Manager	Office	—1 workstation	—Private Office, secure files/valuables storage —Lockers: 1xP2	1	Day	1
2M06	RESTROOM	40 SF	Operations		Restroom	—1 WC (flushable toilet, no stall) —1 lavatory				
2M06A	CLOSET	5 SF	Operations		Storage					
2M07	REVENUE	200 SF	Operations		Office	—1 workstation	—1 desk in secure room —Lockers: 1xP2	3	24 Hour	1
2M08	SENIOR OPERATIONS MANAGER	225 SF	Operations	Cable Car Senior Ops. Mgr.	Office	—1 workstation	—Private Office, secure files/valuables storage —Lockers: 1xP2	1	Day	1
2M09	DISPATCH	205 SF	Operations	Dispatch	Office	—2 workstations —2 cabinets —Walkie Talkie shelves	—1 shared desk and separate room for radios, and separate room for clipper card chargers —Lockers: 1xP2	3	24 Hour	1
2M10	OPERATORS BREAK ROOM	1705 SF	Operations	Operators		—2 workstations —176 lockers	—Require more locker room space; 208 QTY lockers desired —6 workstations —Lockers: 1xP2 per employee	179		104
2M10A	CORRIDOR	125 SF	Operations		Circulation					
2M11	OFFICE	155 SF	Operations		Office	—Currently used as Wellness Room				
2M12	GYM	120 SF	Operations		Gym	—Currently empty / temporary storage				
2M13	UNION REPRESENTATIVE	130 SF	Operations	Union Representative	Office	—2 workstations —Cabinets, shelves	—Private office	1	Day	1
2M14	MEN	165 SF	Operations		Restroom	—2 WC —2 urinals —1 lavatory —1 shower				
2M15	JANITOR CLOSET	35 SF	Operations		Storage		—Refer to MTA Facilities Dep't for custodian needs			
2M16	WOMEN	100 SF	Operations		Restroom	—1 WC —1 lavatory —1 shower				
2M17	TEL	25 SF	Operations		Storage					
2M18	ELEVATOR EQUIPMENT	270 SF	Operations		Mechanical					
2M19	MECHANICAL	210 SF	Operations		Mechanical		—Needs reassessment of space			
2M20	CORRIDOR	355 SF	Operations		Circulation					
2M20A	CORRIDOR	150 SF	Operations		Circulation					
2M21	CORRIDOR	945 SF	Operations		Circulation					
208D	CARPENTRY BREAK	505 SF								

NOTE: SEE SHEET EQ SERIES FOR EQUIPMENT LIST FOR SHOP AREAS

PREFERRED FUNCTION - NEW PROGRAM					STAFFING		
PROGRAM	TEAM	USER	FUNCTION	NOTES	TOTAL	SHIFT	STAFF PER SHIFT
FIRST FLOOR							
NEW PROGRAM	Maintenance Controller for Propulsion &Track team	Maintenance Controller	Dedicated desk in Shared Office	—1 Occupant —Lockers: 1xP1, 1xL1, 1xL2 per employee —Need new space/shared office	1	Day	
NEW PROGRAM	General Laborer for Propulsion team	Laborer	1 desk in shared space	—1 Occupant —Lockers: 1xP1, 1xL1, 1xL2 per employee —Need new space/shared office	4	Grave	2
NEW PROGRAM	General Utility Mechanic for Propulsion	General Utility Mechanic	Share Same Space as Machinists	—1 Occupant —Lockers: 1xP1, 1xL1, 1xL2 per employee —Need new space/shared office	4	Any	2
NEW PROGRAM	Electronic Maintenance Tech	Electronic Maintenance Tech	Same space as electronic maintenance tech	—1 Occupant —Lockers: 1xP1, 1xL1, 1xL2 per employee —Need new space/shared office	2		
FIRST FLOOR MEZZANINE							
NEW PROGRAM			Security	Refer to MTA Facilities Dep't	4	24 hrs	1
SECOND FLOOR MEZZANINE							
NEW PROGRAM	Transportation Ops Specialist	James	Private office	—Locker: 1 x P2 (P2 = Personal 2 = dimensions 12"x12"x36")	2		1
NEW PROGRAM	Management Assistant	New	Private office, secure file storage	—Locker: 1 x P2	1	Day	1
NEW PROGRAM	Public Service Aide	PST	2 desks in shared space	—Locker: 1 x P2 per employee	2	Day	2
NEW PROGRAM	Transit Supervisor	Field Inspectors	4 desks in shared space	—Locker: 1 x P2 per employee	10	Day	3

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No.	Date	Revisions

PM EunJoo Cho
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Drawing Title

EXISTING & PREFERRED PROGRAM MATRIX

Sheet No. G 0.13

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EXISTING LOCKERS

LOCKER SCHEDULE - EXISTING

ROOM NUMBER	ROOM NAME	LOCKER INFORMATION TYPE	SIZE (W x D)	TYPE	COUNT
FIRST FLOOR					
100	CABLE YARD	Locker - Splicer	15"x12" (Quarter Height)	Four-Tier	16
105	MEN	Locker - Mechanic	12"x12" (Full Height)	Single-Tier	52
106	WOMEN	Locker - Mechanic	12"x12" (Full Height)	Single-Tier	4
110	SPLICER BREAK	Locker - Mechanic	15"x12" (Full Height)	Single-Tier	30
111	WELD SHOP	Locker - Mechanic	15"x12" (Full Height)	Single-Tier	6
111C	GRIP BUILDING AREA	Locker - Clothing Coveralls	13"x21"	Six-Tier	36
111C	GRIP BUILDING AREA	Locker - Clothing General	26"x21"	Single-Tier	1
111C	GRIP BUILDING AREA	Locker - Clothing Shirts & Pants	8"x21"	Double-Tier	8
117A	SUPERVISOR OFFICE AREA	Locker - Mechanic	15"x12" (Full Height)	Single-Tier	2
120	CORRIDOR	Locker - Clothing Coveralls	13"x21"	Six-Tier	12
120	CORRIDOR	Locker - Clothing General	26"x21"	Single-Tier	1
					168
SECOND FLOOR					
200A	PIT	Locker - Tools	12"x15" (Third Height)	Three-Tier	24
203	MEN	Locker - Mechanic	12"x12" (Full Height)	Single-Tier	34
205	WOMEN	Locker - Mechanic	12"x12" (Full Height)	Single-Tier	5
206	LOCKER	Locker - Clothing Coveralls	13"x21"	Six-Tier	24
206	LOCKER	Locker - Clothing General	26"x21"	Single-Tier	1
206	LOCKER	Locker - Clothing Shirts & Pants	8"x21"	Double-Tier	8
208D	CARPENTRY BREAK	Locker - Mechanic	15"x12" (Full Height)	Single-Tier	3
					99
SECOND FLOOR MEZZANINE					
2M10	OPERATORS BREAK ROOM	Locker - Operator	15"x12" (Half Height)	Double-Tier	176
					176

EXISTING LOCKER QTY	L1	L2	L2M	
CLOTHING-COVERALLS	48	24		
CLOTHING-GENERAL	2	1		
CLOTHING-SHIRTS & PANTS	8	8		
PERSONAL	110	42	176	
TOOLS		24		
SUBTOTAL	168	99	176	TOTAL 443

PROPOSED LOCKERS

LOCKER SCHEDULE - NEW

ROOM NUMBER	ROOM NAME	LOCKER INFORMATION TYPE	SIZE (W x D)	TYPE	COUNT
FIRST FLOOR					
100	CABLE YARD	Locker - Splicer	15"x12" (Quarter Height)	Four-Tier	16
105	MEN	Locker - Mechanic	12"x18" (Full Height)	Single-Tier	74
106	WOMEN	Locker - Mechanic	12"x18" (Full Height)	Single-Tier	4
110C	LOCKER ROOM	Locker - Clothing Coveralls	13"x21"	Six-Tier	48
110C	LOCKER ROOM	Locker - Clothing General	26"x21"	Single-Tier	2
110C	LOCKER ROOM	Locker - Clothing Shirts & Pants	8"x21"	Double-Tier	26
110C	LOCKER ROOM	Locker - Mechanic	12"x18" (Full Height)	Single-Tier	40
155	LOCKER ROOM	Locker - Clothing Coveralls	13"x21"	Six-Tier	48
155	LOCKER ROOM	Locker - Clothing General	26"x21"	Single-Tier	3
155	LOCKER ROOM	Locker - Clothing Shirts & Pants	8"x21"	Double-Tier	58
					319
FIRST FLOOR MEZZANINE					
1M09	MACHINIST & STOREKEEPER WORKSTATION	Locker - Mechanic	12"x18" (Full Height)	Single-Tier	1
1M10	WALKWAY	Locker - Operator	12"x18" (Half Height)	Double-Tier	6
					7
SECOND FLOOR					
200	CABLE CAR SHOP	Locker - Clothing Coveralls	13"x21"	Six-Tier	42
200	CABLE CAR SHOP	Locker - Clothing General	26"x21"	Single-Tier	2
200	CABLE CAR SHOP	Locker - Clothing Shirts & Pants	8"x21"	Double-Tier	12
203	MEN	Locker - Mechanic	12"x18" (Full Height)	Single-Tier	42
205	WOMEN	Locker - Mechanic	12"x18" (Full Height)	Single-Tier	4
					102
SECOND FLOOR MEZZANINE					
2M68	LOCKER RM	Locker - Operator	12"x18" (Half Height)	Double-Tier	208
					208

NEW LOCKER QTY	L1	L1M	L2	L2M	
CLOTHING-COVERALLS	96		42		
CLOTHING-GENERAL	5		2		
CLOTHING-SHIRTS & PANTS	84		12		
MECHANIC	118	1	46		
OPERATOR		6		208	
SUBTOTAL	303	7	102	208	TOTAL 620

PROPOSED PROGRAM

ROOM NO.	ROOM NAME	AREA	PROPOSED USE TEAM	USER	FUNCTION	NOTES
SUB FLOOR						
001	VIEWING ROOM	440 SF	Museum			
002	STORAGE	150 SF			Storage	
003	CABLE CLAMPING ROOM	885 SF				
		1475 SF				
FIRST FLOOR						
100	CABLE YARD	8565 SF				
100A	REEL STORAGE AREA	4675 SF				—1 hazardous materials cabinet —1 large rack near stair 6 —8 cabinets near freight elevator
101	OFFICE	155 SF	Track	Track Supervisor, Track Maintenance Supervisor	Office	—4 desks —Relocated from 115 —Desk, secure file storage
101A	SHARED OFFICE	155 SF	Engineering/Propulsion	Student Design Trainee III / Intern	Office	—2 workstations —Relocated from 114
102	LUNCH / MEETING	440 SF	Track/Propulsion		Break	—4 workstations in a shared space —water dispenser —water jugs storage
105	MEN	680 SF	Track/Propulsion		Restroom/Locker Room	
106	WOMEN	150 SF	Track/Propulsion		Restroom/Locker Room	
107	MECHANICAL	255 SF	Propulsion		Mechanical	—(Relocated Chief Engineer desk from 107 to 110B)
107A	STORAGE	35 SF	Facilities		Storage	—Elevator tools
108	CONTROL	230 SF	Propulsion	Stationary Engineer	Control Room/Workshop	—Mechanical repair area —2 desks, materials and equipment storage —1 cabinet for radios
109	ELECTRICAL EQUIPMENT	355 SF	Propulsion		Electrical	
110	SPLICER WORKROOM	740 SF	Propulsion	Splicers	Workshop	—Dedicated Wire Rope Repair Area —Materials and Tools Storage
110A	SPLICER OFFICE	130 SF	Propulsion	Splicers	Office	—4 workstations
110B	SPLICER SUPERVISOR	160 SF	Propulsion	Chief Stationary Engineer, Machine Shop Supervisor, Splicer Supervisor, Laborer Supervisor	Office	—Relocated from 107 and 117A —4 desks for Splicer Sup., Chief Stationary Eng. And Machine Shop Sup.
110C	LOCKER ROOM	375 SF	Propulsion	Splicers	Break	
111	INSPECTION ROOM	455 SF	Propulsion		Workshop	
111A	PULLEY ASSEMBLY AREA	735 SF	Track		Workshop	
111B	STEAM CLEANING AREA	500 SF	Propulsion/Vehicle Maintenance		Workshop	
111C	STORAGE AREA	1020 SF	Track		Storage	—2 cabinets near freight elevator
117	MACHINE SHOP	1990 SF	Propulsion	Machinists	Workshop	—Relocated supervisor desk to 110B
118	LOBBY	165 SF			Circulation	—1 ipad locker —1 cabinet for plumbing —2 tools & spare parts cabinets
119	CORRIDOR	225 SF			Circulation	—1 key locker
120	CORRIDOR	910 SF			Circulation	
150	WELD SHOP	620 SF	Propulsion		Workshop	—1 desk
151	STORAGE	45 SF	Facilities		Storage	—1 electromechanical equipment cabinet (relocated from 104) —1 machinery lubricating oils cabinet (relocated from 104) —1 log books cabinet (relocated from 104)
153	ELEV EQUIP	60 SF			Mechanical	
154	AG RR	115 SF	Track/Propulsion		Restroom	
155	LOCKER ROOM	265 SF	Track/Propulsion		Locker Room	
156	JANITOR	15 SF	Facilities		Janitor	
S4	STAIR 4	70 SF			Circulation	
S5	STAIR 5	200 SF			Circulation	
		24495 SF				
FIRST FLOOR MEZZANINE						
1M00	LOBBY	170 SF			Circulation	
1M01	STORAGE / BREAK	180 SF	Museum		Break	
1M02	JANITOR	35 SF	Facilities		Janitor	
1M03	MEN	175 SF	Museum		Restroom	
1M04	WOMEN	165 SF	Museum		Restroom	
1M05	MUSEUM	4690 SF	Museum		Museum	
1M06	MUSEUM ENTRY	250 SF	Museum		Museum	
1M08	PARTS STORAGE	1380 SF	Propulsion	Machinists	Storage	
1M09	MACHINIST & STOREKEEPER WORKSTATION	590 SF	Facilities/Propulsion	Machinists Storeroom keeper Electronic Maint. Tech Electrician Electronic Maint. Tech PROP F	Workshop	—7 workstations, shared space —2 large cabinets —3 tool carts
1M10	WALKWAY	695 SF	Shared		Storage	—1 hazardous materials cabinet —6 cabinets
1M50	AG RESTROOM	80 SF	Museum		Restroom	
1M51	WALKWAY	295 SF	Shared		Circulation	
1M52	CORRIDOR	380 SF	Shared		Circulation	
1M53	SHARED OFFICE	285 SF	Propulsion	Machinists, Electronic Maintenance Tech, Maintenance Controller	Office	—New office buildout over cable yard —4 workstations —1 Storage cabinet (relocated from 116) —1 File cabinet (relocated from 116) —1 Flat file (relocated from 116) —General storage (relocated from 116) —2 Shelves (relocated from 116) —General storage (relocated from 101)
1M54	MECH ENG	155 SF	Propulsion	Mechanical Engineer, Assistant Engineer	Office	—New office buildout over cable yard —Relocated from 116 —2 workstations —1 cabinet (relocated from 101) —1 cart (relocated from 101) —General storage (relocated from 101) —Binders qty. 2 (relocated from 116) —1 locked cabinet (relocated from 116) —Drawing rolls (relocated from 116)
1M55	OFFICE	100 SF	Track/Propulsion	Shop and Equipment Superintendent (Rob)	Office	—New office buildout over cable yard —Relocated from 101 —Private office —1 desk, secure file storage —General storage (relocated from 101)
1M56	OFFICE	100 SF	Track/Propulsion	Cable Machinery Manager	Office	—New office buildout over cable yard —Private office —1 desk, secure file storage —General storage qty. 2 (relocated from 115)
1M57	OFFICE	100 SF	Track	Track Superintendent (Rigo)	Office	—New office buildout over cable yard —Relocated from 101A —Private office —1 desk, secure file storage —1 shelf (relocated from 101A) —General files storage (relocated from 101A)
1M58	COPY/STOR	150 SF	Track/Propulsion		Storage	—1 printer —1 water dispenser —1 water jugs storage —2 cabinets (relocated from 114) —General storage (relocated from 116)
1M59	SHARED OFFICE	275 SF	Track/Propulsion	Management Assistant, Maintenance Planner(s)	Office	—New office buildout over cable yard —Relocated from 101 —4 workstations —1 Filing cabinet (relocated form 101A) —General storage (relocated form 101A) —3 Cabinets (relocated from 114) —General storage (relocated from 115) —1 Shelf (relocated form 115)
1M60	WALKWAY	245 SF	Shared		Circulation	
		10495 SF				
SECOND FLOOR						
200	CABLE CAR SHOP	25080 SF	Vehicle Maintenance			—4 parts and tools cabinets near freight elevator used by vehicle mechanics —1 hazardous materials cabinet next to bike storage —1 hazardous materials cabinet next to freight elevator
200A	PIT	3645 SF	Vehicle Maintenance			—9 tools cabinets
201	LUNCH / BREAK	290 SF	Vehicle Maintenance	Management Assistant	Break	—2 Workstations —Water dispenser filtration system —Television —1 blank inspection/operations documents storage —1 break room table
202	SUPERVISORS' OFFICE	180 SF	Vehicle Maintenance	Maintenance Controller, 2 Vehicle Maintenance Assistant Supervisors, and Car Cleaner Assistant Supervisor	Office	—4 desks in shared office
203	MEN	385 SF	Vehicle Maintenance		Restroom/Locker Room	
204	JAN.	20 SF	Facilities		Janitor	
205	WOMEN	165 SF	Vehicle Maintenance		Restroom/Locker Room	
206	AG RR	80 SF	Vehicle Maintenance		Restroom	
207	PARTS	295 SF	Vehicle Maintenance		Storage	
208	CARPENTRY/PAINT SHOP	2225 SF	Vehicle Maintenance	Carpenters	Workshop	—tools and storage —Workstation for this room located in 208C
208A	TOOLS	170 SF	Vehicle Maintenance			
208B	PAINT BOOTH	565 SF	Vehicle Maintenance		Workshop	—tools and storage —Workstation for this room located in 208C
208C	VEHICLE MAINT. OFFICE	225 SF	Electric Transit System Mechanic Transit Car Cleaner		Office	—7 workstations —Secure files storage, secure valuables storage —For cable yard area
208D	SPRAY BOOTH	200 SF	Vehicle Maintenance		Workshop	
209	LOBBY	185 SF	General Building		Circulation	
250	12KV ELECTRICAL ROOM	800 SF	General Building		Electrical	
251	SUPERINTENDENT OFFICE	160 SF	Vehicle Maintenance	Vehicle Maintenance Supervisor	Office	—Relocated from 208C —1 desk
252	BICYCLE STORAGE	125 SF	General Building		Storage	
253	GRIP BUILDING AREA	670 SF	Vehicle Maintenance		Workshop	
		35455 SF				
SECOND FLOOR MEZZANINE						
2M17	TEL	25 SF	Operations		Tel/Data	
2M18	ELEVATOR EQUIPMENT	265 SF	General Building		Mechanical	
2M19	MECHANICAL	210 SF	General Building		Mechanical	
2M20	CORRIDOR	355 SF	General Building		Circulation	
2M20A	CORRIDOR	150 SF	General Building		Circulation	
2M50	LOBBY	200 SF	General Building		Circulation	
2M51	HALLWAY	805 SF	Operations		Circulation	
2M52	STORAGE	60 SF	Operations		Storage	—3 cabinets (relocated from 2M04)
2M53	AG RESTROOM	95 SF	Operations		Restroom	
2M54	GYM	255 SF	Operations		Gym	
2M55	CLASSROOM	215 SF	Operations		Classroom	—7 workstations
2M56	LEAD TRAINER	110 SF	Operations	Lead Trainer	Office	—3 workstations
2M57	COPY/STOR	140 SF	Operations		Copy/Storage	—1 printer —3 cabinets (relocated from 2M04) —Telecom equipment relocated from 2M04
2M58	SHARED OFFICE	110 SF	Operations	New Function	Shared Office	—2 workstations
2M59	ASST OPS MGR	140 SF	Operations	Assistant Operations Mgr	Office	—1 desk
2M60	SHARED OFFICE	170 SF			Shared Office	—4 workstations
2M61	ADMIN SUPPORT	140 SF			Office	—1 desk
2M62	SHARED OFFICE	170 SF			Shared Office	—3 workstations
2M63	SENIOR OPS MGR	140 SF	Operations	Senior Operations Mgr	Office	—1 desk
2M64	REVENUE	130 SF	Operations	Revenue	Office	—1 desk
2M65	DISPATCH	130 SF	Operations	Dispatch	Office	—1 desk —1 cabinet for radios —1 filing cabinet —1 cabinet for clipper cards
2M66	OPEN WORK STATIONS	140 SF			Shared Office	—6 workstations
2M67	OPERATORS BREAK ROOM	630 SF	Operations		Break	—2 tables —1 sofa —1 pool table —1 table tennis
2M68	LOCKER RM	530 SF	Operations		Locker Room	
2M69	UNION REP	105 SF	Operations		Office	—1 desk —1 cabinet —1 shelving
2M70	STORAGE	105 SF	Facilities		Storage	
2M71	MEN	230 SF	Operations		Restroom	
2M72	WOMEN	180 SF	Operations		Restroom	
2M73	JAN	20 SF	Facilities		Janitor	
2M74	LACTATION	65 SF	Operations		Lactation Room	—1 chair —1 side table
2M75	VESTIBULE	175 SF	Operations		Circulation	
		6195 SF				
TOTAL		78110 SF				

NOTE:
1. SEE SHEET EQ SERIES FOR EQUIPMENT LIST FOR SHOP AREAS.
2. ALL EXISTING MEP EQUIPMENT AND PANELS ARE TO REMAIN, UON.

BUREAU OF ARCHITECTURE

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FOR DBI USE ONLY

CONCEPT 10/29/2021

No.	Date	Revisions
	06/30/22	FINAL MASTER PLAN

PM EunJoo Cho
PA EunJoo Cho
Drawn JD/KL
Checked Checker

NOT FOR CONSTRUCTION

Drawing Title

PROPOSED PROGRAM AND LOCKER MATRIX

Sheet No.

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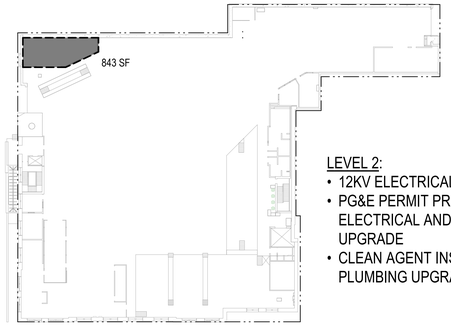
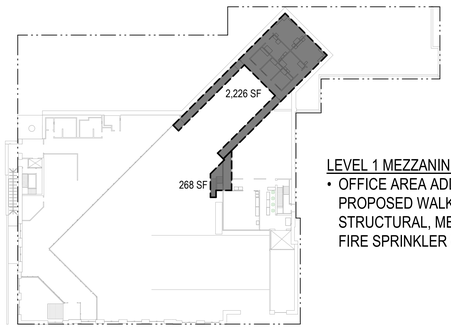
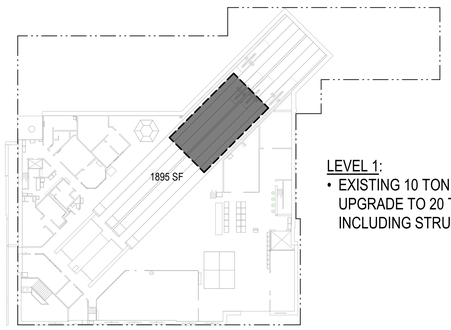


LEVEL 2:
- 12KV ELECTRICAL UPGRADE
- PG&E PERMIT PROCESS FOR 12KV ELECTRICAL AND ALL POWER UPGRADE
- CLEAN AGENT INSTALLATION AND PLUMBING UPGRADE (EYE WASH)

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



LEVEL 1 MEZZANINE:
- OFFICE AREA ADDITION AND PROPOSED WALKWAY, INCLUDING STRUCTURAL, MEP, FIRE ALARM, FIRE SPRINKLER WORK.



LEVEL 1:
- EXISTING 10 TON BRIDGE CRANE UPGRADE TO 20 TON AND EXTENSION, INCLUDING STRUCTURAL WORK

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

CONSTRUCTION PHASING NOTES

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)

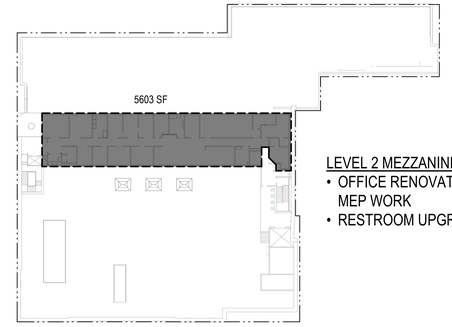
PHASE 1B: **LEVEL 1**: EXISTING 10 TON BRIDGE CRANE UPGRADE TO 20 TON AND EXTENSION, INCLUDING STRUCTURAL WORK
LEVEL 1M: OFFICE AREA ADDITION AND PROPOSED WALKWAY, INCLUDING STRUCTURAL, MEP, FIRE ALARM, FIRE SPRINKLER WORK.

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)

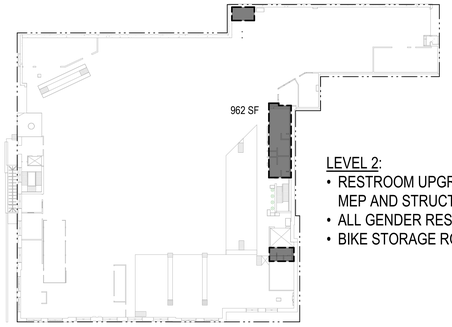
PHASE 3A: **LEVEL 1**: REALLOCATION OF WELD ROOM AND NEW INSPECTION ROOM. EXISTING MACHINE SHOP, PULLEY ASSEMBLY AREA AND STEAM CLEANING/WELD AREA UPGRADE. 2 TON BRIDGE CRANE ADDITION. MEP WORK.
LEVEL 1M: COMPACT STORAGE INCLUDING STRUCTURAL WORK
LEVEL 2: REALLOCATION OF GRIP BUILDING AREA FROM LEVEL 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

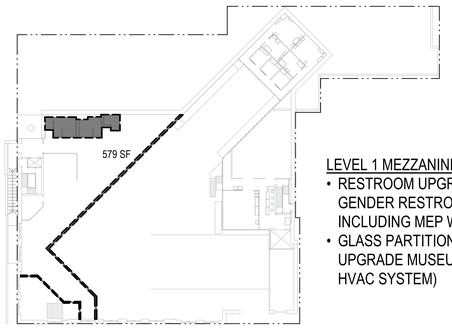
PHASE 4: REMAINING MEP UPGRADE, NEW SKYLIGHTS AND ENTIRE ROOF REPLACEMENT



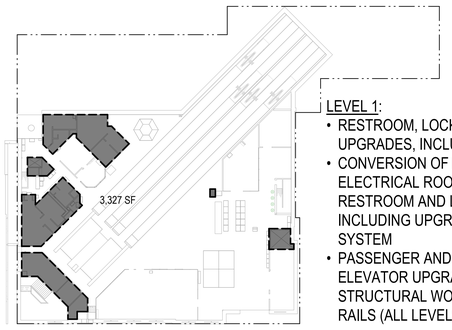
LEVEL 2 MEZZANINE:
- OFFICE RENOVATIONS, INCLUDING MEP WORK
- RESTROOM UPGRADES



LEVEL 2:
- RESTROOM UPGRADES, INCLUDING MEP AND STRUCTURAL WORK
- ALL GENDER RESTROOM ADDITION
- BIKE STORAGE ROOM ADDITION



LEVEL 1 MEZZANINE:
- RESTROOM UPGRADES AND ALL GENDER RESTROOM ADDITION, INCLUDING MEP WORK
- GLASS PARTITION UPGRADE, HVAC UPGRADE MUSEUM (INSTALLING HVAC SYSTEM)



LEVEL 1:
- RESTROOM, LOCKER AND OFFICE UPGRADES, INCLUDING MEP WORK
- CONVERSION OF EXISTING ELECTRICAL ROOM TO ALL GENDER RESTROOM AND LOCKER ROOM, INCLUDING UPGRADE CLEAN AGENT SYSTEM
- PASSENGER AND FREIGHT ELEVATOR UPGRADES, INCLUDING STRUCTURAL WORK FOR GUIDE RAILS (ALL LEVELS)

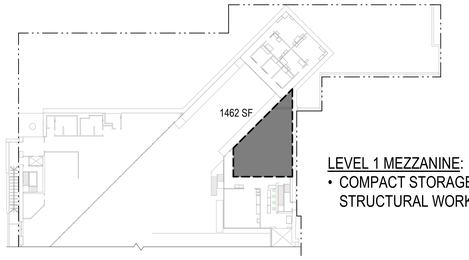
2 PHASE 2 | OFFICE IMPROVEMENTS
1" = 40'-0"

PHASE 5: SEISMIC RETROFIT WORK

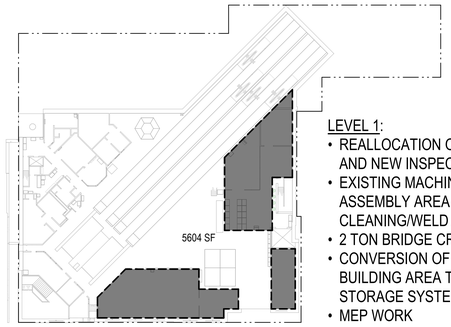
*COST ESTIMATOR TO PROVIDE COST BREAKDOWN BOTH BY CONCURRENT WORK AND BY INDIVIDUAL PHASE.

*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.

LEVEL 2:
- REALLOCATION OF GRIP BUILDING AREA FROM LEVEL 1, INCLUDING MEP AND STRUCTURAL WORK

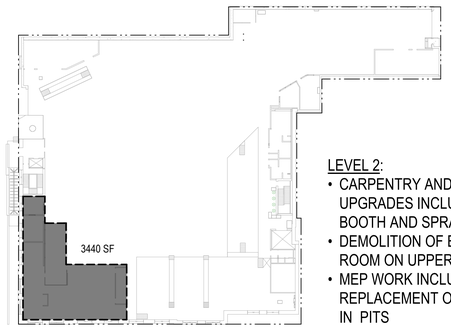


LEVEL 1 MEZZANINE:
- COMPACT STORAGE INCLUDING STRUCTURAL WORK



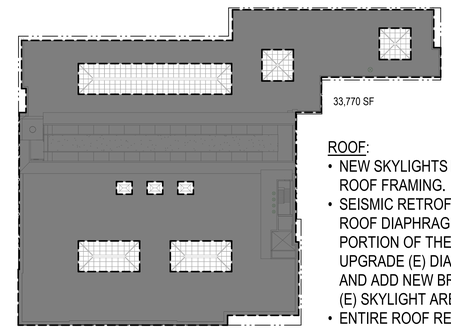
LEVEL 1:
- REALLOCATION OF WELD ROOM AND NEW INSPECTION ROOM
- EXISTING MACHINE SHOP, PULLEY ASSEMBLY AREA AND STEAM CLEANING/WELD AREA UPGRADES
- 2 TON BRIDGE CRANE ADDITION
- CONVERSION OF EXISTING GRIP BUILDING AREA TO COMPACT STORAGE SYSTEM
- MEP WORK

3A PHASE 3A | PROGRAM RESTRUCTURING
1" = 40'-0"



LEVEL 2:
- CARPENTRY AND OFFICE AREA UPGRADES INCLUDING PAINT BOOTH AND SPRAY BOOTH
- DEMOLITION OF EXISTING BREAK ROOM ON UPPER LEVEL
- MEP WORK INCLUDING REPLACEMENT OF HEATING UNITS IN PITS

3B PHASE 3B | CARPENTRY UPGRADES
1" = 40'-0"



ROOF:
- NEW SKYLIGHTS INCLUDING NEW ROOF FRAMING.
- SEISMIC RETROFITTING OF MAIN ROOF DIAPHRAGM OVER EAST PORTION OF THE BUILDING. UPGRADE (E) DIAGONAL BRACES AND ADD NEW BRACES, INCLUDING (E) SKYLIGHT AREAS.
- ENTIRE ROOF REPLACEMENT.

4 PHASE 4 | ROOF REPLACEMENT
1" = 40'-0"

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No.	Date	Revisions
	12/17/21	DRAFT MASTER PLAN
	06/30/22	FINAL MASTER PLAN

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PA EunJoo Cho
Drawn JD/KL
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Drawing Title

CONSTRUCTION PHASING PLANS

Sheet No.

G 0.15

Scale: 1" = 40'-0"

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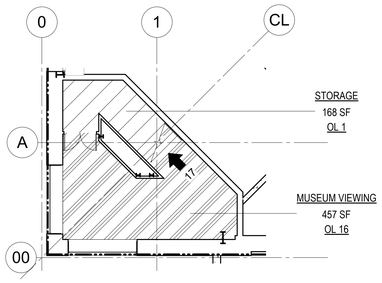
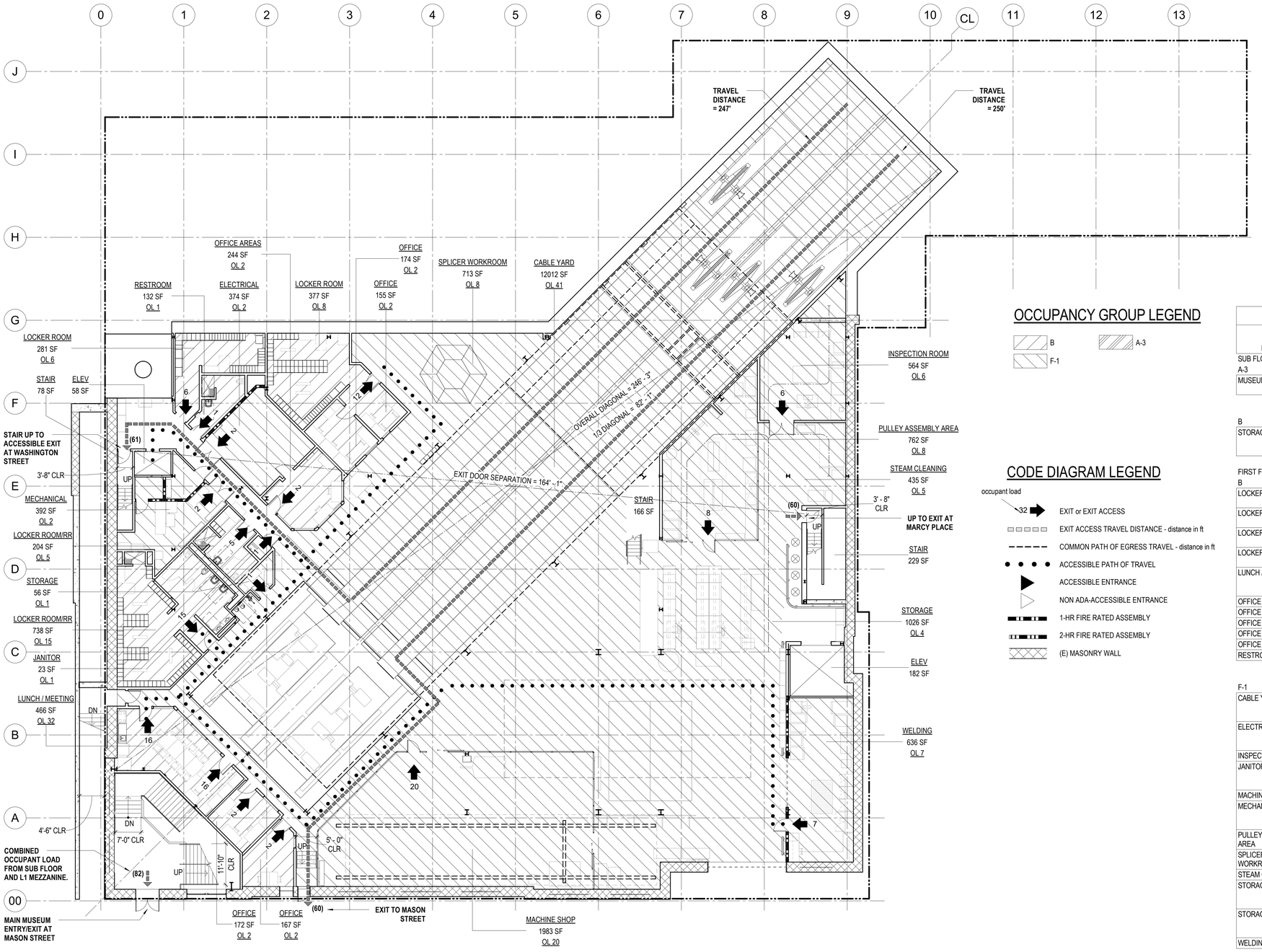


2 SUB FLOOR
3/32" = 1'-0"



1 FIRST FLOOR
3/32" = 1'-0"

OCCUPANCY GROUP LEGEND

B
A-3
F-1

CODE DIAGRAM LEGEND

occupant load
32 EXIT or EXIT ACCESS
EXIT ACCESS TRAVEL DISTANCE - distance in ft
COMMON PATH OF EGRESS TRAVEL - distance in ft
ACCESSIBLE PATH OF TRAVEL
ACCESSIBLE ENTRANCE
NON ADA-ACCESSIBLE ENTRANCE
1-HR FIRE RATED ASSEMBLY
2-HR FIRE RATED ASSEMBLY
(E) MASONRY WALL

OCCUPANCY LOAD ANALYSIS

NAME	FUNCTION OF SPACE	AREA	OCCUPANCY LOAD FACTOR	OCCUPANCY LOAD OF SPACE
SUB FLOOR				
A-3				
MUSEUM VIEWING	ASSEMBLY - EXHIBIT GALLERY AND MUSEUM	457 SF	30 SF	16
		457 SF		16
B				
STORAGE	ACCESSORY STORAGE AREAS, MECH. EQUIP. ROOM	168 SF	300 SF	1
		168 SF		1
FIRST FLOOR				
B				
LOCKER ROOM	LOCKER ROOMS (REMOVED FOR 2013)	281 SF	50 SF	6
LOCKER ROOM	LOCKER ROOMS (REMOVED FOR 2013)	377 SF	50 SF	8
LOCKER ROOM/RR	LOCKER ROOMS (REMOVED FOR 2013)	738 SF	50 SF	15
LOCKER ROOM/RR	LOCKER ROOMS (REMOVED FOR 2013)	204 SF	50 SF	5
LUNCH / MEETING	ASSEMBLY - UNCONCENTRATED (CHAIRS AND TABLES)	466 SF	15 SF	32
OFFICE	BUSINESS AREAS	174 SF	150 SF	2
OFFICE	BUSINESS AREAS	172 SF	150 SF	2
OFFICE	BUSINESS AREAS	167 SF	150 SF	2
OFFICE	BUSINESS AREAS	155 SF	150 SF	2
OFFICE AREAS	BUSINESS AREAS	244 SF	150 SF	2
RESTROOM	BUSINESS AREAS	132 SF	150 SF	1
		3111 SF		77
F-1				
CABLE YARD	ACCESSORY STORAGE AREAS, MECH. EQUIP. ROOM	12012 SF	300 SF	41
ELECTRICAL	ACCESSORY STORAGE AREAS, MECH. EQUIP. ROOM	374 SF	300 SF	2
INSPECTION ROOM	INDUSTRIAL AREAS	564 SF	100 SF	6
JANITOR	ACCESSORY STORAGE AREAS, MECH. EQUIP. ROOM	23 SF	300 SF	1
MACHINE SHOP	INDUSTRIAL AREAS	1983 SF	100 SF	20
MECHANICAL	ACCESSORY STORAGE AREAS, MECH. EQUIP. ROOM	392 SF	300 SF	2
PULLEY ASSEMBLY AREA	INDUSTRIAL AREAS	762 SF	100 SF	8
SPLICER WORKROOM	INDUSTRIAL AREAS	713 SF	100 SF	8
STEAM CLEANING	INDUSTRIAL AREAS	435 SF	100 SF	5
STORAGE	ACCESSORY STORAGE AREAS, MECH. EQUIP. ROOM	1026 SF	300 SF	4
STORAGE	ACCESSORY STORAGE AREAS, MECH. EQUIP. ROOM	56 SF	300 SF	1
WELDING	INDUSTRIAL AREAS	636 SF	100 SF	7
		18975 SF		105
TOTAL		22711 SF		199

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PA EunJoo Cho
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Drawing Title

OCCUPANCY, EGRESS & ACCESSIBLE PATH PLAN - SUB FLOOR & FIRST FLOOR

Sheet No. G 2.11

Scale: As indicated

Original Sheet Size: 30" x 42"

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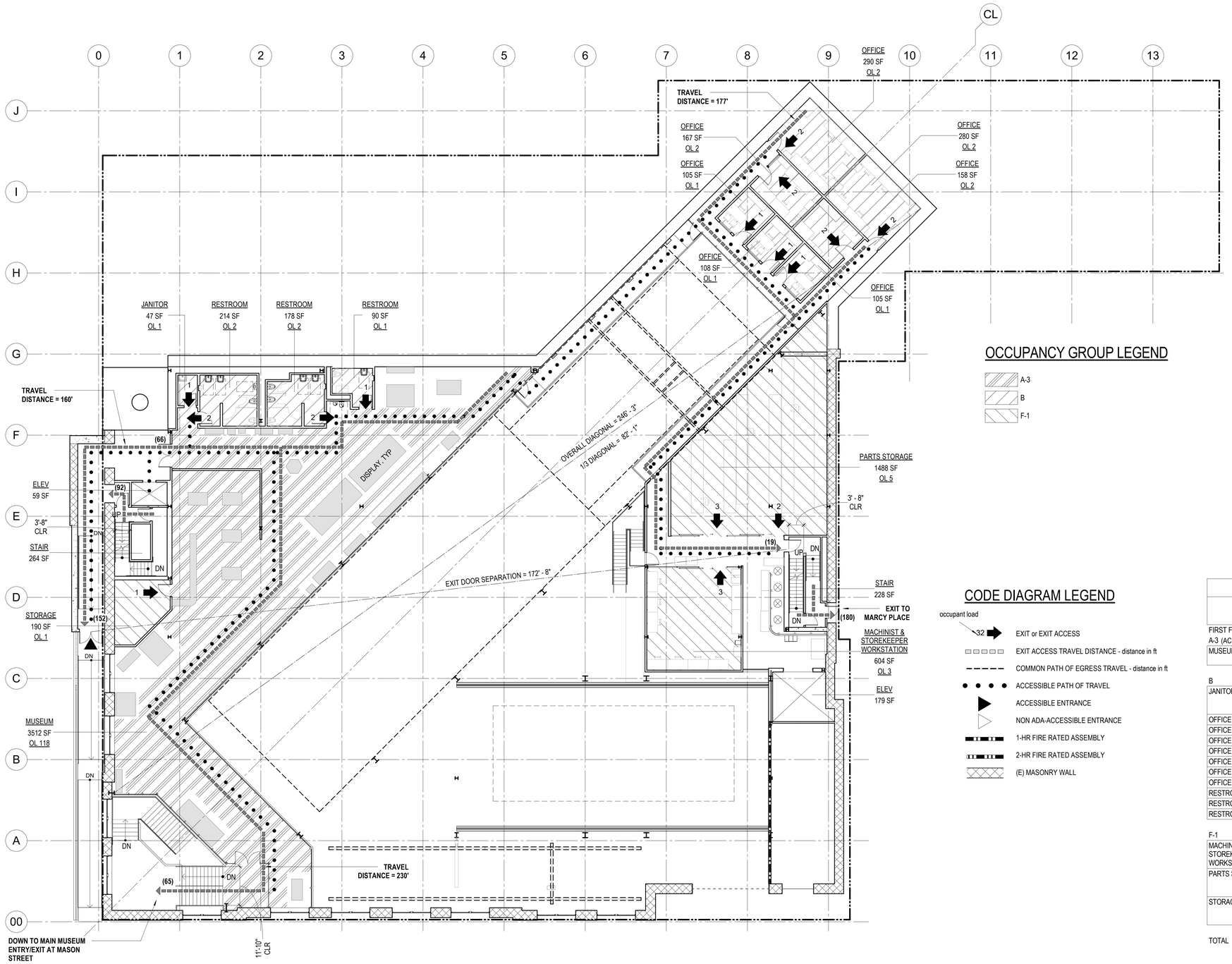

1 FIRST FLOOR MEZZANINE

3/32" = 1'-0"

OCCUPANCY GROUP LEGEND

- A-3
- B
- F-1

CODE DIAGRAM LEGEND

occupant load

- 32 — EXIT or EXIT ACCESS
- EXIT ACCESS TRAVEL DISTANCE - distance in ft
- COMMON PATH OF EGRESS TRAVEL - distance in ft
- ACCESSIBLE PATH OF TRAVEL
- ACCESSIBLE ENTRANCE
- NON ADA-ACCESSIBLE ENTRANCE
- 1-HR FIRE RATED ASSEMBLY
- 2-HR FIRE RATED ASSEMBLY
- (E) MASONRY WALL

OCCUPANCY LOAD ANALYSIS

NAME	FUNCTION OF SPACE	AREA	OCCUPANCY LOAD FACTOR	OCCUPANCY LOAD OF SPACE
FIRST FLOOR MEZZANINE				
A-3 (ACCESSORY TO F)				
MUSEUM	ASSEMBLY - EXHIBIT GALLERY AND MUSEUM	3512 SF	30 SF	118
		3512 SF		118
B				
JANITOR	ACCESSORY STORAGE AREAS, MECH. EQUIP. ROOM	47 SF	300 SF	1
OFFICE	BUSINESS AREAS	280 SF	150 SF	2
OFFICE	BUSINESS AREAS	290 SF	150 SF	2
OFFICE	BUSINESS AREAS	167 SF	150 SF	2
OFFICE	BUSINESS AREAS	105 SF	150 SF	1
OFFICE	BUSINESS AREAS	158 SF	150 SF	2
OFFICE	BUSINESS AREAS	108 SF	150 SF	1
OFFICE	BUSINESS AREAS	105 SF	150 SF	1
RESTROOM	BUSINESS AREAS	214 SF	150 SF	2
RESTROOM	BUSINESS AREAS	178 SF	150 SF	2
RESTROOM	BUSINESS AREAS	90 SF	150 SF	1
		1744 SF		17
F-1				
MACHINIST & STOREKEEPER WORKSTATION	ACCESSORY STORAGE AREAS, MECH. EQUIP. ROOM	604 SF	300 SF	3
PARTS STORAGE	ACCESSORY STORAGE AREAS, MECH. EQUIP. ROOM	1488 SF	300 SF	5
STORAGE	ACCESSORY STORAGE AREAS, MECH. EQUIP. ROOM	190 SF	300 SF	1
		2282 SF		9
TOTAL		7538 SF		144

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	06/30/22	FINAL MASTER PLAN

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OCCUPANCY, EGRESS & ACCESSIBLE PATH PLAN - FIRST FLOOR MEZZANINE

Sheet No. G 2.12

Scale: As indicated

Original Sheet Size: 30" x 42"

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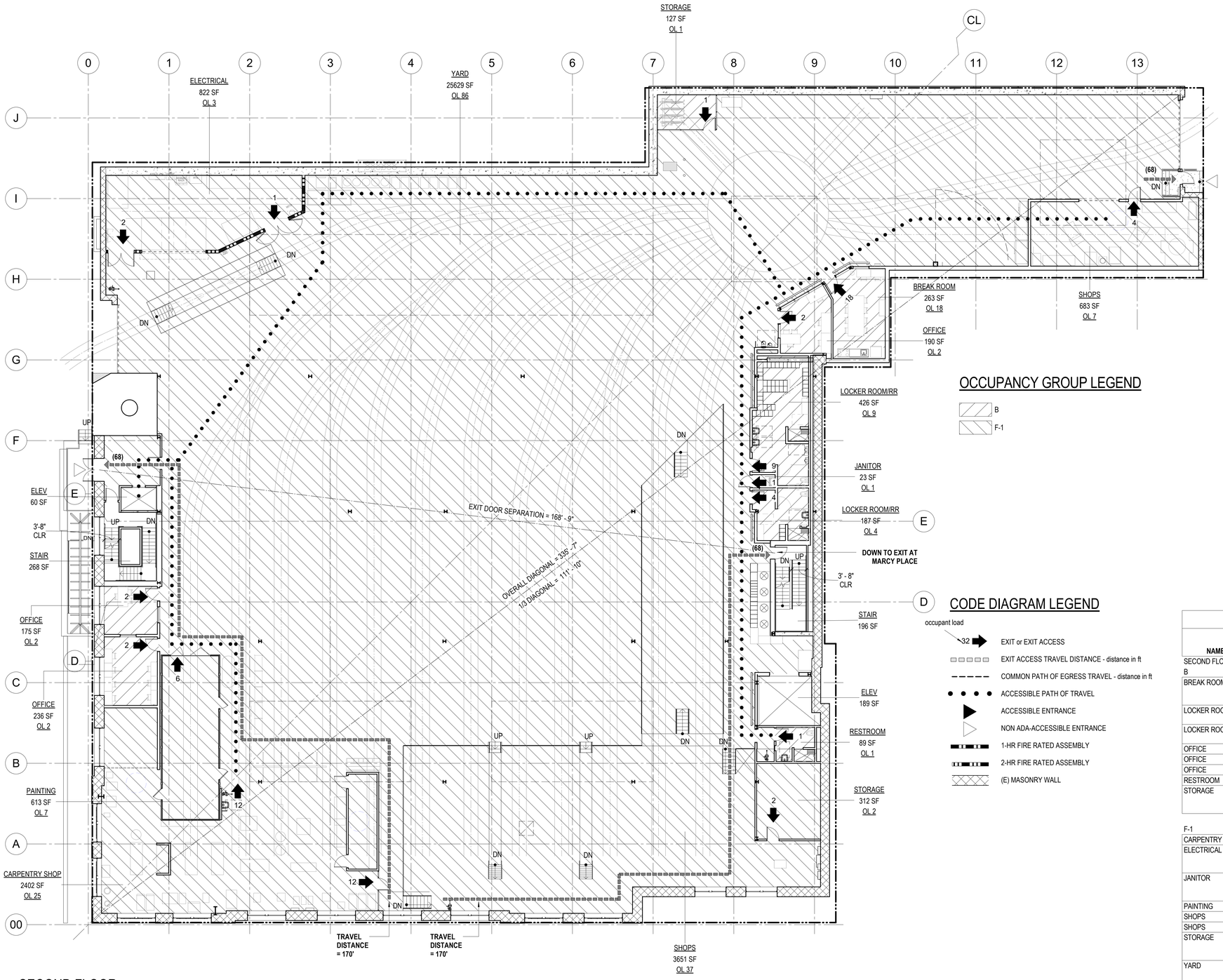

1 SECOND FLOOR
3/32" = 1'-0"

OCCUPANCY GROUP LEGEND

- B
- F-1

CODE DIAGRAM LEGEND

occupant load

- 32 — EXIT or EXIT ACCESS
- EXIT ACCESS TRAVEL DISTANCE - distance in ft
- COMMON PATH OF EGRESS TRAVEL - distance in ft
- ACCESSIBLE PATH OF TRAVEL
- ACCESSIBLE ENTRANCE
- NON ADA-ACCESSIBLE ENTRANCE
- 1-HR FIRE RATED ASSEMBLY
- 2-HR FIRE RATED ASSEMBLY
- (E) MASONRY WALL

OCCUPANCY LOAD ANALYSIS

NAME	FUNCTION OF SPACE	AREA	OCCUPANCY LOAD FACTOR	OCCUPANCY LOAD OF SPACE
SECOND FLOOR				
B				
BREAK ROOM	ASSEMBLY - UNCONCENTRATED (CHAIRS AND TABLES)	263 SF	15 SF	18
LOCKER ROOM/RR	LOCKER ROOMS (REMOVED FOR 2013)	426 SF	50 SF	9
LOCKER ROOM/RR	LOCKER ROOMS (REMOVED FOR 2013)	187 SF	50 SF	4
OFFICE	BUSINESS AREAS	236 SF	150 SF	2
OFFICE	BUSINESS AREAS	175 SF	150 SF	2
OFFICE	BUSINESS AREAS	190 SF	150 SF	2
RESTROOM	BUSINESS AREAS	89 SF	150 SF	1
STORAGE	ACCESSORY STORAGE AREAS, MECH. EQUIP. ROOM	127 SF	300 SF	1
		1693 SF		39
F-1				
CARPENTRY SHOP	INDUSTRIAL AREAS	2402 SF	100 SF	25
ELECTRICAL	ACCESSORY STORAGE AREAS, MECH. EQUIP. ROOM	822 SF	300 SF	3
JANITOR	ACCESSORY STORAGE AREAS, MECH. EQUIP. ROOM	23 SF	300 SF	1
PAINTING	INDUSTRIAL AREAS	613 SF	100 SF	7
SHOPS	INDUSTRIAL AREAS	3651 SF	100 SF	37
SHOPS	INDUSTRIAL AREAS	683 SF	100 SF	7
STORAGE	ACCESSORY STORAGE AREAS, MECH. EQUIP. ROOM	312 SF	300 SF	2
YARD	ACCESSORY STORAGE AREAS, MECH. EQUIP. ROOM	25629 SF	300 SF	86
		34134 SF		168
TOTAL		35827 SF		207

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OCCUPANCY, EGRESS & ACCESSIBLE PATH PLAN - SECOND FLOOR

Sheet No. G 2.13

Scale: As indicated

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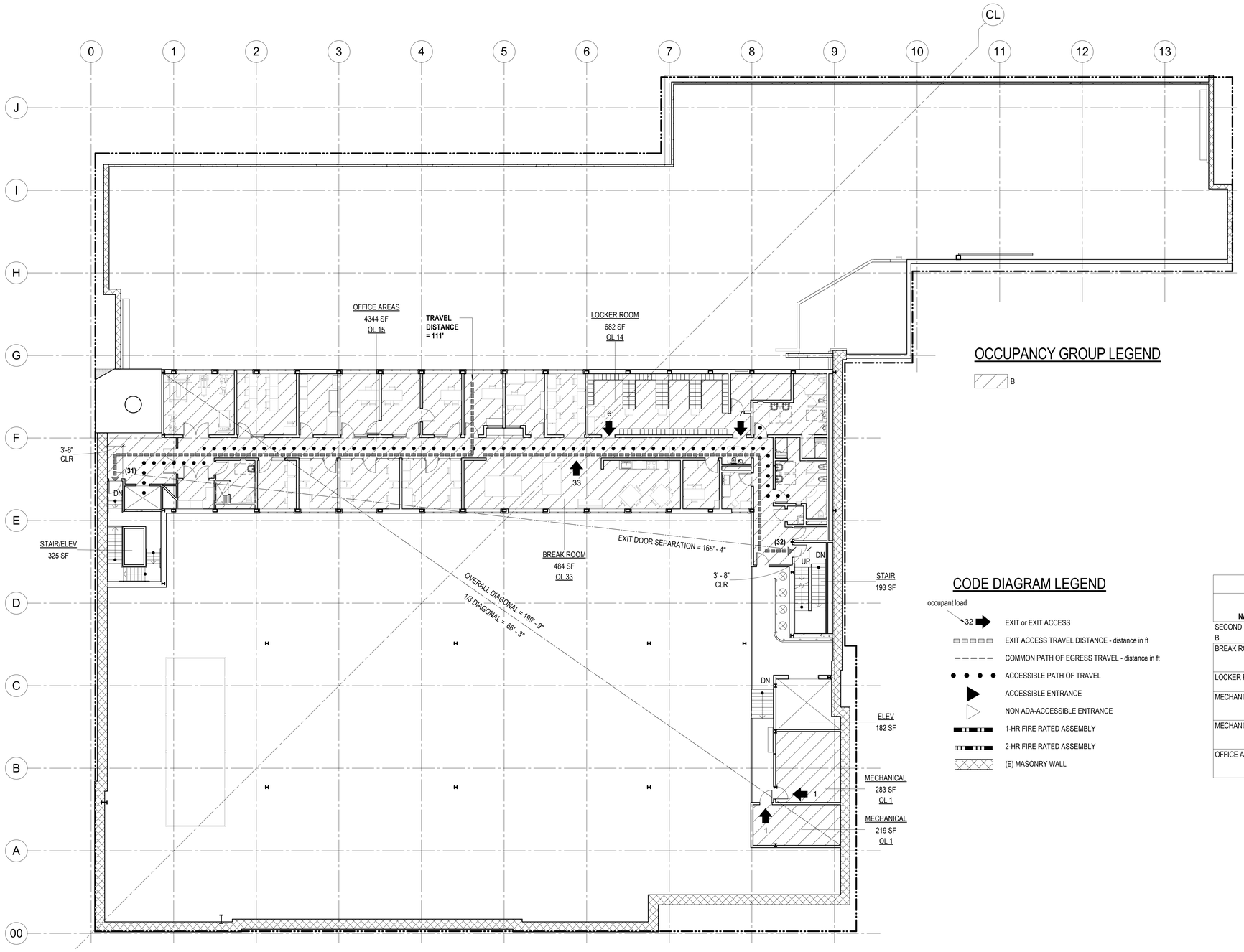

1 SECOND FLOOR MEZZANINE
3/32" = 1'-0"

OCCUPANCY GROUP LEGEND

B

CODE DIAGRAM LEGEND

occupant load

32 EXIT or EXIT ACCESS

EXIT ACCESS TRAVEL DISTANCE - distance in ft

COMMON PATH OF EGRESS TRAVEL - distance in ft

ACCESSIBLE PATH OF TRAVEL

ACCESSIBLE ENTRANCE

NON ADA-ACCESSIBLE ENTRANCE

1-HR FIRE RATED ASSEMBLY

2-HR FIRE RATED ASSEMBLY

(E) MASONRY WALL

OCCUPANCY LOAD ANALYSIS

NAME	FUNCTION OF SPACE	AREA	OCCUPANCY LOAD FACTOR	OCCUPANCY LOAD OF SPACE
SECOND FLOOR MEZZANINE				
B				
BREAK ROOM	ASSEMBLY - UNCONCENTRATED (CHAIRS AND TABLES)	484 SF	15 SF	33
LOCKER ROOM	LOCKER ROOMS (REMOVED FOR 2013)	682 SF	50 SF	14
MECHANICAL	ACCESSORY STORAGE AREAS, MECH. EQUIP. ROOM	283 SF	300 SF	1
MECHANICAL	ACCESSORY STORAGE AREAS, MECH. EQUIP. ROOM	219 SF	300 SF	1
OFFICE AREAS	ACCESSORY STORAGE AREAS, MECH. EQUIP. ROOM	4344 SF	300 SF	15
		6013 SF		64

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Drawing Title

OCCUPANCY, EGRESS & ACCESSIBLE PATH PLAN - SECOND FLOOR MEZZANINE

Sheet No. G 2.14

Scale: As indicated

Original Sheet Size: 30" x 42"

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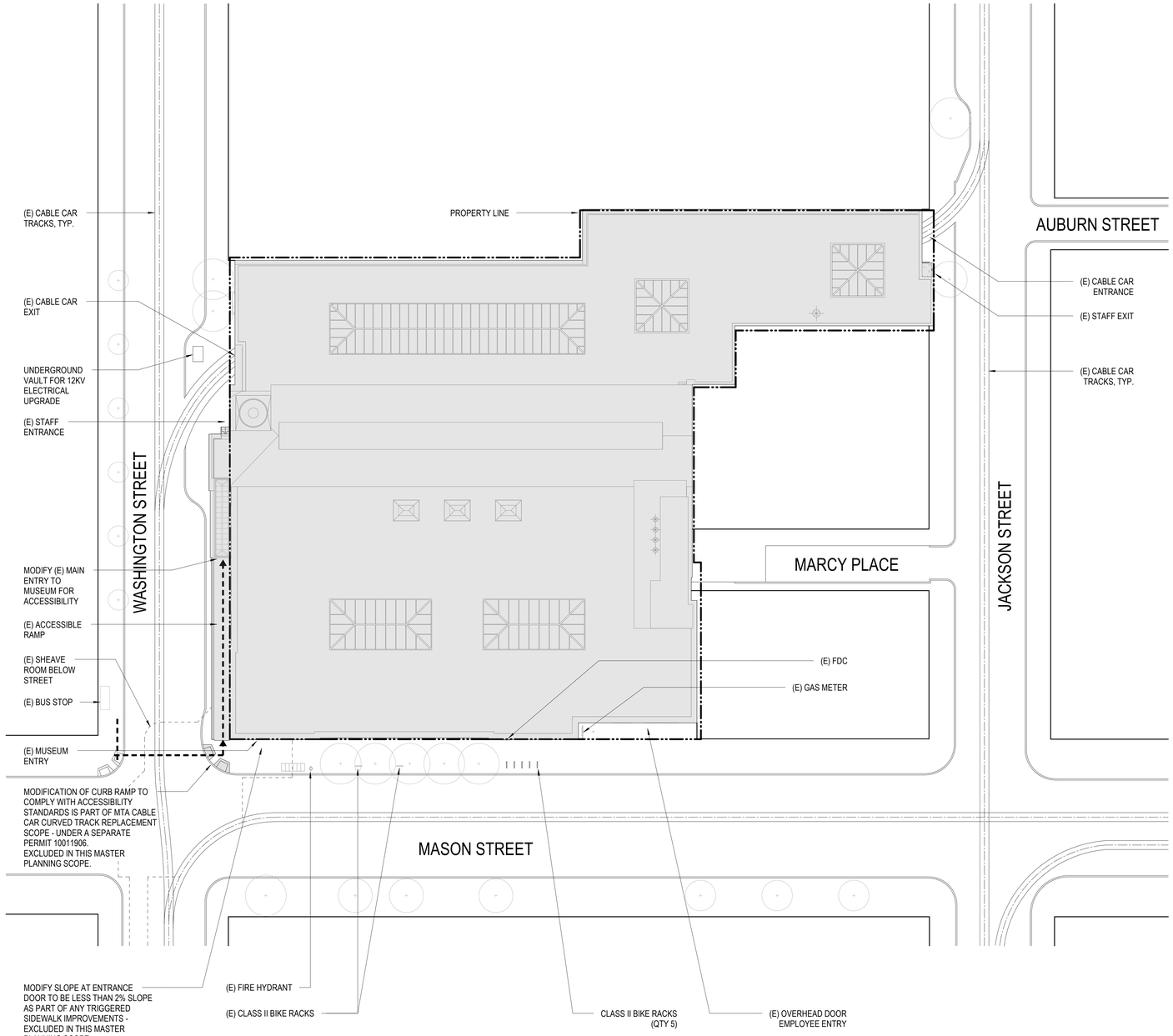

1 SITE PLAN
1" = 20'-0"

N

LEGEND

- PROPERTY LINE
- EXISTING STREET TREE
- ACCESSIBLE ENTRANCE
- ACCESSIBLE PATH OF TRAVEL

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Drawing Title

SITE PLAN

Sheet No. A 0.01

Scale: As indicated

Original Sheet Size: 30" x 42"

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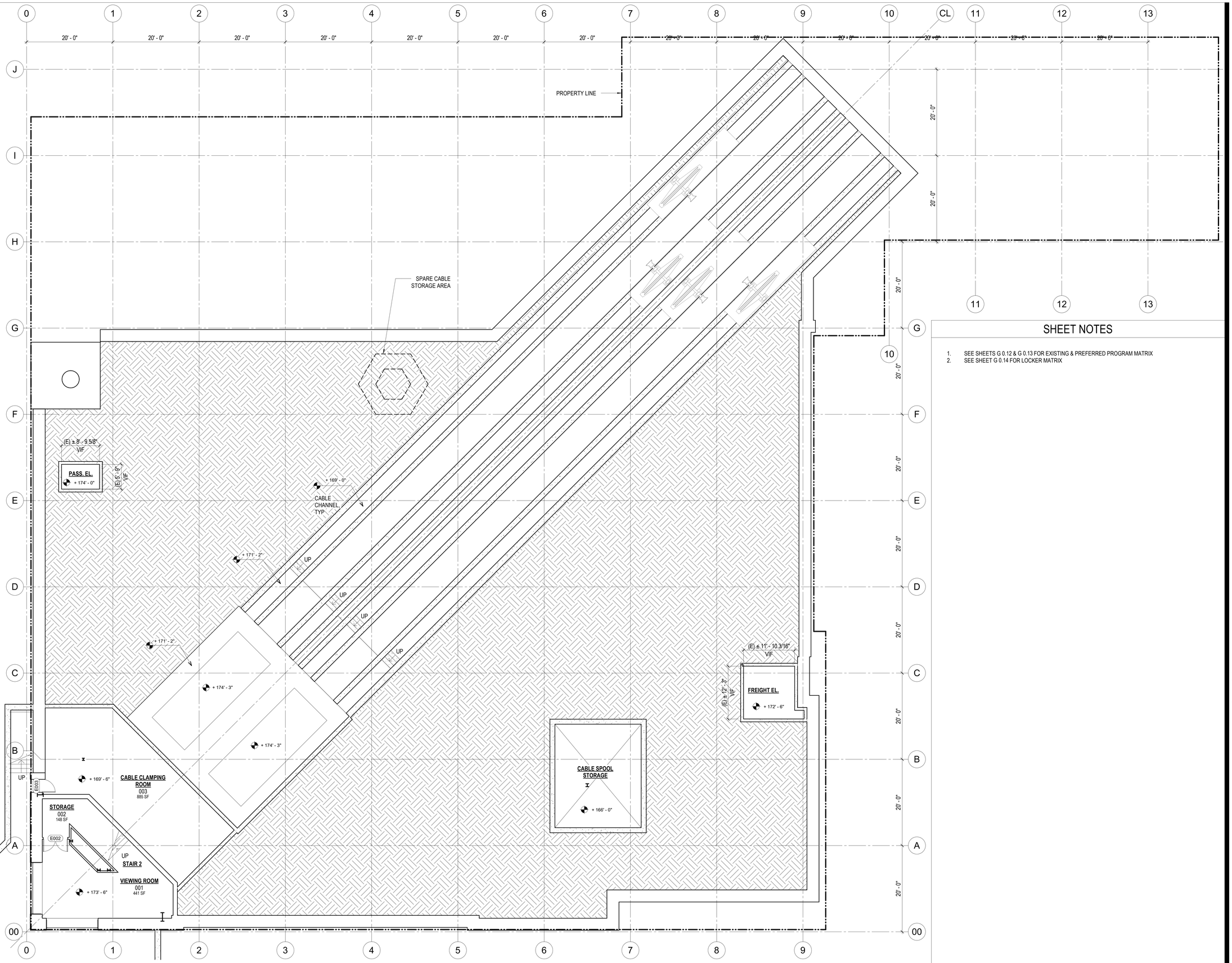

1 EXISTING PLAN - SUB FLOOR
1/8" = 1'-0"

SHEET NOTES

1. SEE SHEETS G 0.12 & G 0.13 FOR EXISTING & PREFERRED PROGRAM MATRIX
2. SEE SHEET G 0.14 FOR LOCKER MATRIX

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Drawing Title

EXISTING PLAN - SUB FLOOR

Sheet No. A 0.10

Scale: 1/8" = 1'-0"

Original Sheet Size: 30" x 42"

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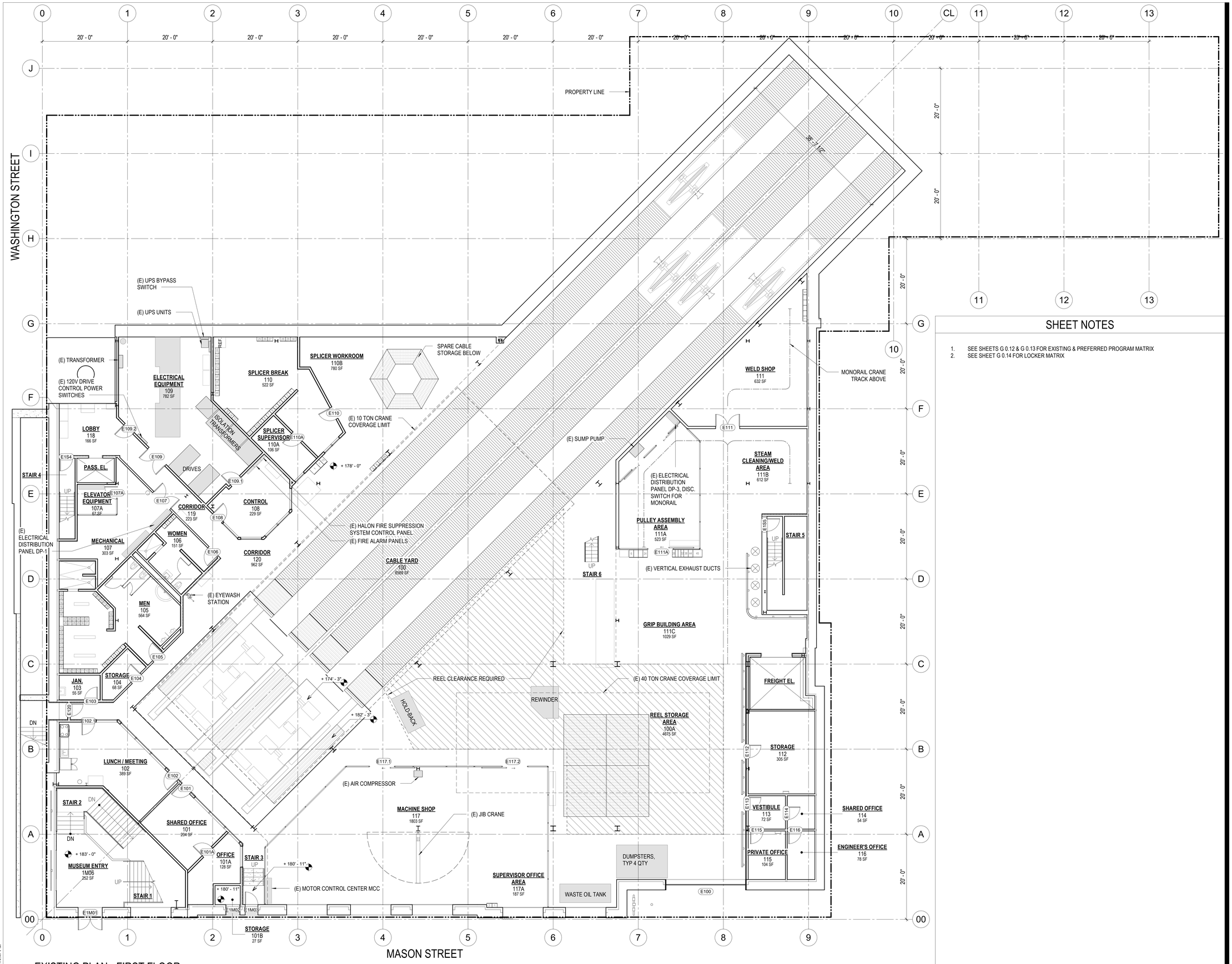

1 EXISTING PLAN - FIRST FLOOR
1/8" = 1'-0"

SHEET NOTES

1. SEE SHEETS G 0.12 & G 0.13 FOR EXISTING & PREFERRED PROGRAM MATRIX
2. SEE SHEET G 0.14 FOR LOCKER MATRIX

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EXISTING PLAN - FIRST FLOOR

Sheet No. A 0.11

Scale: 1/8" = 1'-0"

Original Sheet Size: 30" x 42"

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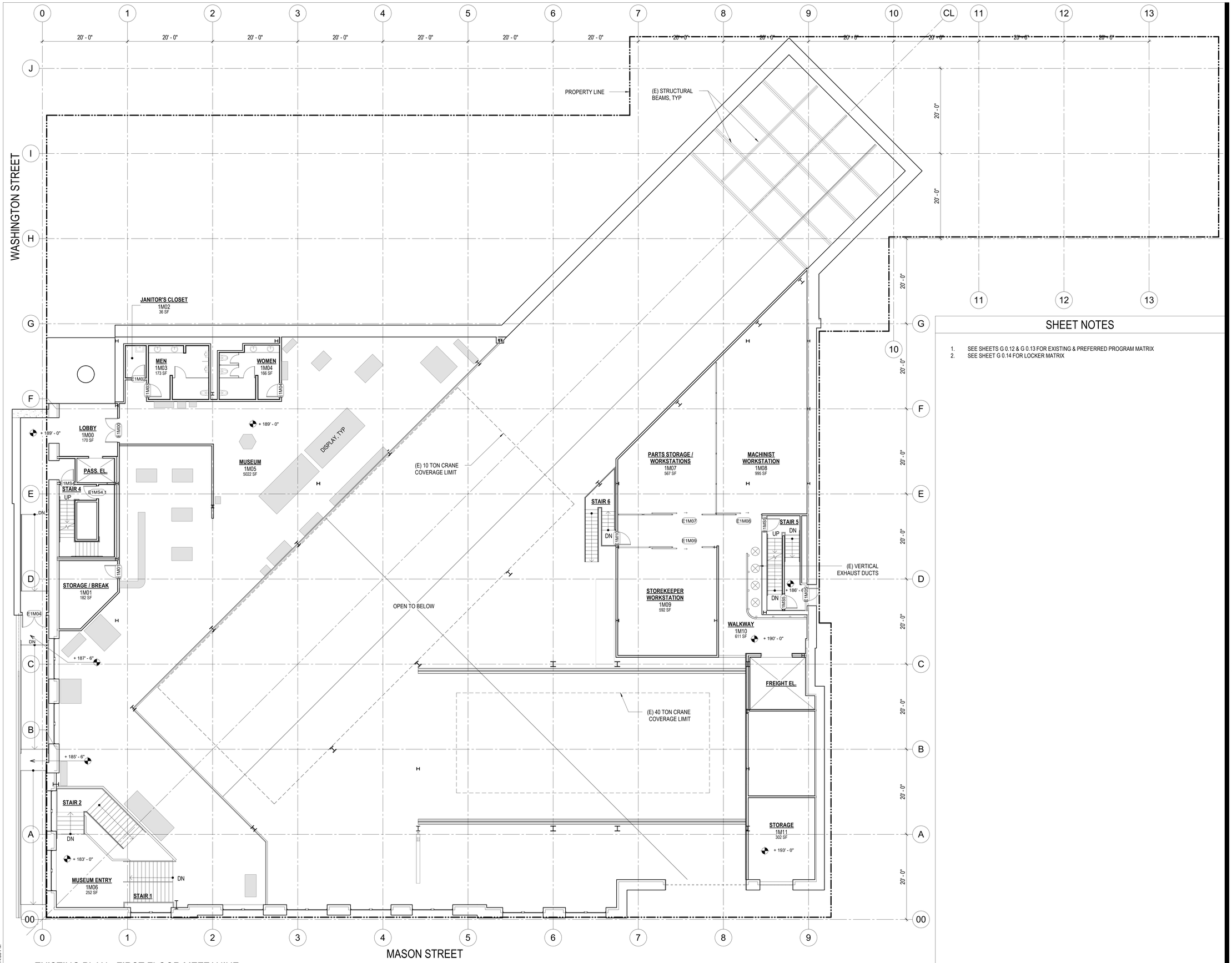

1 EXISTING PLAN - FIRST FLOOR MEZZANINE
1/8" = 1'-0"

SHEET NOTES

1. SEE SHEETS G 0.12 & G 0.13 FOR EXISTING & PREFERRED PROGRAM MATRIX
2. SEE SHEET G 0.14 FOR LOCKER MATRIX

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EXISTING PLAN - FIRST FLOOR MEZZANINE

Sheet No. A 0.12

Scale: 1/8" = 1'-0"

Original Sheet Size: 30" x 42"

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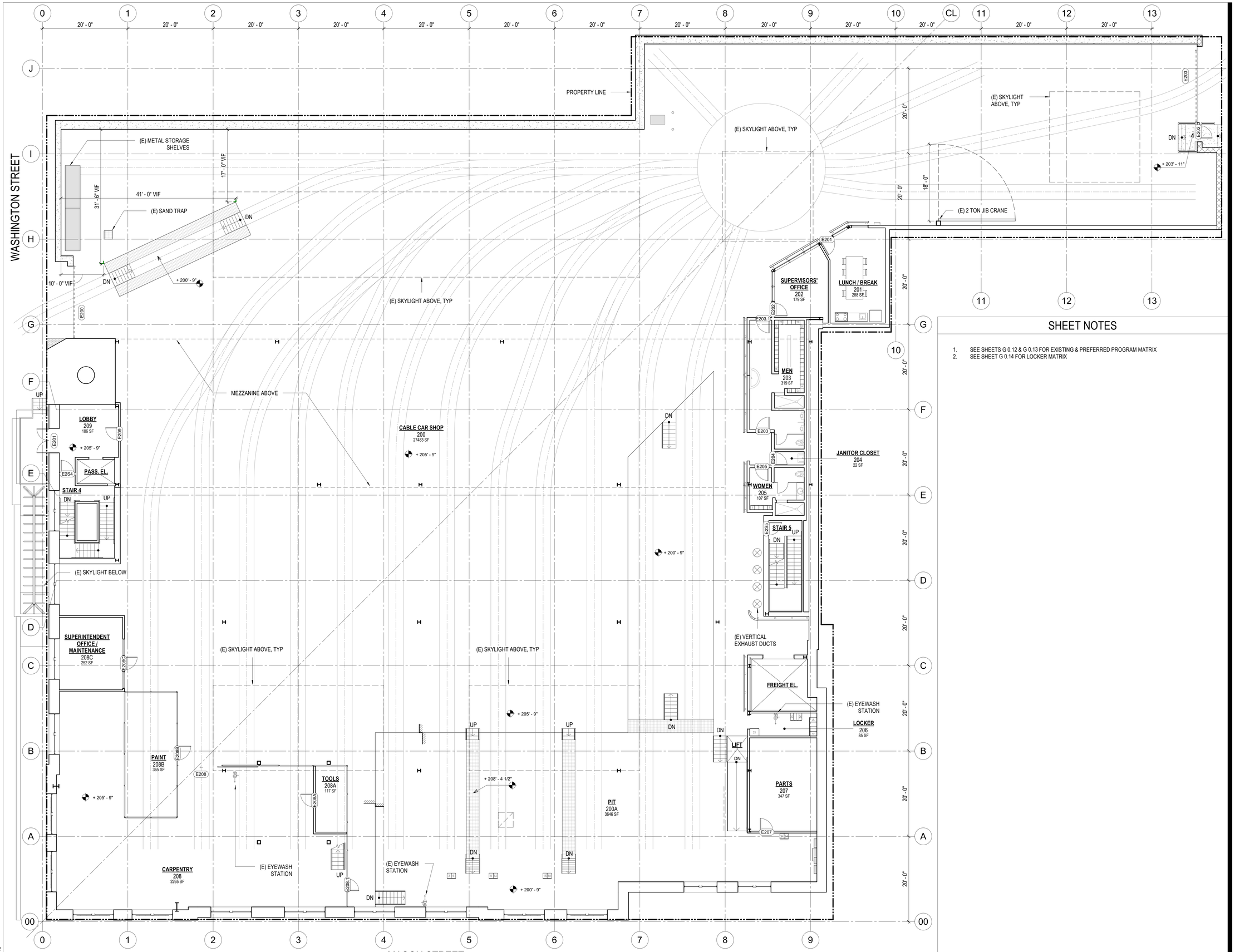

1 EXISTING PLAN - SECOND FLOOR
1/8" = 1'-0"

SHEET NOTES

1. SEE SHEETS G 0.12 & G 0.13 FOR EXISTING & PREFERRED PROGRAM MATRIX
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EXISTING PLAN - SECOND FLOOR

Sheet No. A 0.13

Scale: 1/8" = 1'-0"

Original Sheet Size: 30" x 42"

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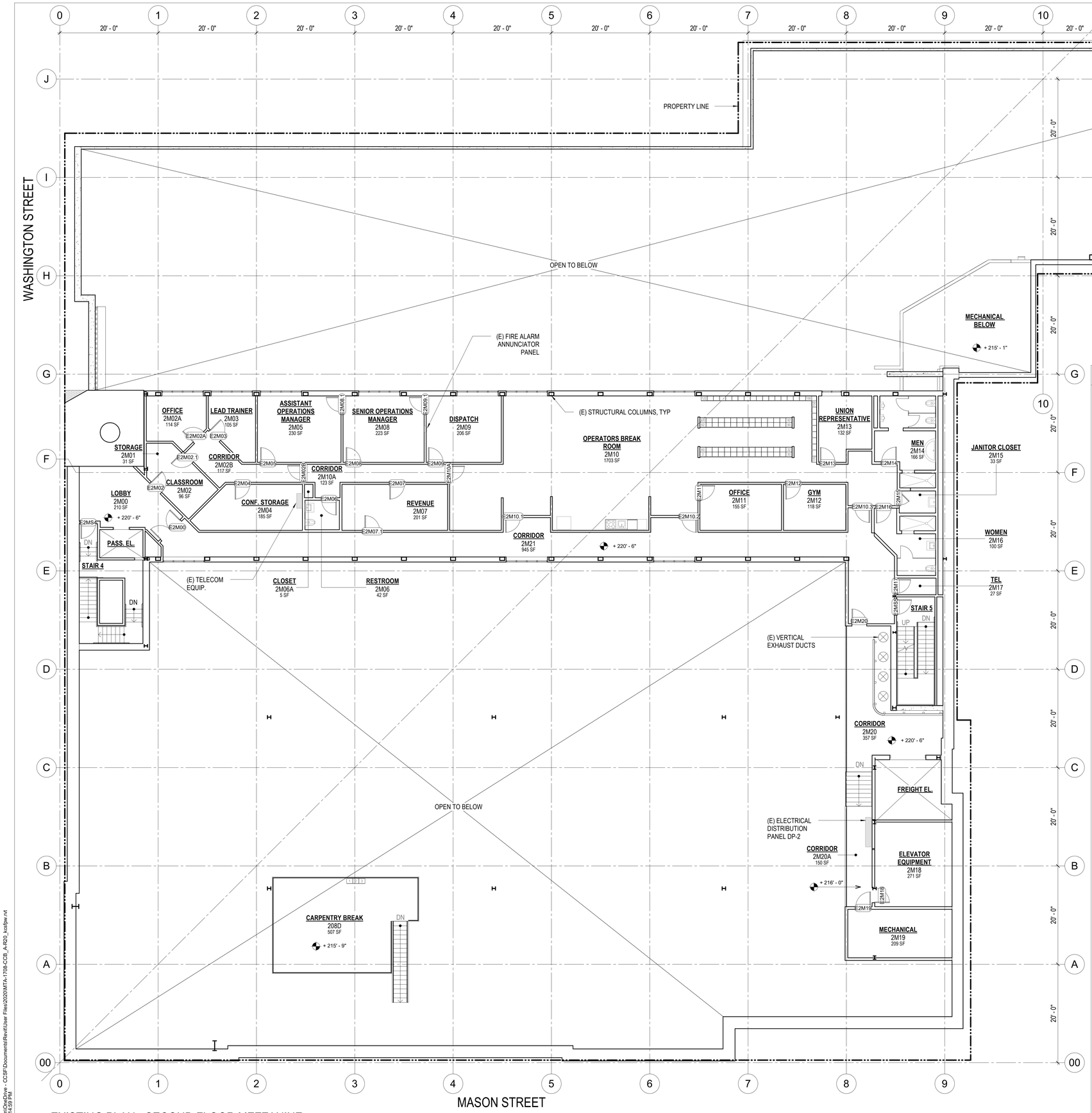

1 EXISTING PLAN - SECOND FLOOR MEZZANINE
1/8" = 1'-0"

SHEET NOTES

1. SEE SHEETS G 0.12 & G 0.13 FOR EXISTING & PREFERRED PROGRAM MATRIX
2. SEE SHEET G 0.14 FOR LOCKER MATRIX

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EXISTING PLAN - SECOND FLOOR MEZZANINE

Sheet No. A 0.14

Scale: 1/8" = 1'-0"

Original Sheet Size: 30" x 42"

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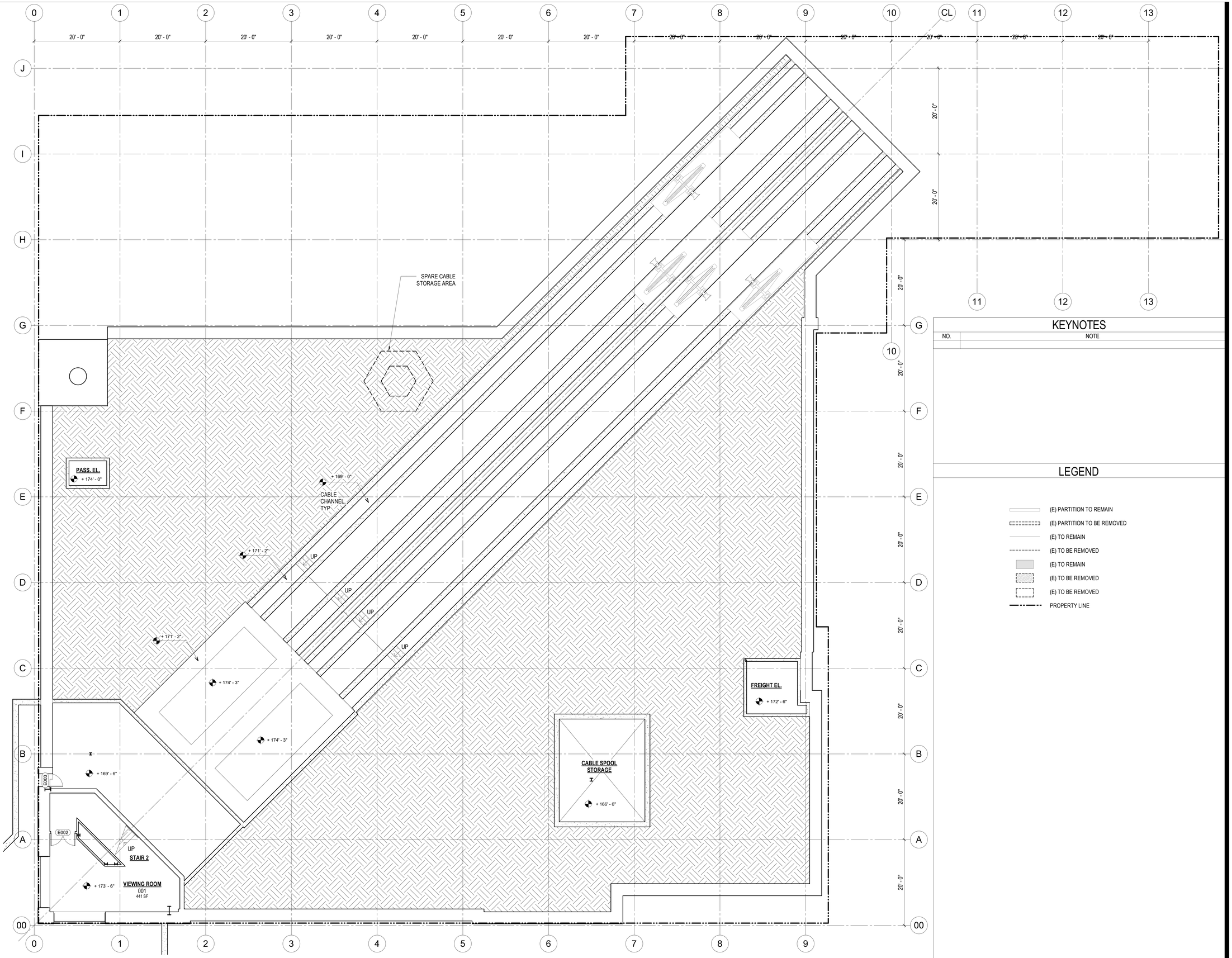

1 DEMOLITION PLAN - SUB FLOOR
1/8" = 1'-0"

KEYNOTES

NO.	NOTE

LEGEND

- (E) PARTITION TO REMAIN
- (E) PARTITION TO BE REMOVED
- (E) TO REMAIN
- (E) TO BE REMOVED
- (E) TO REMAIN
- (E) TO BE REMOVED
- (E) TO BE REMOVED
- PROPERTY LINE

BUREAU OF ARCHITECTURE

SAN FRANCISCO PUBLIC WORKS

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No.	Date	Revisions

PM EunJoo Cho
PA EunJoo Cho
Drawn JD/KL
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Drawing Title

DEMOLITION PLAN - SUB FLOOR

Sheet No. A 1.10

Scale: 1/8" = 1'-0"

Original Sheet Size: 30" x 42"

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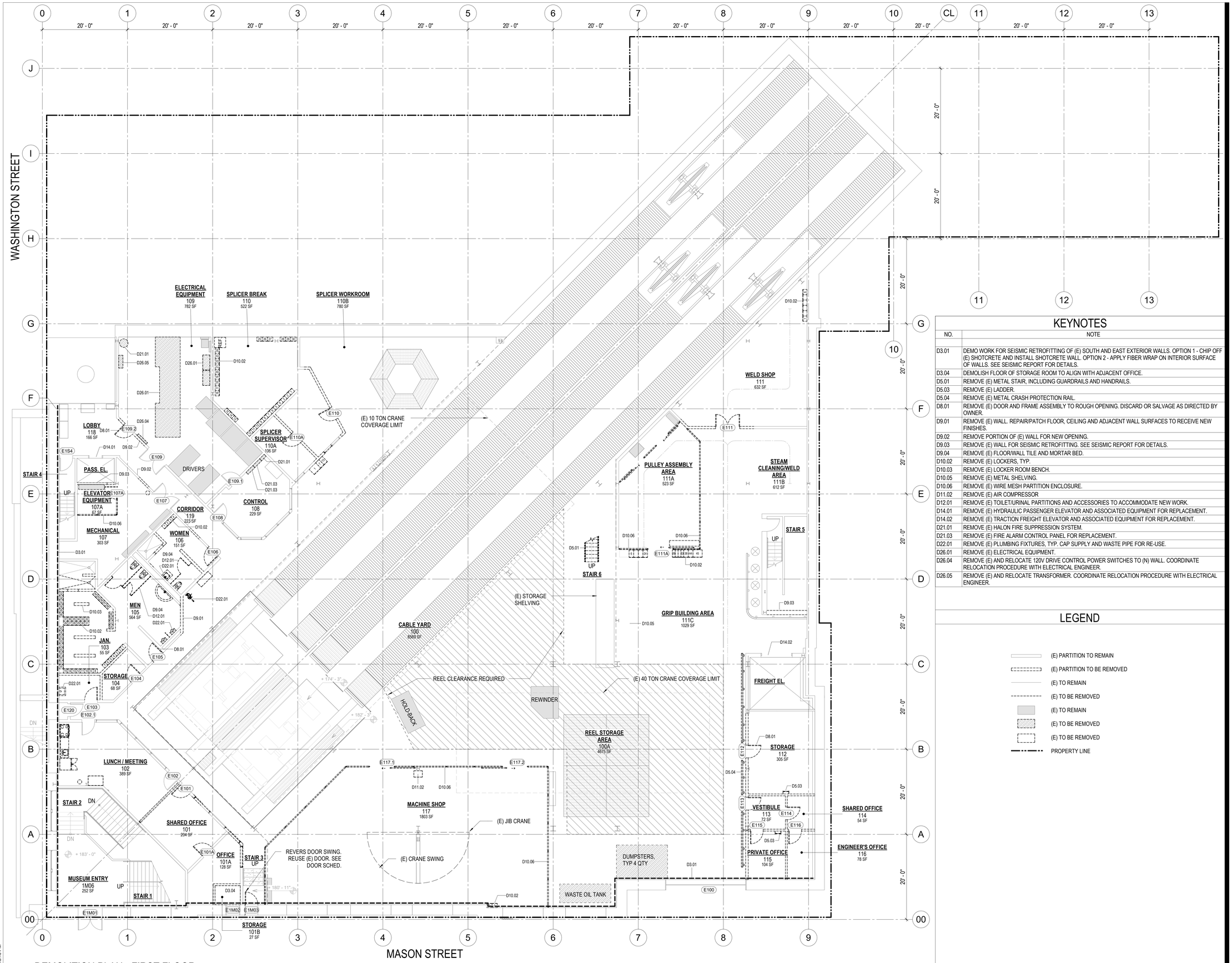

1 DEMOLITION PLAN - FIRST FLOOR

1/8" = 1'-0"

KEYNOTES

NO.	NOTE
D3.01	DEMO WORK FOR SEISMIC RETROFITTING OF (E) SOUTH AND EAST EXTERIOR WALLS. OPTION 1 - CHIP OFF (E) SHOTCRETE AND INSTALL SHOTCRETE WALL. OPTION 2 - APPLY FIBER WRAP ON INTERIOR SURFACE OF WALLS. SEE SEISMIC REPORT FOR DETAILS.
D3.04	DEMOLISH FLOOR OF STORAGE ROOM TO ALIGN WITH ADJACENT OFFICE.
D5.01	REMOVE (E) METAL STAIR, INCLUDING GUARDRAILS AND HANDRAILS.
D5.03	REMOVE (E) LADDER.
D5.04	REMOVE (E) METAL CRASH PROTECTION RAIL.
D8.01	REMOVE (E) DOOR AND FRAME ASSEMBLY TO ROUGH OPENING. DISCARD OR SALVAGE AS DIRECTED BY OWNER.
D9.01	REMOVE (E) WALL. REPAIR/PATCH FLOOR, CEILING AND ADJACENT WALL SURFACES TO RECEIVE NEW FINISHES.
D9.02	REMOVE PORTION OF (E) WALL FOR NEW OPENING.
D9.03	REMOVE (E) WALL FOR SEISMIC RETROFITTING. SEE SEISMIC REPORT FOR DETAILS.
D9.04	REMOVE (E) FLOOR/WALL TILE AND MORTAR BED.
D10.02	REMOVE (E) LOCKERS, TYP.
D10.03	REMOVE (E) LOCKER ROOM BENCH.
D10.05	REMOVE (E) METAL SHELVING.
D10.06	REMOVE (E) WIRE MESH PARTITION ENCLOSURE.
D11.02	REMOVE (E) AIR COMPRESSOR
D12.01	REMOVE (E) TOILET/URINAL PARTITIONS AND ACCESSORIES TO ACCOMMODATE NEW WORK.
D14.01	REMOVE (E) HYDRAULIC PASSENGER ELEVATOR AND ASSOCIATED EQUIPMENT FOR REPLACEMENT.
D14.02	REMOVE (E) TRACTION FREIGHT ELEVATOR AND ASSOCIATED EQUIPMENT FOR REPLACEMENT.
D21.01	REMOVE (E) HALON FIRE SUPPRESSION SYSTEM.
D21.03	REMOVE (E) FIRE ALARM CONTROL PANEL FOR REPLACEMENT.
D22.01	REMOVE (E) PLUMBING FIXTURES, TYP. CAP SUPPLY AND WASTE PIPE FOR RE-USE.
D26.01	REMOVE (E) ELECTRICAL EQUIPMENT.
D26.04	REMOVE (E) AND RELOCATE 120V DRIVE CONTROL POWER SWITCHES TO (N) WALL. COORDINATE RELOCATION PROCEDURE WITH ELECTRICAL ENGINEER.
D26.05	REMOVE (E) AND RELOCATE TRANSFORMER. COORDINATE RELOCATION PROCEDURE WITH ELECTRICAL ENGINEER.

LEGEND

- (E) PARTITION TO REMAIN
- (E) PARTITION TO BE REMOVED
- (E) TO REMAIN
- (E) TO BE REMOVED
- (E) TO REMAIN
- (E) TO BE REMOVED
- (E) TO BE REMOVED
- PROPERTY LINE

BUREAU OF ARCHITECTURE

SAN FRANCISCO PUBLIC WORKS

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No.	Date	Revisions
	12/17/21	DRAFT MASTER PLAN
	06/30/22	FINAL MASTER PLAN

PM EunJoo Cho
PA EunJoo Cho
Drawn JD/KL
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Drawing Title

DEMOLITION PLAN - FIRST FLOOR

Sheet No. A 1.11

Scale: 1/8" = 1'-0"

Original Sheet Size: 30" x 42"

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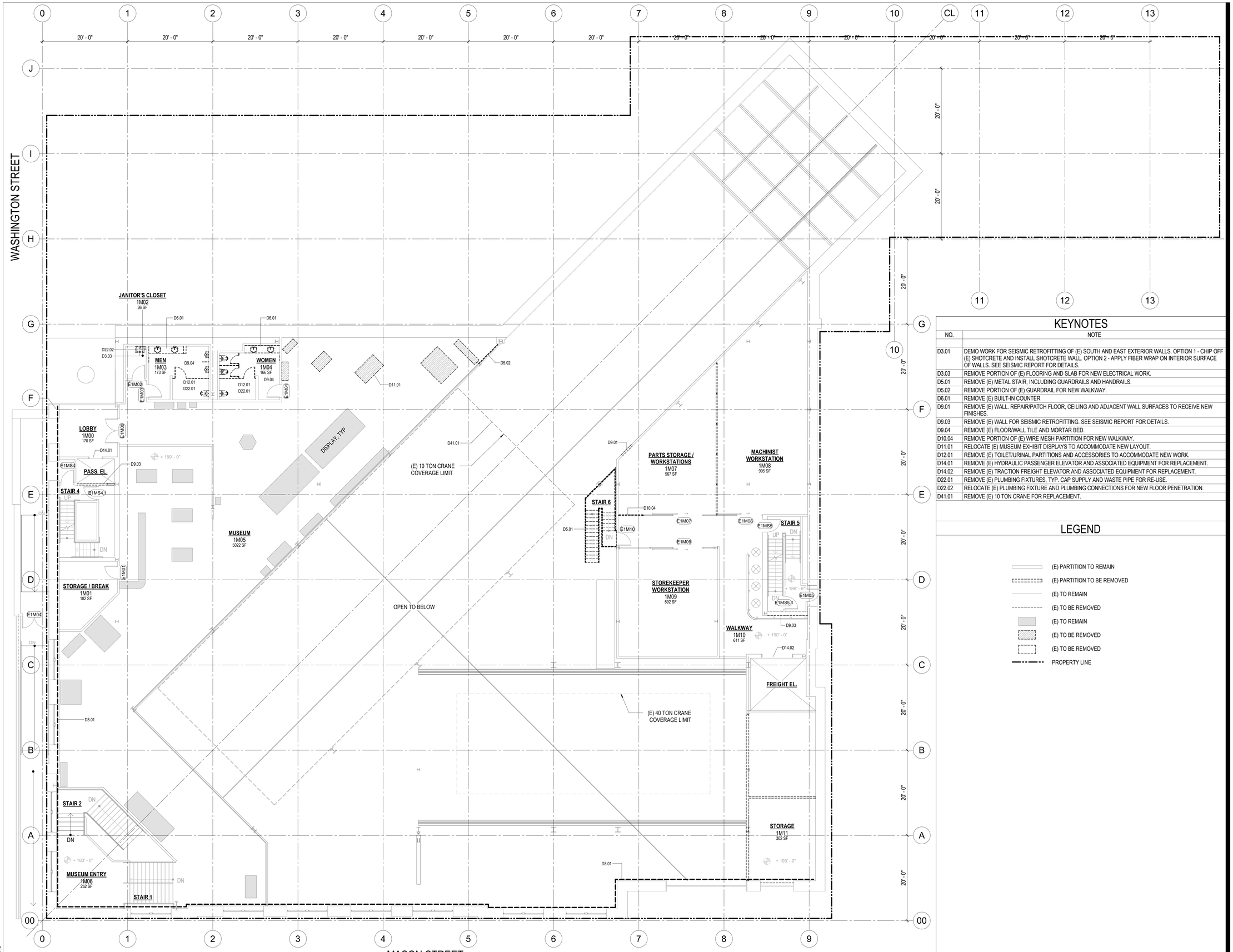

1 DEMOLITION PLAN - FIRST FLOOR MEZZANINE
1/8" = 1'-0"

KEYNOTES

NO.	NOTE
D3.01	DEMO WORK FOR SEISMIC RETROFITTING OF (E) SOUTH AND EAST EXTERIOR WALLS. OPTION 1 - CHIP OFF (E) SHOTCRETE AND INSTALL SHOTCRETE WALL. OPTION 2 - APPLY FIBER WRAP ON INTERIOR SURFACE OF WALLS. SEE SEISMIC REPORT FOR DETAILS.
D3.03	REMOVE PORTION OF (E) FLOORING AND SLAB FOR NEW ELECTRICAL WORK.
D5.01	REMOVE (E) METAL STAIR, INCLUDING GUARDRAILS AND HANDRAILS.
D5.02	REMOVE PORTION OF (E) GUARDRAIL FOR NEW WALKWAY.
D6.01	REMOVE (E) BUILT-IN COUNTER
D9.01	REMOVE (E) WALL. REPAIR/PATCH FLOOR, CEILING AND ADJACENT WALL SURFACES TO RECEIVE NEW FINISHES.
D9.03	REMOVE (E) WALL FOR SEISMIC RETROFITTING. SEE SEISMIC REPORT FOR DETAILS.
D9.04	REMOVE (E) FLOOR/WALL TILE AND MORTAR BED.
D10.04	REMOVE PORTION OF (E) WIRE MESH PARTITION FOR NEW WALKWAY.
D11.01	RELOCATE (E) MUSEUM EXHIBIT DISPLAYS TO ACCOMMODATE NEW LAYOUT.
D12.01	REMOVE (E) TOILET/URINAL PARTITIONS AND ACCESSORIES TO ACCOMMODATE NEW WORK.
D14.01	REMOVE (E) HYDRAULIC PASSENGER ELEVATOR AND ASSOCIATED EQUIPMENT FOR REPLACEMENT.
D14.02	REMOVE (E) TRACTION FREIGHT ELEVATOR AND ASSOCIATED EQUIPMENT FOR REPLACEMENT.
D22.01	REMOVE (E) PLUMBING FIXTURES, TYP. CAP SUPPLY AND WASTE PIPE FOR RE-USE.
D22.02	RELOCATE (E) PLUMBING FIXTURE AND PLUMBING CONNECTIONS FOR NEW FLOOR PENETRATION.
D41.01	REMOVE (E) 10 TON CRANE FOR REPLACEMENT.

LEGEND

- (E) PARTITION TO REMAIN
- (E) PARTITION TO BE REMOVED
- (E) TO REMAIN
- (E) TO BE REMOVED
- (E) TO REMAIN
- (E) TO BE REMOVED
- (E) TO BE REMOVED
- PROPERTY LINE

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No.	Date	Revisions
	06/30/22	FINAL MASTER PLAN

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Drawing Title

DEMOLITION PLAN - FIRST FLOOR MEZZANINE

Sheet No. A 1.12

Scale: 1/8" = 1'-0"

Original Sheet Size: 30" x 42"

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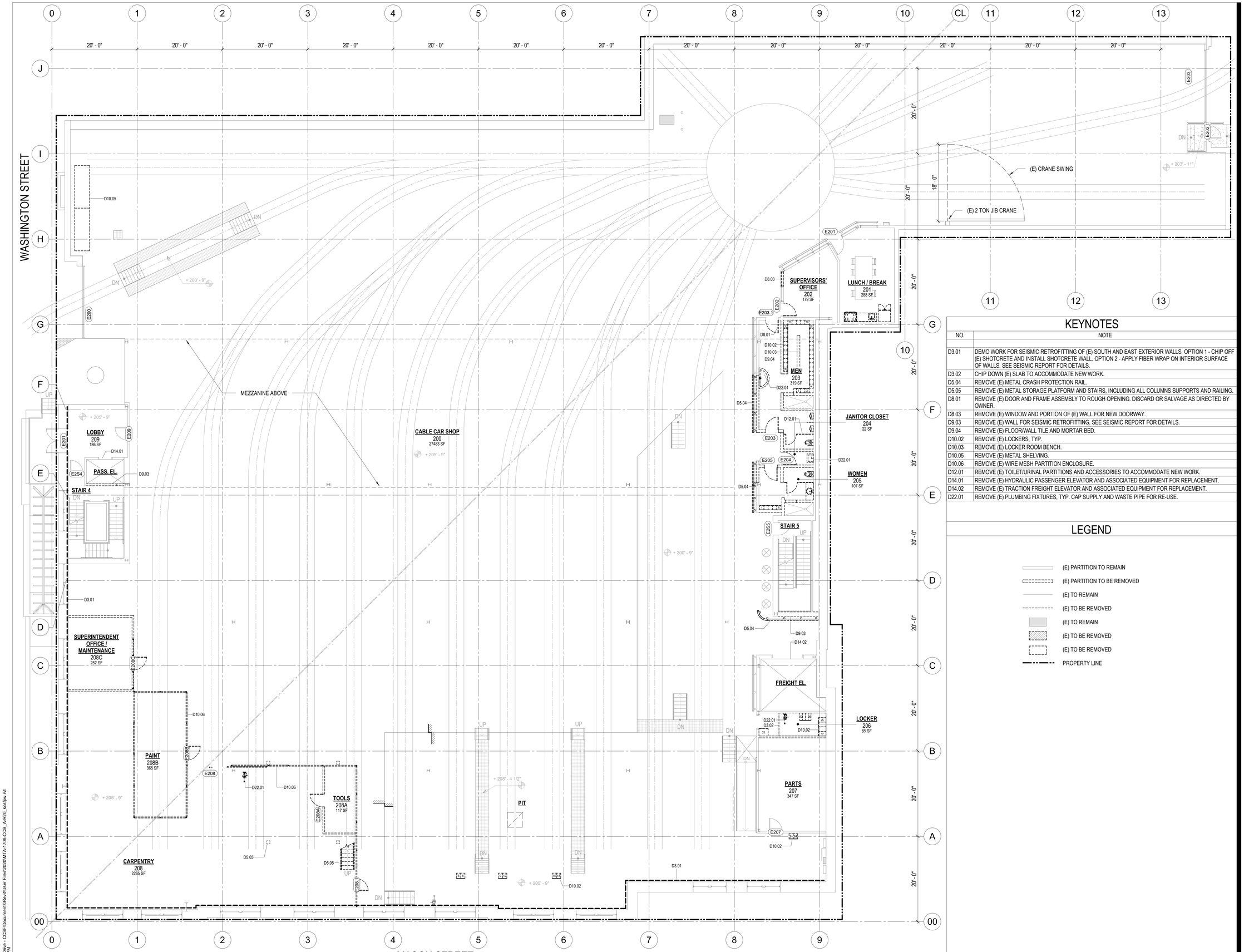

1 DEMOLITION PLAN - SECOND FLOOR
1/8" = 1'-0"

KEYNOTES

NO.	NOTE
D3.01	DEMO WORK FOR SEISMIC RETROFITTING OF (E) SOUTH AND EAST EXTERIOR WALLS. OPTION 1 - CHIP OFF (E) SHOTCRETE AND INSTALL SHOTCRETE WALL. OPTION 2 - APPLY FIBER WRAP ON INTERIOR SURFACE OF WALLS. SEE SEISMIC REPORT FOR DETAILS.
D3.02	CHIP DOWN (E) SLAB TO ACCOMMODATE NEW WORK.
D5.04	REMOVE (E) METAL CRASH PROTECTION RAIL.
D5.05	REMOVE (E) METAL STORAGE PLATFORM AND STAIRS, INCLUDING ALL COLUMNS SUPPORTS AND RAILING.
D8.01	REMOVE (E) DOOR AND FRAME ASSEMBLY TO ROUGH OPENING. DISCARD OR SALVAGE AS DIRECTED BY OWNER.
D8.03	REMOVE (E) WINDOW AND PORTION OF (E) WALL FOR NEW DOORWAY.
D9.03	REMOVE (E) WALL FOR SEISMIC RETROFITTING. SEE SEISMIC REPORT FOR DETAILS.
D9.04	REMOVE (E) FLOOR/WALL TILE AND MORTAR BED.
D10.02	REMOVE (E) LOCKERS, TYP.
D10.03	REMOVE (E) LOCKER ROOM BENCH.
D10.05	REMOVE (E) METAL SHELVING.
D10.06	REMOVE (E) WIRE MESH PARTITION ENCLOSURE.
D12.01	REMOVE (E) TOILET/URINAL PARTITIONS AND ACCESSORIES TO ACCOMMODATE NEW WORK.
D14.01	REMOVE (E) HYDRAULIC PASSENGER ELEVATOR AND ASSOCIATED EQUIPMENT FOR REPLACEMENT.
D14.02	REMOVE (E) TRACTION FREIGHT ELEVATOR AND ASSOCIATED EQUIPMENT FOR REPLACEMENT.
D22.01	REMOVE (E) PLUMBING FIXTURES, TYP. CAP SUPPLY AND WASTE PIPE FOR RE-USE.

LEGEND

- (E) PARTITION TO REMAIN
- (E) PARTITION TO BE REMOVED
- (E) TO REMAIN
- (E) TO BE REMOVED
- (E) TO REMAIN
- (E) TO BE REMOVED
- (E) TO BE REMOVED
- PROPERTY LINE

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No.	Date	Revisions
	06/30/22	FINAL MASTER PLAN

PM EunJoo Cho
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Drawing Title

DEMOLITION PLAN - SECOND FLOOR

Sheet No. A 1.13

Scale: 1/8" = 1'-0"

Original Sheet Size: 30" x 42"

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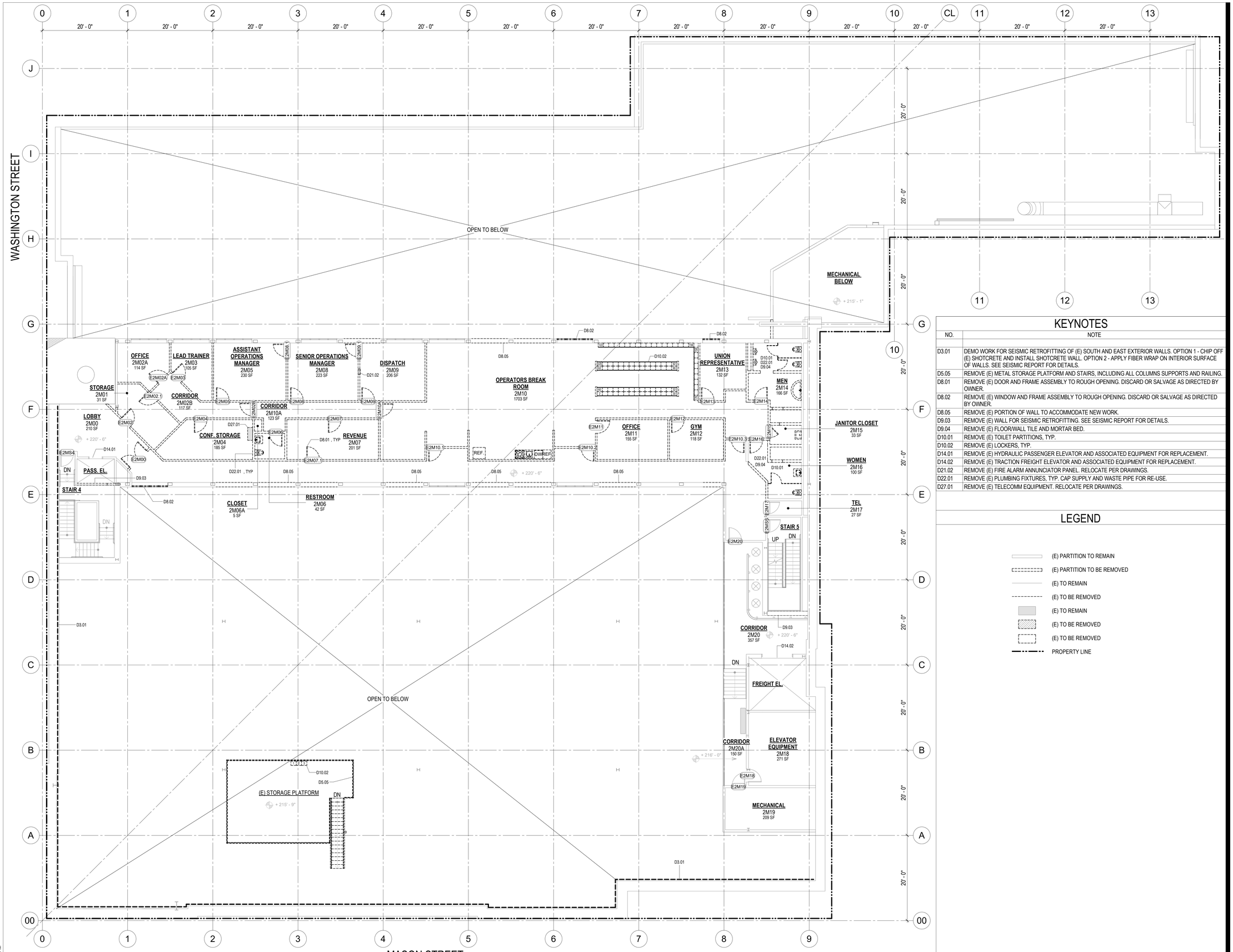

1 DEMOLITION PLAN - SECOND FLOOR MEZZANINE
1/8" = 1'-0"

N

KEYNOTES

NO.	NOTE
D3.01	DEMO WORK FOR SEISMIC RETROFITTING OF (E) SOUTH AND EAST EXTERIOR WALLS. OPTION 1 - CHIP OFF (E) SHOTCRETE AND INSTALL SHOTCRETE WALL. OPTION 2 - APPLY FIBER WRAP ON INTERIOR SURFACE OF WALLS. SEE SEISMIC REPORT FOR DETAILS.
D5.05	REMOVE (E) METAL STORAGE PLATFORM AND STAIRS, INCLUDING ALL COLUMNS SUPPORTS AND RAILING.
D8.01	REMOVE (E) DOOR AND FRAME ASSEMBLY TO ROUGH OPENING. DISCARD OR SALVAGE AS DIRECTED BY OWNER.
D8.02	REMOVE (E) WINDOW AND FRAME ASSEMBLY TO ROUGH OPENING. DISCARD OR SALVAGE AS DIRECTED BY OWNER.
D8.05	REMOVE (E) PORTION OF WALL TO ACCOMMODATE NEW WORK.
D9.03	REMOVE (E) WALL FOR SEISMIC RETROFITTING. SEE SEISMIC REPORT FOR DETAILS.
D9.04	REMOVE (E) FLOOR/WALL TILE AND MORTAR BED.
D10.01	REMOVE (E) TOILET PARTITIONS, TYP.
D10.02	REMOVE (E) LOCKERS, TYP.
D14.01	REMOVE (E) HYDRAULIC PASSENGER ELEVATOR AND ASSOCIATED EQUIPMENT FOR REPLACEMENT.
D14.02	REMOVE (E) TRACTION FREIGHT ELEVATOR AND ASSOCIATED EQUIPMENT FOR REPLACEMENT.
D21.02	REMOVE (E) FIRE ALARM ANNUNCIATOR PANEL. RELOCATE PER DRAWINGS.
D22.01	REMOVE (E) PLUMBING FIXTURES, TYP. CAP SUPPLY AND WASTE PIPE FOR RE-USE.
D27.01	REMOVE (E) TELECOMM EQUIPMENT. RELOCATE PER DRAWINGS.

LEGEND

- (E) PARTITION TO REMAIN
- (E) PARTITION TO BE REMOVED
- (E) TO REMAIN
- (E) TO BE REMOVED
- (E) TO REMAIN
- (E) TO BE REMOVED
- (E) TO BE REMOVED
- PROPERTY LINE

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	06/30/22	FINAL MASTER PLAN

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Drawing Title

DEMOLITION PLAN - SECOND FLOOR MEZZANINE

Sheet No. A 1.14

Scale: 1/8" = 1'-0"

Original Sheet Size: 30" x 42"

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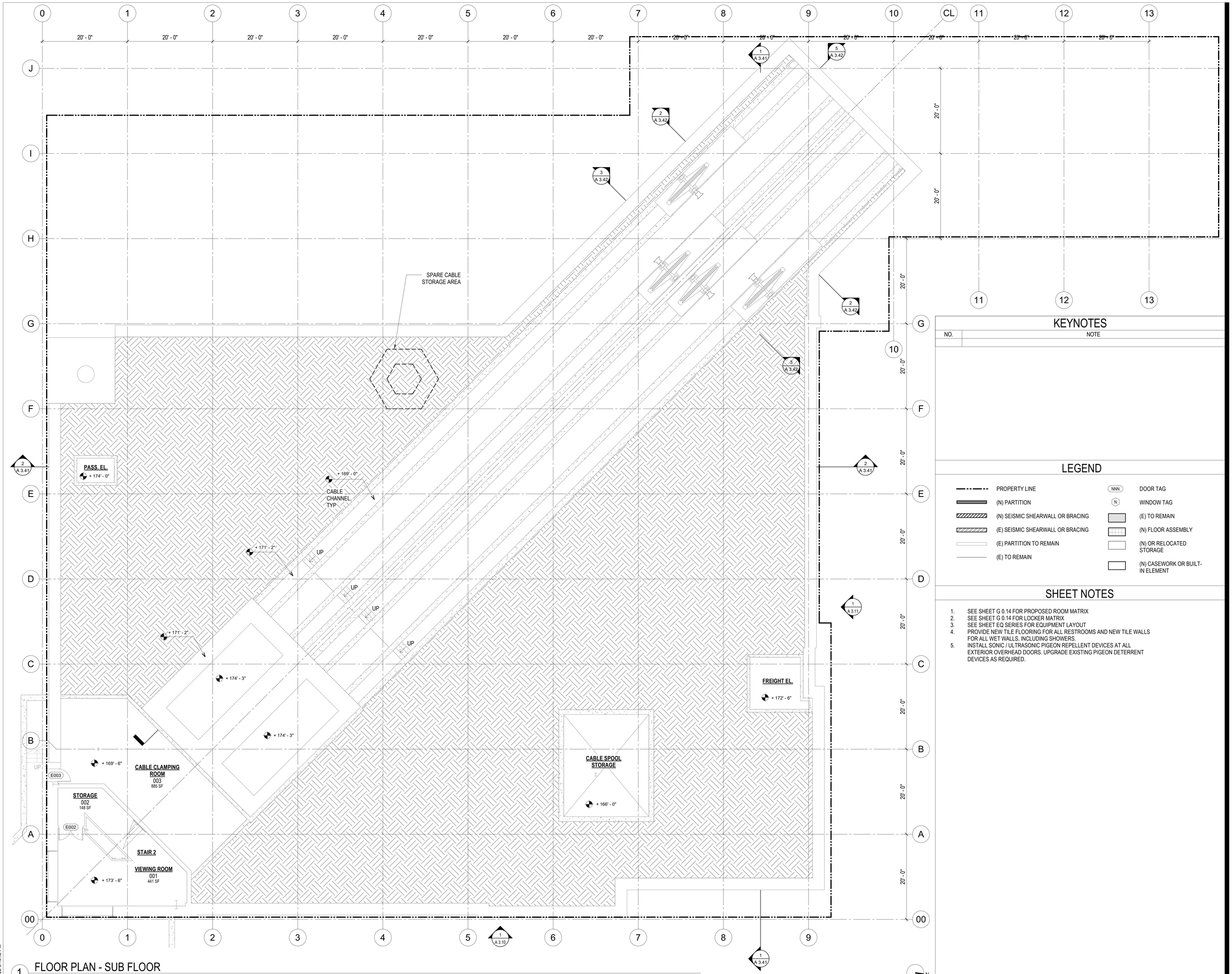

1 FLOOR PLAN - SUB FLOOR
1/8" = 1'-0"

KEYNOTES

NO.	NOTE

LEGEND

- PROPERTY LINE
- (N) PARTITION
- (N) SEISMIC SHEARWALL OR BRACING
- (E) SEISMIC SHEARWALL OR BRACING
- (E) PARTITION TO REMAIN
- (E) TO REMAIN
- NNN DOOR TAG
- N WINDOW TAG
- (E) TO REMAIN
- (N) FLOOR ASSEMBLY
- (N) OR RELOCATED STORAGE
- (N) CASEWORK OR BUILT-IN ELEMENT

SHEET NOTES

1. SEE SHEET G 0.14 FOR PROPOSED ROOM MATRIX
2. SEE SHEET G 0.14 FOR LOCKER MATRIX
3. SEE SHEET EQ SERIES FOR EQUIPMENT LAYOUT
4. PROVIDE NEW TILE FLOORING FOR ALL RESTROOMS AND NEW TILE WALLS FOR ALL WET WALLS, INCLUDING SHOWERS.
5. INSTALL SONIC / ULTRASONIC PIGEON REPELLENT DEVICES AT ALL EXTERIOR OVERHEAD DOORS. UPGRADE EXISTING PIGEON DETERRENT DEVICES AS REQUIRED.

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Drawing Title

FLOOR PLAN - SUB FLOOR

Sheet No. A 2.10

Scale: 1/8" = 1'-0"

Original Sheet Size: 30" x 42"

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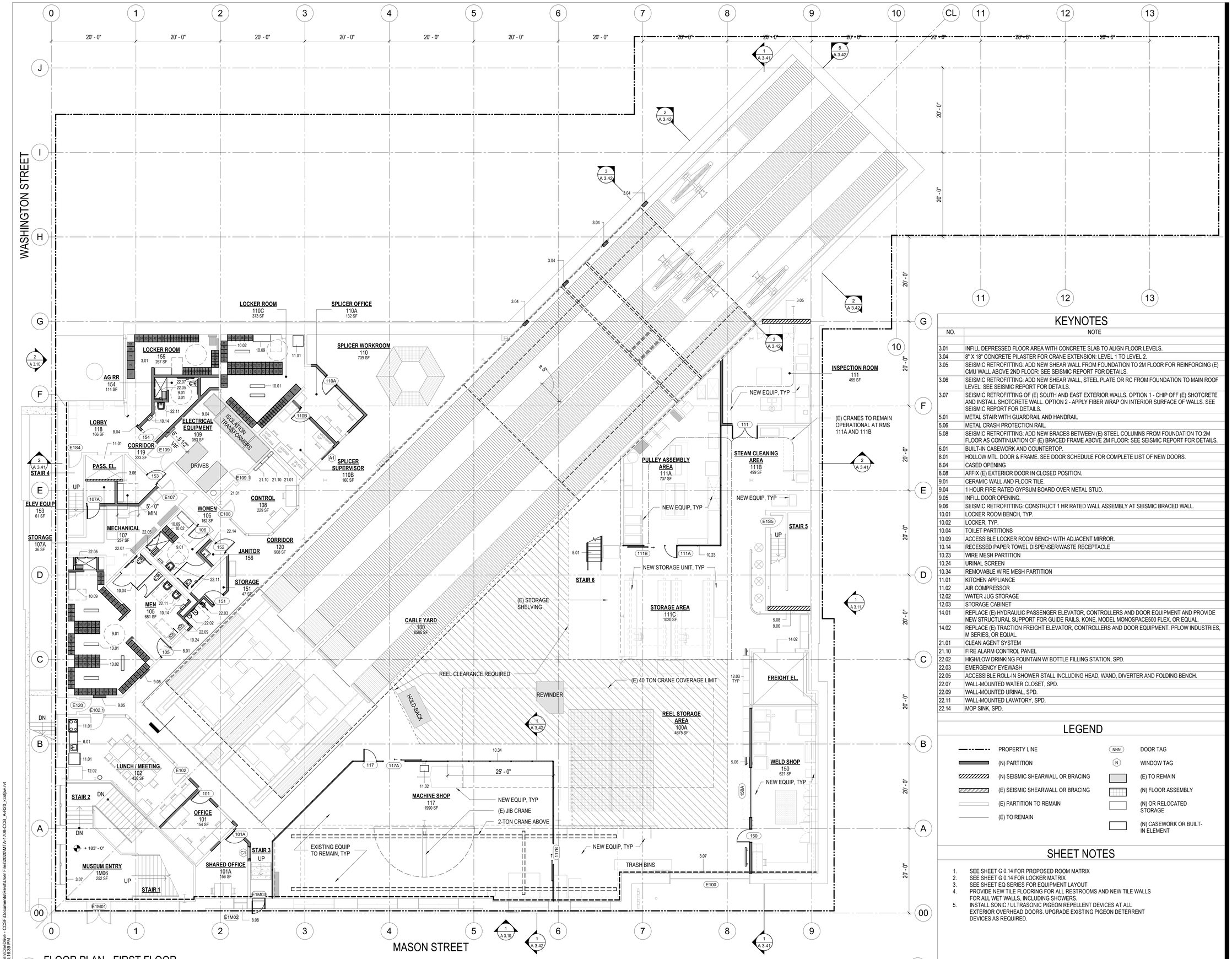

1 FLOOR PLAN - FIRST FLOOR
1/8" = 1'-0"

KEYNOTES

NO.	NOTE
3.01	INFILL DEPRESSED FLOOR AREA WITH CONCRETE SLAB TO ALIGN FLOOR LEVELS.
3.04	8" X 18" CONCRETE PILASTER FOR CRANE EXTENSION: LEVEL 1 TO LEVEL 2.
3.05	SEISMIC RETROFITTING: ADD NEW SHEAR WALL FROM FOUNDATION TO 2M FLOOR FOR REINFORCING (E) CMU WALL ABOVE 2ND FLOOR: SEE SEISMIC REPORT FOR DETAILS.
3.06	SEISMIC RETROFITTING: ADD NEW SHEAR WALL, STEEL PLATE OR RC FROM FOUNDATION TO MAIN ROOF LEVEL: SEE SEISMIC REPORT FOR DETAILS.
3.07	SEISMIC RETROFITTING OF (E) SOUTH AND EAST EXTERIOR WALLS. OPTION 1 - CHIP OFF (E) SHOTCRETE AND INSTALL SHOTCRETE WALL. OPTION 2 - APPLY FIBER WRAP ON INTERIOR SURFACE OF WALLS. SEE SEISMIC REPORT FOR DETAILS.
5.01	METAL STAIR WITH GUARDRAIL AND HANDRAIL
5.06	METAL CRASH PROTECTION RAIL.
5.08	SEISMIC RETROFITTING: ADD NEW BRACES BETWEEN (E) STEEL COLUMNS FROM FOUNDATION TO 2M FLOOR AS CONTINUATION OF (E) BRACED FRAME ABOVE 2M FLOOR: SEE SEISMIC REPORT FOR DETAILS.
6.01	BUILT-IN CASEWORK AND COUNTERTOP.
8.01	HOLLOW MTL. DOOR & FRAME. SEE DOOR SCHEDULE FOR COMPLETE LIST OF NEW DOORS.
8.04	CASED OPENING
8.08	AFFIX (E) EXTERIOR DOOR IN CLOSED POSITION.
9.01	CERAMIC WALL AND FLOOR TILE.
9.04	1 HOUR FIRE RATED GYPSUM BOARD OVER METAL STUD.
9.05	INFILL DOOR OPENING.
9.06	SEISMIC RETROFITTING: CONSTRUCT 1 HR RATED WALL ASSEMBLY AT SEISMIC BRACED WALL.
10.01	LOCKER ROOM BENCH, TYP.
10.02	LOCKER, TYP.
10.04	TOILET PARTITIONS
10.09	ACCESSIBLE LOCKER ROOM BENCH WITH ADJACENT MIRROR.
10.14	RECESSED PAPER TOWEL DISPENSER/WASTE RECEPTACLE
10.23	WIRE MESH PARTITION
10.24	URINAL SCREEN
10.34	REMOVABLE WIRE MESH PARTITION
11.01	KITCHEN APPLIANCE
11.02	AIR COMPRESSOR
12.02	WATER JUG STORAGE
12.03	STORAGE CABINET
14.01	REPLACE (E) HYDRAULIC PASSENGER ELEVATOR, CONTROLLERS AND DOOR EQUIPMENT AND PROVIDE NEW STRUCTURAL SUPPORT FOR GUIDE RAILS. KONE, MODEL MONOSPACE500 FLEX, OR EQUAL.
14.02	REPLACE (E) TRACTION FREIGHT ELEVATOR, CONTROLLERS AND DOOR EQUIPMENT. PFLOW INDUSTRIES, M SERIES, OR EQUAL.
21.01	CLEAN AGENT SYSTEM
21.10	FIRE ALARM CONTROL PANEL
22.02	HIGH/LOW DRINKING FOUNTAIN W/ BOTTLE FILLING STATION, SPD.
22.03	EMERGENCY EYEWASH
22.05	ACCESSIBLE ROLL-IN SHOWER STALL INCLUDING HEAD, WAND, DIVERTER AND FOLDING BENCH.
22.07	WALL-MOUNTED WATER CLOSET, SPD.
22.09	WALL-MOUNTED URINAL, SPD.
22.11	WALL-MOUNTED LAVATORY, SPD.
22.14	MOP SINK, SPD.

LEGEND

- PROPERTY LINE
- (N) PARTITION
- (N) SEISMIC SHEARWALL OR BRACING
- (E) SEISMIC SHEARWALL OR BRACING
- (E) PARTITION TO REMAIN
- (E) TO REMAIN
- NNN DOOR TAG
- N WINDOW TAG
- (E) TO REMAIN
- (N) FLOOR ASSEMBLY
- (N) OR RELOCATED STORAGE
- (N) CASEWORK OR BUILT-IN ELEMENT

SHEET NOTES

1. SEE SHEET G 0.14 FOR PROPOSED ROOM MATRIX
2. SEE SHEET G 0.14 FOR LOCKER MATRIX
3. SEE SHEET EQ SERIES FOR EQUIPMENT LAYOUT
4. PROVIDE NEW TILE FLOORING FOR ALL RESTROOMS AND NEW TILE WALLS FOR ALL WET WALLS, INCLUDING SHOWERS.
5. INSTALL SONIC / ULTRASONIC PIGEON REPELLENT DEVICES AT ALL EXTERIOR OVERHEAD DOORS. UPGRADE EXISTING PIGEON DETERRENT DEVICES AS REQUIRED.

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NOT FOR CONSTRUCTION

Drawing Title

FLOOR PLAN - FIRST FLOOR

Sheet No. A 2.11

Scale: 1/8" = 1'-0"

Original Sheet Size: 30" x 42"

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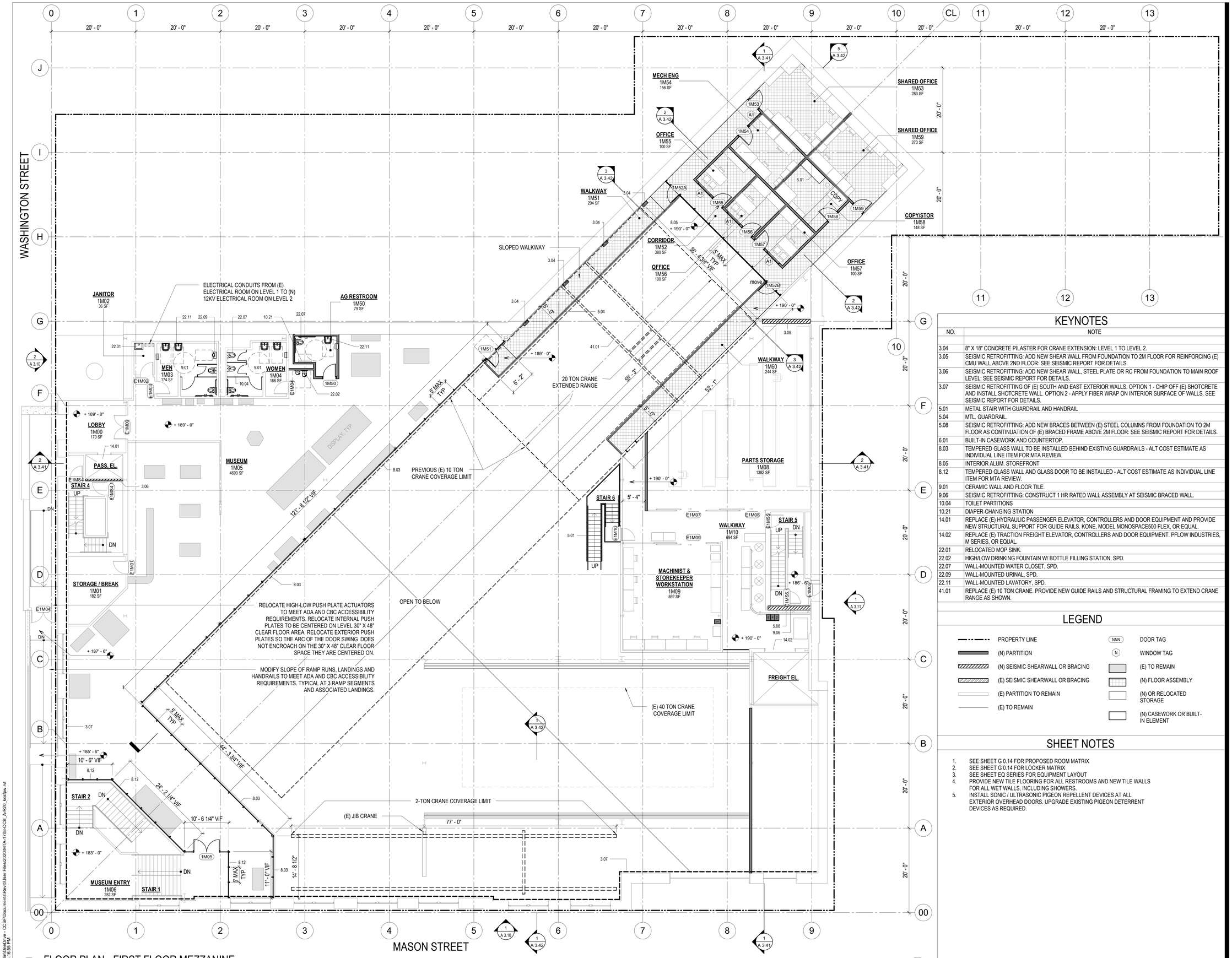

1 FLOOR PLAN - FIRST FLOOR MEZZANINE
1/8" = 1'-0"

KEYNOTES

NO.	NOTE
3.04	8" X 18" CONCRETE PILASTER FOR CRANE EXTENSION: LEVEL 1 TO LEVEL 2.
3.05	SEISMIC RETROFITTING: ADD NEW SHEAR WALL FROM FOUNDATION TO 2M FLOOR FOR REINFORCING (E) CMU WALL ABOVE 2ND FLOOR: SEE SEISMIC REPORT FOR DETAILS.
3.06	SEISMIC RETROFITTING: ADD NEW SHEAR WALL, STEEL PLATE OR RC FROM FOUNDATION TO MAIN ROOF LEVEL: SEE SEISMIC REPORT FOR DETAILS.
3.07	SEISMIC RETROFITTING OF (E) SOUTH AND EAST EXTERIOR WALLS. OPTION 1 - CHIP OFF (E) SHOTCRETE AND INSTALL SHOTCRETE WALL. OPTION 2 - APPLY FIBER WRAP ON INTERIOR SURFACE OF WALLS. SEE SEISMIC REPORT FOR DETAILS.
5.01	METAL STAIR WITH GUARDRAIL AND HANDRAIL
5.04	MTL. GUARDRAIL.
5.08	SEISMIC RETROFITTING: ADD NEW BRACES BETWEEN (E) STEEL COLUMNS FROM FOUNDATION TO 2M FLOOR AS CONTINUATION OF (E) BRACED FRAME ABOVE 2M FLOOR: SEE SEISMIC REPORT FOR DETAILS.
6.01	BUILT-IN CASEWORK AND COUNTERTOP.
8.03	TEMPERED GLASS WALL TO BE INSTALLED BEHIND EXISTING GUARDRAILS - ALT COST ESTIMATE AS INDIVIDUAL LINE ITEM FOR MTA REVIEW.
8.05	INTERIOR ALUM. STOREFRONT
8.12	TEMPERED GLASS WALL AND GLASS DOOR TO BE INSTALLED - ALT COST ESTIMATE AS INDIVIDUAL LINE ITEM FOR MTA REVIEW.
9.01	CERAMIC WALL AND FLOOR TILE.
9.06	SEISMIC RETROFITTING: CONSTRUCT 1 HR RATED WALL ASSEMBLY AT SEISMIC BRACED WALL.
10.04	TOILET PARTITIONS
10.21	DIAPER-CHANGING STATION
14.01	REPLACE (E) HYDRAULIC PASSENGER ELEVATOR, CONTROLLERS AND DOOR EQUIPMENT AND PROVIDE NEW STRUCTURAL SUPPORT FOR GUIDE RAILS. KONE, MODEL MONOSPACE500 FLEX, OR EQUAL.
14.02	REPLACE (E) TRACTION FREIGHT ELEVATOR, CONTROLLERS AND DOOR EQUIPMENT. PFLOW INDUSTRIES, M SERIES, OR EQUAL.
22.01	RELOCATED MOP SINK.
22.02	HIGH/LOW DRINKING FOUNTAIN W/ BOTTLE FILLING STATION, SPD.
22.07	WALL-MOUNTED WATER CLOSET, SPD.
22.09	WALL-MOUNTED URINAL, SPD.
22.11	WALL-MOUNTED LAVATORY, SPD.
41.01	REPLACE (E) 10 TON CRANE. PROVIDE NEW GUIDE RAILS AND STRUCTURAL FRAMING TO EXTEND CRANE RANGE AS SHOWN.

LEGEND

- PROPERTY LINE
- (N) PARTITION
- (N) SEISMIC SHEARWALL OR BRACING
- (E) SEISMIC SHEARWALL OR BRACING
- (E) PARTITION TO REMAIN
- (E) TO REMAIN
- NNN DOOR TAG
- N WINDOW TAG
- (E) TO REMAIN
- (N) FLOOR ASSEMBLY
- (N) OR RELOCATED STORAGE
- (N) CASEWORK OR BUILT-IN ELEMENT

SHEET NOTES

1. SEE SHEET G 0.14 FOR PROPOSED ROOM MATRIX
2. SEE SHEET G 0.14 FOR LOCKER MATRIX
3. SEE SHEET EQ SERIES FOR EQUIPMENT LAYOUT
4. PROVIDE NEW TILE FLOORING FOR ALL RESTROOMS AND NEW TILE WALLS FOR ALL WET WALLS, INCLUDING SHOWERS.
5. INSTALL SONIC / ULTRASONIC PIGEON REPELLENT DEVICES AT ALL EXTERIOR OVERHEAD DOORS. UPGRADE EXISTING PIGEON DETERRENT DEVICES AS REQUIRED.

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No.	Date	Revisions
	12/17/21	DRAFT MASTER PLAN
	06/30/22	FINAL MASTER PLAN

PM
PA EunJoo Cho
Drawn EunJoo Cho
Checked JD/KL
Checker

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Drawing Title

FLOOR PLAN - FIRST FLOOR MEZZANINE

Sheet No. A 2.12

Scale: 1/8" = 1'-0"

Original Sheet Size: 30" x 42"

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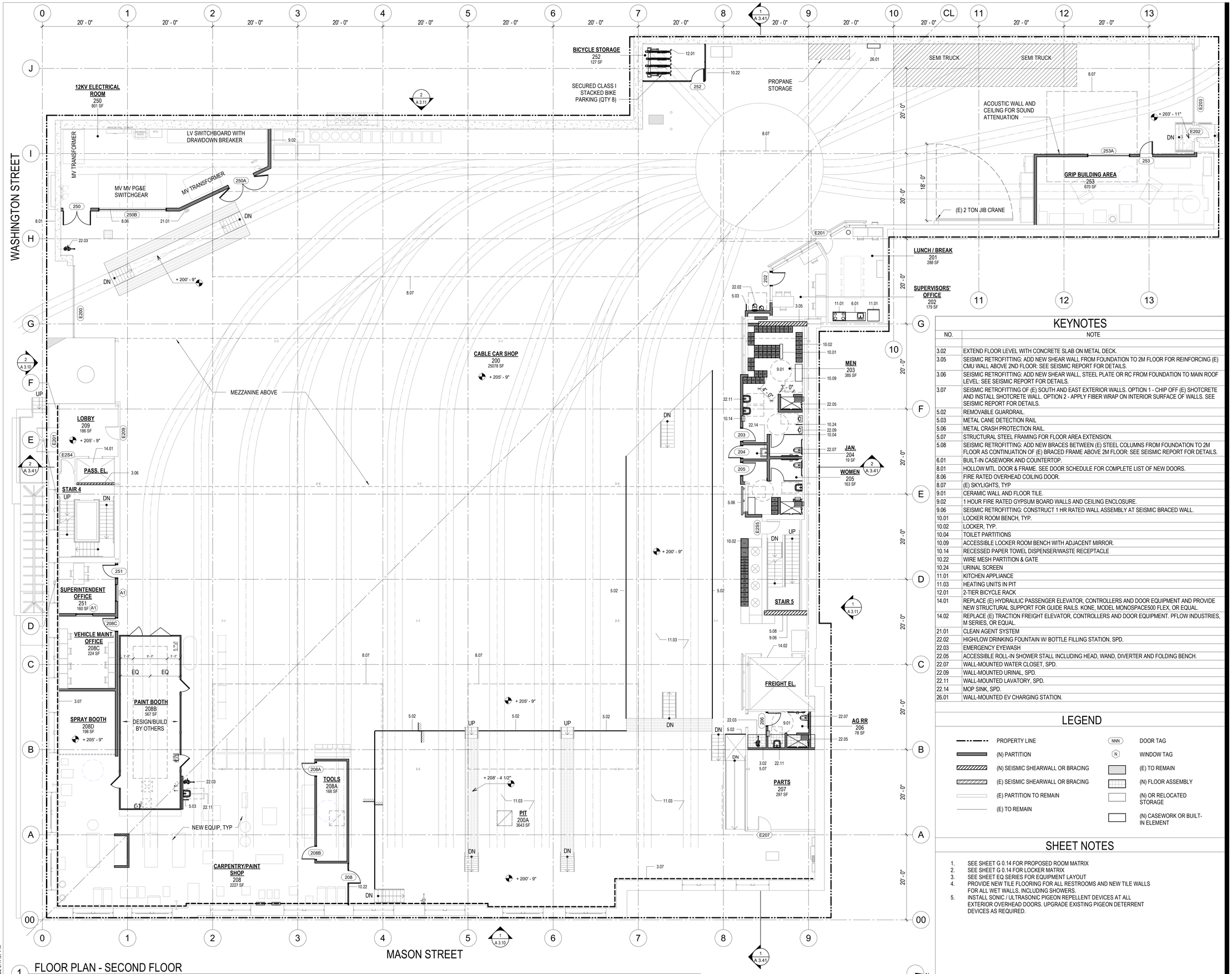

1 FLOOR PLAN - SECOND FLOOR
1/8" = 1'-0"

KEYNOTES

NO.	NOTE
3.02	EXTEND FLOOR LEVEL WITH CONCRETE SLAB ON METAL DECK.
3.05	SEISMIC RETROFITTING: ADD NEW SHEAR WALL FROM FOUNDATION TO 2M FLOOR FOR REINFORCING (E) CMU WALL ABOVE 2ND FLOOR: SEE SEISMIC REPORT FOR DETAILS.
3.06	SEISMIC RETROFITTING: ADD NEW SHEAR WALL, STEEL PLATE OR RC FROM FOUNDATION TO MAIN ROOF LEVEL: SEE SEISMIC REPORT FOR DETAILS.
3.07	SEISMIC RETROFITTING OF (E) SOUTH AND EAST EXTERIOR WALLS. OPTION 1 - CHIP OFF (E) SHOTCRETE AND INSTALL SHOTCRETE WALL. OPTION 2 - APPLY FIBER WRAP ON INTERIOR SURFACE OF WALLS. SEE SEISMIC REPORT FOR DETAILS.
5.02	REMOVABLE GUARDRAIL.
5.03	METAL CANE DETECTION RAIL
5.06	METAL CRASH PROTECTION RAIL.
5.07	STRUCTURAL STEEL FRAMING FOR FLOOR AREA EXTENSION.
5.08	SEISMIC RETROFITTING: ADD NEW BRACES BETWEEN (E) STEEL COLUMNS FROM FOUNDATION TO 2M FLOOR AS CONTINUATION OF (E) BRACED FRAME ABOVE 2M FLOOR: SEE SEISMIC REPORT FOR DETAILS.
6.01	BUILT-IN CASEWORK AND COUNTERTOP.
8.01	HOLLOW MTL. DOOR & FRAME. SEE DOOR SCHEDULE FOR COMPLETE LIST OF NEW DOORS.
8.06	FIRE RATED OVERHEAD COILING DOOR.
8.07	(E) SKYLIGHTS, TYP
9.01	CERAMIC WALL AND FLOOR TILE.
9.02	1 HOUR FIRE RATED GYPSUM BOARD WALLS AND CEILING ENCLOSURE.
9.06	SEISMIC RETROFITTING: CONSTRUCT 1 HR RATED WALL ASSEMBLY AT SEISMIC BRACED WALL.
10.01	LOCKER ROOM BENCH, TYP.
10.02	LOCKER, TYP.
10.04	TOILET PARTITIONS
10.09	ACCESSIBLE LOCKER ROOM BENCH WITH ADJACENT MIRROR.
10.14	RECESSED PAPER TOWEL DISPENSER/WASTE RECEPTACLE
10.22	WIRE MESH PARTITION & GATE
10.24	URINAL SCREEN
11.01	KITCHEN APPLIANCE
11.03	HEATING UNITS IN PIT
12.01	2-TIER BICYCLE RACK
14.01	REPLACE (E) HYDRAULIC PASSENGER ELEVATOR, CONTROLLERS AND DOOR EQUIPMENT AND PROVIDE NEW STRUCTURAL SUPPORT FOR GUIDE RAILS. KONE, MODEL MONOSPACE500 FLEX, OR EQUAL.
14.02	REPLACE (E) TRACTION FREIGHT ELEVATOR, CONTROLLERS AND DOOR EQUIPMENT. PFLOW INDUSTRIES, M SERIES, OR EQUAL.
21.01	CLEAN AGENT SYSTEM
22.02	HIGH/LOW DRINKING FOUNTAIN W/ BOTTLE FILLING STATION, SPD.
22.03	EMERGENCY EYEWASH
22.05	ACCESSIBLE ROLL-IN SHOWER STALL INCLUDING HEAD, WAND, DIVERTER AND FOLDING BENCH.
22.07	WALL-MOUNTED WATER CLOSET, SPD.
22.09	WALL-MOUNTED URINAL, SPD.
22.11	WALL-MOUNTED LAVATORY, SPD.
22.14	MOP SINK, SPD.
26.01	WALL-MOUNTED EV CHARGING STATION.

LEGEND

- PROPERTY LINE
- (N) PARTITION
- (N) SEISMIC SHEARWALL OR BRACING
- (E) SEISMIC SHEARWALL OR BRACING
- (E) PARTITION TO REMAIN
- (E) TO REMAIN
- NNN DOOR TAG
- N WINDOW TAG
- (E) TO REMAIN
- (N) FLOOR ASSEMBLY
- (N) OR RELOCATED STORAGE
- (N) CASEWORK OR BUILT-IN ELEMENT

SHEET NOTES

1. SEE SHEET G 0.14 FOR PROPOSED ROOM MATRIX
2. SEE SHEET G 0.14 FOR LOCKER MATRIX
3. SEE SHEET EQ SERIES FOR EQUIPMENT LAYOUT
4. PROVIDE NEW TILE FLOORING FOR ALL RESTROOMS AND NEW TILE WALLS FOR ALL WET WALLS, INCLUDING SHOWERS.
5. INSTALL SONIC / ULTRASONIC PIGEON REPELLENT DEVICES AT ALL EXTERIOR OVERHEAD DOORS. UPGRADE EXISTING PIGEON DETERRENT DEVICES AS REQUIRED.

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	06/30/22	FINAL MASTER PLAN

PM	EunJoo Cho
PA	EunJoo Cho
Drawn	JD/KL
Checked	Checker

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Drawing Title

FLOOR PLAN - SECOND FLOOR

Sheet No. A 2.13

Scale: 1/8" = 1'-0"

Original Sheet Size: 30" x 42"

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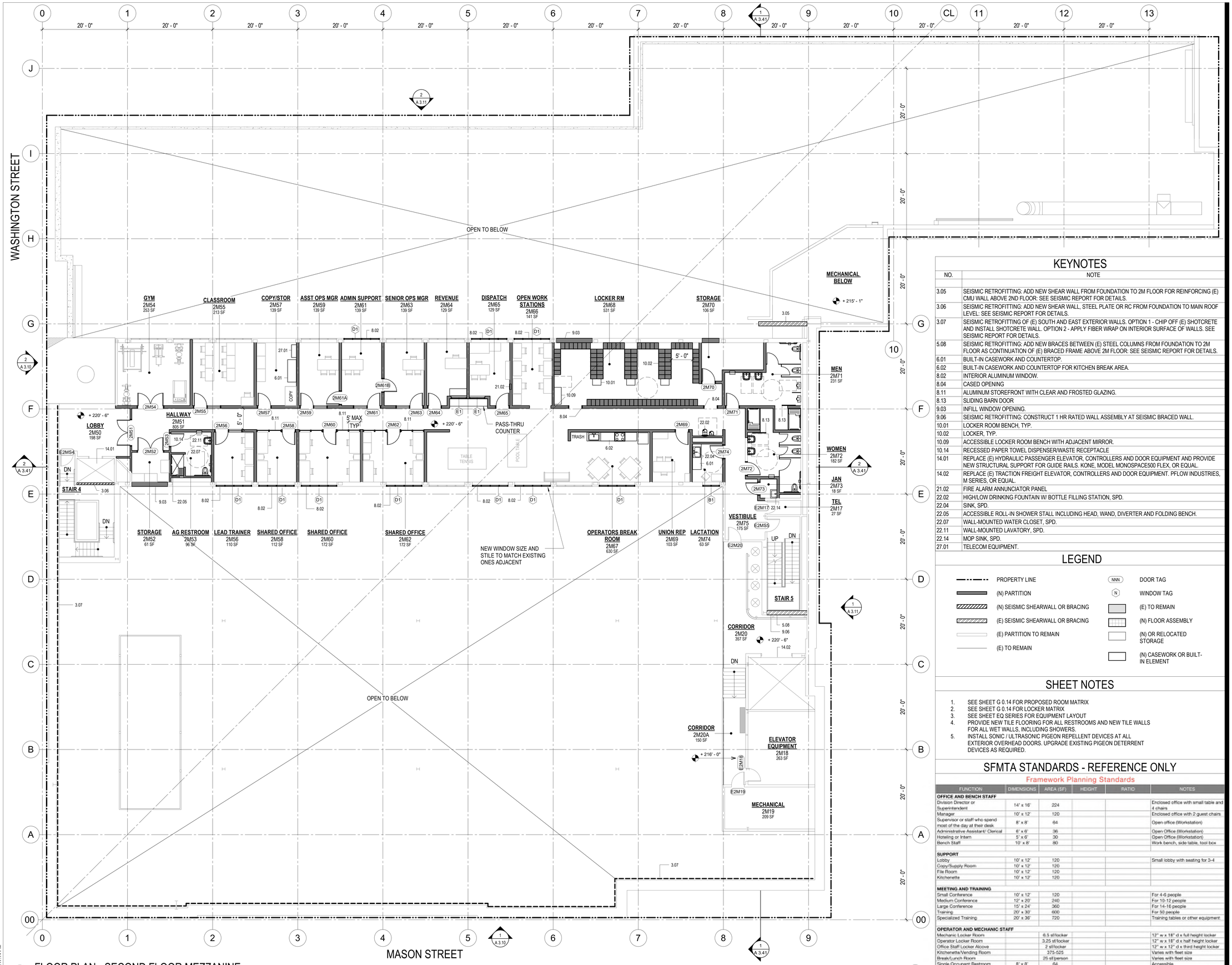

1 FLOOR PLAN - SECOND FLOOR MEZZANINE
1/8" = 1'-0"

KEYNOTES

NO.	NOTE
3.05	SEISMIC RETROFITTING: ADD NEW SHEAR WALL FROM FOUNDATION TO 2M FLOOR FOR REINFORCING (E) CMU WALL ABOVE 2ND FLOOR: SEE SEISMIC REPORT FOR DETAILS.
3.06	SEISMIC RETROFITTING: ADD NEW SHEAR WALL, STEEL PLATE OR RC FROM FOUNDATION TO MAIN ROOF LEVEL: SEE SEISMIC REPORT FOR DETAILS.
3.07	SEISMIC RETROFITTING OF (E) SOUTH AND EAST EXTERIOR WALLS. OPTION 1 - CHIP OFF (E) SHOTCRETE AND INSTALL SHOTCRETE WALL. OPTION 2 - APPLY FIBER WRAP ON INTERIOR SURFACE OF WALLS. SEE SEISMIC REPORT FOR DETAILS.
5.08	SEISMIC RETROFITTING: ADD NEW BRACES BETWEEN (E) STEEL COLUMNS FROM FOUNDATION TO 2M FLOOR AS CONTINUATION OF (E) BRACED FRAME ABOVE 2M FLOOR: SEE SEISMIC REPORT FOR DETAILS.
6.01	BUILT-IN CASEWORK AND COUNTERTOP.
6.02	BUILT-IN CASEWORK AND COUNTERTOP FOR KITCHEN BREAK AREA.
8.02	INTERIOR ALUMINUM WINDOW.
8.04	CASED OPENING
8.11	ALUMINUM STOREFRONT WITH CLEAR AND FROSTED GLAZING.
8.13	SLIDING BARN DOOR
9.03	INFILL WINDOW OPENING.
9.06	SEISMIC RETROFITTING: CONSTRUCT 1 HR RATED WALL ASSEMBLY AT SEISMIC BRACED WALL.
10.01	LOCKER ROOM BENCH, TYP.
10.02	LOCKER, TYP.
10.09	ACCESSIBLE LOCKER ROOM BENCH WITH ADJACENT MIRROR.
10.14	RECESSED PAPER TOWEL DISPENSER/WASTE RECEPTACLE
14.01	REPLACE (E) HYDRAULIC PASSENGER ELEVATOR, CONTROLLERS AND DOOR EQUIPMENT AND PROVIDE NEW STRUCTURAL SUPPORT FOR GUIDE RAILS. KONE, MODEL MONOSPACE500 FLEX, OR EQUAL.
14.02	REPLACE (E) TRACTION FREIGHT ELEVATOR, CONTROLLERS AND DOOR EQUIPMENT. PFLOW INDUSTRIES, M SERIES, OR EQUAL.
21.02	FIRE ALARM ANNUNCIATOR PANEL
22.02	HIGH/LOW DRINKING FOUNTAIN W/ BOTTLE FILLING STATION, SPD.
22.04	SINK, SPD.
22.05	ACCESSIBLE ROLL-IN SHOWER STALL INCLUDING HEAD, WAND, DIVERTER AND FOLDING BENCH.
22.07	WALL-MOUNTED WATER CLOSET, SPD.
22.11	WALL-MOUNTED LAVATORY, SPD.
22.14	MOP SINK, SPD.
27.01	TELECOM EQUIPMENT.

LEGEND

- PROPERTY LINE
- (N) PARTITION
- (N) SEISMIC SHEARWALL OR BRACING
- (E) SEISMIC SHEARWALL OR BRACING
- (E) PARTITION TO REMAIN
- (E) TO REMAIN
- NNN DOOR TAG
- N WINDOW TAG
- (E) TO REMAIN
- (N) FLOOR ASSEMBLY
- (N) OR RELOCATED STORAGE
- (N) CASEWORK OR BUILT-IN ELEMENT

SHEET NOTES

1. SEE SHEET G 0.14 FOR PROPOSED ROOM MATRIX
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SFMTA STANDARDS - REFERENCE ONLY

Framework Planning Standards

FUNCTION	DIMENSIONS	AREA (SF)	HEIGHT	RATIO	NOTES
OFFICE AND BENCH STAFF					
Division Director or Superintendent	14' x 16'	224			Enclosed office with small table and 4 chairs
Manager	10' x 12'	120			Enclosed office with 2 guest chairs
Supervisor or staff who spend most of the day at their desk	8' x 8'	64			Open office (Workstation)
Administrative Assistant/ Clerical	6' x 6'	36			Open Office (Workstation)
Hoteling or Intern	5' x 6'	30			Open Office (Workstation)
Bench Staff	10' x 8'	80			Work bench, side table, tool box
SUPPORT					
Lobby	10' x 12'	120			Small lobby with seating for 3-4
Copy/Supply Room	10' x 12'	120			
File Room	10' x 12'	120			
Kitchenette	10' x 12'	120			
MEETING AND TRAINING					
Small Conference	10' x 12'	120			For 4-6 people
Medium Conference	12' x 20'	240			For 10-12 people
Large Conference	15' x 24'	360			For 14-16 people
Training	20' x 30'	600			For 50 people
Specialized Training	20' x 36'	720			Training tables or other equipment
OPERATOR AND MECHANIC STAFF					
Mechanic Locker Room		6.5 sf/locker			12" w x 18" d x full height locker
Operator Locker Room		3.25 sf/locker			12" w x 18" d x half height locker
Office Staff Locker Alcove		2 sf/locker			12" w x 12" d x third height locker
Kitchenette/Vending Room		375-525			Varies with fleet size
Breaks/Lunch Room		25 sf/person			Varies with fleet size
Single Occupant Restroom	8' x 8'	64			Accessible
Single Occupant Restrm/Shower	10' x 11'	110			Accessible with a couple lockers
BUS MAINTENANCE, FUEL AND WASH, & STAGING					
Maintenance					

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PA EunJoo Cho
Drawn JD/KL
Checked Checker

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Drawing Title

FLOOR PLAN - SECOND FLOOR MEZZANINE

Sheet No. A 2.14

Scale: 1/8" = 1'-0"

Original Sheet Size: 30" x 42"

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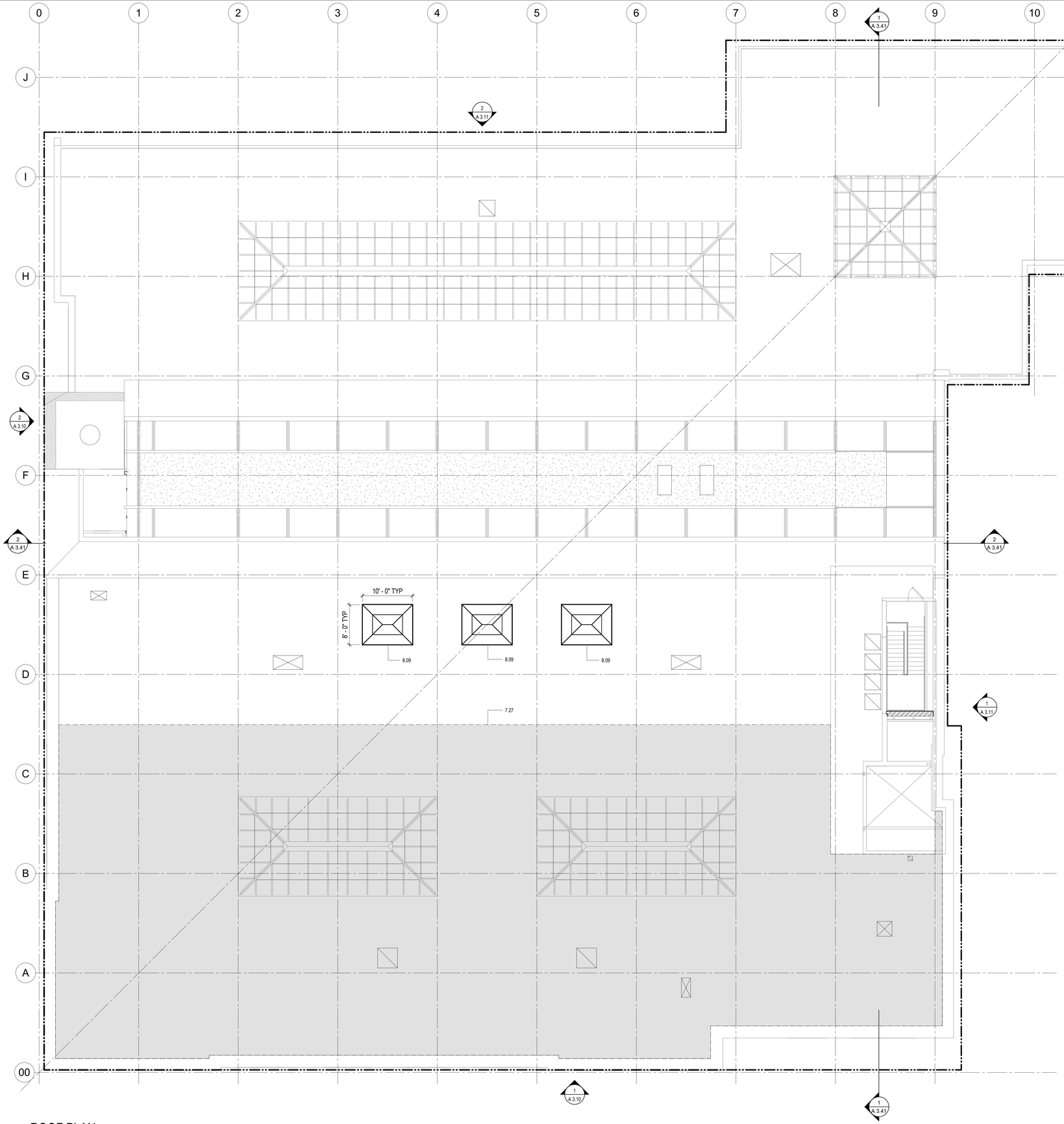

1 ROOF PLAN
1/8" = 1'-0"

SHEET NOTES

1. SELECTIVE REPLACEMENT OF ROOFTOP MECHANICAL EQUIPMENT TO ACCOMMODATE HVAC UPGRADES.
2. IN-KIND REPLACEMENT OF ENTIRE ROOFING SYSTEM (PRIMARY ROOF: FLAT, BUILT-UP MEMBRANE; SECONDARY ROOF: SHEET METAL; BOTH CONSTRUCTED IN 1984), INCLUDING ROOF FLASHINGS AND PARAPET WALL COPINGS.
3. IN-KIND REPLACEMENT OF EXISTING DETERIORATED COPPER FLASHING.

KEYNOTES

NO.	NOTE
7.27	SEISMIC RETROFITTING: STRENGTHEN ROOF DIAPHRAGM IN HATCHED AREAS. UPGRADE (E) DIAGONAL BRACES AND ADD NEW BRACES, INCLUDING (E) SKYLIGHT AREAS. SEE SEISMIC REPORT FOR DETAILS.
8.09	PROVIDE NEW SKYLIGHT IN EXISTING ROOF.

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Drawing Title

ROOF PLAN

Sheet No. A 2.15

Scale: 1/8" = 1'-0"

Original Sheet Size: 30" x 42"

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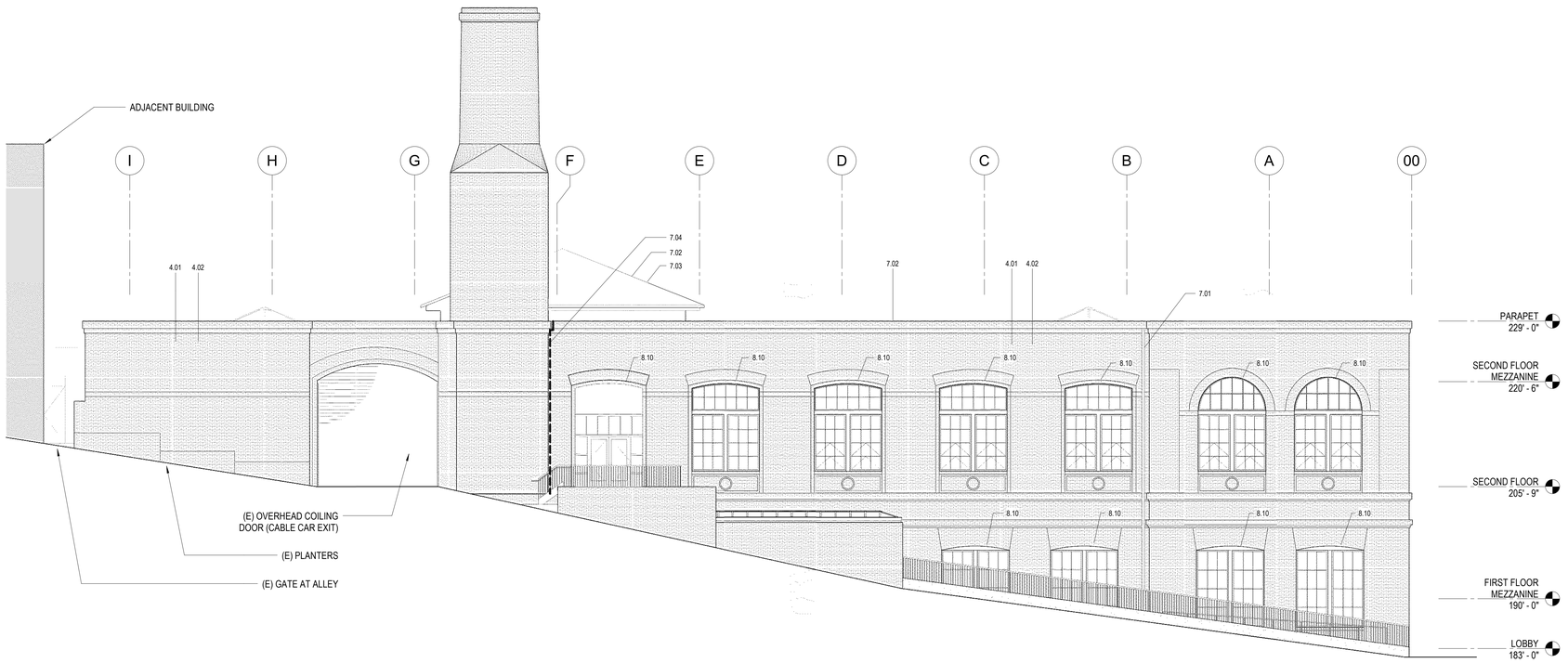
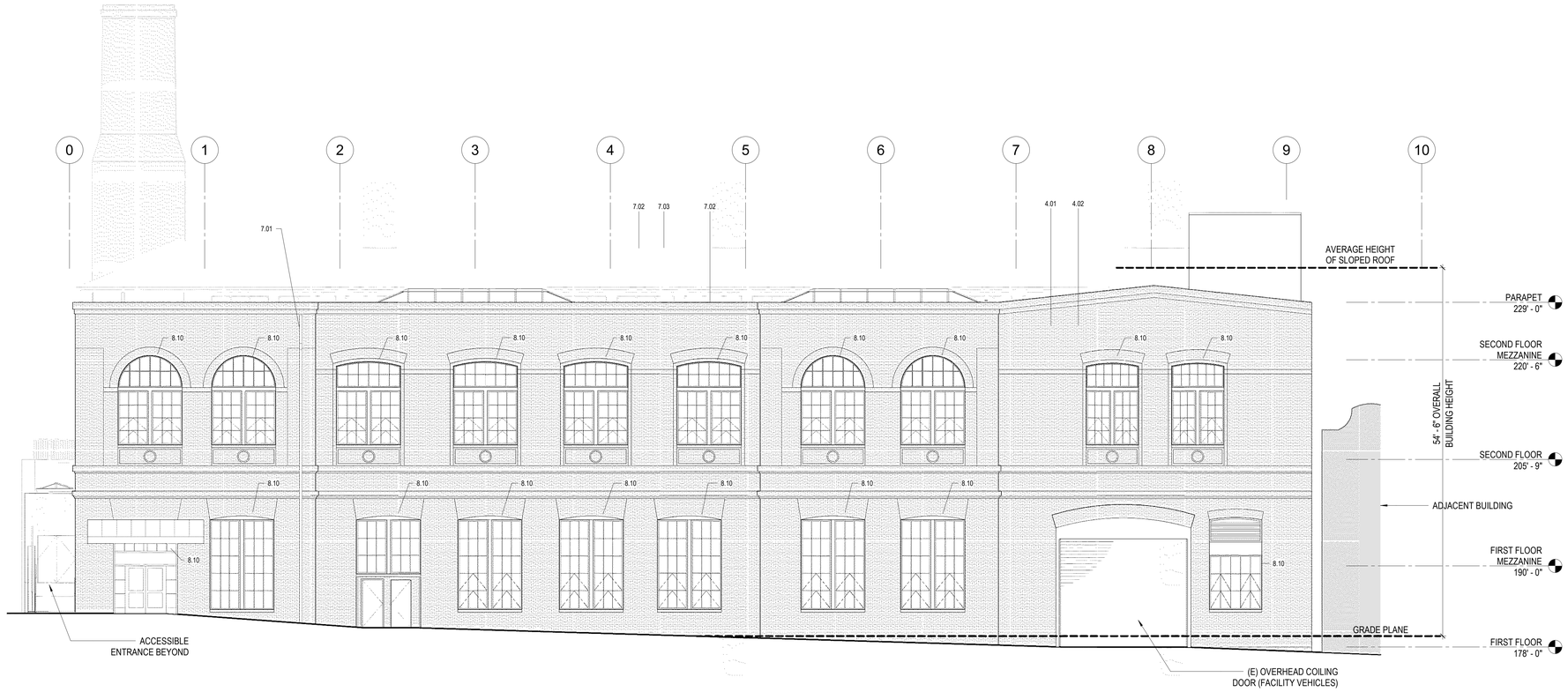
KEYNOTES

NO.	NOTE
4.01	BRICK REPOINTING AS NEEDED TO SECRETARY OF INTERIOR STANDARDS.
4.02	IN-KIND REPLACEMENT OF MISSING OR DAMAGED BRICKS.
7.01	ADDITION OF MISSING METAL DOWNSPOUTS TO FACADE CONNECTING TO NEW UNDER-SIDEWALK DRAINS, TO ROADWAY GUTTER OR TO AN EXISTING SEWER LATERAL.
7.02	IN-KIND REPLACEMENT OF ENTIRE ROOFING SYSTEM (PRIMARY ROOF: FLAT, BUILT-UP MEMBRANE; SECONDARY ROOF: SHEET METAL; BOTH CONSTRUCTED IN 1984), INCLUDING ROOF FLASHINGS AND PARAPET WALL COPINGS.
7.03	IN-KIND REPLACEMENT OF EXISTING DETERIORATED COPPER FLASHING.
7.04	SEISMIC RETROFITTING: EXPANSION JOINT BETWEEN SOUTH MASONRY WALL AND CHIMNEY ABOVE L2: SEE SEISMIC REPORT FOR DETAILS.
8.10	REPAIR EXISTING WINDOWS TO SECRETARY OF INTERIOR STANDARDS.



2 SOUTH BUIDLING ELEVATION - WASHINGTON STREET
1/8" = 1'-0"



1 EAST BUILDING ELEVATION - MASON STREET
1/8" = 1'-0"

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PA EunJoo Cho
Drawn Author
Checked Checker

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Drawing Title

EXTERIOR ELEVATIONS - SOUTH & EAST

Sheet No.
A 3.10
Scale: 1/8" = 1'-0"

Original Sheet Size: 30" x 42"

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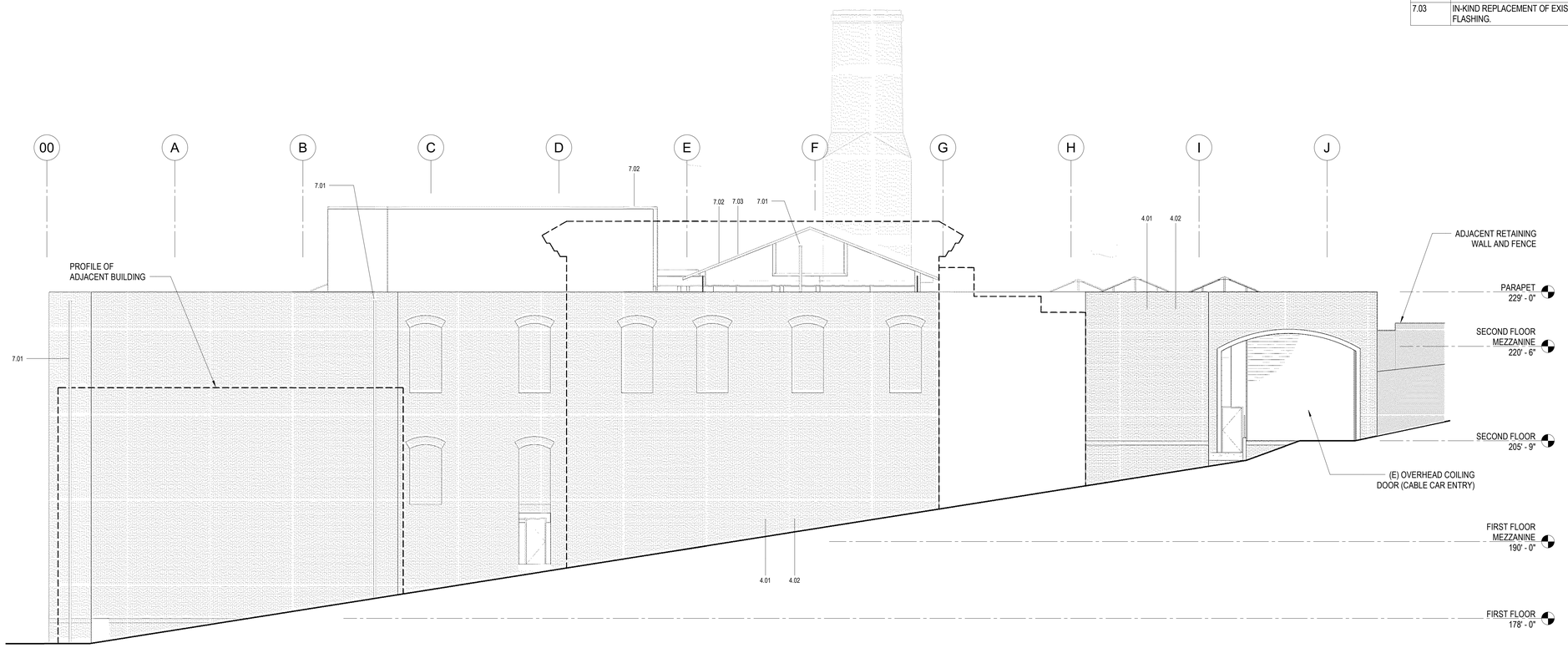
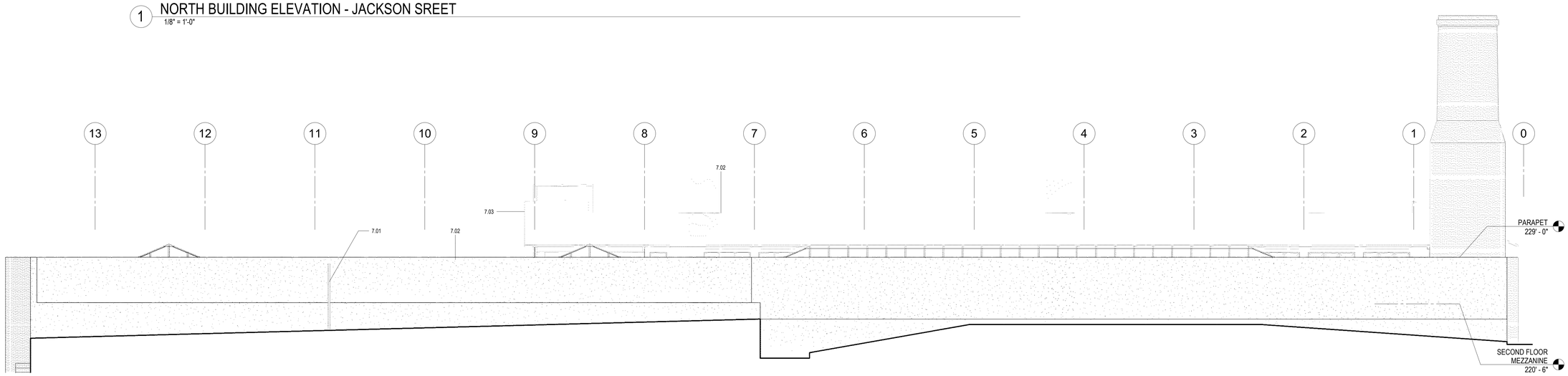
KEYNOTES

NO.	NOTE
4.01	BRICK REPOINTING AS NEEDED TO SECRETARY OF INTERIOR STANDARDS.
4.02	IN-KIND REPLACEMENT OF MISSING OR DAMAGED BRICKS.
7.01	ADDITION OF MISSING METAL DOWNSPOUTS TO FACADE CONNECTING TO NEW UNDER-SIDEWALK DRAINS, TO ROADWAY GUTTER OR TO AN EXISTING SEWER LATERAL.
7.02	IN-KIND REPLACEMENT OF ENTIRE ROOFING SYSTEM (PRIMARY ROOF: FLAT, BUILT-UP MEMBRANE; SECONDARY ROOF: SHEET METAL; BOTH CONSTRUCTED IN 1984), INCLUDING ROOF FLASHINGS AND PARAPET WALL COPINGS.
7.03	IN-KIND REPLACEMENT OF EXISTING DETERIORATED COPPER FLASHING.



1 NORTH BUILDING ELEVATION - JACKSON SREET
1/8" = 1'-0"



2 WEST BUILDING ELEVATION
1/8" = 1'-0"

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PM EunJoo Cho
PA EunJoo Cho
Drawn Author
Checked Checker

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Drawing Title

EXTERIOR ELEVATIONS - NORTH & WEST

Sheet No. A 3.11

Scale: 1/8" = 1'-0"

Original Sheet Size: 30" x 42"

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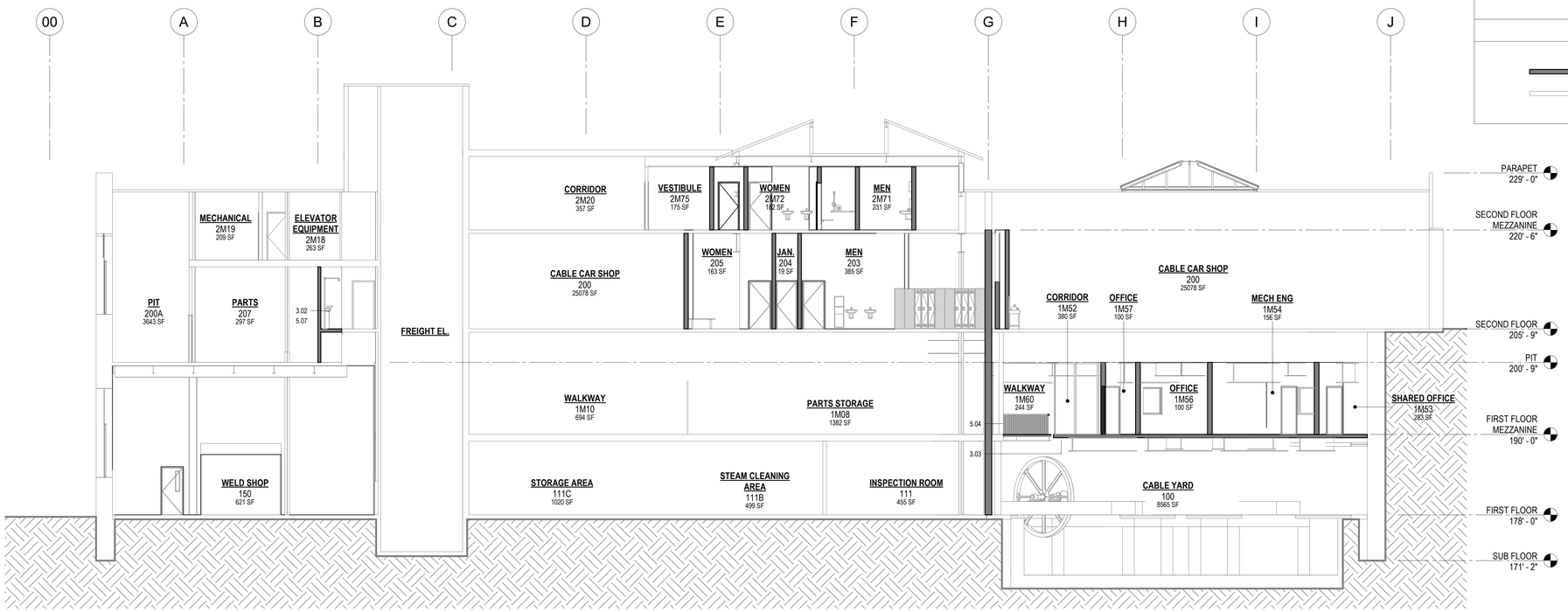
KEYNOTES

NO.	NOTE
3.02	EXTEND FLOOR LEVEL WITH CONCRETE SLAB ON METAL DECK.
3.03	CONC. SLAB ON MTL. DECK OVER EXISTING STRUCTURAL FRAMING.
5.04	MTL. GUARDRAIL.
5.07	STRUCTURAL STEEL FRAMING FOR FLOOR AREA EXTENSION.

LEGEND

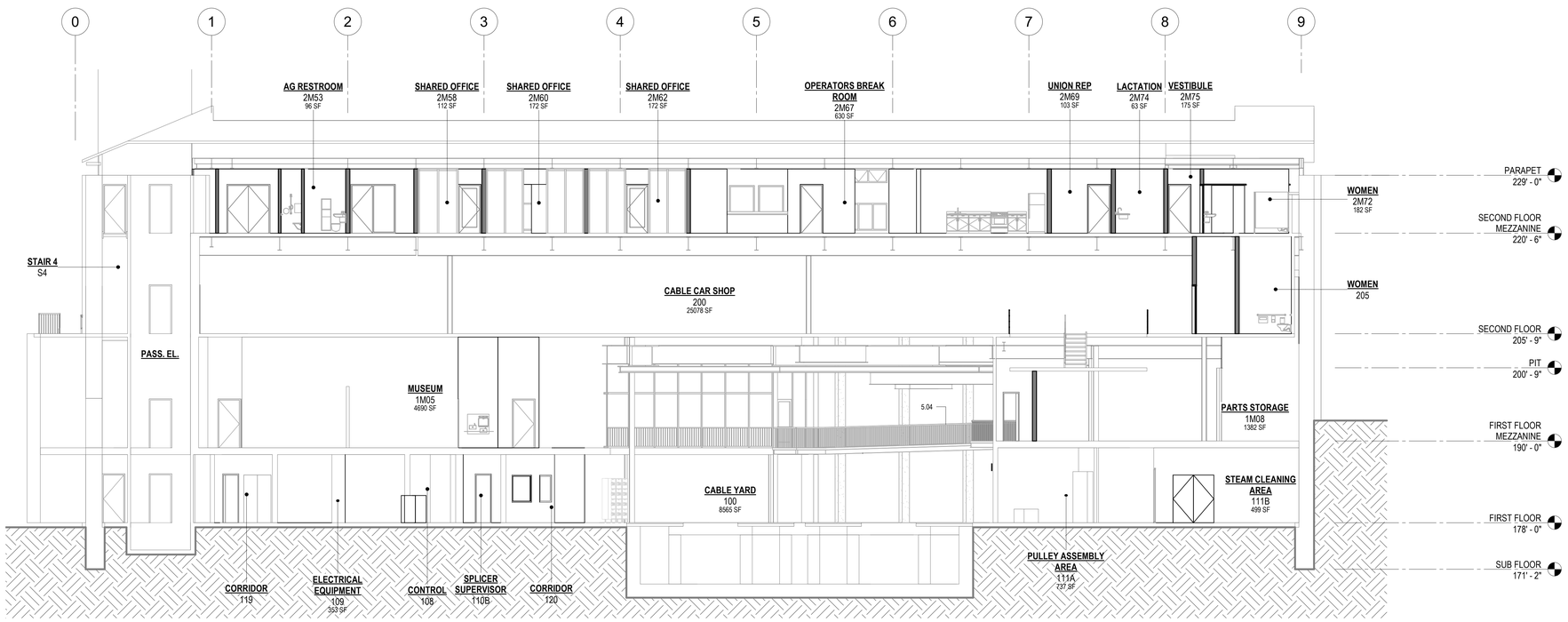
(N) PARTITION

(E) PARTITION TO REMAIN



1 E-W BUILDING SECTION FACING SOUTH (AT GL 8.5)

1/8" = 1'-0"



2 N-S BUILDING SECTION FACING WEST (AT GL E.5)

1/8" = 1'-0"

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Drawing Title

BUILDING SECTIONS

Sheet No. A 3.41

Scale: 1/8" = 1'-0"

Original Sheet Size: 30" x 42"

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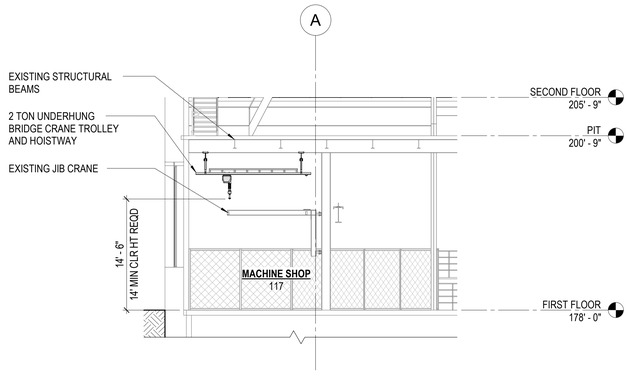
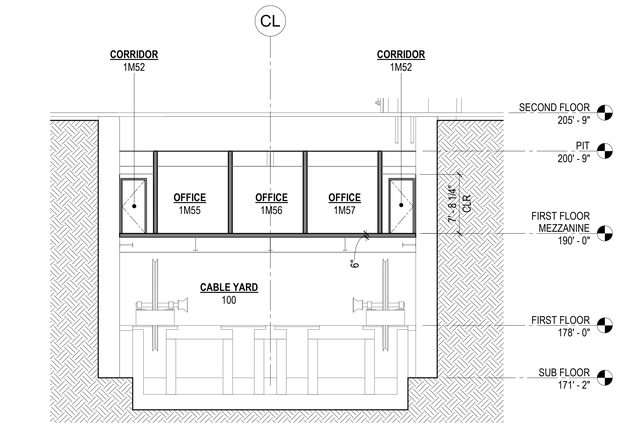
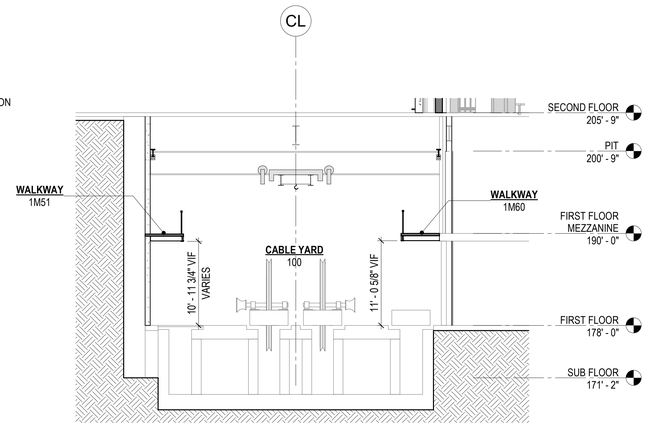


1 BUILDING SECTION AT MACHINE SHOP
1/8" = 1'-0"

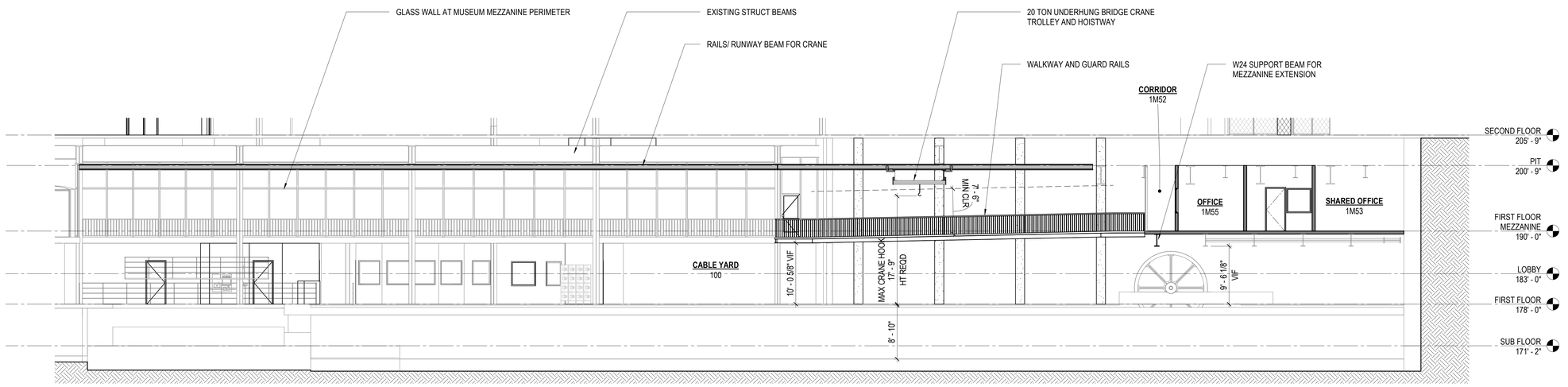




4 PHOTO - EXISTING CABLE YARD AREA
1/8" = 1'-0"

3 E-W BUILDING SECTION AT NEW WALKWAYS
1/8" = 1'-0"

2 E-W BUILDING SECTION AT NEW OFFICE ADDITION
1/8" = 1'-0"



5 BUILDING SECTION AT WALKWAY
1/8" = 1'-0"

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Cable Car Barn

1201 Mason St
San Francisco, CA 94108

Consultant

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No.	Date	Revisions
	06/30/22	FINAL MASTER PLAN

PM EunJoo Cho
PA EunJoo Cho
Drawn Author
Checked Checker

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BUILDING SECTIONS MACHINE SHOP & OFFICE

Sheet No. A 3.42

Scale: 1/8" = 1'-0"

Original Sheet Size: 30" x 42"

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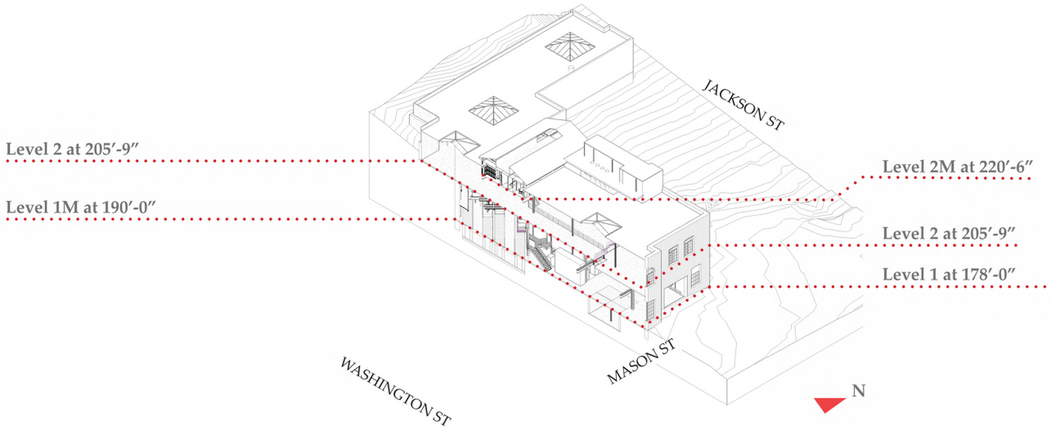
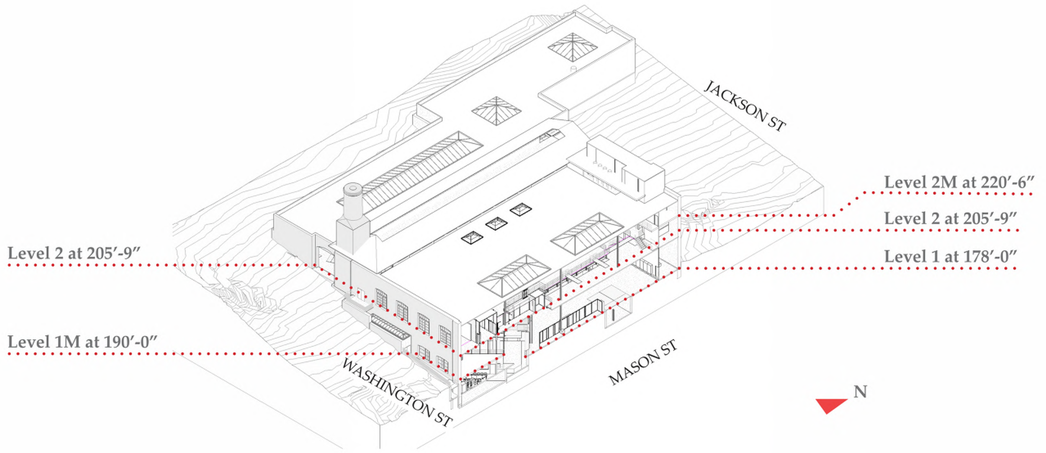
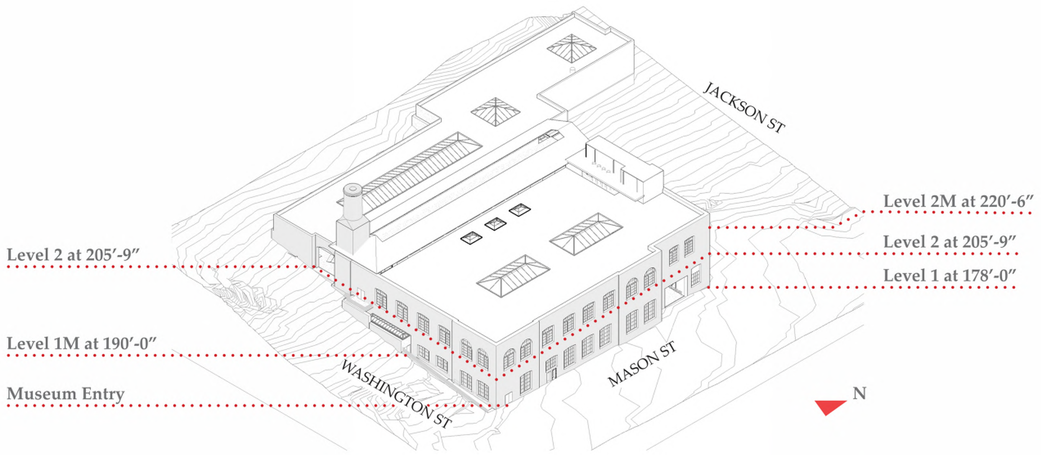


3 AXON SECTION 2
N.T.S.



1 AXON SECTION 1
N.T.S.



2 AXON VIEW
N.T.S.

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3D VIEWS - EXTERIOR

Sheet No. A 3.51

Scale: NO SCALE

Original Sheet Size: 30" x 42"

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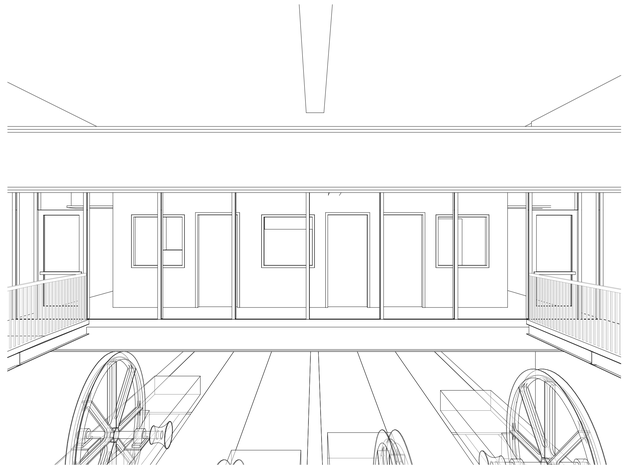
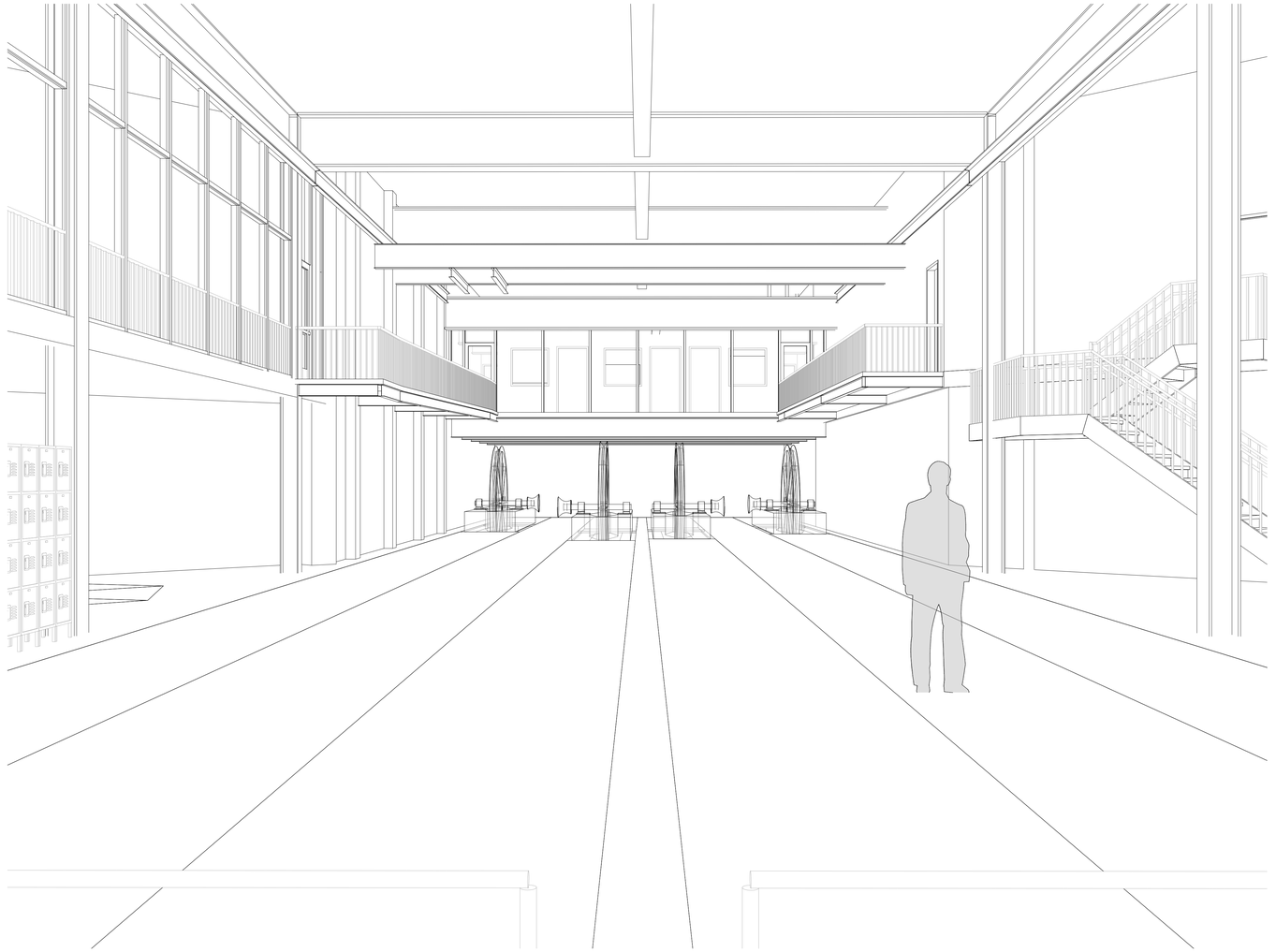
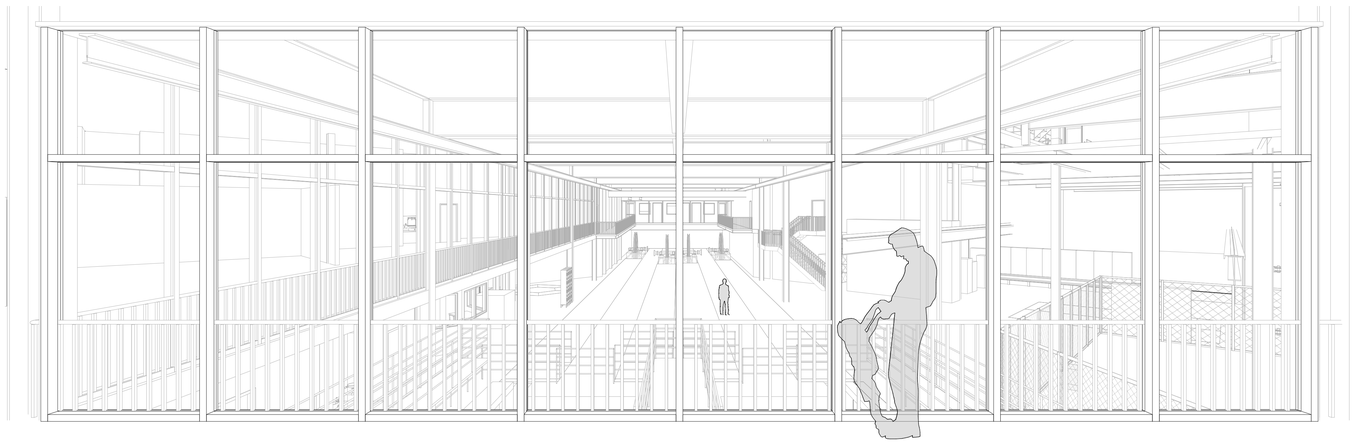


3 3D VIEW - FIRST FLOOR MEZZANINE OFFICE ADDITION

4 3D VIEW - FIRST FLOOR MEZZANINE OFFICE ADDITION HALLWAY



1 3D VIEW - FIRST FLOOR LOOKING TOWARDS OFFICE ADDITION



2 3D VIEW - FIRST FLOOR MEZZANINE MUSEUM LOOKING TOWARDS OFFICE ADDITION

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Drawing Title

3D VIEWS - INTERIOR

Sheet No. A 3.52

Scale: NO SCALE

Original Sheet Size: 30" x 42"

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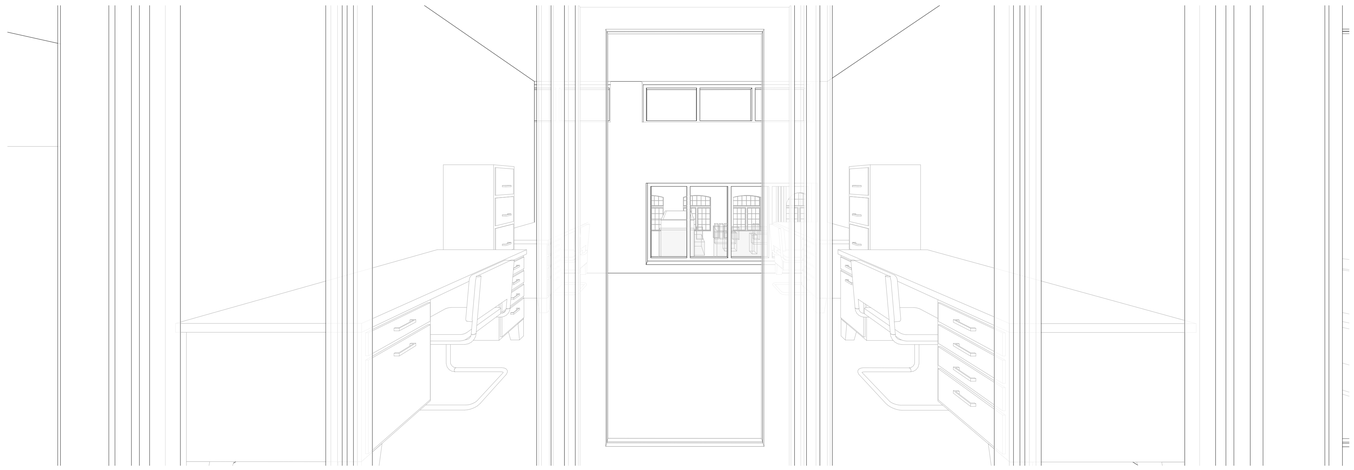
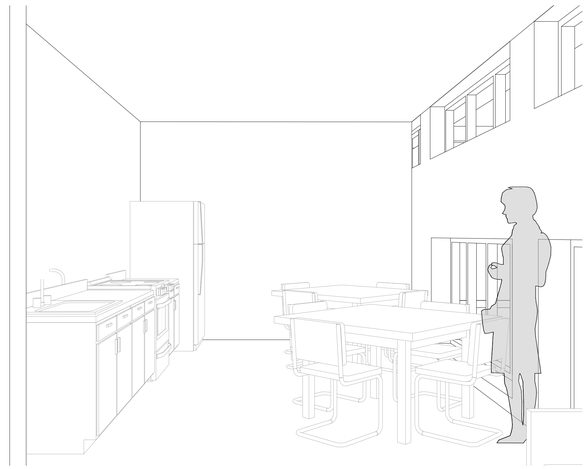
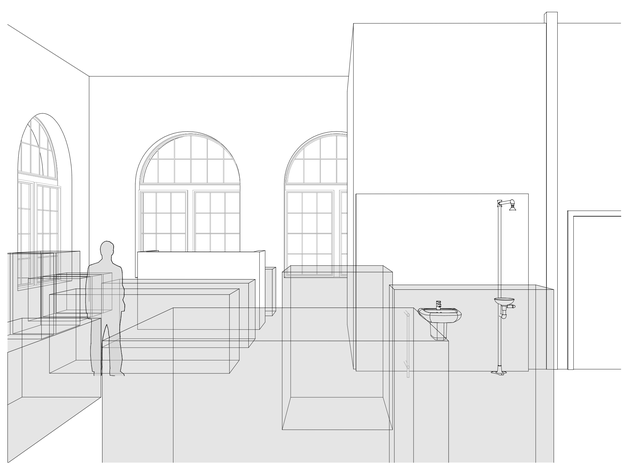


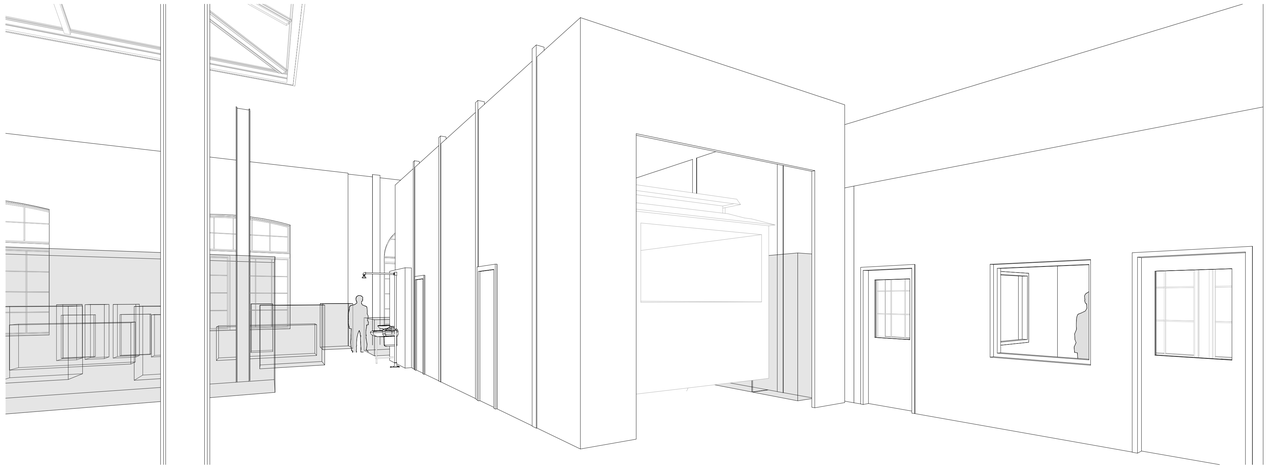
4 3D VIEW - SECOND FLOOR MEZZANINE SHARED OFFICE



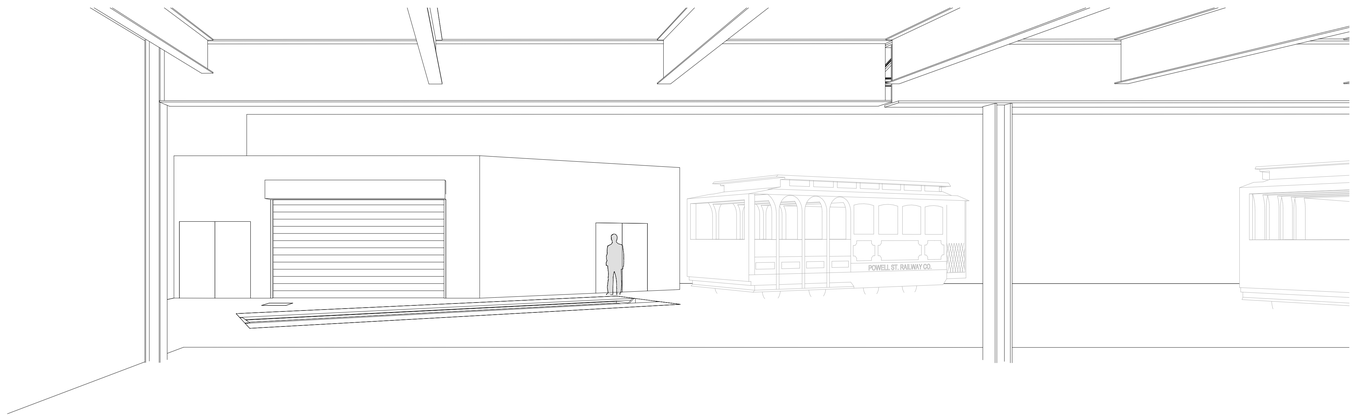
1 3D VIEW - SECOND FLOOR MEZZANINE BREAK ROOM



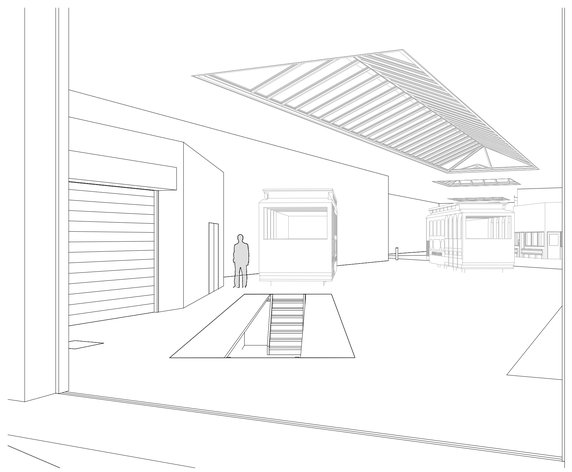
5 3D VIEW - SECOND FLOOR CARPENTRY



2 3D VIEW - SECOND FLOOR CARPENTRY / PAINT ROOM / VEHICLE MAINT. & SUPERINTENDENT OFFICE



6 3D VIEW - SECOND FLOOR 12KV ELECTRICAL ROOM



3 3D VIEW - SECOND FLOOR WASHINGTON ST ENTRANCE

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	06/30/22	FINAL MASTER PLAN

PM EunJoo Cho
PA EunJoo Cho
Drawn Author
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3D VIEWS - INTERIOR

Sheet No. A 3.53

Scale: NO SCALE

Original Sheet Size: 30" x 42"

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DOOR SCHEDULE - EXISTING, NON-CONFORMING

DOOR NO.	ROOM NO.	ROOM NAME	DOOR SIZE WIDTH	DOOR SIZE HEIGHT	DOOR SIZE THICKNESS	COMMENTS
FIRST FLOOR						
E1S4	S4	STAIR 4	3' - 0"	7' - 0"	0' - 1 3/4"	No accessible door maneuvering space
E1S5	S5	STAIR 5	3' - 0"	7' - 0"	0' - 1 3/4"	No accessible door maneuvering space
E120	120	CORRIDOR	3' - 0"	7' - 0"	0' - 1 3/4"	No accessible door maneuvering space
3						
FIRST FLOOR MEZZANINE						
E1M03	120	CORRIDOR	3' - 0"	7' - 0"	0' - 1 3/4"	Reverse door swing direction for egress; Historic and feasibility review required.
E1MS4	S4	STAIR 4	3' - 0"	7' - 0"	0' - 1 3/4"	No accessible door maneuvering space
E1MS4.1	S4	STAIR 4	3' - 0"	7' - 0"	0' - 1 3/4"	No accessible door maneuvering space
E1MS5	S5	STAIR 5	3' - 0"	7' - 0"	0' - 1 3/4"	No accessible door maneuvering space
E1MS5.1	S5	STAIR 5	3' - 0"	7' - 0"	0' - 1 3/4"	No accessible door maneuvering space
5						
SECOND FLOOR						
E2S4	S4	STAIR 4	3' - 0"	7' - 0"	0' - 1 3/4"	No accessible door maneuvering space
E2S5	S5	STAIR 5	3' - 0"	7' - 0"	0' - 1 3/4"	No accessible door maneuvering space
E202	200	CABLE CAR SHOP	3' - 0"	7' - 0"	0' - 1 3/4"	No accessible door maneuvering space
3						
SECOND FLOOR MEZZANINE						
E2MS4	S4	STAIR 4	3' - 0"	7' - 0"	0' - 1 3/4"	No accessible door maneuvering space
1						

***VERIFY ALL EXISTING DOOR AND FRAME SIZES IN FIELD.**

WINDOW SCHEDULE - NEW

WINDOW TAG	MATERIAL	OPENING WIDTH	OPENING HEIGHT	SILL HEIGHT	COMMENTS
A1	ALUM	4' - 0"	4' - 0"	3' - 0"	
B1	ALUM	4' - 0"	4' - 0"	0' - 5"	
C1	ALUM	3' - 0"	4' - 0"	3' - 0"	
D1	ALUM	8' - 5"	4' - 0"	0' - 5"	
E1	ALUM	3' - 8"	4' - 0"	3' - 0"	TRANSACTION WINDOW
V	ALUM	8' - 0"	10' - 0"		SKYLIGHT AT ROOF
Total: 24					

DOOR & FRAME SCHEDULE - NEW

DOOR NO.	ROOM NO.	ROOM NAME	DOOR TYPE	FRAME TYPE	DOOR SIZE WIDTH	DOOR SIZE HEIGHT	DOOR SIZE THICKNESS	FIRE RATING	COMMENTS
FIRST FLOOR									
105	105	MEN	F	HM; SINGLE	3' - 0"	7' - 0"	0' - 1 3/4"		
106	106	WOMEN	F	HM; SINGLE	3' - 0"	7' - 0"	0' - 1 3/4"		
107A	107A	STORAGE	F	HM; SINGLE	3' - 0"	7' - 0"	0' - 1 3/4"		
110A	110A	SPLICER OFFICE	G	HM; SINGLE	3' - 0"	7' - 0"	0' - 1 3/4"		
110B	110B	SPLICER SUPERVISOR	F	HM; SINGLE	3' - 0"	7' - 0"	0' - 1 3/4"		
111	111	INSPECTION ROOM	F	HM; PAIR	6' - 0"	7' - 0"	0' - 1 3/4"		
111A	111A	PULLEY ASSEMBLY AREA	WM1		2' - 9 1/2"	7' - 9 1/2"			
117	117	MACHINE SHOP	WM1		3' - 0"	7' - 9 1/2"			
150	150	WELD SHOP	N	HM; SINGLE	3' - 0"	7' - 0"	0' - 1 3/4"	45 MIN RATED	
150A	150	WELD SHOP	OC	NA	12' - 0"	9' - 0"	0' - 2"	45 MIN RATED	
151	151	STORAGE	F	HM; SINGLE	3' - 0"	7' - 0"	0' - 1 3/4"		
152	119	CORRIDOR	F	HM; SINGLE	3' - 0"	7' - 0"	0' - 1 3/4"		
153	153	ELEV EQUIP	F	HM; SINGLE	3' - 0"	7' - 0"	0' - 1 3/4"	45 MIN RATED	
154	154	AG RR	F	HM; SINGLE	3' - 0"	7' - 0"	0' - 1 3/4"		
14									
FIRST FLOOR MEZZANINE									
1M05	1M05	MUSEUM	WM12	ALUM; PAIR	6' - 0"	7' - 1 1/4"	0' - 1 3/4"		
1M50	1M50	AG RESTROOM	F	HM; SINGLE	3' - 0"	7' - 0"	0' - 1 3/4"		
1M51	1M51	WALKWAY	FG	ALUM: SINGLE	3' - 0"	7' - 1 1/4"			
1M52A	1M52	CORRIDOR	FG	ALUM: SINGLE	3' - 0"	7' - 1 1/4"			
1M52B	1M52	CORRIDOR	FG	ALUM: SINGLE	3' - 0"	7' - 1 1/4"			
1M53	1M53	SHARED OFFICE	F	HM; SINGLE	3' - 0"	7' - 0"	0' - 1 3/4"		
1M54	1M54	MECH ENG	F	HM; SINGLE	3' - 0"	7' - 0"	0' - 1 3/4"		
1M55	1M55	OFFICE	F	HM; SINGLE	3' - 0"	7' - 0"	0' - 1 3/4"		
1M56	1M56	OFFICE	F	HM; SINGLE	3' - 0"	7' - 0"	0' - 1 3/4"		
1M57	1M57	OFFICE	F	HM; SINGLE	3' - 0"	7' - 0"	0' - 1 3/4"		
1M58	1M58	COPY/STOR	G	HM; SINGLE	3' - 0"	7' - 0"	0' - 1 3/4"		
1M59	1M59	SHARED OFFICE	F	HM; SINGLE	3' - 0"	7' - 0"	0' - 1 3/4"		
12									
SECOND FLOOR									
202	202	SUPERVISORS' OFFICE	G	HM; SINGLE	3' - 0"	7' - 0"	0' - 1 3/4"		
203	203	MEN	F	HM; SINGLE	3' - 0"	7' - 0"	0' - 1 3/4"		
204	204	JAN.	F	HM; SINGLE	2' - 10"	7' - 0"	0' - 1 3/4"		
205	205	WOMEN	F	HM; SINGLE	3' - 0"	7' - 0"	0' - 1 3/4"		
206	206	AG RR	F	HM; SINGLE	3' - 0"	7' - 0"	0' - 1 3/4"		
208A	208A	TOOLS	N	HM; SINGLE	3' - 0"	7' - 0"	0' - 1 3/4"		
208B	208A	TOOLS	N	HM; SINGLE	3' - 0"	7' - 0"	0' - 1 3/4"		
208C	208C	VEHICLE MAINT. OFFICE	G	HM; SINGLE	3' - 0"	7' - 0"	0' - 1 3/4"		
250	250	12KV ELECTRICAL ROOM	F	HM; PAIR	6' - 6"	7' - 0"	0' - 1 3/4"	90 MIN RATED	DOORS NEED TO UNIQUELY KEYED FOR SUBSTATION ACCESS. COORD WITH MTA.
250A	250	12KV ELECTRICAL ROOM	F	HM; PAIR	6' - 6"	7' - 0"	0' - 1 3/4"	90 MIN RATED	DOORS NEED TO UNIQUELY KEYED FOR SUBSTATION ACCESS. COORD WITH MTA.
250B	250	12KV ELECTRICAL ROOM	OC		16' - 0"	9' - 0"	0' - 2"	90 MIN RATED	DOORS NEED TO UNIQUELY KEYED FOR SUBSTATION ACCESS. COORD WITH MTA.
251	251	SUPERINTENDENT OFFICE	G	HM; SINGLE	3' - 0"	7' - 0"	0' - 1 3/4"		
253	253	GRIP BUILDING AREA	F	HM; SINGLE	3' - 0"	7' - 0"	0' - 1 3/4"		
253A	253	GRIP BUILDING AREA	OC		10' - 0"	9' - 0"	0' - 2"		
14									
SECOND FLOOR MEZZANINE									
2M51	2M51	HALLWAY	F	HM; PAIR	6' - 0"	7' - 0"	0' - 1 3/4"		
2M52	2M52	STORAGE	F	HM; PAIR	6' - 0"	7' - 0"	0' - 1 3/4"		
2M53	2M53	AG RESTROOM	F	HM; SINGLE	3' - 0"	7' - 0"	0' - 1 3/4"		
2M54	2M54	GYM	F	HM; PAIR	6' - 0"	7' - 0"	0' - 1 3/4"		
2M55	2M55	CLASSROOM	F	HM; SINGLE	3' - 0"	7' - 0"	0' - 1 3/4"		3' W x 7' H SIDELITE W/ TRANSLUCENT GLASS
2M56	2M56	LEAD TRAINER	F	HM; SINGLE	3' - 0"	7' - 0"	0' - 1 3/4"		3' W x 7' H SIDELITE W/ TRANSLUCENT GLASS
2M57	2M57	COPY/STOR	F	HM; SINGLE	3' - 0"	7' - 0"	0' - 1 3/4"		
2M58	2M58	SHARED OFFICE	FG	HM; SINGLE	3' - 0"	7' - 0"	0' - 1 3/4"		
2M59	2M59	ASST OPS MGR	F	HM; SINGLE	3' - 0"	7' - 0"	0' - 1 3/4"		3' W x 7' H SIDELITE W/ TRANSLUCENT GLASS
2M60	2M60	SHARED OFFICE	FG	HM; SINGLE	3' - 0"	7' - 0"	0' - 1 3/4"		
2M61	2M61	ADMIN SUPPORT	F	HM; SINGLE	3' - 0"	7' - 0"	0' - 1 3/4"		3' W x 7' H SIDELITE W/ TRANSLUCENT GLASS
2M61A	2M59	ASST OPS MGR	F	HM; SINGLE	3' - 0"	7' - 0"	0' - 1 3/4"		
2M61B	2M63	SENIOR OPS MGR	F	HM; SINGLE	3' - 0"	7' - 0"	0' - 1 3/4"		
2M62	2M62	SHARED OFFICE	FG	HM; SINGLE	3' - 0"	7' - 0"	0' - 1 3/4"		
2M63	2M63	SENIOR OPS MGR	F	HM; SINGLE	3' - 0"	7' - 0"	0' - 1 3/4"		3' W x 7' H SIDELITE W/ TRANSLUCENT GLASS
2M64	2M64	REVENUE	F	HM; SINGLE	3' - 0"	7' - 0"	0' - 1 3/4"		
2M65	2M65	DISPATCH	F	HM; SINGLE	3' - 0"	7' - 0"	0' - 1 3/4"		
2M69	2M69	UNION REP	F	HM; SINGLE	3' - 0"	7' - 0"	0' - 1 3/4"		
2M70	2M70	STORAGE	F	HM; SINGLE	3' - 0"	7' - 0"	0' - 1 3/4"		
2M71	2M71	MEN	F	HM; SINGLE	3' - 0"	7' - 0"	0' - 1 3/4"		
2M72	2M72	WOMEN	F	HM; SINGLE	3' - 0"	7' - 0"	0' - 1 3/4"		
2M73	2M73	JAN	F	HM; SINGLE	2' - 10"	7' - 0"	0' - 1 3/4"		
22									

LEGEND

DOOR TYPES

F	FLUSH PANEL
FG	FULL GLASS
G	HALF GLASS
N	NARROW LITE
OC	OVERHEAD COILING
WM1	WIRE MESH - SWING
WM2	WIRE MESH - ROLLING

WINDOW TYPES

A	FIXED - SINGLE LITE
B	FIXED - TWO LITE
C	FIXED - THREE LITE
D	FIXED - FOUR LITE
E	OPERABLE - SLIDING
V	FIXED - SKYLIGHT

BUREAU OF ARCHITECTURE

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Drawing Title

DOOR & WINDOW SCHEDULES

Sheet No.

A 5.00

Scale: NO SCALE

Original Sheet Size: 30" x 42"

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9/19/2022 6:16:59 PM

MACHINE SHOP EQUIPMENT

Note: Dims are best assumptions, taken from data available online and typcial industry standards. DPW/MTA to confirm dimensions of their equipment.

ITEM NO.	EQUIPMENT	MANUF / MODEL NO.	QTY	SIZE (WxDxH)	EXISTING CLEARANCE	PW & MTA COMMENTS	STANTEC COMMENTS	REPLACE?	NEW MODEL	SIZE (WxDxH)	NEW CLEARANCE
E001	CNC LATHE	Haas ST-30							CHUCKER LATHE	Haas CL-1	
			1	186"x104"x81"		Possible relocation to different MTA facility		Yes			
E002	LATHE BED	Clausing V460									
			1	128"x67"x81"				No			
E003	MANUAL LATHES	Turnmaster (PHL1500)									
			1	159"x44"x67"				No			
E004	VERTICAL MILL	Haas VF-3SSYT									
			1	163"x134"x125"	Min. distance required to remove conveyor from mill is 85" without folding the conveyor. Min. distance required to remove conveyor is 50" when the conveyor is folded at 90 degrees and folded down as if removed.	Possible relocation to different MTA facility					
E005	VERTICAL MILL	Bridgeport									
			1	84"x120"x87"				No			
E006	DRILL PRESS	Sajo									
			1	66"x101"x78"				No			

MACHINE SHOP EQUIPMENT

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E007	DRILL PRESS	HMT									
			1	95"x45"x110"	Machine can swing 360 degrees about a vertical axis.			No			
E008	GEAR HEAD DRILL PRESS	Wilton #24802									
			1	36"x36"x84"				No			
E009	HYDRAULIC PRESS	Dake H-Frame (50 ton)									
			1	38"x46"x92"				No			
E010	ARBOR PRESS	Enco									
			1	16"x19"x36"		Attached to I-beam. See pictures.		No			

MACHINE SHOP EQUIPMENT

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ITEM NO.	EQUIPMENT	MANUF / MODEL NO.	QTY	SIZE (WxDxH)	EXISTING CLEARANCE	PW & MTA COMMENTS	STANTEC COMMENTS	REPLACE?	NEW MODEL	SIZE (WxDxH)	NEW CLEARANCE
E011	HYDRAULIC PRESS	Enerpac (150 ton)									
			1	96"x80"x104"		Requires access to crane (crane access for entirety of machine shop desired. See item 24 below).		No			
E012	VERTICAL BAND SAW	Grob									
			1	48"x48"x90"				No			
E013	HORIZONTAL BAND SAW										
			1	84"x44"x68"	Requires large clearance in feed direction to accommodate cutting long (up to 20 feet long) pieces of metal.			No			
E014	HYDRAULIC IRONWORKER	Piranha									
			1	35"x90"x64"	Requires large clearance in the feed direction to accommodate cutting long (up to 20 feet long) pieces of metal.			No			
E015	FLOOR SANDER										
			1	36"x28"x60"				No			

MACHINE SHOP EQUIPMENT

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ITEM NO.	EQUIPMENT	MANUF / MODEL NO.	QTY	SIZE (WxDxH)	EXISTING CLEARANCE	PW & MTA COMMENTS	STANTEC COMMENTS	REPLACE?	NEW MODEL	SIZE (WxDxH)	NEW CLEARANCE
E016	PARTS WASHER										
			1	54"x24"x77"				No			
E017	DRUM-MOUNTED PARTS WASHER										
			1	24"x24"x48"				No			
E018	SAND BLASTER CABINET										
			1	70"x32"x87"	Front: Allow 3'-0" Back: Allow 1'-0" Sides: Allow 18"		Confirmed "Existing to Remain" on a 9/01/2021 coordination call with MTA & DPW project leadership.				
E019	PEDESTAL GRINDER										
			1	24"x24"x56"				No			
E020	DRILL SHARPENER	Darex									
			1	24"x20"x24"				No			

MACHINE SHOP EQUIPMENT

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ITEM NO.	EQUIPMENT	MANUF / MODEL NO.	QTY	SIZE (WxDxH)	EXISTING CLEARANCE	PW & MTA COMMENTS	STANTEC COMMENTS	REPLACE?	NEW MODEL	SIZE (WxDxH)	NEW CLEARANCE
E021	END MILL SHARPENER	CutterMaster (CM-01)									
			1	32"x32"x24"				No			
E022	CNC TOOLING CARTS										
			2	56"x19"x36"		one(qty) for ST-30 one(qty) for Haas VF-3SSYT		No			
E023	JIB CRANE	(1 ton)									
			1			Possible replacement - Overhead crane with 1.5 ton capacity desired. Crane access for entirety of machine shop desired.	MTA prefered-vendor, "GP Cranes & Hoist Services" provided cutsheet and sketches for Gorbel bridge crane over Machine Room. Stantec created generic bridge crane Family from manfr cutsheets for use in Revit model	Yes			
E024	UNUSED NO. (equip either removed or relocated based on MTA feedback)										
E025	PLASMA CUTTER										
	NO PHOTO AVAILABLE		1					Yes			
E026	Automatic Surface Grinder (Acra 1224HS)										
			1					Yes	Acra 1224HS	90" x 71" x 88"	
E027	PIPE STORAGE AREA Moves w/Machine Shop per MTA feedback)										
			1	Preferrably able to accommodate 25 ft lengths.		20 feet. Preferrably able to accommodate 25 ft lengths. Current space is not sufficient as it is very difficult to unload material from the rack. Additional clearance on both sides desired.	Pic taken by Stantec on a site visit.				

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Consultant

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CONCEPT 10/29/2021

No.	Date	Revisions
	06/30/22	FINAL MASTER PLAN

PM EunJoo Cho
PA EunJoo Cho
Drawn Author
Checked Checker

NOT FOR CONSTRUCTION

Drawing Title

EQUIPMENT LIST - MACHINE SHOP

Sheet No. EQ 0.10

Scale:

Original Sheet Size: 30" x 42"

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NEW INSPECTION ROOM

Note: Dims are best assumptions, taken from data available online and typcial industry standards. DPW/MTA to confirm dimensions of their equipment.

ITEM NO.	EQUIPMENT	MANUF / MODEL NO.	QTY	SIZE (WxDxH)	EXISTING CLEARANCE	PW & MTA COMMENTS	STANTEC COMMENTS	REPLACE?	NEW MODEL	SIZE (WxDxH)	NEW CLEARANCE
E101	HARDNESS TESTER	Rockwell									
			1	18"x32"x36"	Currently located in Machine Shop			No			
E102	MEASURING ARM	FARO Arm									
			1	26"x36"x58"		FARO arm currently locked in engineer's office and specialized granite table stored temporarily in first floor Break Room		No			
E103	OPTICAL COMPARATOR										
			1	24"x36"x36"		Located in supervisor office. Supervisor office located in corner of machine shop.		No			
E104	TOOLS STORAGE	Precision									
			1	30"x27.75"x59"		Currently located in Machine Shop. Could be substituted with new, likely smaller cabinet. MTA Comments (2/16): chose "full height modular drawer cabinet"		Yes			
E105	GRANITE BLOCK TABLE										
			1	72"x48"x34"		Existing slab stored in drawer. A dedicated table where this type of slab could be fixed or just a separate granite table is desired for parts inspection	18"24"xOptimal height for working with parts	Yes			
E106	SPRING COMPRESSOR										
			1	12"x12"x60"		Currently located in Machine Shop		No			

WELD SHOP EQUIPMENT

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ITEM NO.	EQUIPMENT	MANUF / MODEL NO.	QTY	SIZE (WxDxH)	EXISTING CLEARANCE	PW & MTA COMMENTS	STANTEC COMMENTS	REPLACE?	NEW MODEL	SIZE (WxDxH)	NEW CLEARANCE
E201		Hobart									
			1	36"x32"x42"				No			
E202		Miller Dynasty									
			1	48"x32"x72"				No			
E203	STICK WELDER	Lincoln Electric Idealarc									
			1	56"x36x72"				No			
E204	MIG CART	Miller (460 V)									
			1	44"x24"48"				No			

WELD SHOP EQUIPMENT

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ITEM NO.	EQUIPMENT	MANUF / MODEL NO.	QTY	SIZE (WxDxH)	EXISTING CLEARANCE	PW & MTA COMMENTS	STANTEC COMMENTS	REPLACE?	NEW MODEL	SIZE (WxDxH)	NEW CLEARANCE
E205	WELDER	Miller 211 MIG Welder									
								No			
E206	OXYGEN / ACETYLENE CART	SafTcart									
			1	36"x36"64"				No			
E207	WELDING FUME EXTRACTOR	Lincoln Electric Smog Hog									
			1	48"x32"x96"		This piece of equipment is the Smog Hog (Item 7 in spreadsheet submitted 4/29/21 to DPW for Stantec). It is used at the welding table and is considered part of the welding space.		No			
E208	UNUSED NO. (equip either removed or relocated based on MTA feedback)										
E209	PEDESTAL GRINDER										
			1	28"x24"x48"				No			

WELD SHOP EQUIPMENT

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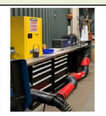
ITEM NO.	EQUIPMENT	MANUF / MODEL NO.	QTY	SIZE (WxDxH)	EXISTING CLEARANCE	PW & MTA COMMENTS	STANTEC COMMENTS	REPLACE?	NEW MODEL	SIZE (WxDxH)	NEW CLEARANCE
E210	WELDING/FRAME TABLE										
			1	96"x60"x36"		MTA Comments (2/16): "Existing welding Frame will need to be replaced"	Size in plan is represented the same as existing size	Yes			
E211											
			1	96"x30"x36"	TBD	This workstation belongs to the welder and is used for staging jobs and general storage. Size is sufficient. Workstation consists of two work benches that are side-by- side and mirrors of each other. The one on the left which is partically cut off has a dry rod oven underneath. The tool cabinets of both contain hand tools.		Yes			
E212											
			1	96"x30"x36"	TBD	This workstation is a desk for the welder to sit at and complete paperwork. It is still used.		Yes			
E213											
			2	36"x24"x72"	TBD	These are indeed two grey cabinets side by side. They are back to back with more storage cabinets for a confirmed total of 4 at the pictured location. These contain hand tools, power tools, welding equipment, and welding consumables.	Pic taken by Stantec on a site visit.	No			

WELD SHOP EQUIPMENT

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ITEM NO.	EQUIPMENT	MANUF / MODEL NO.	QTY	SIZE (WxDxH)	EXISTING CLEARANCE	PW & MTA COMMENTS	STANTEC COMMENTS	REPLACE?	NEW MODEL	SIZE (WxDxH)	NEW CLEARANCE
E214	TOOL CABINET	Knaack									
			1	5'x2'x5'	TBD		Pic taken by Stantec on a site visit.	No			
E215		Knaack									
			1	7'-6"x4'-3"x6'-0"	TBD	This workstation is typically used by the welder for TIG welding. Dimensions are 7'6"x 4'3"x6'. The size is sufficient, but configuration desired to be upgraded with functional welding fume extraction and rack of storage perhaps relocated off table in a dedicated, but accessible spot.	Pic taken by Stantec on a site visit.	Yes			
E216		Knaack									
			1	Confirm	TBD	No.	Pic taken by Stantec on a site visit. Storage shelves unused.				
E217	UNUSED NO. (equip either removed or relocated based on MTA feedback)										

WELD SHOP EQUIPMENT

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ITEM NO.	EQUIPMENT	MANUF / MODEL NO.	QTY	SIZE (WxDxH)	EXISTING CLEARANCE	PW & MTA COMMENTS	STANTEC COMMENTS	REPLACE?	NEW MODEL	SIZE (WxDxH)	NEW CLEARANCE
E218	Metal Cart										
			1	5'x30"x5'		This metal cart contains sheet metal and belongs to the welder. It is located nearby the welding table and is considered part of the welding space, not the pulley assembly area. Dimension are approx. (including largest piece of sheet metal protruding from top and sides of cart) 2'5"x5'x5'.	Pic taken by Stantec on a site visit in Steam Cleaning Area.				
E219	Scrap Metal Storage Area										
			1	3'x6'x6'							
E220	Scrap Metal Cart										
			1	3'x5'x4'							

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Checked Checker

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Drawing Title

EQUIPMENT LIST - INSPECTION ROOM & WELD SHOP

Sheet No.

EQ 0.11

Scale:

Original Sheet Size: 30" x 42"

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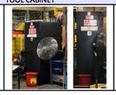
GRIP BUILDING AREA

Note: Dims are best assumptions, taken from data available online and typcial industry standards. DPW/MTA to confirm dimensions of their equipment.

ITEM NO.	EQUIPMENT	MANUF / MODEL NO.	QTY	SIZE (WxDxH)	EXISTING CLEARANCE	PW & MTA COMMENTS	STANTEC COMMENTS	REPLACE?	NEW MODEL	SIZE (WxDxH)	NEW CLEARANCE
E301	ELEVATING PLATFORMS										
			2	36"x48"x24"	Provide 30" on all sides	Currently locatd in Grip Building Area	Pic taken by Stantec on a site visit. 1 of 2 Elevating Platforms	No			
E302	UNUSED NO. (equip either removed or relocated based on MTA feedback)										
E303	WORKSTATION										
			1	8'6"x2'6"x10'4"		This workstation is used for pressing pieces called dies in and out of a subassembly of the Cable Car Grip. The dimensions are approx 8'6"x2'6"x10'4" tall. Size is sufficient.	Pic taken by Stantec on a site visit.				
E304	WORKSTATION										
			1	8'x30"x78"		Workstation is used for storage and handling of Cable Car grip parts. Dimensions are 8'x2'6"x6'6" tall. Size is sufficient.	Pic taken by Stantec on a site visit.				
E305	TOOL CABINET										
			1	2'x3'x7'		Cabinet is used to store hand tools, hand held power tools, and miscellaneous grip parts used for the Grip Building Area.	Pics taken by Stantec on a site visit.	No			

GRIP BUILDING AREA

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ITEM NO.	EQUIPMENT	MANUF / MODEL NO.	QTY	SIZE (WxDxH)	EXISTING CLEARANCE	PW & MTA COMMENTS	STANTEC COMMENTS	REPLACE?	NEW MODEL	SIZE (WxDxH)	NEW CLEARANCE
E306	PARTS WASHER (based on MTA feedback)										
			--			Currently located in the Steam Cleaning Area	This parts washer currently located in the steam cleaning area remains. New parts washer needed in the new location of the Grip Building Room on Level 2.	Yes			
E307	SCRAP METAL CART										
			1	3'x4'-3"x3'-8"		This is for metal disposal/recycling mostly used for grip dies, but also for pulleys. The dimensions are approx. 3'x4'3"x3'8" tall. Size is sufficient. This one is typically stationed in the grip building area. There are 2 other metal recycling bins, one in the tension run area used mainly for scrap wire strands and one near Lvl 1 rolling door for general purpose (both of these bins measure about 6'x5').	Pic taken by Stantec on a site visit.				
E308	PALETTE										
			1			Palette of materials are stored here relatively permanently. These palettes contain new dies which are used for the grip die replacement. Dimensions of 1 palette (there are two shown in the picture) is approx. 3'x3'x1'8" tall.	Pic taken by Stantec on a site visit.				
E309	GRIP WASHER	Proceco Typhoon-HD									
			1	50"Dia Turntable 96" Clear Height		Per Sept 8, 2021 email: The parts are "grips" for the cable cars. They are 8 feet tall (with handle vertical) x 4 foot x 18 inches. Mild steel, Cast iron, Brass and Bronze. Mostly grease. Hit steam cleaning over a pit. Parts are removed from the vehicle and inspected, if deemed to need a rebuild or maintenance then they are cleaned. Assemblies are torn down parts replaced and tested with a final greasing. Possibly purchase prior to the remodel therefore within the next 12 months.					

PULLEY ASSEMBLY AREA

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ITEM NO.	EQUIPMENT	MANUF / MODEL NO.	QTY	SIZE (WxDxH)	EXISTING CLEARANCE	PW & MTA COMMENTS	STANTEC COMMENTS	REPLACE?	NEW MODEL	SIZE (WxDxH)	NEW CLEARANCE
E401	H FRAME PRESS	Power Team (55 ton)									
			1			Currently located in Pulley Assembly Area		No			
E402	PEDESTAL GRINDER										
			1			Currently located in Pulley Assembly Area		No			
E403	UNUSED NO. (equip either removed or relocated based on MTA feedback)										
E404											
			1			Yes. Yes a rack that accommodates 15 of these pullies would be helpful.	Wheels leaned-up against fencing are part of Pulley Assembly Area.	Yes			
E405	UNUSED NO. (equip either removed or relocated based on MTA feedback)										
E406	UNUSED NO. (equip either removed or relocated based on MTA feedback)										
E407	MOBILE CART										
			1	30"x5'x42"		This cart is used to transport pullies. Dimensions are approx. 5'x2'6"x3'6". This is typicaly stored in the pulley assembly area as shown. Size is sufficient.	Pic taken by Stantec on a site visit.	No			

PULLEY ASSEMBLY AREA

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ITEM NO.	EQUIPMENT	MANUF / MODEL NO.	QTY	SIZE (WxDxH)	EXISTING CLEARANCE	PW & MTA COMMENTS	STANTEC COMMENTS	REPLACE?	NEW MODEL	SIZE (WxDxH)	NEW CLEARANCE
E408	MOBILE CART										
			1	2'x42"x34"		Cart is used to transport miscellaneous small track parts or tools. Size is sufficient. This is typically stored in the pulley assembly area or the track storage room (room 112). Dimensions are approx. 3'6" 2'x2'10" tall.	Pic taken by Stantec on a site visit.	No			
E409	WORKSTATION										
			1	91"x33"x37"		This workstation is the main workbench for general use in the Pulley Assembly Area. There are small parts (nuts and bolts) and some hand tools stored in here. Dimensions are approx. 2'9"x7'7"x3'1" tall. Size is sufficient.	Pic taken by Stantec on a site visit. Size confirmed sufficient.	No			
E410	LG PULLEY STORAGE										
			2	62"x2'x5'		Dimensions are approximately 2'x5'2"x5' tall (6' tall if including 3 yellow pulley rims stacked on top of one another as shown in the photo). SFMTA is open to more compact/efficient storage solutions.	Pic taken by Stantec on a site visit. Size confirmed sufficient.	No			
E411	MOBILE SHIELD										
			2	36"x30"x84"		Shield is generally a moveable partition used when an employee is using the hydraulic press in the pulley assembly area, as it was deemed by employees using the hydraulic press to provide additional safety. It is typically stored in the pulley assembly area.	Pic taken by Stantec on a site visit.	No			

PULLEY ASSEMBLY AREA

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E412	SM PULLEY STORAGE										
			3	7'x16"x90"		Yes, 9 inch pullies. There is 1 shelf in fenced area and 1 longer shelf outside the fenced area. Size is sufficient. Dimensions of shelf in fenced area are approx. 7'x1'4"x7'6" tall. Dimensions of shelf outside fenced area are approx. 10'4"x1'6"x8' tall.	Pic taken by Stantec on a site visit. Looks like 1 inside the fenced area and 2 outside. All to be relocated inside the fenced area, if possible. Size confirmed sufficient.	No			
E413	TOOL BOX										
			1	30"x23"x42"		Tool box is locked, but is not considered frequently used. Dimensions are approx. 1'11"x2'6"x3'6".	Pic taken by Stantec on a site visit. Size confirmed sufficient.	No			
E414	DEPRESSION BEAM STORAGE										
			1	90"x54"x6'		This storage rack is used to store depression beams and can be referred to as the Depression Beam Storage Rack. Size is sufficient. Dimensions are approximately 7'9"x4'6"x6'. Crane is required overhead to move materials off. Current space utilizes 1 ton crane. The following text was submitted by MTA on 4/20/2021 where the storage rack is referred to as "storage structure": *"The Depression Beam work area is used to rebuild/assemble depression beams. Depression beams are track mechanisms (beneath the track along the Cable Car lines) that "depress" the cable at locations where the cable would otherwise tend to elevate and contact the bottom of the slot rail. Depression beams and large pullies/hubs are also stored in the dedicated work area. A mechanism to lift (currently a 1 ton crane is used) and place the depression beam on the holding fixture is needed for rebuilding and assembly. This work station alone measures approximately 7'x 15'. Adjacent to the 7'x 15' work station is a storage structure that accommodates 12 depression beams. Each depression beam is approximately 1' x 1' x 7'."*	Pic taken by Stantec on a site visit. Size confirmed sufficient.	No			
E415	MISCELLANEOUS SHELVING										
			2	8'x30"x8'		Storage shelving is miscellaneous storage including traffic delineator curb systems, pulleys, lengths of steel material, lift table, and small spare grip parts. This shelf is not necessarily tied to the Grip Building Area. Forklift is sufficient provided a forklift has clearances necessary. Current configuration of adjacent grip rebuilding equipment does not seem to provide sufficient clearance for use of forklift.	As shelf is not tied to Grip Building Area, these storage items can get folded into the High-Density Storage Solution.	No			

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Drawing Title

EQUIPMENT LIST - GRIP BUILDING AREA & PULLEY ASSEMBLY AREA

Sheet No.

EQ 0.12

Scale:

Original Sheet Size: 30" x 42"

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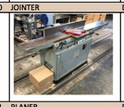
STEAM CLEANING AREA

Note: Dims are best assumptions, taken from data available online and typcial industry standards. DPW/MTA to confirm dimensions of their equipment.

ITEM NO.	EQUIPMENT	MANUF / MODEL NO.	QTY	SIZE (WxDxH)	EXISTING CLEARANCE	PW & MTA COMMENTS	STANTEC COMMENTS	REPLACE?	NEW MODEL	SIZE (WxDxH)	NEW CLEARANCE
E501	PARTS WASHER										
			1	N/A	TBD	Currently located in the Steam Cleaning Area	This piece of equipment remains.	No			
E502	PRESSURE WASHER	Hosty									
			1	25"x34"x52"	TBD	Currently Located in the Steam Cleaning Area					
E503	STEAM CLEANING BAY										
			1	11'x76"x50"	TBD	In conjunction with the pressure washer above, this is referred to as the Steam Cleaning Area. Dimensions are approx. 10'11"x8'4"x4'2" tall.	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.				
E504	HOT PRESSURE WASHER	Hosty									
			1	6.17'x3.17'x6'	TBD	Hot pressure washer typically used for cleaning of outside insfrastructure. Typically stored in the open floor of the 1st floor near the front rolling door entrance. Dimensions are approximately 6.17'x3.17'x6'.	Equipment mobile.	No			

CARPENTRY

Note: Dims are best assumptions, taken from data available online and typcial industry standards. DPW/MTA to confirm dimensions of their equipment.

ITEM NO.	EQUIPMENT	MANUF / MODEL NO.	QTY	SIZE (WxDxH)	EXISTING CLEARANCE	PW & MTA COMMENTS	STANTEC COMMENTS	REPLACE?	NEW MODEL	SIZE (WxDxH)	NEW CLEARANCE
E709	BAND SAW	Dayton 7LKT4A									
			1	42"x15.5"x56" (56" when angled up)	Front: Allow 8'-0" Back: Allow 8'-0" (to accommodate 8'-0" material lengths) Sides: Allow for 3'-0" on both sides		Equipment mounted on casters. This piece is listed as cutting metal (cast iron, tool steel, bronze, aluminum, & plastic)	?			
E710	JOINTER	Delta DJ20 | Mo No: 37350									
			1	76.5"x26"x32"	Front: Allow 5'-0" Back: Allow 2'-0" Sides: Allow for 2'-0" on both sides at the ends			No			
E711	PLANER	Powermatic | Mo No. 201HH									
			1	49"x42"x59"	Front: Allow 8'-0" Back: Allow 8'-0" (to accommodate 8'-0" material lengths) Sides: Allow for 3'-0" on both sides			No			
E712	SANDER	Kalamazoo | Mo No. S612/S612V									
			1	~24"x~24"x60"	Front: Allow 8'-0" (to accommodate 8'-0" material lengths) Back: Allow 30" for motor access panel L Side: Allow 8'-0" for sanding R Side: Allow 3'-0" for hoses & belt replacement			No			

CARPENTRY

Note: Dims are best assumptions, taken from data available online and typcial industry standards. DPW/MTA to confirm dimensions of their equipment.

ITEM NO.	EQUIPMENT	MANUF / MODEL NO.	QTY	SIZE (WxDxH)	EXISTING CLEARANCE	PW & MTA COMMENTS	STANTEC COMMENTS	REPLACE?	NEW MODEL	SIZE (WxDxH)	NEW CLEARANCE
E701	SLIDING MITER SAW	Dewalt									
			1	19.05"x32.77"x20"	Front: Allow for 5'-0" Sides: Allow for 8'-0" on both sides (to accommodate standard 16ft length lumber)		Sits on countertop	No			
E702	DUST EXTRACTOR	Festool CT 26									
			1	14"x25"x22"	Front: Allow 6" Sides: Allow 6" both sides (for handling and slumpped hoses)		Floor model; on castors	?			
E703	VERTICAL BANDSAW	Delta 28-640									
			1	20.5"x27"x66" Table: ~16"x18"	Front: Allow 5'-0" Sides: Allow for 5'-0" on both sides from centerline (to accommodate standard 4x8 sheet of plywood)			?			
E704	STANDING DRILL PRESS	Jet JDP-17FSE									
			1	19"x28.5"x65" Table: ~14"x19"	Front: Allow 5'-0" Sides: Allow for 5'-0" on both sides from centerline (to accommodate standard 4x8 sheet of plywood)			?			

CARPENTRY

Note: Dims are best assumptions, taken from data available online and typcial industry standards. DPW/MTA to confirm dimensions of their equipment.

ITEM NO.	EQUIPMENT	MANUF / MODEL NO.	QTY	SIZE (WxDxH)	EXISTING CLEARANCE	PW & MTA COMMENTS	STANTEC COMMENTS	REPLACE?	NEW MODEL	SIZE (WxDxH)	NEW CLEARANCE
E705	BENCH GRINDER	Jet 8" JBG-8B									
			1	21"x19"x11" Add 30" for stand	Front: Allow 5'-0" Sides: Allow 18"		Sander only weighs 60lbs+weight of the stand. Its not on casters; but if it needs to be moved to accommodate a longer piece of wood, it can.	No			
E706	SHOP VAC	Nilfisk Eliminator Pro									
			1	17.25"x24"x36.5"	Front: Allow 6" Sides: Allow 6" both sides (for handling and slumpped hoses)			No			
E707	TABLE SAW	SawStop 10" Cab Saw - Model No ICS53230									
			1	85.25"x36.5"x34"	Front: Allow 5'-0" Back: Allow 5'-0" Sides: Allow for 3'-0" on both sides			?			
E708	DUST COLLECTOR	Powermatic PM2200									
			1	31.88"x54.5"x85.25"	Front: Allow 4'-0" Back: Allow 6" Sides: Allow for 1'-0" on both sides			?			

CARPENTRY

Note: Dims are best assumptions, taken from data available online and typcial industry standards. DPW/MTA to confirm dimensions of their equipment.

ITEM NO.	EQUIPMENT	MANUF / MODEL NO.	QTY	SIZE (WxDxH)	EXISTING CLEARANCE	PW & MTA COMMENTS	STANTEC COMMENTS	REPLACE?	NEW MODEL	SIZE (WxDxH)	NEW CLEARANCE
E713	SPINDLE SANDER	Max VSI.18									
			1	39" Height Table: 24"x24"	Allow 3'-0" on at least three sides			?			
E714	ROUTER TABLE	ToolTech Systems - Festool CMS-GE 203158									
	NO PHOTO AVAILABLE					Possibly in queue to be ordered. Not currently existing.		Yes		48"x40"x30"	Front: Allow 5'-0" Back: Allow 2'-0" Sides: Allow 8'-0" on both sides from centerline (to accommodate 8'-0" material length)
E715	AIR FILTRATION SYSTEM	Jet ASF-2000									
			2	27"x47"x23"	Ceiling-Mounted Allow 2'-0" on all sides for airflow and installation Allow clear floor area below	Desired to be hung from ceiling. Currently in storage and not installed.	Clear floor area required below installation for maintenance, filter replacement, and ladder set-up.				
E717	UNUSED NO. (equip either removed or relocated based on MTA feedback)										
E717	UNUSED NO. (equip either removed or relocated based on MTA feedback)										
E718	DUST EXTRACTOR	Festoon CT 36 E (HEPA Filter)									
			1	14.4"x25"x23.4"	Front: Allow 3'-0" Back: Allow 4"-6" Sides: Allow 6" both sides						

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CONCEPT 10/29/2021

No.	Date	Revisions
	06/30/22	FINAL MASTER PLAN

PM EunJoo Cho
PA EunJoo Cho
Drawn Author
Checked Checker

NOT FOR CONSTRUCTION

Drawing Title

EQUIPMENT LIST - STEAM CLEANING AREA & CARPENTRY

Sheet No. EQ 0.13

Scale:

Original Sheet Size: 30" x 42"

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PAINT GROUP

Note: Dims are best assumptions, taken from data available online and typcial industry standards. DPW/MTA to confirm dimensions of their equipment.

ITEM NO.	EQUIPMENT	MANUF / MODEL NO.	QTY	SIZE (WxDxH)	EXISTING CLEARANCE	PW & MTA COMMENTS	STANTEC COMMENTS	REPLACE?	NEW MODEL	SIZE (WxDxH)	NEW CLEARANCE
E801	VEHICLE DUSTER	Duster 3000 Downdraft									
			1	Base: 32"x30" Height = 8'-6" Length of Inflated Arm = 11'-10"	Allow 18" on all sides for airflow and storage manuverability when not in operation.		If designing a new enclosed room, account for this piece of equipment when fully inflated.				
E802	AIR FILTRATION	Novatek Corp									
			1				If designing a new enclosed room, consider upgrade to Novair 2000-BIO HEPA	Yes		26"x37"x31"	Allow 2'-0" on all sides for airflow and installation Allow clear floor area below if installed overhead
E803	PARTS WASHER	Safety-Kleen | Mo No. 5077									
			1	Sink Size: ~20"Dia	Front: Allow 36" Back: Allow 24" for hoses/pipes Side: Allow 18" on both sides Note: this is for model on the left		Floor Space Req'd in front of sink per Manuf = 36"Wx71"H				
E804	PARTS WASHER	Safety-Kleen | Mo No. 5055									
			1	Sink Size: ~18"Dia	Front: Allow 36" Back: Allow 24" for hoses/pipes Side: Allow 18" on both sides Note: this is for model on the right		Floor Space Req'd in front of sink per Manuf = 32"Wx18"Dx61"H				

PAINT GROUP

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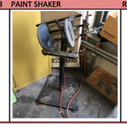
ITEM NO.	EQUIPMENT	MANUF / MODEL NO.	QTY	SIZE (WxDxH)	EXISTING CLEARANCE	PW & MTA COMMENTS	STANTEC COMMENTS	REPLACE?	NEW MODEL	SIZE (WxDxH)	NEW CLEARANCE
E805	AIR COMPRESSOR	Makita Pneumatics | Mo No. MAC2400									
			1	18"x20"x18.75 Cart: ~24"x48"x34"	Allow 6" around cart for storage clearance		This piece of equipment is stored on a cart.				
E806	SHP VAC	Nilfist Eliminator II Wet/Dry									
			1	24"x34"x40"	Front: Allow 36" to pull out Back: Allow 6" for hoses/pipes Side: Allow 6" on both sides						
E807	BENCH BUFFER	Dayton Variable Speed Buffer | Mo No. 48WC54									
			1	~36"x24"x32" Wheel Dia = 10"	Front: Allow 5'-0" for operation Back: Allow 6" Sides: Allow 18" both sides						

PAINT GROUP

Note: Dims are best assumptions, taken from data available online and typcial industry standards. DPW/MTA to confirm dimensions of their equipment.

ITEM NO.	EQUIPMENT	MANUF / MODEL NO.	QTY	SIZE (WxDxH)	EXISTING CLEARANCE	PW & MTA COMMENTS	STANTEC COMMENTS	REPLACE?	NEW MODEL	SIZE (WxDxH)	NEW CLEARANCE
E808	PAINT SHAKER	Red Devil									
			1	12"x18"x31.5" (Note: 1 Gal paint can = 6.75"Dia x 8" H)	Front: Allow 3'-0" Back: Allow 6" Sides: Allow 18" both sides			No			
E809	SANDBLASTER	Aboytes Mfg | Mo No ADHP DG9									
			1	70"x32"x87"	Front: Allow 3'-0" Back: Allow 18"-24" (for panel access) Sides: Allow 24" (for panel access)			No			

CAR CLEANING & LVL 2 STORAGE

Note: Dims for this category were provided by DPW and MTA on 9/24 documenting Displaced Storage where the new 12KV Electrical Room is slated for installation

ITEM NO.	EQUIPMENT	MANUF / MODEL NO.	QTY	SIZE (WxDxH)	EXISTING CLEARANCE	PW & MTA COMMENTS	STANTEC COMMENTS	REPLACE?	NEW MODEL	SIZE (WxDxH)	NEW CLEARANCE
E901	Shed										
			1	11'-0" x 10'-5/16" x 7'-6"	For car cleaning equipment. Located inside... - (6) Rubbermaid carts (48"x24"x60") - (2) Boxes of Rags (20"x14"x19") - (2) Buckets (24"x18"x18") - Other shop vacs, barrel pumps, brooms, rags, spray bottles, ladders, gloves, etc. MTA Comments (2/16): "We should not look at reusing the existing shed and building out or using a lockable storage solution"		Refer to replacement storage E911 & E912	Yes			
E902	55 Gallon Drums										
			5	2'-0" Dia 3'-0" Tall		Between Sand and Shed; Germ Wipe, POCL		No			
E903	1 Gallon Adran Jel-R										
	NO PHOTO AVAILABLE		6	1'-0" Dia 15'-0" Tall		Between Sand and shed		No			
E904	1 Gallon SF Blue										
	NO PHOTO AVAILABLE		6	1'-0" Dia 15'-0" Tall		Between Sand and shed		No			
E905	Storage Rack										
			1	21'-6" x 4'-6" x 14'-6"		Adjacent to pull-out gate Includes (2) "Hazardous Waste Boxes," Extra Sheet Metal Storage, and other drum storage, stored on the rack.		No			

CAR CLEANING & LVL 2 STORAGE

Note: Dims for this category were provided by DPW and MTA on 9/24 documenting Displaced Storage where the new 12KV Electrical Room is slated for installation

ITEM NO.	EQUIPMENT	MANUF / MODEL NO.	QTY	SIZE (WxDxH)	EXISTING CLEARANCE	PW & MTA COMMENTS	STANTEC COMMENTS	REPLACE?	NEW MODEL	SIZE (WxDxH)	NEW CLEARANCE
E906	Metal Trash/Recycle Bin										
			1	45" x 63" x 52"		Under storage rack by pull-out gate		No			
E907	Metal Trash/Recycle Bin										
			1	45" x 63" x 52"		MTA Comment (2/16): "E906 is a trash bin 2 yard E907 is currently the same size as E906 (was returned to full size post pandemic shutdown). Needs to be corrected on the sheet"		No			
E908	Recyling Bin										
	NO PHOTO AVAILABLE		1	24" x 33" x 40"		Under storage rack by pull-out gate		No			
E909	Compost Bin										
			3	24" x 33" 40"		Under storage rack by pull-out gate		No			
E910	Sand Pallet										
			Varies	Actual size of wrapped palette measured by MTA = 50" x36-5/8" x 24"	Allowing for 4" of clearance on all sides for maneuverability.	FYI, shipments of sand come in packages of 2 pallets i.e. 2 pallets of sand stacked on top of one another and both covered in a single piece of plastic. Dimensions provided are just one pallet of sand. Storeroom has expressed openness to storing a smaller quantity of sand.	Standard palette = 48" x 40" Allowing for 24" Height If space is req'd for 40 palettes (with openness to store smaller qty), then plan will show 5 to 6 spaces in plan, assuming palette's stacked 6-high.	No			

CAR CLEANING & LVL 2 STORAGE

Note: Dims for this category were provided by DPW and MTA on 9/24 documenting Displaced Storage where the new 12KV Electrical Room is slated for installation

ITEM NO.	EQUIPMENT	MANUF / MODEL NO.	QTY	SIZE (WxDxH)	EXISTING CLEARANCE	PW & MTA COMMENTS	STANTEC COMMENTS	REPLACE?	NEW MODEL	SIZE (WxDxH)	NEW CLEARANCE
E911	Pallet Rack Enclosures	WireCrafters									
			1	72"x36"x96"		MTA Comments (2/16): "We should not look at reusing the existing shed and building out or using a lockable storage solution"	Items contained in existing shed can be stored in new lockable storage containment.	New			
E912	Pallet Rack Enclosures	WireCrafters									
			1	48"x24"x96"		MTA Comments (2/16): "We should not look at reusing the existing shed and building out or using a lockable storage solution"	Items contained in existing shed can be stored in new lockable storage containment.	New			

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	06/30/22	FINAL MASTER PLAN

PM EunJoo Cho
PA EunJoo Cho
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EQUIPMENT LIST - PAINT, CAR CLEANING & LVL 2 STORAGE

Sheet No.

EQ 0.14

Scale:

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9/19/2022 2:19:08 PM

Original Sheet Size: 30" x 42"

1 EQ2.11 **MASTER PLAN - CONCEPT STUDY - LEVEL 1**

1/8" = 1'-0"

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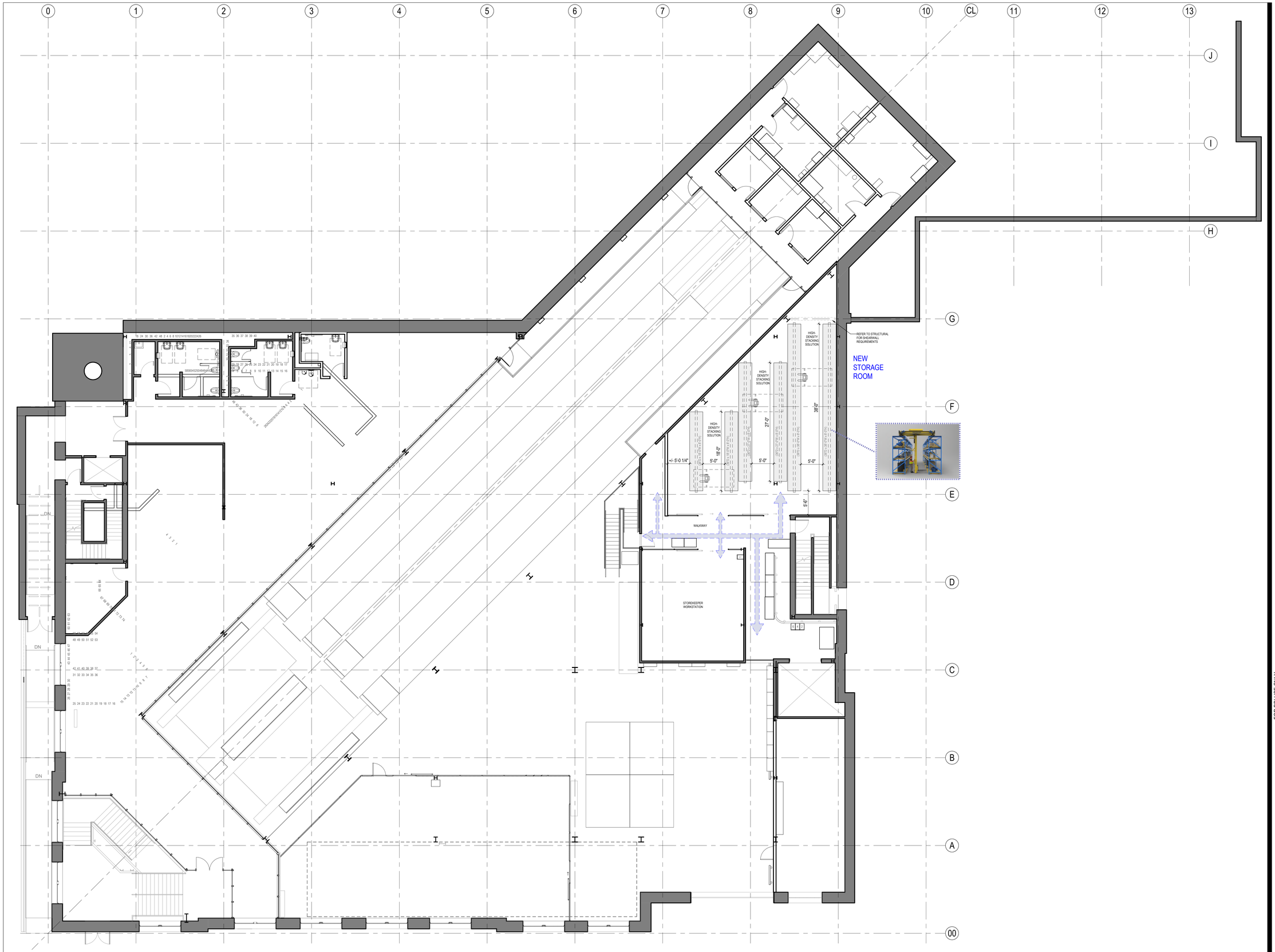
EQUIPMENT PLAN - FIRST FLOOR

Sheet No. EQ2.11

Scale: 1/8" = 1'-0"



1 EQ2.12 **MASTER PLAN - CONCEPT STUDY - LEVEL 1M**
1/8" = 1'-0"

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EQUIPMENT PLAN - FIRST FLOOR MEZZANINE

Sheet No. EQ2.12

Scale: 1/8" = 1'-0"

Original Sheet Size: 30" x 42"

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NEW 12KV ELECTRICAL ROOM

OPEN STORAGE ITEMS

MOBILE ITEMS

ANNUAL PKG. CHNGR

RTU

LV SWITCHBOARD WITH DRAWOUT BREAKER (CONFIG 1)

MV TRANSFORMER

MV SWITCHGEAR

OVERHEAD COILING DOOR

EYE WASH

(E) EDGE OF PIT

DN

UP

(E) JIB CRANE

CAR CLEANING

NEW GRIP BUILDING ROOM

VERTICAL GRIP STORAGE AREA

E350 WORKSTATION

E351 ELECTRIC HAND TOOLS

E352 BATTERY CHARGING

E353 SCRAP MTL CRATE

E354 PALETTE STORAGE

E355 GRIP WASHER

E356 TOOL CRIB

E357 BOOTS WASH

12TON OVERHEAD JIB CRANE

STEEL PLATE, TYP AT EACH PLATFORM

EXISTING CONDITIONS

NEW DESIGN INTENT

SUPERINTENDENT OFFICE

VEHICLE MAINTENANCE OFFICE

AIR COMPRESSOR

PAINT BOOTH

SPRAY BOOTH

MANUFACTURER-DESIGNED ROOM FOR DECONTAMINATION AND ABATEMENT, AS REQUIRED.

WALLS ARE NOT FULL-HEIGHT, TO ALLOW FOR LIGHT TRANSMISSION OF EXISTING WINDOWS ABOVE SPACES

DEDICATED VENTILATION FOR THESE TWO ROOMS

CURTAIN

DIVIDER BETWEEN PAINT & CARPENTRY. POTENTIAL HALF-HEIGHT WALL (UP TO 48") TO ALLOW FOR LIGHT TRANSMISSION OF EXISTING WINDOWS

NEW PAINT SHOP

NEW CARPENTRY SHOP

LUMBER CARPENTRY RACK

TOOLS & SMALL PARTS STORAGE

PAINT SHELVING (18")

E711 PLANER

E707 TABLE SAW

E710 JOINTER

E709 BANDSAW

E708 BELT SANDER

E705 DUST COLLECTOR

E706 SHAPER

E703 MORTISER

E704 DRILL PRESS

E702 MINI BAND SAW

E701 SABERSAW

TOOL CART

ADDT'L STORAGE

MOBILE CART

WORK TABLE (29"-39")

WORK SURFACE

MOBILE WORK TABLE

PAINTED FLOOR STRIPING

PORTABLE EQUIPMENT HERE CAN BE MOVED FOR ACCESS TO BUILDING SYSTEMS ALONG WALL

EXISTING ELECTRICAL ITEMS & FIRE STORAGE CABINET - CONFIRM EXISTING EXTENTS

RELOCATE DOOR IN FENCE

DOORS WITH VISION GLASS

2 EQ2.13

MASTER PLAN - CONCEPT STUDY - LEVEL 2

1/8" = 1'-0"

Original Sheet Size: 30" x 42"

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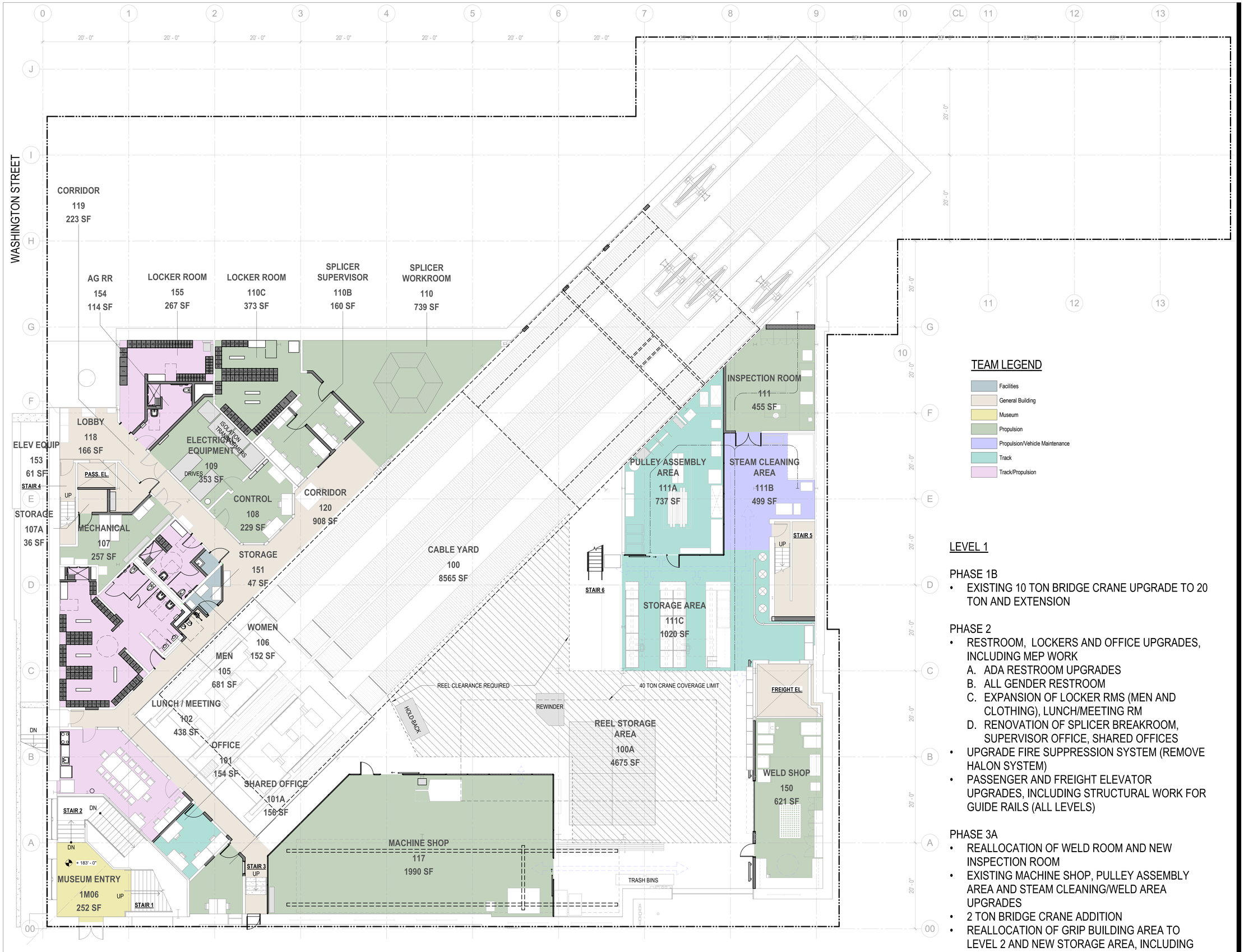
Drawing Title

EQUIPMENT PLAN - SECOND FLOOR

Sheet No.

EQ2.13

Scale: 1/8" = 1'-0"



1 PROPOSED SPACE DIAGRAM - FIRST FLOOR
1/8" = 1'-0"

TEAM LEGEND

- Facilities
- General Building
- Museum
- Propulsion
- Propulsion/Vehicle Maintenance
- Track
- Track/Propulsion

LEVEL 1

PHASE 1B
- EXISTING 10 TON BRIDGE CRANE UPGRADE TO 20 TON AND EXTENSION

PHASE 2
- RESTROOM, LOCKERS AND OFFICE UPGRADES, INCLUDING MEP WORK
  - A. ADA RESTROOM UPGRADES
  - B. ALL GENDER RESTROOM
  - C. EXPANSION OF LOCKER RMS (MEN AND CLOTHING), LUNCH/MEETING RM
  - D. RENOVATION OF SPLICER BREAKROOM, SUPERVISOR OFFICE, SHARED OFFICES
- UPGRADE FIRE SUPPRESSION SYSTEM (REMOVE HALON SYSTEM)
- PASSENGER AND FREIGHT ELEVATOR UPGRADES, INCLUDING STRUCTURAL WORK FOR GUIDE RAILS (ALL LEVELS)

PHASE 3A
- REALLOCATION OF WELD ROOM AND NEW INSPECTION ROOM
- EXISTING MACHINE SHOP, PULLEY ASSEMBLY AREA AND STEAM CLEANING/WELD AREA UPGRADES
- 2 TON BRIDGE CRANE ADDITION
- REALLOCATION OF GRIP BUILDING AREA TO LEVEL 2 AND NEW STORAGE AREA, INCLUDING MEP WORK

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	06/30/22	FINAL MASTER PLAN

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Drawn Author
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PROPOSED SPACE DIAGRAM - FIRST FLOOR

Sheet No. PA 2.11

Scale: 1/8" = 1'-0"

Original Sheet Size: 30" x 42"

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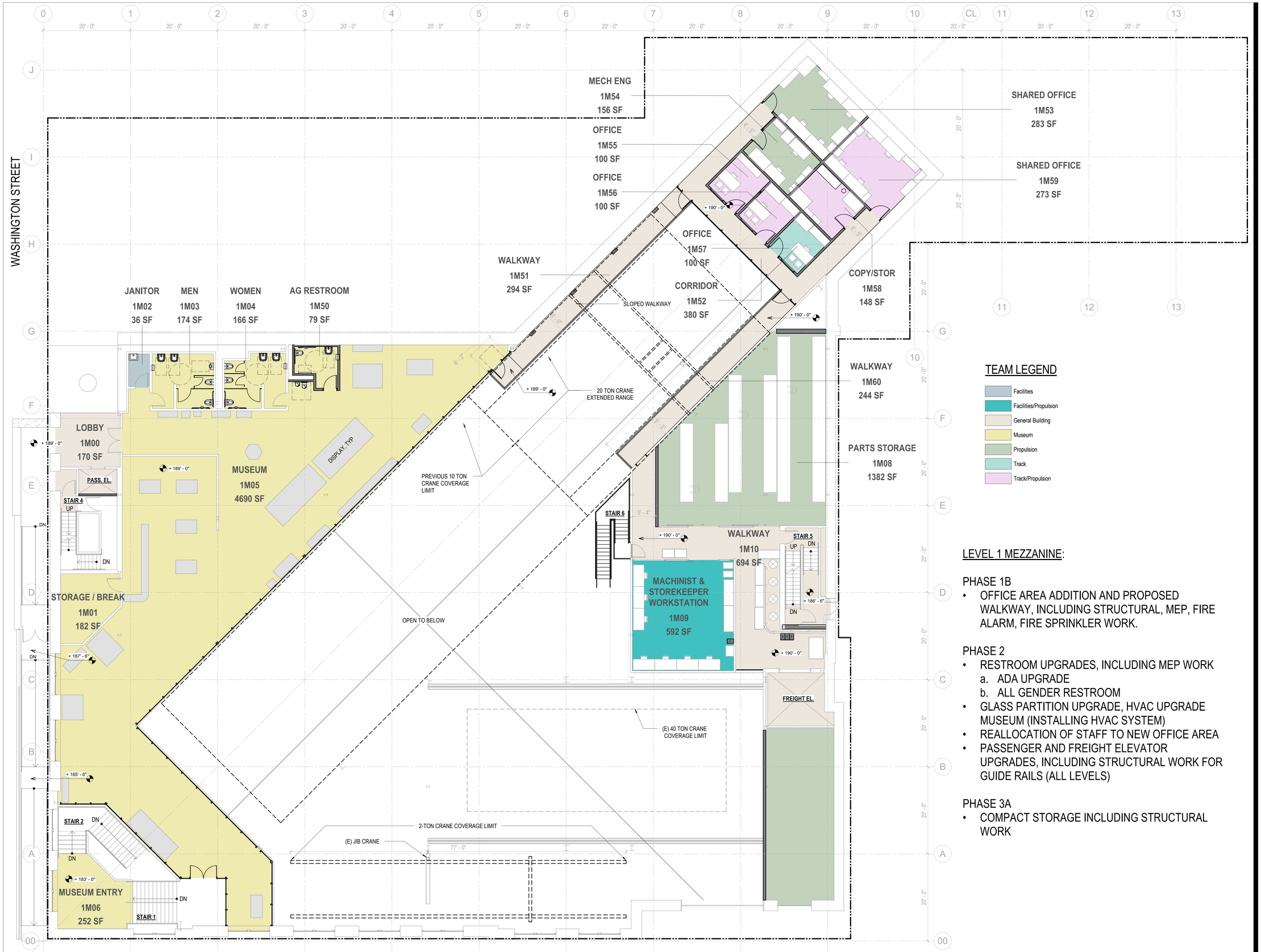

1 PROPOSED SPACE DIAGRAM - FIRST FLOOR MEZZANINE
1/8" = 1'-0"

TEAM LEGEND

- Facilities
- Facilities/Propulsion
- General Building
- Museum
- Propulsion
- Track
- Track/Propulsion

LEVEL 1 MEZZANINE:

PHASE 1B
- OFFICE AREA ADDITION AND PROPOSED WALKWAY, INCLUDING STRUCTURAL, MEP, FIRE ALARM, FIRE SPRINKLER WORK.

PHASE 2
- RESTROOM UPGRADES, INCLUDING MEP WORK
  a. ADA UPGRADE
  b. ALL GENDER RESTROOM
- GLASS PARTITION UPGRADE, HVAC UPGRADE MUSEUM (INSTALLING HVAC SYSTEM)
- REALLOCATION OF STAFF TO NEW OFFICE AREA
- PASSENGER AND FREIGHT ELEVATOR UPGRADES, INCLUDING STRUCTURAL WORK FOR GUIDE RAILS (ALL LEVELS)

PHASE 3A
- COMPACT STORAGE INCLUDING STRUCTURAL WORK

BUREAU OF ARCHITECTURE

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Cable Car Barn

1201 Mason St
San Francisco, CA 94108

Consultant

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CONCEPT 10/29/2021

No.	Date	Revisions
	06/30/22	FINAL MASTER PLAN

PM EunJoo Cho
PA EunJoo Cho
Drawn Author
Checked Checker

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Drawing Title

PROPOSED SPACE DIAGRAM - FIRST FLOOR MEZZANINE

Sheet No. PA 2.12

Scale: 1/8" = 1'-0"

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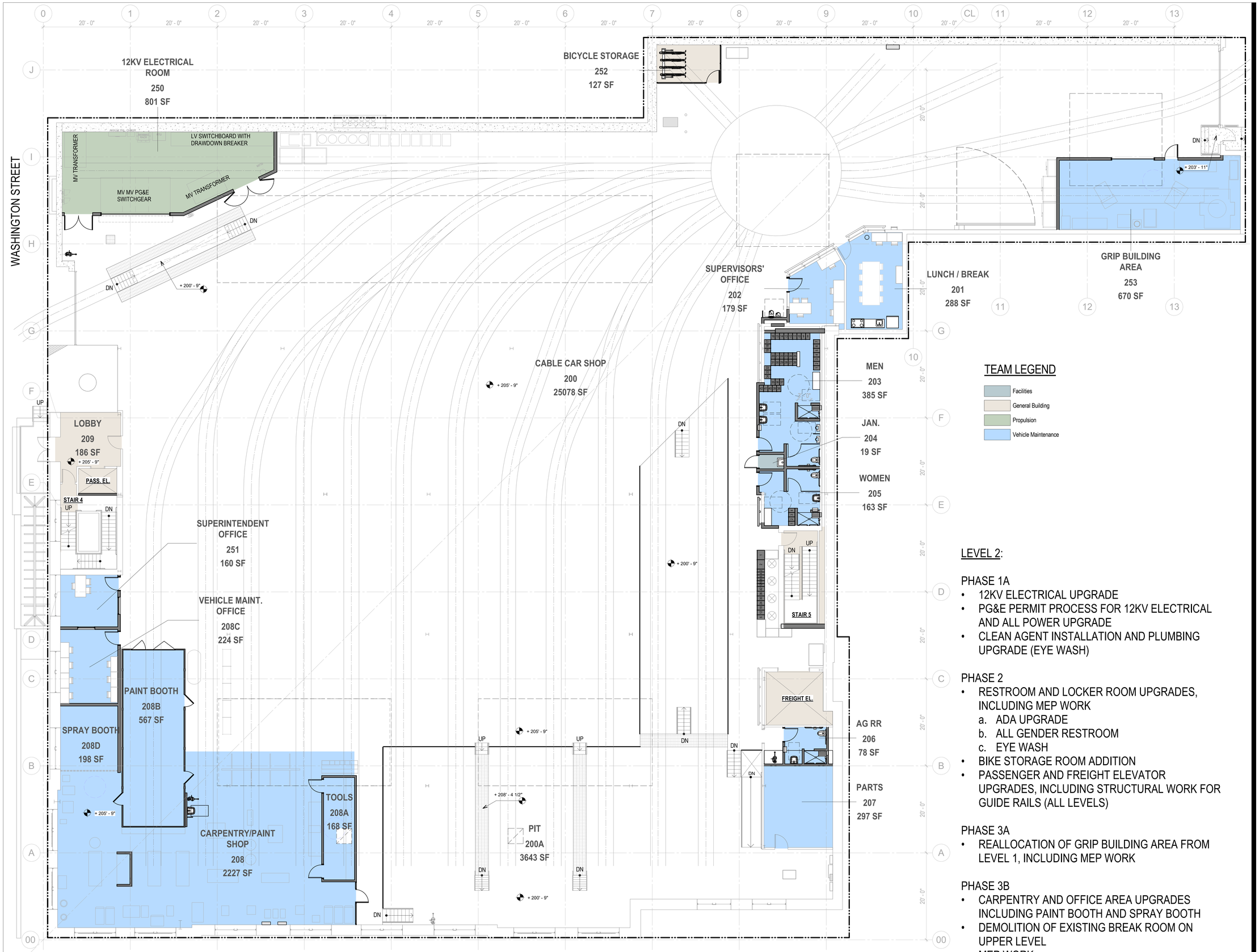

TEAM LEGEND

- Facilities
- General Building
- Propulsion
- Vehicle Maintenance

LEVEL 2:

PHASE 1A
- 12KV ELECTRICAL UPGRADE
- PG&E PERMIT PROCESS FOR 12KV ELECTRICAL AND ALL POWER UPGRADE
- CLEAN AGENT INSTALLATION AND PLUMBING UPGRADE (EYE WASH)

PHASE 2
- RESTROOM AND LOCKER ROOM UPGRADES, INCLUDING MEP WORK
  a. ADA UPGRADE
  b. ALL GENDER RESTROOM
  c. EYE WASH
- BIKE STORAGE ROOM ADDITION
- PASSENGER AND FREIGHT ELEVATOR UPGRADES, INCLUDING STRUCTURAL WORK FOR GUIDE RAILS (ALL LEVELS)

PHASE 3A
- REALLOCATION OF GRIP BUILDING AREA FROM LEVEL 1, INCLUDING MEP WORK

PHASE 3B
- 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

1 PROPOSED SPACE DIAGRAM - SECOND FLOOR
1/8" = 1'-0"

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	06/30/22	FINAL MASTER PLAN

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PA	EunJoo Cho
Drawn	Author
Checked	Checker

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PROPOSED SPACE DIAGRAM - SECOND FLOOR

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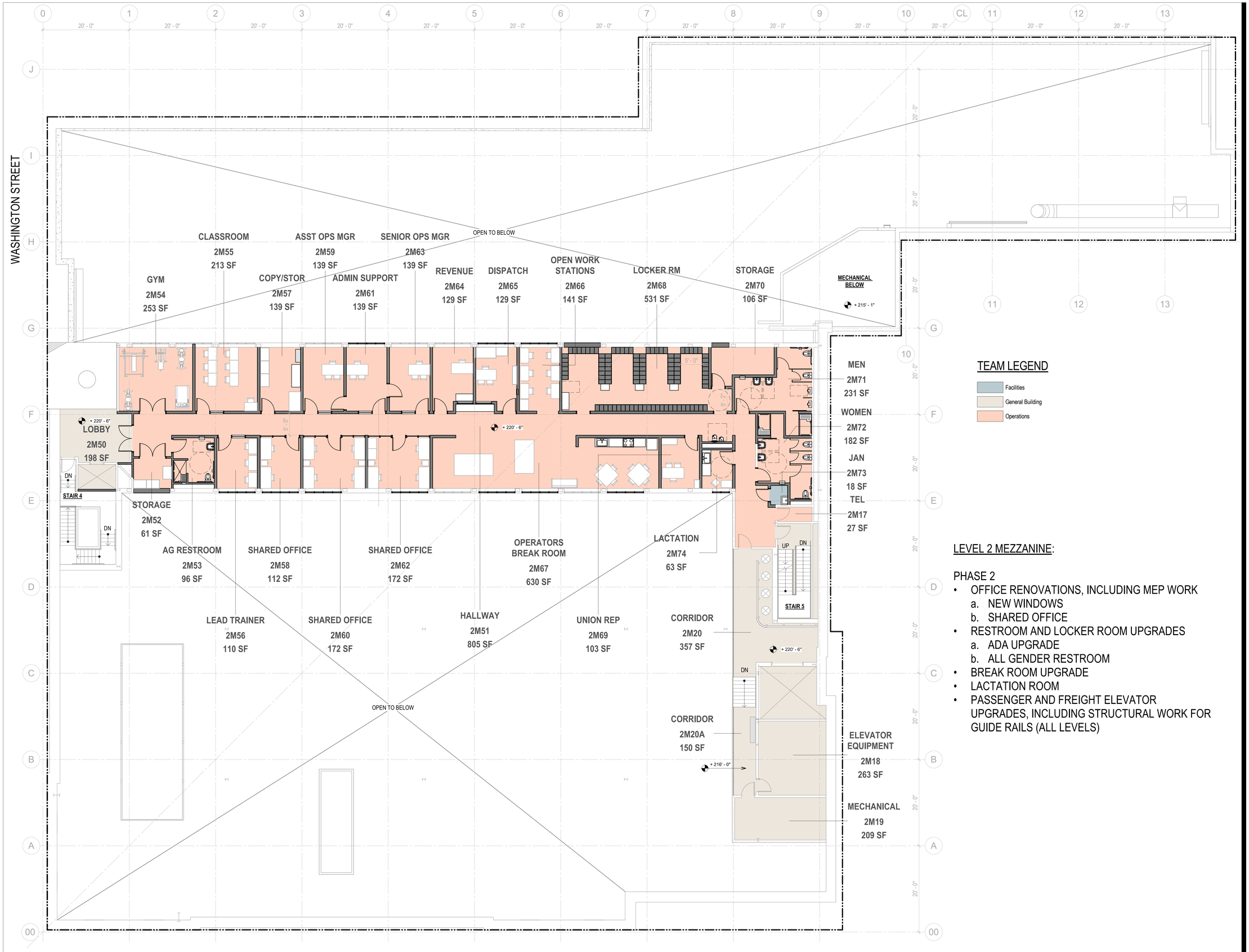

LEVEL 2 MEZZANINE:

PHASE 2
- OFFICE RENOVATIONS, INCLUDING MEP WORK
  a. NEW WINDOWS
  b. SHARED OFFICE
- RESTROOM AND LOCKER ROOM UPGRADES
  a. ADA UPGRADE
  b. ALL GENDER RESTROOM
- BREAK ROOM UPGRADE
- LACTATION ROOM
- PASSENGER AND FREIGHT ELEVATOR UPGRADES, INCLUDING STRUCTURAL WORK FOR GUIDE RAILS (ALL LEVELS)

1 PROPOSED SPACE DIAGRAM - SECOND FLR MEZZANINE
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No.	Date	Revisions
	06/30/22	FINAL MASTER PLAN

PM EunJoo Cho
PA EunJoo Cho
Drawn Author
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Drawing Title

PROPOSED SPACE DIAGRAM - SECOND FLOOR MEZZANINE

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A2 - Existing & Proposed Program Matrix

Existing & Preferred Program

Room			Existing Use				Preferred Use			
Room No.	Room Name	Area	Team	User	Function	Notes	Notes	Total	Shift	Staff Per Shift
Sub Floor										
001	Viewing Room	441	Museum							
002	Storage	148								
003	Cable Clamping Room	885								
First Floor										
100	Cable Yard	8569								
100A	Reel Storage Area	4675				—9 cabinets				
101	Shared Office	204	Propulsion/Vehicle Maintenance	Management Asst. Shop and Equip. Supervisor Cable Machinery Superint. Intern	Office	—3 occupants —3 workstations —Filing cabinets, shelves	—RELOCATE to new office space above Tension Carriages for Shop and Equipment Supt. and Management Assistant —Private Office —1 workstation —Desk, secure file storage —Lockers: 1-P1 (15"x18"x72")	1	Day	1
101A	Office	128	Track	Track Superintendent	Private Office	—1 occupant —1 workstation —Filing cabinets, shelves	—RELOCATE to new office space above Tension Carriages —1 workstation —Desk, secure file storage —Lockers: 1-L1 (12"x12"x22"), 10L2 (7.5"x21"x40"), 1-P1 (15"x18"x72")	1	Day	1
101B	Storage	27	General Building			—Exterior door at street level				
102	Lunch/Meeting	389	Track/Propulsion		Break	—Kitchen (Cabinet for water jugs, Refrigerator, sink, stove, cabinets, Water dispenser) —2 workstations —11 chairs —1 parts inspection table/desk —1 break/meeting table —(No Lockers)	—4 workstations (in a shared space) —Lockers: 1xL1, 1xL2, 1xP1 per employee	40		17
103	Janitor	55	Facilities		Storage		—Refer to MTA Facilities Dep't for custodian needs			

Existing & Preferred Program

Room			Existing Use				Preferred Use			
Room No.	Room Name	Area	Team	User	Function	Notes	Notes	Total	Shift	Staff Per Shift
104	Storage	68	Facilities		Storage	—1 electromechanical equipment cabinet —1 machinery lubricating oils cabinet —1 log books cabinet				
105	Men	564	Track/Propulsion		RR/Locker	—52 lockers —2 WC —2 urinals —1 large shared lavatory —2 showers	—Need more lockers and space	40		17
106	Women	151	Track/Propulsion		RR/Locker	—4 lockers —1 WC —1 lavatory —1 shower				
107	Mechanical	303	Propulsion	Chief Stationary Eng.	Storage Workshop	—1 workstation —Fenced area —Machinery, storage —Elevator machineroom (in a fenced off portion) —Electrical panels, switchboards, water heater	—RELOCATE workspace. Ideally, this room dedicated only to storage, electrical equipment, elevator machinery, etc. and not at all utilized as an office. —1 workstation —Lockers: 1xL1, 1xL2, 1xP1 per employee —RELOCATE workspace. Ideally, this room dedicated only to storage, electrical equipment, elevator machinery, etc. and not at all utilized as an office.	2		1
107A	Elevator Equipment	67								
108	Control Room	229	Propulsion	Stationary Eng.	Storage Workshop	—1 workstation —Equipment/machinery motor controller, prognost HMI, security camera HMI, relays for safety circuit —Cabinet for radios	—Control Room upgrade —1 workstation —Lockers: 1xL1, 1xL2, 1xP1 per employee	9		3

Existing & Preferred Program

Room			Existing Use				Preferred Use			
Room No.	Room Name	Area	Team	User	Function	Notes	Notes	Total	Shift	Staff Per Shift
109	Electrical Equipment	782	Propulsion		Electrical	—Switchgear, Transformers, Motor Controllers, Back up power —Access safety circuit relays in control room —2 cabinets	—12kV Equipment Upgrade			
110	Splicer Break Room	522	Propulsion	Splicers (Wire Rope Mechanic and Trainee)	Break	—36 lockers —2 workstations	—Need more locker room space, 2 splicers/shift other than Grave —4 workstations (in shared space) —24 occupants (19 Mechanics and 5 Trainees) —Dedicated Wire Rope Repair Area, Materials and Tools Storage —Lockers: 1xL1, 1xL2, 1xP1 per employee	24	Grave	4
110A	Splicer Supervisor	106	Propulsion	Splicer Supervisor	Office	—1 workstation	—Need more locker room space —Private office with valuables and storage —Lockers: 1xL1, 1xL2, 1xP1 per employee	1		
110B	Splicer Workroom	780	Propulsion	Splicers	Workshop	—2 locker cabinets, 8 lockers each	—Includes storage and workbenches			
111	Weld Shop	632	Propulsion	Welder	Workshop	—1 workstation —6 lockers —3 tables —Welding —Storage	—Weld Shop Upgrade /Relocation —Lockers: 1xL1, 1xL2, 1xP1 per employee —Desk, Multiple welding machines, 3 phase power, storage, ventilation, compressed air, 2 Welding Stations —Caged Off for Security	3	Grave	2
111A	Pulley Assembly Area	523				—Fenced area —Pulleys; Rack in walkway —Large misc rack adj to grip repair —Large misc rack near tension run stairs to 1M	—Pulley Assembly Area Upgrade / Relocation			

Existing & Preferred Program

Room			Existing Use				Preferred Use			
Room No.	Room Name	Area	Team	User	Function	Notes	Notes	Total	Shift	Staff Per Shift
111B	Steam Cleaning/Weld Area	612				—Table in open floor —Sectioned off between depression beam repair area and room 111	—Steam Cleaning/Weld Area Upgrade / Relocation			
111C	Grip Building Area	1029				—Grip Repair Area —2 cabinets near freight elevator	—Cable Car has preference for moving the function (grip building and repair) of this space to the 2nd floor			
112	Storage	305	Track		Storage	—Tall racks for storing depression beams —Overflow storage crowding the walkways in this room —Equipment/machinery/tools	—Need more storage space			
113	Vestibule	72	Track		Storage	—Equipment/machinery/tools —Cabinets for batteries				
114	Shared Office	54	Track/Engineering	Track Supervisor Track Maint. Worker Sup.	Office	—1 workstation —3 cabinets —Equipment/machinery/tools	—UPGRADE/RELOCATION: Room 114 does not have enough space to accommodate 4 people/workstations. If room remains as is, then 1 occupant should remain and the rest relocated. —4 workstations in Shared Offices for track workers —Lockers: 1xP1 per employee	4	Day	4
115	Provate Office	104	Track	Track Supervisor Track Maint. Worker Sup.	Office	—1 workstation —4 storage units —Ladder	—2 workstations —Lockers: 1xL1, 1xL2, 1xP1 per employee —If room remains as is, then 1 occupant should remain and 2 occupants relocated.	5		1

Existing & Preferred Program

Room			Existing Use				Preferred Use			
Room No.	Room Name	Area	Team	User	Function	Notes	Notes	Total	Shift	Staff Per Shift
116	Engineer's Office	78	Propulsion	Mechanical Engineer (Full Engineer and Assistant Engineer)	Storage Workshop	—1 workstation —Equipment/machinery/tools —Drawing rolls, flat files —Networking equipment —Cabinets, shelves	—RELOCATE to new office space above Tension Carriages. If room remains as is, then 1 occupant should remain and the rest relocated. —Private Office —2 workstations —Flat File, Large Format Printer/Scanner, Secure Valuables Storage, Parts Rack —Lockers: 1xP1 per employee	2	Day	1
117	Machine Shop	1803	Propulsion	Machine Shop Sup. Machinist	Storage Workshop	—Fenced area —Equipment/machinery/tools —Parts rack —2 lockers —1 workstation —Optical comparator	—Machine Shop UPGRADE/RELOCATION —Need supervisor private office and machinist workstation —See 1M08 note below —Private Office —Rack for Parts/Equipment Storage —Lockers: 1xL1, 1xL2, 1xP1 per employee	5		4
117A	Supervisor Office Area	187	Propulsion	Machine Shop Sup.	Office					
118	Lobby	166				—1 ipad locker —1 cabinet for plumbing —2 tools & spare parts cabinets				
119	Corridor	223				—1 key locker				
120	Corridor	962								
S4	Stair 4	71								
S5	Stair 5	200								

Existing & Preferred Program

Room			Existing Use				Preferred Use			
Room No.	Room Name	Area	Team	User	Function	Notes	Notes	Total	Shift	Staff Per Shift
First Floor Mezzanine										
1M00	Lobby	170			Circulation	—Passenger elevator lobby				
1M01	Storage/Break	182	Museum		Break	—Storage	—Refer to MTA Facilities Dep't			
1M02	Janitor's Closet	36	Museum		Storage		—Refer to MTA Facilities Dep't	2	Day	1
1M03	Men	173	Museum		Restroom	—1 WC —2 urinals —2 lavatories				
1M04	Women	166	Museum		Restroom	—2 WC —3 lavatories				
1M05	Museum	5022	Museum		Museum					
1M06	Museum Entry	252	Museum		Museum					
1M07	Parts Storage/Workstations	567	Propulsion	Electronic Maint. Tech Electrician Electronic Maint. Tech PROP F	Workshop	—Fenced area —2 workstations —2 large cabinets —3 tool carts	—3 workstations total (shared space w/ Electrician - 4 Occupants) —Lockers: 1xL1, 1xL2, 1xP1 per employee	4 (Shift Excludes PROP F)	Grave	1
1M08	Machinist Workstation	995	Propulsion	Machinists	Workshop	—1 workstation	—See 117 Machine Shop note —Need new shared space - Same Floor As and Near/In Machine Shop —3 workstations (shared space in new space near Machine Shop) —Lockers: 1xL1, 1xL2, 1xP1 per employee —Employee owned toolboxes	1 (3 are included in 117)	Day	1
1M09	Storekeeper Workstation	592	Facilities	Storeroom keeper	Workshop	—1 workstation	—Refer to MTA Facilities Dep't	1	Day	1
1M10	Walkway	611	Shared		Storage	—Caged flammable gas —6 cabinets				
1M11	Storage	302	Track		Storage	—Access: Enter room 115 on first floor and walk up ladder/stair provision.				

Existing & Preferred Program

Room			Existing Use				Preferred Use			
Room No.	Room Name	Area	Team	User	Function	Notes	Notes	Total	Shift	Staff Per Shift
Second Floor										
200	Cable Car Shop	27484	Vehicle Maintenance	Electric Transit System Mechanic Transit Car Cleaner Transit Car Cleaner Assistant Supervisor	Workshop	—4 parts and tools cabinets near freight elevator used by vehicle mechanics —1 hazardous materials cabinet near turntable —1 hazardous materials cabinet next to freight elevator	—Need new shared spaces —See 202 function and note —3 workstations in shared space —2 shared workstations in shared space —Desk in Shared Office w/ other Assistant Supervisor —Lockers: 1xL1, 1xL2, 1xP1 per employee	36		22
200A	Pit	3646				—9 tools cabinets				
201	Lunch/Break	288	Vehicle Maintenance		Break	—Water dispenser filtration system —Television —1 blank inspection/operations documents storage	—Kitchen sink, stove, refrigerator all against wall —1 workstation —1 break/meeting table			
202	Supervisors' Office	179	Vehicle Maintenance	Vehicle Maint. Sup's	Office	—2 workstations	—See 200 function and note —Management Assistant —Dedicated desk in shared office —Desk in Shared Office w/ Car Cleaner Assistant Supervisor —Lockers: 1xL1, 1xL2, 1xP1 per employee	2	Day	1
203	Men	319	Vehicle Maintenance		Restroom	—1 WC —2 urinals —1 large shared lavatory —34 lockers —1 shower				
204	Janitor Closet	22	Vehicle Maintenance		Storage		—Refer to MTA Facilities Dep't			
205	Women	107	Vehicle Maintenance		Restroom	—1 WC —1 lavatory —1 shower —5 lockers				

Existing & Preferred Program

Room			Existing Use				Preferred Use			
Room No.	Room Name	Area	Team	User	Function	Notes	Notes	Total	Shift	Staff Per Shift
206	Locker	85	Vehicle Maintenance			—4 lockers (8qty, 12qty x2, 1qty; Uniform lockers) —Eye wash				
207	Parts	347	Vehicle Maintenance		Storage	—Equipment/machinery/tools				
208	Carpentry	2265	Vehicle Maintenance	Carpenters	Workshop	—3 lockers	—UPGRADE Carpentry Shop —1 workstation —Tools and storage —Lockers: 1xL1, 1xL2, 1xP1 per employee	3	Day	3
208A	Tools	117	Vehicle Maintenance	Management Assistant	Workshop	—Fenced area	—Need private office for Management Assistant —Lockers: 1xP1	1		1
208B	Paint	365	Vehicle Maintenance		Workshop	—Fenced area	—Need paint booth w ventilation —1 workstation —Tools and storage —Lockers: 1xL1, 1xL2, 1xP1 per employee	2	Day	2
208C	Superintendent Office/Maintenance	252	Vehicle Maintenance	Vehicle Maint. Sup.	Office	—1 workstation	—Private Office —Secure files storage, secure valuables storage —Lockers: 1xL1, 1xL2, 1xP1	1	Day	1
208D	Carpentry Break	507								
209	Lobby	186			Circulation	—Passenger elevator lobby				

Existing & Preferred Program

Room			Existing Use				Preferred Use			
Room No.	Room Name	Area	Team	User	Function	Notes	Notes	Total	Shift	Staff Per Shift
Second Floor Mezzanine										
2M00	Lobby	210			Circulation	—Passenger elevator lobby				
2M01	Storage	30	Operations		Storage					
2M02	Classroom	96	Operations	Lead Trainer	Office	—2 workstations	—Dedicated Training Instruction Room fitted for at least 1 instructor and 4 people receiving training —Lockers: 1xP2 per employee	5		5
2M02A	Office	113	Operations		Office	—1 workstation	—Private Office, secure files storage —Lockers: 1xP2 per employee	2		1
2M02B	Corridor	117	Operations		Circulation					
2M03	Lead Trainer	105	Operations	Lead Trainer	Office	—1 workstation —1 cabinet	—Locate close to Classroom; see 2M02 —3 desks in shared Trainers office —Lockers: 1xP2 per employee	3	Day	3
2M04	Conference Storage	185	Operations		Storage	—6 cabinets				
2M05	Assistant Operations Manager	230	Operations	Asst. Operations Manager	Office	—1 workstation	—Private Office, secure files/valuables storage —Lockers: 1xP2	1	Day	1
2M06	Restroom	42	Operations		Restroom	—1 WC (flushable toilet, no stall) —1 lavatory				
2M06A	Closet	5	Operations		Storage					
2M07	Revenue	201	Operations		Office	—1 workstation	—1 desk in secure room —Lockers: 1xP2	3	24 Hour	1
2M08	Senrior Operations Manager	223	Operations	Cable Car Senior Ops. Mgr.	Office	—1 workstation	—Private Office, secure files/valuables storage —Lockers: 1xP2	1	Day	1
2M09	Dispatch	206	Operations	Dispatch	Office	—2 workstations —2 cabinets —Walkie Talkie shelves	—1 shared desk and separate room for radios, and separate room for clipper card chargers —Lockers: 1xP2	3	24 Hour	1

Existing & Preferred Program

Room			Existing Use				Preferred Use			
Room No.	Room Name	Area	Team	User	Function	Notes	Notes	Total	Shift	Staff Per Shift
2M10	Operators Break Room	1703	Operations	Operators		—2 workstations —176 lockers	—Require more locker room space; 208 QTY lockers desired —6 workstations —Lockers: 1xP2 per employee	179		104
2M10A	Corridor	123	Operations		Circulation					
2M11	Office	155	Operations		Office	—Currently used as Wellness Room				
2M12	Gym	118	Operations		Gym	—Currently empty / temporary storage				
2M13	Union Representative	132	Operations	Union Representative	Office	—2 workstations —Cabinets, shelves	—Private office	1	Day	1
2M14	Men	166	Operations		Restroom	—2 WC —2 urinals —1 lavatory —1 shower				
2M15	Janitor Closet	33	Operations		Storage		—Refer to MTA Facilities Dep't for custodian needs			
2M16	Women	100	Operations		Restroom	—1 WC —1 lavatory —1 shower				
2M17	Tel	27	Operations		Storage					
2M18	Elevator Equipment	271	Operations		Mechanical					
2M19	Mechanical	209	Operations		Mechanical		—Needs reassessment of space			
2M20	Corridor	357	Operations		Circulation					
2M20A	Corridor	150	Operations		Circulation					
2M21	Corrdidor		Operations		Circulation					

Proposed Program

Room			Proposed Use		
Room No.	**Room Name**	**Team**	**User**	**Function**	**Notes**
Sub Floor					
001	Viewing Room	Museum			
002	Storage			Storage	
003	Cable Clamping Room				
First Floor					
100	Cable Yard				
100A	Reel Storage Area				—1 hazardous materials cabinet —1 large rack near stair 6 —8 cabinets near freight elevator
101	Office	Track	Track Supervisor, Track Maintenance Supervisor	Office	—4 desks —Relocated from 115 —Desk, secure file storage
101A	Shared Office	Engineering/Propulsion	Student Design Trainee III / Intern	Office	—2 workstations —Relocated from 114
102	Lunch/Meeting	Track/Propulsion		Break	—4 workstations in a shared space —water dispenser —water jugs storage
105	Men	Track/Propulsion		Restroom/Locker Room	
106	Women	Track/Propulsion		Restroom/Locker Room	
107	Mechanical	Propulsion		Mechanical	—(Relocated Chief Engineer desk from 107 to 110B)
107A	Storage	Facilities		Storage	—Elevator tools
108	Control	Propulsion	Stationary Engineer	Control Room/Workshop	—Mechanical repair area —2 desks, materials and equipment storage —1 cabinet for radios
109	Electrical Equipment	Propulsion		Electrical	
110	Splicer Workroom	Propulsion	Splicers	Workshop	—Dedicated Wire Rope Repair Area —Materials and Tools Storage
110A	Splicer Office	Propulsion	Splicers	Office	—4 workstations
110B	Splicer Supervisor	Propulsion	Chief Stationary Engineer, Machine Shop Supervisor, Splicer Supervisor, Laborer Supervisor	Office	—Relocated from 107 and 117A —4 desks for Splicer Sup., Chief Stationary Eng. And Machine Shop Sup.
110C	Locker Room	Propulsion	Splicers	Break	

Proposed Program

Room			Proposed Use		
Room No.	**Room Name**	**Team**	**User**	**Function**	**Notes**
111	Inspection Room	Propulsion		Workshop	
111A	Pulley Assembly Area	Track		Workshop	
111B	Steam Cleaning	Propulsion/Vehicel Maintenance		Workshop	
111C	Storage Area	Track		Storage	—2 cabinets near freight elevator
117	Machine Shop	Propulsion	Machinists	Workshop	—Relocated supervisor desk to 110B
118	Lobby			Circulation	—1 ipad locker —1 cabinet for plumbing —2 tools & spare parts cabinets
119	Corridor			Circulation	—1 key locker
120	Corridor			Circulation	
150	Weld Shop	Propulsion		Workshop	—1 desk
151	Storage	Facilities		Storage	—1 electromechanical equipment cabinet (relocated from 104) —1 machinery lubricating oils cabinet (relocated from 104) —1 log books cabinet (relocated from 104)
153	Elevator Equipment			Mechanical	
154	All Gender Restroom	Track/Propulsion		Restroom	
155	Locker Room	Track/Propulsion		Locker Room	
156	Janitor	Facilities		Janitor	
S4	Stair 4			Circulation	
S5	Stair 5			Circulation	

First Floor Mezzanine

1M00	Lobby			Circulation	
1M01	Storage/Break	Museum		Break	
1M02	Janitor	Facilities		Janitor	
1M03	Men	Museum		Restroom	
1M04	Women	Museum		Restroom	
1M05	Museum	Museum		Museum	
1M06	Museum Entry	Museum		Museum	
1M08	Parts Storage	Propulsion	Machinists	Storage	

Proposed Program

Room			Proposed Use		
Room No.	Room Name	Team	User	Function	Notes
1M09	Machinist & Storekeeper Workstation	Facilities/Propulsion	Machinists Storeroom keeper Electronic Maint. Tech Electrician Electronic Maint. Tech PROP F	Workshop	—7 workstations, shared space —2 large cabinets —3 tool carts
1M10	Walkway	Shared		Storage	—1 hazardous materials cabinet —6 cabinets
1M50	All Gender Restroom	Museum		Restroom	
1M51	Walkway	Shared		Circulation	
1M52	Corridor	Shared		Circulation	
1M53	Shared Office	Propulsion	Machinists, Electronic Maintenance Tech, Maintenance Controller	Office	—New office buildout over cable yard —4 workstations —1 Storage cabinet (relocated from 116) —1 File cabinet (relocated from 116) —1 Flat file (relocated from 116) —General storage (relocated from 116) —2 Shelves (relocated from 116) —General storage (relocated from 101)
1M54	Mechanical Engineer	Propulsion	Mechanical Engineer, Assistant Engineer	Office	—New office buildout over cable yard —Relocated from 116 —2 workstations —1 cabinet (relocated from 101) —1 cart (relocated from 101) —General storage (relocated from 101) —Binders qty. 2 (relocated from 116) —1 locked cabinet (relocated from 116) —Drawing rolls (relocated from 116)
1M55	Office	Track/Propulsion	Shop and Equipment Superintendent (Rob)	Office	—New office buildout over cable yard —Relocated from 101 —Private office —1 desk, secure file storage —General storage (relocated from 101)

Proposed Program

Room			Proposed Use		
Room No.	**Room Name**	**Team**	**User**	**Function**	**Notes**
1M56	Office	Track/Propulsion	Cable Machinery Manager	Office	—New office buildout over cable yard —Private office —1 desk, secure file storage —General storage qty. 2 (relocated from 115)
1M57	Office	Track	Track Superintendent (Rigo)	Office	—New office buildout over cable yard —Relocated from 101A —Private office —1 desk, secure file storage —1 shelf (relocated from 101A) —General files storage (relocated from 101A)
1M58	Copy/Storage	Track/Propulsion		Storage	—1 printer —1 water dispenser —1 water jugs storage —2 cabinets (relocated from 114) —General storage (relocated from 116)
1M59	Shared Office	Track/Propulsion	Management Assistant, Maintenance Planner(s)	Office	—New office buildout over cable yard —Relocated from 101 —4 workstations —1 Filing cabinet (relocated form 101A) —General storage (relocated form 101A) —3 Cabinets (relocated from 114) —General storage (relocated from 115) —1 Shelf (relocated form 115)
1M60	Walkway	Shared		Circulation	

Proposed Program

Room			Proposed Use		
Room No.	Room Name	Team	User	Function	Notes
Second Floor					
200	Cable Car Shop	Vehicle Maintenance			—4 parts and tools cabinets near freight elevator used by vehicle mechanics —1 hazardous materials cabinet next to bike storage —1 hazardous materials cabinet next to freight elevator
200A	Pit	Vehicle Maintenance			—9 tools cabinets
201	Lunch/Break	Vehicle Maintenance	Management Assistant	Break	—2 Workstations —Water dispenser filtration system —Television —1 blank inspection/operations documents storage —1 break room table
202	Supervisors' Office	Vehicle Maintenance	Maintenance Controller, 2 Vehicle Maintenance Assistant Supervisors, and Car Cleaner Assistant Supervisor	Office	—4 desks in shared office
203	Men	Vehicle Maintenance		Restroom/Locker Room	
204	Janitor	Facilities		Janitor	
205	Women	Vehicle Maintenance		Restroom/Locker Room	
206	All Gender Restroom	Vehicle Maintenance		Restroom	
207	Parts	Vehicle Maintenance		Storage	
208	Carpentry/Paint Shop	Vehicle Maintenance	Carpenters	Workshop	—tools and storage —Workstation for this room located in 208C
208A	Tools	Vehicle Maintenance			
208B	Paint Booth	Vehicle Maintenance		Workshop	—tools and storage —Workstation for this room located in 208C
208C	Vehicle Maintenance Office	Electric Transit System Mechanic Transit Car Cleaner		Office	—7 workstations —Secure files storage, secure valuables storage —For cable yard area
208D	Spray Booth	Vehicle Maintenance		Workshop	
209	Lobby	General Building		Circulation	
250	12KV Electrical Room	General Building		Electrical	

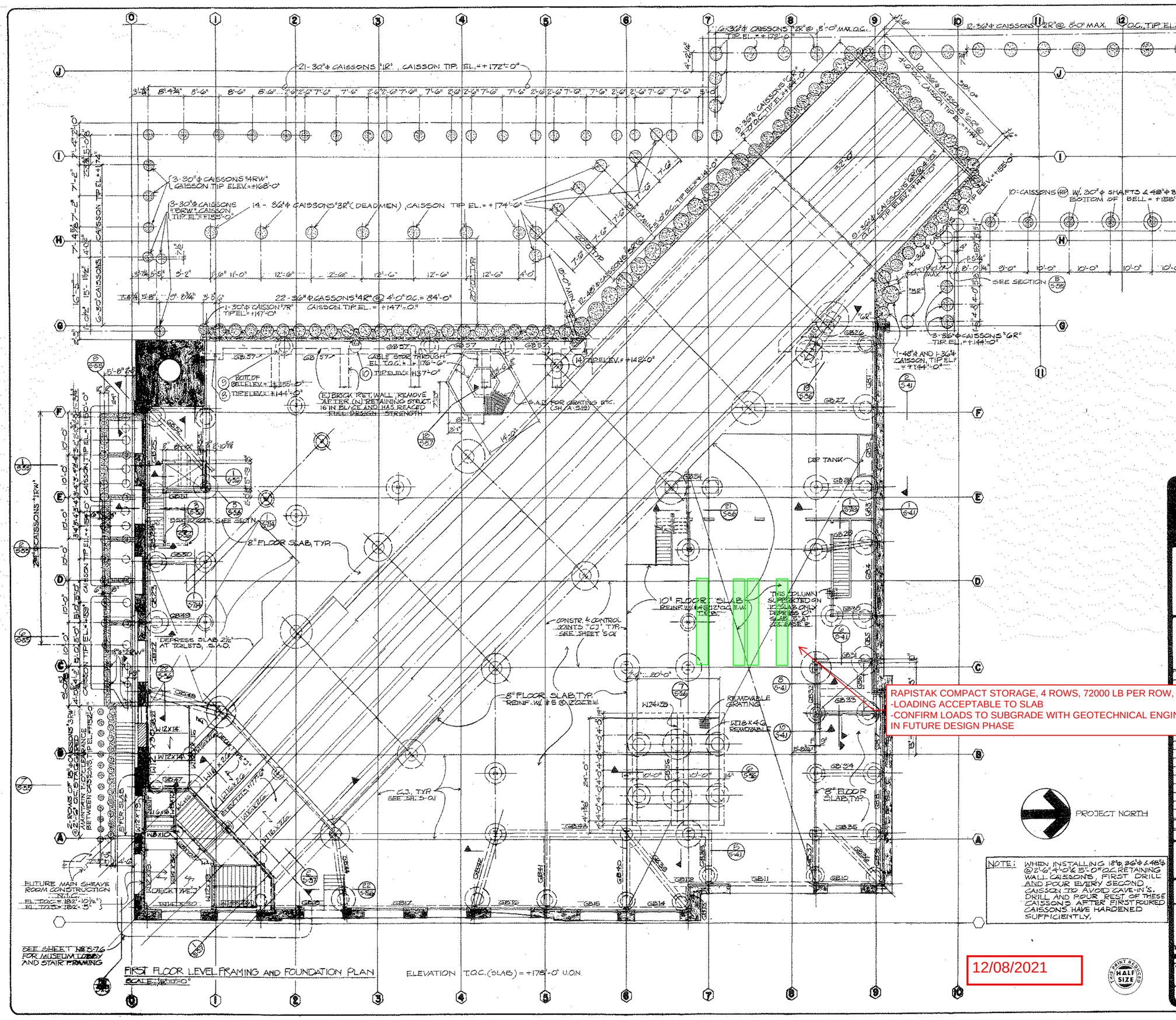
Proposed Program

Room			Proposed Use		
Room No.	**Room Name**	**Team**	**User**	**Function**	**Notes**
251	Superintendent Office	Vehicle Maintenance	Vehicle Maintenance Supervisor	Office	—Relocated from 208C —1 desk
252	Bicycle Storage	General Building		Storage	
253	Grip Building Area	Vehicle Maintenance		Workshop	
Second Floor Mezzanine					
2M17	Tel	Operations		Tel/Data	
2M18	Elevator Equipment	General Building		Mechanical	
2M19	Mechanical	General Building		Mechanical	
2M20	Corridor	General Building		Circulation	
2M20A	Corridor	General Building		Circulation	
2M50	Lobby	General Building		Circulation	
2M51	Hallway	Operations		Circulation	
2M52	Storage	Operations		Storage	—3 cabinets (relocated from 2M04)
2M53	All Gender Restroom	Operations		Restroom	
2M54	Gym	Operations		Gym	
2M55	Classroom	Operations		Classroom	—7 workstations
2M56	Lead Trainer	Operations	Lead Trainer	Office	—3 workstations
2M57	Copy/Storage	Operations		Copy/Storage	—1 printer —3 cabinets (relocated from 2M04) —Telecom equipment relocated from 2M04
2M58	Shared Office	Operations	New Function	Shared Office	—2 workstations
2M59	Assistant Operations Manager	Operations	Assistant Operations Mgr	Office	—1 desk
2M60	Shared Office			Shared Office	—4 workstations
2M61	Admin Support			Office	—1 desk
2M62	Shared Office			Shared Office	—3 workstations
2M63	Senior Operations Manager	Operations	Senior Operations Mgr	Office	—1 desk
2M64	Revenue	Operations	Revenue	Office	—1 desk

Proposed Program

Room			Proposed Use		
Room No.	Room Name	Team	User	Function	Notes
2M65	Dispatch	Operations	Dispatch	Office	—1 desk —1 cabinet for radios —1 filing cabinet —1 cabinet for clipper cards
2M66	Open Workstations			Shared Office	—6 workstations
2M67	Operators Break Room	Operations		Break	—2 tables —1 sofa —1 pool table —1 table tennis
2M68	Locker Room	Operations		Locker Room	
2M69	Union Rep	Operations		Office	—1 desk —1 cabinet —1 shelving
2M70	Storage	Facilities		Storage	
2M71	Men	Operations		Restroom	
2M72	Women	Operations		Restroom	
2M73	Janitor	Facilities		Janitor	
2M74	Lactation	Operations		Lactation Room	—1 chair —1 side table
2M75	Vestibule	Operations		Circulation	

A3 - Structural Concept Sketches



RAPISTAK COMPACT STORAGE, 4 ROWS, 72000 LB PER ROW, 9' TALL
-LOADING ACCEPTABLE TO SLAB
-CONFIRM LOADS TO SUBGRADE WITH GEOTECHNICAL ENGINEER IN FUTURE DESIGN PHASE

PROJECT NORTH

NOTE: WHEN INSTALLING 18"ϕ, 36"ϕ & 48"ϕ @ 2'-6", 4'-0" & 5'-0" O.C. RETAINING WALL CAISSONS, FIRST DRILL AND POUR EVERY SECOND CAISSON TO AVOID CAVE-IN'S. DRILL AND POUR REST OF THESE CAISSONS AFTER FIRST POURED CAISSONS HAVE HARDENED SUFFICIENTLY.

12/08/2021

CONTRACT NO. MR 684

CHIN & HENSOLT ENGINEERS, INC.

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1	3-1-82	ISSUED FOR FINAL REVIEW	HF	

ISSUES

REHABILITATION OF CABLE CAR BARN

CITY AND COUNTY OF SAN FRANCISCO
PUBLIC UTILITIES COMMISSION
UTILITIES ENGINEERING BUREAU

FIRST FLOOR LEVEL FRAMING AND FOUNDATION PLAN

SCALE 1/8" = 1'-0"

Chief Engineer & Deputy General Manager PUBLIC UTILITIES COMMISSION

General Manager MUNICIPAL RAILWAY

SHEET S1.1 OF

DRAWING NO. DL7084

REV. NO.

NOTES:

1. PERIMETER CAISSONS TO BE DRILLED AS CLOSE AS POSSIBLE TO (E) BRICK WALL. SEE SHT S-4.1.
2. CAISSON NUMBERING SYSTEM IS SIMILAR TO COLUMN NUMBERING SYSTEM. SEE SHT S.02.
3. SEE SHEETS S5.1 A,B & C FOR DETAILS OF TENSION RUN & MACHINERY FOUNDATION.
4. SEE SHEET A-1.3 FOR EXISTING PITS & OTHER EXIST'G. UNDERGROUND CONSTRUCTION.

REMOVE (E) WALLS AS REQ'D FOR (N) CAISSONS AND RETAINING WALLS

SIM. DETAIL 9/S6.1

ELEVATOR PIT

REMOVE (E) VAULT CONSTR. AT INTERFERENCE W/(N) ELEV. PIT & COL. CAISSON ETC.

REMOVE (E) VAULT CEILING, FILL ENTIRE SPACE W/ EARTH (95% COMPACTION REQ'D.)

(E) VAULT FLOOR ELEV. +172'-9"

REMOVE (E) VAULT CONSTR. FOR (N) COL. CAISSON

TO FLR. SLAB ELEV. +173'-4" (12" SLAB)

TO FLR. SLAB ELEV. +173'-4" (8" SLAB)

DETAIL 17/S5.1

SIM. DETAIL 6/S6.1

FLOOR ELEV. +168'-6"

(E) VAULT

BOTTOM OF TENSION RUN CABLE CHANNELS ELEV. +169'-0" (-TOP OF SLAB) SEE SHEET S-5.1

CABLE E

CABLE E

CABLE E

CABLE E

(E) CURB

(N) OIL SEPARATOR TANK 11-6" BELOW SIDEWALK. SEE SHEET S-5.7 FOR PLAN & SECTIONS S.4AD FOR LOCATN. AND PIPING.

BOTTOM OF PIT ELEV. +159'-0"±

ELEVATOR PIT

SIM. DETAIL 7/S6.1

SIM. DETAIL 10/S6.1

(E) STORAGE TANK VAULT REMOVE VAULTED CEILING AND STORAGE TANKS, FILL REMAINING PIT WITH EARTH (95% COMPACTION REQ'D.)

PROJECT NORTH

40'-9"

21'-5"

CONTRACT NO. MR 584

CHIN & HENSOLT STRUCTURAL ENGINEERS INC

REGISTERED PROFESSIONAL ENGINEER P. Q. CHIN No. 836 STRUCTURAL STATE OF CALIFORNIA

DRAWING CERTIFIED BY

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ISSUES

REHABILITATION OF CABLE CAR BARN

CITY AND COUNTY OF SAN FRANCISCO
PUBLIC UTILITIES COMMISSION
UTILITIES ENGINEERING BUREAU

BASEMENT LEVEL FOUNDATION PLAN

RECORD BY: H. Fernandez | DR. T. [illegible] | CH. | SCALE 1/8"=1'-0" | DATE

APPROVED: Chief Engineer & Deputy General Manager PUBLIC UTILITIES COMMISSION

APPROVED: General Manager MUNICIPAL RAILWAY

SHEET S1.2 OF

DRAWING NO. D-7085

REV. NO.

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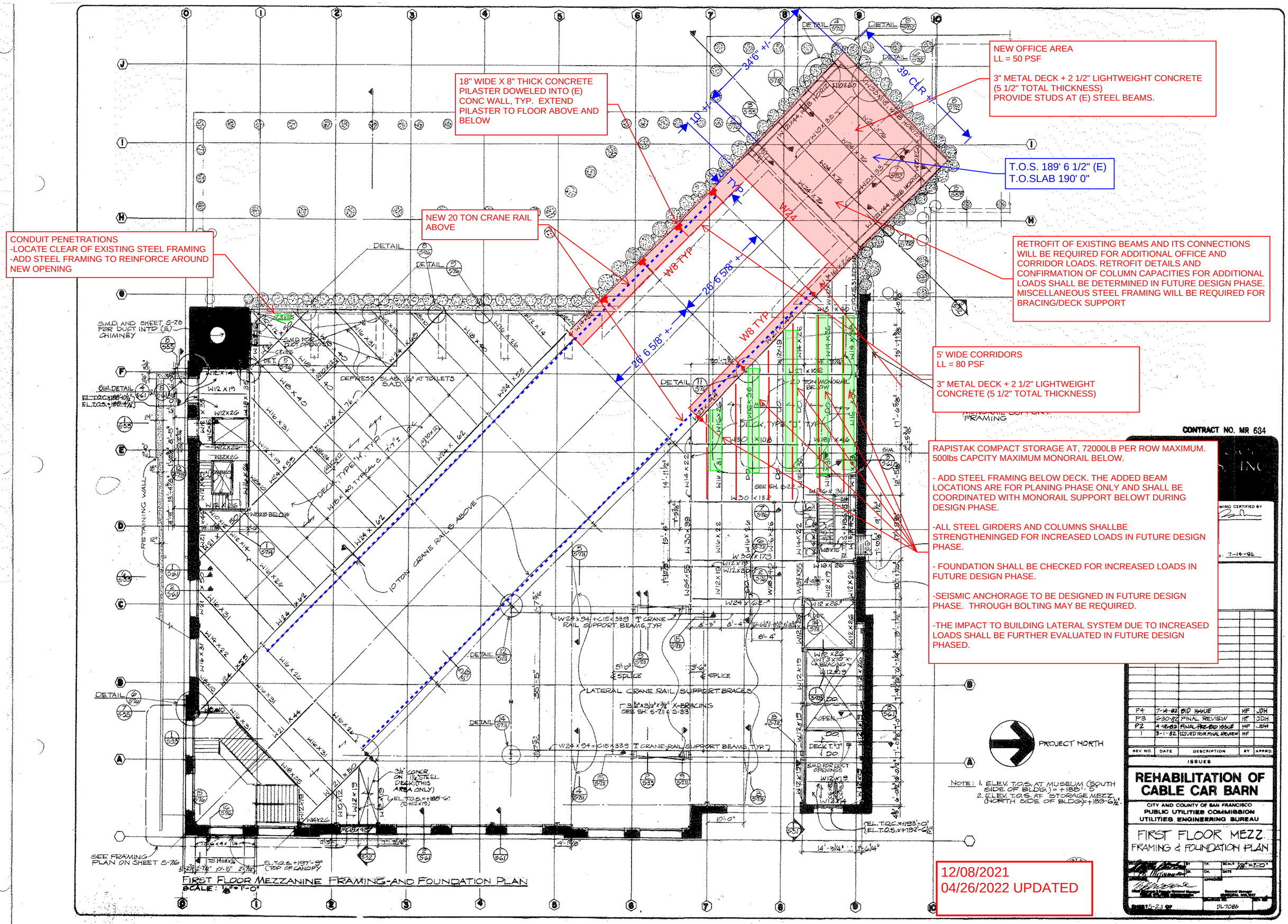
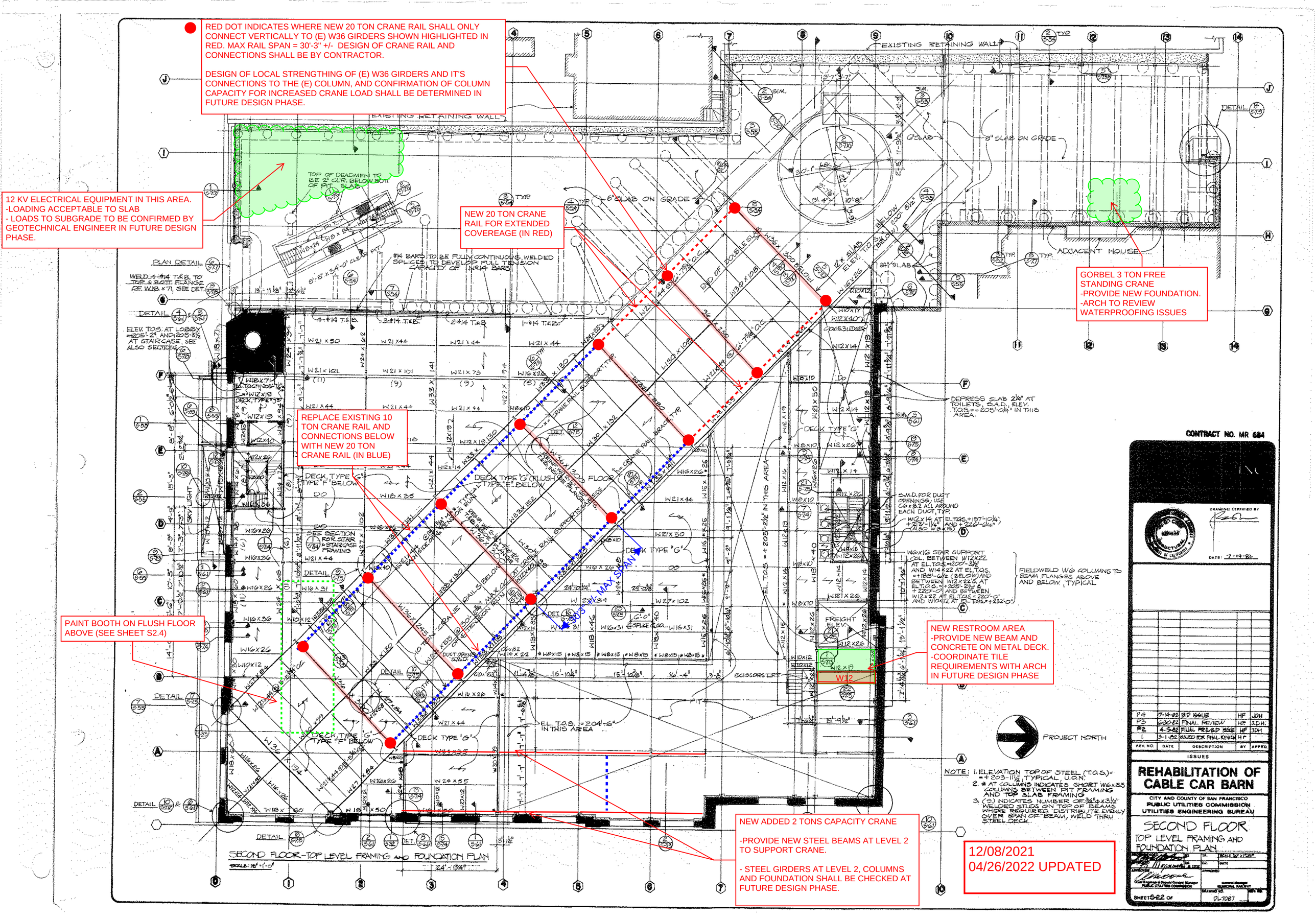
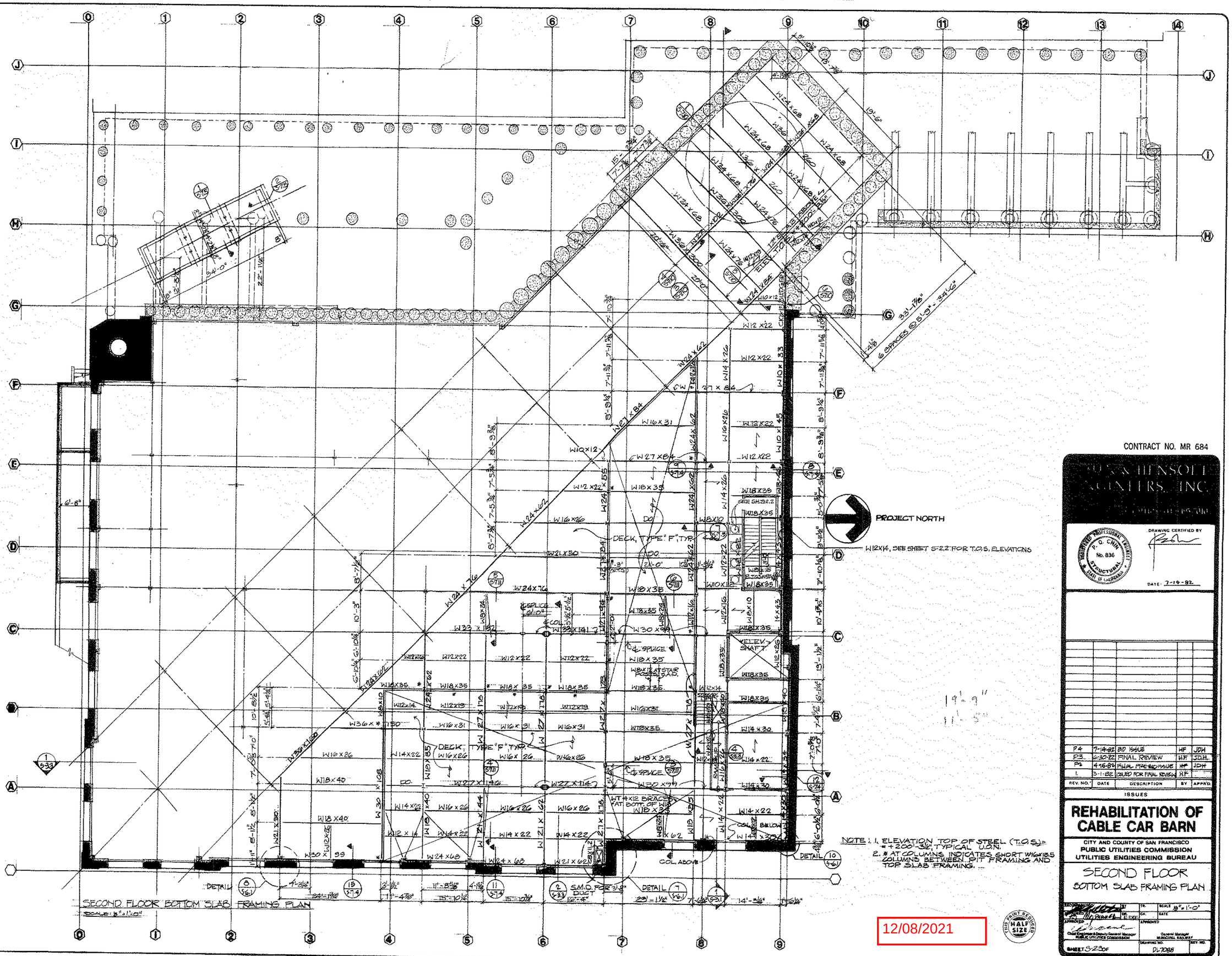


18" WIDE X 8" THICK CONCRETE PILASTER DOWELED INTO (E) CONC WALL, TYP. EXTEND PILASTER TO FLOOR ABOVE AND BELOW
NEW OFFICE AREA
LL = 50 PSF
3" METAL DECK + 2 1/2" LIGHTWEIGHT CONCRETE (5 1/2" TOTAL THICKNESS)
PROVIDE STUDS AT (E) STEEL BEAMS.
T.O.S. 189' 6 1/2" (E)
T.O.SLAB 190' 0"
NEW 20 TON CRANE RAIL ABOVE
CONDUIT PENETRATIONS
-LOCATE CLEAR OF EXISTING STEEL FRAMING
-ADD STEEL FRAMING TO REINFORCE AROUND NEW OPENING
RETROFIT OF EXISTING BEAMS AND ITS CONNECTIONS WILL BE REQUIRED FOR ADDITIONAL OFFICE AND CORRIDOR LOADS. RETROFIT DETAILS AND CONFIRMATION OF COLUMN CAPACITIES FOR ADDITIONAL LOADS SHALL BE DETERMINED IN FUTURE DESIGN PHASE. MISCELLANEOUS STEEL FRAMING WILL BE REQUIRED FOR BRACING/DECK SUPPORT
5' WIDE CORRIDORS
LL = 80 PSF
3" METAL DECK + 2 1/2" LIGHTWEIGHT CONCRETE (5 1/2" TOTAL THICKNESS)
RAPISTAK COMPACT STORAGE AT, 72000LB PER ROW MAXIMUM. 500lbs CAPCITY MAXIMUM MONORAIL BELOW.
- ADD STEEL FRAMING BELOW DECK. THE ADDED BEAM LOCATIONS ARE FOR PLANING PHASE ONLY AND SHALL BE COORDINATED WITH MONORAIL SUPPORT BELOWT DURING DESIGN PHASE.
-ALL STEEL GIRDERS AND COLUMNS SHALLBE STRENGTHENINGED FOR INCREASED LOADS IN FUTURE DESIGN PHASE.
- FOUNDATION SHALL BE CHECKED FOR INCREASED LOADS IN FUTURE DESIGN PHASE.
-SEISMIC ANCHORAGE TO BE DESIGNED IN FUTURE DESIGN PHASE. THROUGH BOLTING MAY BE REQUIRED.
-THE IMPACT TO BUILDING LATERAL SYSTEM DUE TO INCREASED LOADS SHALL BE FURTHER EVALUATED IN FUTURE DESIGN PHASED.
34'6" +/-
39' CLR +/-
10' +/-
26' 6 5/8" +-
26' 6 5/8" +-
W8 TYP
W24
10 TON CRANE RAILS ABOVE
LATERAL CRANE RAIL SUPPORT BRACES
PROJECT NORTH
NOTE: 1. ELEV. T.O.S. AT MUSEUM (SOUTH SIDE OF BLDG.) = +188'-5"
2. ELEV. T.O.S. AT STORAGE MEZZ. (NORTH SIDE OF BLDG.) = +189'-6½"
FIRST FLOOR MEZZANINE FRAMING AND FOUNDATION PLAN
SCALE: 1/8" = 1'-0"
CONTRACT NO. MR 634
REHABILITATION OF CABLE CAR BARN
CITY AND COUNTY OF SAN FRANCISCO
PUBLIC UTILITIES COMMISSION
UTILITIES ENGINEERING BUREAU
FIRST FLOOR MEZZ.
FRAMING & FOUNDATION PLAN
12/08/2021
04/26/2022 UPDATED


RED DOT INDICATES WHERE NEW 20 TON CRANE RAIL SHALL ONLY CONNECT VERTICALLY TO (E) W36 GIRDERS SHOWN HIGHLIGHTED IN RED. MAX RAIL SPAN = 30'-3" +/- DESIGN OF CRANE RAIL AND CONNECTIONS SHALL BE BY CONTRACTOR.
DESIGN OF LOCAL STRENGTHING OF (E) W36 GIRDERS AND IT'S CONNECTIONS TO THE (E) COLUMN, AND CONFIRMATION OF COLUMN CAPACITY FOR INCREASED CRANE LOAD SHALL BE DETERMINED IN FUTURE DESIGN PHASE.
12 KV ELECTRICAL EQUIPMENT IN THIS AREA.
-LOADING ACCEPTABLE TO SLAB
- LOADS TO SUBGRADE TO BE CONFIRMED BY GEOTECHNICAL ENGINEER IN FUTURE DESIGN PHASE.
NEW 20 TON CRANE RAIL FOR EXTENDED COVEREAGE (IN RED)
GORBEL 3 TON FREE STANDING CRANE
-PROVIDE NEW FOUNDATION.
-ARCH TO REVIEW WATERPROOFING ISSUES
REPLACE EXISTING 10 TON CRANE RAIL AND CONNECTIONS BELOW WITH NEW 20 TON CRANE RAIL (IN BLUE)
PAINT BOOTH ON FLUSH FLOOR ABOVE (SEE SHEET S2.4)
NEW RESTROOM AREA
-PROVIDE NEW BEAM AND CONCRETE ON METAL DECK.
-COORDINATE TILE REQUIREMENTS WITH ARCH IN FUTURE DESIGN PHASE
NEW ADDED 2 TONS CAPACITY CRANE
-PROVIDE NEW STEEL BEAMS AT LEVEL 2 TO SUPPORT CRANE.
- STEEL GIRDERS AT LEVEL 2, COLUMNS AND FOUNDATION SHALL BE CHECKED AT FUTURE DESIGN PHASE.
12/08/2021
04/26/2022 UPDATED
EXISTING RETAINING WALL
ADJACENT HOUSE
PROJECT NORTH
SECOND FLOOR-TOP LEVEL FRAMING AND FOUNDATION PLAN
CONTRACT NO. MR 684
REHABILITATION OF CABLE CAR BARN
CITY AND COUNTY OF SAN FRANCISCO
PUBLIC UTILITIES COMMISSION
UTILITIES ENGINEERING BUREAU
SECOND FLOOR
TOP LEVEL FRAMING AND FOUNDATION PLAN
DATE: 7-14-82
SHEET S-22 OF



NOTE: 1. ELEVATION TOP OF STEEL (T.O.S.) = +200'-3½", TYPICAL U.O.N.
2. * AT COLUMNS INDICATES SHORT W16X18.5 COLUMNS BETWEEN PIT FRAMING AND TOP SLAB FRAMING.

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JOHN & HENSOLT ENGINEERS, INC.

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ISSUES

REHABILITATION OF CABLE CAR BARN

CITY AND COUNTY OF SAN FRANCISCO
PUBLIC UTILITIES COMMISSION
UTILITIES ENGINEERING BUREAU

SECOND FLOOR
BOTTOM SLAB FRAMING PLAN

SCALE 1/8" = 1'-0"

SHEET S-2.3 OF

DRAWING NO. DL-7088

12/08/2021

PAINT BOOTH
-ACCEPTABLE HERE
-CONFIRM LOADS TO STRUCTURE AND ANCHORAGE REQUIREMENTS IN FUTURE DESIGN PHASE

PER EMAIL 10/21/21, NO VERTICAL LIFT MODULE

SECOND FLOOR TRACK AND FLUSH FLOOR SUPPORT PLAN
SCALE: 1/8"=1'-0"

S.A.D. SHEETS A-24 & A79 FOR STAIRS AND WALKWAYS AT CABLE CAR PITS

PROJECT NORTH

CONTRACT NO. MR 634

LEGEND:
= POURED CONCR. WALLS AT PITS ETC.
CONCR. TRACK & TOP SLAB SUPPORT BEAMS
SLOT FOR CABLE CAR GRIPS
RAILS
W8X18 TOP SLAB SUPPORT BEAMS ON TOP OF BASE SLAB
BEAMS AND GIRDERS BELOW BASE SLAB

NOTE:
1. SPANS FOR S5B'S, NOT TO EXCEED 12'-6".
2. PLACE S5B'S, WHEREVER CLEAR DISTANCE BETWEEN EDGES OF CONCR. TRACK & SLAB SUPPORT BEAMS EXCEEDS 6'-0"
3. ALLOWED SPLICES OF S5B'S, IF NOT SPLICED ON TOP OF STEEL BEAMS BELOW
STEEL BEAMS BELOW BASE SLAB
4. USE 9½" x 7" x 0'-6" SPLICE PL. EACH SIDE W/ 2-3/4" ϕ HSB TO EACH BEAM AT SPLICES OF W8X18 S5B'S.
5. SEE SHEETS Nº T-1.1, T-2.1, T-3.1, T-3.2 AND S-7.10 FOR TRACK LAYOUT AND TRACK & TURNOUT SECTIONS AND DETAILS.

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REHABILITATION OF CABLE CAR BARN

CITY AND COUNTY OF SAN FRANCISCO
PUBLIC UTILITIES COMMISSION
UTILITIES ENGINEERING BUREAU

SECOND FLOOR TRACK AND FLUSH FLOOR SUPPORT PLAN

SCALE 1/8"=1'-0"
DRAWING NO. S-7089
REV. NO.
SHEET S24 OF

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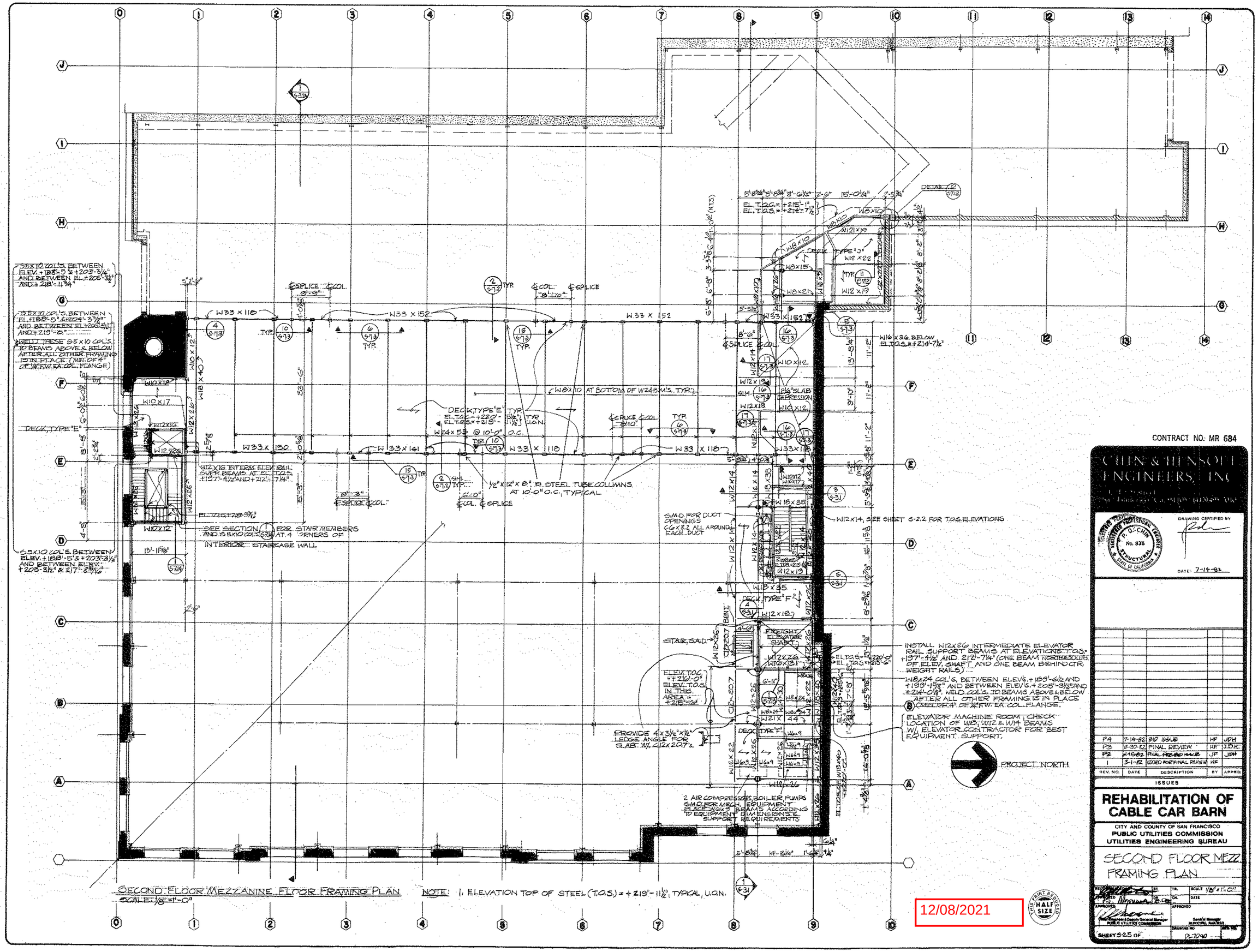
W33 x 118
W33 x 152
W33 x 130
W33 x 141
W24x53 @ 10'-0" O.C.
W10x12
W10x17
W12x26
W18x40
W12x16
W8x10
W8x15
W8x21
W12x19
W12x22
W18x10
W18x35
W12x14
W16x36
W16x26
W12x36
W8x24
W21x44
W16x31
W12x30
W18x24
W16x67
W16x89
W14x82
W14x68
W14x61
W14x53
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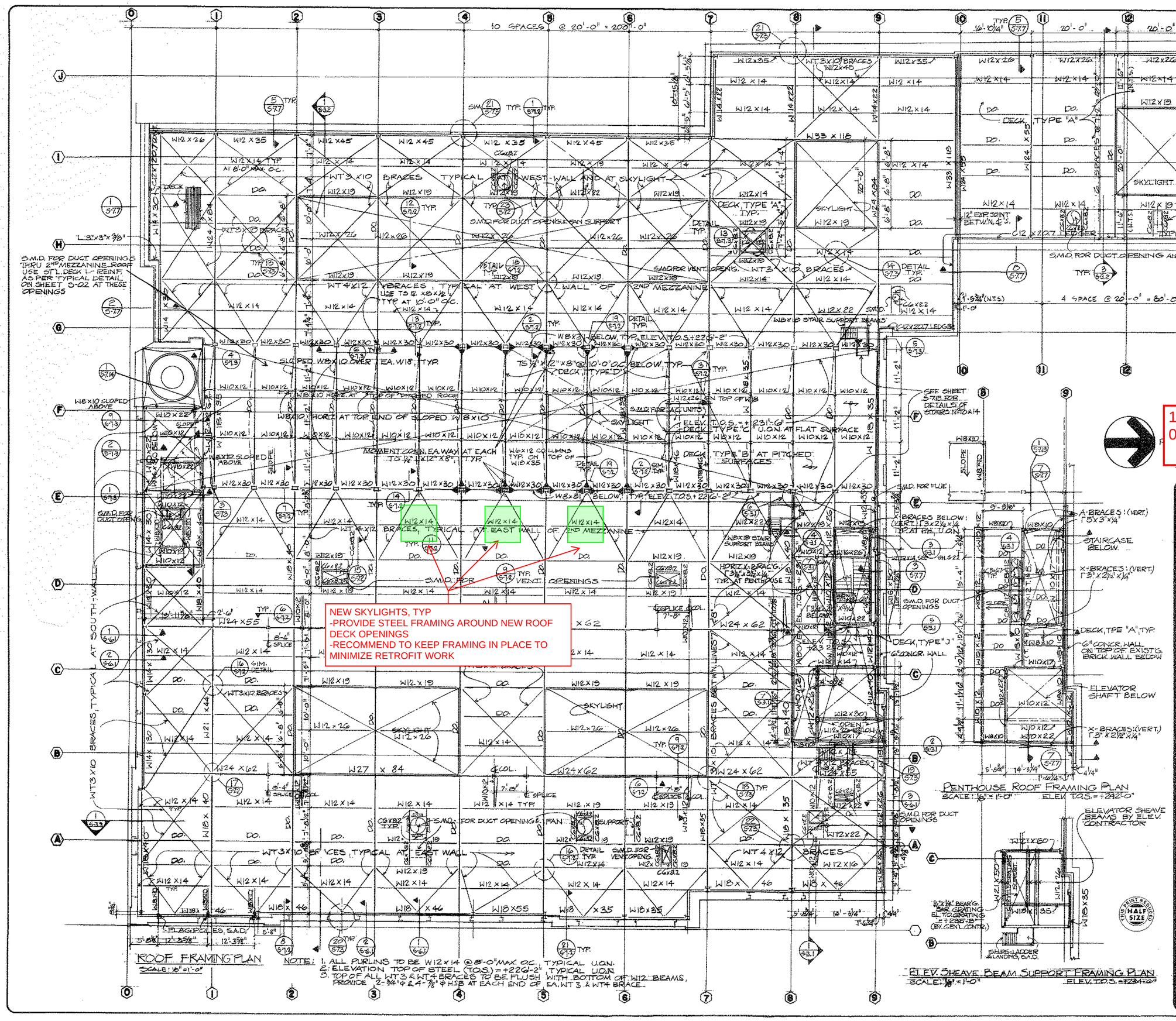

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1.	3-4-82	ISSUED FOR FINAL REVIEW	HF	

ISSUES

REHABILITATION OF CABLE CAR BARN

CITY AND COUNTY OF SAN FRANCISCO
PUBLIC UTILITIES COMMISSION
UTILITIES ENGINEERING BUREAU

MAIN & PENTHOUSE ROOF FRAMING PLAN

SCALE 1/8" = 1'-0"

SHEETS-26 OF

DRAWING NO. D-2091

A4 - Seismic Evaluation Report

Seismic Evaluation Report

Appendix A - Tier 1 Checklist

Appendix B - Tier 2 Evaluation Engineering Calculations

Appendix C - Geotechnical Memo

SEISMIC EVALUATION REPORT

CABLE CAR BARN, SAN FRANCISCO

Prepared for:

San Francisco Public Works
San Francisco, California

Prepared By:
STRUCTUS, Inc.

SFPW Order No. 187,751
CSO No. ES2-ST-05

October 21, 2021

EXECUTIVE SUMMARY

Structus Inc. has performed a preliminary seismic evaluation of the existing Cable Car Bern Facility located at 1201 Mason Street, San Francisco, California. Our findings and recommendations are presented in the following report.

The subject facility houses cable car operations and controls, and also includes an area at the corner of Mason Street and Washington Street for a Cable Car Museum opening to the public.

The intent of the subject evaluation is to provide an overview of the existing structural conditions and anticipated seismic performance based on ASCE 41-17 provisions for evaluation of existing structures. The evaluation includes Tier-1 screening and Tier-2 deficiency-based evaluations. The subject evaluation is limited to primary seismic force resisting system in the existing building. Gravity load carrying system, which appears meeting the current usage needs, is not included in the current scope of evaluation.

The seismic evaluation is based on available drawings (mostly 1983 renovation architectural and structural drawings) for the existing building and our field observations, without conducting any destructive or invasive investigation or exploration at existing structures. Consequently, there are conditions where evaluations were based on engineering judgement and assumptions, which shall be verified and validated during detailed retrofitting design. Based on discussion with SFPW engineers, it is understood the subject facility does not serve functions for responding to emergencies or natural disasters and is considered as regular occupancy and usage. Thus, the seismic evaluation for the subject facility is conducted accordingly as **Risk Category II.**

Two seismic hazard levels have been considered, namely BSE-1E (20%/50-year) and BSE-2E (5%/50-year) per ASCE 41-17. The targeted seismic performance for BSE-1E and BSE-2E are life safety and collapse prevention, respectively for risk category II facilities.

The facility went through a substantial renovation and seismic retrofitting in the early 80's last century with re-building most of the interior spaces and retrofitting of existing masonry walls for seismic force resistance. The structure experienced the moderate 1989 Loma Prieta Earthquake after the reconstruction and reported no noticeable damages. By field observations, the facility appears functioning for current intended usage.

Detailed review of the existing drawings revealed that 1983 seismic retrofitting enhanced the seismic force resisting systems but fell significantly short in meeting current standards for seismic force resisting systems detailing requirements. Evaluation results confirmed that many of the existing seismic force resisting elements/components do not have adequate strength to meet the intended collapse prevention performance goal for BSE-2E seismic risk level and may suffer severe damages when experiencing BSE-2E level earthquakes.

Evaluation analyses indicated that the anticipated structural deformation was limited due to the low height-to-width ratio of the building and inherent stiffness of the structures.

During the early 80's renovation a complete gravity load carrying system, which is independent from the seismic force resisting system, was constructed inside the building perimeter walls. While the seismic force resisting system are expected to suffer significant damages when experiencing BSE-2E level earthquakes, it is our professional opinion that the probability of the

building's gravity load carrying system being destroyed due to damages in the seismic force resisting system is low. Therefore, we recommend an overall **Seismic Hazard Rating (SHR) of 3** for the subject building.

Significant retrofitting measures, in order to meet established performance goals per ASCE 41-17 provisions, include strengthening the south and east side shear wall piers and spandrels, strengthening CMU walls along grid line G, and reinforcing east areas of main roof diaphragm.

Detailed evaluation procedures and results, retrofitting concepts including alternative options and minor retrofitting measures limited in localized areas are discussed in the report.

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Appendix C – Geotechnical Memo

1. INTRODUCTION

As part of an as-needed structural engineering services contract with SFPW, Structus was assigned the task to perform a preliminary seismic evaluation of the existing Cable Car Barn facility.

1.1 Objectives

The purpose of the subject evaluation is to access the current structural conditions with respect to anticipated performance in resisting future earthquakes, including maximum considered earthquake events that may affect the project site. Where deficiencies are found, possible retrofitting schemes will be discussed.

1.2 Scope of Work

Structus' scope of work for the subject seismic assessment includes evaluations of the building's primary seismic forces resisting systems, elements, and components. The building's gravity load supporting systems are reviewed only to the extent of their interactions with the seismic force resisting system's performance. Elements and components not participating in seismic force resistance are not included in the subject evaluation.

The current seismic evaluation is limited to above grade structures. Underground structures and other retaining structures, some may extend beyond the building footprint, are not included in the current evaluation.

Structus' scope of work also includes developing possible retrofitting concepts for planning purposes where significant deficiencies are found. The development of such retrofitting schemes will be at conceptual level and will not be suitable for detailed budgeting and construction use.

1.3 Document Reviewed

SFDW provided the following document for the purpose of current seismic evaluation:

Contract No. MR 684, "REHABILITATION OF CABLE CAR BARN" by Chin & Hensolt Engineers, Inc. dated 07.14.1982, Did Issue.

Contract No. MR 684, "REHABILITATION OF CABLE CAR BARN" by Chin & Hensolt Engineers, Inc. dated 08.12.1983, Construction Revision (revised sheets only).

"Geotechnical Investigation, Cable Car Barn Renovation Project" by Geo/Resource Consultants, Inc. dated 09.24.1979.

"Geotechnical Investigation, Proposed Building Wall Cable Car Barn Renovation Project" by Geo/Resource Consultants, Inc. dated 10.22.1981 (121-5S).

"Cable Car Barn – US Seismic Design Maps (ASCE 41-17)" by SFPW.

1.4 Limitations

Findings presented in this report are based on analysis of the existing building as represented by the available building drawings and limited field observations. No destructive or invasive field investigation or material testing were conducted. Engineering calculations involving existing material strength, reinforcing details, and

connection properties were primarily performed based on professional engineering judgment, available building drawings, and historical data per ASCE 41-17.

The subject evaluation is limited to ASCE 41-17 Tier-1 Screening and Tier-2 Deficiency Based Evaluation for seismic hazard levels prescribed per ASCE 41-17, and for primary seismic force resisting systems and components. Evaluations of non-structural systems/elements/components were not included in the subject evaluation and report.

The development of retrofitting concepts focusses on structural effectiveness and construction feasibilities. Though most recommended retrofitting work is limited inside the building envelope, no specific considerations are given to historical preservation requirements. Consulting with historical preservation professionals is recommended for detailed retrofitting design.

2. BUILDING AND STRUCTURAL SYSTEM DESCRIPTIONS

The Cable Car Barn building was originally built in 1900's as a two-story building. The original building was mostly unreinforced masonry construction, including foundations, walls, and other elements. No information about the original construction is available.

2.1 General Descriptions of the Existing Structures

The building has two distinguished areas: a two-story east portion between the lower retaining structure along grid line G at west and Mason Street at the east, and a one-story west portion between the upper retaining structure along grid line I at the west and the lower retaining structure along grid line G at the east, situated at the elevation corresponding to Level 2 of the east portion on top of the lower retaining structure. The east portion includes two separate triangular-shaped mezzanine areas between ground floor and Level 2 (1M floor), separated by the cable tensioning facility running in a diagonal direction between the S-E and N-W corners of the building. The S-W corner mezzanine houses the Cable Car Museum, and the N-W corner mezzanine are storage spaces for cable car operations and maintenance. The east portion also includes a narrow mezzanine above Level 2 (2M floor) between the south and north walls of the building for office space. The main roof for the east and west portions are at the same elevation (except minor drainage slopes) but is interrupted by the 2nd floor mezzanine. The roof for 2nd floor mezzanine stands above the main roof structure.

The ground level in the east portion is generally at near Mason Street elevation (Floor EL. 178'-0"). The elevation at 2nd level in the east portion and the ground level at the west portion is approximately 205'-9". The main roof structure top of steel elevation is at approximately 226'-2". A general E-W building section is shown in Fig. 2.1.

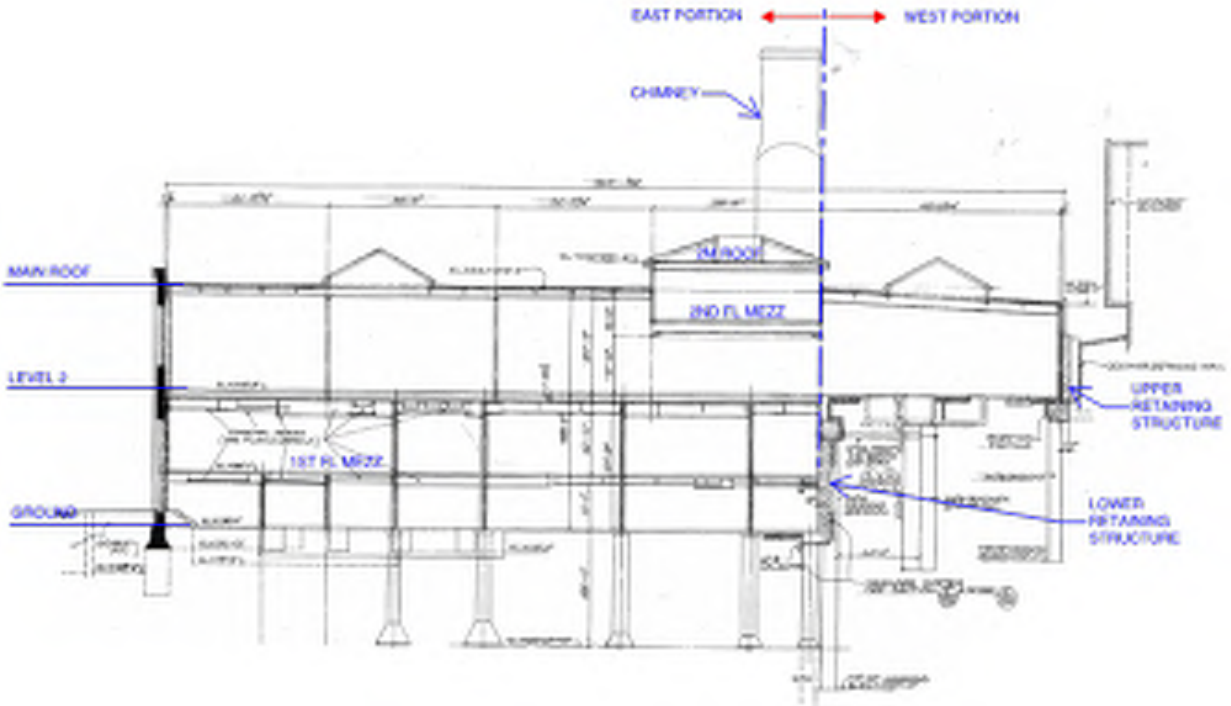


Fig. 2.1 Building E-W Section Viewing South

Structural plans of the building excerpted from existing drawings are shown in Figures 2.2 to 2.8 from the Ground Level to 2M Roof. There are areas having below grade structures for cable conveying and elevator pits, etc. Such areas do not actively participate in building structure's seismic response and are not included in the current evaluation. Primary seismic force resisting systems are noted on each plan for reference.

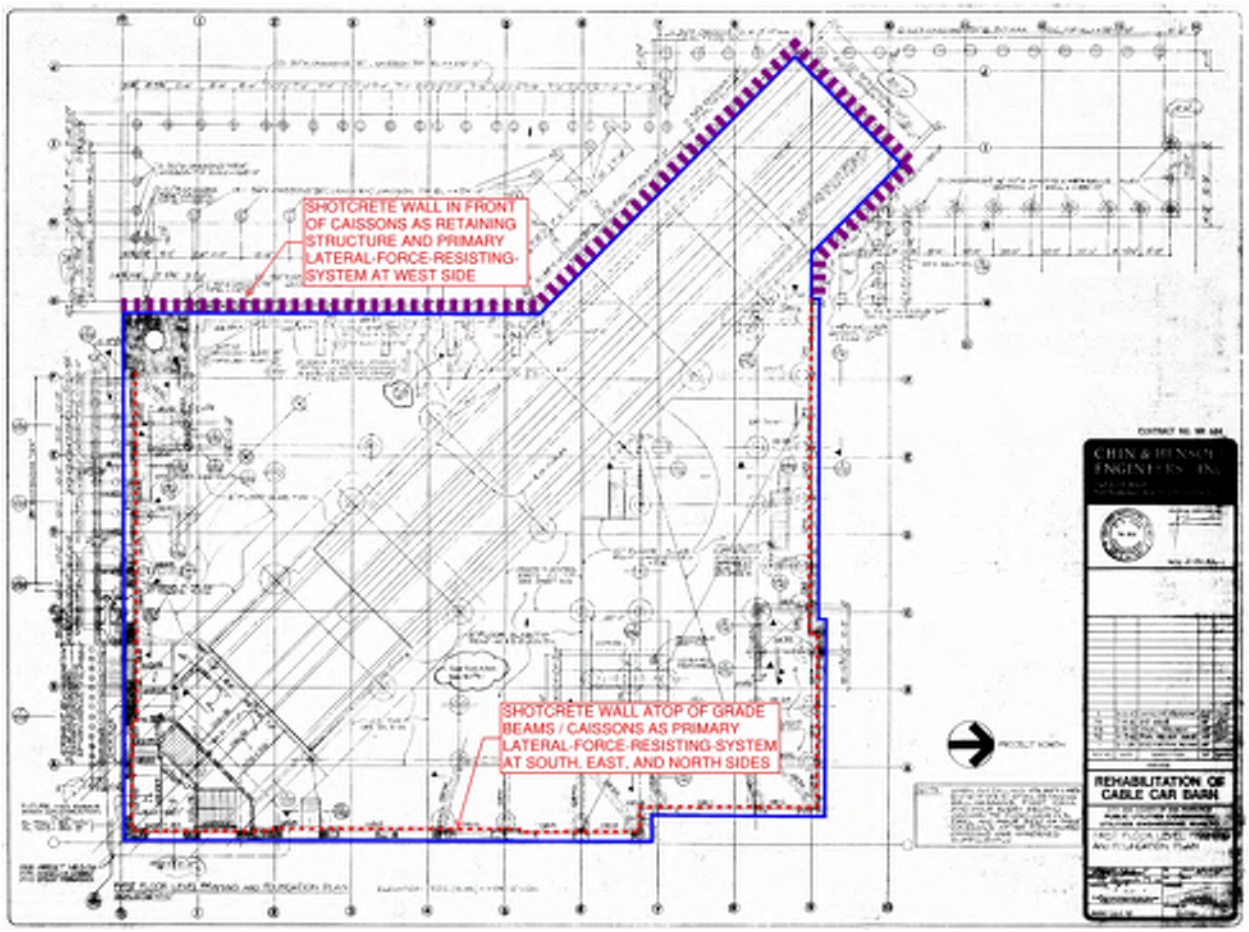


Fig. 2.2 Ground Level / Foundation Plan

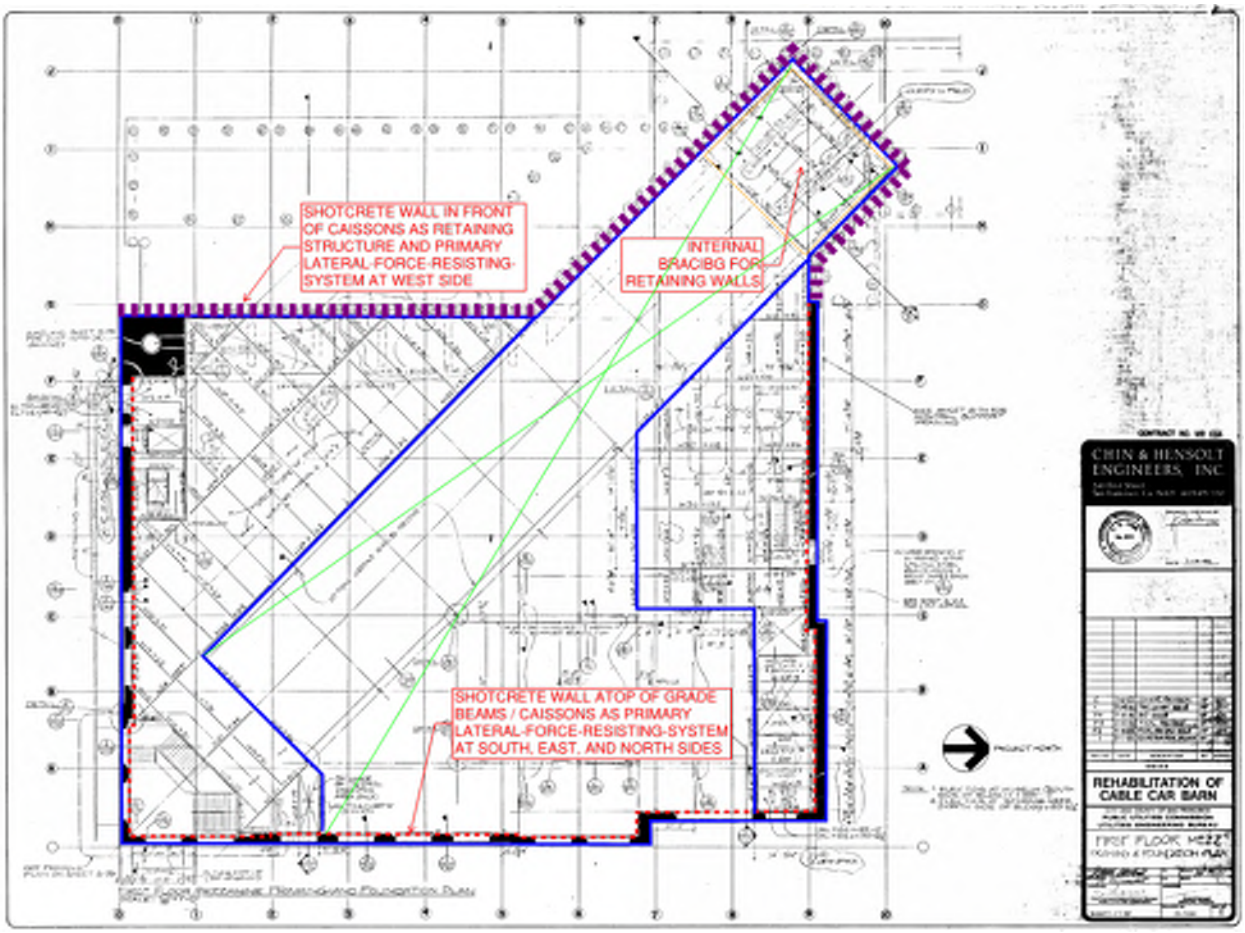


Fig. 2.3 First Floor Mezz Plan

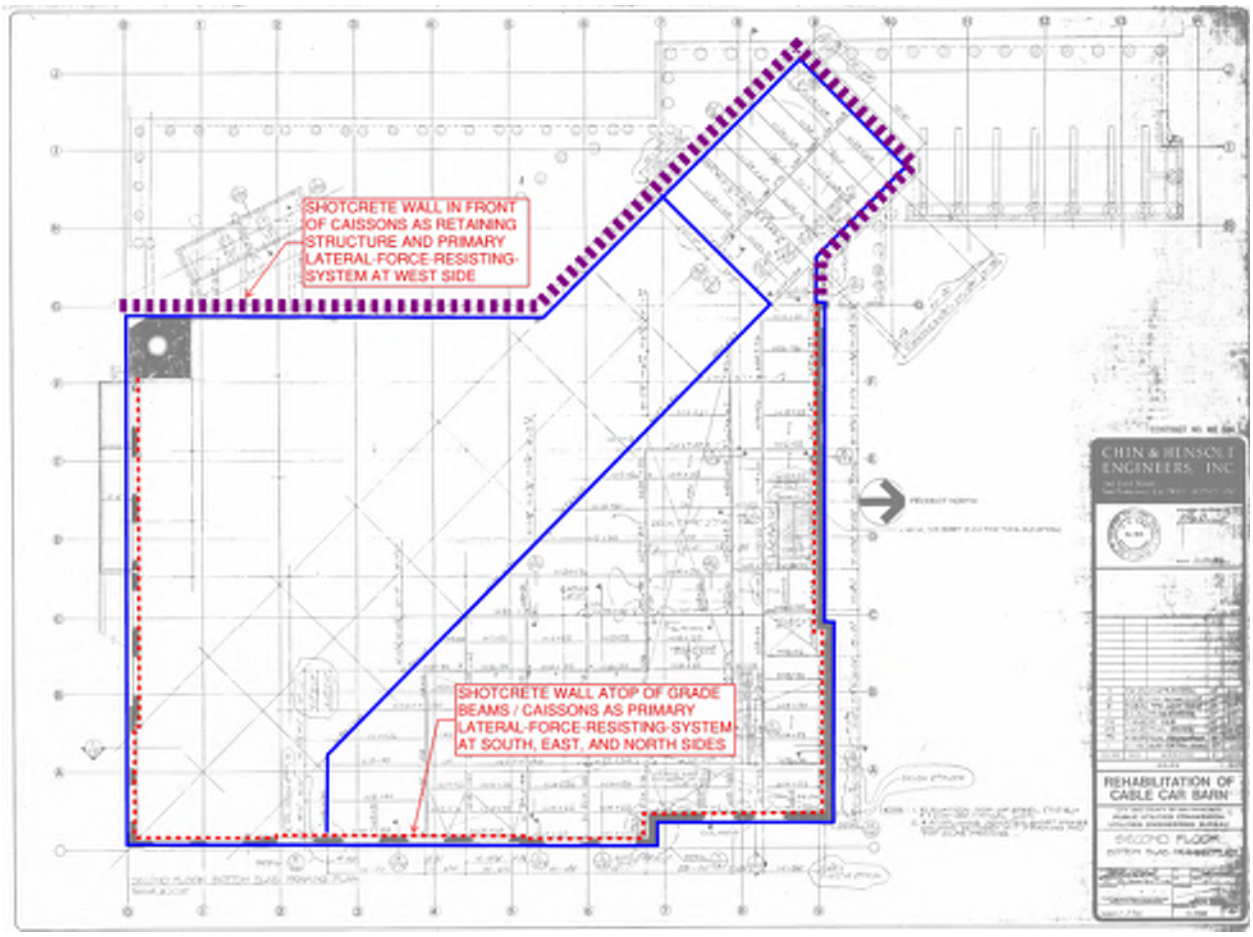


Fig. 2.4 Level 2 Lower Plan

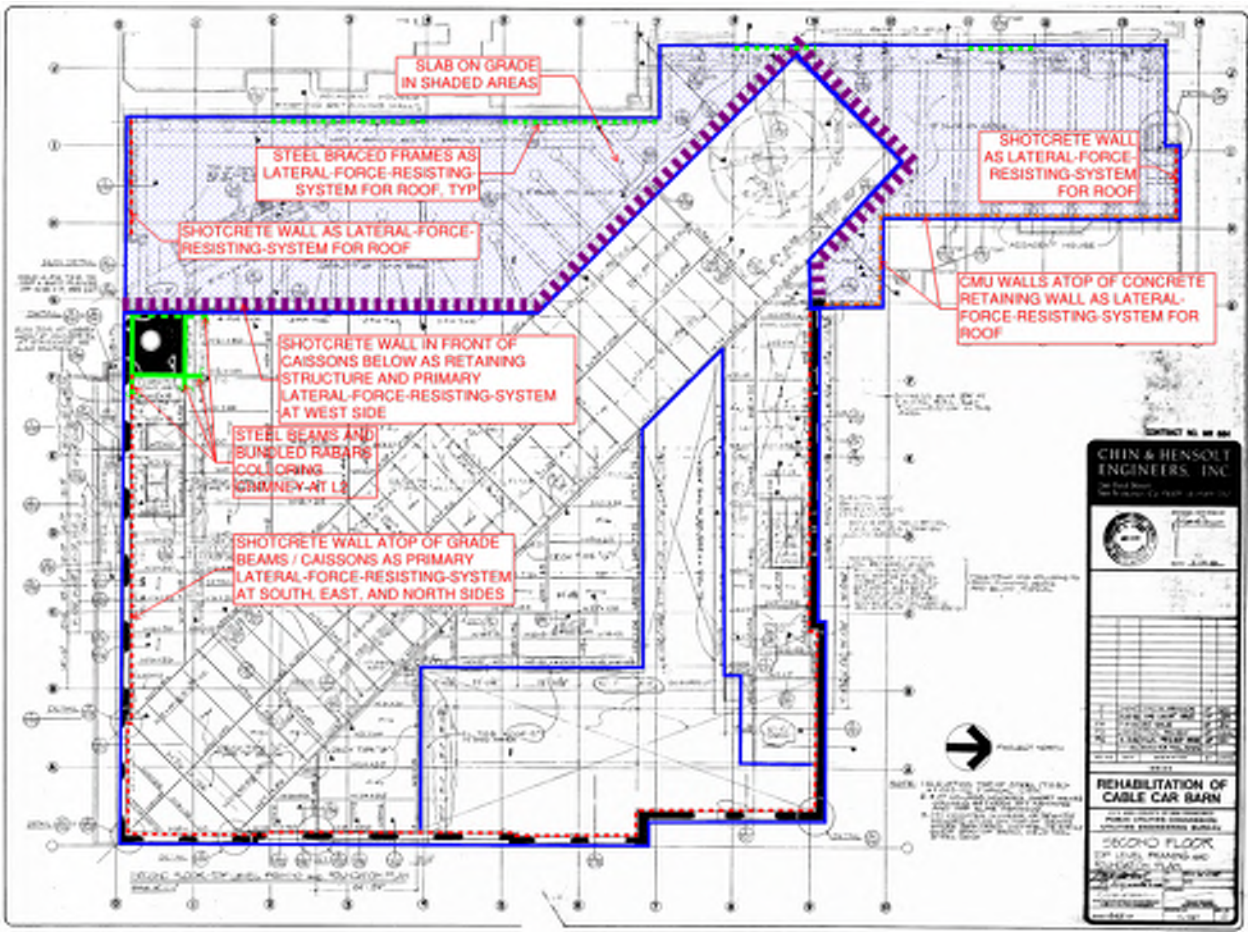


Fig. 2.5 Level 2 Upper Plan

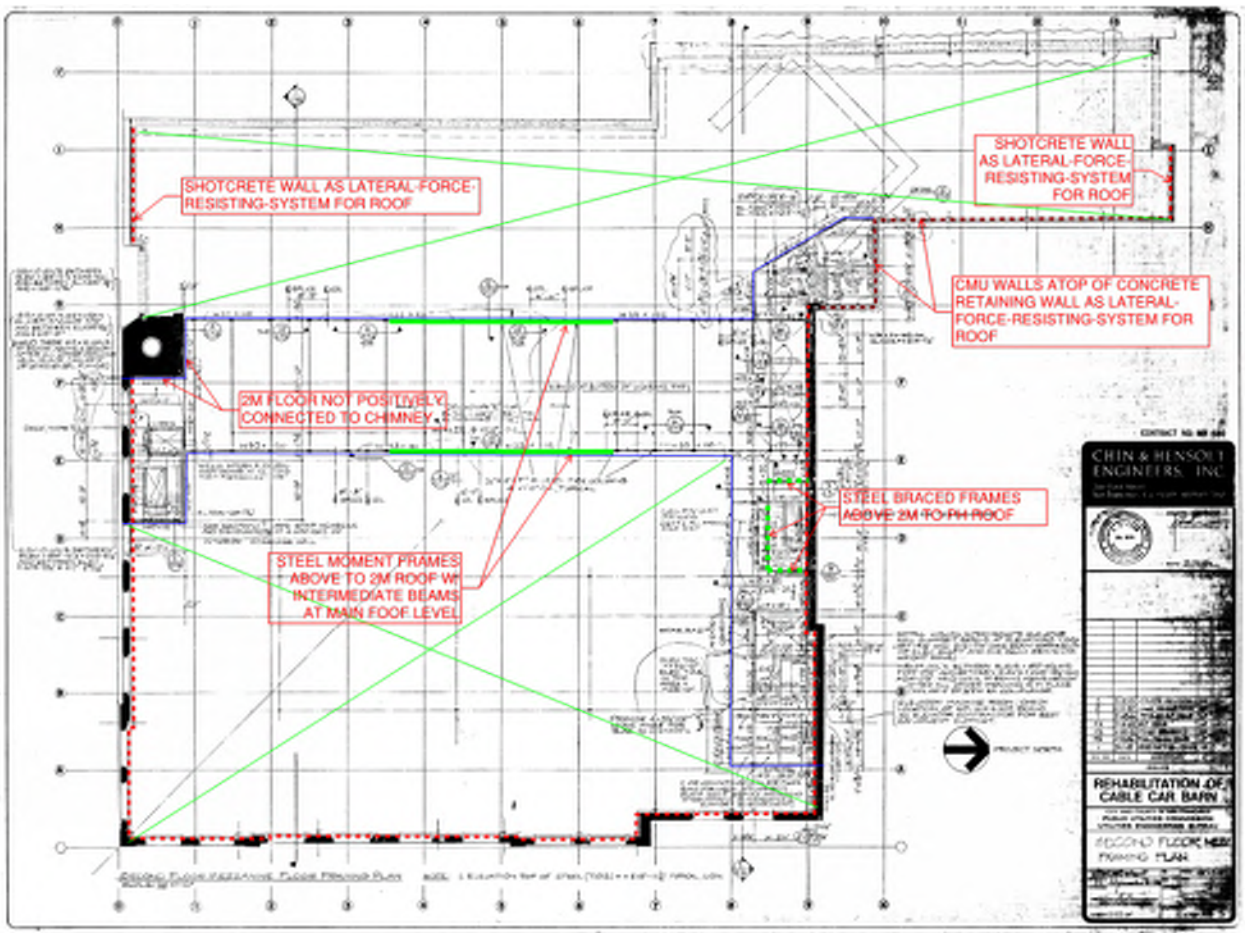


Fig 2.6 Second Floor Mezz Plan

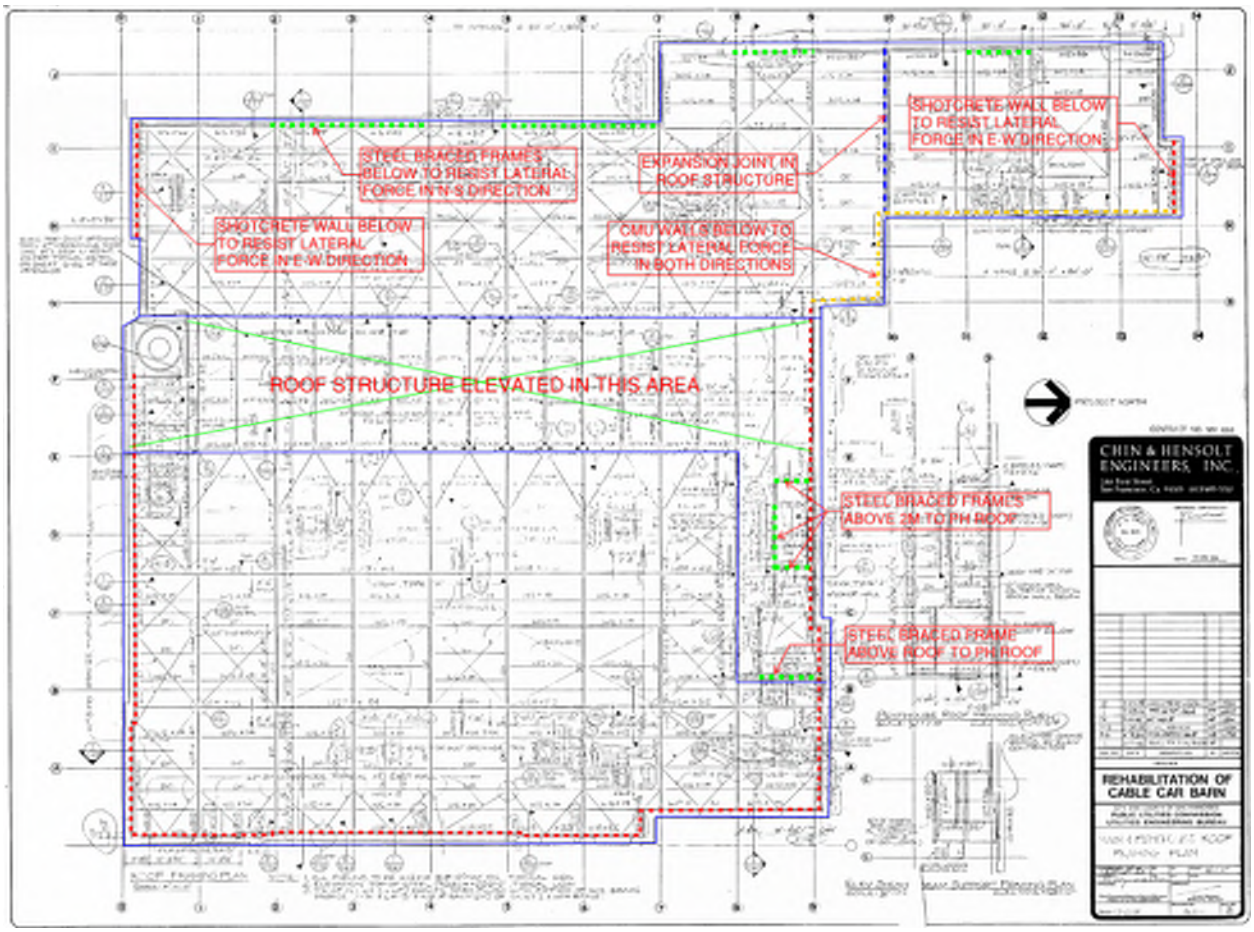


Fig. 2.7 Main Roof Plan

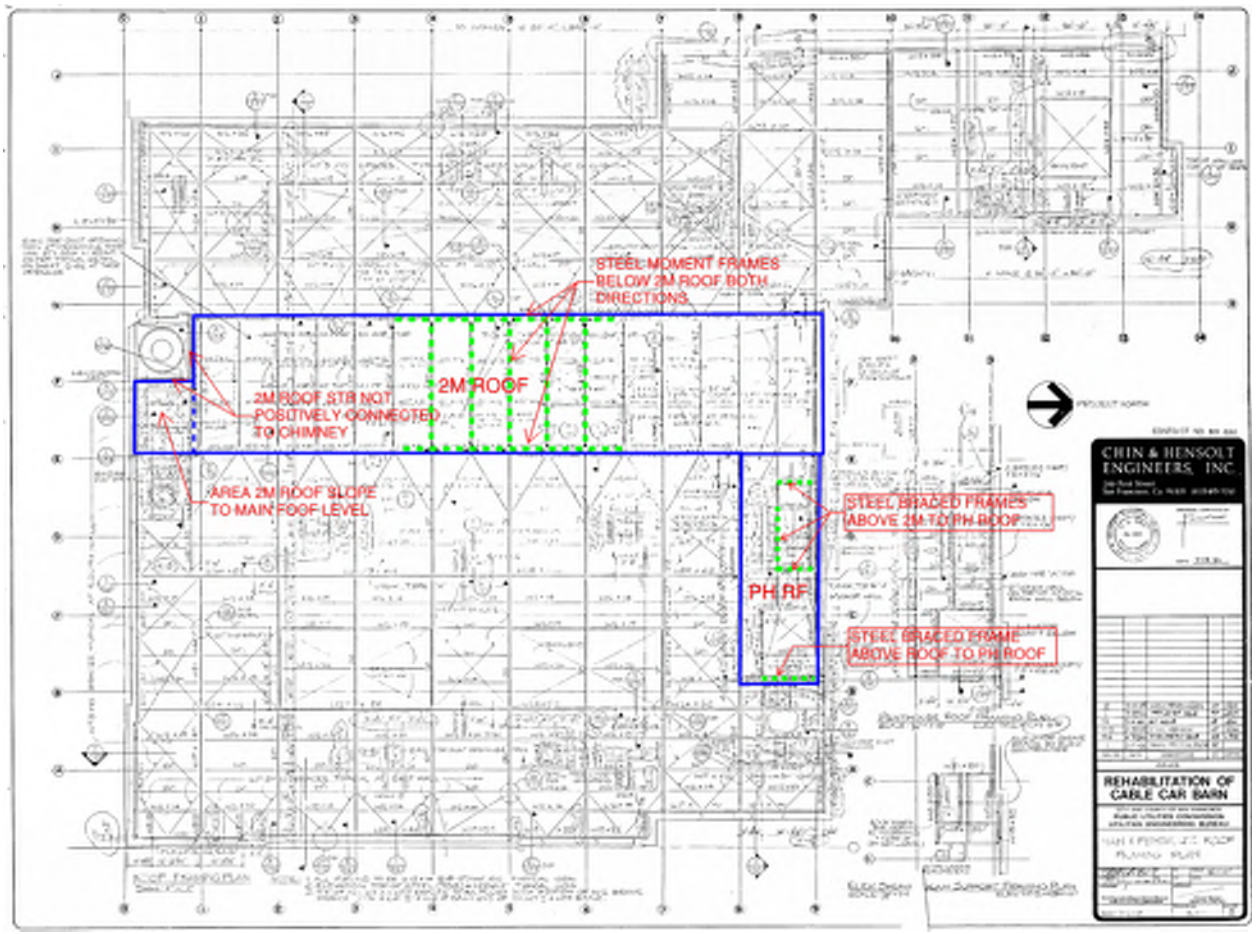


Fig. 2.8 Second Floor Mezz Roof Plan

The building includes a unique masonry chimney of nearly 100 ft tall from the base, or about 70 ft above the adjacent Washington Street. The lower portion of the chimney is of rectangular shape in cross section, integrated with the south wall and lower retaining structure of the building. The upper portion of the chimney transitioned to a circular shaped cross section of approximately 11 ft diameter.

It was understood that the masonry chimney was one of the historical features preserved during the renovation and was reinforced by inserting a full height 4 ft diameter structural steel pipe in the cavity of the chimney. Details of the seismic performance of the chimney will be discussed in the report.

It is not clear if the chimney is still functioning for the cable car barn operations.

2.2 Gravity Load Support System

The building's gravity load support systems consist of metal decks supported by steel beams/girders, which are subsequently supported by steel columns and foundations.

Metal decks are filled with structural concrete topping slab for occupied spaces, including first floor mezz for Cable Car Museum and storage areas, second floor lower and upper areas for cable car maintenance use, second floor mezz for office use. Metal

decks are filled with insulation materials or not filled for unoccupied roof areas, including main roof over both east and west portions and second floor mezz roof.

Steel columns along the building perimeters are supported by drilled caissons and concrete grade beams without relying on masonry foundations below the existing perimeter walls. According to the renovation drawings, the existing masonry foundations were partially demolished where they interfered with then new construction of drilled caissons or grade beams.

Interior steel columns are supported on top of drilled caissons and grade beams.

The entire vertical load support systems were completely reconstructed during the 1980's renovation.

2.3 Seismic Force Resisting Systems

As previously described, the building has an east and a west portion situated on ground floor and second floor elevations, respectively (see Fig. 2.1). Seismic force resisting systems for each portion consist of different structural elements.

The east portion includes ground floor, second floor, main roof, and mezzanine areas between ground and second floors (1M) and between second floor and main roof (2M). The roof over the 2M areas is above the main roof elevation to achieve clear height for 2M floor. The primary seismic force resisting system consists of shotcrete walls inside of existing masonry walls along south, east, and north sides, providing seismic force resistance up to main roof level. The west side has a retaining wall system along grid line G (previously described as lower retaining structure) that provides seismic force resistance up to second floor.

The west portion includes second floor (on grade) and main roof. The seismic force resisting system in the N-S direction consists of steel braced frames along the west side and CMU shear walls along the east side. The seismic force resisting system in the E-W direction consists of reinforced concrete shear walls along the south and north edges, and a CMU shear wall near the expansion joint in the main roof at grid line 10.

The seismic force resisting system for 2M office floor and its roof (2M Roof) in the N-S direction consists of steel moment frames between 2M floor, main roof, and 2M roof levels along the east and west edges. The seismic force resisting system in the E-W direction consists of shotcrete shear walls at south and north end for the 2M floor, and steel moment frames in the middle bays to transfer the 2M roof loads to 2M floor level.

The 2M office space separates the main roof structure into east and west portions, where the seismic force resistance relies heavily on the strength and stiffness of roof diaphragms. Existing roof framing includes in-plane diagonal braces to enhance the diaphragm performance.

The seismic force resisting system for the chimney, after the 1980's renovation, is a cantilevered column with vertical and lateral restraints at the base and lateral support at Level 2 by connecting to the building diaphragm at Level 2.

3. SEISMIC HAZARD AND PERFORMANCE LEVELS

3.1 Seismic Hazard Levels

The intensity of earthquake ground shaking is generally inversely related to the frequency an earthquake may occur. Minor to moderate earthquakes occur more frequently than the severe and rare ones. According to ASCE 41-17, the severity of an earthquake is described as seismic hazard levels for structural evaluation of existing buildings and other structures, and the intensity of ground shaking corresponding to each seismic hazard level is expressed as spectral accelerations at a specific site. Table 3.1 lists seismic hazard levels and their probability of exceedance per building codes and other provisions. The table includes seismic hazard levels considered for both new building design and existing building evaluations, for reference.

Table 3.1 Seismic Hazard Levels and Probability of Exceedance

Earthquake Level[1]			Description[2]	Probability of Exceedance	Return Interval
ASCE 7-16	ASCE 41-17	SPUR			
		Routine	Earthquakes that are likely to occur routinely. In general, earthquakes of this size will have magnitudes equal to 5.0 to 5.5, should not cause any noticeable damage, and should only serve as a reminder of the inevitable.	70% probability of exceedance in 50 years	43 years
	BSE-1E[3]			20% probability of exceedance in 50 years	224 years
Design Basis Earthquake (DBE)	BSE-1N[5]	Expected	An earthquake that can reasonably be expected to occur once during the useful life of a structure or system. San Francisco's Community Action Plan for Seismic Safety (CAPSS) assumed that a magnitude 7.2 earthquake located on the peninsula segment of the San Andreas Fault would produce this level of shaking in most of the City.	10% probability of exceedance in 50 years[7]	475 years
	BSE-2E[4,8]			5% probability of exceedance in 50 years	975 years
Risk Targeted Maximum Considered Earthquake (MCE_R)	BSE-2N[6]	Extreme	The extreme earthquake that can reasonably be expected to occur on a nearby fault. A magnitude 8.3 earthquake, similar to the 1906 Great San Francisco Earthquake, located on the peninsula segment of the San Andreas Fault would produce this level of shaking in most of the City.	2% probability of exceedance in 50 years[9]	2,500 years

Spectral response acceleration parameters for the Cable Car Barn site are listed in Table 3.2, based on information provided by SFPW geotechnical engineers.

Table 3.2: Spectral Acceleration Parameters

Seismic Hazard Level	Spectral Response Parameters	
	SXS	SX1
BSE-1E	0.891	0.547
BSE-1N	1.000	0.680
BSE-2E	1.374	0.937
BSE-2N	1.500	1.020

3.2 Building Performance Levels

ASCE 41-17 defines building performance for structural and nonstructural systems. The subject evaluation is limited to primary seismic force resisting system and focus only on structural performance. Six discrete structural performance levels, representing the best to the worst, are defined per ASCE 41-17 as Immediate Occupancy (S-1), Damage Control (S-2), Life Safety (S-3), Limited Safety (S-4), Collapse Prevention (S-5), and Not Considered (S-6). A brief description of S-1, S-3, and S-5 structural performance level is summarized in Table 3.3.

Table 3.3 Structural Performance Levels

Performance Level	Definition
Immediate Occupancy (S-1) Performance Level	The post-earthquake damage state of a structure remains safe to occupy and essentially retains its pre-earthquake strength and stiffness. Limited structural damage may occur, but structural repair is not required before re-occupancy. Building use may be limited by damage or disruption to nonstructural elements of the building, furnishings, equipment, or utilities.
Life Safety (L.S.) Performance Level	The structure has suffered earthquake damage, but structural components retain a safety margin against either partial or total collapse. Injuries may occur, but probability of falling hazards from structural debris causing life-threating injury is expected to be low. Structural repair may be possible but may not be practical or economical.
Collapse Prevention (C.P.) Performance Level	The building has suffered significant earthquake damage and retains little to no margin of safety against collapse. Building may experience significant permanent lateral deformation. Significant life-threatening injuries may occur due to falling hazards from structural debris. Structural repair may not be possible.

3.3 Target Building Performance

As the Cable Car Barn facility is considered as a regular occupancy building and Risk Category II, Basic Performance Objective for Existing Buildings (BPOE) is selected per ASCE 41-17 for the subject evaluation.

Therefore, the Cable Car Barn facility is evaluated for seismic hazard levels BSE-1E and BSE-2E with corresponding target structural performance level of Life Safety (S-3) and Collapse Prevention (S-5), respectively. According to ASCE 41-17, the current scope of evaluation is limited to seismic hazard level BSE-2E with target structural performance level of collapse prevention.

4. EVALUATION APPROACHES

The subject building was first screened following ASCE 41-17 Tier-1 procedure. A Tier-2 evaluation was then conducted using a 3D structural model subjected to BSE-2E level spectral acceleration at the project site.

4.1 Tier-1 Screening

Tier-1 screening was performed according to the ASCE 41-17 procedures. A set of load maps were developed for the purpose of consolidating seismic reacting weight from various areas in the building serving different functions, as shown in Fig. 4.1.

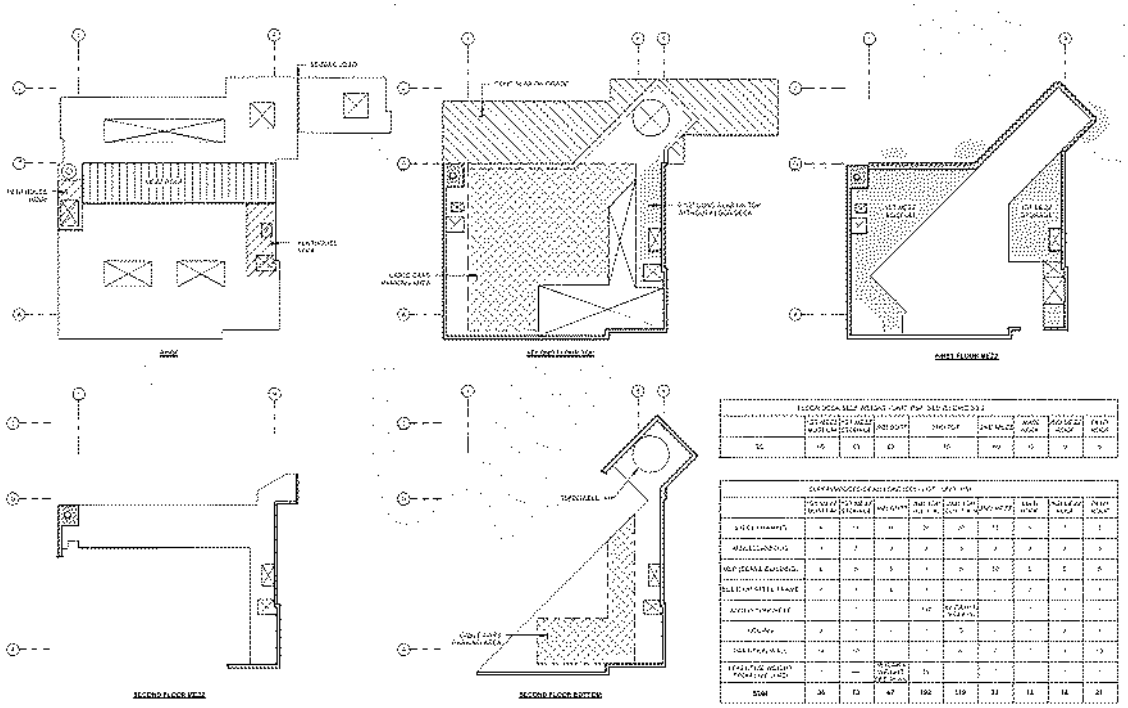


Fig. 4.1 Existing Building Load Maps

Ground floor, where most of the operation machineries are located, is considered as the base of the building for seismic evaluation and its weight is not included in the building weight calculation. The weight of the exterior masonry and shotcrete walls are accounted separately, with tributary weight of 1/2 of the height between the floor under consideration and the adjacent floor above or below assigned to the edge of the floor under consideration. A summary of building weight by floor areas (Wi) are presented in Tables 4.1 to 4.3 for the East Portion, West Portion, and the Chimney, respectively. The last two columns in each table include ASCE 41-17 Tier-1 estimated seismic force (Fi) and story shear (Vi) for each floor.

Table 4.1 Summary of Floor Weight and Seismic Force (East Portion)

	hi	Wi	Wi*hi	Fi	Vi
Mezz Roof	53.50	180	9619	652	652
Main Roof	48.17	1658	79851	5409	6061
2nd Mezz	42.50	821	34911	2365	8426
2nd Top	27.75	6015	166914	11307	19732
2nd Bott	23.75	1699	40344	2733	22465
1st Mezz	11.50	2195	25245	1710	24176
Base-1st	0.00				
Sum		12568	356884	24176	

Table 4.2 Summary of Floor Weight and Seismic Force (West Portion)

	hi	Wi	Wi*hi	Fi	Vi
West Roof	20.42	611.2	12479	1176	1176
Base-2nd	0.00				
Sum		611.2	12479	1176	

Table 4.3 Summary of Floor Weight and Seismic Force (Chimney)

	hi	Wi	Wi*hi	Fi	Vi
TOP	94.00	106.0	9964	325.4	325
Mid	76.50	340.0	26010	849.4	1175
Mezz Roof	53.50	698.0	37343	1219.4	2394
L2	27.75	1099.0	30497	995.9	3390
L1/BASE	0.00				
Sum		2243.0	103814	3390	

Required checklists per ASCE 41-17 are completed for high seismicity level and collapse prevention building performance level. Significant aspects of screening and findings are summarized in Table 4.4.

Table 4.4 Summary of Tier-1 Screening

Deficiency	Checklist Statement
Load Path	Noncompliant
Adjacent Buildings	Compliant
Weak Story	Compliant
Soft Story	Compliant
Vertical Irregularities	Noncompliant
Torsion	Unknown
Concrete/CMU Shearwall Shear Stress	Unknown
Concrete/CMU Shearwall Reinforcing Steel	Compliant
Wall anchorage at Flexible Diaphragms	Compliant
Foundation Dowels	Compliant
Deflection Compatibility	Unknown
Steel Braced Frame Compact Members	Noncompliant
Steel Braced Frame Column Axial Stress	Unknown
Steel Braced Frame Brace Axial Strength	Unknown
Steel Braced Frame Redundancy	Compliant
Steel Braced Frame Connection Strength	Compliant
Diaphragm Shear Strength	Unknown

Because a Tier-2 evaluation is planned, only very limited quantitative assessment was conducted for Tier-1 screening. Most of the numerical calculations are deferred to Tier-2 evaluation. Details of Tier-1 checklists are included in Appendix A.

4.2 Tier-2 Evaluation

4.2.1 3D Structural Model of Existing Structures

STRUCTUS developed a composite three-dimensional computer model using structural analysis software ETABS (v2016) (Computer and Structures, Inc) of the existing Cable Car Barn building. An isometric view of the computer model is shown in Fig. 4.2.

Overall modeling descriptions are as following:

- The model is developed mostly based on existing drawings and field observations.
- The model base is set at the ground level elevation of 178’-0” per existing drawings.
- All primary lateral force resisting elements, including shotcrete walls, concrete retaining walls, concrete masonry unit shear walls, structural steel braced frames and moment frames, floor diaphragms with and without concrete topping slabs, diaphragm diagonal braces, are modeled. Selected steel girders and columns are also included in the model.
- Restraint springs are used to represent the lateral stiffness of the drilled caissons and tie beams along the retaining structures at grid line G.

- Static seismic loads are assigned at each floor as seismic weight multiplier in two orthogonal directions based on ASCE 41-17 provisions.
- Load combinations per ASCE 17-41 provisions are used to evaluate the adequacy of various seismic force resisting elements.

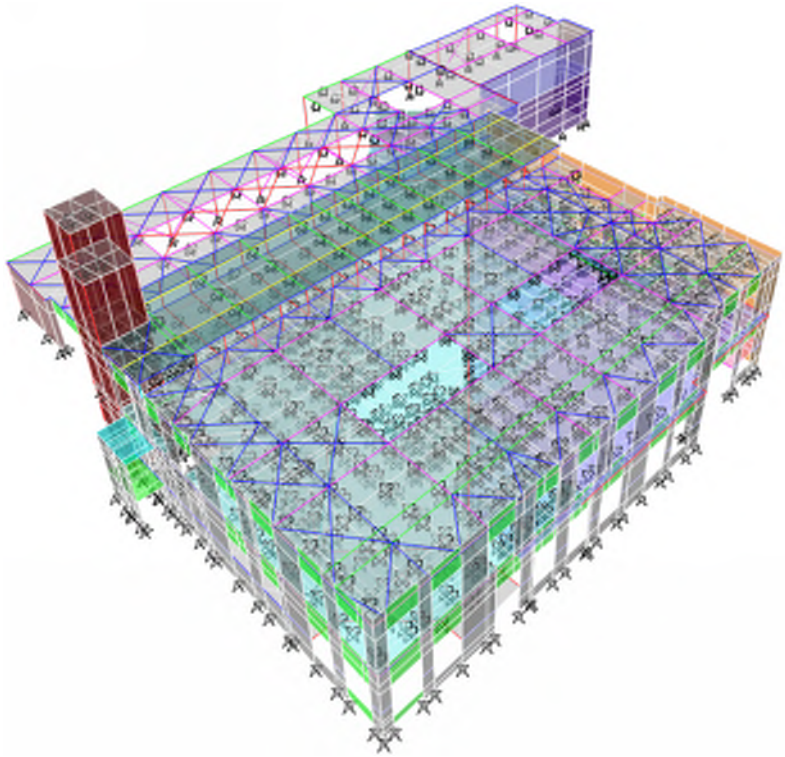


Fig. 4.2 Isometric 3D View of the ETABS Model

Detailed descriptions for each floor and each major shearwall are presented in the following sections.

4.2.1.1 First Floor Mezzanine Modeling Description

First Floor Mezzanine has two areas: one is the Museum floor at elevation of 188'-11" and one is the Storage area at elevation of 190'-0". To simplify the modeling, these two diaphragms are set at the same elevation at 189.5'. Figure 4.3 lists ETABS model each level elevation above the first floor (ETABS model base at elevation 178'-0").

Story	Height ft	Elevation ft
Chimney Top	40.5	94
2nd-Mezz Roof	5.3333	53.5
Roof	5.6667	48.1667
2nd-Mezz	14.75	42.5
2nd	16.25	27.75
1st-Mezz	11.5	11.5
Base		0

Fig. 4.3 ETABS Model Story Data

Figure 4.4 depicts various areas for the first floor Mezzanine model.

- Gray slab indicates the Museum slab; Pink slab indicate the Storage slab. Green slab indicates the slab of the access of the ramp at the sidewalk.
- Diaphragm element material properties are summarized in Section 4.2.2.2.
- Major openings for stairs and elevators are modeled.
- Museum slab is connected to the south wall, the retaining structure, and the chimney.
- Major columns at the diagonal gridlines have been model per existing schedule.
- Other diaphragm mashing nodal points at without column are restrained for vertical displacement with “roller” to provide stability in the vertical direction. This vertical displacement restraint concept is used for all other diaphragm levels, as typical gravity beams are in modeled.

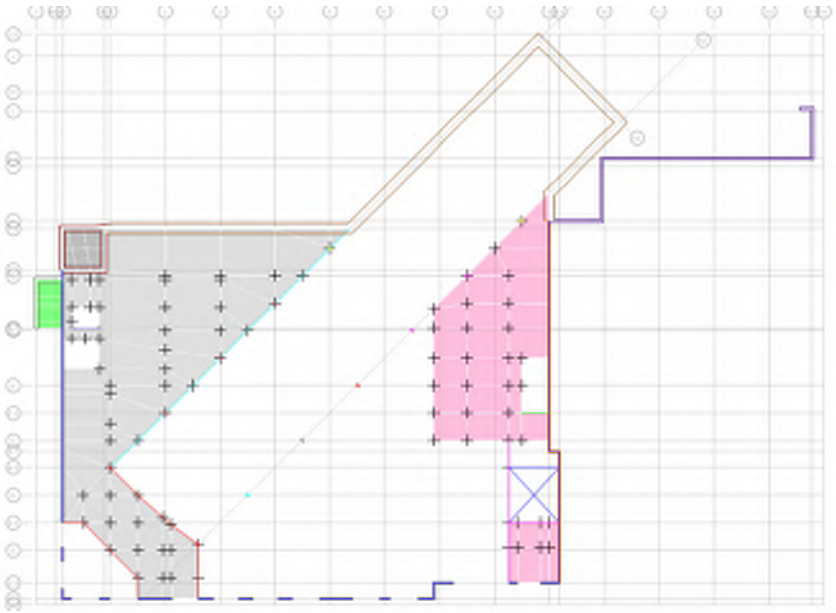


Fig. 4.4 ETABS Model First Mezzanie Floor Plan Veiw

4.2.1.2 Second Floor Modeling Description

Per existing structural plans S2.2 - S2.4 and details 3 & 4 on sheet S7.4, Second Floor includes two levels of metal deck with concrete topping slab: top of concrete elevation in typical areas is 203' 11 ½" and top of concrete elevation in the lower area (referred as "bottom slab") is 200'-3 ½". A build-up slab is built in typical areas for installing cable car tracks at elevation of 205'-9" (referred as "track and flush floor").

See Fig.4.5 for the second floor plan in the model.

- The bottom slab occurs at the north-east triangle area and north-west area below a cable car turn table. Additional steel framing is constructed to support cable car tracks and turn table at elevation 205'-9".
- Major columns along diagonal grid lines are modeled to provide vertical support to typical area and lower slabs.
- At gridline G, the second floor diaphragm is connected to the retaining wall structure, the south wall, and the chimney.
- A series of soil springs are modeled at the top of retaining structure to simulating additional support from pre-stressed grade beams engaging additional drilled pier "dead man" on the west side of retaining structure, as shown on S2.2 and 3/S5.4. The spring constant has been adjusted by trials so that the resulting grade beam axial force is approximately at the grade beam reinforcing capacity.

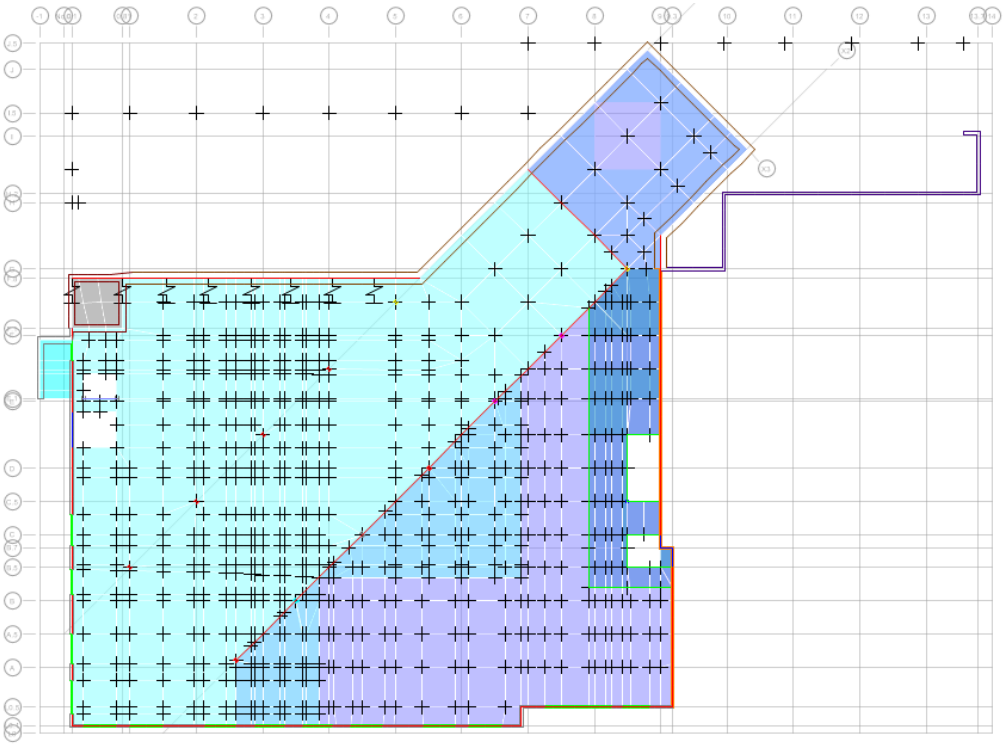


Fig. 4.5 ETABS Model Second Floor Plan Veiw

4.2.1.3 Second Floor Mezzanine Modeling Description

Per existing structural plan S2.5, the diaphragm of the Second Floor Mezzanine has been modelled as shown in Figure 4.6.

- The south and north ends of the 2nd floor Mezz (2M) is connected to the south wall and the north wall, respectively for seismic force resistance in the E-W direction.
- No positive connections between the 2M diaphragm and the Chimney are shown in existing drawings, and thus, the 2M diaphragm is not connected to the Chimney in the ETABS model.
- A horizontal offset between the west edge of 2M framing and CMU shear wall along grid line G exists near the north end. For simplicity, the floor area north-west of 2M floor where the as-built elevation is lower than 2M floor is modeled at the 2M floor elevation and connected to the CMU shear wall at grid line G. The CMU shear wall provides N-S direction seismic force resistance for the 2M floor. The adequacy of the subject load path is discussed later in the report.

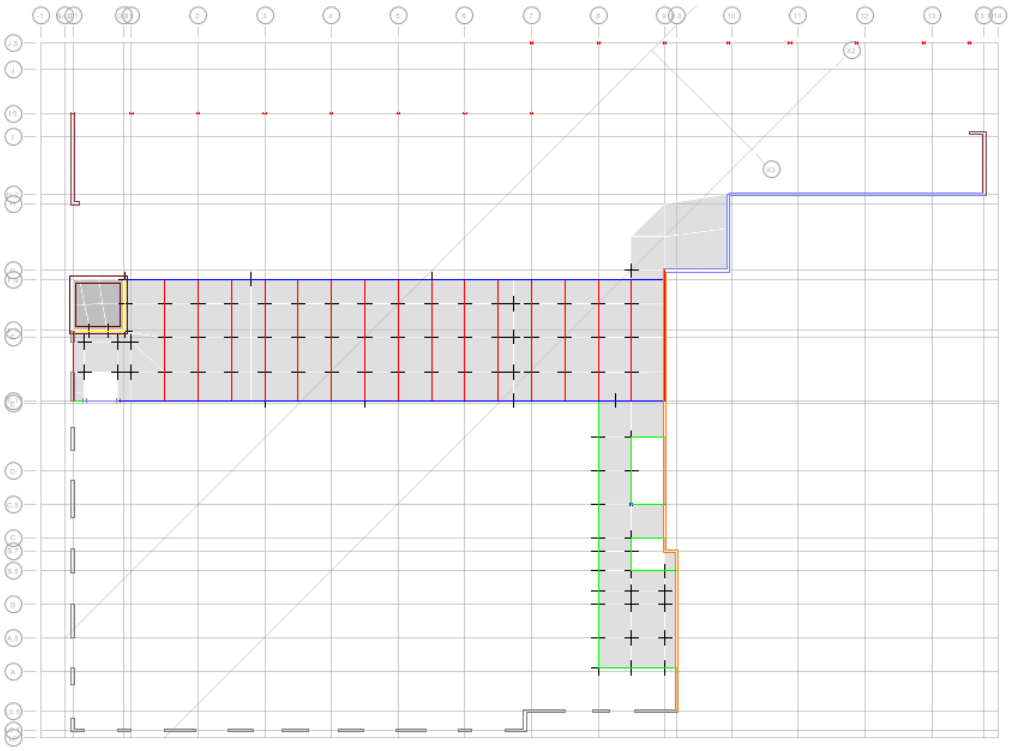


Fig. 4.6-1 ETABS Model Second Floor Mezzanine Plan Veiw

- Two lines of steel moment-resisting frames along the east and west edges, respectively of 2M floors appear to transfer the N-S direction seismic force from 2M roof level to 2M floor lever. Figures 4.6-2 and 4.6-3 show moment frame elevations near grid line E (East side of 2M floor) and grid line G (West side of the mezzanine), respectively. Beam ends not welded specifically for moment resistance are “released” from transferring bending in the model, as indicated in grey dots in Figures 4.5-2 and 4.6-3.
- Columns below 2M floor supporting W33 beams are not modelled, but are simulated with nodal point vertical displacement restrains.

Fig. 4.6-2 ETABS Model Second Floor Mezzanine East Elevation Veiw

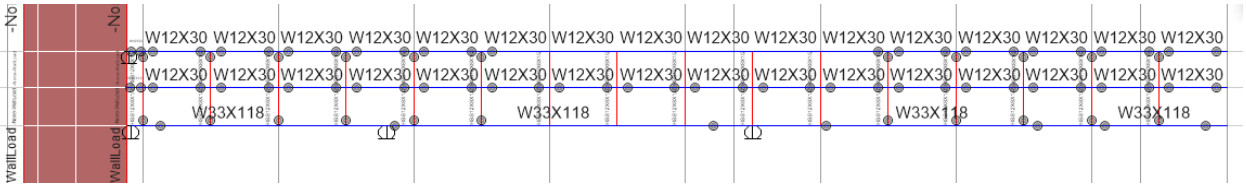


Fig. 4.6-3 ETABS Model Second Floor Mezzanine West Elevation Veiw

4.2.1.4 Main Roof Diaphragm Modeling Description

The main roof diaphragm is interrupted by the 2nd floor mezz space and is effectively divided into east and west areas, as shown in Figure 4.7.

- The main roof diaphragm consists of metal decks and horizontal diagonal braces.
- Metal decks are modeled as shell elements with equivalent shear stiffness per metal deck manufacturer's published catalogs.
- Diagonal braces, mostly at the mid-depth of roof beams per existing drawings, are modeled at the same plane as the metal deck shell elements for practical modeling reasons.
- Main roof diaphragm is connected to the south wall, east wall, north wall, and west steel framed frames along the perimeters of the diaphragm.
- Major skylight openings are included in the model.
- West area diaphragm north of grid line 10 is separated from the south side by a expansion joint, which is modeled as a small gap near grid line 10 in the model.
- Penthouse roof areas over elevator, stair, and mechanical shaft are not explicitly modelled for simplicity. The additional penthouse roof weight, where occurs, is lumped on the main roof diaphragm. to simplify the modelling.
- The west side main roof diaphragm is connected to the south-west corner of the Chimney. See retrofitting scheme description for further discussions.

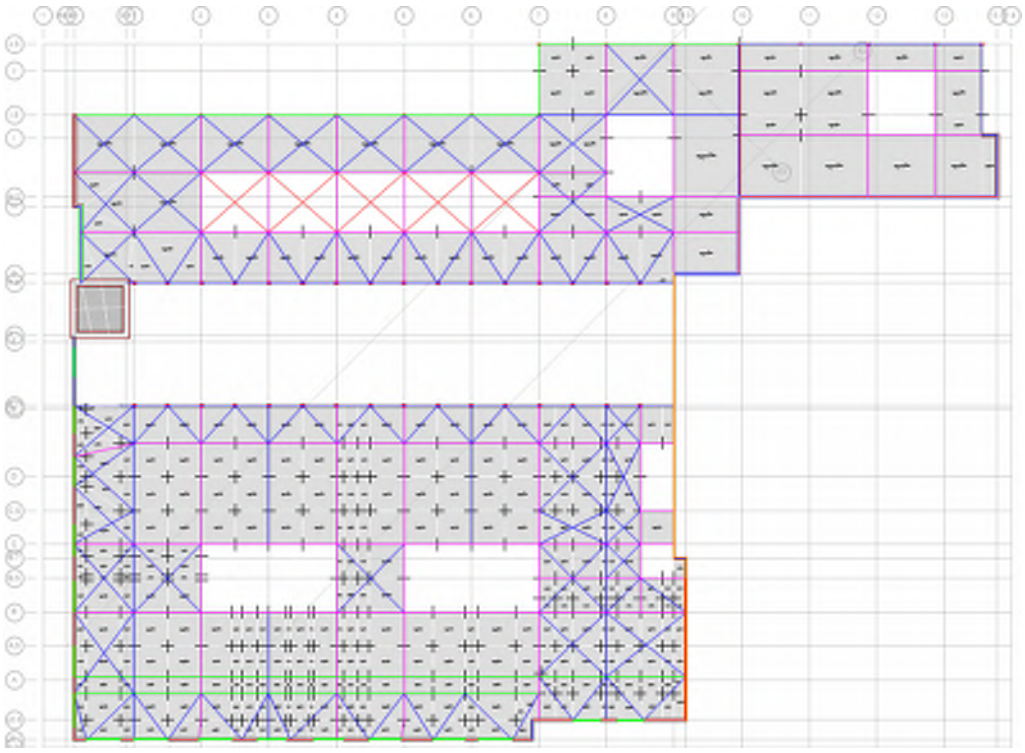


Fig. 4.7 ETABS Model Main Roof Plan Veiw

4.2.1.5 Second Floor Mezzanine Roof Modeling Description

As-built 2nd floor mezz (2M) roof include a flat diaphragm and built-up pitches along the east and west edges. To simplify modeling, only the flat 2M diaphragm is modeled with the additional weight in built-up pitches added to the flat diaphragm. A plan view of 2M roof diaphragm is shown in Figure 4.8.

- 2M roof diaphragm is connected to the moment frames along grid lines E and G for N-S direction seismic force resistance and is connected to the south and north walls for E-W direction seismic force resistance.
- 2M roof diaphragm is disconnected from the existing chimney structure.
- The sloping portion of the 2M roof diaphragm near south end and east of the Chimney is modeled as flat diaphragm extending to the south wall and an added steel braced frame atop of south wall to avoid complications from modeling sloped diaphragm. The subject simplification is judged not affecting overall structural behavior.

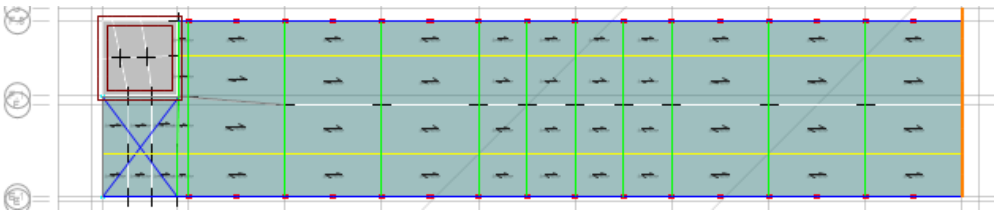


Fig. 4.8 ETABS Model Mezzanine Roof Plan Veiw

4.2.1.6 Chimney Modeling Description

A snapshot of the 3D model focusing on the chimney structure is shown in Figure 4.9.

- The base of the chimney structure is the same as the base of the building structure at elevation 178'-0".
- The chimney structure is modeled as a hollow box with shell elements around four sides. The inserted steel pipe is not explicitly modeled. The properties of the chimney masonry-steel pipe composite section are evaluated to determine the equivalent shell element thickness in the model. Details of the subject evaluation and determination of equivalent thickness is presented and discussed in Section 4.2.2.5 of this report.
- Artificial diaphragms inside the hollow box are included to maintain the geometric configuration of the chimney.
- Chimney wall elements are connected to first floor mezz diaphragm and second floor diaphragm. Chimney structures above second floor diaphragm is effectively a cantilever structure.

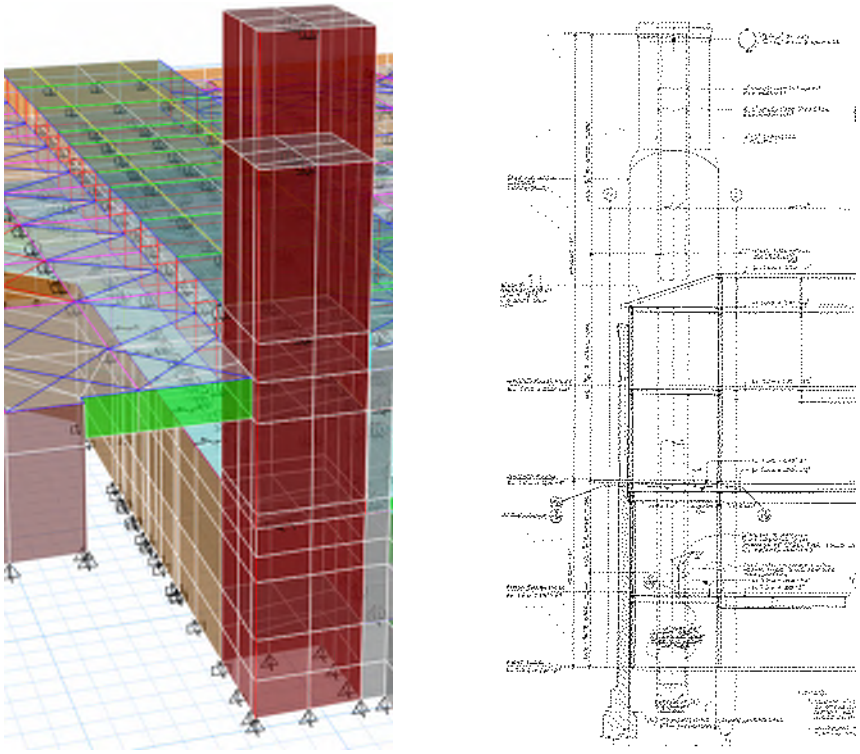


Fig. 4.9 ETABS Model Chimney 3D Veiw and Section From Existing Drawings

4.2.1.7 East Wall and South Wall Modeling Description

Figures 4.10 and 4.11 show the modeled shear wall elevation for South wall and East wall, respectively. Grey colored areas indicate wall piers where horizontal shear and bending moment at top of bottom of adjacent openings are reported for evaluations. Green colored areas indicate spandrels, where vertical shear and bending moment at left and right end of adjacent openings are reported for evaluations,

- All wall piers and spandrels are modelled as shell element. Existing Masonry walls are not explicitly modeled, but the weight of the brick walls is included in the model.
- The strength capacity of shotcrete walls with reinforcement from 1983 renovation are the only structural components contributing to seismic force resistance along the south wall and east wall. However, an in-plane stiffness corresponding to 15% of the masonry wall thickness is included in shell element thickness to account for stiffness contribution from existing masonry walls. Wall out-of-plane stiffness is ignored. Further details are presented and discussed in Section 4.2.2.3 of this report.
- Weight of existing masonry and shotcrete walls are lumped at floor levels based on the tributary height to adjacent floors.
- Wall base nodal points are restrained by “pin” support.
- Spandrel depth at main roof level include height of wall parapet.
- Wall nodes are connected to diaphragm nodes at floor levels where they are physically connected per existing drawings.

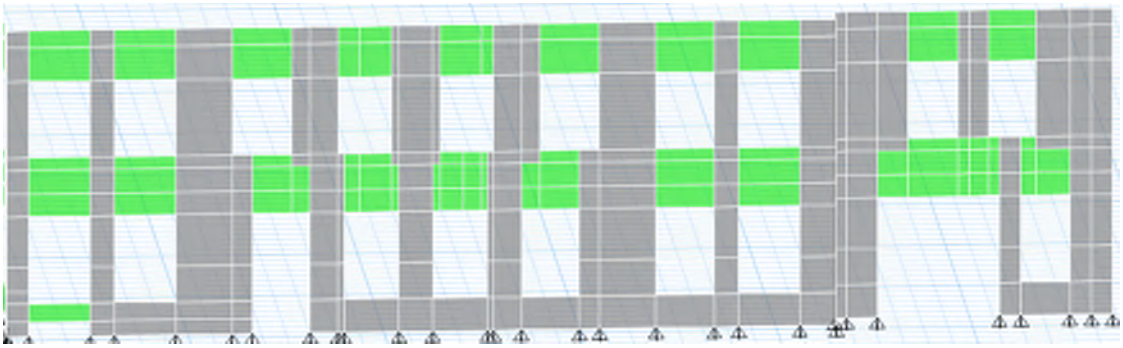


Fig. 4.10 ETABS Model East Wall 3D Veiw

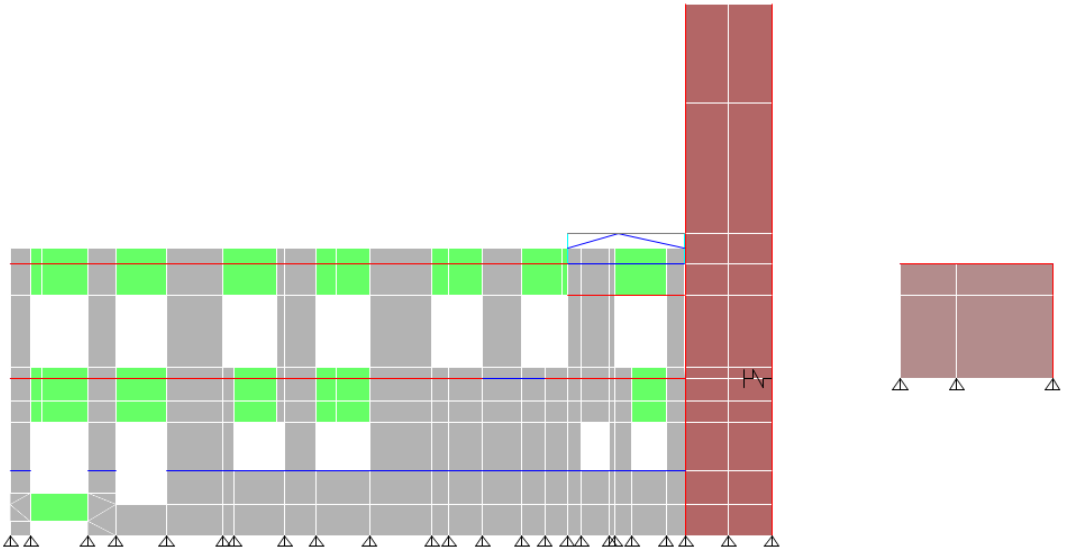


Fig. 4.11 ETABS Model South Wall Elevation Veiw

4.2.1.8 North Wall and Adjacent CMU Wall Modeling Description

The north wall is largely a solid wall as it is situated at the edge of adjacent properties. Modeling approaches for north wall are similar to those for south and east walls and are not repeated. Yellow colored elements in Figure 4.12 represent north walls.

In additional to north wall, the 3D view of Figure 4.12 also includes a "Z" shaped (in plan) Cement Masonry Unit (CMU) shear walls along grid lines G, 10, and H, respectively and are indicated in blue areas. Another segment of masonry wall along Jackson Street with shotcrete reinforcement on interior face is shown in brown areas in the snapshot.

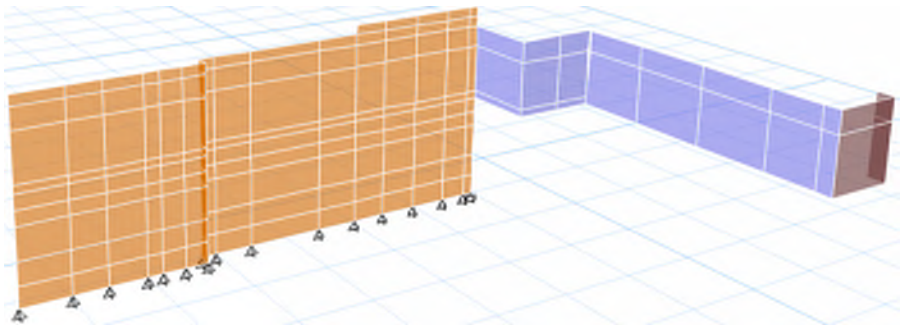


Fig. 4.12 ETABS Model North Cconcrete Wall and CMU Wall 3D Veiw

4.2.1.9 West Steel Braced Frame Modeling Description

The lateral force resisting system along the west edge of the building consists of steel concentrically braced frames. All steel columns along the west edge are included in the ETABS model for consistency. Steel member sizes and connections are modeled per drawing S7.5. A perspective view of steel braced frames along the west edge is shown in Figure 4.13. Steel braces are modeled as pin-pin end conditions.

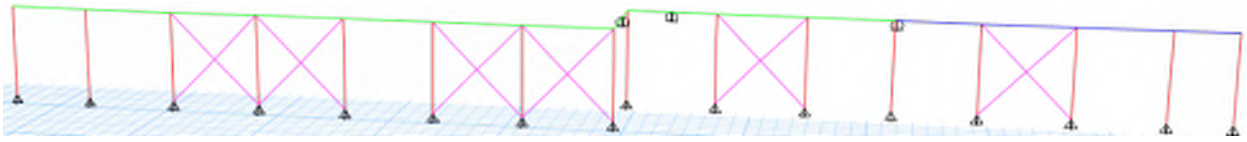


Fig. 4.13 ETABS Model West Brace Frame 3D Veiw

4.2.2 Significant Assumptions and Basis of Evaluation

See the following assumption of the seismic load assignment, material assignment, wall elements, diaphragm elements, and other major assumptions.

4.2.2.1 Basis of Evaluation

Based on section 7.3 of ASCE 41, the linear static procedure (LSP) is selected for the analysis of the building. The acceptance criteria for Linear Procedures are based on Section 7.5.2.2. The primary components of the lateral load resisting system for the building comprise of horizontal composite metal deck diaphragm supported by concrete shear walls and steel diagonal braces. The building is supported on existing concrete grade beam and drilled caissons.

Seismic Hazard Level:	BSE-2E
Target Building Performance Level:	Collapse Prevention for BSE-2E
Analysis Procedure:	Linear Static/Dynamic Procedure

Design Forces (per ASCE 41-13 § 7.5.2.1)

- QE= Action caused by the response to the selected Seismic Hazard Level. Multiplied by C1C2 since Response Spectrum Analysis is used per § 7.4.2.3.1. C1C2 is per ASCE41 Table 7-3.
- QG= Action caused by gravity loads.

The action due to design gravity loads:
QG = 1.1(QD + QL)
QG = 0.9QD

- QD= Action due to design dead loads.
- QL= Action due to design live loads.

Deformation-Controlled Design Actions:	QUD = QG ± QE
Force-Controlled Design Actions:	QUF = QG ± QE / (C1C2 J)

- Per 7.5.2.1.2, where the forces contributing to QUF are delivered by components of the seismic-force-resisting system that remain elastic, J shall be taken as 1.0.

Acceptance Criteria (per ASCE 41-13 § 7.5.2.2)

Deformation-Controlled Actions:

$$m \kappa QCE > QUD$$

- m = Component capacity modification factor to account for expected ductility associated with this action at the selected Structural Performance Level. m factors are variable and specified in Chapters 8 through 12 and 14.
- QCE = Expected strength of component deformation controlled action of an element at the deformation level under consideration. QCE, the expected strength, shall be determined considering all coexisting actions on the component under the loading condition by procedures specified in Chapters 8 through 14.
- κ = Knowledge factor, per Table 6-1. Since no material testing data available, the following factors are taken.
  0.75, where material information is not available from existing drawings.
  0.90, where material information is available from existing drawings.

Force-Controlled Actions:

κ QCL > QUF

- QCL = Lower-bound strength of a force-controlled action of an element at the deformation level under consideration. QCL, the lower-bound strength, shall be determined considering all coexisting actions on the component under the loading condition by procedures specified in Chapters 8 through 12 and 14.

Static Load has been assigned at each floor per the static calculations above. The weight multiplier for each floor and wall are calculated see the table below. See more information in Appendix B.

Table 4.4 Weight Mutiplier for Static Seismic Load

Stick-1: East Areas			Stick-2: West Areas			Stick-3: Chimney	
	Weight Multiplier			Weight Multiplier			Weight Multiplier
Mezz Roof	3.624		West Roof	1.924		TOP	3.070
Main Roof	3.263					Mid	2.498
2nd Mezz	2.879					Mezz Roof	1.747
2nd Top	1.880					L2	0.906
2nd Bott	1.609						
1st Mezz	0.779						

4.2.2.2 Diaphragm element modeling assumption

Nominal or Specified Properties. Nominal material properties, or properties specified in construction documents, shall be taken as lower-bound material properties. Corresponding expected material properties shall be calculated by multiplying lower-bound values by a factor taken from Table 10-1 to translate from lower-bound to expected values.

Table 10-1. Factors to Translate Lower-Bound Material Properties to Expected Strength Material Properties

Material Property	Factor
Concrete compressive strength	1.50
Reinforcing steel tensile and yield strength	1.25
Connector steel yield strength	1.50

ASCE 41-17 Table 10-1

Per existing structure drawings S-0.1, for major structural elements, the existing concrete compressive strength f'c = 3000 psi, and multiplied by 1.5 equals to 4500 psi. Major reinforcing bars and ties were ASTM A615, Grade 60. Fy = 60 ksi, and multiplied by 1.25 equals to 75 ksi.

Table 10-5. Effective Stiffness Values

Component	Flexural Rigidity	Shear Rigidity	Axial Rigidity
Beams—nonprestressed[a]	$0.3E_{cE}I_g$	$0.4E_{cE}A_w$	—
Beams—prestressed[a]	$E_{cE}I_g$	$0.4E_{cE}A_w$	—
Columns with compression caused by design gravity loads $\geq 0.5A_g f'_{cE}$[b]	$0.7E_{cE}I_g$	$0.4E_{cE}A_w$	$E_{cE}A_g$
Columns with compression caused by design gravity loads $\leq 0.1A_g f'_{cE}$ or with tension[b]	$0.3E_{cE}I_g$	$0.4E_{cE}A_w$	$E_{cE}A_g$ (compression) $E_{sE}A_s$ (tension)
Beam–column joints	Refer to Section 10.4.2.2.1		$E_{cE}A_g$
Flat slabs—nonprestressed	Refer to Section 10.4.4.2	$0.4E_{cE}A_g$	—
Flat slabs—prestressed	Refer to Section 10.4.4.2	$0.4E_{cE}A_g$	—
Walls—cracked[c]	$0.35E_{cE}A_g$	$0.4E_{cE}A_w$	$E_{cE}A_g$ (compression) $E_{sE}A_s$ (tension)

[a] For T-beams, I_g can be taken as twice the value of I_g of the web alone. Otherwise, I_g should be based on the effective width as defined in Section 10.3.1.3.
[b] For columns with axial compression falling between the limits provided, flexural rigidity shall be determined by linear interpolation. If interpolation is not performed, the more conservative effective stiffnesses shall be used. An imposed axial load N_{UG} is permitted to be used for stiffness evaluations.
[c] See Section 10.7.2.2.

ASCE 41-17 Table 10-5

Composite Concrete metal deck slab and roof bare deck has been modelled per existing sheet S0.2. See the snapshot from Model of the roof deck definition as an example.

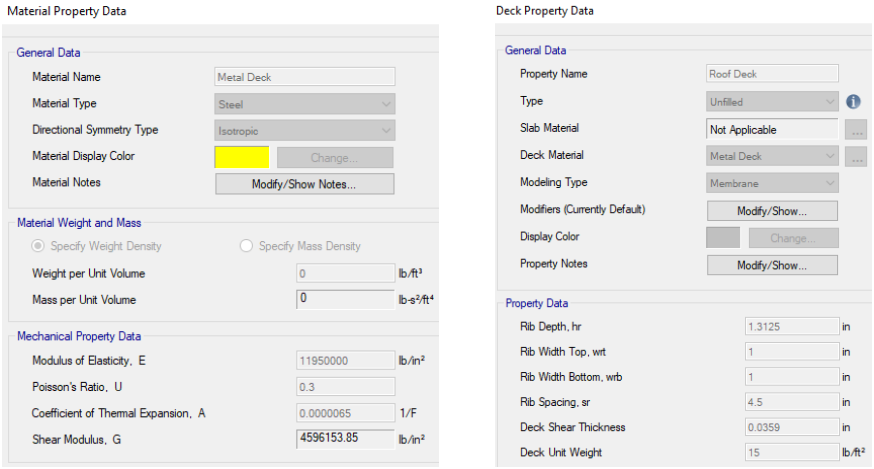


Fig. 4.14-1 ETABS Model Deck Elements

4.2.2.3 South, East and North Wall Modeling Assumption

Per wall sections at sheet S6.1, reinforced shotcrete layers have been modeled. See the table 4.5 Below for the wall thinness information. To account the stiffness contribution from the masonry to the reinforced gunite layer, assume 15% masonry thickness is to be added to the wall element thickness. For example, modelled east wall pier thickness = 0.15*22.5 + 6 = 9.4 inch.

Table 4.5-1 Summary of Wall Pier thickness

Base - Level 2 Bottom					
	Masonry Thk (in)	w_Masonry (psf)	Gunite Thk (in)	w_conc (psf)	Modeled Wall Thk (in)
East & SouthWall	22.5	206.3	6	75.0	9.4
North Wall (Line 9)	22	201.7	4	50.0	7.3
Level 2 Bottom - Roof					
	Masonry Thk (in)	w_Masonry (psf)	Gunite Thk (in)	w_conc (psf)	Modeled Wall Thk (in)
East & SouthWall	17.5	160.4	6	75.0	8.6
North Wall (Line 9)	19	174.2	4	50.0	6.9

Table 4.5-2 Summary of Wall Spandrel thickness

Base - Level 2 Bottom					
	Masonry Thk (in)	w_Masonry (psf)	Gunite Thk (in)	w_conc (psf)	Modeled Wall Thk (in)
East & SouthWall	22.5	206.3	4	50.0	7.4
North Wall (Line 9)	/	/	/	/	/
Level 2 Bottom - Roof					
	Masonry Thk (in)	w_Masonry (psf)	Gunite Thk (in)	w_conc (psf)	Modeled Wall Thk (in)
East & SouthWall	17.5	160.4	4	50.0	6.6
North Wall (Line 9)	/	/	/	/	/

See the snapshots as an example in Fig.4.14-2 for the modeling wall elements. See the calculations in Appendix B for all elements assignments.

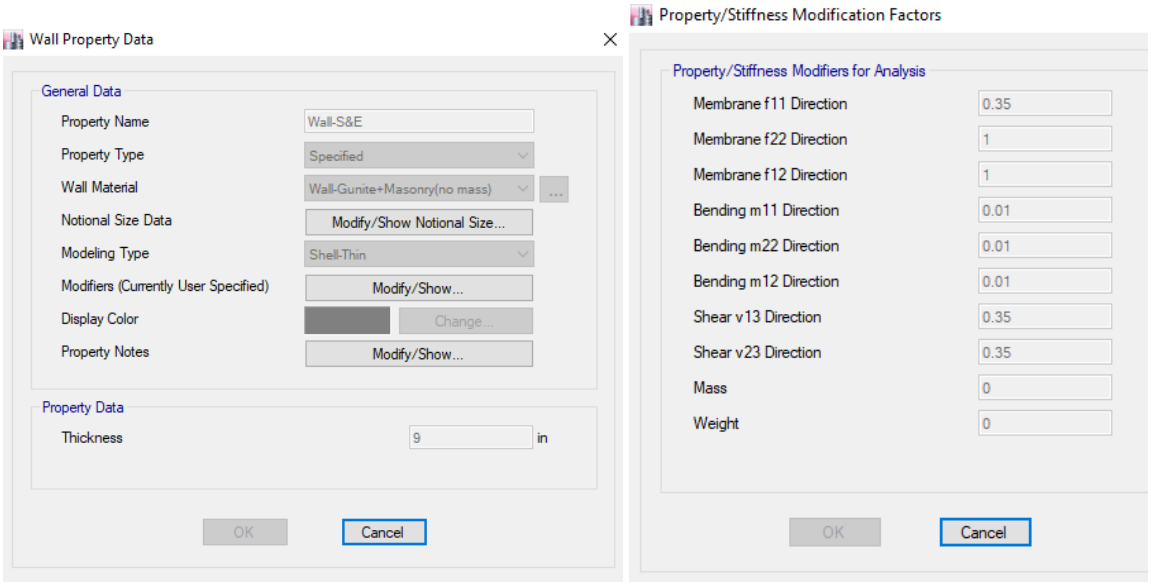


Fig. 4.14-2 ETABS Model Wall Elements

4.2.2.4 Retaining Structure Modeling Assumption

See the 3D snapshot below of the retaining structure.

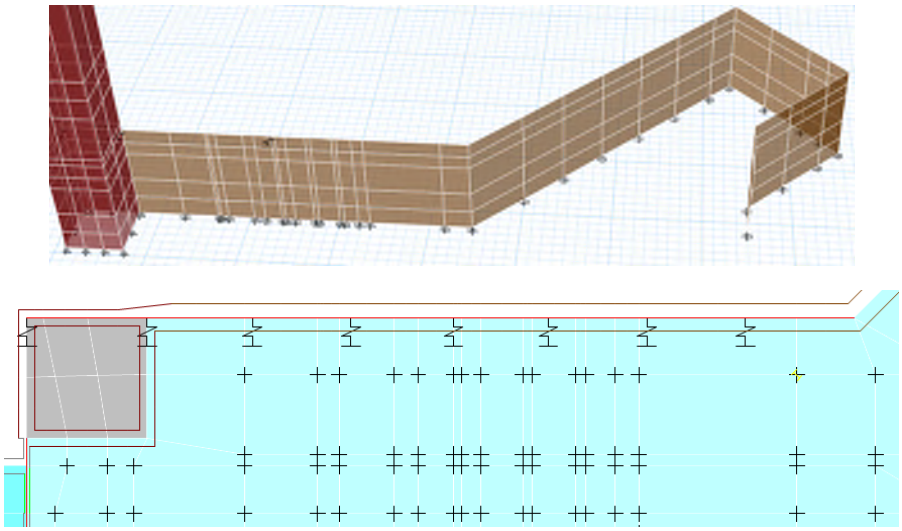


Fig. 4.15 ETABS Model Chimney Wall element and Spring Support From Grade Beam

Use Etabs section builder to calculate the composite section moment of inertia. See Fig.4.16.

With numerous trials, a spring constant of 400 k/in is modelled at nodal points where grade beams occur per existing plan. The resulting E-W displacements at 2nd floor are about 0.5 inch at the line of this retaining wall, and about 200 kips reaction for each spring. This assumption seems to be reasonable without detailed soil-structure interaction studies, which may be considered during detailed retrofitting design.

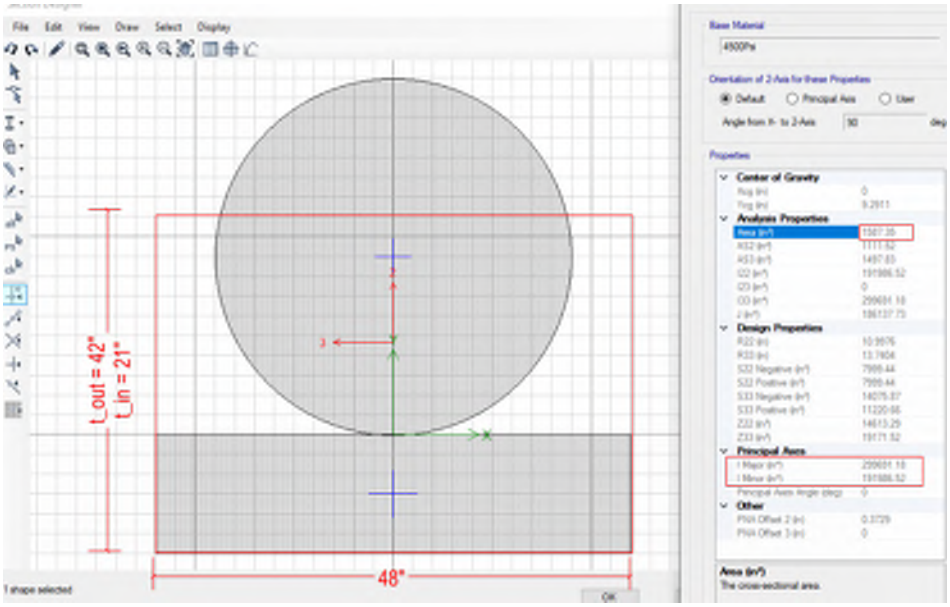


Fig. 4.16 ETABS Model Retaining Structure Section

Equivalent in-plane and out-of-plane properties for the retaining wall structures are summarized in Figure 4.17.

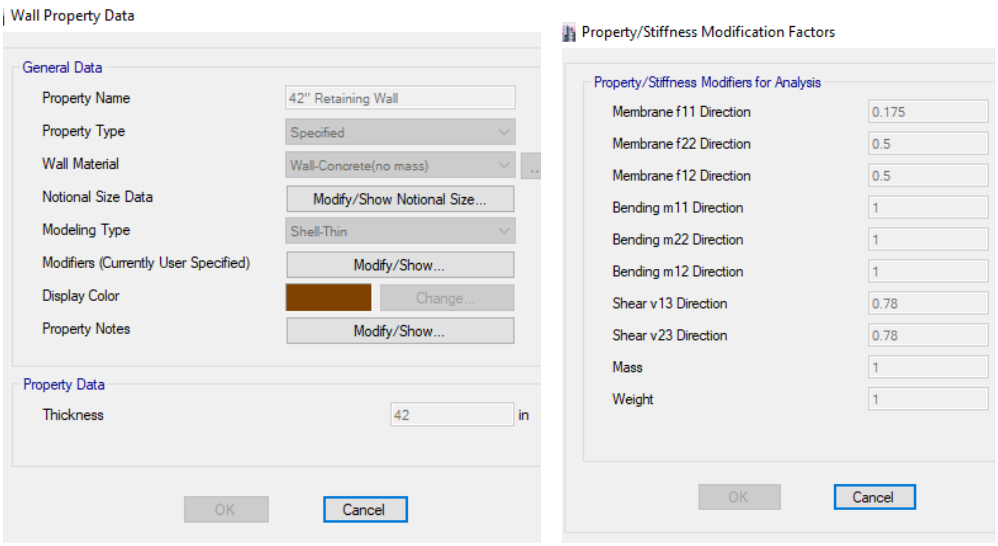
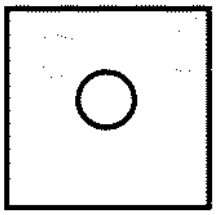
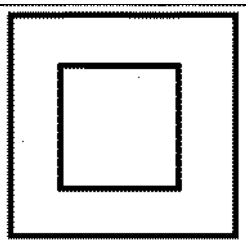


Fig. 4.17 ETABS Model Retaining Structure Assignment

4.2.2.5 Chimney Modeling Assumption

Per existing drawings, the chimney is a masonry structure with an inserted steel tube. In order to simplify the modeling, an equivalent rectangular hollow box is used in ETABS model. The equivalent hollow box simulates the as-built masonry and steel tube properties, as shown in Table 4.6.

Table 4.6 Chimney Equivalent Section Calculations

Chimney Size			
Length a =	15.5	ft	
Width b =	15.5	ft	
Hole Diameter =	4	ft	
I =	9.95E+07	in^4	
E =	1000	ksi	
E*I =	9.95E+10	k*in^2	
Modelled Rectangular Box Size			
a (cl to cl) =	15.25	ft	
b (cl to cl) =	15.25	ft	
t =	24	in	
I =	9.97E+07	in^4	
E =	1000	ksi	
E*I =	9.97E+10	k*in^2	

ETABS model hollow box shell element property assignments are shown in Figure 4.18.

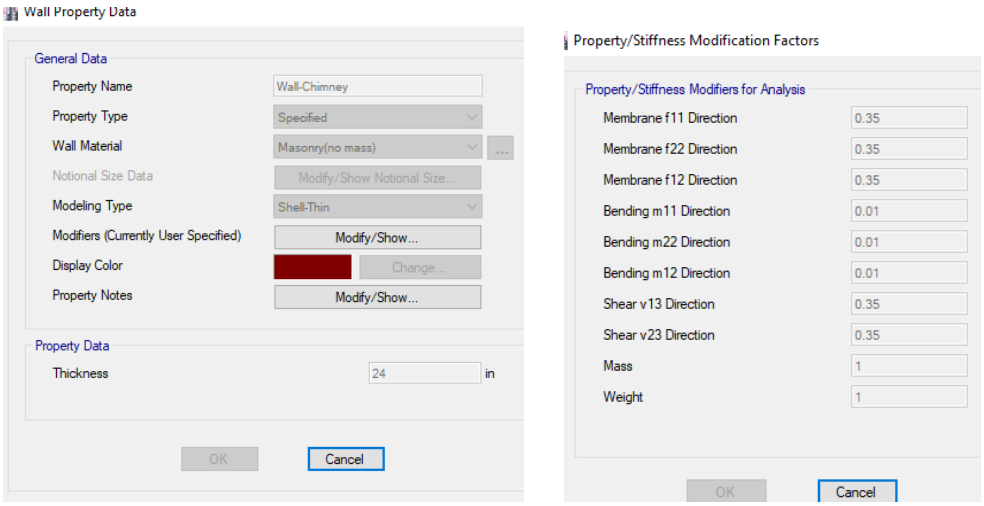


Fig. 4.18 ETABS Model Chimney Wall element

The chimney wall shell elements are modelled as weightless, with total weight of the chimney lumped at selected nodes associated with ETABS model floor levels. The lumped chimney weight calculation and assignment are summarized in Table 4.7.

Table 4.7 Chimney Weight Calculations

Floor	Size		length	Pipe OD	Pipe wall t	Masonry A	Masonry W	Steel A	Steel W	w
	ft	ft	ft	in	in	ft2/ft	k/ft	in2/ft	k/ft	k/ft
Base to 2nd	16.5	16.5	27.75	48	0.625	260	28.57	93.02	0.32	28.88
2nd to Mezz Roof	16	16.5	25.75	48	0.375	251	27.66	56.11	0.19	27.85
Mezz Roof to Mid	14	14	23	48	0.375	183	20.18	56.11	0.19	20.37
Mid to top	11	11	17.5	48	0.375	108	11.93	56.11	0.19	12.12

4.2.3 Summary of Tier-2 Evaluation Findings

Significant results for major structural elements/components from Tier-2 evaluation using 3D ETABS model are presented in the following sections. Detailed calculations are included in Appendix B.

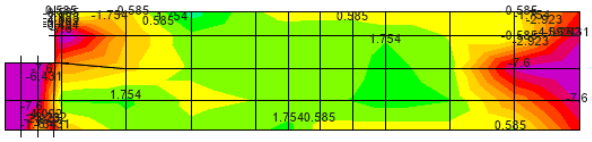
4.2.3.1 Diaphragm Results

Based on metal deck profile types, deck gage thickness, concrete topping slab thickness and reinforcement specified in existing drawing Sheet S0.2, diaphragm shear capacities for all floor levels are summarized in Table 4.8.

Table 4.8 Diaphragm Shear Capcity

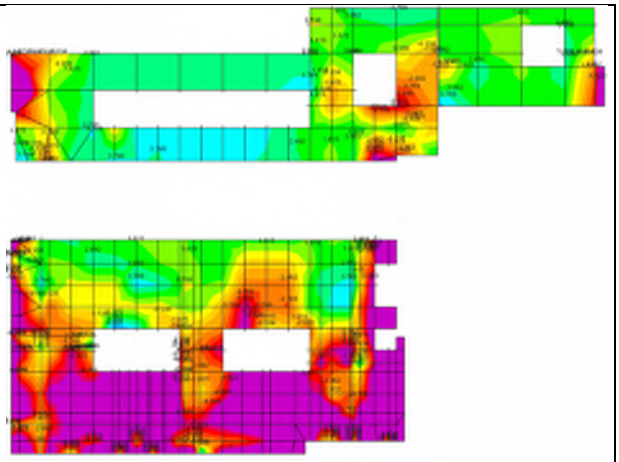
	Metal Deck				Concrete						
	Deck t	Gauge	Verco Type	V_deck (k/ft)	Fill Thk	Eff. Conc. Depth	Rebar	Vc (k/ft)	Vs(k/ft)	m factor	m*Vn (k/ft)
Mezz Roof	3	16	N 24	2.25	/	/	/	/	/	3	**6.7**
Main Roof	1.3	20	DV 36	2.00	/	/	/	/	/	3	**12.0**
2nd Mezz	1.5	16	B Deck	2.12	4.5	5.00	6x6 WF	8.04	15	3	**81.8**
2nd Top	1.5	16		2.00	5	5.50	#5 @6"	8.85	35.39	3	**144.7**
2nd Bott	1.5	16		2.12	4.5	5.00	6x6 WF	8.04	15	3	**81.8**
Museum	1.5	16		2.08	4.5	5.00	#5 @12"	8.04	23.25	3	**106.3**
Storage	1.5	16		2.08	4	4.50	6x6 WF	7.24	15	3	**79.2**

Snapshots from ETABS diaphragm shear force (f12) contour for each diaphragm level are shown in Figure 4.19. The dark purple and dark blue areas indicate areas with high demand to capacity ratios.



Mezz Roof

Dark blue & Dark puple indicate shear DCR > 1



Main Roof

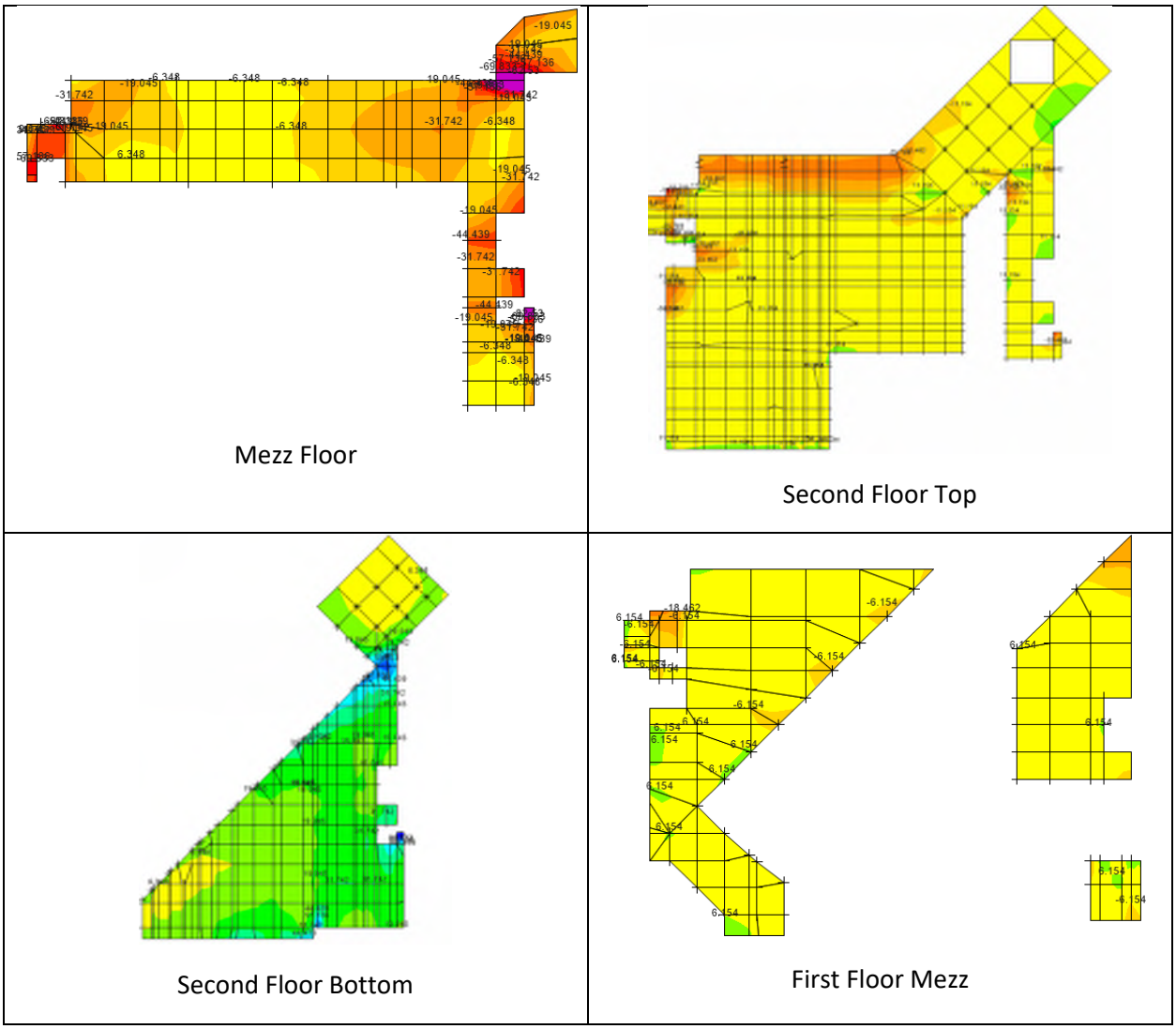


Fig. 4.19 Diaphragm Shear Force Countour

Some areas of main roof diaphragm included in-plane diagonal brace members to enhance the diaphragm shear capacities. Calculated bracing member axial force envelopes are presented in Figure 4.20.

According to ASCE 41-17 provisions, the “m” factor for diaphragm in-plane braces is 7 and resulting axial load capacity (m*Qce) is approximately 390 kips for WT3X10 members. Comparing with reported axial forces, the DCR for diagonal bracing members are generally below 0.5.

It should be noted that calculated shear force in shell elements and axial force in brace members are based on relative elastic stiffness of those two types of elements. For redistribution between those elements will occur in response to induced lateral forces in the diaphragm. For areas with high DCR in shell element shear forces, adding extra axial force capacity would reduce the subject DCRs. However, most areas with high DCR in shear remain inadequate in diaphragm capacity considering combined capacities in metal deck and diagonal braces. Diaphragm retrofitting in these areas would be necessary, as discussed in Section 5.2.5.

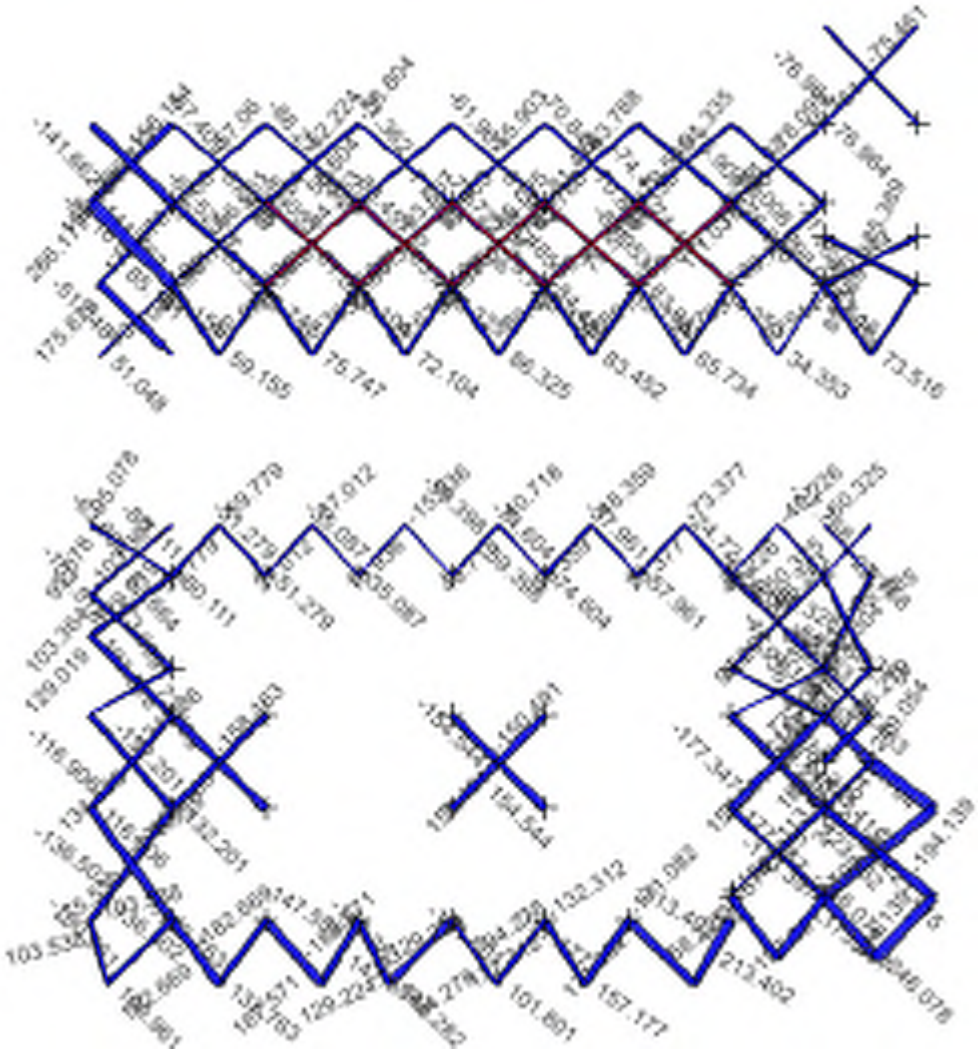


Fig. 4.20 Horizontal Diagonal Brace Axial Force Max. and Min. (kip)

4.2.3.2 South, East and North Wall Results

Tables 4.9-1 to 4.9-3 summarize the shear wall pier and spandrel member DCRs for shear and flexural in south, east, and north walls, respectively.

Table 4.9-1 South Wall DCR Summary

				DCR_V	DCR_M
SOUTH	PIER	2ND			
			S-2-P-22	0.9	0.7
			S-2-P-23	0.6	0.4
			S-2-P-24	1.0	0.7
			S-2-P-25	0.9	0.5
			S-2-P-26	1.9	1.2
			S-2-P-27	2.7	1.8
			S-2-P-29	0.2	0.2

		1ST	S-1-P-02	1.2	1.0
			S-1-P-03	1.5	0.7
			S-1-P-04	2.4	1.4
			S-1-P-05	1.7	0.6
			S-1-P-06	2.6	1.5
	SPANDREL	2ND	S-2-S-21	0.4	0.9
			S-2-S-22	0.7	1.2
			S-2-S-23	0.7	1.4
			S-2-S-24	0.9	1.7
			S-2-S-25	1.1	1.9
			S-2-S-26	1.6	2.8
			S-2-S-27	2.3	4.0
			S-2-S-28	0.1	1.2
		1ST	S-1-S-01.1	1.4	2.4
			S-1-S-01.2	0.8	0.8
			S-1-S-02	1.5	1.6
			S-1-S-03	3.0	2.4
			S-1-S-04	3.1	2.8
			S-1-S-05	4.9	4.0

Table 4.9-2 East Wall DCR Summary

				DCR_V	DCR_M
East	PIER	2ND	E-2-P-22	1.4	1.2
			E-2-P-23	0.6	0.6
			E-2-P-24	1.1	0.8
			E-2-P-25	0.9	0.6
			E-2-P-26	1.0	0.7
			E-2-P-27	0.6	0.7
			E-2-P-28	1.8	1.6
			E-2-P-29	0.7	0.7
			E-2-P-30	0.4	0.2
			E-2-P-31	0.5	0.5
			E-2-P-32	1.8	1.3
			E-2-P-33	0.4	0.3
		1ST	E-1-P-02	1.1	1.1
			E-1-P-03	1.7	1.5
			E-1-P-04	1.2	1.1
			E-1-P-05	1.5	1.5
			E-1-P-06	1.6	1.5
			E-1-P-07	2.2	2.0
			E-1-P-08	1.6	1.4
			E-1-P-09	2.0	1.4
			E-1-P-10	0.9	0.5
			E-1-P-11	1.7	1.0
			E-1-P-12	1.0	1.3

			E-1-P-13	2.5	1.5
	SPANDREL	2ND	E-2-S-21	1.0	1.2
			E-2-S-22	1.1	1.4
			E-2-S-23	1.3	1.6
			E-2-S-24	1.4	1.5
			E-2-S-25	1.3	1.4
			E-2-S-26	1.1	1.4
			E-2-S-27	1.4	1.6
			E-2-S-28	1.4	1.8
			E-2-S-29	0.1	0.1
			E-2-S-30	0.1	0.1
		1ST	E-1-S-01.1	1.2	1.5
			E-1-S-01.2	1.0	1.1
			E-1-S-02	1.7	1.9
			E-1-S-03	3.3	2.7
			E-1-S-04	2.2	1.7
			E-1-S-05	2.2	1.7
			E-1-S-06	3.3	2.9
			E-1-S-07	1.9	2.3
			E-1-S-08	1.6	2.0
			E-1-S-09	2.6	2.0
			E-1-S-10	2.4	0.9

Table 4.9-3 North Wall DCR Summary

NORTH	PIER	2ND	N-2-P-21	0.5	0.1
			N-2-P-22	1.7	3.9
			N-2-P-23	0.7	0.2
NORTH	PIER	1ST	N-1-P-01	1.0	0.6
			N-1-P-02	1.6	2.0
			N-1-P-03	1.0	0.1

Many of the piers and spandrels in the south and east walls are inadequate for meeting the established performance goals. Retrofitting measures for the south and east walls are discussed in Section 5.2.2.

The wall piers N-1-P-02 and N-2-P-22 are the short wall segment in the north wall between the offset wall segments along the north edge, and the high DCRs appear to be caused by out-of-plane wall displacement. Retrofitting may include strengthening the short wall or otherwise bracing the wall from excessive out-of-plane displacement at the adjacent locations.

4.2.3.3 CMU Wall Results

Two out three CMU wall segments, one next to grid line 10 and one next to grid line H, have adequate capacities to meet performance goals.

The CMU shear wall segment at grid line G is found inadequate for resisting N-S direction seismic force from the main roof and 2M floor, with most of the shear force transferred from 2M floor. Resulting DCR for this wall segment in shear is 1.6. Retrofitting concept is discussed in Section 5.2.3.

In addition, an alternative scheme of adding new shear wall elements at grid line E behind the passenger elevator has been explored. Initial preliminary studies showed two potential benefits of adding such shear wall segment: reducing shear wall force in CMU shear wall along grid line G; and reducing main roof diaphragm shear stresses in the east areas, as discussed in Section 5.2.4.

4.2.3.4 West Steel Brace Frame Results

Steel braced frames along the west edge of the building are found to be adequate for achieving the established performance goals. A snapshot of diagonal brace axial force from ETABS analysis is shown in Figure 4.21. Other bays not included have smaller brace member axial forces than those shown. Calculated DCR for maximum brace force is presented in Table 4.10.

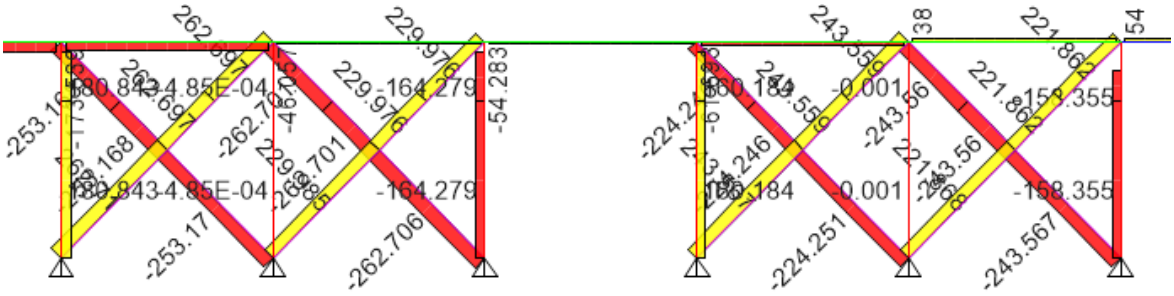


Fig. 4.21 West Vetical Diagonal Brace Axial Force (kip)

Table 4.10 West Steel Brace Maximum DCR

	in-plane	out-of-plane	
Fcr =	20.0	20.0	ksi
Pn = Ag*Fcr	63.2	63.2	kip
mPn =	505.9	442.7	kip
DCR_comp =	0.51	0.58	

4.2.3.5 Chimney Results

The chimney is a unique element in the subject facility. The large height to width aspect ratio results in distinguished dynamic response characteristics and its own mode shape with fundamental periods around 0.5 sec in two orthogonal directions, longer than the fundamental periods for the building structures. Therefore, the factors C1*C2 per ASCE 41-17 provisions are adjusted to 1.1 per ASCE 41-17 Table 7.3.

Table 7-3. Alternate Values for Modification Factors C_1C_2

Fundamental Period	$m_{max} < 2$	$2 \le m_{max} < 6$	$m_{max} \ge 6$
$T \le 0.3$	1.1	1.4	1.8
$0.3 < T \le 1.0$	1.0	1.1	1.2
$T > 1.0$	1.0	1.0	1.1

ASCE 41-17 Table 7-3

Table 4.11 summarizes the critical chimney section forces due to BSE-2E level seismic loads, including 100% loads from one direction and 30% from the perpendicular direction, at various height.

Table 4-11 Summary of Chimney Load

	Vu(kip)	Mu(ft-k)	Pu(kip)
2nd Mezz Roof	927	24881	420
Main Roof	1886	34571	810
2nd Floor Top	1925	72521	1350

The composite sectional P-M intersection capacities are evaluated using commercial program SP Column, where the inserted steel tube is represented by a series of reinforcing bars in a circular layout consistent with the steel pipe diameter and total steel cross sectional areas, as shown in Figure 4.22.

The maximum bending moment demand occurs at the section above 2nd floor, of 72,521 ft-kip. With calculated nominal flexural capacity using expected yielding strength for steel tube of 37,500 ft-kip and a m factor of 2, the resulting DCR at the subject section is approximately 0.96 without considering beneficial effects from cumulated chimney self-weight.

Considering existing masonry chimney structure retains no shear resistance due to unreliable motor shear strength and thus, 100% of shear force is resisted by the steel pipe alone, the steel tube section is found to have adequate shear capacity.

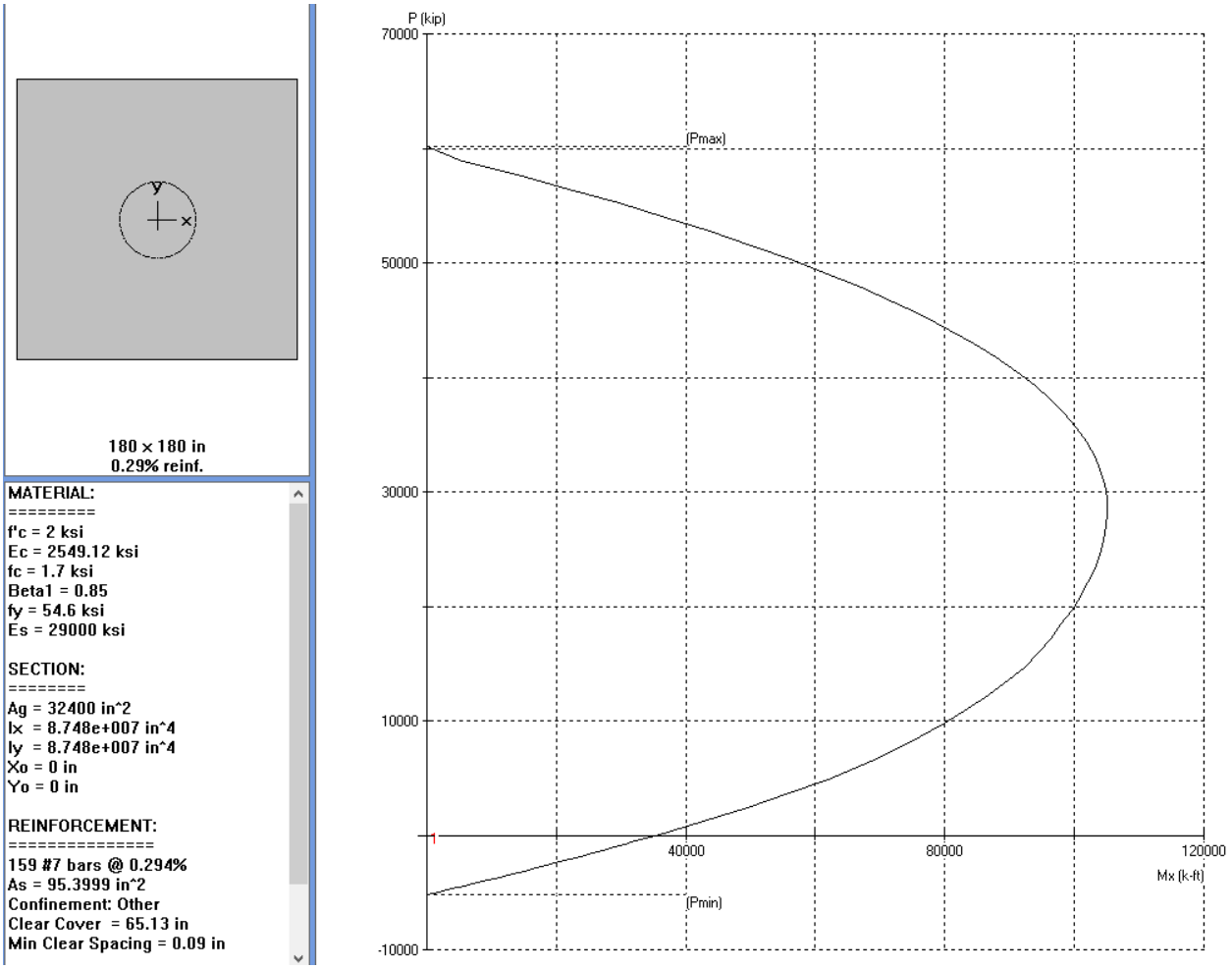


Fig. 4.22 SPCOL P-M Diagram Output For Chimney Section

4.2.4 Summary of Significant Deficiencies

- 2nd floor mezzanine (2M) roof diaphragm shear strength is not sufficient at the north and south edges.
- Main roof diaphragm shear strength is not sufficient in most of the east areas.
- Most south wall spandrels at main roof and 2nd floor lever and wall piers below 2nd floor do not have adequate shear and flexural strength.
- Most east wall spandrels at main roof and 2nd floor level and wall piers below main roof do not have adequate shear and flexural strength.
- CMU wall at gridline G below 2nd floor mezz level does not have adequate shear strength.

4.3 Seismic Hazard Rating

According to SFPW engineers, each facility owned and operated by City and County of San Francisco is required to have a Seismic Hazard Rating (SHR) number. The rating number ranges from 1 to 4, representing the lowest to the highest risk levels. Descriptions for each SHR are summarized in Table 4.12.

Table 4.12 Seismic Hazard Rating Descriptions

ASCE 41 Structural Performance Level at BSE-1N	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.
		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.
Damage Control	2	**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.
Life Safety (L.S.)	3	**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.
Limited Safety		
Collapse Prevention (C.P.)		
	4	**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.

Based on Tier-2 evaluation results, it was found that many seismic force resisting elements, such as the south and east wall piers and spandrels, reinforcing bar development/splice length, main roof diaphragms, and some localized 2M roof diaphragm areas, do not have adequate strength for the targeted seismic performance goal. On the other hand, the calculated inter-story drift and overall lateral displacement for the existing structure subjecting to BSE-2E level seismic loading is within an acceptable limit due to the overall height to width ratio of the building and the inherent stiffness in the existing structures. It is our professional opinion that the existing building may suffer severe damages in the seismic force resisting systems with little post-earthquake strength and stiffness reserves after BSE-2E level earthquake events. However, because the gravity load supporting system is independent from the seismic force resisting systems (except floor diaphragms), the probability of the gravity load supporting system being destroyed by damages in the seismic force resisting system and causing partial or total collapse of the building is low.

Therefore, an overall Seismic Hazard Rating (SHR) of 3 is recommended for the subject facility.

5. RECOMMENDED FURTHER STUDIES AND RETROFITTING CONCEPTS

5.1 Recommended Further Studies

The subject building has a special condition at or near the transition between east portion and west portion divided by a retaining structure near grid line G. The retaining structure consists of closely spaced drilled caissons and a 12-inch thick concrete wall on the east side of drilled caissons. Th subject retaining structure appears to provide lateral force resistance for the east portion of the structure at Level 2 while retaining soil on the west side. Assumptions have been made regarding to the stiffness of the retaining structure, both in-plane and out-of-plane of the retailing structure, in order to advance the seismic evaluation of the building. Details of the assumptions and engineering judgement for the subject condition are included in Tier-2 evaluation structural model descriptions.

Because the retaining structure retains about 28 feet soil pressure from the west side, it behaves totally differently when combined with seismic loading in the E-W direction: either provide significant support via soil passive pressure or add significant loads from the active pressure. The Tier-2 evaluation assumed uniform behavior in both east and west directions, which is not most suitable for the subject condition. Detailed studies, which likely will involve soil-structure interactions, is recommended to further access the condition and to understand the structural behavior.

Another aspect of seismic evaluation is non-structural elements, which is not included in the current scope. It is recommended to conduct such evaluations at appropriate time.

5.2 Retrofitting Concepts

Concepts of retrofitting the existing building to address deficiencies and to enhance the seismic performance are discussed below. It should be noted that such concepts are preliminary and not suitable for construction.

5.2.1 Chimney Separation

Existing drawings indicate the main roof diaphragm on the west portion is connected to the chimney structure. Tier-2 evaluation found the interaction between the chimney and main building structure resulted in additional demands to the roof diaphragms and other seismic force resisting elements that are not adequate to resist seismic force from the chimney. Additional analysis revealed that separating the chimney from the building structure above 2nd floor, including disconnecting the south wall above Level 2 and disconnecting the west portion roof diaphragm from the chimney, resulted in reduced demands to the south wall above Level 2 and main roof diaphragm, and a cleaner load path for transferring seismic loads to the foundations.

Based on available structural drawings, the shotcrete walls along the south wall and steel columns had no positive connections to the chimney structure above Level 2 diaphragm. It is obvious that existing mortar joints between the chimney and south wall masonry units are not adequate to transfer significant force and will be severely damaged when experiencing BSE-2E level earthquakes, causing disengagement of the chimney and south wall structures. It is recommended to cut the chimney and masonry wall connections above 2nd floor to achieve a more predictable structural performance.

Steel column and dowels along the column height near the edge of masonry wall will provide out-of-plane bracing when the south wall and chimney is separated.

New connection details between west side main roof diaphragm and the chimney need to be incorporated, which will accommodate the relative lateral displacement while maintaining vertical load support at the north and west faces of the chimney.

Based on the Tier-2 evaluation, the existing chimney with inserted steel pipe reinforcement is adequate to support the chimney cantilevered above Level 2.

5.2.2 South and East Walls Along Washington Street and Mason Street

Based on Tier-2 evaluation results, the South and East walls do not have adequate strength to meet targeted performance goal. Two options may be considered for retrofitting the existing wall, up to the main roof level.

One option is removing the existing shotcrete layer (chipping and jack hammering) and leave rebars dowels to existing masonry wall in place, adding adequate reinforcing steel and install shotcrete wall of sufficient thickness to meet strength requirements.

Second option is applying fiber wrap of sufficient layers, potentially in both vertical and horizontal orientations on the interior surface of existing shotcrete walls, to meet flexural and shear strength requirements for wall piers and spandrels.

In each of the above options, the new reinforcing steel or fiber wrap shall be anchored into existing grade beams and developed in floor diaphragms. Stated retrofitting options are depicted in Figures 5.1 to 5.5 for ground floor to main roof level, respectively.

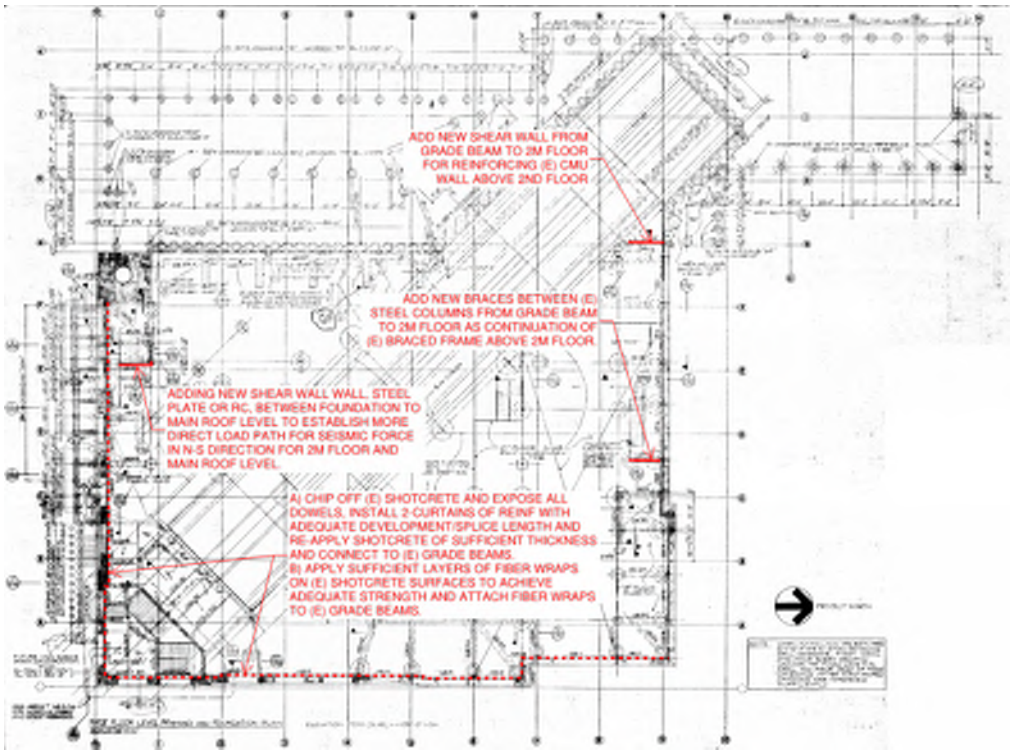


Fig. 5.1 Retrofitting Concept at Ground Level

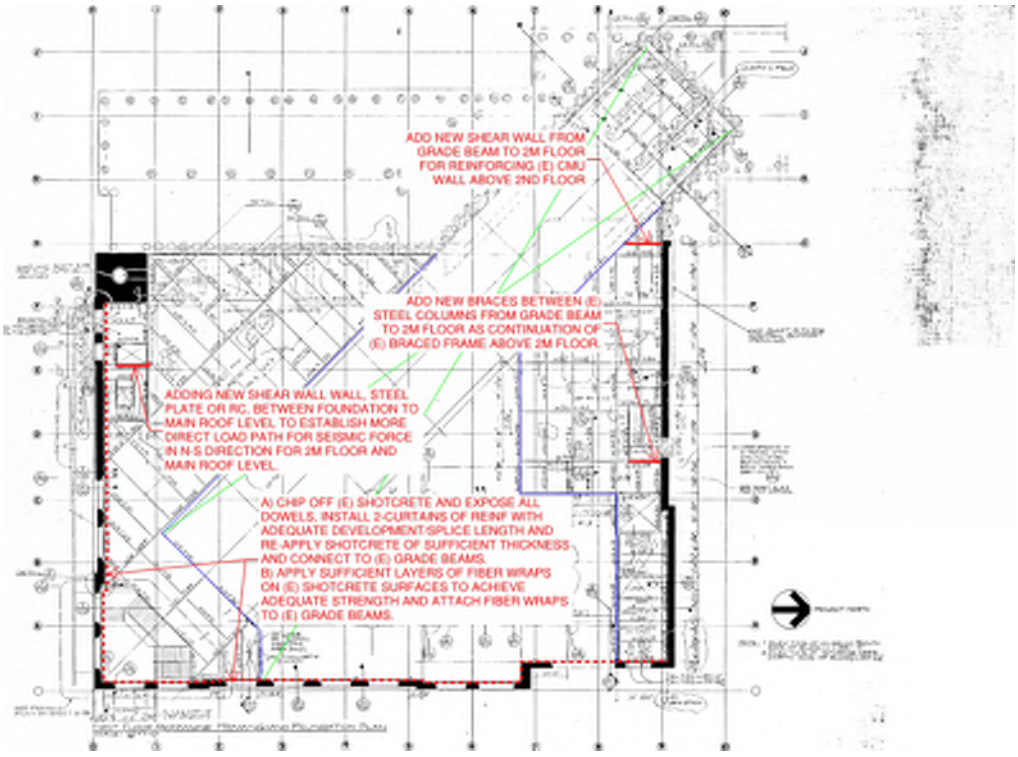


Fig. 5.2 Retrofitting Concept at 1M Level

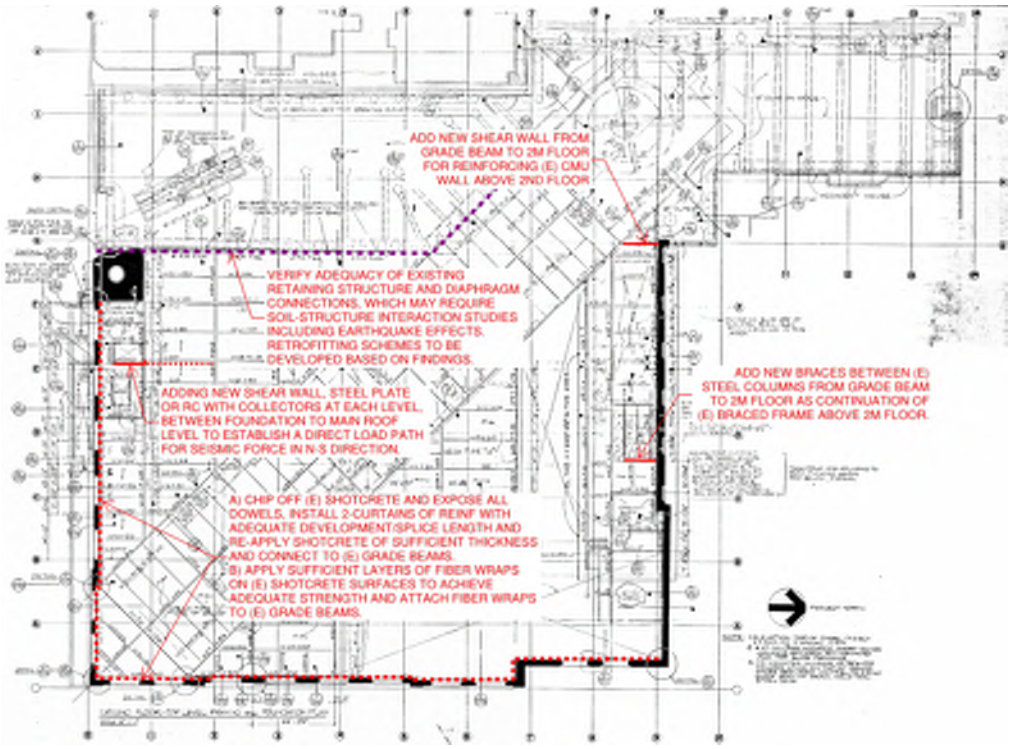


Fig. 5.3 Retrofitting Concept at 2nd Level

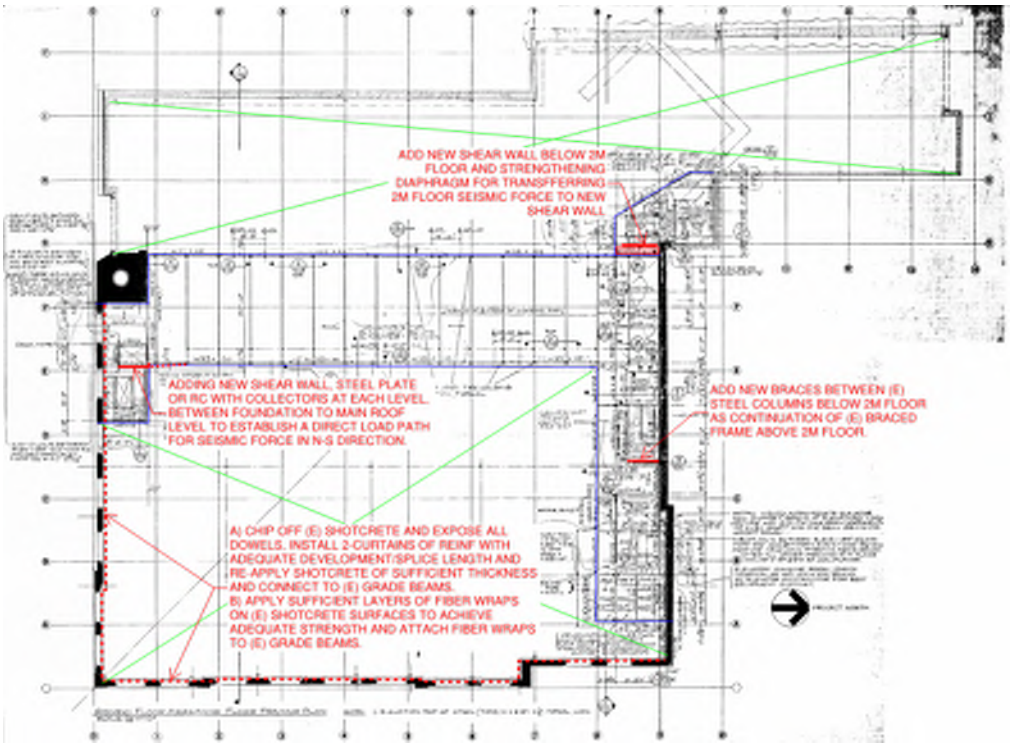


Fig. 5.4 Retrofitting Concept at 2M Level

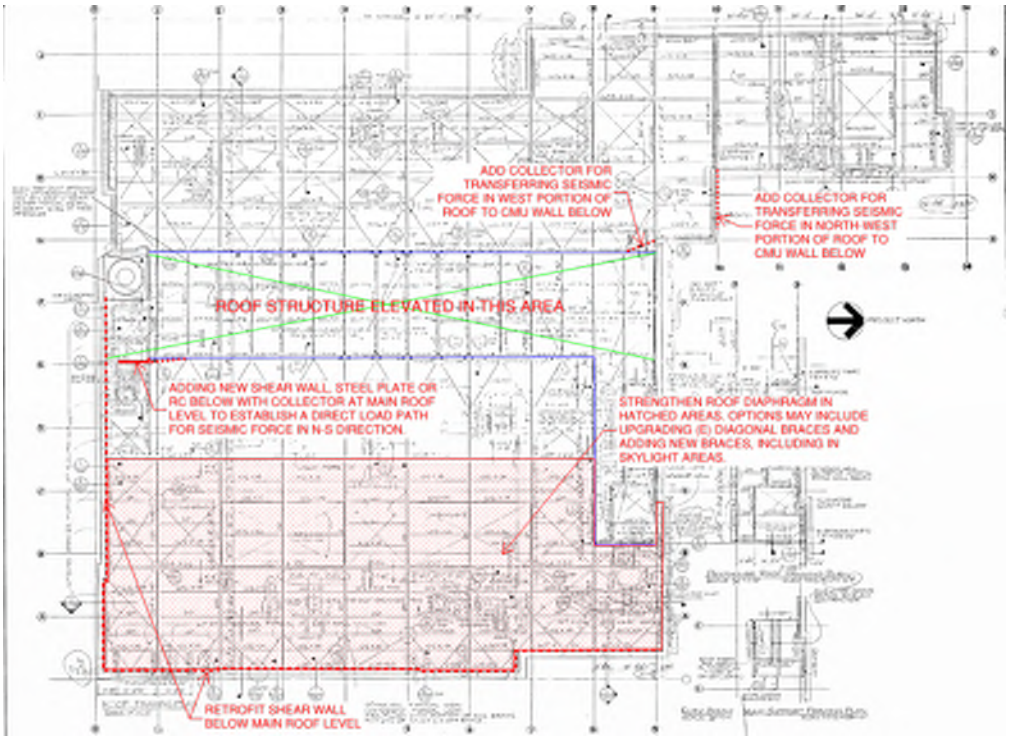


Fig. 5.5 Retrofitting Concept at Main Roof Level

5.2.3 Concrete Masonry Unit Wall at Grid line G

Existing CMU wall between grid lines 9 and 10 above 2nd floor (grade level at west portion) is not adequate to meet targeted performance strength requirements. Based on reviewing existing drawings and field observations, it appears to be feasible to add new shear wall elements inside the north wall from ground floor to 2M floor, in-line with the existing CMU wall. The new shear wall shall be connected to the CMU wall segment to form an integral shear wall below 2M floor.

Refer to Fig. 5.1 to 5.4 for added shear wall elements along grid line G.

5.2.4 Adding New Seismic Force Resisting Elements at Grid Lines E

Existing seismic force resisting system do not have defined seismic force resisting elements along the east side of the 2M floor and west edge of east portion of the main roof for seismic force in the N-S direction. Adding a new shear wall segment along the back wall of the passenger elevator. The added new shear wall element may attain lateral support at ground and 2nd level and provide seismic force resistance in the N-S direction for 2M and main roof levels, which will permit a more direct load path (without going through the main roof diaphragm) for transferring seismic force to foundations.

Refer to Fig. 5.1 to 5.5 for added shear wall element at grid line E.

5.2.5 Main Roof Diaphragm

A large portion of existing roof diaphragm over the east portion of the building, mostly east of grid line C, does not have adequate strength to meet targeted performance strength requirements. Upgrade existing diagonal bracing members and adding new

diagonal bracing members will enhance the diaphragm capacity for transferring N-S direction seismic to the east wall and transferring E-W direction seismic force to the south and north walls, respectively.

Refer to Fig. 5.5 for areas requiring roof diaphragm strengthening.

5.2.6 Other added elements for completing seismic force load path

Two locations of incomplete load path were noticed and new seismic force resisting elements are recommended to establish a complete load path.

One condition is the east wall of north exit stair, where diagonal bracing members exist above 2M floor only. Recommend adding diagonal bracing elements from 2M floor to foundation between existing steel columns. Refer to Fig. 5.1 to 5.4 for added bracing members.

The second condition occurs where an expansion joint separated the north-west portion of the roof (north of grid line 10) from the remaining roof structure. The separated roof portion has E-W direction seismic force resisting element along the north edge (near grid line 14) only. Recommend adding a collector element from the roof beam north of the expansion joint to transfer seismic force in the E-W direction to existing CMU wall along grid line 10. Refer to Fig. 5.5 for added collector location.

APPENDIX A

TIER – 1 CHECKLISTS

Table 17-2. Collapse Prevention Basic Configuration Checklist

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
Low Seismicity			
Building System—General			
C **NC** N/A U	LOAD PATH: The structure contains a complete, well-defined load path, including structural elements and connections, that serves to transfer the inertial forces associated with the mass of all elements of the building to the foundation.	5.4.1.1	A.2.1.1
C NC N/A U	ADJACENT BUILDINGS: The clear distance between the building being evaluated and any adjacent building is greater than 0.25% of the height of the shorter building in low seismicity, 0.5% in moderate seismicity, and 1.5% in high seismicity.	5.4.1.2	A.2.1.2
C **NC** N/A U	MEZZANINES: Interior mezzanine levels are braced independently from the main structure or are anchored to the seismic-force-resisting elements of the main structure.	5.4.1.3	A.2.1.3
Building System—Building Configuration			
C NC N/A U	WEAK STORY: The sum of the shear strengths of the seismic-force-resisting system in any story in each direction is not less than 80% of the strength in the adjacent story above.	5.4.2.1	A.2.2.2
C NC N/A U	SOFT STORY: The stiffness of the seismic-force-resisting system in any story is not less than 70% of the seismic-force-resisting system stiffness in an adjacent story above or less than 80% of the average seismic-force-resisting system stiffness of the three stories above.	5.4.2.2	A.2.2.3
C **NC** N/A U	VERTICAL IRREGULARITIES: All vertical elements in the seismic-force-resisting system are continuous to the foundation.	5.4.2.3	A.2.2.4
C **NC** N/A U	GEOMETRY: There are no changes in the net horizontal dimension of the seismic-force-resisting system of more than 30% in a story relative to adjacent stories, excluding one-story penthouses and mezzanines.	5.4.2.4	A.2.2.5
C NC N/A U	MASS: There is no change in effective mass of more than 50% from one story to the next. Light roofs, penthouses, and mezzanines need not be considered.	5.4.2.5	A.2.2.6
C NC N/A **U**	TORSION: The estimated distance between the story center of mass and the story center of rigidity is less than 20% of the building width in either plan dimension.	5.4.2.6	A.2.2.7
Moderate Seismicity (Complete the Following Items in Addition to the Items for Low Seismicity)			
Geologic Site Hazards			
C NC N/A U	LIQUEFACTION: Liquefaction-susceptible, saturated, loose granular soils that could jeopardize the building's seismic performance do not exist in the foundation soils at depths within 50 ft (15.2 m) under the building.	5.4.3.1	A.6.1.1
C NC N/A U	SLOPE FAILURE: The building site is located away from potential earthquake-induced slope failures or rockfalls so that it is unaffected by such failures or is capable of accommodating any predicted movements without failure.	5.4.3.1	A.6.1.2
C NC N/A U	SURFACE FAULT RUPTURE: Surface fault rupture and surface displacement at the building site are not anticipated.	5.4.3.1	A.6.1.3
High Seismicity (Complete the Following Items in Addition to the Items for Moderate Seismicity)			
Foundation Configuration			
C NC N/A U	OVERTURNING: The ratio of the least horizontal dimension of the seismic-force-resisting system at the foundation level to the building height (base/height) is greater than $0.6S_a$.	5.4.3.3	A.6.2.1
C NC N/A U	TIES BETWEEN FOUNDATION ELEMENTS: The foundation has ties adequate to resist seismic forces where footings, piles, and piers are not restrained by beams, slabs, or soils classified as Site Class A, B, or C.	5.4.3.4	A.6.2.2

Note: C = Compliant, NC = Noncompliant, N/A = Not Applicable, and U = Unknown.

Table 17-10. Collapse Prevention Structural Checklist for Building Types S2 and S2a

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
Low Seismicity			
Seismic-Force-Resisting System			
C **NC** N/A U	REDUNDANCY: The number of lines of braced frames in each principal direction is greater than or equal to 2.	5.5.1.1	A.3.3.1.1
C **NC** N/A U	COLUMN AXIAL STRESS CHECK: The axial stress caused by gravity loads in columns subjected to overturning forces is less than $0.10F_y$. Alternatively, the axial stress caused by overturning forces alone, calculated using the Quick Check procedure of Section 4.4.3.6, is less than $0.30F_y$.	5.5.2.1.3	A.3.1.3.2
C NC N/A **U**	BRACE AXIAL STRESS CHECK: The axial stress in the diagonals, calculated using the Quick Check procedure of Section 4.4.3.4, is less than $0.50F_y$.	5.5.4.1	A.3.3.1.2
Connections			
C NC N/A U	TRANSFER TO STEEL FRAMES: Diaphragms are connected for transfer of seismic forces to the steel frames.	5.7.2	A.5.2.2
C NC N/A U	STEEL COLUMNS: The columns in seismic-force-resisting frames are anchored to the building foundation.	5.7.3.1	A.5.3.1
Moderate Seismicity (Complete the Following Items in Addition to the Items for Low Seismicity)			
Seismic-Force-Resisting System			
C NC N/A U	REDUNDANCY: The number of braced bays in each line is greater than 2.	5.5.1.1	A.3.3.1.1
C NC N/A U	CONNECTION STRENGTH: All the brace connections develop the buckling capacity of the diagonals.	5.5.4.4	A.3.3.1.5
C **NC** N/A U	COMPACT MEMBERS: All brace elements meet compact section requirements in accordance with AISC 360, Table B4.1.	5.5.4	A.3.3.1.7
C NC N/A U	K-BRACING: The bracing system does not include K-braced bays.	5.5.4.6	A.3.3.2.1
High Seismicity (Complete the Following Items in Addition to the Items for Low and Moderate Seismicity)			
Seismic-Force-Resisting System			
C NC **N/A** U	COLUMN SPLICES: All column splice details located in braced frames develop 50% of the tensile strength of the column.	5.5.4.2	A.3.3.1.3
C NC N/A U	SLENDERNESS OF DIAGONALS: All diagonal elements required to carry compression have Kl/r ratios less than 200.	5.5.4.3	A.3.3.1.4
C NC N/A U	CONNECTION STRENGTH: All the brace connections develop the yield capacity of the diagonals.	5.5.4.4	A.3.3.1.5
C **NC** N/A U	COMPACT MEMBERS: All brace elements meet section requirements in accordance with AISC 341, Table D1.1, for moderately ductile members.	5.5.4	A.3.3.1.7
C NC **N/A** U	CHEVRON BRACING: Beams in chevron, or V-braced, bays are capable of resisting the vertical load resulting from the simultaneous yielding and buckling of the brace pairs.	5.5.4.6	A.3.3.2.3
C NC N/A U	CONCENTRICALLY BRACED FRAME JOINTS: All the diagonal braces frame into the beam–column joints concentrically.	5.5.4.8	A.3.3.2.4
Diaphragms (Stiff or Flexible)			
C NC N/A U	OPENINGS AT FRAMES: Diaphragm openings immediately adjacent to the braced frames extend less than 25% of the frame length.	5.6.1.3	A.4.1.5
Flexible Diaphragms			
C NC N/A U	CROSS TIES: There are continuous cross ties between diaphragm chords.	5.6.1.2	A.4.1.2
C NC **N/A** U	STRAIGHT SHEATHING: All straight-sheathed diaphragms have aspect ratios less than 2-to-1 in the direction being considered.	5.6.2	A.4.2.1
C NC **N/A** U	SPANS: All wood diaphragms with spans greater than 24 ft (7.3 m) consist of wood structural panels or diagonal sheathing.	5.6.2	A.4.2.2
C NC **N/A** U	DIAGONALLY SHEATHED AND UNBLOCKED DIAPHRAGMS: All diagonally sheathed or unblocked wood structural panel diaphragms have horizontal spans less than 40 ft (12.2 m) and aspect ratios less than or equal to 4-to-1.	5.6.2	A.4.2.3
C NC N/A U	OTHER DIAPHRAGMS: Diaphragms do not consist of a system other than wood, metal deck, concrete, or horizontal bracing.	5.6.5	A.4.7.1

Note: C = Compliant, NC = Noncompliant, N/A = Not Applicable, and U = Unknown.

Table 17-24. Collapse Prevention Structural Checklist for Building Types C2 and C2a

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
Low and Moderate Seismicity			
Seismic-Force-Resisting System			
C NC N/A U	COMPLETE FRAMES: Steel or concrete frames classified as secondary components form a complete vertical-load-carrying system.	5.5.2.5.1	A.3.1.6.1
C **NC** N/A U	REDUNDANCY: The number of lines of shear walls in each principal direction is greater than or equal to 2.	5.5.1.1	A.3.2.1.1
C NC N/A **U**	SHEAR STRESS CHECK: The shear stress in the concrete shear walls, calculated using the Quick Check procedure of Section 4.4.3.3, is less than the greater of 100 lb/in.^{2} (0.69 MPa) or $2\sqrt{f'_c}$.	5.5.3.1.1	A.3.2.2.1
C NC N/A U	REINFORCING STEEL: The ratio of reinforcing steel area to gross concrete area is not less than 0.0012 in the vertical direction and 0.0020 in the horizontal direction.	5.5.3.1.3	A.3.2.2.2
Connections			
C NC N/A U	WALL ANCHORAGE AT FLEXIBLE DIAPHRAGMS: Exterior concrete or masonry walls that are dependent on flexible diaphragms for lateral support are anchored for out-of-plane forces at each diaphragm level with steel anchors, reinforcing dowels, or straps that are developed into the diaphragm. Connections have strength to resist the connection force calculated in the Quick Check procedure of Section 4.4.3.7.	5.7.1.1	A.5.1.1
C NC N/A U	TRANSFER TO SHEAR WALLS: Diaphragms are connected for transfer of seismic forces to the shear walls.	5.7.2	A.5.2.1
C NC N/A U	FOUNDATION DOWELS: Wall reinforcement is doweled into the foundation with vertical bars equal in size and spacing to the vertical wall reinforcing directly above the foundation.	5.7.3.4	A.5.3.5
High Seismicity (Complete the Following Items in Addition to the Items for Low and Moderate Seismicity)			
Seismic-Force-Resisting System			
C NC N/A **U**	DEFLECTION COMPATIBILITY: Secondary components have the shear capacity to develop the flexural strength of the components.	5.5.2.5.2	A.3.1.6.2
C NC **N/A** U	FLAT SLABS: Flat slabs or plates not part of the seismic-force-resisting system have continuous bottom steel through the column joints.	5.5.2.5.3	A.3.1.6.3
C NC N/A U	COUPLING BEAMS: The ends of both walls to which the coupling beam is attached are supported at each end to resist vertical loads caused by overturning.	5.5.3.2.1	A.3.2.2.3
Diaphragms (Stiff or Flexible)			
C **NC** N/A U	DIAPHRAGM CONTINUITY: The diaphragms are not composed of split-level floors and do not have expansion joints.	5.6.1.1	A.4.1.1
C NC N/A U	OPENINGS AT SHEAR WALLS: Diaphragm openings immediately adjacent to the shear walls are less than 25% of the wall length.	5.6.1.3	A.4.1.4
Flexible Diaphragms			
C NC N/A U	CROSS TIES: There are continuous cross ties between diaphragm chords.	5.6.1.2	A.4.1.2
C NC **N/A** U	STRAIGHT SHEATHING: All straight-sheathed diaphragms have aspect ratios less than 2-to-1 in the direction being considered.	5.6.2	A.4.2.1
C NC **N/A** U	SPANS: All wood diaphragms with spans greater than 24 ft (7.3 m) consist of wood structural panels or diagonal sheathing.	5.6.2	A.4.2.2
C NC **N/A** U	DIAGONALLY SHEATHED AND UNBLOCKED DIAPHRAGMS: All diagonally sheathed or unblocked wood structural panel diaphragms have horizontal spans less than 40 ft (12.2 m) and aspect ratios less than or equal to 4-to-1.	5.6.2	A.4.2.3
C NC N/A U	OTHER DIAPHRAGMS: Diaphragms do not consist of a system other than wood, metal deck, concrete, or horizontal bracing.	5.6.5	A.4.7.1
Connections			
C NC **N/A** U	UPLIFT AT PILE CAPS: Pile caps have top reinforcement, and piles are anchored to the pile caps.	5.7.3.5	A.5.3.8

Note: C = Compliant, NC = Noncompliant, N/A = Not Applicable, and U = Unknown.

Table 17-34. Collapse Prevention Structural Checklist for Building Types RM1 and RM2

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
Low and Moderate Seismicity			
Seismic-Force-Resisting System			
C NC N/A U	REDUNDANCY: The number of lines of shear walls in each principal direction is greater than or equal to 2. (COMBINING WITH OTHER LFRS)	5.5.1.1	A.3.2.1.1
C NC N/A **U**	SHEAR STRESS CHECK: The shear stress in the reinforced masonry shear walls, calculated using the Quick Check procedure of Section 4.4.3.3, is less than 70 lb/in.^{2} (0.48 MPa).	5.5.3.1.1	A.3.2.4.1
C NC N/A U	REINFORCING STEEL: The total vertical and horizontal reinforcing steel ratio in reinforced masonry walls is greater than 0.002 of the wall with the minimum of 0.0007 in either of the two directions; the spacing of reinforcing steel is less than 48 in. (1220 mm), and all vertical bars extend to the top of the walls.	5.5.3.1.3	A.3.2.4.2
Stiff Diaphragms			
C NC **N/A** U	TOPPING SLAB: Precast concrete diaphragm elements are interconnected by a continuous reinforced concrete topping slab.	5.6.4	A.4.5.1
Connections			
C NC N/A U	WALL ANCHORAGE: Exterior concrete or masonry walls that are dependent on the diaphragm for lateral support are anchored for out-of-plane forces at each diaphragm level with steel anchors, reinforcing dowels, or straps that are developed into the diaphragm. Connections have strength to resist the connection force calculated in the Quick Check procedure of Section 4.4.3.7.	5.7.1.1	A.5.1.1
C NC **N/A** U	WOOD LEDGERS: The connection between the wall panels and the diaphragm does not induce cross-grain bending or tension in the wood ledgers.	5.7.1.3	A.5.1.2
C NC N/A U	TRANSFER TO SHEAR WALLS: Diaphragms are connected for transfer of seismic forces to the shear walls.	5.7.2	A.5.2.1
C NC **N/A** U	TOPPING SLAB TO WALLS OR FRAMES: Reinforced concrete topping slabs that interconnect the precast concrete diaphragm elements are doweled for transfer of forces into the shear wall or frame elements.	5.7.2	A.5.2.3
C NC N/A U	FOUNDATION DOWELS: Wall reinforcement is doweled into the foundation.	5.7.3.4	A.5.3.5
C NC **N/A** U	GIRDER–COLUMN CONNECTION: There is a positive connection using plates, connection hardware, or straps between the girder and the column support.	5.7.4.1	A.5.4.1
High Seismicity (Complete the Following Items in Addition to the Items for Low and Moderate Seismicity)			
Stiff Diaphragms			
C NC N/A U	OPENINGS AT SHEAR WALLS: Diaphragm openings immediately adjacent to the shear walls are less than 25% of the wall length.	5.6.1.3	A.4.1.4
C NC N/A U	OPENINGS AT EXTERIOR MASONRY SHEAR WALLS: Diaphragm openings immediately adjacent to exterior masonry shear walls are not greater than 8 ft (2.4 m) long.	5.6.1.3	A.4.1.6
Flexible Diaphragms			
C NC N/A U	CROSS TIES: There are continuous cross ties between diaphragm chords.	5.6.1.2	A.4.1.2
C NC N/A U	OPENINGS AT SHEAR WALLS: Diaphragm openings immediately adjacent to the shear walls are less than 25% of the wall length.	5.6.1.3	A.4.1.4
C NC N/A U	OPENINGS AT EXTERIOR MASONRY SHEAR WALLS: Diaphragm openings immediately adjacent to exterior masonry shear walls are not greater than 8 ft (2.4 m) long.	5.6.1.3	A.4.1.6
C NC **N/A** U	STRAIGHT SHEATHING: All straight-sheathed diaphragms have aspect ratios less than 2-to-1 in the direction being considered.	5.6.2	A.4.2.1
C NC **N/A** U	SPANS: All wood diaphragms with spans greater than 24 ft (7.3 m) consist of wood structural panels or diagonal sheathing.	5.6.2	A.4.2.2
C NC **N/A** U	DIAGONALLY SHEATHED AND UNBLOCKED DIAPHRAGMS: All diagonally sheathed or unblocked wood structural panel diaphragms have horizontal spans less than 40 ft (12.2 m) and aspect ratios less than or equal to 4-to-1.	5.6.2	A.4.2.3
C NC N/A U	OTHER DIAPHRAGMS: Diaphragms do not consist of a system other than wood, metal deck, concrete, or horizontal bracing.	5.6.5	A.4.7.1
Connections			
C NC **N/A** U	STIFFNESS OF WALL ANCHORS: Anchors of concrete or masonry walls to wood structural elements are installed taut and are stiff enough to limit the relative movement between the wall and the diaphragm to no greater than 1/8 in. (3 mm) before engagement of the anchors.	5.7.1.2	A.5.1.4

Note: C = Compliant, NC = Noncompliant, N/A = Not Applicable, and U = Unknown.

Table 17-38. Nonstructural Checklist

Status	Evaluation Statement[a,b]	Tier 2 Reference	Commentary Reference
Life Safety Systems			
C NC N/A U	**HR—not required; LS—LMH; PR—LMH**. FIRE SUPPRESSION PIPING: Fire suppression piping is anchored and braced in accordance with NFPA-13.	13.7.4	A.7.13.1
C NC N/A **U**	**HR—not required; LS—LMH; PR—LMH**. FLEXIBLE COUPLINGS: Fire suppression piping has flexible couplings in accordance with NFPA-13.	13.7.4	A.7.13.2
C NC N/A **U**	**HR—not required; LS—LMH; PR—LMH**. EMERGENCY POWER: Equipment used to power or control Life Safety systems is anchored or braced.	13.7.7	A.7.12.1
C NC N/A **U**	**HR—not required; LS—LMH; PR—LMH**. STAIR AND SMOKE DUCTS: Stair pressurization and smoke control ducts are braced and have flexible connections at seismic joints.	13.7.6	A.7.14.1
C NC N/A **U**	**HR—not required; LS—MH; PR—MH**. SPRINKLER CEILING CLEARANCE: Penetrations through panelized ceilings for fire suppression devices provide clearances in accordance with NFPA-13.	13.7.4	A.7.13.3
C NC **N/A** U	**HR—not required; LS—not required; PR—LMH**. EMERGENCY LIGHTING: Emergency and egress lighting equipment is anchored or braced.	13.7.9	A.7.3.1
Hazardous Materials SUBJECT FACILITY IS NOT REPORTED TO CONTAIN HAZARDOUS MATERIALS			
C NC **N/A** U	**HR—LMH; LS—LMH; PR—LMH**. HAZARDOUS MATERIAL EQUIPMENT: Equipment mounted on vibration isolators and containing hazardous material is equipped with restraints or snubbers.	13.7.1	A.7.12.2
C NC **N/A** U	**HR—LMH; LS—LMH; PR—LMH**. HAZARDOUS MATERIAL STORAGE: Breakable containers that hold hazardous material, including gas cylinders, are restrained by latched doors, shelf lips, wires, or other methods.	13.8.3	A.7.15.1
C NC **N/A** U	**HR—MH; LS—MH; PR—MH**. HAZARDOUS MATERIAL DISTRIBUTION: Piping or ductwork conveying hazardous materials is braced or otherwise protected from damage that would allow hazardous material release.	13.7.3 13.7.5	A.7.13.4
C NC **N/A** U	**HR—MH; LS—MH; PR—MH**. SHUTOFF VALVES: Piping containing hazardous material, including natural gas, has shutoff valves or other devices to limit spills or leaks.	13.7.3 13.7.5	A.7.13.3
C NC **N/A** U	**HR—LMH; LS—LMH; PR—LMH**. FLEXIBLE COUPLINGS: Hazardous material ductwork and piping, including natural gas piping, have flexible couplings.	13.7.3 13.7.5	A.7.15.4
C NC **N/A** U	**HR—MH; LS—MH; PR—MH**. PIPING OR DUCTS CROSSING SEISMIC JOINTS: Piping or ductwork carrying hazardous material that either crosses seismic joints or isolation planes or is connected to independent structures has couplings or other details to accommodate the relative seismic displacements.	13.7.3 13.7.5 13.7.6	A.7.13.6
Partitions			
C NC **N/A** U	**HR—LMH; LS—LMH; PR—LMH**. UNREINFORCED MASONRY: Unreinforced masonry or hollow-clay tile partitions are braced at a spacing of at most 10 ft (3.0 m) in Low or Moderate Seismicity, or at most 6 ft (1.8 m) in High Seismicity.	13.6.2	A.7.1.1
C NC **N/A** U	**HR—LMH; LS—LMH; PR—LMH**. HEAVY PARTITIONS SUPPORTED BY CEILINGS: The tops of masonry or hollow-clay tile partitions are not laterally supported by an integrated ceiling system.	13.6.2	A.7.2.1
C NC **N/A** U	**HR—not required; LS—MH; PR—MH**. DRIFT: Rigid cementitious partitions are detailed to accommodate the following drift ratios: in steel moment frame, concrete moment frame, and wood frame buildings, 0.02; in other buildings, 0.005.	13.6.2	A.7.1.2
C NC **N/A** U	**HR—not required; LS—not required; PR—MH**. LIGHT PARTITIONS SUPPORTED BY CEILINGS: The tops of gypsum board partitions are not laterally supported by an integrated ceiling system.	13.6.2	A.7.2.1
C NC **N/A** U	**HR—not required; LS—not required; PR—MH**. STRUCTURAL SEPARATIONS: Partitions that cross structural separations have seismic or control joints.	13.6.2	A.7.1.3

continues

Table 17-38 *(Continued)*. Nonstructural Checklist

Status	Evaluation Statement[a,b]	Tier 2 Reference	Commentary Reference
C NC N/A U	**HR—not required; LS—not required; PR—MH**. TOPS: The tops of ceiling-high framed or panelized partitions have lateral bracing to the structure at a spacing equal to or less than 6 ft (1.8 m).	13.6.2	A.7.1.4
Ceilings			
C NC N/A U	**HR—H; LS—MH; PR—LMH**. SUSPENDED LATH AND PLASTER: Suspended lath and plaster ceilings have attachments that resist seismic forces for every 12 ft^2 (1.1 m^2) of area.	13.6.4	A.7.2.3
C NC N/A U	**HR—not required; LS—MH; PR—LMH**. SUSPENDED GYPSUM BOARD: Suspended gypsum board ceilings have attachments that resist seismic forces for every 12 ft^2 (1.1 m^2) of area.	13.6.4	A.7.2.3
C NC N/A U	**HR—not required; LS—not required; PR—MH**. INTEGRATED CEILINGS: Integrated suspended ceilings with continuous areas greater than 144 ft^2 (13.4 m^2) and ceilings of smaller areas that are not surrounded by restraining partitions are laterally restrained at a spacing no greater than 12 ft (3.6 m) with members attached to the structure above. Each restraint location has a minimum of four diagonal wires and compression struts, or diagonal members capable of resisting compression.	13.6.4	A.7.2.2
C NC N/A U	**HR—not required; LS—not required; PR—MH**. EDGE CLEARANCE: The free edges of integrated suspended ceilings with continuous areas greater than 144 ft^2 (13.4 m^2) have clearances from the enclosing wall or partition of at least the following: in Moderate Seismicity, 1/2 in. (13 mm); in High Seismicity, 3/4 in. (19 mm).	13.6.4	A.7.2.4
C NC N/A U	**HR—not required; LS—not required; PR—MH**. CONTINUITY ACROSS STRUCTURE JOINTS: The ceiling system does not cross any seismic joint and is not attached to multiple independent structures.	13.6.4	A.7.2.5
C NC N/A U	**HR—not required; LS—not required; PR—H**. EDGE SUPPORT: The free edges of integrated suspended ceilings with continuous areas greater than 144 ft^2 (13.4 m^2) are supported by closure angles or channels not less than 2 in. (51 mm) wide.	13.6.4	A.7.2.6
C NC N/A U	**HR—not required; LS—not required; PR—H**. SEISMIC JOINTS: Acoustical tile or lay-in panel ceilings have seismic separation joints such that each continuous portion of the ceiling is no more than 2,500 ft^2 (232.3 m^2) and has a ratio of long-to-short dimension no more than 4-to-1.	13.6.4	A.7.2.7
Light Fixtures			
C NC N/A U	**HR—not required; LS—MH; PR—MH**. INDEPENDENT SUPPORT: Light fixtures that weigh more per square foot than the ceiling they penetrate are supported independent of the grid ceiling suspension system by a minimum of two wires at diagonally opposite corners of each fixture.	13.6.4 13.7.9	A.7.3.2
C NC N/A U	**HR—not required; LS—not required; PR—H**. PENDANT SUPPORTS: Light fixtures on pendant supports are attached at a spacing equal to or less than 6 ft. Unbraced suspended fixtures are free to allow a 360-degree range of motion at an angle not less than 45 degrees from horizontal without contacting adjacent components. Alternatively, if rigidly supported and/or braced, they are free to move with the structure to which they are attached without damaging adjoining components. Additionally, the connection to the structure is capable of accommodating the movement without failure.	13.7.9	A.7.3.3
C NC N/A U	**HR—not required; LS—not required; PR—H**. LENS COVERS: Lens covers on light fixtures are attached with safety devices.	13.7.9	A.7.3.4
Cladding and Glazing SUBJECT FACILITY DOES NOT INCLUDE CLADDIDNG PANELS			
C NC N/A U	**HR—MH; LS—MH; PR—MH**. CLADDING ANCHORS: Cladding components weighing more than 10 lb/ft^2 (0.48 kN/m^2) are mechanically anchored to the structure at a spacing equal to or less than the following: for Life Safety in Moderate Seismicity, 6 ft (1.8 m); for Life Safety in High Seismicity and for Position Retention in any seismicity, 4 ft (1.2 m)	13.6.1	A.7.4.1

continues

Table 17-38 *(Continued)*. Nonstructural Checklist

Status	Evaluation Statement[a,b]	Tier 2 Reference	Commentary Reference
C NC N/A U	**HR—not required; LS—MH; PR—MH**. CLADDING ISOLATION: For steel or concrete moment-frame buildings, panel connections are detailed to accommodate a story drift ratio by the use of rods attached to framing with oversize holes or slotted holes of at least the following: for Life Safety in Moderate Seismicity, 0.01; for Life Safety in High Seismicity and for Position Retention in any seismicity, 0.02, and the rods have a length-to-diameter ratio of 4.0 or less.	13.6.1	A.7.4.3
C NC N/A U	**HR—MH; LS—MH; PR—MH**. MULTI-STORY PANELS: For multi-story panels attached at more than one floor level, panel connections are detailed to accommodate a story drift ratio by the use of rods attached to framing with oversize holes or slotted holes of at least the following: for Life Safety in Moderate Seismicity, 0.01; for Life Safety in High Seismicity and for Position Retention in any seismicity, 0.02, and the rods have a length-to-diameter ratio of 4.0 or less.	13.6.1	A.7.4.4
C NC N/A U	**HR—not required; LS—MH; PR—MH**. THREADED RODS: Threaded rods for panel connections detailed to accommodate drift by bending of the rod have a length-to-diameter ratio greater than 0.06 times the story height in inches for Life Safety in Moderate Seismicity and 0.12 times the story height in inches for Life Safety in High Seismicity and Position Retention in any seismicity.	13.6.1	A.7.4.9
C NC N/A U	**HR—MH; LS—MH; PR—MH**. PANEL CONNECTIONS: Cladding panels are anchored out of plane with a minimum number of connections for each wall panel, as follows: for Life Safety in Moderate Seismicity, 2 connections; for Life Safety in High Seismicity and for Position Retention in any seismicity, 4 connections.	13.6.1.4	A.7.4.5
C NC N/A U	**HR—MH; LS—MH; PR—MH**. BEARING CONNECTIONS: Where bearing connections are used, there is a minimum of two bearing connections for each cladding panel.	13.6.1.4	A.7.4.6
C NC N/A U	**HR—MH; LS—MH; PR—MH**. INSERTS: Where concrete cladding components use inserts, the inserts have positive anchorage or are anchored to reinforcing steel.	13.6.1.4	A.7.4.7
C NC N/A U	**HR—not required; LS—MH; PR—MH**. OVERHEAD GLAZING: Glazing panes of any size in curtain walls and individual interior or exterior panes more than 16 ft^2 (1.5 m^2) in area are laminated annealed or laminated heat-strengthened glass and are detailed to remain in the frame when cracked.	13.6.1.5	A.7.4.8
Masonry Veneer	SUBJECT FACILITY DOES NOT INCLUDE MASONRY VENEER		
C NC N/A U	**HR—not required; LS—LMH; PR—LMH**. TIES: Masonry veneer is connected to the backup with corrosion-resistant ties. There is a minimum of one tie for every 2-2/3 ft^2 (0.25 m^2), and the ties have spacing no greater than the following: for Life Safety in Low or Moderate Seismicity, 36 in. (914 mm); for Life Safety in High Seismicity and for Position Retention in any seismicity, 24 in. (610 mm).	13.6.1.2	A.7.5.1
C NC N/A U	**HR—not required; LS—LMH; PR—LMH**. SHELF ANGLES: Masonry veneer is supported by shelf angles or other elements at each floor above the ground floor.	13.6.1.2	A.7.5.2
C NC N/A U	**HR—not required; LS—LMH; PR—LMH**. WEAKENED PLANES: Masonry veneer is anchored to the backup adjacent to weakened planes, such as at the locations of flashing.	13.6.1.2	A.7.5.3
C NC N/A U	**HR—LMH; LS—LMH; PR—LMH**. UNREINFORCED MASONRY BACKUP: There is no unreinforced masonry backup.	13.6.1.1 13.6.1.2	A.7.7.2
C NC N/A U	**HR—not required; LS—MH; PR—MH**. STUD TRACKS: For veneer with cold-formed steel stud backup, stud tracks are fastened to the structure at a spacing equal to or less than 24 in. (610 mm) on center.	13.6.1.1 13.6.1.2	A.7.6.1

continues

Table 17-38 *(Continued)*. Nonstructural Checklist

Status	Evaluation Statement[a,b]	Tier 2 Reference	Commentary Reference
C NC N/A U	**HR—not required; LS—MH; PR—MH**. ANCHORAGE: For veneer with concrete block or masonry backup, the backup is positively anchored to the structure at a horizontal spacing equal to or less than 4 ft along the floors and roof.	13.6.1.1 13.6.1.2	A.7.7.1
C NC N/A U	**HR—not required; LS—not required; PR—MH**. WEEP HOLES: In veneer anchored to stud walls, the veneer has functioning weep holes and base flashing.	13.6.1.2	A.7.5.6
C NC N/A U	**HR—not required; LS—not required; PR—MH**. OPENINGS: For veneer with cold-formed-steel stud backup, steel studs frame window and door openings.	13.6.1.1 13.6.1.2	A.7.6.2
Parapets, Cornices, Ornamentation, and Appendages			
C NC N/A U	**HR—LMH; LS—LMH; PR—LMH**. URM PARAPETS OR CORNICES: Laterally unsupported unreinforced masonry parapets or cornices have height-to-thickness ratios no greater than the following: for Life Safety in Low or Moderate Seismicity, 2.5; for Life Safety in High Seismicity and for Position Retention in any seismicity, 1.5.	13.6.5	A.7.8.1
C NC N/A U	**HR—not required; LS—LMH; PR—LMH**. CANOPIES: Canopies at building exits are anchored to the structure at a spacing no greater than the following: for Life Safety in Low or Moderate Seismicity, 10 ft (3.0 m); for Life Safety in High Seismicity and for Position Retention in any seismicity, 6 ft (1.8 m).	13.6.6	A.7.8.2
C NC N/A U	**HR—H; LS—MH; PR—LMH**. CONCRETE PARAPETS: Concrete parapets with height-to-thickness ratios greater than 2.5 have vertical reinforcement.	13.6.5	A.7.8.3
C NC N/A U	**HR—MH; LS—MH; PR—LMH**. APPENDAGES: Cornices, parapets, signs, and other ornamentation or appendages that extend above the highest point of anchorage to the structure or cantilever from components are reinforced and anchored to the structural system at a spacing equal to or less than 6 ft (1.8 m). This evaluation statement item does not apply to parapets or cornices covered by other evaluation statements.	13.6.6	A.7.8.4
Masonry Chimneys STEEL PIPE INSERTED INSIDE TO REINFORCE THE CHIMNEY PER PREVIOUS RENOVATION			
C NC N/A U	**HR—LMH; LS—LMH; PR—LMH**. URM CHIMNEYS: Unreinforced masonry chimneys extend above the roof surface no more than the following: for Life Safety in Low or Moderate Seismicity, 3 times the least dimension of the chimney; for Life Safety in High Seismicity and for Position Retention in any seismicity, 2 times the least dimension of the chimney.	13.6.7	A.7.9.1
C NC N/A U	**HR—LMH; LS—LMH; PR—LMH**. ANCHORAGE: Masonry chimneys are anchored at each floor level, at the topmost ceiling level, and at the roof.	13.6.7	A.7.9.2
Stairs			
C NC N/A U	**HR—not required; LS—LMH; PR—LMH**. STAIR ENCLOSURES: Hollow-clay tile or unreinforced masonry walls around stair enclosures are restrained out of plane and have height-to-thickness ratios not greater than the following: for Life Safety in Low or Moderate Seismicity, 15-to-1; for Life Safety in High Seismicity and for Position Retention in any seismicity, 12-to-1.	13.6.2 13.6.8	A.7.10.1
C NC N/A U	**HR—not required; LS—LMH; PR—LMH**. STAIR DETAILS: The connection between the stairs and the structure does not rely on post-installed anchors in concrete or masonry, and the stair details are capable of accommodating the drift calculated using the Quick Check procedure of Section 4.4.3.1 for moment-frame structures or 0.5 in. for all other structures without including any lateral stiffness contribution from the stairs.	13.6.8	A.7.10.2
Contents and Furnishings			
C NC N/A U	**HR—LMH; LS—MH; PR—MH**. INDUSTRIAL STORAGE RACKS: Industrial storage racks or pallet racks more than 12 ft high meet the requirements of ANSI/RMI MH 16.1 as modified by ASCE 7, Chapter 15.	13.8.1	A.7.11.1

continues

Table 17-38 *(Continued)*. Nonstructural Checklist

Status	Evaluation Statement[a,b]	Tier 2 Reference	Commentary Reference
C NC N/A U	**HR—not required; LS—H; PR—MH**. TALL NARROW CONTENTS: Contents more than 6 ft (1.8 m) high with a height-to-depth or height-to-width ratio greater than 3-to-1 are anchored to the structure or to each other.	13.8.2	A.7.11.2
C NC N/A U	**HR—not required; LS—H; PR—H**. FALL-PRONE CONTENTS: Equipment, stored items, or other contents weighing more than 20 lb (9.1 kg) whose center of mass is more than 4 ft (1.2 m) above the adjacent floor level are braced or otherwise restrained.	13.8.2	A.7.11.3
C NC **N/A** U	**HR—not required; LS—not required; PR—MH**. ACCESS FLOORS: Access floors more than 9 in. (229 mm) high are braced.	13.6.10	A.7.11.4
C NC **N/A** U	**HR—not required; LS—not required; PR—MH**. EQUIPMENT ON ACCESS FLOORS: Equipment and other contents supported by access floor systems are anchored or braced to the structure independent of the access floor.	13.7.7 13.6.10	A.7.11.5
C NC **N/A** U	**HR—not required; LS—not required; PR—H**. SUSPENDED CONTENTS: Items suspended without lateral bracing are free to swing from or move with the structure from which they are suspended without damaging themselves or adjoining components.	13.8.2	A.7.11.6
Mechanical and Electrical Equipment			
C NC N/A U	**HR—not required; LS—H; PR—H**. FALL-PRONE EQUIPMENT: Equipment weighing more than 20 lb (9.1 kg) whose center of mass is more than 4 ft (1.2 m) above the adjacent floor level, and which is not in-line equipment, is braced.	13.7.1 13.7.7	A.7.12.4
C NC **N/A** U	**HR—not required; LS—H; PR—H**. IN-LINE EQUIPMENT: Equipment installed in line with a duct or piping system, with an operating weight more than 75 lb (34.0 kg), is supported and laterally braced independent of the duct or piping system.	13.7.1	A.7.12.5
C NC N/A U	**HR—not required; LS—H; PR—MH**. TALL NARROW EQUIPMENT: Equipment more than 6 ft (1.8 m) high with a height-to-depth or height-to-width ratio greater than 3-to-1 is anchored to the floor slab or adjacent structural walls.	13.7.1 13.7.7	A.7.12.6
C NC **N/A** U	**HR—not required; LS—not required; PR—MH**. MECHANICAL DOORS: Mechanically operated doors are detailed to operate at a story drift ratio of 0.01.	13.6.9	A.7.12.7
C NC **N/A** U	**HR—not required; LS—not required; PR—H**. SUSPENDED EQUIPMENT: Equipment suspended without lateral bracing is free to swing from or move with the structure from which it is suspended without damaging itself or adjoining components.	13.7.1 13.7.7	A.7.12.8
C NC **N/A** U	**HR—not required; LS—not required; PR—H**. VIBRATION ISOLATORS: Equipment mounted on vibration isolators is equipped with horizontal restraints or snubbers and with vertical restraints to resist overturning.	13.7.1	A.7.12.9
C NC **N/A** U	**HR—not required; LS—not required; PR—H**. HEAVY EQUIPMENT: Floor-supported or platform-supported equipment weighing more than 400 lb (181.4 kg) is anchored to the structure.	13.7.1 13.7.7	A.7.12.10
C NC **N/A** U	**HR—not required; LS—not required; PR—H**. ELECTRICAL EQUIPMENT: Electrical equipment is laterally braced to the structure.	13.7.7	A.7.12.11
C NC **N/A** U	**HR—not required; LS—not required; PR—H**. CONDUIT COUPLINGS: Conduit greater than 2.5 in. (64 mm) trade size that is attached to panels, cabinets, or other equipment and is subject to relative seismic displacement has flexible couplings or connections.	13.7.8	A.7.12.12
Piping			
C NC **N/A** U	**HR—not required; LS—not required; PR—H**. FLEXIBLE COUPLINGS: Fluid and gas piping has flexible couplings.	13.7.3 13.7.5	A.7.13.2

continues

Table 17-38 *(Continued)*. Nonstructural Checklist

Status	Evaluation Statement[a,b]	Tier 2 Reference	Commentary Reference
C NC N/A U	**HR—not required; LS—not required; PR—H**. FLUID AND GAS PIPING: Fluid and gas piping is anchored and braced to the structure to limit spills or leaks.	13.7.3 13.7.5	A.7.13.4
C NC N/A U	**HR—not required; LS—not required; PR—H**. C-CLAMPS: One-sided C-clamps that support piping larger than 2.5 in. (64 mm) in diameter are restrained.	13.7.3 13.7.5	A.7.13.5
C NC N/A U	**HR—not required; LS—not required; PR—H**. PIPING CROSSING SEISMIC JOINTS: Piping that crosses seismic joints or isolation planes or is connected to independent structures has couplings or other details to accommodate the relative seismic displacements.	13.7.3 13.7.5	A.7.13.6
Ducts			
C NC N/A U	**HR—not required; LS—not required; PR—H**. DUCT BRACING: Rectangular ductwork larger than 6 ft^2 (0.56 m^2) in cross-sectional area and round ducts larger than 28 in. (711 mm) in diameter are braced. The maximum spacing of transverse bracing does not exceed 30 ft (9.2 m). The maximum spacing of longitudinal bracing does not exceed 60 ft (18.3 m).	13.7.6	A.7.14.2
C NC N/A U	**HR—not required; LS—not required; PR—H**. DUCT SUPPORT: Ducts are not supported by piping or electrical conduit.	13.7.6	A.7.14.3
C NC N/A U	**HR—not required; LS—not required; PR—H**. DUCTS CROSSING SEISMIC JOINTS: Ducts that cross seismic joints or isolation planes or are connected to independent structures have couplings or other details to accommodate the relative seismic displacements.	13.7.6	A.7.14.4
Elevators			
C NC N/A U	**HR—not required; LS—H; PR—H**. RETAINER GUARDS: Sheaves and drums have cable retainer guards.	13.7.11	A.7.16.1
C NC N/A U	**HR—not required; LS—H; PR—H**. RETAINER PLATE: A retainer plate is present at the top and bottom of both car and counterweight.	13.7.11	A.7.16.2
C NC N/A U	**HR—not required; LS—not required; PR—H**. ELEVATOR EQUIPMENT: Equipment, piping, and other components that are part of the elevator system are anchored.	13.7.11	A.7.16.3
C NC N/A U	**HR—not required; LS—not required; PR—H**. SEISMIC SWITCH: Elevators capable of operating at speeds of 150 ft/min (0.30 m/min) or faster are equipped with seismic switches that meet the requirements of ASME A17.1 or have trigger levels set to 20% of the acceleration of gravity at the base of the structure and 50% of the acceleration of gravity in other locations.	13.7.11	A.7.16.4
C NC N/A U	**HR—not required; LS—not required; PR—H**. SHAFT WALLS: Elevator shaft walls are anchored and reinforced to prevent toppling into the shaft during strong shaking.	13.7.11	A.7.16.5
C NC N/A U	**HR—not required; LS—not required; PR—H**. COUNTERWEIGHT RAILS: All counterweight rails and divider beams are sized in accordance with ASME A17.1.	13.7.11	A.7.16.6
C NC N/A U	**HR—not required; LS—not required; PR—H**. BRACKETS: The brackets that tie the car rails and the counterweight rail to the structure are sized in accordance with ASME A17.1.	13.7.11	A.7.16.7
C NC N/A U	**HR—not required; LS—not required; PR—H**. SPREADER BRACKET: Spreader brackets are not used to resist seismic forces.	13.7.11	A.7.16.8
C NC N/A U	**HR—not required; LS—not required; PR—H**. GO-SLOW ELEVATORS: The building has a go-slow elevator system.	13.7.11	A.7.16.9

Note: C = Compliant, NC = Noncompliant, N/A = Not Applicable, and U = Unknown.
[a] Performance Level: HR = Hazards Reduced, LS = Life Safety, and PR = Position Retention.
[b] Level of Seismicity: L = Low, M = Moderate, and H = High.

APPENDIX B

TIER - 2 EVALUATION

ENGINEERING CALCULATIONS

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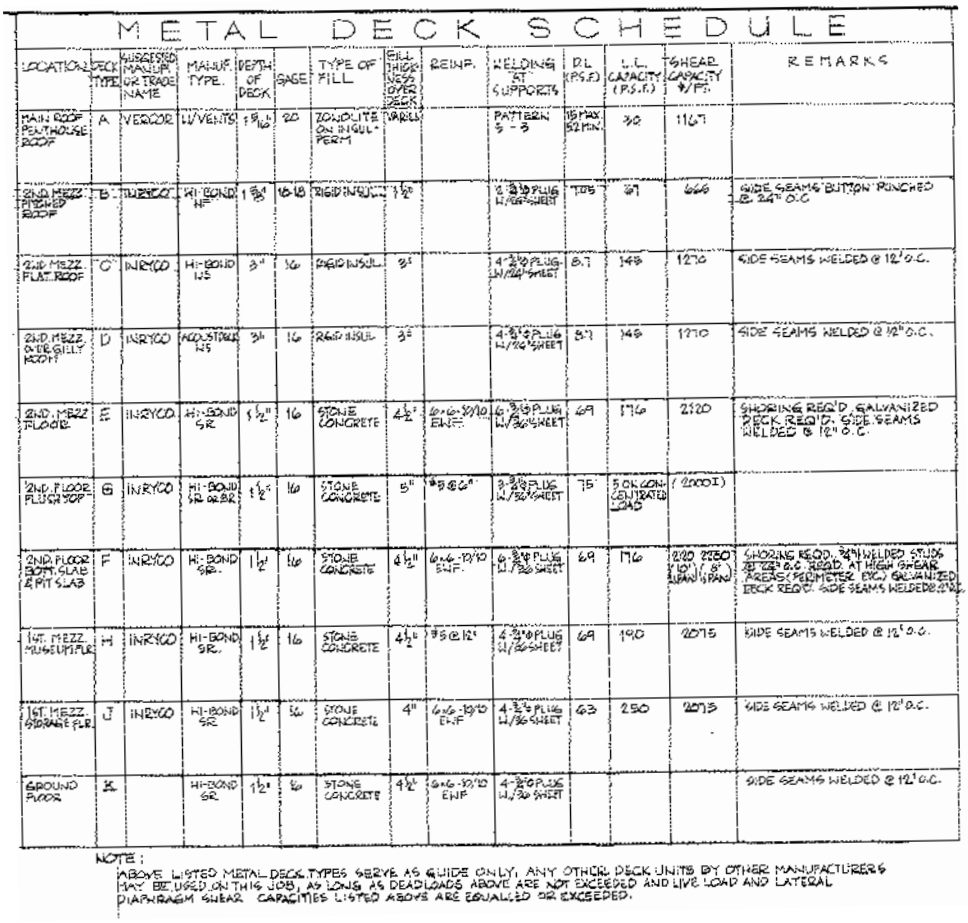
1. Seismic Weight and Base Shear

This calc is to determine the effective seismic weight of the building according to ASCE 41, section 4.4.2

W = Effective seismic weight of the building, including the total dead load and applicable portions of other gravity loads listed below:
1. In areas used for storage, a minimum of 25% of the floor live load shall be applicable. The live load shall be permitted to be reduced for tributary area as approved by the code official. Floor live load in public garages and open parking structures need not be considered.
2. Where an allowance for partition load is included in the floor load design, the actual partition weight or a minimum weight of 10 psf of floor area, which ever is greater, shall be applied.
3. Total operating weight of permanent equipment.
4. Where the design flat roof snow load calculated in accordance with ASCE 7 exceeds 30 lb/ft2 (1.44 kN/m2), the effective snow load shall be taken as 20% of the design snow load. Where the design flat roof snow load is 30lb/ft2 or less, the effective snow load shall be permitted to be zero.

The following calculations will determine the seismic weight of the structure, including structural selfweight and superimposed dead load and effective live load

Seismic weight input - Read the Floor deck self weight on the existing drawing's schedule:



METAL DECK SCHEDULE

LOCATION	DECK TYPE	SUGGESTED MANUF. OR TRADE NAME	MANUF. TYPE	DEPTH OF DECK	GAGE	TYPE OF FILL	FILL THICKNESS OVER DECK	REINF.	WELDING AT SUPPORTS	D.L. (P.S.F.)	L.L. CAPACITY (P.S.F.)	SHEAR CAPACITY #/FT.	REMARKS
MAIN ROOF PENTHOUSE ROOF	A	VERCOR	W/VENTS	1 5/16"	20	ZONOLITE ON INSUL-PERM	VARIES		PATTERN 5 - 3	15 MAX 52 MIN.	30	1167	
2ND MEZZ. FINISHED ROOF	B	INRYCO	HI-BOND HF	1 5/8"	18-18	RIGID INSUL.	1 1/2"		2-3/4"Ø PLUG W/66" SHEET	7.05	67	666	SIDE SEAMS BUTTON PUNCHED @ 24" O.C.
2ND MEZZ. FLAT ROOF	C	INRYCO	HI-BOND NS	3"	16	RIGID INSUL.	3"		4-3/4"Ø PLUG W/24" SHEET	8.7	145	1270	SIDE SEAMS WELDED @ 12" O.C.
2ND MEZZ. OVER GILLY ROOF	D	INRYCO	ACOUSTDECK NS	3"	16	RIGID INSUL.	3"		4-3/4"Ø PLUG W/24" SHEET	8.7	145	1270	SIDE SEAMS WELDED @ 12" O.C.
2ND MEZZ FLOOR	E	INRYCO	HI-BOND SR	1 1/2"	16	STONE CONCRETE	4 1/2"	6x6-10/10 EWF.	6-3/4"Ø PLUG W/36" SHEET	69	176	2120	SHORING REQ'D. GALVANIZED DECK REQ'D. SIDE SEAMS WELDED @ 12" O.C.
2ND FLOOR FLUSH TOP	G	INRYCO	HI-BOND SR OR BR	1 1/2"	16	STONE CONCRETE	5"	#5 @ 6"	3-3/4"Ø PLUG W/36" SHEET	75	5 OK CONCENTRATED LOAD	(2000I)	
2ND FLOOR BOTT. SLAB & PIT SLAB	F	INRYCO	HI-BOND SR.	1 1/2"	16	STONE CONCRETE	4 1/2"	6x6-10/10 EWF.	6-3/4"Ø PLUG W/36" SHEET	69	176	2120 2250 (10') (8') SPAN SPAN	SHORING REQD. 3/4"Ø WELDED STUDS @ 24" O.C. REQD. AT HIGH SHEAR AREAS (PERIMETER EXC.) GALVANIZED DECK REQ'D. SIDE SEAMS WELDED @ 12" O.C.
1ST. MEZZ. MUSEUM FLR	H	INRYCO	HI-BOND SR.	1 1/2"	16	STONE CONCRETE	4 1/2"	#5 @ 12"	4-3/4"Ø PLUG W/36" SHEET	69	190	2075	SIDE SEAMS WELDED @ 12" O.C.
1ST. MEZZ. STORAGE FLR	J	INRYCO	HI-BOND SR	1 1/2"	16	STONE CONCRETE	4"	6x6-10/10 EWF	4-3/4"Ø PLUG W/36" SHEET	63	250	2075	SIDE SEAMS WELDED @ 12" O.C.
GROUND FLOOR	K		HI-BOND SR	1 1/2"	16	STONE CONCRETE	4 1/2"	6x6-10/10 EWF	4-3/4"Ø PLUG W/36" SHEET				SIDE SEAMS WELDED @ 12" O.C.

NOTE:
ABOVE LISTED METAL DECK TYPES SERVE AS GUIDE ONLY. ANY OTHER DECK UNITS BY OTHER MANUFACTURERS MAY BE USED ON THIS JOB, AS LONG AS DEADLOADS ABOVE ARE NOT EXCEEDED AND LIVE LOAD AND LATERAL DIAPHRAGM SHEAR CAPACITIES LISTED ABOVE ARE EQUALLED OR EXCEEDED.

Seismic weight input - superimposed dead load and effective live load:

1ST MEZZ MUSEUM

STEEL FRAMING	typical steel beam W18x40 @7.5' one direction, W24x62 @26' the other direction, determine the framing average weight: 40/7.5+62/26 = 7.7, round up to 8 psf
MISCELLANEOUS	Misc. = 3 psf
MEP (SERVE BUILDING)	MEP. = 8 psf
BUILD-UP STEEL FRAME	/
ADDED CONC	/
CEILING	according to A6.1, GYP. BRD ceiling = 3 psf
PARTITION WALL	according to A6.2, total partition wall length about 700 ft, according to A9.6 assume wall is 8 psf, therefore: wall = 700*15*8/6323 = 14 psf
EFFECTIVE W FROM LL	/

1ST MEZZ STORAGE

STEEL FRAMING	typical steel beam W12x26 @8' one direction, W30x132 @17' the other direction, determine the framing average weight: 26/8+132/17 = 11 psf
MISCELLANEOUS	Misc. = 3 psf
MEP (SERVE BUILDING)	MEP. = 5 psf
BUILD-UP STEEL FRAME	/
ADDED CONC	/
CEILING	/
PARTITION WALL	according to A6.2, total partition wall length about 350 ft, according to A9.6 assume wall is 8 psf, therefore: wall = 350*11*8/3277 = 10 psf
EFFECTIVE W FROM LL	175*0.25 = 44 psf according to S-0.1

2ND BOTTOM

STEEL FRAMING	typical steel beam W18x35 @7' one direction, W27x178 @16' the other direction, determine the framing average weight: 16 psf
MISCELLANEOUS	Misc. = 3 psf
MEP (SERVE BUILDING)	MEP. = 5 psf
BUILD-UP STEEL FRAME	Cable car elevated frame and rail: 8 psf
ADDED CONC/INSULATION	/
CEILING	/
PARTITION WALL	/
EFFECTIVE W FROM LL	turntable: 10,000*0.25 = 25000 lb point load, about 25000/(3.14*15^2) = 35 psf Parking cable car, total 40 cars: 40*15,000/18000 sf = 35 psf (at the area where has car rail, see the load map)

2ND TOP (between gridline 1~8)

STEEL FRAMING	diagonal zone: W21x44 @6.5' + W36x300 @30' one direction, W30x132 @20' the other direction, = 24 psf other zone: 118/10 + 141/20 = 20 psf
MISCELLANEOUS	Misc. = 3 psf
MEP (SERVE BUILDING)	/
BUILD-UP STEEL FRAME	/
ADDED CONC	according section 1~4 S7.4, 6.5" concrete fill uniformly, + conc beam @12', 54"x9.5"/144 = 3.5"; Therefore, 6.5+3.5 = 10" = 125 psf, and plus 5 psf rail = 130 psf
CEILING	/
PARTITION WALL	/
EFFECTIVE W FROM LL	Parking cable car, total 40 cars: 40*15,000/18000 sf = 35 psf

2ND TOP (gridline 0~1, gridline 8~9)

STEEL FRAMING	diagonal zone: W21x44 @6.5' + W36x300 @30' one direction, W30x132 @20' the other direction, = 24 psf other zone: 118/10 + 141/20 = 20 psf
MISCELLANEOUS	Misc. = 3 psf
MEP (SERVE BUILDING)	MEP. = 5 psf
BUILD-UP STEEL FRAME	/
ADDED CONC	according section 1~4 S7.4, 6.5" concrete fill uniformly = 82 psf
CEILING	ceiling = 3 psf
PARTITION WALL	according to A6.3, total partition wall length about 270 ft, therefore: wall = 270*8*8/2800 = 6 psf
EFFECTIVE W FROM LL	/
	Note: for slab at gridline 8~9, the top has 6.5" concrete, no extra floor deck below.

2ND MEZZ

STEEL FRAMING	typical steel beam W24x55 @10' one direction, W33x152 @20' the other direction, determine the framing average weight: 55/10+152/20 = 13 psf
MISCELLANEOUS	Misc. = 3 psf
MEP (SERVE BUILDING)	MEP. = 10 psf
BUILD-UP STEEL FRAME	/
ADDED CONC	/
CEILING	/
PARTITION WALL	according to A6.4, total partition wall length about 900 ft, therefore: wall = 900*8*8/8700 = 7 psf
EFFECTIVE W FROM LL	/

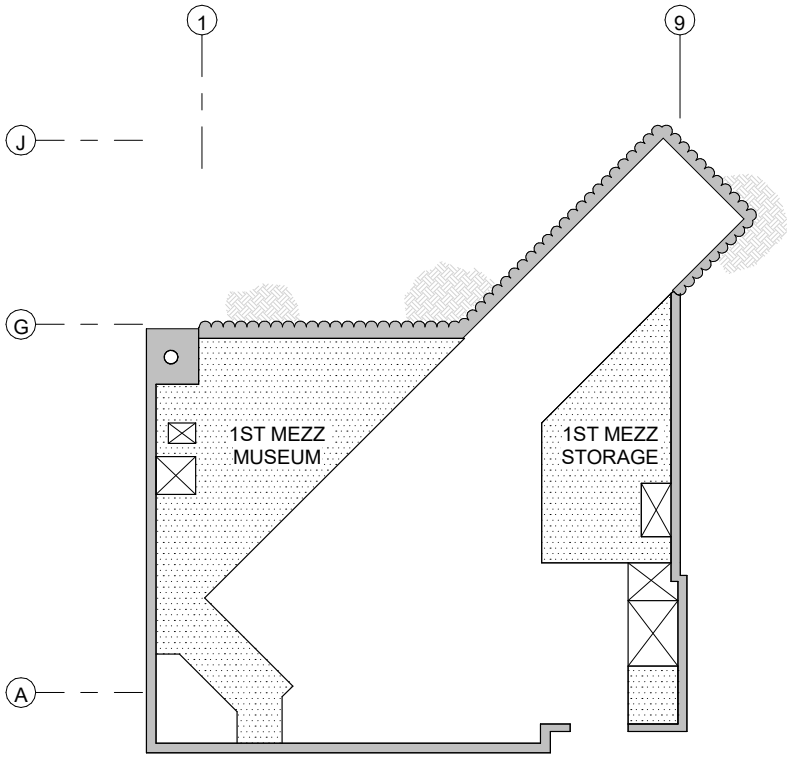
MAIN ROOF

STEEL FRAMING	typical steel beam W12x19 @8' one direction, W18x40 @20' the other direction, determine the framing average weight: 19/8+40/20 = 4.4 psf
MISCELLANEOUS	Misc. = 3 psf
MEP (SERVE BUILDING)	MEP. = 5 psf
BUILD-UP STEEL FRAME	/
ADDED CONC	/
CEILING	/
PARTITION WALL	/
EFFECTIVE W FROM LL	/

2ND MEZZ ROOF

STEEL FRAMING	bottom layer W18x35 @8', top layer: W10x12@10' + W8x10@8' determine the framing average weight: 35/8+12/10+10/8 = 7 psf
MISCELLANEOUS	Misc. = 3 psf
MEP (SERVE BUILDING)	MEP. = 5 psf
BUILD-UP STEEL FRAME	/
ADDED CONC	/
CEILING	GYP. BRD ceiling = 3 psf
PARTITION WALL	8*4 ft *2/20 = 3 psf
EFFECTIVE W FROM LL	/

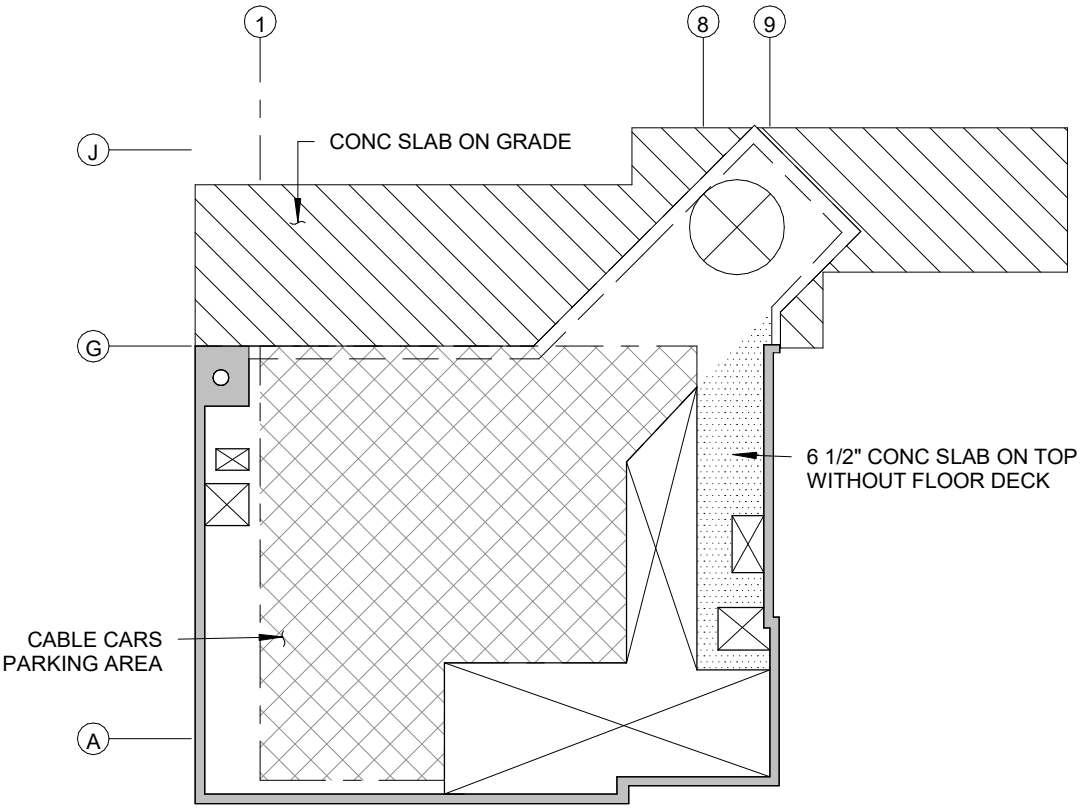
See the following pages for the lad map:



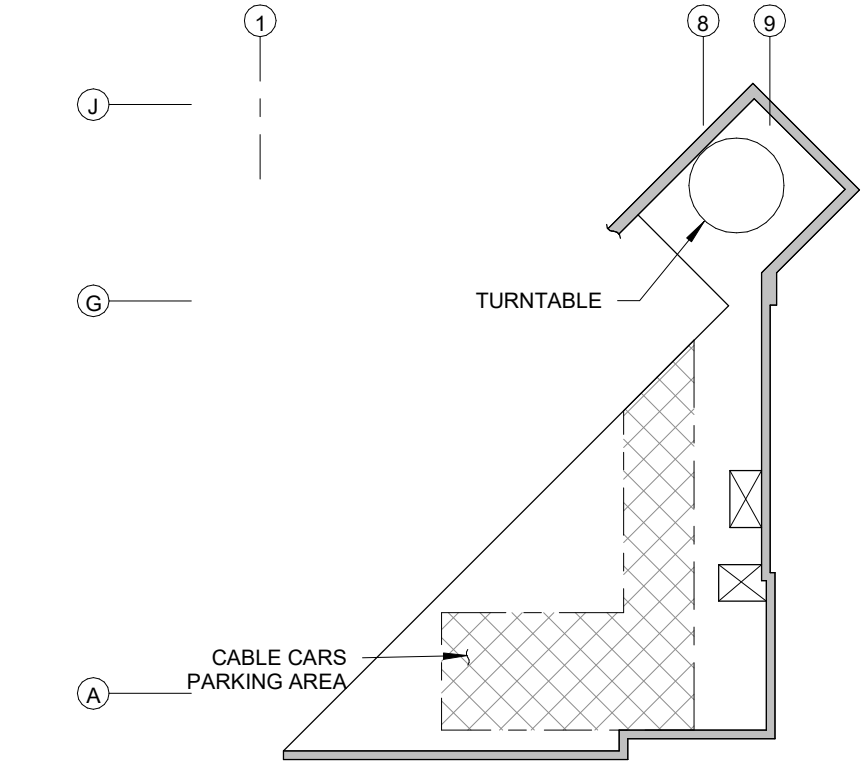
FIRST FLOOR MEZZ

FLOOR DECK SELF WEIGHT - UNIT: PSF, SEE (E) DWG S0.2								
	1ST MEZZ MUSEUM	1ST MEZZ STORAGE	2ND BOTT	2ND TOP	2ND MEZZ	MAIN ROOF	2ND MEZZ ROOF	PENT ROOF
DL	69	63	69	75	69	15	9	6

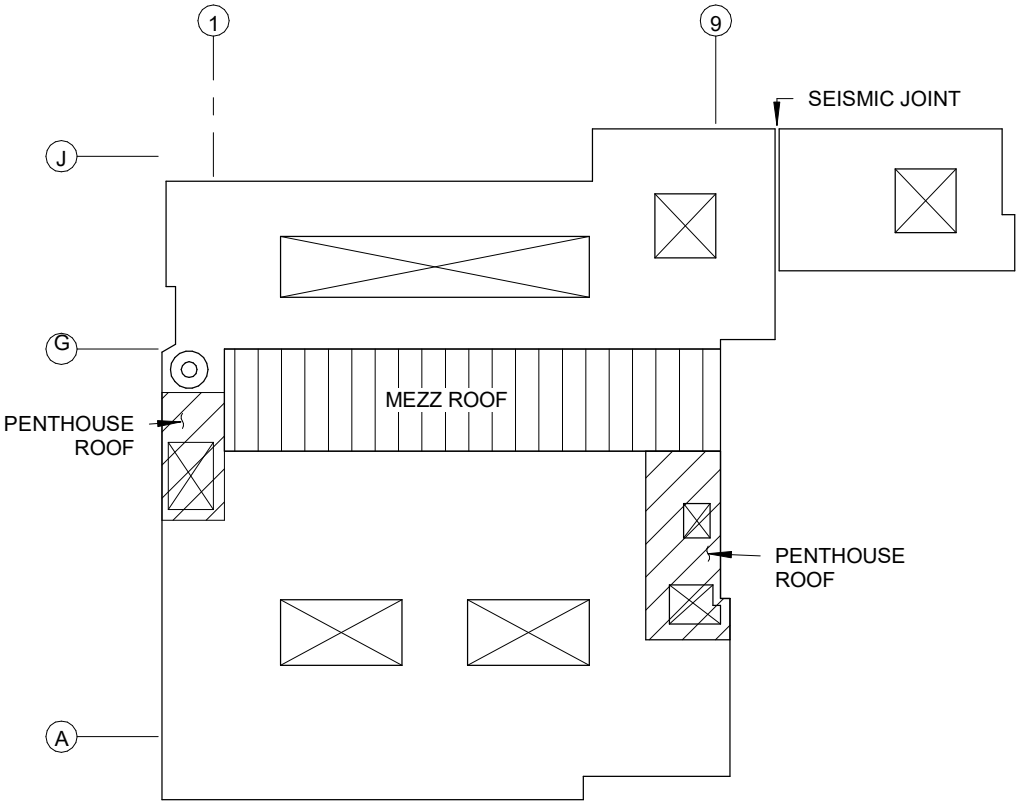
SUPERIMPOSED DEAD LOAD (SDL) LIST - UNIT: PSF									
	1ST MEZZ MUSEUM	1ST MEZZ STORAGE	2ND BOTT	2ND TOP (GL:1~8)	2ND TOP GL0~1,8~9	2ND MEZZ	MAIN ROOF	2ND MEZZ ROOF	PENT ROOF
STEEL FRAMING	8	11	16	24	20	13	5	7	3
MISCELLANEOUS	3	3	3	3	3	3	3	3	3
MEP (SERVE BUILDING)	8	5	5	/	5	10	5	5	5
BUILD-UP STEEL FRAME	/	/	8	/	/	/	/	/	/
ADDED CONCRETE	/	/	/	130	82 (GL0~1) 0(GL8~9)	/	/	/	/
CEILING	3	/	/	/	3	/	/	3	/
PARTITION WALL	14	10	/	/	6	7	/	3	10
EFFECTIVE WEIGHT FROM LIVE LOAD	/	44	35 (CARS WEIGHT SEE PLAN	35	/	/	/	/	/
SUM	**36**	**73**	**67**	**192**	**119**	**33**	**13**	**18**	**21**



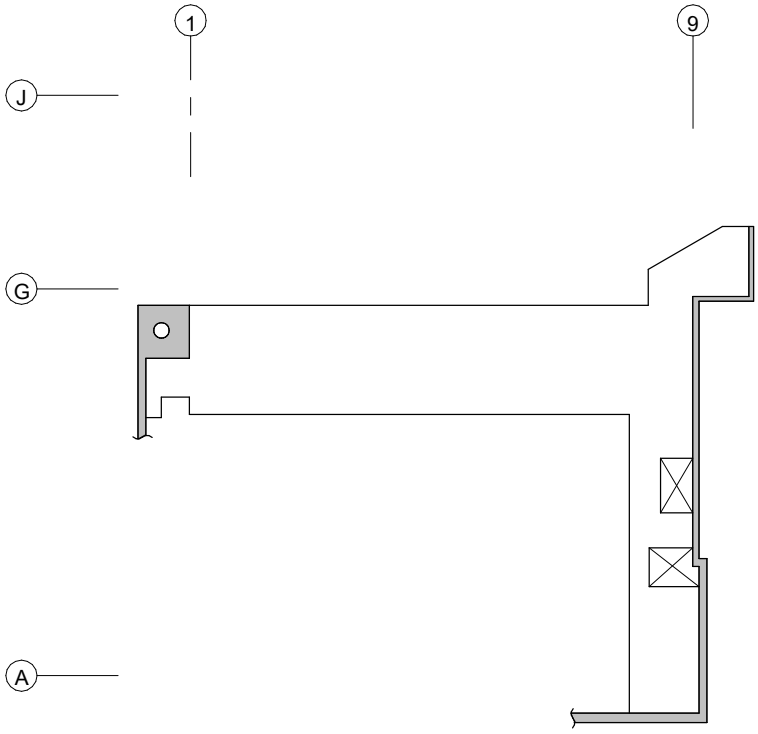
SECOND FLOOR TOP



SECOND FLOOR BOTTOM



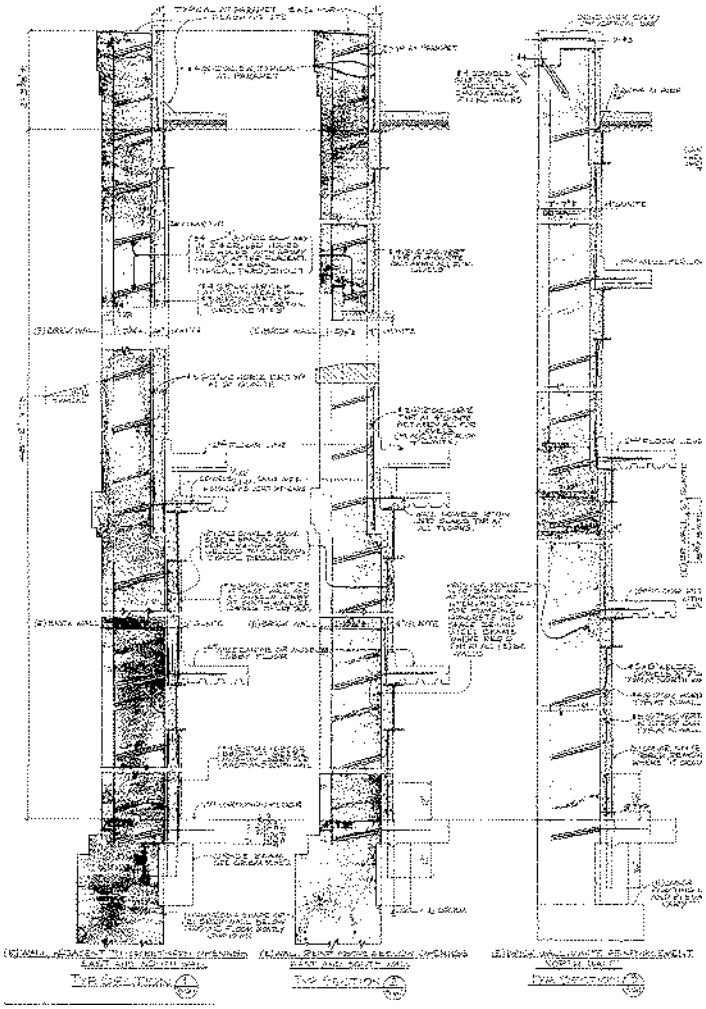
ROOF



SECOND FLOOR MEZZ

Seismic weight input - wall weight:

Existing structural sheet S6.1



w_Masonry (pcf)	110
w_conc (pcf)	150

Wall Pier

Level 1 - Level 2 Bottom					
	Masonry Thk (in)	w_Masonry (psf)	Gunite Thk (in)	w_conc (psf)	modeled wall thickness
East & SouthWall	22.5	206.3	6	75.0	9.375
North Wall (Line 9)	22	201.7	4	50.0	7.3
Level 2 Bottom - Roof					
	Masonry Thk (in)	w_Masonry (psf)	Gunite Thk (in)	w_conc (psf)	
East & SouthWall	17.5	160.4	6	75.0	8.625
North Wall (Line 9)	19	174.2	4	50.0	6.85

Spandrel

Level 1 - Level 2 Bottom					
	Masonry Thk (in)	w_Masonry (psf)	Gunite Thk (in)	w_Conc (psf)	modeled thickness
East & SouthWall	22.5	206.3	4	50.0	7.375
North Wall (Line 9)	/	/	/	/	
Level 2 Bottom - Roof					
	Masonry Thk (in)	w_Masonry (psf)	Gunite Thk (in)	w_conc (psf)	modeled thickness
East & SouthWall	17.5	160.4	4	50.0	6.625
North Wall (Line 9)	/	/	/	/	

ASCE41-17 7.4.1.3.1 Pseudo Seismic Force for LSP.

7.4.1.3.1 Pseudo Seismic Force for LSP.
The pseudo lateral force in a given horizontal direction of a building shall be determined using Eq. (7-21). This force shall be used to evaluate or retrofit the vertical elements of the seismic-force-resisting system.

$$V = C_1 C_2 \cdot C_m \cdot S_a \cdot W$$

where

V = Pseudo lateral force; and

C1= Modification factor to relate expected maximum inelastic displacements to displacements calculated for linear elastic response. For fundamental periods less than 0.2s, C1 need not be taken as greater than the value at T = 0.2 s. For fundamental periods greater than 1.0 s, C1 = 1.0.

$$C_1 = 1 + \frac{\mu_{strength} - 1}{a \cdot T^2}$$

where

a = Site class factor;
= 130 site Class A or B;
= 90 site Class C;
= 60 site Class D, E, or F;

$\mu_{strength}$ = Ratio of elastic strength demand to yield strength coefficient calculated in accordance with Eq. (7-31) with the elastic base shear capacity substituted for shear yield strength, Vy;

T = Fundamental period of the building

C2 = Modification factor to represent the effect of pinched hysteresis shape, cyclic stiffness degradation, and strength deterioration on maximum displacement response. For fundamental periods greater than 0.7 s, C2 = 1.0.V

$$C_2 = 1 + \frac{1}{800} \cdot \left(\frac{\mu_{strength} - 1}{T} \right)^2$$

Alternately, it shall be permitted to use C1C2 per Table 7-3, where mmax is the largest m-factor for all primary elements of the building in the direction under consideration.

Table 7-3. Alternate Values for Modification Factors $C_1 C_2$

Fundamental Period	$m_{max} < 2$	$2 \le m_{max} < 6$	$m_{max} \ge 6$
$T \le 0.3$	1.1	1.4	1.8
$0.3 < T \le 1.0$	1.0	1.1	1.2
$T > 1.0$	1.0	1.0	1.1

Cm = Effective mass factor to account for higher modal mass participation effects obtained from Table 7-4. Cm shall be taken as 1.0 if the fundamental period, T,is greater than 1.0 s;

Sa = Response spectrum acceleration, at the fundamental peri-odanddampingratiooftheBuildinginthedirectionunderconsideration. The value of Sa shall be obtained from theprocedure specified in Section 2.4; and

W = Effective seismic weight of the building, including the total dead load and applicable portions of other gravity loads

Table 7-4. Values for Effective Mass Factor C_m

No. of Stories	Concrete Moment Frame	Concrete Shear Wall	Concrete Pier-Spandrel	Steel Moment Frame	Steel Concentrically Braced Frame	Steel Eccentrically Braced Frame	Other
1–2	1.0	1.0	1.0	1.0	1.0	1.0	1.0
3 or more	0.9	0.8	0.8	0.9	0.9	0.9	1.0

Therefore:

$C_1C_2 := 1.4$

$C_m := 1.0$

$W := 15800\ kip$ $C_1C_2 \cdot C_m = 1.4$

For BSE-1E: $S_a := 0.891$ $V := C_1C_2 \cdot C_m \cdot S_a \cdot W = 19709\ kip$

Base shear coefficient = $C_1C_2 \cdot C_m \cdot S_a = 1.247$

For BSE-2E: $S_a := 1.374$ $V := C_1C_2 \cdot C_m \cdot S_a \cdot W = 30393\ kip$

Base shear coefficient = $C_1C_2 \cdot C_m \cdot S_a = 1.924$

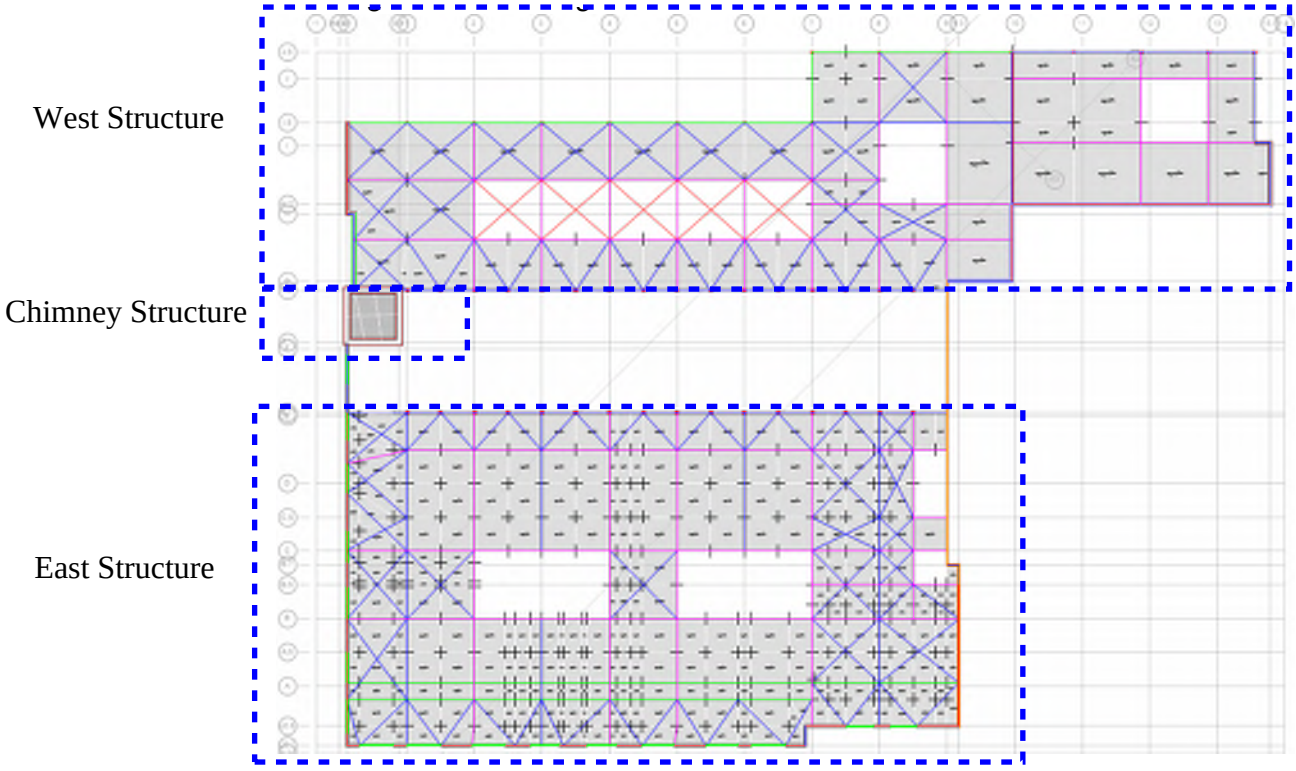
For Chimney Structure, where T>0.3S, at BSE-2E:

$C_1C_2 := 1.1$

$S_a := 1.374$

Base shear coefficient = $C_1C_2 \cdot C_m \cdot S_a = 1.511$

See the report content for the major assumption of the existing structure. The West Structure, Chimney and East Structure can be calculated as disconnected structure above the level 2. See the figure below:



ETABS Model Main Roof Plan Veiw

Static Load has been assigned at each floor per the static calculations. See the spread sheet below for each part of structure's static seismic load.

Floor Uniform Load (psf)		1st Mezz		2nd			2nd Mezz	Main Roof		Mezz Roof
		1st Mezz	1st Mezz	2nd	2nd Top	2nd Top		Main Roof	Pent	
		Museum	Storage	Bottom	GL 1~8	Other				
DL	Metal Deck w/ Conc Fill	69	63	69	75	75	69	15	6	9
	Steel Framing	8	11	16	24	20	13	5	3	7
SDL	Added Concrete	0	0	0	130	82	0	0	0	0
	Build-up Steel	0	0	8	0	0	0	0	0	0
	Miscellaneous	2	2	2	2	2	2	2	2	2
	MEP	8	5	5	0	5	10	5	5	5
	Ceiling	3	0	0	0	3	0	0	0	3
	Partition Wall	14	10	0	0	6	7	0	10	3
LL	Effective Weight	0	44	35	0	0	0	0	0	0
Sum		104	135	135	231	193	101	27	26	29

								East	West-stick2	
Area (sf)	6432	3113	12583	13577	6410	8133	15642	12537	6200
Floor Weight (kip)	1089		1699	4373		821	443	338	180

Weight adding the wall

Stick-1: East Areas

Mezz Roof	180
Main Roof	1658
2nd Mezz	821
2nd Top	6015
2nd Bott	1699
1st Mezz	2195
Base-1st	0

Work out shear forces at each level and acceleration multiplier

S_{XS} = 1.374 g

Stick-1: East Areas

	hi	Wi	Wi*hi	Fi	acceleration multiplier
Mezz Roof	53.50	180	9619	652	3.6241
Main Roof	48.17	1658	79851	5409	3.2628
2nd Mezz	42.50	821	34911	2365	2.8790
2nd Top	27.75	6015	166914	11307	1.8798
2nd Bott	23.75	1699	40344	2733	1.6088
1st Mezz	11.50	2195	25245	1710	0.7790
Base-1st	0.00	0			
Sum		12568	356884	24176	

$Vb = 1.4*S_{XS}*W$ = 24176

Stick-2: West Areas

	hi	Wi	Wi*hi	Fi	acceleration multiplier
RF	20.42	611.2	12479	1176	1.9236
Base-2nd	0.00	0.0			
Sum		611.2	12479	1176	

$Vb = 1.4*S_{XS}*W$ = 1176

Stick-3: Chimney

	hi	Wi	Wi*hi	Fi	acceleration multiplier
TOP	94.00	106.0	9964	325.4	3.0696
Mid	76.50	340.0	26010	849.4	2.4981
Mezz Roof	53.50	698.0	37343	1219.4	1.7471
L2	27.75	1099.0	30497	995.9	0.9062
L1/BASE	0.00				
Sum		2243.0	103814	3390	

$Vb = 1.1*S_{XS}*W$ = 3390 (C1C2 = 1.1, since the foundamental perio

Total weight = 15719
Total shear = 29300

note: model output is 14500 kip

total base shear = 29300
etabs auto base sh 28300

Work out ETABS shell and linear members load assignment

Stick-1: East Areas

	Floor Wi	Floor Fi
Mezz Roof	180	652
Main Roof	443	1446
2nd Mezz	821	2365
2nd Top	4373	8221
2nd Bott	1699	2733
1st Mezz	1089	848

ETABS MODEL

Area	uniform(psf)
6232	105
15642	92
8133	291
19987	411
12583	217
9545	89

Stick-2: West Areas

	Floor Wi	Floor Fi
RF	338	651

Area	uniform(psf)
12537	52

Stick-3: Chimney

point numbers	load in Etabs
4	81
4	212
4	305
4	249

This spreadsheet calculated the static seismic load assigned in the ETABS shell elements

Work out ETABS wall load assignment

This spreadsheet calculated the static seismic load assigned in the ETABS linear elements on walls.

Sorth Wall	Wi	Fi	wall legnth	linear (k/ft)
Main Roof	288	938	120	7.82
2nd Top	418	786	120	6.55
1st Mezz	379	295	60	4.92

	Wi	Fi	wall legnth	linear (k/ft)
retaining wall	297	558	90	6.20

East Wall	Wi	Fi	wall legnth	linear (k/ft)
Main Roof	487	1589	181	8.78
2nd Top	613	1152	181	6.36
1st Mezz	265	207	90.5	2.28

Nothwest CMU wall	Wi	Fi	wall legnth	linear (k/ft)
	145	279	120	2.33

North Wall	Wi	Fi	wall legnth	linear (k/ft)
Main Roof	440	1436	140	10.25
2nd Top	611	1148	140	8.20
1st Mezz	462	360	140	2.57

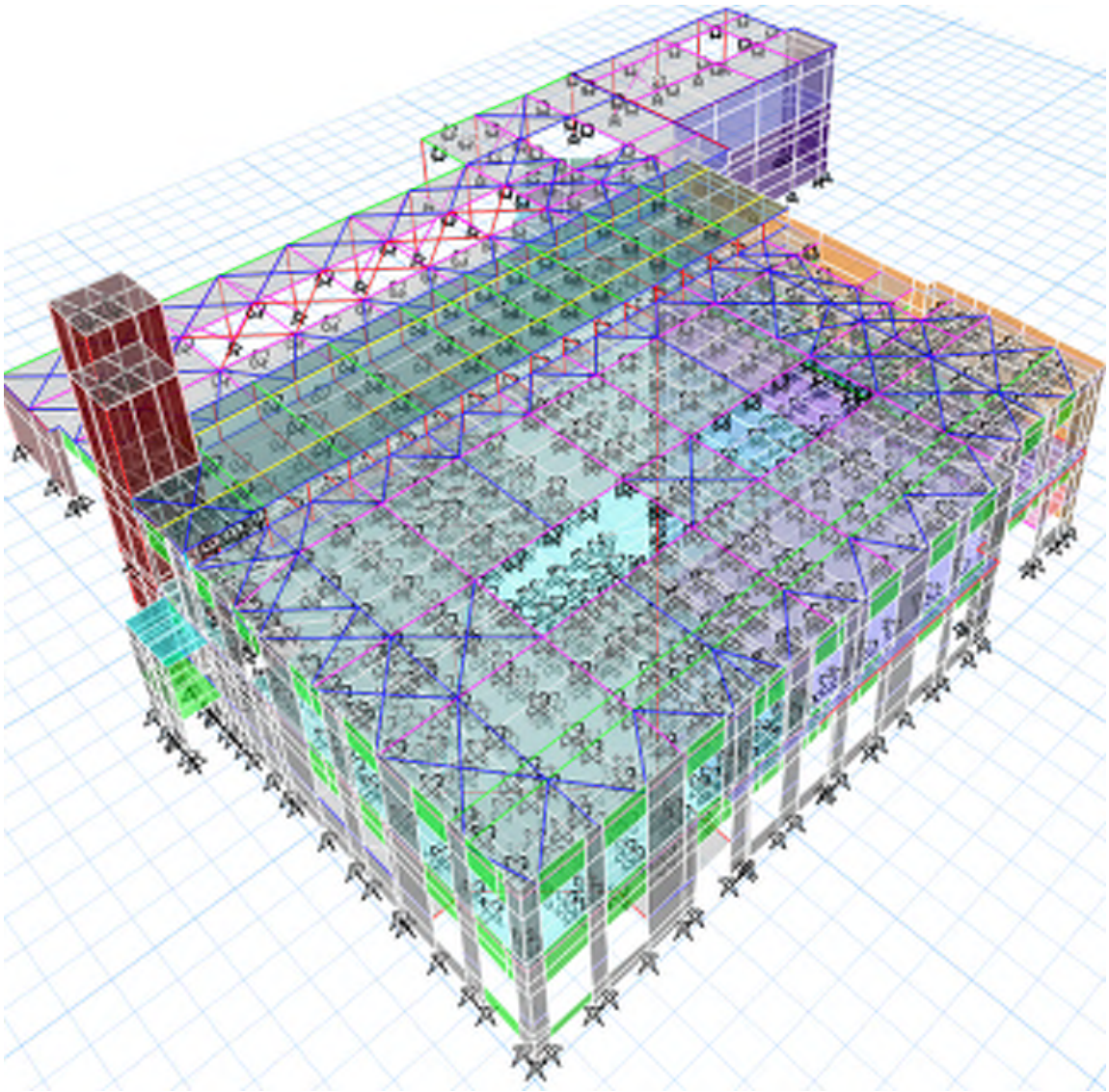
Stick-2: West Areas

South West concrete wall	Wi	Fi	wall legnth	linear (k/ft)
	100	192	50	3.85

Nothwest Concrete wall	Wi	Fi	wall legnth	linear (k/ft)
	28	53	25	2.12

2. ETABS Model Description

STRUCTUS developed a composite three-dimensional computer model using structural analysis software ETABS (v2016) (Computer and Structures, Inc) of the existing Cable Car Barn building. See the report for major molding assumptions.



Isometric View Of The Computer Model

See the following snapshots and notes below for the major assignment of the modeling.

Materials

Material Properties - Summary

Name	Type	E lb/in²	v	Unit Weight lb/ft³	Design Strengths
4500Psi	Concrete	3823676	0.2	150	Fc=4500 lb/in²
A416Gr270	Tendon	28500000	0	0	Fy=245100 lb/in², Fu=270000 lb/in²
A615Gr60	Rebar	29000000	0.3	0	Fy=60000 lb/in², Fu=90000 lb/in²
A992Fy50	Steel	29000000	0.3	0	Fy=50000 lb/in², Fu=65000 lb/in²
A992Fy50(Steel PL SW)	Steel	29000000	0.3	0	Fy=50000 lb/in², Fu=65000 lb/in²
Dumy Material	Other	0	0.2	0	
Masonry(no mass)	Masonry	1000000	0.2	0	
Slab-Concrete	Concrete	3823676	0.2	150	Fc=4500 lb/in²
Wall-Concrete(no mass)	Concrete	3823676	0.2	0	Fc=4500 lb/in²
Wall-Gunite+Masonry(no mass)	Concrete	3823676	0.2	0	Fc=4500 lb/in²

Shell Sections - Summary

Name	Design Type	Element Type	Material	Total Thickness in
10" Concrete Wall	Wall	Shell-Thin	Wall-Concrete(no mass)	10
12" CMU Wall	Wall	Shell-Thin	Masonry(no mass)	12
16" Concrete Spandrel	Wall	Shell-Thin	Wall-Concrete(no mass)	16
24" Conc Wall	Wall	Shell-Thin	Wall-Concrete(no mass)	24
2nd Mezz Roof Deck	Deck	Membrane	Not Applicable	1.3125
42" Retaining Wall	Wall	Shell-Thin	Wall-Concrete(no mass)	42
NorthWestRetaining-Segment01	Wall	Shell-Thin	Wall-Concrete(no mass)	12
NorthWestRetaining-Segment02	Wall	Shell-Thin	Wall-Concrete(no mass)	12
NorthWestRetaining-Segment03	Wall	Shell-Thin	Wall-Concrete(no mass)	12
NorthWestRetaining-Segment04	Wall	Shell-Thin	Wall-Concrete(no mass)	12
Roof Deck	Deck	Membrane	Not Applicable	1.3125
Slab-1stMazz Museum	Slab	Shell-Thin	Slab-Concrete	4.75
Slab-1stMazz Museum -6" conc	Slab	Shell-Thin	Slab-Concrete	6
Slab-1stMazz Storage	Slab	Shell-Thin	Slab-Concrete	4.75
Slab-2nd	Slab	Shell-Thin	Slab-Concrete	5.75
Slab-2nd Bottom	Slab	Shell-Thin	Slab-Concrete	5.25
Slab-2nd Mazz	Slab	Shell-Thin	Slab-Concrete	5.25
Slab-2nd-6" conc	Slab	Shell-Thin	Slab-Concrete	6
Slab-2nd-6.5" conc	Slab	Shell-Thin	Slab-Concrete	6.5
Slab-Chimney-Brace Membrane	Slab	Shell-Thin	Wall-Concrete(no mass)	4
Spandrel-0	Wall	Shell-Thin	Wall-Gunite+Masonry(no mass)	7
Steel PL SW	Wall	Shell-Thin	A992Fy50(Steel PL SW)	0.75
Wall-Chimney	Wall	Shell-Thin	Masonry(no mass)	24
Wall-N	Wall	Shell-Thin	Wall-Gunite+Masonry(no mass)	7
Wall-S&E	Wall	Shell-Thin	Wall-Gunite+Masonry(no mass)	9
Wall-S&E-Parapet	Wall	Shell-Thin	Wall-Gunite+Masonry(no mass)	7

Load Patterns

Name	Type	Self Weight Multiplier	Auto Load
Dead	Dead	1	
Live	Live	0	
$Dead_{WallWeight}$	Superimposed Dead	0	
$Dead_{Floor}$	Superimposed Dead	0	
$Dead_{SkyLight}$	Superimposed Dead	0	
$Dead_{CableCar}$	Superimposed Dead	0	
$Dead_{Deck}$	Superimposed Dead	0	
Static BSE-1E - Ex	Seismic	0	User Coefficient
Static BSE-1E - Ey	Seismic	0	User Coefficient
Static BSE-2E - Ex	Seismic	0	User Coefficient
Static BSE-2E - Ey	Seismic	0	User Coefficient
$UserDefined_{+Ex}$	Seismic	0	User Loads
$UserDefined_{+Ey}$	Seismic	0	User Loads

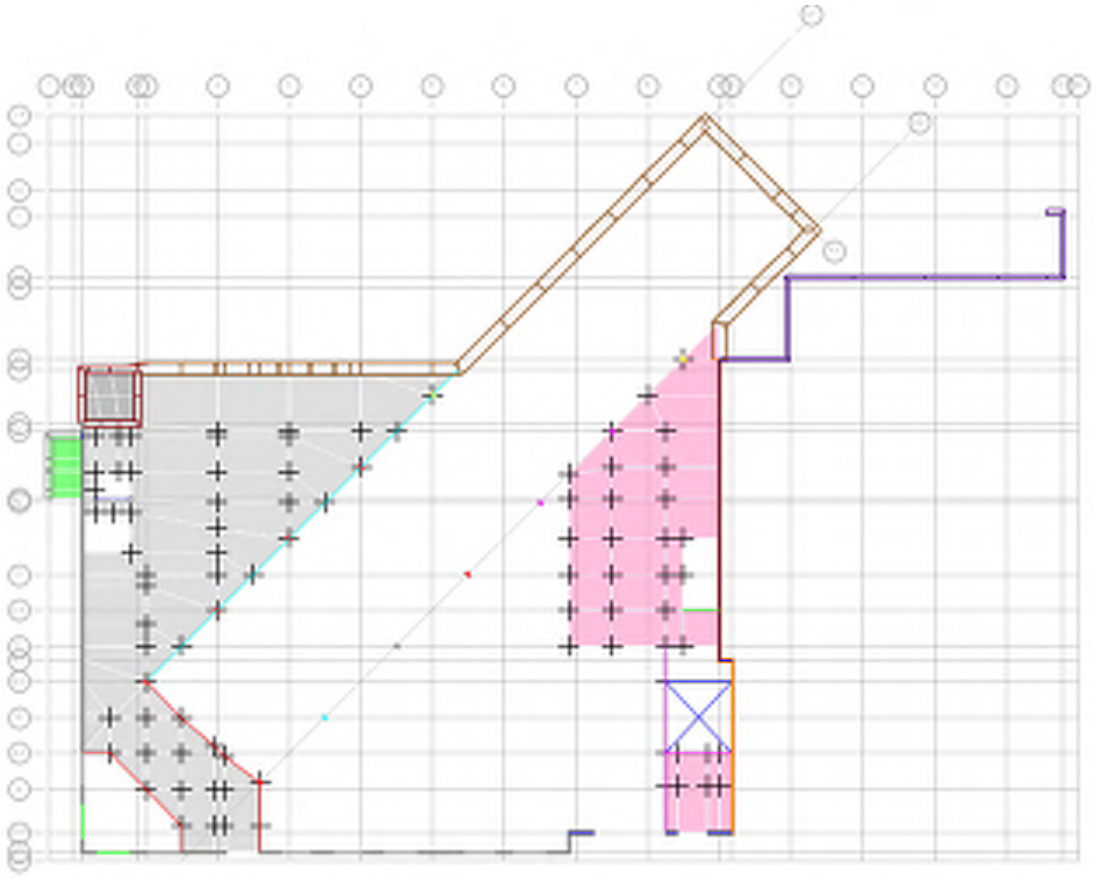
Shell Element Stiffness Modifier

Name	Material	Element Type	Thickness in	f11 Modifier	f22 Modifier	f12 Modifier	m11 Modifier	m22 Modifier	m12 Modifier	v13 Modifier	v23 Modifier
10" Concrete Wall	Wall-Concrete(no mass)	Shell-Thin	10	0.35	1	1	0.01	0.01	0.01	0.35	0.35
12" CMU Wall	Masonry(no mass)	Shell-Thin	12	0.35	0.35	0.35	0.01	0.01	0.01	0.35	0.35
12" Conc Block Wall	Wall-Concrete(no mass)	Shell-Thin	12	0.35	0.35	0.35	0.01	0.01	0.01	0.35	0.35
16" Concrete Spandrel	Wall-Concrete(no mass)	Shell-Thin	16	0.35	1	1	0.01	0.01	0.01	0.35	0.35
18" Conc Wall	Wall-Concrete(no mass)	Shell-Thin	18	0.35	0.35	0.35	0.01	0.01	0.01	0.35	0.35
18" Retaining Wall	Wall-Concrete(no mass)	Shell-Thin	18	0.35	0.35	0.35	0.01	0.01	0.01	0.35	0.35
24" Conc Wall	Wall-Concrete(no mass)	Shell-Thin	24	0.35	1	1	0.01	0.01	0.01	0.35	0.35
42" Retaining Wall	Wall-Concrete(no mass)	Shell-Thin	42	0.175	0.5	0.5	1	1	1	0.78	0.78
6" Concrete Wall	Wall-Concrete(no mass)	Shell-Thin	6	0.35	0.35	0.35	0.01	0.01	0.01	0.35	0.35
NorthWestRetaining-S...	Wall-Concrete(no mass)	Shell-Thin	12	0.35	0.35	0.35	0.01	0.01	0.01	0.35	0.35
NorthWestRetaining-S...	Wall-Concrete(no mass)	Shell-Thin	12	0.35	0.35	0.35	0.01	0.01	0.01	0.35	0.35
NorthWestRetaining-S...	Wall-Concrete(no mass)	Shell-Thin	12	0.35	0.35	0.35	0.01	0.01	0.01	0.35	0.35
NorthWestRetaining-S...	Wall-Concrete(no mass)	Shell-Thin	12	0.35	0.35	0.35	0.01	0.01	0.01	0.35	0.35
Spandrel-0	Wall-Gunite+Masonry(no ...	Shell-Thin	7	0.35	1	1	0.01	0.01	0.01	0.35	0.35
Steel PL SW	A992Fy50(Steel PL SW)	Shell-Thin	0.75								
Wall-Chimney	Masonry(no mass)	Shell-Thin	24	0.35	0.35	0.35	0.01	0.01	0.01	0.35	0.35
Wall-N	Wall-Gunite+Masonry(no ...	Shell-Thin	7	0.35	1	1	0.01	0.01	0.01	0.35	0.35
Wall-S&E	Wall-Gunite+Masonry(no ...	Shell-Thin	9	0.35	1	1	0.01	0.01	0.01	0.35	0.35
Wall-S&E-Parapet	Wall-Gunite+Masonry(no ...	Shell-Thin	7	0.35	1	1	0.01	0.01	0.01	0.35	0.35

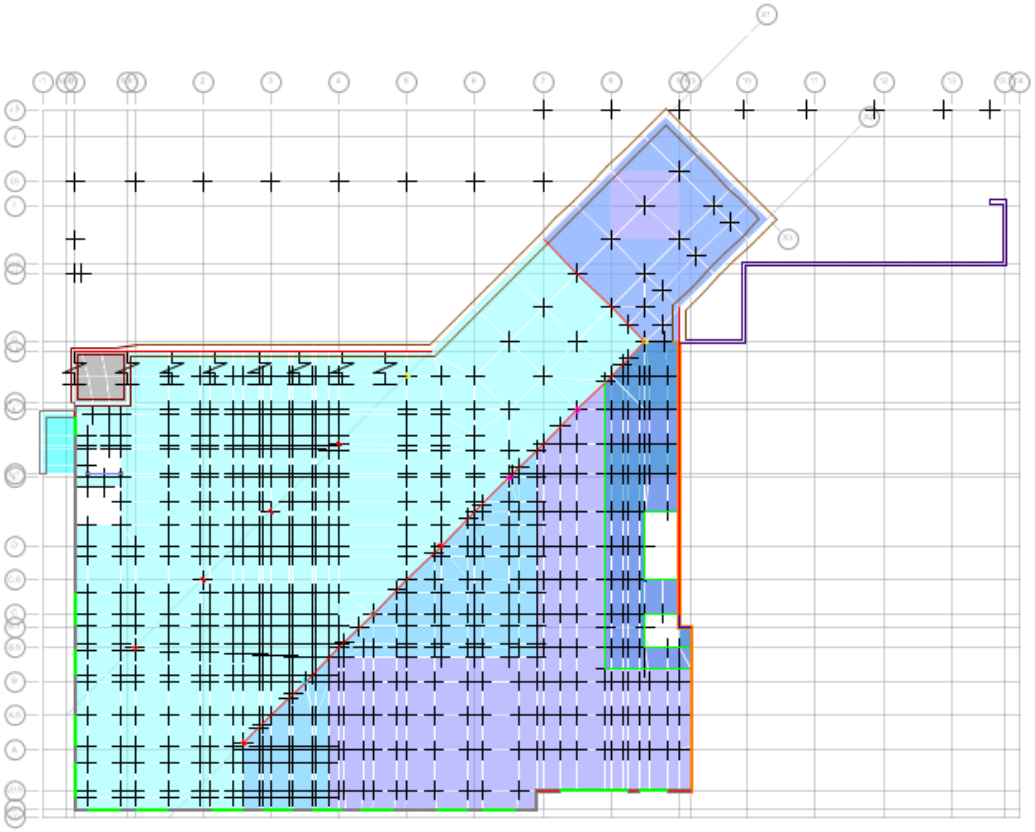
See the following snapshots and notes below for the major assignment, plans and elevation views of the Etabs model:

Story	Height ft	Elevation ft	Master Story	Similar To	Splice Story
Chimney Top	40.5	94	Yes	None	No
2nd-Mezz Roof	5.3333	53.5	Yes	None	No
Roof	5.6667	48.1667	Yes	None	No
2nd-Mezz	14.75	42.5	Yes	None	No
2nd	16.25	27.75	Yes	None	No
1st-Mezz	11.5	11.5	Yes	None	No
Base		0			

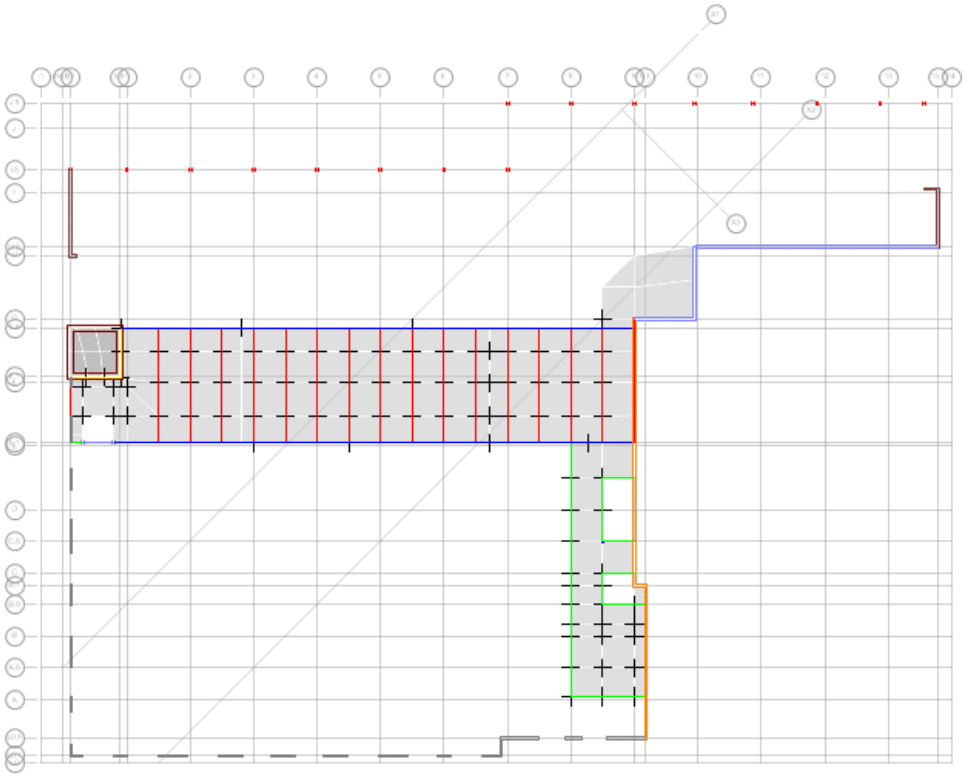
Floor Elevation information in Etabs



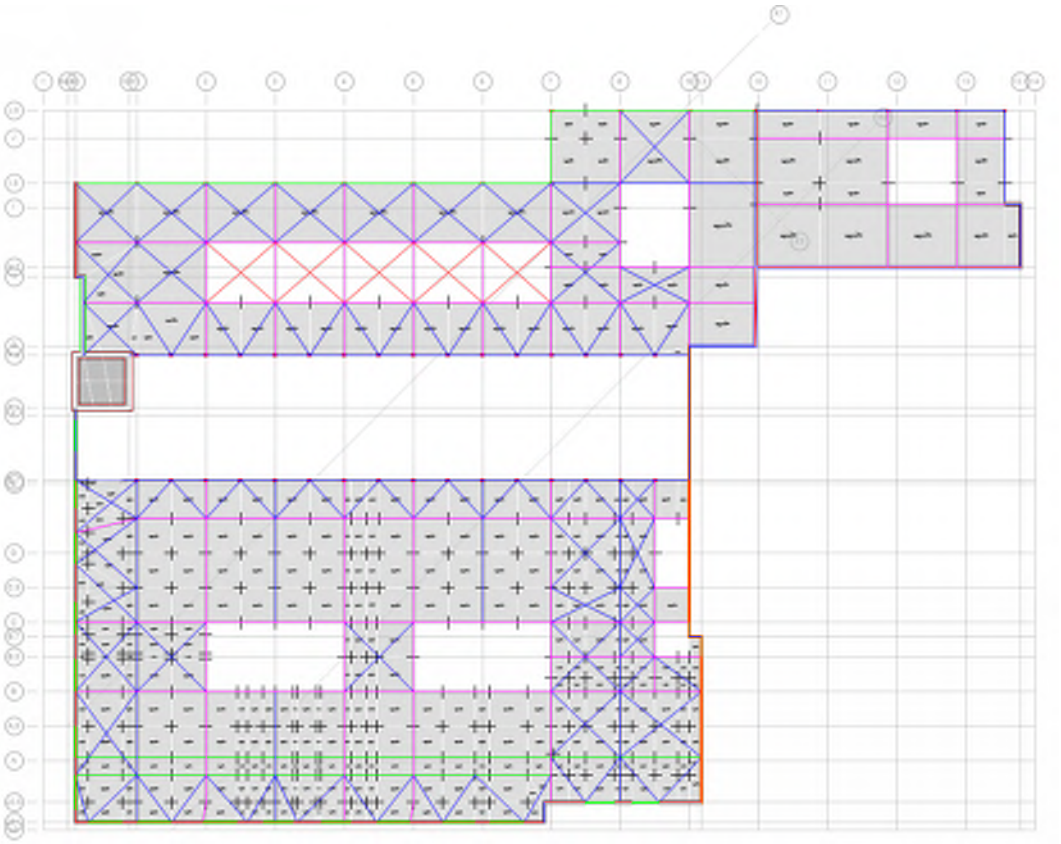
1st Mezz Floor Plan View in ETABS



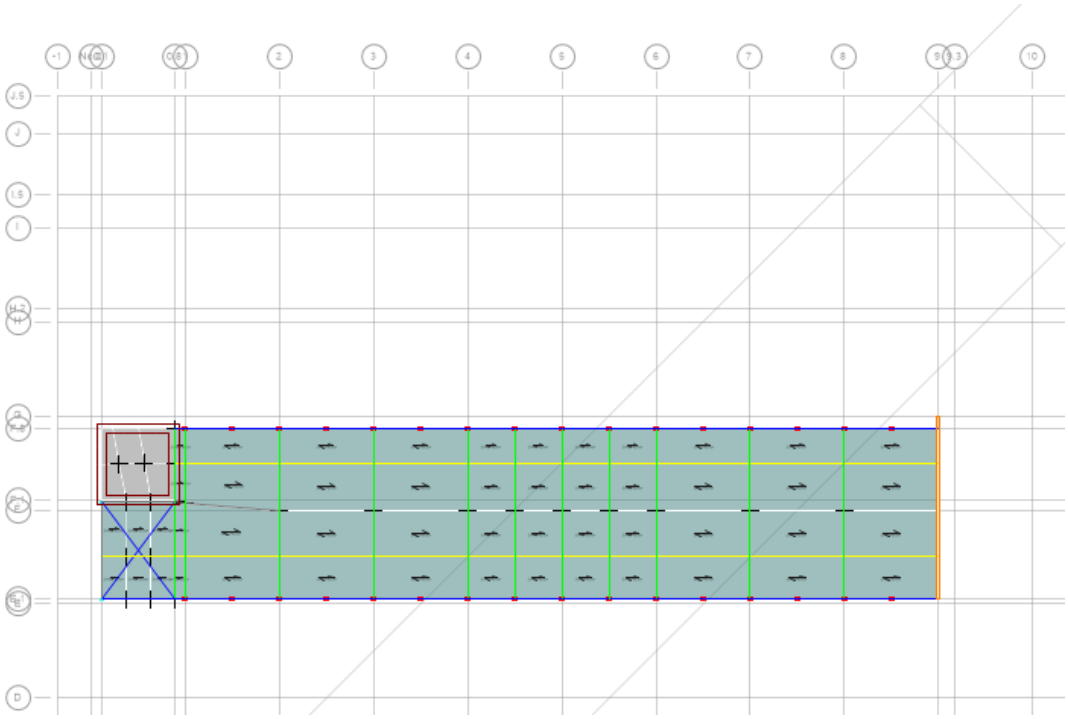
1st Floor Plan View in ETABS



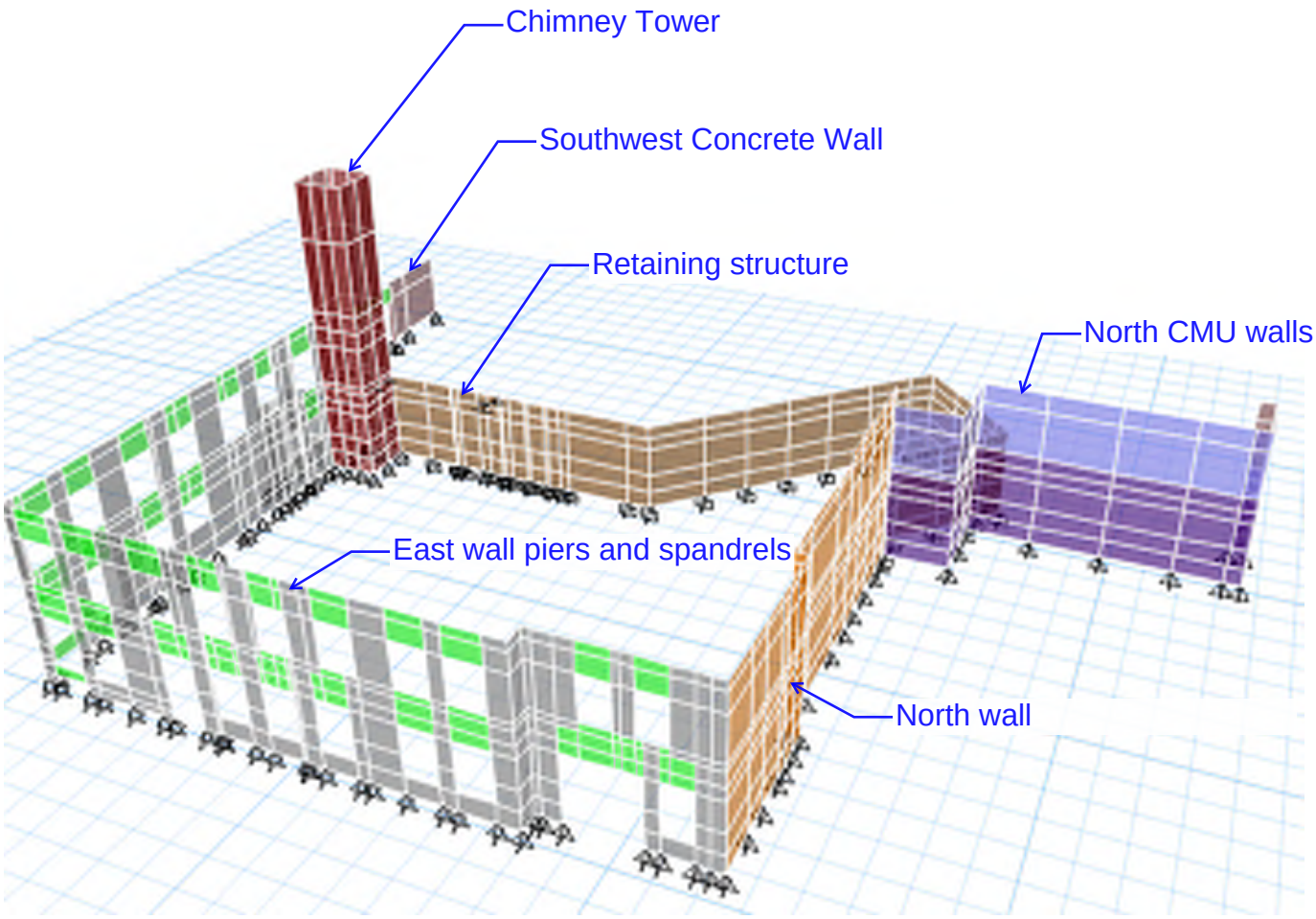
2nd Floor Plan View in ETABS



Main Roof Plan View in ETABS



Mezz Roof Plan View in ETABS



Wall only - Floor hidden for clarity

Load combinations

Q_E= Action caused by the response to the selected Seismic Hazard Level. ***Multiplied by C_1C_2 since Response Spectrum Analysis is used per § 7.4.2.3.1. C_1C_2 is per Table 7-3.***
Q_G= Action caused by gravity loads.

The action due to design gravity loads: $Q_G = 1.1(Q_D + Q_L)$
$Q_G = 0.9Q_D$
Q_D= Action due to design dead loads.
Q_L= Action due to design live loads.

- Deformation-Controlled Design Actions:

$$Q_{UD} = Q_G \pm Q_E$$

- Force-Controlled Design Actions:

$$Q_{UF} = Q_G \pm Q_E / (C_1C_2J)$$

J= 2.0 for Life Safety Performance Level.
1.0 for Immediate Occupancy Performance Level or in any case where the force contributing to Q_{UF} are delivered by component of the lateral force resisting system remain elastic.

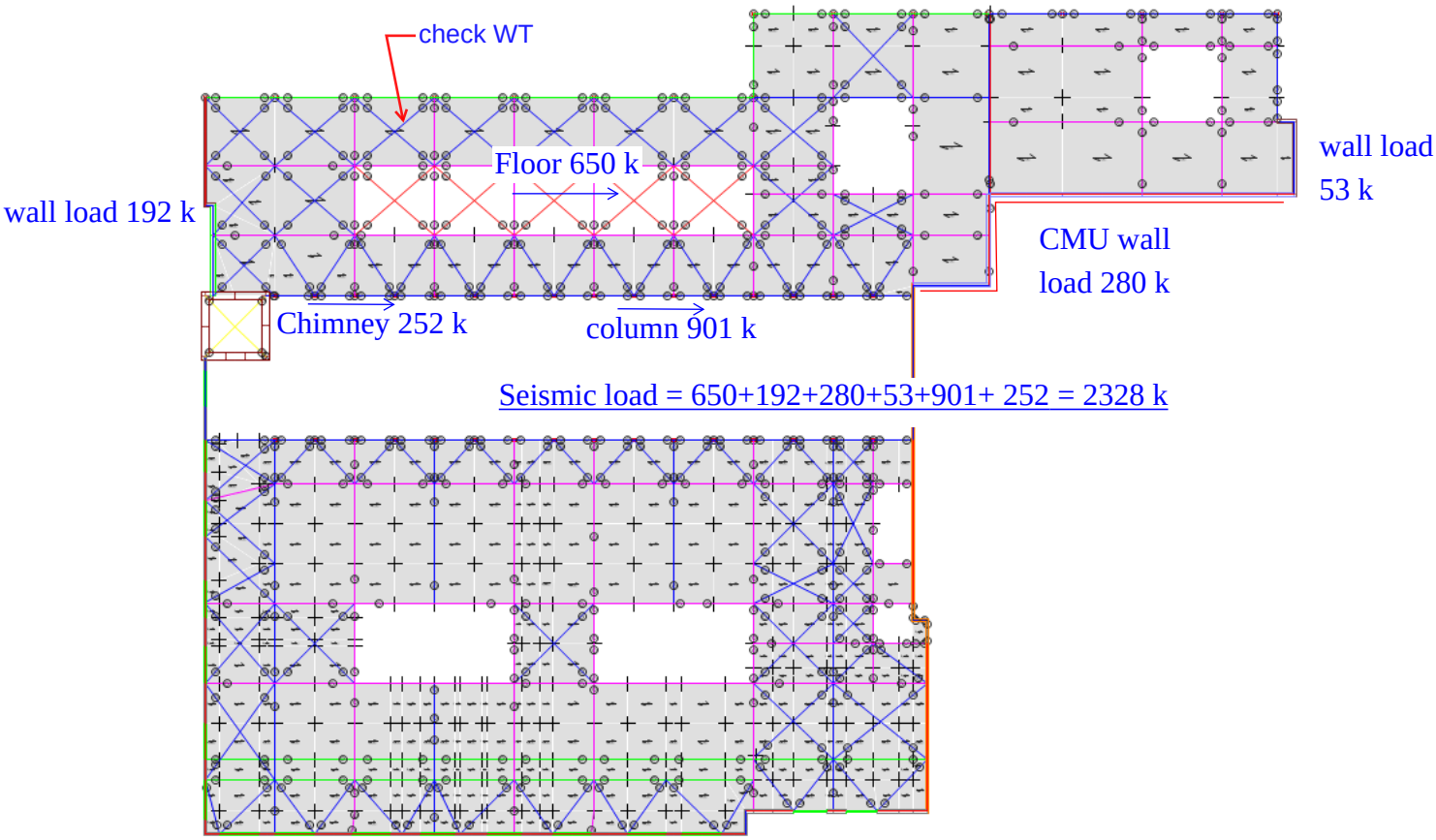
ASCE 41 7.2.5.1 Concurrent Seismic Effects

Where the LSP or LDP is used as the basis for analysis, elements and components shall be analyzed for (a) forces and deformations associated with 100% of the forces in the X direction plus the forces and deformations associated with 30% of the forces in the Y direction; and for (b) forces and deformations associated with 100% of the forces in the Y direction plus the forces and deformations associated with 30% of the forces in the X direction.

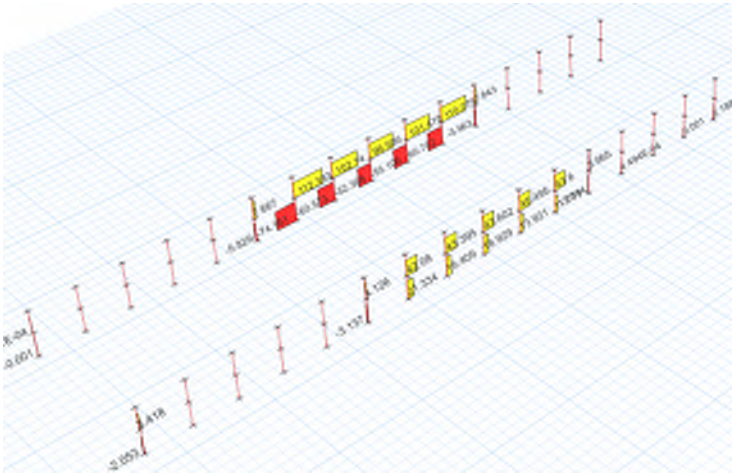
Load comb	DL	LL	Ex	Ey
LC-1.1	1.1	1.1	+ 1.0	+ 0.3
LC-1.2			+ 1.0	- 0.3
LC-1.3			- 1.0	+ 0.3
LC-1.4			- 1.0	- 0.3
LC-2.1			+ 0.3	+ 1.0
LC-2.2			+ 0.3	- 1.0
LC-2.3			- 0.3	+ 1.0
LC-2.4			- 0.3	- 1.0
LC-3.1	0.9	0	+ 1.0	+ 0.3
LC-3.2			+ 1.0	- 0.3
LC-3.3			- 1.0	+ 0.3
LC-3.4			- 1.0	- 0.3
LC-4.1			+ 0.3	+ 1.0
LC-4.2			+ 0.3	- 1.0
LC-4.3			- 0.3	+ 1.0
LC-4.4			- 0.3	- 1.0

ETABS model - Load path study:
This section is to study the force output from ETABS under static load case, to verify the load path is within engineer's expectation.

See the following pictures for the Roof Load Path in X-direction seismic load

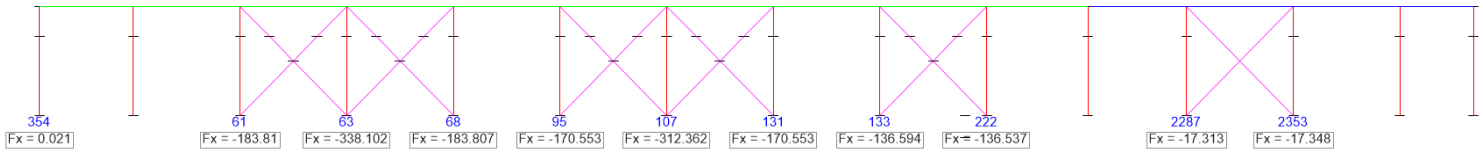


from column = 7+6+112+74+102+60+97+52+101+55+110+61+8+6 = 901

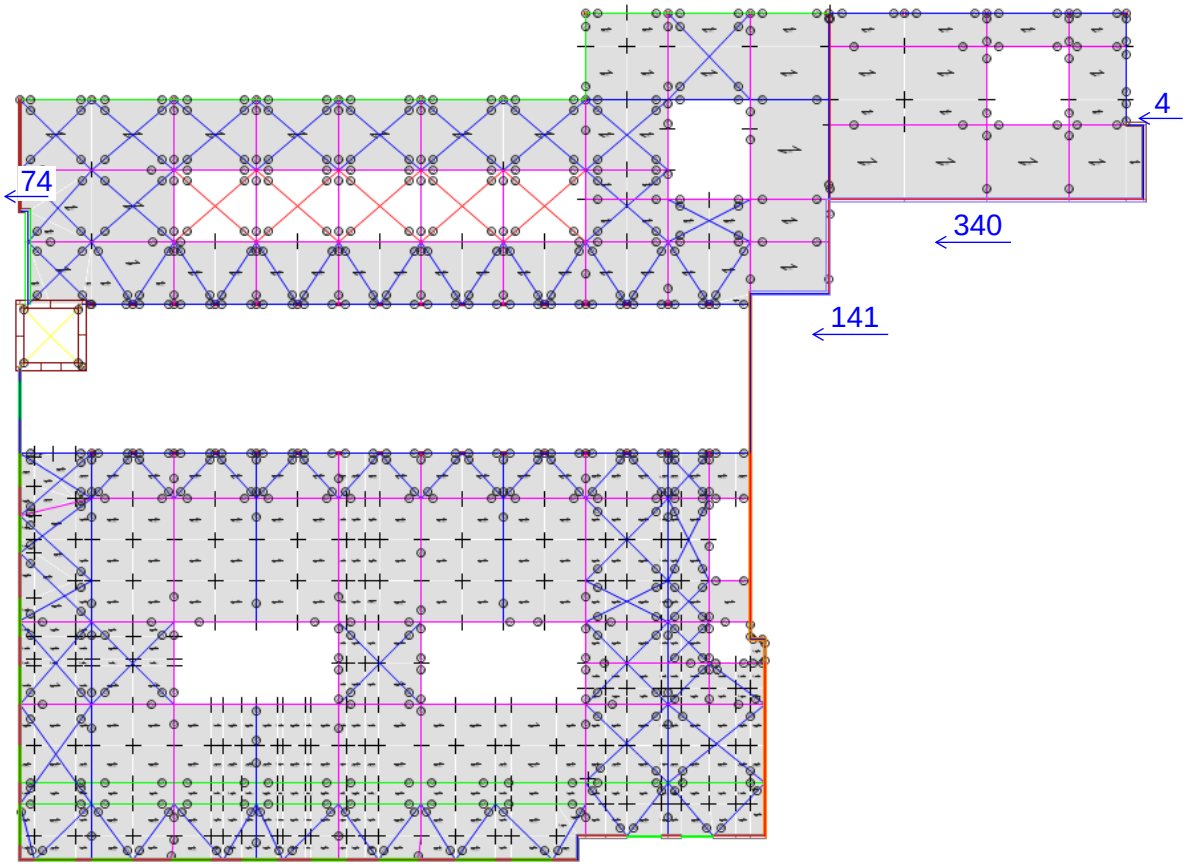


Moment frame Column Shear at 2nd Floor Mezz

Roof Load Path - Static Load - X direction

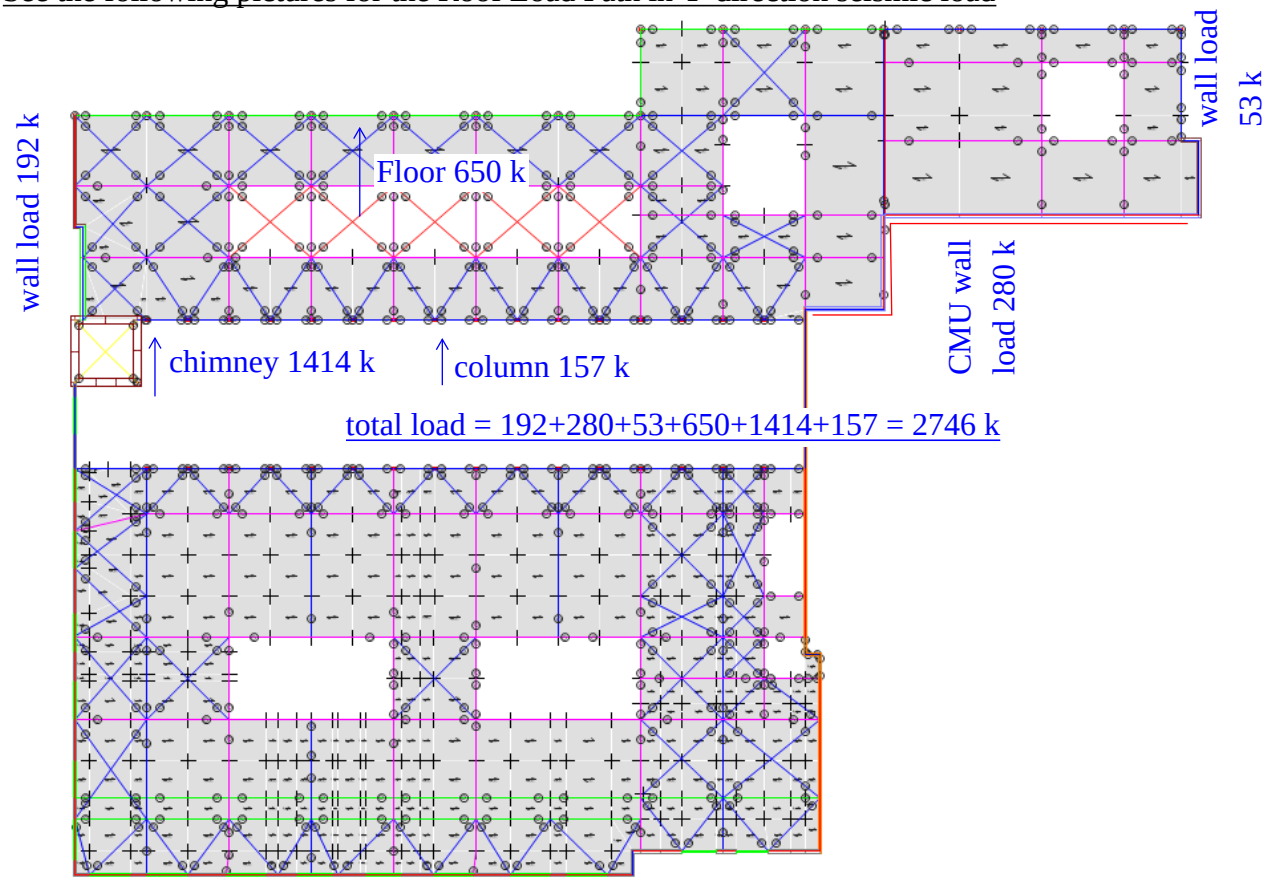


resistance by brace =184+338+184+170+312+170+137+137+17+17 =1666 kip

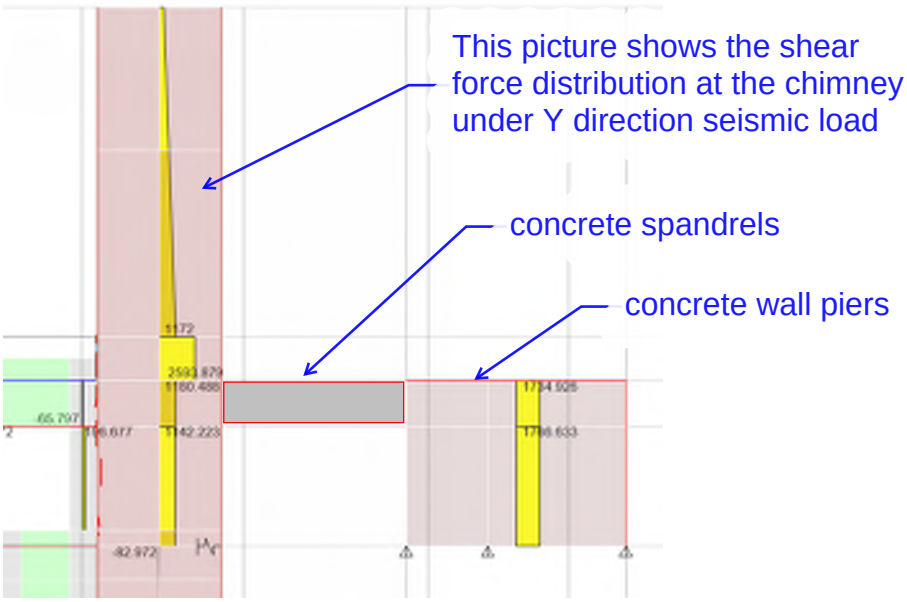


total resistance = 1666+74+141+340+4 = 2225, roughly equal to the total seismic load.

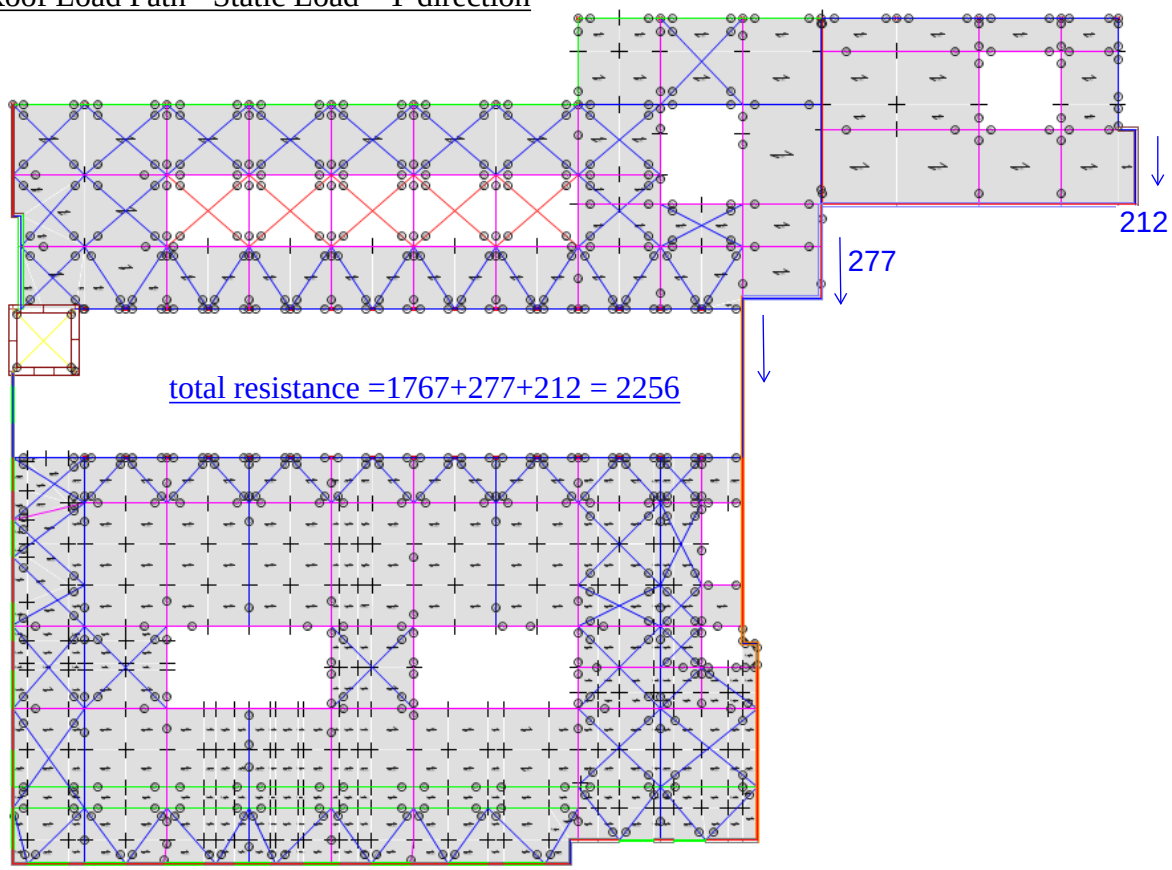
See the following pictures for the Roof Load Path in Y-direction seismic load



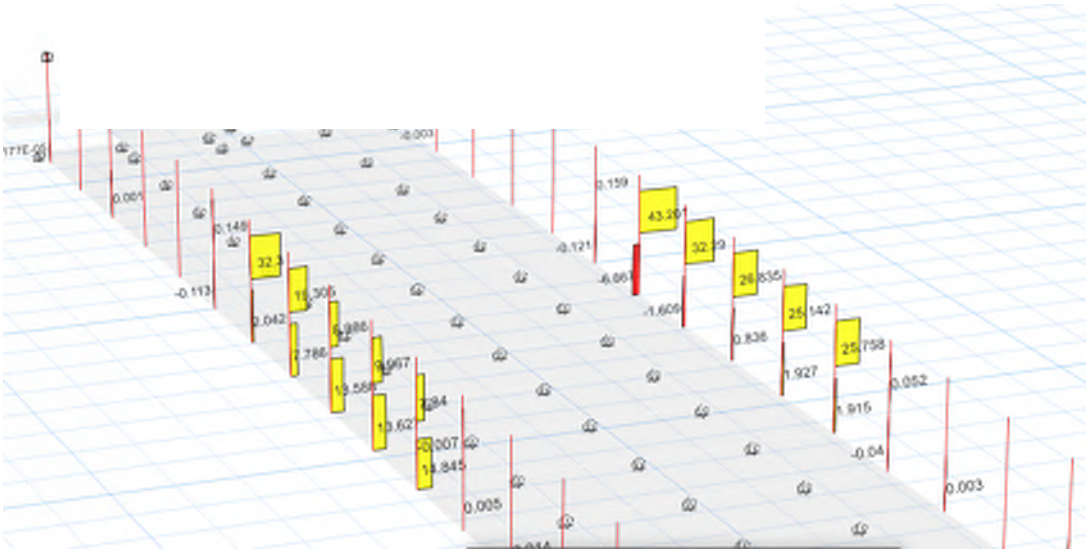
Shear Load



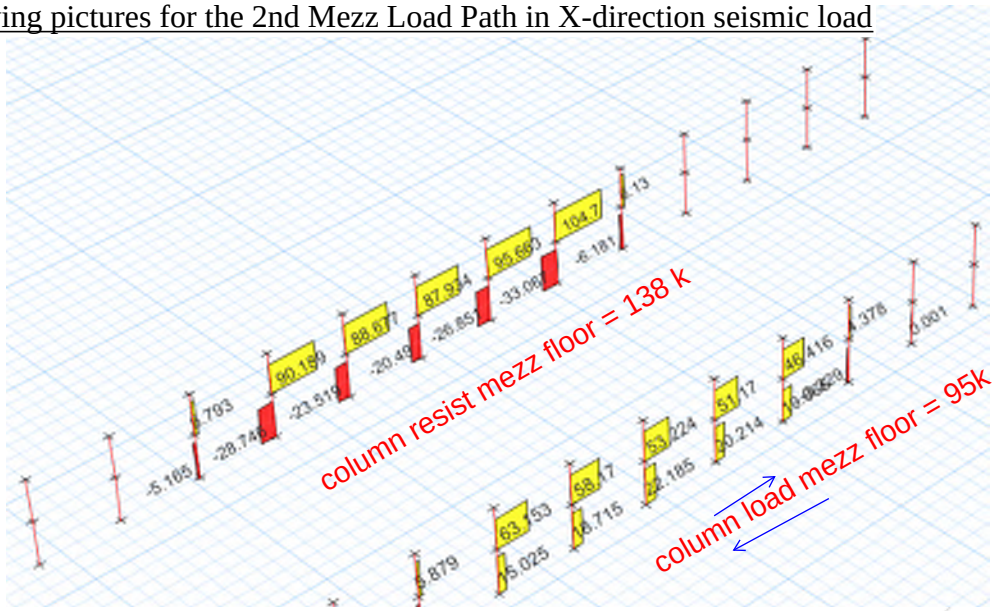
Roof Load Path - Static Load - Y direction

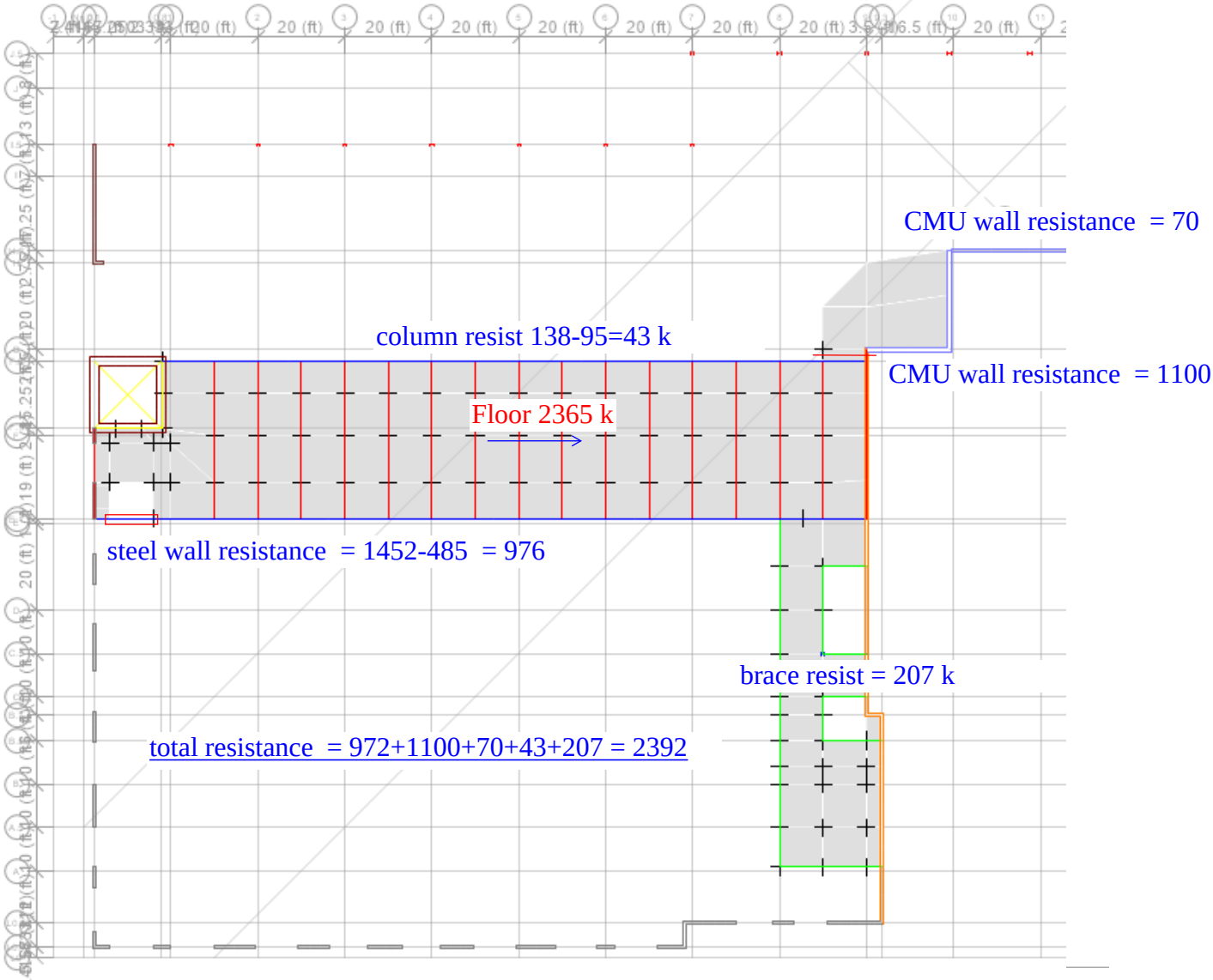


From column input = 49+33+26+25+24 = 157

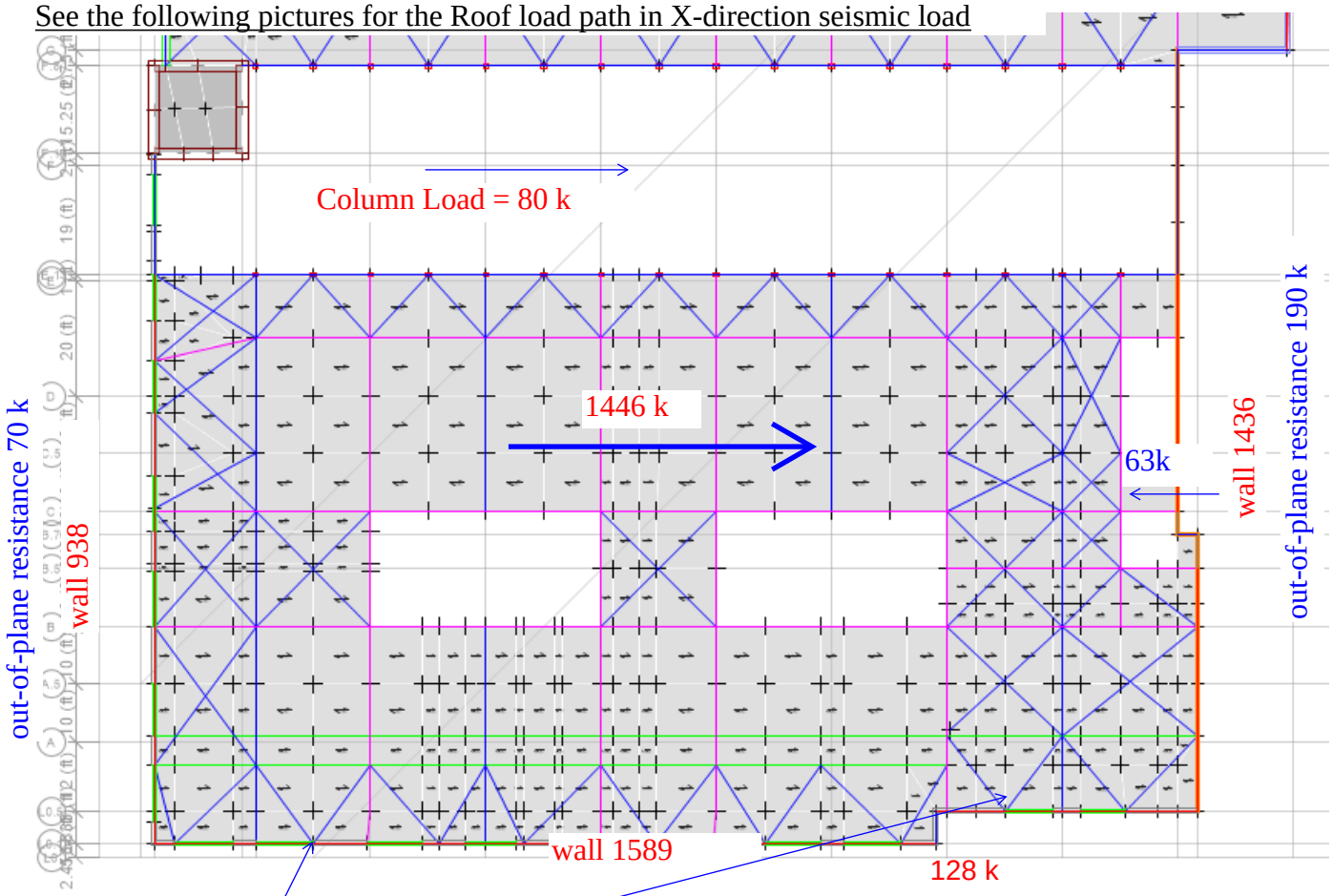


See the following pictures for the 2nd Mezz Load Path in X-direction seismic load





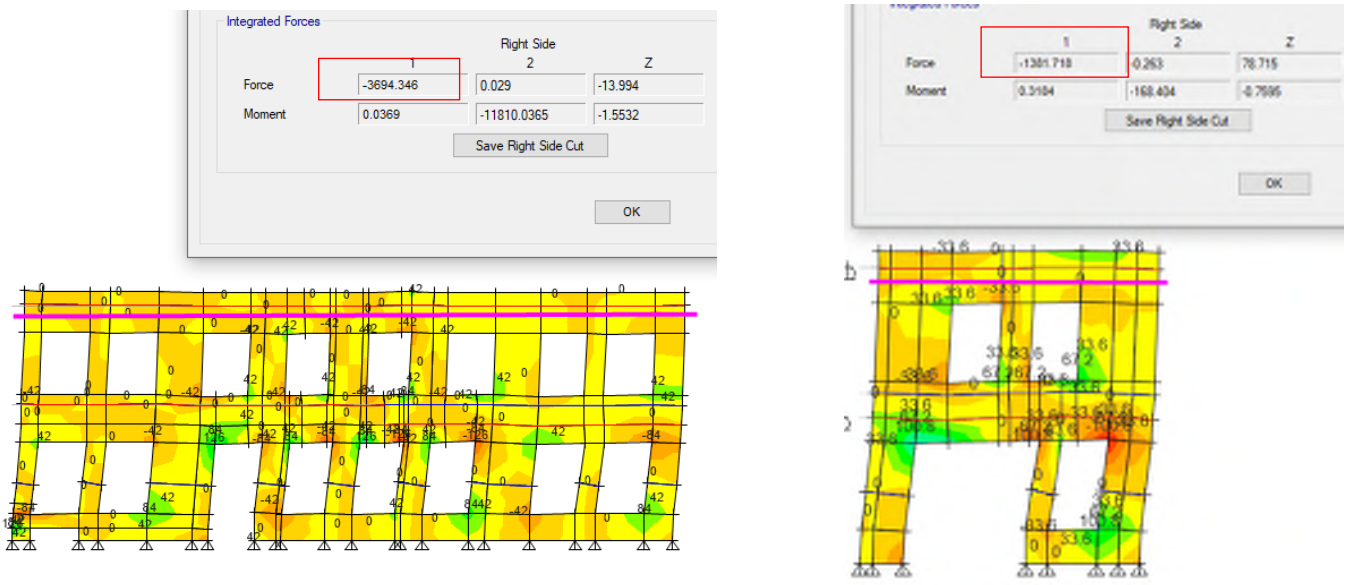
See the following pictures for the Roof load path in X-direction seismic load



Roof Load = 1446 + 938 +1589+1436 + 80 = 5489 k

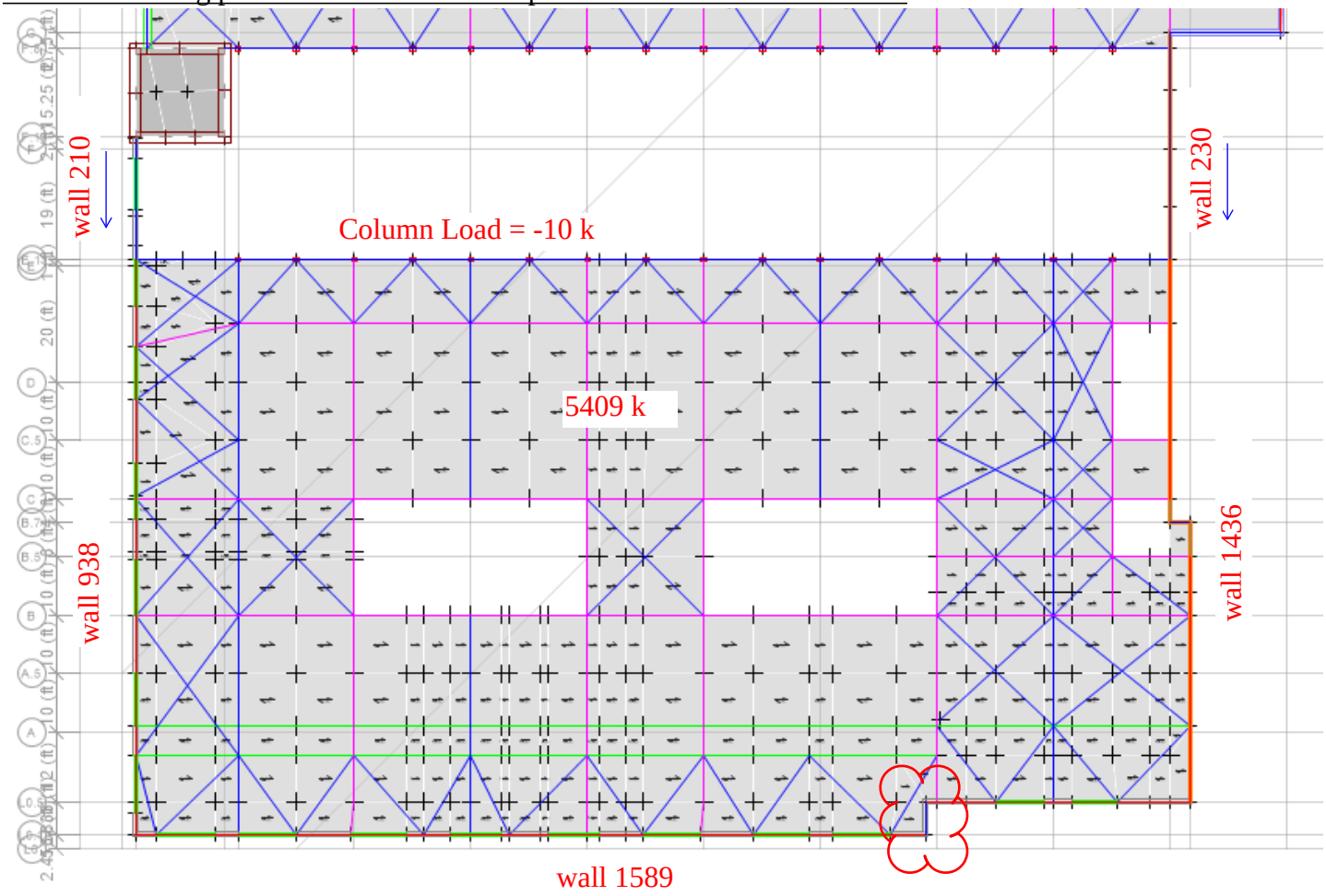
wall resistance = 3694+1381 +63 +70 +190 = 5398

East Structure Roof Plan View



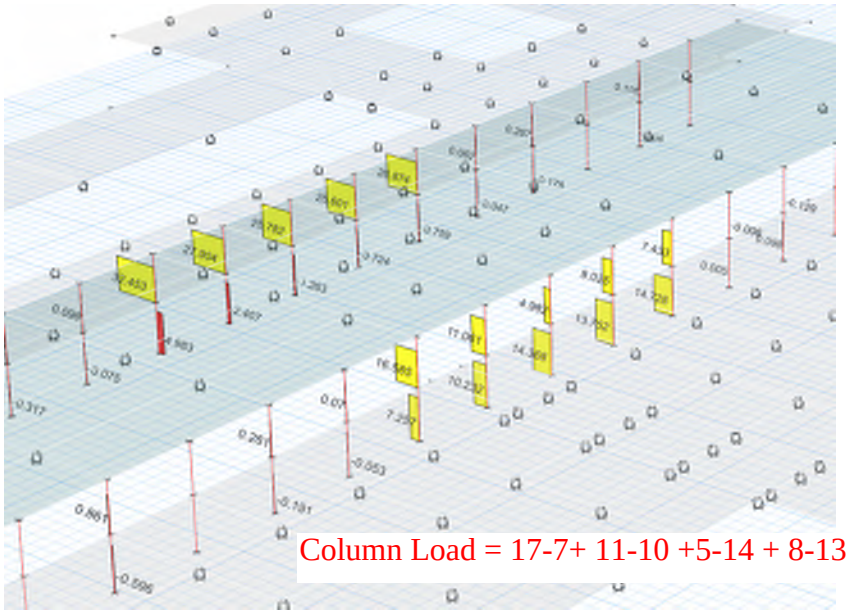
Shear Section Cut From the East Wall

See the following pictures for the Roof load path in Y-direction seismic load



Roof Load = 1446 + 938 +1589+1436 - 10 +210+230 = 5839 k

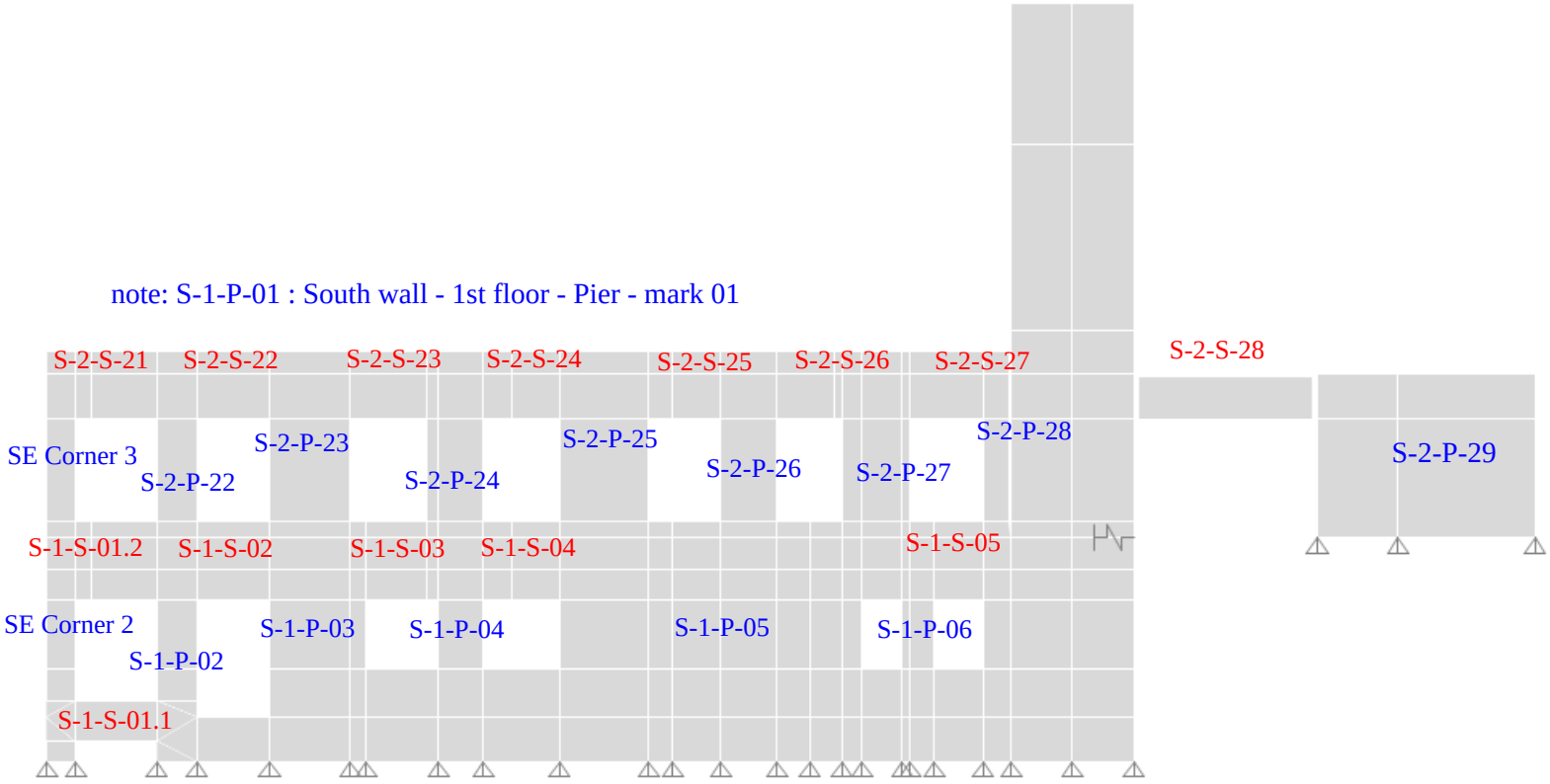
wall resistance = 2585+1575 + 1929 = 6089



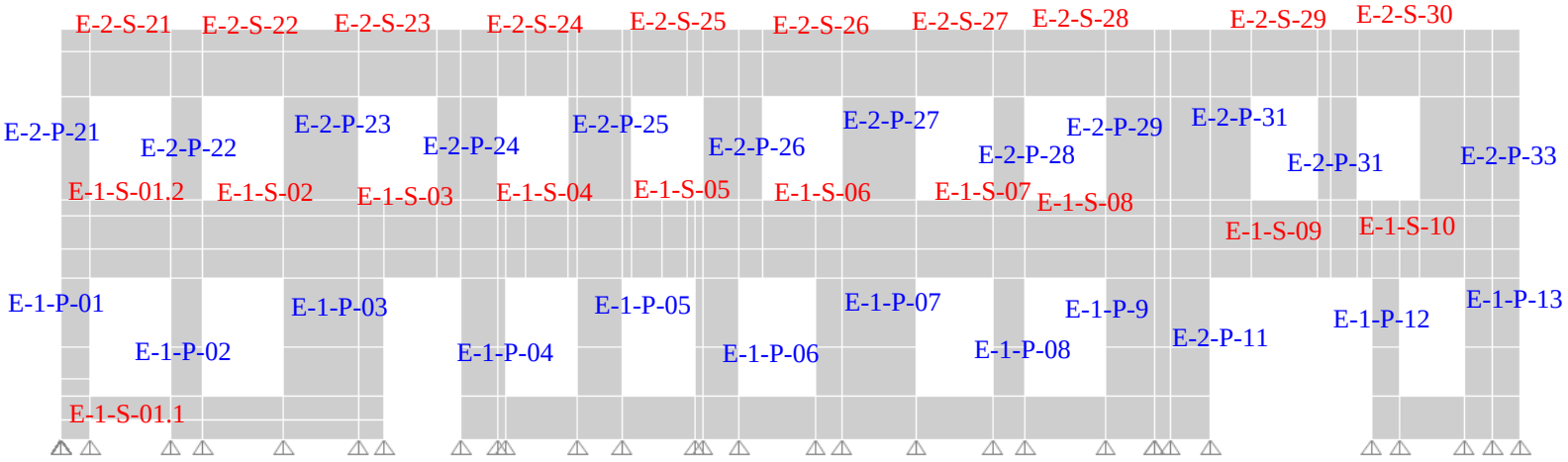
Column Load = 17-7+ 11-10 +5-14 + 8-13 + 7-14 = -10 k

3. Shear Wall Evaluation

See the snapshot below for the labels of each shear wall pier and spandrel. In this section, a single pier's calculation will be performed to check it's shear and flexural capacity.



South Wall Piers and Spandrel Labels



East Wall Piers and Spandrel Labels

Take S-2-P-22 as an example:

1. Read the load from the model: See the table of summary below:

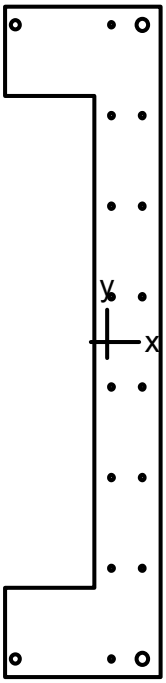
Wanted Mark	Mark in Etabs	P (kip)	T (kip)	In-plane Force		Out-of-plane Force	
				V (kip)	M(ft-kip)	V (kip)	M(ft-kip)
12	SW-P02.6	-126	126	315	2058	0	1

2. Summarized the reinforcing per the existing drawings:

horizontal rebar: #3 @12" each face
vertical rebar: #4@12" each face
boundary element: 1#9 +1#7, typical. Boundary size: 8"x14"

See the following tables of the summary of all piers and spandrels.

3. Calculated the capacity of the shear and flexural capacity by using spreadsheet and SPCol Program. See the following pages



14 x 60 in

Code: ACI 318-14

Units: English

Run axis: About X-axis

Run option: Investigation

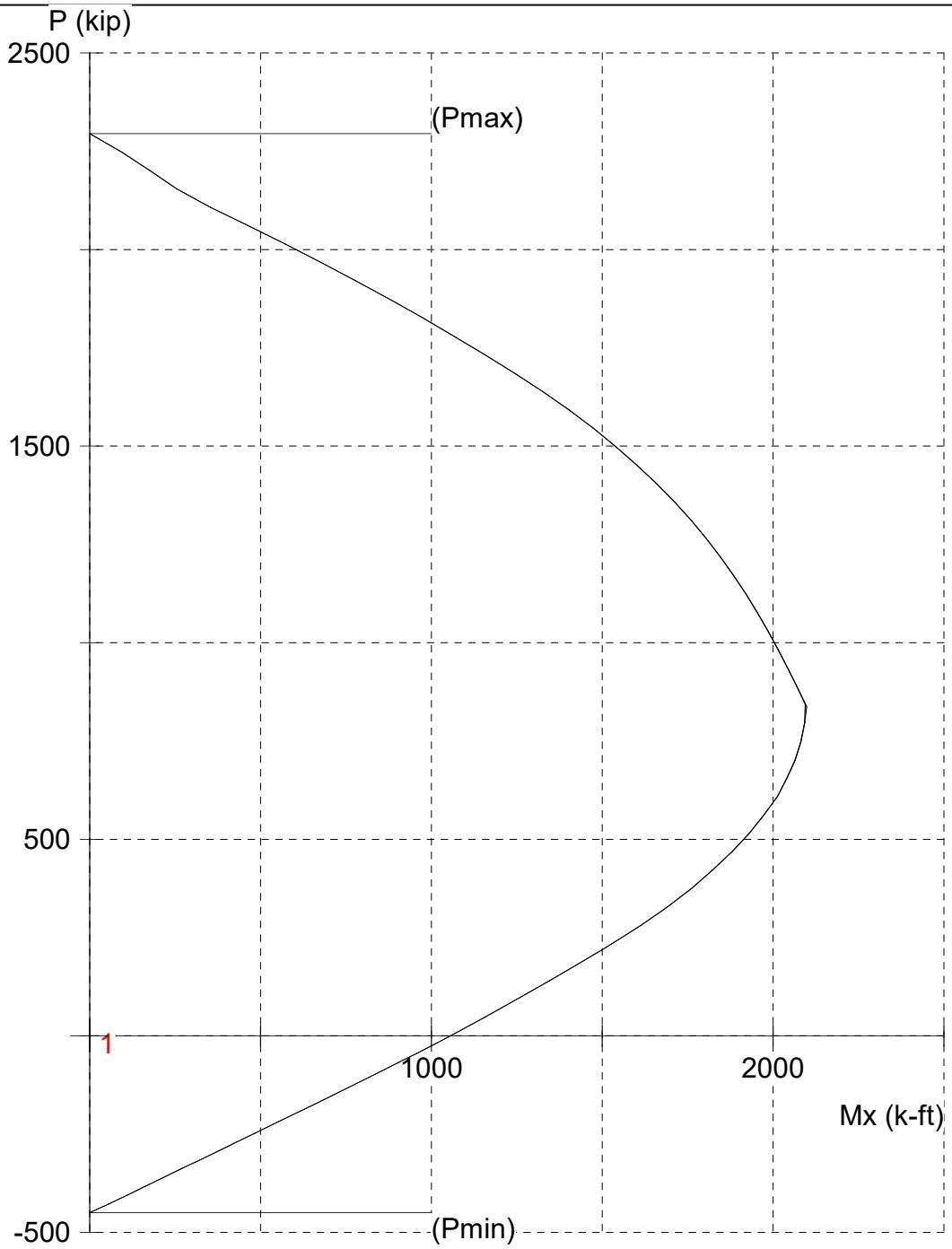
Slenderness: Not considered

Column type: Structural

Bars: ASTM A615

Date: 10/19/21

Time: 16:22:15



STRUCTUREPOINT - spColumn v7.00 (TM). Licensed to: Structus, Inc.. License ID: 73350-1074749-4-1ED57-26C3E

File: P:\Public\2018 Projects\1806-5 Cable Car Barn Seismic Evaluation\Calc\SP-Col\Wall and Boundary E...\5ft wall #4at8.col

Project:

Column:

Engineer:

f'c = 4.5 ksi	fy = 75 ksi	Ag = 488 in^2	18 bars
Ec = 3824 ksi	Es = 29000 ksi	As = 6.00 in^2	rho = 1.23%
fc = 3.825 ksi	e_yt = 0.00258621 in/in	Xo = -0.00 in	Ix = 195211 in^4
e_u = 0.003 in/in		Yo = -0.00 in	Iy = 6389.55 in^4
Beta1 = 0.825		Min clear spacing = 1.93 in	Clear cover = N/A

Confinement: Other

phi(a) = 1, phi(b) = 1, phi(c) = 1

Demand Prameters				
C_1	C_1	J	χ	κ
1	1	1	1	0.9

(knowledge factor per ASCE 41-17 Table 6-1 or section 6.2.4.4)

Wall Geometry		
Height	Length	Thickness
(ft)	(ft)	(in)
14.75	5	6

Material Properties			
f'_{cl}	f'_{ce}	f_{yl}	f_{ye}
psi	psi	psi	psi
3000	4500	60000	75000

	# Layers	Bar Size	As	Spacing
			in^2	in
H Reinf	2	#3	0.11	12
V Reinf	2	#4	0.2	12

Design Loads				
P_D	P_L	P_E	V_E	M_E
kip	kip	kip	kip	kip-ft
0.0	0.0	0.0	315.0	2058.0

(Compression negative, tension positive)

P_{CL}
kip
1080
Pu>0.1Pcl

Shear Strength

A_{cv} (in^2)	h_w/l_w	α_c	λ	ρ_t
360	2.95	2.00	1	0.0031

ρ_t >= 0.0015 Deformation Controlled Wall per 10.7.2.3

Forced Controlled: NO (YES/NO)

Force-Controlled

V_{CL}	V_{UF}
kip	kip
NA	315
DCR_V =	NA

Deformation Controlled

V_{CE}	V_{UD}
kip	kip
130.8	315
DCR_V =	241%

Flexural Strength

β_1	Rows
0.825	6

Nominal flexural strength using lower bound material propoerties, are determined as follows:

Assume "c"	β_1 c	Equivalent l	Approx As	Approx d	A's	d'	Calc a	ΔMn	Mn
in	in	in	in^2	in	in^2	in	in	kip-ft	kip-ft
9.72	8.02	70	1.61	41.55	0.22	11.55	5.26	14.75	406

Adjust C47 such that D47 gets close to J47 — Adjusted From SP COL: 1061

M_UD 2058 kip-ft — DCR_M = 194%

Governing Action

DCR_M < DCR_V => Shear Controlled

m-factor

Assuming not confined by boundary elements
Assuming collapse prevention
Component Type Primary

[(As-A's)fyE + P]/(tw lw f'cE) = 0.04 — Flexure Controlled, m-factor = 2.50

V/(tw lw sqrt(f'cE)) = 13.04 — Shear Controlled, m-factor = 3

Acceptance Demand Capacity Ratio (DCR)

m-factor = 3 (used)

Acceptance Criteria per: Deformation Controlled Wall (per 10.7.2.3)

Acceptance DCR_V = 89%
Acceptance DCR_M = 72%

See the following tables of the summary of all piers and spandrels:

Sourth Wall Pier														
	Dimensions					In-plane Force		Out-of-plane Force		Shear Rebar (E.F.)		Flexure Rebar (E.F.)		
Pier Mark	H (ft)	W (ft)	t (in)	P (kip)	T (kip)	V (kip)	M(ft-kip)	V (kip)	M(ft-kip)	#	@ (in)	#	@ (in)	Boundary
SE Corner 1	2.5	/	6	-1070	1070	254	1059	#N/A	#N/A	#3	12	#4	12	
SE Corner 2	12.5	/	6	-750	553	258	1543	282	1360	#3	12	#4	12	
S-1-P-02	13	5	6	-553	553	414	2480	13	75	#3	12	#4	12	
S-1-P-03	13	12	6	-154	154	1504	6525	1	8	#3	12	#4	12	
S-1-P-04	13	5.5	6	-219	219	926	4253	0	1	#3	12	#4	12	
S-1-P-05	13	37.5	6	-1506	1506	5166	32183	1	5	#3	12	#4	12	
S-1-P-06	13	4	6	-450	450	731	3208	0	0	#3	12	#4	12	
S-1-P-07	13	3.5	6	-584	584	398	1733	0	0	#3	12	#4	12	1#9 +1#7,
SE Corner 3	14.75	6	6	-314	314	114	843	138	1014	#3	12	#4	8	typical.
S-2-P-22	14.75	5	6	-104	104	307	2020	0	1	#3	12	#4	8	Boundary
S-2-P-23	14.75	10	6	-23	23	488	3608	0	2	#3	12	#4	8	size: 8"x14"
S-2-P-24	14.75	7	6	-129	129	490	3300	0	2	#3	12	#4	8	
S-2-P-25	14.75	11	6	-137	137	839	5598	0	5	#3	12	#4	8	
S-2-P-26	14.75	7	6	-278	278	918	5891	0	3	#3	12	#4	8	
S-2-P-27	14.75	8.5	6	-599	599	1747	11558	1	4	#3	12	#4	8	
S-2-P-28	14.75	3.5	6	-2067	2067	589	3802	0	1	#3	12	#4	8	
S-2-P-29	14.75	27	10	-697	697	876	11039	1	12	#4	12	#5	8	

Sourth Wall Spandrel													
	Dimensions					In-plane Force		Out-of-plane Force		ear Rebar(Mid Dept		xure Rebar(Mid Dep	
Pier Mark	L (ft)	H (ft)	t (in)	P (kip)	T (kip)	V (kip)	M(ft-kip)	V (kip)	M(ft-kip)	#	@ (in)	#	@ (in)
S-1-S-01.1	10	5	4	-37	37	330	1669	3	18	#4	12	#5	12
S-1-S-01.2	10	7.75	4	-137	137	464	2368	1	4	#4	12	#5	12
S-1-S-02	9	7.75	4	-249	249	876	4473	2	9	#4	12	#5	12
S-1-S-03	9	7.75	4	-201	201	1010	4038	0	0	#4	12	#5	12
S-1-S-04	9.5	7.75	4	-280	280	1056	4860	0	0	#4	12	#5	12
S-1-S-05	6	7.75	4	-364	364	1665	6803	0	0	#4	12	#5	12
S-2-S-21	10	8.42	4	-93	93	206	1166	1	1	#4	12	#5	12
S-2-S-22	9	8.42	4	-247	247	314	1485	0	1	#4	12	#5	12
S-2-S-23	9.5	8.42	4	-322	322	336	1701	0	2	#4	12	#5	12
S-2-S-24	9.5	8.42	4	-352	352	427	2107	0	2	#4	12	#5	12
S-2-S-25	9	8.42	4	-681	681	511	2367	2	6	#4	12	#5	12
S-2-S-26	8	8.42	4	-1201	1201	766	3450	77	75	#4	12	#5	12
S-2-S-27	9	8.42	4	-1466	1466	1075	4892	3	45	#4	12	#5	12
S-2-S-28	20	5.67	16	-377	377	166	3798	9	60	#5	16	#5	16

East Wall Pier														
	Dimensions					In-plane Force		Out-of-plane Force		Shear Rebar (E.F.)		Flexure Rebar (E.F.)		
Pier Mark	H (ft)	W (ft)	t (in)	P (kip)	T (kip)	V (kip)	M(ft-kip)	V (kip)	M(ft-kip)	#	@ (in)	#	@ (in)	Boundary
E-1-P-02	14.5	4	6	-435	435	320	2238	5	28	#3	12	#4	12	
E-1-P-03	14.5	12.5	6	-254	254	1795	14331	2	7	#3	12	#4	12	
E-1-P-04	14.5	5.5	6	-336	336	450	3243	2	8	#3	12	#4	12	
E-1-P-05	14.5	5.5	6	-93	93	572	4353	5	41	#3	12	#4	12	
E-1-P-06	14.5	5.5	6	-254	254	607	4508	4	44	#3	12	#4	12	
E-1-P-07	14.5	12.5	6	-59	59	2248	19790	10	102	#3	12	#4	12	
E-1-P-08	14.5	4	6	-248	248	438	3045	3	29	#3	12	#4	12	
E-1-P-09	14.5	6	6	-1008	1008	845	4547	1	7	#3	12	#4	12	
E-1-P-10	26.75	8	6	-226	226	482	2534	0	3	#3	12	#4	12	
E-1-P-11	14.5	7	6	-993	993	837	4360	2	12	#3	12	#4	12	
E-1-P-12	14.5	3.5	6	-32	32	202	1750	0	1	#3	12	#4	12	1#9 +1#7,
E-1-P-13	14.5	7	6	-760	760	1236	6883	0	0	#3	12	#4	12	typical.
														Boundary
E-2-P-22	14.75	4	6	-74	74	382	2521	0	0	#3	12	#4	8	size: 8"x14"
E-2-P-23	14.75	9.25	6	-56	56	457	4116	0	1	#3	12	#4	8	
E-2-P-24	14.75	7.5	6	-68	68	599	4067	0	1	#3	12	#4	8	
E-2-P-25	14.75	8	6	-53	53	523	3620	1	6	#3	12	#4	8	
E-2-P-26	14.75	7.5	6	-110	110	556	3792	3	45	#3	12	#4	8	
E-2-P-27	14.75	9.25	6	-98	98	401	4139	4	68	#3	12	#4	8	
E-2-P-28	14.75	4	6	-56	56	512	3398	3	42	#3	12	#4	8	
E-2-P-29	14.75	6	6	-379	379	303	2250	2	18	#3	12	#4	8	
E-2-P-30	20.42	8	6	-17	17	198	1541	0	5	#3	12	#4	8	
E-2-P-31	14.75	12	6	-587	587	527	4289	4	50	#3	12	#4	8	
E-2-P-32	14.75	5	6	-50	50	625	3985	3	47	#3	12	#4	8	
E-2-P-33	14.75	12.5	6	-568	568	364	3249	5	56	#3	12	#4	8	

East Wall Spandrel													
	Dimensions					In-plane Force		Out-of-plane Force		ear Rebar(Mid Dept		xure Rebar(Mid Dep	
Pier Mark	L (ft)	H (ft)	t (in)	P (kip)	T (kip)	V (kip)	M(ft-kip)	V (kip)	M(ft-kip)	#	@ (in)	#	@ (in)
E-1-S-01.1	10	5	4	-66	66	209	1046	1	6	#4	12	#5	12
E-1-S-01.2	10	7.75	4	-100	100	554	3207	1	5	#4	12	#5	12
E-1-S-02	10	7.75	4	-284	284	940	5560	1	3	#4	12	#5	12
E-1-S-03	9.5	7.75	4	-582	582	1125	4681	0	0	#4	12	#5	12
E-1-S-04	9	7.75	4	-188	188	758	2888	0	1	#4	12	#5	12
E-1-S-05	9	7.75	4	-232	232	761	2839	3	11	#4	12	#5	12
E-1-S-06	9.5	7.75	4	-439	439	1125	4962	2	9	#4	12	#5	12
E-1-S-07	9.5	7.75	4	-385	385	1089	6598	2	9	#4	12	#5	12
E-1-S-08	10	7.75	4	-58	58	915	5739	0	9	#4	12	#5	12
E-1-S-09	20	7.75	4	-218	218	778	3501	0	10	#4	12	#5	12
E-1-S-10	8	7.75	4	-299	299	819	1493	1	6	#4	12	#5	12
E-2-S-21	10	5.67	4	-131	131	287	1530	0	1	#4	12	#5	12
E-2-S-22	10	5.67	4	-164	164	332	1674	0	0	#4	12	#5	12
E-2-S-23	9.75	5.67	4	-235	235	388	1950	0	1	#4	12	#5	12
E-2-S-24	8.75	5.67	4	-307	307	421	1801	0	1	#4	12	#5	12
E-2-S-25	8.75	5.67	4	-365	365	409	1765	1	2	#4	12	#5	12
E-2-S-26	9.75	5.67	4	-403	403	313	1684	0	2	#4	12	#5	12
E-2-S-27	9.5	5.67	4	-359	359	411	1985	0	1	#4	12	#5	12
E-2-S-28	10	5.67	4	-319	319	419	2226	1	4	#4	12	#5	12
E-2-S-29	8.25	5.67	4	-30	30	44	188	0	0	#4	12	#5	12
E-2-S-30	7.75	5.67	4	-105	105	36	143	0	0	#4	12	#5	12

North Wall													
	Dimensions					In-plane Force		Out-of-plane Force		Shear Rebar (E.F.)		Flexure Rebar (E.F.)	
Pier Mark	H (ft)	W (ft)	t (in)	P (kip)	T (kip)	V (kip)	M(ft-kip)	V (kip)	M(ft-kip)	#	@ (in)	#	@ (in)
N-1-P-01	47.17	48	4	-5367	5367	3322	50897	3	16	#3	12	#4	12
N-1-P-02	47.17	3.5	4	-19	19	283	1061	0	0	#3	12	#4	12
N-1-P-03	47.17	84	4	-3465	3465	5795	33952	0	1	#3	12	#4	12
N-2-P-21	47.17	48	4	-897	897	1589	11134	36	245	#3	12	#4	12
N-2-P-22	47.17	3.5	4	-73	73	304	2031	0	0	#3	12	#4	12
N-2-P-23	47.17	84	4	-2086	2086	4014	46222	4	21	#3	12	#4	12

North West Wall													
	Dimensions					In-plane Force		Out-of-plane Force		Shear Rebar (E.F.)		Flexure Rebar (E.F.)	
Pier Mark	H (ft)	W (ft)	t (in)	P (kip)	T (kip)	V (kip)	M(ft-kip)	V (kip)	M(ft-kip)	#	@ (in)	#	@ (in)
NW-1-P-01	20	5.25	10	-29	29	221	1154	0	2	#4	12	#5	12
NW-1-P-02	20	18.75	10	-20	20	15	44	0	0	#4	12	#5	12

CMU													
	Dimensions					In-plane Force		Out-of-plane Force		Shear Rebar (E.F.)		Flexure Rebar (E.F.)	
Pier Mark	H (ft)	W (ft)	t (in)	P (kip)	T (kip)	V (kip)	M(ft-kip)	V (kip)	M(ft-kip)	#	@ (in)	#	@ (in)
CMU-1				-444	444	2071	11975	5	4				
CMU-2				-1059	1059	496	4370	4	7				
CMU-3	Per drawings			-49	49	341	5806	0	1	Per drawings			

All shear walls are summarized as following spreadsheet below:

South Wall Piers

Pier ID	Forced Controlled	Shear DCR (Def-Controlled)			β_1	Flexure Strength														Governing Action	Flexure Controlled m-factor	Shear Controlled m-factor	Shear Controlled (used) m-factor	Acceptance DCR	
		V_{CE}	V_{CO}	DCR_V		Rows	Assume "c"	β_1 c	Equiv. I	Apprx As	Apprx d	A'_s	d'	Calc a	Δ	ΔMn	Mn(handcalc)	Mn(Spcol)	Mu	DCR_M				DCR_V	DCR_M
		kip	kip	(%)			in	in	in	in^2	in	in^2	in	in	in	kip-ft	kip-ft	kip-ft	kip-ft	(%)					
S-1-P-02	NO	130.8	413.912	316%	0.825	6	7.00	5.78	70	1.78	39.02	0.20	9.02	5.82	0.05	10.84	413	934	2480	266%	Shear Controlled	2.50	3	3	1.2	1.0
S-1-P-03	NO	371.9	1504.114	404%	0.825	13	16.00	13.20	154	4.03	89.40	0.24	17.40	13.15	-0.05	24.87	2108	3512	6525	186%	Shear Controlled	2.50	3	3	1.5	0.7
S-1-P-04	NO	143.9	926.009	644%	0.825	7	8.20	6.77	76	2.05	43.13	0.23	10.13	6.71	-0.05	13.45	524	1103	4253	386%	Shear Controlled	2.50	3	3	2.4	1.4
S-1-P-05	NO	1162.1	5166.009	445%	0.825	39	43.90	36.22	460	12.66	268.37	0.38	43.37	41.37	5.15	95.56	19691	20556	32183	157%	Shear Controlled	2.50	3	3	1.7	0.6
S-1-P-06	NO	104.6	731.049	699%	0.825	5	5.75	4.74	58	1.46	31.85	0.20	7.85	4.77	0.02	9.72	278	785	3208	409%	Shear Controlled	2.50	3	3	2.6	1.5
S-1-P-07	NO	134.2	997.607	743%	0.825	5	6.75	5.57	92	1.99	29.78	0.34	8.78	6.49	0.92	17.46	347	786	1733	220%	Shear Controlled	2.50	3	3	1.0	0.8
S-2-P-22	NO	130.8	306.7	234%	0.825	9	9.72	8.02	66	2.45	40.55	0.24	10.55	8.00	-0.02	14.68	574	1061	2020	190%	Shear Controlled	2.50	3	3	0.9	0.7
S-2-P-23	NO	309.9	489.246	158%	0.825	16	18.00	14.85	126	4.55	78.26	0.28	18.26	14.85	0.00	29.88	2042	3130	3608	115%	Shear Controlled	2.50	3	3	0.6	0.4
S-2-P-24	NO	183.1	489.612	267%	0.825	12	13.18	10.87	90	3.33	55.77	0.26	13.77	10.89	0.01	20.79	1069	1795	3300	184%	Shear Controlled	2.50	3	3	1.0	0.7
S-2-P-25	NO	340.9	939.057	276%	0.825	18	20.15	16.62	128	5.09	96.26	0.30	20.26	16.62	0.00	35.90	2514	3774	5598	148%	Shear Controlled	2.50	3	3	0.9	0.5
S-2-P-26	NO	183.1	918.25	501%	0.825	12	13.22	10.91	90	3.33	55.81	0.26	13.81	10.87	-0.03	20.87	1068	1795	5891	328%	Shear Controlled	2.50	3	3	1.9	1.2
S-2-P-27	NO	244.1	1747.013	716%	0.825	14	15.60	12.87	108	3.94	67.02	0.27	16.02	12.87	0.00	25.15	1516	2421	11558	477%	Shear Controlled	2.50	3	3	2.7	1.8
S-2-P-28	NO	154.2	589.238	382%	0.825	7	9.50	7.84	48	2.39	31.34	0.38	10.34	7.81	-0.03	22.92	433	2422	3802	157%	Shear Controlled	2.50	3	3	1.4	0.6
S-2-P-29	NO	1462.0	876.383	60%	0.825	42	45.50	37.54	330	19.12	205.86	0.73	43.86	37.49	-0.05	188.67	22547	22547	11039	49%	Shear Controlled	3.97			0.2	0.2

South Wall Spandrel

Pier ID	Forced Controlled	Shear DCR (Def-Controlled)			β_1	Flexure Strength														Governing Action	Flexure Controlled m-factor	Shear Controlled m-factor	Shear Controlled (used) m-factor	Acceptance DCR	
		V_{CE}	V_{CO}	DCR_V		Rows	Assume "c"	β_1 c	Equiv. I	Apprx As	Apprx d	A'_s	d'	Calc a	Δ	ΔMn		Mn	Mu	DCR_M					DCR_V	DCR_M
		kip	kip	(%)			in	in	in	in^2	in	in^2	in	in	in	kip-ft	kip-ft	kip-ft	kip-ft	(%)						
S-1-S-01.1	NO	107.2	329.731	308%	0.825	6	12.14	10.02	70	1.13	43.80	0.18	13.80	5.52	-4.49	14.38	303	303	1569	518%	Flexure Controlled	2.50	1.5	1.5	1.4	2.4
S-1-S-01.2	NO	266.0	464.326	175%	0.825	9	13.14	10.84	103	3.98	61.23	0.37	14.73	19.53	8.69	31.95	1313	1313	2368	180%	Flexure Controlled	2.50	1.5	2.5	0.8	0.8
S-1-S-02	NO	252.8	875.51	346%	0.825	12	12.14	10.02	133	2.95	75.30	0.19	13.80	14.45	4.43	15.14	1269	1269	4473	352%	Flexure Controlled	2.50	1.5	2.5	1.5	1.6
S-1-S-03	NO	252.8	1010.097	400%	0.825	12	12.14	10.02	133	2.95	75.30	0.19	13.80	14.45	4.43	15.14	1269	1269	4028	318%	Shear Controlled	2.50	1.5	1.5	3.0	2.4
S-1-S-04	NO	252.8	1056.198	418%	0.825	12	12.14	10.02	133	2.95	75.30	0.19	13.80	14.45	4.43	15.14	1269	1269	4860	383%	Shear Controlled	2.50	1.5	1.5	3.1	2.8
S-1-S-05	NO	252.8	1665.369	659%	0.825	12	12.14	10.02	133	2.95	75.30	0.19	13.80	14.45	4.43	15.14	1269	1269	6803	536%	Shear Controlled	2.50	1.5	1.5	4.9	4.0
S-2-S-21	NO	207.6	205.77	99%	0.850	10	9.23	7.85	111	2.48	61.61	0.18	11.09	#DIV/0!	0.00	#DIV/0!		550	1166	212%	Flexure Controlled	2.50	1.5	2.5	0.4	0.9
S-2-S-22	NO	207.6	313.725	151%	0.825	10	9.23	7.61	111	2.48	61.61	0.18	11.09	12.16	4.55	11.41	872	550	1485	270%	Flexure Controlled	2.50	1.5	2.5	0.7	1.2
S-2-S-23	NO	207.6	335.928	162%	0.825	10	9.23	7.61	111	2.48	61.61	0.18	11.09	12.16	4.55	11.41	872	550	1701	309%	Flexure Controlled	2.50	1.5	2.5	0.7	1.4
S-2-S-24	NO	207.6	426.521	205%	0.825	10	9.23	7.61	111	2.48	61.61	0.18	11.09	12.16	4.55	11.41	872	550	2107	383%	Flexure Controlled	2.50	1.5	2.5	0.9	1.7
S-2-S-25	NO	207.6	511.257	246%	0.825	10	9.23	7.61	111	2.48	61.61	0.18	11.09	12.16	4.55	11.41	872	550	2367	430%	Flexure Controlled	2.50	1.5	2.5	1.1	1.9
S-2-S-26	NO	207.6	766.167	369%	0.825	10	9.23	7.61	111	2.48	61.61	0.18	11.09	12.16	4.55	11.41	872	550	3450	627%	Flexure Controlled	2.50	1.5	2.5	1.6	2.8
S-2-S-27	NO	207.6	1074.658	518%	0.825	10	9.23	7.61	111	2.48	61.61	0.18	11.09	12.16	4.55	11.41	872	550	4892	889%	Flexure Controlled	2.50	1.5	2.5	2.3	4.0
S-2-S-28	NO	268.5	1661.447	62%	0.825	6	9.23	7.61	82	1.31	46.11	0.19	12.09	1.61	-6.01	11.33	985	680	3798	559%	Flexure Controlled	5.00	3	5	0.1	1.2

East Wall Pier

Pier ID	Forced Controlled	Shear DCR (Def-Controlled)			Flexure Strength					Governing Action	Flexure Controlled	Shear Controlled	Acceptance DCR	
		V_{CE}	V_{UD}	DCR_V	β_1	Rows	ΔMn	Mn	Mu	DCR_M		m-factor	m-factor (used)	DCR_V	DCR_M
		kip	kip	(%)			kip-ft	kip-ft	kip-ft	(%)				(%)	(%)
E-1-P-02	NO	104.6	320.195	306%	0.825	5	9.22	785	2238	285%	Shear Controlled	2.50	3	1.1	1.1
E-1-P-03	NO	387.4	1795.067	463%	0.825	14	27.78	3650	14331	393%	Shear Controlled	2.50	3	1.7	1.5
E-1-P-04	NO	143.9	449.653	313%	0.825	7	13.37	1103	3243	294%	Shear Controlled	2.50	3	1.2	1.1
E-1-P-05	NO	143.9	572.298	398%	0.825	7	13.37	1103	4353	395%	Shear Controlled	2.50	3	1.5	1.5
E-1-P-06	NO	143.9	607.345	422%	0.825	7	13.37	1103	4508	409%	Shear Controlled	2.50	3	1.6	1.5
E-1-P-07	NO	387.4	2247.744	580%	0.825	14	27.78	3650	19790	542%	Shear Controlled	2.50	3	2.2	2.0
E-1-P-08	NO	104.6	438.015	419%	0.825	5	9.22	785	3045	388%	Shear Controlled	2.50	3	1.6	1.4
E-1-P-09	NO	157.0	845.112	538%	0.825	7	12.61	1203	4547	378%	Shear Controlled	2.50	3	2.0	1.4
E-1-P-10	NO	209.3	481.882	230%	0.825	9	16.34	2000	2534	127%	Shear Controlled	2.50	3	0.9	0.5
E-1-P-11	NO	183.1	837.238	457%	0.825	8	14.39	1600	4360	273%	Shear Controlled	2.50	3	1.7	1.0
E-1-P-12	NO	91.6	202.156	221%	0.825	5	9.99	610	1750	287%	Flexure Controlled	2.50	3	1.0	1.3
E-1-P-13	NO	183.1	1235.581	675%	0.825	8	14.45	1750	6883	393%	Shear Controlled	2.50	3	2.5	1.5
E-2-P-22	NO	104.6	382.38	365%	0.825	7	10.58	785	2521	321%	Shear Controlled	2.50	3	1.4	1.2
E-2-P-23	NO	278.2	457.48	164%	0.825	15	27.47	2620	4116	157%	Shear Controlled	2.50	3	0.6	0.6
E-2-P-24	NO	198.6	598.564	301%	0.825	13	23.34	2000	4067	203%	Shear Controlled	2.50	3	1.1	0.8
E-2-P-25	NO	221.4	522.779	236%	0.825	13	22.53	2300	3620	157%	Shear Controlled	2.50	3	0.9	0.6
E-2-P-26	NO	198.6	555.979	280%	0.825	13	23.34	2000	3792	190%	Shear Controlled	2.50	3	1.0	0.7
E-2-P-27	NO	278.2	400.844	144%	0.825	15	27.47	2620	4139	158%	Flexure Controlled	2.50	2.5	0.6	0.7
E-2-P-28	NO	104.6	511.878	489%	0.825	7	10.58	785	3398	433%	Shear Controlled	2.50	3	1.8	1.6
E-2-P-29	NO	157.0	302.905	193%	0.825	10	16.07	1203	2250	187%	Shear Controlled	2.50	3	0.7	0.7
E-2-P-30	NO	209.3	198.034	95%	0.825	13	22.47	2300	1541	67%	Shear Controlled	3.15	3	0.4	0.2
E-2-P-31	NO	371.9	527.153	142%	0.825	19	38.14	3500	4289	123%	Shear Controlled	2.50	3	0.5	0.5
E-2-P-32	NO	130.8	624.837	478%	0.825	9	14.64	1100	3985	362%	Shear Controlled	2.50	3	1.8	1.3
E-2-P-33	NO	387.4	363.507	94%	0.825	20	41.42	3700	3249	88%	Shear Controlled	2.50	3	0.4	0.3

East Wall Spandrel

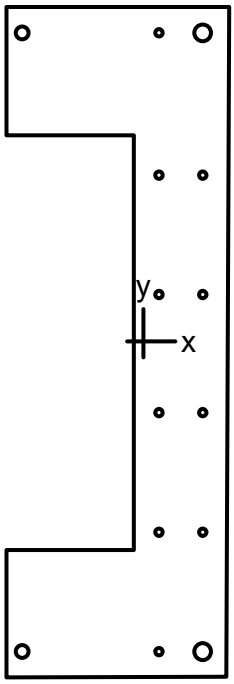
Pier ID	Forced Controlled	Shear DCR (Def-Controlled)				Flexure Strength					Governing Action	Flexure Controlled	Shear Controlled	Shear Controlled (used)	Acceptance DCR	
		V_{CE}	V_{UD}	DCR_V	β_1	Rows	ΔMn	Mn	Mn(SPCOL)	Mu	DCR_M				DCR_V	DCR_M
		kip	kip	(%)			kip-ft	kip-ft	kip-ft	kip-ft	(%)	m-factor	m-factor	m-factor	(%)	(%)
E-1-S-01.1	NO	75.0	209.075	279%	0.825	6	9.40	315	315	1046	332%	Flexure Controlled	2.50	1.5	2.5	152%	152%
E-1-S-01.2	NO	252.8	554.389	219%	0.825	12	15.14	1269	1269	3207	253%	Flexure Controlled	2.50	1.5	2.5	101%	101%
E-1-S-02	NO	252.8	939.591	372%	0.825	12	15.14	1269	1269	5560	438%	Flexure Controlled	2.50	1.5	2.5	169%	169%
E-1-S-03	NO	252.8	1124.901	445%	0.825	12	15.14	1269	1269	4681	369%	Shear Controlled	2.50	1.5	1.5	273%	273%
E-1-S-04	NO	252.8	758.222	300%	0.825	12	15.14	1269	1269	2888	228%	Shear Controlled	2.50	1.5	1.5	165%	165%
E-1-S-05	NO	252.8	760.865	301%	0.825	12	15.14	1269	1269	2839	224%	Shear Controlled	2.50	1.5	1.5	165%	165%
E-1-S-06	NO	252.8	1124.75	445%	0.825	12	15.14	1269	1269	4962	391%	Shear Controlled	2.50	1.5	1.5	259%	259%
E-1-S-07	NO	252.8	1089.383	431%	0.825	12	15.14	1269	1269	6598	520%	Flexure Controlled	2.50	1.5	2.5	230%	230%
E-1-S-08	NO	252.8	915.15	362%	0.825	12	15.14	1269	1269	5739	452%	Flexure Controlled	2.50	1.5	2.5	200%	200%
E-1-S-09	NO	223.0	778.409	349%	0.825	12	15.14	1269	1269	3501	276%	Shear Controlled	2.50	1.5	1.5	242%	242%
E-1-S-10	NO	252.8	819.046	324%	0.825	12	15.14	1269	1269	1493	118%	Shear Controlled	2.50	1.5	1.5	91%	91%
E-2-S-21	NO	130.2	286.595	220%	0.825	7	11.37	412	550	1530	278%	Flexure Controlled	2.50	1.5	2.5	104%	139%
E-2-S-22	NO	130.2	332.262	255%	0.825	7	11.37	412	550	1674	304%	Flexure Controlled	2.50	1.5	2.5	120%	160%
E-2-S-23	NO	131.8	388.472	295%	0.825	7	11.37	412	550	1950	354%	Flexure Controlled	2.50	1.5	2.5	140%	187%
E-2-S-24	NO	138.2	420.621	304%	0.825	7	11.37	412	550	1801	327%	Flexure Controlled	2.50	1.5	2.5	129%	172%
E-2-S-25	NO	138.2	408.975	296%	0.825	7	11.37	412	550	1765	321%	Flexure Controlled	2.50	1.5	2.5	127%	169%
E-2-S-26	NO	131.8	313.122	238%	0.825	7	11.37	412	550	1684	306%	Flexure Controlled	2.50	1.5	2.5	121%	161%
E-2-S-27	NO	133.4	410.816	308%	0.825	7	11.37	412	550	1985	361%	Flexure Controlled	2.50	1.5	2.5	143%	190%
E-2-S-28	NO	130.2	418.88	322%	0.825	7	11.37	412	550	2226	405%	Flexure Controlled	2.50	1.5	2.5	160%	213%
E-2-S-29	NO	139.8	44.172	32%	0.825	7	11.37	412	550	188	34%	Flexure Controlled	5.00	3	5	13%	17%
E-2-S-30	NO	139.8	36.145	26%	0.825	7	11.37	412	550	143	26%	Flexure Controlled	5.00	3	5	10%	14%

North Wall

Pier ID	Forced Controlled	Shear DCR (Def-Controlled)				Flexure Strength					Governing Action	Flexure Controlled	Shear Controlled	Shear Controlled (used)	Acceptance DCR	
		V_{CE}	V_{UD}	DCR_V	β_1	Rows	ΔMn	Mn	Mu	DCR_M					DCR_V	DCR_M
		kip	kip	(%)			kip-ft	kip-ft	kip-ft	(%)		m-factor	m-factor	m-factor	(%)	(%)
N-1-P-01	NO	1255.7	3321.719	265%	0.825	49	264.59	29891	50897	170%	Shear Controlled	2.50	3	3	1.0	0.6
N-1-P-02	NO	80.3	282.889	352%	0.825	5	12.98	230	1061	461%	Flexure Controlled	2.50	3	2.5	1.6	2.0
N-1-P-03	NO	2197.4	5794.501	264%	0.825	85	689.75	90646	33952	37%	Shear Controlled	2.50	3	3	1.0	0.1
N-2-P-21	NO	1255.7	1589.471	127%	0.825	49	264.59	29891	11134	37%	Shear Controlled	2.50	3	3	0.5	0.1
N-2-P-22	NO	80.3	303.838	378%	0.825	5	12.98	230	2031	882%	Flexure Controlled	2.50	3	2.5	1.7	3.9
N-2-P-23	NO	2197.4	4013.837	183%	0.825	85	689.75	90646	46222	51%	Shear Controlled	2.50	3	3	0.7	0.2

North West Concrete V

Pier ID	Forced Controlled	Shear DCR (Def-Controlled)				Flexure Strength					Governing Action	Flexure Controlled	Shear Controlled	Shear Controlled (used)	Acceptance DCR	
		V_{CE}	V_{UD}	DCR_V	β_1	Rows	ΔMn	Mn	Mu	DCR_M					DCR_V	DCR_M
		kip	kip	(%)			kip-ft	kip-ft	kip-ft	(%)		m-factor	m-factor	m-factor	(%)	(%)
NW-1-P-01	NO	242.0	221.035	91%	0.825	7	19.99	780	1154	148%	Flexure Controlled	3.07	3	3.07	0.3	0.5
NW-1-P-02	NO	1015.3	14.642	1%	0.825	20	64.02	7872	44	1%	Shear Controlled	4.00	3	3	0.0	0.0



14 x 42 in

Code: ACI 318-14

Units: English

Run axis: About X-axis

Run option: Investigation

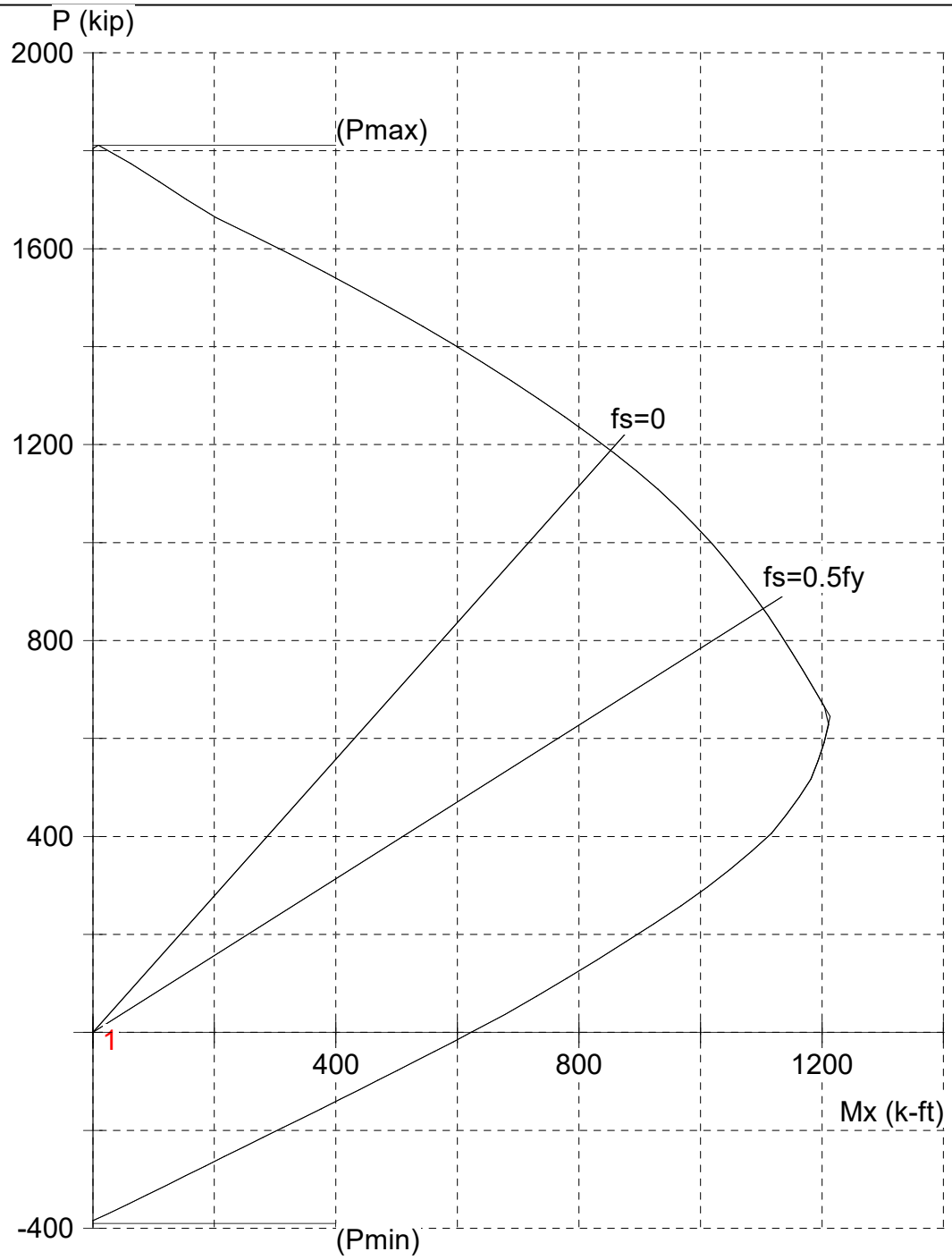
Slenderness: Not considered

Column type: Structural

Bars: ASTM A615

Date: 10/19/21

Time: 16:19:56



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Project:

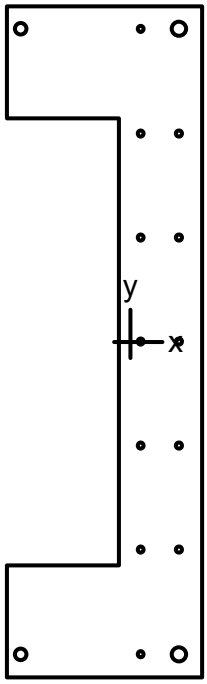
Column:

Engineer:

f'c = 4.5 ksi	fy = 75 ksi	Ag = 376.538 in^2	14 bars
Ec = 3824 ksi	Es = 29000 ksi	As = 5.20 in^2	rho = 1.38%
fc = 3.825 ksi	e_yt = 0.00258621 in/in	Xo = 0.00 in	Ix = 74140.8 in^4
e_u = 0.003 in/in		Yo = -0.00 in	Iy = 5503.64 in^4
Beta1 = 0.825		Min clear spacing = 1.93 in	Clear cover = N/A

Confinement: Other

phi(a) = 1, phi(b) = 1, phi(c) = 1



14 x 48 in

Code: ACI 318-14

Units: English

Run axis: About X-axis

Run option: Investigation

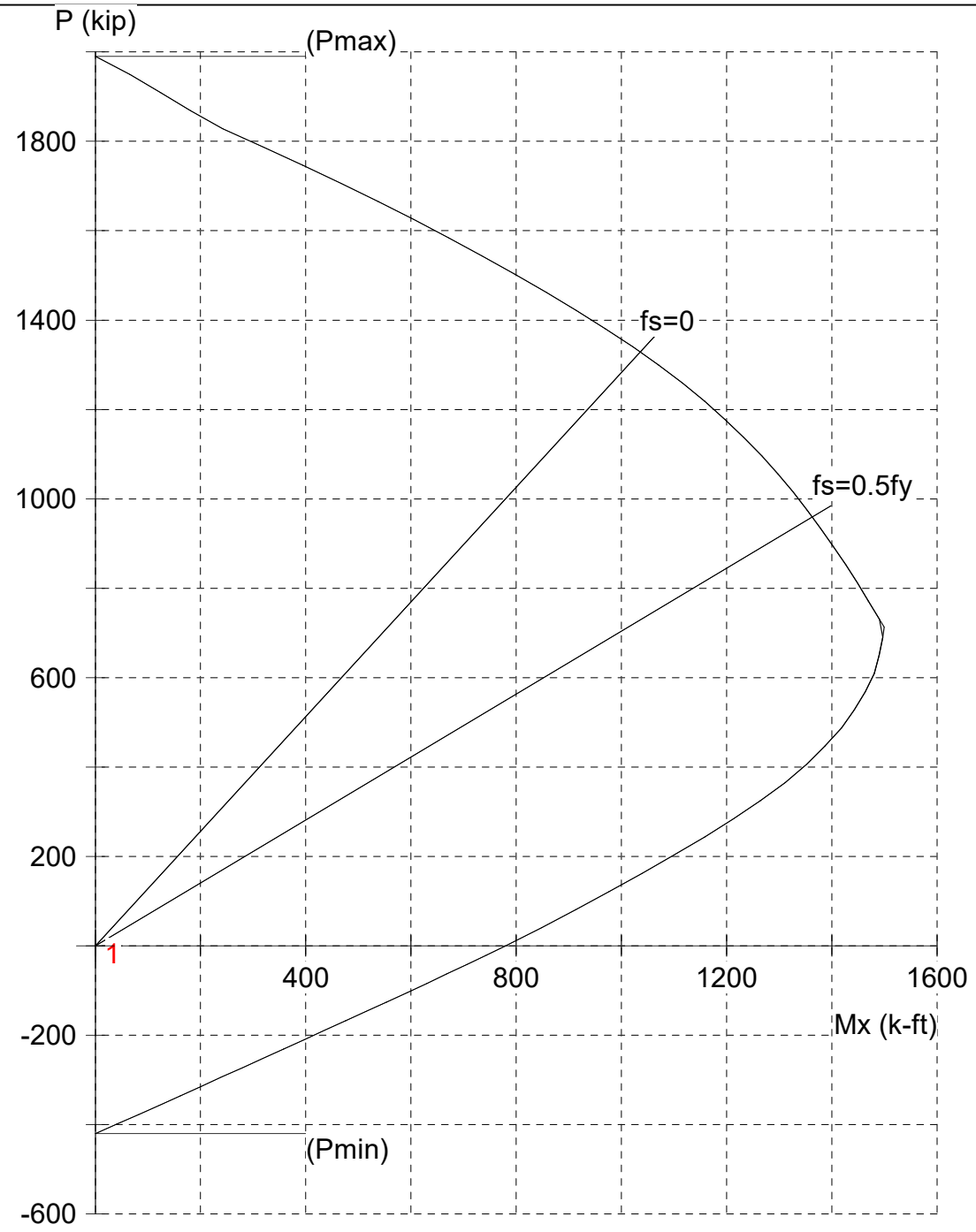
Slenderness: Not considered

Column type: Structural

Bars: ASTM A615

Date: 10/19/21

Time: 16:21:04



STRUCTUREPOINT - spColumn v7.00 (TM). Licensed to: Structus, Inc.. License ID: 73350-1074749-4-1ED57-26C3E

File: P:\Public\2018 Projects\1806-5 Cable Car Barn Seismic Evaluation\Calc\SP-Col\Wall and Boundary Element\4ft wall.col

Project:

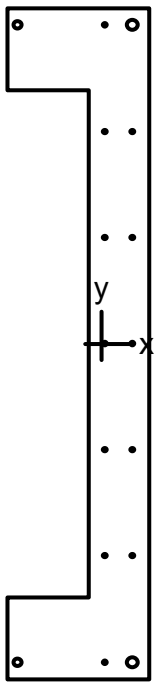
Column:

Engineer:

f'c = 4.5 ksi	fy = 75 ksi	Ag = 416 in^2	16 bars
Ec = 3824 ksi	Es = 29000 ksi	As = 5.60 in^2	rho = 1.35%
fc = 3.825 ksi	e_yt = 0.00258621 in/in	Xo = -0.00 in	Ix = 107179 in^4
e_u = 0.003 in/in		Yo = -0.00 in	Iy = 5888.82 in^4
Beta1 = 0.825		Min clear spacing = 1.93 in	Clear cover = N/A

Confinement: Other

phi(a) = 1, phi(b) = 1, phi(c) = 1



14 x 66 in

Code: ACI 318-14

Units: English

Run axis: About X-axis

Run option: Investigation

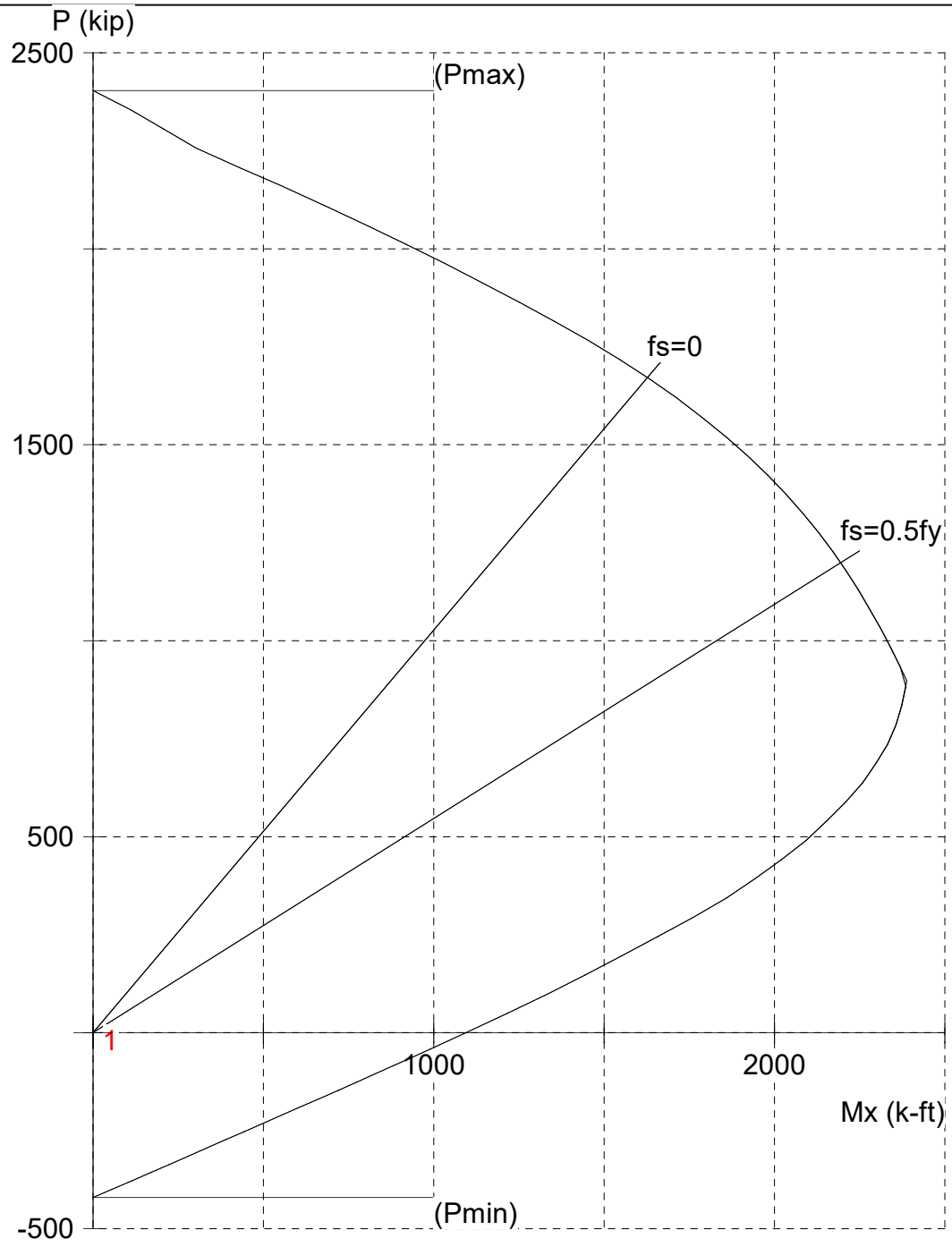
Slenderness: Not considered

Column type: Structural

Bars: ASTM A615

Date: 10/19/21

Time: 16:21:32



STRUCTUREPOINT - spColumn v7.00 (TM). Licensed to: Structus, Inc.. License ID: 73350-1074749-4-1ED57-26C3E

File: P:\Public\2018 Projects\1806-5 Cable Car Barn Seismic Evaluation\Calc\SP-Col\Wall and Boundary Element\5.5ft wall.col

Project:

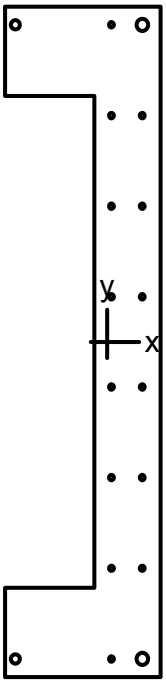
Column:

Engineer:

f'c = 4.5 ksi	fy = 75 ksi	Ag = 524 in^2	16 bars
Ec = 3824 ksi	Es = 29000 ksi	As = 5.60 in^2	rho = 1.07%
fc = 3.825 ksi	e_yt = 0.00258621 in/in	Xo = 0.00 in	Ix = 252079 in^4
e_u = 0.003 in/in		Yo = -0.00 in	Iy = 6610.58 in^4
Beta1 = 0.825		Min clear spacing = 1.93 in	Clear cover = N/A

Confinement: Other

phi(a) = 1, phi(b) = 1, phi(c) = 1



14 x 60 in

Code: ACI 318-14

Units: English

Run axis: About X-axis

Run option: Investigation

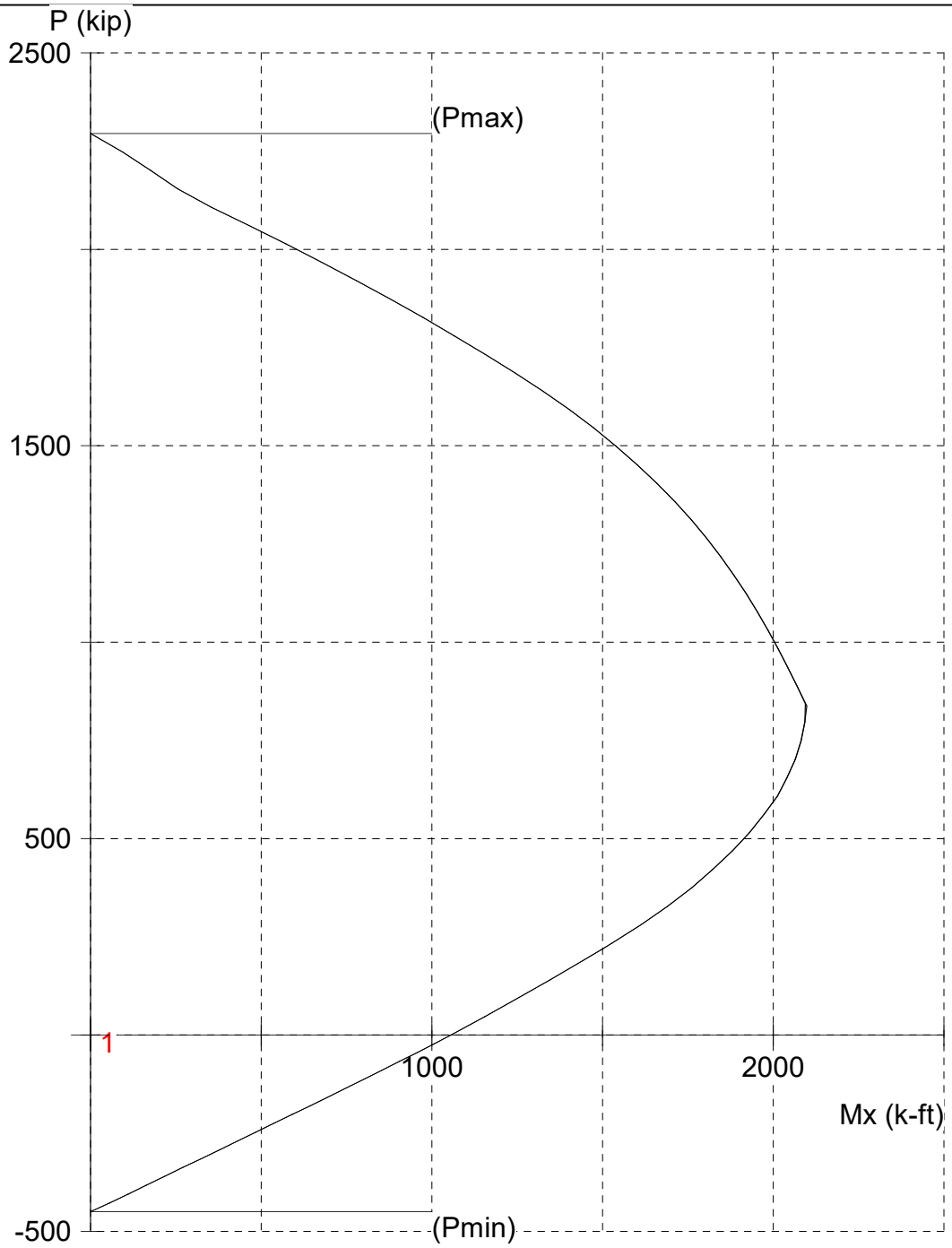
Slenderness: Not considered

Column type: Structural

Bars: ASTM A615

Date: 10/19/21

Time: 16:22:15



STRUCTUREPOINT - spColumn v7.00 (TM). Licensed to: Structus, Inc.. License ID: 73350-1074749-4-1ED57-26C3E

File: P:\Public\2018 Projects\1806-5 Cable Car Barn Seismic Evaluation\Calc\SP-Col\Wall and Boundary E...\5ft wall #4at8.col

Project:

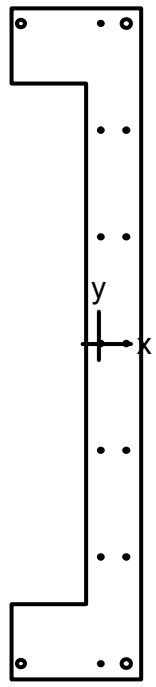
Column:

Engineer:

f'c = 4.5 ksi	fy = 75 ksi	Ag = 488 in^2	18 bars
Ec = 3824 ksi	Es = 29000 ksi	As = 6.00 in^2	rho = 1.23%
fc = 3.825 ksi	e_yt = 0.00258621 in/in	Xo = -0.00 in	Ix = 195211 in^4
e_u = 0.003 in/in		Yo = -0.00 in	Iy = 6389.55 in^4
Beta1 = 0.825		Min clear spacing = 1.93 in	Clear cover = N/A

Confinement: Other

phi(a) = 1, phi(b) = 1, phi(c) = 1



14 x 72 in

Code: ACI 318-14

Units: English

Run axis: About X-axis

Run option: Investigation

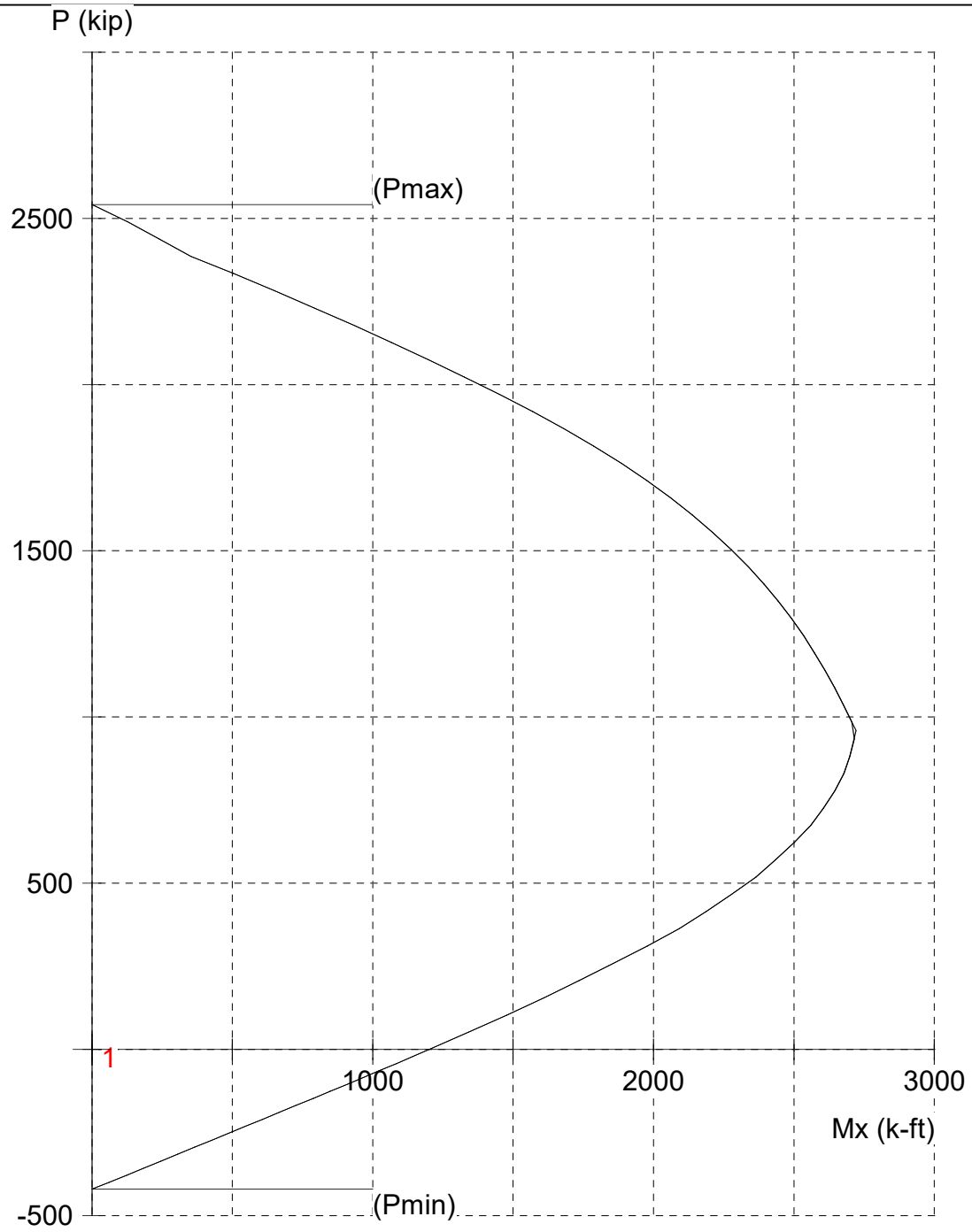
Slenderness: Not considered

Column type: Structural

Bars: ASTM A615

Date: 10/19/21

Time: 16:23:18



STRUCTUREPOINT - spColumn v7.00 (TM). Licensed to: Structus, Inc.. License ID: 73350-1074749-4-1ED57-26C3E

File: P:\Public\2018 Projects\1806-5 Cable Car Barn Seismic Evaluation\Calc\SP-Col\Wall and Boundary Element\6ft wall.col

Project:

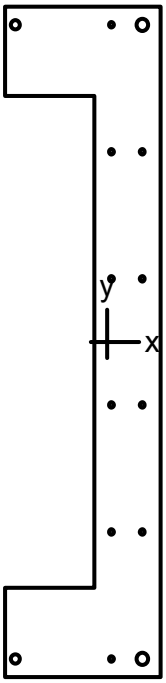
Column:

Engineer:

f'c = 4.5 ksi	fy = 75 ksi	Ag = 560 in^2	16 bars
Ec = 3824 ksi	Es = 29000 ksi	As = 5.60 in^2	rho = 1.00%
fc = 3.825 ksi	e_yt = 0.00258621 in/in	Xo = 0.00 in	Ix = 318379 in^4
e_u = 0.003 in/in		Yo = -0.00 in	Iy = 6817.07 in^4
Beta1 = 0.825		Min clear spacing = 1.93 in	Clear cover = N/A

Confinement: Other

phi(a) = 1, phi(b) = 1, phi(c) = 1



14 x 60 in

Code: ACI 318-14

Units: English

Run axis: About X-axis

Run option: Investigation

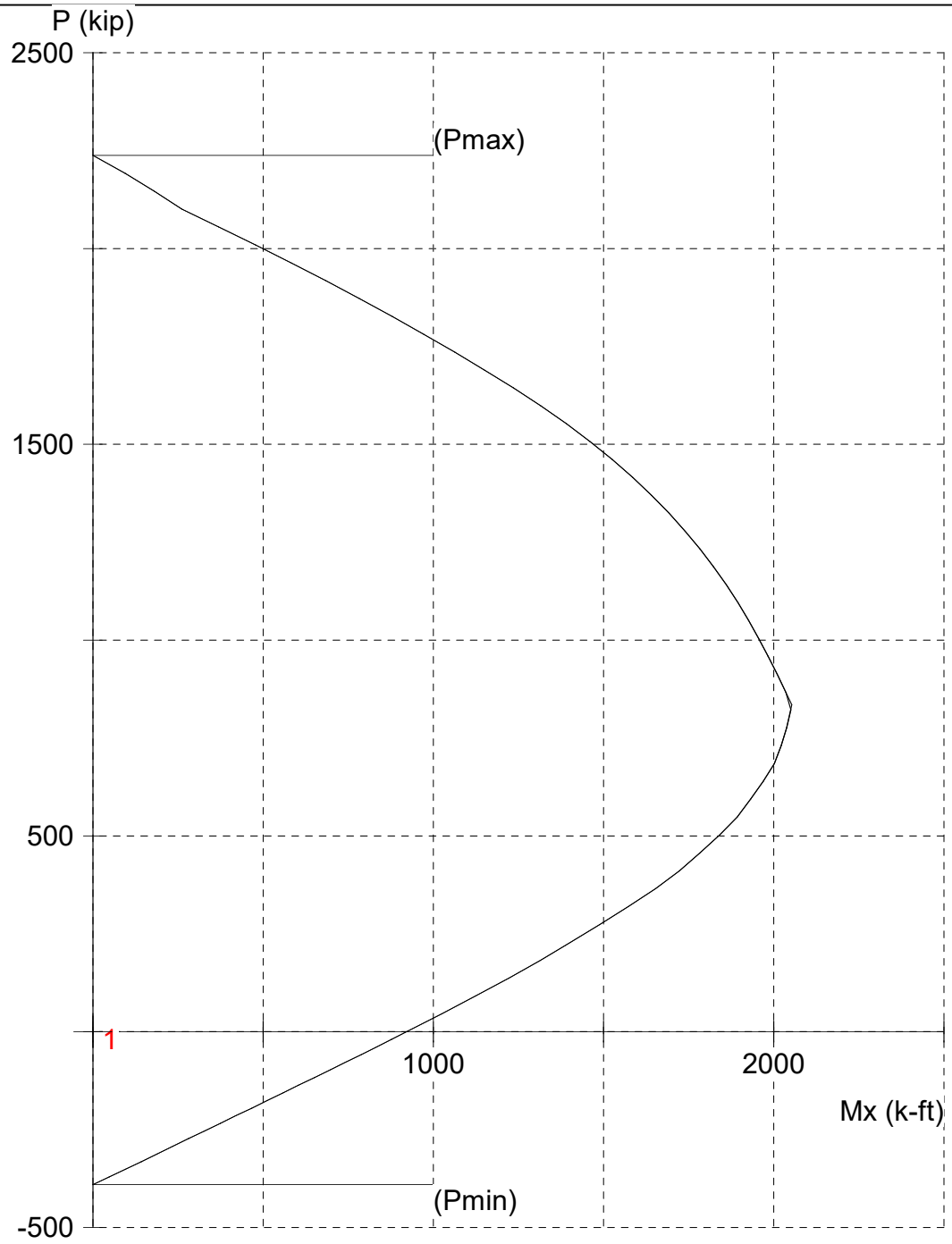
Slenderness: Not considered

Column type: Structural

Bars: ASTM A615

Date: 10/19/21

Time: 16:22:47



STRUCTUREPOINT - spColumn v7.00 (TM). Licensed to: Structus, Inc.. License ID: 73350-1074749-4-1ED57-26C3E

File: P:\Public\2018 Projects\1806-5 Cable Car Barn Seismic Evaluation\Calc\SP-Col\Wall and Boundary Element\5ft wall.col

Project:

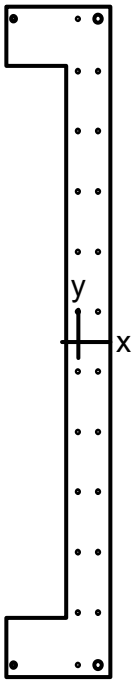
Column:

Engineer:

f'c = 4.5 ksi	fy = 75 ksi	Ag = 488 in^2	14 bars
Ec = 3824 ksi	Es = 29000 ksi	As = 5.20 in^2	rho = 1.07%
fc = 3.825 ksi	e_yt = 0.00258621 in/in	Xo = -0.00 in	Ix = 195211 in^4
e_u = 0.003 in/in		Yo = -0.00 in	Iy = 6389.55 in^4
Beta1 = 0.825		Min clear spacing = 1.93 in	Clear cover = N/A

Confinement: Other

phi(a) = 1, phi(b) = 1, phi(c) = 1



14 x 90 in

Code: ACI 318-14

Units: English

Run axis: About X-axis

Run option: Investigation

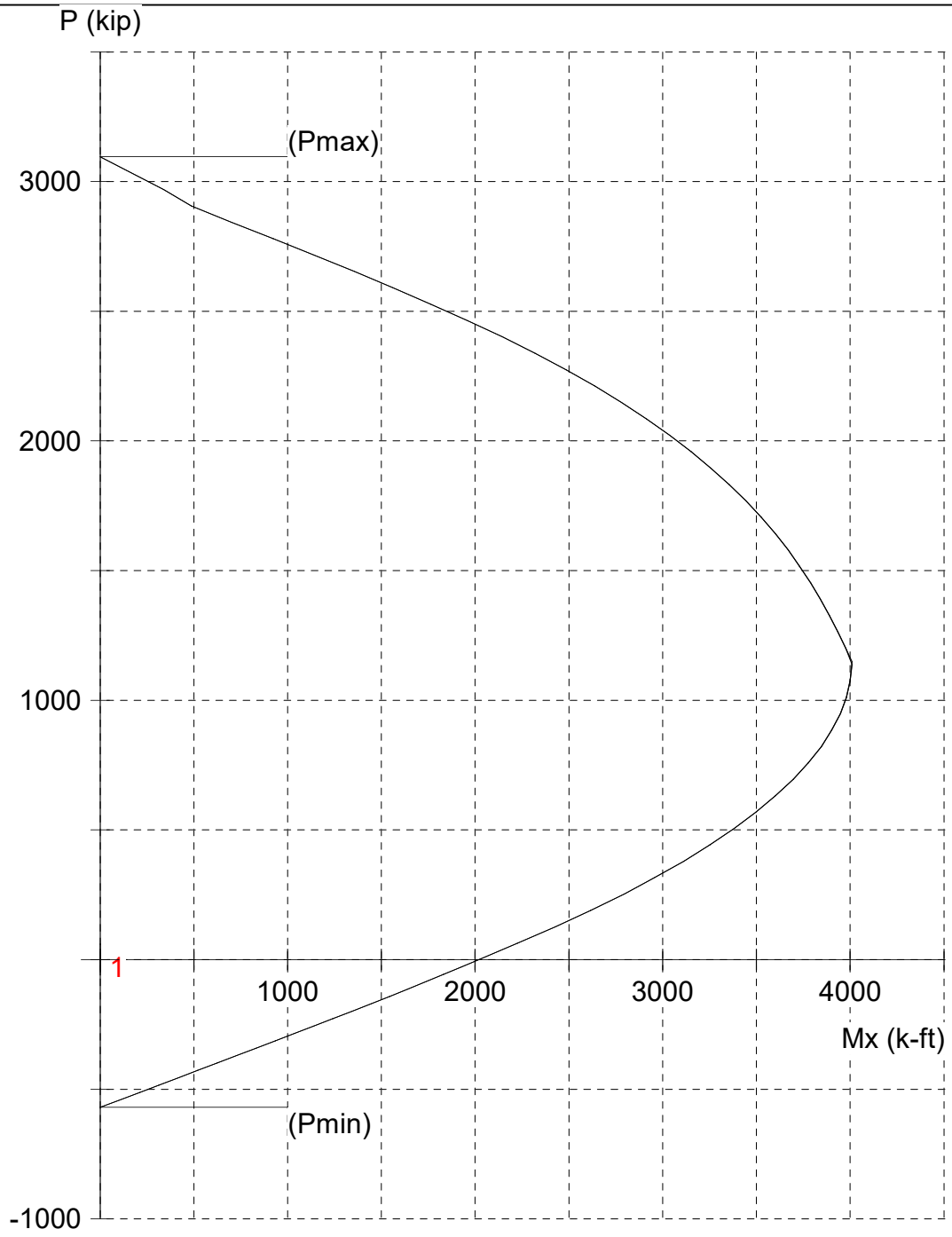
Slenderness: Not considered

Column type: Structural

Bars: ASTM A615

Date: 10/19/21

Time: 16:24:02



STRUCTUREPOINT - spColumn v7.00 (TM). Licensed to: Structus, Inc.. License ID: 73350-1074749-4-1ED57-26C3E

File: P:\Public\2018 Projects\1806-5 Cable Car Barn Seismic Evaluation\Calc\SP-Col\Wall and Boundary ...\7.5ftwall #4at8.col

Project:

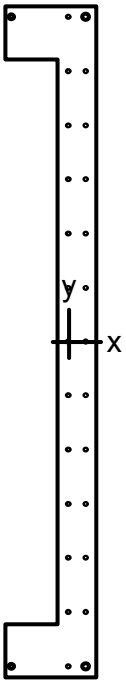
Column:

Engineer:

f'c = 4.5 ksi	fy = 75 ksi	Ag = 668 in^2	26 bars
Ec = 3824 ksi	Es = 29000 ksi	As = 7.60 in^2	rho = 1.14%
fc = 3.825 ksi	e_yt = 0.00258621 in/in	Xo = -0.00 in	Ix = 580351 in^4
e_u = 0.003 in/in		Yo = -0.00 in	Iy = 7372.85 in^4
Beta1 = 0.825		Min clear spacing = 1.93 in	Clear cover = N/A

Confinement: Other

phi(a) = 1, phi(b) = 1, phi(c) = 1



14 x 102 in

Code: ACI 318-14

Units: English

Run axis: About X-axis

Run option: Investigation

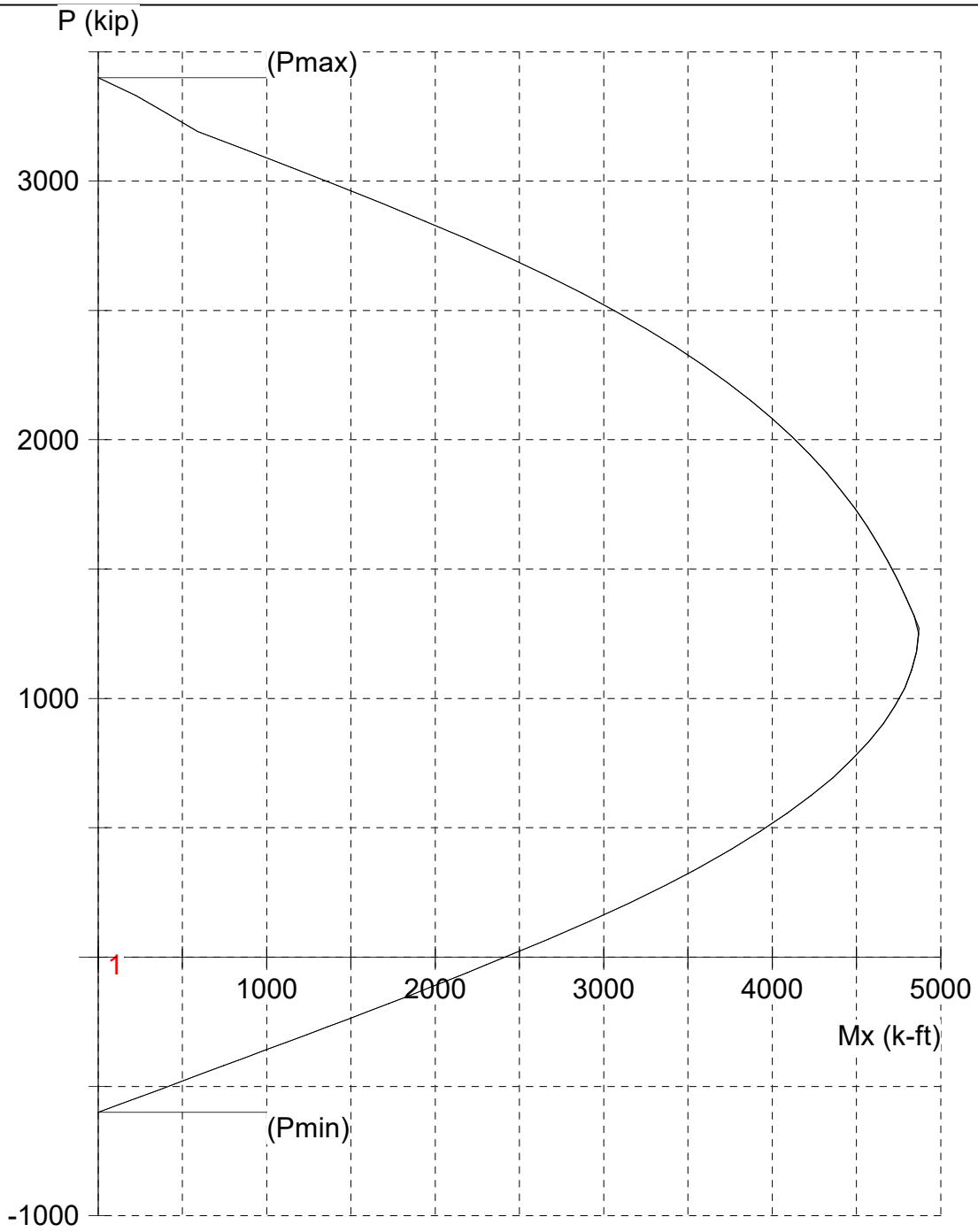
Slenderness: Not considered

Column type: Structural

Bars: ASTM A615

Date: 10/19/21

Time: 16:25:14



STRUCTUREPOINT - spColumn v7.00 (TM). Licensed to: Structus, Inc.. License ID: 73350-1074749-4-1ED57-26C3E

File: P:\Public\2018 Projects\1806-5 Cable Car Barn Seismic Evaluation\Calc\SP-Col\Wall and Boundary ...\8.5ftwall #4at8.col

Project:

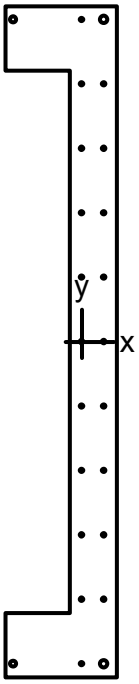
Column:

Engineer:

f'c = 4.5 ksi	fy = 75 ksi	Ag = 740 in^2	28 bars
Ec = 3824 ksi	Es = 29000 ksi	As = 8.00 in^2	rho = 1.08%
fc = 3.825 ksi	e_yt = 0.00258621 in/in	Xo = -0.00 in	Ix = 814039 in^4
e_u = 0.003 in/in		Yo = -0.00 in	Iy = 7705.78 in^4
Beta1 = 0.825		Min clear spacing = 1.93 in	Clear cover = N/A

Confinement: Other

phi(a) = 1, phi(b) = 1, phi(c) = 1



14 x 84 in

Code: ACI 318-14

Units: English

Run axis: About X-axis

Run option: Investigation

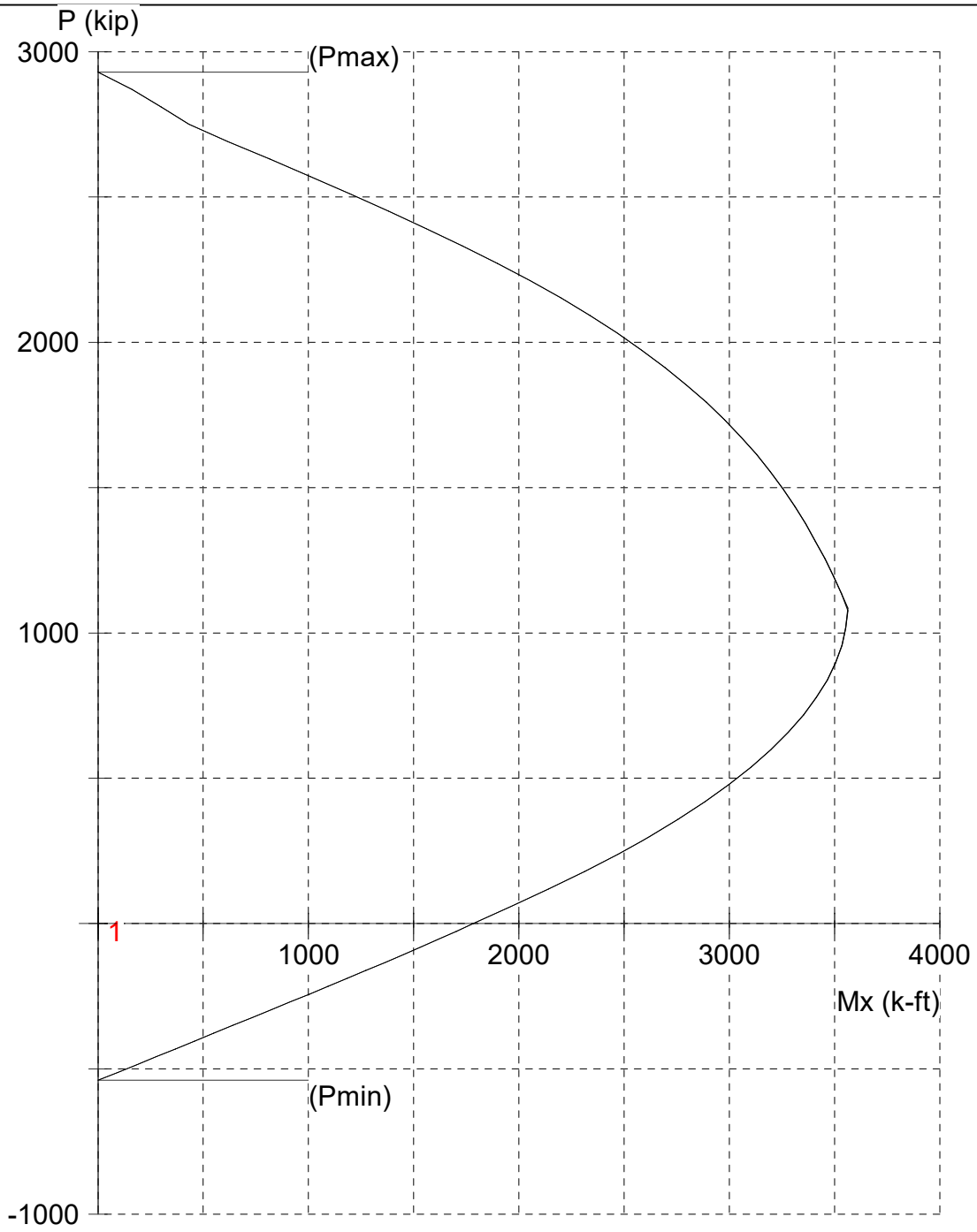
Slenderness: Not considered

Column type: Structural

Bars: ASTM A615

Date: 10/19/21

Time: 16:24:41



STRUCTUREPOINT - spColumn v7.00 (TM). Licensed to: Structus, Inc.. License ID: 73350-1074749-4-1ED57-26C3E

File: P:\Public\2018 Projects\1806-5 Cable Car Barn Seismic Evaluation\Calc\SP-Col\Wall and Boundary El...\7ftwall #4at8.col

Project:

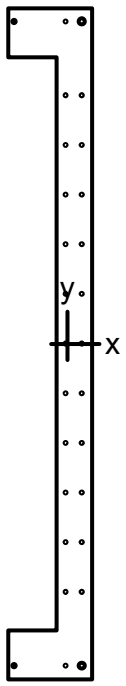
Column:

Engineer:

f'c = 4.5 ksi	fy = 75 ksi	Ag = 632 in^2	24 bars
Ec = 3824 ksi	Es = 29000 ksi	As = 7.20 in^2	rho = 1.14%
fc = 3.825 ksi	e_yt = 0.00258621 in/in	Xo = 0.00 in	Ix = 481867 in^4
e_u = 0.003 in/in		Yo = -0.00 in	Iy = 7196.39 in^4
Beta1 = 0.825		Min clear spacing = 1.93 in	Clear cover = N/A

Confinement: Other

phi(a) = 1, phi(b) = 1, phi(c) = 1



14 x 111 in

Code: ACI 318-14

Units: English

Run axis: About X-axis

Run option: Investigation

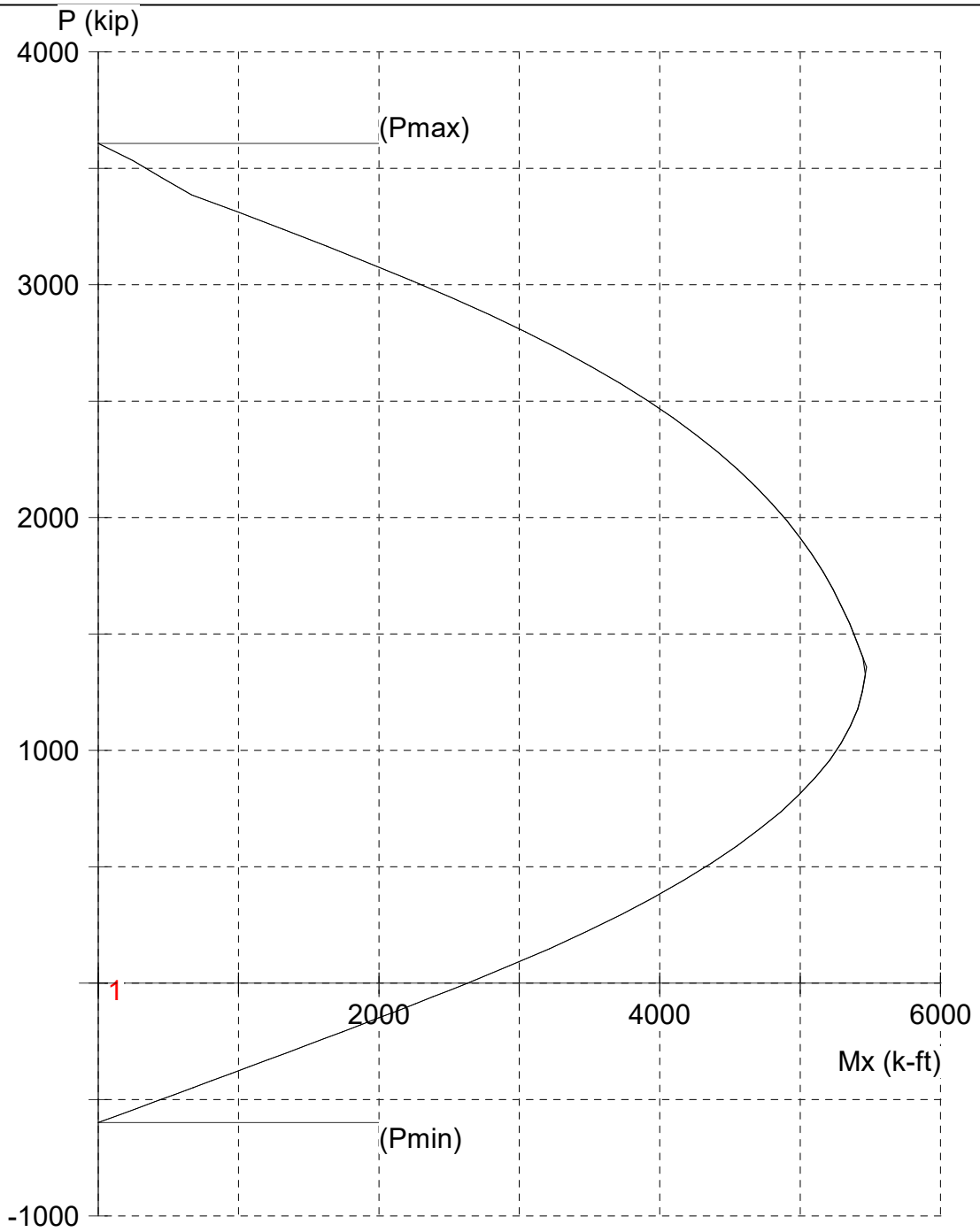
Slenderness: Not considered

Column type: Structural

Bars: ASTM A615

Date: 10/19/21

Time: 16:26:11



STRUCTUREPOINT - spColumn v7.00 (TM). Licensed to: Structus, Inc.. License ID: 73350-1074749-4-1ED57-26C3E

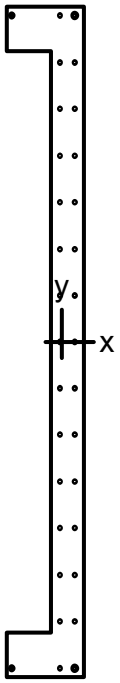
File: P:\Public\2018 Projects\1806-5 Cable Car Barn Seismic Evaluation\Calc\SP-Col\Wall and Boundary...\9.25ftwall #4at8.col

Project:

Column:		Engineer:	
f'c = 4.5 ksi	fy = 75 ksi	Ag = 794 in^2	28 bars
Ec = 3824 ksi	Es = 29000 ksi	As = 8.00 in^2	rho = 1.01%
fc = 3.825 ksi	e_yt = 0.00258621 in/in	Xo = -0.00 in	Ix = 1.02399e+006 in^4
e_u = 0.003 in/in		Yo = -0.00 in	Iy = 7941.56 in^4
Beta1 = 0.825		Min clear spacing = 1.93 in	Clear cover = N/A

Confinement: Other

phi(a) = 1, phi(b) = 1, phi(c) = 1



14 x 120 in

Code: ACI 318-14

Units: English

Run axis: About X-axis

Run option: Investigation

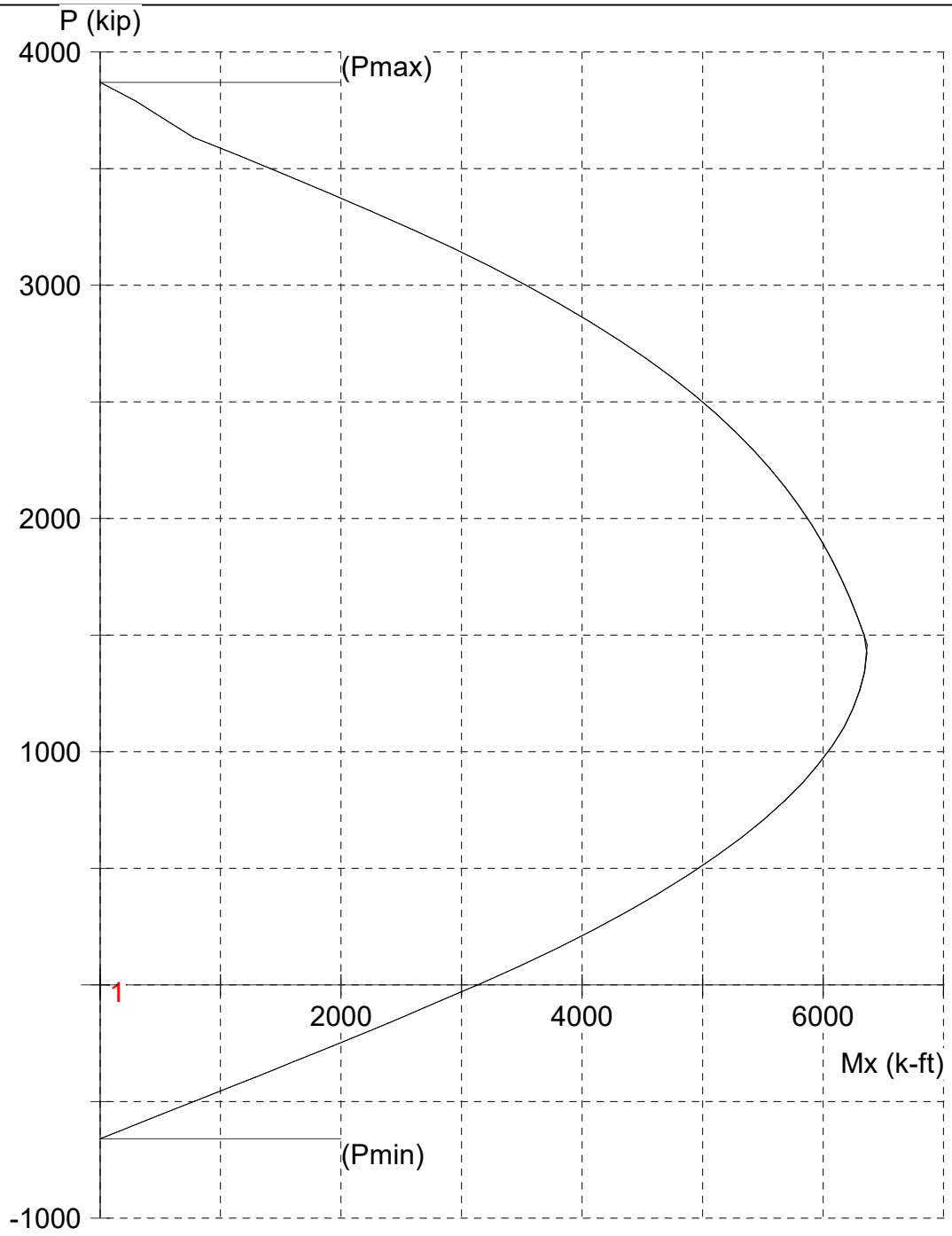
Slenderness: Not considered

Column type: Structural

Bars: ASTM A615

Date: 10/19/21

Time: 16:26:38



STRUCTUREPOINT - spColumn v7.00 (TM). Licensed to: Structus, Inc.. License ID: 73350-1074749-4-1ED57-26C3E

File: P:\Public\2018 Projects\1806-5 Cable Car Barn Seismic Evaluation\Calc\SP-Col\Wall and Boundary ...\10ft wall #4at8.col

Project:

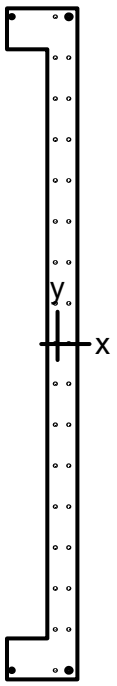
Column:

Engineer:

f'c = 4.5 ksi	fy = 75 ksi	Ag = 848 in^2	32 bars
Ec = 3824 ksi	Es = 29000 ksi	As = 8.80 in^2	rho = 1.04%
fc = 3.825 ksi	e_yt = 0.00258621 in/in	Xo = 0.00 in	Ix = 1.26609e+006 in^4
e_u = 0.003 in/in		Yo = -0.00 in	Iy = 8167.95 in^4
Beta1 = 0.825		Min clear spacing = 1.93 in	Clear cover = N/A

Confinement: Other

phi(a) = 1, phi(b) = 1, phi(c) = 1



14 x 132 in

Code: ACI 318-14

Units: English

Run axis: About X-axis

Run option: Investigation

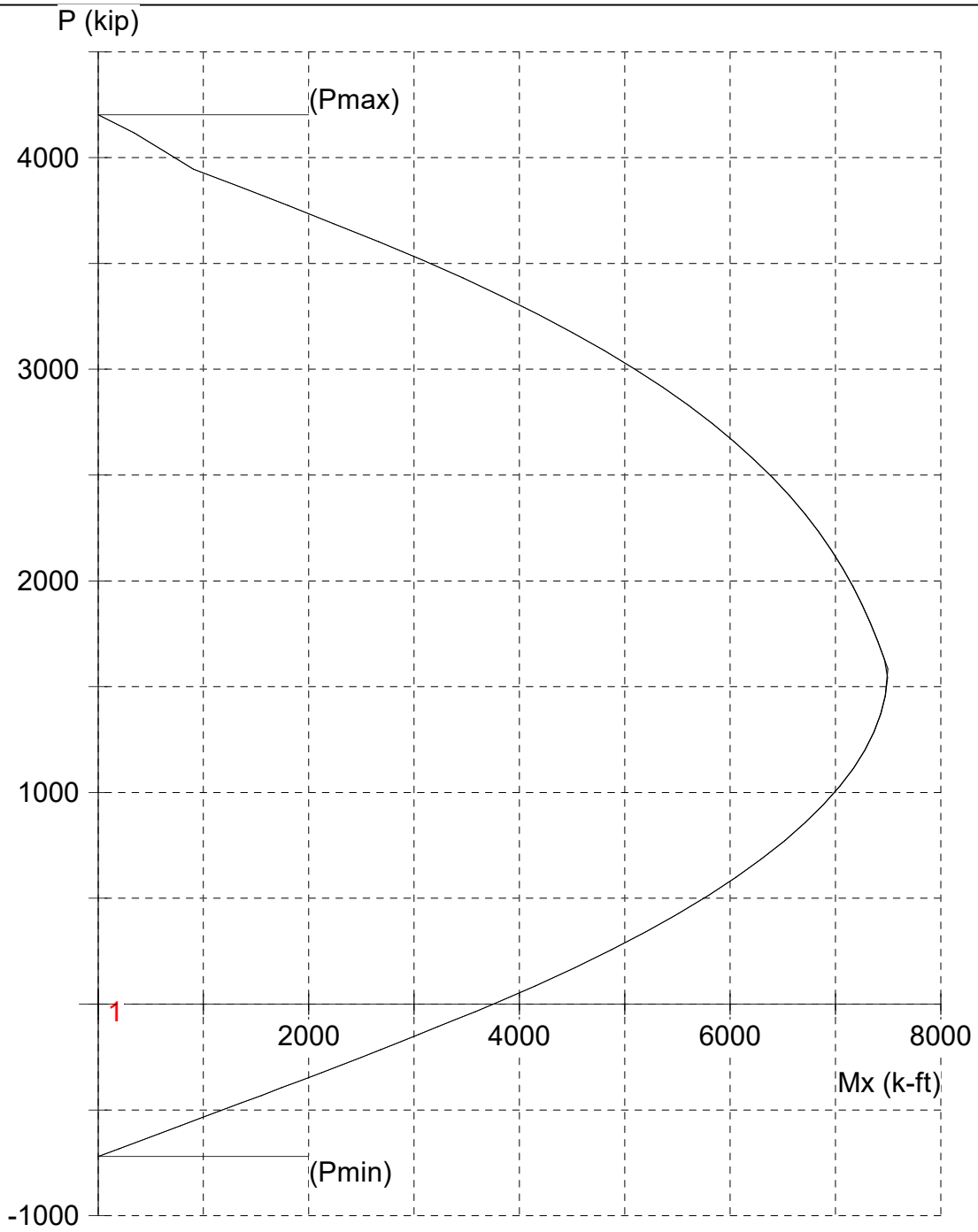
Slenderness: Not considered

Column type: Structural

Bars: ASTM A615

Date: 10/19/21

Time: 16:27:04



STRUCTUREPOINT - spColumn v7.00 (TM). Licensed to: Structus, Inc.. License ID: 73350-1074749-4-1ED57-26C3E

File: P:\Public\2018 Projects\1806-5 Cable Car Barn Seismic Evaluation\Calc\SP-Col\Wall and Boundary E...\11ftwall #4at8.col

Project:

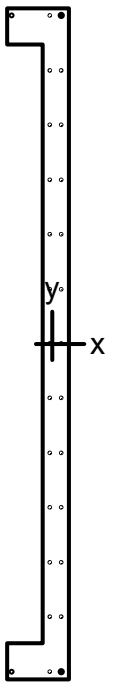
Column:

Engineer:

f'c = 4.5 ksi	fy = 75 ksi	Ag = 920 in^2	36 bars
Ec = 3824 ksi	Es = 29000 ksi	As = 9.60 in^2	rho = 1.04%
fc = 3.825 ksi	e_yt = 0.00258621 in/in	Xo = 0.00 in	Ix = 1.6427e+006 in^4
e_u = 0.003 in/in		Yo = -0.00 in	Iy = 8458.04 in^4
Beta1 = 0.825		Min clear spacing = 1.93 in	Clear cover = N/A

Confinement: Other

phi(a) = 1, phi(b) = 1, phi(c) = 1



14 x 150 in

Code: ACI 318-14

Units: English

Run axis: About X-axis

Run option: Investigation

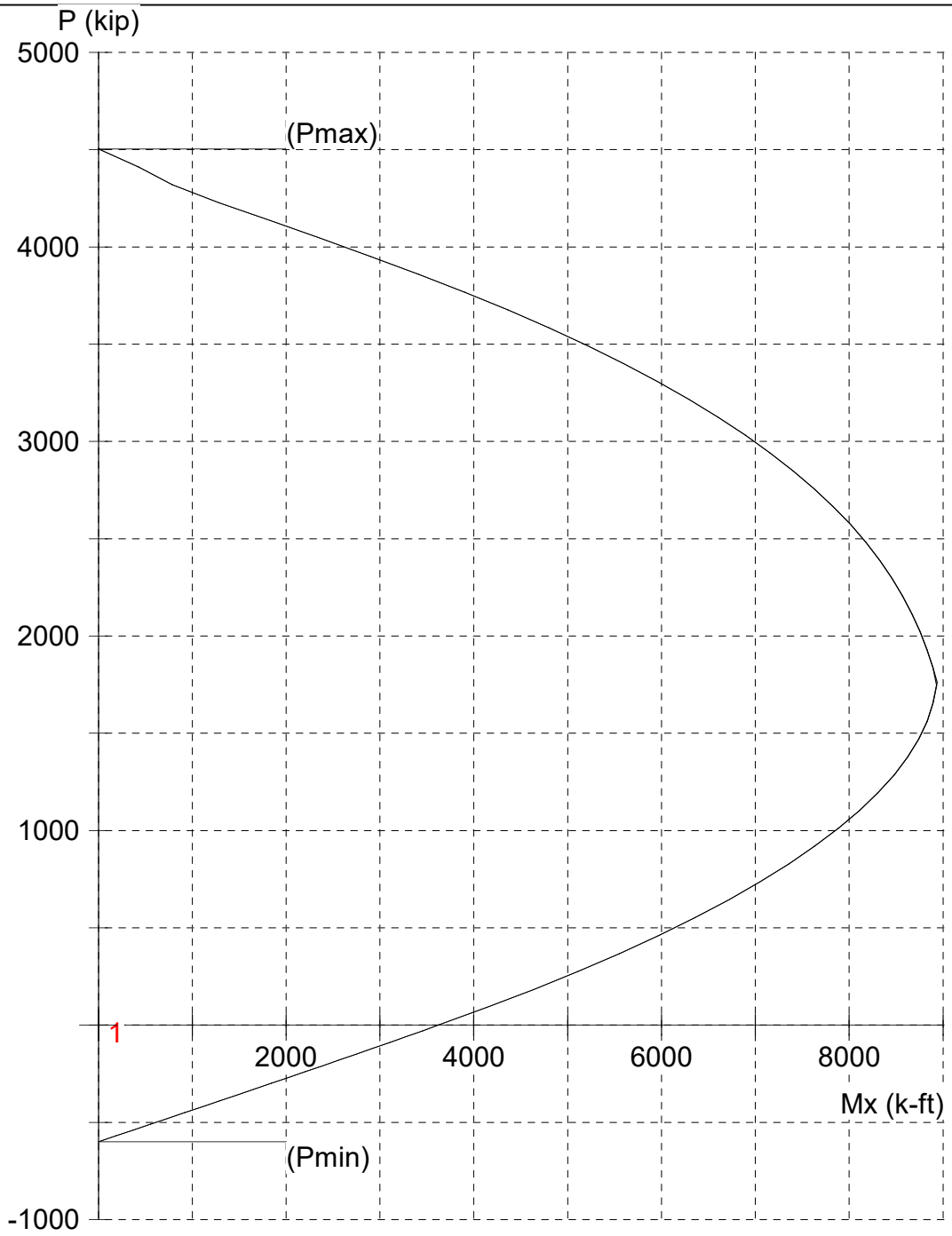
Slenderness: Not considered

Column type: Structural

Bars: ASTM A615

Date: 10/19/21

Time: 16:27:33



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File: P:\Public\2018 Projects\1806-5 Cable Car Barn Seismic Evaluation\Calc\SP-Col\Wall and Boundary...\12.5ftwall #4at8.col

Project:

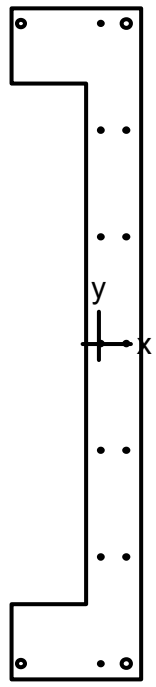
Column:

Engineer:

f'c = 4.5 ksi	fy = 75 ksi	Ag = 1028 in^2	28 bars
Ec = 3824 ksi	Es = 29000 ksi	As = 8.00 in^2	rho = 0.78%
fc = 3.825 ksi	e_yt = 0.00258621 in/in	Xo = 0.00 in	Ix = 2.33343e+006 in^4
e_u = 0.003 in/in		Yo = -0.00 in	Iy = 8873.72 in^4
Beta1 = 0.825		Min clear spacing = 1.93 in	Clear cover = N/A

Confinement: Other

phi(a) = 1, phi(b) = 1, phi(c) = 1



14 x 72 in

Code: ACI 318-14

Units: English

Run axis: About X-axis

Run option: Investigation

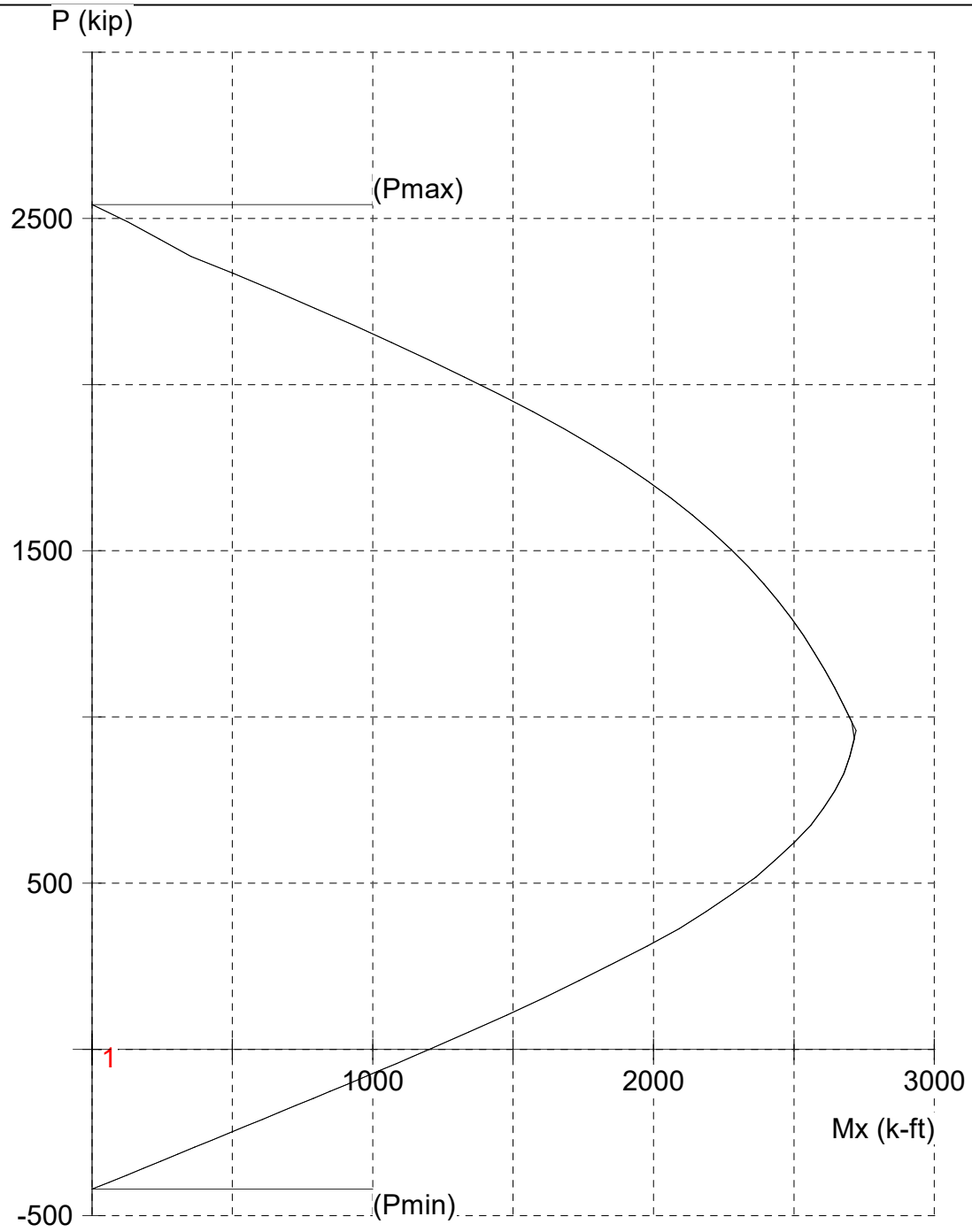
Slenderness: Not considered

Column type: Structural

Bars: ASTM A615

Date: 10/19/21

Time: 16:25:43



STRUCTUREPOINT - spColumn v7.00 (TM). Licensed to: Structus, Inc.. License ID: 73350-1074749-4-1ED57-26C3E

File: P:\Public\2018 Projects\1806-5 Cable Car Barn Seismic Evaluation\Calc\SP-Col\Wall and Boundary Element\8ft wall .col

Project:

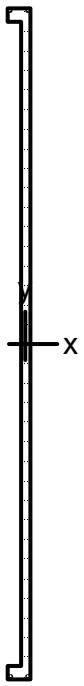
Column:

Engineer:

f'c = 4.5 ksi	fy = 75 ksi	Ag = 560 in^2	16 bars
Ec = 3824 ksi	Es = 29000 ksi	As = 5.60 in^2	rho = 1.00%
fc = 3.825 ksi	e_yt = 0.00258621 in/in	Xo = 0.00 in	Ix = 318379 in^4
e_u = 0.003 in/in		Yo = -0.00 in	Iy = 6817.07 in^4
Beta1 = 0.825		Min clear spacing = 1.93 in	Clear cover = N/A

Confinement: Other

phi(a) = 1, phi(b) = 1, phi(c) = 1



14 x 408 in

Code: ACI 318-14

Units: English

Run axis: About X-axis

Run option: Investigation

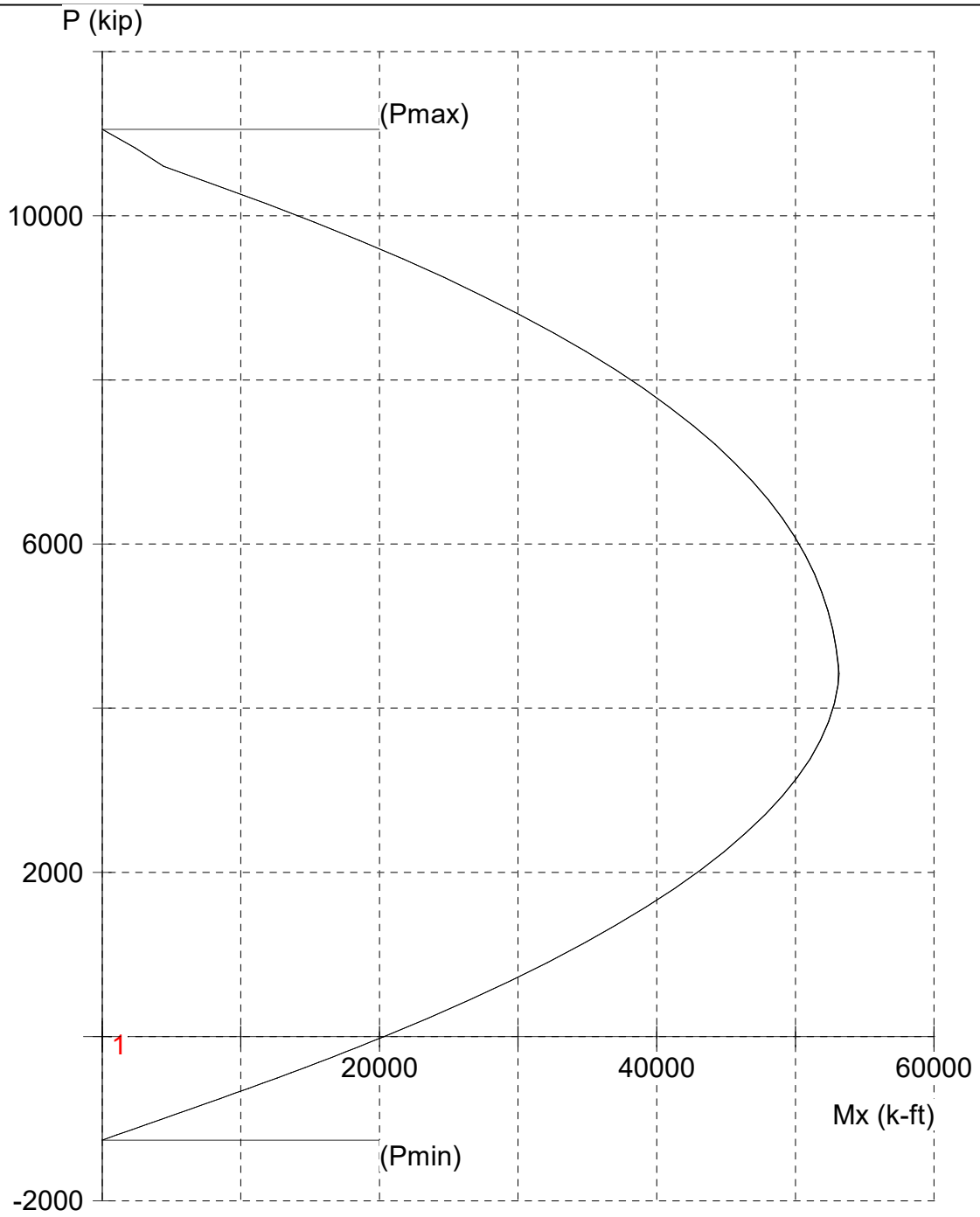
Slenderness: Not considered

Column type: Structural

Bars: ASTM A615

Date: 10/19/21

Time: 16:29:00



STRUCTUREPOINT - spColumn v7.00 (TM). Licensed to: Structus, Inc.. License ID: 73350-1074749-4-1ED57-26C3E

File: P:\Public\2018 Projects\1806-5 Cable Car Barn Seismic Evaluation\Calc\SP-Col\Wall and Boundary Element\34ft wall.col

Project:

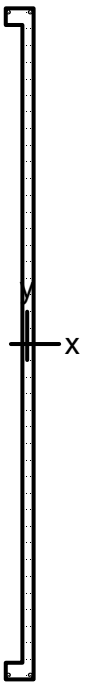
Column:

Engineer:

f'c = 4.5 ksi	fy = 75 ksi	Ag = 2576 in^2	72 bars
Ec = 3824 ksi	Es = 29000 ksi	As = 16.80 in^2	rho = 0.65%
fc = 3.825 ksi	e_yt = 0.00258621 in/in	Xo = -0.00 in	Ix = 3.90793e+007 in^4
e_u = 0.003 in/in		Yo = -0.00 in	Iy = 13987 in^4
Beta1 = 0.825		Min clear spacing = 1.93 in	Clear cover = N/A

Confinement: Other

phi(a) = 1, phi(b) = 1, phi(c) = 1



14 x 324 in

Code: ACI 318-14

Units: English

Run axis: About X-axis

Run option: Investigation

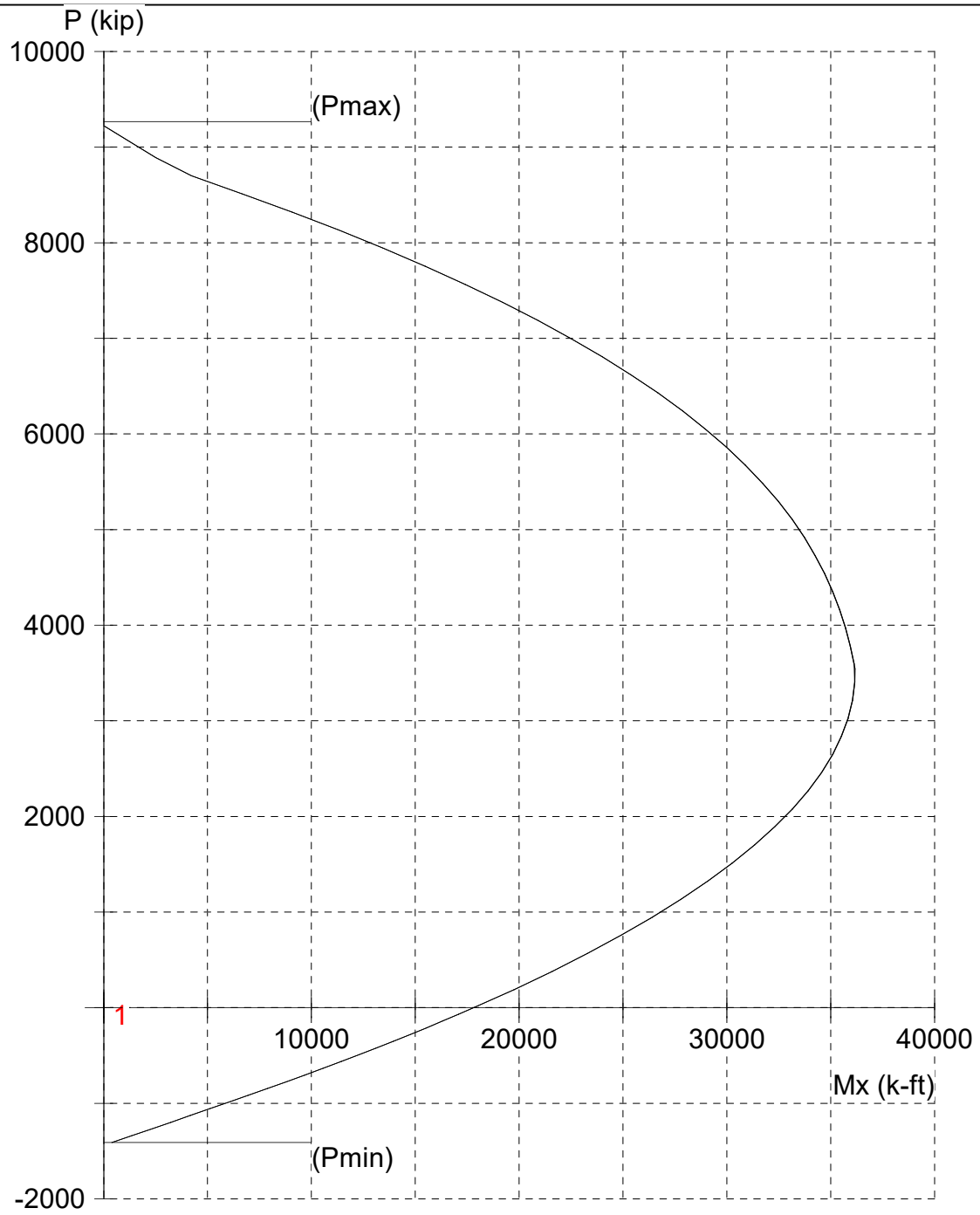
Slenderness: Not considered

Column type: Structural

Bars: ASTM A615

Date: 10/19/21

Time: 16:28:31



STRUCTUREPOINT - spColumn v7.00 (TM). Licensed to: Structus, Inc.. License ID: 73350-1074749-4-1ED57-26C3E

File: P:\Public\2018 Projects\1806-5 Cable Car Barn Seismic Evaluation\Calc\SP-Col\Wall and Boundary ...\27ft wall #4at8.col

Project:

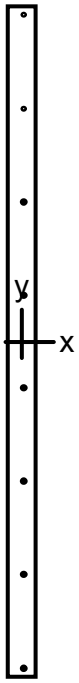
Column:

Engineer:

f'c = 4.5 ksi	fy = 75 ksi	Ag = 2072 in^2	84 bars
Ec = 3824 ksi	Es = 29000 ksi	As = 18.80 in^2	rho = 0.91%
fc = 3.825 ksi	e_yt = 0.00258621 in/in	Xo = -0.00 in	Ix = 2.02022e+007 in^4
e_u = 0.003 in/in		Yo = -0.00 in	Iy = 12399.2 in^4
Beta1 = 0.825		Min clear spacing = 1.93 in	Clear cover = N/A

Confinement: Other

phi(a) = 1, phi(b) = 1, phi(c) = 1



4 x 92 in

Code: ACI 318-14

Units: English

Run axis: About X-axis

Run option: Investigation

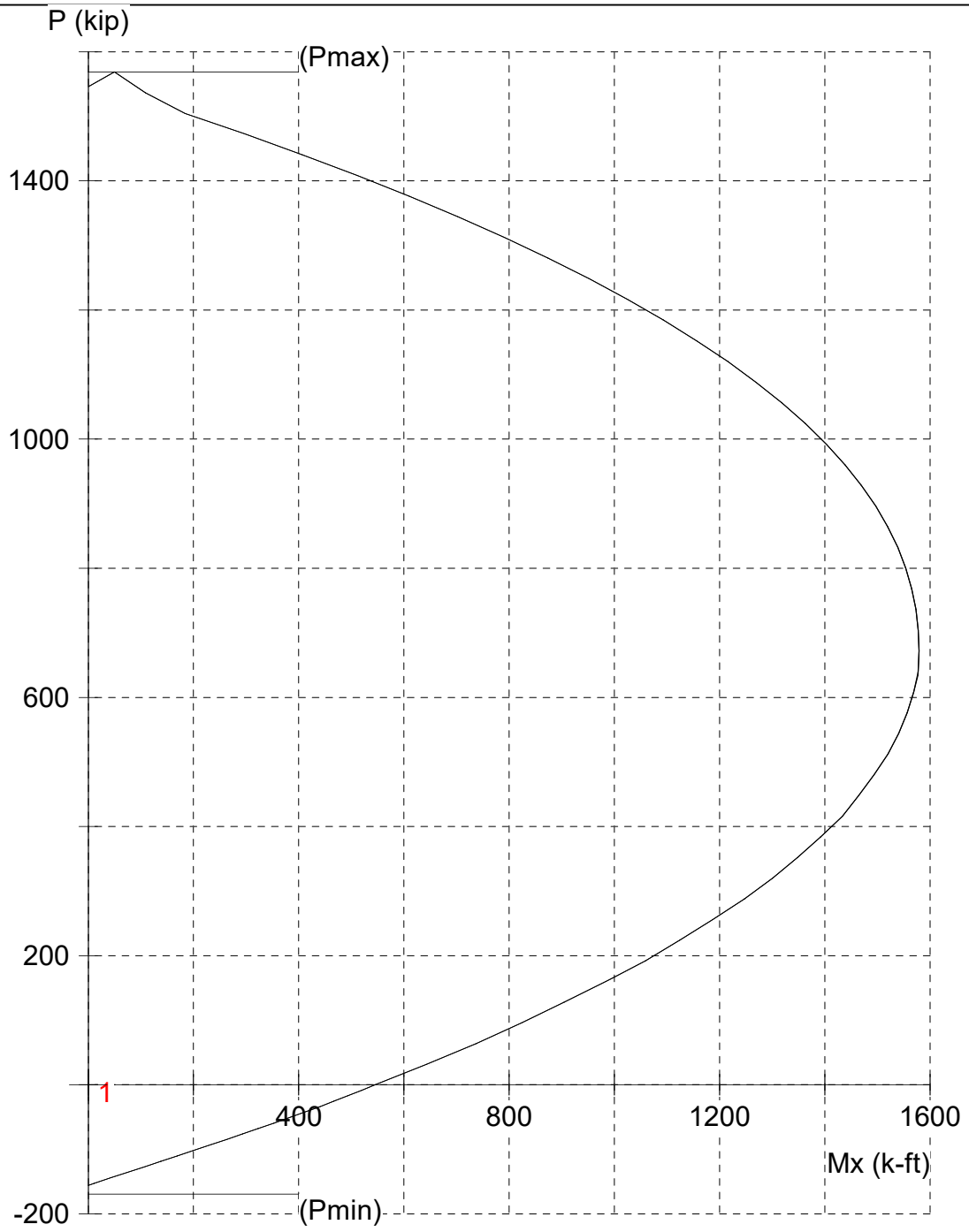
Slenderness: Not considered

Column type: Structural

Bars: ASTM A615

Date: 10/19/21

Time: 16:29:32



STRUCTUREPOINT - spColumn v7.00 (TM). Licensed to: Structus, Inc.. License ID: 73350-1074749-4-1ED57-26C3E

File: P:\Public\2018 Projects\1806-5 Cable Car Barn Seismic Evaluation\Calc\SP-Col\Wall and Boundary Element\E-2-S-21.col

Project:

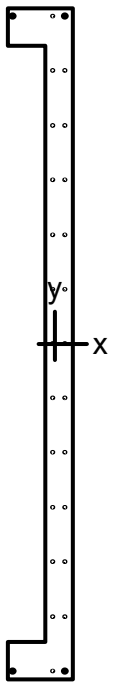
Column:

Engineer:

f'c = 4.5 ksi	fy = 75 ksi	Ag = 368 in^2	8 bars
Ec = 3824 ksi	Es = 29000 ksi	As = 2.26 in^2	rho = 0.61%
fc = 3.825 ksi	e_yt = 0.00258621 in/in	Xo = 0.00 in	Ix = 259563 in^4
e_u = 0.003 in/in		Yo = 0.00 in	Iy = 490.667 in^4
Beta1 = 0.825		Min clear spacing = 12.18 in	Clear cover = 0.87 in

Confinement: Other

phi(a) = 1, phi(b) = 1, phi(c) = 1



14 x 144 in

Code: ACI 318-14

Units: English

Run axis: About X-axis

Run option: Investigation

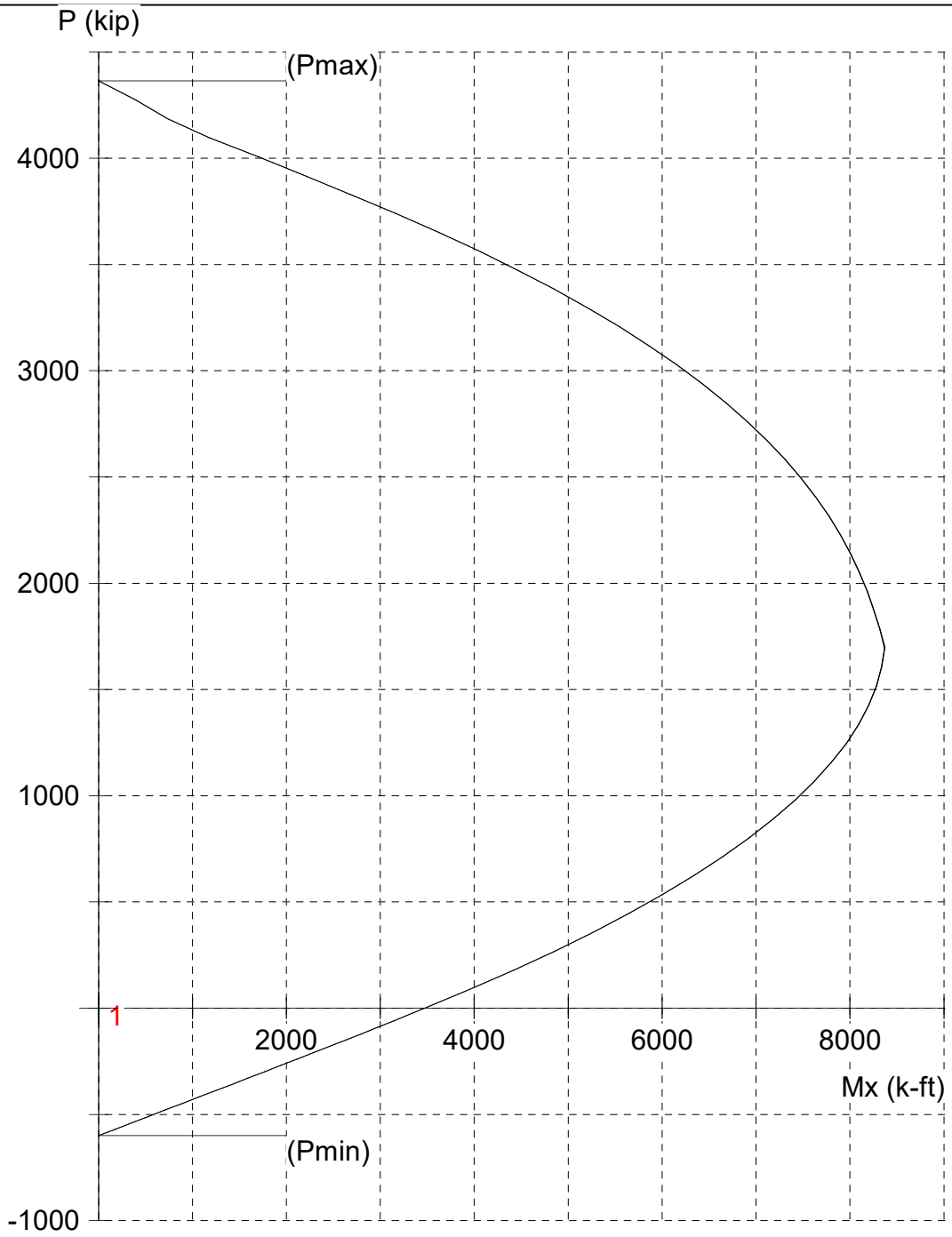
Slenderness: Not considered

Column type: Structural

Bars: ASTM A615

Date: 10/19/21

Time: 16:28:01



STRUCTUREPOINT - spColumn v7.00 (TM). Licensed to: Structus, Inc.. License ID: 73350-1074749-4-1ED57-26C3E

File: P:\Public\2018 Projects\1806-5 Cable Car Barn Seismic Evaluation\Calc\SP-Col\Wall and Boundary Element\12ft wall.col

Project:

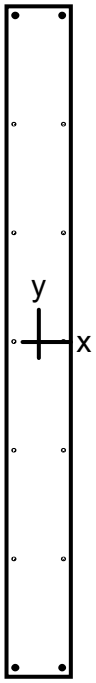
Column:

Engineer:

f'c = 4.5 ksi	fy = 75 ksi	Ag = 992 in^2	28 bars
Ec = 3824 ksi	Es = 29000 ksi	As = 8.00 in^2	rho = 0.81%
fc = 3.825 ksi	e_yt = 0.00258621 in/in	Xo = 0.00 in	Ix = 2.08555e+006 in^4
e_u = 0.003 in/in		Yo = -0.00 in	Iy = 8737.38 in^4
Beta1 = 0.825		Min clear spacing = 1.93 in	Clear cover = N/A

Confinement: Other

phi(a) = 1, phi(b) = 1, phi(c) = 1



14 x 144 in

Code: ACI 318-14

Units: English

Run axis: About X-axis

Run option: Investigation

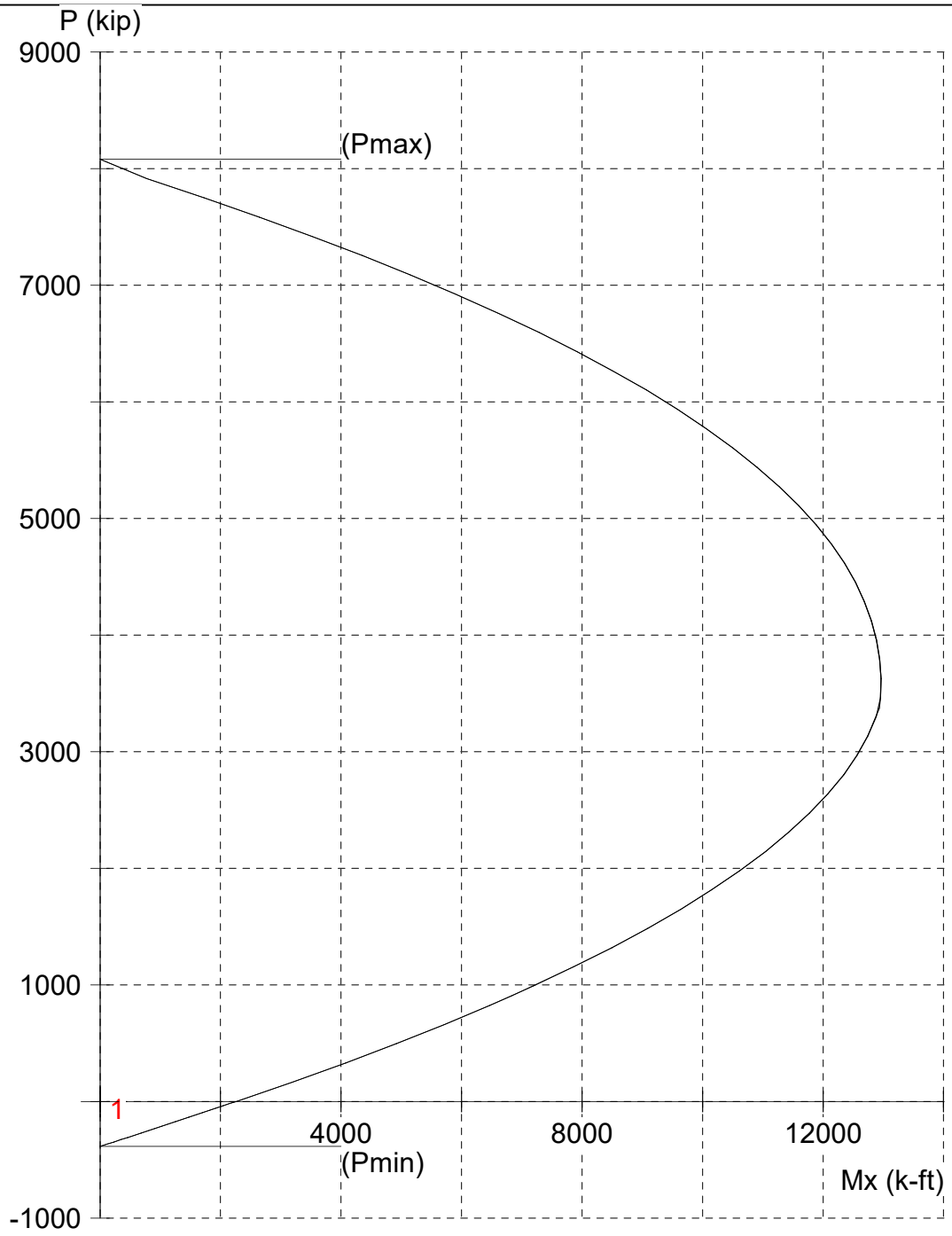
Slenderness: Not considered

Column type: Structural

Bars: ASTM A615

Date: 10/19/21

Time: 16:30:04



STRUCTUREPOINT - spColumn v7.00 (TM). Licensed to: Structus, Inc.. License ID: 73350-1074749-4-1ED57-26C3E

File: P:\Public\2018 Projects\1806-5 Cable Car Barn Seismic Evaluation\Calc\SP-Col...\equivalent reactangular 12ft wall.col

Project:

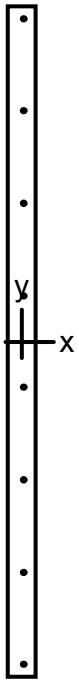
Column:

Engineer:

f'c = 4.5 ksi	fy = 75 ksi	Ag = 2016 in^2	14 bars
Ec = 3824 ksi	Es = 29000 ksi	As = 5.16 in^2	rho = 0.26%
fc = 3.825 ksi	e_yt = 0.00258621 in/in	Xo = 0.00 in	Ix = 3.48365e+006 in^4
e_u = 0.003 in/in		Yo = 0.00 in	Iy = 32928 in^4
Beta1 = 0.825		Min clear spacing = 9.25 in	Clear cover = 1.37 in

Confinement: Other

phi(a) = 1, phi(b) = 1, phi(c) = 1



4 x 93 in

Code: ACI 318-14

Units: English

Run axis: About X-axis

Run option: Investigation

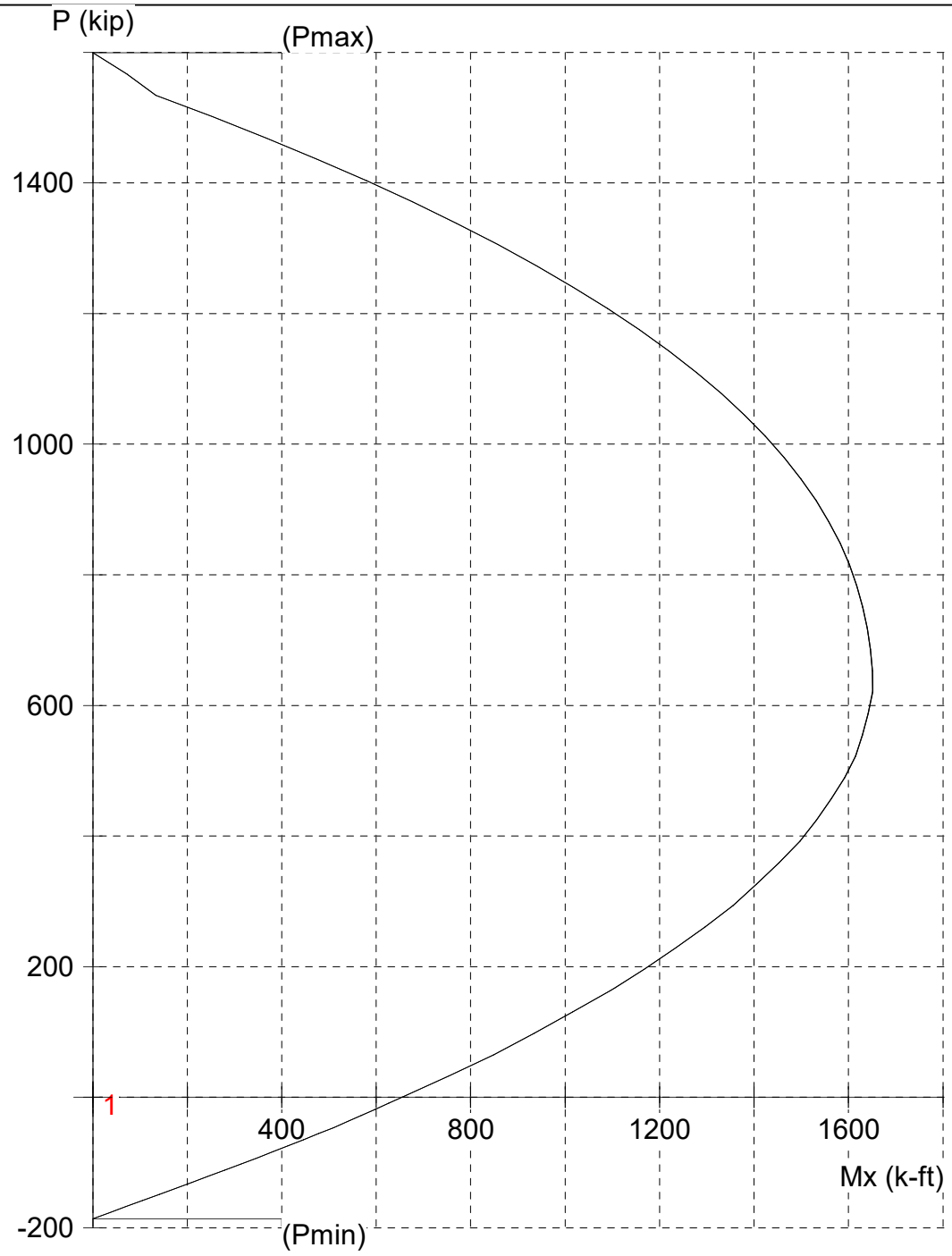
Slenderness: Not considered

Column type: Structural

Bars: ASTM A615

Date: 10/19/21

Time: 16:31:33



STRUCTUREPOINT - spColumn v7.00 (TM). Licensed to: Structus, Inc.. License ID: 73350-1074749-4-1ED57-26C3E

File: P:\Public\2018 Projects\1806-5 Cable Car Barn Seismic Evaluation\Calc\SP-Col\Wall and Boundary Element\S-1-S-01.col

Project:

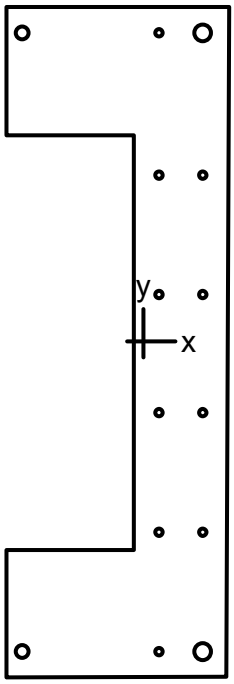
Column:

Engineer:

f'c = 4.5 ksi	fy = 75 ksi	Ag = 372 in^2	8 #5 bars
Ec = 3824 ksi	Es = 29000 ksi	As = 2.48 in^2	rho = 0.67%
fc = 3.825 ksi	e_yt = 0.00258621 in/in	Xo = 0.00 in	Ix = 268119 in^4
e_u = 0.003 in/in		Yo = 0.00 in	Iy = 496 in^4
Beta1 = 0.825		Min clear spacing = 12.18 in	Clear cover = 1.37 in

Confinement: Other

phi(a) = 1, phi(b) = 1, phi(c) = 1



14 x 42 in

Code: ACI 318-14

Units: English

Run axis: About X-axis

Run option: Investigation

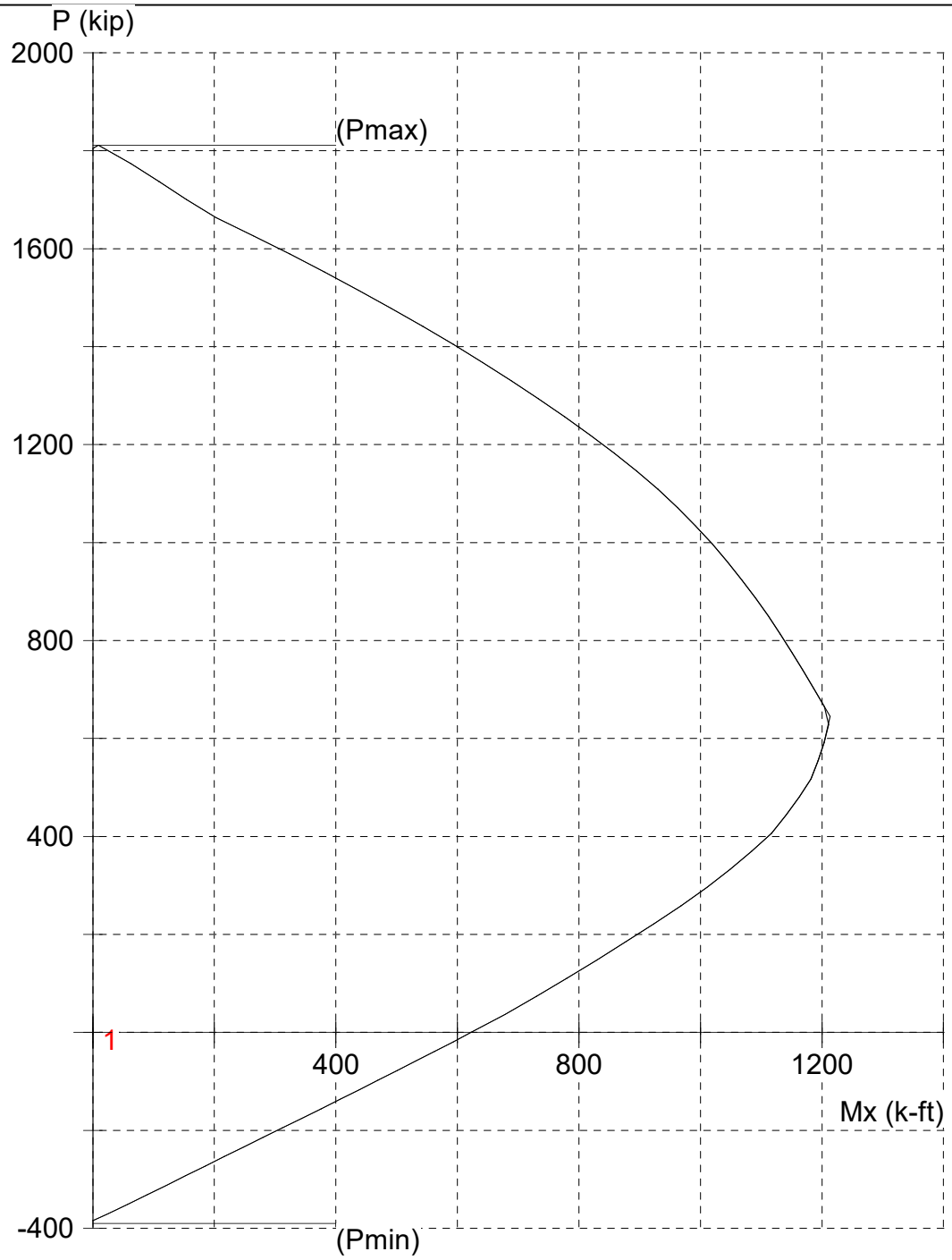
Slenderness: Not considered

Column type: Structural

Bars: ASTM A615

Date: 10/19/21

Time: 16:32:01



STRUCTUREPOINT - spColumn v7.00 (TM). Licensed to: Structus, Inc.. License ID: 73350-1074749-4-1ED57-26C3E

File: P:\Public\2018 Projects\1806-5 Cable Car Barn Seismic Evaluation\Calc\SP-Col\Wall and B...\South East wall corner.col

Project:

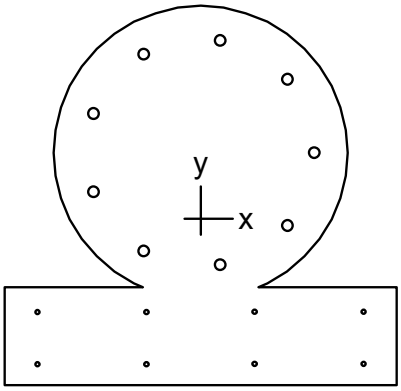
Column:

Engineer:

f'c = 4.5 ksi	fy = 75 ksi	Ag = 376.538 in^2	14 bars
Ec = 3824 ksi	Es = 29000 ksi	As = 5.20 in^2	rho = 1.38%
fc = 3.825 ksi	e_yt = 0.00258621 in/in	Xo = 0.00 in	Ix = 74140.8 in^4
e_u = 0.003 in/in		Yo = -0.00 in	Iy = 5503.64 in^4
Beta1 = 0.825		Min clear spacing = 1.93 in	Clear cover = N/A

Confinement: Other

phi(a) = 1, phi(b) = 1, phi(c) = 1



48 x 46.497 in

Code: ACI 318-11

Units: English

Run axis: About X-axis

Run option: Investigation

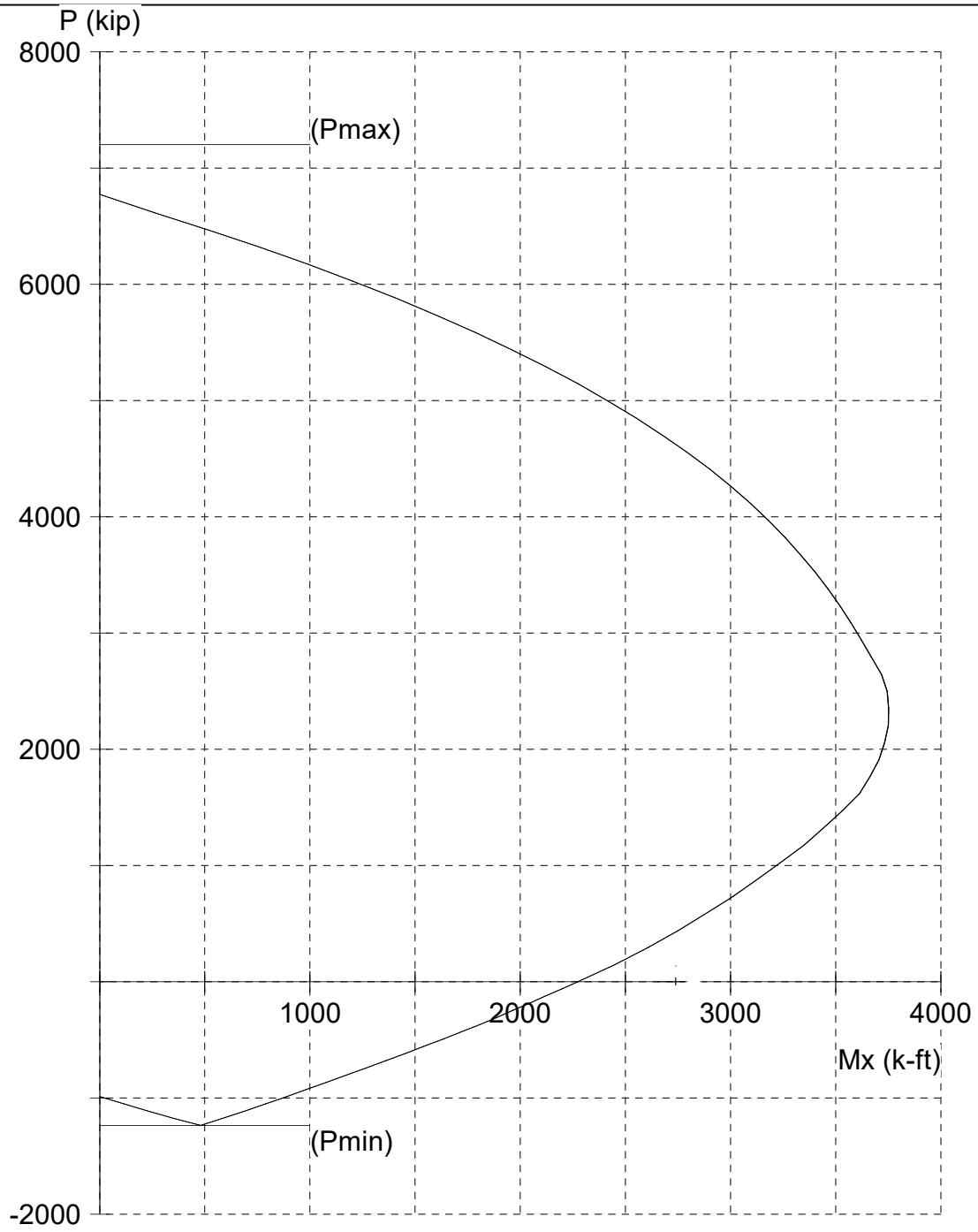
Slenderness: Not considered

Column type: Structural

Bars: ASTM A615

Date: 10/19/21

Time: 16:30:39



STRUCTUREPOINT - spColumn v7.00 (TM). Licensed to: Structus, Inc.. License ID: 73350-1074749-4-1ED57-26C3E

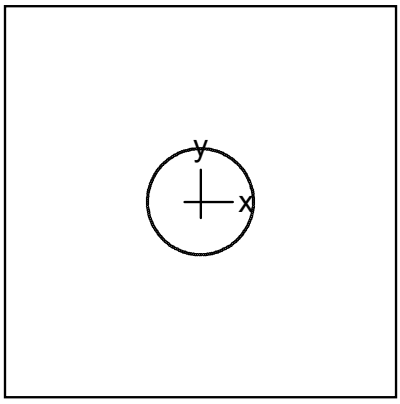
File: P:\Public\2018 Projects\1806-5 Cable Car Barn Seismic Evaluation\Calc\SP-Col\Wall and Boun...\retainning structure.col

Project:

Column:		Engineer:	
f'c = 4.5 ksi	fy = 75 ksi	Ag = 1575.69 in^2	17 bars
Ec = 3824 ksi	Es = 29000 ksi	As = 16.52 in^2	rho = 1.05%
fc = 3.825 ksi	e_yt = 0.00258621 in/in	Xo = 0.00 in	Ix = 273449 in^4
e_u = 0.003 in/in		Yo = 0.00 in	Iy = 192222 in^4
Beta1 = 0.825		Min clear spacing = 5.74 in	Clear cover = N/A

Confinement: Other

phi(a) = 1, phi(b) = 1, phi(c) = 1



180 x 180 in

Code: ACI 318-19

Units: English

Run axis: About X-axis

Run option: Investigation

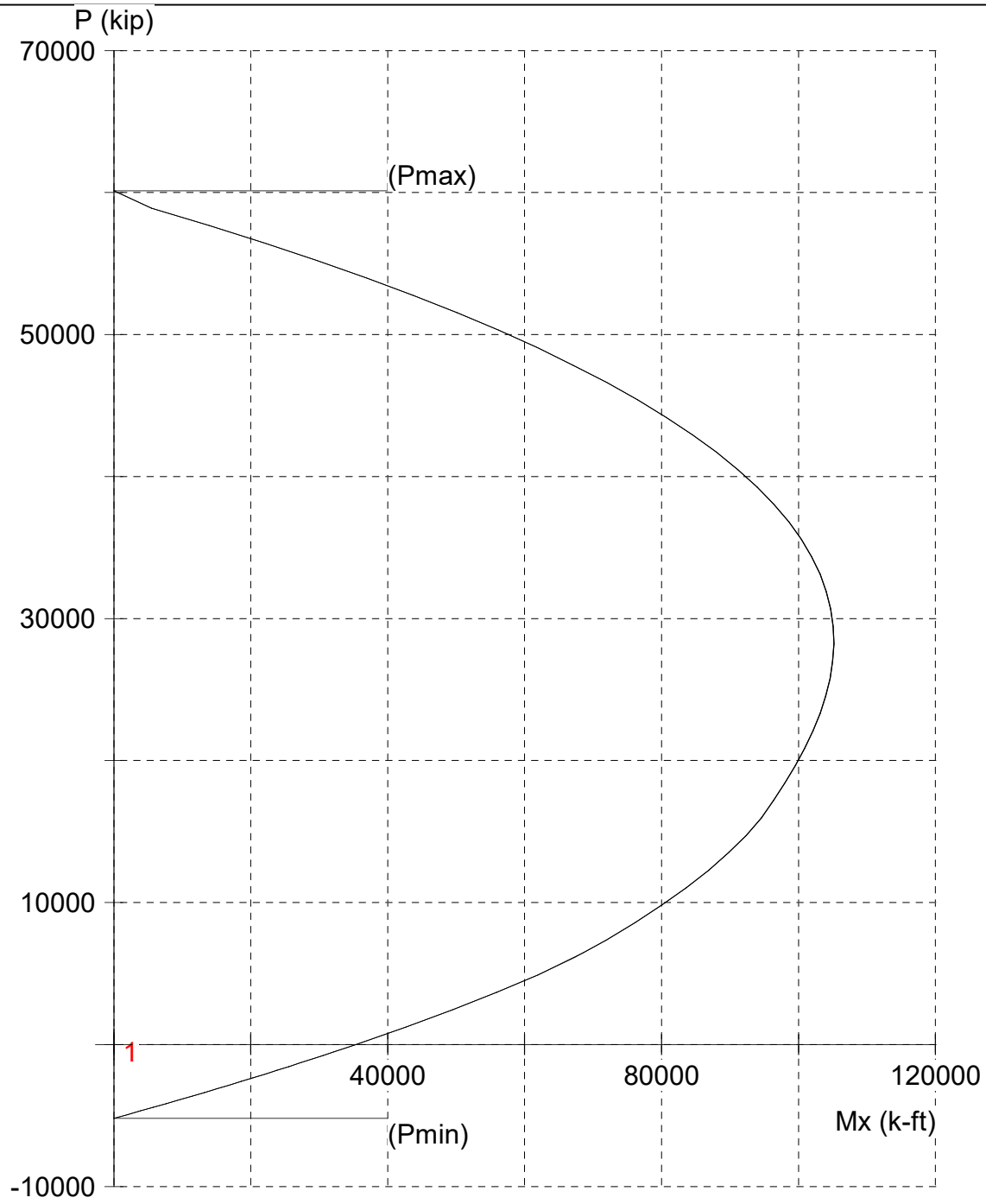
Slenderness: Not considered

Column type: Structural

Bars: ASTM A615

Date: 10/19/21

Time: 16:32:40



STRUCTUREPOINT - spColumn v7.00 (TM). Licensed to: Structus, Inc.. License ID: 73350-1074749-4-1ED57-26C3E

File: P:\Public\2018 Projects\1806-5 Cable Car Barn Seismic Evaluation\Calc\SP-Col\Chimney-v2.col

Project:

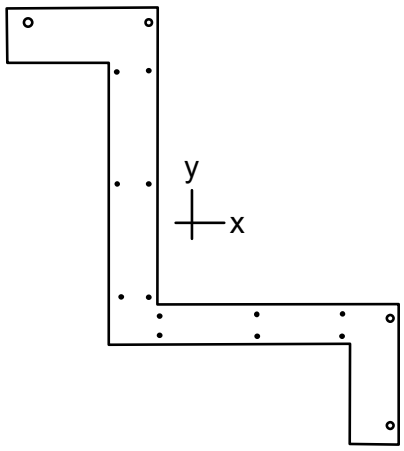
Column:

Engineer:

f'c = 2 ksi	fy = 54.6 ksi	Ag = 32400 in^2	159 #7 bars
Ec = 2549 ksi	Es = 29000 ksi	As = 95.40 in^2	rho = 0.29%
fc = 1.7 ksi	e_yt = 0.00188276 in/in	Xo = 0.00 in	Ix = 8.748e+007 in^4
e_u = 0.003 in/in		Yo = 0.00 in	Iy = 8.748e+007 in^4
Beta1 = 0.85		Min clear spacing = 0.09 in	Clear cover = 65.13 in

Confinement: Other

phi(a) = 1, phi(b) = 1, phi(c) = 1



48.6167 x 54.2521 in

Code: ACI 318-14

Units: English

Run axis: About X-axis

Run option: Investigation

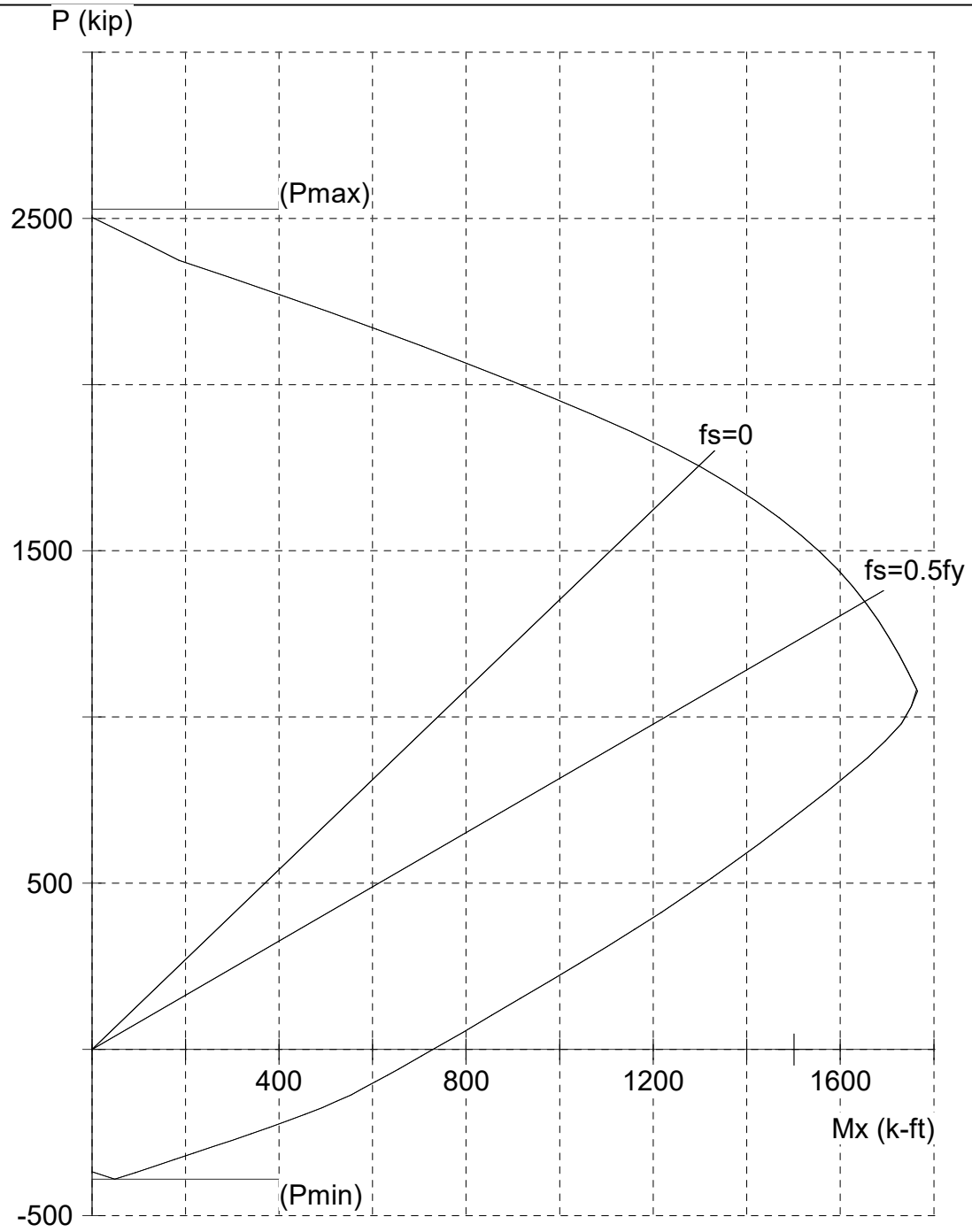
Slenderness: Not considered

Column type: Structural

Bars: ASTM A615

Date: 10/20/21

Time: 15:47:39



STRUCTUREPOINT - spColumn v7.00 (TM). Licensed to: Structus, Inc.. License ID: 73350-1074749-4-1ED57-26C3E

File: P:\Public\2018 Projects\1806-5 Cable Car Barn Seismic Evaluation\Calc\SP-Col\Wall and Boundary El...\SE Corner 1.col

Project:

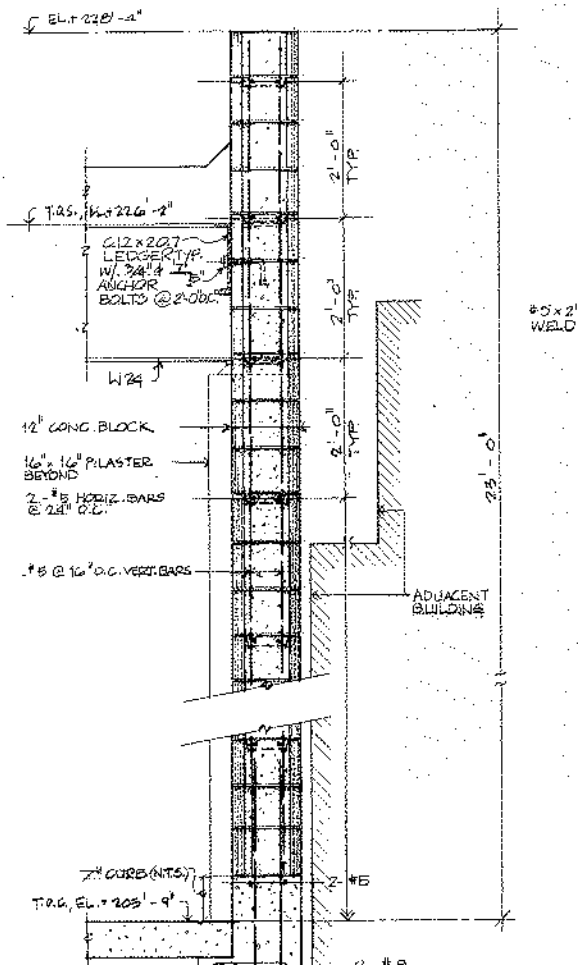
Column: Engineer:

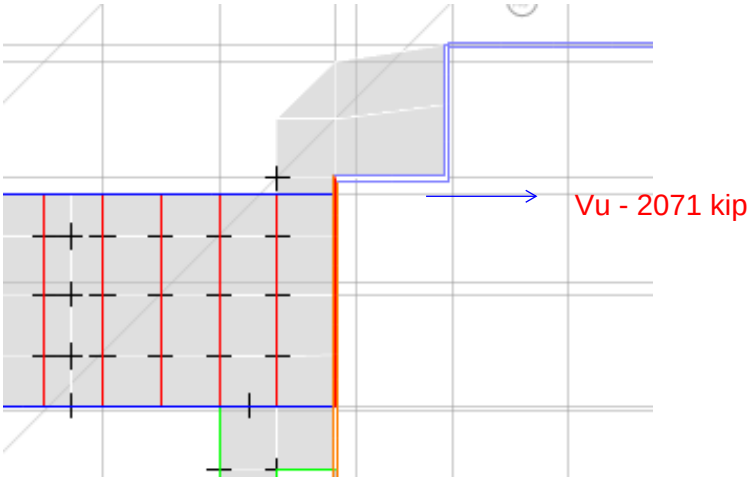
f'c = 4.5 ksi	fy = 75 ksi	Ag = 563.967 in^2	16 bars
Ec = 3824 ksi	Es = 29000 ksi	As = 5.20 in^2	rho = 0.92%
fc = 3.825 ksi	e_yt = 0.00258621 in/in	Xo = -0.00 in	Ix = 151518 in^4
e_u = 0.003 in/in		Yo = 0.00 in	Iy = 106111 in^4
Beta1 = 0.825		Min clear spacing = 1.89 in	Clear cover = N/A

Confinement: Other

phi(a) = 1, phi(b) = 1, phi(c) = 1

CMU wall output





Demand Prameters				
C_1	C_2	J	χ	κ
1	1	1	1	0.9

(knowledge factor per ASCE 41-17 Table 6-1 or section 6.2.4.4)

Wall Geometry		
Height	Length	Thickness
(ft)	(ft)	(in)
22	16	12

Material Properties			
Grout f'$_{cl}$	f'$_{ce}$	f_{yl}	f_{ye}
psi	psi	psi	psi
1900	2850	60000	75000

	# Layers	Bar Size	As	Spacing
			in^2	in
H Reinf	2	#5	0.31	24
V Reinf	2	#5	0.31	16

Design Loads				
P_D	P_L	P_E	V_E	M_E
kip	kip	kip	kip	kip-ft
0	0	0	2071	11975

(Compression negative, tension positive)

P_{CL}
kip
4377.6
Pu>0.1Pcl

Shear Strength

A_{cv} (in^2)	h_w/l_w		λ	ρ_t
2304	1.38		1	0.0022

ρ_t >= 0.0015 Deformation Controlled Wall per 10.7.2.3

Forced Controlled: NO (YES/NO)

Force-Controlled

V_{CL}	V_{UF}
kip	kip
NA	2071
DCR_V =	NA

Deformation Controlled

V_{CE}	V_U
kip	kip
462.7	2071
DCR_V =	448%

Flexural Strength

β_1	Rows
0.85	13

Nominal flexural strength using lower bound material propoerties, are determined as follows:

Assume "c"	β_1 c	Equivalent I	Approx As	Approx d	A's	d'	Calc a	ΔMn	Mn
in	in	in	in^2	in	in^2	in	in	kip-ft	kip-ft
19.3	16.41	206	6.38	117.47	0.38	21.47	16.46	48.80	4405

Adjust C47 such that D47 gets close to J47

M_UD 11975 kip-ft

DCR_M = 272%

Governing Action

DCR_M < DCR_V => Shear Controlled

m-factor

Assuming not confined by boundary elements
Assuming collapse prevention
Component Type Primary

[(As-A's)fyE + P]/(tw lw f'cE) = 0.05
V/(tw lw sqrt(f'cE)) = 16.84

Flexure Controlled, m-factor = 2.50
Shear Controlled, m-factor = 3

Acceptance Demand Capacity Ratio (DCR)

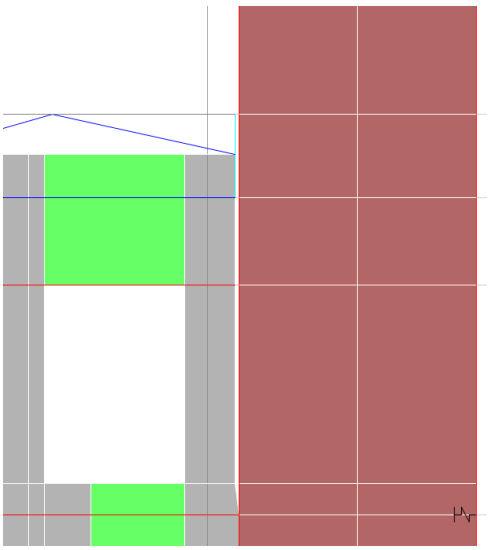
m-factor = 3 (used)

Acceptance Criteria per: Deformation Controlled Wall (per 10.7.2.3)

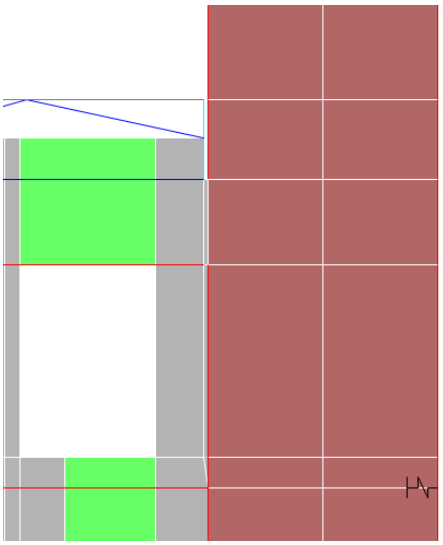
Acceptance DCR_V = 166%
Acceptance DCR_M = 101%

Additional study for the retrofit:

Add new shear wall, steel plate or rc below with collector at main roof level to establish a direct load path for seismic force in n-s direction. See the snapshot below of the diaphragm force changes:

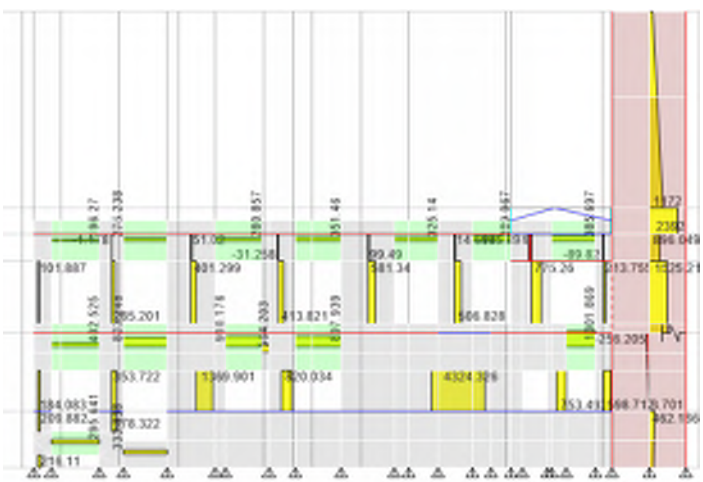


Model-A, a gap between south wall and chimney

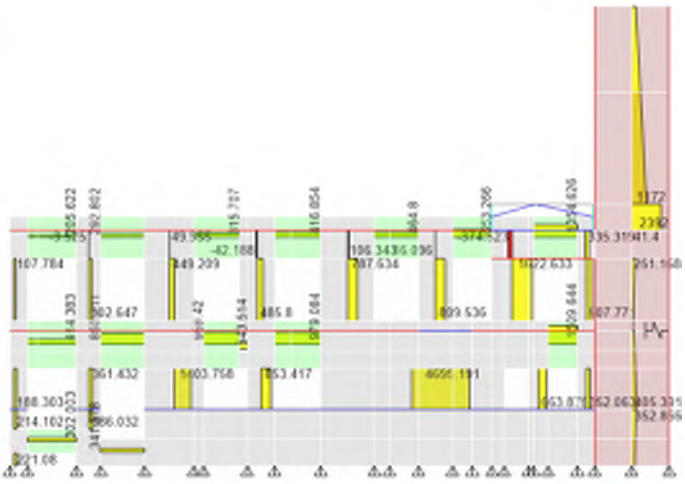


Model-B, connect south wall and chimney with rigid link

Modeling of the Chimney - Connection vs Disconnection



Model-A



Model-B

Shear output under the Y-direction Seismic Load

Additional study for the retrofit:

See the table below of the South wall piers and spandrels DCR from each model.

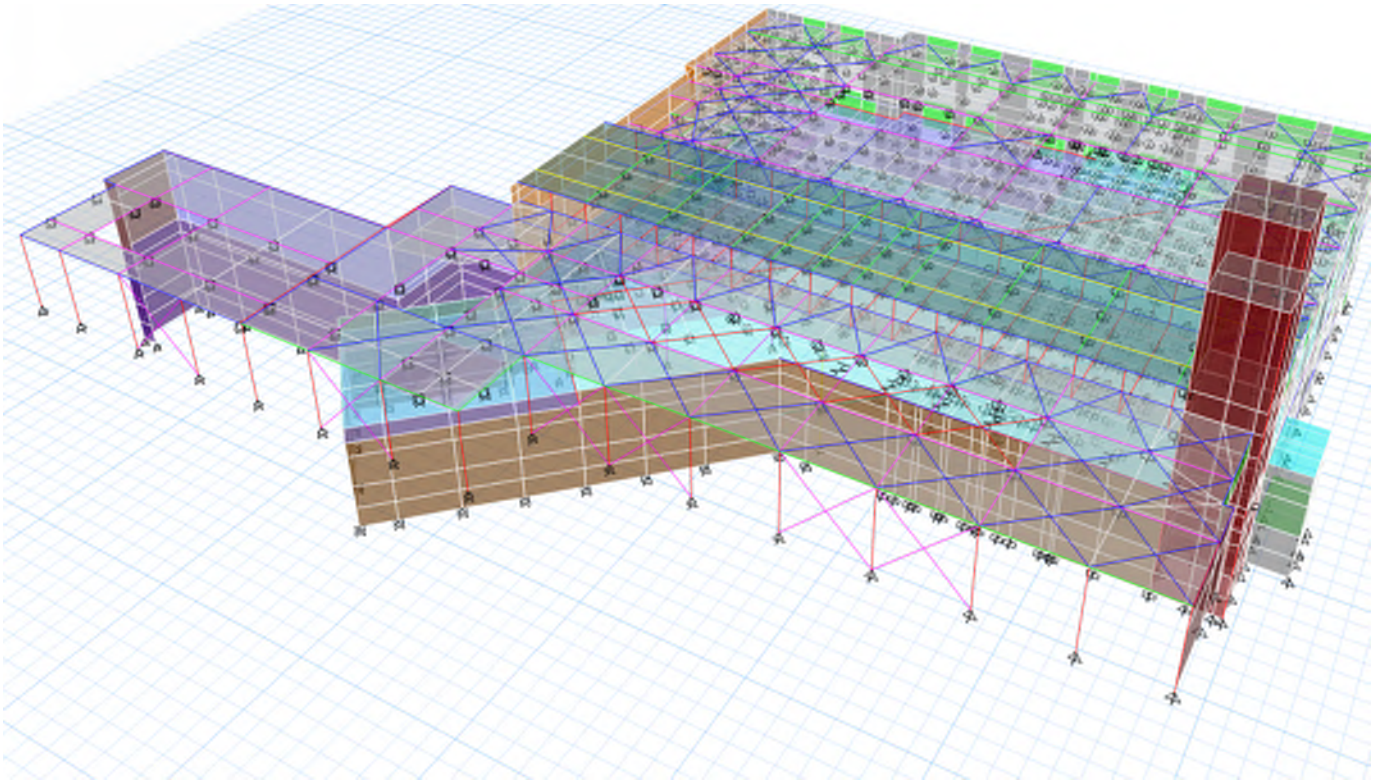
				DCR_V	DCR_M		DCR_V	DCR_M
SOUTH	PIER	2ND	S-2-P-22	0.8	0.7	S-2-P-22	0.9	0.7
			S-2-P-23	0.6	0.4	S-2-P-23	0.6	0.4
			S-2-P-24	0.9	0.6	S-2-P-24	1.0	0.7
			S-2-P-25	0.6	0.4	S-2-P-25	0.9	0.5
			S-2-P-26	1.1	0.7	S-2-P-26	1.9	1.2
			S-2-P-27	1.2	0.8	S-2-P-27	2.7	1.8
			S-2-P-29	0.4	0.3	S-2-P-29	0.2	0.2
		1ST	S-1-P-02	1.1	1.0	S-1-P-02	1.2	1.0
			S-1-P-03	1.5	0.7	S-1-P-03	1.5	0.7
			S-1-P-04	2.3	1.4	S-1-P-04	2.4	1.4
			S-1-P-05	1.5	0.6	S-1-P-05	1.7	0.6
			S-1-P-06	3.0	1.7	S-1-P-06	2.6	1.5
	SPANDREL	2ND	S-2-S-21	0.4	0.9	S-2-S-21	0.4	0.9
			S-2-S-22	0.7	1.2	S-2-S-22	0.7	1.2
			S-2-S-23	0.7	1.3	S-2-S-23	0.7	1.4
			S-2-S-24	0.8	1.5	S-2-S-24	0.9	1.7
			S-2-S-25	0.7	1.2	S-2-S-25	1.1	1.9
			S-2-S-26	0.9	1.5	S-2-S-26	1.6	2.8
			S-2-S-27	0.9	1.6	S-2-S-27	2.3	4.0
			S-2-S-28	0.2	1.8	S-2-S-28	0.1	1.2
		1ST	S-1-S-01.1	1.3	2.4	S-1-S-01.1	1.4	2.4
			S-1-S-01.2	0.8	0.8	S-1-S-01.2	0.8	0.8
			S-1-S-02	1.5	1.5	S-1-S-02	1.5	1.6
			S-1-S-03	2.8	2.2	S-1-S-03	3.0	2.4
			S-1-S-04	2.8	2.5	S-1-S-04	3.1	2.8
			S-1-S-05	4.4	3.1	S-1-S-05	4.9	4.0

Model-A

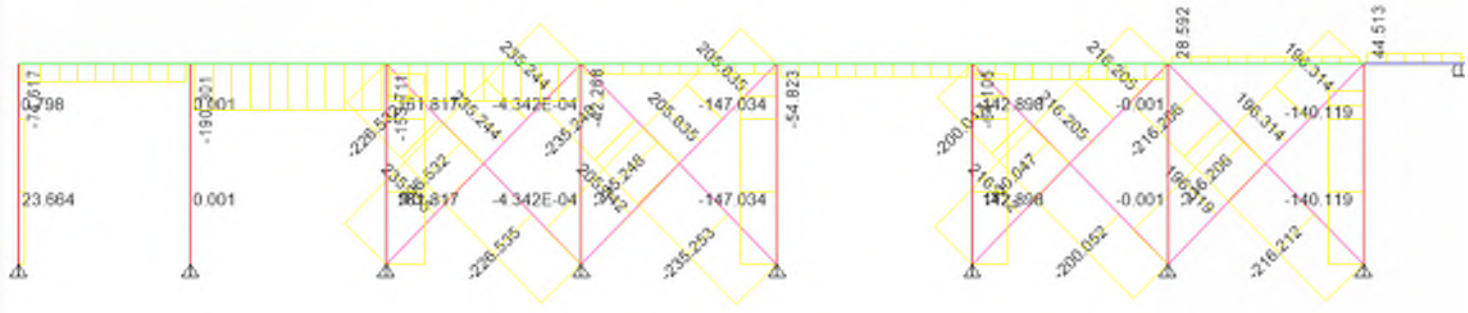
Model-B

South wall piers and spandrels DCR output

4. Steel Brace Frame Evaluation



3D view of the TABES Model



Brace Axial Force Output From X-direction Seismic Load

4.1. check diagonal bracing capacity:

Assume the diagonal brace framing is taking both tension and compression. The maximum axial force is about 256 kip by load combinations.
See the spreadsheet below for the calculations:

1 Brace Mmeber Parameter

Size =	2L 3 1/2x3x1/4 LLV x3/8"	
E =	29000	ksi
Fye,br =	41.0	ksi
Ag =	3.16	sq.in

	in-plane (rx)	out-of-plane(ry)
K	1	1
L (ft)	12.25	12.25
r	1.1	1.32

2 Factored Demands

Pu =	256	kip
Tu =	256	kip

3 Braces in Compression: Determine M factor ASCE 41-17 Table 9-6

Braces in Compression (except EBF braces)

a. Slender[J] $\frac{KL}{r} \geq 4.2\sqrt{E/F_y}$

1. W, I, 2L in-plane[K], 2C in-plane[K]	1.25	6	8	7	9
2. 2L out-of-plane[K], 2C out-of-plane[K]	1.25	5	7	6	8
3. HSS, pipes, tubes, L	1.25	5	7	6	8

b. Stocky[J] $\frac{KL}{r} \leq 2.1\sqrt{E/F_y}$

1. W, I, 2L in-plane[K], 2C in-plane[K]	1.25	5	7	6	8
2. 2L out-of-plane[K], 2C out-of-plane[K]	1.25	4	6	5	7
3. HSS, pipes, tubes	1.25	4	6	5	7

4.2√E/Fy =	111.7
2.1√E/Fy =	55.9

	in-plane	out-of-plane
KL/r	134	111

both bigger than 4.2√E/Fy

m =	8	7	(CP)

4 Determine compression capacity (AISC 360 E.4)

(b) For singly symmetric members twisting about the shear center where y is the axis of symmetry

$$F_e = \left(\frac{F_{ey} + F_{ez}}{2H}\right)\left[1 - \sqrt{1 - \frac{4F_{ey}F_{ez}H}{(F_{ey} + F_{ez})^2}}\right] \qquad \text{(E4-3)}$$

Fex =	16.03	
Fey =	23.08	
G =	11200	ksi
J =	0.072	in^4
r0(3/8) =	0.787	in
H (3/8) =	0.807	
Fez =	412.02	
Fe =	22.82	ksi

The nominal compressive strength, P_n, shall be determined based on the limit state of flexural buckling:

$$P_n = F_{cr} A_g \qquad \text{(E3-1)}$$

The critical stress, F_{cr}, is determined as follows:

(a) When $\frac{L_c}{r} \le 4.71\sqrt{\frac{E}{F_y}}$ $\left(\text{or } \frac{F_y}{F_e} \le 2.25\right)$

$$F_{cr} = \left(0.658^{\frac{F_y}{F_e}}\right) F_y \qquad \text{(E3-2)}$$

(b) When $\frac{L_c}{r} > 4.71\sqrt{\frac{E}{F_y}}$ $\left(\text{or } \frac{F_y}{F_e} > 2.25\right)$

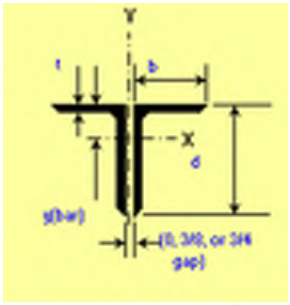
$$F_{cr} = 0.877 F_e \qquad \text{(E3-3)}$$

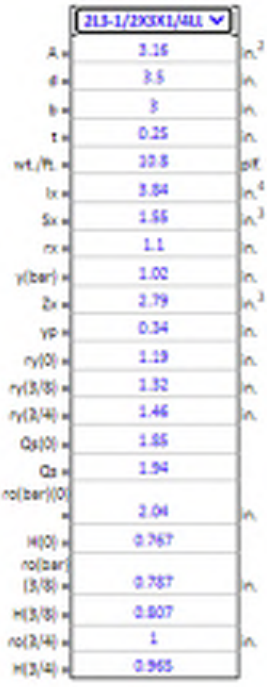
4.71√E/Fy =	125.3	

	in-plane	out-of-plane
KL/r	134	111

both bigger than 4.71√E/Fy

	in-plane	out-of-plane		
Fcr =	20.0	20.0	ksi	19.32874
Pn = Ag*Fcr	63.2	63.2	kip	
mPn =	505.9	442.7	kip	
DCR_comp =	0.51	0.58		





where

C_w = warping constant, in.^{6} (mm^6)

$$F_{ex} = \frac{\pi^2 E}{\left(\frac{L_{cx}}{r_x}\right)^2} \quad \text{(E4-5)}$$

$$F_{ey} = \frac{\pi^2 E}{\left(\frac{L_{cx}}{r_y}\right)^2} \quad \text{(E4-6)}$$

$$F_{ez} = \left(\frac{\pi^2 E C_w}{L_{cz}^2} + GJ\right)\frac{1}{A_g \bar{r}_o^2} \quad \text{(E4-7)}$$

G = shear modulus of elasticity of steel = 11,200 ksi (77 200 MPa)

H = flexural constant

$$= 1 - \frac{x_o^2 + y_o^2}{\bar{r}_o^2} \quad \text{(E4-8)}$$

I_x, I_y = moment of inertia about the principal axes, in.^{4} (mm^4)

J = torsional constant, in.^{4} (mm^4)

K_x = effective length factor for flexural buckling about x-axis

K_y = effective length factor for flexural buckling about y-axis

K_z = effective length factor for torsional buckling about the longitudinal axis

L_{cx} = $K_x L_x$ = effective length of member for buckling about x-axis, in. (mm)

L_{cy} = $K_y L_y$ = effective length of member for buckling about y-axis, in. (mm)

L_{cz} = $K_z L_z$ = effective length of member for buckling about longitudinal axis, in. (mm)

L_x, L_y, L_z = laterally unbraced length of the member for each axis, in. (mm)

$\bar{r}_o$ = polar radius of gyration about the shear center, in. (mm)

$$\bar{r}_o^2 = x_o^2 + y_o^2 + \frac{I_x + I_y}{A_g} \quad \text{(E4-9)}$$

r_x = radius of gyration about x-axis, in. (mm)

r_y = radius of gyration about y-axis, in. (mm)

x_o, y_o = coordinates of the shear center with respect to the centroid, in. (mm)

User Note: For doubly symmetric I-shaped sections, C_w may be taken as $I_y h_o^2/4$, where h_o is the distance between flange centroids, in lieu of a more precise analysis. For tees and double angles, omit the term with C_w when computing F_{ez} and take x_o as 0.

4.2. check column capacity:

1 Brace Mmeber Parameter

Size =	W10X33	
E =	29000	ksi
Fye,br =	41.0	ksi
Ag =	9.71	sq.in

	in-plane (rx)	out-of-plane(ry)	
K	1	1	in-plane - strong direction
L (ft)	13.00	13.00	out-of-plane - weak direction
r	4.2	1.94	
KL/r	37.2	80.4	

2 Factored Demands

Pu =	195	kip
Tu =	182	kip

3 Braces in Compression: Determine M factor ASCE 41-17 Table 9-6

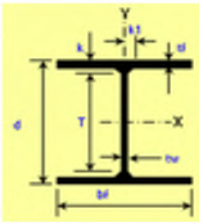
Columns in Compression or Tension—*Flexure*[b,c]

For $|P_{UF}|/P_{ye} < 0.2$

a. $\frac{b_f}{2t_f} \le 0.30\sqrt{\frac{E}{F_{ye}}}$ and $\frac{h}{t_w} \le 2.45\sqrt{\frac{E}{F_{ye}}}\left(1-0.71\frac{\lvert P_{UF}\rvert}{P_{ye}}\right)$	2	6	8	10	12
b. $\frac{b_f}{2t_f} \ge 0.38\sqrt{\frac{E}{F_{ye}}}$ or $\frac{h}{t_w} \ge 3.76\sqrt{\frac{E}{F_{ye}}}\left(1-1.83\frac{\lvert P_{UF}\rvert}{P_{ye}}\right)$	1.25	1.25	2	2	3
c. Other	Linear interpolation between the values on lines *a* and *b* for both flange slenderness (first term) and web slenderness (second term) shall be performed, and the lowest resulting value shall be used.				

For $|P_{UF}|/P_{ye} \ge 0.2$

a. $\frac{b_f}{2t_f} \le 0.30\sqrt{\frac{E}{F_{ye}}}$ and $\frac{h}{t_w} \le 0.77\sqrt{\frac{E}{F_{ye}}}\left(2.93-\frac{\lvert P_{UF}\rvert}{P_{ye}}\right) \le 1.49\sqrt{\frac{E}{F_{ye}}}$	$\frac{1.5\,(1-5/3\,\lvert P_{UF}\rvert/P_{ye})}{+1} \ge 1$	$\frac{7.5\,(1-5/3\,\lvert P_{UF}\rvert/P_{ye})}{+1} \ge 1$	$\frac{10.5\,(1-5/3\,\lvert P_{UF}\rvert/P_{ye})}{+1} \ge 1$	$\frac{13.5\,(1-5/3\,\lvert P_{UF}\rvert/P_{ye})}{+1} \ge 1$	$\frac{16.5\,(1-5/3\,\lvert P_{UF}\rvert/P_{ye})}{+1} \ge 1$
b. $\frac{b_f}{2t_f} \ge 0.38\sqrt{\frac{E}{F_{ye}}}$ or $\frac{h}{t_w} \ge 1.12\sqrt{\frac{E}{F_{ye}}}\left(2.33-\frac{\lvert P_{UF}\rvert}{P_{ye}}\right) \ge 1.49\sqrt{\frac{E}{F_{ye}}}$	$\frac{0.375\,(1-5/3\,\lvert P_{UF}\rvert/P_{ye})}{+1} \ge 1$	$\frac{0.375\,(1-5/3\,\lvert P_{UF}\rvert/P_{ye})}{+1} \ge 1$	$\frac{1.5\,(1-5/3\,\lvert P_{UF}\rvert/P_{ye})}{+1} \ge 1$	$\frac{1.5\,(1-5/3\,\lvert P_{UF}\rvert/P_{ye})}{+1} \ge 1$	$\frac{3\,(1-5/3\,\lvert P_{UF}\rvert/P_{ye})}{+1} \ge 1$
c. Other	Linear interpolation between the values on lines *a* and *b* for both flange slenderness (first term) and web slenderness (second term) shall be performed, and the lowest resulting value shall be used.				



Pye = Ag* Fy =	398.11	kip
Pu/Pye =	0.49	
0.3VE/Fy =	8.0	
0.38VE/Fy =	10.1	
1.49VE/Fy =	39.6	
bf/2tf =	9.15	
h/tw =	27.1	
m =	2.4	(CP)

$0.77\sqrt{\frac{E}{F_{ye}}}\left(2.93-\frac{\lvert P_{UF}\rvert}{P_{ye}}\right)$ = 49.97 2.928248 2.101856

$1.12\sqrt{\frac{E}{F_{ye}}}\left(2.33-\frac{\lvert P_{UF}\rvert}{P_{ye}}\right)$ = 54.81 1.275464

W10X33		
A =	9.71	in.^2
d =	9.75	in.
tw =	0.29	in.
bf =	7.96	in.
tf =	0.435	in.
k(det) =	0.935	in.
k(det) =	1.125	in.
k1 =	0.75	in.
T =	7.5	in.
gage =	5.5	in.
wt./ft. =	33	plf.
bf/(2*tf) =	9.15	
h/tw =	27.1	
Ix =	171	in.^4
Sx =	35	in.^3
rx =	4.19	in.
Zx =	38.8	in.^3
Iy =	36.6	in.^4
Sy =	9.2	in.^3
ry =	1.94	in.
Zy =	14	in.^3
rts =	2.2	in.
ho =	9.3	in.
J =	0.583	in.^4
Cw =	791	in.^6
a =	59.27	in.
Wno =	18.5	in.^2
Sw =	16	in.^4
Qf =	7.75	in.^3
Qw =	18.9	in.^3

4 Determine compression capacity (AISC 360 E.4)

Fe = 44.26 ksi

The nominal compressive strength, P_n, shall be determined based on the limit state of flexural buckling:

$$P_n = F_{cr} A_g \quad \text{(E3-1)}$$

The critical stress, F_{cr}, is determined as follows:

(a) When $\frac{L_c}{r} \le 4.71\sqrt{\frac{E}{F_y}}$ (or $\frac{F_y}{F_e} \le 2.25$)

$$F_{cr} = \left[0.658^{\frac{F_y}{F_e}}\right] F_y \quad \text{(E3-2)}$$

(b) When $\frac{L_c}{r} > 4.71\sqrt{\frac{E}{F_y}}$ (or $\frac{F_y}{F_e} > 2.25$)

$$F_{cr} = 0.877 F_e \quad \text{(E3-3)}$$

4.71VE/Fy = 125.3

	in-plane	out-of-plane
KL/r	37	80

both smaller than 4.71VE/Fy

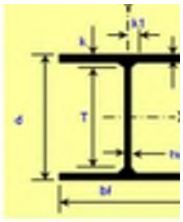
Fcr =	27.8	ksi
Pn = Ag*Fcr	270.2	kip
mPn =	648.4	kip
DCR_comp =	0.30	

4.3. check Beam axial capacity:

1 Brace Mmeber Parameter

Size =	W12x45	
E =	29000	ksi
Fye,br =	41.0	ksi
Ag =	13.10	sq.in

	in-plane (rx)	
K	1	in-plane - strong direction
L (ft)	20.00	out-of-plane - weak direction
r	5.15	
KL/r	46.6	



W12X45	
A =	13.1 in.
d =	12.1 in.
tw =	0.335 in.
bf =	8.05 in.
tf =	0.575 in.
k(det) =	1.08 in.
k(det) =	1.375 in.
k1 =	0.9375 in.
T =	9.25 in.
gage =	5.5 in.
wt./ft. =	45 plf
bf/(2*tf) =	7
h/tw =	29.6
Ix =	348 in.
Sx =	57.7 in.
rx =	5.15 in.
Zx =	64.2 in.
Iy =	50 in.
Sy =	12.4 in.
ry =	1.95 in.
Zy =	19 in.
rts =	2.23 in.
ho =	11.5 in.
J =	1.26 in.
Cw =	1650 in.
a =	58.23 in.
Wno =	23.2 in.
Sw =	26.8 in.
Qf =	12.8 in.
Qw =	31.7 in.

2 Factored Demands

Pu =	180	kip
Tu =	180	kip

3 Braces in Compression: Determine M factor ASCE 41-17 Table 9-6

Columns in Compression or Tension—*Flexure*[b,c]

For $|P_{UF}|/P_{ye} \le 0.2$

a. $\frac{b_f}{2t_f} \le 0.30\sqrt{\frac{E}{F_{ye}}}$ and $\frac{h}{t_w} \le 2.45\sqrt{\frac{E}{F_{ye}}}\left(1-0.71\frac{\lvert P_{UF}\rvert}{P_{ye}}\right)$	2	6	8	10	12
b. $\frac{b_f}{2t_f} \ge 0.38\sqrt{\frac{E}{F_{ye}}}$ or $\frac{h}{t_w} \ge 3.76\sqrt{\frac{E}{F_{ye}}}\left(1-1.83\frac{\lvert P_{UF}\rvert}{P_{ye}}\right)$	1.25	1.25	2	2	3
c. Other	Linear interpolation between the values on lines *a* and *b* for both flange slenderness (first term) and web slenderness (second term) shall be performed, and the lowest resulting value shall be used.				

For $|P_{UF}|/P_{ye} \ge 0.2$

a. $\frac{b_f}{2t_f} \le 0.30\sqrt{\frac{E}{F_{ye}}}$ and	$1.5\left(1-5/3\frac{\lvert P_{UF}\rvert}{P_{ye}}\right) \ge 1$	$7.5\left(1-5/3\frac{\lvert P_{UF}\rvert}{P_{ye}}\right) \ge 1$	$10.5\left(1-5/3\frac{\lvert P_{UF}\rvert}{P_{ye}}\right) \ge 1$	$13.5\left(1-5/3\frac{\lvert P_{UF}\rvert}{P_{ye}}\right) \ge 1$	$16.5\left(1-5/3\frac{\lvert P_{UF}\rvert}{P_{ye}}\right) \ge 1$
$\frac{h}{t_w} \le 0.77\sqrt{\frac{E}{F_{ye}}}\left(2.93-\frac{\lvert P_{UF}\rvert}{P_{ye}}\right) \le 1.49\sqrt{\frac{E}{F_{ye}}}$					
b. $\frac{b_f}{2t_f} \ge 0.38\sqrt{\frac{E}{F_{ye}}}$ or	$0.375\left(1-5/3\frac{\lvert P_{UF}\rvert}{P_{ye}}\right) \ge 1$	$0.375\left(1-5/3\frac{\lvert P_{UF}\rvert}{P_{ye}}\right) \ge 1$	$1.5\left(1-5/3\frac{\lvert P_{UF}\rvert}{P_{ye}}\right) \ge 1$	$1.5\left(1-5/3\frac{\lvert P_{UF}\rvert}{P_{ye}}\right) \ge 1$	$3\left(1-5/3\frac{\lvert P_{UF}\rvert}{P_{ye}}\right) \ge 1$
$\frac{h}{t_w} \ge 1.12\sqrt{\frac{E}{F_{ye}}}\left(2.33-\frac{\lvert P_{UF}\rvert}{P_{ye}}\right) \ge 1.49\sqrt{\frac{E}{F_{ye}}}$					
c. Other	Linear interpolation between the values on lines *a* and *b* for both flange slenderness (first term) and web slenderness (second term) shall be performed, and the lowest resulting value shall be used.				

Pye = Ag* Fy =	537.1	kip	$0.77\sqrt{\frac{E}{F_{ye}}}\left(2.93-\frac{\lvert P_{UF}\rvert}{P_{ye}}\right)$ =	53.14 5.63517
Pu/Pye =	0.34		$1.12\sqrt{\frac{E}{F_{ye}}}\left(2.33-\frac{\lvert P_{UF}\rvert}{P_{ye}}\right)$ =	59.42 1.662167
0.3VE/Fy =	8.0			
0.38VE/Fy =	10.1			
1.49VE/Fy =	39.6			
bf/2tf =	7			
h/tw =	29.6			
m =	5.6	(CP)		

4 Determine compression capacity (AISC 360 E.4)

Fe = 131.79 ksi

The nominal compressive strength, P_n, shall be determined based on the limit state of flexural buckling:

$$P_n = F_{cr} A_g \quad \text{(E3-1)}$$

The critical stress, F_{cr}, is determined as follows:

(a) When $\frac{L_c}{r} \le 4.71\sqrt{\frac{E}{F_y}}$ $\left(\text{or } \frac{F_y}{F_e} \le 2.25\right)$

$$F_{cr} = \left[0.658^{\frac{F_y}{F_e}}\right] F_y \quad \text{(E3-2)}$$

(b) When $\frac{L_c}{r} > 4.71\sqrt{\frac{E}{F_y}}$ $\left(\text{or } \frac{F_y}{F_e} > 2.25\right)$

$$F_{cr} = 0.877 F_e \quad \text{(E3-3)}$$

4.71VE/Fy =	125.3	
	in-plane	
KL/r	47	
Fcr =	36.0	ksi
Pn = Ag*Fcr	471.5	kip
mPn =	2640.5	kip
DCR_comp =	0.07	

5. Diaphragm Evaluation

Per existing structural sheet, the existing metal deck shear capacity are summarized below:

Conc Strength	4.5	ksi
Rebar	75	ksi

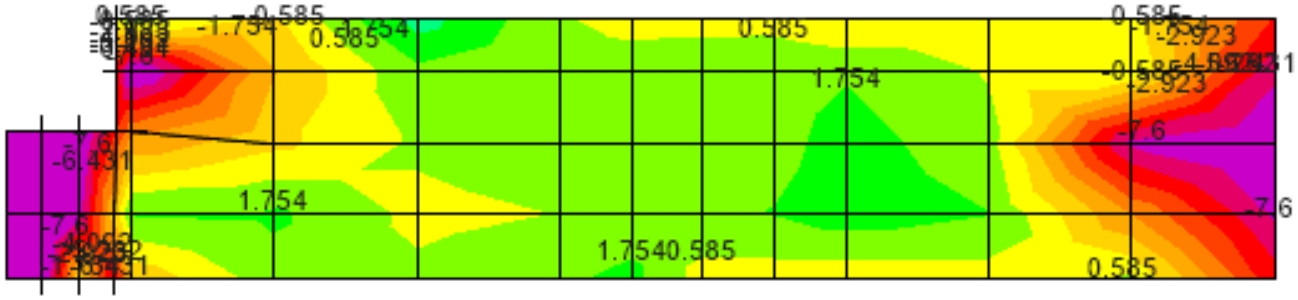
	Metal Deck				Concrete						
	Deck Depth	Gauge	Verco Type	V_deck (k/ft)	Fill Thickness	Eff. Conc. Depth	Rebar	Vc (k/ft)	Vs(k/ft)	m factor	m*Vn(k/ft)
Mezz Roof	3	16	N 24	2.25	/	/	/	/	/	3	**6.7**
Main Roof	1 5/16	20	DV 36	2.00	/	/	/	/	/	3	**12.0**
2nd Mezz	1.5	16	B Deck	2.12	4.5	5.00	6x6 10/10 EWF	8.04	15	3	**81.8**
2nd Top	1.5	16		2.00	5	5.50	#5 @6"	8.85	35.39	3	**144.7**
2nd Bott	1.5	16		2.12	4.5	5.00	6x6 10/10 EWF	8.04	15	3	**81.8**
Museum	1.5	16		2.08	4.5	5.00	#5 @12"	8.04	23.25	3	**106.3**
Storage	1.5	16		2.08	4	4.50	6x6 10/10 EWF	7.24	15	3	**79.2**

See the following snaps shot of the diaphragm contour. The dark purple and dark blue area indicate the exceeding of the m*Vn (Vn is the diaphragm shear capacity).

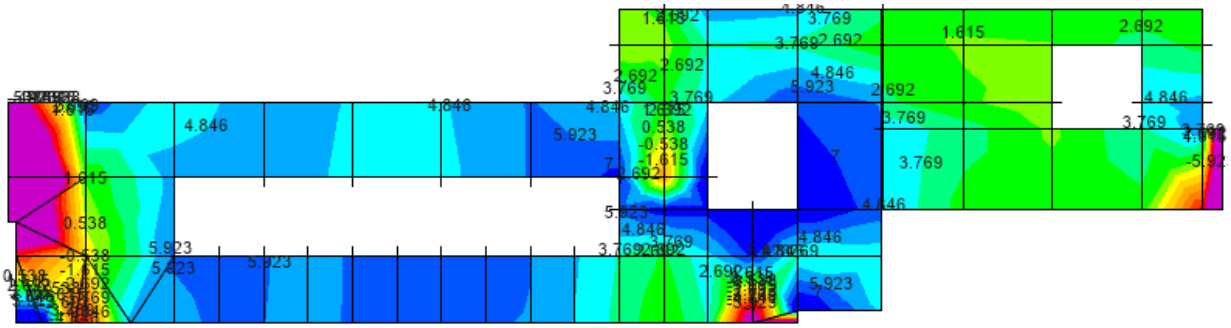
DCR > 1

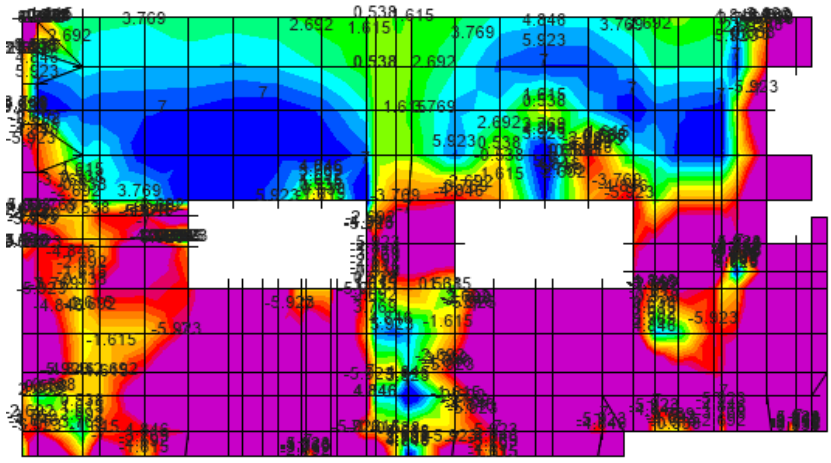
DCR > 1

DCR for the Contour

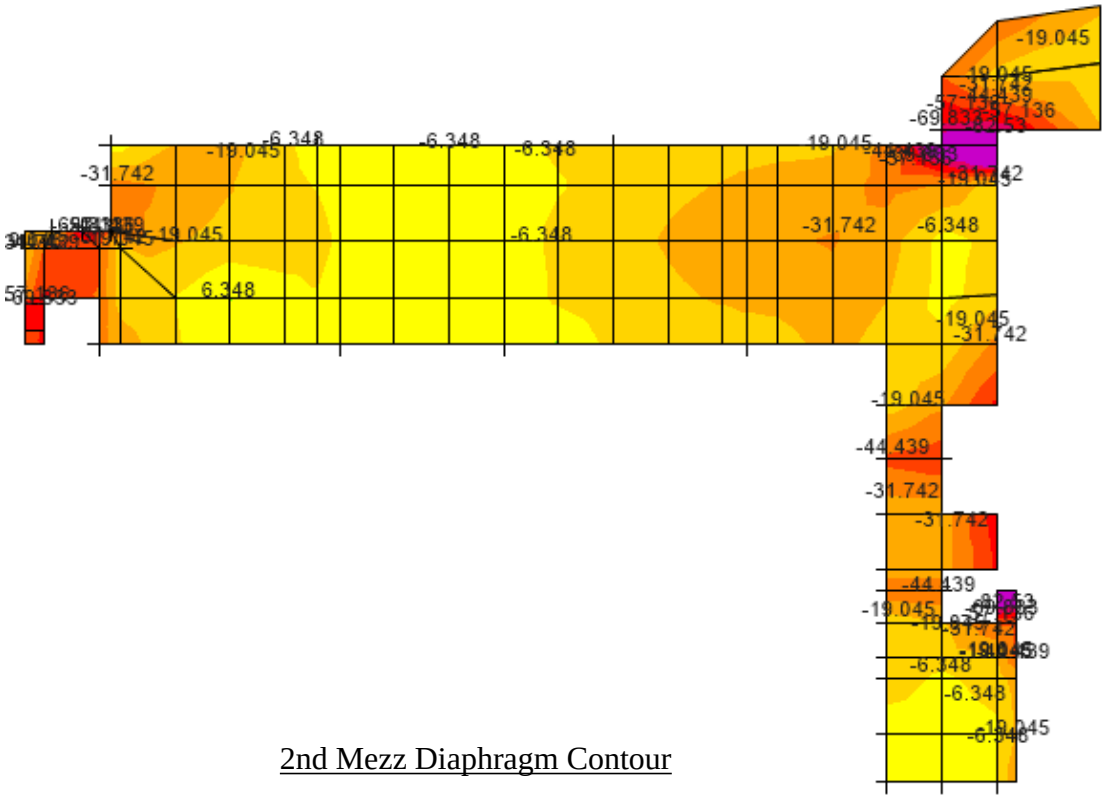


2nd Mezz Roof Diaphragm Contour

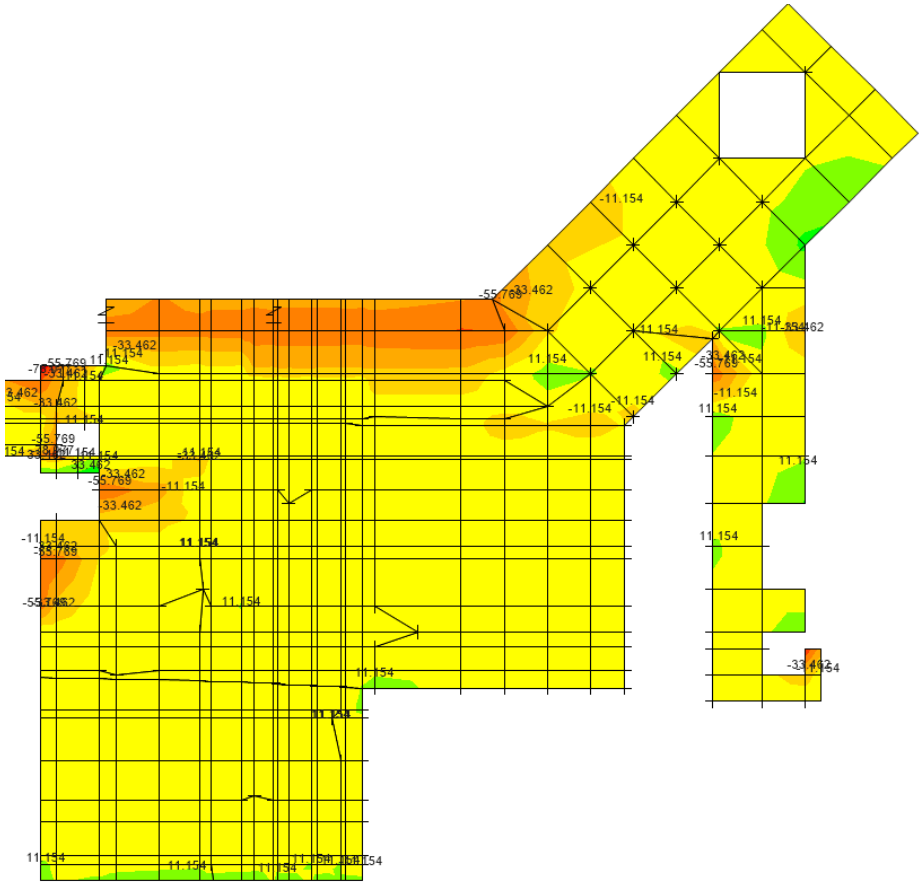




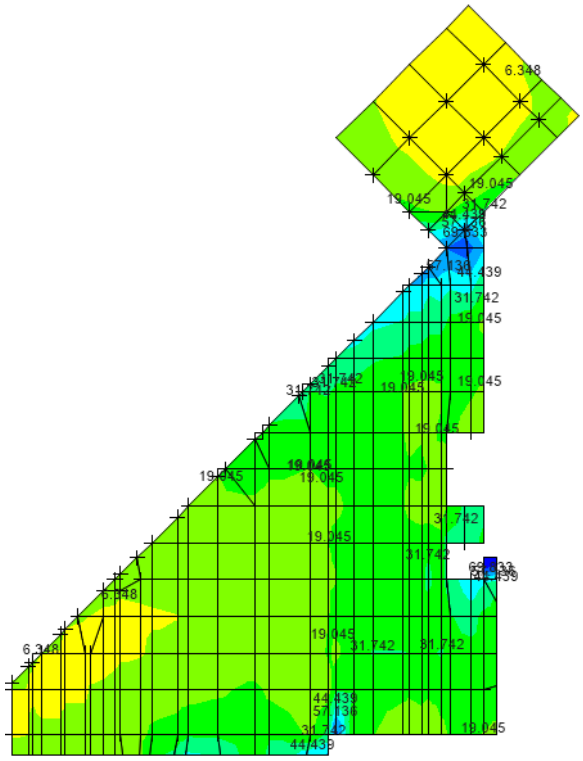
Main Roof Diaphragm Contour



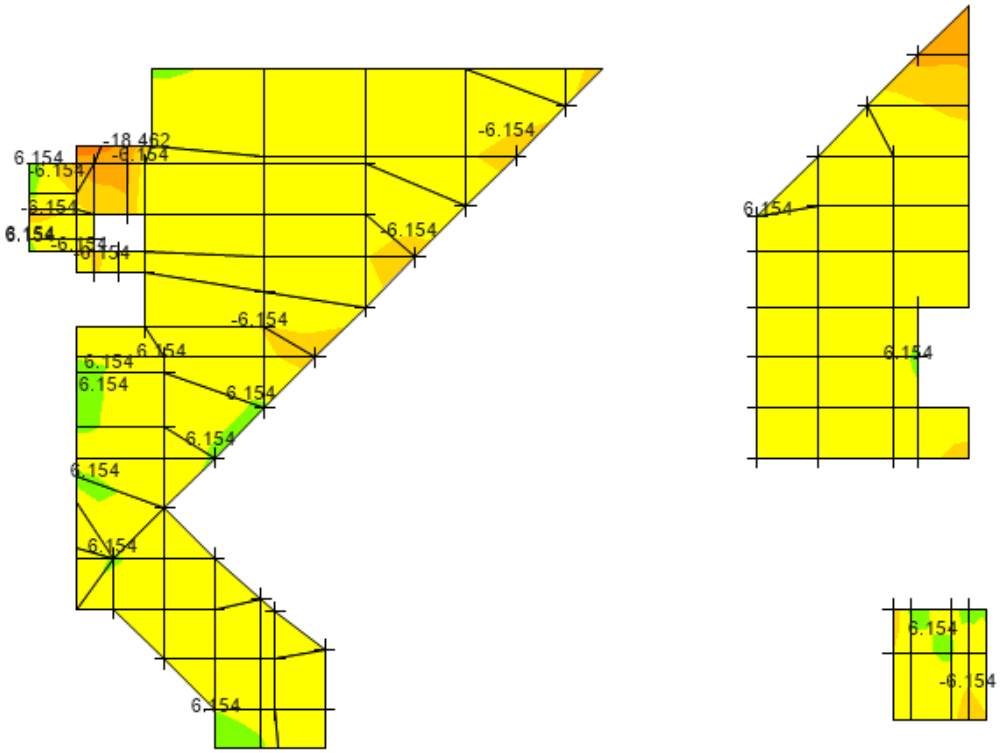
2nd Mezz Diaphragm Contour



2nd Floor Top Diaphragm Contour

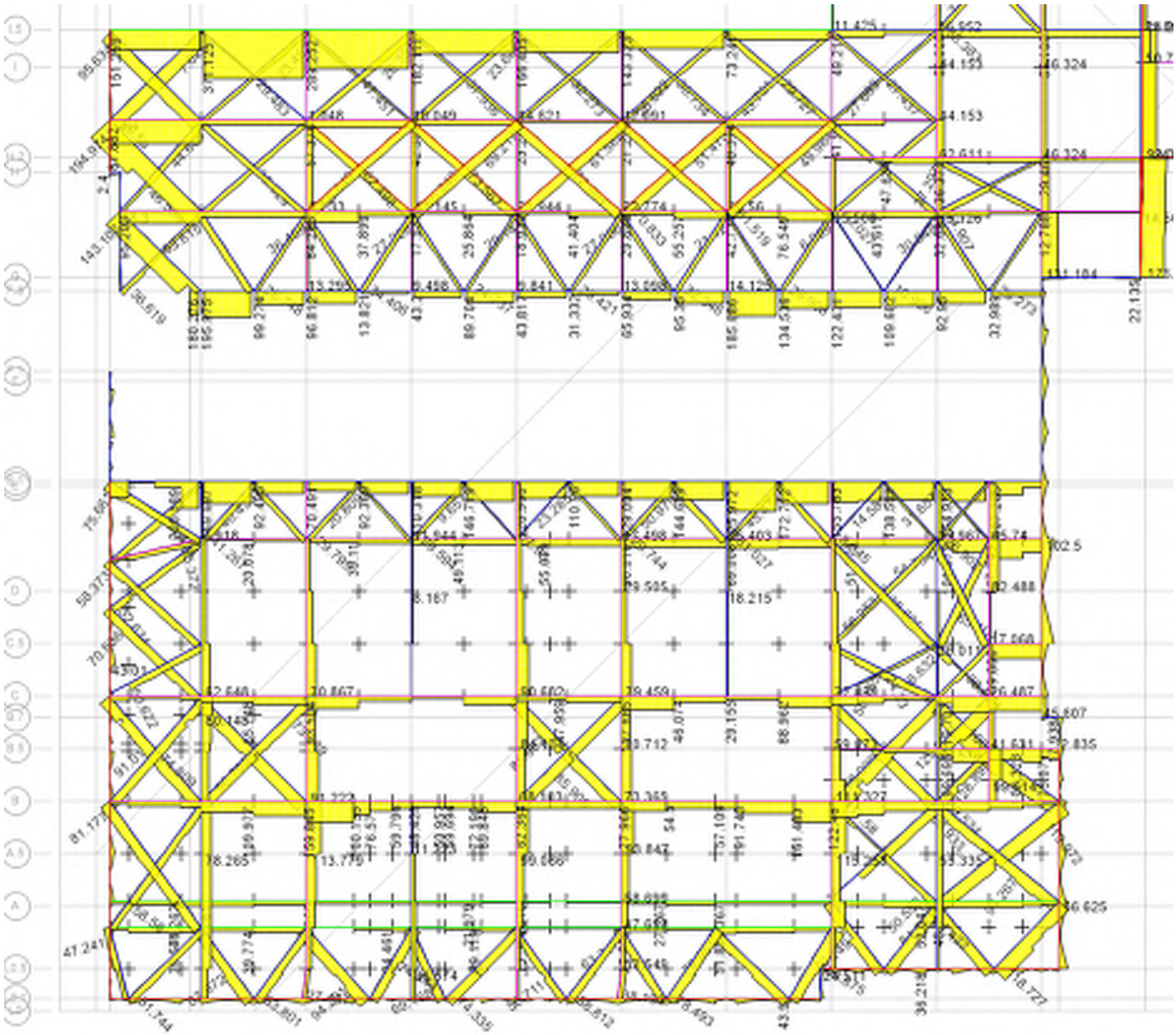


2nd Floor Bottom Diaphragm Contour



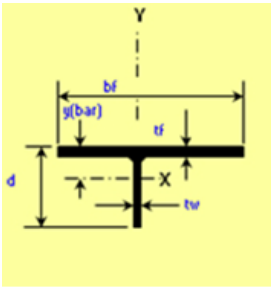
1st Mezz Floor Diaphragm Contour

The following calculation will evaluate the horizontal diagonal member's axial capacity and diagram cord member axial capacity.



Axial Force of Steel beams and braces at Roof Level

Check the horizontal diagonal capacity:



WT3X10		
A =	2.94	in.^{2}
d =	3.100	in.
tw =	0.260	in.
bf =	6.020	in.
tf =	0.365	in.
k(des) =	0.6640	in.
k(det) =	0.8750	in.
gage =	3.5	in.
wt./ft.	10.00	plf.
bf/(2*tf)	8.250	
d/tw	11.900	
Ix =	1.76	in.^{4}
Sx =	0.69	in.^{3}
rx =	0.77	in.
y(bar) =	0.560	in.
Zx =	1.29	in.^{3}
yp =	0.244	in.
Iy =	6.64	in.^{4}
Sy =	2.21	in.^{3}
ry =	1.50	in.
Zy =	3.36	in.^{3}
Qs(50) =	1.000	
J =	0.12	in.^{4}
Cw =	0.0858	in.^6
a =	1.36	in.
ro(bar) =	1.73	in.
H =	0.953	

1 Brace Mmeber Parameter

Size =	WT3X10	
E =	29000	ksi
Fye,br =	41.0	ksi
Ag =	2.94	sq.in

	in-plane (rx)	out-of-plane(ry)
K	1	1
L (ft)	14.00	14.00
r	0.77	1.50

2 Factored Demands

Pu =	200	kip
Tu =	200	kip

3 Braces in Compression: Determine M factor ASCE 41-17 Table 9-6

Braces in Compression (except EBF braces)

a. Slender^{1} $\frac{Kl}{r} \geq 4.2\sqrt{E/F_y}$

1. W, I, 2L in-plane^{a}, 2C in-plane^{a}	1.25	6	8	7	9
2. 2L out-of-plane^{a}, 2C out-of-plane^{a}	1.25	5	7	6	8
3. HSS, pipes, tubes, L	1.25	5	7	6	8

b. Stocky^{1} $\frac{Kl}{r} \leq 2.1\sqrt{E/F_y}$

1. W, I, 2L in-plane^{a}, 2C in-plane^{a}	1.25	5	7	6	8
2. 2L out-of-plane^{a}, 2C out-of-plane^{a}	1.25	4	6	5	7
3. HSS, pipes, tubes	1.25	4	6	5	7

4.2√E/Fy =	111.7
2.1√E/Fy =	55.9

	in-plane	out-of-plane
KL/r	218	112

both bigger than 4.2√E/Fy

m =	8	7	(CP)

4 Determine compression capacity (AISC 360 E.4)

(b) For singly symmetric members twisting about the shear center where y is the axis of symmetry

$$F_e = \left(\frac{F_{ey}+F_{ez}}{2H}\right)\left[1-\sqrt{1-\frac{4F_{ey}F_{ez}H}{(F_{ey}+F_{ez})^2}}\right] \qquad \text{(E4-3)}$$

Fex =	6.01	
Fey =	22.82	
G =	11200	ksi
J =	0.072	in^4
r0 =	1.730	in
H =	0.953	
Fez =	91.65	
Fe =	22.47	ksi

The nominal compressive strength, P_n, shall be determined based on the limit state of flexural buckling:

$$P_n = F_{cr} A_g \qquad \text{(E3-1)}$$

The critical stress, F_{cr}, is determined as follows:

(a) When $\frac{L_c}{r} \leq 4.71\sqrt{\frac{E}{F_y}}$ (or $\frac{F_y}{F_e} \leq 2.25$)

$$F_{cr} = \left[0.658^{\frac{F_y}{F_e}}\right]F_y \qquad \text{(E3-2)}$$

(b) When $\frac{L_c}{r} > 4.71\sqrt{\frac{E}{F_y}}$ (or $\frac{F_y}{F_e} > 2.25$)

$$F_{cr} = 0.877F_e \qquad \text{(E3-3)}$$

4.71√E/Fy =	125.3

	in-plane	out-of-plane
KL/r	218	112

both bigger than 4.71√E/Fy

	in-plane	out-of-plane		
Fcr =	19.7	19.1	ksi	19.10597
Pn = Ag*Fcr	57.9	56.2	kip	
mPn =	463.6	393.2	kip	
DCR_comp =	0.43	0.51		

Check the 2nd Mezz roof cord member:

1 Brace Mmeber Parameter

Size =	W12X30	
E =	29000	ksi
Fye,br =	41.0	ksi
Ag =	8.79	sq.in

	in-plane (rx)	out-of-plane(ry)
K	1	1
L (ft)	10.00	1.00
r	5.21	1.52
KL/r	23.0	7.9

2 Factored Demands

Pu =	125	kip
Tu =	125	kip

3 Force control member

$$Q_{UF} = Q_G \pm \frac{\chi Q_E}{C_1 C_2 J} \qquad (7\text{-}35)$$

X =	1.0
C1C2 =	1.4
J =	1.0

Quf =	89.3	KIP

4 Determine compression capacity (AISC 360 E.4)

F_e = elastic buckling stress determined according to Equation E3-4, as specified in Appendix 7, Section 7.2.3(b), or through an elastic buckling analysis, as applicable, ksi (MPa)

$$= \frac{\pi^2 E}{\left(\frac{L_c}{r}\right)^2} \qquad (E3\text{-}4)$$

Fe =	539.5	ksi

The nominal compressive strength, P_n, shall be determined based on the limit state of flexural buckling:

$$P_n = F_{cr} A_g \qquad (E3\text{-}1)$$

The critical stress, F_{cr}, is determined as follows:

(a) When $\frac{L_c}{r} \le 4.71\sqrt{\frac{E}{F_y}}$ (or $\frac{F_y}{F_e} \le 2.25$)

$$F_{cr} = \left[0.658^{\frac{F_y}{F_e}}\right] F_y \qquad (E3\text{-}2)$$

(b) When $\frac{L_c}{r} > 4.71\sqrt{\frac{E}{F_y}}$ (or $\frac{F_y}{F_e} > 2.25$)

$$F_{cr} = 0.877 F_e \qquad (E3\text{-}3)$$

4.71√E/Fy =	125.3

	in-plane	out-of-plane
KL/r	23	8

	in-plane	out-of-plane		
Fcr =	39.7	39.7	ksi	39.71645
Pn = Ag*Fcr	349.1	349.1	kip	
DCR_comp =	0.26	0.26		

5 in Tension

Tn = Ag*Fy =	360	kip
DCR_tens =	0.25	

Check the 2nd Mezz floor cord member:

1 Brace Mmeber Parameter

Size =	W33X118	
E =	29000	ksi
Fye,br =	41.0	ksi
Ag =	8.79	sq.in

	in-plane (rx)	out-of-plane(ry)
K	1	1
L (ft)	10.00	1.00
r	5.21	1.52
KL/r	23.0	7.9

2 Factored Demands

Pu =	340	kip
Tu =	340	kip

3 Force control member

$$Q_{UF} = Q_G \pm \frac{\chi Q_E}{C_1 C_2 J} \qquad (7\text{-}35)$$

X =	1.0
C1C2 =	1.4
J =	1.0
Quf =	242.9

4 Determine compression capacity (AISC 360 E.4)

F_e = elastic buckling stress determined according to Equation E3-4, as specified in Appendix 7, Section 7.2.3(b), or through an elastic buckling analysis, as applicable, ksi (MPa)

$$= \frac{\pi^2 E}{\left(\frac{L_c}{r}\right)^2} \qquad (E3\text{-}4)$$

Fe =	539.5	ksi

The nominal compressive strength, P_n, shall be determined based on the limit state of flexural buckling:

$$P_n = F_{cr} A_g \qquad (E3\text{-}1)$$

The critical stress, F_{cr}, is determined as follows:

(a) When $\frac{L_c}{r} \le 4.71\sqrt{\frac{E}{F_y}}$ (or $\frac{F_y}{F_e} \le 2.25$)

$$F_{cr} = \left(0.658^{\frac{F_y}{F_e}}\right) F_y \qquad (E3\text{-}2)$$

(b) When $\frac{L_c}{r} > 4.71\sqrt{\frac{E}{F_y}}$ (or $\frac{F_y}{F_e} > 2.25$)

$$F_{cr} = 0.877 F_e \qquad (E3\text{-}3)$$

4.71VE/Fy =	125.3	

	in-plane	out-of-plane
KL/r	23	8

	in-plane	out-of-plane		
Fcr =	39.7	39.7	ksi	39.71645
Pn = Ag*Fcr	349.1	349.1	kip	
DCR_comp =	0.70	0.70		

5 in Tension

Tn = Ag*Fy =	360	kip
DCR_tens =	0.67	

Check the main roof cord member:

1 Brace Mmeber Parameter

Size =	W8X31	
E =	29000	ksi
Fye,br =	41.0	ksi
Ag =	9.12	sq.in

	in-plane (rx)	out-of-plane(ry)
K	1	1
L (ft)	10.00	1.00
r	3.47	2.02
KL/r	34.6	5.9

2 Factored Demands

Pu =	220	kip
Tu =	220	kip

3 Force control member

$$Q_{UF} = Q_G \pm \frac{\chi Q_E}{C_1 C_2 J} \qquad (7\text{-}35)$$

X =	1.0
C1C2 =	1.4
J =	1.0
Quf =	157.1

4 Determine compression capacity (AISC 360 E.4)

F_e = elastic buckling stress determined according to Equation E3-4, as specified in Appendix 7, Section 7.2.3(b), or through an elastic buckling analysis, as applicable, ksi (MPa)

$$= \frac{\pi^2 E}{\left(\frac{L_c}{r}\right)^2} \qquad (E3\text{-}4)$$

Fe =	239.3	ksi

The nominal compressive strength, P_n, shall be determined based on the limit state of flexural buckling:

$$P_n = F_{cr} A_g \qquad (E3\text{-}1)$$

The critical stress, F_{cr}, is determined as follows:

(a) When $\frac{L_c}{r} \le 4.71\sqrt{\frac{E}{F_y}}$ (or $\frac{F_y}{F_e} \le 2.25$)

$$F_{cr} = \left(0.658^{\frac{F_y}{F_e}}\right) F_y \qquad (E3\text{-}2)$$

(b) When $\frac{L_c}{r} > 4.71\sqrt{\frac{E}{F_y}}$ (or $\frac{F_y}{F_e} > 2.25$)

$$F_{cr} = 0.877 F_e \qquad (E3\text{-}3)$$

4.71√E/Fy =	125.3

	in-plane	out-of-plane
KL/r	35	6

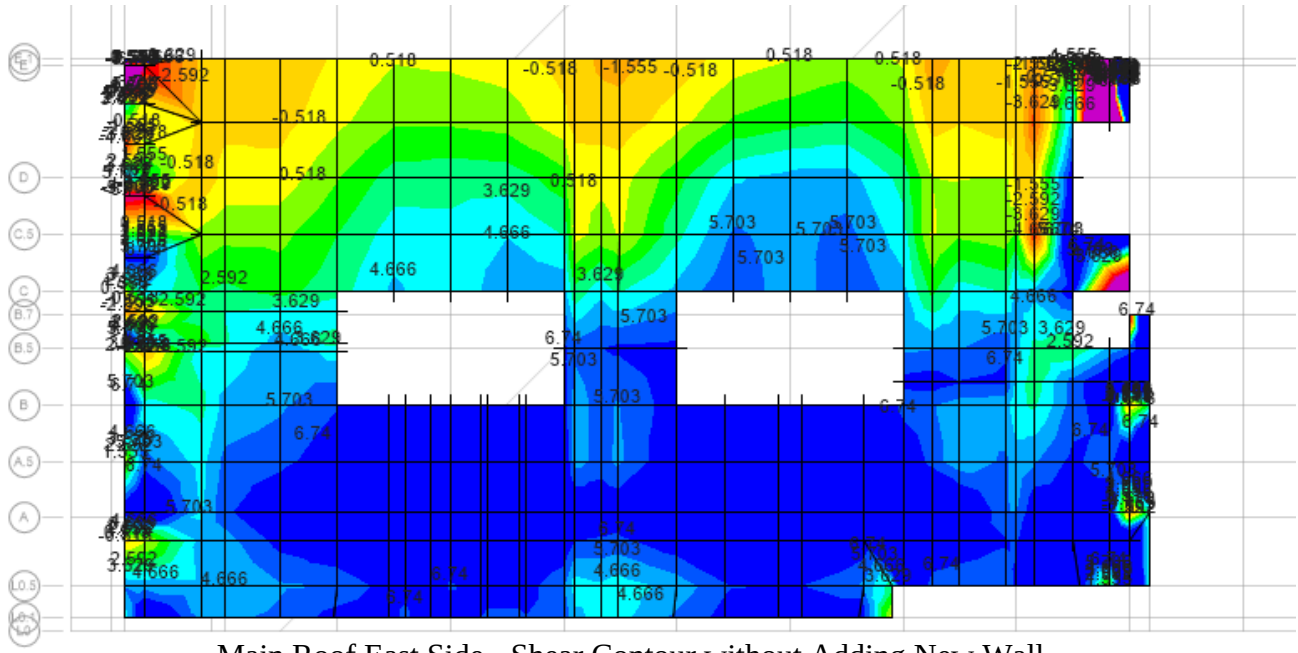
	in-plane	out-of-plane		
Fcr =	38.2	38.2	ksi	38.16311
Pn = Ag*Fcr	348.0	348.0	kip	
DCR_comp =	0.45	0.45		

5 in Tension

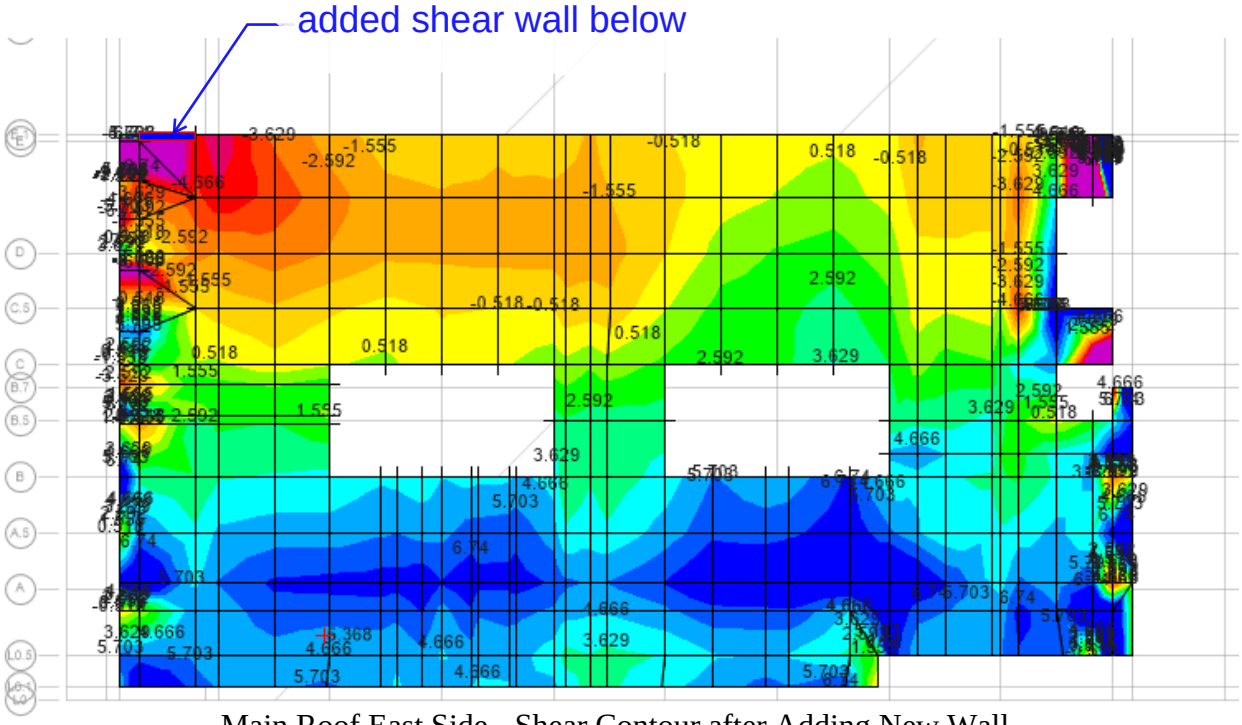
Tn = Ag*Fy =	374	kip
DCR_tens =	0.42	

Additional study for the retrofit:

Add new shear wall, steel plate or rc below with collector at main roof level to establish a direct load path for seismic force in n-s direction. See the snapshot below of the diaphragm force changes:



Main Roof East Side - Shear Contour without Adding New Wall



Main Roof East Side - Shear Contour after Adding New Wall

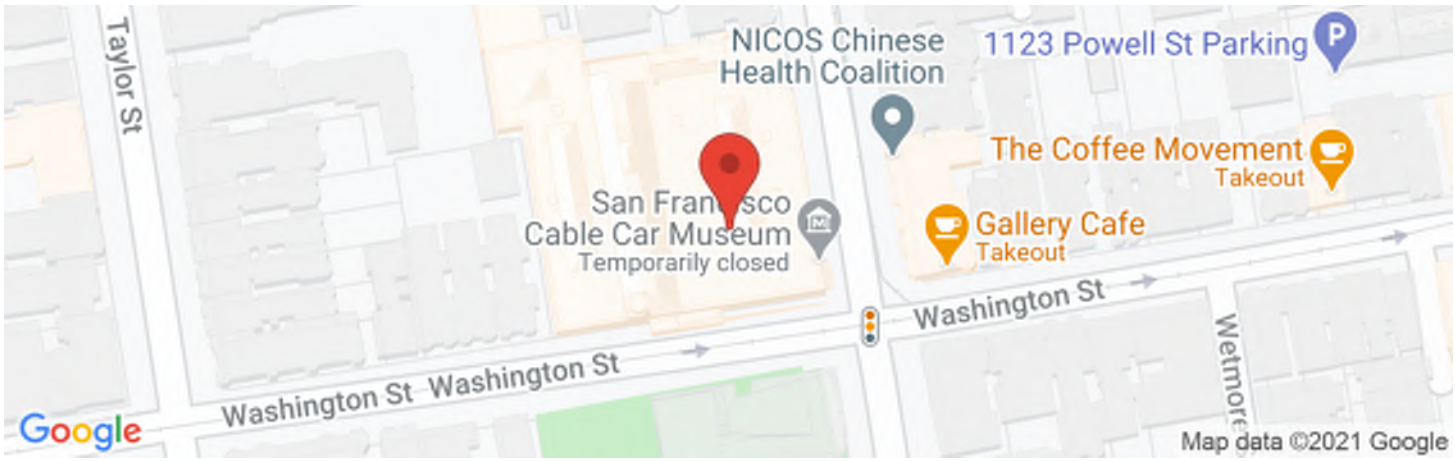
APPENDIX C

GEOTECHNICAL MEMO

Cable Car Barn

1201 Mason St, San Francisco, CA 94108, USA

Latitude, Longitude: 37.7947043, -122.4117199



Date	3/26/2021, 3:03:45 PM
Design Code Reference Document	ASCE41-17
Custom Probability	
Site Class	D - Stiff Soil

Type	Description	Value
Hazard Level		BSE-2N
S_S	spectral response (0.2 s)	1.5
S_1	spectral response (1.0 s)	0.6
S_{XS}	site-modified spectral response (0.2 s)	1.5
S_{X1}	site-modified spectral response (1.0 s)	1.02
F_a	site amplification factor (0.2 s)	1
F_v	site amplification factor (1.0 s)	1.7
ssuh	max direction uniform hazard (0.2 s)	1.877
crs	coefficient of risk (0.2 s)	0.931
ssrt	risk-targeted hazard (0.2 s)	1.748
ssd	deterministic hazard (0.2 s)	1.5
s1uh	max direction uniform hazard (1.0 s)	0.746
cr1	coefficient of risk (1.0 s)	0.912
s1rt	risk-targeted hazard (1.0 s)	0.681
s1d	deterministic hazard (1.0 s)	0.6

Type	Description	Value
Hazard Level		BSE-1N
S_{XS}	site-modified spectral response (0.2 s)	1
S_{X1}	site-modified spectral response (1.0 s)	0.68

Type	Description	Value
Hazard Level		BSE-2E
S_S	spectral response (0.2 s)	1.374
S_1	spectral response (1.0 s)	0.529
S_{XS}	site-modified spectral response (0.2 s)	1.374
S_{X1}	site-modified spectral response (1.0 s)	0.937
f_a	site amplification factor (0.2 s)	1
f_v	site amplification factor (1.0 s)	1.771

Type	Description	Value
Hazard Level		BSE-1E
S_S	spectral response (0.2 s)	0.736
S_1	spectral response (1.0 s)	0.264
S_{XS}	site-modified spectral response (0.2 s)	0.891
S_{X1}	site-modified spectral response (1.0 s)	0.547
F_a	site amplification factor (0.2 s)	1.211
F_v	site amplification factor (1.0 s)	2.072

Type	Description	Value
Hazard Level		TL Data
T-Sub-L	Long-period transition period in seconds	12

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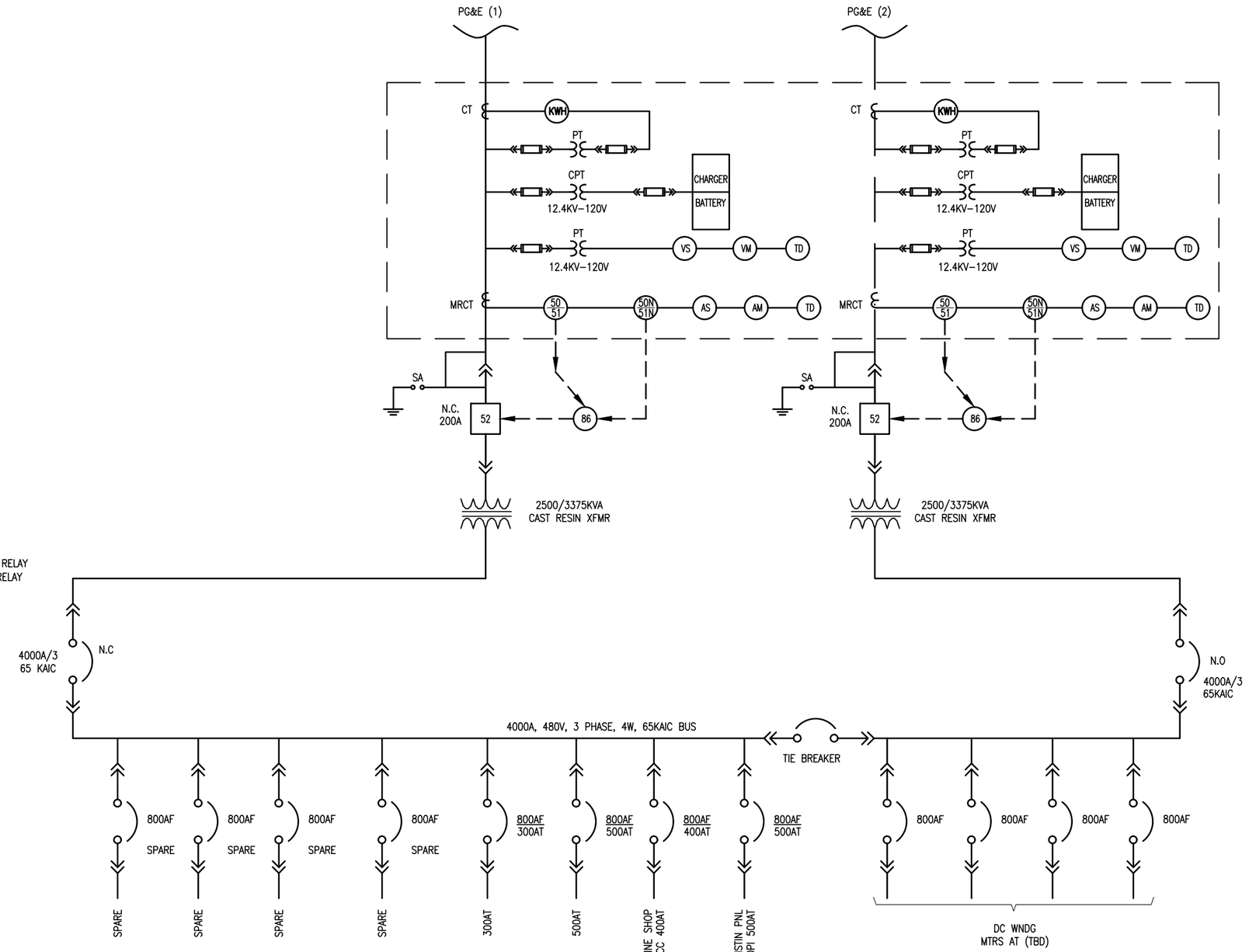
A5 - Electrical Diagrams

SYMBOLS:

A	AMMETER
V	VOLTMETER
AS	3 PHASE AMMETER SWITCH
VS	3 PHASE VOLTMETER SWITCH
UV	UNDERVOLTAGE TRIP
XX	PROTECTIVE RELAY; SEE ABBREVIATIONS FOR FUNCTION
	DRAWOUT ELEMENT
	FUSE
250AT 400AF	MOLDED CASE CIRCUIT BREAKER AS SHOWN: 250A TRIP UNIT, 400A RATED FRAME
	DRAWOUT TYPE CIRCUIT BREAKER
	POWER TRANSFORMER (CONTROL POWER TRANSFORMER)
	CURRENT TRANSFORMER
SA	SURGE ARRESTOR
TD	TEST DEVICE

ABBREVIATIONS:

50/51	OVERCURRENT TIME AND INSTANTANEOUS (SHORT TIME) RELAY
50N/51N	AC NEUTRAL OVERCURRENT TIME AND INSTANTANEOUS RELAY
52	CIRCUIT BREAKER
86	OVER VOLTAGE RELAY
A	AMPERE
AIC	AMPERE INTERRUPTING CAPACITY
AF	FRAME AMPERE RATING
AT	TRIP AMPERE RATING
CPT	CONTROL POWER TRANSFORMER
CT	CURRENT TRANSFORMER
K	KILO
N.C	NORMALLY CLOSED
N.O	NORMALLY OPEN
PG&E	PACIFIC GAS & ELECTRIC
V	VOLT
VA	VOLT-AMPERE
XFMR	TRANSFORMER



NOTES:

1. XXXX

NO.	DATE	DESCRIPTION	REVISED	CHECKED	APPROVED

REVISIONS

BORDER REVISED 11/01/16

DESIGNED
DRAWN
CHECKED
REVIEWED
RECOMMENDED
APPROVED
DATE

CITY AND COUNTY OF SAN FRANCISCO
MUNICIPAL TRANSPORTATION AGENCY

APPROVED

for the DIRECTOR OF TRANSPORTATION

MUNI METRO SYSTEM

XXXXXXXXX

####

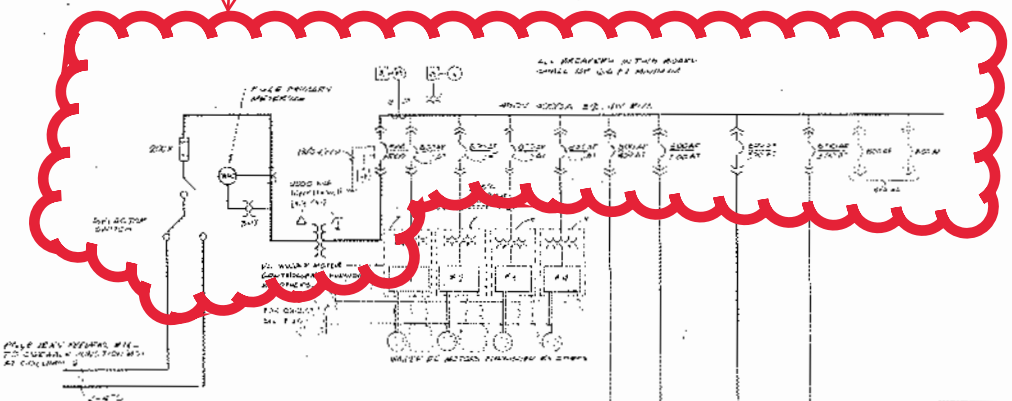
CONTRACT XXXX

DRAWING ####

REVISION #### ####

F:\IN_Cad_031616\QINGWEN\Cable Car Barn\ SINGLE DIAGRAM.dwg HThoi Thu Apr 21,2022 - 11:34 am

To be replaced in phase 1, see new equipment layout in the new electrical room on level 2.

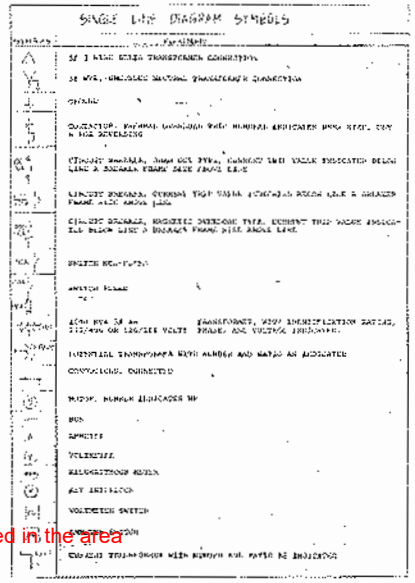


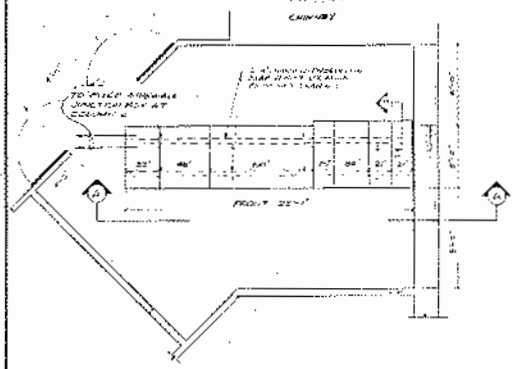
To be replaced when other work is being performed in the area

To be replaced when other work is being performed in the area

To be replaced when other work is being performed in the area

To be replaced when other work is being performed in the area





ELEVATION

UNIT SUBSTATION LAYOUT

NOTE: MR 820 FOR REFERENCE ONLY

CHIN & HENSOLT ENGINEERS, INC.

REHABILITATION OF CABLE CAR BARN

CITY AND COUNTY OF SAN FRANCISCO
PUBLIC UTILITIES COMMISSION
UTILITIES ENGINEERING BUREAU

SINGLE LINE DIAGRAM AND UNIT SUB STATION LAYOUT

A6 - Historic Report

HISTORIC RESOURCE EVALUATION

Cable Car Barn
San Francisco, California

San Francisco Department of Public Works | *September 2021*

Architecture
Planning
Conservation

Architectural
Resources Group

Architectural Resources Group

Cable Car Barn
Historic Resource Evaluation
San Francisco, California

September 2021

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1. INTRODUCTION

1.1 Project Background

At the request of the San Francisco Department of Public Works (DPW), Architectural Resources Group (ARG) has prepared this Historic Resource Evaluation (HRE) for the Cable Car Barn located at 1201 Mason Street (0190/005) in the Nob Hill neighborhood in San Francisco (Figure 1). The property was initially developed as a maintenance and powerhouse facility between 1887 to 1888 for the Ferries & Cliff House Railroad Company, which was one of several cable car operators during the late nineteenth century. The original 1888 three-story, brick masonry building was largely destroyed in the 1906 earthquake and fires but was replaced with the existing two-story building the following year by the United Railroads of San Francisco; the 1888 foundations and lower 85 feet of the original smokestack were incorporated into the replacement building. Since its completion in 1908, the Cable Car Barn has continued to serve as a center for cable car operations in the city, now under the ownership of the San Francisco Municipal Transportation Agency (SFMTA). The building has undergone multiple alterations since its reconstruction in 1908 to improve maintenance and operation capacities and to provide an onsite museum dedicated to the history of the cable cars.

Figure 1. Aerial photograph of the Cable Car Barn at 1201 Mason Street and immediate vicinity. The location of subject property outlined in red (Google Earth, 2021; amended by author).

Beginning in the 1960s, the Cable Car Barn has been recognized as an integral component of the San Francisco cable car network, which has been preserved as an iconic historic feature of the city. In 1964, the San Francisco Cable Cars system, including the Cable Car Barn, cable cars, and tracks, was designated as a National Historic Landmark. The cable car system was subsequently listed in the National Register of Historic Places (National Register) and California Register of Historical Resources (California Register). In 1971, the Cable Car Barn was designated separately as San Francisco Landmark No. 43. As such, the building is a historical resource under the California Environmental Quality Act (CEQA).

The San Francisco DPW is currently completing a Master Plan for the Cable Bar Barn. The goals of the project are to optimize allocation of space in the Cable Car Barn for function and workflow and to ensure that all aspects of the space are architecturally and structurally sound and appropriate for their chosen functions. The building last underwent an extensive renovation in the early 1980s, when the majority of the interior was replaced, select windows were replaced, and new entrances for cable cars and for the museum were added. Since these alterations post-date the property's historic designations at the national, state, and local levels in the 1960s and early 1970s, this HRE report provides an updated historic context, construction chronology, and integrity assessment to confirm that the Cable Car Barn remains a historic resource under CEQA. This report also provides a list of character-defining features to inform DPW's Cable Car Barn Master Planning effort and future projects at the property.

1.2 Current Historic Status

Since the 1960s, the Cable Car Barn has been recognized as a historic resource at the national, state, and local level, primarily as a contributor to the broader San Francisco Cable Car system. Thus, the property is a historical resource under CEQA and is currently classified by the San Francisco Planning Department as "Category A – Historic Resource Present."[1] The following section provides a summary of its historic designations, and a copy of the corresponding documentation is included in Appendix B.

National Historic Landmark

The San Francisco Cable Car system, which includes the Cable Car Barn as a contributing feature, was designated as a National Historic Landmark in 1964. While the initial documentation outlining the San Francisco Cable Car National Historic Landmark was brief, subsequent documentation identified the individual cable cars, tracks and cables, turning platforms, other operating equipment and infrastructure, and the Cable Car Barn building (identified as the "Cable Car Barn and Powerhouse") as contributing features.[2]

National Register of Historic Places

In 1966, the San Francisco Cable Car network was automatically listed in the National Register due to its National Historic Landmark status. In 1978, a National Register nomination form was prepared and identifies the Cable Car Barn as a contributing feature to the historic property.[3]

Historic American Engineering Record (HAER)

In 1981, the Cable Car Barn was documented as a contributor to the San Francisco Cable Car system (identified as the San Francisco Cable Railway) through the Historic American Engineering Record (HAER) program, which is administered by the National Park Service. The HAER documentation, which includes a written history, measured drawings, and large-format photographs, was prepared to document the cable car system, including the Cable Car

1 San Francisco Planning Department, Property Information Map, accessed July 13, 2021, https://sfplanninggis.org/pim/?tab=Historic Preservation&search=1201+Mason+Street.
2 National Park Service, "National Register of Historic Places Inventory – Nomination Form: San Francisco Cable Cars," prepared by James Dillon, 1978, 2.
3 Ibid., 1-2.

Barn, prior to the large renovation campaign completed in 1984. The HAER documentation attests to the significance of the Cable Car Barn as a contributing feature within the San Francisco Cable Car system.[4]

California Register of Historical Resources

The San Francisco Cable Car system, including the Cable Car Barn, has been automatically listed in the California Register following its listing in the National Register. As such, the system has been assigned California Historical Resource (CHR) Status Code of 1S, as an "individual property listed in the [National Register] by the Keeper. Listed in the [California Register]" in the California Historical Resource Information System (CHRIS).[5] The CHRIS is maintained by the California Office of Historic Preservation as a comprehensive database of properties that have been evaluated or reviewed for historical significance throughout California.[6]

San Francisco Landmark

In 1971, the Cable Car Barn (identified as the "Cable Car Barn and Power House") was individually designated a San Francisco Landmark No. 43. It was identified as significant as "the only surviving cable car barn and [powerhouse] in the city."[7] The landmark designation also states that the exterior of the Cable Car Barn should preserved as an "excellent example of industrial construction."[8]

1976 Citywide Architectural Survey

Between 1974 and 1976, the San Francisco Planning Department surveyed thousands of buildings throughout the city and assigned each building a numerical rating from -2 to 5, with 5 as the highest rating.[9] The Cable Car Barn was surveyed in 1975 and given a summary rating of 3, while also noting that it is a rare brick industrial building in area and featured "splendid" interiors.

1.3 Methodology

To complete this HRE for the Cable Car Barn, ARG:

- Conducted a site visit to examine the existing condition of the subject property on April 7, 2021;
- Conducted preliminary archival research at the San Francisco Recorder's Office, San Francisco Department of Building Inspection, and San Francisco Public Library History Room;
- Reviewed digital repositories, including the Internet Archive, SFMTA Photo Collection and Archive, *San Francisco Chronicle* Historical Database, and California Digital Newspaper Collection; and

4 Patrick W. O'Bannon, Marcia Osterhout and Steven Petrow, "San Francisco Cable Railway, Washington and Mason Streets, San Francisco, San Francisco County, California," Historic American Engineering Record, HAER No. CA-12 (Washington D.C.: Department of the Interior, National Park Service, 1981).
5 California Office of Historic Preservation, "California Historical Resource Status Codes," published December 8, 2003, accessed August 8, 2021, https://ohp.parks.ca.gov/pages/1069/files/chrstatus%20codes.pdf.
6 National Park Service, "National Register of Historic Places Inventory – Nomination Form: San Francisco Cable Cars," 2.
7 City and County of San Francisco Planning Commission, San Francisco Cable Car Barn and Powerhouse Landmark Designation, Resolution No. 6725, April 28, 1971, 1.
8 Ibid., 2.
9 San Francisco Planning Department, "San Francisco Preservation Bulletin No. 15: Parcel Information Database: Understanding the Survey Ratings Tab," July 25, 2003, accessed July 1, 2021, http://sf-planning.org/sites/default/files/FileCenter/Documents/5093-PresBulletin15PARCELINFO.PDF.

- Reviewed resources such as Sanborn Fire Insurance Maps, city directories, building permits and plans, historic newspaper articles and photographs, and other primary and secondary sources regarding the Cable Car Barn property.

2. PHYSICAL DESCRIPTION

The following section provides a preliminary physical description of the exterior and interior of the Cable Car Barn; additional existing conditions photographs are provided in Appendix A.

The Cable Car Barn is a two-story-over-basement brick masonry building located within an irregular parcel at the northwest corner of Washington and Mason streets in San Francisco, California. It was completed in 1908 to replace the original 1888, three-story cable car barn and powerhouse destroyed in the 1906 earthquake and fires. The current building was constructed on the footings and foundations of the original building. These features, and the remaining shortened portion of the smokestack at the southwest corner of the building, are the only remnants of the original 1888 cable car barn and powerhouse.

The building is constructed to the property lines and largely fronts Mason Street to the east and Washington Street to the south. It includes a panhandle extension along the rear property line north toward Jackson Street. The north façade directly abuts the north-adjacent properties. The 1908 brick masonry façades create a box-like massing with a predominantly flat roof profile (Figure 2). The shortened smokestack at the southwest corner adds some verticality to the massing, although the horizontality of the building defines the building. A pair of string courses visually separate the first and second floors. The fenestration includes regularly spaced, multi-lite steel windows with awning or fixed sashes. The first-floor fenestration typically feature low-pitched, segmented arch openings, whereas the second-floor windows have a segmented or rounded arch transoms (Figure 3). Large entrance door assemblies with sidelights and transoms are located throughout the envelope that cater to both pedestrians and vehicles. Some of these entrances provide interior access for San Francisco's cable cars, which are located at the rear of the building and front Washington and Jackson streets (Figure 4). A third-floor penthouse addition is setback within the roof and is partially visible from the north façade. It is defined by a stucco veneer with elongated hipped skylights.

Figure 2. East (right) and south (left) façades of the Cable Car Barn at 1201 Mason Street, view northwest (ARG, April 2021).

Figure 3. Southeast corner of the Cable Car Barn, with typical fenestration, view northwest (ARG, April 2021).

Figure 4. North cable car entrance at Jackson Street, view south (ARG, April 2021).

The interior of the building is organized by use with the cable systems located on the basement and first floor; a museum located at the mezzanine; cable car maintenance and operations located on the second floor; and a series of offices and administrative spaces at the third-floor penthouse level. The first floor is defined by a large open volume with the winding equipment and engines and cable tension run extending diagonal through the space (Figure 5). This diagonal orientation of the winding equipment and tension run is consistent with the Cable Car Barn's original design, although the equipment and associated components have been updated and replaced since its they were originally installed. Operator rooms and a machine shop and storage that caters to the maintenance of the cables and drive system is located immediately adjacent. Overlooking the ground floor on the south side of the interior is an elevated mezzanine deck occupied by the museum. The second-floor features maintenance bays and pits for the cable cars, which enter the property along to the north and south from Jackson and Washington streets, respectively, and are distributed through the interior through a series tracks accessed by a large turntable. The third-floor penthouse features offices, break rooms, training and conference spaces, and similar administrative spaces. The second- and third-floor interiors date to the 1980s remodel, which removed most of the pre-existing interior fabric of the Cable Car Barn.

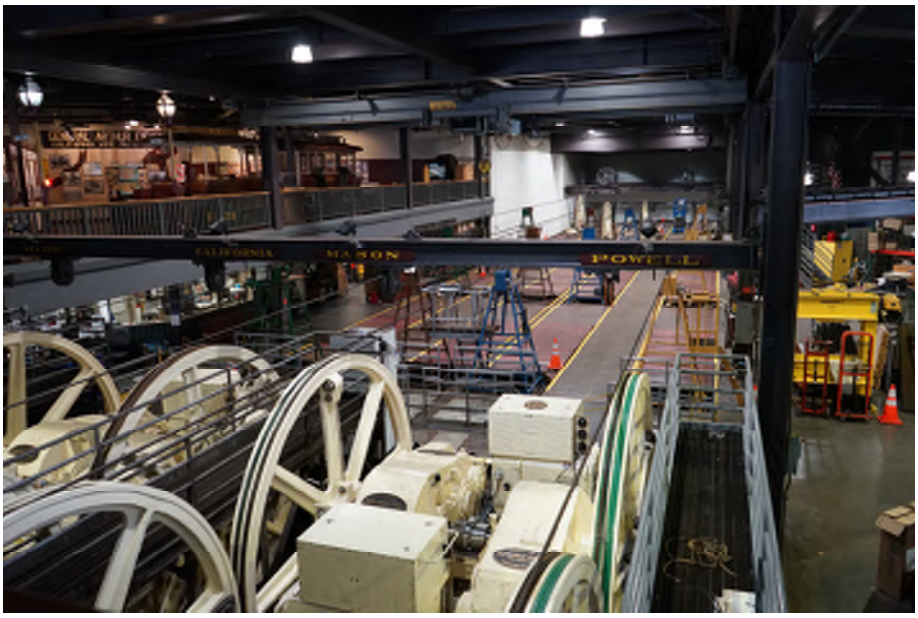

Figure 5. First-floor interior of the Cable Car Barn with winding equipment and tension run (center), machine shop space (right), and museum mezzanine (left), view northwest (ARG, April 2021).

3. CONSTRUCTION CHRONOLOGY

3.1 Site History

The following section provides a history of the site, specifically outlining the evolution of the property since its initial use as a cable car barn and powerhouse, as well as the companies and entities associated with the ownership and operation of the property. Sanborn Fire Insurance Maps for the subject property are included as Appendix C, and additional historic photographs are included in Appendix D.

Early Period, 1888-1906

The first Cable Car Barn at 1201 Mason Street was constructed by the Ferries & Cliff House Railway in 1888. Prior to the acquisition of the property by the Ferries & Cliff House Railway in 1886, much of the subject property was used as a boarding stable (Figure 6). The Ferries & Cliff House Railway hired engineer Howard C. Holmes to design its cable car system. At the center of this system was the cable car barn and powerhouse, which housed the boilers, steam engines, cable winding equipment, and cable car maintenance space. Construction of the original foundations began in February 1887, and construction of the exterior façade was well underway by that June.[10] The three-story, brick masonry building was completed in 1888 and featured regularly spaced windows openings, a gabled parapet, and an elongated smokestack (Figures 7).

10 O'Bannon, "San Francisco Cable Railway," HAER No. CA-12, 38.

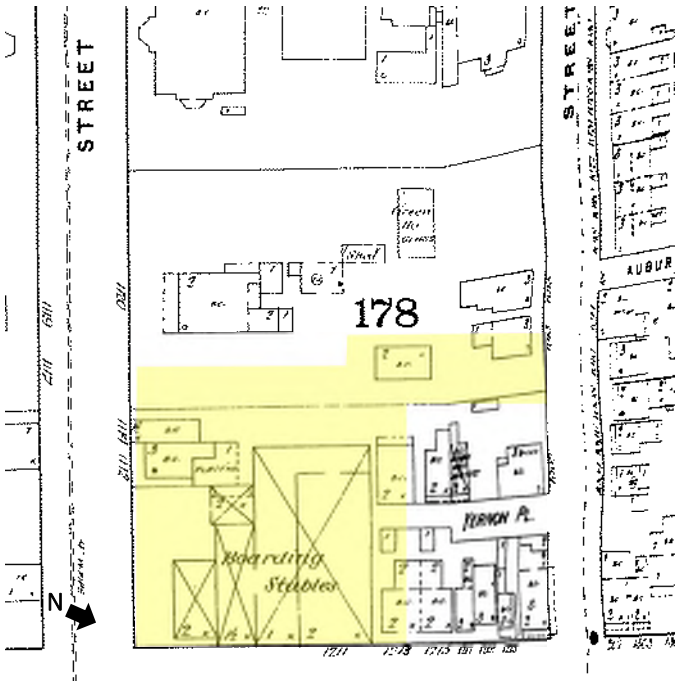

Figure 6. 1886 Sanborn Fire Insurance Map, Volume 2, Sheet 34a; approximate boundary of the current parcel is highlighted in yellow (San Francisco Public Library; amended by author).

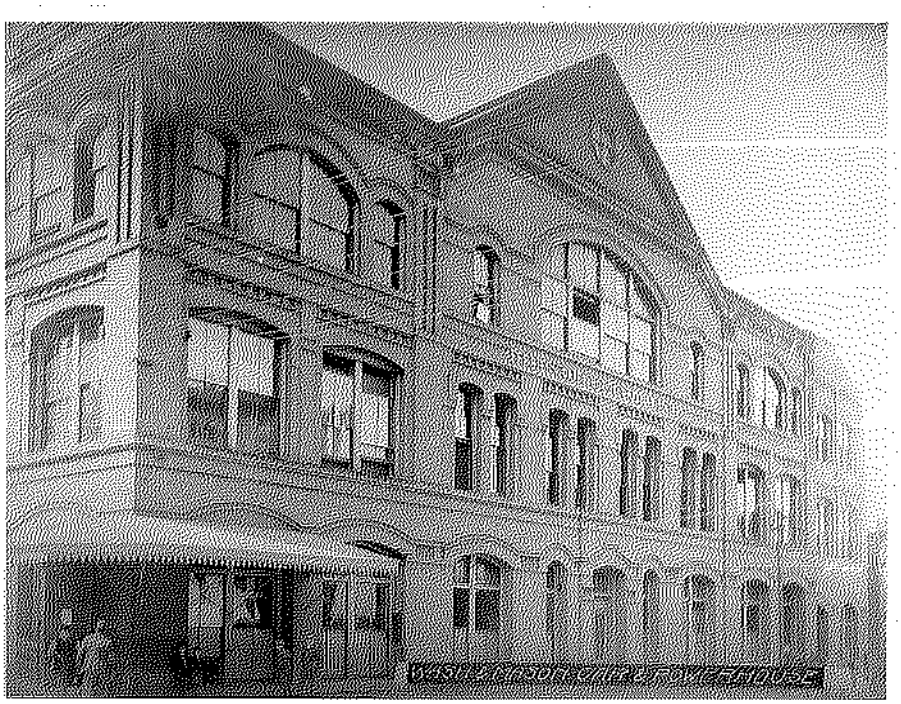

Figure 7. East façade of the original 1888 Cable Car Barn and Powerhouse at 1201 Mason Street, view northwest from Mason Street, 1904 (SFMTA Collection and Archives).

The Ferries & Cliff House Railroad was founded by W. J. Adams, a San Francisco-based lumber dealer and sawmill owner. In the mid-1880s, Adams was developing plans for a cable car line to extend north-south along Powell

Street and up Nob Hill. Simultaneously, Gustav Sutro, brother of Adolph Sutro, who owned the Cliff House and Sutro Baths resort, was planning a cable car route to extend from downtown to the resort area.[11] Adams purchased the interest in the plans for a cable car line from Sutro and combined the two concepts as the Ferries & Cliff House Railroad. The company would open its first Powell Street line in March 1888, which extended along Union Square, the affluent neighborhoods of Nob Hill, and served the predominantly Italian American community in North Beach. A second line opened soon after in April 1888, running east-west along Washington and Jackson streets towards the Presidio and eventually the Cliff House and Sutro Bath. Both lines were designed by engineer Howard C. Holmes and operated out of the single, three-story brick powerhouse located at the corner of Mason and Washington streets.

Sited into the side of the hill at the Washington and Mason streets, the 1888 building had a square footprint that housed the winding machinery, boilers, and engines below grade and at the ground floor. Additionally, a machine shop was located on the ground floor, which provided workers immediate access to the maintain and splice the cables running through the winding machinery. The upper floors of the three-story building were used for cable car maintenance and administrative offices (Figure 8).[12] Because of the small site, Holmes oriented the winding equipment diagonally within the ground floor of the building to increase the lengths of the tensions runs; the engines, boilers, and smokestack would be located at the southwest corner of the building.[13]

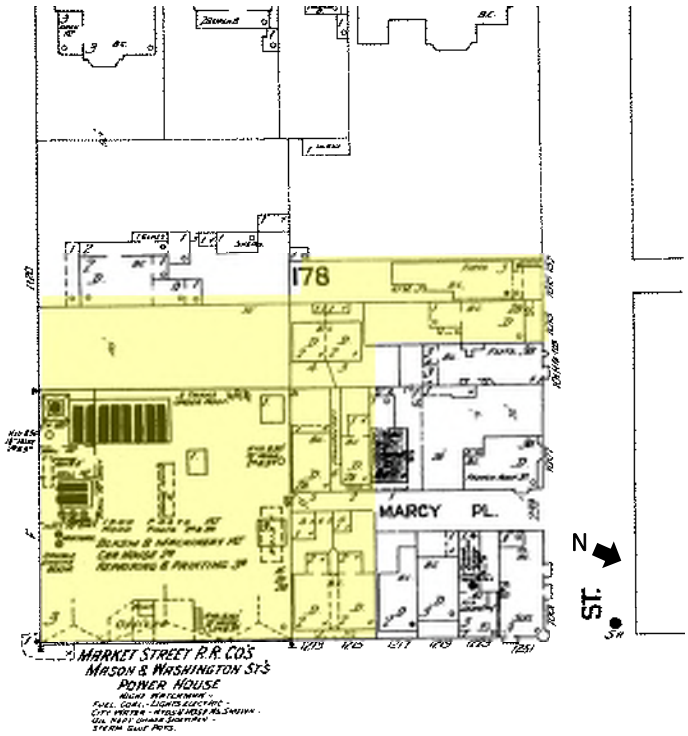

Figure 8. 1899 Sanborn Fire Insurance Map, Volume 1, Sheet 53; approximate boundary of the current parcel is highlighted in yellow (San Francisco Public Library; amended by author).

In 1887, the Ferries & Cliff House Railroad purchased the Clay Street Hill Railroad, which was the initial cable car company of San Francisco, founded by cable car inventor Andrew Hallidie. Portions of the original Clay Street cable

11 The following sections are derived from O'Bannon, "San Francisco Cable Railway," HAER No. CA-12. Any additional sources will be cited accordingly.
12 Ibid., 37.
13 Ibid., 37; Sanborn Fire Insurance Map, Vol. 1, Sheet 53, 1899.

car line that served as the city's first cable car route was incorporated into Ferries & Cliff House Railroad's Clay-Sacramento route. This cable car line opened in 1892 and provided the company with access to the Ferry Building. However, the rapid expansion of the Ferries & Cliff House Railroad accrued substantial debts for the company. In 1893, the Ferries & Cliff House Railroad was acquired by the Market Street Railway, a competing cable car operator. As part of the acquisition, original Cable Car Barn and all of the Ferries & Cliff House Railroad cable car infrastructure was transferred to the Market Street Railway. Almost immediately after, the Market Street Railway replaced much of the original cable winding equipment, boilers, and engines within the original Cable Car Barn at 1201 Mason Street. It also introduced a new figure-eight drive and sheave system to drive the cables out of the powerhouse, although the original diagonal layout of the tension run developed by Howard C. Helms was retained.[14]

In 1902, the Market Street Railway was purchased by the United Railroads of San Francisco (United Railroads). United Railroads was primarily owned by investors in the eastern states but began investing aggressively in San Francisco during this period. In addition to the Market Street Railway, United Railroads also acquired several other transportation other companies, including electric trolley lines, which were becoming more commonplace as a more affordable and less complicated mode of transportation compared to the cable cars. That same year that United Railroads acquired the Cable Car Barn and all of the associated cable car infrastructure, a three-story brick annex was attached at the north elevation of the subject building towards Jackson Street. This annex increased the square footage for storage and maintenance of the cable cars, while also creating a new cable car entrance from the hillside on Jackson Street. This expanded maintenance area and new Jackson Street entrance was serviced by a new turntable constructed towards the rear of the property.[15] This development gave the property an irregular layout bounded by Washington Street to the south, Mason Street to the east, and Jackson Street to the north, which is largely consistent with the current configuration.

Reconstruction and Decline, 1906-1944

In 1906, the earthquake and fires decimated much of the United Railroads cable car rolling stock, cable car lines and tracks, and many of the powerhouses and cable car barns. The company immediately began reconstructing infrastructure and restoring cable car services

The original Cable Car Barn sustained noteworthy damage during the earthquake but was largely destroyed in the subsequent fires (Figure 9). United Railroads cleared much of the site, leaving the existing footings and foundations, as well as the remaining portion of the original 1888 smokestack (Figure 10).[16] Construction of the current Cable Car Barn began the following year and continued into 1908. The replacement building was designed by architect H. K. Stevens and cost $75,000.[17] It featured a slightly expanded, irregular footprint compared to the original but was at a reduced height of two stories (Figures 11, 12). The brick masonry façade was notably more austere than the original with simple brickwork detailing, arched window openings, and a flat roof profile, although a small gabled portion was located at the north portion of the east façade. The smokestack was retained, albeit at a reduced height from 185 feet to 89 feet.[18] At the interior, the diagonal orientation for the winding equipment and tension run was retained at the ground floor, which also included machine shop spaces. The second floor, which was supported by steel columns and beams, housed the cable car storage, cable car maintenance facilities, and administrative offices. During reconstruction of the Cable Car Barn, the United Railroads used temporary team engines and winding equipment housed in wooden sheds to continue operating the cable car lines.[19]

14 O'Bannon, "San Francisco Cable Railway," HAER No. CA-12, 39.
15 Ibid., 40.
16 Ibid.
17 San Francisco Department of Building and Inspection, "Application for Building Permit – Brick Building," Permit No. 6881, December 26, 1906.
18 O'Bannon, "San Francisco Cable Railway," HAER No. CA-12, 41.
19 O'Bannon, "San Francisco Cable Railway," HAER No. CA-12, 41.

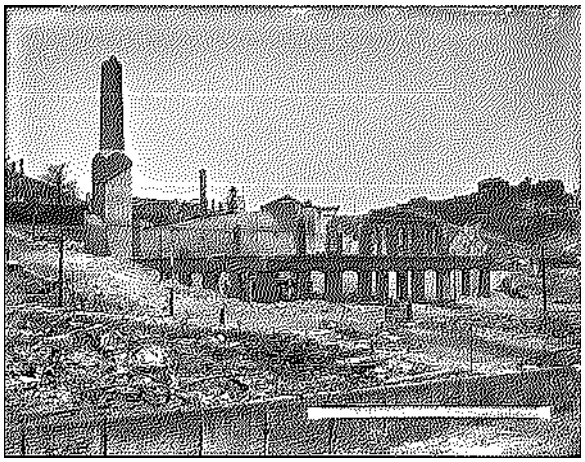

Figure 9. Remnants of the 1888 Cable Car Barn after the 1906 earthquake and fires, view northwest, May 1906 (SFMTA Photo Collection and Archives).

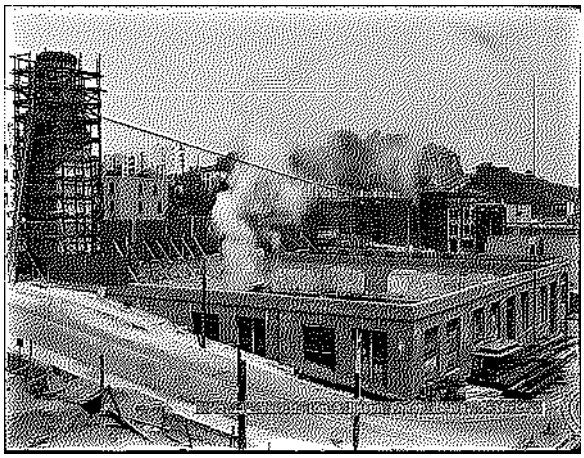

Figure 10. Current Cable Car Barn under construction, view northwest, March 1907 (SFMTA Photo Collection and Archives).

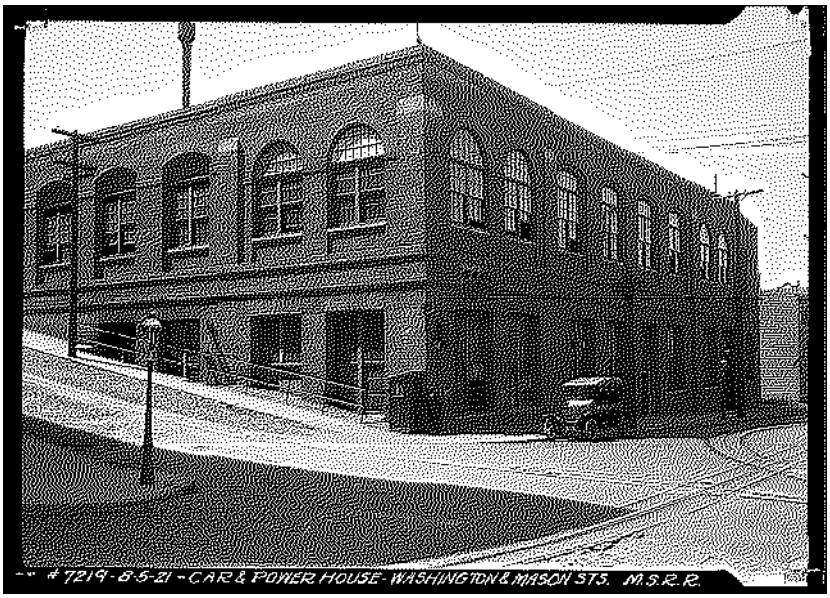

Figure 11. Cable Car Barn after reconstruction, view northwest from corner of Mason and Washington streets, August 1921 (SFMTA Photo Collection and Archives).

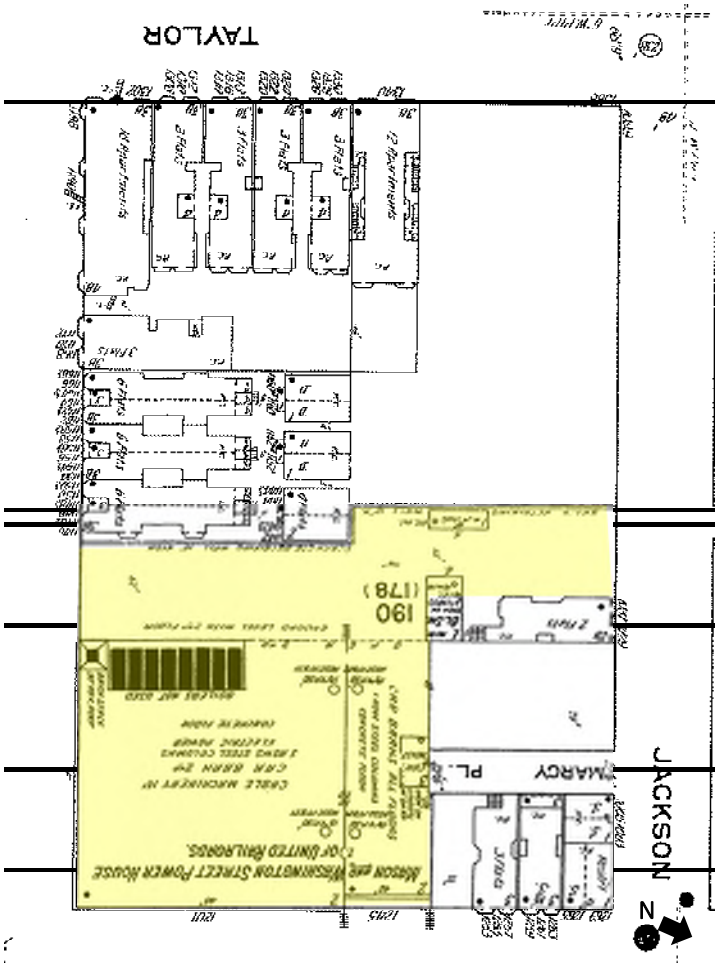

Figure 12. 1913 Sanborn Fire Insurance Map, Volume 1, Sheet 73; the approximate boundary of the current parcel is highlighted in yellow (San Francisco Public Library; amended by author).

In 1912, United Railroads replaced the steam engines with a new electric motor system, which required a 275kw substation to be installed within the building. Some steam engines would remain onsite for backup generation until 1924 when the last steam engines and boilers were replaced with electric motors.[20] As such, 1924 was the last year that the Cable Car Barn had the capacity to use steam power in its powerhouse function.

In 1918, the United Railroads was bankrupt. Its assets were reorganized and rebranded in 1921 under the former Market Street Railway name. The second iteration of the Market Street Railway would continue to operate the former Ferries & Cliff Hose Railroad lines over the follow years with the Cable Car Barn as a key center of operations. However, with the proliferation of electric trolleys and eventual bus transportation options through the early to mid-twentieth century, cable cars were becoming expensive, impractical, and obsolete. In 1942, the Market Street Railway stopped operating the Clay-Sacramento cable car line, which included remnants of the first 1873 cable car line founded by Andrew Hallidie. In 1944, the Market Street Railway was purchased by the city through the San Francisco Municipal Railway (Muni).

20 O'Bannon, "San Francisco Cable Railway," HAER No. CA-12, 41.

City Ownership and Heritage Tourism, 1944-Present

In 1944, Muni acquired the Market Street Railway and its cable car line assets, including the subject property. Although the cable cars were an antiquated technology, their value to the city as living history was becoming apparent. In 1952, Muni also acquired the other remaining cable car company, the California Street Railroad. This gave the city control over all of the remaining cable car lines in San Francisco. Soon after, Muni began integrating the California Street Railroad system into the former Market Street Railway infrastructure.[21] Between 1956 and 1957, Muni consolidated the operations of the California Street lines into the Cable Car Barn, which required a substantial renovation of the mechanical equipment in the building.[22] Despite funding issues, the project was completed, and all of San Francisco's cable car lines were operated out of the subject property.[23] In 1960, Muni began another renovation at the Cable Car Barn by converting the former boiler spaces along the west portion of the first floor into office space.

In 1965, Muni announced plans to rehabilitate the Cable Car Barn and include a new museum space. Publications at the time clearly demonstrate the excitement of the project and the preservation of the property, particularly in contrast to the aggressive redevelopment programs of the period.[24] In 1967, the mezzanine floor was constructed at the southern portion of the building to accommodate a new cable car museum and viewing platform of the winding machinery and tension run. As part of this, the southern ground floor window at the east Mason Street façade was converted to a new museum entrance (Figure 13). The brick masonry envelope, which was painted white ca. 1960, was also sandblasted and late nineteenth and early twentieth century period-inspired elements, such as an awning canopy above the museum entrance and gas lamp-inspired streetlights were added; the "Ferries & Cliff House Railway Co." signage was first installed in 1966, as were two additional flagpoles at the southeast corner of the roof to total three.[25] The new cable car museum was dedicated on November 10, 1967 by then U.S. Secretary of Transportation Alan S. Boyd.[26] However, despite the recent work, it was recognized by city officials that more would be required to maintain the Cable Car Barn. In 1969, the city formed a citizens committee to continue to oversee and advise on the further restoration and operation efforts at the Cable Car Barn.[27]

21 O'Bannon, "San Francisco Cable Railway," HAER No. CA-12, 23-24.
22 Ibid., 37.
23 Richard Reinhardt, "Bid Too High – New Delay on Cal Cable," *San Francisco Chronicle*, June 7, 1957.
24 "Cable Car Museum," *San Francisco Chronicle*, July 5, 1965.
25 O'Bannon, "San Francisco Cable Railway," HAER No. CA-142.
26 Elmont Waite, "Why Cable Cars Survive – High Praise from U.S. Official," *San Francisco Chronicle*, November 11, 1967.
27 Jerry Burns, "Barn, Palace – Big Plans for Two Landmarks," *San Francisco Chronicle*, August 5, 1969.

Figure 13. Cable Car Barn after the 1967 renovation with the new museum entrance at the southeast corner, view northwest from corner of Mason and Washington streets, July 1968 (SFMTA Photo Collection and Archives).

The Cable Car Barn changed little through the 1970s. This period was also marked by a series of labor disputes between the cable car workers, represented by the Transport Workers Union, and the city. Notable incidents included an altercation between Muni cable car operators and the San Francisco Police Department following a traffic incident in November 1970, as well as a series of strikes in the mid to late 1970s stemming from an increasing number of fatal accidents, deteriorated working conditions, and constant shutdowns resulting in widespread frustrations among the public, all resulting in poor morale. These incidents were attributed to the deteriorating condition of the cable car infrastructure.[28] With publicized accidents, infrequent service, and worker frustrations, Muni began to invest in a series of improvements to the system. The San Francisco Public Utilities Commission allocated more than $15 million into a preventative maintenance program in 1977, largely intended to improve multiple safety violations.[29]

By the early 1980s, a major rehabilitation campaign began for the cable car network and Cable Car Barn. The subject building itself was seen as in desperate need of repairs and unable to support the continued operation of the cable cars. To remedy this, the entire interior volume of the Cable Car Barn was removed, saving the south and east façades and portions of the west façades, as well as the smokestack at the exterior (Figure 14). The new interior would feature new equipment and spaces to operate and support the cable car system, although the new winding equipment and tension run would be installed in the same diagonal configuration within the main interior

28 "Brawl Sith Police Shuts Down Cable Cars," *San Francisco Chronicle*, November 6, 1970; Susan Ehmer, "The Cable Crisis," *San Francisco Chronicle*, August 10, 1976; Katy Butler, "Cable Car Crisis Over – For Now," *San Francisco Chronicle*, August 13, 1976; Larry D. Hatfield, "The Cable cars aren't safe, says injured Muni Gripman," *San Francisco Examiner*, August 22, 1976; Harry Jupiter and Stephen Hall, "New Cable Car Crash Sets off Wildcat Strike," *San Francisco Chronicle*, November 15, 1978; Dick Nolan, "The Cable Car Story Again," *The S.F. Sunday Examiner and Chronicle*, August 19, 1979.

29 Maitland Zane, "Muni Maintenance Funds in PUC Budget," *San Francisco Chronicle*, January 12, 1977.

volume. The original exterior windows with their single-hung lower sashes were replaced. However, the replacement windows matched the appearance of the original, except with awning sashes instead of single-hung sashes at the lower lites. Towards the rear of the property, new arched cable car entrance openings were constructed facing Washington and Jackson streets, providing a controlled pass through for the cable cars entering and exiting the maintenance floor of the Cable Car Barn. Previously, these entrances were to the property were an open yard and the addition of the brick masonry archways with metal doors provided an added layer of security. Additionally, a secondary cable car museum entrance was constructed along the south façade and features brick masonry with a hipped skylight. The new entrances were designed to be compatible with the existing architecture of the Cable Car Barn, primarily through the use of arched openings and brick masonry construction.

Within the stabilized 1908 envelope, an entirely new interior was constructed. Some similarities to the previous floorplan were maintained, such as the diagonal orientation of the winding equipment and tension run, the museum mezzanine, and the separation of spaces with the machine shop at the ground floor and cable car maintenance and storage at the second floor. However, these spaces featured entirely new infrastructure, including a new turntable. A third-level penthouse floor was also added, which created additional offices, meeting spaces, and break rooms for employees. The total cable car renovation project cost $18 million, which was part of the larger $58 million cable car reconstruction project.[30] The entire project was conducted on an aggressive schedule in order to be completed for the 1984 Democratic Convention being held in San Francisco. The renovated Cable Car Barn was dedicated by Mayor Diane Feinstein on June 4, 1984.[31]

Figure 14. Renovation of the Cable Car Barn with the interior removed and 1908 façades stabilized, view east, ca. 1982 (San Francisco Public Library, Historical Photograph Collection).

30 San Francisco Municipal Railway, "5-Year Plan: 1982-1987 – Capital Improvement Program," Vol 2, 1982, 1.
31 Chris Steward, "Mayor Overdoes It," *San Francisco Chronicle*, September 9, 1983.

Since the major renovation, improvements to the building have largely been in the form of tenant improvements with the alteration of offices and fire and life safety systems and telecommunication improvements. In 1999, San Francisco voters approved a proposing to combine Muni and the Department of Parking and Traffic into a single agency now known as the SFMTA. Muni officially became part of the new agency in March 2000.[32] The building continues to operate as the center for the cable car line, as well as a cable car museum.

3.2 Permit History

Table 1 below lists the building permits on file at the San Francisco Department of Building Inspection (DBI) for the Cable Car Barn at 1201 Mason Street. A copy of the building permit record is included in Appendix D of this report.

Table 1. Subject Property Building Permit History

Date	Permit No.	Architect/Builder	Description
12/26/1906	6681	H.K. Stevens, Architect American Hawaiian Engineering and Construction Company, Builder	Application for Brick Building at 1201 Mason Street – Powerhouse and Car House on existing foundations. Two-story, 48' tall building with wood joists on steel beams and brick masonry walls.
10/06/1960	215817	T. M. Cormick, Builder	Alterations to interior walls.
04/13/1961	222513	Public Utilities Engineering Bureau, Architect	Additional washroom.
09/08/1982	498143	T. M. Cormick, Builder	Alterations of the cable car garage, maintenance area, and machine shop. Demolition, earthwork, caissons, concrete and masonry, structural steel, carpentry, roofing, waterproofing, doors, windows and glass, plastering, floor and wall finishing, building specialties, carpeting, passenger and freight elevators, cranes, turntables, plumbing, heating and ventilation, fire protection and electrical.
10/08/1982	495988	Public Utilities Engineering Bureau, Architect Robert L. Sage, Builder	Non-structural demolition and alterations pursuant to pending construction of work.
11/16/1982	495902	Chin & Hensolt Engineers, Inc., Architect Tutor-Saliba, Inc., Builder	Structural shoring for exterior walls during building alteration.
3/9/1983	500101	Chin & Hensolt Engineers, Inc., Architect Tutor-Saliba, Inc., Builder	Structural shoring for main cable sheave pit.
4/25/1983	501261	Chin & Hensolt Engineers, Inc., Architect Tutor-Saliba, Inc., Builder	Structural shoring – areaway.

32 Chris Steward, "Mayor Overdoes It," *San Francisco Chronicle*, September 9, 1983.

Date	Permit No.	Architect/Builder	Description
2/6/1984	512214	Chin &Hensolt Engineers, Inc., Architect Tutor-Saliba, Inc., Builder	Fire protection sprinkler system.
9/12/1986	555259	Stop Fire, Inc., Engineer and Builder	Fire detection and suppression system to be installed in Electrical Equipment Room, Control Room.
1/10/1992	725585	Public Utilities Engineering Bureau, Architect	Addition of mezzanine offices.
12/16/1999	897450	Stop Fire, Inc., Engineer and Builder	Upgrades to existing fire sprinkler system.
3/23/2015	1352698	International Fire Equipment, Engineer and Builder	Install 2 fire sprinkler heads in new office.
8/5/2015	1365250	Antonio Genoese, Architect Champion Telecom, Builder	Install DIS server. Install cables hyper flex, fiber optic, DC in conduits and trays. Install radio cabinet. Install antennae on ballast mounts on roof and building.

4. HISTORIC CONTEXT

The following section provides a focused historic context for the development of the Cable Car Barn.

4.1 San Francisco Cable Car Network

The cable car was invented between 1869 and 1873 in San Francisco by engineer Andrew Smith Hallidie. Hallidie had come to San Francisco in 1852 from Great Britain as part of the California Gold Rush. Upon arriving, he began using wire rope cable, an invention of his father's that he improved upon and manufactured in San Francisco, into bridge construction and mining conveyance systems throughout the gold fields of California.[33] When Hallidie began operating the first cable car in August 1873 under the Clay Street Hill Railroad company, horse drawn trolley networks had been the norm for public transportation. However, these systems were often dangerous and limited by San Francisco's steep and varied topography. With the introduction of the cable car, new areas of the city were open to a rapid wave of real estate speculation and development.[34]

The success of the Clay Street Hill Railroad spurred the founding of several other transportation companies that used the cable car model, including the Sutter Street Railroad (1877); California Street Cable Railroad (1878); Geary Street, Park & Ocean Railroad (1880); Presidio & Ferries Railroad (1882), Market Street Cable Railway (1883); Ferries & Cliff House Railway (1888); and the Omnibus Railroad & Cable Company (1889). During the late nineteenth and early twentieth centuries, these cable car companies would construct over fifty-three miles of tracks and cable lines throughout the city. [35] Each cable car company used at least one cable car barn and powerhouse as the center of their operations and occasionally more where long cable alignments required separate facilities for the necessary winding and cable driving equipment on specific routes. These cable car barn

33 Gray Brechin, *Imperial San Francisco: Urban Power, Earthly Ruin* (Berkeley: University of California Press, 2001), 65.
34 Ibid.
35 San Francisco Municipal Transportation Agency, "Cable Car History," accessed July 1, 2021, https://www.sfmta.com/getting-around/muni/cable-cars/cable-car-history.

and powerhouse facilities were occasionally replaced with new buildings as operations expanded and technology changed.[36]

The Market Street Railway was founded in the 1860s as the Market Street Cable Railway Company, which operated an early horsecar line in San Francisco. The company was converted to cable cars in the early 1880s after major investments from Leland Stanford, Charles F. Crocker, and Henry Huntington, all members of the "Big Four" responsible for the transcontinental railroad and the founding of the Southern Pacific Railroad. The Market Street Railway company operated one of the largest networks of cable car lines that branched from its central line that extended along Market Street, serving the Mission District, Golden Gate Park, and the Western Addition. In 1893, under the presidency of Leland Stanford, the Market Street Cable Railway acquired the Ferries & Cliff House Railroad, the Omnibus Railroad & Cable Company, and two horsecar line operators into a single company under the name "Market Street Railway."

Prior to 1906, the public transportation network in San Francisco was a mixture of cable car, horsecar, and electric streetcars that were operated by private companies, many of which had been acquired by the Union Railroad in the years prior. However, the earthquake and fires destroyed most of the cable car infrastructure throughout the city, including the cable car barns and powerhouses. In many instances, the rebuilding period allowed cable car companies to improve upon the systems with new mechanical systems and technology. At the same time as the cable cars were rebuilding, new electric streetcar systems were becoming more common on the streets of San Francisco. These overhead wire-based streetcar networks were significantly cheaper to construct and maintain compared to the below-grade cable driven systems of the cable cars.

In 1909, voters approved the formation of a publicly owned transportation agency and system, which led to the creation of Muni. By 1912, Muni was operating an overhead wire-based electric streetcar line along Geary Street.[37] Over the followings years, Muni rapidly expanded their electric streetcar system throughout the city, often using a series of tunnels to navigate the varied terrain of San Francisco, which was another noted advantage over the existing cable car system. The electric streetcar model would continue to be used by Muni, although buses were introduced increasingly during the 1930s and 1940s, often favored for being cheaper and more flexible.[38]

During the 1910s and 1920s, cable car companies shifted to electric driven engines from steam, although the widespread adoption of the automobile and introduction of buses during the 1930s and 1940s made the inflexible and expensive cable cars increasingly obsolete.[39] With many of the cable car lines removed by the 1940s, the Citizens Committee to Save the Cable Cars was founded and advocated for the maintenance, preservation, and continued operations of the remaining cable car lines. It was recognized that the cable cars were not an effective form of public transportation as buses became the predominant form of transportation, but were now an important tourist draw and a defining element of San Francisco's character. The city acquired the remaining cable car infrastructure through the 1940s and 1950s as part of Muni, which continues to operate the cable cars under the SFMTA.[40]

4.2 Cable Car Barns and Powerhouses

All of the cable car companies in San Francisco used cable car barns and powerhouses as a central component of their operations. First and foremost, these buildings would house the mechanical equipment to drive the cable systems throughout one or more cable lines. Initially, this was done through steam power, which required large

36 O'Bannon, "San Francisco Cable Railway," HAER No. CA-12, 43.
37 Western Railway Museum, "San Francisco Municipal Railway," accessed July 6, 2021, https://www.wrm.org/about/railroad-history/san-francisco-municipal-railway.
38 San Francisco Municipal Transportation Agency, "Muni History," accessed July 6, 2021, https://www.sfmta.com/getting-around/muni/muni-history.
39 O'Bannon, "San Francisco Cable Railway," HAER No. CA-12, 43.
40 San Francisco Municipal Transportation Agency, "Cable Car History."

boilers and steam engines that would drive the large winding wheels and supporting equipment; conversion to electric-driven engines became more common particularly in the aftermath of the 1906 earthquake and fires, which damaged many of the cable car lines and support buildings.[41] The second function included in the cable car barns and powerhouses was the housing of the cable cars themselves. This required large garage spaces to facilitate storage and maintenance of the cable cars when they were not in use. Additionally, administrative and office spaces were often included alongside the garage portion. Typically, these uses were separated in the building with the mechanical and winding systems located in large basements and below grade vaults, whereas the cable car maintenance, storage use, and administration offices were relegated to the upper floors of the building. Where large sites could accommodate a larger footprint, cable car barns and powerhouses may have a large layout with these various functions over a single floor. In other instances, these buildings were sited on the hillsides of San Francisco, which led to a split-level organization of the building floor plates that could use gravity when bringing cable cars into the garage portion. This integration into the hillside often resulted in cable car barn functions being set on the second story.

Approximately a dozen or so cable car barns and powerhouses were constructed in San Francisco between the 1870s and early twentieth century. These buildings were not uniform in style and appearance, although most appeared to have exhibited an industrial quality.[42] This was emphasized by the smokestacks required as part of the original steam power driving systems, as well as the large floorplans with square or rectilinear layouts that used large portions of a subject city block. Where possible, cable car companies would consolidate their winding equipment for multiple lines into a single building, although particularly long cable car lines often required separate powerhouses in order to effectively drive the necessary lengths of cable. Cable car barns featured various materials, including exposed brick masonry, stucco veneer, and wood siding, as well as a mixture of stylistic details and ornamentation (Figures 15, 16). Of the cable car barns and powerhouses constructed throughout San Francisco, only the Cable Car Barn at 1201 Mason Street is extant.[43]

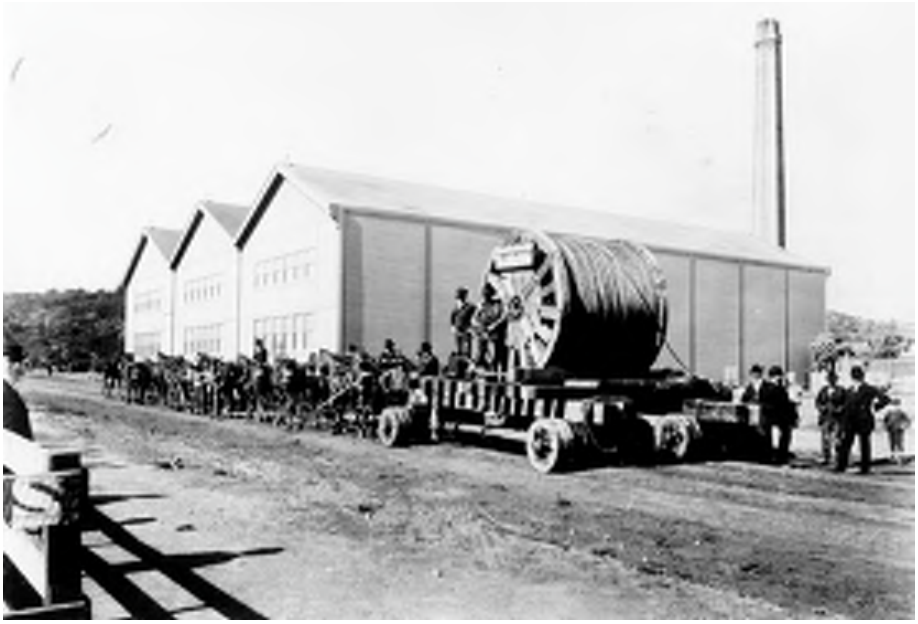

Figure 15. Market Street Cable Railway cable car barn and powerhouse for the McAllister Street cable car route, located at the corner of Fulton and Central streets, 1882 (San Francisco Public Library, Historical Photograph Collection).

41 The following section is derived from O'Bannon, "San Francisco Cable Railway," HAER No. CA-12. Any additional sources will be cited accordingly.
42 O'Bannon, "San Francisco Cable Railway," HAER No. CA-12, 3-43.
43 Ibid.

Figure 16. California Street Railway cable car barn and powerhouse at California and Hyde Streets, 1956 (San Francisco Public Library, Historical Photograph Collection).

4.3 H. K. Stevens, Architect

The extant Cable Car Barn building at 1201 Mason Street is attributed to an architect H. K. Stevens, who reportedly was an in-house architect or engineer at United Railroads.[44] Preliminary research has not revealed additional information about H. K. Stevens's life or practice. Some records indicate that Stevens may have arrived in San Francisco as early as 1851.[45] It is also possible that H. K. Stevens was a New York-based engineer that worked for the firm Ford, Bacon & Davis designing railroad infrastructure.[46] This possibility has merit as United Railroads was primarily owned by east coast investors who may have hired Ford, Bacon & Davis as part of the 1908 reconstruction of the Cable Car Barn and cable car lines.

5. EVALUATIVE FRAMEWORK

5.1 Federal Regulations

National Register of Historic Places

The National Register of Historic Places (National Register) is the nation's inventory of historic places and the national repository of documentation on historic property types, significance, abundance, condition, ownership, needs, and other information. The National Register Criteria for Evaluation define the scope of the National Register of Historic Places; they identify the range of resources and kinds of significance that will qualify properties for listing in the National Register. The Criteria are written broadly to recognize the wide variety of historic properties associated with our prehistory and history. A property eligible for the National Register must be significant at the local, state, or national level under one or more of the following criteria:

44 San Francisco Department of Building and Inspection, "Application for Building Permit – Brick Building," Permit No. 6881 (December 26, 1906).
45 D. Blethen Adams Levy, "Passenger Lists: San Francisco 1800s – SS Tennessee," *The Maritime Heritage Project – San Francisco 1846-1899*, accessed July 1, 2021, https://www.maritimeheritage.org/passengers/SS-Tennessee-4March1851.html.
46 New York Railroad Club, *Official Proceedings of the New York Railroad Club* 12 no.1 (November 21, 1901): 126.

A. Association with events that have made a significant contribution to the broad patterns of our history.

B. Association with the lives of significant persons in or past.

C. A property that embodies the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction.

D. A property that had yielded or may be likely to yield information important in history or prehistory.

For a property to qualify under the National Register, it must retain "historic integrity of those features necessary to convey its significance."[47] Integrity is the authenticity of a historical resource's physical identity evidenced by the survival of characteristics that existed during the resource's period of significance. Since integrity is based on a property's significance within a specific historic context, an evaluation of a property's integrity can only occur after historic significance has been established. To determine if a property retains the physical characteristics corresponding to its historic context, the National Register has identified seven aspects of integrity:

- *Location* is the place where the historic property was constructed or the place where the historic event occurred.
- *Setting* is the physical environment of a historic property.
- *Design* is the combination of elements that create the form, plan, space, structure, and style of a property.
- *Materials* are the physical elements that were combined or deposited during a particular period of time and in a particular pattern or configuration to form a historic property.
- *Workmanship* is the physical evidence of the crafts of a particular culture or people during any given period in history or prehistory.
- *Feeling* is a property's expression of the aesthetic or historic sense of a particular period of time.
- *Association* is the direct link between an important historic event or person and a historic property.

5.2 National Historic Landmarks

The National Historic Landmark program was created to encourage the long-term preservation of the most nationally significant historic properties within the United States. The National Historic Landmark program includes over 2,500 designated properties exceptional national significance. Per 36 Code of Federal Regulations (CFR) Section 65.4(a), a National Historic Landmark is typically older than 50 years and must exhibit exceptional national significance under at least one of six specific national significance criteria while also retaining a high degree of integrity. The Specific Criteria of National Significance for determining National Historic Landmark eligibility include:

- Associations with events that have made a significant contribution to, and are identified with, or that outstandingly represent, the broad national patterns of U.S. history and from which an understanding and appreciation of those patterns may be gained.
- Important associations with the lives of persons nationally significant in the history of the U.S.

47 National Park Service, "National Register Bulletin: How to Apply the National Register Criteria for Evaluation," accessed March 13, 2019, http://www.nps.gov/nr/publications/bulletins/nrb15/nrb15_6.htm.

- Represents some great idea or ideal of the American people.
- Embodies the distinguishing characteristics of an architectural type specimen exceptionally valuable for a study of a period, style, or method of construction, or that represents a significant, distinctive, and exceptional entity whose components may lack individual distinction.
- Composed of integral parts of the environment not sufficiently significant by reason of historical associated or artistic merit to warrant individual recognition, but collectively compose an entity of exception historical or artistic significance, or outstandingly commemorate or illustrate a way of life or culture.
- Yields or may be likely to yield information of major scientific importance by revealing new cultures, or by shedding light upon periods of occupation over large areas of the U.S. Such sites are those which have yielded, or which may reasonable be expected to yield, data affecting theories, concepts, and ideas to a major degree.

As with the National Register, certain types of properties must meet exception considerations in order to qualify as National Historic Landmarks. These properties include religious properties, relocated buildings or structures, buildings or structures no longer standing, birthplaces and graves of historical figures, cemeteries, reconstructed properties, commemorative properties, and properties that have achieved significance within the last 50 years. All National Historic Landmark properties are automatically listed in the National Register.

5.2 State Regulations

California Register of Historical Resources

The California Register of Historical Resources (California Register) is the authoritative guide to the State's significant historical and archaeological resources. It serves to identify, evaluate, register, and protect California's historical resources. The California Register program encourages public recognition and protection of resources of architectural, historical, archaeological, and cultural significance; identifies historical resources for state and local planning purposes; determines eligibility for historic preservation grant funding; and affords certain protections under the California Environmental Quality Act (CEQA). All resources listed on or formally determined eligible for the National Register are automatically listed on the California Register. In addition, properties designated under municipal or county ordinances are eligible for listing in the California Register.

The California Register criteria are modeled on the National Register criteria. A historical resource must be significant at the local, state, or national level under one or more of the following criteria:

1. It is associated with events or patterns of events that have made a significant contribution to the broad patterns of local or regional history, or the cultural heritage of California or the United States.
2. It is associated with the lives of persons important to local, California, or national history.
3. It embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of a master, or possesses high artistic values.
4. It has yielded, or has the potential to yield, information important to the prehistory or history of the local area, state or the nation.

Like the National Register, evaluation for eligibility to the California Register requires an establishment of historic significance before integrity is considered. California uses the same seven aspects of integrity to determine if a property retains the physical characteristics corresponding to its historic significance. However, the integrity threshold is slightly lower at the state level than at the federal level. As a result, some resources that are historically significant but do not meet National Register integrity standards may be eligible for listing in the California Register.

5.3 Local Regulations

San Francisco Landmark Designation

San Francisco Landmarks are designated under Article 10 of the San Francisco Planning Code. The designation process includes a review of the Landmark Designation Application by the Planning Department and the Historic Preservation Commission. Final approval is made by the San Francisco Board of Supervisors. The following section on the eligibility requirements and designation process is excerpted from the Application for Historic Landmark Designation.[48]

Most San Francisco landmarks are buildings. However, a landmark can also be a structure, site, feature or area of special historical, architectural, or aesthetic interest. Collections of properties can also be designated as landmark districts. Landmarks can be significant for a variety of reasons. The criteria are based on those used by the National Register and include:

- Properties significant for their association with historic events, including the city's social and cultural history
- Properties significant for their association with a person or group important to the history of the city, state or country
- Properties significant for their architecture or design
- Properties that are valued as visual landmarks, or that have special character or meaning to the city and its residents
- Collections of properties or features that are linked by history, plan, aesthetics or physical development.

6. SUMMARY OF SIGNIFICANCE

6.1 Historical Significance

Based on preliminary research and review of the existing documentation about the subject property, ARG finds the Cable Car Barn continues to qualify as a historical resource under CEQA. It is currently a contributor to the San Francisco Cable Car System National Historic Landmark, which was designated in 1964. In turn, the San Francisco Cable Car System was listed in the National Register in 1966 and updated in 1978, which provided further clarification about the Cable Car Barn's contributing status to the system. In turn, the San Francisco Cable Car System was automatically listed in the California Register. In addition to these designations of the San Francisco Cable Car System, the Cable Car Barn was individually designated as a San Francisco Landmark in 1971.

The Cable Car Barn was primarily constructed in 1908 following the 1906 earthquake and fires, which destroyed much of the original 1888 building built by the Ferries & Cliff House Railroad Company. Although the Cable Car Barn was not the first cable car barn and powerhouse associated with a cable car line in San Francisco, the extant building reflects the reconstruction period following 1906, as well as the continued operation of the San Francisco cable cars through the early twentieth century. Research indicates that it has direct associations with the development and operations of the San Francisco cable cars as the only remaining cable car barn and powerhouse. Similarly, the Cable Car Barn at 1201 Mason Street is also significant as the only surviving example of the cable car barn and powerhouse property type in San Francisco.

48 San Francisco Planning Department, "Application for Historic Landmark Designation," n.d., accessed August 8, 2021, http://forms.sfplanning.org/Historic_Landmark_Designation_Application.pdf.

6.2 Period of Significance

The period of significance for the Cable Car Barn spans from 1908 to 1944. This corresponds with the completion of the existing building envelope following the damage of the 1906 earthquake and fires to the previous building at the site and extends through the period when it was owned and operated by the Market Street Railway Company through 1944. When it was purchased by Muni in 1944, the cable car system had largely been replaced by the public bus system and transitioned to primarily function as heritage tourism infrastructure.

6.3 Integrity Assessment

The designation of the Cable Car Barn at the national, state, and local level occurred in the 1960s and 1970s and predates major alterations to the building that occurred during a renovation campaign conducted from 1982 to 1984. Despite these alterations, the Cable Car Barn retains sufficient integrity to convey its historically significant associations with the development and operation of the San Francisco cable car system and as a rare example of the cable car barn and powerhouse property type.

The subject property largely retains integrity given its ongoing use as a cable car barn, which has preserved many of the original exterior features and interior spatial organization. The building remains in its original location within the irregular parcel that fronts Mason, Washington, and Jackson streets, retaining integrity of location. The property also remains within the mid-rise urban setting along Washington and Mason streets with cable car tracks and infrastructure extending out from the building along the established routes; thus, it retains integrity of setting.

The brick masonry building retains the original 1908 façades along Washington and Mason streets, as well as sections visible from Jackson Street and Marcy Place. This includes brick masonry detailing, original fenestration patterns with arched, regularly repeating openings, as well as remaining portion of the original 1888 smokestack, which was reconfigured to its current height during the 1908 reconstruction. Some alterations, such as the conversion of windows to building entrances, addition of entrances, and the replacement of the original windows, were compatible with the original design, features, and material of the building and do not reduce the overall integrity of design, materials, workmanship, feeling, or association.

The interior alterations and additions, which largely date to 1982 to 1984, have removed much of the preexisting materials from the Cable Car Barn. Although the interiors were completely altered outside the recommended period of significance between 1908-1944, many of the contributing features associated with the San Francisco Cable Car System—winding equipment, tension runs, and sheaves and cable conduits in the basement vaults—have been replaced to match the existing in overall appearance and placement.

6.4 Character-Defining Features

A character-defining feature is an aspect of a building or structure's design, construction, or detail that is representative of its function, type, or architectural style. Generally, character-defining features include specific building systems, architectural ornament, construction details, massing, materials, craftsmanship, site characteristics, and landscaping within the period of significance. In order for an important historic property to retain its significance, its character-defining features must be retained to the greatest extent possible.

Based upon the review of the historical significance and the existing condition, the character-defining features of the Cable Car Barn property at 1201 Mason Street are outlined below. Any other elements or spaces not specifically referred to here and/or constructed outside of the period of significance of 1908-1944 are considered to be non-contributors.

Site

- Mid-rise urban setting along Mason, Washington, and Jackson streets;
- Connection with the cable car tracks and cable system with circulation patterns extending from Washington and Jackson streets; and
- Integration into the hillside that provides cable cars access to the maintenance facilities on the second floor from the slopes of Washington and Jackson streets.

Exterior

- Two-story height and squared massing of the 1908 envelope;
- 1908 brick masonry façades along Washington (south), Mason (east), and Marcy Place (west);
- Brick masonry smokestack with chamfered base dating to 1888, with the height reduced in 1908;
- Predominantly flat roof profile from the parapet wall with a noted gable peak at the northeast bay on Mason Street;
- Red brick laid in running bond pattern with circular and pennant inlay detailing along the parapet course;
- Paired brick masonry string course separating the first and second floors; and
- Regular and rhythmic spacing of segmental and rounded arch fenestration openings along the first and second floors.

Interior

- Diagonal spatial organization of the winding equipment and tension run within the central volume of the ground floor; and
- Sheave and cable equipment located in the basement vault spaces of the building.

7. CONCLUSION

The Cable Car Barn at 1201 Mason street retains integrity and continues to qualify as a historical resource under CEQA. It is a contributor to the San Francisco Cable Car System National Historic Landmark, which is also listed in the National Register and California Registers. The subject building is also individually designated a San Francisco Landmark. Expanded research has demonstrated that the Cable Car Barn has significant associations for its development and operation of the San Francisco cable cars and as a rare example of the cable car barn and powerhouse property type. The period of significance for the property of 1908 to 1944, which coincides with the completion of the building in 1908 and its role in the operations of the cable cars as public transport prior to being transferred to Muni.

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Appendix A: Existing Conditions Photographs

South and east façades of the Cable Car Barn, view northwest from the corner of Mason and Washington streets (ARG, April 2021).

East façade of the Cable Car Barn, view southwest from Mason Street (ARG, April 2021).

Primary entrance to the Cable Car Museum at the east façade of the Cable Car Barn (ARG, April 2021).

Second floor of the southern portion at the east façade, view west from Mason Street (ARG, April 2021).

Center portion of the east façade, view west from Mason Street (ARG, April 2021).

Maintenance vehicle entrance to the Cable Car Barn at the east façade, view west from Mason Street (ARG, April 2021).

Visible portion of the north façade with the 1984 third-story addition visible, view south along Marcy Place from Jackson Street (ARG, April 2021).

1908 brick masonry at the lower floors of the north façade, view south from Marcy Place (ARG, April 2021).

Detail of the upper floors of the north façade, view west from Marcy Place (ARG, April 2021).

Jackson Street cable car entrance (dating to 1984) at the north façade, view south from Jackson Street (ARG, April 2021).

South façade of the Cable Car Barn with the 1888 smokestack, 1908 brick masonry façade, and 1984 cable car entrance and third floor, view east from Washington Street (ARG, April 2021).

Eastern portion of the south façade with the 1908 brick masonry façade and 1888 smokestack, view northwest from Washington Street (ARG, April 2021).

East portion of the south façade with the 1908 brick masonry envelope and 1984 secondary museum entrance (bottom left), view northeast from Washington Street (ARG, April 2021).

Washington Street entrance to the Cable Car Barn with the 1908 brick masonry envelope and 1984 secondary museum entrance (bottom right), view northeast from Washington Street (ARG, April 2021).

Detail of the 1888 smokestack, view from Washington Street (ARG, April 2021).

Washington Street cable car entrance from 1984 at the south façade, view northwest from Washington Street (ARG, April 2021).

Detail of the signage reading “Ferries and Cliff House Railway Co. 1887” at the south façade, view north from Washington Street (ARG, April 2021).

Secondary Cable Car museum entrance at the south façade, view west (ARG, April 2021).

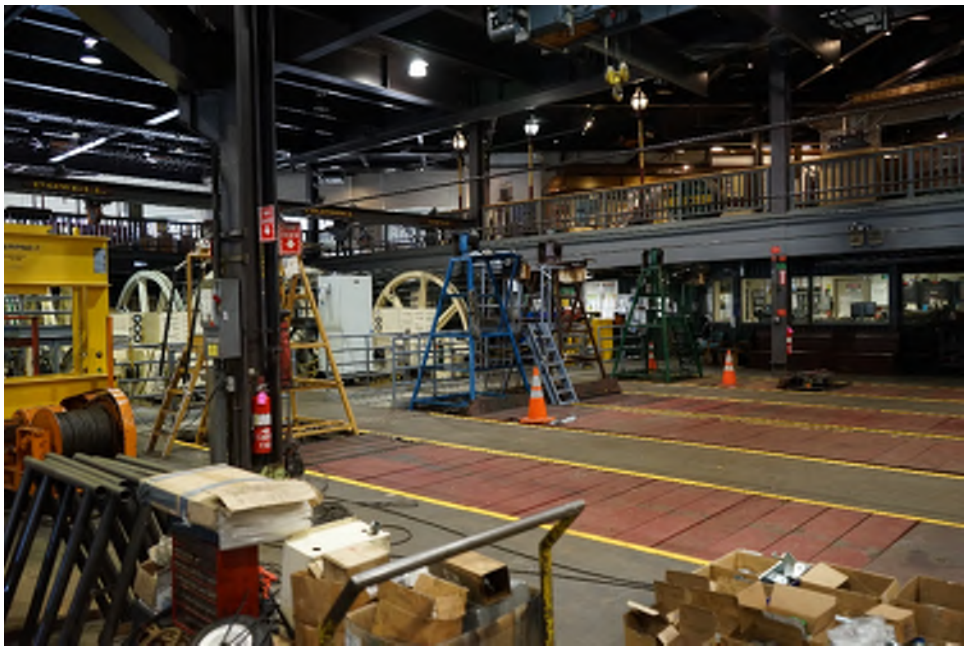
Detail of the second story at the eastern portion of the south façade, view north from Washington Street (ARG, April 2021).

East portion of the roof with the 1984 third floor skylights, view southeast (ARG, April 2021).

Detail of the 1888 smokestack, view south from the roof (ARG, April 2021).

Western portion of the roof with the 1984 third floor skylights, view southeast (ARG, April 2021).

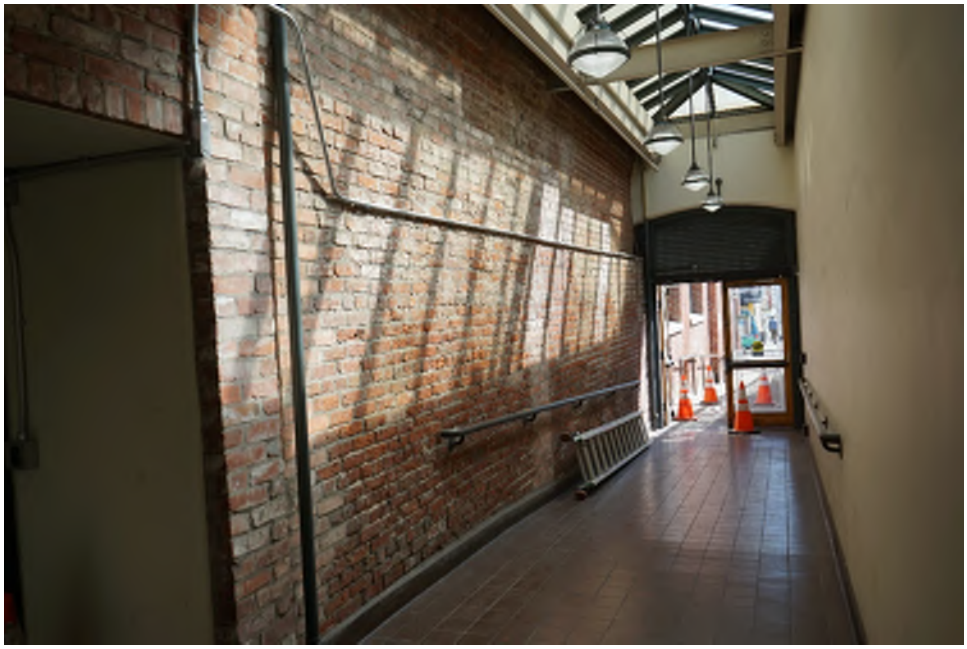
Cable Car Barn interior, museum mezzanine overlooking the cable system and tension run at the first floor (ARG, April 2021).



Cable Car Barn interior, cable turning equipment, tension run, and museum mezzanine at the first floor (ARG, April 2021).

Cable Car Barn interior, cable turning equipment at the first floor and foyer to the cable car museum and mezzanine in the background (ARG, April 2021).

Cable Car Barn interior, cable car system operations rooms at the first floor with the cable car museum mezzanine above (ARG, April 2021).



Cable Car Barn interior, view of the 1984 secondary cable car museum entrance at the south façade, view east towards the intersection of Mason and Washington streets (ARG, April 2021).

Cable Car Barn interior, machine shop and maintenance space at the first floor (ARG, April 2021).

Cable Car Barn interior, below ground cable equipment and sheaves (ARG, April 2021).

Cable Car Barn interior, interior elevation of the second floor windows (ARG, April 2021).

Cable Car Barn interior, cable car maintenance yard, view south towards Washington Street from the turntable (ARG, April 2021).

Cable Car Barn interior, cable car maintenance bays at the second floor (ARG, April 2021).

Cable Car Barn interior, cable car maintenance bays with open maintenance pits at the second floor (ARG, April 2021).

Cable Car Barn interior, 1984 cable car turntable at the second floor (ARG, April 2021).

Cable Car Barn interior, typical office space at the third-floor penthouse (ARG, April 2021).

Appendix B: Existing Documentation

L58-CBAR PAGES

SAN FRANCISCO CABLE CARS

L58

JAN 28 1964

Dear Senator Kuchel:

It is a pleasure to inform you that in your State the historic site listed on the enclosure has been found to possess exceptional value in commemorating and illustrating the history of the United States.

This site has been evaluated in the National Survey of Historic Sites and Buildings, and by the Advisory Board on National Parks, Historic Sites, Buildings, and Monuments, and approved by me pursuant to the Historic Sites Act of August 21, 1935.

As explained in the enclosures this historic property is eligible to receive, from the Department of the Interior, a certificate and bronze plaque designating it as a Registered National Historic Landmark. The Director of the National Park Service will notify the owner and provide him with the proper application forms.

In recognizing the historical importance of this site, we wish to commend the owner for the care and preservation of this property.

Sincerely yours,

(sgd) Stewart L. Udall

Secretary of the Interior

Hon. Thomas H. Kuchel
United States Senate
Washington, D. C.

IDENTICAL LETTER SENT TO SENATORS AND CONGRESSMEN ON ATTACHED LIST

Enclosures

cc:
LM (2)
Secretary's Reading File Copy
Respective Regional Directors in Regions concerned
Mr. Price
Mr. Thompson
Mr. Stratton
Miss Thomas
Mr. Littleton
HPS Office copy
LEP Comeback Copy

JOLittleton:mg 12-6-63

UNITED STATES

DEPARTMENT of the INTERIOR

★★★★★★★★★★★★★★★★★★★★★★★★★news release

NATIONAL PARK SERVICE — Foley - 343-4895

For Release to PM's, JANUARY 29, 1964

SECRETARY UDALL ANNOUNCES FORTY-EIGHT SITES ELIGIBLE FOR REGISTERED NATIONAL HISTORIC LANDMARK STATUS

The rise of the United States as a World Power, and the importance of Travel and Communication in the development of this Nation, are two of the themes which are commemorated in the latest list of 48 sites approved for Registered National Historic Landmark status, Secretary of the Interior Stewart L. Udall announced today. In addition to sites connected with political and military affairs after 1865, and Travel and Communication, new Landmark sites were named which illustrate architectural and archeological areas; commerce and industry; conservation of natural resources; and Westward Expansion.

Secretary Udall explained that Registered National Historic Landmarks are areas which have been found to possess exceptional value and are of national significance in commemorating and illustrating the history of the United States. Such landmark sites are not administered by the Department's National Park Service, but are recognized by the Service with a certificate and bronze plaque. The number of sites declared eligible for Registered National Historic Landmark status now totals 452.

The 48 additional sites were recommended by the Advisory Board on National Parks, Historic Sites, Buildings, and Monuments from studies prepared by the National Survey of Historic Sites and Buildings. Four of the 48 sites previously announced by the Advisory Board on November 27, 1963, were Robie House, Chicago, Illinois; Fort Richardson, Texas; Stephen Tyng Mather Homestead, Darien, Connecticut; and Saugus Iron Works, Saugus, Massachusetts.

Political and Military Landmark examples are: Pearl Harbor Naval Base, Hawaii, intimately associated with the rise of the United States as a world power;

"Fairview," home of William Jennings Bryan at Lincoln, Nebraska, commemorating one of the major leaders of the late 19th and early 20th century who had a great impact on the political history of that time; Robert M. Lafollette Home, Maple Bluff, Wisconsin, memorializing a man who believed with his heart and soul that democracy had to rest on the people, not on special interest groups or cliques; U. S. S. Olympia, Philadelphia, Pennsylvania, one of the most historic naval vessels in America; and Temple Square, Salt Lake City, Utah, which captured the essence of the Mormon achievement in building a kingdom on the Utah desert.

Travel and Communication examples include: The First Telephone Exchange, New Haven, Connecticut, the building in which the world's first telephone exchange was established, which began operations on January 28, 1878; Jarrett Manor, "Travlers Rest," Toccoa, Georgia, which served as a well-known stagecoach inn, tavern, and post office throughout the 19th century; Illinois and Michigan Canal (Locks and Towpath), Channahon, Illinois, which propelled Chicago into a position of supremacy in the Middle West; Sandy Hook Light, Sandy Hook, New Jersey, the oldest standing light tower in the United States; and Samuel F. B. Morse Home, "Locust Grove," New York, where Morse first successfully demonstrated his telegraph in 1844.

Archeological Landmarks are Angel Mounds, Indiana, a site which has produced more than 2,000,000 catalogued artifacts--the most outstanding being an effigy of a seated man which was carved from fluorspar; Pinson Mounds, Tennessee, a site of major importance, one of the few large temple mound sites with an earthworks; and Piilanihale Heiau, Hawaii, a structure attributed to Piilani, of the Maui line of great chiefs of the 16th century.

Brief descriptions are attached of the 48 sites.

x x x

Political and Military Affairs After 1865

In the study of "Political and Military Affairs After 1865," 16 sites were listed by the Advisory Board. They are as follows:

1. Pearl Harbor Naval Base, Hawaii. Pearl Harbor was one of the keys to the development of American naval power in the Pacific, and is still today an active, major naval base. The U. S. S. Arizona Memorial, where over 1,100 men were entombed in the battleship sunk by the Japanese in their surprise attack of December 7, 1941, is a point of major visitor interest.

2. Benjamin Harrison Home, Indiana. President Harrison's house was constructed in 1874-75 and remained his home, when he was not in Washington, D. C., until his death in 1901. It is well maintained and contains many furnishings that formerly belonged to Harrison.

3. James G. Blaine Home, "Blaine House," Maine. The Blaine House was built in the early 19th century, and purchased by Blaine in 1862. Now the governor's mansion, it was restored and redecorated in 1962, and the study meticulously restored to its appearance when Blaine occupied it.

4. William Jennings Bryan Home, "Fairview," Nebraska. Bryan moved in 1887 to Lincoln, Nebraska, and soon launched his significant political career, serving in Congress, three times as Democratic candidate for President, and as Secretary of State from 1913-1915. The first floor has been restored as a historic house, containing original furnishings contributed by the family.

5. Thomas Nast Home, "Villa Fontana," New Jersey. The famous cartoonist's well-preserved home is not open to the public. He occupied it from 1873 to 1902, a handsome three-story, clapboard building with mansard roof which was built about 1860.

6. William H. Seward House, New York. The Seward House was built in 1816-17 as the home of Mrs. Seward's parents. Mr. and Mrs. Seward made it their home after their marriage in 1824, to the time of his death in 1872. It is in excellent condition, well maintained, under foundation ownership.

7. James A. Garfield Home, "Lawnfield," Ohio. Garfield purchased Lawnfield in 1876, a 152-acre farm with 1½-story house built in 1832 and outbuildings. He enlarged and remodeled it extensively, and ran his successful presidential election campaign of 1880 from this house, now restored and owned by the Lake County Historical Society.

8. Rutherford B. Hayes Home, "Spiegel Grove," Ohio. The Hayes house, built between 1859 and 1863, and later enlarged, is located on the grounds of the Hayes State Memorial. The Memorial contains the graves of the 19th president and Mrs. Hayes, and also a museum and library building preserving their papers and other possessions.

9. William Howard Taft Home, Ohio. Taft was born and spent his first 25, formative years in this house, from which he emerged to pursue his remarkable career in law and public administration. The house is still basically sound, but somewhat altered and in only fair condition.

10. U. S. S. "Olympia," Pennsylvania. This cruiser, built in 1888, is the oldest steel-hulled American naval ship afloat. Excellently restored by a patriotic association, it commemorates the triumph of May 1, 1898, when it was Commodore George Dewey's flagship in the Battle of Manila Bay.

11. U.S. Naval War College, Rhode Island. Alfred Thayer Mahan became president of the Naval War College in 1886, one year after the first students were received. Under him it developed in spite of vigorous opposition into an institution of inestimable value. The original college building, built in 1819, is now the Newport Naval Base commander's residence.

12. Temple Square, Utah. The walled Temple Square symbolizes achievement in the Utah desert, as well as Mormon religious and cultural individuality. The three historic structures in Temple Square are the Temple, built between 1853 and 1893, the Tabernacle, an architectural and engineering marvel built between 1862 and 1867, and the Assembly Hall, completed in 1882.

13. Brigham Young House, "Lion House," Utah. This two-story adobe building, plastered, with small-paned windows, green shutters, tall chimneys, and 20 steep-roofed gables, was built under Brigham Young's direction in 1856. He and his large family resided here until his death in 1877. It is now a public center and historic house museum.

14. Robert M. LaFollette Home, Wisconsin. Three acres remain in family ownership of the 60-acre farm LaFollette purchased in 1905. The house, originally built about 1860, remains in a condition generally similar to that of the time of his death in 1925.

15. George Hunt Pendleton Home, Ohio. Pendleton, the "patron saint" of the U. S. Civil Service, lived in a brick, three-story home on a splendid site overlooking Cincinnati. The structure is not in a good state of preservation.

16. John Sherman Birthplace, Ohio. Born here in 1823, younger brother of William Tecumseh Sherman who was also born here, John Sherman enjoyed a remarkable career in U. S. House and Senate, and as Secretary of the Treasury and, later, of State. The house is open to the public.

Travel and Communication

In the study of "Travel and Communication," 25 sites were listed by the Advisory Board. They are as follows:

1. The First Telephone Exchange, Connecticut. The world's first telephone exchange (commercial switchboard) began operating on January 28, 1878, in a room of the Metropolitan Building, New Haven.

2. Jarrett Manor, "Travelers Rest," Georgia. Built in 1784 as a frontier home and fort, this structure near Toccoa served as a stagecoach inn, tavern, and post office throughout the 19th century. It is an excellent example of an early inn in a rural, frontier setting.

3. Illinois and Michigan Canal (Locks and Towpath at Channahon), Illinois. This canal propelled Chicago into a position of supremacy in the Middle West. Built from 1836-1848, it linked Chicago to the Mississippi River, completing a continuous waterway from New York to the Mississippi. It has not been used commercially since 1933, but the locks have been restored and the old towpath may be followed.

4. Castleman Bridge, National Road, Maryland. This well-built stone bridge over the Little Youghiogeny River was used from 1813 to 1933. It included the largest stone arch in the United States when erected, and is still a magnificent example of the bridge-building art of the early 19th century.

5. Thomas Viaduct, Baltimore and Ohio Railroad, Maryland. This majestic solidly-built bridge, still used today, is the world's oldest multiple stone-arch railroad bridge. Completed in 1835, it was designed by Benjamin H. Latrobe, civil engineer, son of the famous architect of the same name.

6. Boston Light, Massachusetts. Little Brewster Island is the site of the first lighthouse in North America, erected in 1716 and destroyed in 1776. The present structure, built in 1783 on the same site, is the second oldest light tower in the United States, and is still in use.

7. Boston Subway, Massachusetts. Boston's subway (built 1895-98) was the first in North America and the fifth such system in the world. New York and other cities later followed Boston's example, making the subway a major means of urban transportation.

8. Eads Bridge, Missouri. James Buchanan Eads designed and built, 1867-1874, the world's first steel-truss bridge, spanning the Mississippi River at St. Louis. It was one of the major engineering achievements of its time, and opened up a new era in bridge construction.

9. Sandy Hook Light, New Jersey. This is the oldest standing light tower in the United States. It was erected in 1764 and is still in use.

10. Old Blenheim Bridge, New York. This magnificent example of the lost American art of building wooden covered bridges was erected in 1835 by Nicholas M. Powers, a leading covered-bridge builder of New England.

11. Samuel F. B. Morse Home, "Locust Grove," New York. Morse purchased Locust Grove estate in 1847 and returned to it summer after summer until his death in 1871. The original part of the house was built in 1830, but Morse added onto it a great deal, including the four-story tower on the west side.

12. Brooklyn Bridge, New York. This was the world's first great steel suspension bridge, both a thing of beauty and a technical masterpiece which opened a new era in bridge construction. It was designed and constructed, 1869-1883, by John A. and Washington A. Roebling, father and son.

13. Salem Tavern, North Carolina. Salem Tavern is a splendid example of an 18th-century "ordinary" in the South. Erected in 1784, it enjoyed a widespread reputation for hospitality and comfort.

14. S-Bridge (Old Washington Bridge), National Road, Ohio. This stone bridge, constructed in 1828, is a splendid reminder of the great National Road which was built across Ohio between 1825 and 1837. The bridge is still in excellent condition, along U. S. Highway 40 west of Old Washington.

15. Miami and Erie Canal (Deep Cut), Ohio. The "Deep Cut" of the Miami and Erie Canal, near Spencerville, is a striking remain of Ohio's great antebellum canal system, which contributed notably to Ohio's swift rise to a leading position in the nation by 1860. It was originally 6,600 feet long and 5 to 52 feet deep. It is identified today by a State roadside park and marker.

16. William Aiken House and Associated Railroad Structures, South Carolina. Aiken was first president (1828-1831) of the South Carolina Canal and Railroad Company, and builder (1830-33) of the pioneer Charleston and Hamburg Railroad, 136 miles in length. The handsome, stuccoed, brick house was built between 1807 and 1811 and is now Division Headquarters of the Southern Railway Company. Other interesting antebellum railroad buildings are located nearby.

17. Lakeboat, The Ticonderoga, Vermont. The Ticonderoga carried passengers on Lake Champlain from 1906, when it was built, until 1953. This side-paddlewheel lakeboat is the only extant and basically unchanged vessel of its kind in the United States.

18. Cape Henry Lighthouse, Virginia. This was the first lighthouse to be erected by the Federal Government, and was used as a light tower from its completion in 1792 until 1881. It is the third oldest standing structure of this type in the United States.

19. Gadsby's Tavern, Virginia. Gadsby's was an important center of Virginia life in the 18th and early 19th centuries, for both travelers and residents of the Alexandria area. It consists of two adjoinging taverns erected in 1752 and 1792.

20. Rising Sun Tavern, Virginia. This tavern was a favorite stopping and meeting place of Virginia Revolutionary War patriots--social center, post office, and stagecoach stop for Fredericksburg, traditionally built about 1760.

21. Sheridan Inn, Wyoming. This hotel opened in 1893 and rated for years as the finest hotel between Chicago and San Francisco. It was also the social center of the region.

22. Robert Fulton Birthplace, Pennsylvania. Robert Fulton was born in 1765 in this 2½-story stone structure 8 miles south of Quarryville. Since that time the building has been altered notably.

23. Toll House, National Road, Pennsylvania. This brick structure, recently restored, is a reminder of the transfer from Federal to State ownership of the National Road, lifeline of the early West, in 1831. The building was constructed in 1835 and is on U. S. 40, just west of Uniontown.

24. East Broad Top Railroad, Pennsylvania. The E. B. T. Railroad was primarily a coal-carrying line, operating over 30 miles of narrow gauge track between Mount Union and Robertsdale from 1872 to 1953. The old station at Orbinsonia is now preserved along with 3½ miles of track over which passenger trains are run for visitors.

25. San Francisco Cable Cars, California. This method of urban transportation--cars moved by gripping moving underground cables--was pioneered in 1873 in San Francisco, to which it was especially well suited because of steep hills in the downtown area. At the maximum, 8 companies operated 112 miles of track in San Francisco, and 5 other American cities had similar lines. About 10 miles are still in operation, all in San Francisco.

Indian Villages and Communities

In the study of "Indian Villages and Communities," two sites were listed by the Advisory Board. They are as follows:

1. Angel Mounds, Indiana. Deriving its name from former owners of the property, Angel Mounds is one of the largest and most impressive "Mississippian" temple mound sites, covering over 100 acres. Excavation over a long period has uncovered numerous rectangular houses, temples, a town square, a palisade augmented with projecting bastions at 120-foot intervals, and over 2,000,000 catalogued artifacts relating to the period of occupancy, about A. D. 1400-1600.

2. Pinson Mounds, Tennessee. This site includes probably more than 30 mounds, thousands of yards of earthworks and other features. It is believed to cover about 1,000 acres, and is of major importance as one of the few large temple mound sites with an earthworks. Furthermore, it was occupied during several major archeological periods, from Late Archaic to Woodland and Mississippian periods.

Westward Expansion

in the study of "Westward Expansion," subtheme: "Military and Indian Affairs" one site was listed by the Advisory Board:

1. Fort Richardson, Texas. Fort Richardson was one of the most important military posts on the southwest frontier during the period of Comanche and Kiowa depradations. It obstructed the movement of Indian raiders against the Texas frontier and down across the Rio Grande into Mexico. Fort Richardson and its troops played key roles in the Jacksboro case of 1871 and the Red River War of 1874, which brought peace to the Texas frontier. The site is owned by the State of Texas and administered by the Jack County Historical Society.

Architecture

In the study of "Architecture," one site was listed by the Advisory Board:

1. The Robie House, Illinois. Frank Lloyd Wright designed and built this residence for Frederick Carleton Robie in 1907-09. Incorporating many forms which have become identified with modern styles, the Robie house has won international acclaim as a turning point in architectural development. Now part of the University of Chicago campus, it is the object of a nation-wide fund-raising campaign for its restoration and preservation.

Conservation of Natural Resources

In the study of "Conservation of Natural Resources one site was listed by the Advisory Board:

1. Stephen Tyng Mather Homestead, Connecticut. This residence is notable as the home of the man who, more than any single individual, created the National Park System and made it the organization that now serves the country so capably. It was built by Mather's great-grandfather in 1778, and after undergoing various modifications through the years now remains substantially the same as it was when Mather died in 1930.

Commerce and Industry

In the study of "Commerce and Industry," one site was recommended by the Advisory Board:

1. Saugus Iron Works, Massachusetts. The First Iron Works Association, Inc., owns and operates this careful reconstruction of the original iron works which operated intermittently at Saugus between 1648 and 1670. Consisting of a blast furnace, casting house, forge, and rolling and slitting mill, it was an important business enterprise in American history.

Hawaii Aboriginal Culture

In the study of "Hawaii Aboriginal Culture" one site was recommended by the Advisory Board:

1. Piilanihale Heiau, Hawaii. This is the largest heiau, or temple, in the Hawaiian Islands, about 340 by 425 feet, built probably in the 16th century. Privately owned, located on the east coast of Maui, it is well preserved because of heavy vegetation but also difficult to reach for the same reason.

X X X

INT.DUP.,D.C.64-40883

JAN 29 1964 San Francisco Cable Cars, California

Honorable George Christopher
Mayor of the City of San Francisco
San Francisco, California

Dear Mayor Christopher:

It is a pleasure to inform you that the property described in the enclosure has been found to possess exceptional value in commemorating and illustrating the history of the United States.

It has been studied by the National Survey of Historic Sites and Buildings; evaluated by the Advisory Board on National Parks, Historic Sites, Buildings, and Monuments; and approved by the Secretary of the Interior pursuant to the Historic Sites Act of August 21, 1935.

As explained in the enclosed folder, this site is eligible for Registered National Historic Landmark status. A certificate and bronze marker attesting to this status may be obtained upon your application and your agreement to adhere to simple preservation practices. Should you wish to apply for the certificate and marker, copies of the application form are enclosed. These should be completed in triplicate for each site to be certified. Two copies for each site should be returned to the National Park Service. You may retain the third copy of each application as part of your own records.

At the present time, the work of the National Survey of Historic Sites and Buildings is incomplete. From time to time, announcements will be made of additional sites eligible for Landmark certification.

The Registry of National Historic Landmarks is designed to encourage the preservation of the Nation's historical and archeological heritage. We will be happy to have you participate in the Program.

Sincerely yours,

E. CLARK STEVENS

Acting Director

Enclosures
cc:
Regional Director, Western
Mr. Littleton

JOLittleton:mg 12-20-63

Form 10-317
(Sept. 1957)

UNITED STATES
DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

NATIONAL SURVEY OF HISTORIC SITES AND BUILDINGS

1. STATE: California

2. THEME(S). IF ARCHEOLOGICAL SITE, WRITE "ARCH" BEFORE THEME NO.: XVIII - Travel and Communication

3. NAME(S) OF SITE: San Francisco Cable Car Railway

4. APPROX. ACREAGE:

5. EXACT LOCATION (*County, township, roads, etc. If difficult to find, sketch on Supplementary Sheet*): Powell and Market Streets, San Francisco

6. NAME AND ADDRESS OF PRESENT OWNER (*Also administrator if different from owner*): City of San Francisco

7. IMPORTANCE AND DESCRIPTION (*Describe briefly what makes site important and what remains are extant*)

Andrew S. Hallidee, an English builder of aerial cables for use in Western mines, invented an arrangement whereby heavy cables could be laid underground to draw cars up the steep hills of San Francisco. The first car thus equipped ran from Kearny Street via Clay Street over Nob Hill to Leavenworth in August 1873, and soon thereafter such lines were in general use in the city.

Cable lines were built in most major American cities in the 1880's; the largest such system was that of Chicago, where three companies owned 82 miles of track and 710 grip cars. By 1893, however, the cable car, except on steep grades, was generally being replaced by the electric street car.

About 10 miles of the San Francisco cable car system, with the grip cars, have been retained in use and serve as an interesting tourist attraction.

8. BIBLIOGRAPHICAL REFERENCES (*Give best sources; give location of manuscripts and rare works*): George W. Hilton and John F. Due, The Electric Interurban Railways in America (Stanford, 1960), 5; J. Bucknell Smith, A Treatise Upon Cable or Rope Traction as Applied to the Working of Street and Other Railways (London, 1892); Mildred B. Hoover, Hero B. Rensch, and Ethel G. Rensch, revised by Ruth Teiser, Historic Spots in California (Stanford, 1958), 299.

9. REPORTS AND STUDIES (*Mention best reports and studies, as, NPS study, HABS, etc.*)

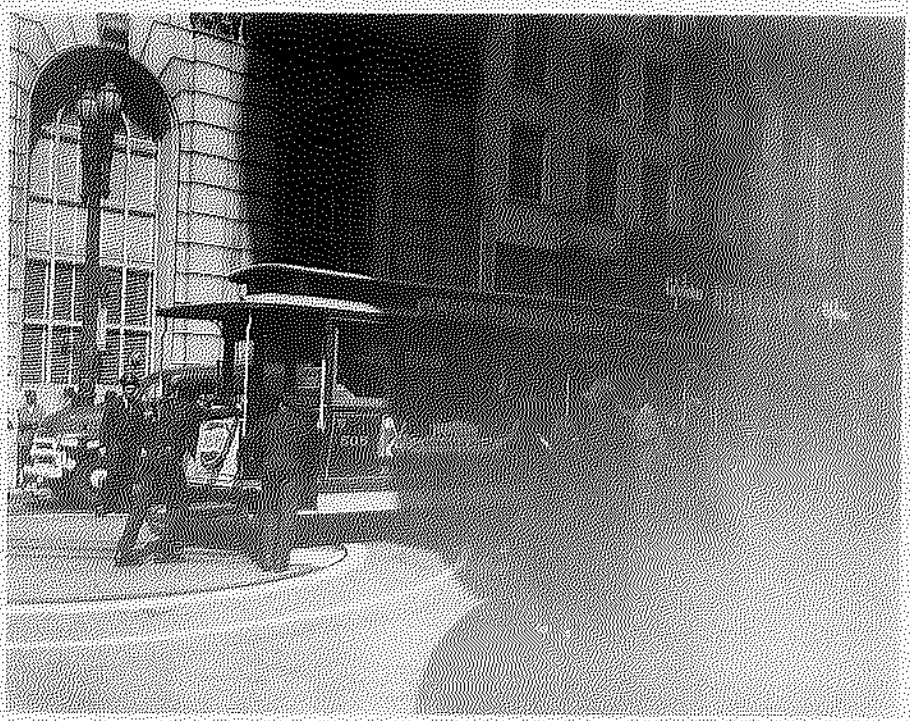
10. PHOTOGRAPHS* ATTACHED: YES ☒ NO ☐	11. CONDITION	12. PRESENT USE (*Museum, farm, etc.*)	13. DATE OF VISIT
	Good	Transportation	June 8, 1961

14. NAME OF RECORDER (*Signature*)	15. TITLE	16. DATE
Charles W. Snell	Reg. Chief, Branch Hist. Sites	Nov. 29, 1962

*DRY MOUNT ON AN 8 X 10½ SHEET OF FAIRLY HEAVY PAPER. IDENTIFY BY VIEW AND NAME OF THE SITE, DATE OF PHOTOGRAPH, AND NAME OF PHOTOGRAPHER. GIVE LOCATION OF NEGATIVE. IF ATTACHED, ENCLOSE IN PROPER NEGATIVE ENVELOPES.

(IF ADDITIONAL SPACE IS NEEDED USE SUPPLEMENTARY SHEET, 10-317a, AND REFER TO ITEM NUMBER)

U. S. GOVERNMENT PRINTING OFFICE 16—74016-1



Cable Car

Powell and Market Streets
San Francisco, California

June 8, 1961

Charles W. Snell
Neg. 2415-Western Region

REGISTRY OF NATIONAL HISTORIC LANDMARKS

BIENNIAL VISIT REPORT

San Francisco Cable Car System

Date: March 17, 1970

Visited by: G. C. Murray

1. Location: City of San Francisco, Cable Cars on three designated routes, plus Cable Car Barn at Washington and Mason Streets, San Francisco

2. Theme: XVIII - Travel and Communication

3. Owner

   a. When designated City of San Franciso

   b. Present: (X) Same

      ( ) New

4. Use:

   a. When designated Municipal transit system; Maintenance of cable car system.

   b. Present: (X) Same

      (X) Changed as follows: Cable Car Barn is being restored and developed as visitor information facility

REGISTRY OF NATIONAL HISTORIC LANDMARKS

BIENNIAL VISIT REPORT

San Francisco Cable Car System

5. Plaque and Certificate: Location and condition

a. Plaque (2 Plaques) 1. Wall of visitors' viewing platform, Cable Car Barn, Washington & Mason Sts. S.F.; 2. Hyde St. Cable Car Terminal, S. F.; both excellent

b. Certificate didn't see

6. Physical condition

a. When designated Excellent

b. Present: (X) Excellent; ( ) Good; ( ) Fair; ( ) Poor

Comments:

REGISTRY OF NATIONAL HISTORIC LANDMARKS

BIENNIAL VISIT REPORT

San Francisco Cable Car System

7. Special Problems:

Safety: Both operators and passengers almost totally disregard passenger safety.

Attitudes: As with other municipal transportation, operator attitudes vary from Beligerent, rude, and hostile to friendly, courteous and helpful. Although residents accept this as a fact of life, visitors are offended and puzzled by rudeness from what is considered a prime tourist attraction. Because the Cable Car's reason for continued existence is their unusual historic interest, it is regrettable that operator attitudes do not reflect a little pride in their role in recreating the City's history.

8 Suggestions Offered: None concerning the above special problems.

The National Park Service has been requested by the San Francisco Public Utilities Commission to provide interpretive planning assistance in the development of the Car Barn visitor information facility. Contacted by: James Leonard, Assistant to General Manager James K. Carr, Public Utilities Commission, City Hall, S. F.

Heritage Conservation and Recreation Service
Department of the Interior

NATIONAL HISTORIC LANDMARK STATUS REPORT: 1978

General Background

1. Official Landmark name: San Francisco Cable Car System
   Address: Cable Car Barn at Washington & Mason Streets, and cable cars on three designated routes (Powell-Mason, Powell-Hyde & California Street), City of San Francisco, CA

2. Name, address, phone number of the Landmark owner: City & County of San Francisco, Public Utilities Commission, Municipal Railway, Cable Car Division. Superintendent: Oscar Norman, Washington & Mason Streets, San Francisco, CA 415-558-3382

3. Name, title, address, and phone number of person responsible for the management of the Landmark: (If same as person in number 2, write 'same')

same

4. Name, title, address and phone number of additional person(s) contacted about this Landmark: Rino Bei, Program Manager, MUNI Transit Improvement, 415-558-2801 and Mrs. Hans Klussman, San Francisco Citizen & Cable Car Supporter, 415-421-2608

5. Name, region and phone number of HCRS official preparing report:

Julie Nagle, Pacific Southwest Regional Office, FTS: 556-8313

6. Date of this report:

7/25/78

II. Condition and Maintenance of Buildings, Sites and Historic Districts (If Landmark is visited, provide photographs (or slides) of serious problems or possible threats)

1. Architectural or Engineering Features

a. What is the general physical condition? X excellent ___good ___needs repairs (explain)

b. Are there any obvious structural problems or water related problems? X no ___yes (describe)

c. Are there planned future building alterations or new construction? ___no X yes (explain) see comments (V)

d. Are there historic interior furnishings present? X yes ___no
Are they well cared for? X yes ___no (explain)

Will they be retained? X yes ___no (explain)

e. Is there historic machinery or equipment present? X yes ___no
Is it well cared for? X yes ___no (explain)

Will it be retained? ___yes ___no (explain) See comments (V)

. Environmental, Battlefield, Natural and Archeological Features

a. What is the general condition of the site? X excellent ___good
___needs repairs (explain)

b. Are there visible archeological ruins, remains or artifacts? ___yes X n
Are they well cared for?___yes ___no (explain)

c. Has there been recent site disturbance, digging, or construction?
X no ___yes (explain)

d. Are there plans for future site work or construction?
___no X yes (explain) see comments (V)

3. Historic District Features

a. What is the general physical condition of the buildings, roadways, and other historic features of the district? ___excellent ___good
___needs repair (explain) N A

b. In general, what is the level of construction activity in the district?
___high construction activity __moderate ___low NA

c. Is there a local design review board, historic district commission, or other governmental body which reviews construction activity in the district? ___yes ___no NA

III. Building, Site, or Historic District Integrity

1. Are there any conditions on the lands adjacent to the Landmark that might result in serious impairment, diminishment, or destruction of Landmark resources, character, and/or significnace? X no ___yes (explain)

2. Has there been an introduction of visual, audible, or atmospheric elements that are out of character with the property and its setting?
X no ___yes (explain)

3. Are there any potential threats (i.e., highways, adjacent construction, zoning changes, etc.) likely to occur in the future? ___no X yes (explain)

see comments (V)

4. Is there any urgency regarding any of the threats? X no ___yes (explain)
Probably not, since specific plans will not be finalized for some time. See comments (V)

Does the owner show interest in the long-term preservation of the Landmark?
___no ___yes. (explain) City expresses concern for landmark preservation, but
ational Trust for Historic Preservation distrusts MUNI's commitment. See comments (V).

IV. Supplementary Information

1. Does the Landmark have a plaque? X yes ___no two plaques. One is displayed
Is it displayed? X yes ___no in the Cable Car Barn, the other at the Cable Car Terminal at the foot of Hyde Street.

2. Has an agreement form been submitted? X yes ___no 3-25-64
If no, does the owner wish to sign an agreement with HCRS? ___yes ___no

V. Comments: Early in 1978 the City and County of San Francisco, long concerned about the safety, cost and reliability problems associated with the cable car system, initiated a $415,000 contract study of the system. The overall purpose of this study, conducted by an architectural engineering consulting firm under contract to the city, and partially funded by an Urban Mass Transportation Administration (UMTA) grant, is to investigate the possible ways that the system can be improved, modernized, and otherwise made more efficient, safe and dependable. The contract consultant has been charged with two basic tasks: 1) to investigate the rehabilitation of the Cable Car Barn, and 2) to inventory the current condition of the cable care system. This study is currently in progress and will not be completed until early next year, at which time it will be forwarded to the City as recommendations/options for modification of the cable car system. The City's Municipal Railway (MUNI), Public Utilities Commission, and Board of Supervisors, and UMTA will then review the consultant's recommendations and reach a decision regarding the future of the Cable Car Rehabilitation Project based on those recommendations as contained in the study. At that time the city will decide which portions it will seek to fund through its already obtained UMTA grant.
Some of the improvements to the cable car system that are being explored include the following:

Marianne Nickles-Lockwood
for Julie Nagle
Signature

7/25/78
Date

UNITED STATES
DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
WASHINGTON 25, D. C.

The National Survey of Historic Sites and Buildings

San Francisco Cable Cars, California

There are approximately 10 miles of cable car tracks still remaining in the San Francisco Municipal Railway. They are the only ones still operating in the United States. One terminus of this cable car operation is in the heart of downtown San Francisco, at the corner of Powell and Market Streets. It is a common and always an interesting sight to see the crowds of people loading on and hanging on to the sides of the little cars in the summertime as they start up the hill from the corner of Powell and Market Streets. At this point there is a turntable which the car operator uses to turn the car around.

The cable car was contrived by Andrew S. Hallidie, an English builder of aerial cables for mines in the western United States. He arranged a system by which the heavy cables, laid underground, would draw the cars up the steep hills of San Francisco. The first underground cable track was laid from Kearny Street over Nob Hill to Leavenworth in August 1873. In a relatively short time 8 companies had put down 112 miles of cable track in the city. Other cities, such as New York, Washington, D. C., Cincinnati, Boston, and Chicago soon had their cable car systems.

But electric street cars were replacing cable cars almost everywhere by the early 1890's, except on steep grades. It is this condition which prevails on many of downtown San Francisco's streets, some of them known for their very steep pitches, that prolonged the life of the cable car there. Recent proposals and attempts to remove the last remaining vestige of cable car transportation in San Francisco have always produced an outcry from an enraged citizenry that has come to look upon the Powell Street cable car line as a beloved institution and an irreplaceable part of the City's atmosphere and life. As the last of its kind, and now a symbol of a departed era and yet a landmark of San Francisco, the cable cars have an unusual significance.

MSHSB 12/6/63 REA

SAN FRANCISCO CABLE CARS

San Francisco, California

This method of urban transportation--cars moved by gripping moving underground cables--was pioneered in San Francisco in 1873. Today the ten-mile cable car system of San Francisco is the only example of this once important means of city transportation still operating in the United States.

San Francisco's existing cable car system is comprised of three separate lines, all owned and operated by the San Francisco Municipal Railway. These lines are: the Powell-Mason line, the Powell-Hyde line, and the California line, which runs on California Street from Market Street to Van Ness Avenue.

The cable car was invented by Andrew S. Hallide, a San Francisco engineer and builder of metal aerial cables for use in mines in the western United States. Born in London of Scottish parents in 1836, he came to California with his father while still a boy. Having already perfected metal cables that could withstand a tremendous strain, he began working in 1869 on the problem of developing a cable grip that would carry a load of passengers up the steep San Francisco hills. In 1872-73 Hallide arranged a system by which the heavy cables, laid underground and moved by a steam-driven power plant, would draw the cars up these hills. The first underground cable track was laid from Kearny Street over Nob Hill, via Clay Street, to Leavenworth; this line began operations on August 1, 1873.

By 1880, eight lines had put down 112 miles of cable in the city. Other cities, such as New York, Washington, D. C., Cincinnati, Boston, Chicago, and Seattle, soon had their cable car systems. By the mid-1890s, however, electric street cars were replacing cable cars almost everywhere, except on steep grades. It is this condition which prevails on many downton San Francisco streets that prolonged the life of the cable car there.

Dedication
Cable Car Barn and
Visitors Gallery

November 10, 1967

The Cable Car Barn, located at Washington and Mason Streets, dates from 1887 when the structure was originally built to house machinery powering the Ferries and Cliff House Railway.

Today, restored to its general turn of the century appearance, it provides power for moving 10 1/2 miles of 1 1/4-inch cable beneath some of San Francisco's sharpest hills at a steady 9 1/2 miles an hour.

The structure was virtually demolished during the 1906 earthquake and fire, and was rebuilt the following year.

The Cable Car Division of the Municipal Railway (which is a department of the San Francisco Public Utilities Commission) operates a fleet of 39 cable cars.

And it is looking for more. Car No. 520 will soon come off the "assembly line" at the Muni's Elkton shops. As the Honorable Alan S. Boyd, Secretary of Transportation, points out in his dedication comments, the car was rebuilt from "a piece of an old Cable Car roof, a piece of a seat, and an old windshield wiper".

The system's equipment is basically the same as that Andrew Smith Hallidie tested for the first time on August 1, 1873.

Hallidie's pity for the horses that struggled up the hills with heavy horse-cars is well remembered. He began working on a better system in 1869, coincident with the start of production of wire rope by A.S. Hallidie and Company at Mason and Chestnut Streets.

Andrew Smith, the cable car inventor's father, developed the wire rope idea, which was patented between 1835 and 1849.

The son, Andrew Smith, chose the surname Hallidie to honor his godfather and uncle, Sir Andrew Hallidie. In his book, "Cable Car Days in San Francisco", historian Edgar M. Kahn stated that Sir Andrew was physician to King William IV and Queen Victoria.

Hallidie Machinery, still a going concern in Seattle, Washington, is a subsidiary of Western Gear Corporation which manufactured some of the machinery in use at the Cable Car Barn.

Charles Bannon, Vice President of the Western Gear Corporation, plans to attend the dedication ceremony. His firm was born as the Pacific Gear and Tool Works in San Francisco in 1888.

By 1890 the City's population of approximately 299,000 persons was served by eight cable car companies operating 600 cars over 110 miles of single cable track. They employed 1500 men.

Today the cable car system has much more than charm and personality.

At the present rate it will carry about 11 million passengers this year--about 800,000 more than were carried last year.

###

Excerpts from the remarks of
The Honorable Earl Warren, Chief Justice of the United States
marking the San Francisco Cable Car System
as a national historic landmark at Victoria
Plaza, Hyde and Beach Streets, Thursday,
October 1, 1964 - 2:00 p.m.

This occasion is of great significance to the citizens of San Francisco, but it is also one which will attract the attention of people who hear about it all over the world. There is an affection for San Francisco's cable cars in many lands. They are truly world-renowned.

I wish to express my thanks to Assistant Secretary of the Interior Carver, the National Park Service, and Mayor Shelley, for making my short visit to California not only more enjoyable but one that I shall recall with pleasure for a long time to come because I too have great affection for San Francisco's cable cars.

My appreciation of them is based on a host of memories. When I was a freshman student at the University of California I first rode the cable cars on the San Francisco hills. In those days the cable cars were always a part of our week-end outings. I associate them as hundreds of thousands of people do, with stimulating experiences, superb views of the Bay, and the sheer excitement of being in "everyone's favorite city." It is difficult for people to ride the cable cars in San Francisco on a clear, crisp day without feeling the thrill of activity and progress that characterizes San Francisco despite the age of the cable car system.

When the inventor, Andrew Hallidie, first operated the cars on August 1, 1873, it is probable that he and his passengers shared some of the same feelings that we still have on taking a cable car ride. The first run was up Clay Street, over Nob Hill, to Leavenworth many years ago. The cars had been labeled "Hallidie's Folly" but they soon proved themselves, and other American cities installed them until they were replaced by electric street-cars in the last days of the last century. In all these years, since 1873, the familiar sound of the cables singing in the slots along Powell, California, Hyde and Mason Streets is a familiar sound to San Francisco residents and visitors.

This ceremony today is part of a nationwide celebration of American landmarks, and the week of September 28 to October 4 has been designated "American Landmarks Week." It is being sponsored by the National Trust for Historic Preservation.

Preservation of the American heritage is the keynote of "American Landmarks Week." It was also the basic objective of the Congress of the United States when it passed the Historic Sites Act of 1935.

All too frequently structures and areas which represent the achievement of past generations are thoughtlessly and wantonly destroyed in the name of progress. We as a people are the product of a history that has shaped this nation into the greatest nation in the world. It is indeed fortunate that recently there has been a revival of a determination to preserve the cherished landmarks of the United States. In the forefront of that effort is the National Trust for Historic Preservation.

On this occasion I must also mention the work that is being done by the National Park Service. Regional Parks Director Edward Hummel, who is here today, is one of those who has an historic background in his work for the National Park Service, and there are many more in that agency who share his concern for preserving America. Fortunately the Park Service program has received the full support of Secretary of the Interior Udall. As a Californian I am especially pleased to note that the National Park Service is devoting more time to some of the historic places and things that are so interwoven in California's history. Within a few days, October 11, a similar ceremony will be held at the Old Mission Dam near San Diego, probably the first water conservation project in the western states.

In closing, may I direct my remarks more pointedly to the young men and young women who stand here today facing some of the most rapid changes in California's history. Please don't leave the preservation of historic sites and the great achievements of past generations in California to the older generations. Study the value of past accomplishments, become acquainted with what has been done in California, and use your youthful energy to help keep those things in California which are beautiful and deserving of preservation.

Few people will realize the vast inheritance that we as Californians possess until vital parts of it are taken away. It is only through knowledge of the things that have made California a distinctive place for the people of the world, such as the San Francisco cable cars, that you will learn to love and appreciate and defend California against thoughtless change merely for the sake of change. With drive and determination and knowledge, the young people of California can make California an even better place to live.

Form No. 10-300 (Rev. 10-74)

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

NATIONAL REGISTER OF HISTORIC PLACES INVENTORY -- NOMINATION FORM

FOR NPS USE ONLY
RECEIVED
DATE ENTERED

SEE INSTRUCTIONS IN *HOW TO COMPLETE NATIONAL REGISTER FORMS*
TYPE ALL ENTRIES -- COMPLETE APPLICABLE SECTIONS

1 NAME

HISTORIC: SAN FRANCISCO CABLE CARS

AND/OR COMMON: Same

2 LOCATION

STREET & NUMBER: 1390 Washington Street (Car Barn and Power House) ___ NOT FOR PUBLICATION

CITY, TOWN: San Francisco ___ VICINITY OF

CONGRESSIONAL DISTRICT:

STATE: California CODE: 06 COUNTY: San Francisco CODE: 075

3 CLASSIFICATION

CATEGORY	OWNERSHIP	STATUS	PRESENT USE	
X DISTRICT	___ PUBLIC	X OCCUPIED	___ AGRICULTURE	X MUSEUM
X BUILDING(S)	___ PRIVATE	___ UNOCCUPIED	___ COMMERCIAL	___ PARK
X STRUCTURE	___ BOTH	___ WORK IN PROGRESS	___ EDUCATIONAL	___ PRIVATE RESIDENCE
___ SITE	**PUBLIC ACQUISITION**	**ACCESSIBLE**	___ ENTERTAINMENT	___ RELIGIOUS
X OBJECT	___ IN PROCESS	X YES: RESTRICTED	___ GOVERNMENT	___ SCIENTIFIC
	___ BEING CONSIDERED	___ YES: UNRESTRICTED	___ INDUSTRIAL	X TRANSPORTATION
		___ NO	___ MILITARY	___ OTHER

4 OWNER OF PROPERTY

NAME: San Francisco Municipal Railway

STREET & NUMBER: 1390 Washington Street

CITY, TOWN: San Francisco ___ VICINITY OF STATE: California

5 LOCATION OF LEGAL DESCRIPTION

COURTHOUSE, REGISTRY OF DEEDS, ETC.: County Recorder's Office

STREET & NUMBER: Room 167, City Hall (Corner Grove and Polk Streets)

CITY, TOWN: San Francisco STATE: California

6 REPRESENTATION IN EXISTING SURVEYS

TITLE

DATE

___ FEDERAL ___ STATE ___ COUNTY ___ LOCAL

DEPOSITORY FOR SURVEY RECORDS

CITY, TOWN STATE

7 DESCRIPTION

CONDITION		CHECK ONE	CHECK ONE
X EXCELLENT	__DETERIORATED	X UNALTERED	X ORIGINAL SITE
__GOOD	__RUINS	__ALTERED	__MOVED DATE_____
__FAIR	__UNEXPOSED		

DESCRIBE THE PRESENT AND ORIGINAL (IF KNOWN) PHYSICAL APPEARANCE

The designated "San Francisco Cable Cars" National Historic Landmark,consists of the cable cars themselves, the mileage of track and cable which remains today (approximately 10 miles on 8 different streets), and the building at Washington and Mason Streets which serves as both the power house and the car-barn, as well as the turning mechanisms which one finds at the ends of the various lines of track.

Since the cars can only move in one direction, when one of them reaches the end of the line, it must be turned around. This is accomplished by driving the car on to a swivelling circular section of the pavement and then having it rotated by the driver and/or passengers.

The power for the system of underground cables is supplied from a building at Washington and Mason Streets. There, in the building that also serves as the car-barn and now a cable car museum, a series of electrically driven wheels keep the cables of San Francisco moving beneath the streets at a steady pace. When the cable car is to be moved along, the driver engages a gripping mechanism which grasps the cable and moves the car along the street. When he wants to stop, he releases the grip and engages a brake, if the car is on grade.

The cable cars of San Faancisco constitute one of the city's most identifiable symbols and because of their "quaintness" draw many tourists to the city each year. Only San Francisco retains this form of street railway which once was used in many other American cities.

The San Francisco cable car system consists of the following:

1) Rails on which the cars run.
2) Cars which run on the rails. There are 39 cars in the fleet.
3) Roundtable turnarounds at the end of the lines. This in necessary since the cars can only run in one direction.
4) A moving cable between the tracks and below ground, covered over at ground level, with a narrow slot left so that the clutch mechanism from the car can reach through and grasp the moving cable.
5) A car-barn and repair shop at the corner of Washington and Mason Streets, which also contains the huge winding mechanism to keep the cables continuously moving throughout the city of San Francisco.

The two-storey building is a simple brick commercial structure with little of particular architectural note. A pair of string courses serve to separate visually the first from the second floor, while the large windows throughout the building are topped by segmental arches at the upper floor and a much more flattened segmental type of arch at the ground floor. This theme carries through except at the two corners of the building on Mason Street, where a round arch is used, creating a visual pin for the structure on that street. The rear of the bullding is "pinned", so to speak, by a huge mass of brick acting as the smokestack.

8 SIGNIFICANCE

PERIOD	AREAS OF SIGNIFICANCE -- CHECK AND JUSTIFY BELOW				
__PREHISTORIC	__ARCHEOLOGY-PREHISTORIC	__COMMUNITY PLANNING	__LANDSCAPE ARCHITECTURE	__RELIGION	
__1400-1499	__ARCHEOLOGY-HISTORIC	__CONSERVATION	__LAW	__SCIENCE	
__1500-1599	__AGRICULTURE	__ECONOMICS	__LITERATURE	__SCULPTURE	
__1600-1699	__ARCHITECTURE	__EDUCATION	__MILITARY	__SOCIAL/HUMANITARIAN	
__1700-1799	__ART	__ENGINEERING	__MUSIC	__THEATER	
X 1800-1899	__COMMERCE	__EXPLORATION/SETTLEMENT	__PHILOSOPHY	X TRANSPORTATION	
__1900-	__COMMUNICATIONS	__INDUSTRY	__POLITICS/GOVERNMENT	__OTHER (SPECIFY)	
		__INVENTION			

SPECIFIC DATES

BUILDER/ARCHITECT Designer: Andrew Hallidee

STATEMENT OF SIGNIFICANCE

The San Francisco Cable Cars are the only ones still operating in a United States city. As a system of traction locomotion designed to accomodate even the steepest of grades, the cable cars have remained useful in this very hilly city, while they were replaced in places less hilly by electric street railways, and then trolleys and buses. San Francisco cherishes the system as a quaint reminder of its past, as one of its prime tourist attractions, and in fact as the virtual trademark of "the city by the Bay."

History

Andrew S. Hallidee, an Englishman who build aerial cables for use in the mines of the western U.S.A., devised the contrivances used in San Francisco. He arranged a system by which the heavy cables, laid underground, would draw the cars up the steep hills of San Francisco. The first underground cable track was laid from Kearny Street over Nob Hill to Leavenworth, in August 1873. In a relatively short time,eight companies had put down 112 miles of cable track in the city, and other cities, such as New York, Washington, D.C., Cincinnati, Boston, and Chicago, soon had their cable car system. But electric street cars were replacing cable cars almost everywhere by the early 1890's, except on steep grades. It is this condition which prevails on many of downtown San Francisco's streets, some of them known for their very steep pitches, that prolonged the life of the cable car there.

Recent proposals and attempts to remove the last remaining vestige of cable car transportation in San Francisco have always produced an outcry from an enraged citizenry that has come to look upon the Powell Street line, for instance, as a beloved institution and an irreplaceable part of the city's atmosphere and life. As the last of its kind, and now a symbol of a departed era and yet a landmark of San Francisco, the cable cars have an unusual significance.

9 MAJOR BIBLIOGRAPHICAL REFERENCES

Hilton, George and Doe, John F., The Electric Interurban Railways of America (Stanford, 1960).

Smith, J. Bucknell, A Treatise Upon Cable or Rope Traction as Applied to the Working of Street and Other Railways (London, 1892).

10 GEOGRAPHICAL DATA

ACREAGE OF NOMINATED PROPERTY Approximately 5½

UTM REFERENCES

	ZONE	EASTING	NORTHING
D	10	550960	4184400
A	10	553400	4184380
B	10	553400	4181800
C	10	550940	4181800

VERBAL BOUNDARY DESCRIPTION

See continuation sheet

LIST ALL STATES AND COUNTIES FOR PROPERTIES OVERLAPPING STATE OR COUNTY BOUNDARIES

STATE	CODE	COUNTY	CODE
STATE	CODE	COUNTY	CODE

11 FORM PREPARED BY

NAME / TITLE

James Dillon, Architectural Historian, NPS

ORGANIZATION

STREET & NUMBER

CITY OR TOWN

Landmark Designated: JAN. 29, 1974

DATE

Boundary Certified

TELEPHONE

March 15, 1978

STATE

12 STATE HISTORIC PRESERVATION OFFICER CERTIFICATION

THE EVALUATED SIGNIFICANCE OF THIS PROPERTY WITHIN THE STATE IS:

NATIONAL ___ STATE ___ LOCAL ___

As the designated State Historic Preservation Officer for the National Historic Preservation Act of 1966 (Public Law 89-665), I hereby nominate this property for inclusion in the National Register and certify that it has been evaluated according to the criteria and procedures set forth by the National Park Service.

FEDERAL REPRESENTATIVE SIGNATURE

TITLE DATE

FOR NPS USE ONLY

I HEREBY CERTIFY THAT THIS PROPERTY IS INCLUDED IN THE NATIONAL REGISTER

DIRECTOR, OFFICE OF ARCHEOLOGY AND HISTORIC PRESERVATION DATE 4/3/78

ATTEST: DATE

KEEPER OF THE NATIONAL REGISTER

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

NATIONAL REGISTER OF HISTORIC PLACES INVENTORY -- NOMINATION FORM

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The boundary of the designated San Francisco Cable Cars Landmark, consists firstly, of a building at Washington and Mason Streets, and secondly, of about 10 miles of streets, all that remains with active cable car tracks, of the once more extensive system throughout San Francisco. The building serves a dual function: 1) as a car-barn, it stores the equipment which runs on the tracks, and 2) a power-house, it contains the winding mechanisms for the cables that pull the cars.

The tracks today run on eight streets in the "Nob Hill," "Chinatown," and "North Beach" sections of the city. These streets are:

1) Hyde Street, between Beach and Washington Streets.
2) Washington Street, between Hyde and Powell Streets.
3) Powell Street, between Market and Jackson Streets.
4) Jackson Street, between Hyde and Powell Streets.
5) California Street, between Van Ness Avenue and Market Street.
6) Mason Street, between Washington Street and Columbus Avenue.
7) Columbia Avenue, between Mason and Taylor Streets.
8) Taylor Street, between Bay and Chestnut Streets.

The lines are identified on the accompanying USGS map of San Francisco. The lines cover approximately five acres. The acreage of the building at Washington and Mason Streets is approximately 1/2 acre. Fronting approximately 150 feet on each of those streets, the boundary of the building is a 150 foot square at the northwest corner of Washington and Mason Streets.

CITY PLANNING COMMISSION

RESOLUTION NO. 6725

WHEREAS, A proposal to designate the Cable Car Barn and Power House as a Landmark pursuant to the provisions of Article 10 of the City Planning Code was initiated by the Landmarks Preservation Advisory Board on April 28, 1971, and said Advisory Board after due consideration, has recommended approval of this proposal; and

WHEREAS, The City Planning Commission, after due notice given, held a public hearing on June 17, 1971, to consider the proposed designation and the report of said Advisory Board; and

WHEREAS, The Commission believes that the proposed Landmark has a special character and special historical, architectural and aesthetic interest and value; and that the proposed designation would be in furtherance of and in conformance with the purposes and standards of the said Article 10;

NOW THEREFORE BE IT RESOLVED, First, That the proposal to designate the Cable Car Barn and Power House as a Landmark pursuant to Article 10 of the City Planning Code is hereby APPROVED, the location and boundaries of the landmark site being as follows:

> Beginning at the point of intersection of the westerly line of Mason Street and the northerly line of Washington Street; running thence westerly along said line of Washington Street 187 feet 6 inches; thence at a right angle northerly 137 feet 6 inches; thence at a right angle westerly 18 feet 9 inches; thence at a right angle northerly 137 feet 6 inches to the southerly line of Jackson Street; thence at a right angle easterly along said line of Jackson Street 45 feet 10 inches; thence at a right angle southerly 77 feet 6 inches; thence at a right angle easterly 22 feet 11 inches; thence at a right angle southerly 16 feet; thence at a right angle easterly 68 feet 6 inches; thence at a right angle northerly 2 feet; thence at a right angle easterly 69 feet to the said line of Mason Street; thence southerly along said line of Mason Street 183 feet 6 inches to the point of beginning; being Lot 5 in Assessor's Block 190.

Second, That the special character and special historical, architectural and aesthetic interest and value of the said Landmark justifying its designation are as follows:

> This is the only surviving cable car barn and power house in the city, of some fourteen which at one time or another served various lines. Although cable propulsion was invented in England early in the nineteenth century, its successful application to actual operation did not occur until Andrew S. Hallidie's inaugural run up the Clay Street hill, beginning at Portsmouth Plaza, on August 1, 1873. The great and world-wide interest generated by San Francisco's success lasted well into the 1890's, to be displaced by the advent of electric railways. In the 1880's when cable car systems were at the height of their popularity, they existed in a score of cities from Edinburgh to Melbourne and from Brooklyn to Constantinople; but San Francisco was unquestionably the world's cable car capital then, and it has fortunately remained so to the present.

The Washington and Mason Cable Car Barn was constructed in 1885-87. The building at first housed the cable cars and propelling machinery for the Powell Street Railway Company, which merged into the Ferries and Cliff House Railway Company in 1887 and after a series of further mergers became the property of the Municipal Railway in 1944. Power was supplied to the engines from steam boilers until 1906, after which the system was converted to electric motor operation. The original three-story building was in large part destroyed by the Great Fire that followed the 1906 Earthquake, but was reconstructed with two stories, preserving a similar general appearance.

A plaque designating the San Francisco Cable Car System as a National Historic Landmark was affixed to the Barn in November 1967, when the restored building was rededicated by Secretary Boyd of the U.S. Department of Transportation. This plaque had originally been placed at the Victorian Park turntable of the Powell-Hyde line in 1964, with then Chief Justice Earl Warren of the U.S. Supreme Court presiding at the ceremonies.

Third, That the said Landmark should be preserved generally in all of its particular exterior features as existing on the date hereof and as described and depicted in the photographs, case report and other material on file in the Department of City Planning in Docket No. LM71.1; the summary description being as follows:

The building has two stories, with entrances from two levels, on both Mason Street and Washington Street. It is constructed of red brick, now restored to the appearance of the original structure. Thick, heavy bearing walls present a warehouse-like aspect, preserving an excellent example of industrial construction. The windows are large and multipaned, those at the lower level being deeply embrasured and very slightly arched with a brick keystone pattern above; while at the upper level some windows -- including a pair facing each street at the corner -- have rounded arches and some have flattened arches, with corresponding brick patterns lightly traced in each case above the window. Decorative circular patterns appear in brick below each window, and between some pairs of windows, at the upper level. There are two horizontal projecting brick courses between the upper and lower levels, as well as a projecting course at the roof line.

A prominent feature of the building is the round chimney that sits on a squared base atop the rear of the building's Washington Street side; once functional, it is no longer used. The name "Ferries and Cliff House Railway Co. 1887" is affixed to the building above the central windows on each street facade.

AND BE IT FURTHER RESOLVED, That the Commission hereby directs its Secretary to transmit the proposal for designation, with a copy of this Resolution, to the Board of Supervisors for appropriate action.

AND BE IT FURTHER RESOLVED, That the Commission hereby directs its Secretary to transmit the proposal for designation, with a copy of this Resolution, to the Board of Supervisors for appropriate action.

I hereby certify that the foregoing Resolution was ADOPTED by the City Planning Commission at its regular meeting of June 17, 1971.

Lynn E. Pio
Secretary

AYES: Commissioners Crowley, Fleishhacker, Mellon, Newman, Porter, Ritchie & Rueda

NOES: None

ABSENT: None

PASSED: June 17, 1971

LANDMARKS PRESERVATION ADVISORY BOARD
Revised Case Report - February 24, 1971

CABLE CAR BARN
AND POWER HOUSE

OWNER: City and County of San Francisco (under the jurisdiction of the Public Utilities Commission, Municipal Railway).

LOCATION: Northwest corner of Washington and Mason Streets (lot has 183.5 feet of frontage on Mason Street and 187.5 feet of frontage on Washington Street, and extends through to Jackson Street); being Lot 5 in Assessor's Block 190.

HISTORY AND SIGNIFICANCE: This is the only surviving cable car barn and power house in the city, of some fourteen which at one time or another served various lines. Although cable propulsion was invented in England early in the nineteenth century, its successful application to actual operation did not occur until Andrew S. Hallidie's inaugural run up the Clay Street hill, beginning at Portsmouth Plaza, on August 1, 1873. The great and world-wide interest generated by San Francisco's success lasted well into the 1890's to be displaced by the advent of electric railways. In the 1880's when cable car systems were at the height of their popularity, they existed in a score of cities from Edinburgh to Melbourne and from Brooklyn to Constantinople; but San Francisco was unquestionably the world's cable car capital then, and it has fortunately remained so to the present.

The Washington and Mason Cable Car Barn was constructed in 1885-87 near the site of the original spring and reservoir of the Spring Valley Water Company, which along with other private companies served the city's needs during the 1850's. The building at first housed the cable cars and propelling machinery for the Powell Street Railway Company, which merged into the Ferries and Cliff House Railway Company in 1887 and after a series of further mergers became the property of the Municipal Railway in 1944. Power was supplied to the engines from steam boilers until 1906, after which the system was converted to electric motor operation. The original three-story building was in large part destroyed by the Great Fire that followed the 1906 Earthquake, but was reconstructed with two stories, preserving a similar general appearance.

ARCHITECTURAL DESCRIPTION: The building has two stories, with entrances from two levels, on both Mason Street and Washington Street. It is constructed of red brick, now restored to the appearance of the original structure. Thick, heavy bearing walls present a warehouse-like aspect, preserving an excellent example of industrial construction. The windows are large and multipaned, those at the lower level being deeply embrasured and very slightly arched with a brick keystone pattern above; while at the upper level some windows -- including a pair facing each street at the corner -- have rounded arches and some have flattened arches, with corresponding brick patterns lightly traced in each case above the window. Decorative circular patterns appear in brick below each window, and between some pairs of windows, at the upper level. There are two horizontal projecting brick courses between the upper and lower levels, as well as a projecting course at the roof line.

ARCHITECTURAL DESCRIPTION: (Continued)

A prominent feature of the building is the round chimney that sits on a squared base atop the rear of the building's Washington Street side; once functional, it is no longer used. The name "Ferries and Cliff House Railway Co. 1887" is affixed to the building above the central windows on each street facade.

VISITORS GALLERY:

A new visitors gallery and mezzanine has been constructed inside the Cable Car Barn, to enable the public to view the "winding room" with its imposing wheels which move the long cables of the system. Wheels and columns have been brightly painted by workers at the Barn. The upper level contains tracks and pits for storage and repair of the cars, storage of parts, and offices for master mechanic and superintendent, as well as cable cars dating from the 1870's and an exhibit of historic photographs. There is an elevator -- no longer in use since the end of the Sacramento-Clay Street line -- for raising cars from lower to higher level, with tracks entering at both levels.

SURROUNDING LAND USE AND ZONING:

Uses are mixed residential and neighborhood commercial across Mason Street to the east and north; and residential to the west and northwest. To the south across Washington Street is the Chinatown Recreational Center of the Recreation and Park Department, a corner formerly the site of the old Washington Grammar School. Zoning of the Barn is R-4 (never rezoned to P for Public Use) with R-4 predominating to the north, west and south, and C-2 to the east and north; more distantly to the south the top of Nob Hill is zoned R-5.

DESIGNATION BY OTHER GOVERNMENT AGENCIES:

A plaque designating the San Francisco Cable Car System as a National Historic Landmark was affixed to the Barn in November 1967, when the restored building was rededicated by Secretary Boyd of the U. S. Department of Transportation. This plaque had originally been placed at the Victorian Park turntable of the Powell-Hyde line in 1964, with then Chief Justice Earl Warren of the U. S. Supreme Court presiding at the ceremonies.

1201 Mason | 190 | 5 | 3

street address | block number | lot number | summary

Cable Car barn / 3 | #43

building type/use/number of floors | landmark number

RELATIONSHIP WITH SURROUNDING BUILDINGS

Relationship of setting to building -2 -1 0 1 (2) 3 4 5

Importance as contribution to a cluster/streetscape -2 -1 0 1 2 (3) 4 5

ARCHITECTURAL DESIGN VALUATION

Facade proportions -2 -1 0 (1) 2 3 4 5

Richness/Excellence of detailing/decoration -2 -1 (0) 1 2 3 4 5

Unique visual feature of interest 0 1 2 (3) 4 5

Example of a rare or unusual style or design (0) 1 2 3 4 5

Overall architectural quality -2 -1 0 (1) 2 3 4 5

☐ PROPOSED FOR FURTHER INVESTIGATION

☐ CORNICE, PARAPET, APPENDAGE

Importance of cornice to building design -2 -1 0 1 2 3 4 5

Cornice contribution to streetscape -2 -1 0 1 2 3 4 5

FACADE CONDITION

Physical condition -2 -1 0 1 2 3 4 5

Paint/Material color -2 -1 0 1 2 3 4 5

☐ REMODELING

Appropriateness of improvements -2 -1 0 1 2 3 4 5

3/18/75 KEITH

date

87

photo J-87

Field Notes

A brick box Industrial bldg, rare in these residential parts. Interiors are splendid.

Landmark #93

Review Notes

Junior League Listing

☐ text ☐ index ☐ file

☐ Northern California Guide

☐ Other Listing _____

Landmark

87.412 R

F1

Address 1201 Mason Block 190 Lot

REVIEW PANEL NOTES

SETTING

-2 -1 0 1 2 3 4 5

CLUSTER/STREETSCAPE SBW

-2 -1 0 1 2 3 (4) 5

FACADE PROPORTIONS

-2 -1 0 1 2 3 4 5

DETAILING/DECORATION

SBW

-2 -1 0 (1) 2 3 4 5

UNIQUE FEATURES SBW

0 1 2 3 (4) 5

BASE STYLE/DESIGN

0 1 2 3 4 5

OVERALL ARCHITECTURAL QUALITY

SBW

-2 -1 0 1 2 (3) 4 5

SUMMARY (3)

STYLE

ARCHITECT
DESIGNER
BUILDER 87.412 R

APPROXIMATE DATE

SEE BACK FOR COMMENTS

Important visual moment in the street — hard to judge on exterior alone when interior is the main point.

S.B.W.

San Francisco Cable Railway
Washington and Mason Streets
San Francisco
San Francisco County
California

HAER No. CA-12

HAER
CAL,
38-SANFRA,
137-

Photographs
Reduced Copies of Measured Drawings
Written Historical and Descriptive Data

ADDENDUM
FOLLOWS...

Historic American Engineering Record
National Park Service
Department of the Interior
Washington, D.C. 20240

HAER
CAL,
38-SANFRA,
137-

HISTORIC AMERICAN ENGINEERING RECORD

San Francisco Cable Railway

Location:	Powerhouse and carbarn located at southwest corner of Washington and Mason Streets, San Francisco, California.Track located on Powell, Mason, Hyde, Washington, Jackson, and Taylor Streets, and Columbus Avenue.
Date of Construction:	Existing system originally built 1877-1892. Rehabilitated throughout its life.
Present Owner:	San Francisco Municipal Railway, City of San Francisco.
Present Use:	Cable railway.
Siginificance:	The last operating cable railroad in the world. Representative of an important type of urban transportation system intermediary betweem horse drawn vehicles and electric streetcars.
Historians:	Patrick W. O'Bannon, Marcia Osterhout, Steven Petrow, September 1981

INTRODUCTION

Cable railways thrived in American cities for the twenty years from 1873 to 1893, operating more than 300 miles of track by the early 1890's. San Francisco, site of the first cable railway, accounted for fully one-fourth of this mileage. Today only San Francisco's 4.7 miles of cable railway survive. This system is the last remnant of a transportation technology that played an important role in expanding urban mass transportation facilities and which served as an intermediate step between the horse-drawn streetcar and the electric trolley.

Two of the cable traction companies operating in San Francisco constructed the lines which comprise the existing system. In order to appreciate fully the place of these surviving lines in the history of cable traction technology it is necessary to examine all eight of the firms that built cable railways in San Francisco. Rather than describing at length the technology of installations which no longer exist, this report will confine itself to brief histories of each of the cable railroad companies in San Francisco, and will concentrate on their contributions to cable traction technology, the basic elements of the system having changed little over the years. A detailed technological description of the trackway elements, powerhouse installation, and rolling stock will be given only for those companies whose lines are represented in the surviving system. In addition to these sections on company history and the technology of cable traction, a separate section of the report will deal with the impact of the cable car upon the growth and development of San Francisco.

The technology of wire cable traction is both simple and derivative. Andrew S. Hallidie, often considered the inventor of the cable railroad, drew upon his experience with the ore haulage systems used in the mines of California and Nevada to develop the Clay Street Hill Railroad, San Francisco's first cable railway. Hallidie based his system upon an "endless" wire rope, running at a constant speed. Passenger cars are attached or released from the cable by means of a grip, controlled by the driver or gripman. It is this ability to grasp or release the cable at the gripman's discretion that distinguishes cable railroads from the mining systems. The essential elements of a cable railroad include the "endless" wire rope; a series of sheaves or pulleys that carry the rope through a slotted tube or conduit beneath the street; a stationary power source, originally steam and now electric motors, that drive the cable; and a gripping device to connect the cars to the cable and permit their smooth operation.[1]

Cable traction technology derived from the practice of using a wire cable driven by a stationary steam engine to draw loaded ore cars out of mines. Considering San Francisco's position as a provider of both capital and machinery to mining operations throughout the Far West it is hardly surprising that the first successful application of this mining technology to urban

[1]The Pacific Cable Railway Co., The System of Wire-Cable Railways for Cities and Towns as Operated in San Francisco, Los Angeles, Chicago, St. Louis, Kansas City, New York, Cincinnati, Hoboken, Etc. (San Francisco: 1887), p. 17.

transportation needs occurred in San Francisco. Andrew S. Hallidie, who constructed San Francisco's first cable railroad in 1873, relied heavily upon his experience with ore haulage systems when designing his street railway installation.

Hallidie was at least the third American to attempt to use wire rope traction for urban transportation. Charles T. Harvey patented a system in 1866 in which a gripping fork or claw on a car engaged ferrules on an open ended cable. Harvey actually built and operated a line in New York City using this system between 1868 and 1870. In New Orleans former Confederate general George F. Beauregard experimented with an overhead cable system in 1870.[2] At an even earlier date Philadelphian E.S. Gardiner patented the basic elements of the underground conduit used in by all later cable railways in 1858.[3] The degree to which Hallidie drew upon the work of these earlier inventors is unknown, but the essential elements necessary for a cable traction system clearly existed prior to his first interest in the subject.

The grip and cable represent an effort to forge a purely mechanical link between the period's horse-drawn streetcars and the stationary steam engine, the most common prime mover in post-Civil War America. Cable railroad engineers desired low speed engines of intermediate horsepower, usually of the Corliss type, easily adaptable to the variable loads experienced in daily operation of an urban transportation system. Large and heavy flywheels lessened the jarring and jerking resulting from cars gripping and releasing the cable.[4] Engines of this type made no special demands upon the talents of contemporary engine builders, frequently being ordered straight from the builders' catalogues.

Although simple, cable technology also proved both inflexible and expensive. Prior to 1880 all cable roads ran only in straight lines, curves being considered impossible. Construction costs for the conduit alone averaged $60,000 to $100,000 per mile, fully two-thirds of the full cost of the line.[5] In addition to the conduit, engines, and grip, a cable railway also required a variety of pulleys or sheaves to hold the cable down at the foot of steep grades and assist it over the summits of hills and around curves. The technology for negotiating curves, developed after 1880, required special construction work of a particularly heavy and expensive nature. Reversing the cars at the ends of the line necessitated either turntables or some type of switching arrangement.

THE CLAY STREET HILL RAILROAD

Andrew Smith Hallidie was born in London in 1836. His father, Andrew Smith,[6]

[2]George W. Hilton, The Cable Car in America (Berkeley: 1971), p. 17.
J. Bucknall Smith, A Treatise Upon Cable or Rope Traction as Applied to the Working of Street and Other Railways (London: 1887), pp. 9-15.
[3]Mining and Scientific Press, 43 (3 September 1881), pp. 145, 153.
[4]Street Railway Journal, 4 (October 1888), p. 263.
Hilton, p. 131.
[5]Hilton, p. 103.

held a number of patents for wire rope dating back as far as 1835. Young Hallidie's early training included work as both a mechanic and draftsman. In 1852, at the age of sixteen, Hallidie and his father came to California for the boy's health. Smith returned to England the following year, leaving his son behind.[7]

After a luckless stint gold mining, young Hallidie put his mechanical training to work, and in 1855, at the age of nineteen, designed and constructed a 200-foot long wire-suspension viaduct over the middle fork of the American River. In 1856 he began manufacturing wire rope, using one of his father's inventions, establishing a factory in San Francisco in 1857. Ten years later, in 1867, he took out patents for the "Hallidie Ropeway," a system for transporting ore out of mines by means of an overhead wire rope cable.[8]

Hallidie first turned his attention to the problems of urban transportation in 1869. He claimed, in a paper read in 1891, to have conceived the idea of adopting his ore haulage system to urban transportation needs after watching the agony of street car horses struggling to climb the steep grade of Jackson Street between Kearny and Stockton on a wet, slippery, evening.[9] It is a charming anecdote, and probably partially true, but it is doubtful that Hallidie invested thousands of dollars simply to relieve the sufferings of street car horses. His wire rope firm stood to increase its business and profits greatly should cable traction prove applicable to the urban setting.

Other evidence indicates that Hallidie did not originate the notion of using a stationary steam engine and an endless wire cable as the basis of a street railway system in San Francisco. A local attorney, Benjamin H. Brooks, acquired a franchise from the city in 1869 to construct a wire cable railway. Brooks and his engineer, W.H. Hepburn, a machinist at the Vulcan Foundry in San Francisco, laid their plans for the route, but failed to attract any investors. In 1872 they sold their franchise to Hallidie for a "nominal consideration."[10] It is unknown whether Hallidie borrowed Brooks'

[7]Hilton, p. 21.
Christopher Swan, Cable Car (Berkeley, California: 1978), p. 95.
[8]Hilton, p. 21.
Swan, p. 95.
Edgar M. Kahn, Cable Car Days in San Francisco, rev. ed. (Stanford, California: 1944), p. 28.
A.S. Hallidie, "A Brief History of the Cable Railway System Its Origin and Progress, and Papers in Connection Therewith," Report of the Mechanics' Institute Exposition, 1890 (San Francisco: 1891), p. 4.
A.S. Hallidie, The Mechanical Miners' Guide, 3rd ed. (San Francisco: 1879), p. 8.
[9]Hallidie (1891), p. 4.
Mining and Scientific Press, 43 (3 September 1881), p. 153.
[10]San Francisco Chronicle (22 April 1917).
Langley's San Francisco Directory: 1880 (San Francisco: 1880), p. 22.

and Hepburn's plans for his own project, but considering the controversy which later surrounded Hallidie and his draftsman, William Eppelsheimer, concerning the design of the Clay Street Hill Railroad it is not inconceivable.

Hallidie quietly began laying the plans for his own project in 1870, hiring an engineer named David R. Smith to survey a route along California Street between Kearny and Powell. The Sacramento Record published the news of Hallidie's intentions on 8 July 1870, and within a month a group of enterprising speculators had blocked Hallidie by securing a city franchise for a street railway which covered every street between Pine and Pacific.[11] This group apparently made no effort to develop their own traction system but merely secured the franchise in order to force Hallidie to buy them out. This tale may be a reference to Brooks' franchise, twisted over the years to make the attorney appear no more than a speculator intent on profiting from Hallidie's plans.

Between 1870 and 1872 Hallidie worked to perfect his plans. In 1870 he patented his first grip pulley, the device that drove the cable.[12] By 1872, Hallidie had eliminated most of the technical and legal obstacles, the acquisition of the franchise rights that year cleared the way for the construction of the road. The franchise granted by the city stipulated that the new line could not interfere with street traffic to any greater extent than existing horse car lines. Motors or engines which might frighten horses or people could not be used on the cars, which must be completely controllable at any point on the line. The franchise further stipulated that the line must be operable by 1 August 1873, and run daily between 5:00 am and 11:30 pm at a speed of between 3 and 8 mph, and that the fare be no higher than five cents.[13]

Hallidie was confident that the stipulations of the city franchise could be met easily, later stating that the "greatest difficulties were of a financial rather than of a mechanical character."[14] Efforts to induce the public to purchase stock in the venture failed miserably, only 120 shares being subscribed, and the entire project appeared in doubt due to "a lack of faith in the system."[15] Three associates of Hallidie's in the Mechanics' Institute of San Francisco, Joseph Britton, Henry L. Davis, and James Moffitt, all prominent businessmen in San Francisco, rescued the project in 1872, buying back the previously purchased shares of stock, and contributing $60,000 to the enterprise.[16]

[11] Mining and Scientific Press, 43 (3 September 1881), p. 153.
[12] Ibid.
[13] Smith, p. 21.
San Francisco. Board of Supervisors. Street Railroad Franchises Granted by the Board of Supervisors of the City and County of San Francisco and Statutes and Orders Relative to their Construction and Operation (San Francisco: 1884), pp. 1-6.
[14] Hallidie (1891), p. 5.
[15] Street Railway Journal, 1 (April 1885), p. 116.
[16] Hallidie (1891), p. 6.

During this time of financial uncertainty Hallidie abandoned his plans to construct the road on California Street, in part because his engineer, Smith, had taken a job in Central America. He determined instead to build two blocks north of California on Clay Street. Hallidie believed that because Clay reaches the summit of what is now Nob Hill it would provide a better demonstration of his systems' capabilities while also serving a more densely populated area.[17]

Hallidie and his three partners organized as the Clay Street Hill Railroad and took offices above the Clay Street Bank in June 1872. They sent out a prospectus to all property owners along the projected route that brought pledges of $40,000 contingent upon completion of the line, although the company ultimately received only $28,000 from the local property owners. Of the remaining funds needed to begin construction, $20,000 came from Hallidie, and $30,000 from the Clay Street Bank, which took a 10 year, 10% mortgage on the property.[18]

With financing secured, the mechanical questions resolved, and a city franchise in hand, the Clay Street Hill Railroad let the construction contract to W.H. Martin & Co., a bridge and wharf building firm. They broke ground on 2 June 1873.[19] Construction of the roadbed involved removing and replacing two sets of underground gas and water mains and filling in or building over the cisterns of the city's old fire system. Even so Martin & Co. virtually completed construction by the end of July 1873, after only about 60 days.[20]

The first trial of the Clay Street Hill Railroad took place at 4:00 am on 2 August 1873, four hours after the deadline set by the city franchise for the line's operation.[21] Hallidie presumably chose this early hour both to avoid calling attention to the fact that the line had not complied with its franchise, and to keep any possible failure of the system as inconspicuous as possible.

The trial run started a block east of the powerhouse at Jones, the conduit being complete only to that point. It was made by an incomplete dummy or grip car, whose brakes consisted only of four simple levers, each of which required a man to press it against the wheels. The brakes could not hold the car on the street's steepest grades, a deficency that proved "far from conducive to confidence, and the driver deputed to take the first car down succumbed to

[17] Mining and Scientific Press, 27 (27 September 1873), p. 200.
[18] Hallidie (1891), p. 6.
[19] Smith, p. 21.
Mining and Scientific Press, 27 (27 September 1873), p. 200.
[20] Hallidie (1891), p. 8.
[21] This first trial of Hallidie's line is traditionally dated as occurring on the morning of 1 August, however newspaper research indicates that it actually took place in the early hours of 2 August. The city franchise required the line to be operational by 1 August, but the trial took place so early the next day that apparently nobody noticed the failure to comply precisely with the stipulations of the franchise.

cogent scepticism regarding the relability of the scheme and his personal safety."[22] Hallidie took the place of the frightened gripman, and with a man stationed at each brake, and the entire car secured to telegraph poles by ropes in order to prevent a runaway, he began the descent of the hill. Despite the inadequate brakes the trip proved successful. The car was turned around at the lower terminus and made the return ascent without incident, demonstrating the practicality of the system. Hallidie described the moment as devoid of "frivolity," noting that "there was simply a mutual handshaking, and nothing but cold water.[23]

A public demonstration that afternoon with a dummy and its attached car, or "trailer," proved equally successful, attracting a large crowd. The press of people endeavoring to help turn the dummy at the lower terminus broke a bolt connecting the grip to the car, necessitating a twenty-minute delay. Nevertheless, some ninety people clambered aboard the train for the trip up the hill. The train stalled at Powell Street when the cable began to slip on the grip pulley in the powerhouse, but Hallidie remedied the situation by tossing some sawdust onto the overly tarred cable, increasing the friction and permitting the uphill trip to be concluded successfully.[24]

The Clay Street Hill Railroad opened for revenue service on 1 September 1873, following the completion of the conduit to the powerhouse at Leavenworth Street. For the first two days the firm offered free rides to the public in an effort attract riders and alleviate the public's fear of the new contraption.[25] Cars departed the termini at five minute intervals (three minutes during the evening rush hour) and took eleven minutes to run the length of the .6-mile long road.[26]

After an initial period of scepticism and distrust of the new system the Clay Street Hill Railroad became a great success. In February 1874 the line carried 76,500 passengers, and by 1876 monthly ridership averaged 150,000 as the area served by the line, what is now known as Nob Hill, developed.[27] Built at a cost of about $100,000, the line earned $220-230 per day in the years prior to 1877 with daily expenses of $120, resulting in a daily profit of $100, or $3000 per month. This amounted to a 5% return on the $60,000 invested by the firm's stockholders, despite the "poorly managed" state of the company.[28] A modern historian of cable traction, George Hilton, claims the road returned as much as 35% on the initial investment.[29]

The company extended its cable line west about .4 miles to Van Ness Avenue in 1877, replacing the horsecars the firm originally used to carry passengers

[22]Smith, p. 22.
[23]Hallidie (1891), p. 8.
[24]Hallidie (1891), p. 9.
[25]San Francisco Chronicle (3 April 1887).
[26]Smith, p. 34.
[27]Smith, p. 35.
[28]Real Estate Circular, v.13, n.1 (November 1877).
[29]Hilton, p. 23.

over this stretch of road. The earnings of Hallidie's company began to decline after the California Street Cable Railroad built a parallel line operating with a more modern physical plant.[30]

The Clay Street Hill Railroad remained independent until 1888, when the Ferries & Cliff House Railroad purchased it for $200,000, and incorporated it into its own Clay-Sacramento route. Service on the original installation ended on 9 September 1891, when the new owners decided to tear out the old double tracks and rebuild a single set of tracks along Clay. Following the final trip over the old road a bottle of champagne was broken over the dummy's grip as a tribute to this pioneer cable railroad.[31]

THE TECHNOLOGY OF THE CLAY STREET HILL RAILROAD

The Clay Street Hill Railroad, 2791 feet of narrow gauge (3-feet 6-inch) double track, ran on Clay Street from Kearny to Leavenworth, climbing 307 feet in seven blocks. The line's steepest grade, 16%, occurred in the block between Jones and Taylor. Hallidie made extensive use of redwood in constructing the line, because its experimental nature required that costs be kept to a minimum, precluding a more permanent type of construction.[32]

The cable conduit, which cost about $38,000 to construct, consisted of a series of cast iron frames, or "yokes," connected by wooden planking. The yokes were placed at 3-4 foot intervals in a 29-inch deep trench, to form the framework of the conduit. Two-inch thick redwood planking connected the yokes, forming the sidewalls of the 22"x16" tube in which the cable ran. Metal stays connected the tops of the yokes, stiffening the conduit and supporting wooden scantlings laid alongside the opening in the top of the yokes. These scantlings formed a 3/4-inch wide slot, set two inches off the centerline between the tracks. The gripping device entered the tube through this slot. Iron straps screwed to the tops of the scantlings protected them from excessive wear. Wooden ties extended laterally from each yoke, supporting stringers which carried the line's 30-pound Tee rails. Packed earth surrounded the entire conduit, holding it in position and supporting the wooden planking that formed the surface of the roadway between the slot and the rails.[33]

The cable ran inside the wooden-walled tube, supported about every 40 feet by iron carrier pulleys, 11 inches in diameter. At the summits of grades 4-foot diameter crown pulleys supported the cable. Hallidie installed fixed depression pulleys where the grade of the road changed at the base of hills.

[30]Hilton, p. 186.
[31]Scientific American, 65 (31 October 1891), p. 276.
[32]Hallidie (1879), p. 64.
Smith, pp. 26, 34.
Henry Root, Personal History and Reminisence with Personal Opinion on Contemporary Events 1845-1921 (San Francisco: 1921), p. 41.
[33]Hallidie (1891), p. 7.
Mining and Scientific Press, 51 (18 July 1885), p. 34.
Scientific American, 32 (17 April 1875), p. 239.

These 7-inch diameter pulleys prevented the cable from rising to the top of the tube and damaging itself against the underside of the slot. The off-center design of the slot, combined with the "L" shaped foot of the grip, allowed the grip to pass these depression pulleys without striking them. The offset slot also afforded the cable some degree of protection from the water and debris that fell through the slot into the tube.[34]

At each end of the line, in an underground vault set just beyond the tracks, sat an 8-foot diameter horizontal sheave that reversed the direction of the cable and sent it back through the conduit on the opposite side of the street. Each reversing sheave was mounted on a wheeled carriage riding on 10 feet of track. A chain connected the carriage to a 3300-pound counterweight suspended above a pit at the end of these tracks. The counterweight kept a constant tension upon the cable, compensating for the daily changes in its length resulting from variable loads on the line, changes in the weather, and other factors.[35]

The line also provided facilities for reversing the direction of the dummies and trailers at each end of the line so that they could be dispatched along the opposite set of tracks. At the lower terminus on Kearny Street, two turntables, sitting side-by-side, reversed the cars. As a train approached the end of the line the crew uncoupled the cars, ran the dummy onto the first turntable, turned it 90 degrees by hand and rolled the car onto the second turntable. The crew then turned this second turntable another 90 degrees until the dummy faced back up the tracks. After pushing the car forward to a point where it could retake the cable, the crew repeated the operation with the trailer, recoupled the cars, and started them on the trip up the hill. At the upper, Leavenworth Street, terminus the cars passed over a turnout and were reversed using a single turntable.[36]

The firm's powerhouse, a single-story wooden building measuring 68'x68', stood at the southwest corner of Clay and Leavenworth. The boilers, and steam engines for the line occupied the basement of the building, the winding machinery occupying a vault set 15 feet below the sidewalk. Horizontal deflecting sheaves, eight feet in diameter, diverted the cable from the conduit into the powerhouse, where it passed around an 8-foot diameter grip pulley designed and patented by Hallidie. Jaws set along the outer rim of the pulley alternately grasped and released the cable as the pulley revolved, supplying the adhesion necessary to drive the cable without letting it slip. From the grip pulley the cable passed around an 8-foot diameter tension sheave, back around the grip pulley, and then exited the powerhouse. It was diverted back into the conduit by another 8-foot diameter deflecting sheave. The tension sheave, which could be moved away from the grip pulley along a 60-foot bedplate, took up the long-term stretching that occurred in the cable.

[34] Mining and Scientific Press, 51 (18 July 1885), p. 34.
[35] Ibid.
Smith, p. 39.
[36] Mining and Scientific Press, 51 (18 July 1885), p. 34.
Scientific American, 32 (17 April 1875), p. 239.

Since the cable passed over the bedplate twice, coming and going from the tension sheave, 120 feet of cable could be taken up.[37]

Two 14"x28", 30hp horizontal steam engines, built by the Delameter Iron Works of New York, drove the winding machinery, supplied with steam by two 54"x16' boilers. Only one boiler and one engine operated at a time; the other set constituting a reserve. Pinion and spur gearing connected the engines to the winding machinery, which initially drove the cable at 4 mph, increased to 6 mph about 1877.[38]

Hallidie determined to use a separate dummy and trailer for the Clay Street Hill Railroad in order to avoid wasting passenger space by placing the grip in the middle of the passenger car, and to afford the gripman a better view of the street. The Kimball Manufacturing Co., a car and carriage manufacturing firm based in San Francisco, built the 2200-pound dummies. In addition to standard shoe-type wheel brakes, each dummy also carried two other braking systems: a pedal-actuated brake that pressed a shoe against the rails, and an iron drag pole to prevent the car from slipping down a grade. As a last resort the grip could be raised against the top of the conduit as a crude emergency brake.[39]

Although Hallidie is generally credited with designing the gripping mechanism used by the Clay Street Hill Railroad, and although the patents for the device are in his name, it appears that his draftsman, a German immigrant named William Eppelsheimer, actually worked out most of the mechanical problems involved in developing an operable gripping mechanism. In the articles he wrote for the British magazine Engineering, J. Bucknall Smith baldly stated that "this gripping apparatus was designed by Mr. Eppelsheimer."[40] It is interesting to note that the "Hallidie grip" saw service on only one other cable railroad. Meanwhile Eppelsheimer, having parted from Hallidie's employ, went on to become one of the most important engineers working in the field of cable traction.[41]

Hallidie and Eppelsheimer's grip consisted of a large hollow screw fastened to the floor of the dummy. This screw raised and lowered the grip mechanism within the tube by means of a hand wheel. An upper hand wheel worked a

[37] Mining and Scientific Press, 51 (18 July 1885), p. 34.
Smith, pp. 37-39.
Mining and Scientific Press, 43 (3 September 1881), p. 156.
[38] Mining and Scientific Press, 43 (3 September 1881), p. 156.
Hilton, p. 186.
Smith, pp. 36-37.
[39] Mining and Scientific Press, 27 (27 September 1873), p. 200.
Mining and Scientific Press, 43 (3 September 1881), pp. 154, 156.
Hallidie (1891), p. 6.
[40] Quoted in J. Bucknall Smith, A Treatise Upon Cable or Rope Traction as Applied to the Working of Street and Other Railways, 2nd ed., George W. Hilton ed. (Philadelphia: 1977), p. 197.
[41] Street Railway Journal, 11 (May 1895), p. 312.

threaded rod which ran through the hollow screw and operated the grip's jaws. These jaws, made of replaceable, soft cast iron, were supported by an "L" shaped foot carrying two sliding frames. By turning the upper hand wheel the gripman moved the frames, bringing the jaws into contact with the cable. A pair of grooved pulleys guided the cable between the jaws. H.J. Booth & Co.'s Union Iron Works built the first of these grips.

When a gripman desired to take the cable, which could be done at any point on the line, he opened the jaws with the upper hand wheel and lowered the grip over the cable using the lower hand wheel. Turning the upper wheel, he then closed the jaws until the guide pulleys contacted the cable, which could run freely over the pulleys without contacting the jaws. Tightening the upper wheel further brought the jaws gradually into contact with the cable, imparting motion to the dummy and its attached trailer.[42]

During its first months of operation the line experienced a great deal of trouble with its dummies. The first cars behaved like "untamed steeds," kicking "up into the air, much to the alarm of the passengers." Repairing the damage these dummies daily inflicted upon the cable and the conduit often required all night during the first months of the line's operation.[43]

When the firm initiated revenue service in September 1873 it employed two new dummies with large diameter wheels in the front and smaller ones in the rear. This design also proved unsatisfactory, exhibiting a disturbing tendency to rear up and jump the track, snapping the grip shank off in the conduit. The design of the dummy remained imperfect until early in 1875, almost a year and a half after the line's first trial.[44]

Between August and October 1877 the firm extended its cable line .4 miles west on Clay to Van Ness Avenue. This construction utilized a modified yoke, weighing 380 pounds, which extended under the rails giving them added support. The conduit walls of the extension consisted of a light iron casing instead of the redwood planks used in the initial construction.[45]

THE SUTTER STREET RAILROAD

Henry Casebolt's Sutter Street Railroad, incorporated out of the old City Front, Mission & Ocean Railroad in 1863, converted one of its unprofitable horsecar lines into San Francisco's second cable railway. Unlike the Clay Street Hill Railroad, the Sutter Street line ran over fairly level ground, its highest point being only 170 feet above the elevation of the lower terminus, and its steepest grade only 4%.[46]

[42] Mining and Scientific Press, 43 (3 September 1881), p. 155.
Smith, pp. 32-33.
Hallidie (1891), p. 6.
[43] San Francisco Chronicle (3 April 1887).
[44] Ibid.
[45] Mining and Scientific Press, 51 (18 July 1885), p. 35.
Smith, p. 35.
San Francisco Chronicle (3 April 1887).

When Casebolt first expressed interest in converting one of his horsecar lines to cable in 1876, the Clay Street Hill Railroad's owners demanded a $50,000 license fee for the use of their patents and a royalty on every grip used by the new line.[47] Outraged, Casebolt determined to design his own system, circumventing Hallidie's patents. Along with Asa Hovey, an employee of his car building firm, Casebolt designed the new cable line's physical plant.[48]

The Traction Railroad Co., a holding company formed in 1875 for Hallidie's cable railway patents, instituted a suit against the Sutter Street Railroad. It claimed Casebolt had infringed upon Hallidie's patent for a dummy equipped with a grip working in an underground conduit. In 1880 the United States Circuit Court decided the case, ruling that Hallidie's prior use of this invention constituted only experimental use, and that a patent for a device not yet perfected could not be infringed. The Court ordered that the Sutter Street Railroad pay $1 in damages to Hallidie.[49] This case was the first in a series of patent suits which characterized the cable traction industry throughout its history.

Conversion of the property from horsecar to cable operations took place in 1876, and on 27 January 1877 the line initiated revenue service, running from the intersection of Market and Sutter Streets west on Sutter to Larkin.[50] The change from horse to cable proved immediately successful. Ridership increased by 962,000 during the first year of operation.[51]

The success of this first line soon led the company to extend its cable operations. In late 1878 the firm opened the first crosstown line in the city, running from the powerhouse at Larkin and Bush south on Larkin to Hayes, in late 1878. Upon completion of this line the firm extended the main line west on Sutter to Central (now Presidio) Avenue. Opened in October 1879, this extension constituted the first movement of the cable lines into the sparsely developed section of the city known as the Western Addition, and brought the total amount of track operated by the firm to 2.5 miles on Sutter and .7 miles on Larkin.[52]

Robert F. Morrow, a local real estate broker, bought out Casebolt in 1883, and began another expansion of the firm's cable lines. Morrow abandoned the powerhouse built at Sutter and Presidio in 1879 to drive the western end of the Sutter Street cable in favor of consolidating the firm's operations into a single powerhouse located at Sutter and Polk. He further extended the Larkin

[47] San Francisco Chronicle (22 April 1917).
[48] Street Railway Journal, 11 (May 1895), pp. 312, 315.
Langley's San Francisco Directory: 1875 (San Francisco: 1875).
[49] Mining and Scientific Press, 40 (15 May 1880), p. 305.
[50] Hilton, p. 187.
[51] Smith, p. 42.
[52] Mining and Scientific Press, 43 (3 September 1881), p. 158.

line south, across Market and down 9th Street, to Mission. Work crews pressed this extension forward rapidly, hoping to cross Market in front of the tracks being laid by the Market Street Cable Railway, and thereby earn the advantage of seniority at the cable crossing. At any intersection where two cable roads crossed it became necessary to pass one cable over the other. In San Francisco the senior line, that firm which ran its tracks across the intersection first, invariably received the right to the more desirable upper position. To avoid striking the senior firm's cable the cars of the junior company had to drop the cable and retake it on the other side of the intersection. A legal action won the superior position at the crossing for the Market Street line, which possessed an earlier franchise, despite the efforts of Morrow's work crews, but the Larkin line held the superior position at all of its six other cable crossings.

The Sutter Street Railroad was renamed the Sutter Street Railway in 1887. That same year the firm extended its Larkin Street line farther south on 9th Street to Brannan. The following year construction crews pushed the cross-town line north on Polk from the powerhouse to Pacific Avenue, and then west out Pacific to Fillmore. The firm's financial success during is indicated by newpaper reports of earnings of between $1500 and $1700 per day in 1888.[53]

The company rebuilt its entire system in 1890-91, continuing daily operation of the lines throughout the work. During this reconstruction the firm also extended the Pacific Avenue branch west from Fillmore to Divisadero. This addition gave the company a total of approximately six miles of cable track, as well as a mile of horsecar track that connected the Sutter and Market terminus with the Ferry Building.

The Sutter Street Railway became part of the United Railroads of San Francisco in 1902, in conjunction with two electric streetcar companies and the Market Street Railway. The new firm, controlled by eastern capitalists, operated the Sutter Street lines until 18 April 1906, when the earthquake and fire destroyed the powerhouse, most of the rolling stock, and portions of the conduit. United Railroads, intent upon cutting operating expenses to the bone in order to pay dividends on the firm's watered stock, converted all of the old Sutter Street Railway lines, with the exception of the Pacific Avenue route, to the more cost effective electric streetcars following the earthquake and fire. The Pacific Avenue line, operating out of a small powerhouse at the corner of Polk and Pacific, ran over grades beyond the capabilities of the period's electric streetcars. The survival of this last vestige of the Sutter Street Railroad, which went out of service on 29 November 1929, depended as much upon the objections of the wealthy residents along its route to "unsightly" overhead trolley lines as it did to the steepness of its grades.[54]

THE TECHNOLOGY OF THE SUTTER STREET RAILROAD

The conduits used by the Sutter Street Railroad marked no real advance in cable traction technology from those used by Hallidie. Casebolt and Hovey

[53]San Francisco Call (13 November 1888).
[54]Hilton, pp. 187-88.

designed the original installation along the lines adopted by Hallidie on the Clay Street Hill Railroad, using large quantities of wood in order to keep construction costs at a minimum.[55] In 1879 the firm adopted a yoke of bent railroad iron, modeled after that designed by Henry Root in 1877 for the California Street Cable Railroad.[56] During the 1890-91 reconstruction of the line, new conduit was installed consisting of square wrought iron yokes embedded in Portland cement. This supported 46-pound rails set at a 5-foot gauge.[57]

During the relocation of the powerhouse and extension of the Larkin Street line across Market in 1883, the firm built the first pull curves used in San Francisco. George Duncan invented the pull curve in 1881 for the Dunedin & Roslyn Tramway Co. of Dunedin, New Zealand.[58] Prior to this date existing technology restricted the operation of cable railroads to straight lines, except in special cases like that of San Francisco's Presidio & Ferries Railway, which in 1880 built a drift curve that allowed cars to release the cable and simply coast through the turn. This type of construction proved possible only where both streets involved descended as they approached the intersection.

Pull curves did not require specific street conditions but could be built at any intersection. This advantage over the drift curve resulted in their use for most of the turns built by cable railroads, despite their technical complexity, complicated construction and high cost. A series of horizontal pulleys guided the cable through the turn. A chafing bar, located above and just to the outside of these pulleys, prevented the grip from striking the pulleys and reduced the lateral strain on the grip shank exerted by the pull of the cable. As a car approached a pull curve a slight reverse curve positioned the grip, which pulled the cable up and away from its normal resting place against the pulleys, outside the chafing bar. The car proceeded around the turn at full grip, traveling at the speed of the cable.[59]

The Sutter Street Railroad built six pull curves in conjunction with its 1883 expansion. A contemporary newspaper marvelled at the "bold curve" across Market Street which the cars would negotiate at the full speed of the cable. Ten 5-foot diameter pulleys guided the cable through the two curves at this intersection. At the other turns on the line, which had radii of between forty and fifty feet, 20-inch pulleys set three feet apart in concrete vaults carried the cable.[60]

[55]Smith, p. 42.
Root, p. 50.
[56]Smith, p. 42.
Mining and Scientific Press, 51 (18 July 1885), p. 35.
[57]Hilton, p. 187.
Street Railway Journal, 9 (June 1893), p. 393.
[58]Hilton, p.29.
[59]Hilton, p. 117.
[60]San Francisco Cable Car Days, 1880-89, microfilm in San Francisco Public Library Special Collections, p. 49.

The grip used by the Sutter Street Railroad represented that company's most important contribution to the industry. Hovey and T. Day, the chief engineers of the line, designed the grip, the first to take the cable from the side. Hallidie and Eppelsheimer's grip employed horizontally moving jaws which the cable entered from below, while Hovey and Day's used vertically moving jaws which took the cable from the side. The Sutter Street Railroad grip abandoned the screw-within-a-screw principle of Hallidie and Eppelsheimer, using instead a lever and quadrant arrangement to transfer the gripman's motion to the jaws.[61]

Hovey's first grip design, used a combination of rollers and brakes designed by Colonel W.H. Paine instead of jaws. Hovey tested this design on the Sutter Street line during the summer of 1876, but it quickly proved unsatisfactory. Instead of simply grasping the cable the rollers acted like the dies of a rolling mill, stretching and lengthening the cable, and ultimately breaking its wires. With heavily loaded cars the gripmen simply could not exert enough force upon the lever to prevent the cable from slipping through the rollers. Within six months Hovey and Day substituted jaws for the roller/brake combination, resolving the problem.[62]

The Hovey and Day grip eliminated the need for turntables at the ends of the line. The gripman changed his position, pulling back on the lever eastbound and pushing it forward westbound. By inconveniencing the gripman in this manner it proved unnecessary to turn the dummies around at the termini, and the Sutter Street Railroad used simple switches to change its cars from one track to the other.[63]

A side grip could not be lowered onto the cable like the bottom grip used on the Clay Street Hill Railroad. In order for the grip to take the cable a sheave in the conduit raised the cable to the level of the jaws and then, by means of a lateral deflection in the roadbed, the car and grip were moved onto the cable. The special construction required to move the cable into the jaws of the side grip made it less flexible than the bottom grip, Nevertheless, most lines preferred side grips because of their firmer hold upon the cable. Hovey and Day's side grip, built for a line without any curves, proved too lightly constructed for widespread use among cable traction companies. Even so, it became the progenitor of all future side grips, with its lever and quadrant arrangement being used on nearly every grip designed after 1877. In 1881 Hovey modified the side grip developed by Day and himself for use on the Chicago City Railway. This improved version of the Sutter Street grip became the most popular in the industry for several years.[64]

[61]Smith, pp. 46-47.
[62]Mining and Scientific Press, 52 (9 January, 1886), p. 24.
[63]Hilton, p. 187.
[64]Hilton, pp. 54-55, 235.
Mining and Scientific Press, 51 (18 July 1885), p. 38.
Charles Smallwood, Warren Edward Miller, and Don DeNevi, The Cable Car Book (Millbrae, California: 1980), p. 31.

The powerhouse of the Sutter Street Railroad also differed substantially from that of the Clay Street Hill Railroad. The line's first powerhouse stood at the corner of Bush and Larkin. Four steam engines, each with a 12-inch bore and a 24-inch stroke, drove the three cables run out of the building in 1881. A second powerhouse, built in 1879 at Sutter and Presidio, drove the western end of the Sutter Street cable, which was apparently too long to be operated solely out of the main powerhouse. Two 12"x24" steam engines, built by Prescott, Scott & Co's. Union Iron Works in San Francisco, drove this cable, which ran east from the powerhouse to Buchanan Street. Six boilers, all 16 feet long and varying in diameter from 48 to 54 inches, supplied the steam for the firm's engines in 1883. In 1881 the boilers consumed about twelve tons of coal in the course of nineteen and a half hours of daily operation.[65]

The firm consolidated all its cable driving operations into a single powerhouse, located at the southeast corner of Polk and Sutter, in 1883. As was common with most of San Francisco's cable traction companies, the steam engines, boilers, and winding machinery occupied the building's basement, while the upper floors were used for car storage and repair and offices.[66]

Two pairs of cross compound, non-condensing 500hp steam engines drove the winding machinery in the new powerhouse. The two pair of engines, only one of which operated at a time, ran at 61 rpm under 110 pounds of steam furnished by six 100hp tubular boilers built by the Union Iron Works. A rope drive transmitted power from the engines to a 25-foot diameter receiving pulley mounted on one of the main driving shafts, located 42 feet away across the powerhouse. A set of 12-foot diameter, helical-toothed gears connected this first shaft with a second.[67]

Casebolt and Hovey developed a new driving system for the Sutter Street Railroad in order to avoid the patents held by Hallidie upon the system used by the Clay Street Hill Railroad. It is unclear whether or not the installation used in the 1883 powerhouse employed the same driving system used in the original powerhouse. In the 1883 installation two driving sheaves, also known as winders, drove each cable. The adhesion necessary to avoid slipping was obtained by wrapping the cable around the winders in a figure-eight pattern. The sheaves were mounted in line with each other on the two main shafts. In 1883 the Sutter Street Railroad used one set of 12-foot diameter winders and two sets measuring 10 feet 10 inches in diameter. Some controversy exists as to the winding system used by the Sutter Street Railroad. J. Bucknall Smith, a generally reliable source, claims that the firm used multiple wraps of the cable around a driving and an idler drum to provide the needed adhesion. George Hilton, the most distinguished modern historian of cable traction, accepts Smith's view, but several other contemporary

[65]Hilton, p. 187.
Mining and Scientific Press, 43 (3 September 1881), p. 158.
Smith, p. 43.
[66]Street Railway Journal, 9 (June 1893), p. 393.
[67]Street Railway Journal 9 (June 1893), pp. 393-94.

sources indicate that the line used the figure-eight system described here, also known as the "American" drive system.[68]

In 1883 the Sutter Street Railroad also used a different method for maintaining tension on the cable from that developed by Hallidie. From the winders the cable passed around a vertical tension sheave mounted on a wheeled carriage running on rails. Weights, hanging suspended over a pit and attached by a chain to each tension carriage, pulled the carriages back along the rails as the cable's length varied, keeping it taut.[69]

The surviving descriptions of the Sutter Street Railroad's powerhouse all refer to the building erected in 1883, by which date several other cable traction firms were operating in San Francisco. The details of the firm's original installation are unknown, and it is unclear whether or not the company introduced the figure-eight drive system and moveable tension carriages used in the 1883 powerhouse. They may instead have been adopted after other lines demonstrated their practicality.

The physical plant of the Sutter Street Railroad, designed to circumvent the patents held by Andrew S. Hallidie, made several valuable contributions to cable traction technology. The most important of these contributions, Hovey and Day's side grip, differed radically from the device used by the Clay Street Hill Railroad, and introduced the lever and quadrant motion used on nearly every grip developed after this time. In 1883 the company introduced the pull curve, invented in New Zealand, to San Francisco, freeing the cable car from the restriction of straight line operations. It is unclear, however whether or not the Sutter Street Railroad made any substantial contribution to powerhouse technology, since no descriptions of the original drive system survive. The figure-eight drive system and moveable tension carriages used in the 1883 powerhouse represented marked advances in cable technology, but both appeared in the powerhouses of other firms prior to 1883; the role of the Sutter Street Railroad in pioneering their use is uncertain.

THE CALIFORNIA STREET CABLE RAILROAD

Leland Stanford, one of the "Big Four" entrepreneurs responsible for the construction of the Central Pacific Railroad, financed the construction of San Francisco's third cable line, the California Street Cable Railroad. Impressed

[68]Sutter Street Railroad, Powerhouse Drawings, 1883, California Historical Society Library, San Francisco, California.
Street Railway Journal, 9 (June 1893), p. 394.
Transactions of the Technical Society of the Pacific Coast, vol. 1, num. 3 (July-September 1884), p. 110.
Mining and Scientific Press, 43 (3 September 1881), p. 35.
Hilton, p. 137.
Smith, pp. 45-46.

[69]Mining and Scientific Press, 43 (3 September 1881), p. 35.

by the financial and technical success of Hallidie's Clay Street Hill Railroad, Stanford determined to build a route up California Street past the palatial mansion he had begun building in 1874.[70]

Stanford, Mark Hopkins, another of the "Big Four," commission merchant Louis Sloss and several other prominent San Francisco businessmen, together incorporated the California Street Cable Railroad Co., capitalized at $500,000. They received a franchise for their project on 14 July 1876. Most of the new firm's financial burdens fell on Stanford's shoulders. He purchased 4750 of the 5000 shares offered for sale, his associates, for the most part, lent only their names to the venture, fearful that it would never earn a profit through the collection of nickel fares. Stanford turned over responsibility for designing the line to Henry Root, an assistant engineer with the Central Pacific. Root, who became one of the most important engineers in the cable traction industry, estimated the cost to construct a cable route along California from Kearny to Fillmore at $350,000.[71]

Hallidie demanded $40,000 and final approval of the firm's construction plans for the rights to his patents. Stanford instructed Root to build the best road possible, claiming he would pay the costs if it infringed on Hallidie's patents. Despite Root's efforts to design the line without infringing upon these patents, Stanford was still forced to pay Hallidie $30,000 in patent license fees.[72]

Construction started on 5 July 1877. The route was to consist of 1.7 miles of narrow gauge (3-foot 6-inch) track running on both sides of California from Kearny Street, downtown, over Nob Hill to Fillmore Street in the Western Addition. The construction of the route, which cost $430,000, took only five months, however problems with hot boxes in the engine bearings delayed the opening of the line until 10 April 1878. In its first day of operation the new route carried over 11,000 passengers.[73]

In the spring of 1879 the firm extended its line from about 150 feet west of Fillmore to Presidio Avenue. Stanford wanted to pay for the construction of this short extension out of the line's earnings in order to avoid the incurrance of a debt or a lapse in the payment of dividends to the line's stockholders. Root designed the extension with inexpensive wooden yokes and a plank roadway in order to meet Stanford's desires. The extension opened for service on 30 May 1879, but its had to be completely rebuilt with concrete conduit and iron yokes in 1884.[74]

[70]Root, pp. 35, 61.
[71]Kahn, pp. 45, 48.
Root, p. 43.
[72]Kahn, p.49.
Root, pp. 42-43, 54.
[73]Kahn, p. 48.
Root, p. 45.
San Francisco Morning Call (12 April 1878).
[74]Hilton, p. 193.

Stanford sold his interest in the company to a syndicate headed by local banker Antoine Borel in 1884. In association with company president James B. Stetson, Borel inaugurated an extensive program of improvement and expansion. Installing new machinery in the powerhouse at Larkin and California in 1887 reduced the length of a trip from one end of the line to the other from 21.5 minutes to 18 minutes.[75]

In 1889 Borel and Stetson laid plans for extending the mainline east on California from Kearny to Market, and for constructing a crosstown line running on O'Farrell, Jones, and Hyde Streets. Financing for these projects came from the sale of $950,000 worth of 6% first mortgage bonds on the property. The half-mile long extension on California opened in 1890, and the O'Farrell-Jones-Hyde line, whose construction necessitated moving the company's powerhouse to the corner of California and Hyde, began service on 9 February 1891. The route was the last cable line built in San Francisco.[76]

Unlike other cable lines that gave way to electric trolleys, California Cable operated profitably for many years. The steep grades over which it operated precluded conversion to electric trolleys. Following the earthquake and fire of April 1906, which destroyed all 52 of the company's cars, the firm rebuilt its entire system. This was accomplished despite the fact that the Fireman's Fund Insurance Co., which held a substantial share of the company's stock, was able to pay only about 50% of the $177,000 of damage claims. Restoration of service following the earthquake and fire was not complete until July 1908, over two years after the disaster.[77]

The large traction companies that dominated San Francisco's street railways in the twentieth century never acquired California Cable, which remained independent longer than any of the other cable traction companies in the city. The Market Street Railway, the largest traction company in San Francisco, obtained 1000 shares of stock in California Cable from the Fireman's Fund Insurance Co. in 1907, intending to eliminate the competing firm, but changed its plans and sold the stock in 1917.[78]

The company proved financially rewarding to its stockholders. In 1940 the company president estimated that $600 worth of dividends had been paid out on every share of company stock, which originally sold for $60. In addition to

Root, p. 46.

[75] Hilton, p. 193.
Kahn, p. 57.
San Francisco Morning Call (25 April 1887).

[76] Root, p. 47.
Kahn, pp. 59-60.
Hilton, p. 193.

[77] Hilton, p. 196.
Kahn, pp. 94-95.
San Francisco Morning Call (25 June 1906).

[78] Hilton, p. 197.
Kahn, p. 110.

these dividends the firm had also completely retired the $960,000 debt incurred during the construction of the O'Farrell-Jones-Hyde line in 1890-91.[79]

The cancellation of the company's insurance policy following an adverse legal decision in 1951, forced the company to cease operations on 31 July 1951. The City and County of San Francisco purchased the entire property for a mere $138,000, and reopened the lines on 13 January 1952. The high operating costs of the lines resulted in their running at a loss. In an effort to minimize these losses the city's Municipal Railway, which operated the property, discontinued the O'Farrell-Jones-Hyde line and cut the California line back from Presidio to Van Ness Avenue in May 1954.

In 1956-57 the city consolidated the old California Cable operations into its other cable powerhouse, the structure that still stands at Washington and Mason Streets. The California Street line reopened on 27 December 1957, nearly ten months after the resumption of service on a portion of the old Hyde Street line.

THE TECHNOLOGY OF THE CALIFORNIA STREET CABLE RAILROAD

Root contributed several major innovations to cable traction technology in his designs for the California Street Cable Railroad. Perhaps the most important of these involved the use of wrought iron yokes set in a concrete conduit to form a solid underground structure that enclosed the cable and supported the tracks. Root later admitted that while construction of the line did not constitute "an epoch making event in railroad transportation," it represented exactly that in terms of its "use of concrete construction," being "the first use of a structure made up of wrought metal buried in concrete and moulded to form in place."[80]

Root salvaged discarded 60-pound Tee rails, had them bent to shape, and used them as yokes in the installation. Placed four feet apart, these yokes formed the basic shape of the conduit. Root used Rosendale cement, which was less expensive than imported Portland cement, to encase the yokes and form the sidewalls of the conduit. The cement was poured against a removable wooden form which preserved the shape of the 22-inch deep tube.[81]

The rails used by "Cal Cable" also represented an advance over the simple Tee rails generally employed by earlier lines. Root designed a 36.5-pound girder rail specially rolled for Cal Cable by the Cambria Iron Works of Johnstown Pennsylvania. The officials at Cambria initially refused to roll these rails, citing the expense involved in producing such a small special order, but relented when C.E. Huntington, one of Stanford's business partners in the Southern Pacific Railroad, threatened to take that firm's business elsewhere

[79]Hilton, p. 197.
[80]Root, p. 52.
[81]Smith, p. 49.
Root, pp. 46, 52.
Engineering News, 5 (4 April 1878), p. 105.

unless Root received his rails. Cambria produced the rails, which continued in service until 1909, for $20,000, the only portion of the line's construction funds spent outside California.[82] The paving between the narrow gauge rails consisted of basalt blocks grouted with Portland cement, a substantial improvement over the wooden planking used on the first cable lines.

The construction of the O'Farrell-Jones-Hyde line, supervised by C.H. Holmes, utilized the same basic type of conduit as that on California Street, except that riveted iron members were substituted for the worn Tee rails used as yokes in the original construction. The new line employed a centered slot, for use with the Eppelsheimer bottom grip, instead of the offset slot found on California Street. The Pacific Rolling Mills, a local firm in which Antoine Borel, principal owner of California Cable at the time of the extension, had extensive interests, rolled the slot and track rails used on the new line.[83]

The firm's original powerhouse, a 70'x80', three-story structure standing on the southeast corner of California and Larkin, drove two cables, one running east to Kearny and the other west to Fillmore (later to Presidio). The engines and boilers occupied the building's basement, while the winding machinery sat in a 110'x30' vault located 31' underneath the center of California Street. A shaft 30' long, and 9.5" in diameter connected the engines to the winding machinery.[84]

Wallace W. Hanscom's Hope Iron Works built the two vertical, marine-type steam engines that drove the cable.[85] In 1887 J. Bucknall Smith, an English civil engineer, criticized the engines, which cost over $15,000, complaining that vertical engines were "scarcely suitable" for cable traction because the vibration of the engines could be "distinctly felt when travelling upon the line."[86] Three horizontal, multi-tubular boilers, built by the San Francisco-based firm of McAfee, Spiers & Co., supplied steam for the engines. Daily operation of these boilers in 1887 required nearly eight tons of coal.[87]

[82] Root, pp. 44, 46-47.
Kahn, p. 49.
[83] Street Railway Journal, 9 (June 1893), p. 382.
Daily Alta Californian (21 July 1889).
[84] Engineering News, 5 (4 April 1878), p. 106.
[85] These engines measured 22"x36", and operated at 90rpm. The flywheel measured 9 feet in diameter and weighed 6 tons.
Mining and Scientific Press, (17 November 1877), p. 312.
[86] Smith, p. 50.
Root, p. 45.
Mining and Scientific Press, (17 November 1877), p. 312.
Mining and Scientific Press, 51 (18 July 1885), p. 33.
[87] These boilers measured 57"x12', and supplied an average of 70 pounds of steam for the engines.
Root, p. 45.
Smith, p. 49.
Engineering News, 5 (4 April 1878), p. 106.

The major contribution of the California Street Cable Railroad to powerhouse technology consisted of the placement of the winding machinery, built by William H. Birch's California Machine Works, in the vault under California. This eliminated one of the major sources of cable wear, their deflection and out of the powerhouse. The firm possibly introduced the figure-eight drive system, described for the Sutter Street Railroad, to the industry. It is impossible to verify whether or not credit for this major improvement in cable winding technology belongs to Root, because the nature of the original drive system of the Sutter Street road remains a mystery. The tension apparatus used by Root definitely did not mark an advance in cable technology. As early as 1887 Smith described it as "primitive, if not undesirable." It consisted of a reversing sheave, mounted on a truck loaded with scrap iron, which ran on rails set on a 30 degree slope. The weight of the scrap iron pulled the car, and its sheave, down the incline as the cable stretched, keeping it taut.[88]

The firm replaced the gearing that connected the engine shaft with the drive shaft in 1887. The new gears increased the speed of the cable, and allowed cars to traverse the 26 blocks of the road in 21.5 instead of 18 minutes.[89]

California Cable erected a new powerhouse at the southwest corner of California and Hyde in 1891, a move necessitated by the building of the O'Farrell-Jones-Hyde line. J.C.H. Stutt, a local engineer, designed the powerhouse installation and the Union Iron Works built the engines and other machinery.[90]

The three-story brick powerhouse did not include the 22'x80' lot situated exactly at the southwest corner of the intersection. When the owner of this property discovered that a cable traction company wanted his land for a powerhouse he held out for the "stupendous figure" of $870 a front foot, believing the company would be forced to meet his price. Instead, California Cable bought the rest of the property it desired for about $325 a front foot, and simply built its powerhouse around the holdout, rendering his property virtually worthless.[91]

The steam engines installed in the new powerhouse marked the first use of triple expansion engines for cable traction. Three condensing engines, coupled to a single shaft, produced 500hp at 61rpm. Three 120hp Babcock & Wilcox boilers, only two of which operated at any one time, provided steam for the engines.[92] The company replaced the steam engines with electric motors in

[88]Root, p. 45.
Smith, pp. 50-51.
Engineering News, 5 (4 April 1878), p. 106.
[89]San Francisco Morning Call (25 April 1887).
[90]Root, p. 47.
[91]San Francisco Chronicle (2 November 1889).
[92]The three engines had bores of 14, 20, and 34 inches, and a 54-inch stroke. Street Railway Journal, 9 (June 1893), pp. 379-80.

1916.[93]

In place of gearing, the new powerplant utilized a rope drive to transmit power from a 7' 9" driving pinion on the engine shaft to a 25-foot diameter receiving pulley on the main drive shaft. The main shaft carried two sets of 12-foot diameter winding sheaves. Stutt designed a multiple-wrap driving system for the powerhouse, in which the cable passed around the driving and idler drums four or five times in order to acquire the adhesion needed to prevent the cable from slipping. Up to 300 feet of cable could be taken up by moving the idler drums along a 30-foot long bedplate as the cable stretched with use. Stutt developed an innovative, vertical tension run for the powerhouse, eliminating the need for the long tension runs used by other firms. Stutt's design employed an 8-foot diameter sheave, supported in a gate frame, which bore down on the cable with a weight of 1800 pounds. The weight of the sheave kept the cable taut during the variations incurred during daily operation.[94]

California Cable used two different types of grips on its cars. On the California Street route the firm employed a side grip designed by Root, which operated in essentially the same manner as the Hovey and Day grip used on the Sutter Street Railroad. On the O'Farrell-Jones-Hyde line the need to drop the cable 22 times during the course of a round trip forced the company to adopt the Eppelsheimer bottom grip, first used by the Geary Street Park & Ocean Railroad in 1880. Retaking the cable with a bottom grip required only a small dip in the roadbed to bring the grip down onto the cable, a much simpler process than with side grips, which required a sheave to raise the cable to the level of the grip and a deflection of the track to move the grip onto the cable.[95]

The line's first cars, built in 1877 by the Central Pacific Shops in Sacramento and the Kimball Manufacturing Co. in San Francisco, followed the period's standard practice of using a dummy and trailer. Root developed the combination car, which incorporated the dummy and trailer into a single vehicle, in 1883 for the Market Street Cable Railway. In 1888 Cal Cable adopted double-ended combination-type cars, also invented by Root. California Cable's 30-foot long, 11,200-pound cars, built by the John Hammond Car Co., could be operated from either end by means of duplicate grip levers linked to the grip by connecting rods. Unlike the Market Street cars, which had to be reversed on a turntable at the end of the line, the California-type cars simply passed through a switch onto the opposite track, where the gripman disconnected his grip lever, moved to the opposite end of the car, connected the grip lever at that end, an started on the return trip. This system enabled the company to continue using its termini switches, saving the expense of replacing them with turntables. These double-ended combination cars are still used on the California Street line of the existing San Francisco cable

[93]San Francisco Chronicle (12 January 1916).
[94]Street Railway Journal, 9 (June 1893), pp. 380-81.
[95]Hilton, p. 66.

system.[96]

In 1956-57 the San Francisco Municipal Railway rerouted the California Street cable into its powerhouse at Washington and Mason Streets and abandoned the old California Street Cable Railroad powerhouse. To incorporate the Cal Cable routes into its existing cable system MUNI converted the California Street line to a centered slot compatible with the Eppelsheimer bottom grip used on its other routes. Aside from this change and the rerouting of the cable required to bring it into the Washington and Mason Street powerhouse, most of the trackway of the former California Street Cable lines remains constructed in its original manner.

THE GEARY STREET PARK & OCEAN RAILROAD

Chartered in November 1878, the Geary Street Park & Ocean Railroad, San Francisco's fourth cable traction company, began temporary horsecar service over its routes in August 1879, initiating cable service in February 1880. The cable route ran from Market to Central (now Presidio) Avenue along Geary Street, one of the city's major east-west thoroughfares. Charles F. Crocker, the son of Central Pacific Railroad mogul Charles Crocker, provided most of the $275,000 required for the construction of the line which encountered neither significant grades nor turns in its route.[97]

The company proved financially successful from the outset, a fact which prompted the Market Street Cable Railway to purchase the firm in 1887. Market Street Cable operated the lines separately from its own system, retaining the original name. In 1892 the company extended the tracks west 1.9 miles to Golden Gate Park, simultaneously rebuilding the original line with more permanent conduit and standard gauge track. This conversion to standard gauge allowed the Market Street Cable Railway's cars to operate over the line, making possible through-service from the Ferry Building at the foot of Market to Golden Gate Park.[98]

The city franchise for the route expired in November 1903, and for the next 10 years the company operated under a special arrangement which required it to turn over 10% (later reduced to 5%) of its earnings to the city.[99] The Geary Street Park & Ocean survived the earthquake and fire of April 1906 comparatively unscathed and resumed service on 22 June 1906.[100]

The San Francisco Municipal Railway began erecting overhead streetcar wires along the route in June 1911. Cable operations ceased on 5 May 1912, and on 28 December 1912 the line reopened as the first of MUNI's streetcar

[96]Kahn, p. 50.
Root, p. 48.
Smallwood, et.al., pp. 32, 35.
[97]Kahn, p. 42.
Hilton, p. 201.
[98]Hilton, p. 201.
[99]Root, p. 81.
[100]San Francisco Morning Call (21 June 1906).

operations.[101]

THE TECHNOLOGY OF THE GEARY STREET PARK & OCEAN RAILROAD

With the exception of the Eppelsheimer bottom grip, which is in use today on San Francisco's cable cars, the Geary Street Park & Ocean contributed little to the development of cable traction. William Eppelsheimer, Hallidie's draftsman and collaborator on the Clay Street Hill Railroad, designed the 5-foot gauge Geary Street Park & Ocean with yokes and other track elements of wood. The line operated over grades so slight that it did not require depression pulleys. Considering Root's extensive use of concrete during the construction of the California Street Cable Railroad three years previously, this use of wood amounted to a backward step in cable traction technology.[102]

During the 1892 extension of the tracks to Golden Gate Park the company rebuilt its entire system, replacing its wooden yokes and conduit with cast iron yokes and concrete conduit and reducing the track gauge to the standard 4-foot 8.5-inch gauge. The company also rebuilt its slot rails to accomodate the Root side-grip used on the Market Street Cable Railway's cars.[103]

The firm's powerhouse at the northeast corner of Geary and Buchanan, like much of the rest of the line, was built of wood. Two cables were operated from the building, driven by two horizontal, 250hp O'Neill-type steam engines, built by the Union Iron Works and supplied with steam by three steel boilers.[104] A rope drive connected an 8-foot diameter driving pinion on the engine shaft to a 20-foot diameter receiving pulley on the main shaft. The firm employed the multiple-wrap system to drive its cables.[105]

The bottom grip designed for the Geary Street Park & Ocean represented the line's most important technical contribution to the industry. This grip used the standard lever and quadrant-type linkage to lower a plate which forced the grip's jaws against a pair of stationary rollers. These rollers forced the jaws inwards against the cable. This grip is presently the only type of grip used on the San Francisco cable railroad system. Market Street Cable replaced the Eppelsheimer grips with their own Root single-jaw side grips during the course of the 1892 reconstruction. The line continued to use the Root grips until it ceased operations in 1912.

[101] Hilton, p. 202.

[102] Hilton, p.201.
Smith, pp. 56-57.
Mining and Scientific Press, 51 (18 July 1885), p. 35.

[103] Root, p. 79.

[104] The steam engines had bores of 18 inches and strokes of 48 inches. The boilers, which supplied 65 pounds of steam, measured 52"x16'.
Smith, p. 60.
Street Railway Journal, 9 (June 1893), pp. 387-88.
Mining and Scientific Press, 43 (3 September 1881), p. 158.

[105] Smith, p. 60.
Street Railway Journal, 9 (June 1893), pp. 387-88.

THE PRESIDIO & FERRIES RAILROAD

The Presidio & Ferries Railroad ran primarily on Union Street. It marked the first assault upon Russian Hill, just north of Nob Hill, by cable car. Hallidie served as president of the firm, organized in October 1878. Both Joseph Britton and James Moffitt, partners with Hallidie in the Clay Street Hill Railroad, invested in the new firm, as did Antoine Borel, who purchased Stanford's interests in the California Street Cable Railroad in 1884.[106]

The firm's nearly two miles of 5-foot gauge track was built at a cost of $190,000, and opened for revenue service on 23 October 1880. The line extended from Columbus and Montgomery, where a horsecar line linked the cable tracks to the Ferry Building, north on Columbus and west on Union to Steiner Street. From there a steam line continued out to the Presidio.[107]

A group of local businessmen, including commission merchant George A. Newhall and real estate man A.D. Sharon, purchased the line from the Hallidie interests in the early 1890's, and placed J.C.H. Stutt in charge of two projects: the design of improvements to the existing system and a one-mile extension running along Union, Baker, and Lombard Streets to the Presidio. This extension opened for service in 1892.[108]

The Presidio & Ferries Railroad suffered more damage than any other San Francisco cable route during the earthquake and fire in April 1906. After the disaster the owners of the company rebuilt the system as an electric streetcar line. This line continued in operation as a private company until 1913, when the San Francisco Municipal Railway purchased the firm.[109]

THE TECHNOLOGY OF THE PRESIDIO & FERRIES RAILROAD

The Presidio & Ferries Railroad represented an extremely conservative approach to cable traction. Chief Engineer W.H. Milliken, who served as superintendent of the California Street Cable Railroad in 1878, designed the Presidio & Ferries as a broad-gauge adaptation of Hallidie's original technology.

Prior to 1880 most engineers considered cable cars incapable of negotiating any type of turn. At the intersection of Columbus and Union the Presidio & Ferries Railroad proved this assumption false by building the first curve ever constructed for a cable railroad. Both Union and Columbus ran downhill as they approached the intersection, from the west and south respectively, and Milliken took advantage of this fortunate circumstance in designing his curve. The cable passed around the turn on two 8-foot diameter horizontal sheaves, laid under the pavement beyond the line of the tracks. As cars

[106] Kahn, p. 42.
San Francisco Cable Car Days: 1880-1889, p. 17. Microfilm located in Special Collections Department, San Francisco Public Library.
[107] Kahn, p. 42.
Smith, p. 64.
Hilton, p. 205.
[108] Hilton, pp. 205-06.
[109] Ibid., p. 206.

approached the curve they released the cable and coasted through the 50-foot long turn under their own momentum, retaking the cable at the far side of the curve.[110]

While Milliken's curve, known as a "drift" or "let-go" curve, freed the cable car from the restriction of straight line operations, it did not prove completely successful from the start. Contemporary newspaper reports indicate that the cars often came to a stop before they completely rounded the turn, forcing the crews to push them forward to a point where the grip could retake the cable.[111]

The Presidio & Ferries' powerhouse, located at the southeast corner of Union and Hyde, represented the industry's most extreme example of a firm placing its powerhouse at the highest point on the line. Locating the powerhouse at the line's summit lessened the strain of the cable on the terminal sheaves, but greatly increased the difficulty of hauling fuel and new cables to the building.

Milliken designed the firm's winding machinery to use the grip pulley drive system first employed by Hallidie. The Fulton Iron Works, operated by the firm of Hinckley, Spiers & Hayes, built the 300hp Corliss-type cross compound steam engine used to drive the winders and the three 150hp multi-tubular boilers that provided steam for the engines. Leather belting transmitted power from an 8-foot diameter pinion located on the engine shaft to a 25-foot diameter receiving pulley on the main shaft. The Golden State & Miners' Iron Works built these pulleys, as well as the two grip pulleys which drove the firm's two cables.[112]

Stutt made several changes in the powerhouse in 1892. He replaced the belt drive between the engine and main shafts with a cotton-rope drive, and he substituted multiple-wrap drivers and idlers for the Hallidie grip pulleys. In addition to these changes Stutt introduced a vertical-type tension apparatus similar to the one he designed in 1891 for the California Street Cable Railroad.[113]

In 1892, while engaged in designing the extension of the Presidio & Ferries tracks to the Presidio, Stutt decided that the Hallidie-type bottom grip used

[110] Smith, p. 65.
San Francisco Cable Car Days: 1880-1889, p. 13. Microfilm located in Special Collections, San Francisco Public Library.
[111] San Francisco Cable Car Days: 1880-1889, p. 25. Microfilm located at Special Collections, San Francisco Public Library.
[112] Ibid., pp. 17, 19.
Street Railway Journal, 9 (June 1893), p. 393.
Smith, p. 66.
The cylinders of the firm's engine had bores of 18 and 24 inches with a 36-inch stroke. The engine operated at 72rpm under 80 pounds of steam supplied by the boilers, which measured 54"x16'.
[113] Street Railway Journal, 9 (June 1893), p. 392.

by the firm would not stand the side strain involved in negotiating the pull curve planned for the corner of Union and Baker. He developed a new type of bottom grip for the line in which the outer jaw remained stationary while the inner jaw moved against the cable. This unique design permitted Stutt to retain the road's off-center slot design.[114]

THE MARKET STREET CABLE RAILWAY

The origins of the Market Street Cable Railway date from a horsecar line established in 1867. On 22 August 1883 the company began operating its first cable line, known locally as the Southern Pacific line because its stockholders included Charles F. Crocker, Leland Stanford, and Henry Huntington. The firm eventually became the largest cable traction company in San Francisco, serving the Mission District, Golden Gate Park, and the Western Addition via five branch lines stemming from the main line on Market Street. The Market Street line travelled over the most important shopping street in the city, sharing the street with eight other street railroad companies, and providing the first direct cable car link to the Ferry Building at the foot of Market.[115]

The Valencia line, which ran on Valencia through the Mission District to 29th Street, opened at the same time as the mainline in August 1883. The Haight and McAllister lines began service later that same year, running west from Market to Golden Gate Park. A separate powerhouse drove the McAllister Street cable.[116] By November 1885, while technically profitable, these three branch lines and the main line earned an average of only $40 a day, $75 on Sundays.[117]

Market Street Cable opened a fourth branch line, running west on Hayes Street from Market to Golden Gate Park, on 26 May 1886. This line, like the McAllister Street line, operated out of its own powerhouse. The firm's fifth and final branch, which ran south on Market to Castro and out Castro to 26th Street, opened in 1887. With the addition of these two lines the earnings of the company increased to an average of between $12,500 and $35,000 a month in 1888, and continued to increase at the rate of $4000-5000 per quarter. After completing the Castro line the company's only constuction activity involved two short extensions of the McAllister line in 1892 and 1902.[118]

In 1893 Leland Stanford, then president of Market Street Cable, arranged a merger which brought Market Street Cable, the Omnibus Railroad & Cable Co., the Ferries & Cliff House Railway, and two horsecar operations together under a single management, known as the Market Street Railway. The three cable

[114] Ibid.
Hilton, p. 61.
[115] Street Railway Journal, 9 (June 1893), p. 383.
Mining and Scientific Press, 47 (27 October 1883).
[116] Mining and Scientific Press, 47 (27 October 1883).
[117] Real Estate Circular, 2 (November 1885).
[118] Hilton, p. 207.
San Francisco Call (13 November 1888).

traction companies involved in the new company, Market Street Cable, Omnibus Railroad & Cable, and the Ferries & Cliff House, received $13,500,000, $3,000,000, and $1,000,000 respectively in stock in the new firm.[119]

This new firm led the fight by the city's cable traction companies against the incursions of the electric streetcars. Horsecar operators desired conversion of their unprofitable lines to electric operations following the successful demonstration of electric traction by Frank Sprague in Richmond, Virginia in 1888. The large capital investment required for a cable railroad created a vested interest for the owners to strive to protect their expensive, inflexible systems against the incursions of competing electric lines. A propaganda campaign instituted by the Market Street Railway, and the other cable companies, attempted to convince the public of the dangers of overhead trolley lines. In an even more direct fashion, the cable interests bribed the Board of Supervisors into passing an ordinance prohibiting the use of overhead wires.[120]

In 1902 a syndicate of eastern investors calling themselves the United Railroads of San Francisco, acquired ownership of the Market Street Railway, the Sutter Street Railway and two electric streetcar companies. The new firm, owned by the United Railroads Investment Company of San Francisco, a New Jersey holding company backed by the German investment banking firm of Ladenburg, Thalmann & Co., now controlled 260 of the 288 miles of street railroad operating in San Francisco.[121] The firm paid an inflated price for the companies it bought, and then issued $40,000,000 of watered stock to its owners, assuming that earnings would increase as the population of the city grew. To pay dividends on this vast amount of stock required that the firm rationalize its operations in order to increase earnings, and decrease its expenses in order to hold costs down.[122]

Patrick Calhoun, president of the company, realized the need for efficient operation of the firm if he hoped to pay dividends on the watered stock. His plans called for the maintenance of labor costs at as low a level as possible and the conversion of unprofitable cable lines to electric operations. Several factors combined to prevent Calhoun from implementing this program. The need to avoid the stigma of an anti-union reputation in San Francisco, one of the nation's most unionized cities, forced Calhoun to accept the carmen's union, organized in 1901, and substantially increase the wages of carmen in 1902-3. The general public opposition to overhead trolley lines, favored by Calhoun because of their low construction and operating costs, and the provisions of certain street railway franchises restricting their operation to either cable or horsecar lines, blocked wholesale conversion of unprofitable lines to elctric operation. Former mayor James D. Phelan and sugar magnate

[119] Judd Kahn, Imperial San Francisco: Politics and Planning in an American City, 1897-1906 (Lincoln, Nebraska: 1979), p. 110.
[120] Kahn, pp. 111-12.
[121] Electric Railway Journal, 32 (5 September 1908), p. 575.
[122] Kahn (1979), pp. 42, 112.
Walton Bean, Boss Reuf's San Francisco (Berkeley: 1972), pp. 109-110.

Rudolph Spreckels led the public opposition to overhead trolley lines, complaining bitterly against the ugliness of the poles and wires they required. Phelan and Spreckels went so far as to organize the Municipal Street Railways Co. in order to build an electric line utilizing a power source located in a conduit under the street as a demonstration of the practicality of that alternative to trolley operations. It is interesting to note that both men owned property along the Pacific Avenue route of the former Sutter Street Railway, one of the lines Calhoun wanted to convert to trolley operations.[123]

The earthquake and fire of April 1906 presented Calhoun with the perfect opportunity to convert many of the United Railroad lines to electric streetcar operations. He and his subordinates supplied a $200,000 bribe to the Board of Supervisors to guarantee passage of an ordinance permitting electrification of street railways regardless of original franchise stipulations. In order to gain public support for the conversion from cable to electric operations Calhoun claimed that United Railroad's cable lines required complete reconstruction, having suffered $400,000 of damage during the earthquake and fire. Local newspapers accused the firm of delaying restoration of streetcar service in order to modernize its system, since insurance claims filed by the firm totaled only 9% of the amount of damages claimed publicly.[124] Following the earthquake and fire United Railroads retained only those cable lines which operated over grades too steep for electric streetcars. Of the original Market Street Cable Railway, only the Castro Street line south of 18th Street remained a cable route.[125]

The Castro line continued as a cable operation until 6 April 1941, when diesel buses replaced the cars. During the intervening years, United Railroads survived a long, bloody strike by its carmen in 1907, declared bankruptcy in 1918, and reorganized as the second Market Street Railway in 1921. The firm operated under this name until closure of the Castro line in 1941. The other cable routes operated by United Railroads and Market Street Railway, built by earlier firms, continued in operation until 1944, when the San Francisco Municipal Railway bought out the Market Street company.[126]

THE TECHNOLOGY OF THE MARKET STREET CABLE RAILWAY

Market Street Cable operated one of the busiest cable railroads in the entire United States, with cars departing the Ferry Building at 40 second intervals, reduced to 15 seconds during rush hours, and traveling along Market Street at 8mph. A complete trip from the Ferry Building to the end of the Valencia Street line required only 34 minutes, a fact facilitated by the easy route of

[123]Bean, p. 111-13.
Kahn (1979), pp. 112-14.
[124]Bean, p. 134.
[125]Hilton, p. 210.
[126]Hilton, p. 210.

the line, which lacked significant curvature except in the area of the main powerhouse at Market and Valencia, or grades greater than 12%, excluding the 18.4% grade on the Castro Street hill.[127]

Henry Root designed the original Market Street Cable installation, using the bent Tee rail and concrete conduit construction he had developed for use on the California Street Cable Railroad. Root found it neccessary to provide supporting structures for much of the conduit because of the swampy, unstable terrain over which much of the line passed. At 9-foot intervals all along the route work crews excavated to a depth of 10 feet and poured 16"x5' concrete piers to support the conduit. At the lower end of Market, where the line ran across land reclaimed from the bay, driven piles supported the piers. The line contained 9000 of these piers, and included 25,000 yokes, 1000 tons of slot rail, and 43,000 barrels of Portland cement.[128]

Root designed the first beam-mounted depression pulleys used by a cable railroad for the Market Street line. Prior to this time all cable railroads used fixed depression pulleys and a grip with an "L" shaped foot which allowed the grip to pass the pulleys without striking them. Root's depression beam utilized a counterweighted, 6-foot-long horizontal arm which carried the pulleys. This beam swiveled or pivoted out of the way when struck by an approaching grip.[129]

Root also developed a new means for negotiating turns for Market Street Cable. A 400-foot-long auxiliary cable, run off a 6-foot diameter sheave mounted directly on the engine shaft in the main powerhouse at Market and Valencia Streets, pulled the cars around the 55 degree curve from Valencia into Market at half the speed of the main cable. The auxiliary, which was guided around the 120-foot curve by fifteen side-bearing cone pulleys, filled the gap between the points where the Valencia and Market Street cables were deflected into the powerhouse. As cars approached the curve, a lateral deflection in the track allowed the gripman to release the Valencia cable. The car then coasted forward eight feet, picked up the auxiliary cable, and travelled through the turn. At the end of the curve the gripman released the auxiliary and grasped the Market Street cable. Cars running from Market into Valencia negotiated the turn as a simple drift curve.[130]

Root's design for Market Street Cable's turntables also represented a departure from previous cable railroad practice. The 30-foot diameter, double-tracked turntable at the Ferry Building allowed cars to be run on and

[127] Hilton, pp. 208, 210.
Mining and Scientific Press, 47 (27 October 1883), p.268.
[128] Root, p. 54.
Smith, p. 69.
Mining and Scientific Press, 47 (27 October 1883), p. 268.
[129] Smith, p. 71.
Mining and Scientific Press, 47 (27 October 1883), p. 268.
[130] Smith, p. 71.
Mining and Scientific Press, 47 (27 October 1883), p. 269.

off the table at the same time, reducing the amount of time required to reverse the cars. The turntable dispatched cars onto three separate spur tracks, one for each of the company's branch lines in 1883, permitting cars to be dispatched up Market with minimum headway. Because of its size and weight this turntable could not be operated by hand, and Root relied upon the motion of the cable against a series of pulleys to turn the table at 1/5 the speed of the cable.[131]

Market Street Cable's main powerhouse occupied the southeast corner of Market and Valencia. The winding machinery, which utilized the figure-eight drive system, drove the Market, Valencia, Haight, and, later the Castro Street cables. The "American" system, as the figure-eight method was termed, required fewer wraps of the cables around the winding sheaves than the multiple-wrap method of driving, known as the "English" system. Many contemporary engineers felt that fewer wraps meant a longer cable life.[132]

Two pairs of 400hp cross-compound, non-condensing, O'Neill-type steam engines, built by the Union Iron Works, drove the 12-foot diameter winding sheaves, transmitting their power to the main shaft be means of spur gearing. In 1887 these were the only cross-compound steam engines operating a cable railroad in San Francisco. Only one pair of engines operated at a time, the other set being kept in reserve. The engines consisted of four separate engines, linked together in pairs by connecting the bottoms of their cylinders. By 1893 the firm planned to divide the main engine shaft and run both pairs of engines simultaneously, each driving two cables, because of the increase in traffic upon the line. Six Babcock & Wilcox, horizontal, multi-tubular boilers (which the firm claimed were the first Babcock & Wilcox "type" boilers used on the Pacific Coast) supplied 120 pounds of steam to the engines.[133]

For each cable Root employed standard, carriage-type tension devices, each with a suspended, 8000-pound counterweight. The tension runs extended 165 feet back from the winding machinery. These tension carriages closely resembled those now in use in the Washington and Mason Street powerhouse[134]

The McAllister and Hayes Street powerhouses, constructed in 1882 and 1886 respectively, also used the figure-eight drive system. The Hayes Street powerhouse used a 300hp Corliss-type steam engine instead of the O'Neill-type engines used at the line's other powerhouses. Neither of these installations

[131] Smith, p. 73.
Mining and Scientific Press, 47 (27 October 1883), pp. 269-70.
[132] Smith, p. 75.
Mining and Scientific Press, 47 (27 October 1883), p. 265.
[133] The firm's steam engines measured 24"x34"x48". The boilers sat in three batteries, each generating 440hp.
Street Railway Journal, 9 (June 1893), p. 386.
Smith, p. 75.
Mining and Scientific Press, 47 (27 October 1883), p. 265.
[134] Smith, p. 76.
Mining and Scientific Press, 47 (27 October 1883), p. 265.

significantly advanced the technology of cable traction.[135]

In 1883 Root developed a combination-type car, which placed the grip and passengers on a single car instead of separate dummies and trailers, in order to permit conversion of Market Street Cable's old horse cars to cable operations. The Southern Pacific Shops in Sacramento built most of these cars, which ran on two, pivoted trucks, each equipped with both wheel and track brakes, similar to the trucks on standard railroad carriages. Prior to this time all cable cars ran on a single truck. Root's combination cars measured 30 feet in length and weighed 9600 pounds. The grips used by the line, manufactured by the Judson Iron Works and William H. Birch's California Machine Works, represented an improved version of the side-grip developed by Root for the California Street Cable Railroad. The grips were mounted on the forward truck of each car.[136]

Market Street Cable operated more ancilliary facilities than any of the other cable traction companies in San Francisco. A two-story, brick repair building located behind the main powerhouse included an iron working shop and brass foundry in addition to the usual carpentry, painting and repair facilities. In about 1886 the firm undertook the manufacture of its own cable, using a massive machine patented by Root. The firm abandoned the machine about 1893 because it could not produce "Lang lay" cable, an 1881 British invention which wrapped the strands and individual wires of the cable in the same direction. This technique resulted in the wires of the cable presenting a long continuous surface to the jaws of the grip, evenly distributing the pressure of the jaws. As Lang lay cables aged they tended to wear smooth, reducing the chance of broken wires and dangerous strands in the cable.[137]

THE OMNIBUS RAILROAD & CABLE COMPANY

The Omnibus Railroad & Cable Co. operated 11.3 miles of cable railroad, the second largest, but least successful, cable system in San Francisco. The origins of Omnibus Railroad & Cable date back to one of the first transportation companies in the city, the Omnibus Railroad, a horsecar line organized in 1861. In the 1880's the firm's owner, Gustav Sutro, brother of mining entrepreneur Adolph Sutro, undertook a two-year study of the economies of cable and electric traction, and determined to replace the horsecar operations of his firm with a cable system. Unfortunately, Sutro opted for a technology that was to be outdated within five years, as electric streetcars reached a high level of reliability. Eleven years after the opening of the first Omnibus cable route in August 1889, all the firm's routes had been converted to electric operations or abandoned.[138]

[135] San Francisco Call (2 June 1886).
[136] Mining and Scientific Press, 47 (27 October 1883), pp. 266-67.
[137] Street Railway Journal, 9 (June 1893), pp. 386, 388-89.
Hilton, p. 77.
Root, p. 64.
Scientific American Supplement No. 565, 22 (30 October 1886), 9017.
[138] Hilton, p. 229.
San Francisco Chronicle (5 March 1945).

The Omnibus cable system largely duplicated the existing routes of the Market Street Cable Railway, except that it ran on less heavily travelled and developed streets. The company never succeeded in generating any substantial traffic for its lines, and failed to ever pay a dividend to its stockholders. In August 1893, after less than four years of operation, the company closed its route on Howard Street, which had run from the powerhouse at 10th Street to 26th Street. Market Street Railway acquired the foundering company in October 1893, and began systematically converting the firm's lines to electric operations or completely eliminating them. The Oak and Ellis routes, operating out of a powerhouse at Oak and Broderick Streets, converted from cable to electric operations at the end of 1895. The mainline, running along Howard from the Ferry Building to the powerhouse at 10th Street, ceased operating altogether, along with the firm's Post Street route, at the close of 1899.[139]

THE TECHNOLOGY OF THE OMNIBUS RAILROAD & CABLE COMPANY

G.W. Douglas served as engineer for the conversion of the firm's 5-foot gauge horsecar tracks to narrow gauge (3-foot 6-inch) cable tracks. The firm used a standard concrete conduit with iron yokes and 51-pound Tee rails. The seven turntables on the line operated in a manner similar to those designed by Root for the Market Street Cable Railway, taking their motion from the cable.[140]

The main powerhouse at Howard and 10th Streets drove three cables, two running on Howard Street, one to the Ferry Building and one to 26th Street, and the Post Street cable, the most torturous route in the entire city. Two pair of 750hp cross-compound O'Neill-type steam engines, supplied with 75 pounds of steam by six 250hp elephant-type tubular boilers, drove the winding machinery, transmitting power from the engine shaft to the main shaft by means of a rope drive.[141]

The line utilized the multiple-wrap drive system, winding the cable five times around the drivers and idlers. The idlers could be moved 56 feet away from the drivers, along a bedplate, in order to take up slack in the cable. A standard, carriage-type tension arrangement compensated for the stretching of the cable, though the tension run measured only 10 feet in length. The normal stretching that occured during the first days of a new cable's use was cut out after a week to ten days, allowing this shorter than usual tension run.[142]

In 1893 Omnibus Railroad & Cable operated 143 combination-type cars, all built by the John Hammond Car Co. in San Francisco. The company used the

[139] Hilton, p. 229.
Street Railway Journal, 12 (February 1896), p. 119.
[140] Street Railway Journal, 9 (June 1893), p. 390.
[141] The line's engines measured 29"x44"x60", and operated at 59rpm. The rope drive ran 44 feet between an 8-foot diameter drive pinion and 24-foot diameter receiving pulley. Elephant boilers were so named because they might be built up to 50 feet in length.
Street Railway Journal, 9 (June 1893), p. 390.
[142] Ibid.

Eppelsheimer bottom grip because it occupied the inferior position at all cable crossings.

THE FERRIES & CLIFF HOUSE RAILWAY

San Francisco's surviving cable car operations are an amalgam of portions of the California Street Cable Railroad and the Ferries & Cliff House Railway. While the California and Hyde Street lines, originally owned by Cal Cable, comprise the major share of the extant track, the Ferries & Cliff House Railway, San Francisco's seventh cable traction company, furnished the heart of the present system, the powerhouse at Washington and Mason Streets, and the Powell-Mason line.

In the mid-1880's Gustav Sutro, owner of the Omnibus Railroad & Cable Co., projected a line of steam dummies and cable cars, called the Park & Cliff House Railway, to run from downtown to the resort area being developed by his brother, mining entrepreneur Adolph Sutro, near Cliff House. Gustav sold his interest in the scheme before it moved beyond the planning stages to W.J. Adams, a sawmill owner and lumber dealer, who was actively promoting a north-south cable route, the Powell Street Railway, up Nob Hill. Adams combined the two projects into the Ferries & Cliff House Railway, although he continued to refer to the line as the Powell Street Railway.[143] Associated with Adams in the venture were William H. Martin and John Ballard, the contractors who built the Clay Street Hill Railroad, Thomas Magee, a real estate man and editor of the influential Real Estate Circular, and Henry H. Lynch, a real estate man who served as superintendent of the Ferries & Cliff House.[144]

The Powell Street line served several important and populous areas of the city largely ignored by the other cable lines. From Powell and Market the Powell Street line, which opened on 28 March 1888, ran north through the fashionable shopping area surrounding Union Square, the elegant residential neighborhoods of Nob Hill, and the largely Italian North Beach section, to the waterfront at Bay and Taylor. The east-west line of the company, in service by 5 April 1888, ran on Washington and Jackson Streets, connecting with a steam line at Central (Presidio) Avenue and Sacramento which continued west to the Cliff House and Sutro Baths. Newspapers projected that this line would open up an "extensive and desirable" region which would furnish homesites for "thousands of... Artisans, merchants and clerks."[145]

Operating these two lines out of a single powerhouse (located at the northwest corner of Washington and Mason Streets) resulted in one of the most complicated cable systems ever constructed. Howard C. Holmes, an engineer with a background in steam railroading, and the designer of the Oakland Cable Railway, drew up the plans for the Ferries & Cliff House system. He also supervised construction of the O'Farrell-Jones-Hyde extension to the

[143] Smallwood, et. al. (1980), p. 41.
[144] Hilton, p. 217.
Real Estate Circular, 22 (September 1887).
Street Railway Journal, 9 (June 1893), p. 395.
[145] San Francisco Chronicle (19 December 1886).

California Street Cable Railroad in 1890, portions of which survive in the present system, and designed the Clay-Sacramento line of the Ferries & Cliff House in 1892.[146]

In September 1887 Adams purchased the Clay Street Hill Railroad for $200,000, considered by local observers to be a high price, in order to secure a route east from Powell to the Ferry Building. The Ferries & Cliff House franchise permitted the line to run along Jackson and Washington to the Ferry Building, but the Omnibus Co. operated horsecars, blocking the route, on both of these streets between Stockton and Montgomery. Any effort to obtain the right-of-way on these streets through the courts would have tied up the route for at least a year. The firm purchased the Clay Street Hill Railroad in order to acquire an uncontested route to the Ferry Building that would enable the cars to operate at a higher speed. Ferries & Cliff House operated the Clay Street route until 1891, when it tore up the original double-track installation and installed a new single set of tracks. After this reconstruction the firm routed cars westbound on Clay to Larkin, crossed over a block to Sacramento, and continued west on Sacramento to Central Avenue. The return to the Ferry Building was entirely on Sacramento. Holmes supervised construction of the 3.4-mile route, which was completed in 1892 in only seventy days. This work included construction of six cable crossings and the extremely complicated cable and trackwork in the vicinity of the powerhouse.[147]

The Ferries & Cliff House Railway incurred a $1,900,000 debt constructing its eight miles of cable road. Historian George Hilton believes the firm had no future as an independent operation, a statement supported by the October 1893 absorption of the firm into the Market Street Railway.[148] The merger resulted in the construction of the one major extension to the former Ferries & Cliff House system. In the fall of 1893 the Market Street Railway undertook to extend the Sacramento line to the site of the Midwinter Fair planned for 1894 at Golden Gate Park. The 1.9-mile long extension, running on Lake Street and 6th Avenue to Golden Gate Park, opened on 15 February 1894. The Market Street Railway's McAllister Street powerhouse drove the 30,500-foot cable used for the extension.

Along with the rest of the Market Street Railway, the Ferries & Cliff House system became part of the United Railroads of San Francisco in 1902. United Railroads discontinued the Sacramento Street cable west of Walnut in 1904, shifting the traffic to their existing electric streetcars.

The earthquake and fire of April 1906 utterly destroyed the powerhouse at Washington and Mason and also ruined much of the line's rolling stock. However, because the period's electric cars could not negotiate the grades they encountered, all three cable lines resumed operation, though in truncated

[146] Root, p. 47.
[147] Hilton, p. 217.
[148] Hilton, p. 217.
Real Estate Circular, 22 (September 1887).
[148] Hilton, p. 220.

form, after the disaster. United Railroads fully restored the Powell-Mason line, cut the Washington-Jackson line back from Central Avenue to Steiner, and cut the Clay-Sacramento line from 6th Avenue to Fillmore. The firm also changed the Clay-Sacramento line so that eastbound cars ran on Clay and westbound cars on Sacramento. This avoided a one block uphill walk for patrons of the Fairmont Hotel who arrived in the city by ferry, and permitted the line to operate with the prevailing traffic flow at the Ferry Building.[149]

The former Ferries & Cliff House system became part of the second Market Street Railway in 1921, following the 1918 bankruptcy of United Railroads. The reduction in ferry traffic and the inroduction of diesel buses led to the elimination of the Clay-Sacramento line on 15 February 1942.

The San Francisco Municipal Railway acquired the old Ferries & Cliff House lines along with the rest of the Market Street Railway in 1944. Mayor Roger Lapham proposed eliminating the remaining cable mileage in January 1947, but public opposition led by the Citizens' Committee to Save the Cable Cars, founded by Friedel Klussman, prevented immediate conversion of the Powell and Sacramento lines to diesel buses. In 1954 Save the Cable Cars finally secured passage of a city charter amendment prohibiting elimination of any of the survivng cable car routes. Between the campaign's start in 1947 and the final victory in seven years later over 50% of the city's cable car lines were removed.[150]

In 1952 the city's Municipal Railway (MUNI) acquired the California Street Cable Railroad lines, incorporating these operations into the Washington and Mason Street powerhouse in 1956-57. The city consolidated its operations by incorporating portions of the O'Farrell-Jones-Hyde line of Cal Cable into the present Hyde Street line. Construction on this work began in 1954, and the new route opened in April 1957. The lines operating at the present time remain unchanged from those in service in April 1957.

THE TECHNOLOGY OF THE FERRIES & CLIFF HOUSE RAILWAY

For the Ferries & Cliff House Railway Howard C. Holmes designed one of the most complex cable systems ever built. He placed the tension runs in the powerhouse on a diagonal because of a lack of space in the building, and directed the cables onto the street through a vault under the building's southeast corner. In order to get the cables in and out of the powerhouse, and to their streets, Holmes relied on several slightly bizarre routes and made extensive use of blind conduit, a tunnel without a slot connecting it to the surface. The west end of the Clay-Sacramento cable, for example, passed through two blocks of blind conduit running east on Washington from the powerhouse to Stockton, and then through another two blocks of blind conduit running south on Stockton from Washington before issuing onto Sacramento. The cable returned to the powerhouse through a block of blind conduit under Mason Street between Clay and Washington.

[149] Ibid.
[150] Save the Cable Cars File, San Francisco Room, San Francisco Public Library.

The complexity of the trackwork around the powerhouse required several novel elements in cable traction technology. On both Washington and Jackson Streets, for the block between Powell and Mason, Holmes designed a roadbed that used two separate conduits, or at least tubes for two separate cables, and only three track rails, the cars sharing the center rail. Cars turning from Mason onto Jackson negotiated the intersection by means of a turntable instead of a pull curve. Holmes adopted a variation of Root's iron and concrete conduit for the entire line, embedding the wrought iron yokes in a brick and earth-fill conduit. Although these arrangements succeeded in moving the cars and cables through the area of the powerhouse, their complexity marked no real advance in cable technology.[151]

The Mahoney Bros., a San Francisco car-building firm owned by Jeremiah and John Mahoney, received the contract to build the company's single-ended cable cars. The Mahoneys subcontracted much of the actual construction of the car bodies to the Burham-Standeford Co.'s Oakland Planing Mills. P.H. McGrew, an Oakland blacksmith, fabricated the cars' trucks and ironwork at a cost of $304 per car.[152]

Holmes adopted the Eppelsheimer bottom grip for use on the line, primarily because a round trip on the Powell line required the gripman to drop the cable 14 times at cable crossings and once for a drift curve, a situation which virtually forced the use of a bottom grip.[153]

The company acquired the powerhouse site at Washington and Mason Streets in October 1886. A stable occupied the site previous to its purchase by the cable traction company.[154] Work began on the foundations by late February 1887, and the company let contracts for the building and machinery in March.[155] By late June 1887 workers had completed the walls of the three-story building up to the level of the second floor. The square brick building measured 137.5'x137.5'. The firm's boilers, engines, and winding machinery occupied the first floor, the upper two floors being devoted to car repair and storage tracks and company offices.

Risdon Iron Works, in San Francisco, built the two original steam engines used

[151] Street Railway Journal, 9 (June 1893), p. 395.
[152] San Francisco Chronicle (16 July 1951).
[153] Hilton, p. 217.
The method of construction used at cable crossings is described in a contemporary newspaper account of the building of the Powell line's crossings at Sutter and Geary. The area around the existing tracks was excavated and the tracks braced with wooden beams. The entire crossing assembly was riveted together on rollers above the crossing. A derrick hoisted the pre-fabricated crossing into place at night, and wooden beams held the whole assembly in place until completion of the paving. San Francisco Chronicle (19 September 1887).
[154] Real Estate Circular, 21 (October 1886).
[155] San Francisco Chronicle (23 February 1887).
San Francisco Chronicle (18 March 1887).

by the firm, reported by the San Francisco Chronicle to be 600hp Corliss-type engines. Six 16-foot long horizontal, tubular boilers, located in fire pits along the south wall of the building, provided steam for the engines.[156]

For unknown reasons the company replaced these engines in 1889 with two 450hp, horizontal, non-condensing Thompson-type steam engines built by the Golden State & Miners' Iron Works of San Francisco. In 1891 the firm installed two 450hp, vertical, non-condensing Corliss-type steam engines built by John B. Clot and Constant Meese's San Francisco-based Reliance Machine Works. These vertical engines straddled the winding machinery. The company scrapped its original boilers in 1894, replacing them with eight 115hp elephant boilers, built by the Union Iron Works. Arranged in pairs in four batteries, these boilers stood against the west wall of the building, providing 125 pounds of steam to the engines.[157]

The two pairs of engines coupled to separate shafts. Either set of engines and shafting could be used to drive the winding machinery. The shaft for the vertical engines measured 14 inches in diameter and was 26 feet long. A 4-foot 6-inch diameter, helical-toothed drive pinion transmitted the power to a 14-foot diameter bull gear mounted on the first drive shaft. This bull gear meshed with an identical gear mounted on the second drive shaft. The flywheel for the vertical engine measured 15 feet in diameter and weighed 25 tons.[158]

Each of the horizontal engines coupled to one end of an 18-inch diameter shaft carrying another 4-foot 6-inch diameter drive pinion. An eccentric arrangement allowed either drive pinion to be thrown into position against the bull gears, permitting either engine to operate the winding machinery.[159]

In 1893 the Ferries and Cliff House used the figure-eight system to drive the five cables operated out of the powerhouse. Each of the six 14-foot diameter winding sheaves carried two grooves, instead of the usual one, on its rim. Two of the sets of winding sheaves drove two cables each while the third set drove only a single cable, wrapped twice around the sheaves in order to gain additional adhesion. The cables passed from the winding sheaves to standard movable tension carriages, patterned on those designed by Henry Root for the California Street Cable Railroad and the Market Street Cable Railway. In the case of the winders driving two cables, the cables passed to two separate tension carriages, positioned one behind the other on the same set of

[156] The steam engines had a 22-inch bore and an 18-inch stroke. Real Estate Circular, 21 (October 1886).

[157] The horizontal engines had a 24-inch bore and a 48-inch stroke. They operated at 65rpm. The vertical engines, which displayed greater efficiency in their consumption of coal, had a 25-inch stroke, a 44-inch stroke, and operated at 73rpm. The elephant boilers measured 56 inches in diameter and 16 feet long.
United Railroads of San Francisco, Statement, January 1905. Original in possession of Charles Smallwood, San Francisco.

[158] Street Railway Journal, 9 (June 1893), p. 395.

[159] Ibid.

tracks.[160]

In 1902, when United Railroads of San Francisco took over the system, the firm erected a three-story brick annex attached to the north wall of the powerhouse and car barn, increasing the structure's car storage and repair facilities. Like the main building the annex was constructed on a slope, so that the second floor on the east side of the building became the first floor on the west side. The annex measured 46'x131.5' on the ground floor, its upper two stories extended west another 50' to the property line. Portions of the west wall of the annex are still evident in the retaining wall along the west side of the present property.[161]

In 1905 the first floor of the annex contained four sets of east-west oriented tracks, connected by a transfer table at the west end of the building, and a large car elevator used to lift the cars to the repair and storage areas on the second and third floors. Cable cars entered the annex by means of a spur track off the Mason Street line. On the second floor of the building a car could be run off the elevator onto a transfer table along the west side of the floor. This transfer table served fifteen sets of east-west oriented repair and storage tracks. A 24-foot diameter turntable sat in the southwest corner of the floor. This turntable moved cars from the transfer table onto the street through a large doorway cut into the south facade of the building just east of the smokestack.

The third floor of the building contained more repair and storage tracks. Cars were pushed off the elevator onto a transfer table that served four sets of east-west oriented tracks in the annex and a spur track leading to another transfer table oriented along the east-west axis of the main building. This second transfer table served ten sets of north-south oriented tracks in the main building.[162]

The earthquake and fire of April 1906 almost completely destroyed the powerhouse. United Railroads utilized the surviving footings and foundations during construction of the present building, erected during 1907 and 1908 at a cost of $75,000.[163] This two-story brick structure, which stands 48 feet tall, measures 137.5'x180.5' in plan. The brick walls are 21 inches thick at the first floor level, tapering to 17 inches at the second floor. Every sixth course of bricks in the exterior walls is a header course. The concrete slab ground floor has several pits or vaults for the winding machinery, tension runs, deflecting sheaves, boilers and fuel storage. The second floor, supported on steel columns and beams, stands 22 feet above the ground floor and consists of wooden planking. Wooden posts on the second floor support a wooden trussed roof in the main portion of the building. In the "annex" the

[160] Ibid.
[161] United Railroads of San Francisco, Drawings C-1476-78 (28 April 1905). Blueprints in possession of Charles Smallwood, San Francisco.
[162] Ibid.
[163] San Francisco, Department of Public Works, Building Permit No. 6881 (18 December 1906.

roof rests on steel columns and beams. During reconstruction of the building the smokestack, which partially collapsed during the earthquake, was reduced from its original 185-foot height to 89 feet.[164]

United Railroads redesigned the car handling facilities of the building during its reconstruction. A 15,000-pound capacity Otis Elevator Co. car elevator was installed in the "annex" portion of the building to permit transfers of cars between the two floors and to facilitate the movement of the 300-pound grips from the car storage area on the second floor to the grip repair facilities on the first. The new "annex" does not extend back to the property line on its west side, like the original annex, but stops some fifty feet short. A set of tracks laid in this space connects the mainline on Jackson Street to a large turntable located in the yard behind the powerhouse. This turntable connects to the thirteen sets of repair and storage tracks on the building's second floor. The entire west facade of the building is open, permitting cars to be rolled easily onto and off of these tracks.

Incoming cars release the cable on Jackson, above a switch connecting the mainline and the yard spur, and roll backwards into the yard under their own momentum. Stopping on the turntable, the cars are then spotted onto the desired track in the car barn. Outbound cars, are pushed onto the turntable from their storage tracks and sent onto Washington Street by means of another spur connecting the turntable with the street.

The United Railroads rebuilt the steam engines, boilers, and winding machinery damaged by the earthquake and fire and used them when operation of the Powell Street line was renewed in January 1907. Temporary wooden sheds protected the equipment from the weather during reconstruction of the building.[165]

In 1912 United Railroads removed the horizontal steam engines and installed a 600hp, 400rpm General Electric induction motor, connected to the main shaft by a chain and sprocket drive which drove the shaft at about 75rpm. The building received at least a portion of its electricity through a feeder line taken off the company's Kearny Street trolley line. This line entered the building trough the circular conduits still evident above the door at the south end of the Mason Street facade. In conjunction with the electrification of the winding machinery the firm installed a 275kw substation in the powerhouse. Transformers stepped the station's voltage down from 11,000 to 440 volts for use by the motor.[166]

The vertical steam engines remained in the building as a backup system to the electric motor until 1924. In August 1926 the company replaced the vertical engines with the present No. 2 Motor and Reduction Gear, relegating the 1912 installation to a backup status. Motor No. 2 is a 750hp General Electric induction motor operating at 712rpm. It is connected to a single reduction gear, manufactured by the Falk Corporation of Milwaukee, which drives the main

[164] Ibid.
[165] San Francisco Call (12 January 1907).
[166] San Francisco Municipal Railway, Drawing 1109 (21 March 1911).

shaft at 78rpm. Helical-toothed gears transmit the power from the main shaft to the driving shafts.

Incorporation of the California Street Cable Railroad operations into the powerhouse in 1956-57 necessitated a major renovation of the building's mechanical plant. In 1958 the present No. 1 Motor and Reduction Gear replaced the 1912 motor installation. Motor No. 1 is a 700hp Fairbanks Morse induction motor operating at 705rpm. A reduction gear, manufactured by the Western Gear Co. of Los Angeles, transmits the power to the main shaft at 78rpm. The original switchboard, transformers and substation were replaced at this time by the present unit, manufactured by the ITC Circuit Breaker Co. This unit rests on a concrete slab poured over the top of the old boiler pits. The 1958 renovation also involved the installation of the existing 30-ton capacity overhead crane and a new cable rewinder, both used when replacing a worn cable with a new one.

In 1960 Muni closed off the old boiler spaces along the west wall of the first floor with partitions, creating offices and workers' facilities. A major renovation of the winding machinery, costing $277,000 took place during 1965. VOEST, an Austrian firm, built the gears and winding sheaves presently in use. The helical-toothed pinion gear measures 42 inches in diameter and meshes with two inter-meshed 14-foot diameter bull gears that drive the shafts carrying the winding sheaves at 19.2rpm. There are six 14-foot diameter winding sheaves, three mounted on each of the driving shafts. The figure-eight drive system and Root-type, moveable tension carriages remain in use. Replacing the winders and gearing required 28 days of work.[167]

A machine shop occupies the space along the east wall of the powerhouse's first floor. Until about 1970 all of the shop's equipment operated off belt drives powered by small electric motors. Five of the machine tools in the shop date from c.1900 and continue to be belt-driven. The other major machine tools in the shop date from c.1970.

The last major alteration to the powerhouse, the installation of the mezzanine floor in the southern half of the building, was made in 1967. This floor is used as a museum and also provides a viewing platform from which to observe the winding machinery. The southernmost window on the Mason Street facade was converted into a doorway to provide access to this level. Various "period" embellishments, such as a decorative canopy, flower boxes, antique-styled signs, and replicas of gas lamps, date from this alteration of the building and are intended to convey the historical nature of the structure.

The street systems of the old Ferries & Cliff House system have changed relatively little over the years. Bringing the California Cable lines into the system in 1956-57 required rebuilding some track, constructing several new turns, and building a new turntable at the northern terminus of the Hyde Street line. MUNI combined the Powell and Mason cables into a single line in 1977, hoping to economize their operations. However, the new cable, 18,200

[167]San Francisco Chronicle (14 April 1965).

feet in length, is subjected to a greater number of curves which tend to curtail its useful life. MUNI engineers designed all-steel depression beams in 1980, which substituted a universal joint for the counterweight used on the old depression beams. These new beams replaced all the old style depression beams, except those on California Street. They require less maintenance and are more reliable than the old-style beams.

CONCLUSION

The existing San Francisco cable railway system incorporates elements from all periods of cable traction. Many yokes, and much of the conduit, date from the 1870's or 1880's. Portions of the powerhouse are associated with the heyday of cable traction during the late 1880's and early 1890's, while most of the structure reflects the rebuilding of the city following the earthquake and fire in April 1906. The functioning 1926 motor installation is a reminder of the substitution of electricity for steam in cable traction, as are the now-covered boiler pits, unused coal storage bins and smokestack at the powerhouse. The truncated California Street line, ending abruptly at Van Ness Avenue instead of continuing west to Central Avenue, symbolizes the hard times faced by cable traction companies in the 1930's and 1940's, when diesel bus lines supplanted most of the surviving cable mileage. The meandering Powell-Hyde line, with its delightfully illogical route and bravely independent turn across traffic at Beach and Hyde Streets, illustrates the inherent inflexibility of cable traction. Survival of the cable cars in the automobile age requires that the public tolerate this inflexibility, for without such tolerance the last cable lines would have closed years ago.

The motors and rebuilt winding machinery in the powerhouse demonstrate the literal linkages between old and new in the system. Motors No. 1 and 2 are electric motors separated in time by thirty years. They drive gears and sheaves manufactured in 1965 but modeled on equipment built eighty years previously. The juxtapositions between old and new are even more evident on the streets, where depression beams designed in 1980 are mounted in 100-year old yokes and conduit, and where cars rebuilt from the trucks up within the last five years carry roofs built in the 1890's.

Operating this antiquated technology, a technology characterized by high capital costs, inflexibility, and ponderously heavy construction, in a modern American city borders on the insane, yet the desire of San Franciscans to preserve this unique and - in its own fashion - workable transportation system dates back at least forty years. In light of the strength of this committment to the cable cars it is only fitting that this clumsy, inflexible, irrational system operate out of a powerhouse once considered one of the most complex in the industry.

URBAN DEVELOPMENT AND CABLE TRACTION

Historians, journalists, and real estate entrepreneurs have long claimed that the development of San Francisco's cable railway lines significantly boosted the city's growth. According to these writers new residential neighborhoods sprang up almost instantaneously along cable routes and the commercial sectors

of downtown reaped benefits from the increased mobility which Andrew S. Hallidie's invention brought to the city's population. Historians have subjected many other communities in which cable railroads operated to intensive studies in an attempt to quantify the exact nature of the impact of the transportation system upon the city.[168] Surprisingly, no such study exists for San Francisco, the city where cable traction first operated successfully on a commercial basis. Nevertheless, the evidence supports the notion that the cable railways of San Francisco aided and hastened development in certain sectors of the city, notably the Mission District and the Western Addition, and in so doing helped transform the spatial organization and structure of the city.

Originally one goal of this study was a route by route, block by block examination of the impact of the cable car upon patterns of growth and development in San Francisco. However, the sources for such a rigorous analysis no longer exist. The earthquake and fire of April 1906 destroyed all records of property transactions, real estate assessments, and building permits, as well as most of the company records for the cable traction companies. Block books for San Francisco have not survived prior to 1895, and the city directories for this period contain little information pertinent to these questions. Census data suggest broad population flows within the city, but because of the manner in which the ward boundaries were drawn and the long periods between censuses it is difficult to trace these flows to such specific areas as the Mission or the Western Addition. Historical maps are similarly scarce and unyielding. The earliest surviving Sanborn Fire Insurance maps date from 1885, making it impossible to use these valuable sources to determine growth and development patterns in the crucial first initial years of cable car operations prior to 1885.

Despite these many obstacles, it was possible to locate several important sources of information. Many of these are highly impressionistic in nature; such as boosters' accounts in local newspapers, popular magazines, and trade journals. These sources concentrate on the business-related matters concerning the lines, relate humorous anecdotal material, or chronicle accidents involving cable cars. One journal, the San Francisco Real Estate Circular, provided a wealth of data about land values, housing starts, and the effects of the cable lines upon the city. It should be noted, however, that Thomas McGee, the editor of the Circular, served on the board of directors of the Ferries & Cliff House Railway, giving him a vested interest to show that the cable lines positively influenced the city's prosperity. Nevertheless the Circular proved to be a very valuable resource.

For the purposes of this report "urban development" has been limited to the concept of the physical expansion of the city. This involves the growth of street systems, residential housing districts, parks and other recreational

[168] See for example: Sam Bass Warner, Streetcar Suburbs (Cambridge: 1962). Robert Carson, A Micro Historical and Economic Study of the Rise and Decline of Street Railroads in Syracuse, New York, 1860-1941 (Washington: 1977). G.A. O'Geran, A History of the Detroit Street Railway (Detroit: 1931).

areas, the downtown core of the city, and the transport systems serving the community. Political, social, and economic trends in the city - although obviously important - are not the primary focus of this study.

The attempt to discover the impact of the cable car upon San Francisco generated a number of secondary questions. For example, if the cable railways affected the growth of the city, did they consistently foster a certain type of growth, such as residential, commercial, or recreational? The impact of San Francisco's environment upon the city's settlement and growth patterns also required consideration. It is possible that the city's benign climate and unwieldy topography influenced its patterns of development to a greater extent than the cable car.

The general and celebratory nature of most historical and contemporary accounts of San Francisco's cable railways reinforced the need for a careful study to determine the impact of the technology upon the community. Both historical and popular sources tend to credit the cable lines with vast developmental powers, while offering only the slightest shreds of supporting evidence. A newspaper article in the 1880's boasted that

> the construction of the cable lines was followed by a great real estate upheaval that brought sudden wealth to thousands of holders of what seemed the most unpromising property in the world. Andrew Hallidie made more millionaires than the Comstock, and opened up possibilities of development before undreamed of.[169]

Many writers argued that the cable railways changed the face of San Francisco and the lives of its citizens. Nineteenth century historian B.E. Lloyd proclaimed that the car lines

> leveled the sand dunes, reclaimed the marshes, filled up the gulches, and instead of a desolate and barren waste that was, there have sprung up blocks and streets of comely residences, the homes of thrifty and industrious citizens.[170]

A modern historian claims no less for the cable car, stating that

> more than any other technological development the street car was responsible for the spatial organization and structure of the. . . . city. Its routes determined the location of industry, the building and maintenance of commercial centers. . . . and the development of the suburb.[171]

These sources claim that the introduction of the cable lines, which carried greater numbers of people, longer distances at higher speeds than had the earlier horse-drawn street railways, altered residential patterns, industrial

[169]Andrew S. Hallidie Papers, Folder 8, California Historical Society, San Francisco.
[170]B.E. Lloyd, Lights and Shades in San Francisco (San Francisco: 1876), p. 175.
[171]Carson (1977), p. 1.

development, and even concepts of leisure and recreation.

Clearly, the literature is full of generalizations concerning the impact of the cable railways upon urban growth, but the evidence to substantiate these claims has not been collected, organized, or analyzed in a systematic way. From the standpoint of an economic approach to these questions there are additional obstacles to a clear picture. The effects of the national economic cycles, with their prevailing boom/bust pattern, was atypically intense in San Francisco. The city's business activity tended to be highly speculative and closely linked to the silver mines of Nevada's Comstock Lode. San Francisco's business cycles often mirrored the ups and downs of the silver mines.

Despite deficiences in quantity and reliability, the historical evidence found in newspapers, the Real Estate Circular, and a variety of other sources does support some of the assumptions made about the importance of the cable car to San Francisco's development. The evidence does not suggest that the cable car determined the city's urban patterns, but that it influenced these patterns is undeniable. The conclusions presented here must be considered tenative, for the reasons cited above. Nevertheless, it is clear that the cable railway system has exerted a profound effect upon San Francisco, an impact that transcends physical facilities and economic development to a position as a symbol of the city itself.

In 1776, while the American colonies deliberated over a brewing revolutionary war, Spanish officals in Mexico engaged in exploring and settling Alta California. That spring, Captain Juan Bautista de Anza led a party of missionaries and soldiers to the northern shore of San Francisco Bay. There the soldiers formed a garrison, or presidio. A few miles to the south Franciscan monks started the Mission of San Francisco de Assisi. Between 1780 and 1830 the population of the area remained fairly constant at about 500. As the hide and tallow trade of the area began to grow the Mexican government established a port of entry at the bay. In 1835 they founded the new town of Yerba Buena.

Shortly after the outbreak of the Mexican War in 1846, the United States conquered the province of California and renamed Yerba Buena San Francisco. In 1848 the United States took formal possession of the town under the terms of the Treaty of Guadalupe Hidalgo. Within a year of their arrival the Anglos began laying plans for the development of the town. Jasper O'Farrell surveyed the city in 1847, extending the rigid grid pattern first established by the Mexican settlers into the largely unpopulated lands west of the settlement. O'Farrell also laid out Market Street, a diagonal artery running southwest from the settlement. Market quickly became the principal thoroughfare of the town, and remains so to this day. Subsequent development in San Francisco, particularly in downtown, south of Market, the Western Addition and Mission Districts, corresponded closely to O'Farrell's survey.

San Francisco's population skyrocketed following the discovery of gold in the Sierra foothills in 1848. In 25 years the city grew from a small settlement of 1000 into a major city of over 150,000.[172] These early residents of the city grappled with a climate and topography that played a major role in

determining the patterns of growth within the city. San Francisco's location at the tip of a peninsula, surrounded on three sides by water, severely restricted the amount of space available for expansion. Most of the early residents settled on the eastern, or lee side, of the peninsula. There hills now known as Russian, Nob and Telegraph Hills, and Pacific Heights, offered shelter from the cold, foggy winds coming off the Pacific and held at bay the sand dunes that dominated the western half of the peninsula. These factors restricted the earliest settlement to the eastern portion of the peninsula along both sides of Market Street, and extending south towards the Mission.

From the 1850's to the 1880's San Franciscans leveled some of the smaller sand dunes and hills in the vicinity of Market Street and used the surplus land for fill, with which they extended the city well into the bay. The larger hills to the west and the dunes beyond remained largely inaccessible and uninhabited, pinning the population of the city against the eastern shore of the bay.

The Gold Rush brought an incredible increase in San Francisco's population. The growing size of the city resulted in an increasing demand for public transportation. A steam dummy line operated along Market Street as early as 1860. In the following year the first horsecar line in the city opened. The next two decades witnessed a rapid extension of these lines throughout San Francisco. An 1865 city directory praised the horsecar lines and noted their importance to the community, noting, "It is hardly too much to say that the modern horse car is among the most indispensable conditions of modern metropolitan growth. . . . The horse car virtually fixes the ultimate limits of suburban growth."[173]

Despite their benefits, horsecars had many shortcomings. They were considered little faster than walking, uncomfortable, and a major source of unsanitary conditions in the city. Horses wore out and needed to be replaced frequently. They often carried disease. These problems, coupled with an increasing push to populate and develop the steep hills overlooking the city, where horsecars could not operate efficiently, provided ample incentive to search for an alternative mode of mass transit.

Andrew S. Hallidie and his three financial partners, James Moffitt, Joseph Britton, and Henry Davis, organized San Francisco's first cable traction company, the Clay Street Hill Railroad, in May 1873. About a quarter of the $110,000 cost of constructing the line was furnished by property owners along Clay Street. Although their $28,000 contribution signified a certain degree of confidence and faith in the experiment, it should be noted that the original pledge to the company amounted to $40,000, but very few individuals could be persuaded to subscribe for the stock of Hallidie's firm.

The Clay Street Hill Railroad opened for revenue service on 1 September

[173]Bion Arnold, Report on Transportation Facilities, City of San Francisco (San Francisco: 1912), p. 415.

1873. It quickly proved a financial success, and by 1876 was transporting 150,000 people annually. Historian George W. Hilton states that "as Hallidie and his associates had hoped, the installation developed Nob Hill very well. . . ."[174] In October 1873 the San Francisco Real Estate Circular gave its opinion of the anticipated effects of this new transportation system on the city

> It has for years been a saying here that our high hills are the most healthy, commanding and pleasant places for residence, but few had either the strength or taste for climbing them. Everybody liked them when there, but to climb them was the difficulty. Should the Clay Street Hill Railroad prove a success, it will make property on the hills over which it runs as accessible as land on level ground south of Market Street. Real estate and rents on the hills will thereby have a great impetus.[175]

By November the Real Estate Circular had begun to write eye-catching headlines about "High Prices on the Hills." An advertisement for a $15,000 fifty-vara lot on Clay and Gough Streets is a typical example of this phenomenon.[176] Hallidie himself purchased a lot on Nob Hill prior to the construction of the Clay Street Hill Railroad for $3000, selling it eighteen months later, after completion of the line, for $9000.[177]

The Real Estate Circular was so confident of the future of cable traction that in May 1874 it announced "beyond a doubt, this method of traction will be used on all the street-railroads of this and every other city of the United States within a few years."[178] Despite this acclaim, two and a half years elapsed before the Sutter Street Railroad converted from horsecars to cable operations, giving San Francisco its second cable railway.

The fact that the Sutter Street line operated over only moderate grades and climbed no steep hills, unlike the Clay Street Hill Railroad, marked a significant development in cable traction, and proved the adaptability of the cable car to operations over flat terrain. The Sutter Street Railroad marked the first real thrust of a cable railway into the largely undeveloped Western Addition section of the city.

Both the Clay and Sutter Street lines replaced earlier horsecar operations, initiating the general demise of the horsecar in San Francisco. Operating expenses for the Sutter Street Railroad's cable cars proved to be 30% lower than for the horsecars they replaced. At the same time the cable cars carried

[174]Hilton, p. 185.
[175]San Francisco Real Estate Circular, 7 (October 1873).
[176]A fifty-vara lot is one-sixth the size of a standard block, measuring aproximately 137.5 feet square. California Architecture and Building Review (1 January 1880).
San Francisco Real Estate Circular, 7 (November 1873).
[177]Street Railway Journal, 1 (April 1885), p. 116.
[178]San Francisco Real Estate Circular, 8 (May 1874).

over 900,000 more passengers than the horsecar lines during their first year of operation. Publication of this information must have produced a tremendous effect upon the owners of most of the city's transportation companies. Surely it encouraged the Sutter Street firm to expand its operations and construct, in 1878, the first crosstown (north-south) line in the city.

The first real impetus for a citywide movement of population toward the Western Addition came with the opening of the California Street Cable Railroad in April 1878. Henry Root, working under the close supervision of principal owner Leland Stanford, pushed the California Street line into the Western Addition and extended the route .8-miles farther west with the extension of the line to Central (now Presidio) Avenue in 1879.

In addition to providing access to the Western Addition, the California Street Cable Railroad also furnished a second route up Nob Hill. In the same year that he obtained a franchise for the cable line Stanford broke ground for his mansion atop the Hill. Historian John Young stated in 1912 that the effect of Stanford's choosing Nob Hill for the site of his mansion proved "very marked. . . . It at once decided that the movement of the fashionable world would be westward."[179] The San Francisco Chronicle recalled in 1909 that "the commencement of the road gave an impetus to the value of property on the Hill at once and during the progress of the work, real estate values were enhanced from 40 to 100 percent along the car line."[180] It is impossible to fix these values exactly, but the general tenor of the report seems to confirm the fact that a good deal of development occurred atop Nob Hill during and after the construction of the car line. Stanford's home proved only the first of a succession of palatial estates constructed atop Nob Hill. Some historians claim that Stanford built the California Street Cable Railroad simply for the convenience of the wealthy residents of Nob Hill, while others believe the development of the Hill as an fashionable residential neighborhood resulted from the convenient transportation furnished by the cable line. The exact nature of the relationship between the California Street Cable Railroad and the settlement of Nob Hill is uncertain, but the diversified ridership of the line, which ran through the heart of Chinatown, indicates that patronage of the cars was not limited to the wealthy.

The Real Estate Circular prophecied the importance of the cable car to hilltop living in the issue in which it announced the granting of Stanford's franchise. The writer remarked that

> The wire-cable mode of propelling street cars being susceptible of use on the very steepest hills, where horses could not possibly be used, will prove ultimately to be one of the most valuable aids to increasing San Francisco real estate values ever devised. The hills would be inaccessible but for the wire-cable railroads. . . It will therefore, in future, be possible to have a residence on the steepest side-

[179] John Young, San Francisco, A History of the Pacific Coast Metropolis, 2 vols. (San Francisco: 1922), 2:passim.
[180] San Francisco Chronicle (1909).

> hills, and still be in a place that will be quickly, easily, and cheaply accessible.[181]

John Young also linked the development of Nob Hill with that of the Western Addition, noting that "the stamp of fashionable approval and improved transportation facilities would cause the filling up of the Western Addition."[182] The Real Estate Circular extolled the anticipated benefits of the new line, stating

> This road will open up easy, direct, and cheap communication with the northern and neglected portion of the Western Addition and with Golden Gate Park. It will fill a want which has long been felt. We have already a finer park than most cities can boast of. . . . but, for want of a cheap and rapid transportation, it has been beyond the reach of the class who would most frequently seek it in search of health and recreation. . . . A most populous neighborhood will be opened up rapidly, in a district well suited for residences, but hitherto cut off from communication with the city.[183]

Thomas McGee, editor of the Real Estate Circular, chafed at the delays in the construction of the California Street line, but when construction finally began on 5 July 1877 he again praised the line and the benefits it would bring to the city.

> The line will be of great service to that section of the city lying between Clay and Bush Street. It never has had any but snail like car communication. Fast time will be made on the new line, which will be most substantially built.[184]

If McGee represented the views of the San Francisco real estate community as a whole, the California Street Cable Railroad was widely seen as an opportunity to both raise property values and encourage development of new geographic areas.

Although they benefited the wealthy living on the hill tops, the cable roads did not operate exclusively for the Stanfords and other nabobs. Frequent references attest to their use by the working classes as well. McGee trumpeted the fact that the California Street line would "be an early and late one. . . . it will run early enough to accomodate the working classes, and late enough to accommodate theatre-goers."[185] He supported the ridership of the working class, complaining that the "Clay Street Hill Railroad cars do not leave the northern read western terminus to bring passengers down into the city each morning until 20 minutes to 8 o'clock. . . . Working people can not use it in the mornings at all."[186] McGee also demanded that the cable companies supply additional seats for "tired workingmen, clerks and working

[181] Ibid.
[182] Young, passim.
[183] San Francisco Real Estate Circular, 10 (May 1876).
[184] San Francisco Real Estate Circular, 12 (July 1877).
[185] San Francisco Real Estate Circular, 12 (May 1877).
[186] San Francisco Real Estate Circular, 12 (April 1877).

girls" returning from their jobs.[187]

The desire to provide transportation to the parks in the western portion of the city becomes evident in contemporary accounts beginning in about 1878. The city established Golden Gate Park in 1870, but the area remained largely sand dunes for nearly a decade. Once improvements were made Golden Gate Park became a popular recreational spot. Buena Vista Park is listed on maps of this period as simply "Park," apparently serving recreational needs from as early as 1873.

The Real Estate Circular raised the cry for cable car service to these recreational areas in November 1878, but it was five years before any cable line reached Golden Gate Park.

> If a wire cable road were built from Market Street to the Park, on either Hayes, Fell, Oak, Page or Haight, he wrote the effect would be immediately to advance land around Buena-Vista Park and the Great Park Golden Gate . Even already, the improvements made, and the prospects of a cable railroad, have advanced the prices of land there.[188]

A month later the Circular again took up the cry,

> Three or four years ago we stated that the next real estate excitement westward would be for land out by the parks, for the erection of fine houses. The projectors of a new wire cable railroad will in ten years have one of the most valuable street railroad franchises in the country.[189]

These two statements are interesting for several reasons. They highlight the fact that the interest of the Circular in recreational opportunities for San Francisco's citizens was matched by a desire to advance property values. They also illustrate the difficulty of attempting to determine whether cable lines opened new areas such as those around the parks to development, or whether the settlement of these districts encouraged cable companies to build new lines to meet the transportation needs of the new residents. From the tone of these statements it would appear that the cable lines that ran to the park districts in the Western Addition provided transport services to a district already developing. While the cable lines undoubtedly made these districts appear more attractive to people considering taking up residence near the parks by providing convenient service to the center of the city, they do not appear to have been solely responsible for this movement.

Three cable companies provided service to Golden Gate Park. The Geary Street Park & Ocean Railroad came within several blocks of the park in 1880, and extended its service to its border in 1892. The Market Street Cable Railway ran lines down McAllister, Haight, and Hayes Streets to the Park in 1883 and 1886, the Hayes and Haight Street lines ran along streets earlier suggested by the Real Estate Circular. In 1889 the Omnibus Railroad & Cable Co. built a

[187] San Francisco Real Estate Circular, 14 (March 1879).
[188] San Francisco Real Estate Circular, 14 (November 1878).
[189] San Francisco Real Estate Circular, 14 (December 1878).

line to the eastern edge of the Park along Oak Street, another of the routes suggested by the Real Estate Circular.

McGee called the opening of the Geary Street line in 1880 "one of the most important city events of the month."

> The company finds that on a fine Sunday it may. . . . carry from 25,000 to 30,000 passengers. The Park has hitherto been unvisited and almost unknown, except to a small class who can indulge in buggy and horseback riding. It is now within reach of all, and the thousands who have visited it since the Geary-street line was opened, show how much. . . . better access to it was needed.[190]

Observers felt that the two Market Street Cable lines that opened in 1883 would spur development in the area and provide better access to the Park than that provided by the Geary Street Park & Ocean. A year prior to its opening the Real Estate Circular predicted that "construction of the Haight Street railroad will make a great change in the value of land in the neighborhood of the Park terminus of this line. The streets adjoining will be among the most fashionable and the most healthy of any in the city."[191]

Property values along the line did increase, according to the Street Railway Journal, which reported that an unimproved block on Fillmore near Haight that had sold for $20,000 in 1881 increased in value to $50,000 by 1886. The Journal also reported that Market Street Cable purchased a block on Haight for $20,000. Before construction of the cable line the same block sold for $12,000. In 1886 Market Street Cable resold half of the lot for $30,000, retaining the other half.[192] Although evidence is too sketchy to prove the existence of this pattern throughout the city, it is clear from this account that at least one cable traction company invested in the property along its routes, apparently for resale on speculative grounds.

The Haight benefited greatly from both its proximity to the Park and the new cable lines. Haight and Stanyan Streets served as the center of the transportation network stretching from the center of the city to Golden Gate Park. The Haight Street line and the Geary Street Park & Ocean operated car barns in the area and the turntables for the Haight and Oak Street lines were located near the intersection. A report published by the City of San Francisco noted that the "simultaneous development of the park and the street-car system stimulated building, increased property values, and made the Haight a center of social activity for the entire city." The report cited an increase in property values along the eastern edge of the park from $25-50 per front foot in the early 1880's to $125-250 in 1891.[193]

Real estate values advanced rapidly in the Haight throughout the 1880's as the

[190]San Francisco Real Estate Circular, 15 (March 1880).
[191]San Francisco Real Estate Circular, 17 (October 1882).
[192]Street Railway Journal, 53 (April 1886).
[193]Arnold (1912), pp. 2-3.

area developed into a middle income and working class neighborhood. A year after the completion of Market Street Cable's first lines into the area the Real Estate Circular reported that

> the Western Addition was the banner portion of the city last year. . . . Very much the most of this increase of sales occurred along or near the McAllister and Haight street lines of cars, particularly the later. Fifty-vara after fifty-vara, block after block, out there has been sold, generally in subdivisions, and never at high prices.[194]

Although prices remained low enough to attract middle income families to the area, it is clear that land values rose significantly after the completion of the new lines. In August 1884 the block bordered by Oak, Fell, Fillmore, and Steiner Streets sold for $35,000. In May of 1881, before the appearance of the cable lines in the area, the same block brought only $25,000. Similarly, the block bounded by Page, Oak, Pierce, and Scott sold for $32,000 in 1884, after selling for $23,900 in June 1880 and $25,000 in August 1882.[195]

The years 1884 and 1885 saw "something of a rush on the part of small buyers for cheap vacant suburban building lots" in the Western Addition because of both the completion of the cable routes and a drop in interest rates. These two factors enabled buyers to purchase inexpensive lots previously considered inaccessible to people working in the heart of the city. Although the prices for lots in the Western Addition appreciated significantly in value during these years they still remained within the reach of many middle class and working class buyers who could not afford the price of lots in the center of the city. By the end of 1885, however, "the rush for cheap lots exhausted itself."[196]

The great number of houses erected on these newly purchased lots is another measure of the rapid development of the Western Addition during these years. In 1887 one-third of the 1350 land sales in the area underwent further development. Many of these new owner-occupants came from the working class, moving into the district from the area south of Market Street. The Real Estate Circular reported that these mechanics and clerks willingly endured a commute five to ten minutes longer in order to take advantage of the relatively lower real estate prices in the Haight and other Western Addition districts.[197]

> The cable car runs so fast that six or eight blocks in distance makes very little difference in time, while they make a very great difference in price and so the cheapest lots rather than the nearest are now purchased most frequently.[198]

The boundaries of census tracts shifted frequently during this period, making

[194]San Francisco Real Estate Circular, 20 (December 1884).
San Francisco Real Estate Circular, 19 (August 1884).
[196]San Francisco Real Estate Circular, 22 (December 1886).
[197]San Francisco Real Estate Circular, 21 (December 1885).
[198]San Francisco Real Estate Circular, 21 (March 1886).

it virtually impossible to quantify the exact extent of population movement within the city, but the addition of new census tracts in the Western Addition suggests a heavy flow into this area.[199] In addition to increased settlement, the area also developed support facilities for the growth of the area as the city's primary recreational district.

> It was not at all unusual to see thousands of people swarming to the park on weekends. An amusement center was operating at Haight and Cole. Bars, bike shops, hotels, restaurants, a livery stable, and numerous other services sprang up along Stanyan.[200]

McGee's Real Estate Circular also promoted other areas in the Western Addition, calling for a direct cable line to the Presidio in 1878.

> Land toward the Presidio is practically as inaccessible as though it were at San Mateo about 20 miles south of San Francisco . . . . S uch a road will alone bring real estate up to its true value there. That end of the city, heretofore almost utterly neglected, is, in fine weather, one of the most desirable portions of the peninsula.[201]

McGee noted the fact that the owners of the Presidio & Ferries Railroad, which built a route to the Presidio in 1880, included "men of means and large property owners in the direction in which the line is to run. This. . . . is the reason that impels them to build the road."[202]

In 1891, the San Francisco Journal of Commerce commented that with the cable car "it became possible to travel two to three miles from the center of the city in 20 minutes to half an hour, and new streets were opened, while new blocks of buildings sprang up as if by magic."[203] Certainly this description is accurate for the Western Addition where, in 1881, growth occurred at a rate approximately three times as rapid as in the other sections of the city.[204]

The Mission District, located to the south of the center of the city, did not enjoy anything so dramatic as this rate of growth, something the Real Estate Circular lamented.

> T he Western Addition is now pretty well supplied by four cable lines in operation. . . . The Mission in this respect is subject to a disadvantage, from which it did not suffer before these new lines were introduced westward. The Mission will not have a fair chance in the competition with other districts in the city until one or two cable lines are running

[199] U.S. Census Bureau, Report on the Social Statistics of Cities, Part 2, San Francisco, California, 1887.
[200] Department of City Planning, Report, p. 3.
[201] San Francisco Real Estate Circular, 14 (September 1878).
[202] Ibid.
[203] San Francisco Journal of Commerce, Builders of a Great City: San Francisco's Representative Men, the City, its History and Commerce, p. 56.
[204] San Francisco Real Estate Circular, 17 (December 1881).

to it.[204]

In 1883 the construction of the Market and Valencia Street lines of the Market Street Cable Railway partially corrected this inequity. In anticipation of their opening the Real Estate Circular prophesied "a decided change for the better in Mission property."[205] Nine months later, having learned that construction of the lines would definitely take place, McGee urged that readers contemplating "buying or building along Valencia Street. . . . may now with confidence go ahead with their building or purchases."[206]

The growth of the Mission proved less regular and predictable than that in the Western Addition. Certain streets, such as Valencia, tended to realize a great deal of growth, while others, also served by cable lines, remained stagnant. Despite these variations McGee persistently urged the conversion of horsecar lines to cable operations, "a change that would have a most beneficial effect on Mission property."[207]

Certain blocks along Valencia tended to exhibit a greater increase than the rest of the street. In 1885 McGee noted that "no Mission property has advanced in price within a year, except that on Valencia and Mission, say, between, 16th and 22nd."[208] The following year he reported a 20-30% increase in property values along Valencia from Market to 26th Street, the limit of the cable line. A lot on the northwest corner of Valencia and 13th Street sold for $4500 in March 1885, and was resold in November 1886 for $6100.[209]

Even in these cases it is difficult to conclude that the cable lines directly affected real estate values. The Real Estate Circular posited a possible influence of the cable cars upon the Market Street shopping district in 1886, noting

> the four lines of the Market Street Cable Company operating on Market Street run so fast and frequently that they form a nearly continuous line of cars. . . . They are of great value to stores, by means of their dummies. Passengers riding on the dummies have a merchants name and business impressed on their minds through their eyes as they never had on the old closed-in horse cars.[210]

It is interesting to speculate about the possible influence merchants along Market Street might possibly have exerted upon Henry Root's design for the combination cars adopted by the line. The forward portion of these cars retained the open arrangement of the early dummies, which McGee felt increased the lure of the street's stores upon the riders.

[204] San Francisco Real Estate Circular, 15 (April 1880).
[205] San Francisco Real Estate Circular, 15 (September 1880).
[206] San Francisco Real Estate Circular, 16 (May 1881).
[207] San Francisco Real Estate Circular, 20 (December 1884).
[208] San Francisco Real Estate Circular, 21 (December 1885).
[209] San Francisco Real Estate Circular, 22 (December 1886).
[210] San Francisco Real Estate Circular, 21 (December 1886).

The Real Estate Circular's editorial stance may also have altered perceptions concerning the relationship between the cable lines and property values. By 1884 the paper's advertising columns carried a listing for "Lots Along the Cable Lines," and its news pages seldom hesitated to proclaim the virtues a cable line held for the districts it served.[211]

Throughout the 1880's and 1890's the Real Estate Circular argued that the improvement of San Francisco's transportation system through the construction of cable lines would diminish out-migration, across the bay to Oakland. In 1880 McGee wrote that

> time, cheapness of access and the low price of lots are the points that create real estate progress. It will soon be utterly impossible for suburban lots to compete with the vacant lots of this city. . . . Oakland must therefore take a back seat.[212]

Ten years later McGee credited the cable car with saving San Francisco from being depleted by the lures of Oakland.

> But for our cable lines, which run everywhere, Oakland therefore would have a population of at least 50,000 more than they have now. Had five of our main cable lines been built fifteen years earlier, Oakland. . . . would have 25,000 less people than they have now. From 1873 to 1880 people left this city by the thousands every year because of the slowness of the horse car lines and of the difficulty of getting a seat on them. . . .[213]

Even in 1893 it took little imagination to realize that San Francisco's cable railway system had peaked. At that time nine lines extended deep into the Western Addition, three had made inroads into the Mission, and an additional three ran crosstown. The cars ran over more than 50 miles of double-tracked streets, an increase in mileage of over 50% in five years. Still the decade of the 1890's proved hard times for both San Francisco and the cable car. Real estate values and sales dropped by nearly 50% between 1891 and 1893, as the city experienced a severe economic downswing. During these same years the electric streetcar became a practical transportation system for urban streets. With its last major shortcomings removed, the electric streetcars began supplanting the cable lines in earnest.

The depression of the 1890's struck particularly hard in the outlying areas of the city, such as the Richmond District and the Point Lobos Avenue vicinity.[214] Even the Haight and Mission Districts, which previously had enjoyed rapidly rising property values, now experienced serious setbacks in terms of property values and prices. McGee reported that "There was not a lively demand for any kind of Mission property in 1892. Even Mission and

[211]San Francisco Real Estate Circular, 19 (April 1884).
[212]San Francisco Real Estate Circular, 15 (September 1880).
[213]San Francisco Real Estate Circular, 25 (May 1890).
[214]San Francisco Real Estate Circular, 28 (December 1892).

Valencia Streets, both destined to be good business streets, were not much sought after by buyers."[215]

The depression notwithstanding, Market Street Cable's Castro Street line prospered during the early 1890's. In 1892 McGee claimed that "the business of no line of the Market Street Cable systems has grown so much as that of the Castro Street line within two years," and that "the chief inquiry for Mission property was along and contiguous to the Castro Street line, where the prices are within the reach of small buyers."[216] In the following year the Real Estate Circular reported that "the number and value of the sales at the Mission. . . . were proportionally larger than in any other suburb of the city, but prices were as weak there as elsewhere."[217]

To a certain extent those areas which enjoyed the greatest increases in values prior to the depression suffered the greatest losses. McGee commented that, "it is especially characteristic of a boom market to send prospective business property up in the air, and of a dead real estate market to let it drop as much too low as it was previously too high."[218] The experience of the Haight, where the greatest gains occurred prior to the 1890's, tended to confirm this notion. In 1892 the Real Estate Circular claimed that "as a rule all lots westward from Fillmore to Stanyan, and from. . . . Fulton to Waller, brought 10 to 25 per cent less than they sold for in 1890 and. . . . 1891. This was due to oversupply and inflated prices."[219] Real estate values in the Western Addition fell off another 20% by 1893, and

> that portion. . . . in which credit sales and booming most prevailed -- say between Divisadero, Stanyan, McAllister, and Waller -- has suffered most. Lots on Page, Oak, Fell and other streets facing or contiguous to the Panhandle of the Park, which sold two to four years ago at $2,800 to $3,200 each, are now quotable at $2,350 to $2,500 each.[220]

Despite such declines the future appeared bright for both the Mission and the Western Addition. The Real Estate Circular noted that the Haight "is on the line of city growth westward, and it is well-supplied with cable car lines, its improvement cannot long be retarded," an evaluation which might also have been applied to the other districts of the city served by the cable car.[221]

By the time San Francisco's economic health improved in 1894 the cable car's domination of the city's urban transportation system was threatened by the electric trolley, which had been first used successfully in the area in 1891. Once loyal to the cable cars, the Real Estate Circular quickly threw its allegiance behind the newer technological innovation, noting that

[215] Ibid.
[216] Ibid.
[217] San Francisco Real Estate Circular, 29 (December 1893).
[218] San Francisco Real Estate Circular, 30 (December 1894).
[219] San Francisco Real Estate Circular, 28 (December 1892).
[220] San Francisco Real Estate Circular, 29 (December 1893).
[221] San Francisco Real Estate Circular, 28 (December 1892).

> it is obvious that we are on the eve of having an efficient and practical electric locomotive engine. It will be particularly well adapted for street cars; it will be less costly than propulsion by cable and fixed engines, and will in all probability revolutionize street travel.[222]

The cable car's heyday was history. During the 1890's the number of articles dealing with cable traction in trade journals, popular magazines, and newspapers steadily diminished, while those on electric streetcars increased. In a sense, the cable car had already given way to the trolley during the depression of the early 1890's, but the event escaped notice until after the onset of economic recovery. The extensive growth experienced by San Francisco during the mid-1890's can not be attributed to the cable car, despite the fact that the lines were more extensive than ever before. The newly developing areas of the city relied upon the growing number of electric trolley lines for transportation. The first substitution of electric trolleys for cable operations dates from this period, and such substitutions occurred with ever increasing rapidity during the 1890s. This trend continued until the earthquake and fire of April 1906. After that catastrophe the resulting devastation provided the impetus needed for the widespread replacement of the cable lines. This process gained further encouragement from the bribes United Railroads of San Francisco tendered to the City and County Board of Supervisors.

By the late 1880's the relationship between cable traction and urban growth had become tenuous, expansion and growth in the outlying Mission and Western Addition districts depended upon a more complex set of circumstances than merely good transportation services. During the 1870s and 1880s the connection between the cable lines and the development of these areas is fairly demonstrable. The combination of the depression of the early 1890s, the adoption of the electric streetcar, and the earthquake and fire of April 1906 all combined to shift the emphasis of the city's transportation systems away from the cable car toward the electric trolley. Although the cable car survived in San Francisco, its era had passed.

[222]San Francisco Real Estate Circular, 19 (October 1894).

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APPENDIX

San Francisco Cable Railway
Guide to Appendix

The xeroxed photographs which appear in this Appendix are copied from various archives listed below. These archives would not allow copy negatives of these photographs to be made for the HAER collection. Because of the useful information contained within the photographs, we are providing researchers using the collection with access to these photocopies. However, should researchers wish to obtain copies of these photographs, they must consult the appropriate archives directly. A 4x5 inch print of each of these photographs may also be found in the HAER field records for the San Francisco Cable Railway Project.

Credit BL: Photocopies of historic photographs and engravings from the collections of the Bancroft Library, University of California, Berkeley. Contact Bancroft Library concerning usage restrictions.

Credit CHS: Photocopies of historic photographs from the collection of the California Historical Society, San Francisco. Contact CHS concerning usage restrictions.

Credit CS: Photocopies of historic photographs in the possession of Charles Smallwood, San Francisco. No restrictions on use.

Credit NMM: Photocopies of photographs from the collection of the National Maritime Museum, San Francisco. Contact NMM concerning usage restrictions.

Credit RDG: Photocopies of historic photographs from the Roy D. Graves Collection, Bancroft Library, University of California, Berkeley. Contact Bancroft Library concerning usage restrictions.

Photo #1 Credit BL.
CAR TERMINI AT OLD FERRY BUILDING: Photocopy of photograph, c.1890 of the Ferry Building at the foot of Market Street. View to northeast. The Ferry Building served as terminus for many cable car lines, including the Howard Street branch of the Omnibus Railroad & Cable Co., one of whose cars is evident in the foreground.

Photo #2 Credit CS.
TRANSPORTING CABLE: Photocopy of 1883 photograph showing hauling of first cable to Market Street Cable Railway's McAllister Street powerhouse. Smokestack of powerhouse is visible behind car barn in foreground. Note massive construction of wagon, and large number of horses required to haul cable.

Photo #3 Credit RDG.
REBUILDING GEARY & LARKIN CROSSING: Photocopy of October 1906 photograph showing rebuilding of crossing of the Geary Street Park & Ocean Railroad and the Sutter Street Railroad (United Railroads of San Francisco) at Geary and Larkin. Note the complicated arrangement of yokes, slot rails, and track rails.

Photo #4 Credit MUNI.
CALIFORNIA & MASON SHEAVE PIT: Photocopy of September 1957 photograph of California and Mason Street sheave pit. View is to the west. This double-sheave directs the cable into and out of the blind conduit on Mason that connects the powerhouse with the California Street line.

Photo #5 Credit SFPL.
RECONSTRUCTION ON HYDE STREET: Photocopy of photograph showing rebuilding of the Hyde Street line in 1956-57. View looking north on Hyde to Beach Street. The yokes for the left-hand trackway are embedded in their concrete conduit, while those for the right-hand track are still exposed.

Photo #6 Credit RDG.
PULL CURVE CONSTRUCTION: Photocopy of an 1883 photograph showing construction of a pull curve at Market and Haight Streets for the Market Street Cable Railway. Plainly evident in the foreground are the flared, horizontal pulleys which guided the cable through the curve. The flare prevented the cable from sliding off the bottoms of the pulleys.

Photo #7 Credit RDG.
PARTIALLY COMPLETED TURNTABLE:- Photocopy of a c.1885 photograph showing workers posed on a partially completed turntable. The two sets of tracks on the table indicate that it might have belonged to the Market Street Cable Railway. The location is unknown.

Photo #8 Credit RDG.
SOUTH SIDE AND EAST FRONT OF F&CH RWY POWERHOUSE: Photocopy of c.1893 photograph showing the Ferries & Cliff House Railway's powerhouse and car barn at Washington and Mason. View of south side and east front. Compare appearance of this building with that of the structure erected following the 1906 earthquake and fire.

Photo #9 Credit RDG.
EAST FRONT OF F&CH RWY POWERHOUSE: Photocopy of c.1904 photograph showing east front of the powerhouse and car barn. Note the annex at the far right of the photograph and the decorative canopy at the building's southeast corner.

Photo#10 Credit RDG.
WASHINGTON & MASON POWERHOUSE AFTER EARTHQUAKE: Photocopy of photograph taken on the morning of 18 April 1906 showing powerhouse and car barn. View is looking east down Washington Street towards the building's southwest corner. The people standing in the street in the background are watching the fire as moved up the hill from downtown. Note the relatively undamaged state of the building, as compared to CA-12-37 and CA-12-38, which show it following the fire. Also note the car trapped by falling bricks as it exited the building.

Photo #11 Credit RDG.
WASHINGTON & MASON POWERHOUSE AFTER FIRE: Photocopy of photograph taken in April 1906 showing southwest corner of powerhouse and car barn. Approximately the same view as CA-12-36, but taken after the fire ravaged the area. Photographs CA-12-36 and CA-12-37 were taken by a United Railroads of San Francisco photographer for insurance purposes.

Photo #12 Credit RDG.
SOUTHEAST CORNER OF POWERHOUSE AFTER FIRE: Photocopy of an April 1906 photograph showing the southeast corner of the powerhouse and car barn after the earthquake and fire. The extent of the damage suffered by the building is plainly evident. A portion of the steam engines that drove the winding machinery is visible through the two corner windows.

Photo #13 Credit RDG.
SOUTHEAST CORNER OF POWERHOUSE DURING RECONSTRUCTION: Photocopy of March 1907 photograph taken during reconstruction of the powerhouse and car barn. View looking north on Mason Street towards southeast corner of building. The cars standing in Mason Street were stored on the street until completion of the new building. Steam rising from building's interior indicates that at least one of the lines operated out of the building had resumed service. Note scaffolding around the walls.

Photo #14 Credit RDG.
WASHINGTON & MASON STREETS DURING RECONSTRUCTION: Photocopy of 1907 photograph, not 1906 as noted on print, taken during reconstruction of the powerhouse and car barn. View looking north on Mason towards the intersection of mason and Washington. Cable cars stored in the street in front of the building are clearly evident. The south wall of the building is visible behind the two cars on Washington Street.

Photo #15 Credit CHS.
HALLIDIE GRIP PULLEY: Photocopy of 1879 engraving of the Hallidie grip pulley. Invented by Andrew S. Hallidie this device drove the cables of the Clay Street Hill Railroad and the Presidio & Ferries Railroad. The jaws on the outer rim of the pulley alternately grasped and released the cable, supplying the adhesion required to prevent the cable from slipping. Engraving from Hallidie's The Mechanical Miner's Guide 3rd ed. (1879).

Photo #16 Credit CHS.
F&CH RWY STEAM ENGINES - 1888: - Photocopy of 1888 Risdon Iron Works builder's photographs of the steam engines installed by the firm in the Ferries & Cliff House powerhouse. View is from southeast corner of the building looking out towards the winding sheaves and tension

runs. The engines are brand new, and have not even had the cables strung over the winding sheaves yet. The brick wall in the left background of the photograph separated the original boiler room from the rest of the building. Note the winding sheaves, engine flywheel, and gearing in the background of the photograph.

Photo #17 Credit CHS.
STEAM ENGINES - F&CH RWY POWERHOUSE: Photocopy of 1888 Risdon Iron Works builder's photograph showing the steam engines installed by the firm in the Ferries & Cliff House powerhouse. View towards east wall of the building.

Photo #18 Credit CHS.
WINDING SHEAVES - 1888: Photocopy of 1888 Risdon Iron Works builder's photograph of the winding sheaves installed by the firm in the Ferries & Cliff House powerhouse. The cables have not yet been wrapped over the sheaves. View from the south towards the northeast corner of the building. Note the low height of the ceiling compared with the present building.

Photo #19 Credit NMM.
F&CH RWY POWERHOUSE ELEPHANT BOILERS: Photocopy of 1893 Union Iron Works builder's photograph of the 56"x16' elephant boilers fabricated by the firm for the Ferries & Cliff House Railway. The boilers were installed along the west wall of the first floor of the powerhouse in 1894.

Photo #20 Credit NMM.
ELEPHANT BOILERS FOR F&CH RWY POWERHOUSE - 1894: Photocopy of May 1894 Union Iron Works builder's photograph of the 56"x16' elephant boilers fabricated by the firm for the Ferries & Cliff House Railway.

Photo #21 Credit CHS.
ENGRAVING OF ELEPHANT BOILER: Photocopy of 1896 engraving of an elephant boiler used by the Sutter Street Railway in their Polk and Sutter Streets powerhouse. Engraving from the Union Iron Works Catalogue No. 1 (1896).

Photo #22 Credit RDG.
FIRST FLOOR INTERIOR - 1905: Photocopy of April 1905 photograph showing the interior of the Washington and Mason Streets powerhouse. View towards southeast corner of the first floor of the building. The winding sheaves are in motion under the vertical steam engine in the foreground. The horizontal steam engines are visible in the background of the photograph. Note the cable support pedastal and cable just left of the column on the far right of the photograph.

Photo #23 Credit RDG.
FIRST FLOOR INTERIOR - AFTER FIRE: Photocopy of April 1906 photograph looking into the southeast corner of the powerhouse following the earthquake and fire. View from the north. The damage suffered by the steam engines and winding machinery is clearly evident. Compare this view with the pre-earthquake interior in CA-12-58.

Photo #24 Credit CS.
ENGINES AND WINDING MACHINERY - AFTER FIRE: Photocopy of May 1906 photograph looking through the easternmost window on the Washington Street (south) side of the powerhouse at the wreckage of the steam engines and winding machinery. Note the flywheel of the horizontal steam engine, bull gears, and winding sheaves buried beneath the rubble.

Photo #25 Credit CS.
INSTALLATION OF 1911 ELECTRIC MOTOR: Photocopy of June 1911 photograph taken during installation of the 600hp General Electric motor in the Washington and Mason Streets powerhouse. View towards southeast corner of first floor of building. The motor's chain drive lies on the floor in the center foreground. Winding sheaves and part of one of the tension runs are visible on the far left of the photograph.

Photo #26 Credit MUNI.
INTERIOR VIEW TO WEST ON FIRST FLOOR - 1956: Photocopy of November 1956 photograph of first floor interior of the powerhouse. View towards west wall. The old boiler pits, covered by a concrete slab in 1958, are visible in the foreground. The smokestack is evident on the far left of the photograph. Note the boiler located along the west wall of the building in the center background.

Photo #27 Credit MUNI.
FOUNDATIONS FOR MOTOR & REDUCTION GEAR NO. 1: Photocopy of November 1956 photograph showing the foundations for the 1956-7 electric motor and reduction gear installation, presently Motor and Reduction Gear No. 1. View towards south wall of first floor. The original electrical switchboard is visible against this wall.

Photo #28 Credit MUNI.
INTERIOR VIEW TO SOUTHEAST ON FIRST FLOOR - 1956: Photocopy of November 1956 photograph showing southeast corner of the first floor of the powerhouse. View towards southeast. The winding sheaves are partially visible at the extreme left of the photograph. The original transformer equipment and switchboard are visible to the right of the column in the foreground.

Photo #29 Credit MUNI.
MOTOR AND REDUCTION GEAR NO. 1 - 1957: Photocopy of April 1957 photograph showing Motor and Reduction Gear No. 1. View towards

northwest on first floor of powerhouse. Note the engineer's shack located behind the motor, and the winding sheave partially visible on the far right of the photograph.

Photo #30 Credit MUNI.
INTERIOR VIEW TO SOUTHWEST ON FIRST FLOOR - 1958: Photocopy of March 1958 photograph showing southwest corner of the first floor of the powerhouse. View towards southwest. The smokestack is visible in the corner of the building. In front of the stack is the old boiler pit, covered by a concrete slab later in 1958.

Photo #31 Credit MUNI.
CABLE REWINDER - 1958: Photocopy of March 1958 photograph showing cable rewinder on the first floor of the Washington and Mason Streets powerhouse. View to north. Cable was wound onto this spool when removed from the street. This winder has since been replaced.

Photo #32 Credit BL.
VIEW TO SOUTHEAST OF WINDING MACHINERY - C.1960: Photocopy of c.1960 photograph showing the winding machinery and Motor and Reduction Gear No. 2 (visible on either side of the left-most column in the photograph). View towards southeast. The tension runs extend to the right out of the photograph.

Photo #33 Credit RDG.
SAN FRANCISCO - VIEW TO WEST C.1847: Photocopy of an engraving showing San Francisco c.1847, before the begining of landfill activity. View towards the west. Compare settlement patterns with CA-12-99, taken ten years later.

Photo #34 Credit BL.
VIEW TO SOUTH OF NOB HILL - 1856: Photocopy of 1856 photograph of Nob Hill taken from Telegraph Hill. View is roughly to the south. Housing density falls off markedly with increasing elevation.

Photo #35 Credit RDG.
VIEW NORTH FROM RUSSIAN HILL - 1862: Photocopy of an 1862 engraving looking north from Russian Hill. Western Addition lands are to the left of the park with the flagpole. Notice the relative lack of development in this district compared to the downtown area.

Photo #36 Credit RDG.
VIEW WEST FROM RUSSIAN HILL - 1862: Photocopy of an 1862 engraving looking west from Russian Hill towards the sparsely populated and developed Western Addition.

Photo #37 Credit RDG.
VIEW SOUTH AND WEST FROM RUSSIAN HILL - 1863: Photocopy of an 1863 engraving looking south and west from Rusian Hill. The Western Addition comprises most of the right half of the engraving.

Photo #38 Credit BL.
VIEW EAST ALONG MARKET STREET - 1865: Photocopy of 1865 photograph of Market Street. View towards east.

Photo #39 Credit RDG.
VIEW SOUTH FROM NOB HILL - 1860S: Photocopy of photograph taken in 1860s looking south from Nob Hill into the Mission District towards Mission Dolores, and Hayes Valley. Photograph taken before the introduction of horsecar lines into the area.

Photo #40 Credit RDG.
HAIGHT & STAYAN TERMINUS OF MARKET STREET CABLE - C. 1885: Photocopy of c.1885 photograph showing the terminus of the Market Street Cable Railway's Haight Street line at Haight and Stanyan Streets, near the entrance to Golden Gate Park. View towards the east looking down Haight Street. The car in the foreground is being turned around on the turntable. Note the almost total absence of women amongst this weekend throng, possibly due to the fact that the cars are advertising service to a baseball game in Golden Gate Park.

Photo #41 Credit RDG.
VIEW WEST ON UNION STREET AT STEINER - 1880: Photocopy of 1880 photograph looking west on Union Street at Steiner. This intersection was the terminus of the recently completed Presidio & Ferries Railroad.

Photo #42 Credit RDG.
VIEW TO SOUTHWEST AT POWELL AND CALIFORNIA STREETS - 1883: Photocopy of 1883 photograph showing a California Street Cable Railroad cable car passing in front of the Stanford (left) and Hopkins Mansions atop Nob Hill. View is towards the southwest from the intersection of Powell and California Streets.

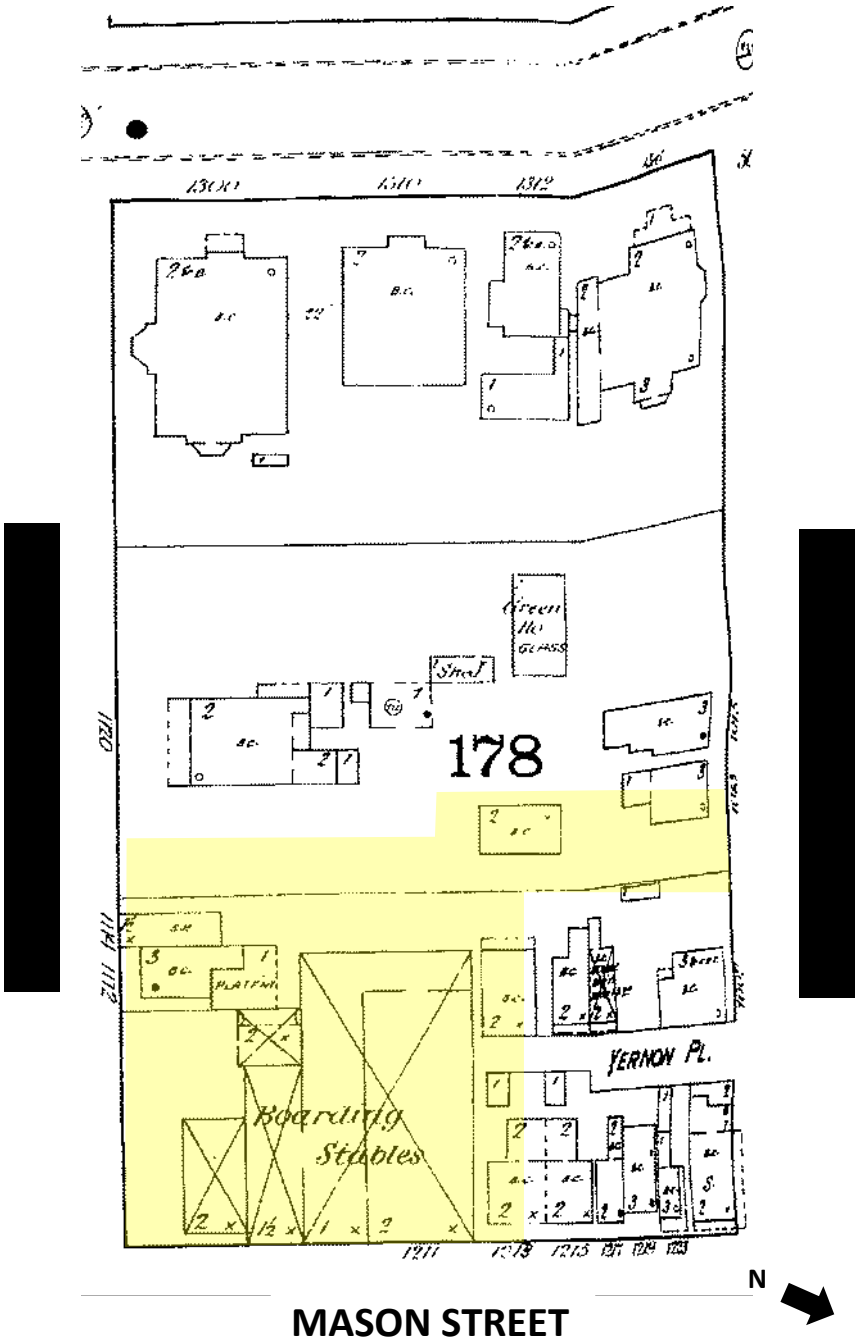
Photo #43 Credit RDG.
VAN NESS TERMINUS OF THE CLAY STREET HILL RAILROAD - 1880S: Photocopy of photograph taken in the 1880s of the Van Ness Avenue terminus of the Clay Street Hill Railroad. View towards the northwest. Note the rather undeveloped appearance of the area.

Photo #44 Credit RDG.
ADVERTISEMENT FOR HAYES PARK - 1880S: Photocopy of an 1880s advertisement for Hayes Park. The copy notes the easy accessibility of the pavilion and garden via cable car routes.

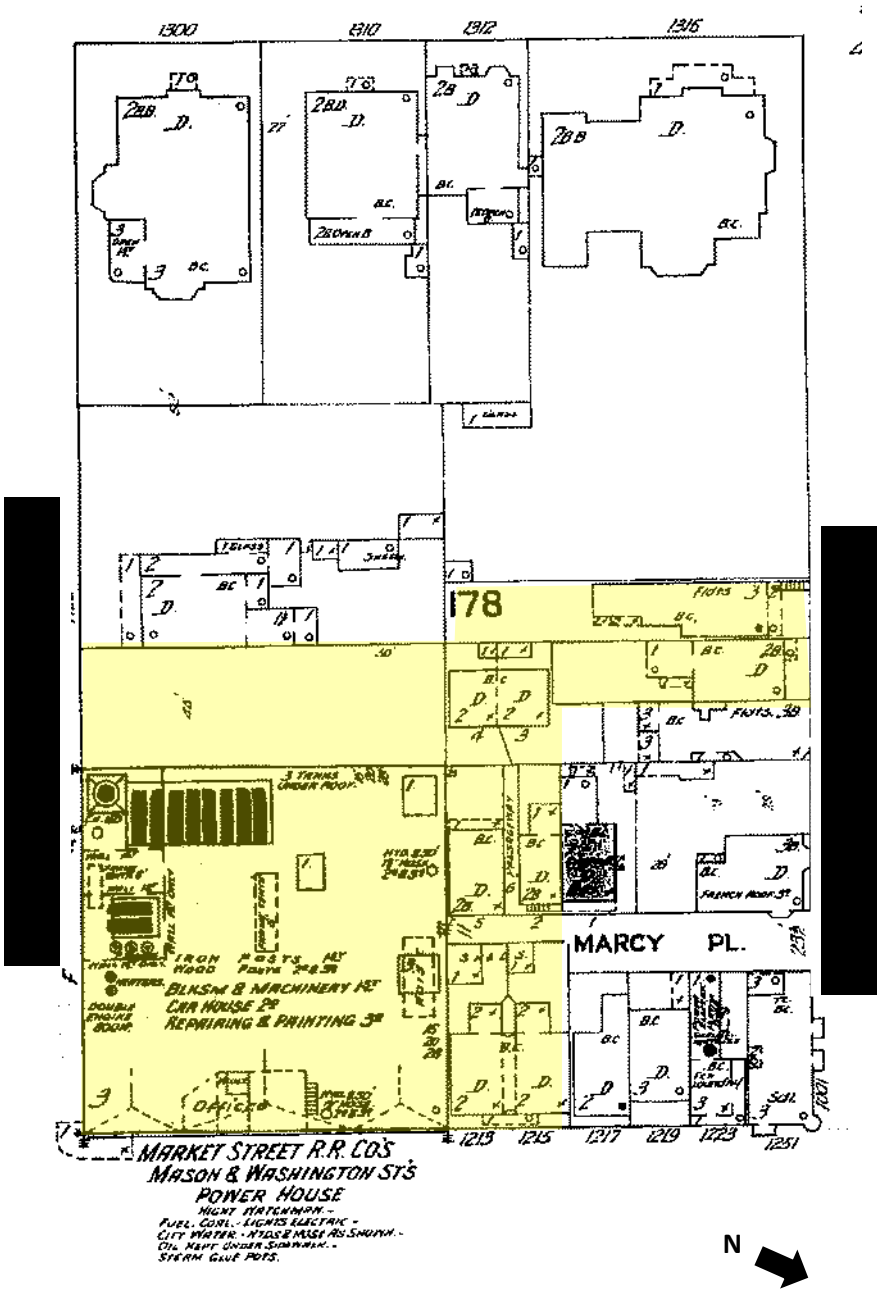
Photo #45 Credit RDG.
ADVERTISEMENT FOR SUTRO HEIGHTS - 1880S: Photocopy of an 1880s advertisement for the Sutro Heights area. The Powell and Jackson Street cable cars receive top billing.

Photo #46 Credit BL.
ADVERTISEMENT FOR GOLDEN GATE PARK - 1880S: Photocopy of an 1880s advertisement for Golden Gate Park printed by the Market Street Cable Railway.

Appendix C: Sanborn Fire Insurance Maps

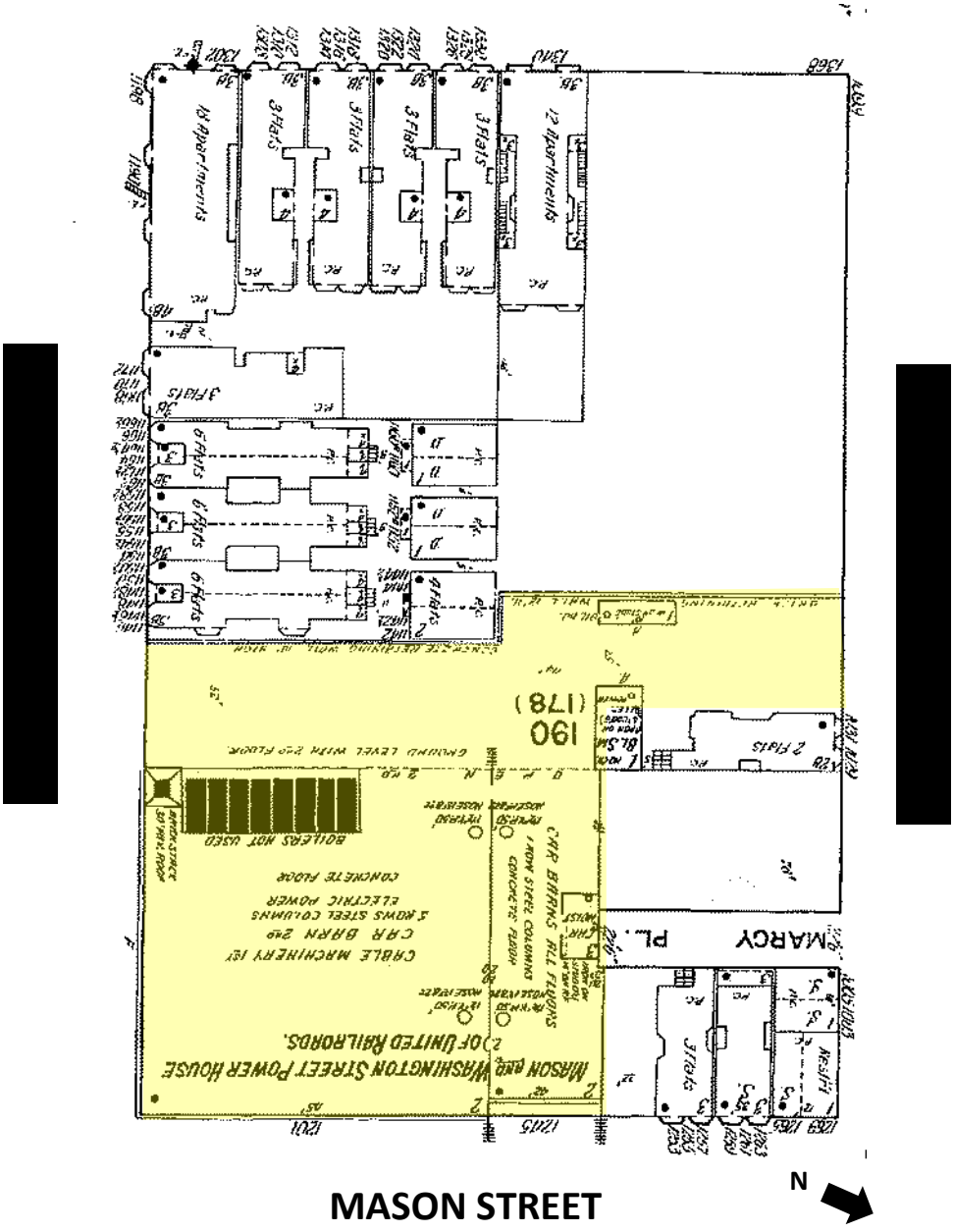


1886 Sanborn Fire Insurance Map, Volume 2, Sheet 34a; approximate boundary of the current parcel highlighted in yellow (San Francisco Public Library; amended by author).

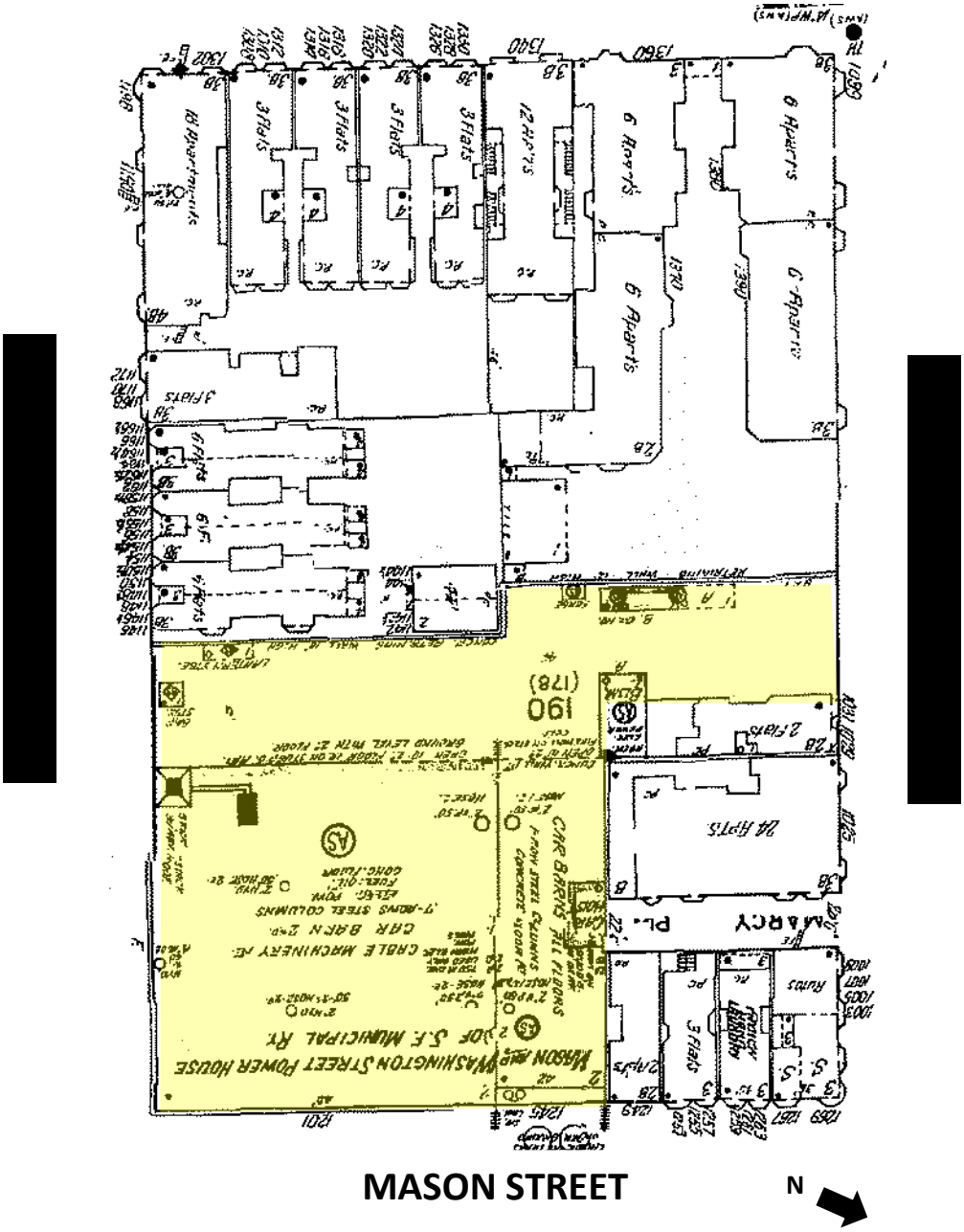


MASON STREET

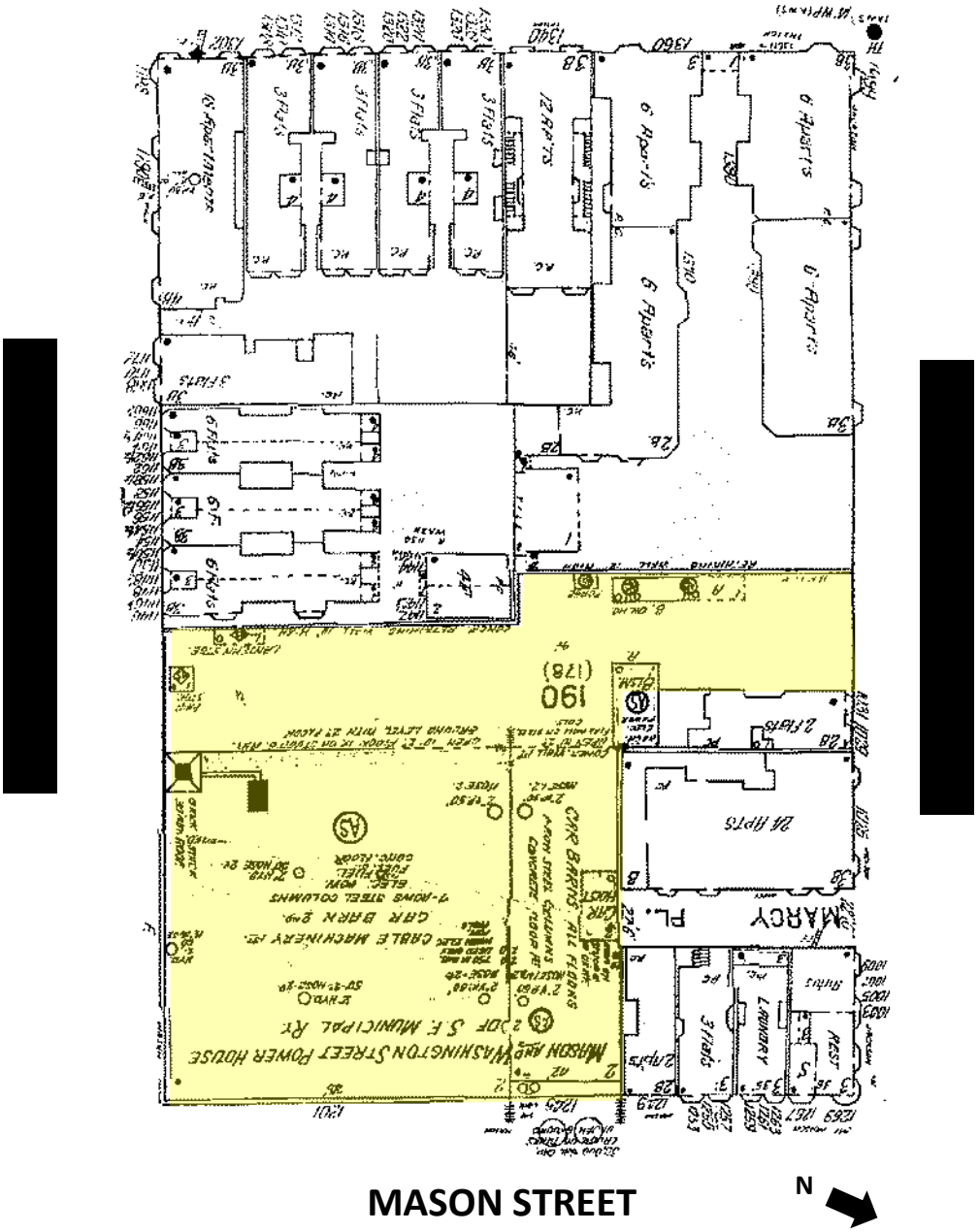
1899 Sanborn Fire Insurance Map, Volume 1, Sheet 53; approximate boundary of the current parcel highlighted in yellow (San Francisco Public Library; amended by author).



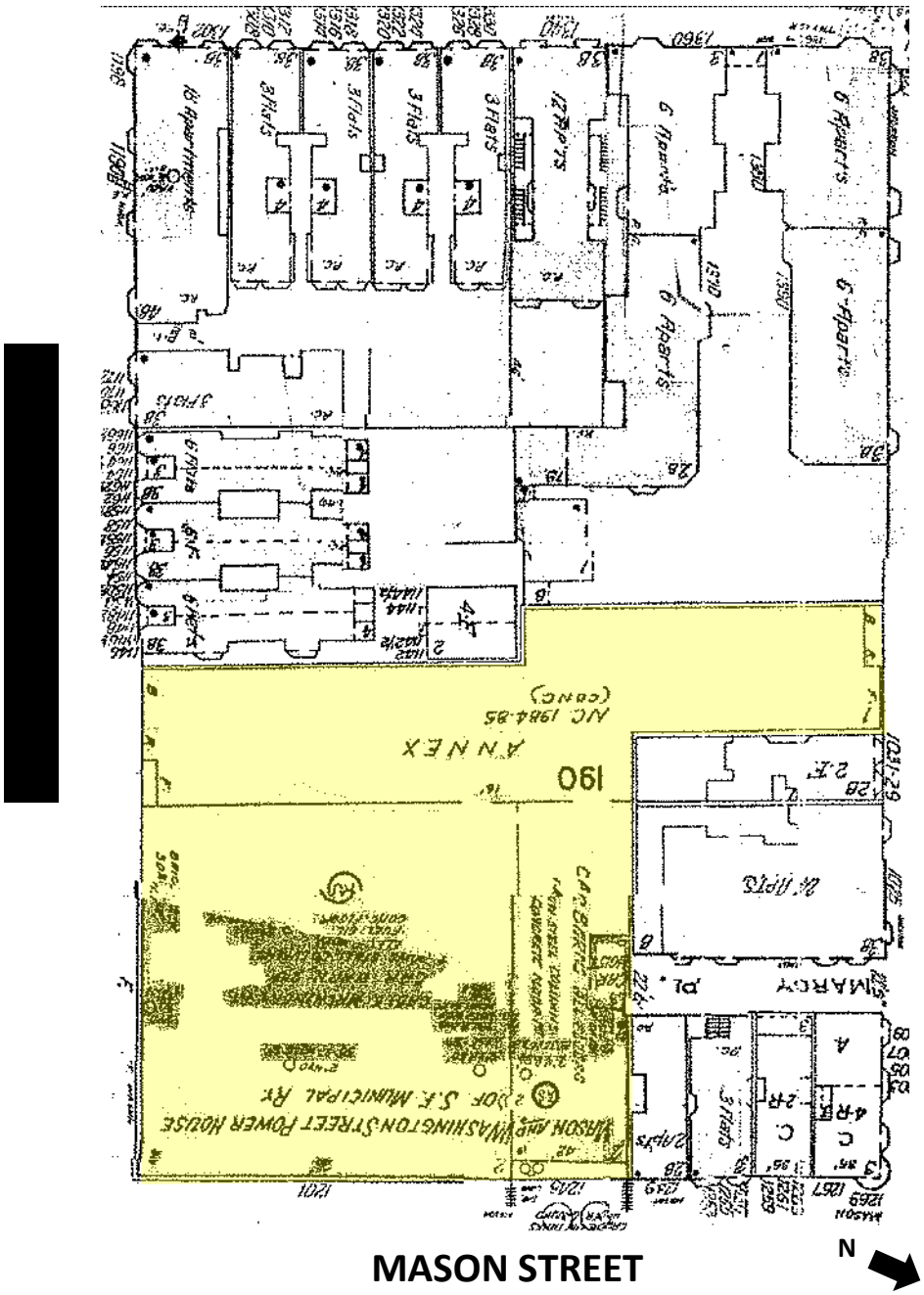
1913 Sanborn Fire Insurance Map, Volume 1, Sheet 57; approximate boundary of the current parcel highlighted in yellow (San Francisco Public Library; amended by author).



1948 Sanborn Fire Insurance Map, Volume 1, Sheet 57; approximate boundary of the current parcel highlighted in yellow (San Francisco Public Library; amended by author).

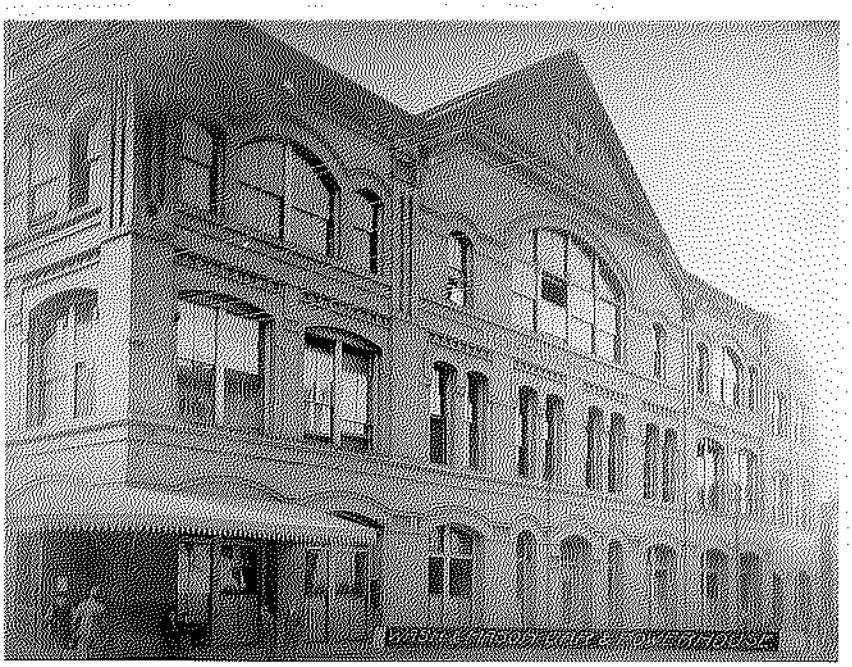


1950 Sanborn Fire Insurance Map, Volume 1, Sheet 57; approximate boundary of the current parcel highlighted in yellow (San Francisco Public Library; amended by author).

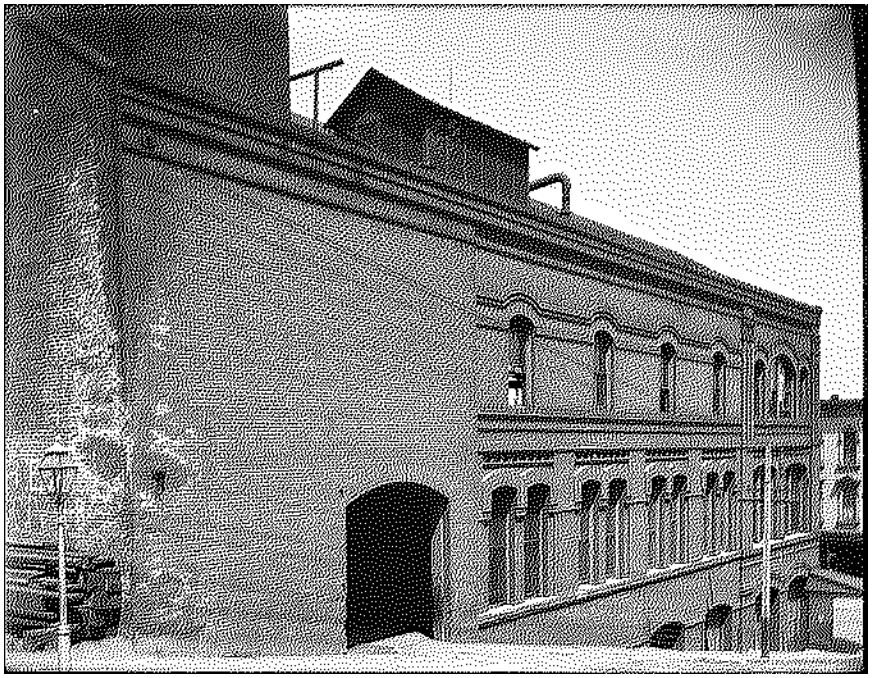


1990 Sanborn Fire Insurance Map, Volume 1, Sheet 57; approximate boundary of the current parcel highlighted in yellow (San Francisco Public Library; amended by author).

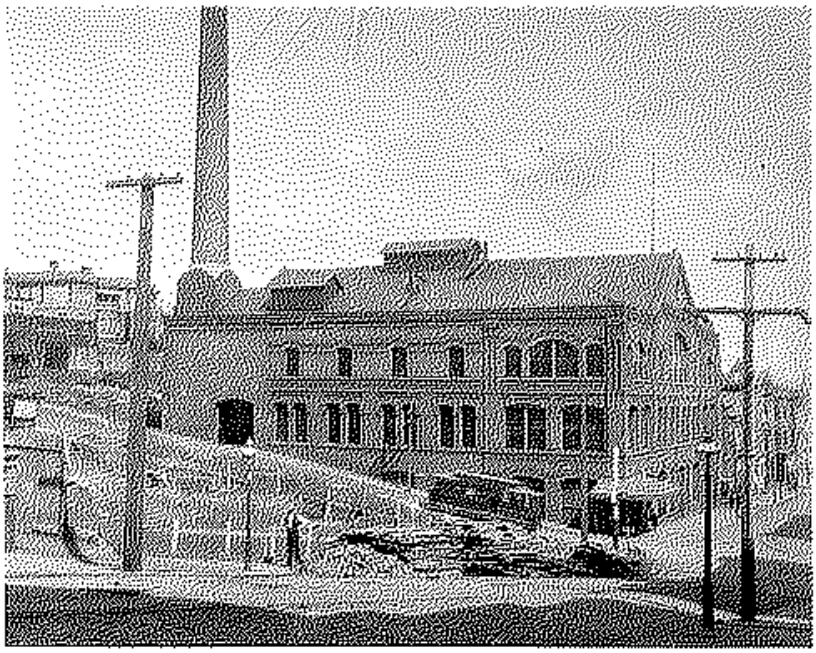
Appendix D: Historic Photographs



East façade of the original 1888 three-story Ferries and Cliff House Railway Cable Car Barn and Powerhouse, view from Mason Street, 1904 (SFMTA Photo Collection and Archives).

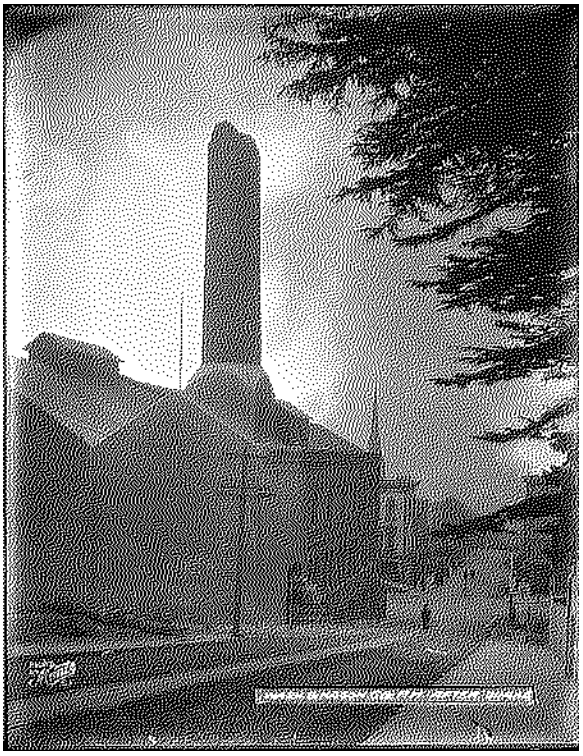


South façade of the original 1888 three-story Ferries and Cliff House Railway Cable Car Barnand Powerhouse, view from Washington Street, 1904 (SFMTA Photo Collection and Archives).



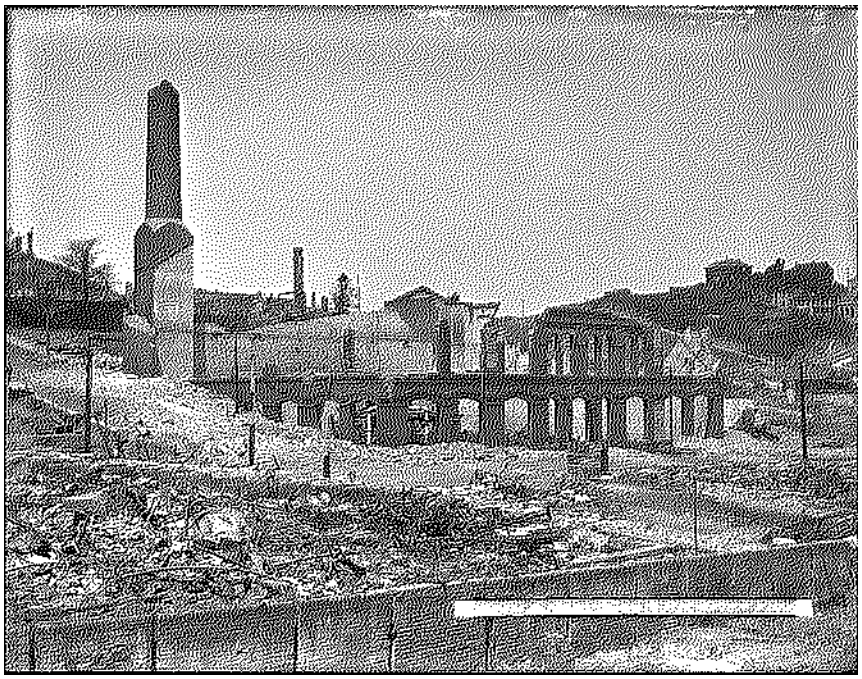
South (right) and east (left) façades of the original 1888 three-story Cable Car Barn and Powerhouse, view from Mason Street, ca. 1900 (San Francisco Public Library, Historical Photograph Collection).

Interior the original 1888 three-story Ferries and Cliff House Railway Company Cable Car Barn and Powerhouse, ca. 1900 (San Francisco Public Library, Historical Photograph Collection).

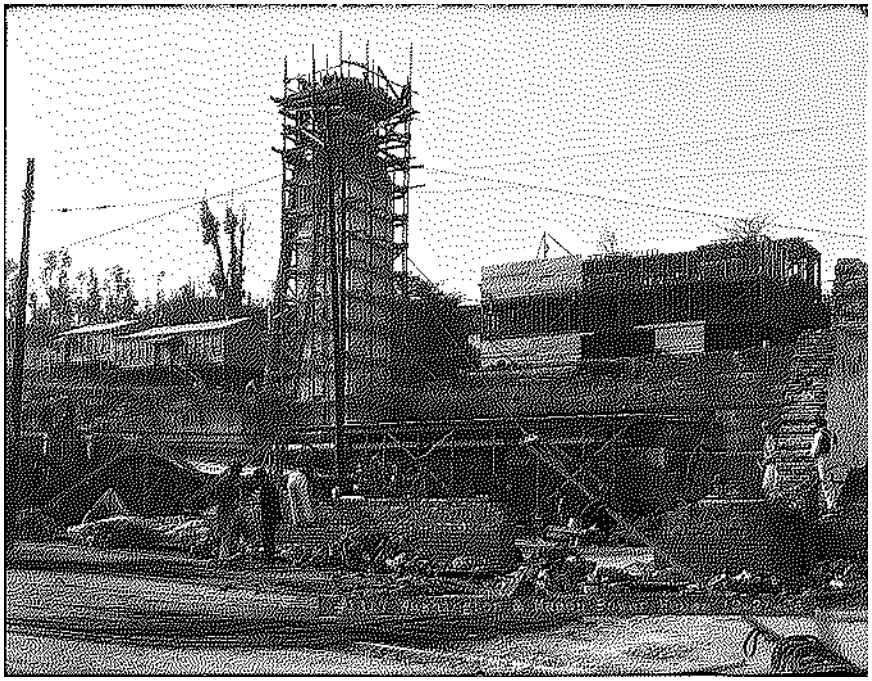


West (left) and south (right) façades of the original Cable Car Barn immediately after the earthquake and before the fires, 1906 (SFMTA Photo Collection and Archives).

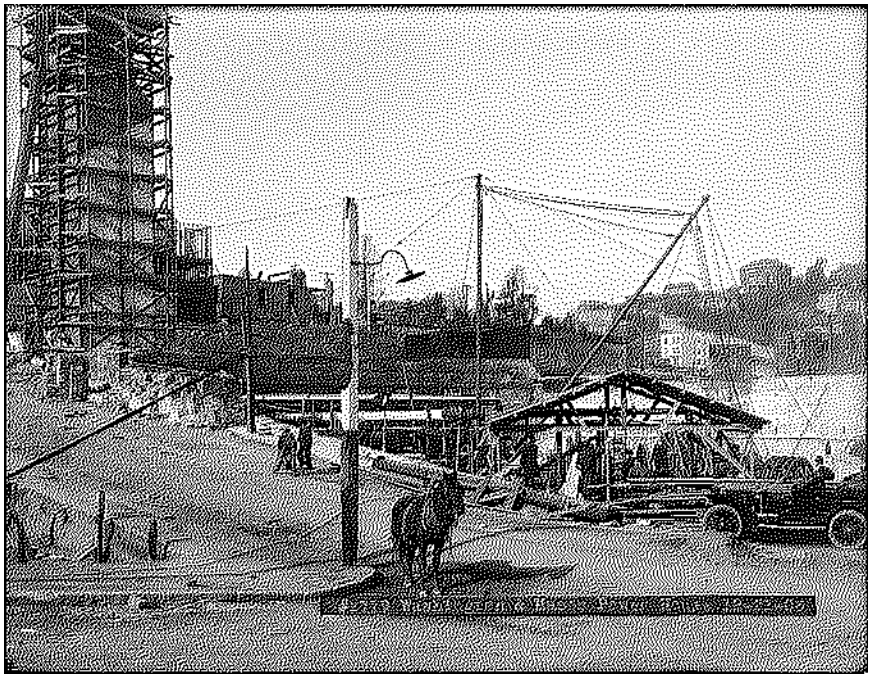
View down Mason Street after the 1906 earthquake and fires with remnants of the original Cable Car Barn with only the smokestack standing (center), 1906 (SFMTA Photo Collection and Archives).



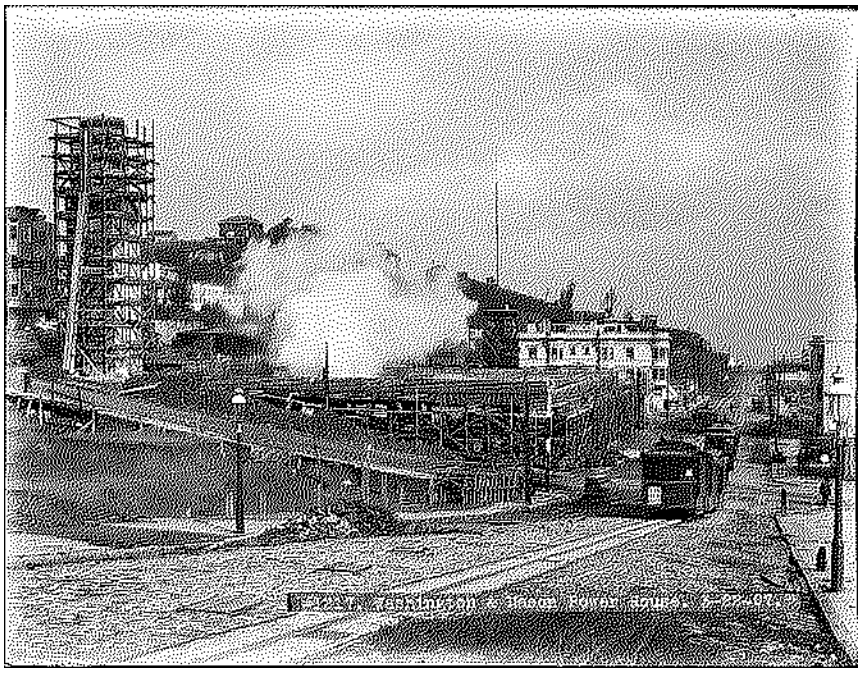
Ruins of the original Cable Car Barn with the smokestack remaining, 1906 (SFMTA Photo Collection and Archives).



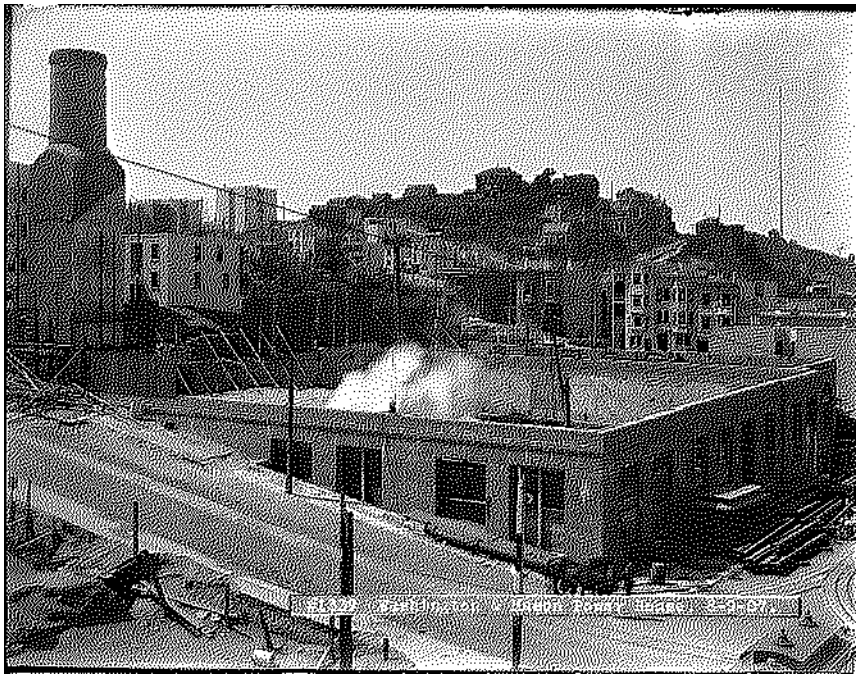
Original 1888 smokestack stabilized during construction of the replaement Cable Car Barn, 1906 (SFMTA Photo Collection and Archives).



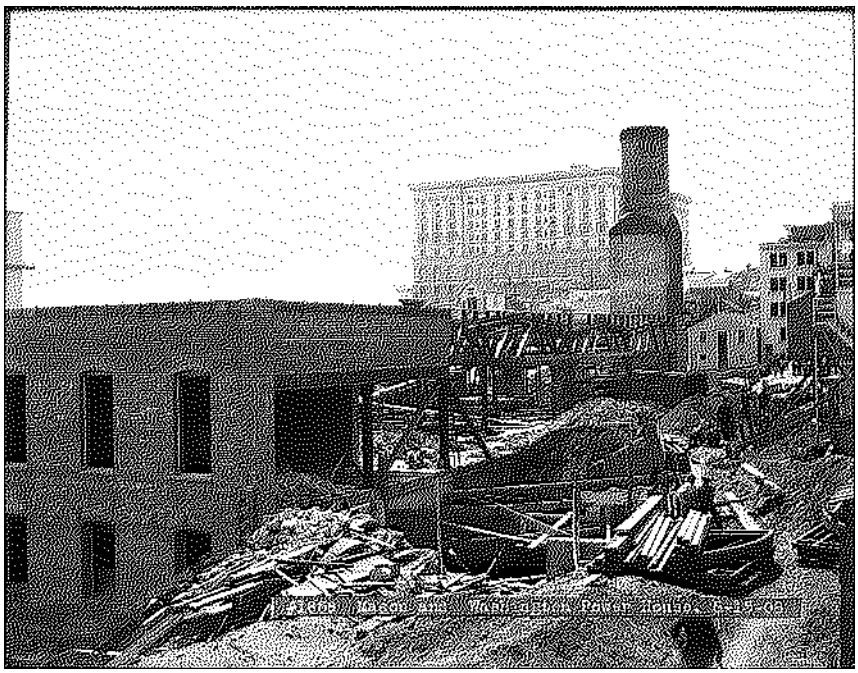
Construction of the replacement Cable Car Barn with the stabilized smokestack (left), view from corner of Mason and Washington streets, 1906 (SFMTA Photo Collection and Archives).



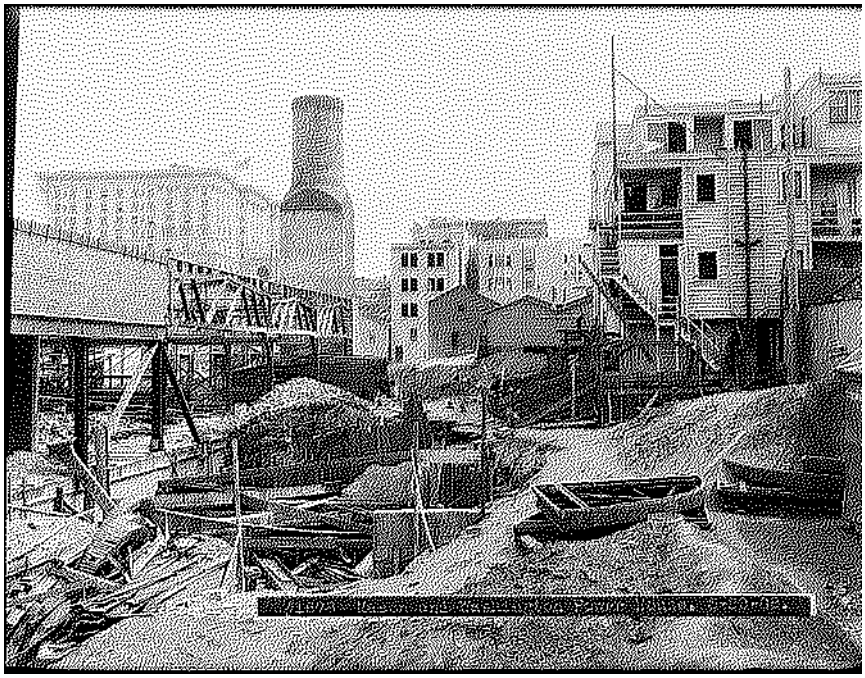
Construction of the replacement Cable Car Barn with the stabilized smokestack (left), view north along Mason Street, 1907 (SFMTA Photo Collection and Archives).



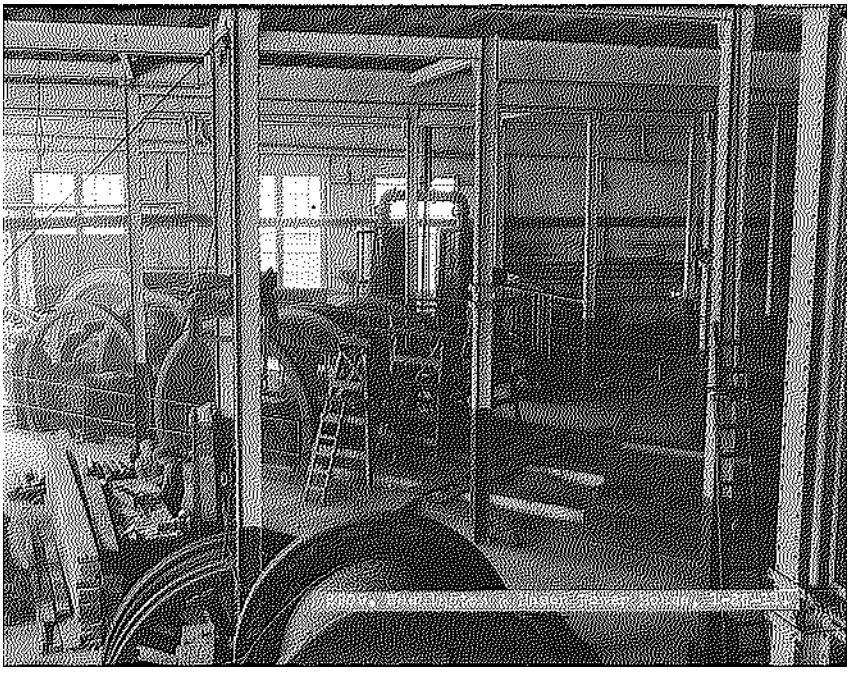
Construction of the replacement Cable Car Barn with the first floor nearing completion and repaired smokestack (left), view from the corner of Mason and Washington streets, 1907 (SFMTA Photo Collection and Archives).



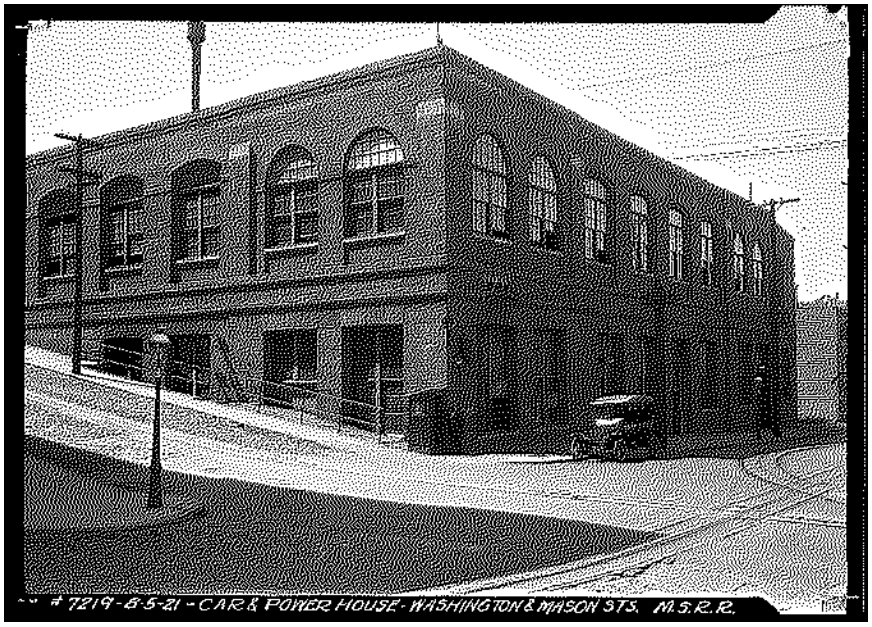
Construction of the replacement Cable Car Barn with the second floor nearing completion and repaired smokestack (right), view of the north façade from Jackson Street, 1908 (SFMTA Photo Collection and Archives).



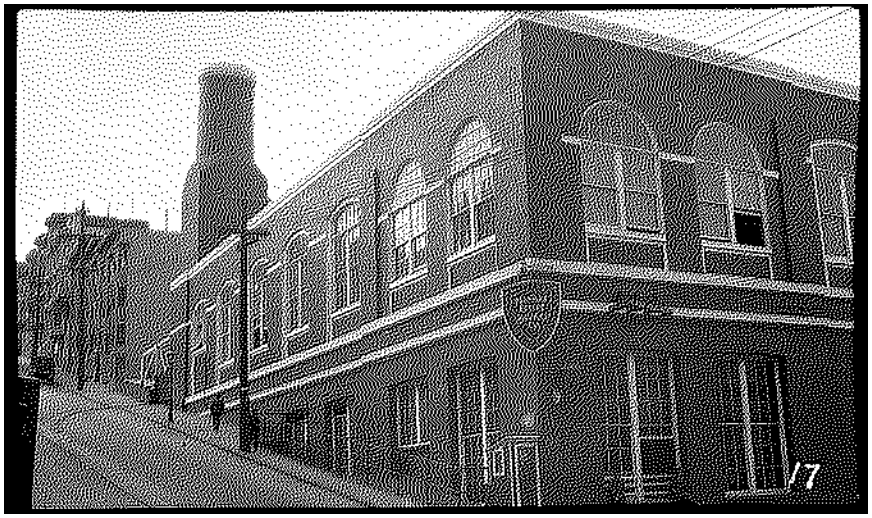
Construction of the replacement Cable Car Barn with the stabilized smokestack (center), view of the rear (west) portion of the building, 1908 (SFMTA Photo Collection and Archives).



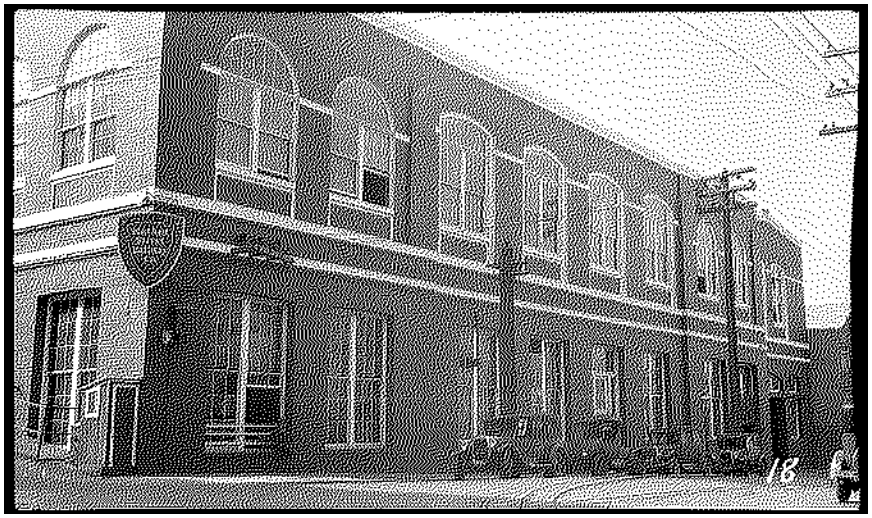
Completed interior of the replacement Cable Car Barn with the cable turning equipment, 1911 (SFMTA Photo Collection and Archives).



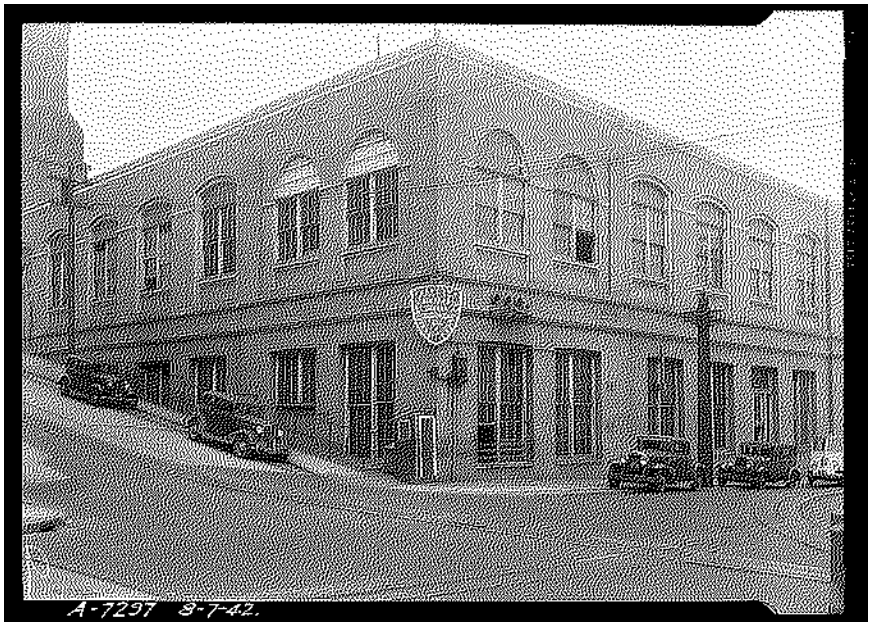
South and east façades of the completed Cable Car Barn, view from corner of Mason and Washington streets, 1921 (SFMTA Photo Collection and Archives).



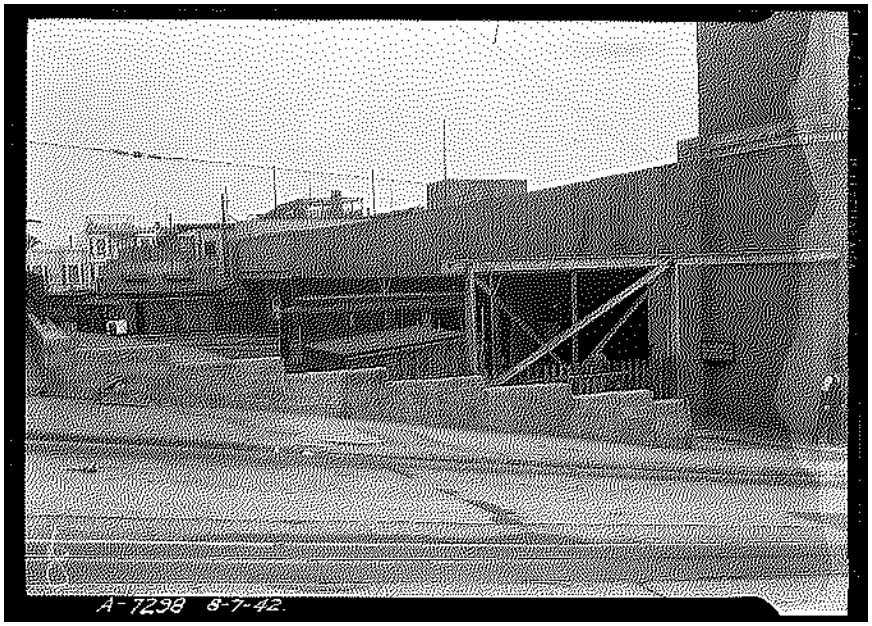
South and east façades of the Cable Car Barn with original smokestack (left), view west along Washington Street, 1928 (SFMTA Photo Collection and Archives).



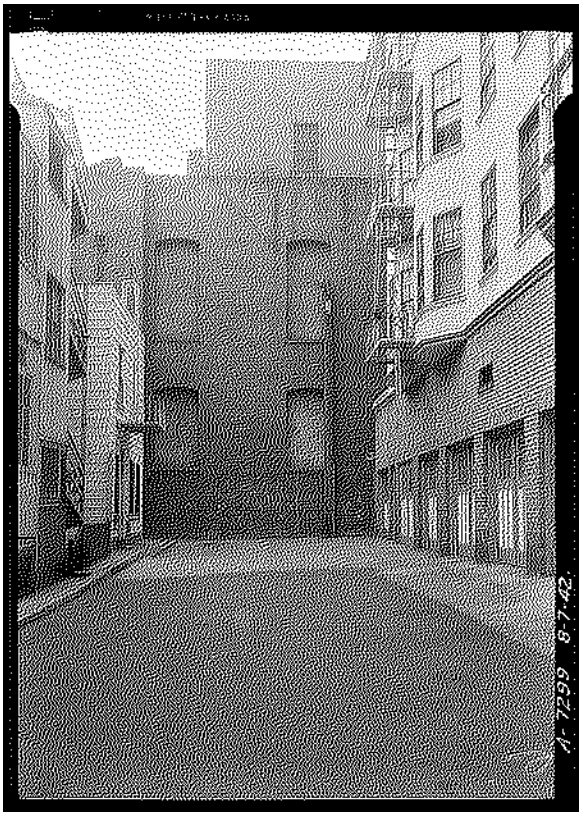
East façade of the Cable Car Barn with "Market Street Railway Co." sign, view up Washington Street, 1928 (SFMTA Photo Collection and Archives).



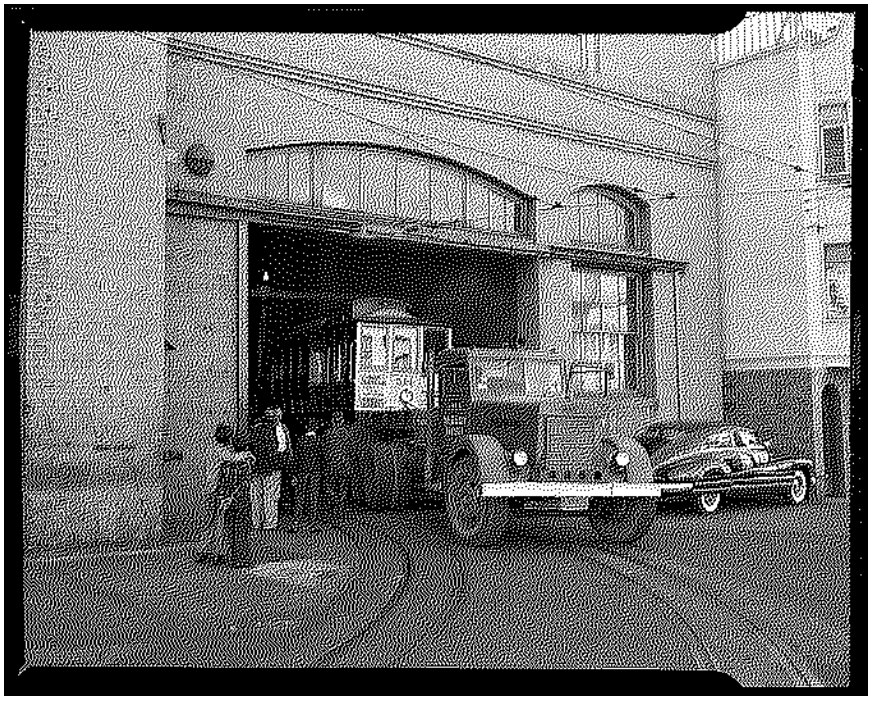
South (left) and east (right) façades of the Cable Car Barn, view from corner of Mason and Washington streets, 1942 (SFMTA Photo Collection and Archives).



West (rear) façade of the Cable Car Barn with the former cable car maintenance garages, 1942 (SFMTA Photo Collection and Archives).

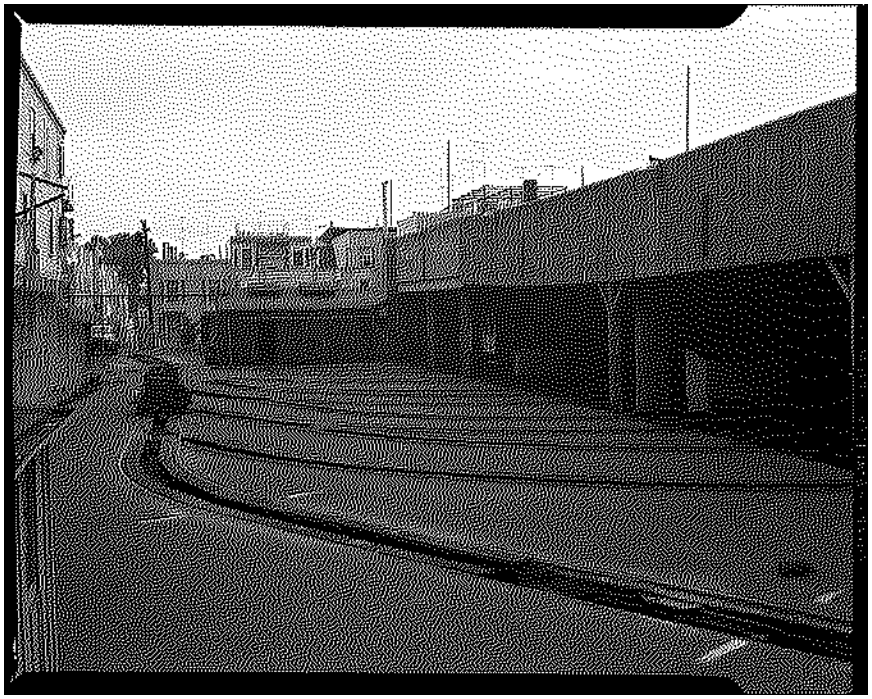


Visible portion of the north façade of the Cable Car Barn, view from Marcy Place, 1942 (SFMTA Photo Collection and Archives).



Vehicle maintenace entrance at the east façade of the Cable Car Barn, view from Mason Street, 1948 (SFMTA Photo Collection and Archives).

Reroofing the Cable Car Barnwith the smokestack in view, 1948 (SFMTA Photo Collection and Archives).



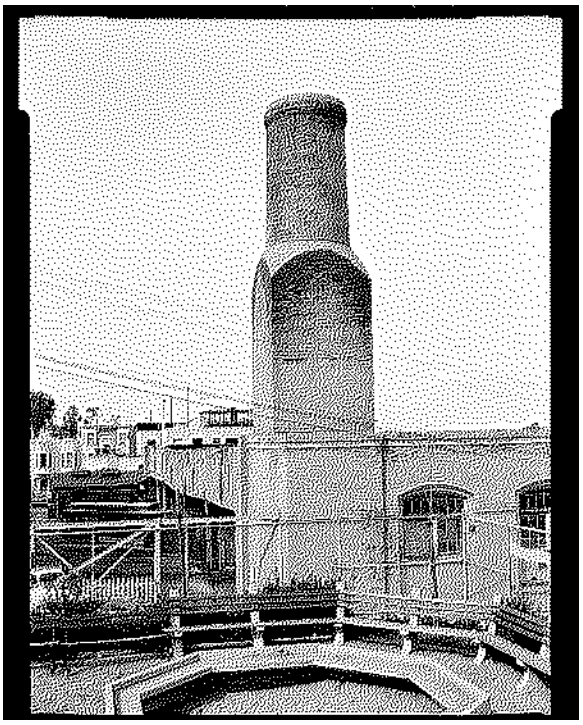
West (rear) façade of the Cable Car Barn with cable car maintenace garage, 1956 (SFMTA Photo Collection and Archives).

West (rear) façade of the Cable Car Barn with cable car maintenace garage, 1956 (SFMTA Photo Collection and Archives).

South (left) and east (right) façades of the Cable Car Barn, view from corner of Mason and Washington streets, 1956 (SFMTA Photo Collection and Archives).

South (left) and east (right) façades of the Cable Car Barn, view from the corner of Mason and Washington streets, 1956 (SFMTA Photo Collection and Archives).

North portion of the east façade of the Cable Car Barnview from Mason Street, 1956 (SFMTA Photo Collection and Archives).

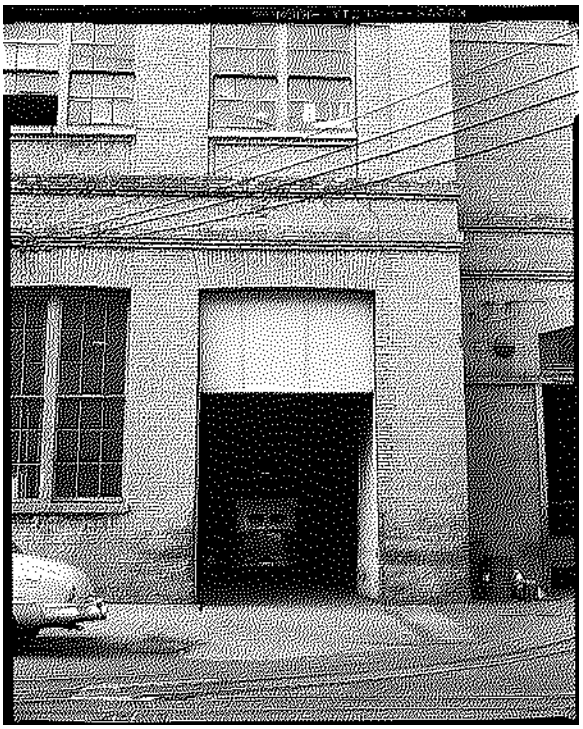


Smokestack and west (rear) façade with cable car maintenace garage, view from Washington Street, 1958 (SFMTA Photo Collection and Archives).

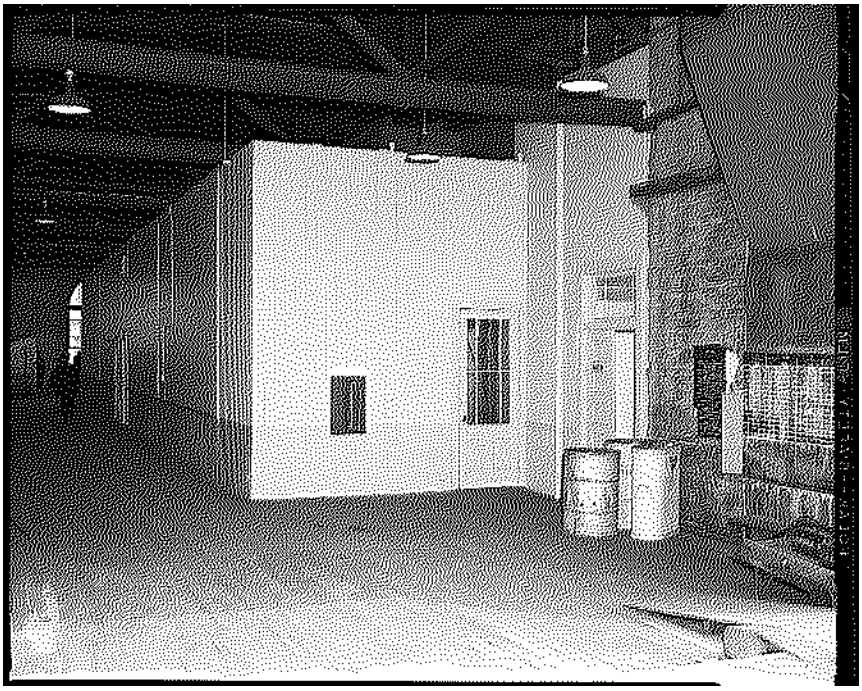
West (rear) façade and cable car maintenance garage in deteriorating condition, 1958 (SFMTA Photo Collection and Archives).

West (rear) façade and cable car maintenance garage in deteriorating condition, 1958 (SFMTA Photo Collection and Archives).

Interior of the rear cable car maintenance garage at the Cable Car Barn, 1958 (SFMTA Photo Collection and Archives).



Former vehicle entrance at the east façade of the Cable Car Barn on Mason Street, 1958 (SFMTA Photo Collection and Archives).



Interior of the Cable Car Barn, 1958 (SFMTA Photo Collection and Archives).

Interior stairs in the Cable Car Barn, 1958 (SFMTA Photo Collection and Archives).

South (left) and east (right) façades of the Cable Car Barn, view from corner of Mason and Washington streets, 1961 (SFMTA Photo Collection and Archives).

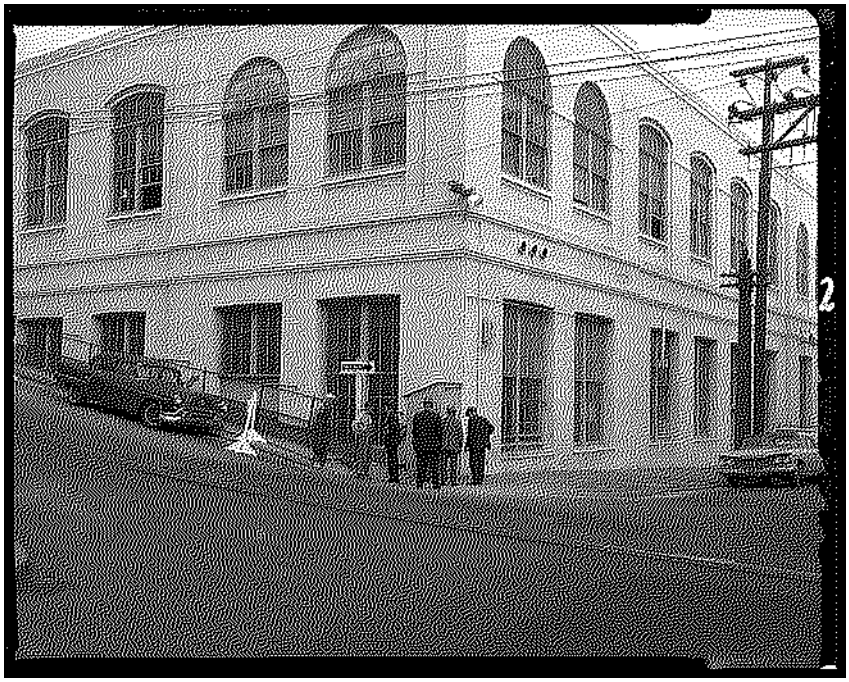
Cable car turntable at the west (rear) façade with cable car maintenance garage (left), 1962 (SFMTA Photo Collection and Archives).

South (left) and east (right) façades of the Cable Car Barn after restoration, view from the corner of Mason and Washington streets, 1963 (SFMTA Photo Collection and Archives).

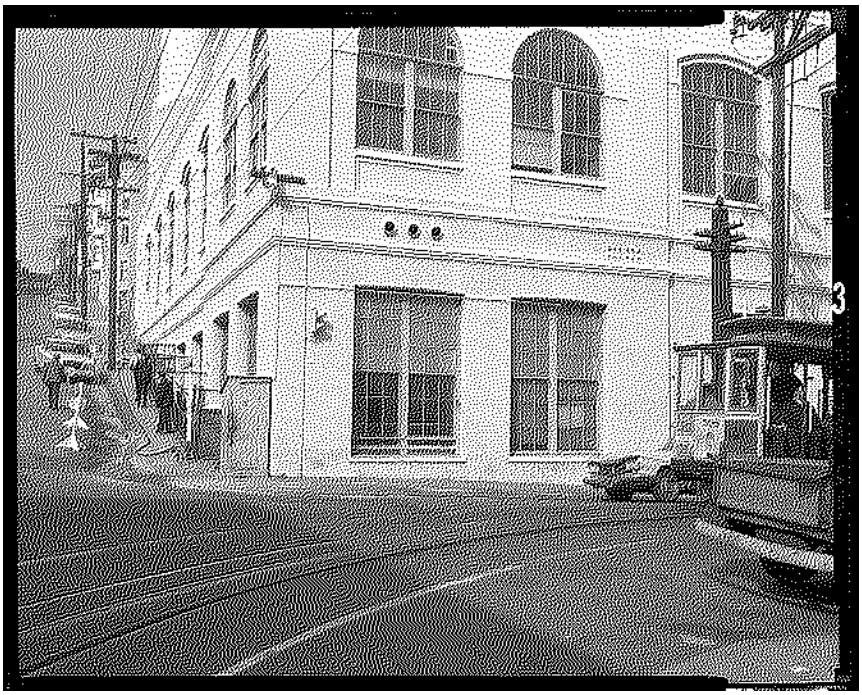
East façade of the Cable Car Barn after restoration, view from Mason Street, 1963 (SFMTA Photo Collection and Archives).

Jackson Street cable car entrance and west (rear) cable car yard, view from Jackson Street, 1964 (San Francisco Public Library, Historical Photograph Collection).

South (left) and east (right) façades of the Cable Car Barn after restoration, view from corner of Mason and Washington streets, 1965 (SFMTA Photo Collection and Archives).



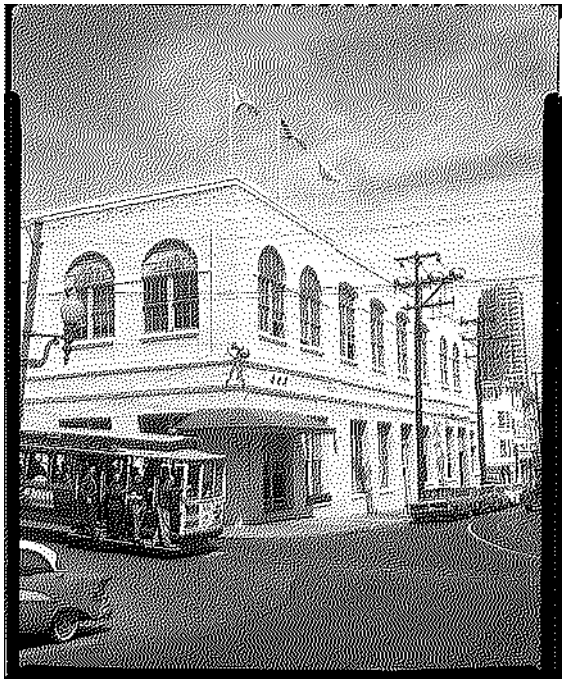
South (left) and east (right) façades of the Cable Car Barn after restoration, view from corner of Mason and Washington streets, 1965 (SFMTA Photo Collection and Archives).



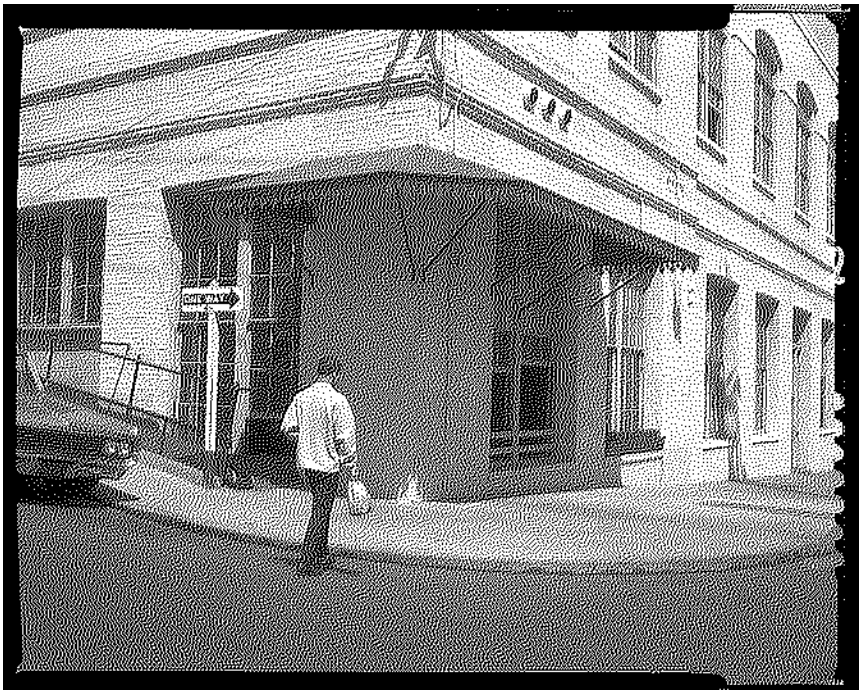
Ground floor of the south (left) and east (right) façades of the Cable Car Barn after restoration, view from corner of Mason and Washington streets, 1965 (SFMTA Photo Collection and Archives).

South (left) and east (right) façades of the Cable Car Barn after restoration, view from corner of Mason and Washington streets, 1965 (SFMTA Photo Collection and Archives).

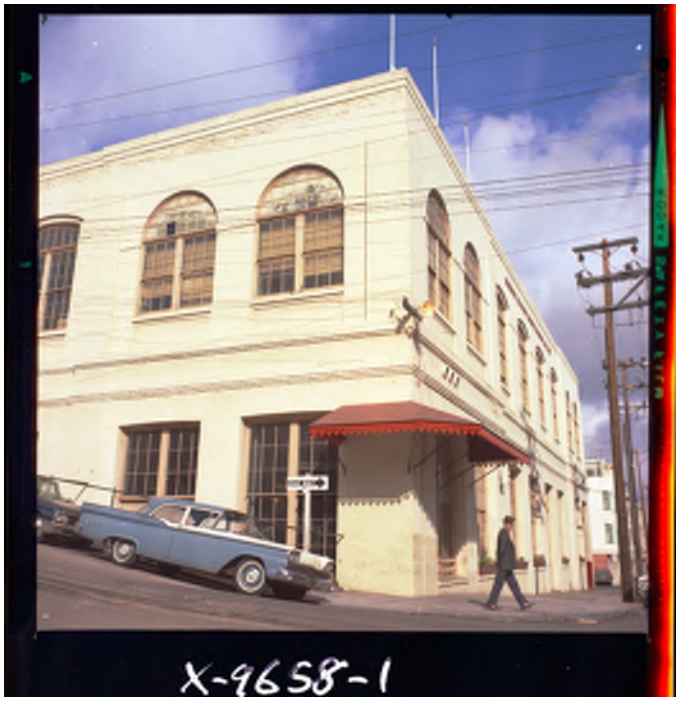
South (left) and east (right) façades of the Cable Car Barn after restoration, view from corner of Mason and Washington streets, 1965 (SFMTA Photo Collection and Archives).



South (left) and east (right) façades of the Cable Car Barn after restoration, view from corner of Mason and Washington streets, 1965 (SFMTA Photo Collection and Archives).



Ground floor of the Cable Car Barn at the corner of Mason and Washington streets, 1965 (SFMTA Photo Collection and Archives).



Southeast corner of the Cable Car Barn, view from the corner of Mason and Washington streets, 1966 (SFMTA Photo Collection and Archives).

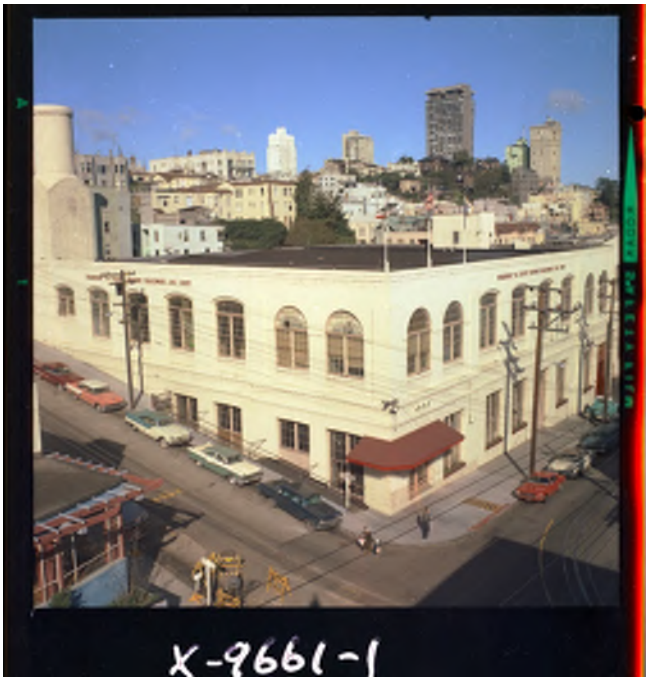
Former vehicle entrance at the east façade of the Cable Car Barn, view from Mason Street, 1966 (SFMTA Photo Collection and Archives).

Former vehicle entrance and the south portion of the east façade of the Cable Car Barn, view from Mason Street, 1966 (SFMTA Photo Collection and Archives).

South (left) and east (right) façades of the Cable Car Barn, view from corner of Mason and Washington streets, 1966 (SFMTA Photo Collection and Archives).

Ground floor of the south (left) and east (right) façades of the Cable Car Barn, view from corner of Mason and Washington streets, 1966 (SFMTA Photo Collection and Archives).

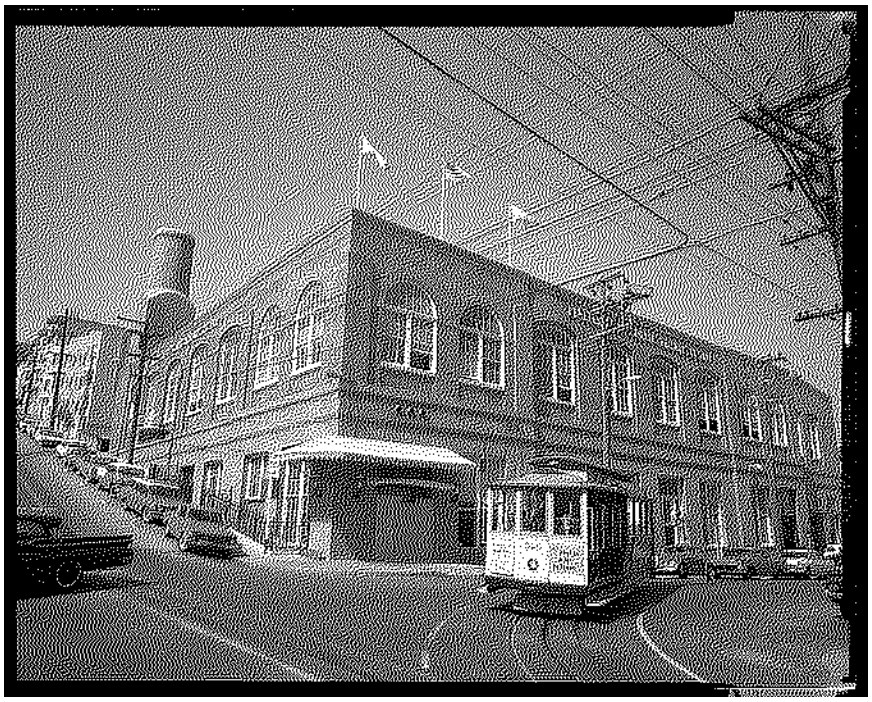
South (left) and east (right) façades of the Cable Car Barn, view from corner of Mason and Washington streets, 1966 (SFMTA Photo Collection and Archives).



South (left) and east (right) façades of the Cable Car Barn, view from building at corner of Mason and Washington streets, 1966 (SFMTA Photo Collection and Archives).

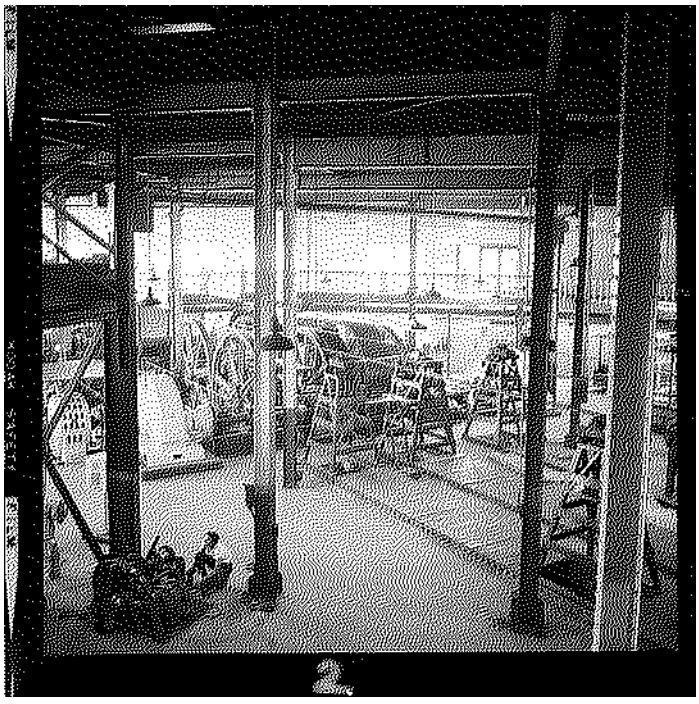
South (left) façade of the Cable Car Barn, view from Washington Street, 1966 (SFMTA Photo Collection and Archives).

Cable car turntable at the rear of the Cable Car Barn, 1966 (SFMTA Photo Collection and Archives).



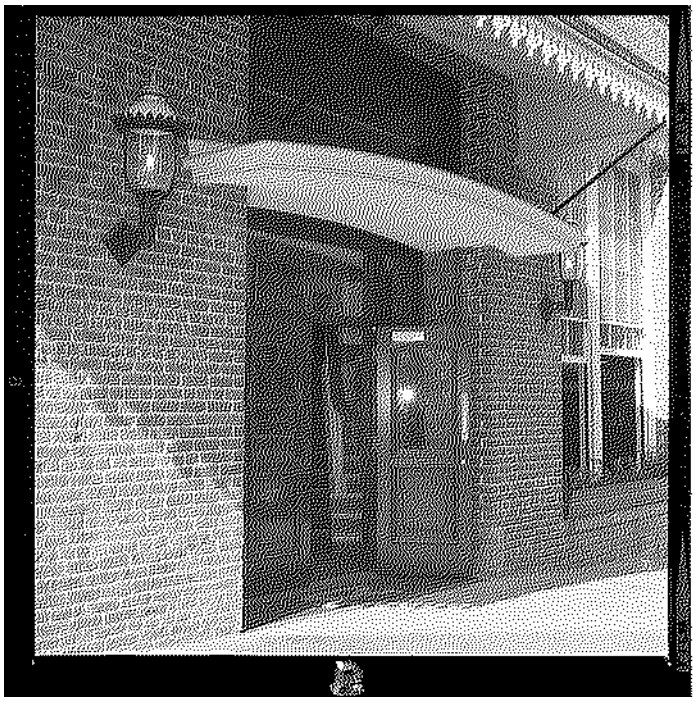
South (left) and east (right) façades of the Cable Car Barn during construction of the cable car museum, 1967 (SFMTA Photo Collection and Archives).

South (left) and east (right) façades of the Cable Car Barn during construction of the cable car museum, 1967 (SFMTA Photo Collection and Archives).

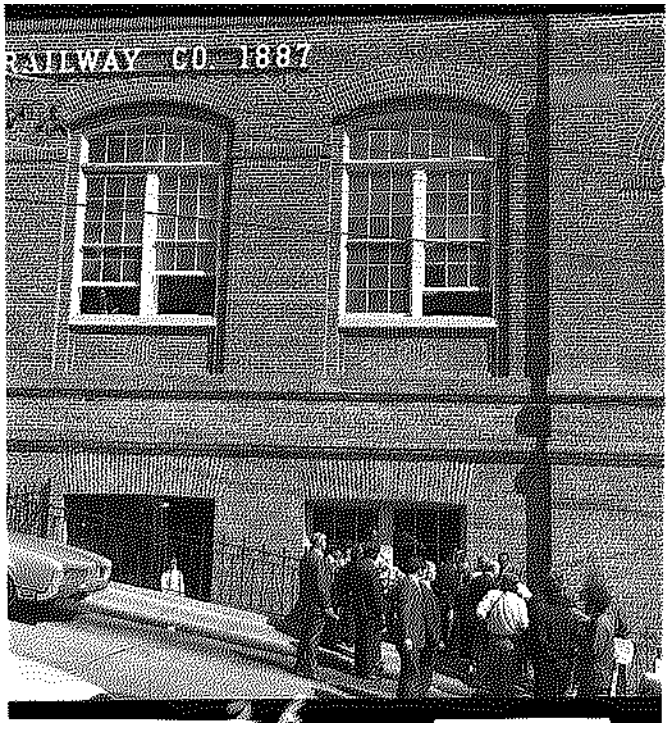


Interior of the Cable Car Barn with the cable turning equipment and museum mezzanine, 1967 (SFMTA Photo Collection and Archives).

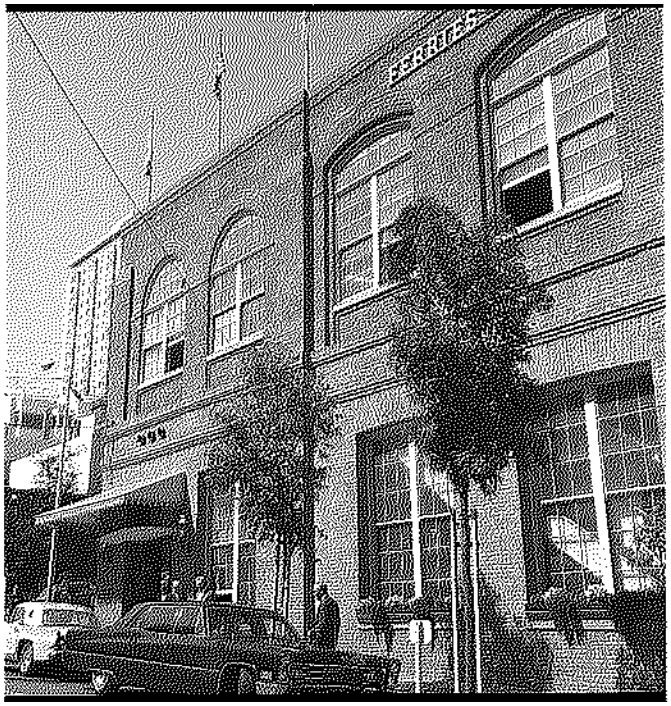
Interior of the Cable Car Barn at the entrance to the museum mezzanine, 1967 (SFMTA Photo Collection and Archives).



Entrance to the cable car museum at the southeast corner of the east façade of the Cable Car Barn, view from corner of Mason and Washington streets, 1967 (SFMTA Photo Collection and Archives).



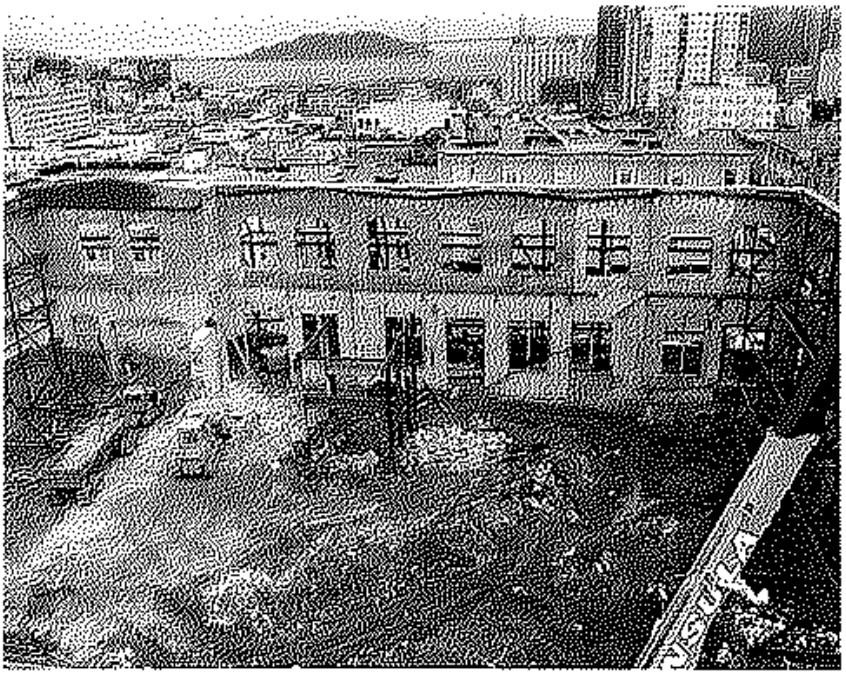
Secondary entrance to the cable car museum at the south façade of the Cable Car Barn, view from Washington Street, 1971 (SFMTA Photo Collection and Archives).



South portion of the east façade of the Cable Car Barn, view from Mason Street, 1971 (SFMTA Photo Collection and Archives).

Photo Collection and Archives

Washington Street cable car entrance and rear cable car yard (left), view from Washington Street, 1973 (SFMTA Photo Collection and Archives).



Rehabilitation of the Cable Car Barn with the east façade preserved and interior fully removed, view towards Mason Street, ca. 1980 (San Francisco Public Library, Historical Photograph Collection).

Rehabilitation of the Cable Car Barn with the east (left) façade, south (right) façade, and smokestack, view towards Washington Street, ca. 1980 (San Francisco Public Library, Historical Photograph Collection).

South (left) and east (right) façades of the Cable Car Barn, view from the corner of Washington and Mason streets, 1985 (SFMTA Photo Collection and Archives).

Appendix E: Building Permit Record

No. 6881

BRICK BUILDING

APPLICATION OF
1201 MASON

For Permit to Erect

Location

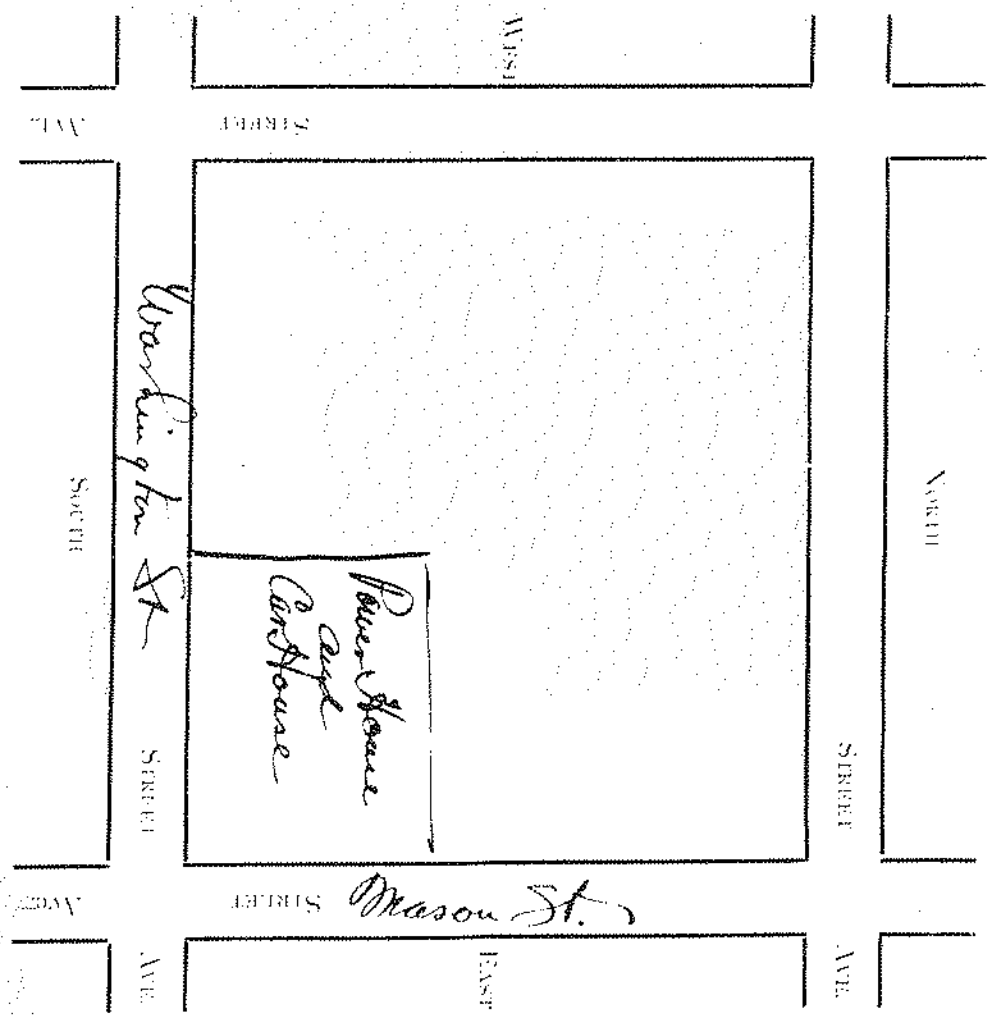
Filed DEC 18 1906

Referred to Inspector

DEC 26 1906

APPROVED:

Chief Building Inspector.



OFFICIAL COPY
SAN FRANCISCO
DEPARTMENT OF BUILDING INSPECTION

Phillips & Van Orden

WRITE IN INK—FILE TWO COPIES

Applicant must indicate in ink correctly and distinctly on the back of this sheet, a diagram of the lot with street, alleys, location of existing buildings on the lot, if any, and location and dimensions of proposed buildings. Plans and Specifications must be fastened together.

APPLICATION FOR BUILDING PERMIT.

BRICK BUILDING

Application is hereby made to the Board of Public Works of the City and County of San Francisco for permission to build a Power House and Car House on the lot situated N.W. Cor Washington and Mason Sts

in accordance with the plans and specifications submitted herewith.

All provisions of the building laws shall be complied with in the erection of said building, whether specified herein or not. Estimated cost of building $ 75,000 Building to be occupied as Power & Car House by ——— families.

Size of Lot 137.5 feet front 137.5 feet rear 137.5 feet deep.

Size of proposed building 137.5 x 137.5

Extreme height of building 48'

If party walls are to be used, give thickness and height of stories No party walls

Are foundations to be on solid or filled ground? Solid

Footings ~~will be of~~ Built before fire Foundation walls ~~will be of~~ built before fire

Concrete will be made of No concrete cement ..... parts. Sand ..... parts. Broken Stone ..... parts

Stone work laid in No stone mortar

Brick work laid in Cement mortar " one " " 6 " and lime paste

Face brick work laid in Same mortar

Face brick work. How bonded? Header course every 6th course.

	WALLS				PIERS OR COLUMNS		JOISTS			GIRDERS		
	Height	Material	Thickness Side	Thickness Front	Material	Size	Material	Size	Longest Span	Material	Size	Longest Span
Footings ✓												
Foundations ✓												
Basement ✓												
1st story	22'	Brick	21"	21"	Steel	Vary	2"x14"	O.P.	12'	Steel	Vary	13'
2nd story	15	"	17"	17"	"	"	2"x12"	"	"	"	"	"
3rd story												
4th story												
5th story												
6th story												
7th story												
8th story												
9th story												
10th story												

State size of bearing partitions on each floor.

	MATERIAL	SIZES
1st floor	Brick	21"
2nd "	"	17"

SAN FRANCISCO
DEPARTMENT OF
BUILDING INSPECTION
OFFICIAL COPY

Floor construction Wood joists on steel beams, 2" thick floor
Roof construction of Wood trusses & roof — Covered with tar & gravel 5 ply
Steep roof construction of ——— — Covered with ———
Walls coped with Cement — Cornices of Brick with cement coping
Partition, of Brick — Stair Partitions, of No partitions
Light court walls, of No courts
Exterior columns, of No exterior columns — Protected with ———
Interior columns, of Steel and wood — Protected with ———

Trusses supporting roofs, if of iron, describe Wood trusses

Flue linings, ~~&~~ None — ~~[illegible]~~ 1-7" diam stack
Boiler flue, of sheet steel ~~[illegible]~~ — height of flue above roof
No. of Stairways, width and construction

Boiler-room location S.W. Cor of Building walls of boiler-room
Ceiling and floor over boiler-room iron lath-3 coats plaster doors to boiler-room none
Fire shutters none
Bay windows, covered with none

Towers, domes or spires, size and extreme height above none level

Skylights, material, number and size none
No. of elevators one where located in Car House
Elevator enclosures, of No enclosure
Vaults under sidewalk Cable vaults

Retaining walls & in before fire occurred ~~[illegible]~~ thickness at top
Areas, coal holes, etc., state if any, and where in before fire occurred

I hereby agree to save, indemnify and keep harmless the City and County of San Francisco against all liabilities, judgments, costs and expenses which may in anywise accrue against said city and county in consequence of the granting of this permit, or from the use or occupancy of any sidewalk, street or sub-sidewalk place by virtue thereof and will in all things strictly comply with the conditions of this permit.

Architect H K Stevens — Owner United Rail Roads of San Francisco
Address United Rail Roads of San Francisco — Address Oak & Broderick
Builder American Hawaiian Eng & Const Co — By Albert Cuss
Address 332 Turk St — Chief Engr

(NOTE—The owner's name must be signed by himself, or by his Architect or authorized Agent.)

OFFICIAL COPY

Approved:

Zone Not Checked

CPC Setbacks

9/23/60 M. Grout
Department of City Planning

Approved:

Robert Murray Sept 26/60
Bureau of Fire Prevention & Public Safety

Approved:

George Jones 10/5/60
Structural Engineer, Bureau Building Inspection

Approved:

Bureau of Engineering

Approved:

Department of Public Health

Approved:

Department of Electricity

Approved:

Art Commission

Approved:

Boiler Inspector

Workman's Compensation Insurance Policy or Certificate filed with Central Permit Bureau . . . . . ☐

No Workman's Compensation Insurance Policy or Certificate on file for reason of exclusion checked:

(a) No one to be employed . . . . . ☐

(b) Casual labor only to employed . ☐

(c) Services or labor to be performed in return for aid or sustenance only, received from any religious, charitable or relief organization . . . ☐

REFER TO:

Bureau of Engineering . . . . . ☐
BBI Struct. Engineer . . . . . ☑
Boiler Inspector . . . . . ☐
Art Commission . . . . . ☐
Dept. of Public Health . . . . . ☐
. . . . . ☐

Approved Sept 22 1960

Building Inspector, Bureau of Building Inspection

I agree to comply with all conditions or stipulations of the various Bureaus or Departments noted hereon.

Owner or Owner's Authorized Agent

BLDG. FORM

3 No.

APPLICATION OF

City Owner

FOR PERMIT TO MAKE
ADDITIONS, ALTERATIONS or REPAIRS
TO BUILDING

Location 1201 Mason St

Total Cost $ 60300

Filed 9-21-60 19

Approved: SEP 22 1960

APPROVED
Dept. Public Works
OCT 6 - 1960
Robert C. Levy
SUPERINTENDENT
BUREAU BUILDING INSPECTION

Superintendent, Bureau of Building Inspection

Permit No. 215817

Issued OCT 1 1960 19

OFFICIAL COPY
SAN FRANCISCO
DEPARTMENT OF
BUILDING INSPECTION

CENTRAL PERMIT BUREAU F425

Write in Ink—File Two Copies

CITY AND COUNTY OF SAN FRANCISCO

DEPARTMENT OF PUBLIC WORKS
BLDG. FORM
3

RECEIVED
DEPT. OF PUBLIC WORKS
CENTRAL PERMIT BUREAU
1960 SEP 22 PM 3:17
BUILDING INSPECTION

APPLICATION FOR BUILDING PERMIT
ADDITIONS, ALTERATIONS OR REPAIRS

9-22-60 19

Application is hereby made to the Department of Public Works of San Francisco for permission to build in accordance with the plans and specifications submitted herewith and according to the description and for the purpose hereinafter set forth:

(1) Location: Mason & Washington St.

(2) Total Cost $ 10300 (3) No. of stories 2 (4) Basement — Yes or No

(5) Present use of building Carbarn (6) No. of families

(7) Proposed use of building Same (8) No. of families

(9) Type of construction 3 (1, 2, 3, 4, or 5) (10) Building Code Occupancy Classification

(11) Any other building on lot No (Yes or No) (Must be shown on plot plan if answer is Yes.)

(12) Does this alteration create an additional floor of occupancy No (Yes or No)

(13) Does this alteration create an additional story to the building No (Yes or No)

(14) Electrical work to be performed Yes (Yes or No) Plumbing work to be performed Yes (Yes or No)

(15) Ground floor area of building sq. ft. (16) Height of building 60 ft.

(17) Detailed description of work to be done

Alteration to interior walls - plans attached

(18) No portion of building or structure or scaffolding used during construction, to be closer than 6'0" to any wire containing more than 750 volts. See Sec. 385, California Penal Code.

(19) Supervision of construction by Address

(20) General contractor T. M. Cormick California License No.

Address

(21) Architect California Certificate No.

Address

(22) Engineer California Certificate No.

Address

(23) I hereby certify and agree that if a permit is issued for the construction described in this application, all the provisions of the permit and all laws and ordinances applicable thereto will be complied with. I further agree to save San Francisco and its officials and employees harmless from all costs and damages which may accrue from use or occupancy of the sidewalk, street or subsidewalk space or from anything else in connection with the work included in the permit. The foregoing covenant shall be binding upon the owner of said property, the applicant, their heirs, successors and assignees.

(24) Owner City (Phone 604-8421) (For Contact by Bureau)

Address

By Address

Owner's Authorized Agent to be Owner's Authorized Architect, Engineer or General Contractor.

PERMIT OF OCCUPANCY MUST BE OBTAINED ON COMPLETION OF HOTEL OR APARTMENT HOUSE PURSUANT TO SEC. 808 SAN FRANCISCO BUILDING CODE.

Approved:

Zone not checked

CPC Setbacks

4/21/61 Wayne S. Rule
Department of City Planning

Approved:

Ed Cowell 4/21/61
Bureau of Fire Prevention & Public Safety

Approved:

Civil Engineer, Bureau of Building Inspection

Approved:

Bureau of Engineering

Approved:

Department of Public Health

Approved:

Department of Electricity

Approved:

Art Commission

Approved:

Boiler Inspector

Approved:

Redevelopment Agency

Approved:

Parking Authority

No portion of building or structure or scaffolding used during construction to be closer than 6'0" to any wire containing more than 750 volts. See Sec. 385 California Penal Code.

REFER TO:

- Bureau of Engineering ☐
- BBI Struct. Engineer ☐
- Boiler Inspector ☐
- Art Commission ☐
- Dept. of Public Health ☐
- Dept. of Electricity ☐
- Redevelopment Agency ☐
- Parking Authority ☐

Approved April 21 1961

Provided the following conditions are complied with:

Building Inspector, Bureau of Building Inspection

I agree to comply with all conditions or stipulations of the various Bureaus or Departments noted hereon.

Owner or Owner's Authorized Agent

BLDG. FORM 3

APPLICATION OF

City of S.F. Lessee Owner

FOR PERMIT TO MAKE ADDITIONS, ALTERATIONS or REPAIRS TO BUILDING

1201 MASON

Location N.W. Corner Washington & Mason Sts

Total Cost $ 1500.00

Filed APR 13 1961 19

APPROVED:

APPROVED
Dept. Public Works
APR 21 1961

Robert C. Levy
SUPERINTENDENT
BUREAU BUILDING INSPECTION

Superintendent, Bureau of Building Inspection

Permit No. 222513

Issued APR 24 1961 19

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OFFICIAL COPY
SAN FRANCISCO
DEPARTMENT OF
BUILDING INSPECTION

CENTRAL PERMIT BUREAU F415

Write in Ink—File Two Copies

CITY AND COUNTY OF SAN FRANCISCO

DEPARTMENT OF PUBLIC WORKS
BLDG. FORM

RECEIVED
DEPT. OF PUBLIC WORKS
BUILDING INSPECTION

CENTRAL PERMIT BUREAU

APPLICATION FOR BUILDING PERMIT
ADDITIONS, ALTERATIONS OR REPAIRS

4-15 1961

Application is hereby made to the Department of Public Works of San Francisco for permission to build in accordance with the plans and specifications submitted herewith and according to the description and for the purpose hereinafter set forth:

(1) Location N.W. Corner Washington & Mason Sts

(2) Total Cost ($) 1500 (3) No. of Stories ..... (4) Basement or Cellar ..... yes or no

(5) Present Use of building Car House (6) No. of families .....

(7) Proposed Use of building " " (8) No. of families .....

(9) Type of construction ..... (10 ..... Proposed Building Code Classification
1, 2, 3, 4, or 5

(11) Any other building on lot No (must be shown on plot plan if answer is yes.)
yes or no

(12) Does this alteration create an additional story to the building? No
yes or no

(13) Does this alteration create a horizontal extension to the building? No
yes or no

(14) Does this alteration constitute a change of occupancy No
yes or no

(15) Electrical work to be performed Yes (16) Plumbing work to be performed Yes
yes or no yes or no

(17) Automobile runway to be altered or installed No
yes or no

(18) Sidewalk over sub-sidewalk space to be repaired or altered No
yes or no

(19) Write in description of all work to be performed under this application:
(Reference to plans is not sufficient)

additional wash room

(20) Supervision of construction by ..... Address .....

(21) General Contractor Robert L. Sage California License No. 185893
Address 1050 Cragmont Ave Berkeley

(22) Architect or Engineer P.U. Eng Bureau California Certificate No. .....
(for design)
Address .....

(23) Architect or Engineer P.U. Eng. Bureau California Certificate No. .....
(for construction)
Address .....

(24) I hereby certify and agree that if a permit is issued for the construction described in this application, all the provisions of the permit and all laws and ordinances applicable thereto will be complied with. I further agree to save San Francisco and its officials and employees harmless from all costs and damages which may accrue from use or occupancy of the sidewalk, street or subsidewalk space or from anything else in connection with the work included in the permit. The foregoing covenant shall be binding upon the owner of said property, the applicant, their heirs, successors and assignees.

(25) Owner City of S.F. P.U. Comm (Phone LA-9-9064
For contract by Bureau
Address .....
By Robert L. Sage Address 1050 Cragmont Ave
Owner's Authorized Agent to be Owner's Authorized Architect, Engineer or General Contractor.

CERTIFICATE OF FINAL COMPLETION AND/OR PERMIT OF OCCUPANCY MUST BE OBTAINED ON COMPLETION OF WORK OR ALTERATION INVOLVING AN ENLARGEMENT OF THE BUILDING OR A CHANGE OF OCCUPANCY PURSUANT TO SEC. 808 AND 809, SAN FRANCISCO BUILDING CODE, BEFORE BUILDING IS OCCUPIED.

Pursuant to Sec. 304, San Francisco Building Code, the building permit shall be posted on job. Owner is responsible for approved plans and application being kept at building site.

APPROVAL OF THIS APPLICATION DOES NOT CONSTITUTE AN APPROVAL FOR THE ELECTRICAL WIRING OR PLUMBING INSTALLATIONS. A SEPARATE PERMIT FOR THE WIRING AND PLUMBING MUST BE OBTAINED.

THIS IS NOT A BUILDING PERMIT. NO WORK SHALL BE STARTED UNTIL A BUILDING PERMIT IS ISSUED.

SAN FRANCISCO
DEPARTMENT OF
BUILDING INSPECTION
OFFICIAL COPY

FOR DEPARTMENTAL USE ONLY

TITLE 24 Y ☐ N ☐

HANDICAPPED ACCESS

APPROVED
BUILDING PERMIT NOW
MAR - 2 1983

FILMED

Robert C. Levy 2-21-83

DATE FILED 9-8-82

PERMIT NO. 499143

ISS. DEC - 2 1983

CITY AND COUNTY OF SAN FRANCISCO
DEPARTMENT OF PUBLIC WORKS

APPLICATION FOR BUILDING PERMIT
ADDITIONS, ALTERATIONS OR REPAIRS

BLDG. FORM 3

APPLICATION IS HEREBY MADE TO THE DEPARTMENT OF PUBLIC WORKS OF SAN FRANCISCO FOR PERMISSION TO BUILD IN ACCORDANCE WITH THE PLANS AND SPECIFICATIONS SUBMITTED HEREWITH AND ACCORDING TO THE DESCRIPTION AND FOR THE PURPOSE HEREINAFTER SET FORTH

OFFICE COPY

(1) STREET ADDRESS OF JOB
San Francisco Cable Car Barn
Mason and Washington Street
San Francisco, CA
1201 MASON

(2) ESTIMATED COST OF JOB
$12,500,000.00

9/12

DESCRIPTION OF EXISTING BUILDING

(4A) TYPE OF CONSTR. 1 ☒ 2 ☐ 3 ☐ 4 ☐ 5 ☐	(5A) NUMBER OF STORIES OF OCCUPANCY 2	(6A) NUMBER OF BASEMENTS AND CELLARS 1	(7A) PRESENT USE Cable Car Garage	(8A) BLDG. CODE OCCUP. CLASS B3, F2, S G	(9A) NO. OF DWELLING UNITS 0

DESCRIPTION OF BUILDING AFTER PROPOSED ALTERATION Machinery Area

(4) TYPE OF CONSTR. 1 ☒ 2 ☐ 3 ☐ 4 ☐ 5 ☐	(5) NUMBER OF STORIES OF OCCUPANCY 2	(6) NUMBER OF BASEMENTS AND CELLARS 1	(7) PROPOSED USE Cable Car Garage Maint. Area & Cable Mach. Area	(8) BLDG. CODE OCCUP. CLASS B3 F2 & G	(9) NO. OF DWELLING UNITS 0

(10A) DOES THIS ALTERATION CREATE ADDITIONAL STORY TO BUILDING?	YES ☐ NO ☒	(10) IF YES, STATE NEW HEIGHT AT CENTER LINE OF FRONT ____ FT	(11A) DOES THIS ALTERATION CREATE DECK OR MOBILE EXTENSION TO BUILDING?	YES ☐ NO ☒	(11) IF YES, STATE NEW GROUND FLOOR AREA ____ SQ. FT
(12) WILL SIDEWALK OVER SUB-SIDEWALK SPACE BE REPAIRED OR ALTERED?	YES ☐ NO ☐	(13) WILL BUILDING EXTEND BEYOND PROPERTY LINE?	YES ☐ NO ☒	(14) IS AUTO RUNWAY TO BE CONSTRUCTED OR ALTERED?	YES ☐ NO ☐	(15) WILL STREET SPACE BE USED DURING CONSTRUCTION?	YES ☐ NO ☐
(19) ANY OTHER EXISTING BLDG ON LOT? (IF YES, SHOW ON PLOT PLAN)	YES ☐ NO ☒	(20) DOES THIS ALTERATION CONSTITUTE A CHANGE OF OCCUPANCY?	YES ☐ NO ☒	(21) ELECTRICAL WORK TO BE PERFORMED?	YES ☒ NO ☐	(22) PLUMBING WORK TO BE PERFORMED?	YES ☒ NO ☐

(23) GENERAL CONTRACTOR — ADDRESS — PHONE — CALIF. LICENSE NO.
Tutor-Saliba, Inc. Sylmar, CA

(24) ARCHITECT OR ENGINEER | DESIGN ☐ CONSTRUCTION ☐ — ADDRESS — CALIF. CERTIFICATE NO.
Chin & Hensolt Engineers, Inc. 246 First Street, San Francisco, CA

(25) CONSTRUCTION LENDER (ENTER NAME AND BRANCH DESIGNATION IF ANY. IF THERE IS NO KNOWN CONSTRUCTION LENDER, ENTER "UNKNOWN") — ADDRESS
Unknown

(26) OWNER — LESSEE (CROSS OUT ONE) — ADDRESS — PHONE (FOR CONTACT BY BUREAU)
Public Utilities Commission 593 Vermont Street, San Francisco, CA 558-2598

(27) WRITE IN DESCRIPTION OF ALL WORK TO BE PERFORMED UNDER THIS APPLICATION. REFERENCE TO PLANS IS NOT SUFFICIENT.

Demolition, Earthwork, Caissons, Concrete & Masonry, Structural Steel, Carpentry, Roofing & Waterproofing, Doors, Windows & Glass, Plastering, Floor & Wall Finishing, Building Specialties, Carpeting, Passenger & Freight Elevators, Cranes, Turntables, Plumbing, Heating & Ventilating, Fire Protection and Electrical.

IMPORTANT NOTICES

No change shall be made in the character of the occupancy or use without first obtaining a Building Permit authorizing such change. See Sec. 103, 104.8, 104.8.1, 104.C, 502, 502.1, San Francisco Building Code and Sec. 104, San Francisco Housing Code.

No portion of building or structure or scaffolding used during construction, to be closer than 5'0" to any wire containing more than 750 volts. See Sec. 385, California Penal Code.

Pursuant to Sec. 302 A.8. San Francisco Building Code, the building permit shall be posted on the job. The owner is responsible for approved plans and application being kept at building site.

Grade lines as shown on drawings accompanying this application are assumed to be correct. If actual grade lines are not the same as shown, revised drawings showing correct grade lines, cuts and fills together with complete details of retaining walls and wall footings required must be submitted to this bureau for approval.

ANY STIPULATION REQUIRED HEREIN OR BY CODE MAY BE APPEALED.

BUILDING NOT TO BE OCCUPIED UNTIL CERTIFICATE OF FINAL COMPLETION IS POSTED ON THE BUILDING OR PERMIT OF OCCUPANCY GRANTED, WHEN REQUIRED.

APPROVAL OF THIS APPLICATION DOES NOT CONSTITUTE AN APPROVAL FOR THE ELECTRICAL WIRING OR PLUMBING INSTALLATIONS. A SEPARATE PERMIT FOR THE WIRING AND PLUMBING MUST BE OBTAINED. SEPARATE PERMITS ARE REQUIRED IF ANSWER IS "YES" TO ANY OF ABOVE QUESTIONS 15, 16, 17, 20, 21, or 22.

THIS IS NOT A BUILDING PERMIT. NO WORK SHALL BE STARTED UNTIL A BUILDING PERMIT IS ISSUED.

In dwellings all insulating materials must have a clearance of not less than two inches from all electrical wires or equipment.

CHECK APPROPRIATE BOX

☐ OWNER ☐ ARCHITECT ☒ ENGINEER
☐ LESSEE ☐ AGENT WITH POWER OF ATTORNEY
☐ CONTRACTOR ☐ ATTORNEY-IN-FACT

APPLICANT'S CERTIFICATION

I HEREBY CERTIFY AND AGREE THAT IF A PERMIT IS ISSUED FOR THE CONSTRUCTION DESCRIBED IN THIS APPLICATION, ALL THE PROVISIONS OF THE PERMIT AND ALL LAWS AND ORDINANCES THERETO WILL BE COMPLIED WITH.

NOTICE TO APPLICANT

HOLD HARMLESS CLAUSE. The Permittee(s) by acceptance of this permit, agree(s) to indemnify and hold harmless the City and County of San Francisco from and against any and all claims, demands and actions for damages resulting from operations under this permit, regardless of negligence of the City and County of San Francisco, and to assume the defense of the City and County of San Francisco against all such claims, demands and actions.

In conformity with the provisions of Section 3800 of the Labor Code of the State of California, the applicant shall have on file, or file with the Central Permit Bureau, either Certificate (I) or (II) or (III) designated below or shall execute Item (IV) or (V) or (VI) below, whichever is applicable. If however, Item (VI) is checked then Item (V) must be checked as well. Mark the appropriate method of compliance below:

- ☐ I — Certificate of Consent to Self-Insure issued by the Director of Industrial Relations.
- ☐ II — Certificate of Workman's Compensation Insurance issued by an admitted insurer.
- ☐ III — An exact copy or duplicate of (I) or (II) certified by the Director or (II) certified by the insurer.
- ☐ IV — The cost of the work to be performed is $100 or less.
- ☐ V — I certify that in the performance of the work for which this Permit is issued, I shall not employ any person in any manner so as to become subject to the workman's compensation laws of California. I further acknowledge that I understand, in the event that I should become subject to the workman's compensation provisions of the Labor Code of California and fail to comply forthwith with the provisions of Section 3800 of the Labor Code, that the Permit hereon applied for shall be deemed revoked.
- X VI — I certify as the owner of the agent of the owner that in the performance of the work for which this Permit is issued, I will employ a contractor who complies with the workman's compensation laws of California and who has on file, or prior to the commencement of any work, will file with the Central Permit Bureau evidence that workman's compensation insurance is carried.

Applicant's Signature: [signature] Date: 9-8-82

OFFICIAL COPY
SAN FRANCISCO
DEPARTMENT OF BUILDING INSPECTION
APPROVED

CONDITIONS AND STIPULATIONS

[illegible]
FOR PUBLIC USE
FOR PUBLIC USE ONLY

[illegible] 9/16/82
BUILDING INSPECTOR, BUR. OF BLDG. INSP.

DATE: [illegible]
REASON:
NOTIFIED MR.

APPROVED: Cof A Approved CA81.6 5/3/81
EE 79.55

☒ PROJECT HAS BEEN DETERMINED NOT TO HAVE A SIGNIFICANT EFFECT ON THE ENVIRONMENT

[illegible] SEP 1[illegible] 1982
DEPARTMENT OF CITY PLANNING

DATE:
REASON:
NOTIFIED MR.

APPROVED: as per plans. Submit sprinkler plans prior to installation. Supervised system

PLEASE NOTIFY SFFD AT START OF WORK
CONTACT FIRE INSPECTOR
[illegible] 861-8000 EXT. 3[illegible]

[illegible] 12-7-82
BUREAU OF FIRE PREVENTION & PUBLIC SAFETY

DATE:
REASON:
NOTIFIED MR.

APPROVED: as noted on plans

SPECIAL INSPECTION REQUIRED PER UBC SECTION [illegible]

[illegible] 2/22/83
CIVIL ENGINEER, BUR. OF BLDG. INSPECTION

DATE:
REASON:
NOTIFIED MR.

APPROVED:

R. Wong 1-5-83
BUREAU OF ENGINEERING

DATE:
REASON:
NOTIFIED MR.

APPROVED:

DEPARTMENT OF PUBLIC HEALTH

DATE:
REASON:
NOTIFIED MR.

APPROVED:

REDEVELOPMENT AGENCY

DATE:
REASON:
NOTIFIED MR.

APPROVED: Chief

[illegible] 2/28/83
REDEVELOPMENT ENGINEER, DIVISION OF [illegible], BUR. INSP. R.D.A.

DATE:
REASON:
NOTIFIED MR.

APPROVED:
PC plan checker. Comments

[illegible] 10/28/82

DATE:
REASON:
NOTIFIED MR.

I AGREE TO COMPLY WITH ALL CONDITIONS OR STIPULATIONS OF THE VARIOUS BUREAUS OR DEPARTMENTS NOTED ON THIS APPLICATION, AND ATTACHED STATEMENTS OF CONDITIONS OR STIPULATIONS, WHICH ARE HEREBY MADE A PART OF THIS APPLICATION.
NUMBER OF ATTACHMENTS ☐

[illegible] FOR [illegible]
SIGNATURE OF OWNER, LESSEE OR AUTHORIZED AGENT FOR OWNER OR LESSEE

HOLD SECTION — NOTE DATES AND NAMES OF ALL PERSONS NOTIFIED DURING PROCESSING

OFFICIAL COPY
SAN FRANCISCO
DEPARTMENT OF
BUILDING INSPECTION

CITY & COUNTY OF SAN FRANCISCO

APPLICATION FILING FEE – PLAN CHECKING RECEIPT

115483

RECEIVED OF

BUILDING APPLICATION NUMBERS

FCC [illegible]

FEE FOR APPLICATION FILING AND CHECKING PLANS PRESCRIBED BY SAN FRANCISCO BUILDING CODE

	DATE	ESTIMATED COST	FEE	REVENUE NO
APPLICATION FILING EX 35-32			[illegible]	7223
PLAN CHECKING	1-21-53		[illegible]	7226

FINAL PLAN CHECKING	FINAL COST	FEE	RECEIVED

3 BUREAU APPL

DEPARTMENT OF PUBLIC WORKS
CENTRAL PERMIT BUREAU

BY [illegible]

OFFICIAL COPY
SAN FRANCISCO
DEPARTMENT OF
BUILDING INSPECTION

CITY AND COUNTY OF SAN FRANCISCO
DEPARTMENT OF PUBLIC WORKS
CENTRAL PERMIT BUREAU

GENERAL
RECEIPT
NO. **35032**

1-[illegible] 1953

RECEIVED FROM:

[illegible]

[illegible] 320 7431

PAYMENT RECEIVED FOR THE ITEMS INDICATED:

NUMBER	DESCRIPTION	AMOUNT
	Exp Fee	15 00
	[illegible]	2,000 00
	SMP	1,250 00
		3,265 00

CENTRAL PERMIT BUREAU

ACCOUNTING

By AC

SAN FRANCISCO
DEPARTMENT OF
BUILDING INSPECTION
OFFICIAL COPY

WAIVER OF TIME RESTRICTION ON REQUESTS
FOR ADDITIONAL INFORMATION

I hereby waive all time restrictions relative to submission of additional information. This waiver applies to those provisions of law which limit the City and County of San Francisco's ability to require further information for this project application. These provisions of law include Sections 65943 and 65944 of Chapter 4.5 of Division 1 of Title 7 of the Government Code (Review and Approval of Development Projects).

Applicant's/Owner's Signature

PUBLIC UTILITIES COMMISSION UTILITY ENGINEERING BUREAU
Type or Print Name

SEPTEMBER 3, 1982
Date

Application No.

693 VERMONT STREET, SAN FRANCISCO CA 94107
Address

CPB 46

OFFICIAL COPY

SAN FRANCISCO
DEPARTMENT OF
BUILDING INSPECTION

CENTRAL PERMIT BUREAU
450 McAllister Street
San Francisco, CA 94102

Appl. # 08207431

Address 1201 Mason
SF Ca
Building Permit

LICENSED CONTRACTOR'S STATEMENT

Licensed Contractor's Declaration

Pursuant to the Business and Professions Code Sec. 7031.5, I hereby affirm that I am licensed under the provisions of Chapter 9 (commencing with Sec. 7000) of Division 3 of the Business and Professions Code, and that my license is in full force and effect.

License # 323829 License Class A, B

Date ~~11-18-82~~ Contractor (print) Tutor-Saliba

(signature) Earl F. [illegible]

Owner-Builder Declaration

I hereby affirm that I am exempt from the Contractor's License Law, Business and Professions Code (Sec. 7031.5). (Mark the appropriate box below.)

☐ I, as owner of the property, or my employees with wages as their sole compensation will do the work, and the structure is not intended or offered for sale (Sec. 7044). I further acknowledge that I understand and agree that in the event that any work is commenced contrary to the representations contained herein, that the Permit herein applied for shall be deemed cancelled.

☐ I, as architect owner am contracting with licensed contractors to construct this project (Sec. 7044). I certify that at the time such contractors are selected I will have them file a copy of this form (Licensed Contractors Declaration) prior to the commencement of any work. I further acknowledge that I understand and agree that, in the event that said contractors fail to file a copy of the Declaration with the Central Permit Bureau, that the Permit herein applied for shall be deemed cancelled.

☐ I am exempt under Business and Professions Code Sec. ____

Reason ____

Date ____ Owner (print) ____

(signature) ____

NOTICE: "Any violation of the Bus. & Prof. Code Sec. 7031.5 by any permit applicant shall be subject to a civil penalty of not more than five hundred dollars ($500)." Bus. & Prof. Code Sec. 7031.5

OFFICIAL COPY

DEPARTMENT OF BUILDING INSPECTION

USE ONLY

DEC 07 1982

APPROVED: ☐
Dept. Public Works
DEC 10 1982
Robert G. Levy
SUPERINTENDENT BUILDING INSPECTION

CITY AND COUNTY OF SAN FRANCISCO
DEPARTMENT OF PUBLIC WORKS

BLDG. FORM 3

APPLICATION FOR BUILDING PERMIT
ADDITIONS, ALTERATIONS OR REPAIRS

APPLICATION NO. 08208280

3-17-83

OFFICE COPY

APPLICATION IS HEREBY MADE TO THE DEPARTMENT OF PUBLIC WORKS OF SAN FRANCISCO FOR PERMISSION TO BUILD IN ACCORDANCE WITH THE PLANS AND SPECIFICATIONS SUBMITTED HEREWITH AND ACCORDING TO THE DESCRIPTION AND FOR THE PURPOSE HEREINAFTER SET FORTH:

(1) STREET ADDRESS OF JOB: 1201 MASON ST
San Francisco Cable Car Barn
Mason and Washington Street
San Francisco, CA.

DATE FILED (AT BUILDING INSPECTION): 10-8-82

FILING FEE RECEIPT NO.: Waived

PERMIT NO.: 495981

ISSUED: DEC 10 1982

(3) ESTIMATED COST OF JOB: ~~$12,500,000.00~~ $200000

DESCRIPTION OF EXISTING BUILDING

(4A) TYPE OF CONSTR. 1-hr ☒ N ☐ 1 ☐ 2 ☐ 3 ☒ 4 ☐ 5 ☐	(5A) NUMBER OF STORIES OF OCCUPANCY: 2	(6A) NUMBER OF BASEMENTS AND CELLARS:	(7A) PRESENT USE: Cable Car Stor., Maint.,&Machinery	(8A) BLDG. CODE OCCUP. CLASS: B3, F2, & G	(9A) NO. OF DWELLING UNITS: 0

DESCRIPTION OF BUILDING AFTER PROPOSED ALTERATION

(4) TYPE OF CONSTR. 1-hr ☒ N ☐ 1 ☐ 2 ☐ 3 ☒ 4 ☐ 5 ☐	(5) NUMBER OF STORIES OF OCCUPANCY: 2	(6) NUMBER OF BASEMENTS AND CELLARS: 1	(7) PROPOSED USE: Cable Car Stor., Maint., & Machinery	(8) BLDG. CODE OCCUP. CLASS: B3, F2, & G	(9) NO. OF DWELLING UNITS: 0

(10A) DOES THIS ALTERATION CREATE ADDITIONAL STORY TO BUILDING? YES ☐ NO ☒	(10) IF YES, STATE NEW HEIGHT AT CENTER LINE OF FRONT: FT.	(11A) DOES THIS ALTERATION CREATE DECK OR HORIZ. EXTENSION TO BUILDING? YES ☐ NO ☒	(11) IF YES, STATE NEW GROUND FLOOR AREA: SQ. FT.
(14) WILL SIDEWALK OVER SUB-SIDEWALK SPACE BE REPAIRED OR ALTERED? YES ☐ NO ☒	(15) WILL BUILDING EXTEND BEYOND PROPERTY LINE? YES ☐ NO ☒	(16) IS AUTO RUNWAY TO BE CONSTRUCTED OR ALTERED? YES ☐ NO ☒	(17) WILL STREET SPACE BE USED DURING CONSTRUCTION? YES ☐ NO ☒
(19) ANY OTHER EXISTING BLDG. ON LOT? (IF YES, SHOW ON PLOT PLAN) YES ☐ NO ☒	(20) DOES THIS ALTERATION CONSTITUTE A CHANGE OF OCCUPANCY? YES ☐ NO ☒	(21) ELECTRICAL WORK TO BE PERFORMED? YES ☐ NO ☒	(22) PLUMBING WORK TO BE PERFORMED? YES ☐ NO ☒

(23) GENERAL CONTRACTOR: Tutor-Saliba, Inc., Sylmar, CA. ADDRESS: 15901 Olden St. Sylmar, Ca. 91342 PHONE: CALIF. LICENSE NO.:

(24) ARCHITECT OR ENGINEER (DESIGN ☐ CONSTRUCTION ☐): Chin & Hensolt Engineers, Inc., 246 First Street, San Francisco, CA. ADDRESS: CALIF. CERTIFICATE NO.:

(25) CONSTRUCTION LENDER (ENTER NAME AND BRANCH DESIGNATION IF ANY. IF THERE IS NO KNOWN CONSTRUCTION LENDER, ENTER "UNKNOWN"): Unknown ADDRESS:

(26) OWNER — LESSEE (CROSS OUT ONE): Public Utilities Commission ADDRESS: 693 Vermont Street, San Francisco, CA. PHONE (FOR CONTACT BY BUREAU): 558-2598

(27) WRITE IN DESCRIPTION OF ALL WORK TO BE PERFORMED UNDER THIS APPLICATION (REFERENCE TO PLANS IS NOT SUFFICIENT):

Non-structural demolition and alterations pursuant to pending construction of work described on Building Permit Application No. 08207431, filed on Sept. 3, 1982.

IMPORTANT NOTICES

No change shall be made in the character of the occupancy or use without first obtaining a Building Permit authorizing such change. See Sec. 103, 104.B, 104.B.1, 104.C, 502, 502.1, San Francisco Building Code and Sec. 104, San Francisco Housing Code.

No portion of building or structure or scaffolding used during construction, to be closer than 6'0" to any wire containing more than 750 volts. See Sec. 385, California Penal Code.

Pursuant to Sec. 302 A.B. San Francisco Building Code, the building permit shall be posted on the job. The owner is responsible for approved plans and application being kept at building site.

Grade lines as shown on drawings accompanying this application are assumed to be correct. If actual grade lines are not the same as shown revised drawings showing correct grade lines, cuts and fills together with complete details of retaining walls and wall footings required must be submitted to this bureau for approval.

ANY STIPULATION REQUIRED HEREIN OR BY CODE MAY BE APPEALED.

BUILDING NOT TO BE OCCUPIED UNTIL CERTIFICATE OF FINAL COMPLETION IS POSTED ON THE BUILDING OR PERMIT OF OCCUPANCY GRANTED, WHEN REQUIRED. APPROVAL OF THIS APPLICATION DOES NOT CONSTITUTE AN APPROVAL FOR THE ELECTRICAL WIRING OR PLUMBING INSTALLATIONS. A SEPARATE PERMIT FOR THE WIRING AND PLUMBING MUST BE OBTAINED. SEPARATE PERMITS ARE REQUIRED IF ANSWER IS "YES" TO ANY OF ABOVE QUESTIONS (15) (16) (17) (20) (21) or (22).

THIS IS NOT A BUILDING PERMIT. NO WORK SHALL BE STARTED UNTIL A BUILDING PERMIT IS ISSUED.

In dwellings all insulating materials must have a clearance of not less than two inches from all electrical wires or equipment.

CHECK APPROPRIATE BOX:

☒ OWNER ☐ ARCHITECT ☐ ENGINEER
☐ LESSEE ☐ AGENT WITH POWER OF ATTORNEY
☐ CONTRACTOR ☐ ATTORNEY IN FACT

APPLICANT'S CERTIFICATION

I HEREBY CERTIFY AND AGREE THAT IF A PERMIT IS ISSUED FOR THE CONSTRUCTION DESCRIBED IN THIS APPLICATION, ALL THE PROVISIONS OF THE PERMIT AND ALL LAWS AND ORDINANCES THERETO WILL BE COMPLIED WITH.

NOTICE TO APPLICANT

HOLD HARMLESS CLAUSE: The Permittee(s) by acceptance of this permit, agree(s) to indemnify and hold harmless the City and County of San Francisco from and against any and all claims, demands and actions for damages resulting from operations under this permit, regardless of negligence of the City and County of San Francisco, and to assume the defense of the City and County of San Francisco against all such claims, demands and actions.

In conformity with the provisions of Section 3800 of the Labor Code of the State of California, the applicant shall have on file, or file with the Central Permit Bureau, either Certificate (I) or (II) or (III) designated below or shall indicate Item (IV) or (V) or (VI) below, whichever is applicable. If however, Item (VI) is checked then Item (V) must be checked as well. Mark the appropriate method of compliance below:

( ) I. Certificate of Consent to Self-Insure issued by the Director of Industrial Relations.
(X) II. Certificate of Workman's Compensation Insurance issued by an admitted insurer.
( ) III. An exact copy or duplicate of (I) certified by the Director or (II) certified by the insurer.
( ) IV. The cost of the work to be performed is $100 or less.
( ) V. I certify that in the performance of the work for which this Permit is issued, I shall not employ any person in any manner so as to become subject to the workman's compensation laws of California. I further acknowledge that I understand, in the event that I should become subject to the workman's compensation provisions of the Labor Code of California and fail to comply forthwith with the provisions of Section 3800 of the Labor Code, that the Permit herein applied for shall be deemed revoked.
( ) VI. I certify as the owner (or the agent of the owner) that in the performance of the work for which this Permit is issued, I will employ a contractor who complies with the workman's compensation laws of California and who has on file, or prior to the commencement of any work will file, with the Central Permit Bureau evidence that workman's compensation insurance is carried.

Applicant's Signature: R. B. Raffaelli Date: 10/8/82

OFFICIAL COPY
SAN FRANCISCO
DEPARTMENT OF
BUILDING INSPECTION

CONDITIONS AND STIPULATIONS

APPROVED: The approval of this application and issuance of permit applies to specified work only and does not constitute an approval of the building.	Carroll McKelly 10/14/82 BUILDING INSPECTOR, BUR. OF BLDG. INSP.	DATE: REASON: NOTIFIED MR.
☒ APPROVED: Malone L.M. Revoked [illegible] [illegible] [illegible] EXEMPT FROM ENVIRONMENTAL REVIEW NOV 24 1982	DEPARTMENT OF CITY PLANNING	DATE: REASON: NOTIFIED MR.
APPROVED: Fire Dept. Work	Robert [illegible] 12/14/82 BUREAU OF FIRE PREVENTION & PUBLIC SAFETY	DATE: REASON: NOTIFIED MR.
☐ APPROVED:	CIVIL ENGINEER, BUR. OF BLDG. INSPECTION	DATE: REASON: NOTIFIED MR.
☐ APPROVED:	BUREAU OF ENGINEERING	DATE: REASON: NOTIFIED MR.
☐ APPROVED:	DEPARTMENT OF PUBLIC HEALTH	DATE: REASON: NOTIFIED MR.
☐ APPROVED:	REDEVELOPMENT AGENCY	DATE: REASON: NOTIFIED MR.
☐ APPROVED:	RESIDENTIAL ENV. INSPECTOR, DIV. OF APT. & HOTEL INSP., B.B.I	DATE: REASON: NOTIFIED MR.
☐ APPROVED:	10/14/82 [illegible] Chief	DATE: REASON: NOTIFIED MR.

HOLD SECTION — NOTE DATES AND NAMES OF ALL PERSONS NOTIFIED DURING PROCESSING

I AGREE TO COMPLY WITH ALL CONDITIONS OR STIPULATIONS OF THE VARIOUS BUREAUS OR DEPARTMENTS NOTED ON THIS APPLICATION, AND ATTACHED STATEMENTS OF CONDITIONS OR STIPULATIONS, WHICH ARE HEREBY MADE A PART OF THIS APPLICATION.
NUMBER OF ATTACHMENTS ☐

X Carrie Chin 12/10/82
SIGNATURE OF OWNER, LESSEE OR AUTHORIZED AGENT FOR OWNER OR LESSEE.

SAN FRANCISCO
DEPARTMENT OF
BUILDING INSPECTION
OFFICIAL COPY

WAIVER OF TIME RESTRICTION ON REQUESTS FOR ADDITIONAL INFORMATION

I hereby waive all time restrictions relative to submission of additional information. This waiver applies to those provisions of law which limit the City and County of San Francisco's ability to require further information for this project application. These provisions of law include Sections 65943 and 65944 of Chapter 4.5 of Division 1 of Title 7 of the Government Code (Review and Approval of Development Projects).

X [signature]
Applicant's/Owner's Signature

PUBLIC UTILITIES COMMISSION UTILITY
Type or Print Name ENGINEERING BUREAU

OCTOBER 8, 1982
Date

Application No.

693 VERMONT STREET, SAN FRANCISCO, CA. 94107
Address

CPB 46

OFFICIAL COPY
SAN FRANCISCO
DEPARTMENT OF BUILDING INSPECTION

CERTIFICATION OF AUTHORIZED AGENT

I hereby certify that for the purpose of filing an application for a building or other permit with the Central Permit Bureau, or completion of any form related to the S.F. Building Code, or to City and County ordinances and regulations, or to State laws and codes, I am the agent of the owner and am authorized to sign all documents connected with this application or permit.

I declare under penalty of perjury that the foregoing is true and correct.

R. S. Kaffaell
Applicant's Signature

Ralph C. Raffaelli
Type or Print Name

P0721285 Cal DL
Identification (Drivers Lic. No., etc.)

City & County of S.F. - P.U.C.
Owner/Lessee

10/8/82
Date

CPB-37

OFFICIAL COPY
SAN FRANCISCO
DEPARTMENT OF BUILDING INSPECTION

WAIVER OF TIME RESTRICTION ON REQUESTS FOR ADDITIONAL INFORMATION

I hereby waive all time restrictions relative to submission of additional information. This waiver applies to those provisions of law which limit the City and County of San Francisco's ability to require further information for this project application. These provisions of law include Sections 65943 and 65944 of Chapter 4.5 of Division 1 of Title 7 of the Government Code (Review and Approval of Development Projects).

Applicant's/Owner's Signature

PUBLIC UTILITIES COMMISSION UTILITY
Type or Print Name ENGINEERING BUREAU

OCTOBER 8, 1982
Date

08208280 10/8/82
Application No.

693 VERMONT STREET, SAN FRANCISCO, CA. 94107
Address

CPB 46

OFFICIAL COPY
SAN FRANCISCO
DEPARTMENT OF PUBLIC WORKS
BUILDING INSPECTION

CENTRAL PERMIT BUREAU
450 McAllister Street
San Francisco, CA 94102

Appl. # 08208280
& 08207431
Address 1201 Mason St.
S.F., Ca. 94108

LICENSED CONTRACTOR'S STATEMENT

Licensed Contractor's Declaration

Pursuant to the Business and Professions Code Sec. 7031.5, I hereby affirm that I am licensed under the provisions of Chapter 9 (commencing with Sec. 7000) of Division 3 of the Business and Professions Code, and that my license is in full force and effect.

License_____ License Class_____

Date_____ Contractor (print)_____

(signature)_____

Owner-Builder Declaration

I hereby affirm that I am exempt from the Contractor's License Law, Business and Professions Code (Sec. 7031.5). (Mark the appropriate box below.)

☐ I, as owner of the property, or my employees with wages as their sole compensation will do the work, and the structure is not intended or offered for sale (Sec. 7044). I further acknowledge that I understand and agree that in the event that any work is commenced contrary to the representations contained herein, that the Permit herein applied for shall be deemed cancelled.

☐ I, as architect owner am contracting with licensed contractors to construct this project (Sec. 7044). I certify that at the time such contractors are selected I will have them file a copy of this form (Licensed Contractors Declaration) prior to the commencement of any work. I further acknowledge that I understand and agree that, in the event that said contractors fail to file a copy of the Declaration with the Central Permit Bureau, that the Permit herein applied for shall be deemed cancelled.

☒ I am exempt under Business and Professions Code Sec._____

Reason City Governmental Agency

Date Oct 8, 1982 Owner (print) Public Utilities Comm.

(signature) [signature]

NOTICE: "Any violation of the Bus. & Prof. Code Sec. 7031.5 by any permit applicant shall be subject to a civil penalty of not more than five hundred dollars ($500)." Bus. & Prof. Code Sec. 7031

CPB-38

OFFICIAL COPY
SAN FRANCISCO
DEPARTMENT OF BUILDING INSPECTION

CERTIFICATION OF AUTHORIZED AGENT

I hereby certify that for the purpose of filing an application for a building or other permit with the Central Permit Bureau, or completion of any form related to the S.F. Building Code, or to City and County ordinances and regulations, or to State laws and codes, I am the agent of the owner and am authorized to sign all documents connected with this application or permit.

I declare under penalty of perjury that the foregoing is true and correct.

Harry Chin
Applicant's Signature

HARRY CHIN
Type or Print Name

DRIVER LICENSE # S0368462
Identification (Drivers Lic. No., etc.)

PUBLIC UTILITIES COMMISSION
Owner/Lessee

DEC. 10, 1982
Date

CPB-37

OFFICIAL COPY
SAN FRANCISCO
DEPARTMENT OF
BUILDING INSPECTION

Tutor-Saliba

Contractors Engineers

15901 OLDEN STREET • SYLMAR, CALIFORNIA 91342
TELEPHONE: (213) 362-8391

December 10, 1982

Central Permit Bureau
450 McAllister Street
San Francisco, California 94102

Attention: Barbara Johnson

This is to authorize Mr. Harry Chin of O'Brien-Kreitzberg & Associates, Inc., to sign all forms related to picking up Permit No. A208280.

Tutor-Saliba Contractor's Liscense is 323829, Type A,B with expiration date of September 30, 1983.

Very truly yours,

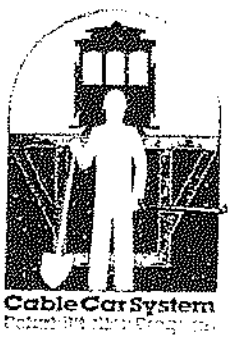
Arturo D. Diaz
Project Manager

Tutor-Saliba
Cable Car Barn Rehabilitation
1265 Mason Street
San Francisco, California 94108

cc: Earl F. Runion
District Manager

Tutor-Saliba

ADD:sl



A Project of the City and
County of San Francisco
Public Utilities Commission

Harry Chin
Resident Engineer
Cable Car Barn/Loop

O'Brien-Kreitzberg & Associates, Inc.
Construction Management
Washington & Mason Streets
San Francisco CA 94108
Telephone 415/776-8990

OFFICIAL COPY

SAN FRANCISCO
APPROVED FOR ISSUANCE
DEPARTMENT OF BUILDING INSPECTION

FOR DEPARTMENTAL USE ONLY

DEC 06 1982

APPROVED
Dept. Public Works

TITLE 24 DHCT STORY Y N
HANDICAPPED ACCESS
SUPERINTENDENT
BUREAU OF BUILDING INSPECTION

12-3-82

DATE FILED 11-16-82

FILING FEE RECEIVED $145.00

PERMIT NO. 495902

ISSUED DEC 08 1982

CITY AND COUNTY OF SAN FRANCISCO
DEPARTMENT OF PUBLIC WORKS

APPLICATION FOR BUILDING PERMIT ADDITIONS, ALTERATIONS OR REPAIRS

OFFICE COPY

APPLICATION IS HEREBY MADE TO THE DEPARTMENT OF PUBLIC WORKS OF SAN FRANCISCO FOR PERMISSION TO BUILD IN ACCORDANCE WITH THE PLANS AND SPECIFICATIONS SUBMITTED HEREWITH AND ACCORDING TO THE DESCRIPTION AND FOR THE PURPOSE HEREINAFTER SET FORTH:

APPLICATION NO. 8209951S

(1) STREET ADDRESS OF JOB:
San Francisco Cable Car Barn
Mason and Washington 1201 Mason ST.
San Francisco, California

(3) ESTIMATED COST OF JOB: $473,000.00

DESCRIPTION OF EXISTING BUILDING

(4A) TYPE OF CONSTR. 1-hr ☒ N ☐ 1 ☐ 2 ☐ 3 ☒ 4 ☐ 5 ☐	(5A) NUMBER OF STORIES OF OCCUPANCY: 2	(6A) NUMBER OF BASEMENTS AND CELLARS: 0	(7A) PRESENT USE: Cable Car Stor. Maint. & Mach.	(8A) BLDG. CODE OCCUP. CLASS: B-3, F-2, & G	(9A) NO. OF DWELLING UNITS: 0

DESCRIPTION OF BUILDING AFTER PROPOSED ALTERATION

(4) TYPE OF CONSTR. 1-hr ☒ N ☐ 1 ☐ 2 ☐ 3 ☒ 4 ☐ 5 ☐	(5) NUMBER OF STORIES OF OCCUPANCY: 2	(6) NUMBER OF BASEMENTS AND CELLARS: 0	(7) PROPOSED USE: Cable Car Stor. Maint. & Mach.	(8) BLDG. CODE OCCUP. CLASS: B-3, F-2, G	(9) NO. OF DWELLING UNITS: 0

(10A) DOES THIS ALTERATION CREATE ADDITIONAL STORY TO BUILDING? YES ☐ NO ☒	(10) IF YES, STATE NEW HEIGHT AT CENTER LINE OF FRONT ____ FT.	(11A) DOES THIS ALTERATION CREATE DECK OR HORIZ EXTENSION TO BUILDING? YES ☐ NO ☒	(11) IF YES STATE NEW GROUND FLOOR AREA ____ SQ. FT.		
(14) WILL SIDEWALK OVER SUB-SIDEWALK SPACE BE REPAIRED OR ALTERED? YES ☒ NO ☐	(15) WILL BUILDING EXTEND BEYOND PROPERTY LINE? YES ☐ NO ☒	(16) IS AUTO RUNWAY TO BE CONSTRUCTED OR ALTERED? YES ☐ NO ☒	(17) WILL STREET SPACE BE USED DURING CONSTRUCTION? YES ☒ NO ☐		
(19) ANY OTHER EXISTING BLDG ON LOT? (IF YES, SHOW ON PLOT PLAN) YES ☐ NO ☒	(20) DOES THIS ALTERATION CONSTITUTE A CHANGE OF OCCUPANCY? YES ☐ NO ☒	(21) ELECTRICAL WORK TO BE PERFORMED? YES ☐ NO ☒	(22) PLUMBING WORK TO BE PERFORMED? YES ☐ NO ☒		

(23) GENERAL CONTRACTOR — ADDRESS — PHONE — CALIF. LICENSE NO.
Tutor-Saliba, Inc. 15901 Olden Street, Sylmar, California 323827

(24) ARCHITECT OR ENGINEER (DESIGN ☐ CONSTRUCTION ☐) — ADDRESS — CALIF. CERTIFICATE NO.
Chin & Hensolt Engineers, Inc. 246 First Street, San Francisco, California RAE E36 (Struct)

(25) CONSTRUCTION LENDER (ENTER NAME AND BRANCH DESIGNATION IF ANY. IF THERE IS NO KNOWN CONSTRUCTION LENDER, ENTER "UNKNOWN") — ADDRESS
Unknown

(26) OWNER — LESSEE (CROSS OUT ONE) — ADDRESS — PHONE (FOR CONTACT BY BUREAU)
Public Utilities Commission, 693 Vermont Street, San Francisco, California 558-2578

(27) WRITE IN DESCRIPTION OF ALL WORK TO BE PERFORMED UNDER THIS APPLICATION (REFERENCE TO PLANS IS NOT SUFFICIENT):
Structural shoring for exterior walls during building alteration.

J.A. WALSTEN

IMPORTANT NOTICES

No change shall be made in the character of the occupancy or use without first obtaining a Building Permit authorizing such change. See Sec. 103, 104.B, 104.B.1, 104.C, 502, 502.1, San Francisco Building Code and Sec. 104, San Francisco Housing Code.

No portion of building or structure or scaffolding used during construction, to be closer than 6'0" to any wire containing more than 750 volts, See Sec. 385, California Penal Code.

Pursuant to Sec. 302 A.B, San Francisco Building Code, the building permit shall be posted on the job. The owner is responsible for approved plans and application being kept at building site.

Grade lines as shown on drawings accompanying this application are assumed to be correct. If actual grade lines are not the same as shown revised drawings showing correct grade lines, cuts and fills together with complete details of retaining walls and wall footings required must be submitted to this bureau for approval.

ANY STIPULATION REQUIRED HEREIN OR BY CODE MAY BE APPEALED.

BUILDING NOT TO BE OCCUPIED UNTIL CERTIFICATE OF FINAL COMPLETION IS POSTED ON THE BUILDING OR PERMIT OF OCCUPANCY GRANTED, WHEN REQUIRED. APPROVAL OF THIS APPLICATION DOES NOT CONSTITUTE AN APPROVAL FOR THE ELECTRICAL WIRING OR PLUMBING INSTALLATIONS. A SEPARATE PERMIT FOR THE WIRING AND PLUMBING MUST BE OBTAINED. SEPARATE PERMITS ARE REQUIRED IF ANSWER IS "YES" TO ANY OF ABOVE QUESTIONS (15) (16) (17) (20) (21) or (22).

THIS IS NOT A BUILDING PERMIT. NO WORK SHALL BE STARTED UNTIL A BUILDING PERMIT IS ISSUED.

In dwellings all insulating materials must have a clearance of not less than two inches from all electrical wires or equipment.

CHECK APPROPRIATE BOX

☒ OWNER ☐ ARCHITECT ☐ ENGINEER
☐ LESSEE ☐ AGENT WITH POWER OF ATTORNEY
☐ CONTRACTOR ☐ ATTORNEY IN FACT

APPLICANT'S CERTIFICATION

I HEREBY CERTIFY AND AGREE THAT IF A PERMIT IS ISSUED FOR THE CONSTRUCTION DESCRIBED IN THIS APPLICATION, ALL THE PROVISIONS OF THE PERMIT AND ALL LAWS AND ORDINANCES THERETO WILL BE COMPLIED WITH.

NOTICE TO APPLICANT

HOLD HARMLESS CLAUSE: The Permittee(s) by acceptance of this permit, agree(s) to indemnify and hold harmless the City and County of San Francisco from and against any and all claims, demands and actions for damages resulting from operations under this permit, regardless of negligence of the City and County of San Francisco, and to assume the defense of the City and County of San Francisco against all such claims, demands and actions.

In conformity with the provisions of Section 3800 of the Labor Code of the State of California, the applicant shall have on file, or file with the Central Permit Bureau, either Certificate (I) or (II) or (III) designated below or shall indicate Item (IV) or (V) or (VI) below, whichever is applicable. If however, Item (VI) is checked then Item (V) must be checked as well. Mark the appropriate method of compliance below:

( ) I. Certificate of Consent to Self-Insure issued by the Director of Industrial Relations.
✓ II. Certificate of Workman's Compensation Insurance issued by an admitted insurer
( ) III An exact copy or duplicate of (I) certified by the Director or (II) certified by the insurer
( ) IV. The cost of the work to be performed is $100 or less.
( ) V. I certify that in the performance of the work for which this Permit is issued, I shall not employ any person in any manner so as to become subject to the workman's compensation laws of California. I further acknowledge that I understand, in the event that I should become subject to the workman's compensation provisions of the Labor Code of California and fail to comply forthwith with the provisions of Section 3800 of the Labor Code, that the Permit herein applied for shall be deemed revoked.
( ) VI. I certify as the owner (or the agent of the owner) that in the performance of the work for which this Permit is issued, I will employ a contractor who complies with the workman's compensation laws of California and who has on file, or prior to the commencement of any work will file, with the Central Permit Bureau evidence that workman's compensation insurance is carried

Applicant's Signature: R.B. Raffaelli Date: 11/16/82

OFFICIAL COPY

SAN FRANCISCO
DEPARTMENT OF BUILDING INSPECTION

CONDITIONS AND STIPULATIONS

REFER TO:	APPROVED: Saul Workilly 11/17/82 BUILDING INSPECTOR, BUR. OF BLDG. INSP.	DATE: REASON: NOTIFIED MR.
☒	APPROVED: as per plans and application 190-5-P LPAB CATEGORICALLY EXEMPT FROM ENVIRONMENTAL REVIEW Pedro Grec DEPARTMENT OF CITY PLANNING DEC 6 1982	DATE: REASON: NOTIFIED MR.
	APPROVED: BUREAU OF FIRE PREVENTION & PUBLIC SAFETY	DATE: REASON: NOTIFIED MR.
☒	APPROVED: as noted on plan SPECIAL INSPECTION REQUIRED PER SFBC SECTION 305.A,B,C. Dot Y. Yee 11/22/82 CIVIL ENGINEER, BUR. OF BLDG. INSPECTION	DATE: REASON: NOTIFIED MR.
☒	APPROVED: R. Wong 11-20-82 BUREAU OF ENGINEERING	DATE: REASON: NOTIFIED MR.
☐	APPROVED: DEPARTMENT OF PUBLIC HEALTH	DATE: REASON: NOTIFIED MR.
☐	APPROVED: REDEVELOPMENT AGENCY	DATE: REASON: NOTIFIED MR.
☐	APPROVED: RESIDENTIAL ENV. INSPECTOR, DIV. OF APT. & HOTEL INSP., B.B.I	DATE: REASON: NOTIFIED MR.
☑	APPROVED: PC Checker [signature] 11/22/82	DATE: REASON: NOTIFIED MR.

HOLD SECTION — NOTE DATES AND NAMES OF ALL PERSONS NOTIFIED DURING PROCESSING

I AGREE TO COMPLY WITH ALL CONDITIONS OR STIPULATIONS OF THE VARIOUS BUREAUS OR DEPARTMENTS NOTED ON THIS APPLICATION, AND ATTACHED STATEMENTS OF CONDITIONS OR STIPULATIONS, WHICH ARE HEREBY MADE A PART OF THIS APPLICATION.
NUMBER OF ATTACHMENTS ☐

R. S. Raffaelli
SIGNATURE OF OWNER, LESSEE OR AUTHORIZED AGENT FOR OWNER OR LESSEE.

OFFICIAL COPY
SAN FRANCISCO
DEPARTMENT OF
BUILDING INSPECTION

WAIVER OF TIME RESTRICTION ON REQUESTS FOR ADDITIONAL INFORMATION

I hereby waive all time restrictions relative to submission of additional information. This waiver applies to those provisions of law which limit the City and County of San Francisco's ability to require further information for this project application. These provisions of law include Sections 65943 and 65944 of Chapter 4.5 of Division 1 of Title 7 of the Government Code (Review and Approval of Development Projects).

Applicant's/Owner's Signature

Public Utilities Commission
Utilities Engineering Bureau
Type or Print Name

November 16, 1982
Date

Application No.

693 Vermont Street
San Francisco, California 94107
Address

CPB 46

OFFICIAL COPY
SAN FRANCISCO
DEPARTMENT OF
BUILDING INSPECTION

CERTIFICATION OF AUTHORIZED AGENT

I hereby certify that for the purpose of filing an application for a building or other permit with the Central Permit Bureau, or completion of any form related to the S.F. Building Code, or to City and County ordinances and regulations, or to State laws and codes, I am the agent of the owner and am authorized to sign all documents connected with this application or permit.

I declare under penalty of perjury that the foregoing is true and correct.

R. G. Raffaelli
Applicant's Signature

R. G. Raffaelli
Type or Print Name

00530 I.D. Pass #
Identification (Drivers Lic. No., etc.)

City & County S.F. PUC.
Owner/Lessee

12/8/82
Date

CPB-37

OFFICIAL COPY
SAN FRANCISCO
DEPARTMENT OF BUILDING INSPECTION

CENTRAL PERMIT BUREAU
450 McAllister Street
San Francisco, CA 94102

Appl. # 08209515

Address 1201 Mason
SF Ca.
Shoring Permit.

LICENSED CONTRACTOR'S STATEMENT

Licensed Contractor's Declaration

Pursuant to the Business and Professions Code Sec. 7031.5, I hereby affirm that I am licensed under the provisions of Chapter 9 (commencing with Sec. 7000) of Division 3 of the Business and Professions Code, and that my license is in full force and effect.

License # 323829 License Class A, B

Date 4-28-82 Contractor (print) Tutor-Saliba

EXP 9/30/83

(signature) Earl F. Symons

Owner-Builder Declaration

I hereby affirm that I am exempt from the Contractor's License Law, Business and Professions Code (Sec. 7031.5). (Mark the appropriate box below.)

☐ I, as owner of the property, or my employees with wages as their sole compensation will do the work, and the structure is not intended or offered for sale (Sec. 7044). I further acknowledge that I understand and agree that in the event that any work is commenced contrary to the representations contained herein, that the Permit herein applied for shall be deemed cancelled.

☐ I, as architect owner am contracting with licensed contractors to construct this project (Sec. 7044). I certify that at the time such contractors are selected I will have them file a copy of this form (Licensed Contractors Declaration) prior to the commencement of any work. I further acknowledge that I understand and agree that, in the event that said contractors fail to file a copy of the Declaration with the Central Permit Bureau, that the Permit herein applied for shall be deemed cancelled.

☐ I am exempt under Business and Professions Code Sec. _____

Reason _____

Date _____ Owner (print) _____

(signature) _____

NOTICE: "Any violation of the Bus. & Prof. Code Sec. 7031.5 by any permit applicant shall be subject to a civil penalty of not more than five hundred dollars ($500)." Bus. & Prof. Code Sec. 7031.5

OFFICIAL COPY

SAN FRANCISCO
DEPARTMENT OF
BUILDING INSPECTION

CITY & COUNTY OF
SAN FRANCISCO

APPLICATION FILING FEE – PLAN CHECKING RECEIPT

114572

RECEIVED OF

City County S.F. (AUC)

BUILDING APPLICATION NUMBERS

[illegible]

FEE FOR APPLICATION FILING AND CHECKING PLANS. PRESCRIBED BY SAN FRANCISCO BUILDING CODE

	DATE	ESTIMATED COST	FEE	REVENUE NO
APPLICATION FILING	12-4-[illegible]		[illegible]	7223
PLAN CHECKING		4[illegible]	[illegible]	7226

FINAL PLAN CHECKING	FINAL COST	FEE	RECEIVED

DEPARTMENT OF PUBLIC WORKS
CENTRAL PERMIT BUREAU

BY [illegible]

3. BUREAU APPL.

OFFICIAL COPY

DEPARTMENT OF BUILDING INSPECTION

FOR DEPARTMENTAL USE ONLY

APPROVED FOR ISSUANCE APR 18 1983

APPROVED Dept. Public Works

TITLE 24 YES ☐ NO ☐ APR 22 1983

HANDICAPPED ACCESS

12-31-83

CITY AND COUNTY OF SAN FRANCISCO
DEPARTMENT OF PUBLIC WORKS
APPLICATION FOR BUILDING PERMIT
ADDITIONS, ALTERATIONS OR REPAIRS

BLDG. FORM 3

APPLICATION NO. 8301911

7-26-83

APPLICATION IS HEREBY MADE TO THE DEPARTMENT OF PUBLIC WORKS OF SAN FRANCISCO FOR PERMISSION TO PROCEED IN ACCORDANCE WITH THE PLANS AND SPECIFICATIONS SUBMITTED HEREWITH AND ACCORDING TO THE DESCRIPTION AND FOR THE PURPOSE HEREINAFTER SET FORTH:

OFFICE COPY

(1) STREET ADDRESS OF JOB: San Francisco Cable Car Barn 1201 Mason St. San Francisco, CA. 94133

DATE FILED	FILING FEE RECEIPT NO.	PERMIT NO.	ISSUED
3-9-83	To be Rec'd	500101	APR 22 1983

(3) ESTIMATED COST OF JOB: $ 120,000.00

DESCRIPTION OF EXISTING BUILDING

(4A) TYPE OF CONSTR. 1-hr ☒ N ☐ 1 ☐ 2 ☐ 3 ☒ 4 ☐ 5 ☐	(5A) NUMBER OF STORIES OF OCCUPANCY: 0	(6A) NUMBER OF BASEMENTS AND CELLARS: 1	(7A) PRESENT USE: Main Cable Sheave Pit	(8A) BLDG. CODE OCCUP. CLASS: B3, F2, G.	(9A) NO. OF DWELLING UNITS: 0

DESCRIPTION OF BUILDING AFTER PROPOSED ALTERATION

72

(4) TYPE OF CONSTR. 1-hr ☒ N ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐	(5) NUMBER OF STORIES OF OCCUPANCY 0	(6) NUMBER OF BASEMENTS AND CELLARS 1	(7) PROPOSED USE: Main Cable Sheave Pit	(8) BLDG. CODE OCCUP. CLASS B3, F2, G.	(9) NO. OF DWELLING UNITS 0

(10A) DOES THIS ALTERATION CREATE ADDITIONAL STORY TO BUILDING? YES ☐ NO ☒	(10) IF YES, STATE NEW HEIGHT AT CENTER LINE OF FRONT: ___ FT.	(11A) DOES THIS ALTERATION CREATE DECK OR HORIZ EXTENSION TO BUILDING? YES ☐ NO ☒	(11) IF YES, STATE NEW GROUND FLOOR AREA ___ SQ. FT.
(14) WILL SIDEWALK OVER SUB-SIDEWALK SPACE BE REPAIRED OR ALTERED? YES ☒ NO ☐	(15) WILL BUILDING EXTEND BEYOND PROPERTY LINE? YES ☐ NO ☒	(16) IS AUTO RUNWAY TO BE CONSTRUCTED OR ALTERED? YES ☐ NO ☒	(17) WILL STREET SPACE BE USED DURING CONSTRUCTION? YES ☒ NO ☐
(19) ANY OTHER EXISTING BLDG. ON LOT? (IF YES, SHOW ON PLOT PLAN) YES ☐ NO ☒	(20) DOES THIS ALTERATION CONSTITUTE A CHANGE OF OCCUPANCY? YES ☐ NO ☒	(21) ELECTRICAL WORK TO BE PERFORMED? YES ☐ NO ☒	(22) PLUMBING WORK TO BE PERFORMED? YES ☐ NO ☒

(23) GENERAL CONTRACTOR — ADDRESS — PHONE — CALIF. LICENSE NO.
Tutor-Saliba, Inc. 15901 Olden St. Sylmar, CA. 323829

(24) ARCHITECT OR ENGINEER (DESIGN ☐, CONSTRUCTION ☐) — ADDRESS — CALIF. CERTIFICATE NO.
Chin & Hensolt Engineers, Inc. 246 1st St. S.F. CA. Pac 836

(25) CONSTRUCTION LENDER (ENTER NAME AND BRANCH DESIGNATION IF ANY. IF THERE IS NO KNOWN CONSTRUCTION LENDER, ENTER "UNKNOWN"). — ADDRESS
Unknown

(26) OWNER — LESSEE (CROSS OUT ONE) — ADDRESS — PHONE (FOR CONTACT BY BUREAU)
Public Utilities Commission, 693 Vermont St. S.F. CA. 558-2598 JA Williston

(27) WRITE IN DESCRIPTION OF ALL WORK TO BE PERFORMED UNDER THIS APPLICATION (REFERENCE TO PLANS IS NOT SUFFICIENT):
Structural Shoring for Main Cable Sheave Pit.

IMPORTANT NOTICES

No change shall be made in the character of the occupancy or use without first obtaining a Building Permit authorizing such change. See Sec. 103, 104.B, 104.B.1, 104.C, 502, 502.1, San Francisco Building Code and Sec. 104, San Francisco Housing Code.

No portion of building or structure or scaffolding used during construction, to be closer than 6'0" to any wire containing more than 750 volts. See Sec. 385, California Penal Code.

Pursuant to Sec. 302 A.8, San Francisco Building Code, the building permit shall be posted on the job. The owner is responsible for approved plans and application being kept at building site.

Grade lines as shown on drawings accompanying this application are assumed to be correct. If actual grade lines are not the same as shown revised drawings showing correct grade lines, cuts and fills together with complete details of retaining walls and wall footings required must be submitted to this bureau for approval.

ANY STIPULATION REQUIRED HEREIN OR BY CODE MAY BE APPEALED.

BUILDING NOT TO BE OCCUPIED UNTIL CERTIFICATE OF FINAL COMPLETION IS POSTED ON THE BUILDING OR PERMIT OF OCCUPANCY GRANTED, WHEN REQUIRED. APPROVAL OF THIS APPLICATION DOES NOT CONSTITUTE AN APPROVAL FOR THE ELECTRICAL WIRING OR PLUMBING INSTALLATIONS. A SEPARATE PERMIT FOR THE WIRING AND PLUMBING MUST BE OBTAINED. SEPARATE PERMITS ARE REQUIRED IF ANSWER IS "YES" TO ANY OF ABOVE QUESTIONS (15) (16) (17) (20) (21) or (22). THIS IS NOT A BUILDING PERMIT. NO WORK SHALL BE STARTED UNTIL A BUILDING PERMIT IS ISSUED.

In dwellings all insulating materials must have a clearance of not less than two inches from all electrical wires or equipment.

CHECK APPROPRIATE BOX

☒ OWNER ☐ ARCHITECT ☐ ENGINEER
☐ LESSEE ☐ AGENT WITH POWER OF ATTORNEY
☐ CONTRACTOR ☐ ATTORNEY IN FACT

APPLICANT'S CERTIFICATION

I HEREBY CERTIFY AND AGREE THAT IF A PERMIT IS ISSUED FOR THE CONSTRUCTION DESCRIBED IN THIS APPLICATION, ALL THE PROVISIONS OF THE PERMIT AND ALL LAWS AND ORDINANCES THERETO WILL BE COMPLIED WITH.

NOTICE TO APPLICANT

HOLD HARMLESS CLAUSE: The Permittee(s) by acceptance of this permit, agree(s) to indemnify and hold harmless the City and County of San Francisco from and against any and all claims, demands and actions for damages resulting from operations under this permit, regardless of negligence of the City and County of San Francisco, and to assume the defense of the City and County of San Francisco against all such claims, demands and actions.

In conformity with the provisions of Section 3800 of the Labor Code of the State of California, the applicant shall have on file, or file with the Central Permit Bureau, either Certificate (I) or (II) or (III) designated below or shall indicate item (IV) or (V) or (VI) below, whichever is applicable. If however, item (VI) is checked then item (V) must be checked as well. Mark the appropriate method of compliance below:

( ) I. Certificate of Consent to Self-Insure issued by the Director of Industrial Relations.

(X) II. Certificate of Workman's Compensation Insurance issued by an admitted insurer.

( ) III. An exact copy or duplicate of (I) certified by the Director or (II) certified by the insurer.

( ) IV. The cost of the work to be performed is $100 or less.

( ) V. I certify that in the performance of the work for which this Permit is issued, I shall not employ any person in any manner so as to become subject to the workman's compensation laws of California. I further acknowledge that I understand, in the event that I should become subject to the workman's compensation provisions of the Labor Code of California and fail to comply forthwith with the provisions of Section 3800 of the Labor Code, that the Permit herein applied for shall be deemed revoked.

( ) VI. I certify as the owner (or the agent of the owner) that in the performance of the work for which this Permit is issued, I will employ a contractor who complies with the workman's compensation laws of California and who has on file, or prior to the commencement of any work will file, with the Central Permit Bureau evidence that workman's compensation insurance is carried.

Applicant's Signature [signature] Date 3/10/83

OFFICIAL COPY
SAN FRANCISCO
DEPARTMENT OF BUILDING INSPECTION

CONDITIONS AND STIPULATIONS

APPROVED:	BUILDING INSPECTOR, BUR. OF BLDG. INSP.	DATE: REASON: NOTIFIED MR.
☒ APPROVED: Not reviewed by the Department of City Planning [illegible] permit [illegible] the use of this property does or does not conform to the City Planning Code. Interim Structural work only! MAR 16 1983	DEPARTMENT OF CITY PLANNING	DATE: REASON: NOTIFIED MR.
☐ APPROVED:	BUREAU OF FIRE PREVENTION & PUBLIC SAFETY	DATE: REASON: NOTIFIED MR.
☒ APPROVED: As shown on plan. SPECIAL INSPECTION REQUIRED FOR SFBC SECTION 70[illegible] A.B.C.	Dot Y. Yee 4/13/83 CIVIL ENGINEER, BUR. OF BLDG. INSPECTION	DATE: REASON: NOTIFIED MR.
☐ APPROVED:	Frank T. Pearson 4/6/83 BUREAU OF ENGINEERING	DATE: REASON: NOTIFIED MR.
☐ APPROVED:	DEPARTMENT OF PUBLIC HEALTH	DATE: REASON: NOTIFIED MR.
☐ APPROVED:	REDEVELOPMENT AGENCY	DATE: REASON: NOTIFIED MR.
☐ APPROVED:	RESIDENTIAL ENV. INSPECTOR, DIV. OF APT. & HOTEL INSP., B.B.I.	DATE: REASON: NOTIFIED MR.
☒ APPROVED: PC Campos	A Campos 4/6/83	DATE: REASON: NOTIFIED MR.

HOLD SECTION — NOTE DATES AND NAMES OF ALL PERSONS NOTIFIED DURING PROCESSING

I AGREE TO COMPLY WITH ALL CONDITIONS OR STIPULATIONS OF THE VARIOUS BUREAUS OR DEPARTMENTS NOTED ON THIS APPLICATION, AND ATTACHED STATEMENTS OF CONDITIONS OR STIPULATIONS, WHICH ARE HEREBY MADE A PART OF THIS APPLICATION.
NUMBER OF ATTACHMENTS ☐

R. L. Raffaelli 4/22/83
SIGNATURE OF OWNER, LESSEE OR AUTHORIZED AGENT FOR OWNER OR LESSEE

OFFICIAL COPY
SAN FRANCISCO
DEPARTMENT OF
BUILDING INSPECTION

CENTRAL PERMIT BUREAU
450 McAllister Street
San Francisco, CA 94102

Appl. # _____

Address _____

LICENSED CONTRACTOR'S STATEMENT

Licensed Contractor's Declaration

Pursuant to the Business and Professions Code Sec. 7031.5, I hereby affirm that I am licensed under the provisions of Chapter 9 (commencing with Sec. 7000) of Division 3 of the Business and Professions Code, and that my license is in full force and effect.

License _____ License Class _____

Date _____ Contractor (print) _____

(signature) _____

Owner-Builder Declaration

I hereby affirm that I am exempt from the Contractor's License Law, Business and Professions Code (Sec. 7031.5). (Mark the appropriate box below.)

☐ I, as owner of the property, or my employees with wages as their sole compensation will do the work, and the structure is not intended or offered for sale (Sec. 7044). I further acknowledge that I understand and agree that in the event that any work is commenced contrary to the representations contained herein, that the Permit herein applied for shall be deemed cancelled.

☐ I, as owner architect am contracting with licensed contractors to construct this project (Sec. 7044). I certify that at the time such contractors are selected I will have them file a copy of this form (Licensed Contractors Declaration) prior to the commencement of any work. I further acknowledge that I understand and agree that, in the event that said contractors fail to file a copy of the Declaration with the Central Permit Bureau, that the Permit herein applied for shall be deemed cancelled.

☒ I am exempt under Business and Professions Code Sec. _____

Reason _____

Date 3/9/83 Owner (print) CCSF-PUC

(signature) R.S. Ryfaells for P.U.C.

NOTICE: "Any violation of the Bus. & Prof. Code Sec. 7031.5 by any permit applicant shall be subject to a civil penalty of not more than five hundred dollars ($500)." Bus. & Prof. Code Sec. 7031.5

SAN FRANCISCO
DEPARTMENT OF
BUILDING INSPECTION
OFFICIAL COPY

WAIVER OF TIME RESTRICTION ON REQUESTS FOR ADDITIONAL INFORMATION

I hereby waive all time restrictions relative to submission of additional information. This waiver applies to those provisions of law which limit the City and County of San Francisco's ability to require further information for this project application. These provisions of law include Sections 65943 and 65944 of Chapter 4.5 of Division 1 of Title 7 of the Government Code (Review and Approval of Development Projects).

CCofS.F. - P.U.C. R.A. Raffaelli for
Applicant's/Owner's Signature

R.G. Raffaelli
Type or Print Name

Mar 2, 1983
Date

830191
Application No.

1201 Mason
Address

CPB 46

OFFICIAL COPY
SAN FRANCISCO
DEPARTMENT OF
BUILDING INSPECTION

CERTIFICATION OF AUTHORIZED AGENT

I hereby certify that for the purpose of filing an application for a building or other permit with the Central Permit Bureau, or completion of any form related to the S.F. Building Code, or to City and County ordinances and regulations, or to State laws and codes, I am the agent of the owner and am authorized to sign all documents connected with this application or permit.

I declare under penalty of perjury that the foregoing is true and correct.

R.S. Leppelli for P.U.C.
Applicant's Signature

R. G. Raffaelli
Type or Print Name

CDL P0721285
Identification (Drivers Lic. No., etc.)

CCSF - PUC.
Owner/Lessee

3/9/83
Date

CPB-37

OFFICIAL COPY
SAN FRANCISCO
DEPARTMENT OF BUILDING INSPECTION

CITY & COUNTY OF SAN FRANCISCO

APPLICATION FILING FEE — PLAN CHECKING RECEIPT

117680

RECEIVED OF

BUILDING APPLICATION NUMBERS

FEE FOR APPLICATION FILING AND CHECKING PLANS, PRESCRIBED BY SAN FRANCISCO BUILDING CODE

	DATE	ESTIMATED COST	FEE	REVENUE NO
APPLICATION FILING				7223
PLAN CHECKING				7225

FINAL PLAN CHECKING	FINAL COST	FEE	RECEIVED

2. BUREAU APPL.

DEPARTMENT OF PUBLIC WORKS
CENTRAL PERMIT BUREAU

BY

OFFICIAL COPY

SAN FRANCISCO

FOR DEPARTMENTAL USE ONLY

APPROVED FOR ISSUANCE: MAY 10 1983

DEPARTMENT OF PUBLIC WORKS
BUREAU OF BUILDING INSPECTION

MAY 24 1983

SAN FRANCISCO
DEPARTMENT OF PUBLIC WORKS
BUILDING PERMIT APPLICATION
FOR ALTERATIONS OR REPAIRS

BLDG. FORM 3

APPLICATION NO. 8803677

DEPARTMENT OF PUBLIC WORKS

TO BUILD (OR DO) WORK IN ACCORDANCE WITH

PLANS FILED HEREWITH AND ACCORDING

TO THE HEREINAFTER SET FORTH:

State Industrial Safety Permit

The attached application falls under the Labor Code Sec. 6500 in that it involves the type of construction work checked below:

☒ Construction of trenches or excavations which are 5 feet or deeper and into which a person is required to descend.

☐ The construction of any building, structure, falsework, or scaffolding more than 3 stories high or the equivalent height (36 ft.).

☐ The demolition of any building, structure, falsework, or scaffold, more than 3 stories high or the equivalent height (36 ft.).

(1) STREET ADDRESS OF JOB:
San Francisco Cable Car Barn
1201 Mason St.
San Francisco, CA. 94133

DATE FILED: 12-31-82

FILING FEE RECEIPT NO.: FCSP Letter to be pd later

PERMIT NO.: 501261

ISSUED: MAY 24 1983

(3) ESTIMATED COST OF JOB: $ 80,000 - Pbk

DESCRIPTION OF EXISTING BUILDING

(4A) TYPE OF CONSTR. 1☒ N☐ 1☐ 2☐ 3☐ 4☐ 5☐	(5A) NUMBER OF STORIES OF OCCUPANCY	(6A) NUMBER OF BASEMENTS AND CELLARS	(7A) PRESENT USE	(8A) BLDG. CODE OCCUP. CLASS	(9A) NO. OF DWELLING UNITS
	2	1	Areaway Shoring	B3 F2-6	0

DESCRIPTION OF BUILDING AFTER PROPOSED ALTERATION

72

(4) TYPE OF CONSTR. 1☒ N☐ 1☐ 2☐ 3☐ 4☐ 5☐	(5) NUMBER OF STORIES OF OCCUPANCY	(6) NUMBER OF BASEMENTS AND CELLARS	(7) PROPOSED USE	(8) BLDG. CODE OCCUP. CLASS	(9) NO. OF DWELLING UNITS
	2	1	Areaway Shoring	B3 F2-6	0

(10A) DOES THIS ALTERATION CREATE ADDITIONAL STORY TO BUILDING?	YES☐ NO☒	(10) IF YES, STATE NEW HEIGHT AT CENTERLINE OF FRONT — FT.	(11A) DOES THIS ALTERATION CREATE DECK OR HORIZ. EXTENSION TO BUILDING?	YES☐ NO☒	(11) IF YES, STATE NEW GROUND FLOOR AREA — SQ. FT.
(14) WILL SIDEWALK OVER SUB-SIDEWALK SPACE BE REPAIRED OR ALTERED?	YES☒ NO☐	(15) WILL BUILDING EXTEND BEYOND PROPERTY LINES?	YES☐ NO☒	(16) IS AUTO RUNWAY TO BE CONSTRUCTED OR ALTERED?	YES☐ NO☒	(17) WILL STREET SPACE BE USED DURING CONSTRUCTION?	YES☒ NO☐
(19) ANY OTHER EXISTING BLDG ON LOT? IF YES, SHOW ON PLOT PLAN.	YES☐ NO☒	(20) DOES THIS ALTERATION CONSTITUTE A CHANGE OF OCCUPANCY?	YES☐ NO☒	(21) ELECTRICAL WORK TO BE PERFORMED?	YES☐ NO☒	(22) PLUMBING WORK TO BE PERFORMED?	YES☐ NO☒

(23) GENERAL CONTRACTOR	ADDRESS	PHONE	CALIF. LICENSE NO.
Tutor-Saliba, Inc.	15901 Olden St. Sylmar, CA.		323829
(24) ARCHITECT OR ENGINEER (DESIGN ☐ CONSTRUCTION ☐)	ADDRESS		CALIF. CERTIFICATE NO.
Chin & Hensolt Engineers, Inc.	246 1st St. S.F. CA.		PQC836
(25) CONSTRUCTION LENDER (ENTER NAME AND BRANCH DESIGNATION IF ANY. IF THERE IS NO KNOWN CONSTRUCTION LENDER, ENTER "UNKNOWN")	ADDRESS		
Unknown			
(26) OWNER – LESSEE (CROSS OUT ONE)	ADDRESS		PHONE (FOR CONTACT BY BUREAU)
Public Utilities Comm.	693 Vermont S.F. CA.	558-2598	J.A. Wollsten

(27) WRITE IN DESCRIPTION OF ALL WORK TO BE PERFORMED UNDER THIS APPLICATION (REFERENCE TO PLANS IS NOT SUFFICIENT):

Structural Shoring - Areaway

IMPORTANT NOTICES

No change shall be made in the character of the occupancy or use without first obtaining a Building Permit authorizing such change. See Sec. 103, 104.8, 104.8.1, 104.C, 502, 502.1, San Francisco Building Code and Sec. 104, San Francisco Housing Code.

No portion of building or structure or scaffolding used during construction, to be closer than 6'0" to any wire containing more than 750 volts. See Sec. 385, California Penal Code

Pursuant to Sec. 302 A 8, San Francisco Building Code, the building permit shall be posted on the job. The owner is responsible for approved plans and application being kept at building site.

Grade lines as shown on drawings accompanying this application are assumed to be correct. If actual grade lines are not the same as shown revised drawings showing correct grade lines, cuts and fills together with complete details of retaining walls and wall footings required must be submitted to this bureau for approval.

ANY STIPULATION REQUIRED HEREIN OR BY CODE MAY BE APPEALED.

BUILDING NOT TO BE OCCUPIED UNTIL CERTIFICATE OF FINAL COMPLETION IS POSTED ON THE BUILDING OR PERMIT OF OCCUPANCY GRANTED, WHEN REQUIRED. APPROVAL OF THIS APPLICATION DOES NOT CONSTITUTE AN APPROVAL FOR THE ELECTRICAL WIRING OR PLUMBING INSTALLATIONS. A SEPARATE PERMIT FOR THE WIRING AND PLUMBING MUST BE OBTAINED. SEPARATE PERMITS ARE REQUIRED IF ANSWER IS "YES" TO ANY OF ABOVE QUESTIONS (15) (16) (17) (20) (21) or (22).

THIS IS NOT A BUILDING PERMIT. NO WORK SHALL BE STARTED UNTIL A BUILDING PERMIT IS ISSUED.

In dwellings all insulating materials must have a clearance of not less than two inches from all electrical wires or equipment.

CHECK APPROPRIATE BOX

☒ OWNER ☐ ARCHITECT ☐ ENGINEER

☐ LESSEE ☐ AGENT WITH POWER OF ATTORNEY

☐ CONTRACTOR ☐ ATTORNEY IN FACT

APPLICANT'S CERTIFICATION

I HEREBY CERTIFY AND AGREE THAT IF A PERMIT IS ISSUED FOR THE CONSTRUCTION DESCRIBED IN THIS APPLICATION, ALL THE PROVISIONS OF THE PERMIT AND ALL LAWS AND ORDINANCES THERETO WILL BE COMPLIED WITH.

NOTICE TO APPLICANT

HOLD HARMLESS CLAUSE: The Permittee(s) by acceptance of this permit, agree(s) to indemnify and hold harmless the City and County of San Francisco from and against any and all claims, demands and actions for damages resulting from operations under this permit, regardless of negligence of the City and County of San Francisco, and to assume the defense of the City and County of San Francisco against all such claims, demands and actions.

In conformity with the provisions of Section 3800 of the Labor Code of the State of California, the applicant shall have on file, or file with the Central Permit Bureau, either Certificate (I) or (II) or (III) designated below or shall indicate item (IV) or (V) or (VI) below, whichever is applicable. If however, item (VI) is checked then item (V) must be checked as well. Mark the appropriate method of compliance below

( )	I	Certificate of Consent to Self-Insure issued by the Director of Industrial Relations
(X)	II	Certificate of Workman's Compensation Insurance issued by an admitted insurer
( )	III.	An exact copy or duplicate of (I) certified by the Director or (II) certified by the insurer
( )	IV	The cost of the work to be performed is $100 or less
( )	V	I certify that in the performance of the work for which this Permit is issued, I shall not employ any person in any manner so as to become subject to the workman's compensation laws of California. I further acknowledge that I understand in the event that I should become subject to the workman's compensation provisions of the Labor Code of California and fail to comply forthwith with the provisions of Section 3800 of the Labor Code that this Permit hereinafter applied for shall be deemed revoked
( )	VI	I certify as the owner (or the agent of the owner) that in the performance of the work for which this Permit is issued, I will employ a contractor who complies with the workman's compensation laws of California and who has on file, or prior to the commencement of any work will file with the Central Permit Bureau evidence that workman's compensation insurance is carried

Applicant's Signature: D.L. Peterson

Date: 1/6-10<

OFFICIAL COPY
SAN FRANCISCO
DEPARTMENT OF
BUILDING INSPECTION

CONDITIONS AND STIPULATIONS

APPROVED:

BUILDING INSPECTOR, BUR. OF BLDG. INSP.

DATE:
REASON:
NOTIFIED MR.

☐ APPROVED:

Not reviewed by the Department or City Planning. Issuance of the requested permit does not imply that use of this property does or does not conform to the City Planning Code.

DEPARTMENT OF CITY PLANNING

DATE:
REASON:
NOTIFIED MR.

☐ APPROVED:

BUREAU OF FIRE PREVENTION & PUBLIC SAFETY

DATE:
REASON:
NOTIFIED MR.

☒ APPROVED: as noted on plan

SPECIAL INSPECTION REQUIRED PER SFBC SECTION 305.A,B,C.

CIVIL ENGINEER, BUR. OF BLDG. INSPECTION 5/5/83

DATE:
REASON:
NOTIFIED MR.

☒ APPROVED:

BUREAU OF ENGINEERING 5-9-83

DATE:
REASON:
NOTIFIED MR.

☐ APPROVED:

DEPARTMENT OF PUBLIC HEALTH

DATE:
REASON:
NOTIFIED MR.

☐ APPROVED:

REDEVELOPMENT AGENCY

DATE:
REASON:
NOTIFIED MR.

☐ APPROVED:

RESIDENTIAL ENV. INSPECTOR, DIV. OF APT. & HOTEL INSP., B.B.I.

DATE:
REASON:
NOTIFIED MR.

☐ APPROVED:

DATE:
REASON:
NOTIFIED MR.

HOLD SECTION — NOTE DATES AND NAMES OF ALL PERSONS NOTIFIED DURING PROCESSING

I AGREE TO COMPLY WITH ALL CONDITIONS OR STIPULATIONS OF THE VARIOUS BUREAUS OR DEPARTMENTS NOTED ON THIS APPLICATION, AND ATTACHED STATEMENTS OF CONDITIONS OR STIPULATIONS, WHICH ARE HEREBY MADE A PART OF THIS APPLICATION.
NUMBER OF ATTACHMENTS ☐

SIGNATURE OF OWNER, LESSEE OR AUTHORIZED AGENT FOR OWNER OR LESSEE

OFFICIAL COPY
SAN FRANCISCO
DEPARTMENT OF
BUILDING INSPECTION

CERTIFICATION OF AUTHORIZED AGENT

I hereby certify that for the purpose of filing an application for a building or other permit with the Central Permit Bureau, or completion of any form related to the S.F. Building Code, or to City and County ordinances and regulations, or to State laws and codes, I am the agent of the owner and am authorized to sign all documents connected with this application or permit.

I declare under penalty of perjury that the foregoing is true and correct.

R. G. Raffaelli
Applicant's Signature

R. G. Raffaelli
Type or Print Name

F0721285
Identification (Drivers Lic. No., etc.)

CCSF - PUC.
Owner/Lessee

4/25/83
Date

CPB-37

OFFICIAL COPY
SAN FRANCISCO
DEPARTMENT OF
BUILDING INSPECTION

WAIVER OF TIME RESTRICTION ON REQUESTS FOR ADDITIONAL INFORMATION

I hereby waive all time restrictions relative to submission of additional information. This waiver applies to those provisions of law which limit the City and County of San Francisco's ability to require further information for this project application. These provisions of law include Sections 65943 and 65944 of Chapter 4.5 of Division 1 of Title 7 of the Government Code (Review and Approval of Development Projects).

R. S. Raffaelli
Applicant's/Owner's Signature

R. G. Raffaelli
Type or Print Name

4/25/83
Date

Application No.

1201 Mason St. S F.
Address

CPB 46

OFFICIAL COPY

SAN FRANCISCO
DEPARTMENT OF BUILDING INSPECTION

CENTRAL PERMIT BUREAU
450 McAllister Street
San Francisco, CA 94102

Appl. # 8303477

Address 1601 Mason St.

NOTICE TO APPLICANTS

Licensed Contractor's Declaration

Pursuant to the Business and Professions Code Sec. 7031.5, I hereby affirm that I am licensed under the provisions of Chapter 9 (commencing with Sec. 7000) of Division 3 of the Business and Professions Code, and that my license is in full force and effect.

License 323829 License Class A&B

Date 9-30-83 Contractor (print) Tutor-Saliba

(signature) [signature]

Owner-Builder Declaration

I hereby affirm that I am exempt from the Contractor's License Law, Business and Professions Code (Sec. 7031.5). (Mark the appropriate box below.)

☐ I, as owner of the property, or my employees with wages as their sole compensation will do the work, and the structure is not intended or offered for sale (Sec. 7044). I further acknowledge that I understand and agree that in the event that any work is commenced contrary to the representations contained herein, that the Permit herein applied for shall be deemed cancelled.

☐ I, as ~~owner~~ architect am contracting with licensed contractors to construct this project (Sec. 7044). I certify that at the time such contractors are selected I will have them file a copy of this form (Licensed Contractors Declaration) prior to the commencement of any work. I further acknowledge that I understand and agree that, in the event that said contractors fail to file a copy of the Declaration with the Central Permit Bureau, that the Permit herein applied for shall be deemed cancelled.

☐ I am exempt under Business and Professions Code Sec. _____

Reason _____

Date _____ Owner (print) _____

(signature) _____

NOTICE: "Any violation of the Bus. & Prof. Code Sec. 7031.5 by any permit applicant shall be subject to a civil penalty of not more than five hundred dollars ($500)." Bus. & Prof. Code Sec. 7031.5

6/83 3C

OFFICIAL COPY
SAN FRANCISCO
DEPARTMENT OF
BUILDING INSPECTION

CITY & COUNTY OF SAN FRANCISCO

APPLICATION FILING FEE — PLAN CHECKING RECEIPT

118877

RECEIVED OF

BUILDING APPLICATION NUMBERS

FEE FOR APPLICATION FILING AND CHECKING PLANS, PRESCRIBED BY SAN FRANCISCO BUILDING CODE

	DATE	ESTIMATED COST	FEE	REVENUE NO
APPLICATION FILING				7223
PLAN CHECKING				7226

FINAL PLAN CHECKING	FINAL COST	FEE	RECEIVED

DEPARTMENT OF PUBLIC WORKS
CENTRAL PERMIT BUREAU

BY

BUREAU APP.

OFFICIAL COPY

SAN FRANCISCO — DEPARTMENTAL USE ONLY

Mark 01 4384 2

APPROVED/ISSUANCE

DEPARTMENT OF BUILDING INSPECTION — APPROVED — Dept. Public Works — Feb 15 1984

SUPERINTENDENT BUREAU BUILDING INSPECTION

DATE FILED 2/6/84 — FILING FEE RECEIPT NO. CITY Job

PERMIT NO. 512214 — ISSUED 3/5/84

CITY AND COUNTY OF SAN FRANCISCO
DEPARTMENT OF PUBLIC WORKS

APPLICATION FOR BUILDING PERMIT
ADDITIONS, ALTERATIONS OR REPAIRS

APPLICATION IS HEREBY MADE TO THE DEPARTMENT OF PUBLIC WORKS OF SAN FRANCISCO FOR PERMISSION TO BUILD IN ACCORDANCE WITH THE PLANS AND SPECIFICATIONS SUBMITTED HEREWITH AND ACCORDING TO THE DESCRIPTION AND FOR THE PURPOSE HEREINAFTER SET FORTH:

OFFICE COPY

(1) STREET NO. AND NAME OF PROPERTY
SAN FRANCISCO CABLE CAR BARN
1201 Mason St.
San Francisco, CA. 94133

(3) ESTIMATED COST OF JOB: $40,000.00

DEPT. ORDER NO. 3A

APPLICATION NO. 8404138

2

DESCRIPTION OF EXISTING BUILDING

(4A) TYPE OF CONSTR. 1-H ☒ N ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐	(5A) NUMBER OF STORIES OF OCCUPANCY: 2	(6A) NUMBER OF BASEMENTS AND CELLARS: 1	(7A) PRESENT USE: Cable car barn	(8A) BLDG. CODE OCCUP. CLASS: A-3, B-2, B-4	(9A) NO. OF DWELLING UNITS: 0

DESCRIPTION OF BUILDING AFTER PROPOSED ALTERATION

(4) TYPE OF CONSTR. 1-H ☒ N ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐	(5) NUMBER OF STORIES OF OCCUPANCY: 2	(6) NUMBER OF BASEMENTS AND CELLARS: 1	(7) PROPOSED USE: Cable car barn	(8) BLDG. CODE OCCUP. CLASS: A-3, B-2, B-4	(9) NO. OF DWELLING UNITS: 0

(10A) DOES THIS ALTERATION CREATE ADDITIONAL STORY TO BUILDING? YES ☐ NO ☒	(10) IF YES, STATE NEW HEIGHT AT CENTER LINE OF FRONT: FT.	(11A) DOES THIS ALTERATION CREATE DECK OR HORIZ. EXTENSION TO BUILDING? YES ☐ NO ☒	(11) IF YES, STATE NEW GROUND FLOOR AREA: SQ. FT.		
(14) WILL SIDEWALK OVER SUB-SIDEWALK SPACE BE REPAIRED OR ALTERED? YES ☐ NO ☐	(15) WILL BUILDING EXTEND BEYOND PROPERTY LINE? YES ☐ NO ☒	(16) IS AUTO RUNWAY TO BE CONSTRUCTED OR ALTERED? YES ☐ NO ☒	(17) WILL STREET SPACE BE USED DURING CONSTRUCTION? YES ☐ NO ☒		
(19) ANY OTHER EXISTING BLDG. ON LOT? (IF YES, SHOW ON PLOT PLAN) YES ☐ NO ☒	(20) DOES THIS ALTERATION CONSTITUTE A CHANGE OF OCCUPANCY? YES ☐ NO ☒	(21) ELECTRICAL WORK TO BE PERFORMED? YES ☒ NO ☐	(22) PLUMBING WORK TO BE PERFORMED? YES ☐ NO ☒		

(23) GENERAL CONTRACTOR: TUTOR-SALIBA, Inc. — ADDRESS: Sylmar, Ca. — PHONE — CALIF. LICENSE NO.

(24) ARCHITECT OR ENGINEER (DESIGN ☐; CONSTRUCTION ☐) — ADDRESS: Chin & Hensolt Engineers Inc. 246 First St. San Francisco, Ca. — CALIF. CERTIFICATE NO.

(25) CONSTRUCTION LENDER (ENTER NAME AND BRANCH DESIGNATION IF ANY. IF THERE IS NO KNOWN CONSTRUCTION LENDER, ENTER "UNKNOWN"). — ADDRESS
Unknown

(26) OWNER — (LESSEE) (CROSS OUT ONE) — ADDRESS: CCSF- Public Utilities Comm. City Hall San Francisco — PHONE (FOR CONTACT BY BUREAU): 558 5128

(27) WRITE IN DESCRIPTION OF ALL WORK TO BE PERFORMED UNDER THIS APPLICATION (REFERENCE TO PLANS IS NOT SUFFICIENT):

FIRE PROTECTION Sprinkler System.

IMPORTANT NOTICES

No change shall be made in the character of the occupancy or use without first obtaining a Building Permit authorizing such change. See Sec. 103, 104.8, 104.8.1, 104.C, 502, 502.1, San Francisco Building Code and Sec. 104, San Francisco Housing Code.

No portion of building or structure or scaffolding used during construction, to be closer than 6'0" to any wire containing more than 750 volts. See Sec. 385, California Penal Code.

Pursuant to Sec. 302.A.8, San Francisco Building Code, the building permit shall be posted on the job. The owner is responsible for approved plans and application being kept at building site.

Grade lines as shown on drawings accompanying this application are assumed to be correct. If actual grade lines are not the same as shown revised drawings showing correct grade lines, cuts and fills together with complete details of retaining walls and wall footings required must be submitted to this bureau for approval.

ANY STIPULATION REQUIRED HEREIN OR BY CODE MAY BE APPEALED.

BUILDING NOT TO BE OCCUPIED UNTIL CERTIFICATE OF FINAL COMPLETION IS POSTED ON THE BUILDING OR PERMIT OF OCCUPANCY GRANTED, WHEN REQUIRED.

APPROVAL OF THIS APPLICATION DOES NOT CONSTITUTE AN APPROVAL FOR THE ELECTRICAL WIRING OR PLUMBING INSTALLATIONS. A SEPARATE PERMIT FOR THE WIRING AND PLUMBING MUST BE OBTAINED. SEPARATE PERMITS ARE REQUIRED IF ANSWER IS "YES" TO ANY OF ABOVE QUESTIONS (15) (16) (17) (20) (21) or (22).

THIS IS NOT A BUILDING PERMIT. NO WORK SHALL BE STARTED UNTIL A BUILDING PERMIT IS ISSUED.

In dwellings all insulating materials must have a clearance of not less than two inches from all electrical wires or equipment.

CHECK APPROPRIATE BOX

☐ OWNER ☐ ARCHITECT ☐ ENGINEER
☐ LESSEE ☐ AGENT WITH POWER OF ATTORNEY
☐ CONTRACTOR ☐ ATTORNEY IN FACT

APPLICANT'S CERTIFICATION

I HEREBY CERTIFY AND AGREE THAT IF A PERMIT IS ISSUED FOR THE CONSTRUCTION DESCRIBED IN THIS APPLICATION, ALL THE PROVISIONS OF THE PERMIT AND ALL LAWS AND ORDINANCES THERETO WILL BE COMPLIED WITH.

NOTICE TO APPLICANT

HOLD HARMLESS CLAUSE: The Permittee(s) by acceptance of this permit, agree(s) to indemnify and hold harmless the City and County of San Francisco from and against any and all claims, demands and actions for damages resulting from operations under this permit, regardless of negligence of the City and County of San Francisco, and to assume the defense of the City and County of San Francisco against all such claims, demands and actions.

In conformity with the provisions of Section 3800 of the Labor Code of the State of California, the applicant shall have on file, or file with the Central Permit Bureau, either Certificate (I) or (II) or (III) designated below or shall indicate item (IV) or (V) or (VI) below, whichever is applicable. If however, item (VI) is checked then item (V) must be checked as well. Mark the appropriate method of compliance below:

( ) I. Certificate of Consent to Self-Insure issued by the Director of Industrial Relations.
( ) II. Certificate of Workman's Compensation Insurance issued by an admitted insurer.
( ) III. An exact copy or duplicate of (I) certified by the Director or (II) certified by the insurer.
( ) IV. The cost of the work to be performed is $100 or less.
( ) V. I certify that in the performance of the work for which this Permit is issued, I shall not employ any person in any manner so as to become subject to the workman's compensation laws of California, I further acknowledge that I understand, in the event that I should become subject to the workman's compensation provisions of the Labor Code of California and fail to comply forthwith with the provisions of Section 3800 of the Labor Code, that the Permit herein applied for shall be deemed revoked.
( ) VI. I certify as the owner (or the agent of the owner) that in the performance of the work for which this Permit is issued, I will employ a contractor who complies with the workman's compensation laws of California and who has on file, or prior to the commencement of any work will file, with the Central Permit Bureau evidence that workman's compensation insurance is carried.

Applicant's Signature: R. B. Kapuler — Date: 2/6/84

OFFICIAL COPY

SAN FRANCISCO
DEPARTMENT OF BUILDING INSPECTION

CONDITIONS AND STIPULATIONS

REFER TO:	APPROVED: [signature] 2/9/84 BUILDING INSPECTOR, BUR. OF BLDG. INSP.	DATE: REASON: NOTIFIED MR.
☐	APPROVED: [signature] FEB 08 1984 DEPARTMENT OF CITY PLANNING CATEGORICALLY EXEMPT FROM ENVIRONMENTAL REVIEW	DATE: REASON: NOTIFIED MR.
☒	APPROVED: SUBJECT TO COMPLIANCE WITH CONDITIONS WRITTEN ON PLANS NEXT TO STAMP & DATED 2-24-84 Paul Hrenoff INSP SFFD. 2-24-84 BUREAU OF FIRE PREVENTION & PUBLIC SAFETY	DATE: REASON: NOTIFIED MR.
☒	APPROVED: as noted on drawing Dot Y. Yee 2/24/84 CIVIL ENGINEER, BUR. OF BLDG. INSPECTION	DATE: REASON: NOTIFIED MR.
☐	APPROVED: BUREAU OF ENGINEERING	DATE: REASON: NOTIFIED MR.
☐	APPROVED: DEPARTMENT OF PUBLIC HEALTH	DATE: REASON: NOTIFIED MR.
☐	APPROVED: REDEVELOPMENT AGENCY	DATE: REASON: NOTIFIED MR.
☐	APPROVED: RESIDENTIAL ENV. INSPECTOR, DIV. OF APT. & HOTEL INSP., B.B.I.	DATE: REASON: NOTIFIED MR.
☒	APPROVED: PC FD or RAY [signature] 2/28/84	DATE: REASON: NOTIFIED MR.

HOLD SECTION — NOTE DATES AND NAMES OF ALL PERSONS NOTIFIED DURING PROCESSING

I AGREE TO COMPLY WITH ALL CONDITIONS OR STIPULATIONS OF THE VARIOUS BUREAUS OR DEPARTMENTS NOTED ON THIS APPLICATION, AND ATTACHED STATEMENTS OF CONDITIONS OR STIPULATIONS, WHICH ARE HEREBY MADE A PART OF THIS APPLICATION.
NUMBER OF ATTACHMENTS ☐

Ralph S. Raffaelli
SIGNATURE OF OWNER, LESSEE OR AUTHORIZED AGENT FOR OWNER OR LESSEE.

SAN FRANCISCO
DEPARTMENT OF
BUILDING INSPECTION
OFFICIAL COPY

WAIVER OF TIME RESTRICTION ON REQUESTS FOR ADDITIONAL INFORMATION

I hereby waive all time restrictions relative to submission of additional information. This waiver applies to those provisions of law which limit the City and County of San Francisco's ability to require further information for this project application. These provisions of law include Sections 65943 and 65944 of Chapter 4.5 of Division 1 of Title 7 of the Government Code (Review and Approval of Development Projects).

R. G. Raffaelli
Applicant's/Owner's Signature

R. G. Raffaelli
Type or Print Name

2/6/84
Date

8401359
Application No.

1201 Mason St.
Address

S.F., 94133

CPB 46

OFFICIAL COPY
SAN FRANCISCO
DEPARTMENT OF
BUILDING INSPECTION

CERTIFICATION OF AUTHORIZED AGENT

I hereby certify that for the purpose of filing an application for a building or other permit with the Central Permit Bureau, or completion of any form related to the S.F. Building Code, or to City and County ordinances and regulations, or to State laws and codes, I am the agent of the owner and am authorized to sign all documents connected with this application or permit.

I declare under penalty of perjury that the foregoing is true and correct.

R.S. Raffaelli
Applicant's Signature

R.G. Raffaelli
Type or Print Name

CDL P0721285
Identification (Drivers Lic. No., etc.)

CCSF PUC
Owner/Lessee

Feb 2, 1984
Date

CPB-37

OFFICIAL COPY
SAN FRANCISCO
DEPARTMENT OF BUILDING INSPECTION

CENTRAL PERMIT BUREAU
450 McAllister Street
San Francisco, CA 94102

Appl. # 8401359

Address 1201 Masan St.

LICENSED CONTRACTOR'S STATEMENT

Licensed Contractor's Declaration

Pursuant to the Business and Professions Code Sec. 7031.5, I hereby affirm that I am licensed under the provisions of Chapter 9 (commencing with Sec. 7000) of Division 3 of the Business and Professions Code, and that my license is in full force and effect.

License 323892 License Class AB

Expiration Date 9-30-84 Contractor (print) TUTOR - SALIBA

(signature) [signature]

Owner-Builder Declaration

I hereby affirm that I am exempt from the Contractor's License Law, Business and Professions Code (Sec. 7031.5). (Mark the appropriate box below.)

☐ I, as owner of the property, or my employees with wages as their sole compensation will do the work, and the structure is not intended or offered for sale (Sec. 7044). I further acknowledge that I understand and agree that in the event that any work is commenced contrary to the representations contained herein, that the Permit herein applied for shall be deemed cancelled.

☐ I, as architect owner am contracting with licensed contractors to construct this project (Sec. 7044). I certify that at the time such contractors are selected I will have them file a copy of this form (Licensed Contractors Declaration) prior to the commencement of any work. I further acknowledge that I understand and agree that, in the event that said contractors fail to file a copy of the Declaration with the Central Permit Bureau, that the Permit herein applied for shall be deemed cancelled.

☐ I am exempt under Business and Professions Code Sec. _____

Reason _____

Date _____ Owner (print) _____

(signature) _____

NOTICE: "Any violation of the Bus. & Prof. Code Sec. 7031.5 by any permit applicant shall be subject to a civil penalty of not more than five hundred dollars ($500)." Bus. & Prof. Code Sec. 7031.5

SAN FRANCISCO
DEPARTMENT OF
BUILDING INSPECTION
OFFICIAL COPY

APPROVED
Dept. of Public Works
OCT 02 1986
Franklin Lee
SUPERINTENDENT
BUREAU OF BUILDING INSPECTION

APPLICATION FOR BUILDING PERMIT
ADDITIONS, ALTERATIONS OR REPAIRS

FORM 3 ☐ OTHER AGENCIES REVIEW REQUIRED
FORM 8 ☐ OVER-THE-COUNTER ISSUANCE
2 NUMBER OF PLAN SETS

CITY AND COUNTY OF SAN FRANCISCO
DEPARTMENT OF PUBLIC WORKS

APPLICATION IS HEREBY MADE TO THE SUPERINTENDENT OF PUBLIC WORKS OF THE CITY AND COUNTY OF SAN FRANCISCO TO BUILD IN ACCORDANCE WITH THE PLANS AND SPECIFICATIONS SUBMITTED HEREWITH AND ACCORDING TO THE DESCRIPTION AND FOR THE PURPOSE HEREINAFTER SET FORTH.

APPROVED FOR ISSUANCE: OCT 2 1986

1-1-87 AG

DO NOT WRITE ABOVE THIS LINE

DATE FILED	PLANS FOR RECENT NO.	(1) STREET ADDRESS OF JOB	BLOCK & LOT
9-12-86	Con Joint 152.5/16	1201 MASON	
PERMIT NO.	ISSUED	(2A) ESTIMATED COST OF JOB	(2B) REVISED COST:
555259	10/2/86	$4,400.00	BY: DATE:

INFORMATION TO BE FURNISHED BY ALL APPLICANTS

DESCRIPTION OF EXISTING BUILDING

(3A) TYPE OF CONSTR.	(3B) NO. OF STORIES OF OCCUPANCY	(3C) NO. OF BASEMENTS AND CELLARS	(7A) PRESENT USE	(7B) OCCUP. CLASS	(7C) NO. OF DWELLING UNITS
FIRE N	3	0	GARAGE CAR STORAGE	H-4	0

DESCRIPTION OF BUILDING AFTER PROPOSED ALTERATION

(4) TYPE OF CONSTR.	(5) NO. OF STORIES OF OCCUPANCY	(6) NO. OF BASEMENTS AND CELLARS	(7) PROPOSED USE (LEGAL USE)	(8) OCCUP. CLASS	(9) NO. OF DWELLING UNITS
3N	3	0	SAME	SAME	SAME

(10) IS AUTO RUNWAY TO BE CONSTRUCTED OR ALTERED?	(11) WILL STREET SPACE BE USED DURING CONSTRUCTION?	(12) ELECTRICAL WORK TO BE PERFORMED?	(13) PLUMBING WORK TO BE PERFORMED?
YES ☐ NO ☒	YES ☐ NO ☒	YES ☒ NO ☐	PIPING YES ☒ NO ☐

(14) GENERAL CONTRACTOR: SIDOR-FIRE INC. ADDRESS: 470 E. BROKAW RD PHONE: 433114 CSLB LIC. NO.: 408888 EXPIRATION DATE: 1-3-87

(15) OWNER (WHERE LESSEE CROSS OUT ONE): City County San Francisco ADDRESS: 1201 Mason St PHONE (FOR CONTACT BY BUREAU): (408) 436 8888

(16) WRITTEN DESCRIPTION OF ALL WORK TO BE PERFORMED UNDER THIS APPLICATION (REFERENCE TO PLANS IS NOT SUFFICIENT): 1. ☐ 2. ☐ 3. ☐

FIRE DETECTION AND SUPPRESSION SYSTEM TO BE INSTALLED IN ELECTRICAL EQUIPMENT ROOM, CONTROL ROOM, [illegible].

ADDITIONAL INFORMATION — FORM 3 APPLICANTS ONLY

(17) DOES THIS ALTERATION CREATE ADDITIONAL STORY TO BUILDING?	(18) IF (17) IS YES, STATE NEW HEIGHT AT CENTER LINE OF FRONT	(19) DOES THIS ALTERATION CREATE OFFICE OR HORIZ. EXTENSION TO BUILDING?	(20) IF (19) IS YES, STATE NEW GROUND FLOOR AREA
YES ☐ NO ☒	FT.	YES ☐ NO ☒	SQ. FT.
(21) WILL SIDEWALK OVER SUBSIDEWALK SPACE BE REMOVED OR ALTERED? YES ☐ NO ☒	(22) WILL BUILDING EXTEND BEYOND PROPERTY LINE? YES ☐ NO ☒	(23) ANY OTHER EXISTING BLDG. ON LOT? IF YES, SHOW ON PLOT PLANS YES ☐ NO ☒	(24) DOES THIS ALTERATION CONSTITUTE A CHANGE OF OCCUPANCY? YES ☐ NO ☒

(25) ARCHITECT OR ENGINEER (DESIGN ☐ CONSTRUCTION ☐): SIDOR-FIRE INC. ADDRESS: 470 E. BROKAW CSLB/PE CERTIFICATE NO.:

(26) CONSTRUCTION LENDER (ENTIRE NAME AND BRANCH DESIGNATION IF ANY. IF THERE IS NO KNOWN CONSTRUCTION LENDER, ENTER "UNKNOWN"): ADDRESS:

IMPORTANT NOTICES

No change shall be made in the character of the occupancy or use without first obtaining a Building Permit authorizing such change. See San Francisco Building Code and San Francisco Housing Code.

No portion of building or structure or scaffolding used during construction, to be closer than 6'0" to any wire containing more than 750 volts. See Sec. 385, California Penal Code.

Pursuant to San Francisco Building Code, the building permit shall be posted on the job. The owner is responsible for approved plans and application being kept at building site.

Grade lines as shown on drawings accompanying this application are assumed to be correct. If actual grade lines are not the same as shown revised drawings showing correct grade lines, cuts and fills together with complete details of retaining walls and wall footings required must be submitted to this bureau for approval.

ANY STIPULATION REQUIRED HEREIN OR BY CODE MAY BE APPEALED.

BUILDING NOT TO BE OCCUPIED UNTIL CERTIFICATE OF FINAL COMPLETION IS POSTED ON THE BUILDING OR PERMIT OF OCCUPANCY GRANTED, WHEN REQUIRED.

APPROVAL OF THIS APPLICATION DOES NOT CONSTITUTE AN APPROVAL FOR THE ELECTRICAL WIRING OR PLUMBING INSTALLATIONS. A SEPARATE PERMIT FOR THE WIRING AND PLUMBING MUST BE OBTAINED. SEPARATE PERMITS ARE REQUIRED IF ANSWER IS "YES" TO ANY OF ABOVE QUESTIONS (10) (11) (12) (13) (22) or (24).

THIS IS NOT A BUILDING PERMIT. NO WORK SHALL BE STARTED UNTIL A BUILDING PERMIT IS ISSUED.

In dwellings all insulating materials must have a clearance of not less than two inches from all electrical wires or equipment.

CHECK APPROPRIATE BOX

☐ OWNER ☐ ARCHITECT ☐ ENGINEER
☐ LESSEE ☐ AGENT WITH POWER OF ATTORNEY
☒ CONTRACTOR ☐ ATTORNEY IN FACT

APPLICANT'S CERTIFICATION

I HEREBY CERTIFY AND AGREE THAT IF A PERMIT IS ISSUED FOR THE CONSTRUCTION DESCRIBED IN THIS APPLICATION, ALL THE PROVISIONS OF THE PERMIT AND ALL LAWS AND ORDINANCES THERETO WILL BE COMPLIED WITH.

Applicant's Signature: [signature] Date:

NOTICE TO APPLICANT

HOLD HARMLESS CLAUSE: The Permittee(s) by acceptance of the permit, agree(s) to indemnify and hold harmless the City and County of San Francisco from and against any and all claims, demands and actions for damages resulting from operations under this permit, regardless of negligence of the City and County of San Francisco, and to assume the defense of the City and County of San Francisco against all such claims, demands and actions.

In conformity with the provisions of Section 3800 of the Labor Code of the State of California, the applicant shall have on file, or file with the Central Permit Bureau, either Certificate (I) or (II) or (III) designated below or shall indicate item (IV) or (V) or (VI) below, whichever is applicable. If however, item (VI) is checked item (V) must be checked as well. Mark the appropriate method of compliance below:

( ) I. Certificate of Consent to Self-Insure issued by the Director of Industrial Relations.
(X) II. Certificate of Workmen's Compensation Insurance issued by an admitted insurer.
( ) III. An exact copy or duplicate of (I) or (II) certified by the insurer.
( ) IV. The cost of the work to be performed is $100 or less.
( ) V. I certify that in the performance of the work for which this Permit is issued, I shall not employ any person in any manner so as to become subject to the workmen's compensation laws of California, I further acknowledge that I understand, in the event that I should become subject to the workmen's compensation provisions of the Labor Code of California and fail to comply forthwith with the provisions of Section 3800 of the Labor Code, that the Permit herein applied for shall be deemed revoked.
( ) VI. I certify as the owner (or the agent of the owner) that in the performance of the work for which this Permit is issued, I will employ a contractor who complies with the workmen's compensation laws of California and who has on file, or prior to the commencement of any work will file, with the Central Permit Bureau evidence that workmen's compensation insurance is carried.

Applicant's Signature: [signature] Date:

OFFICIAL COPY

SAN FRANCISCO
DEPARTMENT OF BUILDING INSPECTION

APPROVED

CONDITIONS AND STIPULATIONS

PER PLANS

DATE
REASON

BUILDING INSPECTOR BUR. OF BLDG. INSP.

NOTIFIED MR.

APPROVED Limited to interim work

APPROVED BY LANDMARKS BOARD
9/22/86
CATEGORICALLY EXEMPT FROM ENVIRONMENTAL REVIEWS

SEP 22 1986

DATE:
REASON:
NOTIFIED MR.

APPROVED: PER PLANS ONLY

DISTRICT FIRE INSPECTOR TO WITNESS TESTING OF HALON SYSTEM. CONTACT 24 HOURS PRIOR TO 861-8000 — EXT. 345

PLEASE NOTIFY AT START OF WORK CONTACT FIRE INSPECTOR 1415 861 8000 EXT. 345

BUREAU OF FIRE PREVENTION & PUBLIC SAFETY

DATE:
REASON:
NOTIFIED MR.

APPROVED:

CIVIL ENGINEER, BUR. OF BLDG. INSPECTION

DATE:
REASON:
NOTIFIED MR.

APPROVED:

BUREAU OF ENGINEERING

DATE:
REASON:
NOTIFIED MR.

APPROVED:

DEPARTMENT OF PUBLIC HEALTH

DATE:
REASON:
NOTIFIED MR.

APPROVED:

DATE:
REASON:
NOTIFIED MR.

APPROVED:

HOUSING INSPECTION DIVISION

DATE:
REASON:
NOTIFIED MR.

HOLD SECTION — NOTE DATES AND NAMES OF ALL PERSONS NOTIFIED DURING PROCESSING

I agree to comply with all conditions [illegible]

Number of attachments

[illegible]

OFFICIAL COPY
SAN FRANCISCO
DEPARTMENT OF
BUILDING INSPECTION

BUREAU APPLICATION

DATE 1-12-16

APPLICATION FILING FEE —
PLAN CHECKING RECEIPT

152516

RECEIVED OF

BUILDING APPLICATION NUMBERS

1,364

FEE FOR APPLICATION FILING AND CHECKING PLANS PRESCRIBED BY SAN FRANCISCO BUILDING CODE

ESTIMATED COST OF JOB	PLAN CHECK FEE REVENUE 7220	FILING FEE REVENUE 7221
54,431	[illegible]	[illegible]
EXPEDITED REVENUE 7899	FULL PLAN CHECK FILING - PLAN CHECK FEE 8% STRUCTURAL 7% ARCHITECTURAL 5% ENERGY	CITY AND COUNTY OF SAN FRANCISCO DEPARTMENT OF PUBLIC WORKS CENTRAL PERMIT BUREAU BY

OFFICIAL COPY
DEPARTMENT OF BUILDING INSPECTION

WAIVER OF TIME RESTRICTION ON REQUESTS
FOR ADDITIONAL INFORMATION

I hereby waive all time restrictions relative to submission of additional information. This waiver applies to those provisions of law which limit the City and County of San Francisco's ability to require further information for this project application. These provisions of law include Sections 65943 and 65944 of Chapter 4.5 of Division 1 of Title 7 of the Government Code (Review and Approval of Development Projects).

Applicant's/Owner's Signature

IAN M. STORLIE
Type or Print Name

9-12-86
Date

8611304
Application No.

470 E. BROKAW RD. SJ, CA 95112
Address

CPB-46

SAN FRANCISCO
DEPARTMENT OF
BUILDING INSPECTION
OFFICIAL COPY

CENTRAL PERMIT BUREAU
450 McALLISTER STREET
SAN FRANCISCO, CA 94102

Appl. # _____

Address _____

_____

LICENSED CONTRACTOR'S STATEMENT

Licensed Constractor's Declaration

Pursuant to the Business and Professions Code Sec. 7031.5, I hereby affirm that I am licensed under the provisions of Chapter 9 (commencing with Sec. 7000) of Division 3 of the Business and Professions Code, and that my license is in full force and effect.

License Number 439114 License Class C-16 / C-61

Expiration Date 1-31-87 Contractor STOP FIRE INC

PRINT

SIGNATURE

Owner-Builder Declaration

I hereby affirm that I am exempt from the Contractor's License Law, Business and Professions Code (Sec. 7031.5). (Mark the appropriate box below.)

☐ I, as owner of the property, or my employees with wages as their sole compensation, will do the work, and the structure is not intended or offered for sale (Sec. 7044). I further acknowledge that I understand and agree that in the event that any work is commenced contrary to the representations contained herein, that the Permit herein applied for shall be deemed cancelled.

☐ architect, agent
☐ I, as owner, am contracting with licensed contractors to construct this project (Sec. 7044). I certify that at the time such contractors are selected, I will have them file a copy of this form (Licensed Contractors Declaration) prior to the commencement of any work. I further acknowledge that I understand and agree that, in the event that said contractors fail to file a copy of the Declaration with the Central Permit Bureau, that the Permit herein applied for shall be deemed cancelled.

☐ I am exempt under Business and Professions Code Sec. _____

Reason _____

☐ Architect (PRINT) _____

Date _____ ☐ Agent (PRINT) _____

☐ Owner (PRINT) _____

(SIGNATURE) _____

NOTICE: "Any violation of the Bus. & Prof. Code Sec. 7031.5 by any permit applicant shall be subject to a civil penalty of not more than five hundred dollars ($500)." Bus. & Prof. Code Sec. 7031.5.

REV. CPB-38/84

OFFICIAL COPY
SAN FRANCISCO
DEPARTMENT OF
BUILDING INSPECTION

CERTIFICATION OF AUTHORIZED AGENT

I hereby certify that for the purpose of filing an application for a building or other permit with the Central Permit Bureau, or completion of any form related to the S.F. Building Code, or to City and County ordinances and regulations, or to state laws and codes, I am the agent of the owner and am authorized to sign all documents connected with this application or permit.

I declare under penalty of perjury that the forgoing is true and correct.

Applicant's Signature

IAN M. STOLLE
Type or Print Name

V9140886
Identification
(Drivers Lic. No., etc.)

CITY
Owner/Lessee

9-12-86
Date

CPB-37/85

OFFICIAL COPY
0022
DEPARTMENT OF BUILDING INSPECTION
If the image of this document appears less sharp than this notice, it is due to the quality of the original.

CENTRAL PERMIT BUREAU
450 McALLISTER STREET
SAN FRANCISCO, CA 94102

Appl. #_____

Address_____

_____

LICENSED CONTRACTOR'S STATEMENT

Licensed Contractor's Declaration

Pursuant to the Business and Professions Code Sec. 7031.5, I hereby affirm that I am licensed under the provisions of Chapter 9 (commencing with Sec. 7000) of Division 3 of the Business and Professions Code, and that my license is in full force and effect.

License Number 466348 License Class B-1

Expiration Date 12-31-94 Contractor Kirkland and Green
PRINT

Theresa Hauk
SIGNATURE

Owner-Builder Declaration

I hereby affirm that I am exempt from the Contractor's License Law, Business and Professions Code (Sec. 7031.5). (Mark the appropriate box below.)

☐ I, as owner of the property, or my employees with wages as their sole compensation, will do the work, and the structure is not intended or offered for sale (Sec. 7044). I further acknowledge that I understand and agree that in the event that any work is commenced contrary to the representations contained herein, that the Permit herein applied for shall be deemed cancelled.

☐ ☐ I, as owner, architect, agent am contracting with licensed contractors to construct this project (Sec. 7044). I certify that at the time such contractors are selected, I will have them file a copy of this form (Licensed Contractors Declaration) prior to the commencement of any work. I further acknowledge that I understand and agree that, in the event that said contractors fail to file a copy of the Declaration with the Central Permit Bureau, that the Permit herein applied for shall be deemed cancelled.

☐ I am exempt under Business and Professions Code Sec._____

Reason_____

☐ Architect (PRINT)_____

Date_____ ☐ Agent (PRINT)_____

☐ Owner (PRINT)_____

(SIGNATURE)_____

NOTICE: "Any violation of the Bus. & Prof. Code Sec. 7031.5 by any permit applicant shall be subject to a civil penalty of not more than five hundred dollars ($500)." Bus. & Prof. Code Sec. 7031.5.

REV. CPB-38/84

OFFICIAL COPY
SAN FRANCISCO
DEPARTMENT OF BUILDING INSPECTION
0 0 2 2 0
If the image of this document appears less sharp than this notice, it is due to the quality of the original.

FIRE

EXT. 5-22-93
3-22-93
UCSF UEB

APPROVED
Dept. of Public Works

CANCELLED

BLDG FORM 3/8

APPLICATION NUMBER 9220181

DATE 3-23-93

OSHA APPROVAL NUMBER

APPROVAL REQD ☐

APPLICATION FOR BUILDING PERMIT
ADDITIONS, ALTERATIONS OR REPAIRS

JUL 15 1993

CITY AND COUNTY OF SAN FRANCISCO
DEPARTMENT OF PUBLIC WORKS

APPLICATION IS HEREBY MADE TO THE DEPARTMENT OF PUBLIC WORKS OF THE CITY AND COUNTY OF SAN FRANCISCO FOR PERMISSION TO [illegible] ACCORDANCE WITH THE PLANS AND SPECIFICATIONS SUBMITTED HEREWITH AND ACCORDING TO THE DESCRIPTION AND FOR THE PURPOSE HEREINAFTER SET FORTH.

FORM 3 ☒ OTHER AGENCIES REVIEW REQUIRED
FORM 8 ☐ OVER-THE-COUNTER ISSUANCE
2 NUMBER OF PLAN SETS

DO NOT WRITE ABOVE THIS LINE

DATE FILED: 1-10-92
PERMIT NO: 725585
ISSUED: 7-15-93
FILING FEE RECEIPT NO:
(11) STREET ADDRESS OF JOB: 1201 Mason Street
BLOCK & LOT: 190/5
(12A) ESTIMATED COST OF JOB: $150,000.00
(12B) REVISED COST:
DATE: 1/27/92

INFORMATION TO BE FURNISHED BY ALL APPLICANTS

DESCRIPTION OF EXISTING BUILDING

(4A) TYPE OF CONSTR.	(5A) NO. OF STORIES OF OCCUPANCY	(6A) NO. OF BASEMENTS AND CELLARS	(7A) PRESENT USE	(8A) OCC. CLASS	(9A) NO. OF DWELLING UNITS
2-F.R.	3	1	Cable Car Barn	H-4 b	-0-

DESCRIPTION OF BUILDING AFTER PROPOSED ALTERATION

(4) TYPE OF CONSTR.	(5) NO. OF STORIES OF OCCUPANCY	(6) NO. OF BASEMENTS AND CELLARS	(7) PROPOSED USE (FROM USE)	(8) OCC. CLASS	(9) NO. OF DWELLING UNITS
2-F.R.	3	1	Offices	H-4 b	-0-

(10) IS AUTO RAMP(S) TO BE CONSTRUCTED OR ALTERED? YES ☐ NO ☒
(11) WILL STREET SPACE BE USED DURING CONSTRUCTION? YES ☒ NO ☐
(12) ELECTRICAL WORK TO BE PERFORMED? YES ☐ NO ☐
(13) PLUMBING WORK TO BE PERFORMED? YES ☐ NO ☒

(14) GENERAL CONTRACTOR: Not Selected — ADDRESS — PHONE — CSLB LIC. NO. — EXPIRATION DATE

(15) OWNER (ISSUES CROSS OUT ONE): City & County of San Francisco — ADDRESS: 949 Presidio Ave. San Francisco, Ca. 94115 — PHONE (FOR CONTACT BY BUREAU): 923-6380

(16) WRITE IN DESCRIPTION OF ALL WORK TO BE PERFORMED UNDER THIS APPLICATION (REFERENCE PLANS IF NOT DIFFERENT): 1 ☐ 2 ☐ 3 ☐

The addition of mezzanine offices

ADDITIONAL INFORMATION — FORM 3 APPLICANTS ONLY

(17) DOES THIS ALTERATION CREATE ADDITIONAL STORY TO BUILDING? YES ☐ NO ☒	(18) IF (17) IS YES, STATE NEW HEIGHT AT CENTER LINE OF FRONT: ft	(19) DOES THIS ALTERATION CREATE DECK OR HORIZ. EXTENSION TO BUILDING? YES ☐ NO ☒	(20) IF (19) IS YES, STATE NEW GROUND FLOOR AREA: SQ. FT.		
(21) WILL SIDEWALK OVER SUB-SIDEWALK SPACE BE REMOVED OR ALTERED? YES ☐ NO ☒	(22) WILL BUILDING EXTEND BEYOND PROPERTY LINE? YES ☐ NO ☒	(23) ARE OTHER EXISTING BLDGS ON LOT? IF YES, SHOW ON PLOT PLANS YES ☐ NO ☒	(24) DOES THIS ALTERATION CONSTITUTE A CHANGE OF OCCUPANCY? YES ☐ NO ☒		

(25) ARCHITECT OR ENGINEER (DESIGN ☐ CONSTRUCTION ☐): Utilities Engineering Bureau — ADDRESS: 1155 Market Street, San Francisco, CA — CA(R) CERTIFICATE NO.

(26) CONSTRUCTION LENDER (ENTER NAME AND BRANCH DESIGNATION IF ANY) IF THERE IS NO KNOWN CONSTRUCTION LENDER, ENTER "UNKNOWN": 94103

IMPORTANT NOTICES

No changes shall be made in the character of the occupancy or use without first obtaining a Building Permit authorizing such change. See San Francisco Building Code and San Francisco Housing Code.

No portion of building or structure or scaffolding used during construction, to be closer than 6'0" to any wire containing more than 750 volts. See Sec. 385, California Penal Code.

Pursuant to San Francisco Building Code, the building permit shall be posted on the job. The owner is responsible for approved plans and application being kept at building site.

Grade lines as shown on drawings accompanying this application are assumed to be correct. If actual grade lines are not the same as shown revised drawings showing correct grade lines, cuts and fills together with complete details of retaining walls and wall footings required must be submitted to this bureau for approval.

ANY STIPULATION REQUIRED HEREIN OR BY CODE MAY BE APPEALED.

BUILDING NOT TO BE OCCUPIED UNTIL CERTIFICATE OF FINAL COMPLETION IS POSTED ON THE BUILDING OR PERMIT OF OCCUPANCY GRANTED, WHEN REQUIRED. APPROVAL OF THIS APPLICATION DOES NOT CONSTITUTE AN APPROVAL FOR THE ELECTRICAL WIRING OR PLUMBING INSTALLATIONS. A SEPARATE PERMIT FOR THE WIRING AND PLUMBING MUST BE OBTAINED. SEPARATE PERMITS ARE REQUIRED IF ANSWER IS "YES" TO ANY OF ABOVE QUESTIONS (10); (11); (12); (13); (22) or (24). THIS IS NOT A BUILDING PERMIT. NO WORK SHALL BE STARTED UNTIL A BUILDING PERMIT IS ISSUED.

In dwellings all insulating materials must have a clearance of not less than two inches from all electrical wires or equipment.

CHECK APPROPRIATE BOX
☒ OWNER ☐ ARCHITECT ☐ ENGINEER
☐ LESSEE ☐ AGENT WITH POWER OF ATTORNEY
☐ CONTRACTOR ☐ ATTORNEY IN FACT

APPLICANT'S CERTIFICATION

I HEREBY CERTIFY AND AGREE THAT IF A PERMIT IS ISSUED FOR THE CONSTRUCTION DESCRIBED IN THIS APPLICATION, ALL THE PROVISIONS OF THE PERMIT AND ALL LAWS AND ORDINANCES THERETO SHALL BE COMPLIED WITH.

9/93

NOTICE TO APPLICANT

HOLD HARMLESS CLAUSE. The Permittee(s) by acceptance of the permit, agree(s) to indemnify and hold harmless the City and County of San Francisco from and against any and all claims, demands and actions for damages resulting from operations under this permit, regardless of negligence of the City and County of San Francisco, and to assume the defense of the City and County of San Francisco against all such claims, demands and actions.

In conformity with the provisions of Section 3800 of the Labor Code of the State of California, the applicant shall have on file with the Central Permit Bureau, either Certificate (I) or (II) or (III) designated below or shall indicate item (IV) or (V) or (VI) below, whichever is applicable. If however, item (V) is checked then item (VI) must be checked as well. Mark the appropriate method of compliance below:

( ) I. Certificate of Consent to Self Insure issued by the Director of Industrial Relations
( ) II. Certificate of Workmen's Compensation Insurance issued by an admitted insurer.
( ) III. An exact copy or duplicate of (I) certified by the Director or (II) certified by the insurer.
( ) IV. The cost of the work to be performed is $100 or less.
(X) V. I certify that in the performance of the work for which this Permit is issued, I shall not employ any person in any manner so as to become subject to the workmen's compensation laws of California. I further acknowledge that I understand, in the event that I should become subject to the workmen's compensation provisions of the Labor Code of California and fail to comply forthwith with the provisions of Section 3800 of the Labor Code, that the Permit herein applied for shall be deemed revoked.
(X) VI. I certify as the owner (or the agent of the owner) that in the performance of the work for which this Permit is issued, I will employ a contractor who complies with the workmen's compensation laws of California and who has on file, or prior to the commencement of any work will file, with the Central Permit Bureau evidence that workmen's compensation insurance is carried.

Applicant's Signature — Date

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SAN FRANCISCO
DEPARTMENT OF
PLANNING
0022
If the image of this document appears less sharp than this notice, it is due to the quality of the original.

CONDITIONS AND STIPULATIONS

APPROVED:

CANCELLED

N/A [signature] 2/27/92

BUILDING INSPECTOR, BUR. OF BLDG. INSP.

DATE:
REASON:
NOTIFIED MR.

☐ APPROVED: Minor addition

CATEGORICALLY EXEMPT FROM ENVIRONMENTAL REVIEW [signature] JAN 14 1992

DEPARTMENT OF CITY PLANNING

DATE:
REASON:
NOTIFIED MR.

☒ APPROVED: Reviewed for routing

[signature] 7-22-92

BUREAU OF FIRE PREVENTION & PUBLIC SAFETY

DATE:
REASON:
NOTIFIED MR.

☒ APPROVED:
SPECIAL INSPECTION AND REPORTS REQUIRED PER SECTION 305 a, b, c.
SUBMIT REPORTS TO THE BUREAU OF BLDG. INSPECTION FOR THE FOLLOWING:

SEE DWG. #5

[signature] 2/27/92

CIVIL ENGINEER, BUR. OF BLDG. INSPECTION

PROPO

DATE:
REASON:
NOTIFIED MR.

☐ APPROVED:

BUREAU OF ENGINEERING

DATE:
REASON:
NOTIFIED MR.

☐ APPROVED:

DEPARTMENT OF PUBLIC HEALTH

DATE:
REASON:
NOTIFIED MR.

☒ APPROVED:

[signature] 7/21/92
PPO-MC

DATE:
REASON:
NOTIFIED MR.

☐ APPROVED:

DATE:
REASON:
NOTIFIED MR.

[signature]

HOLD SECTION — NOTE DATES AND NAMES OF ALL PERSONS NOTIFIED DURING PROCESSING

OFFICIAL COPY
SAN FRANCISCO
0052

CENTRAL PERMIT BUREAU
450 McALLISTER STREET
SAN FRANCISCO, CA 94102

Appl. #_____

Address_____

_____

LICENSED CONTRACTOR'S STATEMENT

Licensed Contractor's Declaration

Pursuant to the Business and Professions Code Sec. 7031.5, I hereby affirm that I am licensed under the provisions of Chapter 9 (commencing with Sec. 7000) of Division 3 of the Business and Professions Code, and that my license is in full force and effect.

License Number_____ License Class_____

Expiration Date_____ Contractor_____
PRINT

_____
SIGNATURE

Owner-Builder Declaration

I hereby affirm that I am exempt from the Contractor's License Law, Business and Professions Code (Sec. 7031.5). (Mark the appropriate box below.)

☐ I, as owner of the property, or my employees with wages as their sole compensation, will do the work, and the structure is not intended or offered for sale (Sec. 7044). I further acknowledge that I understand and agree that in the event that any work is commenced contrary to the representations contained herein, that the Permit herein applied for shall be deemed cancelled.

☒ architect, agent

☐ I, as owner, am contracting with licensed contractors to construct this project (Sec. 7044). I certify that at the time such contractors are selected, I will have them file a copy of this form (Licensed Contractors Declaration) prior to the commencement of any work. I further acknowledge that I understand and agree that, in the event that said contractors fail to file a copy of the Declaration with the Central Permit Bureau, that the Permit herein applied for shall be deemed cancelled.

☐ I am exempt under Business and Professions Code Sec._____

Reason_____

☐ Architect (PRINT)_____

Date 10 January 1992 ☐ Agent (PRINT) John H. O'Brien

☐ Owner (PRINT)_____

(SIGNATURE) John H. O'Brien

NOTICE: "Any violation of the Bus. & Prof. Code Sec. 7031.5 by any permit applicant shall be subject to a civil penalty of not more than five hundred dollars ($500)." Bus. & Prof. Code Sec. 7031.5.

REV. CPB-38/84

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SAN FRANCISCO
DEPARTMENT OF BUILDING INSPECTION
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CERTIFICATION OF AUTHORIZED AGENT

I hereby certify that for the purpose of filing an application for a building or other permit with the Central Permit Bureau, or completion of any form related to the S.F. Building Code, or to City and County ordinances and regulations, or to state laws and codes, I am the agent of the owner and am authorized to sign all documents connected with this application or permit.

I declare under penalty of perjury that the forgoing is true and correct.

Applicant's Signature

Type or Print Name

Identification
(Drivers Lic. No., etc.)

Owner/Lessee

Date

CPB-37/85

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SAN FRANCISCO MUNICIPAL RAILWAY 949 PRESIDIO AVENUE SAN FRANCISCO CALIF 94115 (415) 673-6864

January 9, 1992

Mr. Lawrence Litchfield
Superintendent, Bureau of Building Inspection
450 McAllister Street, Room 202
San Francisco, CA 94102

Subject: Municipal Railway Contract No. MR-1012
Cable Car Barn Office Addition
Permit Application

Dear Mr. Litchfield:

Enclosed please find the plans for the subject project.

It is the intention of the Municipal Railway to submit the plans for review and issuance of a permit prior to letting a contract for bidding. Therefore, the plans are being forwarded to your office.

A Direct Payment Voucher will be sent under separate cover to pay the permit fees. The Direct Payment Voucher will consist of following:

1.	BBI Inspection	$200.00
2.	Plan Check	693.71
3.	Expediter	24.50
4.	DAC	9.75
5.	Fire Plan Check	295.00
6.	Fire Inspector	125.00
7.	SMP	36.00
Total		$1,383.96

If you should require additional information please contact John M. O'Neill, Project Manager at 923-6380

Thank you for your assistance in this matter.

Sincerely,

Edward W. Pearson
Deputy General Manager
Plant Engineering & Construction

EWP:JO'N:cl

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SAN FRANCISCO
DEPARTMENT OF
BUILDING

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A 3-22
to 5-22-93

CITY AND COUNTY OF SAN FRANCISCO
DEPARTMENT OF PUBLIC WORKS
CENTRAL PERMIT BUREAU

GENERAL
RECEIPT
NO. 87036

[illegible] 19 93

RECEIVED FROM:

PAYMENT RECEIVED FOR THE ITEMS INDICATED:

NUMBER	DESCRIPTION	AMOUNT
	[illegible]	31 25
	# 9200481	
	1201 Magnolia St	
	[illegible] Bern	
		31 25

ACCOUNTING

CENTRAL PERMIT BUREAU
By [illegible]

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DEPARTMENT OF
BUILDING INSPECTION
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Muni Dept Fund
Valid Project ?

MUNI SAN FRANCISCO MUNICIPAL RAILWAY 949 PRESIDIO AVENUE, SAN FRANCISCO, CALIF. 94115 415-573-6884

Rm 150

M E M O R A N D U M

DATE: March 12, 1993

TO: Ed Harrington
Controller

FROM: John O'Neill
Project Manager

SUBJECT: Direct Payment Voucher
to Bureau of Building Inspection

Your approval is requested for the certification of the attached direct payment voucher in the amount of $1,415.21 representing payment of permit fees and an application extension fee to the Bureau of Building Inspection to provide for the addition of offices at the Cable Car Barn.

A direct payment voucher is being submitted as Building Inspection will not accept journal entry fund transfers for permits.

When processed, please have the check "in-housed" to me at the above address,

Municipal Railway
Presidio Division, Room 150

If you or your staff should require additional information, please call me at 923-6380.

JON:RR:cl
Enclosure

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0022

CITY AND COUNTY OF SAN FRANCISCO

DIRECT PAYMENT VOUCHER

DEPARTMENT			CONTROLLER'S NO.
35 Railway			DP 35-21415
DEPT. JOB / SEC.	FUND CHRT. / FUND	FISCAL PERIOD	DATE
35/00/00	31-001	FY 92 PM 12	6/03/93 PAGE 1 OF 1
CONTRACT NO. OR OTHER PURCHASING AUTHORITY			CHRT. CONTROL NO.

TO: CCSF DPW Bureau of Building Inspection
450 McAllister Street, Room 104
San Francisco, CA 94102

FOR:
Building Permit Extension Fee for
1201 Mason Street, Cable Car Barn
Application Number 9200481

Extension Fees	$31.25
Total Amount	$31.25

FOR CONTROLLER'S USE ONLY

A	LEGALITY/VALIDITY VERIFIED
U	
D	
I	EXTENSIONS & FOOTINGS CHECKED
T	

BATCH IDENTIFICATION NO.
POSTING DATE
ACCOUNTING SUPERVISOR
TOTAL PAYMENT AMOUNT

CERTIFICATION is hereby made that this expenditure is according to law; that articles or services as shown hereon are for official purposes of the City and County; that any travel advance will be accounted for promptly in accordance with law.

Thomas J. Elzey
DEPARTMENT HEAD

APPROVED FOR MATERIALS, SUPPLIES, AND SERVICES
PURCHASER OF SUPPLIES

CHIEF ADMIN. OFFICER, BOARD OR COMMISSION

LN NO.	TRANS CODE	DOCUMENT NUMBER	DOCUMENT REFERENCE NO.	WARRANT NUMBER OR DUE DATE	SUBSIDIARY ACCOUNT	VENDOR NUMBER	INDEX CODE	SUB OBJECT	PROJECT	WORK PHASE	DEPT. INFO.	AMOUNT
01	9300	DP 35 21415					742916	1436	225	01		$31.25
02												
03												
04												

490805

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City and County of San Francisco

DEPARTMENT OF PUBLIC WORKS
Central Permit Bureau

June 22, 1993

EXTENSION FOR APPROVED PERMIT APPLICATION

City & County of S.F.
949 Presidio Ave
San Francisco, CA 94115

Application No: 9200481

1201 Mason St.
(Address)

Dear Customer:

In response to your letter of March 12, 1993 in which you requested an extension of time during processing of the subject permit application:

Under the provisions of Section 303(a) 1F, S.F. Building Code, the application is extended for a period of 60 days from March 22, 1993 and will be subject to cancellation on May 22, 1993.

No further extensions may be granted.

Very truly yours,

L. L. Litchfield, P.E.
Superintendent
Bureau of Building Inspection

By: Teresa J. Hannell

Teresa J. Hannell, Manager
Central Permit Bureau

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DEPARTMENT OF
BUILDING INSPECTION
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(J O Neill – SF Muni 949 Presidio doc. 94115

PUC sent C/W including duplicate payment of permit fees ~~#~~ + extension fee of $31.25 —

Ret C/W & requested payment of $31.25 only!

Please don't cancell

04/05/93

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DEPARTMENT OF PUBLIC WORKS
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SAN FRANCISCO MUNICIPAL RAILWAY 949 PRESIDIO AVENUE, SAN FRANCISCO, CALIF. 94115 415/673-6864

Rm 150

MEMORANDUM

DATE: March 12, 1993

TO: Ed Harrington
Controller

FROM: John O'Neill
Project Manager

SUBJECT: Direct Payment Voucher
to Bureau of Building Inspection

Your approval is requested for the certification of the attached direct payment voucher in the amount of $1,415.21 representing payment of permit fees and an application extension fee to the Bureau of Building Inspection to provide for the addition of offices at the Cable Car Barn.

A direct payment voucher is being submitted as Building Inspection will not accept journal entry fund transfers for permits.

When processed, please have the check "in-housed" to me at the above address,

Municipal Railway
Presidio Division, Room 150

If you or your staff should require additional information, please call me at 923-6380.

JON:RR:cl
Enclosure

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DEPARTMENT OF BUILDING INSPECTION
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City and County of San Francisco

Department of Public Works
Bureau of Building Inspection

NOTICE OF APPLICATION CANCELLATION
DATE: 05/02/93

UTILITIES ENGINEERING BUREAU
1155 MARKET ST
SAN FRANCISCO, CA 94103

APPLICATION NUMBER: 9200481
ADDRESS: 1201- MASON ST, 0000

APPLICATION APPROVED: 11/12/92

DEAR UTILITIES ENGINEERING BUREAU

YOU ARE HEREBY NOTIFIED THAT YOUR APPLICATION FOR A BUILDING PERMIT AT THE ABOVE NOTED ADDRESS(ES) WILL BE CANCELLED ON 03/22/93.

FOR FURTHER INFORMATION, BRING THIS LETTER TO ROOM 104, 450 MCALLISTER STREET, SAN FRANCISCO. PLEASE DO NOT TELEPHONE. YOU ARE REMINDED THAT BY LAW IT IS NECESSARY TO HAVE A PERMIT ON THE JOB BEFORE WORK CAN BE STARTED.

A ONE TIME EXTENSION OF 60 DAYS, AT ANY POINT DURING THE APPROVAL PROCEDURE, MAY BE GRANTED BY THE SUPERINTENDENT UPON WRITTEN REQUEST BY THE APPLICANT WITH A PAYMENT OF $31.25 MADE PAYABLE TO DEPARTMENT OF PUBLIC WORKS.

THIS NON REFUNDABLE FEE IS REQUIRED IF YOUR APPLICATION WAS FILED ON OR AFTER FEBRUARY 6, 1989.

VERY TRULY YOURS,

TERESA J. HANSELL, MANAGER
CENTRAL PERMIT BUREAU

CC: CITY & COUNTY OF SF
949 PRESIDIO AVE
SAN FRANCISCO, CA
94115

CENTRAL PERMIT BUREAU
450 MCALLISTER ST.
ROOM 104
SAN FRANCISCO, CA. 94102

(415) 558-6070

PTFIL80,PTLTR2

SAN FRANCISCO
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DEPARTMENT OF
BUILDING INSPECTION

APPROVED
DEPARTMENT OF BUILDING INSPECTION
DEC 16 1999

FIRE

DEC 16 1999
APPROVED FOR ISSUANCE

BLDG. FORM 3/8

APPLICATION NUMBER 9926158

OSHA APPROVAL NUMBER:

NO ADDRESS

APPLICATION FOR BUILDING PERMIT
ADDITIONS, ALTERATIONS OR REPAIRS

FORM 3 ☐ OTHER AGENCIES REVIEW REQUIRED

FORM 8 ☒ OVER-THE-COUNTER ISSUANCE

2 NUMBER OF PLAN SETS

WC 1-1-00

CITY AND COUNTY OF SAN FRANCISCO
DEPARTMENT OF BUILDING INSPECTION

APPLICATION IS HEREBY MADE TO THE DEPARTMENT OF BUILDING INSPECTION OF SAN FRANCISCO FOR PERMISSION TO BUILD IN ACCORDANCE WITH THE PLANS AND SPECIFICATIONS SUBMITTED HEREWITH AND ACCORDING TO THE DESCRIPTION AND FOR THE PURPOSE HEREINAFTER SET FORTH.

OFFICE COPY

▼ DO NOT WRITE ABOVE THIS LINE ▼

DATE FILED	PLANS FEE RECEIPT NO.	(1) STREET ADDRESS OF JOB	BLOCK & LOT
12/16/99		1201 MASON ST.	
PERMIT NO.	**ISSUED**	**(2A) ESTIMATED COST OF JOB**	**(2B) REVISED COST:**
894450	12/16/99	6000 —	BY: DATE:

INFORMATION TO BE FURNISHED BY ALL APPLICANTS

LEGAL DESCRIPTION OF EXISTING BUILDING

(3A) CONSTRUCTION TYPE	(3B) NO. OF STORIES OF OCCUPANCY	(3C) NO. OF BASEMENTS AND CELLARS	(3D) PRESENT USE	(3E) OCCUP. CLASS	(3F) NO. OF DWELLING UNITS
V	2	0	CABLE CAR BARN / MUSEUM	B	0

DESCRIPTION OF BUILDING AFTER PROPOSED ALTERATION

(4) CONSTRUCTION TYPE	(4B) NO. OF STORIES OF OCCUPANCY	(4C) NO. OF BASEMENTS AND CELLARS	(4D) PROPOSED USE (LEGAL USE)	(4E) OCCUP. CLASS	(4F) NO. OF DWELLING UNITS
V	2	0	CABLE CAR BARN / MUSEUM	B	0

(5) IS AUTO RUNWAY TO BE CONSTRUCTED OR ALTERED?	(11) WILL STREET SPACE BE USED DURING CONSTRUCTION?	(11A) ELECTRICAL WORK TO BE PERFORMED?	(11B) PLUMBING WORK TO BE PERFORMED?
YES ☐ NO ☒	YES ☐ NO ☒	YES ☐ NO ☒	YES ☐ NO ☒

(14) GENERAL CONTRACTOR — ADDRESS — CITY — STATE — CALIF. LIC. NO. — EXPIRATION DATE

INT'L FIRE EQUIPMENT 5726 PARADISE DR. CORTE MADERA, CA 94925 — 255912 — 4/30/01

(15) OWNER - LESSEE (CROSS OUT ONE) — ADDRESS — CITY — STATE — PHONE (FOR CONTACT BY DEPT.)

CITY AND COUNTY OF SF. 1201 MASON ST, SF, CA

(16) WRITE IN DESCRIPTION OF ALL WORK TO BE PERFORMED UNDER THIS APPLICATION (REFERENCE TO PLANS IS NOT SUFFICIENT)

T. I. SPRINKLER CHANGE FIRE SPRINKLER HEADS
FROM DELUGE TO REGULAR SPRINKLER SYSTEM.
REPLACE 29 OPEN SPRINKLERS (RELOCATE)
PLUG 29 OPEN SPRINKLERS ADD 6 HEADS NEW PIPE ENGINE

ADDITIONAL INFORMATION

(17) DOES THIS ALTERATION CREATE ADDITIONAL HEIGHT OR STORY TO BUILDING?	(18) IF (17) IS YES, STATE NEW HEIGHT AT CENTER LINE OF FRONT FT.	(19) DOES THIS ALTERATION CREATE DECK OR HORIZ. EXTENSION TO BUILDING?	(20) IF (19) IS YES, STATE NEW GROUND FLOOR AREA SQ. FT.
YES ☐ NO ☒		YES ☐ NO ☒	

(21) WILL SIDEWALK OVER SUB-SIDEWALK SPACE BE REMAINED OR ALTERED?	(22) WILL BUILDING EXTEND BEYOND PROPERTY LINE?	(23) ANY OTHER EXISTING BLDG ON LOT? IF YES, SHOW ON PLOT PLAN	(24) DOES THIS ALTERATION CONSTITUTE A CHANGE OF OCCUPANCY?
YES ☐ NO ☒	YES ☐ NO ☒	YES ☐ NO ☒	YES ☐ NO ☒

(25) ARCHITECT OR ENGINEER (DES-GN) CONSTRUCTION JT. — ADDRESS — CALIF. CERTIFICATE NO.

INT'L FIRE 5726 PARADISE DR. CORTE MADERA, CA 94925

(26) CONSTRUCTION LENDER (ENTER NAME AND BRANCH DESIGNATION IF ANY. IF THERE ELNO KNOWN CONSTRUCTION LENDER, ENTER "UNKNOWN") — ADDRESS

NONE

IMPORTANT NOTICES

No change shall be made in the character of the occupancy or use without first obtaining a Building Permit authorizing such change. See San Francisco Building Code and San Francisco Housing Code.

No portion of building or structure or scaffolding used during construction, to be closer than 6'0" to any wire conducting more than 750 volts. See Sec. 385, California Penal Code.

Pursuant to San Francisco Building Code, the building permit shall be posted on the job. The owner is responsible for approved plans and application being kept at building site.

Grade lines as shown on drawings accompanying this application are assumed to be correct. If actual grade lines are not the same as shown revised drawings showing correct grade lines, cuts and fills together with complete details of retaining walls and wall footings required must be submitted to this department for approval.

ANY STIPULATION REQUIRED HEREIN OR BY CODE MAY BE APPEALED.

BUILDING NOT TO BE OCCUPIED UNTIL CERTIFICATE OF FINAL COMPLETION IS POSTED ON THE BUILDING OR PERMIT OF OCCUPANCY GRANTED, WHEN REQUIRED.

APPROVAL OF THIS APPLICATION DOES NOT CONSTITUTE AN APPROVAL FOR THE ELECTRICAL WIRING OR PLUMBING INSTALLATIONS. A SEPARATE PERMIT FOR THE WIRING AND PLUMBING MUST BE OBTAINED. SEPARATE PERMITS ARE REQUIRED IF ANSWER IS "YES" TO ANY OF ABOVE QUESTIONS (10) (11) (12) (13) (22) OR (24).

THIS IS NOT A BUILDING PERMIT. NO WORK SHALL BE STARTED UNTIL A BUILDING PERMIT IS ISSUED.

In dwellings all insulating materials must have a clearance of not less than two inches from all electrical wires or equipment.

CHECK APPROPRIATE BOX

☐ OWNER	☐ ARCHITECT
☐ LESSEE	☐ AGENT
☒ CONTRACTOR	☐ ENGINEER

APPLICANT'S CERTIFICATION

I HEREBY CERTIFY AND AGREE THAT IF A PERMIT IS ISSUED FOR THE CONSTRUCTION DESCRIBED IN THIS APPLICATION, ALL THE PROVISIONS OF THE PERMIT AND ALL LAWS AND ORDINANCES THERETO WILL BE COMPLIED WITH.

3003-03 (REV. 1/96)

NOTICE TO APPLICANT

HOLD HARMLESS CLAUSE: The permittee(s) by acceptance of the permit, agree(s) to indemnify and hold harmless the City and County of San Francisco from and against any and all claims, demands and actions for damages resulting from operations under this permit, regardless of negligence of the City and County of San Francisco, and to assume the defense of the City and County of San Francisco against all such claims, demands or actions.

In conformity with the provisions of Section 3800 of the Labor Code of the State of California, the applicant shall have coverage under (I), or (II) designated below or shall indicate item (III), or (IV), or (V), whichever is applicable. If however item (V) is checked item (IV) must be checked as well. Mark the appropriate method of compliance below:

I hereby affirm under penalty of perjury one of the following declarations:

( ) I. I have and will maintain a certificate of consent to self-insure for workers' compensation, as provided by Section 3700 of the Labor Code, for the performance of the work for which this permit is issued.

(X) II. I have and will maintain workers' compensation insurance, as required by Section 3700 of the Labor Code, for the performance of the work for which this permit is issued. My workers' compensation insurance carrier and policy number are:

Carrier: REPUBLIC INDEMNITY

Policy Number: 136 11 301

( ) III. The cost of the work to be done is $100 or less.

( ) IV. I certify that in the performance of the work for which this permit is issued, I shall not employ any person in any manner so as to become subject to the workers' compensation laws of California. I further acknowledge that I understand that in the event that I should become subject to the workers' compensation provisions of the Labor Code of California and fail to comply forthwith with the provisions of Section 3800 of the Labor Code, that the permit herein applied for shall be deemed revoked.

( ) V. I certify as the owner (or the agent for the owner) that in the performance of the work for which this permit is issued, I will employ a contractor who complies with the workers' compensation laws of California and who, prior to the commencement of any work, will file a completed copy of this form with the Central Permit Bureau.

Signature of Applicant or Agent — Date: 12/16/99

OFFICIAL COPY
SAN FRANCISCO
DEPARTMENT OF BUILDING INSPECTION

CONDITIONS AND STIPULATIONS

APPROVED:	[signature] 12/16/99	DATE: ____ REASON: NOTIFIED MR.
☐ APPROVED:	N/A DEPARTMENT OF CITY PLANNING	DATE: ____ REASON: NOTIFIED MR.
☒ APPROVED:	PLEASE NOTIFY FIRE INSPECTOR AT THE START OF WORK 558-3300 [signature] BUREAU OF FIRE PREVENTION & PUBLIC SAFETY 12/16/99	DATE: ____ REASON: NOTIFIED MR.
☐ APPROVED:	N/A CIVIL ENGINEER, DEPT. OF BLDG. INSPECTION	DATE: ____ REASON: NOTIFIED MR.
☐ APPROVED:	BUREAU OF ENGINEERING	DATE: ____ REASON: NOTIFIED MR.
☐ APPROVED:	DEPARTMENT OF PUBLIC HEALTH	DATE: ____ REASON: NOTIFIED MR.
☐	REDEVELOPMENT AGENCY	DATE: ____ REASON: NOTIFIED MR.
☐ APPROVED:	HOUSING INSPECTION DIVISION	DATE: ____ REASON: NOTIFIED MR.

HOLD SECTION — NOTE DATES AND NAMES OF ALL PERSONS NOTIFIED DURING PROCESSING

I agree to comply with all conditions or stipulations of the various bureaus or departments noted on this application, and attached statements of conditions or stipulations, which are hereby made a part of this application.

Number of attachments ☐

OWNER'S AUTHORIZED AGENT

OFFICIAL COPY

SAN FRANCISCO
DEPARTMENT OF
BUILDING INSPECTION

CENTRAL PERMIT BUREAU
1660 MISSION STREET
SAN FRANCISCO, CA 94103

Appl. # _____
Address _____

LICENSED CONTRACTOR'S STATEMENT

Licensed Contractor's Declaration

Pursuant to the Business and Professions Code Sec. 7031.5, I hereby affirm under penalty of perjury that I am licensed under the provisions of Chapter 9 (commencing with Sec. 7000) of Division 3 of the Business and Professions Code, and that my license is in full force and effect.

License Number 253912 License Class C-16

Expiration Date 4/30/01 Contractor INT'L FREE
PRINT

SIGNATURE

Owner-Builder Declaration

I hereby affirm under penalty of perjury that I am exempt from the Contractor's License Law, Business and Professions Code (Sec. 7031.5). (Mark the appropriate box below.)

_____ I, as owner of the property, or my employees with wages as their sole compensation, will do the work, and the structure is not intended or offered for sale (Sec. 7044). I further acknowledge that I understand and agree that in the event that any work is commenced contrary to the representations contained herein, that the Permit herein applied for shall be deemed suspended.

_____ architect, agent

I, as owner of the property, am exclusively contracting with licensed contractors to construct this project (Sec. 7044). I certify that at the time such contractors are selected, I will have them file a copy of this form (Licensed Contractor's Declaration) prior to the commencement of any work. I further acknowledge that I understand and agree that, in the event that said contractors fail to file a copy of the Declaration with the Central Permit Bureau, that the Permit herein applied for shall be deemed suspended.

_____ I am exempt under Business and Professions Code Sec. _____

Reason _____

Date _____

_____ Architect (PRINT) _____

_____ Agent (PRINT) _____

_____ Owner (PRINT) _____

(SIGNATURE) _____

NOTICE: "Any violation of the Bus. & Prof. Code Sec. 7031.5 by any permit applicant shall be subject to a civil penalty of not more than five hundred dollars ($500)." Bus. & Prof. Code Sec. 7031.5.

REV. CPB-1/95

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SAN FRANCISCO
DEPARTMENT OF
BUILDING INSPECTION

CERTIFICATION OF AUTHORIZED AGENT

I hereby certify that for the purpose of filing an application for a building or other permit with the Central Permit Bureau, or completion of any form related to the S.F. building Code, or to City and County ordinances and regulations, or to state laws and codes, I am the agent of the owner and am authorized to sign all documents connected with this application or permit.

I declare under penalty of perjury that the foregoing is true and correct.

Applicant's Signature

P. DUREK

Type or Print Name

N-963700

Identification
(Drivers Lic. No., etc.)

City and County of SF

Owner/Lessee

12/16/99

Date

CPB-37/85

SAN FRANCISCO DEPARTMENT OF BUILDING INSPECTION — OFFICIAL COPY

APPROVED Dept. of Building Insp.
MAR 25 2015

SFFD INSP. FEES REQ.

FIRE ONLY

APPROVED FOR ISSUANCE MAR 25 2015

BLDG. FORM 3/8

APPLICATION NUMBER 201503258820

OSHA APPROVAL REQ'D ☐ APPROVAL NUMBER

NW

Tom C. Hui
TOM C. HUI, S.E.
DIRECTOR

APPLICATION FOR BUILDING PERMIT ADDITIONS, ALTERATIONS OR REPAIRS

WC 9/22/15

FORM 3 ☐ OTHER AGENCIES REVIEW REQUIRED

FORM 8 ☒ OVER-THE-COUNTER ISSUANCE

2 NUMBER OF PLAN SETS

CITY AND COUNTY OF SAN FRANCISCO DEPARTMENT OF BUILDING INSPECTION

APPLICATION IS HEREBY MADE TO THE DEPARTMENT OF BUILDING INSPECTION OF SAN FRANCISCO FOR PERMISSION TO BUILD IN ACCORDANCE WITH THE PLANS AND SPECIFICATIONS SUBMITTED HEREWITH AND ACCORDING TO THE DESCRIPTION AND FOR THE PURPOSE HEREINAFTER SET FORTH.

▼ DO NOT WRITE ABOVE THIS LINE ▼

DATE FILED	FILING FEE RECEIPT NO.	(1) STREET ADDRESS OF JOB	BLOCK & LOT
3/25/15		1201 MASON ST.	0190/005

PERMIT NO.	ISSUED	(2A) ESTIMATED COST OF JOB	(2B) REVISED COST:
1352698	3/25/15	$3,000 $1,028	BY: $4,028 DATE: 3-25-15

INFORMATION TO BE FURNISHED BY ALL APPLICANTS

LEGAL DESCRIPTION OF EXISTING BUILDING

(4A) TYPE OF CONSTR.	(5A) NO. OF STORIES OF OCCUPANCY:	(6A) NO. OF BASEMENTS AND CELLARS:	(7A) PRESENT USE:	(8A) OCCUP. CLASS	(9A) NO. OF DWELLING UNITS:
V	2	1	Cable Car Museum	B/A3	0

DESCRIPTION OF BUILDING AFTER PROPOSED ALTERATION

(4) TYPE OF CONSTR.	(5) NO. OF STORIES OF OCCUPANCY:	(6) NO. OF BASEMENTS AND CELLARS:	(7) PROPOSED USE (LEGAL USE)	(8) OCCUP. CLASS	(9) NO. OF DWELLING UNITS:
V	2	1	Cable Car Museum	B/A3	0

(10) IS AUTO RUNWAY TO BE CONSTRUCTED OR ALTERED?	(11) WILL STREET SPACE BE USED DURING CONSTRUCTION?	(12) ELECTRICAL WORK TO BE PERFORMED?	(13) PLUMBING WORK TO BE PERFORMED?
YES ☐ NO ☒	YES ☐ NO ☒	YES ☐ NO ☒	YES ☐ NO ☒

(14) GENERAL CONTRACTOR	ADDRESS	ZIP	PHONE	CALIF. LIC. NO.	EXPIRATION DATE
Int. Fire	765 Pennsylvania	SF.	415 643 1767	C16 965370	9/15

(15) OWNER - LESSEE (CROSS OUT ONE)	ADDRESS	ZIP	BTR#	PHONE (FOR CONTACT BY DEPT.)
S.F. Cable Car Museum				

(16) WRITE IN DESCRIPTION OF ALL WORK TO BE PERFORMED UNDER THIS APPLICATION (REFERENCE TO PLANS IS NOT SUFFICIENT)

To install 7 fire sprinkler heads in new office.

ADDITIONAL INFORMATION

(17) DOES THIS ALTERATION CREATE ADDITIONAL HEIGHT OR STORY TO BUILDING?	(18) IF (17) IS YES, STATE NEW HEIGHT AT CENTER LINE OF FRONT	(19) DOES THIS ALTERATION CREATE DECK OR HORIZ. EXTENSION TO BUILDING?	(20) IF (19) IS YES, STATE NEW GROUND FLOOR AREA
YES ☐ NO ☒		YES ☐ NO ☒	SQ. FT.

(21) WILL SIDEWALK OVER SUB-SIDEWALK SPACE BE REPAIRED OR ALTERED?	(22) WILL BUILDING EXTEND BEYOND PROPERTY LINE?	(23) ANY OTHER EXISTING BLDG. ON LOT? (IF YES, SHOW ON PLOT PLAN)	(24) DOES THIS ALTERATION CONSTITUTE A CHANGE OF OCCUPANCY?
YES ☐ NO ☒	YES ☐ NO ☒	YES ☐ NO ☒	YES ☐ NO ☒

(25) ARCHITECT OR ENGINEER (DESIGN OF CONSTRUCTION)	ADDRESS	CALIF. CERTIFICATE NO.
International Fire	765 Pennsylvania SF.	C16 965370

(26) CONSTRUCTION LENDER (ENTER NAME AND BRANCH DESIGNATION IF ANY. IF THERE IS NO KNOWN CONSTRUCTION LENDER, ENTER "UNKNOWN") — ADDRESS

IMPORTANT NOTICES

No change shall be made in the character of the occupancy or use without first obtaining a Building Permit authorizing such change. See San Francisco Building Code and San Francisco Housing Code.

No portion of building or structure or scaffolding used during construction is to be closer than 6'0" to any wire containing more than 750 volts. See Sec 385, California Penal Code.

Pursuant to San Francisco Building Code, the building permit shall be posted on the job. The owner is responsible for approved plans and application being kept at building site.

Grade lines as shown on drawings accompanying this application are assumed to be correct. If actual grade lines are not the same as shown, revised drawings showing correct grade lines, cuts and fills, and complete details of retaining walls and wall footings must be submitted to this department for approval.

ANY STIPULATION REQUIRED HEREIN OR BY CODE MAY BE APPEALED.

BUILDING NOT TO BE OCCUPIED UNTIL CERTIFICATE OF FINAL COMPLETION IS POSTED ON THE BUILDING OR PERMIT OF OCCUPANCY GRANTED, WHEN REQUIRED.

APPROVAL OF THIS APPLICATION DOES NOT CONSTITUTE AN APPROVAL FOR THE ELECTRICAL WIRING OR PLUMBING INSTALLATIONS. A SEPARATE PERMIT FOR THE WIRING AND PLUMBING MUST BE OBTAINED. SEPARATE PERMITS ARE REQUIRED IF ANSWER IS "YES" TO ANY OF ABOVE QUESTIONS (10) (11) (12) (13) (22) OR (24).

THIS IS NOT A BUILDING PERMIT. NO WORK SHALL BE STARTED UNTIL A BUILDING PERMIT IS ISSUED.

In dwellings, all insulating materials must have a clearance of not less than two inches from all electrical wires or equipment.

CHECK APPROPRIATE BOX

☐ OWNER ☐ ARCHITECT
☐ LESSEE ☐ AGENT
☒ CONTRACTOR ☐ ENGINEER

APPLICANT'S CERTIFICATION

I HEREBY CERTIFY AND AGREE THAT IF A PERMIT IS ISSUED FOR THE CONSTRUCTION DESCRIBED IN THIS APPLICATION, ALL THE PROVISIONS OF THE PERMIT AND ALL LAWS AND ORDINANCES THERETO WILL BE COMPLIED WITH.

REV 06/13

NOTICE TO APPLICANT

HOLD HARMLESS CLAUSE. The permittee(s) by acceptance of the permit, agree(s) to indemnify and hold harmless the City and County of San Francisco from and against any and all claims, demands and actions for damages resulting from operations under this permit, regardless of negligence of the City and County of San Francisco, and to assume the defense of the City and County of San Francisco against all such claims, demands or actions.

In conformity with the provisions of Section 3800 of the Labor Code of the State of California, the applicant shall have worker's compensation coverage under (I) or (II) designated below, or shall indicate item (III), (IV), or (V), whichever is applicable. If however item (IV) is checked, item (IV) must be checked as well. Mark the appropriate method of compliance below.

I hereby affirm under penalty of perjury one of the following declarations:

( ) I. I have and will maintain a certificate of consent to self-insure for worker's compensation, as provided by Section 3700 of the Labor Code, for the performance of the work for which this permit is issued.

(X) II. I have and will maintain worker's compensation insurance, as required by Section 3700 of the Labor Code, for the performance of the work for which this permit is issued. My worker's compensation insurance carrier and policy number are: Carrier Markell, Policy Number ~~WWC00123103~~

( ) III. The cost of the work to be done is $100 or less.

( ) IV. I certify that in the performance of the work for which this permit is issued, I shall not employ any person in any manner so as to become subject to the worker's compensation laws of California. I further acknowledge that I understand that in the event that I should become subject to the worker's compensation provisions of the Labor Code of California and fail to comply forthwith with the provisions of Section 3800 of the Labor Code, that the permit herein applied for shall be deemed revoked.

( ) V. I certify as the owner (or the agent for the owner) that in the performance of the work for which this permit is issued, I will employ a contractor who complies with the worker's compensation laws of California and who, prior to the commencement of any work, will file a completed copy of this form with the Central Permit Bureau.

Signature of Applicant or Agent — Date: 3/25/15

OFFICE COPY

SAN FRANCISCO
REFER TO:
DEPARTMENT OF BUILDING INSPECTION
OFFICIAL COPY

CONDITIONS AND STIPULATIONS

	APPROVED: BUILDING INSPECTOR, DEPT. OF BLDG. INSP.	DATE: REASON: NOTIFIED MR.
☐	APPROVED: DEPARTMENT OF CITY PLANNING	DATE: REASON: NOTIFIED MR.
☐	APPROVED: Michelle McCoy, SFFD MAR 25 2015 BUREAU OF FIRE PREVENTION & PUBLIC SAFETY	DATE: REASON: NOTIFIED MR.
☐	APPROVED: MECHANICAL ENGINEER, DEPT. OF BLDG. INSPECTION	DATE: REASON: NOTIFIED MR.
☐	APPROVED: CIVIL ENGINEER, DEPT. OF BLDG. INSPECTION	DATE: REASON: NOTIFIED MR.
☐	APPROVED: BUREAU OF ENGINEERING	DATE: REASON: NOTIFIED MR.
☐	APPROVED: DEPARTMENT OF PUBLIC HEALTH	DATE: REASON: NOTIFIED MR.
☐	APPROVED: REDEVELOPMENT AGENCY	DATE: REASON: NOTIFIED MR.
☐	APPROVED: HOUSING INSPECTION DIVISION	DATE: REASON: NOTIFIED MR.

HOLD SECTION - NOTE DATES AND NAMES OF ALL PERSONS NOTIFIED DURING PROCESSING

I agree to comply with all conditions or stipulations of the various bureaus or departments noted on this application, and attached statements of conditions or stipulations, which are hereby made a part of this application.

Number of attachments ☐

OWNER'S AUTHORIZED AGENT

OFFICIAL COPY
SAN FRANCISCO
DEPARTMENT OF
BUILDING INSPECTION

City and County of San Francisco
Department of Building Inspection

Edwin M. Lee, Mayor
Tom C. Hui, S.E., C.B.O., Director

LICENSED CONTRACTOR'S STATEMENT

Permit Application No. 2015 0325 1820

Job Address: 1201 Mason

Licensed Contractor's Declaration

Pursuant to the Business and Professions Code Sec. 7031.5, I hereby affirm under penalty of perjury that I am licensed under the provisions of Chapter 9 (commencing with Sec. 7000) of Division 3 of the Business and Professions Code, and that my license is in full force and effect.

License Number 965370

License Class C 16

Expiration Date 9/30/15

Contractor

PRINT

SIGNATURE

NOTE: *"Any violation of the Bus. & Prof. Code Sec 7031.5 by any permit applicant shall be subject to a civil penalty of not more than five hundred dollars ($500)" Bus. & Prof. Code Sec. 7031.5.* Revised 10/1/2013.

OFFICIAL COPY

SAN FRANCISCO
DEPARTMENT OF BUILDING INSPECTION

APPROVED
Dept. of Building Insp.
AUG 05 2015

Tom C. Hui
TOM C HUI, S.E.
DIRECTOR
DEPT. OF BUILDING INSPECTION

APPROVED FOR ISSUANCE
AUG 05 2015

BLDG. FORM 3/8

APPLICATION NUMBER 201507131054

OSHA APPROVAL REQ'D ☐

APPROVAL NUMBER

nv

APPLICATION FOR BUILDING PERMIT ADDITIONS, ALTERATIONS OR REPAIRS

wc 10/17/15

FORM 3 ☐ OTHER AGENCIES REVIEW REQUIRED

FORM 8 ☑ OVER-THE-COUNTER ISSUANCE

2 NUMBER OF PLAN SETS

CITY AND COUNTY OF SAN FRANCISCO DEPARTMENT OF BUILDING INSPECTION

APPLICATION IS HEREBY MADE TO THE DEPARTMENT OF BUILDING INSPECTION OF SAN FRANCISCO FOR PERMISSION TO BUILD IN ACCORDANCE WITH THE PLANS AND SPECIFICATIONS SUBMITTED HEREWITH AND ACCORDING TO THE DESCRIPTION AND FOR THE PURPOSE HEREINAFTER SET FORTH.

▼ DO NOT WRITE ABOVE THIS LINE ▼

DATE FILED	FILING FEE RECEIPT NO.	(1) STREET ADDRESS OF JOB	BLOCK & LOT
~~AUG 05 2015~~ ~~7-30-2015~~		1201 Mason St	0190-005

PERMIT NO.	ISSUED	(3A) ESTIMATED COST OF JOB	(3B) REVISED COST: BY:	DATE
1365250	8/5/15 DCA	$20,000.00	$20,000 JP	7-31-15

INFORMATION TO BE FURNISHED BY ALL APPLICANTS

LEGAL DESCRIPTION OF EXISTING BUILDING

(4A) TYPE OF CONSTR.	(5A) NO. OF STORIES OF OCCUPANCY:	(6A) NO. OF BASEMENTS AND CELLARS:	(7A) PRESENT USE:	(8A) OCCUP. CLASS	(9A) NO. OF DWELLING UNITS:
1	2	0	Muni Building	B, S1	0

DESCRIPTION OF BUILDING AFTER PROPOSED ALTERATION

(4) TYPE OF CONSTR.	(5) NO. OF STORIES OF OCCUPANCY:	(6) NO. OF BASEMENTS AND CELLARS:	(7) PROPOSED USE (LEGAL USE)	(8) OCCUP. CLASS	(9) NO. OF DWELLING UNITS:
1	2	0	Muni Building	B, S1	0

(10) IS AUTO RUNWAY TO BE CONSTRUCTED OR ALTERED?	(11) WILL STREET SPACE BE USED DURING CONSTRUCTION?	(12) ELECTRICAL WORK TO BE PERFORMED?	(13) PLUMBING WORK TO BE PERFORMED?
YES ☐ NO ☒	YES ☐ NO ☒	YES ☒ NO ☐	YES ☐ NO ☒

(14) GENERAL CONTRACTOR	ADDRESS	ZIP	PHONE	CALIF. LIC. NO.	EXPIRATION DATE
Champion Telecom	401 Whitney Place, Fremont		5102268525	980705	1/2017

(15) OWNER - LESSEE (CROSS OUT ONE)	ADDRESS	ZIP	STR©	PHONE (FOR CONTACT BY DEPT.)
SFMTA	1 South Van Ness Place			

(16) WRITE IN DESCRIPTION OF ALL WORK TO BE PERFORMED UNDER THIS APPLICATION (REFERENCE TO PLANS IS NOT SUFFICIENT)

Install Radio Cabinet. Install DIS Server. Install Cables of Huberflex, fiber Optic DC in conduits and trays. Install Antennas on balast mounts on roof and building.

ADDITIONAL INFORMATION

(17) DOES THIS ALTERATION CREATE ADDITIONAL HEIGHT OR STORY TO BUILDING?	(18) IF (17) IS YES, STATE NEW HEIGHT AT CENTER LINE OF FRONT	(19) DOES THIS ALTERATION CREATE DECK OR HORIZ. EXTENSION TO BUILDING?	(20) IF (19) IS YES, STATE NEW GROUND FLOOR AREA
YES ☐ NO ☒		YES ☐ NO ☒	SQ. FT.

(21) WILL SIDEWALK OVER SUB-SIDEWALK SPACE BE REPAIRED OR ALTERED?	(22) WILL BUILDING EXTEND BEYOND PROPERTY LINE?	(23) ANY OTHER EXISTING BLDG. ON LOT? (IF YES, SHOW ON PLOT PLAN)	(24) DOES THIS ALTERATION CONSTITUTE A CHANGE OF OCCUPANCY?
YES ☐ NO ☒	YES ☐ NO ☒	YES ☒ NO ☐	YES ☐ NO ☒

(25) ARCHITECT OR ENGINEER (DESIGN ☐ CONSTRUCTION ☐)	ADDRESS	CALIF. CERTIFICATE NO.
Antonino Genoese	300 Frank Ogawa Plaza, Oakland	C 80788

(26) CONSTRUCTION LENDER (ENTER NAME AND BRANCH DESIGNATION IF ANY. IF THERE IS NO KNOWN CONSTRUCTION LENDER, ENTER "UNKNOWN") Unknown ADDRESS

IMPORTANT NOTICES

No change shall be made in the character of the occupancy or use without first obtaining a Building Permit authorizing such change. See San Francisco Building Code and San Francisco Housing Code.

No portion of building or structure or scaffolding used during construction is to be closer than 6'0" to any wire containing more than 750 volts. See Sec 385, California Penal Code.

Pursuant to San Francisco Building Code, the building permit shall be posted on the job. The owner is responsible for approved plans and application being kept at building site.

Grade lines as shown on drawings accompanying this application are assumed to be correct. If actual grade lines are not the same as shown, revised drawings showing correct grade lines, cuts and fills, and complete details of retaining walls and wall footings must be submitted to this department for approval.

ANY STIPULATION REQUIRED HEREIN OR BY CODE MAY BE APPEALED.

BUILDING NOT TO BE OCCUPIED UNTIL CERTIFICATE OF FINAL COMPLETION IS POSTED ON THE BUILDING OR PERMIT OF OCCUPANCY GRANTED, WHEN REQUIRED.

APPROVAL OF THIS APPLICATION DOES NOT CONSTITUTE AN APPROVAL FOR THE ELECTRICAL WIRING OR PLUMBING INSTALLATIONS. A SEPARATE PERMIT FOR THE WIRING AND PLUMBING MUST BE OBTAINED. SEPARATE PERMITS ARE REQUIRED IF ANSWER IS "YES" TO ANY OF ABOVE QUESTIONS (10) (11) (12) (13) (22) OR (24).

THIS IS NOT A BUILDING PERMIT. NO WORK SHALL BE STARTED UNTIL A BUILDING PERMIT IS ISSUED.

In dwellings, all insulating materials must have a clearance of not less than two inches from all electrical wires or equipment.

CHECK APPROPRIATE BOX

☐ OWNER ☐ ARCHITECT
☐ LESSEE ☐ AGENT
☒ CONTRACTOR ☐ ENGINEER

APPLICANT'S CERTIFICATION

I HEREBY CERTIFY AND AGREE THAT IF A PERMIT IS ISSUED FOR THE CONSTRUCTION DESCRIBED IN THIS APPLICATION, ALL THE PROVISIONS OF THE PERMIT AND ALL LAWS AND ORDINANCES THERETO WILL BE COMPLIED WITH.

NOTICE TO APPLICANT

HOLD HARMLESS CLAUSE. The permittee(s) by acceptance of the permit, agree(s) to indemnify and hold harmless the City and County of San Francisco from and against any and all claims, demands and actions for damages resulting from operations under this permit, regardless of negligence of the City and County of San Francisco, and to assume the defense of the City and County of San Francisco against all such claims, demands or actions.

In conformity with the provisions of Section 3800 of the Labor Code of the State of California, the applicant shall have worker's compensation coverage under (I) or (II) designated below, or shall indicate Item (III), (IV), or (V), whichever is applicable. If however Item (V) is checked, Item (IV) must be checked as well. Mark the appropriate method of compliance below.

I hereby affirm under penalty of perjury one of the following declarations:

( ) I. I have and will maintain a certificate of consent to self-insure for worker's compensation, as provided by Section 3700 of the Labor Code, for the performance of the work for which this permit is issued.

(X) II. I have and will maintain worker's compensation insurance, as required by Section 3700 of the Labor Code, for the performance of the work for which this permit is issued. My worker's compensation insurance carrier and policy number are:
Carrier State Fund
Policy Number 9030168

( ) III. The cost of the work to be done is $100 or less.

( ) IV. I certify that in the performance of the work for which this permit is issued, I shall not employ any person in any manner so as to become subject to the worker's compensation laws of California. I further acknowledge that I understand that in the event that I should become subject to the worker's compensation provisions of the Labor Code of California and fail to comply forthwith with the provisions of Section 3800 of the Labor Code, that the permit herein applied for shall be deemed revoked.

( ) V. I certify as the owner (or the agent for the owner) that in the performance of the work for which this permit is issued, I will employ a contractor who complies with the worker's compensation laws of California and who, prior to the commencement of any work, will file a completed copy of this form with the Central Permit Bureau.

Signature of Applicant or Agent: [signature] Date: 7-31-15

REV 05/13

OFFICE COPY

AUG 05 2015

SAN FRANCISCO
OFFICIAL COPY

REFER TO: DEPARTMENT OF BUILDING INSPECTION

CONDITIONS AND STIPULATIONS

	APPROVED: David Pang, DBI JUL 31 2015 BUILDING INSPECTOR, DEPT. OF BLDG. INSP.	DATE: REASON: NOTIFIED MR.
☑	APPROVED: on 8/4/15 OMAR MASRY DEPARTMENT OF CITY PLANNING	DATE: REASON: NOTIFIED MR.
☑	APPROVED: N/A JGH 8/4/15 BUREAU OF FIRE PREVENTION & PUBLIC SAFETY	DATE: REASON: NOTIFIED MR.
☐	APPROVED: N/A JP MECHANICAL ENGINEER, DEPT. OF BLDG. INSPECTION	DATE: REASON: NOTIFIED MR.
☐	APPROVED: CIVIL ENGINEER, DEPT. OF BLDG. INSPECTION	DATE: REASON: NOTIFIED MR.
☐	APPROVED: BUREAU OF ENGINEERING	DATE: REASON: NOTIFIED MR.
☑	APPROVED: DEPARTMENT OF PUBLIC HEALTH 8/5/15	DATE: REASON: NOTIFIED MR.
☐	APPROVED: N/A JP REDEVELOPMENT AGENCY	DATE: REASON: NOTIFIED MR.
☐	APPROVED: HOUSING INSPECTION DIVISION	DATE: REASON: NOTIFIED MR.

HOLD SECTION - NOTE DATES AND NAMES OF ALL PERSONS NOTIFIED DURING PROCESSING

I agree to comply with all conditions or stipulations of the various bureaus or departments noted on this application, and attached statements of conditions or stipulations, which are hereby made a part of this application.

Number of attachments ☐

OWNER'S AUTHORIZED AGENT

OFFICIAL COPY

SAN FRANCISCO DEPARTMENT OF BUILDING INSPECTION
City and County of San Francisco
Department of Building Inspection

Edwin M. Lee, Mayor
Tom C. Hui, S.E., C.B.O., Director

LICENSED CONTRACTOR'S STATEMENT

Permit Application No. _____

Job Address: _____

Licensed Contractor's Declaration

Pursuant to the Business and Professions Code Sec. 7031.5, I hereby affirm under penalty of perjury that I am licensed under the provisions of Chapter 9 (commencing with Sec. 7000) of Division 3 of the Business and Professions Code, and that my license is in full force and effect.

License Number 980705

License Class C10 B1

Expiration Date 1 / 31 / 2017

Contractor

Champion Telecom
PRINT

Gregory Day
SIGNATURE

NOTE: *"Any violation of the Bus. & Prof. Code Sec 7031.5 by any permit applicant shall be subject to a civil penalty of not more than five hundred dollars ($500)" Bus. & Prof. Code Sec. 7031.5.* Revised 10/1/2013.

OFFICIAL COPY
SAN FRANCISCO DEPARTMENT OF BUILDING INSPECTION

City and County of San Francisco
Department of Building Inspection

Edwin M. Lee, Mayor
Tom C. Hui, S.E., C.B.O., Director

PERMIT APPLICANT AND AUTHORIZED AGENT DISCLOSURE AND CERTIFICATION

Date: 7-5-2015 ☐ New ☐ Amended

Permit Application No. 2015-07-31-3054 Job Address: 1201 Mason St

This form must be completed in its entirety in connection with an application for a building permit (Forms 1/2, 3/8, 4/7, 6 and 8). This form must be amended for all new information or change in information for duration of project. Please be advised that the Department does not regulate permit expediters/consultants or afford them preferential treatment.

A. Permit Applicant Information

I hereby certify that for the purpose of filling an application for a building or other permit with the Central Permit Bureau, or completion of any from related to the San Francisco Building Code, or to City and County ordinances and regulations, or to state laws and codes, I am the owner, the lessee or the agent of the owner/lessee and am authorized to sign all documented connected with this application or permit.

I declare under penalty of perjury that the foregoing is true and correct. I am the permit applicant and I am

Check box(es):

☐ The owner (B)
☐ The lessee (C)
☐ The authorized agent. Check entity(ies):
☐ Architect (D) ☐ Engineer (D)
☐ Contractor (E) ☐ Attorney (F)
☐ Permit Consultant/Expediter (G)
☐ Other _____ (H)

Print Applicant Name Gregory Day
Sign Name Gregory Day

B. Owner Information

Name SFMTA
Phone
Address 1 South Van Ness
San Francisco CA
City State Zip

C. Lessee Information

Name
Phone
Address
City State Zip

D. Architect/Engineer Information

☐ None ☐ List of all Architect(s)/Engineer(s) on project:

A. Name
☐ Architect ☐ Engineer
Phone No.
Firm Name
License #
Expiration Date
Firm Address
City State Zip

B. Name
☐ Architect ☐ Engineer
Phone No.
Firm Name
License #
Expiration Date
Firm Address
City State Zip

C. Name
☐ Architect ☐ Engineer
Phone No.
Firm Name
License #
Expiration Date
Firm Address
City State Zip

E. General Contractor Information

Note: Complete separate licensed contractor's statement also.

Name John Hillestad
Phone 510 226 8525
Firm Name Champion Telecom
License # 0463[illegible]8
Expiration Date 08/30/2016
Firm Address 401 Whitney Pl, Fremont
Fremont CA 94539
City State Zip

☐ Contractor not yet selected. If this box is checked, submit an amended form when known.
☐ Owner-Builder. If this box is checked, submit Owner-Builder Declaration Form.

F. Attorney Information

Name
Phone
Address
City State Zip

G. Permit Consultant/Expediter

Name
Phone
Address
City State Zip

H. Authorized Agent - Others

Name Gregory Day
Phone 510 226 8525
Address 401 Whitney Pl
Fremont CA 94539
City State Zip

Please describe your relationship with the owner.

SAN FRANCISCO
DEPARTMENT OF
BUILDING INSPECTION
OFFICIAL COPY

1201 MASON		82	7	8207431
OWNER NAME				TELEPHONE
PUBLIC UTILITIES COMMISSION				
ESTIMATED COST	FILE DATE	DISPOSITION	DISPOSITION DATE	PERMIT NO	EXPIRE DATE
$12,500,000	9/08/82	ISSUED	03/02/83	498143	
FORM CONST. TYPE	OCCUPANCY CODES		PLANS STORIES	UNITS	DISTRICT
5 3	F-2 B-1 G		2 2		BID-INSP 2
CONTACT NAME					TELEPHONE
TUTOR-SALIBA, INC. SYLMAR, CA					558-2598
STANDARD DESCRIPTION/BLDG. USE			OTHER DESCRIPTION		
			Remodel Cable CAR Garage		
SPECIAL INSPECTIONS? NO	FIRE ZONE				
SPECIAL USE DISTRICT	TICF NO				
	PENALTY NO		COMPLIANCE WITH REPORTS		
NOTES					

PERMIT INSPECTION RECORD
DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF SAN FRANCISCO
BUILDING INSPECTION JOB CARD

OFFICIAL COPY

SAN FRANCISCO
DEPARTMENT OF
BUILDING INSPECTION

DATE	BUILDING INSPECTORS JOB RECORD
/ /	8207431
5/6/83	Form work.
6/27/83	OK TO POUR TIE Beams
/ /	x Pit walls.
7/1/83	OK To Pour Tie Beam
7/26/83	Work in progress.
9/8/83	Conf with Cont
10/12/83	Problem Steel.
11/15/83	Walk through with Arch.
1/4/83	OK to Cover in Office
2/21/84	90% Complete
3/8/84	Conf and walk through with
/ /	Proj Manager
4/23/84	Conf with Contractor
/ /	FINAL
/ /	Special Inspectors OK by Eng
5/2/84	OK To FINAL
6/26/84	Inspection with FP
9/11/84	Ready for Final
11/2/84	Hold for FP approval
11/19/84	(WORK COMPLETED) FINAL CERTIFICATE POSTED.

APP. NO.

[signature]
BUILDING INSPECTOR

OFFICIAL COPY

SAN FRANCISCO
DEPARTMENT OF BUILDING INSPECTION

ADDRESS OF JOB	BLOCK & LOT	APPT NO
1201 MASON	01	8208290

OWNER NAME: PUBLIC UTILITIES COMMISION

OWNER ADDRESS:

EST COST	FILE DATE	DISPOSITION	DATE	PERMIT NO	EXPIRATION DATE
$200,000	10/06/82	ISSUE ☒	12/10/82	495986	
		CANCELLED ☐	EXTENSION GRANTED		

CONTACT NAME: DICK GALIEA

PHONE: 558-2598

DISTRICT: BID-INSP 2

FORM	BLDG TYPE	OCCUPANCY	PLANS	STORIES	FAM
3		B-3 F-2 G	0		0000

DESCRIPTION OF WORK: Demo Work

SPECIAL INSPECTION REQUIRED? ☐ Y ☐ N

SPECIAL USE DISTRICT ☐ Y ☐ N

FIRE ZONE ☐ Y ☐ N

PENALTY FEE? ☐ Y ☐ NO

COMPLIANCE WITH REPORTS

BUILDING RECORD
DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF SAN FRANCISCO
BUILDING INSPECTION
JOB CARD

OFFICIAL COPY

SAN FRANCISCO
DEPARTMENT OF
BUILDING INSPECTION

DATE	BUILDING INSPECTORS JOB RECORD
/ /	8208280
12 12 83	Met with Harry Chiang on Job
1 12 83	Working on Frm Shoring
2 18 83	Good Progress
6 17 83	90% Complete
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8/5/83 (WORK COMPLETED) FINAL CERTIFICATE POSTED

APP. NO.

[signature]
BUILDING INSPECTOR

OFFICIAL COPY

SAN FRANCISCO
DEPARTMENT OF
BUILDING INSPECTION

ADDRESS OF JOB		BLOCK & LOT	APPT. NO.
1201 MASON	ST		8209515

OWNER NAME	OWNER ADDRESS
PUBLIC UTILITIES COMMISSION	

EST. COST	FILE DATE	DISPOSITION		DATE	PERMIT NO.	EXPIRATION DATE
$473,000	11/16/82	ISSUE	I	12/08/82	495902	
		CANCELLED		EXTENSION GRANTED		

CONTACT NAME	PHONE	DISTRICT
TUTOR-SALIBA, INC. Harry Chin	558-2598	BID-INSP 2
776-8990		

FORM	BLDG. TYPE	OCCUPANCY	PLANS	STORIES	FAM
3		B-3 F-2 G	2		8

DESCRIPTION OF WORK

Shoring for exterior walls

SPECIAL INSPECTION REQUIRED? ☐ Y ☐ N SPECIAL USE DISTRICT ☐ Y ☐ N FIRE ZONE ☐ Y ☐ N

PENALTY FEE? ☐ Y ☐ N NO

COMPLIANCE WITH REPORTS

BUILDING RECORD
DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF SAN FRANCISCO
BUILDING INSPECTION
JOB CARD

OFFICIAL COPY

SAN FRANCISCO
DEPARTMENT OF
BUILDING INSPECTION

DATE	BUILDING INSPECTORS JOB RECORD
/ /	8209515
12/14/82	Demolite work
1/20/83	Question on Terra Cotta wall Take
/ /	Leg to inspect
2/18/83	Bracing on front wall.
6/17/83	90% Complete
8/15/83	Removing Shoring
11/15/83	Shoring all Removed
/ /	Hold for Allen
2/6/83	Conf with Super Atter all
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12/6/83 (WORK COMPLETED) FINAL CERTIFICATE POSTED

APP. NO.

[signature]
BUILDING INSPECTOR

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SAN FRANCISCO
DEPARTMENT OF
BUILDING INSPECTION

APPL:8209515 STN/SUB:BID-INSP/02 DISP:CC INSP REQ: 1:40

NBR	INSPDATE	TYPE	HOURS	SUB	NBR	INSPDATE	TYPE	HOURS	SUB
1	06/07/82	01	:50						
2	08/15/85	01	:20						
3	11/15/85	01	:20						
4	12/06/85	06	:30						

OFFICIAL COPY

SAN FRANCISCO
DEPARTMENT OF
BUILDING INSPECTION

ADDRESS OF JOB	BLOCK/LOT	APPLICATION NO.
1201 MASON ST		8301911

OWNER NAME	TELEPHONE
CCSF-PUC	558-2598

ESTIMATED COST	FILE DATE	DISPOSITION	DISPOSITION DATE	PERMIT NO.	EXPIRE DATE
$120,000	3/14/83	ISSUED	04/22/83	500101	07/21/83

FORM CONST. TYPE	OCCUPANCY CODES	PLANS	STORIES	UNITS	DISTRICT
3 3 B-3	F-2 G	2	1		BID-INSP 02

CONTACT NAME	TELEPHONE
TUTOR-SALIBA	

STANDARD DESCRIPTION/BLDG. USE	OTHER DESCRIPTION
MUNI CARBARN	Shoring for Muni [illegible]

SPECIAL INSPECTIONS? NO

SPECIAL USE DISTRICT

FIRE ZONE

TIDF NO

PENALTY NO

MAIN Chiv-Roof

COMPLIANCE WITH REPORTS

NOTES:

PERMIT INSPECTION RECORD
DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF SAN FRANCISCO
BUILDING INSPECTION JOB CARD

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SAN FRANCISCO
DEPARTMENT OF
BUILDING INSPECTION

DATE	BUILDING INSPECTORS JOB RECORD
/ /	#301914
6/27/83	Demo block
7/26/83	Work in progress.
9/15/83	Shoring OK
11/15/83	Walls poured
12/6/83	OK to Pour.
3/8/84	Job Complete
4/23/84	Held for Steel Inspection
/ /	
5/28/84	OK to FINAL
/ /	
5/29/84	Held for Final
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7/3/84	WORK COMPLETED. ~~FINAL CERTIFICATE POSTED.~~

APP. NO.

Joseph M. O'Reilly
BUILDING INSPECTOR

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SAN FRANCISCO
DEPARTMENT OF
BUILDING INSPECTION

APPL:8301911 STN/SUB:BID-INSP/02 DISP:CO INSP HRS: 3:40

NBR	INSPDATE	TYPE	HOURS	SUB
1	06/27/83	03	:20	
2	07/26/83	01	:30	13
3	08/15/83	01	:10	
4	11/15/83	01	:20	
5	12/06/83	01	:30	
6	03/08/84	01	:20	
7	04/23/84	01	:30	
8	05/02/84	01	:20	
9	05/29/84	01	:20	
10	07/31/84	06	:20	

NBR	INSPDATE	TYPE	HOURS	SUB

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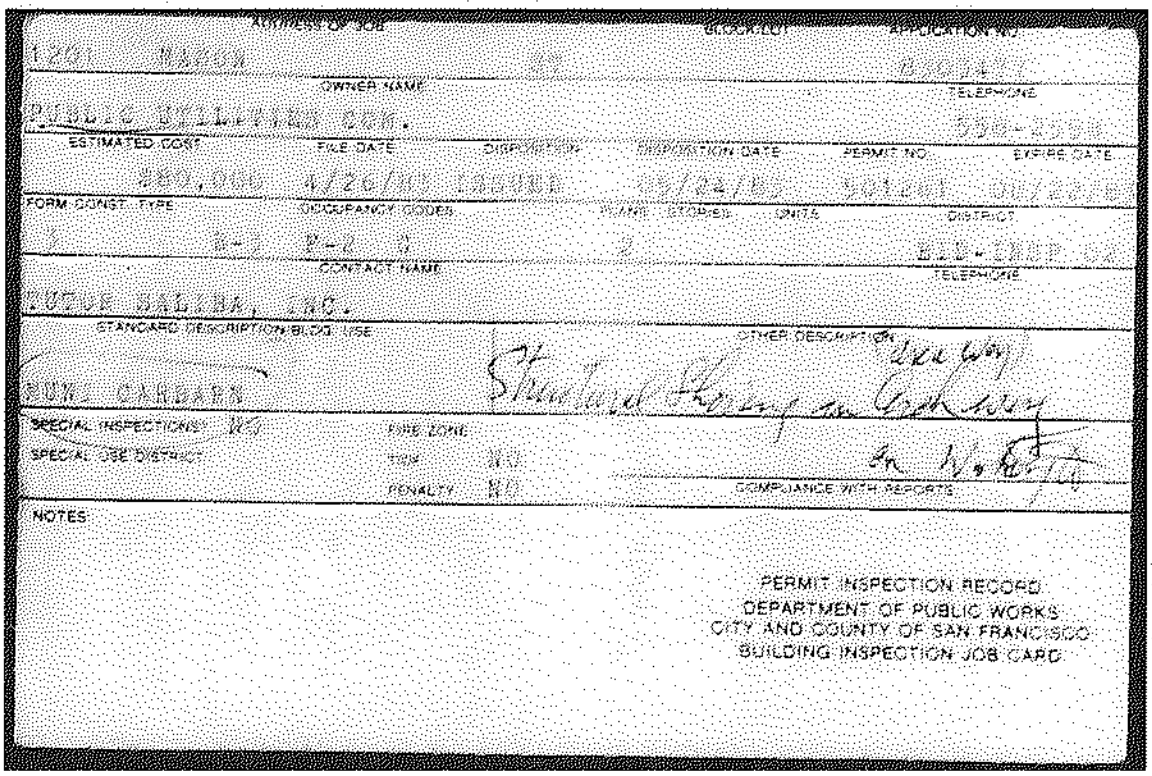
DEPARTMENT OF
BUILDING INSPECTION



ADDRESS OF JOB | BLOCK/LOT | APPLICATION NO.

OWNER NAME | TELEPHONE

ESTIMATED COST | FILE DATE | DISPOSITION | DISPOSITION DATE | PERMIT NO. | EXPIRE DATE

FORM CONST. TYPE | OCCUPANCY CODE(S) | WAIVE STORIES | UNITS | DISTRICT

CONTACT NAME | TELEPHONE

STANDARD DESCRIPTION BLDG. USE | OTHER DESCRIPTION

SPECIAL INSPECTIONS | FIRE ZONE

SPECIAL USE DISTRICT | FEES | COMPLIANCE WITH REPORTS

NOTES

PERMIT INSPECTION RECORD
DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF SAN FRANCISCO
BUILDING INSPECTION JOB CARD

OFFICIAL COPY

SAN FRANCISCO
DEPARTMENT OF
BUILDING INSPECTION

DATE	BUILDING INSPECTORS JOB RECORD
/ /	8303477
6/27/83	Connecting Steel between
/ /	The Backs
7/26/83	work in progress
9/8/83	Conf with Cont
11/15/83	Hold for letter from Eng
12/1/83	[illegible]
2/21/84	[illegible] Complete
3/8/84	Conf with Project [illegible]
/ /	[illegible]
5/2/84	Ok to Final
/ /	
5/29/84	Hold for FINAL Reports
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7/31/84 (WORK COMPLETED) ~~FINAL CERTIFICATE POSTED~~

APP. NO.

Janet M. O'Reilly
BUILDING INSPECTOR

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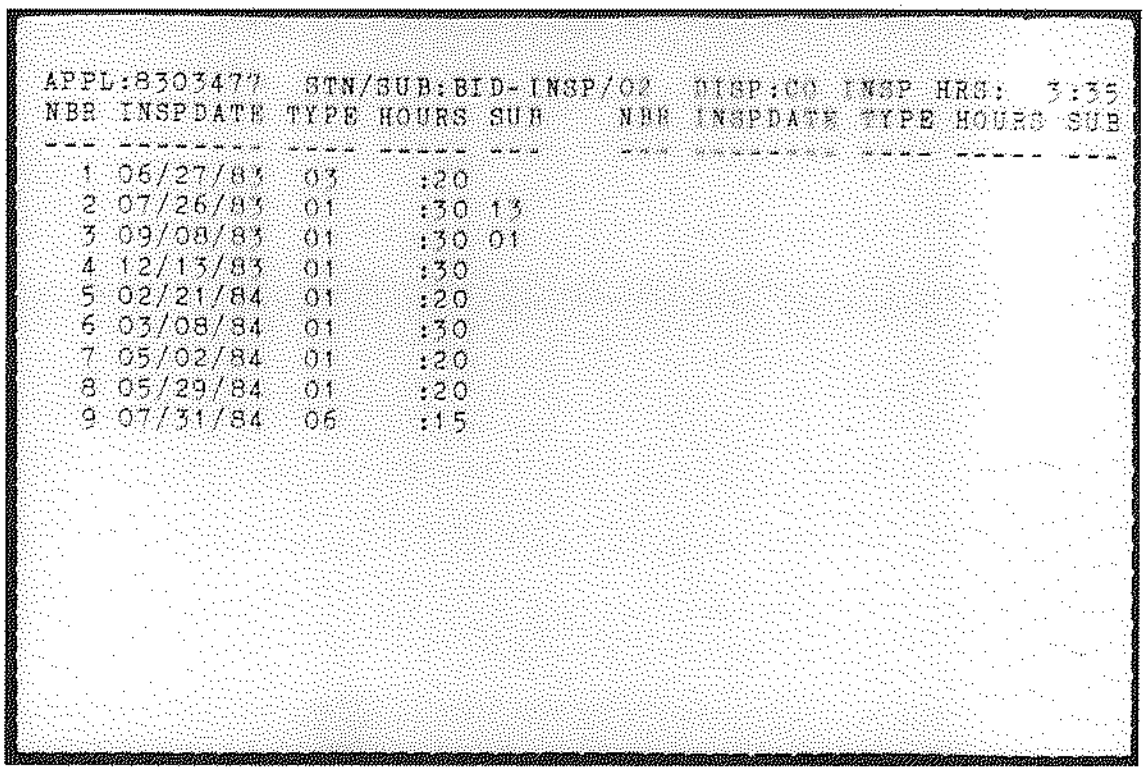
SAN FRANCISCO
DEPARTMENT OF
BUILDING INSPECTION



APPL:8303477 STN/SUB:BID-INSP/02 DISP:CO INSP HRS: 3:35

NBR	INSPDATE	TYPE	HOURS	SUB	NBR	INSPDATE	TYPE	HOURS	SUB
1	06/27/83	03	:20						
2	07/26/83	01	:30	13					
3	09/08/83	01	:30	01					
4	12/13/83	01	:30						
5	02/21/84	01	:20						
6	03/08/84	01	:30						
7	05/02/84	01	:20						
8	05/29/84	01	:20						
9	07/31/84	06	:15						

SAN FRANCISCO
DEPARTMENT OF
BUILDING INSPECTION
OFFICIAL COPY

ADDRESS OF JOB		BLOCK/LOT	APPLICATION NO
1201 MASON	ST		8401359

OWNER NAME	TELEPHONE
CCSF-PUBLIC UTILITIES COMM.	558-5128

ESTIMATED COST	FILE DATE	DISPOSITION	DISPOSITION DATE	PERMIT NO	EXPIRE DATE
$40,000	2/06/84	ISSUED	03/05/84	512214	09/05/85

FORM CONST TYPE		OCCUPANCY CODES		PLANS	STORIES	UNITS	DISTRICT
5	5	A-3	B-2 B-4	2	2		BID-INSP 02

CONTACT NAME	TELEPHONE
TUTOR-SALIBA, INC.	

STANDARD DESCRIPTION/BLDG USE	OTHER DESCRIPTION
OTHER WAREHOUSE	FIRE PROTECTION SPRINKLER SYSTEM

SPECIAL INSPECTIONS?	NO	FIRE ZONE	
SPECIAL USE DISTRICT	NO	TIDF	
		PENALTY	COMPLIANCE WITH REPORTS

NOTES

PERMIT INSPECTION RECORD
DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF SAN FRANCISCO
BUILDING INSPECTION JOB CARD

OFFICIAL COPY

SAN FRANCISCO
DEPARTMENT OF
BUILDING INSPECTION

DATE	BUILDING INSPECTORS JOB RECORD
/ /	8401359
/ /	Installing Heads
/ /	
5/1/84	90% Complete
/ /	
5/29/84	Hold for Final
8/30/84	Question on FP approval
9/11/84	Letter from Eng OK
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10/22/84 (WORK COMPLETED) ~~FINAL CERTIFICATE POSTED~~

APP NO

Janette McKeilly
BUILDING INSPECTOR

OFFICIAL COPY

SAN FRANCISCO
DEPARTMENT OF
BUILDING INSPECTION

ADDRESS OF JOB	BLOCK/LOT	APPLICATION NO.
1201 MASON ST		8611304

OWNER NAME	TELEPHONE
CITY & COUNTY OF SAN FRANCISCO	(408)436-8888

ESTIMATED COST	FILE DATE	DISPOSITION	DISPOSITION DATE	PERMIT NO	EXPIRE DATE
$54,438	9/15/86	ISSUED	10/02/86	555259	10/02/87

FORM	CONST	TYPE	OCCUPANCY CODES	PLANS	STORIES	UNITS	DISTRICT
3	3		H-4	2	3		BID-INSP 10

CONTACT NAME	TELEPHONE
STOP-FIRE INC. [illegible]	4(3-8[illegible] [redacted]

STANDARD DESCRIPTION/BLDG USE	OTHER DESCRIPTION
AUTO REPAIRS	INSTALL FIRE DETECTION, SUPPRESSION SYSTEM

SPECIAL INSPECTIONS? NO
SPECIAL USE DISTRICT
FIRE ZONE
TIDF NO
PENALTY NO
COMPLIANCE WITH REPORTS

NOTES
[illegible] SUN - 404
Ex. [illegible]
[illegible]
CYN [illegible]

PERMIT INSPECTION RECORD
DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF SAN FRANCISCO
BUILDING INSPECTION JOB CARD

9003-15

HALON SYSTEM IN CONTROL AND TRANSFORMER ROOM

OFFICIAL COPY

SAN FRANCISCO
DEPARTMENT OF
BUILDING INSPECTION

DATE	BUILDING INSPECTORS JOB RECORD
11/21/87	WORK STARTED - PRIOR TO
6/3/87	WORK DONE - NEED FP
/ /	AND ELECT. CLEARANCE
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6/17/87 WORK COMPLETED ~~FINAL CERTIFICATE POSTED~~

APP. NO. 8611304

[signature]
BUILDING INSPECTOR

OFFICIAL COPY
SAN FRANCISCO
DEPARTMENT OF BUILDING INSPECTION

ADDRESS OF JOB		BLOCK/LOT	APPLICATION NO.
1201 MASON	ST	0190 /005	9200481

OWNER NAME	TELEPHONE
CITY & COUNTY OF SF	923-6380

ESTIMATED COST	FILE DATE	DISPOSITION	DISPOSITION DATE	PERMIT NO.	EXPIRE DATE
$150,000	1/10/92	CANCELLED	06/29/93		

FORM CONST. TYPE	OCCUPANCY CODES	PLANS	STORIES	UNITS	DISTRICT
3 2	H-4	2	3		BID-INSP 15

CONTACT NAME	TELEPHONE
C&C OF SF	923-6380

STANDARD DESCRIPTION/BLDG. USE	OTHER DESCRIPTION
MUNI CARBARN	CITY JOB/ADDITION OF MEZZNINE OFFICES

SPECIAL INSPECTIONS? YES
SPECIAL USE DISTRICT
FIRE ZONE
TIDF NO
PENALTY NO
COMPLIANCE WITH REPORTS

NOTES:

PERMIT INSPECTION RECORD
DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF SAN FRANCISCO
BUILDING INSPECTION JOB CARD

9003-15

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SAN FRANCISCO
DEPARTMENT OF
BUILDING INSPECTION

DATE	BUILDING INSPECTORS JOB RECORD
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/ /	DEC 28 1995
/ /	EXPIRE per SFBC Sec. 303 (d)
/ /	

WORK COMPLETED. FINAL CERTIFICATE POSTED

APP. NO. 9200481

JOHN AIRES
BUILDING INSPECTOR

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SAN FRANCISCO
DEPARTMENT OF BUILDING INSPECTION

ADDRESS OF JOB				BLOCK/LOT	APPLICATION NO.
1201 MASON ST				0190/005	201507313054
OWNER NAME					TELEPHONE
SMTA CITY PROPERTY					
ESTIMATED COST	FILE DATE	DISPOSITION	DISPOSITION DATE	PERMIT NO.	EXPIRATION DATE
$20,000	07/31/15	REINSTAT	08/19/15	201507313054	07/30/16

FORM	CONST. TYPE	OCCUPANCY CODES	PLANS	STORIES	UNITS	DISTRICT
8	1	B,S-1 ET	2	2	0	15 BID-INSP

CONTACT NAME	TELEPHONE
CHAMPION TELECOM INC	5102268525

DESCRIPTION/BLDG. USE	OTHER DESCRIPTION
MUNI CARBARN	SFMTA RADIO UPGRADE PROJECT INSTALL DIS SERVER. INSTALL CABLES, COAX., H YBERFLEX, FIBER OPTIC DC IN CONDUITS

SPECIAL INSPECTIONS?	NO	FIRE ZONE	NO	
SPECIAL USE DISTRICT		TIDF	NO	
		PENALTY	NO	COMPLIANCE WITH REPORTS

NOTES:

106

Tom (925) 639-8835

(510) 676-7094

9003-15

PERMIT INSPECTION RECORD
DEPARTMENT OF BUILDING INSPECTION
CITY AND COUNTY OF SAN FRANCISCO
BUILDING INSPECTION JOB CARD

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SAN FRANCISCO
DEPARTMENT OF BUILDING INSPECTION

DATE	BUILDING INSPECTORS JOB RECORD
3/5/14	Work Completed
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/ /	☒ FINAL
/ /	☐ EXPIRE
/ /	BY
/ /	SEAN BIRMINGHAM, DBI
/ /	
/ /	
	WORK COMPLETED. FINAL CERTIFICATE ISSUED

APP. NO.

20150731305P

BUILDING INSPECTOR

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SAN FRANCISCO
DEPARTMENT OF
BUILDING INSPECTION

If the image of this document appears less sharp than this notice, it is due to the quality of the original.

PERMIT NO. E 047698

APPLICATION/PERMIT FOR ELECTRICAL WIRING and/or FIXTURES
SAN FRANCISCO DEPARTMENT OF PUBLIC WORKS

BUREAU OF BUILDING INSPECTION — ELECTRICAL DIVISION — 558-6030

THIS FORM MUST BE FILED IN QUADRUPLICATE BEFORE DOING WORK DESCRIBED BELOW. PRINT — USE BALLPOINT PEN OR TYPEWRITER.

PERMIT NO. E 047698

REC'D DEPT. OF PUBLIC WORKS
CENTRAL PERMIT BUREAU
SAN FRANCISCO
AUG 1 1988

ISSUANCE DOES NOT CONSTITUTE A CHANGE

JOB ADDRESS	1201 MASON
OCCUPIED AS	
ROOM OR APT. NO.	
OWNER	S.F. Muni - Cable Car Barn and Museum
TENANT	
TELEPHONE	
INSTALLATION BY	CALIF FIRE SECURITY
TELEPHONE	648-3340
ADDRESS	1334 POTRERO
REQUESTED INSPECTION DATE	
CITY	S.F. CA 94110
VAUD STATE CONTRACTORS LIC. NO. AND CLASS	422185 C-10
EXPIRATION DATE	5/90
SIGNED	

FINAL COMPLETION/PAYMENT OF FEES

AUG 3 1 1988

OUTLETS			SERVICES			SPECIAL EQUIPMENT				SPECIAL EQUIPMENT				FEES	
Light	Switch	Plug Rec.	No.	Switch Size	Conductor	No.	EQUIPMENT	KW	HP	No.	EQUIPMENT	KW	HP	TYPE	AMOUNT
							HOOK-UP							INSP. FEE	
							W.F. JAMPER							SURVEY	
														TEMP. WIRING	
														RE-INSP. FEE	
FIXTURES			FEEDERS											PENALTY FEE	
No. of Circuits	Incandescent	Fluorescent												TOTAL FEES	
														PAID AT FILING	21 50
														BALANCE DUE	0
														OVER-PAID	

SOLE PAYMENT CLAUSE: [illegible]

[illegible]

I Certificate of Consent to Self-Insure Issued by the Director of Industrial Relations.
J Certificate of Workmen's Compensation Insurance Issued by an Admitted Insurer.
[illegible]
[illegible]

[illegible]

Applicant's Signature

8/1/88
Date

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SAN FRANCISCO
DEPARTMENT OF
BUILDING INSPECTION

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RECORD OF INSPECTION

DATE	INSP.	REMARKS	DATE	COMPLAINTS AND REINSPECTIONS
8.31.88	Sug	All 1/2" Rigid & Sealtight Tied into existing Tamper and Flow Loop.		
		Final		

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SAN FRANCISCO
DEPARTMENT OF
BUILDING INSPECTION

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PERMIT NO. E 052079

APPLICATION/PERMIT FOR ELECTRICAL WIRING and/or FIXTURES
SAN FRANCISCO DEPARTMENT OF PUBLIC WORKS

BUREAU OF BUILDING INSPECTION — ELECTRICAL DIVISION — 558-6030

THIS FORM MUST BE FILED IN QUADRUPLICATE BEFORE DOING WORK DESCRIBED BELOW. PRINT — USE BALLPOINT PEN OR TYPEWRITER

PERMIT NO. E 052079

PUBLIC WORKS
CENTRAL PERMIT BUREAU
SAN FRANCISCO

JUL 17 1989

ISSUANCE DOES NOT CONSTITUTE A CHANGE

JOB ADDRESS: 1201 Mason Street	OCCUPIED AS: Cable Car Barn	ROOM OR APT. NO.	
OWNER: City & County of San Francisco, Public Utilities Commision	TENANT	TELEPHONE: 923-6172	
INSTALLATION BY: Fitzgerald Electric Inc.		TELEPHONE: 285-1370	
ADDRESS: 387 De Haro Street		REQUESTED INSPECTION DATE	
CITY: San Francisco, CA	ZIP: 941	13941	
VALID STATE CONTRACTORS LIC. NO. AND CLASS: 510719 C-10	EXPIRATION DATE: 5/89	SIGNED	FINAL COMPLETION/PAYMENT OF FEES: AUG 23 1989

OUTLETS			SERVICES			SPECIAL EQUIPMENT				SPECIAL EQUIPMENT				FEES	
Light	Switch	Fan or Other	No.	Switch Size	Conduit Size	No.	EQUIPMENT	KW	HP	No.	EQUIPMENT	KW	HP	TYPE	AMOUNT
							Reprogramming Controller							INSP. FEE	
														SURVEY	
														TEMP. WIRING	
														RE-INSP. FEE	
														PENALTY FEE	
														TOTAL FEES	Waived
														PAID AT FILING	
														BALANCE DUE	
														OVER-PAID	

FIXTURES			FEEDERS
No. of Circuits	Heater or Vent.	Fan (Attach Sched. if Over 5 HP)	

Waived
Waived

HOLD HARMLESS: (Sec. 223 CAMC) For consideration received, the applicant(s) is (are) jointly and severally obligated to indemnify and hold harmless the City and County of San Francisco, its officers and agents, and each and all of them, from all suits, claims and demands of every kind or nature resulting directly or indirectly from any act or omission of the applicant(s), his (her or their) subcontractors, or any employee of any of them which may occur on the job for which this permit is issued, whether or not the same shall be caused in part by any act, omission, passive or active negligence, or other fault of the City and County of San Francisco, its officers or agents, or any of them, and whether or not the same shall be caused in part or wholly by any condition, defect, or fault on the premises for which this permit is issued, or by any other circumstance, whether or not it shall be liable for the same; and whether or not the same shall be caused in part by the negligence or other fault of the City and County of San Francisco, its officers or agents, or any of them. The applicant(s) shall defend at his (her or their) own expense any suit based upon any such claim or demand, even if such suit, claim or demand shall prove to be groundless, false or fraudulent, which may be brought or instituted against the City and County of San Francisco, its officers or agents, or any of them, on account of any such claim or demand, and shall pay all costs and expenses in connection therewith and all damages which may be recovered against the City and County of San Francisco, its officers or agents, or any of them.

In accordance with the provisions of Section 3800 of the Labor Code of the State of California, the applicant must have on file, or file with the Central Permit Bureau, either Certificate (1) or (2) or (3) designated below or shall indicate that (2) or (3) is not applicable. If insurance, item (2) is changed, then item (1) must be checked as well. Mark the appropriate number of certificate below:

( ) 1 Certificate of Consent to Self-Insure issued by the Director of Industrial Relations.
(X) 2 Certificate of Workmen's Compensation Insurance issued by an admitted insurer.
( ) 3 An exact copy or duplicate of (1) certified by the Director or (2) certified by the insurer.
( ) 4 The cost of the work to be performed is $100 or less.

I certify that in the performance of the work for which this Permit is issued, I shall not employ any person in any manner so as to become subject to the workmen's compensation laws of California, further authorization that I shall, in the event that I should become subject to the workmen's compensation provisions of the Labor Code of California and shall fully comply forthwith with the provisions of Section 3800 of the Labor Code, that the Permit Herein applied for shall be withdrawn immediately.

I certify on the penalty for the value of the subject that is the performance of the work for which this Permit is issued, I will employ a Journeyman Lineman who has the workmen's compensation laws of California and who has on file, at least at the commencement of the work and file, with the Central Permit Bureau satisfactory proof of compliance.

Applicant's Signature

Date 11-15-89

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SAN FRANCISCO
DEPARTMENT OF BUILDING INSPECTION

If the image of this document appears less sharp than this notice, it is due to the quality of the original.

RECORD OF INSPECTION

DATE	INSP.	REMARKS	DATE	COMPLAINTS AND REINSPECTIONS
8-3-07		CANCELED		

SAN FRANCISCO
DEPARTMENT OF
BUILDING INSPECTION
INSPECTOR COPY

City and County of San Francisco
Department of Building Inspection

Permit Issued By: MPANGELI

London N. Breed, Mayor
Patrick O'Riordan, Interim Director

ELECTRICAL PERMIT

PERMIT# ***E201504288147***

Permit Issued date: ***04/28/2015 12:28:58 PM***

Printed on: 03/30/2021 08:31:41 AM

Job Address	Block/Lot/Structure Num	Unit	District
1201 MASON ST	0190/005/0		11

Occupancy: Commercial | Floor/Suite: | Valuation: $24,000.00

Owner Name	Phone	Phone2	Homeowner permit approved by
CITY PROPERTY			

Contractor Company Name	License	Class	License Exp Date	Business Lic#
CHAMPION TELECOM INC	980705	C10 B1	31-JAN-17	0463858

Address	City	State	Zip Code	Office Phone#	Mobile Phone#
401 WHITNEY PLACE	FREMONT	CA	94539-0000	(510)226-8525	(408)680-4740

Applicant/Occupant Name: | Phone: ( ) -

EID Use Only: | Building Appln. No: | Plumbing permit No:

APPLICANT'S DESCRIPTION OF WORK:

INSTALL (N) CONTROL STATION FOR MICROWAVE COMMUNICATIONS (RADIO) PROVIDE CABLING FROM CENTRAL STATION (ANTENNA'S) TO RADIO ON 1ST FLOOR. INSTALL ANTENNAE BALLAST MOUNTS ON ROOFTOP

INSPECTOR'S COMMENT:

Fees

Fee Type	Date Paid	Receipt	Amount	Fee Type	Date Paid	Receipt	Amount
NON_RES_OUTL	28-APR-15	226820	$669.00	TECH_SRCH	28-APR-15	226820	$13.38
BLDG_REV_FEE	28-APR-15	226820	$1.00				

Surcharge **$0.00** Total Fees **$683.38** Total Paid **$683.38** Balance due **$0.00**

Inspection Activity Description

Activity Date	Inspector	Code	Activity Code Description	Inspection Record
03/04/2016	Osha Ashworth	301	COMPLETE	APPROVED INSTALL (N) CONTROL STATION FOR MICROWAVE COMMUNICATIONS (RADIO) PROVIDE CABLING FROM CENTRAL STATION (ANTENNA'S) TO RADIO ON 1ST FLOOR. INSTALL ANTENNAE BALLAST MOUNTS ON ROOFTOP BA # 201507313054
02/24/2016	Mario Ortiz	108	INSPECTION CANCELED - ENROUTE	Inspection canceled in the a.m.

E201504288147 1201 MASON ST CHAMPION TELECOM INC Floor/Suite:

OFFICIAL COPY

SAN FRANCISCO
DEPARTMENT OF
BUILDING INSPECTION

PERMIT NO. P 220698

APPLICATION/PERMIT TO INSTALL PLUMBING, GAS, WATER

1986 220698
CITY AND COUNTY OF SAN FRANCISCO
DEPARTMENT OF PUBLIC WORKS
BUREAU OF BUILDING INSPECTION
PLUMBING DIVISION
861-8402

PERMIT NO. P

AMENDMENT TO:

JOB ADDRESS 1201 Mason Street

BLDG. USE Cable Car Museum NEW [ ] ALT [X] # STORIES 4

OWNER OF BLDG. City & County of San Francisco PHONE

ADDRESS

VALID STATE CONTRACTOR'S LICENSE # 342318

CLASS C-16 EXP. DATE 6-30-86

D. LaPine
SIGNATURE

NAME Robles Fire Protection, Inc.

ADDRESS 250-B Napolean Street

San Francisco (CITY) Ca. (STATE) 94124 (ZIP CODE)

DATE: 03/05/86

REQUESTED INSP. DATE:

(415)285-0460 (TEL. NO.)

PLEASE TYPE OR PRINT LEGIBLY

PRESS HARD

THE ADDRESS PRINTED AT LEFT MUST SHOW CLEARLY THROUGH A WINDOW ENVELOPE

* NOT VALID FOR PERMIT IF ANY EMPLOYEE DESCENDS INTO EXCAVATION DEEPER THAN 5'

FIXTURES 'A' PLUMBING	NO. AT FILING	SHORTS
TOILETS		
WASH BASINS		
BATH TUBS		
SHOWERS		
SINKS		
WASH TRAYS		
DRAINS (ALL KINDS)		
LEADERS (ALL KINDS)		
AUTO. DISH WASHER		
GARBAGE DISPOSAL		
AUTO. CLOTHES WASHER		
MISC. FIXTURES		
DRINKING FOUNTAIN		
URINALS		
AUTO. SUMP INJECTOR		
GREASE INTERCEPTOR		
EXTRA CHARGE FEE	X	
TOTAL PLUMBING FIX TURES @	$	$
PERMIT FEE		X
TOTAL PLUMBING FEE		
[ ] ROUGH IN ONLY	$	

RATE	'B' GAS	NO. AT FILING	FEE	SHORTS	SHORT FEE
	GAS PERMIT FEE	X		X	X
	1ST GAS OUTLET BA. LINE				
	ADD'L GAS OUTLETS				
	WATER HEATER				
	WARM AIR FURNACE				
	MISC. GAS APPLIANCE				
	GAS RANGE				
	EXTRA CHARGE FEE	X	X	X	
	RE-INSPECTION	X			
	TOTAL GAS FEE	X		X	$
			$		

'C' WATER					
	WATER LINES 1-4 OUTLETS EACH SERVICE				
	ADD'L WATER OUTLETS				
	SPRINGLERS FIRE	2	7.00		
	IRRIGATION				
	SOLAR PANELS				
	EXTRA CHARGE FEE	X	X	X	
	RE-INSPECTION	X			
	TOTAL WATER FEE	X	$ 7.00	X	$
			$		

'D' SEWER					
	SEWER REPAIR OR REPLACEMENT		$		$
	STREET SIDE SEWER INSPECTION		$		$

TOTAL FEES		
FIXE	NO.	AMOUNT
PERMIT		
RE-INSPECTION		
PLUMBING 'A'		
GAS 'B'		
WATER 'C'	2	7.00
SEWER 'D'		
PENALTY		
TOTAL		7.00
PD. AT FIL		
EXTRA CHGS		
EX. CHG. FEE		
BAL. DUE		
OVERPAID		
AMOUNT RECEIVED AT FILING $ 7.00		

VALID FOR ISSUANCE:
APPROVED DATE
CHIEF PLUMBING INSPECTOR

VALID FOR ISSUANCE:
APPROVED MAR 10 DATE
CHIEF PLUMBING INSPECTOR

PLEASE MAKE CHECK PAYABLE TO:
DEPARTMENT OF PUBLIC WORKS
CENTRAL PERMIT BUREAU
450 McALLISTER STREET
ROOM 104
SAN FRANCISCO, CA 94102

NOTE: SEE BACK OF GREEN COPY FOR CERTIFICATION OF COMPLIANCE WITH CALIF. STATE LABOR CODE SECTION 3800.

NOT VALID UNLESS DATED AND SIGNED BY CHIEF PLUMBING INSPECTOR

INSPECTOR'S REPORT

If the image of this document appears less sharp than this notice, it is due to the quality of the original.

OFFICIAL COPY

SAN FRANCISCO
DEPARTMENT OF
BUILDING INSPECTION

INSPECTOR'S JOB RECORD

DATE	INSP INITIALS	REMARKS
12/29/86	JET	no call for inspection.

220868

220838

If the image of this document appears less sharp than this notice, it is due to the quality of the original.

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SAN FRANCISCO
DEPARTMENT OF
BUILDING INSPECTION

PERMIT NO. P249581

01980 2P

PERMIT NO. 249581

CITY AND COUNTY OF SAN FRANCISCO
DEPARTMENT OF PUBLIC WORKS
BUREAU OF BUILDING INSPECTION
PLUMBING DIVISION
558-6054

APPLICATION/PERMIT TO INSTALL PLUMBING, GAS, WATER

JOB ADDRESS 1201 MASON @ WASHINGTON S.F. 94108

AMENDMENT NO.

BLDG. USE CABLE CAR BARN NEW ☐ ALT ☒ # STORIES 2

VALID STATE CONTRACTOR'S LICENSE # 304644

OWNER OF BLDG. MUNI PHONE

CLASS C-16 EXP. DATE 1-30-89

ADDRESS 949 PRESIDIO SF

G. Delatorre
SIGNATURE

NAME TOWERS FIRE SAFETY SYSTEMS INC. DATE 8-10-88

ADDRESS 369 BROADWAY

REQUESTED INSP. DATE

SAN FRANCISCO CA 94133
CITY STATE ZIP CODE

421-0486
TEL. NO.

PLEASE TYPE OR PRINT LEGIBLY

PRESS HARD

THE ADDRESS PRINTED AT LEFT MUST SHOW CLEARLY THROUGH A WINDOW ENVELOPE

* NOT VALID FOR PERMIT IF ANY EMPLOYEE DESCENDS INTO EXCAVATION DEEPER THAN 5'

FIXTURES 'A' PLUMBING	NO. AT PLUMB	SHORTS
TOILETS		
WASH BASINS		
BATH TUBS		
SHOWERS		
SINKS		
WASH TRAYS		
DRAINS (ALL KINDS)		
LEADERS (ALL KINDS)		
AUTO. DOM WASHER		
GARBAGE DISPOSAL		
AUTO. CLOTHES WASHER		
MISC. FIXTURES		
DRINKING FOUNTAIN		
URINALS		
AUTO. SUMP INJECTOR		
GREASE INTERCEPTOR		
EXTRA CHARGE FEE	X	
TOTAL PLUMBING FIXTURES #	$	$
PERMIT FEE		X
TOTAL PLUMBING FEE		
☐ ROUGH IN ONLY	$	

RATE	'B' GAS	NO. AT PLUMB	FEE	SHORTS	SHORT FEE
	GAS PERMIT FEE	X		X	X
	1ST GAS OUTLET EA. LINE				
	ADD'L GAS OUTLETS				
	WATER HEATER				
	WARM AIR FURNACE				
	MISC. GAS APPLIANCE				
	GAS RANGE				
	EXTRA CHARGE FEE	X	X	X	
	RE-INSPECTION	X			
	TOTAL GAS FEE	X		X	$
			$		

'C' WATER				
WATER LINES 1-4 OUTLETS EACH SERVICE				
ADD'L WATER OUTLETS				
SPRINKLERS FIRE	54			21.38
IRRIGATION				
SOLAR PANELS				
EXTRA CHARGE FEE	X	X	X	
RE-INSPECTION	X			
TOTAL WATER FEE	X	$	X	$ 21.38
		$		

'D' SEWER				
SEWER REPAIR OR REPLACEMENT		$		$
STREET SIDE SEWER INSPECTION		$		$

TOTAL FEES TYPE	NO	AMOUNT
PERMIT		
RE-INSPECTION		
PLUMBING 'A'		
GAS 'B'		
WATER 'C'		21.38
SEWER 'D'		
PENALTY		
TOTAL		21.38
PD. AT FIL.		21.38
EXTRA CHGS.		0
EX. CHG. FEE		0
BAL. DUE		0
OVERPAID		
AMOUNT RECEIVED AT FILING		21.38

VALID FOR ISSUANCE:

APPROVED DATE

AUG 10 1988

CHIEF PLUMBING INSPECTOR

NOT VALID UNLESS DATED AND SIGNED BY CHIEF PLUMBING INSPECTOR

ISSUANCE DOES CONSTITUTE A CH. OF USE

VALID FOR ISSUANCE:

APPROVED AUG 10 1988

PLUMBING INSPECTOR

Thomas J. Leha

PLEASE MAKE CHECK PAYABLE TO:
DEPARTMENT OF PUBLIC WORKS
CENTRAL PERMIT BUREAU
450 McALLISTER STREET
ROOM 104
SAN FRANCISCO, CA 94102-4584

NOTE: SEE BACK OF GREEN COPY FOR CERTIFICATION OF COMPLIANCE WITH CALIF. STATE LABOR CODE SECTION 3600.

INSPECTOR'S REPORT

If the image of this document appears less sharp than this notice, it is due to the quality of the original.

OFFICIAL COPY

SAN FRANCISCO
DEPARTMENT OF
BUILDING INSPECTION

INSPECTOR'S JOB RECORD

DATE	INSP INITIALS	REMARKS
12/9/88	JET	no call for inspection

If the image of this document appears less sharp than this notice, it is due to the quality of the original.

SAN FRANCISCO

PLUMBING PERMIT

CITY AND COUNTY OF SAN FRANCISCO
DEPARTMENT OF BUILDING INSPECTION

PERMIT # PP20150325104

DATE AND TIME ISSUED: 03/25/2015 09:34:24 AM

Call between 8:00 am and 3:00 pm to schedule an inspection - (415) 558-6570
24-hour voice inspection scheduling - (415) 575-6955

OFFICIAL COPY

1201 MASON ST

RENEWAL | AMENDMENT | PID PERMIT #

Job Location 1201 MASON ST Unit BLK/LOT 0190 / 005
Unit BLK/LOT District 2

OWNER: BLDG APPL# 201503251820 EID PMT#

Owner Name CITY PROPERTY
Owner Address 1201 MASON ST SAN FRANCISCO CA
Owner/Contact CITY PROPERTY (CABLE CAR MUSEU
Owner Phone 4156431767

I hereby affirm that I am licensed under provisions of Chapter 9 (Commencing with Sec. 7000) of Division 3 of the Business and Professions code, and my license is in full force and effect.

CONTRACTOR: HOMEOWNER PERMIT: Approving Inspector:

Company Name	License #	Class	Expiration	BTRC #
INTERNATIONAL FIRE INC	965370	C10,C16	09/30/2015	0926497
Address	City		State	Zip
765 PENNSYLVANIA AV	SAN FRANCISCO		CA	94107-0000
				Phone
				4156431767

DESCRIPTION OF WORK COVERED BY THIS PERMIT:
TO INSTALL 2 FIRE SPRINKLER HEADS IN T.I. AREA.

FEES: MAX INSPECTIONS AVAILABLE 2

NUMBER OF ADDITIONAL INSPECTIONS	0 @	0.00 / 1 EA.	0.00	VALUATION 0.00	BLDG STDS ADMIN FUND 0.00
NUMBER OF PLAN REVIEW HOURS:	0 @	0.00 / 1 EA.	0.00	SURVEY:	0.00
NUMBER OF ADMIN HOURS:	0 @	0.00 / 1 EA.	0.00	MISCELLANEOUS:	0.00
				FIRE SPRINKLER:	0.00
SINGLE RESIDENTIAL UNIT:			0.00	FIRE SPRINKLER (NEW/REMODEL): 1 @ 232.00/ 1 EA.	232.00
PLUMBING INSTALLATION (WITHOUT)	0	UNITS	0.00	RESTAURANT (NEW/REMODEL): 0 OUTLETS	0.00
PLUMBING INSTALLATION (WITH):	0	UNITS	0.00	Web fee: 0.00 Penalty 0.00 Tech surcharge (2%)	4.64
NEW BOILER INSTALLATION:	0 @	0.00 / 1 EA.	0.00		
OFFICE, MERC AND RETAIL BUILDING:	0 @	0.00 / 1 EA.	0.00	TOTAL PERMIT FEE:	236.64

NOT VALID FOR PERMIT IF ANY EMPLOYEE DESCENDS INTO EXCAVATION DEEPER THAN 5'
Effective 6/7/2009 - Permit shall expire 1 year from date of issuance.

DO NOT WRITE BELOW THIS LINE - FOR OFFICIAL USE ONLY

Date	Initials	Remarks

EXPIRED
Date: 3/20/2016
Andrew Palmigiano, PID-DBI
By: Auto Expire JUL 10 2018

NOTICE TO APPLICANT HOLD HARMLESS CLAUSE: The permittee(s) by acceptance of the permit, agree(s) to indemnify and hold harmless the City and County of San Francisco from and against any and all claims, demands and actions for damages resulting from operations under this permit, regardless of negligence of the City and County of San Francisco, and to assume the defense of the City and County of San Francisco against all such claims, demands or actions.

In conformity with the provisions of Section 3800 of the Labor Code of the State of California, the applicant shall have coverage under (I), or (II) designated below or shall indicate item (III) , or (IV), or (V), whichever is applicable. If however item (V) is checked item (IV) must be checked as well. Mark the appropriate method of compliance below:

I. I have and will maintain a certificate of consent to self-insure for workers' compensation, as provided by Section 3700 of the Labor Code for the performance of the work for which this permit is issued.

X II. I have and will maintain workers' compensation insurance, as required by Section 3700 of the Labor Code, for the performance of the work for which this permit is issued. My workers' compensation insurance carrier and policy number are:
Carrier: MARKEL INSURANCE COMPANY Policy Number: MCW0012319

III. The cost of the work to be done is $100 or less.

IV. I certify that in the performance of the work for which this permit is issued, I shall not employ any person in any manner so as to become subject to the workers' compensation laws of California. I further acknowledge that I understand that in the event that I should become subject to the workers' compensation provisions of the Labor Code of California and fail to comply forthwith with the provisions of Section 3800 of the Labor Code, that the permit herein applied for shall be deemed revoked.

V. I certify as the owner (or the agent for the owner) that in the performance of the work for which this permit is issued, I will employ a contractor who complies with the workers' compensation laws of California and who, prior to the commencement of any work, will file a completed copy of this form with the Central Permit Bureau.

PLEASE MAKE CHECK PAYABLE TO: DEPARTMENT OF BUILDING INSPECTION 1660 MISSION STREET SAN FRANCISCO, CA 94103

Plumbing Inspector's signatures:

Rough In: _____ Date: _____

Final: _____ Date: _____

Valid For Issuance: Approved Date: 03/25/2015 09:34:24 AM

Chief Plumbing Inspector: Steve Panelli

INSPECTOR'S RECORD
Issued by: DELFIDEL

OFFICIAL COPY

SAN FRANCISCO
PLUMBING PERMIT
CITY AND COUNTY OF SAN FRANCISCO
DEPARTMENT OF BUILDING INSPECTION
DATE AND TIME: 03/30/2021 08:33:24 AM

PERMIT # PP20150325104 EXPIRED

Call between 8:00 am and 3:00 pm to schedule an inspection - (628) 652-3400
24-hour Web inspection scheduling at: https://dbiweb02.sfgov.org/dbi_plumbing/
24-hour voice inspection scheduling - (628) 652-3401

RENEWAL AMENDMENT PID PERMIT #

Job Location 1201 MASON ST Unit Unit sfx BLK/LOT 0190 / 005
Unit Unit sfx BLK/LOT

1201 MASON ST

OWNER: BLDG APPL# 201503251820 EID PMT# District 2

Owner Name CITY PROPERTY Owner/Contact CITY PROPERTY (CABLE CAR MUSEU
Owner Address 1201 MASON ST SAN FRANCISCO CA Owner Phone 4156431767

I hereby affirm that I am licensed under provisions of Chapter 9 (Commencing with Sec. 7000) of Division 3 of the Business and Professions code, and my license is in full force and effect.

CONTRACTOR: HOMEOWNER PERMIT: Approving Inspector:

Company Name	License #	Class	Expiration	BTRC #
INTERNATIONAL FIRE INC	965370	C10,C16	09/30/2015	0926497
Address	City		State	Zip
765 PENNSYLVANIA AV	SAN FRANCISCO		CA	94107-0000
				Phone
				4156431767

DESCRIPTION OF WORK COVERED BY THIS PERMIT:
TO INSTALL 2 FIRE SPRINKLER HEADS IN T.I. AREA.

FEES: MAX INSPECTIONS AVAILABLE: 2

NUMBER OF ADDITIONAL INSPECTIONS :	0 @	0.00 / 1 EA.	0.00	VALUATION	0.00	BLDG STDS ADMIN FUND	0.00
NUMBER OF PLAN REVIEW HOURS:	0 @	0.00 / 1 EA.	0.00	SURVEY:			0.00
NUMBER OF ADMIN HOURS:	0 @	0.00 / 1 EA.	0.00	MISCELLANEOUS:			0.00
SINGLE RESIDENTIAL UNIT:			0.00	FIRE SPRINKLER:			0.00
PLUMBING INSTALLATION (WITHOUT):	0	UNITS	0.00	FIRE SPRINKLER (NEW/REMODEL):	1 @	232.00/ 1 EA.	232.00
PLUMBING INSTALLATION (WITH):	0	UNITS	0.00	RESTAURANT (NEW/REMODEL):	0	OUTLETS	0.00
NEW BOILER INSTALLATION:	0 @	0.00 / 1 EA.	0.00	Web fee: 0.00	Penalty 0.00	Tech surcharge (2%)	4.64
OFFICE, MERC AND RETAIL BUILDING:	0 @	0.00 / 1 EA.	0.00			TOTAL PERMIT FEE:	236.64

*** NOT VALID FOR PERMIT IF ANY EMPLOYEE DESCENDS INTO EXCAVATION DEEPER THAN 5'**
Effective 8/7/2009 - Permit shall expire 1 year from date of issuance.

DO NOT WRITE BELOW THIS LINE - FOR OFFICIAL USE ONLY

Date	Initials	Remarks

NOTICE TO APPLICANT HOLD HARMLESS CLAUSE: The permittee(s) by acceptance of the permit, agree(s) to indemnify and hold harmless the City and County of San Francisco from and against any and all claims, demands and actions for damages resulting from operations under this permit, regardless of negligence of the City and County of San Francisco, and to assume the defense of the City and County of San Francisco against all such claims, demands or actions.

In conformity with the provisions of Section 3800 of the Labor Code of the State of California, the applicant shall have coverage under (I), or (II) designated below or shall indicate item (III), or (IV), or (V), whichever is applicable. If however item (V) is checked item (IV) must be checked as well. Mark the appropriate method of compliance below:

I hereby affirm under penalty of perjury one of the following declarations:

I. I have and will maintain a certificate of consent to self-insure for workers' compensation, as provided by Section 3700 of the Labor Code for the performance of the work for which this permit is issued.

X II. I have and will maintain workers' compensation insurance, as required by Section 3700 of the Labor Code, for the performance of the work for which this permit is issued. My workers' compensation insurance carrier and policy number are:
Carrier: MARKEL INSURANCE COMPANY Policy Number: MCWD012319

III. The cost of the work to be done is $100 or less.

IV. I certify that in the performance of the work for which this permit is issued, I shall not employ any person in any manner so as to become subject to the workers' compensation laws of California. I further acknowledge that I understand that in the event that I should become subject to the workers' compensation provisions of the Labor Code of California and fail to comply forthwith with the provisions of Section 3800 of the Labor Code, that the permit herein applied for shall be deemed revoked.

V. I certify as the owner (or the agent for the owner) that in the performance of the work for which this permit is issued, I will employ a contractor who complies with the workers' compensation laws of California and who, prior to the commencement of any work, will file a completed copy of this form with the Central Permit Bureau.

PLEASE MAKE CHECK PAYABLE TO: DEPARTMENT OF BUILDING INSPECTION 49 SOUTH VAN NESS AVE, SAN FRANCISCO, CA 94103

Plumbing Inspector's signatures:

Rough In: _____ Date: _____

Final: _____ Date: _____

Valid For Issuance: Approved Date: 03/25/2015 09:34:24 AM

Chief Plumbing Inspector: Steve Panelli

INSPECTOR'S RECORD
Issued by: DELFIDEL

SAN FRANCISCO
Pier 9, The Embarcadero, Suite 107
San Francisco, California 94111
T: 415.421.1680
F: 415.421.0127

argsf.com

LOS ANGELES
360 E. 2nd Street, Suite 225
Los Angeles, CA 90012
T: 626.583.1401
F: 626.583.1414

arg-la.com

PORTLAND
720 SW Washington Street, Suite 300
Portland, OR 97205
T: 971.256.5324

arg-pnw.com

A7 - Exterior Conditions Memo

EXTERIOR CONDITIONS MEMO

Cable Car Barn

San Francisco, California

San Francisco Department of Public Works | September 2021

Architecture
Planning
Conservation

Architectural
Resources Group

Architectural
Resources Group

Pier 9, The Embarcadero, Suite 107
San Francisco, California 94111

argsf.com

Cable Car Barn
Exterior Conditions Memo

San Francisco, California
September 2021

Architectural Resources Group, Inc. (ARG) was retained by the San Francisco Department of Public Works to conduct an exterior conditions assessment of the Cable Car Barn in San Francisco, California, and provide treatment recommendations for its repair. The survey included general assessment of the exterior envelope including brick masonry, windows, doors, and skylights.

BRIEF DESCRIPTION OF THE BUILDING

Cable Car Barn is a two-story-tall brick-masonry building located at the southwest corner of Washington and Mason Streets in San Francisco, California. It was erected in 1907-08 to replace a three-story brick powerhouse and car barn destroyed in the 1906 earthquake and fire. The current structure was built on the footings and foundations of the original building. San Francisco's surviving cable car routes all operate out of this building. There is also a small museum inside the building housing exhibits on the history of San Francisco's cable cars.

The building is a typical brick commercial structure with a large chimney located on the south side. A pair of string courses visually separate the first and second floors. The fenestration includes multi-lite steel windows with awning or fixed sashes. The second-floor windows have an arched or rounded transom. There are also large entrance door assemblies with side lites and transoms.

The building has undergone a few changes over the years, including two major repair and renovation projects in 1967 and the 1980s. The 1967 work included brick masonry sandblasting, waterproofing, and painting. The 1980s rehabilitation project included masonry cleaning and repair, new roof and skylights, window and door replacement, and waterproofing. The Cable Car Barn has been recognized as a historic resource at the national, state, and local level, primarily as a contributor to the broader San Francisco Cable Car system.

METHODOLOGY

ARG conducted a visual survey of the building from the ground in April 2021. The conditions were observed using binoculars and a digital camera. A range of deterioration conditions such as crack, spall, mortar deterioration, general soiling, biological growth, stain, sealant failure, and corrosion was noted. The survey was non-destructive.

ARG also reviewed various background drawings, documents, and historic photographs of the building to prepare this report. They included 1967 and 1980s repair and renovation drawings and documents, National Register of Historic Places Inventory - Nomination Form, San Francisco Landmarks Preservation Advisory Board Case Report, and 2016 Facility Condition Assessment report.

Based on the existing condition survey, ARG identified appropriate treatment recommendations for the repair of the exterior fabric. The recommendations are based on *The Secretary of the Interior's Standards for the Treatment of Historic Properties (The Standards)* with Guidelines for Preserving, Rehabilitating, Restoring, and Reconstructing Historic Buildings, and on the Code of Ethics of the American Institute for Conservation (AIC).

SUMMARY OF EXISTING CONDITIONS AND TREATMENT RECOMMENDATIONS

Overall, the exterior envelope is in fair condition and requires general maintenance work. The brick masonry is in fair condition and exhibits cracks, spalls, open or deteriorated mortar joints, general soiling, biological growth, and sealant failure at the sheet copper flashing. The windows, skylights, and doors are in fair condition and exhibit corrosion, paint deterioration, and perimeter sealant failure. The roof requires replacement including all flashing and sealants.

Various deficiencies in the brick masonry, windows, doors, and skylights outlined in this report should be addressed within the next 3 to 5 years to prevent more serious conditions from forming. Deteriorated sealant joints should be replaced sooner, preferably in the next 1 to 2 years.

ROOFING

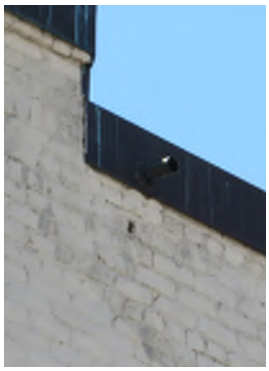
The low-slope roofs consist of a built-up membrane with red aggregate. The roof is drained by a series of in-field roof drains and overflow drains along with supplemental overflow scuppers. Various roof projections, including the clerestory, have standing seam sheet copper roof. Existing roofing may date to the 1984 renovation as no evidence of roof replacement was identified.

The following conditions were observed:

- Condition of the built-up membrane roof is obscured by aggregate, but assumed to be in overall fair to poor condition. Membrane has likely reached the end of its useful life. Evidence of past roof patching or selective replacement was noted.
- Membrane is covered in heavy biological growth at one location on the south side.
- Standing seam metal roofs were observed from the perimeter and appear to be in overall fair condition.
- Sealant joints at sheet metal flashing are deteriorated and in poor condition.
- SFMTA representatives reported a water leak in 2020 near/at the pit on the second floor (area marked in blue on the next page) and suggested the leak may be due to a pipe failure or the condition of the concrete. One pit has since been resealed, however it is not known if the leak has been resolved. ARG was not informed of the leak until after the site visit, however ARG did not observe any signs of major damage on the roof area immediately above the location besides deteriorated sealant and detached flashing. If the leak is still active, further investigation or testing may be needed to identify the source.

Built-up roof with red aggregate

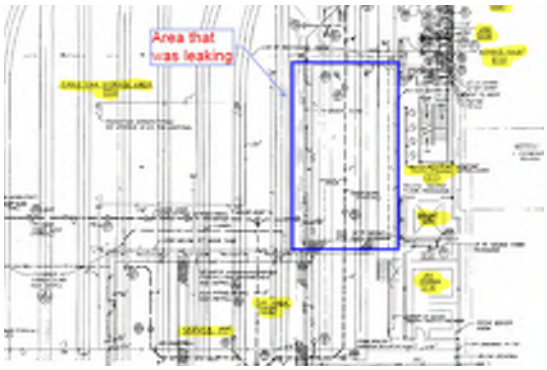
Roof covered in heavy biological growth on the south side



Overflow roof scuppers

Treatment Recommendations

- Replace membrane roof and all related flashing. Remove and replace all sealant joints.
- Remove all tree litter and debris from roof and ensure drains are kept clear.



Water leak near/at the pit on the 2nd floor in 2020 (Image credit: MTA)

Sheet copper roof at the clerestory

Area immediately above the reported water leak

Deteriorated sealant and corroded metal above the flashing at the roof parapet

Area immediately above the reported water leak

SKYLIGHTS

There are multiple aluminum pyramidal skylights on the roof, either square or rectangular. There is also a narrow pyramidal skylight on the ground floor on the south elevation. The glass is laminated.

The following conditions were observed:

- Skylights are in fair condition and exhibit mild corrosion, weathered finish, general soiling, and sealant failure.
- At the ground-floor skylight, the sheet metal flashing on the adjacent wall is detached and has deteriorated sealant.

Treatment Recommendations

- Clean and refinish the skylight frames. Remove and replace all sealant joints. Inspect and touch-up all sealant joints every 3 to 5 years.
- Repair the detached flashing at the ground-floor skylight. Replace the deteriorated sealant.

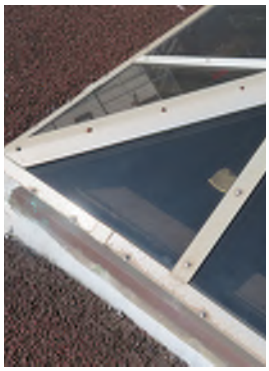
Roof skylights

Roof skylight

Roof skylight

Roof skylight, view from below

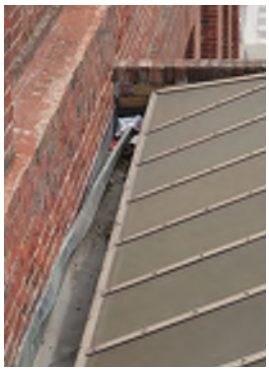
Roof skylight, view from below



Mild corrosion and weathered finish

Mild corrosion, weathered finish, and deteriorated sealant

Ground-floor skylight, views from above and below



Detached flashing at the ground-floor skylight

BRICK MASONRY

The exterior walls are red brick masonry capped with sheet copper coping. The brick masonry has an abraded finish from the 1967 sandblasting work. The coping was installed in the 1980s.

The following conditions were observed:

- Brick masonry is in fair condition and exhibits multiple cracks, spalls, and open or deteriorated mortar joints.
- A full-height hairline-size crack on the south elevation runs through brick units and mortar joints.
- Several stepped cracks were also noted.
- Brick chimney has numerous spalls and open joints.
- Building has several non-matching mortar joints and brick replacements from prior work.
- Masonry has an accumulation of general soiling, biological growth, and efflorescence - most significant at the projecting belt courses and trims, which are more likely to retain water. There are also mortar slurry residue, copper stains, and plant/weed growth.
- Plant beds are overgrown on the south elevation.
- Brick masonry is painted on the north elevation. The paint is in fair to poor condition. It is flaking and peeling at several locations and also covered in general soiling and biological growth at the parapets.
- Building-to-sidewalk joint is open at the base of the building.
- Sealant joints at the metal coping are missing or deteriorated.

East elevation

Ornate brickwork

Full-height crack, south elevation

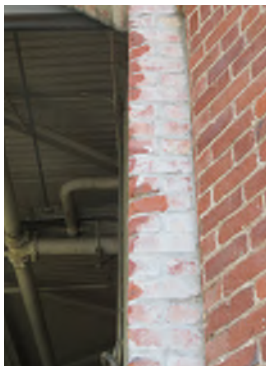
Treatment Recommendations

- Clean masonry to remove general soiling, biological growth, efflorescence, and stains. Consider installation of coating or sloped parge coat on skyfacing masonry surfaces like belt courses to shed water.
- Repair cracks and spalls in the brick masonry. Visually monitor large and long cracks after the repair. If any of the cracks open up again, it may indicate an area of active movement.
- Repoint open or deteriorated joints in the brick masonry.
- Consider replacing poorly matching masonry repairs and mortar joints for aesthetic reasons. Matching new or replacement brick to the existing abraded brick will require extra care.
- Repair leaking pipes on the east elevation.
- Trim overgrown plant beds and remove unwanted plant growth/weeds.
- Prepare, prime, and paint the brick masonry at the north elevation.
- Install sealant joint at the base of the building.
- Replace or repair metal parapet coping.Repair may include installation of an extruded silicone seal at joints.

Stepped crack through mortar joints, east elevation

Stepped crack, south elevation

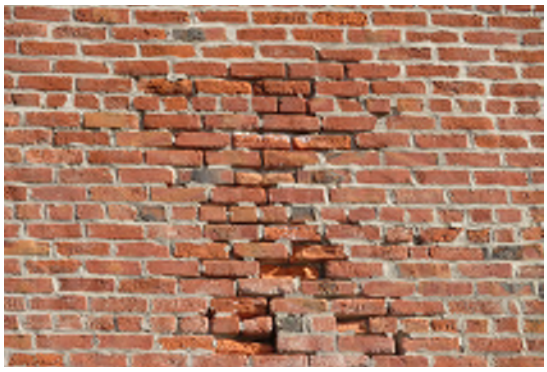
Spalled bricks around the windows, south elevation (left) and east elevation (right)



Spalled bricks around the building entrances, north elevation (left) and south elevation (right)

Spalled brick, south elevation

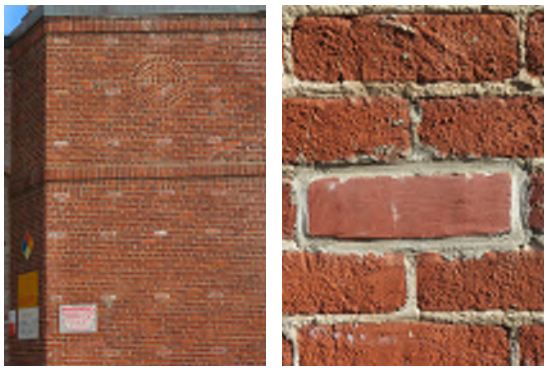
Damaged bricks, south elevation



Spalls and open joints in the brick chimney, south elevation

Spalls and open joints in the brick chimney, south elevation

Open joints



Non-matching mortar joints around brick replacements, south elevation

Non-matching brick replacements, south elevation

Non-matching repairs, east elevation

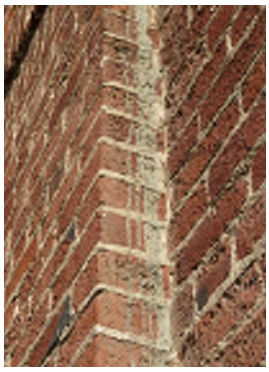
General soiling, biological growth, and paint deterioration, north elevation

General soiling, biological growth, efflorescence, and plant growth, east elevation

Biological growth, efflorescence, and open/deteriorated mortar joints, east elevation

Heavy general soiling and biological growth near overflow scupper, east elevation

Leaking pipes resulting in biological growth, east elevation



Copper stain (left) and mortar slurry residue (right), south elevation

Overgrown plant beds and weed growth, south elevation

Open joint at the base of the building, east elevation

Deteriorated sealant at metal coping

WINDOWS

Most windows are multi-lite steel windows with awning sashes and arched or rounded transom. There are also multi-lite fixed windows on the ground floor. The existing windows are not original and were installed during the 1980s rehabilitation project.

The following conditions were observed:

- Windows are in fair condition and exhibit corrosion, paint deterioration, and perimeter sealant failure.
- Cracked glass and missing hardware was noted at several windows.
- Select sashes were opened with relative ease during the site visit.

Treatment Recommendations

- Replace cracked glass panes to match existing in color, texture, size, and thickness.
- Replace missing or damaged hardware.
- Clean, adjust, or lubricate all sashes to make them easier to operate.
- Install new perimeter sealant at all windows.
- Prepare, prime, and paint all windows.

Second-floor multi-lite steel windows

Second-floor multi-lite steel windows, interior view

Ground-floor multi-lite steel windows

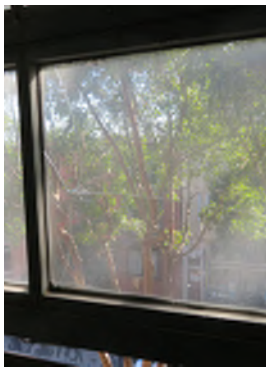
Multi-lite fixed window at the ground floor

Multi-lite fixed window at the ground floor

Corrosion on the windows

Corrosion on the windows

Deteriorated perimeter sealant



Cracked glass (left) and missing lever (right)

CLERESTORY WINDOWS

There are steel awning windows and a copper louver at the clerestory on the roof.

The following conditions were observed:

- Windows are in overall fair condition and exhibit corrosion, paint deterioration, and sealant failure.
- Plaster finish has minor cracks.
- Sealant is deteriorated at the sheet copper flashing at the base of the walls.

Treatment Recommendations

- Clean, adjust, or lubricate all sashes to make them easier to operate.
- Install new sealant at all windows and flashing.
- Prepare, prime, and paint all windows.
- Prepare, prime, and paint the plaster. Before painting, sound and replace all cracked and loose plaster. New plaster to match the texture of the existing plaster.

Steel awning windows at the clerestory

Steel awning windows

Sheet copper louver

Corrosion

Cracks in the plaster

Deteriorated sealant at the flashing

Deteriorated sealant at the flashing

DOORS

The building has a variety of both metal and wood doors. The main entrance has wood double doors set in a steel frame with a multi-lite transom. There is also a steel canopy above the entrance.

The east elevation has steel single doors with multi-lite side lites and transom. The south elevation has wood double doors with a louver in the transom and double steel doors with multi-lite side lites and transom.

The following conditions were observed:

- All metal door and entrance canopy components exhibit corrosion and paint deterioration.
- Wood double doors exhibit a weathered finish.
- Perimeter sealant is deteriorated.

Treatment Recommendations

- Clean, adjust, or lubricate all doors to make them easier to operate.
- Install new perimeter sealant at all door surrounds.
- Prepare, prime, and paint all metal door and entrance canopy components.
- Clean and refinish all wood doors.

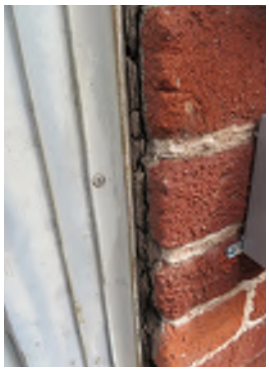
Museum entrance (left); east elevation doors (right)

South elevation wood double doors

South elevation metal double doors

Flush metal door

Corrosion at the museum entrance canopy



Deteriorated perimeter sealant

Deteriorated perimeter sealant

Mild corrosion and weathered finish

Mild corrosion and weathered finish

RAILINGS

There are steel and bronze railings on the south elevation. The railings were installed in the 1980s and are not original.

The following conditions were observed:

- Steel railing is in overall good condition, but exhibits paint deterioration.
- Bronze pipe railing is in overall good condition, but exhibits a weathered finish and mild corrosion.

Treatment Recommendations

- Prepare, prime, and paint the steel railing.
- Clean and refinish the bronze railing.

Steel railing, south elevation

Steel and bronze railings, south elevation

Bronze pipe railing, south elevation

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A8 - Industrial Equipment List

MACHINE SHOP EQUIPMENT

Note: Dims are best assumptions, taken from data available online and typcial industry standards. DPW/MTA to confirm dimensions of their equipment.

ITEM NO.	EQUIPMENT	MANUF / MODEL NO.	QTY	SIZE (WxDxH)	EXISTING CLEARANCE	PW & MTA COMMENTS	STANTEC COMMENTS	REPLACE?	NEW MODEL	SIZE (WxDxH)	NEW CLEARANCE
E001	CNC LATHE	Haas ST-30							CHUCKER LATHE	Haas CL-1	
			1	186"x104"x81"		Possible relocation to different MTA facility		Yes			
E002	LATHE BED	Clausing V460									
			1	128"x67"x81"				No			
E003	MANUAL LATHES	Turnmaster (PHL1500)									
			1	159"x44"x67"				No			
E004	VERTICAL MILL	Haas VF-3SSYT									
			1	163"x134"x125"	Min. distance required to remove conveyor from mill is 85" without folding the conveyor. Min. distance required to remove conveyor is 50" when the conveyor is folded at 90 degrees and folded down as if removed.	Possible relocation to different MTA facility					
E005	VERTICAL MILL	Bridgeport									
			1	84"x120"x87"				No			
E006	DRILL PRESS	Sajo									
			1	66"x101"x78"				No			

MACHINE SHOP EQUIPMENT

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ITEM NO.	EQUIPMENT	MANUF / MODEL NO.	QTY	SIZE (WxDxH)	EXISTING CLEARANCE	PW & MTA COMMENTS	STANTEC COMMENTS	REPLACE?	NEW MODEL	SIZE (WxDxH)	NEW CLEARANCE
E007	DRILL PRESS	HMT									
			1	95"x45"x110"	Machine can swing 360 degrees about a vertical axis.			No			
E008	GEAR HEAD DRILL PRESS	Wilton #24802									
			1	36"x36"x84"				No			
E009	HYDRAULIC PRESS	Dake H-Frame (50 ton)									
			1	38"x46"x92"				No			
E010	ARBOR PRESS	Enco									
			1	16"x19"x36"		Attached to I-beam. See pictures.		No			

MACHINE SHOP EQUIPMENT

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ITEM NO.	EQUIPMENT	MANUF / MODEL NO.	QTY	SIZE (WxDxH)	EXISTING CLEARANCE	PW & MTA COMMENTS	STANTEC COMMENTS	REPLACE?	NEW MODEL	SIZE (WxDxH)	NEW CLEARANCE
E011	HYDRAULIC PRESS	Enerpac (150 ton)									
			1	96"x80"x104"		Requires access to crane (crane access for entirety of machine shop desired. See Item 24 below).		No			
E012	VERTICAL BAND SAW	Grob									
			1	48"x48"x90"				No			
E013	HORIZONTAL BAND SAW										
			1	84"x44"x68"		Requires large clearance in feed direction to accommodate cutting long (up to 20 feet long) pieces of metal.		No			
E014	HYDRAULIC IRONWORKER	Piranha									
			1	35"x90"x64"		Requires large clearance in the feed direction to accommodate cutting long (up to 20 feet long) pieces of metal.		No			
E015	FLOOR SANDER										
			1	36"x28"x60"				No			

MACHINE SHOP EQUIPMENT

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ITEM NO.	EQUIPMENT	MANUF / MODEL NO.	QTY	SIZE (WxDxH)	EXISTING CLEARANCE	PW & MTA COMMENTS	STANTEC COMMENTS	REPLACE?	NEW MODEL	SIZE (WxDxH)	NEW CLEARANCE
E016	PARTS WASHER										
			1	54"x24"x77"				No			
E017	DRUM-MOUNTED PARTS WASHER										
			1	24"x24"x48"				No			
E018	SAND BLASTER CABINET										
			1	70"x32"x87"	Front: Allow 3'-0" Back: Allow 1'-0" Sides: Allow 18"		Confirmed "Existing to Remain" on a 9/01/2021 coordination call with MTA & DPW project leadership.				
E019	PEDESTAL GRINDER										
			1	24"x24"x56"				No			
E020	DRILL SHARPENER	Darex									
			1	24"x20"x24"				No			

MACHINE SHOP EQUIPMENT

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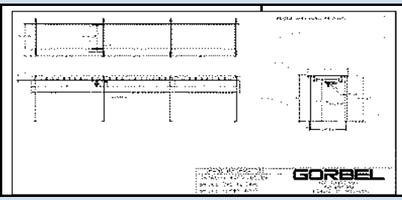
ITEM NO.	EQUIPMENT	MANUF / MODEL NO.	QTY	SIZE (WxDxH)	EXISTING CLEARANCE	PW & MTA COMMENTS	STANTEC COMMENTS	REPLACE?	NEW MODEL	SIZE (WxDxH)	NEW CLEARANCE
E021	END MILL SHARPENER	CutterMaster (CM-01)									
			1	32"x32"x24"				No			
E022	CNC TOOLING CARTS										
			2	56"x19"x36"		one(qty) for ST-30 one(qty) for Haas VF-3SSYT		No			
E023	JIB CRANE	(1 ton)									
			1			Possible replacement - Overhead crane with 1.5 ton capacity desired. Crane access for entirety of machine shop desired.	MTA prefered-vendor, "GP Cranes & Hoist Services" provided cutsheet and sketches for Gorbel bridge crane over Machine Room. Stantec created generic bridge crane Family from manfr cutsheets for use in Revit model	Yes			
E024	UNUSED NO. (equip either removed or relocated based on MTA feedback)										
E025	PLASMA CUTTER										
	NO PHOTO AVAILABLE		1					Yes			
E026	Automatic Surface Grinder (Acra 1224HS)										
			1					Yes	Acra 1224HS	90" x 71" x 88"	
E027	PIPE STORAGE AREA Moves w/Machine Shop per MTA feedback)										
			1	Preferrably able to accommodate 25 ft lengths.		20 feet. Preferrably able to accommodate 25 ft lengths. Current space is not sufficient as it is very difficult to unload material from the rack. Additional clearance on both sides desired.	Pic taken by Stantec on a site visit.				

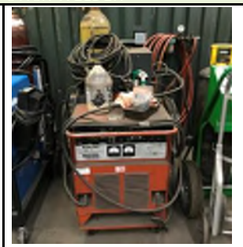
NEW INSPECTION ROOM

Note: Dims are best assumptions, taken from data available online and typcial industry standards. DPW/MTA to confirm dimensions of their equipment.

ITEM NO.	EQUIPMENT	MANUF / MODEL NO.	QTY	SIZE (WxDxH)	EXISTING CLEARANCE	PW & MTA COMMENTS	STANTEC COMMENTS	REPLACE?	NEW MODEL	SIZE (WxDxH)	NEW CLEARANCE
E101	HARDNESS TESTER	Rockwell									
			1	18"x32"x36"	Currently located in Machine Shop			No			
E102	MEASURING ARM	FARO Arm									
			1	26"x36"x58"		FARO arm currently locked in engineer's office and specialized granite table stored temporarily in first floor Break Room		No			
E103	OPTICAL COMPARATOR										
			1	24"x36"x36"		Located in supervisor office. Supervisor office located in corner of machine shop.		No			
E104	TOOLS STORAGE	Precision									
			1	30"x27.75"x59"		Currently located in Machine Shop. Could be substituted with new, likely smaller cabinet. MTA Comments (2/16): chose "full height modular drawer cabinet"		Yes			
E105	GRANITE BLOCK TABLE										
			1	72"x48"x34"		Existing slab stored in drawer. A dedicated table where this type of slab could be fixed or just a separate granite table is desired for parts inspection	18"24"xOptimal height for working with parts	Yes			
E106	SPRING COMPRESSOR										
			1	12"x12"x60"		Currently located in Machine Shop		No			

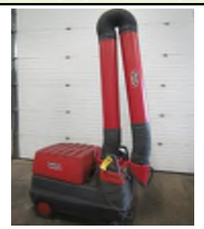
WELD SHOP EQUIPMENT

Note: Dims are best assumptions, taken from data available online and typcial industry standards. DPW/MTA to confirm dimensions of their equipment.

ITEM NO.	EQUIPMENT	MANUF / MODEL NO.	QTY	SIZE (WxDxH)	EXISTING CLEARANCE	PW & MTA COMMENTS	STANTEC COMMENTS	REPLACE?	NEW MODEL	SIZE (WxDxH)	NEW CLEARANCE
E201		Hobart									
			1	36"x32"x42"				No			
E202		Miller Dynasty									
			1	48"x32"x72"				No			
E203	STICK WELDER	Lincoln Electric Idealarc									
			1	56"x36x72"				No			
E204	MIG CART	Miller (460 V)									
			1	44"x24"48"				No			

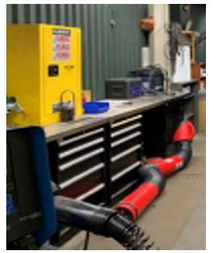
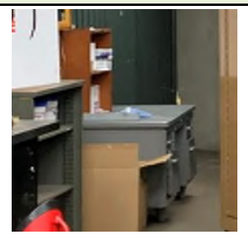
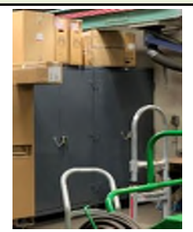
WELD SHOP EQUIPMENT

Note: Dims are best assumptions, taken from data available online and typcial industry standards. DPW/MTA to confirm dimensions of their equipment.

ITEM NO.	EQUIPMENT	MANUF / MODEL NO.	QTY	SIZE (WxDxH)	EXISTING CLEARANCE	PW & MTA COMMENTS	STANTEC COMMENTS	REPLACE?	NEW MODEL	SIZE (WxDxH)	NEW CLEARANCE
E205	WELDER	Miller 211 MIG Welder									
								No			
E206	OXYGEN / ACETYLENE CART	SafTcart									
			1	36"x36"64"				No			
E207	WELDING FUME EXTRACTOR	Lincoln Electric Smog Hog									
			1	48"x32"x96"		This piece of equipment is the Smog Hog (Item 7 in spreadsheet submitted 4/29/21 to DPW for Stantec). It is used at the welding table and is considered part of the welding space.		No			
E208	UNUSED NO. (equip either removed or relocated based on MTA feedback)										
E209	PEDESTAL GRINDER										
			1	28"x24"x48"				No			

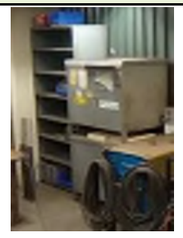
WELD SHOP EQUIPMENT

Note: Dims are best assumptions, taken from data available online and typcial industry standards. DPW/MTA to confirm dimensions of their equipment.

ITEM NO.	EQUIPMENT	MANUF / MODEL NO.	QTY	SIZE (WxDxH)	EXISTING CLEARANCE	PW & MTA COMMENTS	STANTEC COMMENTS	REPLACE?	NEW MODEL	SIZE (WxDxH)	NEW CLEARANCE
E210	WELDING/FRAME TABLE										
			1	96"x60"x36"		MTA Comments (2/16): "Existing welding Frame will need to be replaced"	Size in plan is represented the same as existing size	Yes			
E211											
			1	96"x30"x36"	TBD	This workstation belongs to the welder and is used for staging jobs and general storage. Size is sufficient. Workstation consists of two work benches that are side-by- side and mirrors of each other. The one on the left which is partically cut off has a dry rod oven underneath. The tool cabinets of both contain hand tools.		Yes			
E212											
			1	96"x30"x36"	TBD	This workstation is a desk for the welder to sit at and complete paperwork. It is still used.		Yes			
E213											
			2	36"x24"x72"	TBD	These are indeed two grey cabinets side by side. They are back to back with more storage cabinets for a confirmed total of 4 at the pictured location. These contain hand tools, power tools, welding equipment, and welding consumables.	Pic taken by Stantec on a site visit.	No			

WELD SHOP EQUIPMENT

Note: Dims are best assumptions, taken from data available online and typcial industry standards. DPW/MTA to confirm dimensions of their equipment.

ITEM NO.	EQUIPMENT	MANUF / MODEL NO.	QTY	SIZE (WxDxH)	EXISTING CLEARANCE	PW & MTA COMMENTS	STANTEC COMMENTS	REPLACE?	NEW MODEL	SIZE (WxDxH)	NEW CLEARANCE
E214	TOOL CABINET	Knaack									
			1	5'x2'x5'	TBD		Pic taken by Stantec on a site visit.	No			
E215		Knaack									
			1	7'-6"x4'-3"x6'-0"	TBD	This workstation is typically used by the welder for TIG welding. Dimensions are 7'6"x 4'3"x6'. The size is sufficient, but configuration desired to be upgraded with functional welding fume extraction and rack of storage perhaps relocated off table in a dedicated, but accessible spot.	Pic taken by Stantec on a site visit.	Yes			
E216		Knaack									
			1	Confirm	TBD	No.	Pic taken by Stantec on a site visit. Storage shelves unused.				
E217	UNUSED NO. (equip either removed or relocated based on MTA feedback)										

WELD SHOP EQUIPMENT

Note: Dims are best assumptions, taken from data available online and typcial industry standards. DPW/MTA to confirm dimensions of their equipment.

ITEM NO.	EQUIPMENT	MANUF / MODEL NO.	QTY	SIZE (WxDxH)	EXISTING CLEARANCE	PW & MTA COMMENTS	STANTEC COMMENTS	REPLACE?	NEW MODEL	SIZE (WxDxH)	NEW CLEARANCE
E218	Metal Cart										
			1	5'x30"x5'		This metal cart contains sheet metal and belongs to the welder. It is located nearby the welding table and is considered part of the welding space, not the pulley assembly area. Dimension are approx. (including largest piece of sheet metal protruding from top and sides of cart) 2'5"x5'x5'.	Pic taken by Stantec on a site visit in Steam Cleaning Area.				
E219	Scrap Metal Storage Area										
			1	3'x6'x6'							
E220	Scrap Metal Cart										
			1	3'x5'x4'							

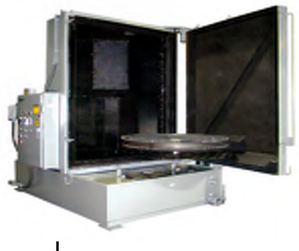
GRIP BUILDING AREA

Note: Dims are best assumptions, taken from data available online and typcial industry standards. DPW/MTA to confirm dimensions of their equipment.

ITEM NO.	EQUIPMENT	MANUF / MODEL NO.	QTY	SIZE (WxDxH)	EXISTING CLEARANCE	PW & MTA COMMENTS	STANTEC COMMENTS	REPLACE?	NEW MODEL	SIZE (WxDxH)	NEW CLEARANCE
E301	ELEVATING PLATFORMS										
			2	36"x48"x24"	Provide 30" on all sides	Currently locatd in Grip Building Area	Pic taken by Stantec on a site visit. 1 of 2 Elevating Platforms	No			
E302	UNUSED NO. (equip either removed or relocated based on MTA feedback)										
E303	WORKSTATION										
			1	8'6"x2'6"x10'4"		This workstation is used for pressing pieces called dies in and out of a subassembly of the Cable Car Grip. The dimensions are approx 8'6"x2'6"x10'4" tall. Size is sufficient.	Pic taken by Stantec on a site visit.				
E304	WORKSTATION										
			1	8'x30"x78"		Workstation is used for storage and handling of Cable Car grip parts. Dimensions are 8'x2'6"x6'6" tall. Size is sufficient.	Pic taken by Stantec on a site visit.				
E305	TOOL CABINET										
			1	2'x3'x7'		Cabinet is used to store hand tools, hand held power tools, and miscellaneous grip parts used for the Grip Building Area.	Pics taken by Stantec on a site visit.	No			

GRIP BUILDING AREA

Note: Dims are best assumptions, taken from data available online and typcial industry standards. DPW/MTA to confirm dimensions of their equipment.

ITEM NO.	EQUIPMENT	MANUF / MODEL NO.	QTY	SIZE (WxDxH)	EXISTING CLEARANCE	PW & MTA COMMENTS	STANTEC COMMENTS	REPLACE?	NEW MODEL	SIZE (WxDxH)	NEW CLEARANCE
E306	PARTS WASHER (based on MTA feedback)										
			--			Currently located in the Steam Cleaning Area	This parts washer currently located in the steam cleaning area remains. New parts washer needed in the new location of the Grip Building Room on Level 2.	Yes			
E307	SCRAP METAL CART										
			1	3'x4'-3"x3'-8"		This is for metal disposal/recycling mostly used for grip dies, but also for pulleys. The dimensions are approx. 3'x4'3"x3'8" tall. Size is sufficient. This one is typically stationed in the grip building area. There are 2 other metal recycling bins, one in the tension run area used mainly for scrap wire strands and one near Lvl 1 rolling door for general purpose (both of these bins measure about 6'x5').	Pic taken by Stantec on a site visit.				
E308	PALETTE										
			1			Palette of materials are stored here relatively permanently. These palettes contain new dies which are used for the grip die replacement. Dimensions of 1 palette (there are two shown in the picture) is approx. 3'x3'x1'8" tall.	Pic taken by Stantec on a site visit.				
E309	GRIP WASHER	Proceco Typhoon-HD									
			1	50"Dia Turntable 96" Clear Height		Per Sept 8, 2021 email: The parts are “grips” for the cable cars. They are 8 feet tall (with handle vertical) x 4 foot x 18 inches. Mild steel, Cast iron, Brass and Bronze. Mostly grease. Hit steam cleaning over a pit. Parts are removed from the vehicle and inspected, if deemed to need a rebuild or maintenance then they are cleaned. Assemblies are torn down parts replaced and tested with a final greasing. Possibly purchase prior to the remodel therefore within the next 12 months.					

PULLEY ASSEMBLY AREA

Note: Dims are best assumptions, taken from data available online and typcial industry standards. DPW/MTA to confirm dimensions of their equipment.

ITEM NO.	EQUIPMENT	MANUF / MODEL NO.	QTY	SIZE (WxDxH)	EXISTING CLEARANCE	PW & MTA COMMENTS	STANTEC COMMENTS	REPLACE?	NEW MODEL	SIZE (WxDxH)	NEW CLEARANCE
E401	H FRAME PRESS	Power Team (55 ton)									
			1			Currently located in Pulley Assembly Area		No			
E402	PEDESTAL GRINDER										
			1			Currently located in Pulley Assembly Area		No			
E403	UNUSED NO. (equip either removed or relocated based on MTA feedback)										
E404											
			1			Yes. Yes a rack that accommodates 15 of these pullies would be helpful.	Wheels leaned-up against fencing are part of Pulley Assembly Area.	Yes			
E405	UNUSED NO. (equip either removed or relocated based on MTA feedback)										
E406	UNUSED NO. (equip either removed or relocated based on MTA feedback)										
E407	MOBILE CART										
			1	30"x5'x42"		This cart is used to transport pullies. Dimensions are approx. 5'x2'6"x3'6". This is typically stored in the pulley assembly area as shown. Size is sufficient.	Pic taken by Stantec on a site visit.	No			

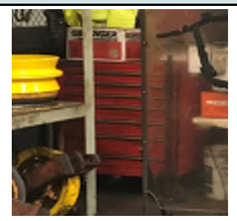
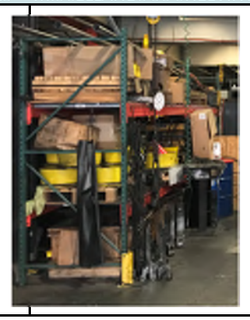
PULLEY ASSEMBLY AREA

Note: Dims are best assumptions, taken from data available online and typcial industry standards. DPW/MTA to confirm dimensions of their equipment.

ITEM NO.	EQUIPMENT	MANUF / MODEL NO.	QTY	SIZE (WxDxH)	EXISTING CLEARANCE	PW & MTA COMMENTS	STANTEC COMMENTS	REPLACE?	NEW MODEL	SIZE (WxDxH)	NEW CLEARANCE
E408	MOBILE CART										
			1	2'x42"x34"		Cart is used to transport miscellaneous small track parts or tools. Size is sufficient. This is typically stored in the pulley assembly area or the track storage room (room 112). Dimensions are approx. 3'6" 2'x2'10" tall.	Pic taken by Stantec on a site visit.	No			
E409	WORKSTATION										
			1	91"x33"x37"		This workstation is the main workbench for general use in the Pulley Assembly Area. There are small parts (nuts and bolts) and some hand tools stored in here. Dimensions are approx. 2'9"x7'7"x3'1" tall. Size is sufficient.	Pic taken by Stantec on a site visit. Size confirmed sufficient.	No			
E410	LG PULLEY STORAGE										
			2	62"x2'x5'		Dimensions are approximately 2'x5'2"x5' tall (6' tall if including 3 yellow pulley rims stacked on top of one another as shown in the photo). SFMTA is open to more compact/efficient storage solutions.	Pic taken by Stantec on a site visit. Size confirmed sufficient.	No			
E411	MOBILE SHIELD										
			2	36"x30"x84"		Shield is generally a moveable partition used when an employee is using the hydraulic press in the pulley assembly area, as it was deemed by employees using the hydraulic press to provide additional safety. It is typically stored in the pulley assembly area.	Pic taken by Stantec on a site visit.	No			

PULLEY ASSEMBLY AREA

Note: Dims are best assumptions, taken from data available online and typcial industry standards. DPW/MTA to confirm dimensions of their equipment.

ITEM NO.	EQUIPMENT	MANUF / MODEL NO.	QTY	SIZE (WxDxH)	EXISTING CLEARANCE	PW & MTA COMMENTS	STANTEC COMMENTS	REPLACE?	NEW MODEL	SIZE (WxDxH)	NEW CLEARANCE
E412	SM PULLEY STORAGE										
			3	7'x16"x90"		Yes, 9 inch pullies. There is 1 shelf in fenced area and 1 longer shelf outside the fenced area. Size is sufficient. Dimensions of shelf in fenced area are approx. 7'x1'4"x7'6" tall. Dimensions of shelf outside fenced area are approx. 10'4"x1'4"x8' tall.	Pic taken by Stantec on a site visit. Looks like 1 inside the fenced area and 2 outside. All to be relocated inside the fenced area, if possible. Size confirmed sufficient.	No			
E413	TOOL BOX										
			1	30"x23"x42"		Tool box is locked, but is not considered frequently used. Dimensions are approx. 1'11"x2'6"x3'6".	Pic taken by Stantec on a site visit. Size confirmed sufficient.	No			
E414	DEPRESSION BEAM STORAGE										
			1	90"x54"x6'	This storage rack is used to store depression beams and can be referred to as the Depression Beam Storage Rack. Size is sufficient. Dimensions are approximately 7'6"x4'6"x6'. Crane is required overhead to move materials off. Current space utilizes 1 ton crane. The following text was submitted by MTA on 4/20/2021 where the storage rack is referred to as "storage structure": *"The Depression Beam work area is used to rebuild/assemble depression beams. Depression beams are track mechanisms (beneath the track along the Cable Car lines) that "depress" the cable at locations where the cable would otherwise tend to elevate and contact the bottom of the slot rail. Depression beams and large pullies/hubs are also stored in the dedicated work area. A mechanism to lift (currently a 1 ton crane is used) and place the depression beam on the holding fixture is needed for rebuilding and assembly. This work station alone measures approximately 7' x 10'. Adjacent to the 7' x 10' work station is a storage structure that accommodates 12 depression beams. Each depression beam is approximately 1' x 1' x 7'."*	Pic taken by Stantec on a site visit. Size confirmed sufficient.	No			
E415	MISCELLANEOUS SHELVING										
			2	8'x30"x8'		Storage shelving is miscellaneous storage including traffic delineator curb systems, pulleys, lengths of steel material, lift table, and small spare grip parts. This shelf is not necessarily tied to the Grip Building Area. Forklift is sufficient provided a forklift has clearances necessary. Current configuration of adjacent grip rebuilding equipment does not seem to provide sufficient clearance for use of forklift.	As shelf is not tied to Grip Building Area, these storage items can get folded into the High-Density Storage Solution.	No			

STEAM CLEANING AREA

Note: Dims are best assumptions, taken from data available online and typcial industry standards. DPW/MTA to confirm dimensions of their equipment.

ITEM NO.	EQUIPMENT	MANUF / MODEL NO.	QTY	SIZE (WxDxH)	EXISTING CLEARANCE	PW & MTA COMMENTS	STANTEC COMMENTS	REPLACE?	NEW MODEL	SIZE (WxDxH)	NEW CLEARANCE
E501	PARTS WASHER										
			1	N/A	TBD	Currently located in the Steam Cleaning Area	This piece of equipment remains.	No			
E502	PRESSURE WASHER	Hosty									
			1	25"x34"x52"	TBD	Currently Located in the Steam Cleaning Area					
E503	STEAM CLEANING BAY										
			1	11'x76"x50"	TBD	In conjunction with the pressure washer above, this is referred to as the Steam Cleaning Area. Dimensions are approx. 10'11"x6'4"x4'2" tall.	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.				
E504	HOT PRESSURE WASHER	Hosty									
			1	6.17'x3.17'x6'	TBD	Hot pressure washer typically used for cleaning of outside insfrastructure. Typically stored in the open floor of the 1st floor near the front rolling door entrance. Dimensions are approximately 6.17'x3.17'x6'.	Equipment mobile.	No			

CARPENTRY

Note: Dims are best assumptions, taken from data available online and typcial industry standards. DPW/MTA to confirm dimensions of their equipment.

ITEM NO.	EQUIPMENT	MANUF / MODEL NO.	QTY	SIZE (WxDxH)	EXISTING CLEARANCE	PW & MTA COMMENTS	STANTEC COMMENTS	REPLACE?	NEW MODEL	SIZE (WxDxH)	NEW CLEARANCE
E701	SLIDING MITER SAW	Dewalt									
			1	19.05"x32.77"x20"	Front: Allow for 5'-0" Sides: Allow for 8'-0" on both sides (to accommodate standard 16ft length lumber)		Sits on countertop	No			
E702	DUST EXTRACTOR	Festool CT 26									
			1	14"x25"x22"	Front: Allow 6" Sides: Allow 6" both sides (for handling and slumpped hoses)		Floor model; on castors	?			
E703	VERTICAL BANDSAW	Delta 28-640									
			1	20.5"x27"x66" Table: ~16"x18"	Front: Allow 5'-0" Sides: Allow for 5'-0" on both sides from centerline (to accommodate standard 4x8 sheet of plywood)			?			
E704	STANDING DRILL PRESS	Jet JDP-17FSE									
			1	19"x28.5"x65" Table: ~14"x19"	Front: Allow 5'-0" Sides: Allow for 5'-0" on both sides from centerline (to accommodate standard 4x8 sheet of plywood)			?			

CARPENTRY

Note: Dims are best assumptions, taken from data available online and typcial industry standards. DPW/MTA to confirm dimensions of their equipment.

ITEM NO.	EQUIPMENT	MANUF / MODEL NO.	QTY	SIZE (WxDxH)	EXISTING CLEARANCE	PW & MTA COMMENTS	STANTEC COMMENTS	REPLACE?	NEW MODEL	SIZE (WxDxH)	NEW CLEARANCE
E705	BENCH GRINDER	Jet 8" JBG-8B									
			1	21"x19"x11" Add 30" for stand	Front: Allow 5'-0" Sides: Allow 18"		Sander only weighs 60lbs+weight of the stand. Its not on casters; but if it needs to be moved to accommodate a longer piece of wood, it can.	No			
E706	SHOP VAC	Nilfisk Eliminator Pro									
			1	17.25"x24"x36.5"	Front: Allow 6" Sides: Allow 6" both sides (for handling and slumpped hoses)			No			
E707	TABLE SAW	SawStop 10" Cab Saw - Model No ICS53230									
			1	85.25"x36.5"x34"	Front: Allow 5'-0" Back: Allow 5'-0" Sides: Allow for 3'-0" on both sides			?			
E708	DUST COLLECTOR	Powermatic PM2200									
			1	31.88"x54.5"x85.25"	Front: Allow 4'-0" Back: Allow 6" Sides: Allow for 1'-0" on both sides			?			

CARPENTRY

Note: Dims are best assumptions, taken from data available online and typcial industry standards. DPW/MTA to confirm dimensions of their equipment.

ITEM NO.	EQUIPMENT	MANUF / MODEL NO.	QTY	SIZE (WxDxH)	EXISTING CLEARANCE	PW & MTA COMMENTS	STANTEC COMMENTS	REPLACE?	NEW MODEL	SIZE (WxDxH)	NEW CLEARANCE
E709	BAND SAW	Dayton 2LKT4A									
			1	42"x15.5"x56" (56" when angled up)	Front: Allow 8'-0" Back: Allow 8'-0" (to accommodate 8'-0" material lengths) Sides: Allow for 3'-0" on both sides		Equipment mounted on casters. This piece is listed as cutting metal (cast iron, tool steel, bronze, aluminum, & plastic)	?			
E710	JOINTER	Delta DJ20 | Mo No: 37350									
			1	76.5"x26"x32"	Front: Allow 5'-0" Back: Allow 2'-0" Sides: Allow for 2'-0" on both sides at the ends			No			
E711	PLANER	Powermatic | Mo No. 201HH									
			1	49"x42"x59"	Front: Allow 8'-0" Back: Allow 8'-0" (to accommodate 8'-0" material lengths) Sides: Allow for 3'-0" on both sides			No			
E712	SANDER	Kalamazoo | Mo No. S612/S612V									
			1	~24"x~24"x60"	Front: Allow 8'-0" (to accommodate 8'-0" material lengths) Back: Allow 30" for motor access panel L Side: Allow 8'-0" for sanding R Side: Allow 3'-0" for hoses & belt replacement			No			

CARPENTRY

Note: Dims are best assumptions, taken from data available online and typcial industry standards. DPW/MTA to confirm dimensions of their equipment.

ITEM NO.	EQUIPMENT	MANUF / MODEL NO.	QTY	SIZE (WxDxH)	EXISTING CLEARANCE	PW & MTA COMMENTS	STANTEC COMMENTS	REPLACE?	NEW MODEL	SIZE (WxDxH)	NEW CLEARANCE
E713	SPINDLE SANDER	Max VSI.18									
			1	39" Height Table: 24"x24"	Allow 3'-0" on at least three sides			?			
E714	ROUTER TABLE	ToolTech Systems - Festool CMS-GE 203158									
	NO PHOTO AVAILABLE					Possibly in queue to be ordered. Not currently existing.		Yes		48"x40"x30"	Front: Allow 5'-0" Back: Allow 2'-0" Sides: Allow 8'-0" on both sides from centerline (to accommodate 8'-0" material length)
E715	AIR FILTRATION SYSTEM	Jet ASF-2000									
			2	27"x47"x23"	Ceiling-Mounted Allow 2'-0" on all sides for airflow and installation Allow clear floor area below	Desired to be hung from ceiling. Currently in storage and not installed.	Clear floor area required below installation for maintenance, filter replacement, and ladder set-up.				
E717	UNUSED NO. (equip either removed or relocated based on MTA feedback)										
E717	UNUSED NO. (equip either removed or relocated based on MTA feedback)										
E718	DUST EXTRACTOR	Festoon CT 36 E (HEPA Filter)									
			1	14.4"x25"x23.4"	Front: Allow 3'-0" Back: Allow 4"-6" Sides: Allow 6" both sides						

PAINT GROUP

Note: Dims are best assumptions, taken from data available online and typcial industry standards. DPW/MTA to confirm dimensions of their equipment.

ITEM NO.	EQUIPMENT	MANUF / MODEL NO.	QTY	SIZE (WxDxH)	EXISTING CLEARANCE	PW & MTA COMMENTS	STANTEC COMMENTS	REPLACE?	NEW MODEL	SIZE (WxDxH)	NEW CLEARANCE
E801	VEHICLE DUSTER	Duster 3000 Downdraft									
			1	Base: 32"x30" Height = 8'-6" Length of Inflated Arm = 11'-10"	Allow 18" on all sides for airflow and storage manuverability when not in operation.		If designing a new enclosed room, account for this piece of equipment when fully inflated.				
E802	AIR FILTRATION	Novatek Corp									
			1				If designing a new enclosed room, consider upgrade to Novair 2000-BIO HEPA	Yes		26"x37"x31"	Allow 2'-0" on all sides for airflow and installation Allow clear floor area below if installed overhead
E803	PARTS WASHER	Safety-Kleen | Mo No. 1077									
			1	Sink Size: ~20"Dia	Front: Allow 36" Back: Allow 24" for hoses/pipes Side: Allow 18" on both sides Note: this is for model on the left		Floor Space Req'd in front of sink per Manuf = 36"Wx71"H				
E804	PARTS WASHER	Safety-Kleen | Mo No. 1055									
			1	Sink Size: ~18"Dia	Front: Allow 36" Back: Allow 24" for hoses/pipes Side: Allow 18" on both sides Note: this is for model on the right		Floor Space Req'd in front of sink per Manuf = 32"Wx18"Dx61"H				

PAINT GROUP

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ITEM NO.	EQUIPMENT	MANUF / MODEL NO.	QTY	SIZE (WxDxH)	EXISTING CLEARANCE	PW & MTA COMMENTS	STANTEC COMMENTS	REPLACE?	NEW MODEL	SIZE (WxDxH)	NEW CLEARANCE
E805	AIR COMPRESSOR	Makita Pneumatics | Mo No. MAC2400									
			1	18"x20"x18.75 Cart: ~24"x48"x34"	Allow 6" around cart for storage clearance		This piece of equipment is stored on a cart.				
E806	SHP VAC	Nilfist Eliminator II Wet/Dry									
			1	24"x34"x40"	Front: Allow 36" to pull out Back: Allow 6" for hoses/pipes Side: Allow 6" on both sides						
E807	BENCH BUFFER	Dayton Variable Speed Buffer | Mo No. 48WE54									
			1	~36"x24"x32" Wheel Dia = 10"	Front: Allow 5'-0" for operation Back: Allow 6" Sides: Allow 18" both sides						

PAINT GROUP

Note: Dims are best assumptions, taken from data available online and typcial industry standards. DPW/MTA to confirm dimensions of their equipment.

ITEM NO.	EQUIPMENT	MANUF / MODEL NO.	QTY	SIZE (WxDxH)	EXISTING CLEARANCE	PW & MTA COMMENTS	STANTEC COMMENTS	REPLACE?	NEW MODEL	SIZE (WxDxH)	NEW CLEARANCE
E808	PAINT SHAKER	Red Devil									
			1	12"x18"x31.5" (Note: 1 Gal paint can = 6.75"Dia x 8" H)	Front: Allow 3'-0" Back: Allow 6" Sides: Allow 18" both sides			No			
E809	SANDBLASTER	Aboytes Mfg | Mo No ADHP DG9									
			1	70"x32"x87"	Front: Allow 3'-0" Back: Allow 18"-24" (for panel access) Sides: Allow 24" (for panel access)			No			

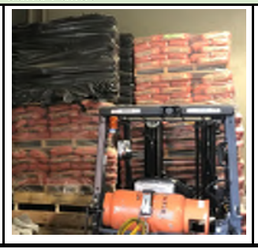
CAR CLEANING & LVL 2 STORAGE

Note: Dims for this category were provided by DPW and MTA on 9/24 documenting Displaced Storage where the new 12KV Electrical Room is slated for installation

ITEM NO.	EQUIPMENT	MANUF / MODEL NO.	QTY	SIZE (WxDxH)	EXISTING CLEARANCE	PW & MTA COMMENTS	STANTEC COMMENTS	REPLACE?	NEW MODEL	SIZE (WxDxH)	NEW CLEARANCE
E901	Shed										
			1	11'-0" x 10'-5/16" x 7'-6"	For car cleaning equipment. Located inside... - (6) Rubbermaid carts (48"x24"x60") - (2) Boxes of Rags (20"x14"x19") - (2) Buckets (24"x18"x18") - Other shop vacs, barrel pumps, brooms, rags, spray bottles, ladders, gloves, etc. MTA Comments (2/16): "We should not look at reusing the existing shed and building out or using a lockable storage solution"		Refer to replacement storage E911 & E912	Yes			
E902	55 Gallon Drums										
			5	2'-0" Dia 3'-0" Tall		Between Sand and Shed; Germ Wipe, PDQ		No			
E903	1 Gallon Adran Jel-R										
	NO PHOTO AVAILABLE		6	1'-0" Dia 15'-0" Tall		Between Sand and shed		No			
E904	1 Gallon SF Blue										
	NO PHOTO AVAILABLE		6	1'-0" Dia 15'-0" Tall		Between Sand and shed		No			
E905	Storage Rack										
			1	21'-6" x 4'-6" x 14'-6"		Adjacent to pull-out gate Includes (2) "Hazardous Waste Boxes," Extra Sheet Metal Storage, and other drum storage, stored on the rack.		No			

CAR CLEANING & LVL 2 STORAGE

Note: Dims for this category were provided by DPW and MTA on 9/24 documenting Displaced Storage where the new 12KV Electrical Room is slated for installation

ITEM NO.	EQUIPMENT	MANUF / MODEL NO.	QTY	SIZE (WxDxH)	EXISTING CLEARANCE	PW & MTA COMMENTS	STANTEC COMMENTS	REPLACE?	NEW MODEL	SIZE (WxDxH)	NEW CLEARANCE
E906	Metal Trash/Recycle Bin										
			1	45" x 63" x 52"		Under storage rack by pull-out gate		No			
E907	Metal Trash/Recycle Bin										
			1	45" x 63" x 52"		MTA Comment (2/16): "E906 is a trash bin 2 yard E907 is currently the same size as E906 (was returned to full size post pandemic shutdown) Needs to be corrected on the sheet"		No			
E908	Recyling Bin										
	NO PHOTO AVAILABLE		1	24" x 33" x 40"		Under storage rack by pull-out gate		No			
E909	Compost Bin										
			3	24" x 33" 40"		Under storage rack by pull-out gate		No			
E910	Sand Pallet										
			Varies	Actual size of wrapped palette measured by MTA = 50" x36-5/8" x 24"	Allowing for 4" of clearance on all sides for maneuverability.	FYI, shipments of sand come in packages of 2 pallets i.e. 2 pallets of sand stacked on top of one another and both covered in a single piece of plastic. Dimensions provided are just one pallet of sand. Storeroom has expressed openness to storing a smaller quantity of sand.	Standard palette = 48" x 40" Allowing for 24" Height If space is req'd for 40 palettes (with openness to store smaller qty), then plan will show 5 to 6 spaces in plan, assuming palette's stacked 6-high.	No			

CAR CLEANING & LVL 2 STORAGE

Note: Dims for this category were provided by DPW and MTA on 9/24 documenting Displaced Storage where the new 12KV Electrical Room is slated for installation

ITEM NO.	EQUIPMENT	MANUF / MODEL NO.	QTY	SIZE (WxDxH)	EXISTING CLEARANCE	PW & MTA COMMENTS	STANTEC COMMENTS	REPLACE?	NEW MODEL	SIZE (WxDxH)	NEW CLEARANCE
E911	Pallet Rack Enclosures	WireCrafters									
			1	72"x36"x96"		MTA Comments (2/16): "We should not look at reusing the existing shed and building out or using a lockable storage solution"	Items contained in existing shed can be stored in new lockable storage containment.	New			
E912	Pallet Rack Enclosures	WireCrafters									
			1	48"x24"x96"		MTA Comments (2/16): "We should not look at reusing the existing shed and building out or using a lockable storage solution"	Items contained in existing shed can be stored in new lockable storage containment.	New			

A9 - Meeting Notes

February 26, 2021
Kick-Off Meeting Notes

May 3, 2021
12kV Options Meeting Notes with Attachments:
- CCB Project Overview & Introduction
- 12kV Options

June 24, 2021
Preliminary Equipment Layout Meeting Notes

July 20, 2021
MTA Comments Meeting Notes
MTA Responses to Design Team Questions

August 23, 2021
Conceptual Plan Draft Presentation Meeting Notes

September 10, 2021
MTA Responses to Design Team Questions

December 15, 2021
Program Questions and MTA Responses

March 28, 2022
MTA Comments and Clarification

Meeting Minutes
PW-MTA-1708 Cable Car Barn

Subject: Kick off meeting notes
Date of Meeting: 2/26/2021
Location: Virtual meeting via MS Teams
Date Issued: 3/1/2021
Prepared by: EunJoo Cho

Attendance (A) / Distribution (D):

A	D	Name	Organization	Role	Email Address
X	X	Licinia Iberri **(LI)**	SFMTA	Project Manager	Licinia.Iberri@sfmta.com
X	X	Robert Bergesen **(RB)**	SFMTA	Track Superintendent	Robert.Bergesen@sfmta.com
X	X	Eric Lee **(EL)**	SFMTA	Facility Engineer	Eric.Lee2@sfmta.com
	X	Wesley Valaris **(WV)**	SFMTA	Transit Manager ll	Wesley.Valaris@sfmta.com
	X	John Becker **(JB)**	SFMTA	Division Manager	John.Becker@sfmta.com
X	X	Arne Hansen **(AH)**	SFMTA		Arne.Hansen@sfmta.com
X	X	Lang Huey **(LH)**	SFMTA	M/P Engineer	Lang.Huey@sfmta.com
	X	Foo Eng **(FE)**	SFMTA	Project Manager	Foo.Eng@sfmta.com
X	X	Qingwen Xi **(QX)**	SFMTA	Electrical Engineer	Qingwen.Xi@sfmta.com
X	X	Frank Lau **(FL)**	SFMTA	Project Manager	Frank.Lau@sfmta.com
X	X	Patricia Solis **(PS)**	SFPW-BOA	Section Manager	Patricia.Solis@sfdpw.org
	X	Tim Kempf **(TK)**	SFPW-PMB	Project Manager	tim.kempf@sfdpw.org
X	X	EunJoo Cho **(EC)**	SFPW-BOA	Project Architect	eunjoo.cho@sfdpw.org
X	X	Jane Chan **(JC)**	SFPW-BOA	Project Architect	jane.y.chan@sfdpw.org
X	X	Jennifer Dameron **(JD)**	SFPW-BOA	Job Captain	Jennifer.Dameron@sfdpw.org
X	X	Arfaraz Khambatta **(AK)**	SFPW-DAC	Disability Access Coordinator	Arfaraz.Khambatta@sfdpw.org
X	X	Sue Chen **(SC)**	SFPW BOE/ CP&C	Structural Engineer	Sue.Chen@sfdpw.org
X	X	Leslyn Maher **(LM)**	SFPW BOE/ CP&C	Structural Engineer	leslyn.maher@sfdpw.org
X	X	Earl Gaffud **(EG)**	SFPW BOE/CP&C		Earl.Gaffud@sfdpw.org
X	X	Pat McKelvey **(PM)**	Stantec	Senior Principal	pat.mckelvey@stantec.com
X	X	Jessica Cooper **(JC)**	Stantec		jessica.cooper@stantec.com
X	X	David Wessel **(DW)**	ARG	Principal	David@ARGSF.com

<table>
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c. Identifying risk factors and structural/mechanical/construction impacts of necessary electrical work
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	g. Ensuring the upgrade's compliance with state and national historic monument guidelines, as well as relevant CEQA/NEPA requirements **Secondary - Future improvements/ shorter-term facility upgrades** a. Space use needs b. Tenant Improvements to the employee spaces ▪ (LI) MTA scope input: a. MTA/ CP&C engineer to provide EC with electrical backgrounds b. 6 weeks shut down period – Need to review phasing multiple projects vs large one project c. Goal is to run cable car museum for 100 years	MTA
1-5.2	**<u>Topic</u>: Project goal** ▪ (RB) Expressed that facility need more space for outgrown staff. Re: 6 weeks shut down, everyone will hesitate to shut down once cable cars up and running. Need a solid plan. ▪ EC to review 12kV work matrix (existing and proposed) information from EL ▪ (LI) No pre-development scoping set up yet. However, project goal is to 1) Get a comprehensive master plan. 2) Break into down into reasonable phases/tasks Get to the big picture in mind e.g. include seismic upgrade in master plan.	EC
1-5.3	▪ Extending mezzanine for office expansion. BOA to review structural implications with CP&C	EC
1-5.4	▪ (JC) Requested project directory. Update 2/26/2021 – EC distribute CCB project directory to the entire team.	Complete
6.0 STRUCTURAL		
1-6.1	**<u>Topic</u>:** ▪ (SC) Expressed that currently structural scope includes evaluating existing seismic retrofit evaluation only. ▪ (LI) MTA would like to get structural input for new work as well. ▪ (SC) Cost estimate for seismic upgrade is included in MOU	
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1-7.1	**<u>Topic</u>: DC vs AC** ▪ (RB) Stay with DC due to design issue; If we switch to AV, we will need to change gear box and proportion layout. ▪ (LI) Need to document this DC decision. RB to provide a narrative to EC for record	RB

8.0 FIXTURES FURNITURE & EQUIPMENT		
N/A	**Topic:** ▪ N/A	
10.0 FIRE ALARM		
1-10.1	**Topic: Fire Alarm scope** ▪ (EG) SFPW will provide Fire Alarm scope; electrical plans by CP&C	
11.0 HISTORIC		
1-11.1	**Topic: Roof Waterproofing** ▪ (DW) ARG to do site visits to assess roof leaks and wall cracks.	ARG
NEW BUSINESS		
ITEMS RESOLVED		

Conclusion:

NOTE: These minutes will be relied upon as the approved record of matters discussed and conclusions reached during the meeting. If you disagree with the contents, please send the author a letter outlining your disagreement within seven calendar days of the issuance of these minutes.

Meeting Minutes #2
PW-MTA-1708 Cable Car Barn

Subject: 12 Kv Options meeting notes
Date of Meeting: 5/3/2021
Location: Virtual meeting via MS Teams
Date Issued: 5/4/2021
Prepared by: EunJoo Cho

Attendance (A) / Distribution (D):

A	D	Name	Organization	Role	Email Address
X	X	Licinia Iberri **(LI)**	SFMTA	Project Manager	Licinia.Iberri@sfmta.com
X	X	Robert Bergesen **(RB)**	SFMTA	Propulsion and Facility Superintendent	Robert.Bergesen@sfmta.com
X	X	Eric Lee **(EL)**	SFMTA	Cable Car Engineer	Eric.Lee2@sfmta.com
	X	Wesley Valaris **(WV)**	SFMTA	Division SOM	Wesley.Valaris@sfmta.com
	X	John Becker **(JB)**	SFMTA	manager of the Mechanical Systems Group	John.Becker@sfmta.com
	X	Arne Hansen **(AH)**	SFMTA	Vehicle Maintenance Superintendent	Arne.Hansen@sfmta.com
X	X	Lang Huey **(LH)**	SFMTA	M/P Engineer	Lang.Huey@sfmta.com
	X	Foo Eng **(FE)**	SFMTA	Project Manager	Foo.Eng@sfmta.com
X	X	Qingwen Xi **(QX)**	SFMTA	Electrical Engineer	Qingwen.Xi@sfmta.com
	X	Frank Lau **(FL)**	SFMTA	Project Manager	Frank.Lau@sfmta.com
X	X	Becky Alderete **(BA)**	SFPUC	Manager	balderete@sfwater.org
X	X	Pamela Gee **(PG)**	SFPUC	Utility Analyst	pgee@sfwater.org
	X	Patricia Solis **(PS)**	SFPW-BOA	Section Manager	Patricia.Solis@sfdpw.org
	X	Tim Kempf **(TK)**	SFPW-PMB	Project Manager	tim.kempf@sfdpw.org
X	X	EunJoo Cho **(EC)**	SFPW-BOA	Project Architect	eunjoo.cho@sfdpw.org
	X	Jennifer Dameron **(JD)**	SFPW-BOA	Job Captain	Jennifer.Dameron@sfdpw.org
	X	Arfaraz Khambatta **(AK)**	SFPW-DAC	Disability Access Coordinator	Arfaraz.Khambatta@sfdpw.org
	X	Sue Chen **(SC)**	SFPW BOE/ CP&C	Structural Engineer	Sue.Chen@sfdpw.org
	X	Leslyn Maher **(LM)**	SFPW BOE/ CP&C	Structural Engineer	leslyn.maher@sfdpw.org

	X	Earl Gaffud **(EG)**	SFPW BOE/CP&C		Earl.Gaffud@sfdpw.org
X	X	Pat McKelvey **(PM)**	Stantec	Senior Principal	pat.mckelvey@stantec.com
X	X	Jessica Cooper **(JC)**	Stantec		jessica.cooper@stantec.com
	X	David Wessel **(DW)**	ARG	Principal	David@ARGSF.com
	X	Erica Schultz **(ES)**	ARG	Historian	E.Schultz@ARGSF.com
	X	Dan Herrick **(DH)**	ARG	Historian	D.Herrick@ARGSF.com

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(Update: EC distributed CCB revised Schedule _Full Complete Scope DRAFT to LI and CCB team on 4/1/2021)</td><td>EC Complete</td></tr>
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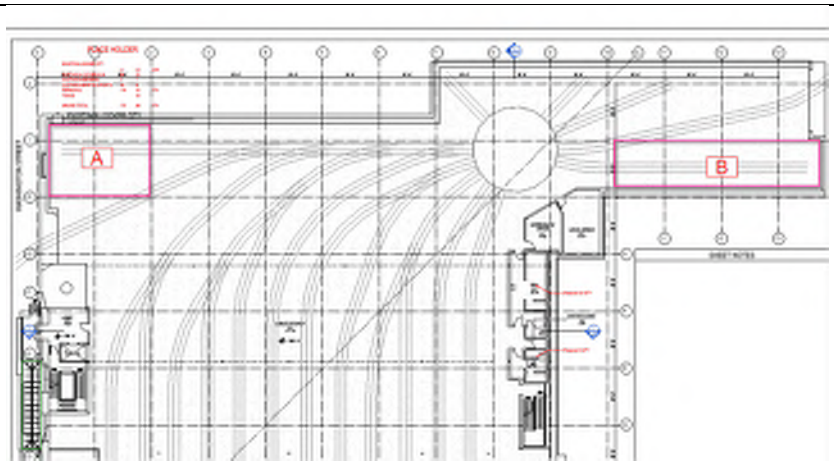
	b. Upgrade existing crane c. Identifying risk factors and structural/mechanical/construction impacts of necessary electrical work d. Development of a conceptual construction schedule indicating recommended phasing of construction activities e. Exploring the potential to compartmentalize work for minimal service disruption f. Identifying and planning for potential impacts on the Cable Car Museum g. Ensuring the upgrade's compliance with state and national historic monument guidelines, as well as relevant CEQA/NEPA requirements **Secondary - Future improvements/ shorter-term facility upgrades** a. Space use needs b. Tenant Improvements to the employee spaces ▪ (LI) MTA scope input: a. MTA/ CP&C engineer to provide EC with electrical backgrounds b. 6 weeks shut down period – Need to review phasing multiple projects vs large one project c. Goal is to run cable car museum for 100 years *(Update: LI confirmed that team need to fully describe the complete scope of needed improvements via 3/23/2021 email)*	Complete
1-5.2	**Topic: Project goal** ▪ (RB) Expressed that facility need more space for outgrown staff. Re: 6 weeks shut down, everyone will hesitate to shut down once cable cars up and running. Need a solid plan. ▪ EC to review 12kV work matrix (existing and proposed) information from EL ▪ (LI) No pre-development scoping set up yet. However, project goal is to 1) Get a comprehensive master plan. 2) Break into down into reasonable phases/tasks Get to the big picture in mind e.g. include seismic upgrade in master plan. *(Update: Architectural ASA was approved. MTA CP&C is preparing ASA for additional MEP scope)*	EC In Progress
1-5.3	▪ Extending mezzanine for office expansion. BOA to review structural implications with CP&C	EC In Progress
1-5.4	▪ (JC) Requested project directory. (*Update: EC distributed CCB project directory to the entire team on 2/26/2021)*	Complete

6.0 STRUCTURAL		
1-6.1	**Topic:** ▪ (SC) Expressed that currently structural scope includes evaluating existing seismic retrofit evaluation only. ▪ (LI) MTA would like to get structural input for new work as well. ▪ (SC) Cost estimate for seismic upgrade is included in MOU	
7.0 MEPF		
1-7.1	**Topic: DC vs AC** ▪ (RB) Stay with DC due to design issue; If we switch to AV, we will need to change gear box and proportion layout. ▪ (LI) Need to document this DC decision. RB to provide a narrative to EC for record *(Update: Rob confirmed the DC motors via email 3/2/2021)*	RB Complete
2-7.1	**Topic: 12Kv location Options** ▪ (EC) EC presented CCB project overview & Introduction -Refer to the PDF, attached ▪ (BA) Is existing electrical 12Kv? (QX) Yes, 12Kv ▪ (JC) JC presented 12Kv Options – Refer to the PDF, attached ▪ (BA) How to bring new equipment into the building? (QX) We can bring them as pieces and parts ▪ (BA) No increase of load? (QX) Future load – TBD (LI) Load might be increased since there is no adequate ventilation/ HVAC system in the existing building. ▪ (BA) No guarantee that existing service line can remain for future use by PG&E; Team need to submit PG&E application ▪ (BA) Team need to discuss with the City for PG&E standards in a timely manner to avoid any project delay. (LI) Currently, no project construction schedule yet. ▪ (BA) Transformers can be placed in the sidewalk vault/basement but not switchgears. ▪ (EC) Option 6: Any concerns with double doors in front of the switchgears for the front 8' clearance? (BA) It appears that there is space for PG&E truck access near the exterior Overhead door on Mason Street. Option 6 looks okay. ▪ (LI) Option 7a/7b: Not in favor; Blocking exterior windows is bad. ▪ (RB) Option 8: Not working; Operations requires this space. ▪ (RB) Spaces near the exterior opening on either Washington Street and Jackson Street can be potential 12Kv location. Relocating Grip Building Area is secondary.	

	 *Possible 12Kv locations on Level 2 – Team to study further, including conduits run.* *A: Existing sand storage/ trash/ palette/ car cleaning stuff* *B: Existing storage/ palette/ vehicle parking* ▪ (BA) Placing 12kv switchgear on Level 2 looks viable. ▪ (RB) Shutting down operation for a couple of days is acceptable. ▪ (BA) Recommend team checking with SFPUC for 12Kv options first and then submit a single option to PG&E (no multiple options to avoid confusions). ▪ (LI) Should we include a letter from Mayor re: Cable Car barn project when submit a single option to PG&E? (BA) Recommend getting PG&E's feedback first. ▪ (LI) EL to provide the existing pit information. (LI) EC to include the pit in Arch Revit plan ▪ (RB) The existing spaces are maxed out.	EL EC
8.0 FIXTURES FURNITURE & EQUIPMENT		
N/A	**Topic:** ▪ N/A	
10.0 FIRE ALARM		
1-10.1	**Topic: Fire Alarm scope** ▪ (EG) SFPW will provide Fire Alarm scope; electrical plans by CP&C	Information Only
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NEW BUSINESS		

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Conclusion:

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SFMTA | 1201 MASON STREET

CABLE CAR BARN MASTER PLAN PROJECT

MAY 03, 2021

1

Project Overview

SFMTA has commissioned Public Works Bureau of Architecture and Bureau of Engineering for a 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.

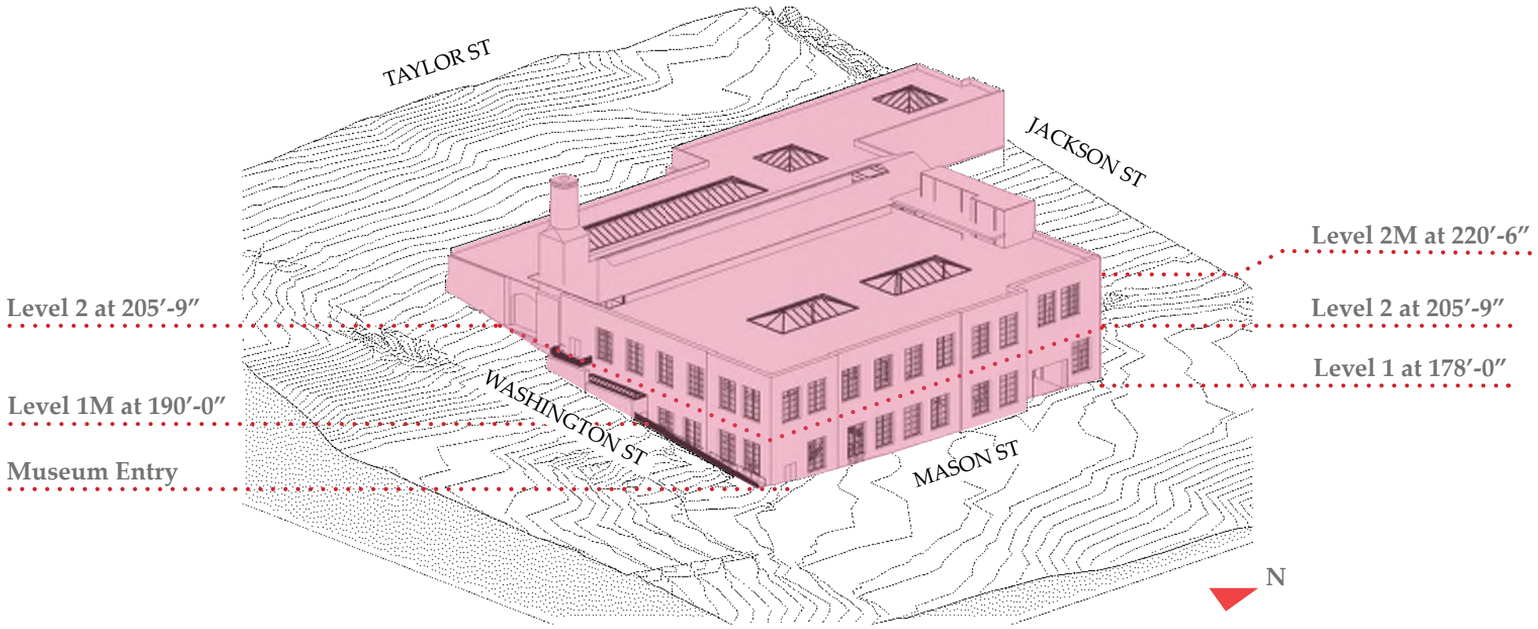
Building Background

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 1900, and most recently renovated in 1984.

Project Scope

Public Works should 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: understand staff and equipment requirements in the current space, identify underutilized spaces under the facility's current conditions, and conceptualize optimal space arrangements for the Cable Car Barn given upcoming capital improvements and additional facility programmatic needs. The scope of the 12kV electrical upgrade should include:

- Investigating the full scope and cost of 12kV conversion
- Upgrade existing crane
- Identifying risk factors and structural/mechanical/construction impacts of the necessary electrical work
- Development of a conceptual construction potential schedule duration indicating and recommended phasing sequencing of construction activities
- Exploring the potential to compartmentalize work for minimal service disruption
- Identifying and planning for potential impacts on the Cable Car Museum
- Ensuring the upgrade's compliance with state and national historic monument guidelines, as well as relevant CEQA/NEPA requirements



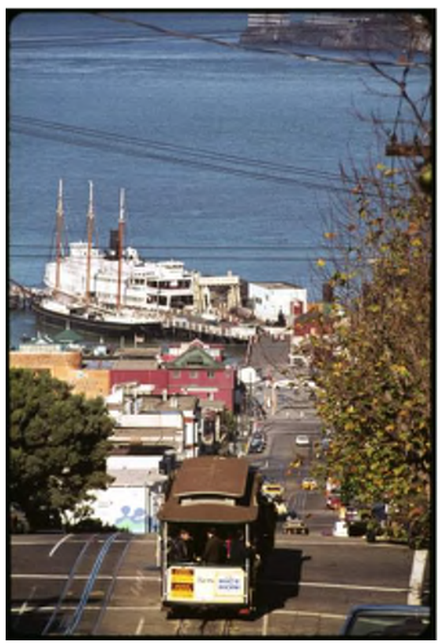
Cable Car Museum with 3D Contour site

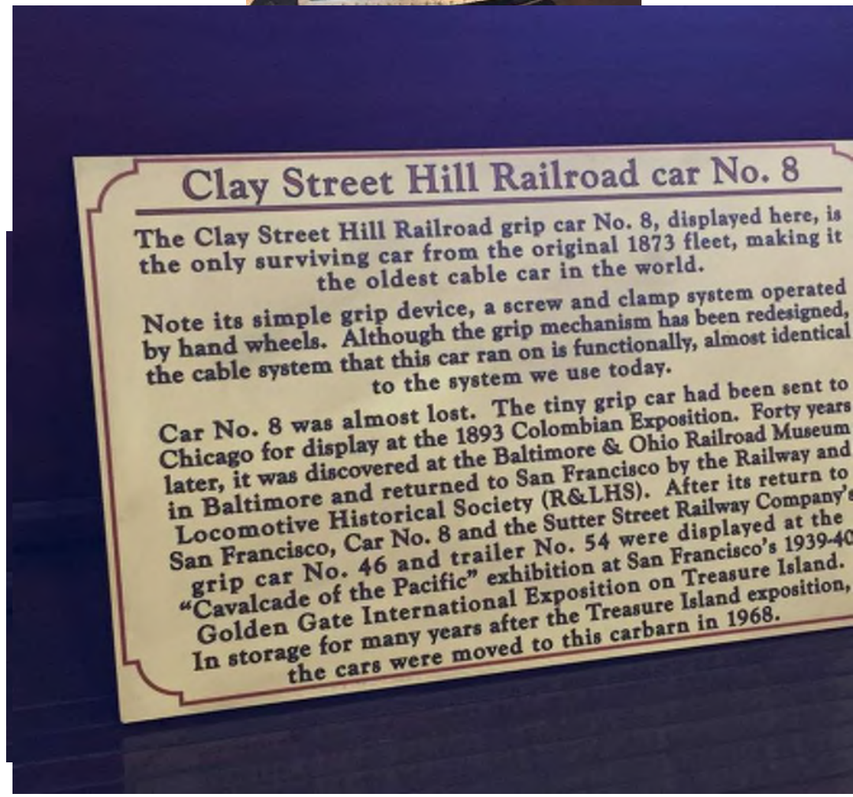
Project site

The scope of future improvements should also include a variety of shorter-term facility upgrades to benefit frontline employees, such as creating and/or improving worker spaces, refreshing paint, patching the roof, and repairing the building's HVAC system.

Site Characteristics of Cable Car Barn

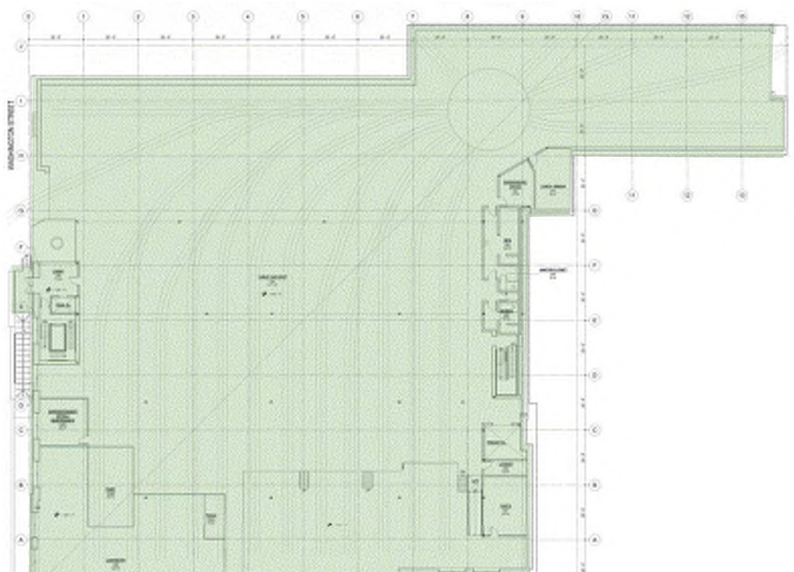
- Lot totaling 11,356 square feet with access along Mason Street and Washington Street
- The lot is a very steep and sloped site
- Public museum access from Mason Street and ADA ramp access along Washington Street
- First floor access from Mason Street and Second floor track yard access from Washington Street and Jackson Street
- Building and cable car fleet are each registered as historic landmarks, both nationally and in California
- Building was originally built in 1900, and most recently renovated in 1984.



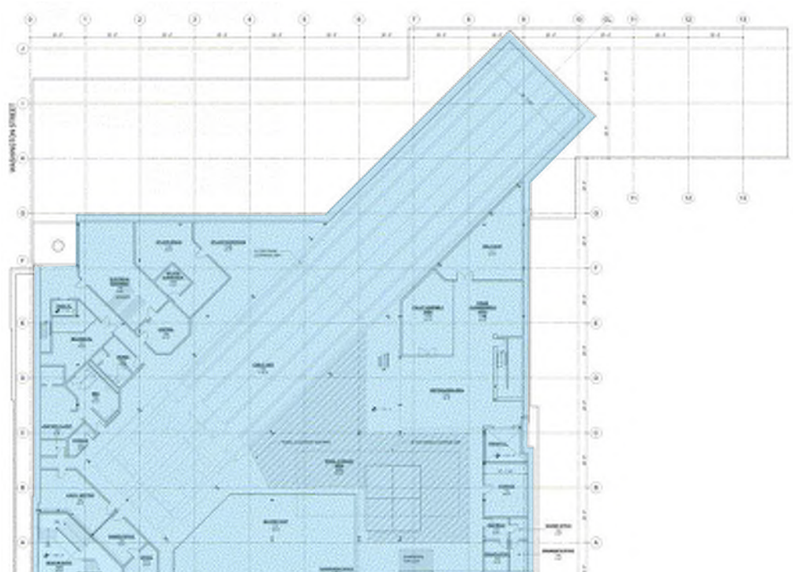


2

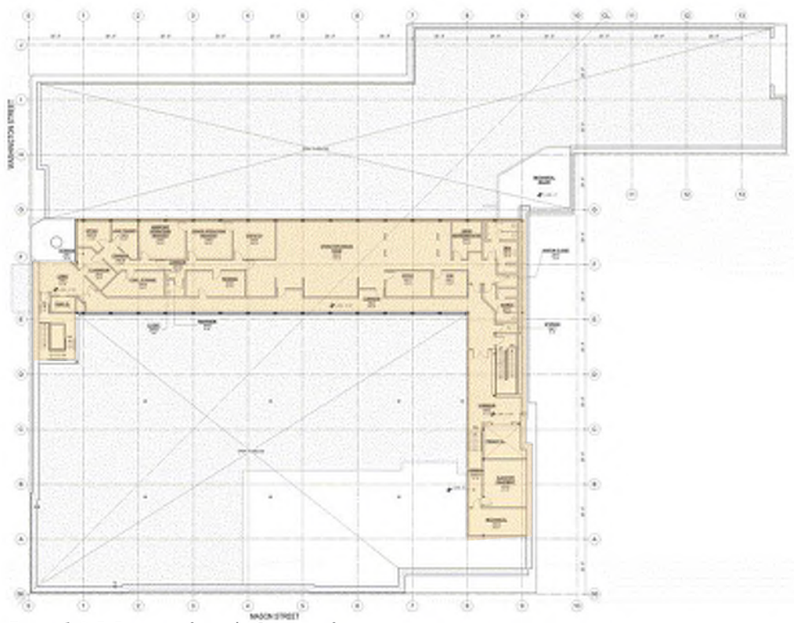
Existing Floor Plans



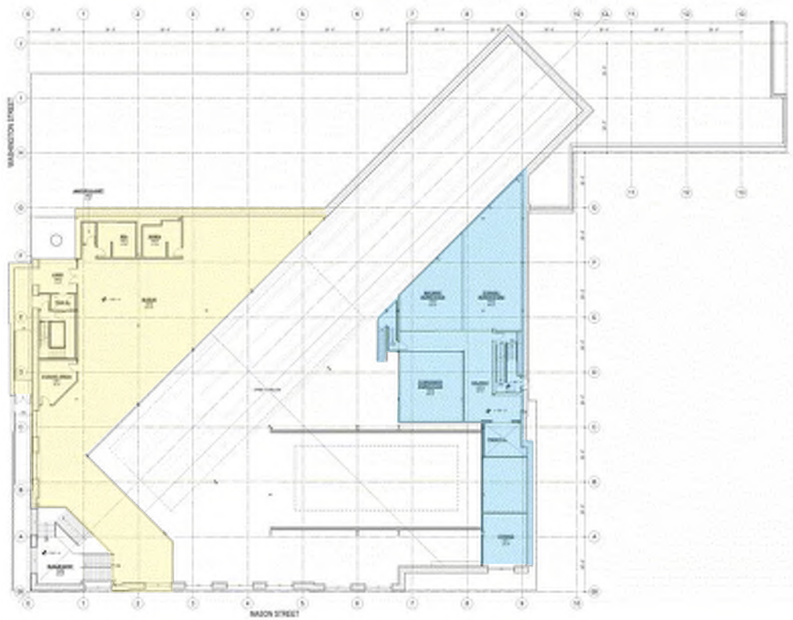
Level 2 | Running Repair



Level 1 | Track & Propulsion



Level 2 Mezzanine | Operations



Level 1 Mezzanine | Museum

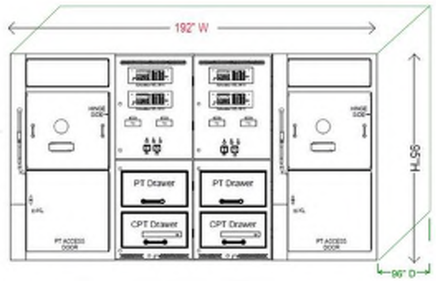
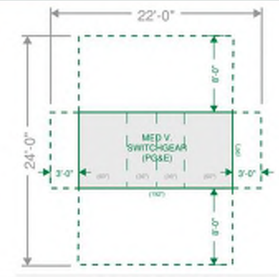
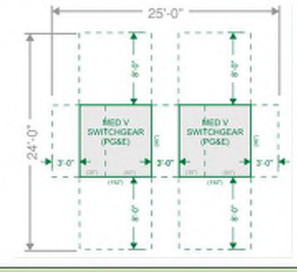
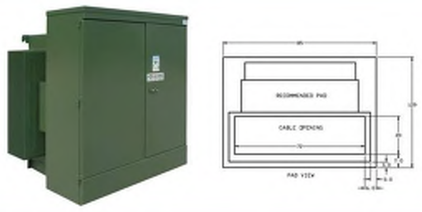
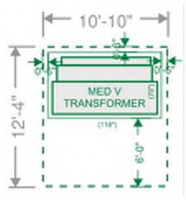
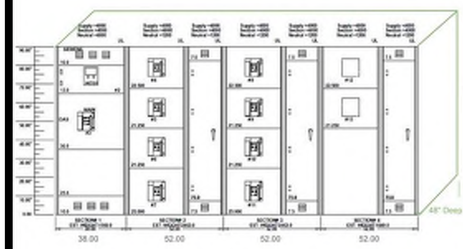
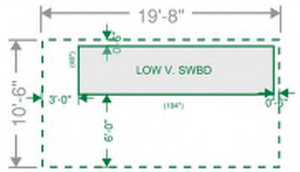
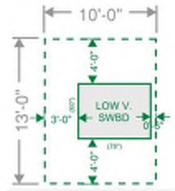
CABLE CAR BARN - ELECTRICAL (12kV) EQUIPMENT STUDIES

Stantec

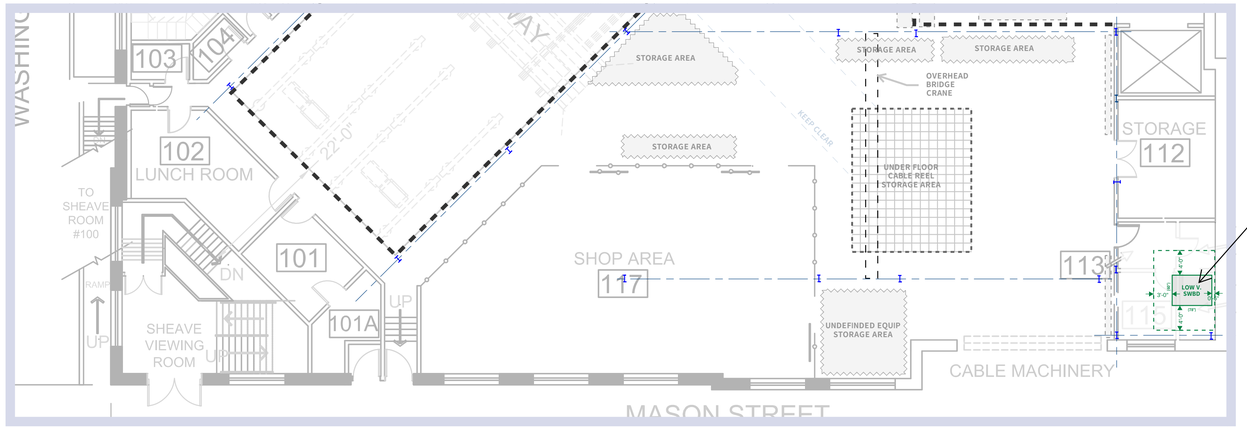
2021.05.03

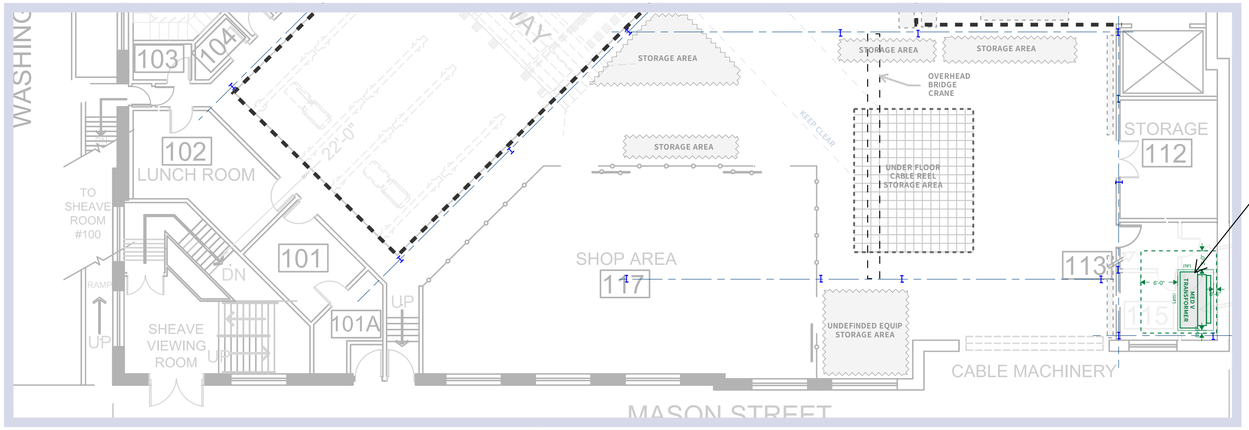
MEETING PARTICIPANTS:
EUNJOO CHO (DPW), QINGWEN XI (MTA), LANG HUEY (MTA), ERIC LEE (MTA), ROB BERGESEN (MTA), LICINIA IBERRI (MTA), BECKY ALDERETE (PUC), PAMELA GEE (PUC), PAT MCKELVEY (STANTEC), & JESSICA COOPER (STANTEC)

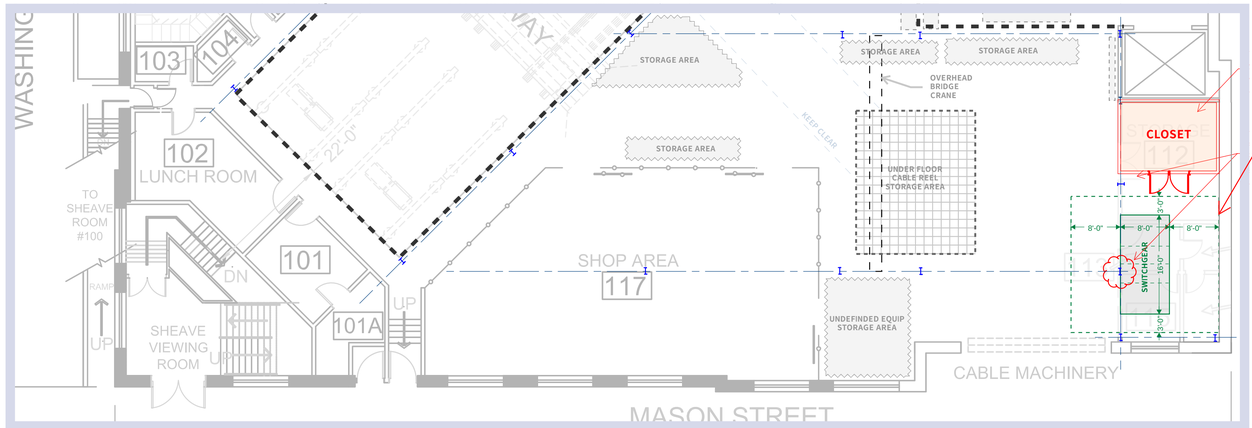
ELECTRICAL EQUIPMENT CRITERIA

EQUIPMENT	CONFIGURATION	SIZE (WxDxH)	CLEARANCE	PLAN SKETCHES W/CLEARANCES
Med V. Switchgear (SWGR) - PG&E				
	Configuration 1	192"x96"x95"	8 feet front and back 3 feet on the sides	
	Configuration 2	two (2) 96"x96"x95"	same as above	
Med V. Transformer				
	Only Configuration	118"x70"x92"	left side against wall, minimum 6" clearance in rear and right side, 6 feet in front (NEC table 110.34 (A))	
Low V. Switchboard				
	Configuration 1	194"x48"x92"	Front accessible only, 3 feet to 4 feet clearance depending on condition (NEC table 110.26(A) (1))	
	Configuration 2	78"x60"x92"	Front and back accessible, 3 feet to 4 feet clearance on both front and back side depending on condition (NEC table 110.26(A) (1))	

OPTIONS 1 TO 4...



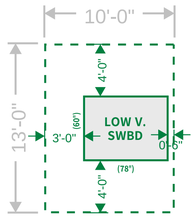




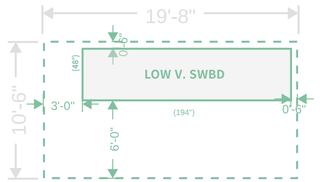
LEVEL 1

STUDIED THE EQUIPMENT IN THE ENGINEERS OFFICES (ALONG MASON ST)

LOW V. SWITCHBOARD WILL FIT IN THIS LOCATION

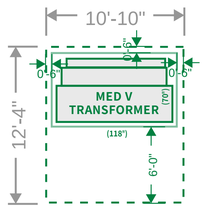


(CONFIGURATION 2)

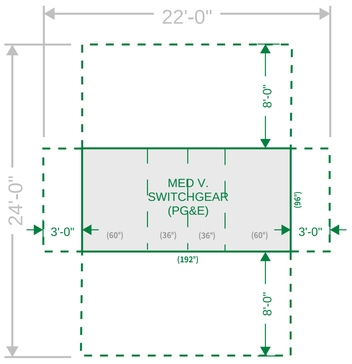


(CONFIGURATION 1 - DOES NOT FIT)

MED V. TRANSFORMER WILL FIT IN THIS LOCATION

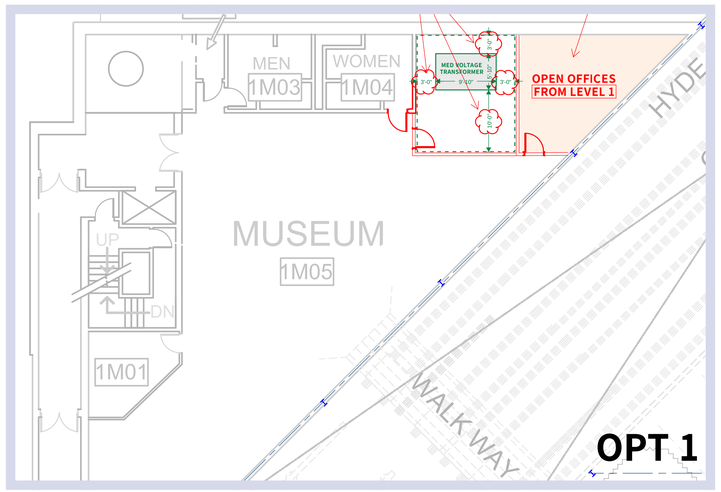


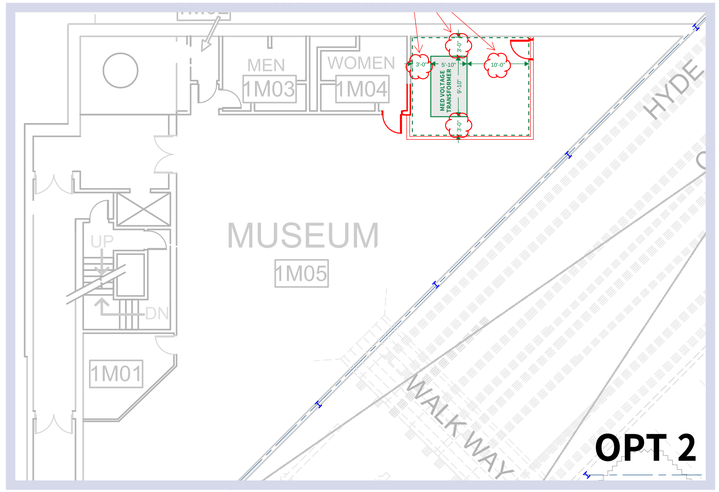
MED V. SWITCHGEAR (PG&E) WILL NOT FIT IN THIS LOCATION - COLLISION WITH EXISTING COLUMN.

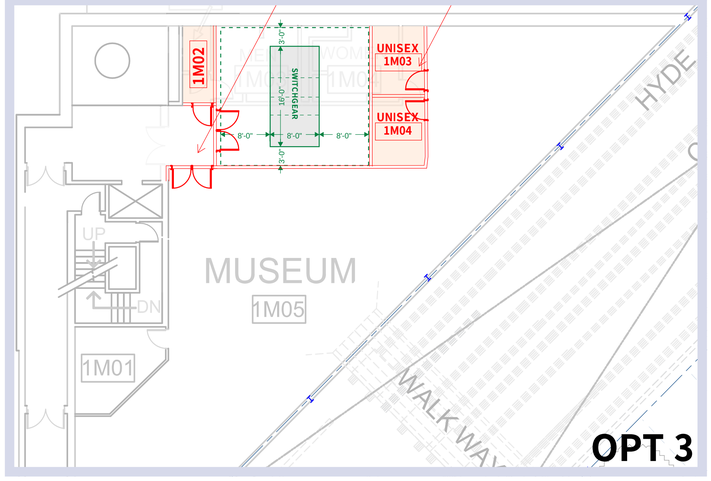


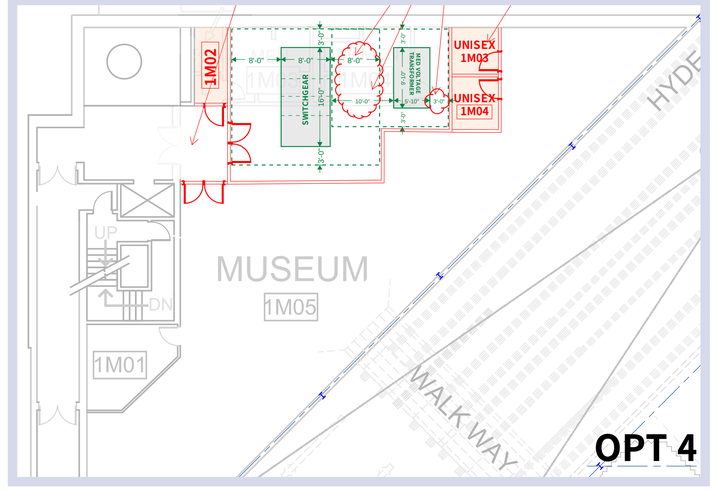
OPTIONS 1 TO 4...

NOT RECOMMENDED









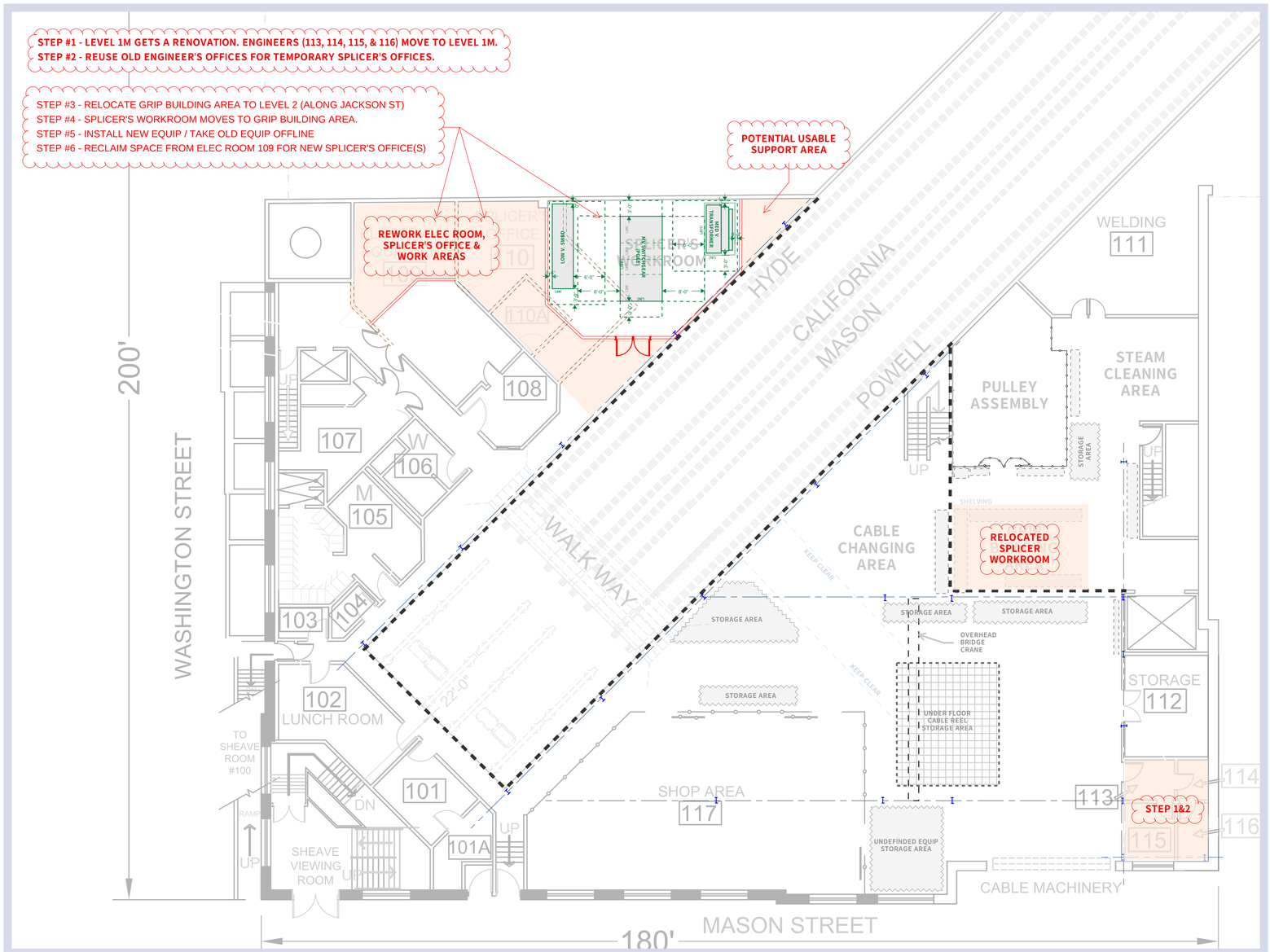
LEVEL 1M

STUDIED THE EQUIPMENT ON THE MUSEUM LEVEL

- **WEIGHT OF EQUIPMENT IS PROBLEMATIC**
- **ACCESS FOR PG&E IS A CONCERN**
- **IMPACT CAUSES A REWORK TO RESTROOMS**
- **MUSEUM SPACE ALREADY TOO SMALL - NO 12kV ON MUSEUM LEVEL (PER MTA & DPW)**
- **LATTER RESEARCH REVEALED EQUIPMENT NEEDS TO BE ON GROUND LEVEL (PER GREENBOOK)**

OPTION 5

LOCATION NOT IDEAL FOR PG&E



LEVEL 1

STUDIED THE SPLICER'S OFFICE AND WORKROOM AREA

- **LOCATION OF ALL 12kV EQUIPMENT HERE IS GOOD FOR INCOMING POWER AND RELATIONSHIP TO EXISTING ELECTRICAL EQUIPMENT ROOM (#109).**
- **MEETS GROUND FLOOR REQUIREMENT**
- **<u>DOES NOT</u> MEET PG&E REQUIREMENT FOR DIRECT DOOR ACCESS FROM OUTSIDE.**

GREENBOOK REQUIREMENTS

5.3.4. Electric Meter and Service Termination Equipment Rooms

Applicants must ensure that meter rooms and service equipment rooms meet the following requirements. Also, see Figure 5-1, "Allowable Locations for Electric Meter Rooms," on Page 5-10, for acceptable and unacceptable meter room locations.

If meters are located in a closet, applicants must meet the requirements described in Item A through Item K., starting below.

A. Meter room specifications must be approved during the initial stages of construction. **Submit drawings showing the dimensions of the room, all service and metering equipment to be installed in the room, and the equipment clearances to your local project coordinator for review by the local meter shop.**

B. Designs must include a designated room for electric service, meters, and metering equipment.

C. Meter rooms must be clear of obstructions and located inside of buildings on the ground floor or below the ground floor. The exception is a qualified high-rise building where the walking surface of the highest tenant-occupied floor is over 75 feet high. PG&E may, at its option, approve grouped meter locations on one or more upper floors.

D. **Meter rooms must have a doorway that opens 90 degrees or more directly to the outside of the building or into an area that is available to the public. DO NOT create a meter room with multiple doorways or which must be accessed by walking down a corridor.**

GREENBOOK REQUIREMENTS

CHALLENGES TO THE PROJECT...

1) AS FOR ACCESS *"...DIRECTLY TO THE OUTSIDE OF THE BUILDING OR INTO AN AREA THAT IS AVAILABLE TO THE PUBLIC." (per item D)*

i) IF NEW DOORS ARE ADDED TO THE FACADE, THIS AFFECTS THE HISTORICAL STATUS OF THE BUILDING.

ii) NOTE: THE CURRENT METER ROOM LOCATION DOES NOT FIT THIS CRITERIA.

iii) THESE REQUIREMENTS ASSUME THAT PUBLIC SPACES ARE INHERENTLY ON THE GROUND FLOOR. BUT IN THIS CASE, THAT'S NOT TRUE - AND WORK ON MUSEUM L1M HAS BEEN VETOED.

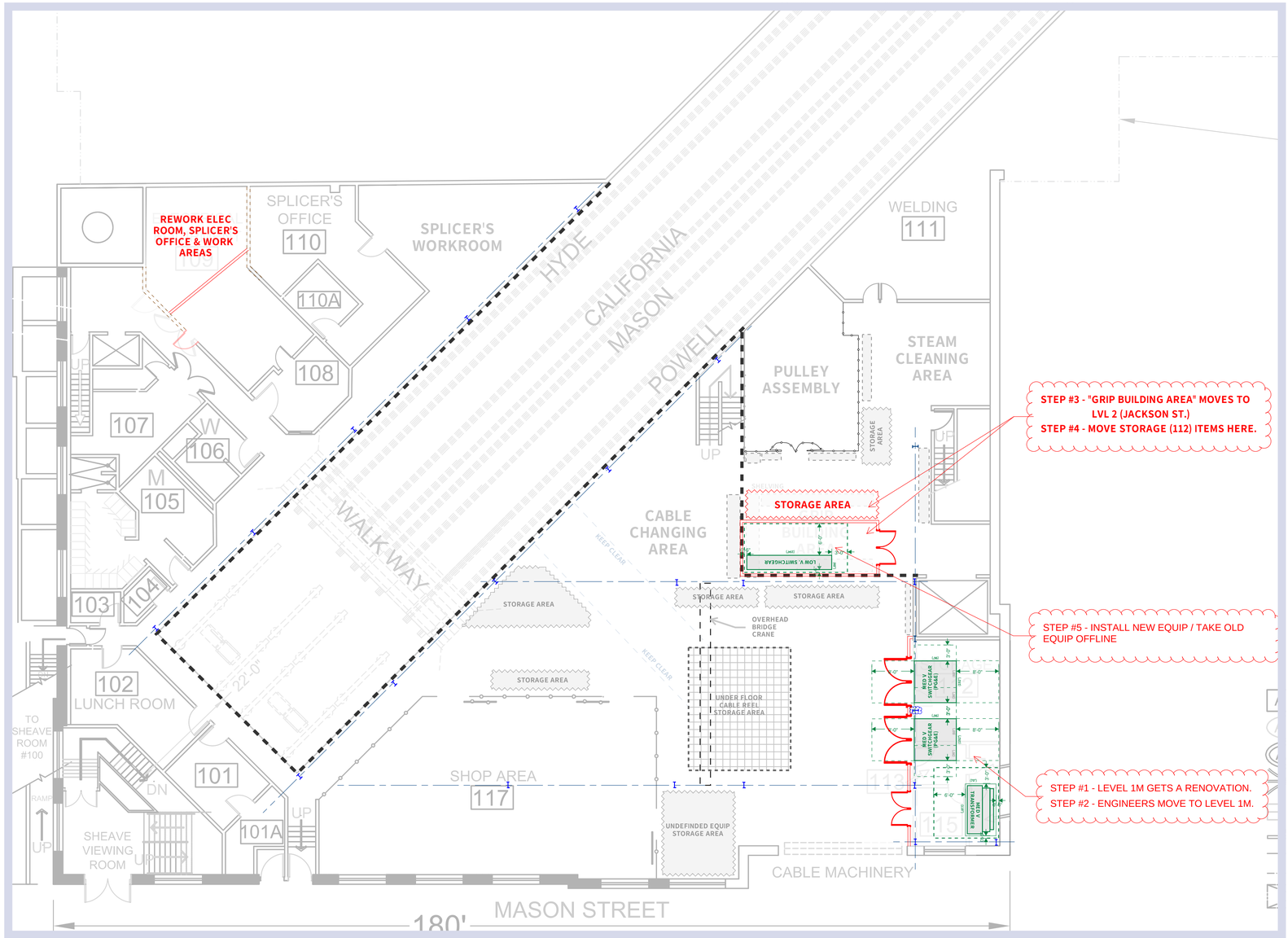
iv) IS THIS APPLICABLE TO NEW CONSTRUCTION OR RENOVATIONS AS WELL?

2) AS FOR THE REQUIREMENT TO *"SIT ON THE GROUND FLOOR"* (per item C)

i) THIS CAN BE ACCOMODATED; BUT NOTE: THERE'S NO DIRECT ACCESS AVAILABLE FROM THE OUTSIDE OF THE BUILDING OTHER THAN ALONG MASON ST. THIS IS DUE TO THE SLOPE OF THE SITE, WHERE NO OTHER FACE OF THE BUILDING SITS ON GROUND LEVEL.

OPTION 6

PREFERRED



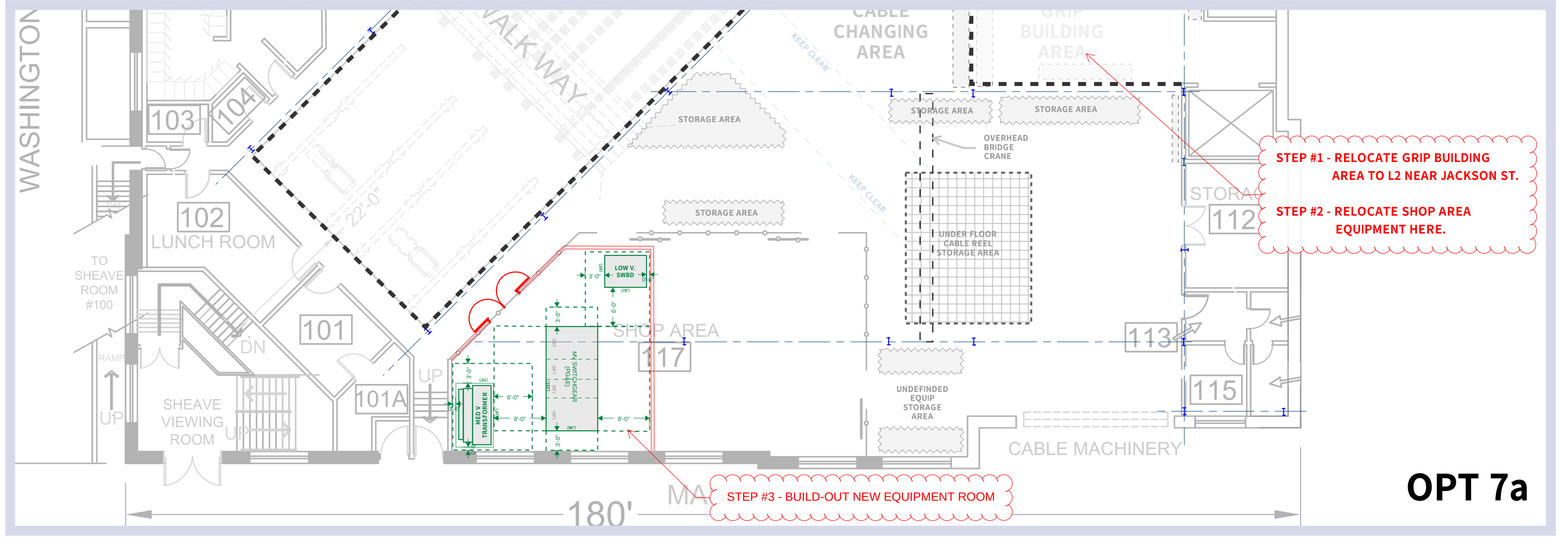
LEVEL 1

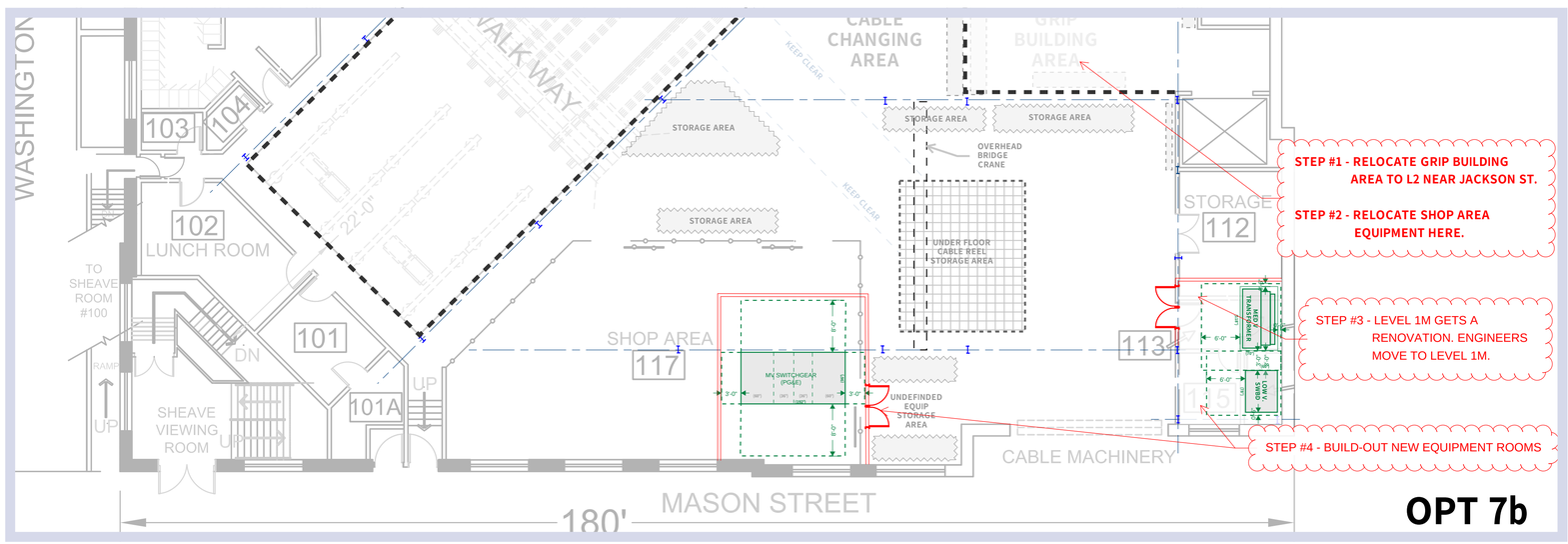
SPLITTING OF THE MED V. SWITCHGEAR (PG&E)

- LOCATION OF ALL 12kV EQUIPMENT HERE LIMITS DISRUPTION TO DAILY MTA OPERATIONS
- MEETS GROUND FLOOR REQUIREMENT
- IMPROVED ACCESS FOR PG&E
- NOTE: THE 8'-0" ACCESS CLEARANCE REQUIRED FOR THE PG&E MED V. SWITCHGEAR IS ACHIEVED BY OPENING A PAIR OF SWING DOORS.
- DOES NOT MEET PG&E REQUIREMENT FOR DIRECT DOOR ACCESS FROM OUTSIDE.

OPTION 7a & 7b

DISAPPROVED





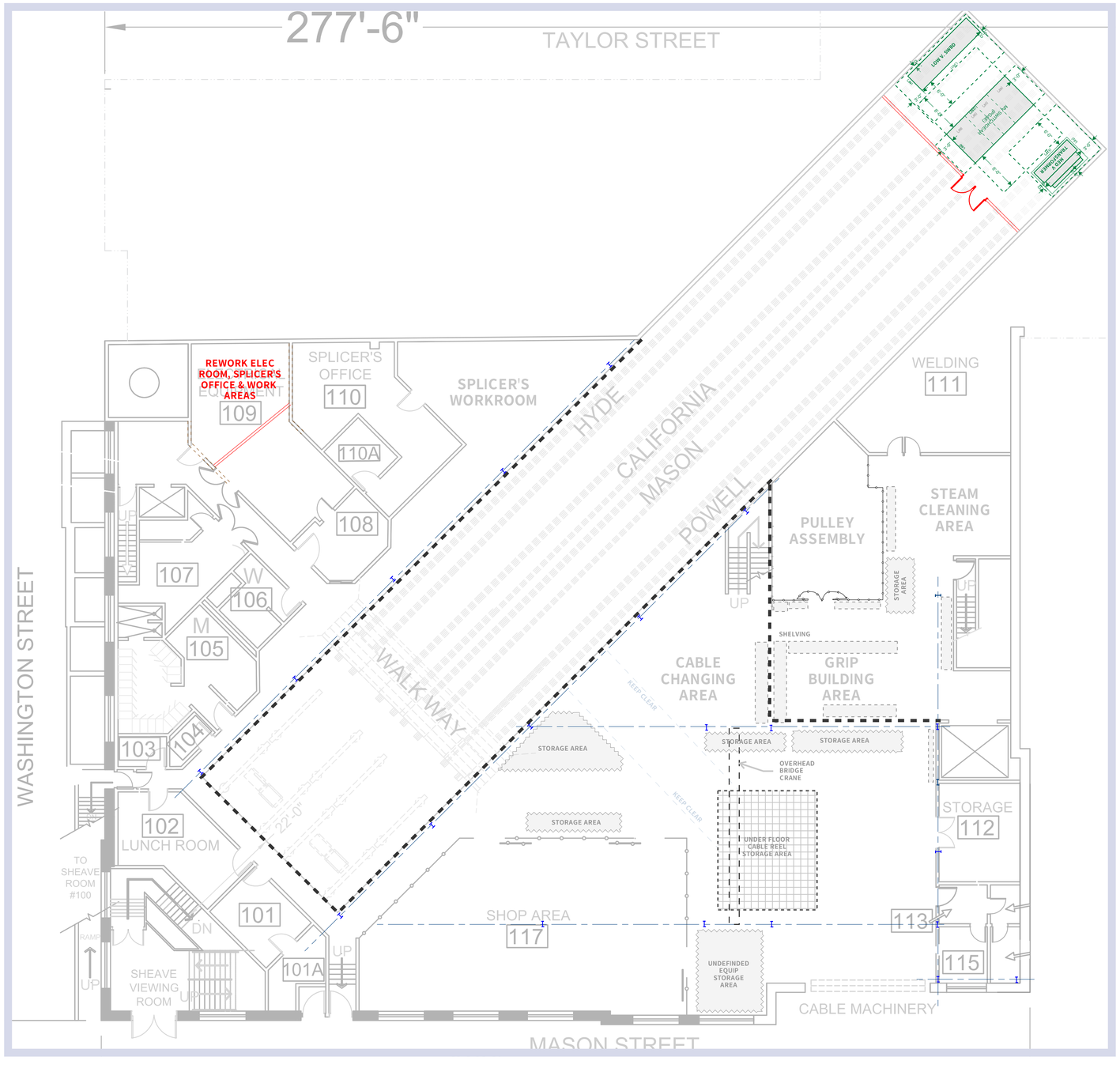
LEVEL 1

PRIORITIZING ACCESS FOR PG&E

- **BOTH LOCATIONS - IMPROVED ACCESS FOR PG&E**
- **MEETS GROUND FLOOR REQUIREMENT**
- **DOES NOT MEET PG&E REQUIREMENT FOR DIRECT DOOR ACCESS FROM OUTSIDE.**
- **CONSTRUCTING WALLS BLOCKS LIGHT FROM MASON ST INTO THE INTERIOR**
  - **WALLS MUST WORK AROUND EXISTING WINDOWS**
  - **OPT 7a BLOCKS 2 WINDOWS UP TO DOUBLE-HEIGHT**
  - **OPT 7b BLOCKS 1 WINDOW UP TO DOUBLE-HEIGHT**

OPTION 8

DISAPPROVED



LEVEL 1

LOCATING ALL 12kV EQUIPMENT TO THE BACK OF CABLE RUNWAY

- **MEETS GROUND FLOOR REQUIREMENT**
- **DOES NOT REQUIRE SHUFFLING OF ACTIVE SPACES TO INSTALL**
- **CAN BE COORDINATED WITH LEVEL 1M IMPROVEMENTS**
- **<u>DOES NOT</u> MEET PG&E REQUIREMENT FOR DIRECT DOOR ACCESS FROM OUTSIDE.**
- **CONCERN FOR ACCESS TO THE CABLES RUNNING UNDERGROUND ALONG THE BACK WALL (PER DPW).**

Meeting Minutes #3
PW-MTA-1708 Cable Car Barn

Subject: Preliminary equipment layout meeting notes
Date of Meeting: 6/24/2021
Time: 4:00 – 5:00 pm
Location: Virtual meeting via MS Teams
Date Issued: 6/25/2021
Prepared by: EunJoo Cho

Attendance (A) / Distribution (D):

A	D	Name	Organization	Role	Email Address
X	X	Licinia Iberri **(LI)**	SFMTA	Project Manager	Licinia.Iberri@sfmta.com
X	X	Robert Bergesen **(RB)**	SFMTA	Propulsion and Facility Superintendent	Robert.Bergesen@sfmta.com
X	X	Eric Lee **(EL)**	SFMTA	Cable Car Engineer	Eric.Lee2@sfmta.com
	X	Wesley Valaris **(WV)**	SFMTA	Division SOM	Wesley.Valaris@sfmta.com
	X	John Becker **(JB)**	SFMTA	manager of the Mechanical Systems Group	John.Becker@sfmta.com
	X	Arne Hansen **(AH)**	SFMTA	Vehicle Maintenance Superintendent	Arne.Hansen@sfmta.com
X	X	Lang Huey **(LH)**	SFMTA	M/P Engineer	Lang.Huey@sfmta.com
	X	Foo Eng **(FE)**	SFMTA	Project Manager	Foo.Eng@sfmta.com
X	X	Qingwen Xi **(QX)**	SFMTA	Electrical Engineer	Qingwen.Xi@sfmta.com
	X	Frank Lau **(FL)**	SFMTA	Project Manager	Frank.Lau@sfmta.com
		Becky Alderete **(BA)**	SFPUC	Manager	balderete@sfwater.org
		Pamela Gee **(PG)**	SFPUC	Utility Analyst	pgee@sfwater.org
X	X	Patricia Solis **(PS)**	SFPW-BOA	Section Manager	Patricia.Solis@sfdpw.org
	X	Tim Kempf **(TK)**	SFPW-PMB	Project Manager	tim.kempf@sfdpw.org
X	X	EunJoo Cho **(EC)**	SFPW-BOA	Project Architect	eunjoo.cho@sfdpw.org
	X	Jennifer Dameron **(JD)**	SFPW-BOA	Job Captain	Jennifer.Dameron@sfdpw.org
	X	Arfaraz Khambatta **(AK)**	SFPW-DAC	Disability Access Coordinator	Arfaraz.Khambatta@sfdpw.org
		Sue Chen **(SC)**	SFPW BOE/ CP&C	Structural Engineer	Sue.Chen@sfdpw.org

		Leslyn Maher **(LM)**	SFPW BOE/ CP&C	Structural Engineer	leslyn.maher@sfdpw.org
		Earl Gaffud **(EG)**	SFPW BOE/CP&C		Earl.Gaffud@sfdpw.org
X	X	Pat McKelvey **(PM)**	Stantec	Senior Principal	pat.mckelvey@stantec.com
X	X	Jessica Cooper **(JC)**	Stantec		jessica.cooper@stantec.com
		David Wessel **(DW)**	ARG	Principal	David@ARGSF.com
		Erica Schultz **(ES)**	ARG	Historian	E.Schultz@ARGSF.com
		Dan Herrick **(DH)**	ARG	Historian	D.Herrick@ARGSF.com

Item	Discussion	Responsible Party/Status
1.0 ADMINISTRATIVE/MISC/CLIENT ITEMS		
3-1.1		
5.0 ARCHITECTURE		
3-5.1		
6.0 STRUCTURAL		
3-6.1		
7.0 MEPF		
3-7.1	**Topic: 12 kV switchgear room update:** ▪ (JC) 12kV switchgear room is proposed at south-west corner near pull-out door along Washington St; Room provides required clearances for all equipment; 12kV switchgear, transformer, LV switchboard, battery rack, electrical panels, etc ▪ (EC) 1 hr rated wall and doors (overhead roll-up door and double swing) proposed. ▪ (EC) Eyewash station and clean agent system are in coordination with QX and LH. ▪ (JC) Existing storage items need to be relocated to somewhere else. (EC) Can we consider compact storage systems for space saving? (RB) Yes	
8.0 FIXTURES FURNITURE & EQUIPMENT		
3-8.1	**Topic: Preliminary equipment layout review** (JC) Stantec presented preliminary equipment layout – See the presentation pdfs, attached. **Level 1** ▪ **Option 1** o Machine shop: relocated to the back area o Pulley Assembly area/ Steam cleaning/ Weld shop: relocated to Mason St side	

- New inspection room: relocated to existing office area near Mason St entry/gate.

- **Option 2**
  - Machine shop: relocated to the back area
  - Weld shop: relocated to existing office area near Mason St entry/gate
  - New inspection room/ Pulley Assembly area/ Steam cleaning: relocated to Mason St side

Feedback & discussion

- **Weld shop in Option 2**:
  - (RB) Prefers Weld shop in Option 2 so shop areas along Mason St can have more natural light from windows.
  - (EC) Existing offices can be moved to new office area on Level 1 Mezzanine. However, existing storage room/area (at RM# 112 and 115) need to be relocated to somewhere else.
  - (RB) Prefers sliding doors over double door for large opening at Weld shop
  - (EL) Need a crane at Weld shop
- **Existing waste oil drums**
  - (RB) Waste oil drum qty could be decreased.
  - (LI) Maintaining exterior window area for natural light is important. Can existing waste oil drums be moved to inside of the building so we can utilize that area for occupied space (RB) Yes
- **Steam cleaning area in both Options**
  - (EC) Steam cleaning area can get dirty easily and visible from Level 1 Mezzanine/ Museum level; not ideal.
  - (RB) The Steam cleaning area can be shifted to existing trash/dumpster area.
- **Storage spaces**
  - (JC) Can compact storage systems be used in shop areas if high volume spaces are available? (RB) Parts storage keeper needs to weigh in. RB to follow up.

Level 2

- **Grip Building area**: relocated to Level 2 near Pull-In door along Jackson St.
- **Carpentry shop**: layout in progress.

Feedback & discussion

- **Grip building area**
  - (EC) Is a crane required? (RB) Yes, one wall mounted jib crane.
  - (EC) Is existing jib crane near Pull-in door to remain? (EL) Yes

	○ (LI) Are existing ducts above to remain? (LH) Yes per current design. (LI) Team to explore to relocate/ reconfigure the ducts if necessary for better space planning. ○ (JC) Can jib crane be located on the north wall instead? RB to follow up. *Update from (EL) 2021-0625 - The jib crane could be relocated if necessary to the opposite wall from the one at which it is currently installed.* ▪ **Carpenter shop Breakroom** ○ (EC) Existing breakroom is located on upper/ Level 2 Mezzanine level. If this room gets renovated, we need to provide full accessibility requirements including ADA lift/elevator. Thus, BOA prefers relocating breakroom on the ground level. ○ (RB) Breakroom could be relocated to somewhere else. ○ (RB) If existing breakroom on upper level remains as is, do we need ADA upgrade? EC to follow up. ▪ **Carpenter shop area and Paint booth** ○ (RB) Car needs to come into the paint booth room. ○ (RB) Prefers reorganizing paint area	EC
10.0 FIRE ALARM		
3-10.1		
11.0 HISTORIC		
3-11.1		
NEXT STEP		
	▪ **Presentation PDF**: EC to share the presentation PDF with MTA RB and EL for review and input ▪ **Client feedback**: MTA RB and EL to provide feedback asap	EC RB/EL
ITEMS RESOLVED		

Conclusion:

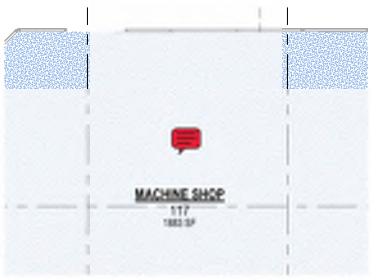
NOTE: These minutes will be relied upon as the approved record of matters discussed and conclusions reached during the meeting. If you disagree with the contents, please send the author a letter outlining your disagreement within seven calendar days of the issuance of these minutes.

2021-0719 Coordination call with JC, QX, LH and EC

2021-0720 Call with Eric and EC

2021-0624-1708 CCB_Master Plan Studies.pdf Markup Summary

1 (15)



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Author: erlee
Date: 7/14/2021 10:31:11 AM
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Stantec

EC: Supervisor office will be relocated to Splicer supervisor area

EL: OK

Machine shop desired to stay in current location. Open to expanding machine shop into current oil drum/tank and garbage area, and relocating oil and garbage.

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Stantec

MEP

LH/QX: For relocated weldshop, ventilation scope to be provided & upgraded

Perhaps inspection room could be located in this location?

EL: New fence to be removable

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Author: erlee
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Stantec

Steam cleaning/weld area can stay here.

Two existing equipment near the fence to be relocated/ replaced with new small one

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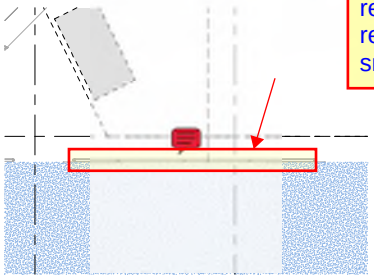

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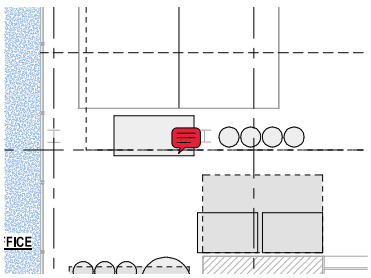
Stantec

BOA Support

JC: How long? Where? Can the existing storage shelving be removed? EC to check with MTA

Perhaps (if necessary) on this side of the machine shop, there is removable/sliding fencing to accommodate machining long lengths material.



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Stantec

Space currently allocated to oil, waste tank, and garbage could be reallocated for expansion of machine shop. Oil, waste tank, garbage cans can be relocated.

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Date: 7/14/2021 11:20:54 AM
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EC: Need plumbing coordination

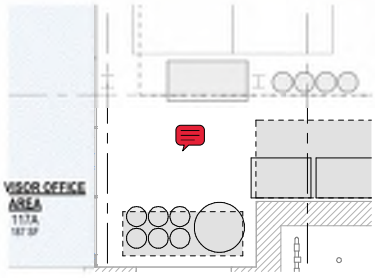
Stantec

MEP

JC: maybe consider oil drum storage solutions

EL: OK

Waste oil tank could possibly be located next to steam cleaning area approx. in this location?



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Date: 7/14/2021 11:21:23 AM
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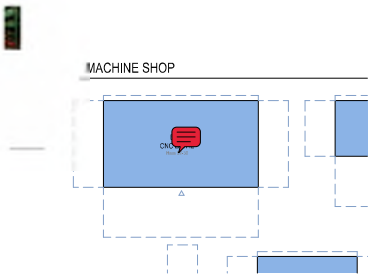
No comments



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Date: 7/14/2021 11:22:30 AM
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Stantec

CNC lathes and CNC vertical mill (Haas machines) more than likely to be moved to another facility per submitted spreadsheet and replaced by 1 smaller machine per submitted spreadsheet.

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Author: erlee
Date: 7/14/2021 11:21:51 AM
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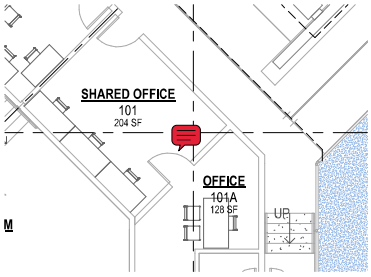
No comments



Subject: Sticky Note
Page Label: 1
Author: erlee
Date: 7/14/2021 11:24:37 AM
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BOA

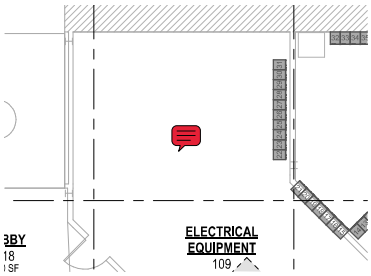
(114 115)

101 101A staff will move move to L1M office

EL: OK

101 and 101A space could be reallocated for track supervisor office and track employee workstation space as well as expanded breakroom

EL: All gender lockers at Level 1 might not be ideal due to privacy issue. Shower is being used by staff.



Subject: Sticky Note
Page Label: 1
Author: erlee
Date: 7/14/2021 11:25:08 AM
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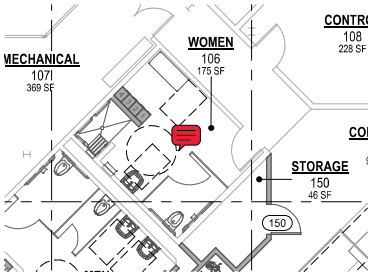
BOA

Possibly space reallocated for women's / all-gender restroom?

Confirming electric reconfiguration & clearance for the demoed area.
Study design option; front could be all-gender restroom + clothing lockers on the back and expand men's locker room on the south?



Subject: Sticky Note
Page Label: 1
Author: erlee
Date: 7/14/2021 11:25:43 AM
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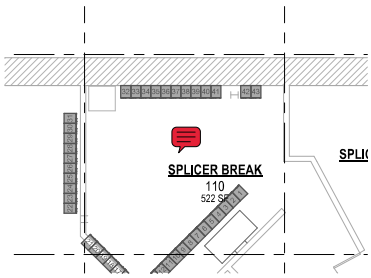
BOA

Study design option

Space possibly reallocated to expanded locker room? Current men's locker room tight on space.



Subject: Sticky Note
Page Label: 1
Author: erlee
Date: 7/14/2021 11:26:28 AM
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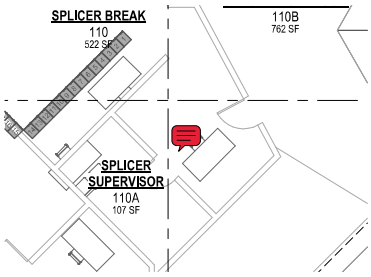
BOA

Study design option; Possibly expand to the existing elec room for more space

Splicer break space with lockers in it could be reallocated to accommodate workstations and more lockers.



Subject: Sticky Note
Page Label: 1
Author: erlee
Date: 7/14/2021 11:27:26 AM
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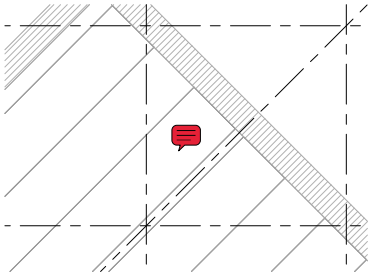
BOA

Study design option (107, 110A, 117)

110A and adjacent space could be reallocated for shared Chief Stationary Engineer, Machine Shop Supervisor, and Splicer Supervisor space.



Subject: Sticky Note
Page Label: 1
Author: erlee
Date: 7/14/2021 11:28:49 AM
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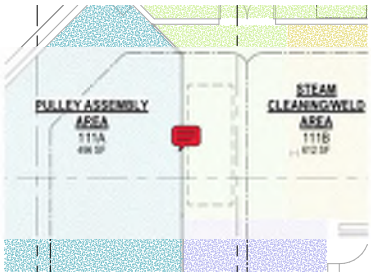
BOA

New offices possibly for track and propulsion superintendents, engineering, and track and propulsion management assistants/maintenance controllers.



Subject: Sticky Note
Page Label: 1
Author: erlee
Date: 7/14/2021 11:29:39 AM
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Stantec

Pulley assembly area and depression beam area can stay in this general vicinity. Open to reconfiguring layout and reallocating space as seen fit between inspection room, pulley assembly area, steam cleaning area, oil and garbage, track storage (Room 112 stored components that would be displaced by relocated weld shop), office space, etc.

2 (1)

Subject: Sticky Note
Page Label: 2
Author: erlee
Date: 7/14/2021 10:36:37 AM
Status:
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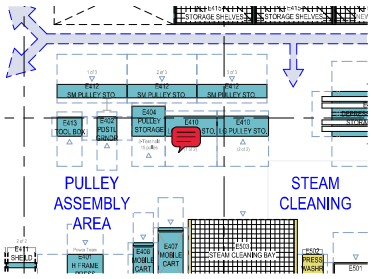
Space:

OK

No to this layout.

3 (5)



Subject: Sticky Note
Page Label: 3
Author: erlee
Date: 7/14/2021 10:37:10 AM
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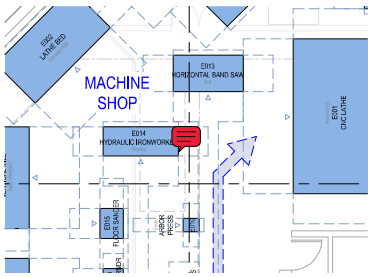
Stantec

OK

Per page 1, machine shop desired to remain in this location.



Subject: Sticky Note
Page Label: 3
Author: erlee
Date: 7/14/2021 10:39:04 AM
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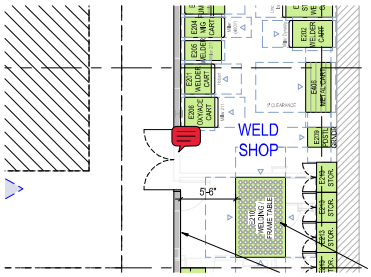
Stantec

OK

Per page 1, machine shop desired to be maintained in current location, and space desired to be reassessed/reconfigured for remaining workspaces noted on page 1.



Subject: Sticky Note
Page Label: 3
Author: erlee
Date: 7/14/2021 11:14:05 AM
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Stantec

MEP

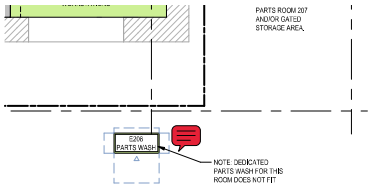
BOA Support

Large rolling door (like at the newly proposed switchgear room) desired for Weld Shop in addition to a regularly manway door adjacent to the rolling door.

LH/QX: For relocated weldshop, ventilation scope to be provided & upgraded

Existing storage space on L1M to be relocated? Maybe old Grip bldg area? EC to check with MTA

EL:OK



Subject: Sticky Note
Page Label: 3
Author: erlee
Date: 7/14/2021 11:15:25 AM
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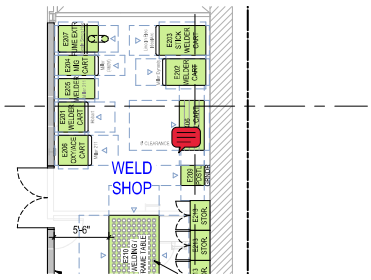
Stantec

LH: Parts wash - chemical only. not water needed? EC to check with MTA

EL: No clean water supply. A separate mobile system

This parts wash technically belongs to Grip Repair Area. Relocate to newly proposed grip repair area.



Subject: Sticky Note
Page Label: 3
Author: erlee
Date: 7/14/2021 11:19:55 AM
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Space:

Stantec

This weld shop location is highly favored and desired. Note that components in the current room dedicated to Storage will be displaced and must be relocated.

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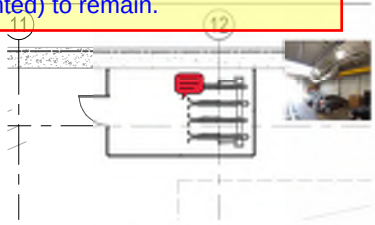
4 (2)

EL: Moving to b/w 7 and 8 along J is okay. Existing control box (floor mounted) to remain.



Subject: Sticky Note
Page Label: 4
Author: erlee
Date: 7/14/2021 10:47:03 AM
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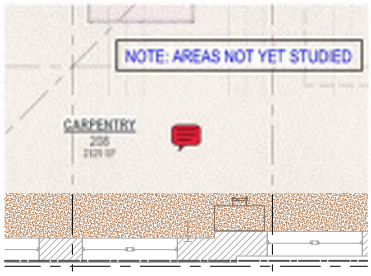
Space:

STANTEC BOA

Relocate bike storage room - TBD further along with AG restroom; potentially PARTS 207 expansion. EC to check with MTA

Per email sent to Eun Joo on 6/29, this space occupied by two large trucks back to back, used for towing Cable Cars. These trucks must be stationed here.

EL: Exploring PARTS 207 expansion for all gender restroom is okay. Storage solution at PARTS 207 should be studied.



Subject: Sticky Note
Page Label: 4
Author: erlee
Date: 7/14/2021 10:48:31 AM
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Stantec

BOA

Relocate breakroom to other ground space. Office on level 2 is not feasible due to ADA. EC to check with MTA

Open to having space allocation here reconfigured. Perhaps a second floor here for office space?

EL: Breakroom at carpentry shop is not MTA program requirement. This could be omitted.

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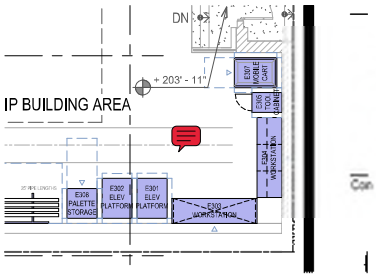
5 (4)



Subject: Sticky Note
Page Label: 5
Author: erlee
Date: 7/14/2021 10:49:51 AM
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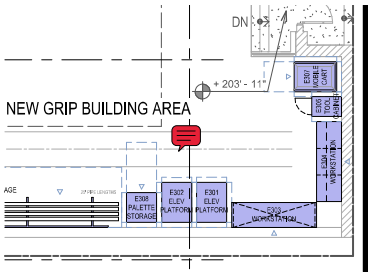
Stantec

JC: Min ceiling height? Natural light needed? fork lift needs to be operated thru door? OH door? EC to check with MTA

LH: Radiant heating to be removed

EL: Natural light - not required but good to have
Min ceiling ht - typically cart to lift grips - Eric to follow up
Crane/ forklift needed? - Eric to follow up

Parts washer shown in weld shop technically belongs to Grip Repair Area. Relocate parts washer to this space.



Subject: Sticky Note
Page Label: 5
Author: erlee
Date: 7/14/2021 10:50:18 AM
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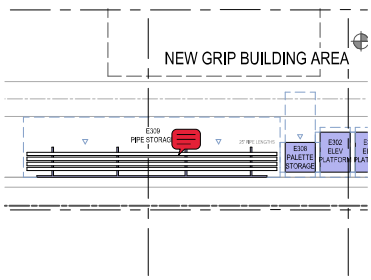
Stantec

OK

This location for Grip Building Area is favored.



Subject: Sticky Note
Page Label: 5
Author: erlee
Date: 7/14/2021 10:51:06 AM
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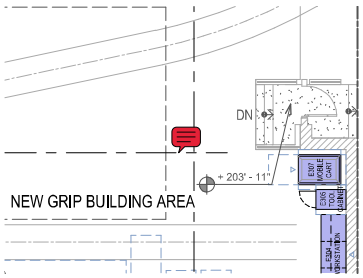
Stantec

Pipe storage is not part of grip building area and should be located on 1st floor so it can be accessed by the machine shop.



Subject: Sticky Note
Page Label: 5
Author: erlee
Date: 7/14/2021 10:52:51 AM
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Stantec

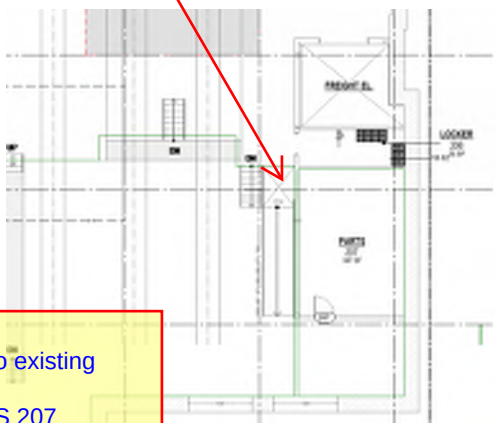
BOA Support

Perhaps a wall/partition for sound deadening here?

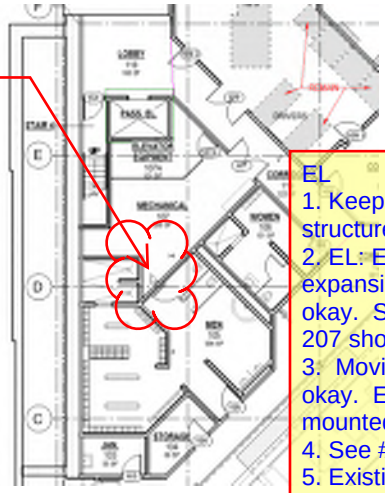
EL: Some walls may be desired for sound attenuation purpose but this space does not need to be fully enclosed.

Questions for MTA- EC to check with MTA
1. Jib crane at L2? North wall
2. Potential all gender restroom space
3. Potential leftover space near Grip bldg Area @ L2 for Bike storage room
4. Parts at L2 - partial reuse for other purpose

6. Existing lift capacity

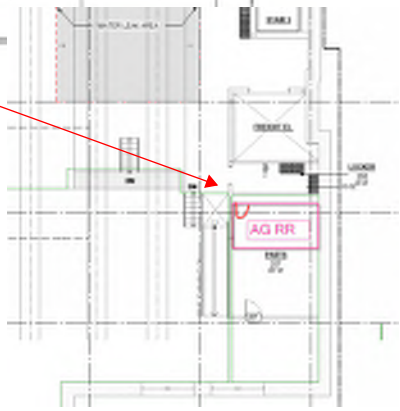


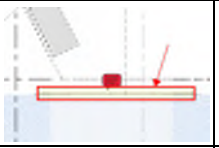
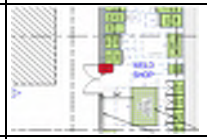
5. Can this corner be used for locker/restroom?

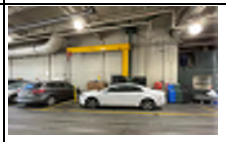
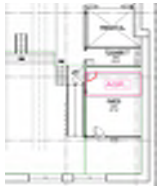


7. Bridge crane safety concerns.

EL
1. Keep jib crane due to existing structure
2. EL: Exploring PARTS 207 expansion for all gender restroom is okay. Storage solution at PARTS 207 should be studied
3. Moving to b/w 7 and 8 along J is okay. Existing control box (floor mounted) to remain.
4. See #2 above
5. Existing mech room to remain
6. Eric to provide existing capacity of the existing lift lb..etc
7. Nothing more than the usual operator caution.



2021-0624 MTA Equipment layout comments & Design team questions					
	Area	MTA Comments & Design team Questions	MTA Response	Notes	Email Date
14	Level 1	*MTA Comment: Machine shop desired to stay in current location. Open to expanding machine shop into current oil drum/tank and garbage area, and relocating oil and garbage.* *110A and adjacent space could be reallocated for shared Chief Stationary Engineer, Machine Shop Supervisor, and Splicer Supervisor space.* BOA: Assume that Supervisor office at Machine shop could be relocated to Splicer Supervisor area.	7/20/2021 MTA Eric: Correct		2021-0721
15	Level 1	*MTA Comment: Perhaps (if necessary) on this side of the machine shop, there is removable/sliding fencing to accommodate machining long lengths material.* BOA: Fence length and location requirements? Can the existing storage shelving to be removed?	7/20/2021 MTA Eric: Two existing equipment near the fence to be relocated and replaced with new small equipment. Desire to have new fence along the two existing equipment to be a removable fence.		2021-0721
16	Level 1	*MTA Comment: Waste oil tank could possibly be located next to steam cleaning area approx. in this location?* BOA: Can we consider oil drum storage solutions?	7/20/2021 MTA Eric: Yes		2021-0721
17	Level 1	*MTA Comment: 101 and 101A space could be reallocated for track supervisor office and track employee workstation space as well as expanded breakroom* BOA: 101 & 101A staff could be moved to Level 1 M office area and 114 & 115 staff could be reallocated to 101 & 101 spaces.	7/20/2021 MTA Eric: Correct		2021-0721
18	Level 1	*MTA Comment: Existing electrical room - Possibly space reallocated for women's / all-gender restroom?* BOA: Relocating Women's restroom here is not ideal since keeping existing plumbing locations is better for cost saving. Also, we need additional space for clothing lockers since future locker QTY is significantly increased. BOA will study option - reallocating all-gender restroom along with clothing locker space to the back side of the existing electrical room. Is all gender locker room acceptable instead gender specific? Also, are the existing showers being used?	7/20/2021 MTA Eric: Agreed on all-gender restroom and clothing locker at the existing electrical room. All gender lockers at Level 1 is not be ideal due to privacy issue. Yes, showers are being used and needed.		2021-0721
19	Level 1	*MTA Comment: Large rolling door (like at the newly proposed switchgear room) desired for Weld Shop in addition to a regularly manway door adjacent to the rolling door.* BOA: Existing storage space at Level 1 M/ 112 & 115 need to be relocated. Can we use the current Grip building area since this space is to be relocated to Level 2?	7/20/2021 MTA Eric: Yes		2021-0721
20	Level 1	*MTA Comment: This parts wash technically belongs to Grip Repair Area. Relocate to newly proposed grip repair area.* BOA: Is Parts Wash required only chemicals, not water?	7/20/2021 MTA Eric: Correct. No clean water supply required. A separate mobile system.		2021-0721
21	Level 2	*MTA Comment: Per email sent to Eun Joo on 6/29, this space occupied by two large trucks back to back, used for towing Cable Cars. These trucks must be stationed here.* BOA: Can we locate a bike storage to left corner space (Grids b/w 7 and 8 along J)?	7/20/2021 MTA Eric: Yes. Please keep existing control box (floor mounted) and clearance around it.		2021-0721
22	Level 2	*MTA Comment: Carpentry breakroom - Open to having space allocation here reconfigured. Perhaps a second floor here for office space?* BOA: Office/breakroom on Level 2 is not feasible due to ADA. We would explore relocating breakroom to ground level (either ground floor under the current breakroom or window area near the elevator)	7/20/2021 MTA Eric: Ok. Breakroom at carpentry shop is not MTA program requirement. This could be omitted.		2021-0721

23	Level 2	*MTA Comment: Parts washer shown in weld shop technically belongs to Grip Repair Area. Relocate parts washer to this space.* BOA: New Grip building area requirements needed. Min ceiling height? Natural light required? Fork lift to be operated? Overhead door?	7/20/2021 MTA Eric: Natural light is not required but good to have. Min. ceiling height and Crane/fork lift -**Eric to follow up**		2021-0721
24	Level 2	*MTA Comment: Grip building area - Perhaps a wall/partition for sound deadening here?* BOA: More clarification needed.	7/20/2021 MTA Eric: Walls may be desired for sound attenuation purpose but this space does not need to be fully enclosed.		2021-0721
25	Level 2	Existing jib crane location at Level 2 - It is better to keep the existing jib crane due to existing structural support	7/20/2021 MTA Eric: Agreed.		2021-0721
	Level 2	All-gender restroom - Can we locate to PARTS 207 room?	7/20/2021 MTA Eric: Yes. Currently PARTS 207 is used as storage room. Storage solution at PARTS 207 should be studied.		2021-0721
26	Level 1	Can some portion of existing Mechanical room 107 be used for restroom expansion?	7/20/2021 MTA Eric: Not desired due to many existing electrical panels on the wall. Existing mech room to remain.		2021-0721
27	Level 2	Existing lift capacity? If this triggers ADA upgrade, we might just leave this as is. MTA can upgrade this lift as a maintenance item.	7/20/2021 MTA Eric: **Eric to follow up on the existing lift information.** Agreed on ADA issue.		2021-0721
28	Level 1	Bridge carne safety concerns along the proposed walkways?	7/20/2021 MTA Eric: Nothing more than the usual operator caution.	Refer to MTA's email response on 7/20/2021	2021-0721

Meeting Minutes #4
PW-MTA-1708 Cable Car Barn

Subject: Conceptual plan draft presentation meeting notes
Date of Meeting: 8/23/2021
Time: 3:00 – 4:00 pm
Location: Virtual meeting via MS Teams
Date Issued: 8/24/2021
Prepared by: EunJoo Cho

Attendance (A) / Distribution (D):

A	D	Name	Organization	Role	Email Address
X	X	Licinia Iberri **(LI)**	SFMTA	Project Manager	Licinia.Iberri@sfmta.com
X	X	Robert Bergesen **(RB)**	SFMTA	Propulsion and Facility Superintendent	Robert.Bergesen@sfmta.com
X	X	Eric Lee **(EL)**	SFMTA	Cable Car Engineer	Eric.Lee2@sfmta.com
	X	Wesley Valaris **(WV)**	SFMTA	Division SOM	Wesley.Valaris@sfmta.com
	X	John Becker **(JB)**	SFMTA	manager of the Mechanical Systems Group	John.Becker@sfmta.com
	X	Arne Hansen **(AH)**	SFMTA	Vehicle Maintenance Superintendent	Arne.Hansen@sfmta.com
X	X	Lang Huey **(LH)**	SFMTA	M/P Engineer	Lang.Huey@sfmta.com
	X	Foo Eng **(FE)**	SFMTA	Project Manager	Foo.Eng@sfmta.com
X	X	Qingwen Xi **(QX)**	SFMTA	Electrical Engineer	Qingwen.Xi@sfmta.com
X	X	Frank Lau **(FL)**	SFMTA	Project Manager	Frank.Lau@sfmta.com
		Becky Alderete **(BA)**	SFPUC	Manager	balderete@sfwater.org
		Pamela Gee **(PG)**	SFPUC	Utility Analyst	pgee@sfwater.org
X	X	Patricia Solis **(PS)**	SFPW-BOA	Section Manager	Patricia.Solis@sfdpw.org
	X	Tim Kempf **(TK)**	SFPW-PMB	Project Manager	tim.kempf@sfdpw.org
X	X	EunJoo Cho **(EC)**	SFPW-BOA	Project Architect	eunjoo.cho@sfdpw.org
	X	Jennifer Dameron **(JD)**	SFPW-BOA	Job Captain	Jennifer.Dameron@sfdpw.org
		Arfaraz Khambatta **(AK)**	SFPW-DAC	Disability Access Coordinator	Arfaraz.Khambatta@sfdpw.org
		Sue Chen **(SC)**	SFPW BOE/ CP&C	Structural Engineer	Sue.Chen@sfdpw.org

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Item	Discussion	Responsible Party/Status
	1.0 ADMINISTRATIVE/MISC/CLIENT ITEMS	

4-1.1	**Topic: General items**
	• **Conceptual plan draft set** – submitted on 8/13
	• **MTA Client input by 9/3** (3 weeks client review period)
	  ○ Large MTA group review comments
	• **Upcoming Schedule:**
	  ○ **MTA Client input** by 9/3
	  ○ **Final Conceptual plan** around 10/1
	  ○ **Master plan Draft** 11/18
	  ○ **Client review** by 12/24
	  ○ **Final Master plan** around 1/22	

	5.0 ARCHITECTURE	

4-5.1	**Topic: Proposed overall layout presentation**
	(EC) presented proposed plans and 3D interior views – See the presentation pdfs, attached.
	▪ **Proposed plans**
	  ○ Team/Department – colored plans
	  ○ 3D interior views
	▪ **Construction Phasing plans**
	
	Feedback & discussion
	
	▪ **Overall presentation**
	  ○ (LI) expressed that presentation is very helpful. LI asked if EC could be available to present the plans at MTA internal meeting; it will be a high-level presentation, not equipment layout review. (EC) responded that she can be available for the meeting.	

	○ (LI) mentioned that the entire roof replacement should be included in the work scope. (EC) responded that this will be included in Master plan. ○ (RB) MTA will provide comprehensive review comments by 9/3 ▪ **Phasing plans** ○ (LI) preferred the phases to read from left to right in the phasing plan sheet. (EC) will update accordingly. ○ (PM) suggested that restroom work on L2M (Phase 4) could be combined with restroom work on other levels (Phase 2). (EC) responded that this is a good point. However, can MTA operations afford to close all restrooms during Phase 2? ○ (EC) asked the maximum closing of operations; maximum six weeks without service in MOU. (RB) responded short closing as much as possible. (LI) asked (RB) about operational perspective. (RB) stated that shutting down for more than 4-5 weeks would require 5-6 weeks to resume the cable car operation. ○ (LI) phasing plans should include construction duration for each phasing. (EC) duration will be addressed in the final package.	EC EC EC
6.0 STRUCTURAL		
4-6.1		
7.0 MEPF		
4-7.1		
8.0 FIXTURES FURNITURE & EQUIPMENT		
4-8.1	**<u>Topic</u>: Proposed equipment layout presentation** (JC) Stantec presented proposed equipment layout – See the presentation pdfs, attached. **Feedback & discussion** ▪ **Storage area** ○ (RB) expressed that storage spaces were reduced a lot in the current design. (JC) explained that the design team focused on equipment layout more and not much on storage cabinets; However, proposed equipment layouts include sufficient storage areas. (RB) concerned about losing floor storage areas for shop parts e.g. Pulley assembly area, Splicer workroom, etc.	

	○ (RB) mentioned that MTA could consider off-site storage space options and (LI) might reach out to stakeholders for this. ○ (EL) mentioned that the spreadsheet provided by MTA previously includes storage area information. (EC) Design team will review the spreadsheet and study storage cabinet locations.	EC/JC
10.0 FIRE ALARM		
4-10.1		
11.0 HISTORIC		
4-11.1		
NEXT STEP		
	▪ **Client feedback**: MTA RB and EL to provide comprehensive feedback by 9/3 ▪ **MTA internal meeting presentation**: LI to check a schedule to invite EC to present high level plans	RB/EL LI
ITEMS RESOLVED		

Conclusion:

NOTE: These minutes will be relied upon as the approved record of matters discussed and conclusions reached during the meeting. If you disagree with the contents, please send the author a letter outlining your disagreement within seven calendar days of the issuance of these minutes.

Cable Car Barn Draft Conceptual Plan Comments									
	Comments from Review of CCB Draft Conceptual Plan (Meeting)								
No.	Name	Page #	Topic	Level	Comment	Design Team Questions/ Responses (Red: BOA Purple: STANTEC)	Meeting Input (2021-0908) Attendees: MTA Licinia, Rob, Eric, BOA EunJoo, Stantec Jessica	Comments discussed	Discipline
1	Janet Gallegos	2	Weld Shop	First Floor	Where you plan to put the weld shop, what is it right now?	MTA: Currently, office space and compact stoarge space. Some new office space will be in the first floor mezzanine.			MTA
2	Janet Gallegos				What time frame will this be accomplished?	MTA: Phase 1, 1A and 1B will take about a year			MTA
3	Foo Eng				Any idea of when Phase 1 would be starting?	MTA: There is not an identified source of funds for the project yet. A schedule would be created after.			MTA
4	Janet Gallegos				Will construction effect operation of the Cable Cars?	MTA: An operational analysis will need to be done first.			MTA
5	Robert Bergesen			2M	We can't have open office when some employees are on discipline cases- having people walk by and be able to look at screens. Privacy issue.	EC: Licinia directed us to follow SFMTA planning standard; Open office spaces for all staff except for Superintendent and managers. Need to discuss further.	Rob and Licinia agreed to add walls to the open office space to section off for Admin staff. Frosted glass could allow more light transmission. Provide a private Union office (possibly remove AG changing room and make room for a private office) EC: BOA will study		Arch
6	Fred Butler				Revenue room needs to have an access window overlooking the pullout	EC: Agreed. Will update accordingly.			Arch -
	Comments from Review of CCB Draft Conceptual Plan (Emails)								
7	Robert Bergesen			2M	2M69 Men's restroom needs another stall (toilet) one is not sufficient for the number of staff on this floor. Higher ration of Men to women on this floor. Is there a shower in this room? Clarify what is in the top of the room.	EC: Current design is based on M:W ratio = 6:4 and 60% of total expected Staff per my conversation with Eric previously. We will study if we can add one more stall to Men's restroom and remove one from Women's restroom. There is a shower inside of the Men's restroom.	Rob: Current staff ratio is 20:1= M:W EC: BOA will calculate 50:50=M:W for code minimum fixture counts and then use 20:1 for additional FTE counts to see if men's toilets can be increased.		Arch
8	Robert Bergesen			2M	2M66 AG changing room but there is no "changing room" for Men or Women. If we are converting to changing room type of locker rooms then there needs to be equivalent rooms for each gender.	EC: I discussed this with Licinia previously. I understood that separated "changing room" is not needed since Operations do not change their uniforms in the locker room. All gender changing room is proposed in case if staff need to change their clothing. We can omit the changing room and convert to other purpose. Please provide a direction.	EC: See line 5 above. We will omit the changing room.		Arch
9	Robert Bergesen			2M	2M65 Theses lockers are for storage of items when on the job in the field and not currently a changing room therefore should not be a changing room.	EC: We can omit the changing room and convert to other purpose. Please provide a direction.	EC: See line 5 above. We will omit the changing room.		Arch
10	Robert Bergesen			2M	2M61 needs a split Dutch door or pass thru counter. This room does not look large enough for the radio chargers, work station and HCR4 hand sets	EC: We will look into the details			Arch
11	Robert Bergesen			2M	2M60 this is a security room to collect fares which needs a service window	EC: We will add a service window			Arch
12	Robert Bergesen			2M	2M59 A/B areas need to be discussed regarding purpose or intended use	EC: This open space is proposed per MTA planning standard	EC: See line 5 above		Arch
13	Robert Bergesen			2M	2M63 will need Operations approval to remove the pool and ping pong tables along with the couches. This will be a Union issue	EC: We can replace two tables with the pool and ping pong tables along with the couches			Arch
14	Robert Bergesen			2M	2M is missing the union office, admin support office and no copy room location.	EC: This open space is proposed for the union office and admin support office per MTA planning standard. We can look into locating copy room.	EC: See line 5 above; BOA will provide a union private office and a shared copy room		Arch
15	Robert Bergesen			2M	Still awaiting feedback from our manager on 2M	EC: Noted	Rob: Proposed 2M layout is close enough once open office and union office issues are addressed.		No Action Rqd
16	Robert Bergesen			2	No trash bin location need to locate near 250	EC: Team will look into the location	**MTA/Eric to provide cutsheet**		MTA Arch
17	Robert Bergesen			2	No location for Car Cleaner materials	EC: They can be located near the Grip building area. STN: -Sure. Agreed. They can be located near the new Grip Building Area. -MTA to provide a cutsheet, share images/data/dimensions, etc – What do they need? What is this function? What type of storage is being used now – open shelving? -Is water needed for this function?	Rob: Car Cleaner materials should be separated from Grip Building area/ Jackson St since car cleaning happens near Pull-out door area/ Washington St. JC: Possibly on the east side of new 12kV room Rob: Current motorcycle parking there Licinia: Need to discuss employee parking issue with Julie as a big group discussion Rob: Suggested dividing a proposed 251 for Superintendent office and provide a vertical car cleaning cabinet. Also Adding more skylights on L2 if possible. EC: BOA will study the layout **MTA/Eric to provide cutsheet**		MTA Arch Stantec
18	Robert Bergesen			2	251 area needs separation from paint and dust	EC: Team will study; Possibly enclose the break area and convert this space to workstations	EC: See line 17 above		Arch
19	Robert Bergesen			2	208C needs to have a separated room/office for Superintendent	EC: Per my conservation with Eric, MTA previously, Superintendent office can be shared with other work stations since he spends most of his time at 202, Supervisor's office. The 2nd floor is pretty maxed out by other programs so it might be difficult to create a separate office for Superintendent. Perhaps, 251 can be omitted and convert this space to workstations since 251 is not the required program.	EC: See line 17 above		Arch
20	Robert Bergesen			2	On the corner (or closely located) of 208 there will be a large air tank plumbed to the compressed air system. Paint is a large user of compressed air and there needs to be a local air storage tank for supply	STN: -Provide cutsheet/data. Knowing the size & what pieces of equipment this connects to will help us identify where this could go in plan.	Rob provided the cutsheet via email 2021-0908 Rob: Air compressor - place close to paint booth outside EC: Stantec to study		Arch MEP Stantec

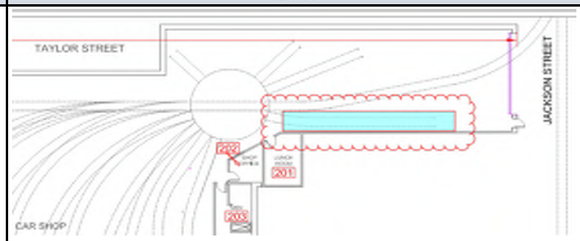
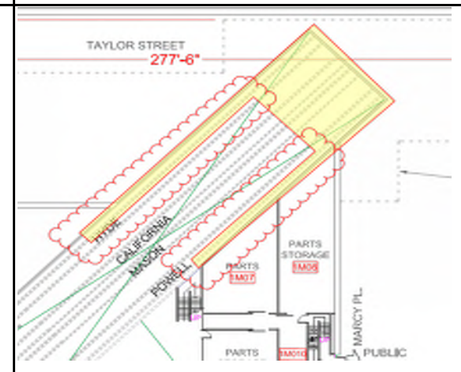
21	Robert Bergesen			2	208D Is this an open face booth? or paint room? Will it have ventilation? Is there a paint mixing area with fume extraction included in the paint room or paint booth?	EC: Design/build option? STN: -We also need direction/clarification on how this room will be used from the staff. There is currently a temporary tent in this location being used for a similar purpose – We need to know from the staff, what's working/what's not? -Our design is: Hard walls, enclosed on 3 sides (note: the east wall against the Paint Room may be designed by manufacturer-specified wall assembly). Yes, the ceiling can be a hard ceiling with ductwork ventilating straight up through the roof above. The 4th wall along the south is shown with a curtain that can be drawn closed to limit fume and dust migration during spraying activities. This way you can control the fumes, but also maximize access and flexibility in moving equipment and painted items in/out. The curtain can be tarp; taken down and washed periodically. -Staff to explain the paint mixing area required. We have a paint canister mixer bolted to the ground just outside of the Spray Booth. Is this location acceptable; or does it need to be inside the Spray Booth?	Rob: Need a separate spray booth for painting small parts Need to increase painter area Need to provide fire rated paint storage; not in Paint Room since lead based paint would be used in this room; not in Spray booth since dust can be collected in shelving/cabinets. EC: Stantec to study layout		Stantec
22	Robert Bergesen			2	Do we need a janitor's closet on each floor?	EC: Existing floor plan has a janitor closet on each floor so we keep the same way for proposed plans. MTA to advise if this is not the case.	Rob thinks two janitor's closets are sufficient. BOA to check with Licinia if we can reduce to TWO **MTA/Licinia to provide direction.**		MTA Arch
23	Robert Bergesen			2	203 Locker count seems high	EC: The locker count is based on the information provided by Eric, MTA 5/25 & 6/17 emails. We will double check			Arch
24	Robert Bergesen			2	253 grip tables in current layout are not accessible to perform tasks. Need to factor grip storage. Will this room have walls to the roof or a roof on the room?	STN: -Needs discussion. Room can be enlarged to "L-shaped" layout fairly easily. -Yes. Walls to roof or roof on the room – either one can be accommodated. There is a skylight and large ductwork above this location currently. Depending on the grip table layout changes, the room might be reconfigured, and that will determine if the walls go to the underside of deck or lower roof. -Proposing a Working Session with Rob to address.	Rob: Need to increase grip building area footprint. EC: Stantec to study layout		Stantec
25	Robert Bergesen			2	Near 253 see if we can add a Spray Wash machine for grip cleaning	STN: Sure. Any Preference? Provide a cutsheet.	Rob: Enclosed grip bldg cleaning area EC: Stantec to study layout		Stantec
26	Robert Bergesen			1M	1M01 is a tenants area no need for lockers	EC: The proposed six lockers are for custodians, security personnel, not for museum staff. Custodians and security personnel are needed lockers and this is confirmed with Licinia 5/25 email. We can reduce the QTY to two since the max shift is one each and redistribute 4 lockers to L1M Shop area.	Rob: Tenants space - no access for Custodians and security personnel. EC: BOA will relocate lockers to other area (e.g. women custodian can use L1 w restroom locker)		Arch
27	Robert Bergesen			1M	Access to the new 1M53-57 from museum in not 24 hour accessible. Museum is a rented area with limited access.	EC: We added the proposed walkway to provide ADA access route and egress purpose only. Cable Car Barn staff should use the proposed walkway near the shop mezzanine area.			No Action Rqd
28	Robert Bergesen			1M	1M53-1M57 printer copier area needed. Possible to add some area to this area up to near the crane limit	EC: It might be difficult to increase the footprint of the L1M. We can add a copier/printer into share office either 1M53/1M57.	EC: BOA will check with IDC Struct if area can be extended.		Arch Struct
29	Robert Bergesen			1M	1M57 Not a good location for Vehicle Maintenance	EC: Vehicle Maintenance staff were relocated from old 101 Room.	Rob clarified that old 101 Room has Track maintenance, not Vehicle. EC: BOA will update department name accordingly.		Arch
30	Robert Bergesen			1M	1M08 Electrical Maintenance Tech and Electrician not machinist work area	EC: Room name was misplaced on new floor plan. Will revise			Arch
31	Robert Bergesen			1M	1M07 Store Room part materials and storage. Add high density storage system	EC: Stantec to respond; Weight & Height to be consider; Lang: sprinkler….	EC: BOA and Stantec to study		Arch Stantec Struct MEP
32	Robert Bergesen			1M	1M09 add high density storage system	EC: Stantec to respond; Weight & Height to be consider; Lang: Sprinkler	EC: BOA and Stantec to study		Arch Stantec Struct MEP
33	Robert Bergesen			1	101B add to 101A?	EC: If 101B is not being used, we can study to combine with 101A	Rob: 101B is not being used. EC: BOA will demo 101B and combine with 101A		Arch
34	Robert Bergesen			1	101A or 101 need to be a track Supervisor Office. (should have 4 desk)	EC: Correct. Track supervisor was relocated to 101A. Please refer to proposed program	Rob: Ok		No Action Rqd
35	Robert Bergesen			1	102 water bottle storage?	EC: Will study; Any plan to replace water jugs with built in water dispensers so we can utilize the storage area for staff?	Rob: Union requirements - part of contract to have water bottle storage		Arch
36	Robert Bergesen			1	151 blocks critical vision of the equipment and is a safety hazard.	EC: Will study			Arch
37	Robert Bergesen			1	153 lockers? Are these the serviced linen lockers?	EC: Correct			No Action Rqd
38	Robert Bergesen			1	109 is missing our UPS systems needed for the controls located in 108	EC: Existing UPS systems in old 109 will remain in 153. We will indicate existing UPS system to remain in our drawing			No Action Rqd
39	Robert Bergesen			1	110A if considered a supervisors office needs to be separated and lockable. Will this be for all propulsion supervisors?	EC: This is proposed for Chief Stationary Engineer, Machine shop supervisor and splicer supervisor per MTA's comment on 6/24/2021. Per MTA's Planning standard, supervisors will not have a private office.	Rob: Okay to keep them in the same room but need privacy. BOA will study adding wall or provide privacy from shared workstations		Arch
40	Robert Bergesen			1	110 will this be for all of propulsion or just splicer dept? If only splicing dept need to verify locker counts	EC: This is for all of propulsion staff			No Action Rqd
41	Robert Bergesen			1	110B needs cable storage and Rigging lockers, tool storage	EC: We are not changing 110B room layout so existing cable storage/lockers/storages should remain	Rob: Ok		No Action Rqd

42	Robert Bergesen			1	117 Machine shop needs to have the equipment laid out to verify space allocation. The office will be removed from this location to increase space.	STN: -Unfortunately, Stantec cannot accommodate this request. The current equipment placement is non-compliant for working clearances. If we replicate the existing layout on our drawings, we are essentially taking ownership of their placement and consenting to that layout. In discussions with Pat, we can't own this liability in our drawings as if we are recommending it. However, if DPW will show the existing locations in their backgrounds, as part of the As-Built condition, then we can certainly show new equipment and new layouts abutting the space.	Rob: No need for as-built equipment layout from Stantec or DPW. Rob and Eric will develop the existing layout; Design team will focus on Grip bldg area and carpentry area		MTA
43	Robert Bergesen			1	Move trash bins to the wall closer tot eh roll door only 2 bins. The remaining area for material storage along with rack. Need to secure the rack and material storage.	STN: -Sure. Note that this will make the removal of pipes to/from the Pipe Storage rack more challenging (less clearance). -Can staff take dimensions of these; so we know we have the right sizes represented?	Rob: Only two bins. **MTA/Eric to provide sizes**		MTA Arch Stantec
44	Robert Bergesen			1	Between stair 6 and storage area add pallet racking (high vertical storage)	STN: -There is currently a palette rack already in that location. If DPW can show its location in their backgrounds, it will show through ours as "existing."	Rob: Keep existing as is. EC: BOA will indicate the existing storage area.		Arch
45	Robert Bergesen			1	Sand Blaster location (can not be located in the machine shop) was in 111A	STN: -There is no Sand Blaster in the Machine Shop. -Is the Yellow Sand Blaster in Pulley Assembly Area still in operation? And is it still needed in the Pulley Assembly Area? If so, it needs to be added to the Equipment List and the Pulley Assembly Area layout has to be revisited to accommodate.	Eric: E415 (storage shelves) can be removed from Pulley Assembly area. EC: Stantec to study location		Stantec
46	Robert Bergesen			1	111 add work station for CAD and programing	STN: -If additional workstation (beyond E409) is needed, then the layout of the Pulley Assembly Room needs to be revisited.	EC: Stantec to study location		Stantec
47	Robert Bergesen			1	101 will need record storage (inspection records)	(EC: I think Rob meant 111) STN: -Confirm Room 101 or 111. -How are these records currently being stored? Is this a file drawer? Flat file? Does it need to be in Pulley Assembly Area or somewhere else more central?	Rob: Room 111 for file cabinet EC: Stantec to study location		Stantec
48	Robert Bergesen			1	Barrel storage for in use barrels (laid on their side with dispensing access)	STN: Sure; We can look into side-positioned barrel storage.			Stantec
49	Robert Bergesen		Overall Comment		This is a coarse review but we are on a good path. Major issues to work out are parking, storage of tools and equipment, copy machines large format scanner possibly located in inspection or on the 1M new segment Crane over the machine shop. Vertical grip storage on 2	EC: Thank you! Licinia informed me to hold off on additional parking. Need clarification on Crane over the machine shop and vertical grip storage on 2 (EC: Stantec to respond)	Rob: Crane for Grip bldg area on Level 2. Stantec to study No action required for cranes at Machine shop yet 		Arch Stantec Struct MEP
50	Eric Lee	6			Why are renovations for operations floor considered phase 4? They've been long overdue for at minimum HVAC upgrades.	EC: Will review and update accordingly			Arch MEP
51	Licinia Iberri	6			Are the operations improvements contingent on any other phases? Per Eric, it would be nice to bring this toward the front if we could. Please describe in phasing plan which phases could occur concurrently if funding were available and operational impact limited.	EC: Will review and update accordingly			Arch MEP
52	Eric Lee	7		1	Some of the legend symbols are missing on the drawing? For example, I don't see any accessible/non-ada accessible entrance symbols on this drawing. Also, accessibility of entrances on this floor was brought up. What is the status of this?	EC: We have accessible entries shown on G2.11 thru G2.14.			No Action Rqd
53	Eric Lee	8		1M	Museum is tenant in SFMTA building. It may be an issue to have to go through a tenant's space in order to take the elevator?	EC: The path to the elevator through the museum is only for ADA access. Staff will use the proposed walkway near the level 1M shops.			No Action Rqd
54	Licinia Iberri	8			we can work something out with the museum here -- and this should be for ADA access only.	EC: Agreed with Licinia.			No Action Rqd
55	Eric Lee	9		2	How final is this location for 12kV? Have required exemptions (PG&E) been granted?	EC: The proposed location for 12kV is final as we went through several options and also reviewed with SFPUC previously. Actual PG&E permit will be submitted in a later phase.			No Action Rqd
56	Eric Lee	9		2	Is the doorway of the restroom being by the lift okay? Potential to be temporarily blocked by lift operations? No railing to prevent someone from falling? What's the status on "accessibility in the pit"?	EC: We can study further but there are additional restrooms nearby if temporarily blocking happens. This is more for operational matter. I believe that we agreed to keep the existing lift/ Pit as is to avoid full accessibility upgrade of the entire pit area. As for the railing, we can add a note "provide railing along the pit" in our drawings.	Eric: Ok		Arch
57	Eric Lee	10		2M	Confirmed this gym to be available to all facility employees, so all facility employees must have access to this floor and room?	EC: Refer to Licinia's response below			Arch
58	Licinia Iberri	10			Yes, wellness spaces should be open to all employees. There should be no key or access different for maintenance and operations employees except for private offices and secure storage. Perhaps we move this closer to the stair/elevator so mechanics feel more welcome.	EC: This location is preferred since close proximity to the breakroom & showers. However, if preferrable, this can be moved to the stair/elevator.	Licinia: Suggested moving GYM along with Classroom to elevator area for public zone; separated from private zone. EC: BOA will study and revise layout accordingly.		Arch
59	Eric Lee	11	Site Plan		Part of Cable Car Curved Track Replacement project scope.	EC: Will note on the drawing			Arch

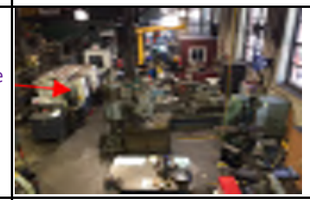
60	Eric Lee	18	Demolition Plan	1	For these note identifiers, what is the numbering scheme? Does this numbering scheme aid in finding the particular note on the drawing? Not a big deal, but it's a little difficult to match these notes to their references on the drawing.	EC: Demo keynotes are organized based on Master Spec CSI numbers. This is BOA standard. We can go over more if you have specific questions.	Eric: Ok		No Action Rqd
61	Eric Lee	18	Demolition Plan	1	Must ensure John Becker is aware of details and extents of intended elevator work.	EC: Please coordinate with John Becker and provide MTA input	**EC: MTA/Eric will coordinate with John Becker and provide input**		MTA
62	Eric Lee	23		1	Files/miscellaneous storage accounted for?	EC: Our team will look into storage areas and update accordingly.			Arch
63	Eric Lee	24		1M	What is the role of the 1973 plans for these offices? Should we expect that the output from the Master Plan completely supersedes the old 1973 new office drawings?	EC: Our project is the Master Planning, not Construction documents and only conceptual plans are included in the MOU. MEP and Structural will provide narratives without drawings. The old 1973 drawings are outdated and not up to the current code.	Eric: Ok EC: Revit/CAD will be included in final deliverables. BOA will look into non-licensed version of 3D format.		Arch
64	Eric Lee	24		1M	What happens to exhaust fans on top of I-beams? Is there some planned replacement for something equivalent?	EC: We will discuss with MECH engineer.			Arch MEP
65	Eric Lee	24		1M	Plans for glass walls / transmission of light / any measures to minimize feeling of being cooped up in these offices? Utilize full glass (instead of just A1 windows) on tension run viewing sides of these offices?	EC: We can look into full glass option.			Arch
66	Licinia Iberri	24			To solve for Rob's concern about discipline and need for privacy, these can be placed into shared offices (2 or 3) if needed, but should not have dedicated single office spaces. If there was any way to squeeze a 4 person conference room in there, that could solve it also.		EC: See line 29 above		Arch
67	Licinia Iberri	24			Agree with Eric that we should do what we can throughout to improve natural light passage -- use as many translucent materials as possible while still being longlasting and industrial	EC: We can look into full glass option.			Arch
68	Licinia Iberri	24			For all water fountain locations, is this still a thing? Seems like there should also be bottle filler taps here?	EC: This is a code requirement. We proposed water fountains with bottle filling station.			No Action Rqd
69	Eric Lee	25		2	Fully enclosed? Any measures to minimize feeling of being cooped up?	EC: Grip Building Area can be fully enclosed. We will study	EC: Stantec to increase footprint of grip bldg area & address noise concerns		Arch Stantec Struct MEP
70	Eric Lee	25		2	Confirm these are the Alsco uniform lockers.	EC: Confirmed. Refer to Locker schedule on G 0.14			No Action Rqd
71	Eric Lee	25		2	208D and 208B room names mixed up?	EC: They are correct. Please clarify the comment.	Eric: Ok		No Action Rqd
72	Eric Lee	26		2M	Was storage for radios and radio chargers that are currently in the existing dispatch room accounted for? Is there a recommended location for these? Is that what door 2M61.1 is intended for? Or Storage rooms 2M56/2M52?	EC: Will review and update accordingly			Arch
73	Eric Lee	30	Door & Frame Schedule		111 instead of 111B	EC: Will update accordingly			Arch
74	Eric Lee	30	Door & Frame Schedule		Inspection Room instead of Steam Cleaning Area.	EC: Will update accordingly			Arch
75	Eric Lee	36	Master Plan - Concept Study	1	Measuring arm has it's own granite table (currently in the lunchroom) that is on wheels. Could place against wall when not in use and then pull to empty areas.	STN: No objections. Can you provide images & size of existing granite table? Does this existing table replace the one shown in our plan? If not, do you need space for 2 granite tables (1 existing, 1 new)?	EC: Stantec to study		Stantec
76	Eric Lee	36	Master Plan - Concept Study	1	To clarify, this parts wash should stay here, and the one in the new 2nd floor grip area is a new one.	STN: No visuals to accompany this comment - When you say "here" what is that in reference to? If its in reference to the Parts Washer shared between Steam Cleaning Area & Pulley Assembly Area, then that's already being tracked accurately in the spreadsheet: 1 to remain in Steam Area; 1 to be purchased for Parts Washer Area. Review & confirm.	EC: Stantec to study		Stantec
77	Eric Lee	36	Master Plan - Concept Study	1	These storage shelves do not need to be in the Pulley Assembly Room, nor should they be. These storage shelves contain miscellaneous items belonging both to Track and Propulsion groups. Also, pallettes are stored on these so they require forklift access. Perhaps, the New Storage Area can accommodate the items from these shelves.	STN: Correct. We are not relocating the storage shelves to Level 2 with Grip Building Area. Anything that doesn't belong to the Pulley Assembly Room can remain on Level 1 to be integrated into the New Storage Area.	EC: Stantec to study		Stantec
78	Eric Lee	36	Master Plan - Concept Study	1	This hot pressure washer is used outside of the barn facility, and just stored in the barn. Needs to be accessible by forklift. Seems difficult to drive forklift through the hallways to access this piece of equipment. Perhaps keeping it closer to the front entrance would be better.	STN: Sure. We can look into an alternative location, more easily accessible by forklift. This may affect the layout of other items already shown in plan.	EC: Stantec to study		Stantec
79	Eric Lee	37	Master Plan - Concept Study	2	Will need to confirm storage space is available for grips that are currently on the 1st floor adjacent to the existing grip repair area as well as those currently stored in the freight elevator.	STN: No visuals to accompany this comment. Please point in photo what you are referencing. I see a pipe storage rack adjacent to this area that is already accounted for. What storage areas are being commented on here? Also... This is the first we're hearing of grips being stored INSIDE the frieght elevator? Is that correct? Does that mean the elevator is not being used for other freight? Please provide images and sizes required for what's inside.	Eric: Grips are stored vertically For future, no grip storage in Freight elevator Rob: Suggested utilizing space above the bike storage area for grip storage on Level 2? Stantec to study		Stantec

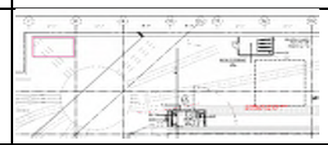
80	Eric Lee	37	Master Plan - Concept Study	2	New grip building layout desired to ideally be nearly identical to existing 1st floor grip area layout, but with one ton chain hoist able to travel between the elevating platforms. Elevating platforms require clearance all around the platform.	EC: This location is what we reviewed and discussed with MTA Rob and Eric previously. Clear direction is required STN: The Grip Building Area needs broader discussion than just Stantec. Initial thoughts... We can look at re-laying out the space to match Level 1; but we all need to understand the challenges. There is an existing duct that limits the addition of an overhead hoist. A new hoist will likely be a free-standing structure with new footings at grade, and not attached to the roof to avoid added forces on the structure - DPW Structural to weigh-in. The ductwork overhead also poses a challenge. It may have to be rerouted to accommodate hoist - DPW Mech Engineers to weigh-in. If the room is laid-out identical to Level 1, then the walls on the north side of the room will partially-block the skylight, as hard walls were requested to mitigate sound - MTA to confirm. We also need details on the grip storage shelving (and those in the freight elevator) per previous comment; so we can integrate into the new layout. These requests should be considered wholistically, as they can't be solved by comment log responses. Stantec requesting a discussion - EunJoo to coordinate. 	EC: The existing ducts could be relocated to nearby. Will coordinate with MEP. Stantec to study the layout and BOA to coordinate MEP and IDC Struct.		Arch Stantec Struct MEP
81	Eric Lee	37	Master Plan - Concept Study	2	Confirm access to compressed air for compressed air tools	STN: We have no objections. But this will be managed by MTA Engineers. It may be easiest to review the Equipment Inventory and note which tools require compressed air, so that the engineers know where to route this in their plans.	EC: Design team to review and study		Arch MEP Stantec
82	Eric Lee	37	Master Plan - Concept Study	2	Ideally, there is some additional provision in the grip area for pressure washing a single grip at a time and individual grip parts as well. This function is currently served by the 1st floor steam wash area. New provision in new grip space can be smaller than 1st floor steam wash area.	STN: Discussion Needed. Can the Parts Washer in the spreadsheet accommodate both these functions? If not, can a larger load be carted down (by way of freight elevator, once replaced) to Level 1 to complete larger jobs?	EC: Stantec to study		Stantec
83	Eric Lee	37	Master Plan - Concept Study	2	Also, need metal scrap bin for grip repair area. Dimensions equal to existing one on first floor.	STN: Yes. This is currently being shown in plan and noted in the spreadsheet (E307).			Stantec
84	Eric Lee	37	Master Plan - Concept Study	2	The storage racks that were previously on the 2M level carpentry space hold more valuable items, so there needs to be some provision to secure items like these.	STN: The storage racks for lumber in that space are being shown in the new plan - see images. The break area items (minifridge, tables/chairs, etc) are slated for rebuild on Level 2 (DPW is managing this space). Other valuable equipment in the lower storage cabinets or in the tall cabinets can be sorted in the new enlarged Tool Storage Room. For lockers and any general-purpose cabinets, Stantec has been directed not to show these in our drawings; but rather focus solely on equipment and parts storage - DPW will manage the relocation and/or replacement of these lockers & cabinets.	Rob: Carpenters can share space e.g. Band Saw; E719 is painter equipment, not Carpenter. EC: Stantec to study equipment layout to maximize the space use		Stantec

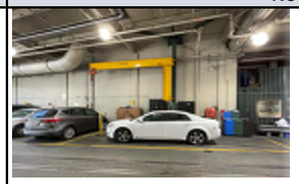
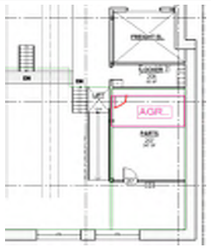
	Area	Questions	MTA Response	Notes	Emailed Date
1	All levels	Existing FTE counts and Future FTE counts per Floor (full time employee)	4/20/2021 MTA Eric: Per phone call with Eric, refer to 07012020 spreadsheet for existing and future FTE counts per floor.		2021-0412
2	All levels	Required lockers QTY per Floor/ Room and Size requirements (e.g L1 Restroom lockers 16…, L2M Breakroom lockers xx…, 24”x24”x3h)	4/20/2021 MTA Eric: Per phone call with Eric, refer to column L of the 07012020 spreadsheet and filter by Activity=Lockers for the 08202020 spreadsheet.	If MTA already provided this previously, please let me know where I can find this information.	2021-0412
3	All levels	Required showers QTY per Floor	4/20/2021 MTA Eric: 1st floor: 1 for each Men's, and 1 for Women's. Also, possibility for an additional locked, separate, gender neutral shower could be explored. 2nd floor: same as 1st floor. 2M: Same as 1st and 2nd. If there can be a gender neutral shower, possibly include in a new (not currently existing) lactation room?		2021-0412
4	111A and 111B	Depression beam at Pulley Area and Weld open area per Eric's excel. Can you provide more information on Depression beam? Function, size or photos?	4/20/2021 MTA Eric: The Depression Beam work area is used to rebuild/assemble depression beams. Depression beams are track mechanisms (beneath the track along the Cable Car lines) that "depress" the cable at locations where the cable would otherwise tend to elevate and contact the bottom of the slot rail. Depression beams and large pullies/hubs are also stored in the dedicated work area. A mechanism to lift (currently a 1 ton crane is used) and place the depression beam on the holding fixture is needed for rebuilding and assembly. This work station alone measures approximately 7' x 10'. Adjacent to the 7' x 10' work station is a storage structure that accommodates 12 depression beams. Each depression beam is approximately 1' x 1' x 7'.		2021-0412

	Area	Questions	MTA Response	Notes	Emailed Date
5	111C	Relocating Grip bldg area to level 2: During 2021-0408's EC site visit, Eric MTA mentioned that the existing grip building area on Level 1 could be relocated to Level 2 near the Jackson st entry area so the existing grip area can become a new Slicer workroom. Here are some follow up questions. Does the Grip area have any relationship with level 1 function? What is the workflow of the Grip area? Does the Grip area need to have welding area? What are the required equipment and space requirements?	4/20/2021 MTA Eric: No relationship with level 1 function with exception to pressure washing grips when needed and use of the solvent tank. The work area includes die removal and replacement area, parts storage, two benches to assemble small components on and storage of grip assemblies (that overflow into adjacent space as well as freight elevator) which are separated by "rebuilt" and "need to be rebuilt" (minimum of 25 total). The work area requires access to compressed air for tools, access to grease, and ventilation/fans. Noise is of concern, as the process of rebuilding the grips is quite loud. Measures for sound attenuation should be considered, for both the public and employees. Again, storage is a concern as grip assemblies are currently stored in areas adjacent to the grip building area as well as in the freight elevator. Rob prefers not to place the splicer work area in the current grip building space, but is okay with a temporary office being setup there. No welding area needed in the grip area. The work flow of the grip area includes laying the grip horizontal in the work area and disassembling to access the grip jaws which contain the dies. Dies are brought to the work bench with the die pressing fixture. Compressed air tools are used to press old dies out and new dies in. The grip is then reassembled and placed in a		2021-0412
6	109	Existing electrical room: Can you provide ceiling Height? The north of the room is potential office space or storage area.	4/20/2021 MTA Eric: Ceiling height was measured to be 10.96 ft. In areas where there is a horizontal I-beam beneath the ceiling, the distance from floor to bottom of I-beam was measured to be approximately 9.5 ft.		2021-0412
7	100	Extended crane: Rob and Eric are okay with extended crane pathway that might conflict proposed walkways slightly. Cables/wheels can be shifted as needed per Eric. 2021-0408 EC site visit. Please let me know if MTA has any concerns.	4/20/2021 MTA Eric: Will do. Refer to 7/20/2021 Email from MTA		2021-0412
8	2M07	2M07 Revenue room - empty? For future Revenue room, please provide size requirements - 1 desk in secure room?	4/20/2021 MTA Eric: Can reduce the size by 50% of current room per Wes, Senior Operations Manager of Cable Car. Needs a counter, desk and some small storage.		2021-0412

	Area	Questions	MTA Response	Notes	Emailed Date
9	110	RM 110 Splicer Breakroom locker Qty: There are only 30 lockers per the photos (see attached). The 2020_0820 excel file shows 44 QTY but it was reduced to 36 QTY per our recent email correspondence. I am not sure where the extra 6 lockers for the total of 116 on Level 1.	5/25/2021 MTA Eric: Apparently some lockers were removed between the time I input data into the 082020 spreadsheet and the more recent time when I took pictures of the Splicer Breakroom. I've confirmed that there are currently 30 lockers in the Splicer Breakroom, instead of the 36 I originally counted.		2021-0524
10		SFMTA standard vs 2020_0820 P1 P2 L1 L2: Licinia provided SFMTA standards last week and it appears that the locker sizes are different from the excel file – see snips below. Which one should we follow?	5/25/2021 MTA Eric: Use the SFMTA standards that Licinia provided, instead of dimensions shown in 082020 spreadsheet, when considering personal lockers (P1 and P2). Use existing Alsco uniform locker cabinets for reference (for example, refer to the lockers in Room 206) when considering the coveralls and shirts&pants lockers (L1 and L2) described in the 082020 spreadsheet. 5/25/2021 MTA Licinia: Cutsheets of lockers; P:\PW-MTA-1708-Cable Car Barn\4.0_Plan-Program\4.02_Programming\SFMTA Standards File: 2021-0525-MTA Space Standards Locker Sheets	P:\PW-MTA-1708-Cable Car Barn\4.0_Plan-Program\4.02_Programming\SFMTA Standards File: 2021-0518-SFMTA Facility Space Planning Standards EC to clarify full, half and third height dimensions in SFMTA standards	2021-0524
11		Future Locker QTY: For future locker QTY, should we refer to the expected total staff #? I would like to know future locker QTY for L1, L1M (none) and L2. L2M needs 208 QTY per our recent email correspondence.	5/25/2021 MTA Eric: Yes, refer to the expected total staff to get the following quantities. a.Floor 1: 50+64 = 114 (mechanic type lockers) b.Floor 2: 46 (mechanic type lockers) c.Floor 2M: 208 (operator type lockers) d.Employees designated as 1M (see snippet below) have special requirements unknown to the Cable Car division. Please consult with the Facilities department for locker needs of these classifications of staff including custodians, security personnel, storeroom parts keepers, museum staff, and the electrician. e.Please note that number of existing electricians in the Programming tab of the 070120 spreadsheet should be increased from 0 to 1. Therefore, total 1M employees should be increased from 13 to 14. f.6 museum staff are counted among the 14 1M employees. To my knowledge, they do not work for SFMTA. Facilities may know more about their arrangement. 5/25/2021: f. MTA Licinia: Museum is a tenant, their staff are their employees. We are not obligated to provide anything beyond the terms of the lease. @Zhao, William manages this lease and can provide any additional details as needed.	e: Updated expected total staff on CCB Program Matrix per MTA Eric. EC to clarify space requirements on L1M	2021-0524
12		Existing locker replacement: Should we assume that all existing lockers are to be replaced by new ones?	5/25/2021 MTA Eric: Yes.		2021-0524

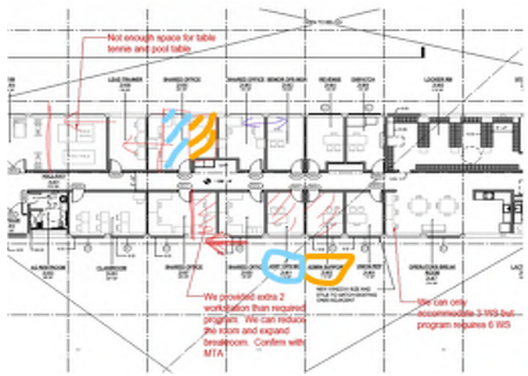
	Area	Questions	MTA Response	Notes	Emailed Date
13	Level 1 Crane	Upgraded crane capacity & Exisiting crane info	7/2/2021 MTA Eric: The upgraded crane should have sufficient capacity to safely lift a 36,000 lb load (dry gearbox). I think we should confirm with the DPW structural group on the recommended capacity given this requirement. **UPDATE: Please add 400 lbs for total of 36400 lbs to account for additional parts (coupling halves) and rigging (slings and shackles).** 5/30/2021 Rob: Here is the information from our 10 ton crane that you requested. Let me know if you need anything further. **MFR Demag** **Model # FP425H11L4/1F10** **SERIAL # 42336**		2021-0702 & 2021-0530
2021-0624 MTA Equipment layout comments & Design team questions					
	Area	**MTA Comments & Design team Questions**	**MTA Response**	**Notes**	**Email Date**
14	Level 1	*MTA Comment: Machine shop desired to stay in current location. Open to expanding machine shop into current oil drum/tank and garbage area, and relocating oil and garbage.* *110A and adjacent space could be reallocated for shared Chief Stationary Engineer, Machine Shop Supervisor, and Splicer Supervisor space.* BOA: Assume that Supervisor office at Machine shop could be relocated to Splicer Supervisor area.	7/20/2021 MTA Eric: Correct		2021-0721
15	Level 1	*MTA Comment: Perhaps (if necessary) on this side of the machine shop, there is removable/sliding fencing to accommodate machining long lengths material.* BOA: Fence length and location requirements? Can the existing storage shelving to be removed?	7/20/2021 MTA Eric: Two existing equipment near the fence to be relocated and replaced with new small equipment. Desire to have new fence along the two existing equipment to be a removable fence.		2021-0721
16	Level 1	*MTA Comment: Waste oil tank could possibly be located next to steam cleaning area approx. in this location?* BOA: Can we consider oil drum storage solutions?	7/20/2021 MTA Eric: Yes		2021-0721
17	Level 1	*MTA Comment: 101 and 101A space could be reallocated for track supervisor office and track employee workstation space as well as expanded breakroom* BOA: 101 & 101A staff could be moved to Level 1 M office area and 114 & 115 staff could be reallocated to 101 & 101A spaces.	7/20/2021 MTA Eric: Correct		2021-0721

	Area	Questions	MTA Response	Notes	Emailed Date
18	Level 1	*MTA Comment: Existing electrical room - Possibly space reallocated for women's / all-gender restroom?* BOA: Relocating Women's restroom here is not ideal since keeping existing plumbing locations is better for cost saving. Also, we need additional space for clothing lockers since future locker QTY is significantly increased. BOA will study option - reallocating all-gender restroom along with clothing locker space to the back side of the existing electrical room. Is all gender locker room acceptable instead gender specific? Also, are the existing showers being used?	7/20/2021 MTA Eric: Agreed on all-gender restroom and clothing locker at the existing electrical room. All gender lockers at Level 1 is not ideal due to privacy issue. Yes, showers are being used and needed.		2021-0721
19	Level 1	*MTA Comment: Large rolling door (like at the newly proposed switchgear room) desired for Weld Shop in addition to a regularly manway door adjacent to the rolling door.* BOA: Existing storage space at Level 1 M/ 112 & 115 need to be relocated. Can we use the current Grip building area since this space is to be relocated to Level 2?	7/20/2021 MTA Eric: Yes		2021-0721
20	Level 1	*MTA Comment: This parts wash technically belongs to Grip Repair Area. Relocate to newly proposed grip repair area.* BOA: Is Parts Wash required only chemicals, not water?	7/20/2021 MTA Eric: Correct. No clean water supply required. A separate mobile system.		2021-0721
21	Level 2	*MTA Comment: Per email sent to Eun Joo on 6/29, this space occupied by two large trucks back to back, used for towing Cable Cars. These trucks must be stationed here.* BOA: Can we locate a bike storage to left corner space (Grids b/w 7 and 8 along J)?	7/20/2021 MTA Eric: Yes. Please keep existing control box (floor mounted) and clearance around it.		2021-0721
22	Level 2	*MTA Comment: Carpentry breakroom - Open to having space allocation here reconfigured. Perhaps a second floor here for office space?* BOA: Office/breakroom on Level 2 is not feasible due to ADA. We would explore relocating breakroom to ground level (either ground floor under the current breakroom or window area near the elevator)	7/20/2021 MTA Eric: Ok. Breakroom at carpentry shop is not MTA program requirement. This could be omitted.		2021-0721
23	Level 2	*MTA Comment: Parts washer shown in weld shop technically belongs to Grip Repair Area. Relocate parts washer to this space.* BOA: New Grip building area requirements needed. Min ceiling height? Natural light required? Fork lift to be operated? Overhead door?	7/20/2021 MTA Eric: Natural light is not required but good to have. Min. ceiling height and Crane/fork lift - **Eric to follow up** **7/23/2021:** **Grip building area minimum required ceiling height can be assumed to be 10 feet. Access to 1 ton chain hoist and/or crane access required. If there were a doorway, width and height would ideally accommodate a forklift carrying a 3ft wide pallet.**		2021-0721
24	Level 2	*MTA Comment: Grip building area - Perhaps a wall/partition for sound deadening here?* BOA: More clarification needed.	7/20/2021 MTA Eric: Walls may be desired for sound attenuation purpose but this space does not need to be fully enclosed.		2021-0721

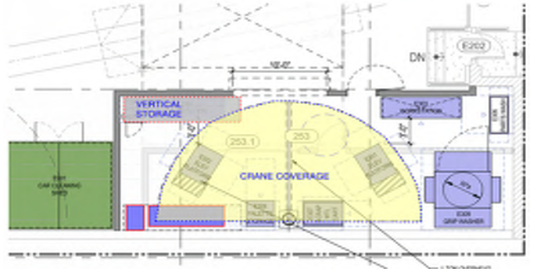
	Area	Questions	MTA Response	Notes	Emailed Date
25	Level 2	Existing jib crane location at Level 2 - It is better to keep the existing jib crane due to existing structural support	7/20/2021 MTA Eric: Agreed.		2021-0721
	Level 2	All-gender restroom - Can we locate to PARTS 207 room?	7/20/2021 MTA Eric: Yes. Currently PARTS 207 is used as storage room. Storage solution at PARTS 207 should be studied.		2021-0721
26	Level 1	Can some portion of existing Mechanical room 107 be used for restroom expansion?	7/20/2021 MTA Eric: Not desired due to many existing electrical panels on the wall. Existing mech room to remain.		2021-0721
27	Level 2	Existing lift capacity? If this triggers ADA upgrade, we might just leave this as is. MTA can upgrade this lift as a maintenance item.	7/20/2021 MTA Eric: **Eric to follow up on the existing lift information.** Agreed on ADA issue. **7/23/2021: We require the 2nd floor lift to safely carry a load equivalent to a model GS-3232 scissor lift or approximately 6000 lbs. Because the existing lift is quite old and we are lacking in documentation on the equipment, it is difficult to confidently pinpoint its current capacity or whether or not insufficient capacity is the reason employees have had issues with it. However, given its age and poor reliability, we would certainly benefit from a modern replacement.**		2021-0721
28	Level 1 Crane	Bridge crane safety concerns along the proposed walkways?	7/20/2021 MTA Eric: Nothing more than the usual operator caution.	Refer to MTA's email response on 7/20/2021	2021-0721
	Area	**Questions**	**MTA Response**	**Notes**	**Email Date**
29	Level 1 Crane	Bridge Crane: What kind of equipment/materials do you carry via the crane? E.g. big wheel.	7/20/2021 MTA Eric and Rob email: 36,400 lb gearbox is the heaviest required load to be lifted using the crane. Other significant items that would be lifted include the 14 foot diameter sheaves (big wheels) with shaft and pillow blocks attached (about 10,000 lbs), the cable off of the sheaves (whether over the big wheels or over the smaller pullies near the bottom of the pit), and the I-beam over the cable machinery area with the signs on it ("Powell", "Mason", etc.) that weighs about 3000 lbs.	New bridge crane extension operations	2021-0720 Received
30	Level 1 Crane	How high do they need to get lifted up/down? E.g. 5 ft up from the ground level? 5 ft down to the pit?	7/20/2021 MTA Eric and Rob email: Being able to lower equipment to the bottom of the pit (9 feet from first floor concrete to bottom of pit) is desired. Also, the current vertical-most position of the crane hook, measured to be 17.75 feet from first floor concrete to tip of fully retracted crane hook, is desired.	New bridge crane extension operations	2021-0720 Received
31	Level 1 Crane	Any concerns about lifted equipment/materials/rod being collapsed into the proposed walkway/new office area?	7/20/2021 MTA Eric and Rob email: Nothing more than the usual operator caution.	New bridge crane extension safety concerns	2021-0720 Received

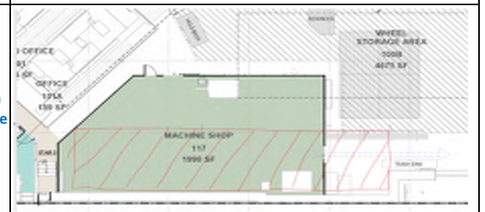
	Area	Questions	MTA Response	Notes	Emailed Date
32	Level 1 Crane	Any clearance requirements between the bridge crane rod and the proposed walkway/new office area for safety?	7/20/2021 MTA Eric and Rob email: Not that we know of.	New bridge crane extension safety concerns	2021-0720 Received
33	Level 1 Crane	Any MTA /OHSA regulations regarding the bridge crane safety protocol?	7/20/2021 MTA Eric and Rob email: Not that we can think of other than operator training	New bridge crane extension safety concerns	2021-0720 Received
34	Level 2	Does Vehicle Maintenance Superintendent at 208C oversee the entire Level 2?	MTA Eric: Yes.	Carpentry area	2021-0727 Received
35	Level 2	Overall Carpentry work flow a.How many new staff will be expected for each Carpentry area? Carpentry 3 or 1, Tools 1, Paint 2 or 1? Some discrepancies on numbers – Please see the chart below. b.Work flow at Carpentry area in general. Do staff at Southwest of Carpentry area need to use a new paint booth frequently? See image below. c.For a new compact storage area (at old breakroom), what materials will be stored? Long wood pieces, etc? d.Any other Carpentry workflow to be considered for the planning?	MTA Eric: Regarding general carpentry work flow, carpenter's typically work on a job using the machinery in their currently allocated space. They may move back and forth between that space and a Cable Car that is the subject of repair, so it is important that Cable Cars can be close to the carpentry shop to minimize the distance they move heavy parts and equipment. a.No new staff. Per spreadsheet from 07012020, currently there are 3 carpenters and 2 painters. The max. number of carpenters and painters that would work during the same shift are 3 and 2 respectively for a total of 5 employees. b.Staff at southwest of carpentry area are the 2 painters. Painters of course will need easy access to the new spray paint booth. c.Regarding storage: i.Fenced area (space that would be used for new spray paint booth): 4'x8' sheets of plywood, cabinets of steel nuts and bolts, cabinets of brass fasteners, and large rack of spare Cable Car parts. Good chunk of parts on spare Cable Car parts rack in this fenced area may be able to be disposed of. ii.Tools Room (208A): sand paper, hand-held power sanding tools, hand-held power cutting tools, replacement blades, staples, nails, steam boxes for bending wood, safety gear like coveralls and earplugs, LED work light iii.2M level carpentry storage/break area: 12'x10' two inch thick sheets of oak (approx.. 40 pieces) and rack with spare Cable Car parts and templates 1.Items stored in this area are regarded as precious and	Carpentry area	2021-0727 Received
36	Level 1 Level 2	1. Level 1 Cranes at current Grip bldg. area and Weld room: 2. Level 1 Machine Shop Equipment: 3. Level 2 Painter Booth 4. Level 2 Painter and Carpentry Shop:	1.Level 1 Cranes at current Grip bldg. area and Weld room: No crane needed for the proposed New inspection room (current Weld room) and New storage area (current Grip bldg. area); Keep cranes at Pulley assembly area and Stem cleaning area 2.Level 1 Machine Shop: New small equipment is Hass CL-1 in the spreadsheet from Eric 4/27 & 5/10. No replacement for E004. 3.Level 2 Painter Booth: Longest Cable car length is 31'. there is one special Cable Car measuring 34 feet in length. 4.Level 2 Painter and Carpentry Shop: Painters and Carpenters do not share equipment and work independently. The current storage cabinet partition is intentional to create a boundary between them. Current space/footprint for painter area works (along Washington St).	Call with Eric & EC	2021-0730

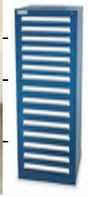
	Area	Questions	MTA Response	Notes	Emailed Date
37	Level 1 Level 2	Q1) Roll-up door and fences at Mason st: Are they always open during business hours? I am trying to figure out egress/ Accessible path of travel along this entry. Q2) Pull in and Pull out openings at Jackson and Washington st: It appears that there are no doors/enclosure. Are they always open 24/7?	MTA Eric Response: No. The rolling door should only be opened only when something needs to come through. Therefore, the door on Mason can be assumed to only be opened for employees entering and leaving or deliveries. Similarly, the doors on the 2nd floor will generally only be open to allow employees, deliveries, or Cable Cars to come in and out. Of course, this means these doors may be open for multiple hours at a time, but there is no official procedure requiring them to be open.	Email	2021-0805
38	Level 2 Pit	Existing heaters at Level 2 Pit inside	MTA Rob Response: Yes they need heat and the current units are not working so replacements should be considered.	Email	2021-0805
39	Level 1 Level 2	Programs: Could you let me know which team is assigned to the following areas/rooms? •Pulley assembly area •Steam cleaning/weld area •Grip building area	MTA Eric: •Pulley assembly area・Track •Steam cleaning/weld area・Shared. Propulsion and Vehicle Maintenance (2nd floor personnel who use the grip building area take the grips to the steam wash area for cleaning) •Grip building area・Vehicle Maintenance	Email	2021-0810
40	Level 1	1.Steam cleaning area: Does the current space have ventilation?	MTA Eric:Yes. The current space has an exhaust fan that can be operated using the control shown in the attached pictures. The motor and disconnect are on level 2M.	Email	2021-0812
41	Level 1	1. New Inspection room: Could you let me know what CCB staff are inspecting in that room and does this work require added ventilation?	MTA Eric: Typically steel parts like gear couplings, turntable latches, metal sealing rings, etc. will be subjected to precise measurement using a laser in this room. Hardness testing may be performed in this room by essentially making a dent in the part. Springs may be subjected to an incrementally increasing load and their resulting compression recorded. This work does not require additional ventilation. Ideally, the room has some sort of temperature and humidity controls and means of minimizing the presence of dust in the room. A significant piece of equipment that will be used in this room is the Laser Coordinate Measuring Machine. I reached out to the sales representative who says that the question of inspection room standards has come up related to this piece of equipment but he hasn't heard of such a standard to date. He did however let me know that there is a standard for the room that calibration of this piece of equipment is performed (typically calibration is performed by the vendor). That standard could be used to inform a conservative approach to requirements of the new inspection room. I'll forward you that information when I receive it. https://knowledge.faro.com/Essentials/Hardware/FARO_A2LA_and_NVLAP_Accreditations	Email	2021-0812

	Area	Questions	MTA Response	Notes	Emailed Date
42	Level 2M	1.L2M Breakroom vs extra Shared office: We have two extra workstations in our proposed Shared offices, compared to the required program. Do you prefer to reduce the Shared office area and expand Breakroom instead? The Breakroom program requires 6 workstations but the current layout only allows 3 workstations.	Rob: MTA will provide input/ markup by 10/5 Eric: I prefer reducing the shared office space and expanding the breakroom.	Email	2021-1001
43	Level 2M	2.L2M Gym: We showed table tennis and pool tables in the Gym but there is not enough space for them (clearances for maneuvering space). Do we need both of them? If we expand Breakroom area (Question #1 above), we might be able to put a pool table in the Breakroom and keep a table tennis only at the Gym. Any suggestions?	Rob: MTA will provide input/ markup by 10/5 Licinia: We don't typically have the pool tables in the workout area—they're not really the same function. I could go either way on table tennis. I suggest to reprogram the pool table to the break area. Eric: 2.I'd keep both pool and table tennis functions and think it's more appropriate to have both pool and table tennis in the breakroom. Table tennis tables can be folded up for storage and unfolded and set up as needed. If other shared work tables / furniture / etc in the breakroom can be temporarily pushed aside to accommodate the required clearances for playing table tennis whenever people want to play it, then that would work.	Email	2021-1001
44	Level 2M	See Item 43 above	Rob: The marks ups were not too clear but the changes we need are as follows 2M As we discussed the pool table and tennis table need to move to the break room. The extra 2 workspaces need to be removed to accommodate a larger brake room Assistance Opps manager office needs to be configured to the other side of the hall along with admin support. It needs to be configured with admin support between the assistant ops mgr and the sr ops manager. The 2M58 office can move closer to the Gym allowing more space for the shift. 2M60 and 2M62 need to be swapped as well. If possible, can we move the Union office 2M65 to between the lactation room and the kitchen. This provides a more open environment for employees to talk to the union rep. Now there is an org change that will impact the 1st floor. We will need to have an office for the Cable Machinery Manager who will oversee the Track and Propulsion superintendents. This will need to be on the mezzanine. Other than this we are looking great!!	Email 	10/13/2021 Received
45	Level 1	3.L1 Splicer office: Can we use some of Splicer workroom (along the west wall) to accommodate new office layout (private office for Chief Mech engineer/Supervisors and 4 workstations)?	Rob: yes you can move the wall	Email	2021-1001

	Area	Questions	MTA Response	Notes	Emailed Date
46	All levels	Qingwen: How many non-revenue vehicles do you have at CCB? We assume they may have to be changed to EVs at some point so we want to plan some extra power for EV charge stations.	Rob: Total we have floor 1 crews Track Dept (park on the street) 6 large trucks 2 pickup trucks Propulsion (park on the street) 3 service trucks 2 pickup trucks 1 small van 2 large vans Floor 2 OPS 2 Hybrid cars Running Repair (mostly park inside on the second floor) 2 Semi trucks (Pusher/tow truck) 1 small van 1 pickup truck 1 yard tug	Email.	2021-1004
47	Level 2M Storage	1.MTA 9/15/2021 response on Item 10: It appears that this is for 2M04, not 2M03. Could you confirm the room #?	Eric: 1.Confirmed that referenced cabinets are for 2M04 not 2M03.	Email	2021-1018 Received
48	Level 1	2.MTA 9/15/2021 response on Item 4: There are many cabinets and items in RM 104 Storage and we are not sure where to relocate them. Do you have any plan to purge them?	Rob: We have already purged what we have is necessary. So I do not have anywhere to place these items as of yet.		2021-1018 Received
49	Level 2	3.Freight Elevator: Are you planning to carry oversized items via Freight elevator? Would 6' clearance in front of the elevator work? We are trying to squeeze many cabinets/ storage items in the elevator vestibule if possible.	Rob: There will be large items moving in the elevator but we can place cabinets against the wall but we need to remove the guard railing shown on your drawing behind the proposed cabinets	Email	2021-1018 Received

	Area	Questions	MTA Response	Notes	Emailed Date
50	Level 2	New Grip bldg area work flow	Rob: They move the grips around by “walking” them it is better to have them closer to the door than to lift them by the Jib. Grips are transported on a dolly to and from the grip area. They are then cleaned using the new washer (previously steamed on our wash rack). After they are placed on the platform to be disassembled. The sub components are then placed on the workstation E304 is the Die changing station and E303 is the work bench for other component rebuilding. Each area will have part new and rebuilt part storage for the respective area. Replacement Die stock is stored on the pallet E308 and scrap parts are disposed of in the bin E307. Upon completion the lift table stands the grip up to vertical and they are walked over to the vertical storage area. Tools are stored in E305 cabinet. We did omit the fume extractor used at station E304 But there is enough room accounting for the size of the workstation. In short the work stations are not identical for each grip table they are specialized of the work to be done at each workstation. The jib will also be used for testing the grips when in the position shown in the middle area.		2021-1028 Received

	Cable Car Barn Cable Car Barn Draft Master Plan - DPW MTA 1708 CCB Comments (March 28, 2022)									
Item #	Name	Page #	Topic	Level	Comment	Discipline	Team Response	Need MTA Input	MTA Response	Images
1	Robert Bergesen	6	SWD		Transit needs to decide if we are still listing the construction date as June of 23 which is a bit too soon to have shovel ready drawings.	MTA/BOA	EC- MTA to confirm	MTA	Emily- Transit agrees that construction date of June 23 is too soon- we will consider a later date	See Email PDFs with images for all comments
2	Robert Bergesen	6	SWD		Transit needs to decide if we are staying with the 6 week max shutdown or this can change (reviewing 8 weeks)	MTA/BOA	EC- MTA to confirm	MTA	Emily- Transit agrees to an 8 week max shutdown	
3	Robert Bergesen	14		1M	Need to consider how to access the shop side of the glass for regular cleaning. Cat walk or rolling platform ect.	BOA	EC-This should be studied during SD-DD phase. Recommended product (Extend-A-Reach - 30 FEET - Window Washgin Squeegee Kit with Extension Pole// Window Cleaning Tool Combo with Telescopic Pole)	MTA	Rob- Let me know if there is anything further you need from me	
4	Robert Bergesen	16		1M	We discussed having the admin for ops office act as the "lobby" to access the SOP and Assistant offices to maximize the privacy. Add doors to allow for entrance into the admin office then to the SOM and Asst Ops offices would allow this	BOA	EC- Will revise	-		
5	Robert Bergesen	25			Fire alarm must be replaced. Current is not upgradable and parts are obsolete.	BOA DAC	EC- Will revise	-		
6	Robert Bergesen	28			Discussion about the Store room location and during the review we think it may be beneficial to utilize the 1M08 Machinist Work Station as the Store Keeper area and the Storekeeper Workstation 1M09 as the Machinist Workstation. The structural will need to be expanded to the entire 1M08 and should also be expanded to include 1M07 for versatility upon time of occupancy.	Struct/BOA/MTA	EC- Same #6, #16, #21 & #39 ; Currently, our compact storage units are placed on L1M to avoid the existing monorails on Level 1 ceiling. Per Structural engineer, swapping the compact storage units can be done but this will be very expensive. Due to the moving monorails on Level 1 ceiling below, beam deflection cannot be too much and strengthening requires deeper beams which might create head room issue. Please confirm if MTA wants to proceed with this and provide a deflection criteria for monorail. EC- Received info from MTA. Will revise our plan.	MTA	Rob- I will look deeper at the monorails and future usage. Yet expensive it will be exponentially more expensive if we do this later. I will review and get back to you no later than Mid day Monday on this topic. Rob- It looks like we only need a capacity of 500 lbs max on the monorail and need to recalculate the load structure for future flexibility.	
7	Robert Bergesen	33			How and when are the SSI Future Analysis going to be performed and will they be required priro to the next step of design?	Struct/BOA	SC- The SSI analysis may include following steps: 1). Soil boring to gethering needed geotechnical data for analysis. 2). Build 1D or 2D soil model to capture/confirm soil preimeters. 3). Building 3D model to incorporate the building and soil around to analyze. SSI analysis could be started at the begining of next design step.	-		
8	Robert Bergesen	36	HVAC		Lunch room should be heated since workstations are present and the rooms are also used as Maintenance Training rooms	Mech	LH: Heating will be provided lunchrooms.	-		
9	Robert Bergesen	40	Plumbing Changes		Room 117 Machine shop requires cold water to be added	Plumb	LH: Will add cold water to the shop. Please identify the equipment requiring cold water.	MTA	Rob- (E004)Haas VF 3 and (E001) Haas lathe. Also a hose bib to add water to other machines for coolant	
10	Robert Bergesen	45			Most high bay lighting has been upgraded to LED	Elec	QX- Do we have a drawing documenting which ones have been upgraded?	MTA	Rob- No we would need to document this but there are no more than 20 left in the facility that need to be upgraded	
11	Robert Bergesen	47			The new grip area needs HVAC. This area needs to be closed in for sound attenuation resulting in the need for its own HVAC controls	Elec/BOA/Stantec	QX- Will add the HVAC load to electrical load calculation	-		
12	Robert Bergesen	46	EV Charging		Currently Cable Car does not have Electric forklifts but provisions need to be incorporated into the building for 2 forklift chargers on the 2nd floor and one on the first floor as well as 2 vehicle chargers on the first floor for a small van and pickup in the future	Elec/BOA	QX- Will add the forklift chargers to EV section of the narrative.	-	Existing forklift model #	
13	Robert Bergesen	48			Network and communications all need dedicated circuits with UPS ability. This includes the Cable Machinery control room, radios and system monitoring as well as the Door access and video systems.	Elec	QX- Will add UPS for communication and network section of electrical narrative.	-		
14	Robert Bergesen	54	Overhead Crane	1	Floor 1 needs to have an overhead crane located above the machine shop.	Stantec/BOA/Struct/MTA	EC-There is an existing Jib crane at the machine shop. Same #14 and #35; MTA to clarify and provide details. EC- Received info from MTA. Will update our plan.	MTA	Rob - You are correct it is not the same as the Jib Crane. It needs an overhead free standing (or possibly tie to the building) 1.5 ton rail crane therefore the floor supporting will need to be reviewed by structural. Currently the overhead crane was repurposed from another facility which we will not install and rather install a lighter system than the 7-1/2 ton one we have. It is not the correct size nor has the range wen need. EC- Could you provide a OH crane capacity requirements/model # if you have/coverage area (entire machine shop area?)? Rob- Crane capacity needed is 2 ton and cover the span of approx. 77' x 17' which will fit along side the existing 40 ton and cover most of the shop with a height of 14' minimum. It can attach or free stand either way. Please see my sketch	

15	Robert Bergesen	54	Weld Shop	1	Level 1 new weld shop/Existing welding Frame will need to be replaced	**Stantec**	**JC: Understood. Will update in narrative**	-		
16	Robert Bergesen	54		1	Swap the Machinist workstation area and the storekeeper areas. This will allow for more store room area located on one area freeing up space in the adjacent area. This will require some revised work for structural calculations and it is best if we can perform a structural factoring on all 3 areas having high-density storage. This will allow for the users flexibility.	**Struct/BOA/Stantec**	**EC- Same #6, #16, #21 & #39**	**MTA**	**See above**	
17	Robert Bergesen		Car Cleaners	2	We should not look at reusing the existing Shed and building out or using a lockable storage solution	**Stantec**	**JC: Will recoommend alternative and update the plan**	-		
18	Robert Bergesen	G0.12		1	108 is staffed all shifts not just grave	**BOA**	**EC- Will revise**	-		
19	Robert Bergesen	G0.14		1	Wheel Storage should be labeled Reel storage and it seems to bounce from 100A to 100B in this Doc I am assuming that they are the same?	**BOA**	**EC- Will revise room name and number.**	-		
20	Robert Bergesen			1	Need 4 desks for track supervisors which will be accomplished by swapping 101 and 101A Rename the "Track/Engineering" to "Engineering" and we will reduce the intern capacity in this office from 4 to 2 for the increase of track supervisors from 2 to 4. Engineering is a Propulsion Resource and 101A needs to have the color changed.	**BOA**	**EC- Will revise**	-		
21	Robert Bergesen			1M	As mentioned earlier Move the Storekeeper into 1M08 which is larger and allows all storage secured in one area. Move the Machinist into 1M09. Structural will need to be updated.	**Struct/BOA**	**EC- Same #6, #16, #21 & #39**	**MTA**	**See above**	
22	Robert Bergesen			1M	1M53 Need to add Maintenance Controller and keep the same number of workstations 1M54 No change 1M55 Swap with 1M56 1M56 Swap with 1M55 and change color to shared Track/Propulsion 1M57 No change 1M58 No Change 1M59 Change to shared Track/Propulsion Management Assistant office and Maintenance Planner(s)	**BOA**	**EC- Will revise**	-		
23	Robert Bergesen			2	Room 202: Needs 4 desks; Maintenance Controller, 2 Vehicle Maintenance Assistant Supervisors, and Car Cleaner Assistant Supervisor.	**BOA**	**EC- Same #23 and 41. Not enough space for 4 desks. Only 3 desks fit. Check with MTA.** **EC- Will revise plan.**	**MTA**	**Rob- Needs to have 4 desks and can fit they do not need to have oversized desks in the open**	
24	Robert Bergesen			2M	Seems to be too many shared office spaces. We should eliminate 2M62 and add that to the 2M67 Break room.	**BOA**	**EC- Currently, breakroom is less than 750 sf and no fire separation required. If we increase sf of breakroom, we will need 1 hr rated walls.**	**MTA**	**Rob- Then keep the room as an additional shared space**	
25	Robert Bergesen			2M	The 2M66 label is missing off of the diagram on page 16	**BOA**	**EC- Will revise**	-		
26	Robert Bergesen			2M	2M72 Janitor closed is only accessed via the men's restroom is not a feasible design since most of our janitors are female.	**BOA**	**EC- Janitor gender should not be an issue. The Janitor closet door can potentially open to the hallway but it's not ideal. MTA to confirm.** **EC- Will revise plan.**	**MTA**	**Rob- This needs to be answered by janitorial staff** **Lisa- We do not want the custodian closet (hopper room) inside any restroom. From the drawing below, please provide a door through the wall where the number '22.14' is shown so that access to the room will be from the hallway. Thanks.**	
27	Robert Bergesen				New Inspection Room Equipment EQ0.12-- E102 Photo of Measurement Arm	**Stantec**	**JC: Image Recieved. Will include in Equipment Inventory Spreadsheet**	-		
28	Robert Bergesen				Tool storage for E104 EQ0.12	**Stantec**	**JC: Image Recieved. Will include in Equipment Inventory Spreadsheet**	-		
29	Robert Bergesen				E105 Granite Block Table 72" x 48" X 34"h EQ0.12	**Stantec**	**JC: Image Recieved. Will include in Equipment Inventory Spreadsheet**	-		
30	Robert Bergesen				Grip Building Area Correction EQ0.12-- **Equipment E301 qty is 2 not 1**	**Stantec**	**JC: There are two Elevated Platform lifts shown in this room: E301 & E302. Are there more? Are they different? They look different in the photos.**	**MTA**	**Rob- The spreadsheet shown 1 that I looked at**	
31	Robert Bergesen				E406 Sandblaster Cabinet EQ0.13 --Currently in the Pulley Assembly area but is a Machine Shop Tool but can not be located within the machine shop we will need to move it to the Weld shop or next to the steam cleaner as shown	**Stantec**	**JC: Yes, we can make room for this sandblaster in the Steam Cleaner area (Weld Shop is too small). We will swap the mobile cart placement with the sandblaster cabinet.** **Also: we have conflicting internal notes over the past year, and its unclear to Stantec if the Sandblaster Cabinet should be tracked/reflected under the Machine Shop (blue) or Pulley Assembly (teal) in the Equipment Inventory list and on our plans. Can someone clarify? This piece of equipment has jumped back/forth between both spaces, and we need direction. Thanks.**	**MTA**	**Rob- IT needs to be tracked and allocated to the Machine Shop. Due to the glass beads we need to keep it away from the machine shop equipment. The glass bead dust is caused damage to our machinery. But the staff needs to access, operate and maintain the sandblasting equipment.**	
32	Robert Bergesen				Trash and Recycling bins located on the second floor EQ0.13 1)E906 is a trash bin 2 yard 2)E907 is currently the same size as E906 (was returned to full size post pandemic shutdown) Needs to be corrected on the sheet	**Stantec**	**JC: Will correct on sheet and on plans**	-		
33	Robert Bergesen				Paint shop equipment miss labeled on EQ0.14	**Stantec**	**EC- Could you clarify which ones?**	**MTA**	**Rob -E716 is a paint shop machine not a carpentry machine.**	
34	Robert Bergesen				E717 belongs in the paint shop not the carpenter shop	**Stantec**	**JC: Correct location on plans; incorrect in Equipment Inventory List. Will update.**	-		
35	Robert Bergesen			1	EQ2.11 -- Missing overhead crane in Machine Shop This will need to be covered in the structural as well 1.5 ton to 2 ton	**Struct/BOA/Stantec**	**EC- Same #14 and #35**	**MTA**	**Rob- Correct**	

36	Robert	Append	Existing and		108 Remove "Grave" needs to be all shifts	**BOA**	**EC- Will revise**	-			
37	Robert Bergesen				Swap 101 and 101A to allow for more Track Supervisor Desks	**BOA**	**EC- Will revise**	-			
38	Robert Bergesen				Room 110B one additional desk for Laborer Supervisor New Program	**BOA**	**EC- Will revise**	-			
39	Robert Bergesen				Rooms 1M08 and 1M09 swap as mentioned	**Struct/BOA**	**EC- Same #6, #16, #21 & #39**	**MTA**	**Rob- See above**		
40	Robert Bergesen				See 1M new office notes above to make same changes here in the related sections below	**BOA**	**EC- Will revise**	-			
41	Robert Bergesen				Room 202 needs 4 desks	**BOA**	**EC- Same #23 and 41**	-			
42	Robert Bergesen				On floor 2M we noted that there are significant number of workstations which seem excessive	**BOA**	**EC- Check with MTA for action item.**	**MTA**	**Rob- As mentioned we will use the extra room as flex space and shared space**		
43	Robert Bergesen		Closing		The Structural will need to be revised for some minor changes and expansion	**Struct/BOA/MTA**	**EC-Need further clarification**	**MTA**	**Rob - was a general comment referring to the items you have captured including the two above.**		
44	Chris Spain	2	Acknowledgements		Charles Drane is the MOW Manager, Chris Spain is the Traction Power Group Manager	**BOA**	**EC- Will revise**	-			
45	Chris Spain	15	12 KV room access		Need to have enough space to remove a transformer and all other equipment if needed. It appears there will be a maintenance pit in front of the electrical doors. Verify this pit will not block access to the electrical room.	**Stantec/BOA**	**JC: Pit is accounted for; it will not block access; refer to clearances in light blue dashed on Stantec plans. Would recommend trench cover plates over pit during install and/or replacement of PG&E Switchgear for added safetly around pit. 12KV Room has been checked for adequate door openings and clearances for the replacement and repair of equipment inside.**	-			
46	Chris Spain	15	Sprinklers		Request No conventional water sprinklers in the 12 KV electrical room. This will need to be addressed between the fire code and electrical code early in the process.	**Plumb/BOA**	**LH: Agree. The 12KV Room will be protectected by a new clean agent fire extinguishing system (e.g., FM 200 system) . However, the SFFD may also require a preaction sprinkler system. This issue will be discussed with the SFFD during pre-application meeting in the design phase of the project. We will request that the room be protected only by clean agent system.**	-			
47	Chris Spain	15	12 KV room access		Doors need to uniquely keyed for Substation access. Other workers should not have this access.	**BOA**	**EC- This is more for DD-CD phase. Check with MTA** **EC- Will add a note to door schedule.**	**MTA**	**Chris (2022-0321): I also eventually want the room to be keyed to the Substation Key. In my opinion, the earlier this is known in the design, the better. No need to install one set of keys and then have to spend money at the end to make an unforeseen change.**		
48	Chris Spain	25	Fire alarm		I believe fire alarm needs a third party continuous monitoring, additionally tie into power SCADA system. Fire alarms should also alarm in 12 KV room.	**FireAlarm/Fire**	**Alexis Ng- I believe that the fire alarm system only needs to be connected to the fire department. Please check with the client to see if they would like to include a third party continuous monitoring and the tie-in to the power SCADA system for the fire alarm system in the narrative.**	**MTA**	**Chris (2022-0321): I believe the code requires monitoring by a UL certified entity. If this role can be meet by the fire department/EOC at Turk Street or other location then we are okay with that. In previous projects, third parties were the only option who had this certification. But if that has changed than we are fine with this going straight to the fire department.**		
49	Chris Spain	36	HVAC		Ensure HVAC system has sufficient capacity to dissipate heat from electrical equipment. I believe the recommendation is capacity to turn over room 15 times per our. 12 KV room should have thermostat control independent from the rest of the building to allow room to operate at correct temperature. HVAC system ducting should not encroach on exclusive electrical rooms	**Mech**	**LH: Will provide sufficient HVAC capacity. Room will have idependent thermostat. HVAC system will be designed per California codes.**	-			
50	Chris Spain	39	Water Pipes		No water pipes (besides eye was station) or sewage pipes in 12 KV room, especially above equipment.	**Plumb**	**LH: No domestic water pipe or sewage pipe will be located in the 12 KV room. The eyewash has been relocated outside the room.**	-			
51	Chris Spain	39	Natural Gas		No natural gas pipes to be routed through 12 KV room.	**Plumb**	**LH: No natural gas pipe will be located in the 12 KV room.**	-			
52	Chris Spain	41	Fire Protection System		Fire protection system needs to coordinate with electrical equipment.	**Mech/Elec**	**LH: The fire protection system will be coordinated with the electrical equipment**	-			
53	Chris Spain	47	120 Volt Outlets		in 12 KV room that 120 convenience outlets should be rated for 20 amps, not 7 as indicated.	**Elec**	**QX- Will add the requirement to electrical narrative for 12 KV electrical room**	-			
54	Chris Spain	54	Breaker moving rigs		We will need a way to move breakers. If this requires a movable rig, we need room to store this rig.	**Elec**	**QX- Will work with Archtects; a breaker lift are W=3FT, D=4'4", H=6'10".**	-			
55	Chris Spain		12 KV Room Storage		Can we make the store shelving in the 12 KV room non-metallic	**Stantec/Elec**	**QX- Yes, if provided** **JC: Unaware of any shelving in 12KV Room. Please Clarify.**	**MTA**	**Chris (2022-0321): I want the shelving racks spec'ed out on page 55 to be non-metallic.** **Level 2 – 12KV Electrical Room** **However, two (2) new heavy-duty storage racks (3'D x 12'W) should be purchased to maximize storage capacity in those areas**		
56	Chris Spain		Two Transformers		Can we confirm this plan includes the two x 12 KV transformer plan presented by Qingwen?	**BOA**	**EC- Confirmed. The two 12kV transfomer layout will be included in the final Master report submission.**	-			

57	William Zhao		Museum level		Make windows operatable. Currently there is airflow if the museum door is left in open position and/or the cable machinery level roll up gate is reeled up. If both the museum door and roll up gate are closed, there is strong fume smell in the museum area		**EC- We proposed a full height glass at the perimeter of the museum mezzanine level edges so fume from the shop area below does not travel to the museum space. This was requested by MTA Operations team previously.**			
58	William Zhao		Museum level		The existing pigeon net in the machinery level and museum are is not effective deterring pigeons	**BOA**	**EC- We will add a note for birds screen/integrated pest management for cost estimate.**			
59	William Zhao		Museum level		Restroom at the museum level needs refresh		**EC- We proposed restroom renovations to meet Accessibility requirements and refresh.**			
60	Chris Nocon				In the document at various locations, it mentions structural related items (foundations, materials…..etc) to be confirmed or verified in the future. Structural related work can be costly and take some time to perform. At this stage in the design process, it is expected to have a number of unknowns to be verified. How are these potential costs captured in the following: - Project cost - Project schedule especially with the limited construction schedule window allowed.	**Struct/BOA /MLee**	EC- We are in master planning phase. I will check with Mlee to add some allowance for unknown conditions. Mlee- Structural cost are related to the structural recommendations and 20% contingency to cover unknowns within the recommendations.			
61	Chris Nocon				Existing Building Seismic Evaluation: Was this clearly explained, in layman's terms, to the decision makers within SFMTA of what would be the likely outcome and what to expect after a seismic event. - If a better performance is desired by SFMTA following a seismic event, was a ROM cost estimate provided to SFMTA for evaluation and documentation for the final decision taken?	**Struct/BOA /MLee**	EC- Yes, the cost estimates of the seismic upgrade was provided to SFMTA. It is included in the draft master report too. Mlee- Estimates is reflective on the seismic evaluation and recommendations. Better performance will need to follow a report/recommendation for what that upgrade is and can be provided as an cost add alternate if SFMTA chooses to go in that direction.			
62	Chris Nocon				Does the structural work cost take into account hazardous materials, if encountered?	**Struct/BOA /MLee**	EC- Will check with Mlee/ Robert Mlee- Hazmat and testing and disposal was not included in the estimate			
63	Chris Nocon	Appendix A6			A6 - Existing Conditions Memo: Are there any associated work related to structural? If unknown at this time, how is this being addressed in the project's cost and schedule.	**BOA/MLee**	EC- No structural related work. Mlee-We have itemized according to the report with added cost for difficulty and access and have not added additional structural allowances. The contingency for unknowns is below the line.			
64	Chris Nocon				If heavy equipment has been relocated or new equipment is added, has this been accounted for structurally?	**Struct/BOA/Stantec**	EC- Yes. For new heavy equipment like cranes, compact storage units, our structural engineer reviewed the weights and provided structuaral inputs.			
65	Chris Nocon				Project team - Does it include a scheduler with construction experience due to the construction constraints?	**BOA**	EC- No scheduler included for the master planning phase. A scheduler can be added in next design phase.			
66	Chris Nocon				HVAC related structural work: Does the project cost and schedule take into account HVAC related structural work (for examples, new equipment and/or openings / penetrations including related to new spray booth)?	**Struct/MEP/BOA/ MLee**	EC- Most of HVAC systems on the roof is replacing the existing units with new. Will check with MLee. Mlee- Most of the HVAC localized recirculation fans, unit heaters and VRFs, Exhaust fans are direct replacement at the roof level. There wasn't any additional upsizing of change in HVAC system.			
67	Wang, Jane				a general question related to exploratory work to verify existing conditions and space proofing with respect to new work. Often times the existing condition verification is left to the contractor which can be risky on rehab projects. What is the extent of exploratory work and condition assessment in the current planning phase?	**BOA/MLee**	EC- Our design team used the as-built drawings, mostly the 1982 and 1983 drawings for the master planning. As for the existing equipment, MTA provided a list of existing equipment inventory which our team used for the new shop space design. The existing equipment inventory lists are included in the master planning report. In addition to this, our team conducted site visits during the programming phase to review some of the existing conditions. Please note that the site visits were for the master planning purpose, not for verifying the existing as-builts. Once we move into our next design phase (Schematic Design), our team recommend MTA to hire a site surveyor to verify the existing conditions compared to the as-builts, and document missing existing conditions such as existing wall mounted electrical panels, exposed plumbing pipes and existing equipment layout. Mlee-Concur with SFPW reponses		Jane - I would recommend that all studies, verification, testing deferred to subsequent phases have appropriate level of contingency and risk assignments in the current budget for the project.	

A10 - Existing Conditions - Exhibits

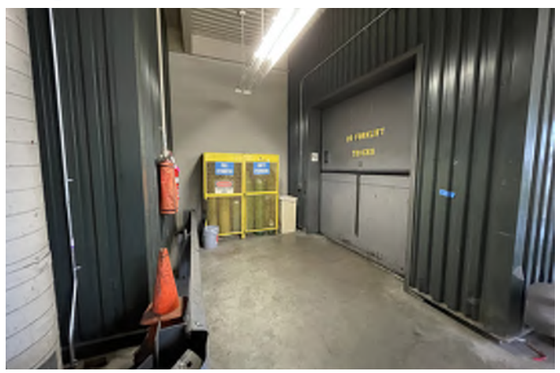
A9 - Existing Conditions - Exhibits

Exterior

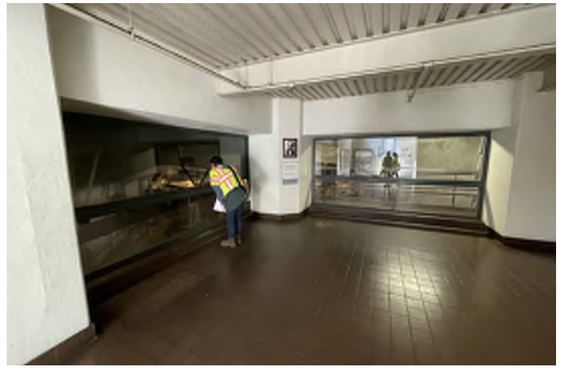
Roof

Passenger Elevator

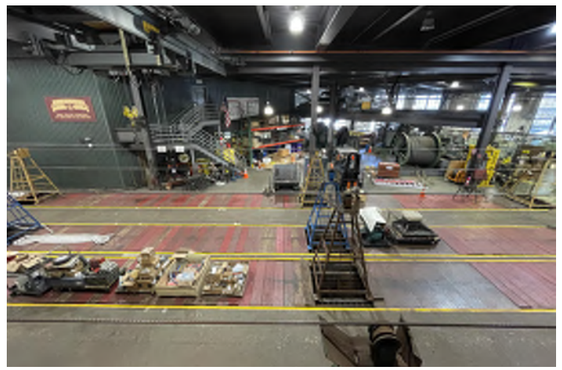
Freight Elevator

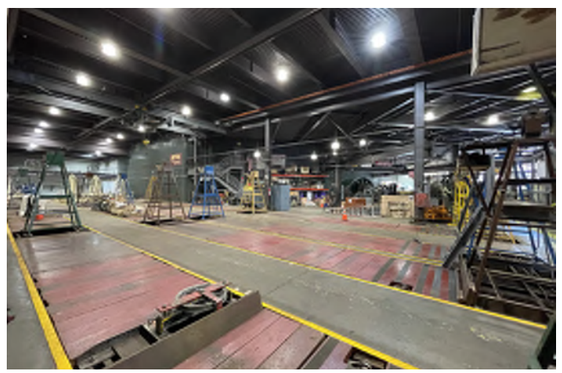


001 | Viewing Room

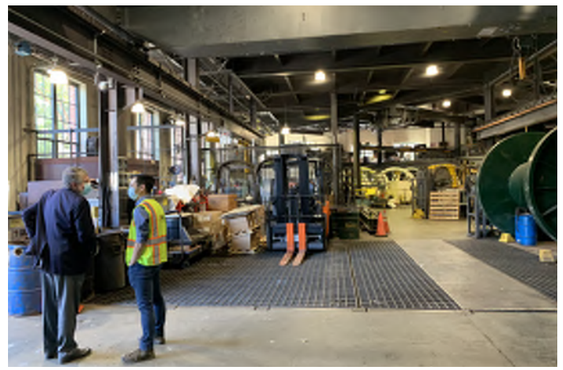


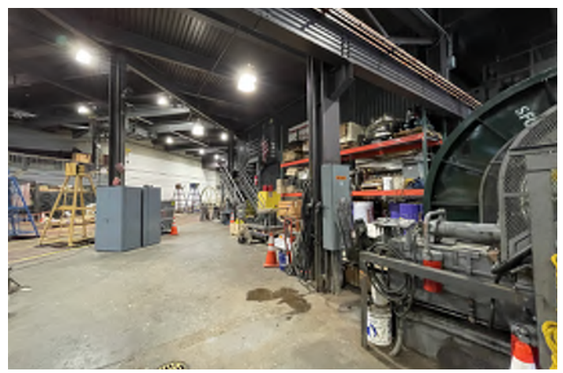
100 | Cable Yard





100A | Wheel Storage Area

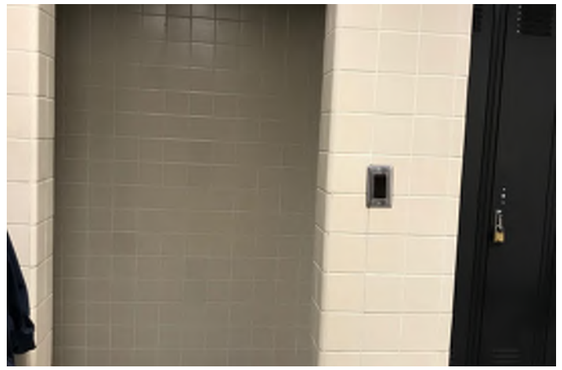




102 | Lunch-Meeting

105 | Men

106 | Women



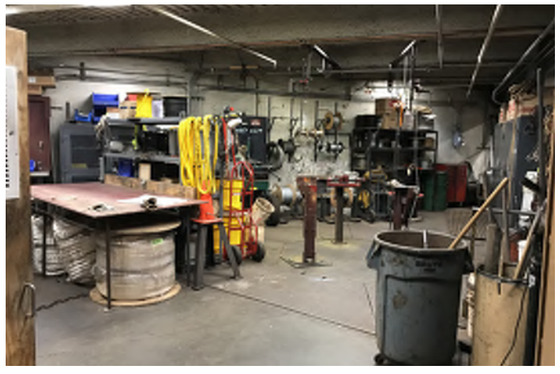
107 | Mech Room

108 | Control Room

109 | Elect Equip

110 | Splicer Break

110B | Splicer Workroom

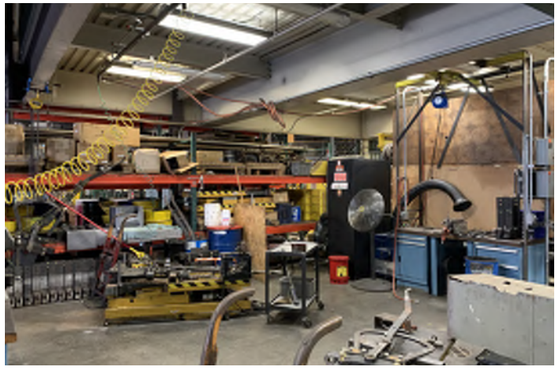


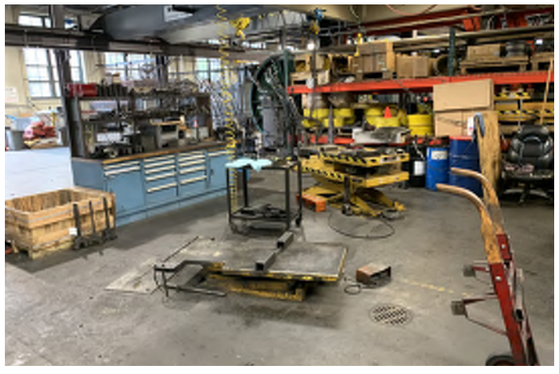
111 | Weld Shop

111A | Pulley Assembly Area

111B | Steam Cleaning-Weld Area

111C | Grip Bldg Area

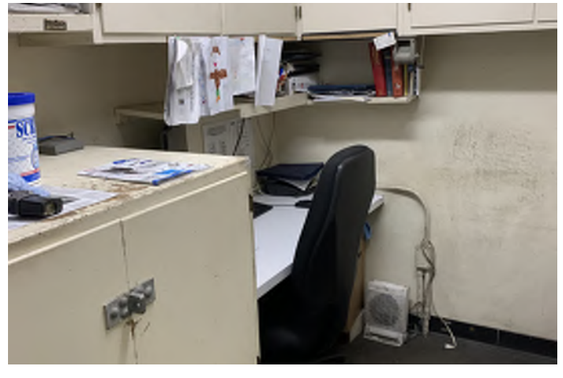




112 | Storage

113 | Vestibule

114 | Office



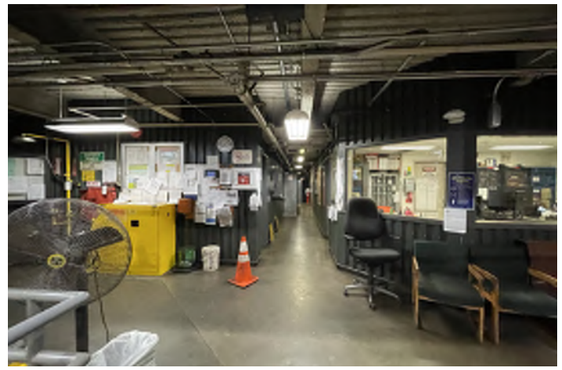
115 | Office

116 | Office

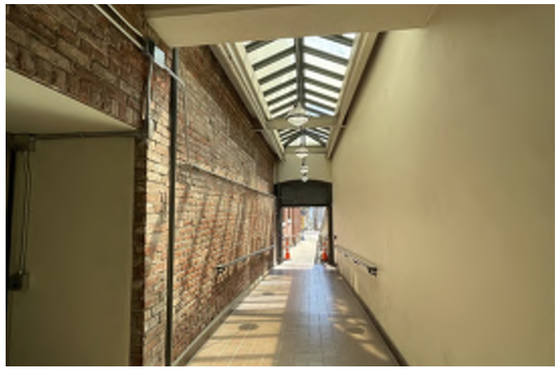
117 | Machine Shop

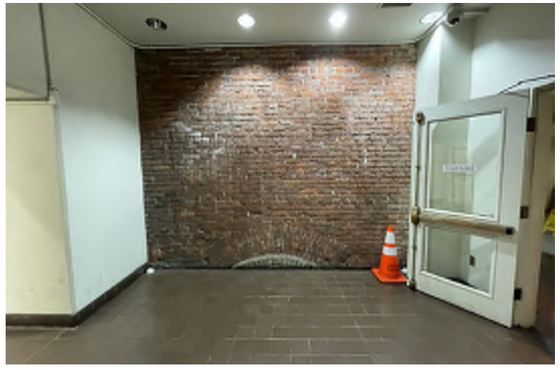
118 | Lobby

120 | Corridor



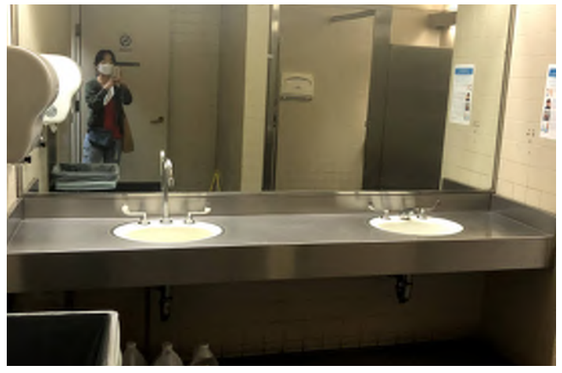
1M00 | Lobby



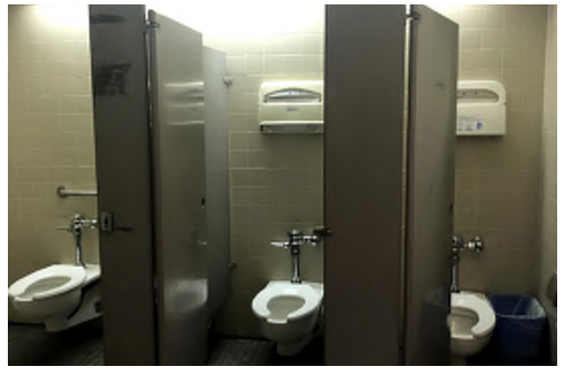


1M01 | Storage-Break

1M03 | Men



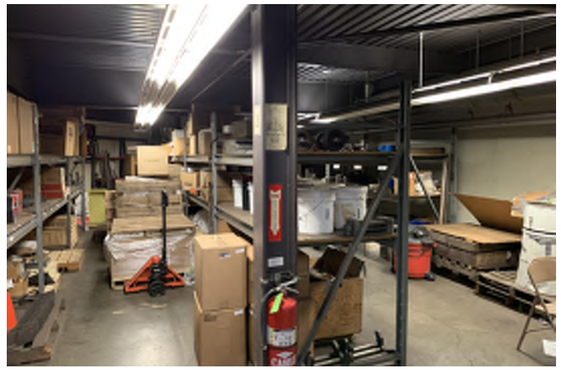
1M04 | Women



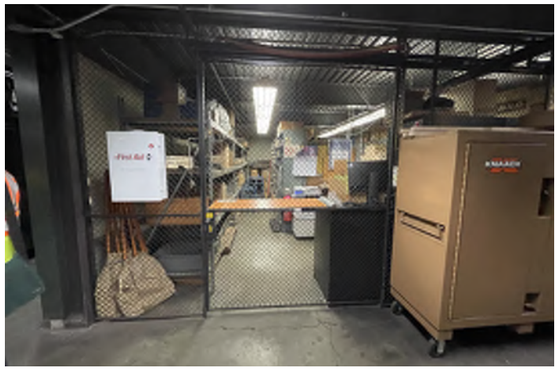
1M05 | Museum

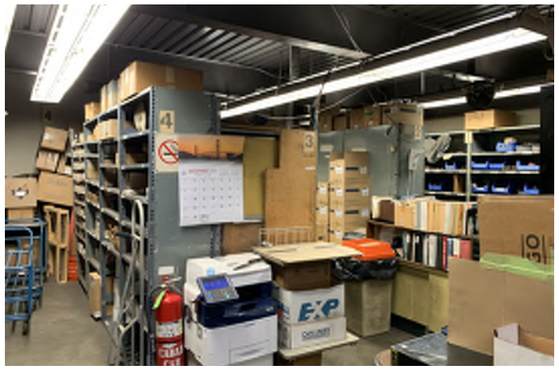
1M06 | Museum Lobby

1M07 | Parts Storage and Workstations



1M09 | Storekeeper





1M10 | Walkway

200 | Cable Car Shop

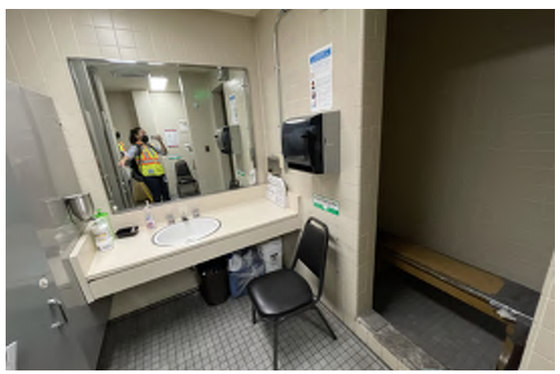
200A | Pit

201 | Break

202 | Supervisor Office

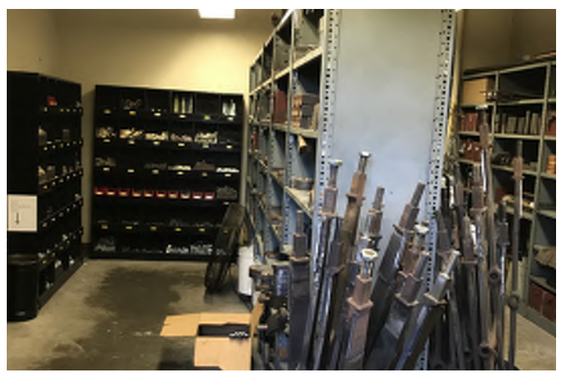
203 | Men

204 | Women

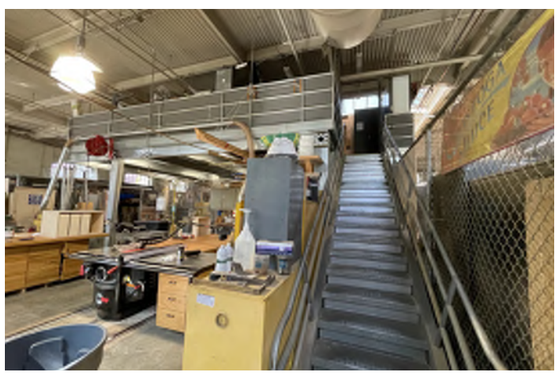


206 | Locker

207 | Parts Storage



208 | Carpentry



208A | Tools

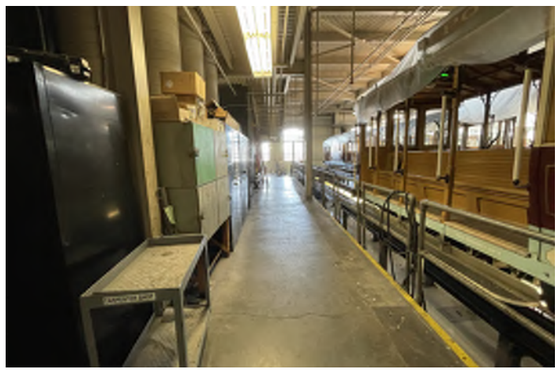
208B | Paint

208C | Superintendent

208D | Carpentry Break

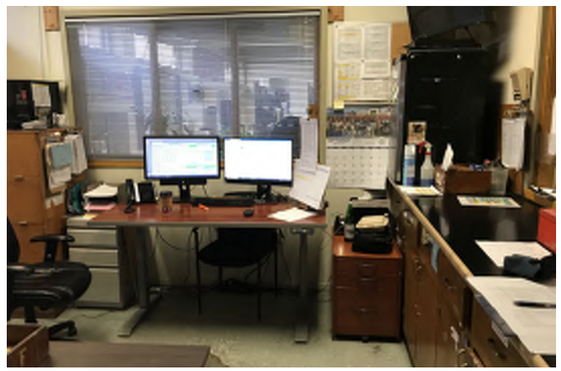
209 | Lobby

Walkway



2M04 | Conference-Storage

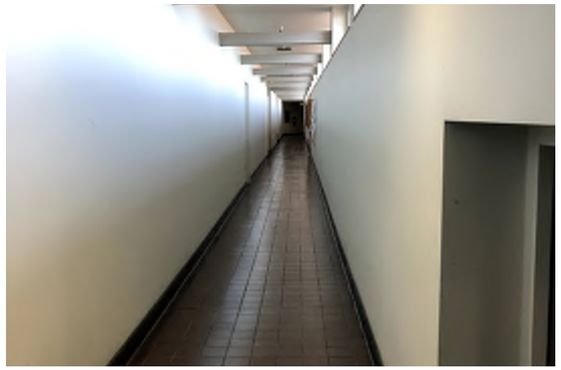
2M09 | Dispatch



2M10 | Operators Break

2M13 | Union Rep

2M21 | Corridor



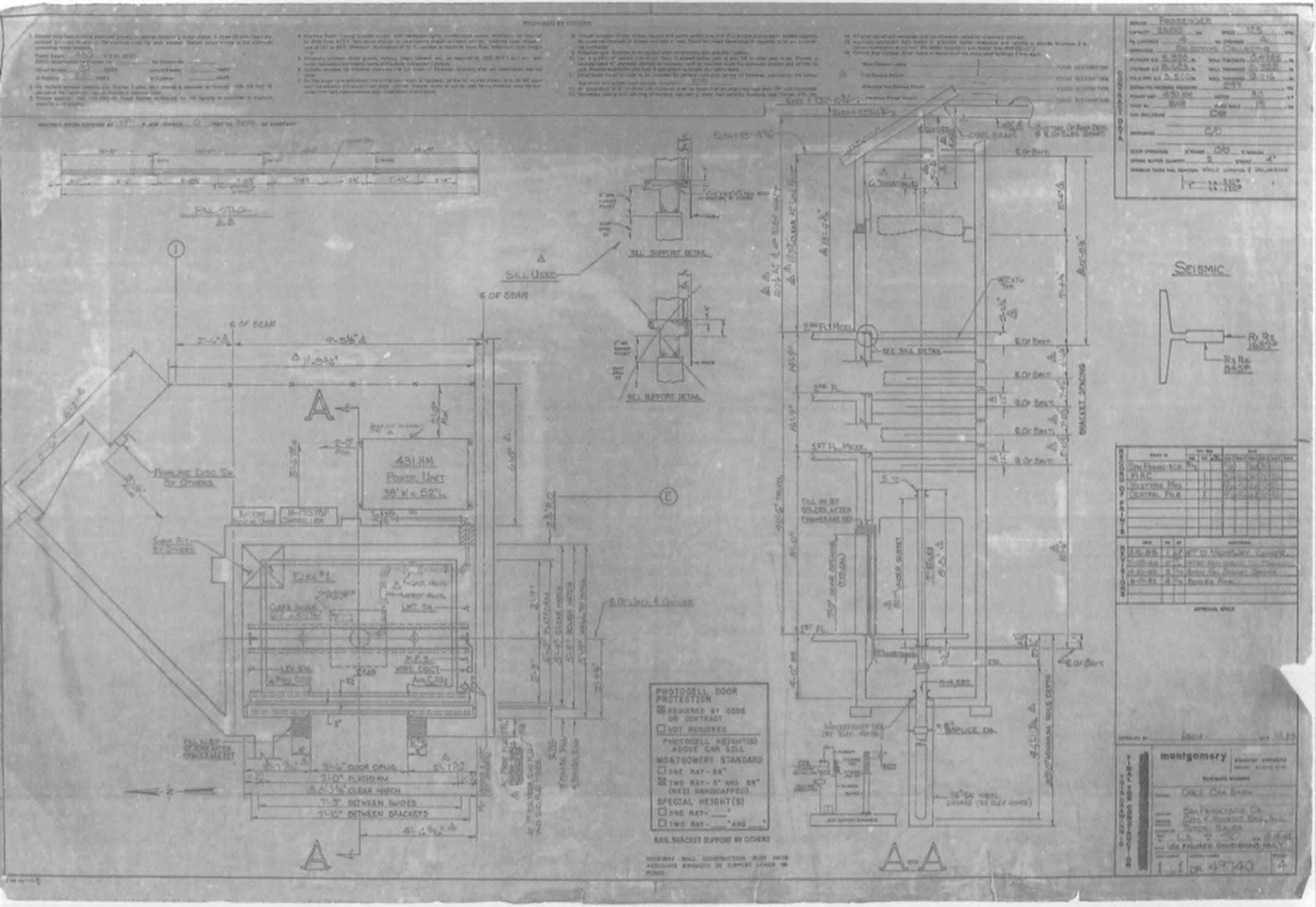
A11 - Elevator Shop Drawings & Assessment

Existing Shop Drawings

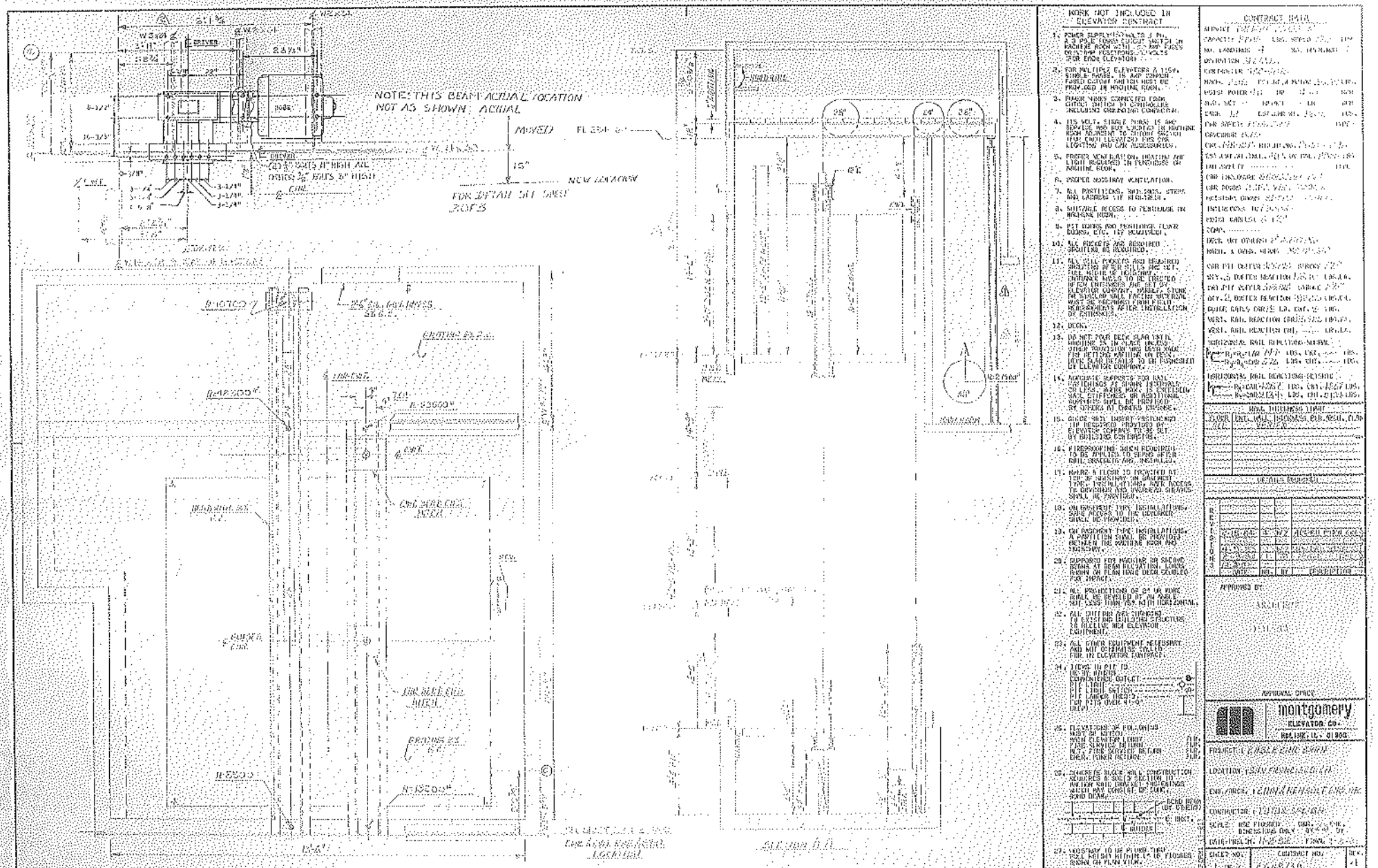
Elevator Replacement Assessment

KONE Passenger Elevator Information

PFLOW Vertical Lift Information


PROVIDED BY OTHERS
PASSENGER
SEISMIC
SILL USED
SILL SUPPORT DETAIL
SILL SUPPORT DETAIL
431 HM
POWER UNIT
38" W x 52" L
MAINLINE DISC. SW. BY OTHERS
SUMP PIT BY OTHERS
3'-6" DOOR OPNG.
7'-0" PLATFORM
8'-5½" CLEAR HATCH
7'-3" BETWEEN GUIDES
7'-10" BETWEEN BRACKETS
PHOTOCELL DOOR PROTECTION
REQUIRED BY CODE OR CONTRACT
NOT REQUIRED
PHOTOCELL HEIGHT(S) ABOVE CAR SILL
MONTGOMERY STANDARD
ONE RAY - 29"
TWO RAY - 5" AND 29" (NEI HANDICAPPED)
SPECIAL HEIGHT(S)
ONE RAY - ___"
TWO RAY - ___" AND ___"
RAIL BRACKET SUPPORT BY OTHERS
BRACKET SPACING
SEE SILL DETAIL
CABLE CAR BARN
montgomery
1 OF 49740
4

10-25-85



WORK NOT INCLUDED IN ELEVATOR CONTRACT

1. POWER SUPPLY 230 VOLTS 3 PH. A.C. 3 POLE FUSED CIRCUIT SWITCH IN MACHINE ROOM WITH 3 AMP FUSES OR 3 AMP THERMAL OVERLOAD PROTECTION, 230 VOLTS FOR EACH ELEVATOR.
2. FOR MULTIPLE ELEVATORS A 115V. SINGLE PHASE, 15 AMP COMMON FUSED CUTOFF SWITCH MUST BE PROVIDED IN MACHINE ROOM.
3. POWER WIRES CONNECTED FROM CUTOFF SWITCH TO CONTROLLERS INCLUDING GROUNDING CONDUCTOR.
4. 115 VOLT, SINGLE PHASE 15 AMP SERVICE AND BUX LOCATED IN MACHINE ROOM ADJACENT TO CUTOFF SWITCH FOR CAR LIGHTING AND CAR ACCESSORIES.
5. PROPER VENTILATION, HEATING AND LIGHT REQUIRED IN PENTHOUSE OR MACHINE ROOM.
6. PROPER HOISTWAY VENTILATION.
7. ALL PARTITIONS, WALLS, DOORS, STEPS AND LANDINGS TO BE FIRE-PROOF.
8. SUITABLE ACCESS TO PENTHOUSE OR MACHINE ROOM.
9. PIT DRAINS AND PENTHOUSE FLOOR DRAINS, ETC. TO BE PROVIDED.
10. ALL PICKETS ARE REQUIRED SHOULD BE FURNISHED BY OTHERS AS REQUIRED.
11. ALL SILL PICKETS AND REQUIRED GROUTING OF SILLS AND SET, TO BE DONE BY OTHERS. ENTRANCES MUST BE ERECTED BEFORE ENTRANCES ARE SET BY ELEVATOR COMPANY. MARBLE STONE OR SIMILAR WALL FACING MATERIAL MUST BE PROVIDED FROM FIELD MEASUREMENTS AFTER INSTALLATION OF ENTRANCES.
12. DECK.
13. DO NOT POUR DECK SLAB UNTIL MACHINE IS IN PLACE UNLESS OTHER PROVISION HAS BEEN MADE FOR BEAM OPENING. SEE PLAN DETAILS TO BE FURNISHED BY ELEVATOR COMPANY.
14. ADEQUATE SUPPORTS FOR RAIL BRACKETS AT FLOORS APPROVED BY OTHERS AT CHANGE ENTRANCE.
15. GROUT SOLID UNDER MACHINE BEDPLATE AND ALL OTHER STEEL WORK IN CONTACT WITH CONCRETE OR MASONRY.
16. FIREPROOFING WHERE REQUIRED IS TO BE APPLIED TO STEEL AFTER RAIL BRACKETS ARE INSTALLED.
17. MARBLE FLOOR TO BE PROVIDED AT TOP OF HOISTWAY ON BASEMENT TYPE INSTALLATIONS. DOOR ACCESS TO GOVERNOR AND UNDERPIT SHEAVES SHALL BE PROVIDED.
18. ON BASEMENT TYPE INSTALLATIONS DOOR ACCESS TO THE GOVERNOR SHALL BE PROVIDED.
19. ON ASCENDANT TYPE INSTALLATIONS A PARTITION SHALL BE PROVIDED BETWEEN THE MACHINE ROOM AND HOISTWAY.
20. SUPPORTS FOR MACHINE OR SHEAVE BEAMS AT DEAD FLOATING LOADS SHOWN ON PLAN HAVE BEEN DOUBLED FOR IMPACT.
21. ALL PROJECTIONS OF BRICK WORK SHALL BE BEVELED AT AN ANGLE NOT LESS THAN 75° WITH HORIZONTAL.
22. ALL CUTTING AND CHASING TO EXISTING BUILDING STRUCTURES TO INSTALL NEW ELEVATOR EQUIPMENT.
23. ALL OTHER EQUIPMENT NECESSARY AND NOT OTHERWISE SPECIFIED FOR IN ELEVATOR CONTRACT.
24. TIEDOWN PIT TO CONCRETE FOR CONVENIENCE OUTLET
PIT LIGHT
PIT LIGHT SWITCH
PILOT LAMPS (RED)
FOR PITS OVER 4'-0" DEEP
25. ELEVATORS OF FOLLOWING MUST BE EQUIPPED WITH ELEVATOR LIGHT FOR SERVICE RETURN
NORMAL POWER RETURN
EMERG. POWER RETURN
26. CONCRETE BLOCK WALL CONSTRUCTION REQUIRES A SOLID SECTION TO INSTALL RAIL BRACKET. UNDERSIZED HOLLOW BLOCK OR CORE FILLED BOND BEAMS.
27. HOISTWAY TO BE PLUMB TRUE FULL HEIGHT WITHIN TOLERANCES SHOWN ON PLAN VIEW.

CONTRACT DATA

SERVICE
CAPACITY LBS. SPEED FPM
NO. LANDINGS NO. OPENINGS
OPERATION
CONTROLLER
MOTOR
HOIST MOTOR HP RPM
SHEAVE DIA. ROPING
CAR ENCLOSURE
CAR DOORS
HOISTWAY DOORS
INDICATORS
FLOOR CABLES
COMP.
DECK HAY OPENING
MACH. & OVHD. BEAMS
CAR PIT DEPTH
BUFFER REACTION LBS.
CWT. PIT DEPTH
BUFFER REACTION
GUIDE RAILS
WEST. RAIL REACTION
WEST. RAIL REACTION
HORIZONTAL RAIL REACTIONS-NORMAL
HORIZONTAL RAIL REACTIONS-SEISMIC

ROPE THICKNESS CHART

FLOOR	ENT.	WALL	THICKNESS	SILL	RECD.	FLOOR

DETAILS REQUIRED

NO.	DATE	BY	DESCRIPTION

APPROVED BY:
ARCHITECT
DATE

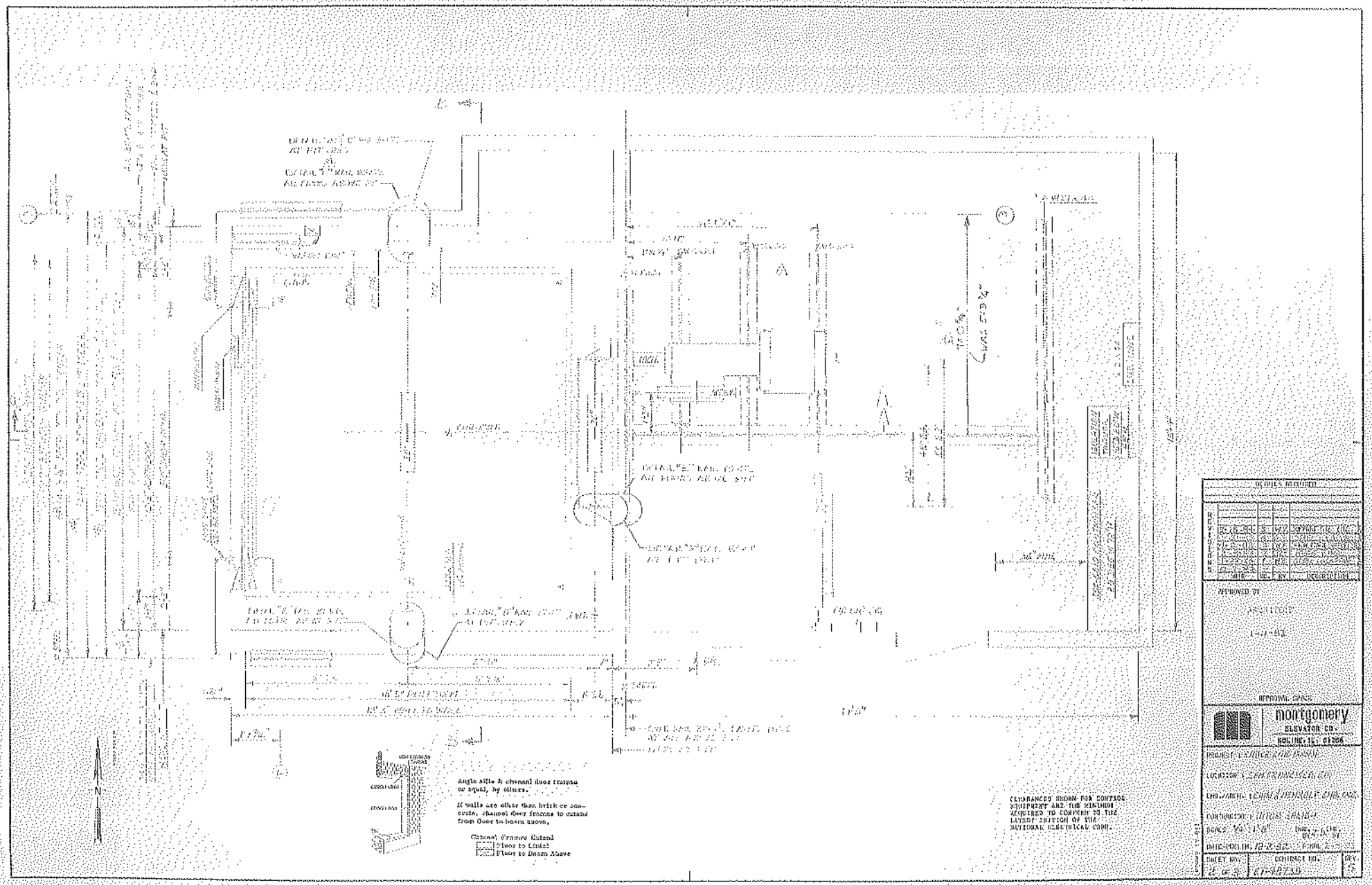
APPROVAL OFFICE

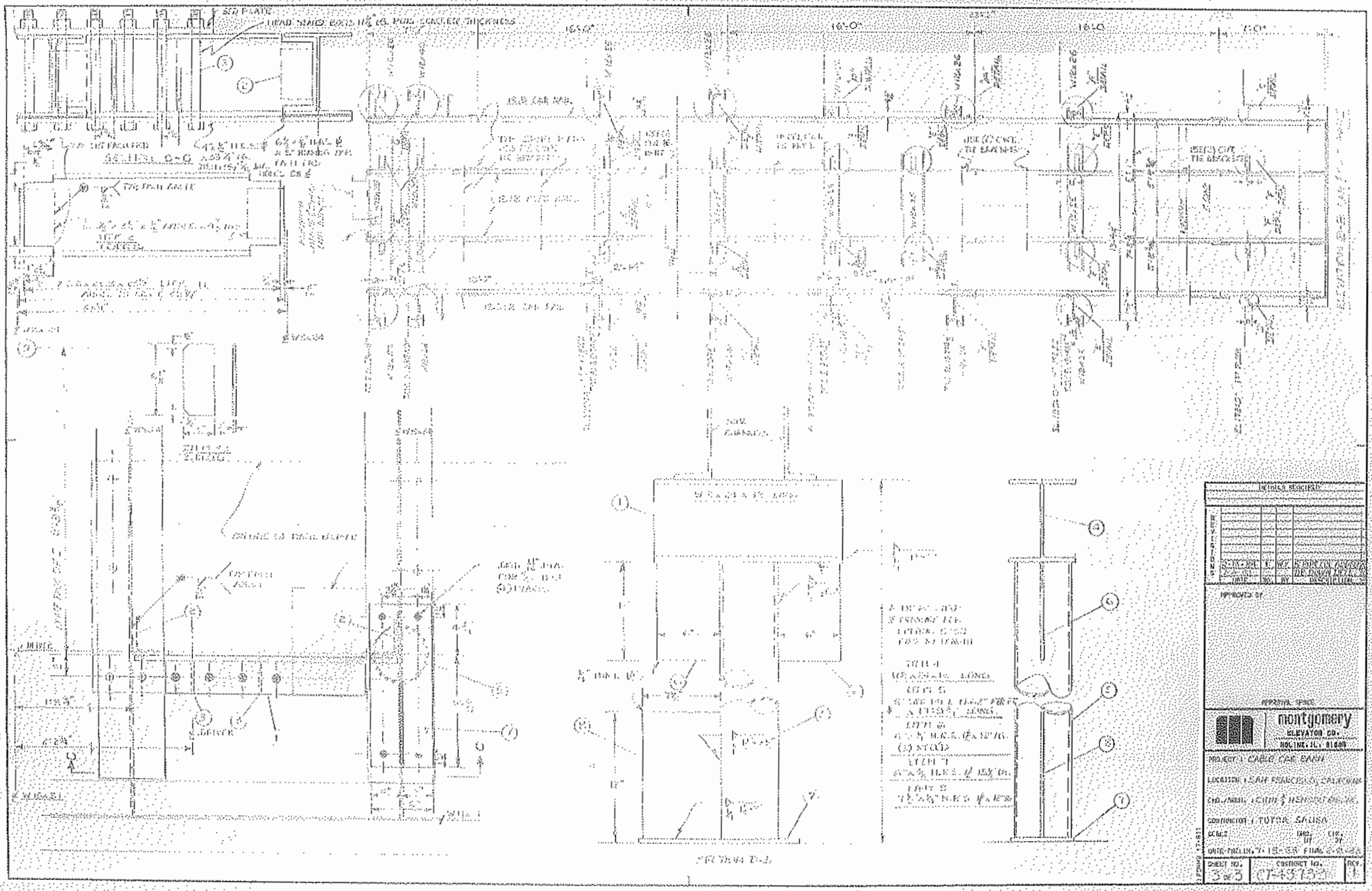
montgomery ELEVATOR CO.
MOLINE, ILL. 61265

PROJECT:
LOCATION:
CONT. AREA:
CONTRACTOR:
SCALE: USE FIGURED DIMENSIONS ONLY
DATE-FIELD:

SHEET NO. 1 OF 2
CONTRACT NO.
REV. 4

2-16-84


Angle sills & channel door frames or equal, by others.
If walls are other than brick or concrete, channel door frames to extend from floor to beam above.
Channel Frames Extend
Floor to Lintel
Floor to Beam Above
CLEARANCES SHOWN FOR CONTROL EQUIPMENT ARE THE MINIMUM REQUIRED TO COMPLY TO THE LATEST EDITION OF THE NATIONAL ELECTRICAL CODE.
montgomery
ELEVATOR CO.
MOLINE, ILL. 61265


montgomery
ELEVATOR CO.
MOLINE, IL. 61265
PROJECT: CABLE CAR BARN
LOCATION: SAN FRANCISCO, CALIFORNIA
CONTRACTOR: TUTOR SALIBA
SHEET NO. 3 of 3
CONTRACT NO. CT-45732
REV. 1

MEMO

Elevator Replacement Assessment

To:	EunJoo Cho	From:	Jessica Cooper
For:	City of San Francisco Public Works	Date:	July 19, 2021

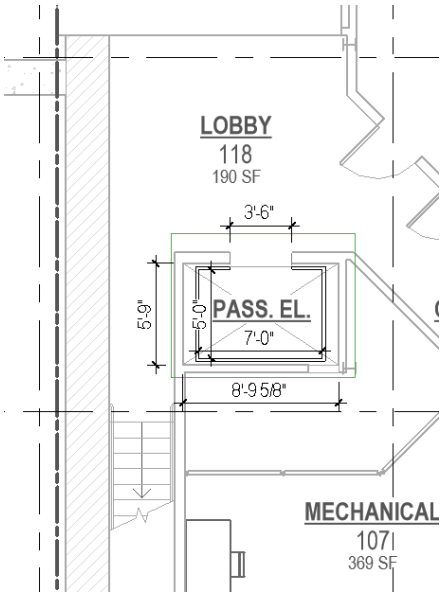
SFMTA has requested upgrades and/or replacement of the two elevators of the Cable Car Barn: Passenger Elevator #1 and Freight Elevator #2.

Please see the following memo for a summary of analysis to date, including assessments of elevator replacement, manufacturer data, and other impacts to the space that requires consideration in decision-making.

1.0 EXISTING CONDITIONS

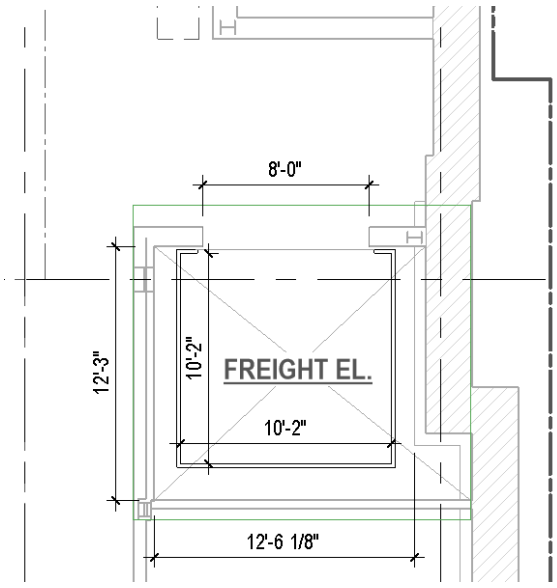
The existing elevator technical data is as shown below. These criteria were confirmed through email discussions between Public Works and the existing manufacturer (Kone) in early June 2021, and are the minimum requirements used in assessing manufacturer makes and models for potential replacement.

Passenger Elevator 1 (State ID #07752)



- Installed in 1984
- Hydraulic – subfloor pit below Level 1
- Montgomery Elevator – company purchased by Kone in 1994.
- 2500lb capacity
- 125 fpm speed

Freight Elevator 2 (State ID #077624)



- Installed in 1984
- Traction – basement machine with an adjacent overhead machine room
- Montgomery Elevator with Guilbert freight doors – company purchased by Kone 1994.
- 8000lb capacity
- 150 fpm speed

2.0 ELEVATOR MANUFACTURERS

2.1 KONE U.S. ELEVATOR COMPAY

2.1.1 Passenger Elevator 1

KONE U.S. has two low-rise assembly models that were assessed as potential replacements for Passenger Elevator 1: KONE EcoSpace and KONE MonoSpace 500. Refer to attached cutsheets for more details.

Below is a comparison chart to the existing specifications of Passenger Elevator 1

Passenger Elev 1 Specs	KONE EcoSpace	KONE MonoSpace 500
• Min Travel = 42'-6" • Landings = 4 • Speed = 125 fpm • Capacity = 2500 lbs • Car Height = Unknown • Clear Overhead = 4'-11"*** • Pit Depth = 4'-0"	• Max Travel = 48'-0" • Max Landings = 4 • Max Speed = 150 fpm • Capacity = 2000-3500 lbs* • Car Height = 8 ft** • Clear Overhead = 13'-0" • Pit Depth = 5'-0"	• Max Travel = 150'-0" • Max Landings = 15 • Available Speeds = 150+ fpm • Capacity = 2000-2500 lbs* • Car Height = 8ft** • Clear Overhead = 13'-0" • Pit Depth = 5'-0"

*Note: Values are based on cab replacement per existing hoistway widths – capacities can be higher as widths and depths increase.
**Note: Lower Car Height adds to Clear Overhead specification, as required per manufacturer
***Note: Per Revit model, and a presumed cab height of 8'-0", the existing clear overhead space = 4'-11" (confirmation required)

Recommendations

After reviewing the manufacturer's data, both elevator models present challenges associated with required Pit Depths and Clear Overhead clearances. These limitations would have to be reviewed and confirmed with the manufacturer, specific to the CCB. Considerations for structural reframing around the roof for required Clear Overhead and excavation below grade to provide increased Pit Depths need to be assessed and well-coordinated with structural and civil engineering teams.

Assuming these accommodations can be made, either the KONE EcoSpace or KONE MonoSpace 500 or the are worth considering as replacement elevators for CCB Passenger Elevator 1.

2.1.2 Freight Elevator 2

For Freight/Service Elevators, KONE offers the following models – all which list freight capacities lower than the existing Freight Elevator 2 capacity of 8000 lbs.

- Low-Rise Elevator KONE MonoSpace 500 – 5000 lb capacity
- Mid-Rise Elevator KONE MonoSpace 700 – 5000 lb capacity

Recommendations

Given the available data, no KONE U.S. product can be reasonably recommended to replace the existing Freight Elevator 2 of the Cable Car Barn.

For the KONE elevator brochure library and additional information, refer to this link:

https://www.kone.us/tools-downloads/brochure-library/

2.2 OTIS ELEVATOR COMPANY

2.2.1 Passenger Elevator 1

For low-rise buildings, Otis offers the HydroFit And Gen2 Underslung elevator models as a solution for Passenger Elevator 1 replacement. Refer to attached cutsheets for additional details.

Below is a comparison chart to the existing specifications of Passenger Elevator 1

Passenger Elev 1 Specs	OTIS HydroFit	OTIS Gen2 Underslung
• Min Travel = 42'-6" • Landings = 4 • Speed = 125 fpm • Capacity = 2500 lbs • Car Height = Unknown • Clear Overhead = 4'-11"*** • Pit Depth = 4'-0"	• Max Travel = 100'-0"** • Max Landings = 4 • Max Speeds = 100,125 fpm • Capacity = 2500 lbs* • Car Height = Unknown • Clear Overhead = 12'-0" • Pit Depth = 5'-0"	• Max Travel = 80'-0"+ • Max Landings = 10+ • Available Speeds = 150+ fpm • Capacity = 2500 lbs* • Car Height = 7'-9" • Clear Overhead = Varies • Pit Depth = 4'-6"-5'-0"

*Note: Values are based on cab replacement per existing hoistway widths – capacities can be higher as widths and depths increase.
**Note: Per brochure, this hydraulic lift has a max rise of 100'-0" with a 4'-0" pit depth.
***Note: Per Revit model, and a presumed cab height of 8'-0", the existing clear overhead space = 4'-11" (confirmation required)

Recommendations

After reviewing the manufacturer's data, both elevator models present challenges associated with required Pit Depths and Clear Overhead clearances. These limitations will have to be reviewed and confirmed with the manufacturer, specific to the CCB. Considerations for structural reframing around the roof for required Clear Overhead and excavation near the foundations to provide increased Pit Depths need to be considered and well-coordinated with the structural and civil engineering teams.

Assuming these challenges can be met, either of these elevator models by OTIS would be acceptable to consider for replacing the Passenger Elevator 1. However, the HydroFit is slightly preferred over the Gen2 Underslung, as one of its boasted benefits is the ability to have a "machine-roomless" design. For the Cable Car Barn, being able to recapture floor area is a sound benefit for overall master-planning.

2.2.2 Freight Elevator 2

For Freight/Service Elevators, Otis offers the following models – all of which list freight capacities lower than the existing Freight Elevator 2 capacity of 8000 lbs.

- Low-Rise Elevator Otis Gen2 Underslung Systems – 5000 lb capacity
- Mid-Rise Elevator Otis Gen2 Overslung Systems – 5000 lb capacity
- High-Rise Elevator Otis Skyrise – 5000 lb capacity

Recommendations

Based on this available data, no Otis model can be recommended to replace the existing Freight Elevator 2 of the CCB, as they do not meet the capacity requirement.

For the Otis elevator brochure library and additional information, refer to this link:

https://www.otiscreate.com/product-finder/en/us

2.3 PFLOW INDUSTRIES

2.3.1 Passenger Elevator 1

People-moving elevator models, not available per this manufacturer

2.3.2 Freight Elevator 2

PFlow Industries offers Vertical Lifts for Material Handling, listing freight capacities equal-to or greater-than the existing CCB Freight Elevator 2 capacity of 8,000 lbs.

The M Series vertical lifts can convey loads up to 10,000 lbs; and the F Series Lift can convey up to 50,000 lbs. The carriages start at standard sizes of 10'x12' and 12'x12' respectively – but, per manufacturer, can be built to required specifications. The carriage is lifted and lowered by heavy-duty roller chains, by straddle configuration.

- Low-Rise Height M Series Lifts – 8,000 lb capacity
  - Available in Mechanical or Hydraulic
  - Available 2-Post Straddle
- Low Rise Height F Series Lift – 50,000 lb capacity
  - Available in Mechanical
  - Available 4-Post Straddle

Below is a comparison chart to the existing specifications of Freight Elevator 1

Freight Elev 1 Specs	M Series Lift (2-Post)	F Series Lift (4-Post)
• Min Travel = 42'-6" • Landings = 4 • Speed = 150 fpm • Capacity = 8000 lbs • Car Height = 8'-0" assumed* • Clear Overhead = 13'-5 3/8"* • Pit Depth = 5'-6"	• Max Travel = 200'-0" • Max Landings = undefined • Max Speeds = 25-30 fpm • Capacity = 10,000 lbs • Car Height = as required • Clear Overhead = undefined • Pit Depth = undefined	• Max Travel = unlimited • Max Landings = undefined • Max Speeds = 20 fpm • Capacity = 50,000 lbs • Car Height = as required • Clear Overhead = undefined • Pit Depth = undefined

*Note: Per Revit model, and a presumed cab height of 8'-0", the existing clear overhead space = 13'-5 3/8 " (confirmation required)

Recommendations

As stated in the manufacturer's data, all products are custom designed and built to exact specifications – no "one size fits all." The dimensions and capacities can match the clients needs and are engineered to order. Either of these models would be acceptable in replacing the Freight Elevator 2 at the CCB. The M Series most-closely fit the current shaft space, meets the minimum capacity required, and will be more cost-efficient than the F Series.

For the M Series PFlow brochure and additional information, refer to this link:
https://www.pflow.com/products/vertical-lifts/m-series/

2.4 OTHER ELEVATOR MANUFACTURERS

When receiving Federal funding, public agencies are often obligated to abide by the Buy American Act and specify products made in the US. This Act created a national preference for the government to procure only domestic goods and materials used on public construction.

Under limited circumstances, the FTA may waive Buy American requirements if the agency finds that:

- The products or materials are inconsistent with the public interest;
- or unavailable in the U.S. in enough quantity or acceptable quality to be specified;
- or will increase the cost of the overall project by more than 25 percent for rolling stock; or costs would be a least 6-12% lower than comparable U.S. products.

The manufacturers listed in this memo are all US-based companies and can commonly meet the BAA requirement. SFDPW to confirm this Act as it pertains to the CCB; and if an exemption is needed, below is a recommended list of other manufacturers to consider, that may or may not be US-based companies.

2.4.1 THYSSENKRUPP

2.4.2 SCHINDLER

2.4.3 CUSTOM INDUSTRIAL PRODUCTS

KONE MONOSPACE® 500

CONFIGURATIONS & DIMENSIONS

Max Travel [8]
150 ft. (45.7 m)

Max Landings [8]
15

Speed [8]
150, 200, 350 fpm
(.75, 1.0, 1.78 m/s)

Car Height F
8, 9 or 10 ft.
(2438, 2743 or 3048 mm)

Entrance Height G
7, 8 or 9 ft.
(2134, 2438 or 2743 mm)

				A	A SEISMIC	B	B SEISMIC	C	D	E	
		CAPACITY LBS. (kg)	OPENING TYPE (mm)	HOISTWAY WIDTH (mm)	HOISTWAY WIDTH (mm)	HOISTWAY DEPTH (mm)	HOISTWAY DEPTH (mm)	INTERIOR WIDTH (mm)	INTERIOR DEPTH (mm)	DOOR WIDTH (mm)	STRETCHER ACCOMMODATION[10]
Front Opening	PASSENGER	2000 (907)	SSP	7'-6" (2286)	7'-11" (2413)	5'-9" (1753)	5'-9 ½" (1766)	5'-8 57/64" (1750)	4'-4 27/64" (1332)	3'-0" (914)	No
		2500 (1134)	SSP-CO	8'-6" (2591)	8'-11" (2718)	5'-9" (1753)	5'-9 ½" (1766)	6'-8 29/32" (2055)	4'-4 27/64" (1332)	3'-6" (1067)	No
		2500 IBC (1134)[10]	SSP	8'-11" (2718)	9'-5" (2870)	5'-9" (1753)	5'-9 ½" (1766)	6'-11 47/64" (2127)	4'-4 27/64" (1332)	3'-6" (1067)	Yes
		3000 (1361)	SSP-CO	8'-6" (2591)	8'-9" (2667)	6'-3" (1905)	6'-3 ½" (1918)	6'-5 19/32" (1971)	5'-0 29/64" (1536)	3'-6" (1067)	No
		3500 (1588)	SSP-CO	8'-6" (2591)	8'-9" (2667)	6'-11" (2108)	6'-11" (2108)	6'-5 19/32" (1971)	5'-6 5/8" (1693)	3'-6" (1067)	Yes
		4000 (1814)	CO	9'-8" (2947)	9'-8" (2947)	6'-11" (2108)	6'-11" (2108)	7'-6 45/64" (2304)	5'-6 5/8" (1693)	4'-0" (1219)	Yes
	SERVICE	4000 (1814)	2SP	7'-8" (2337)	7'-8" (2337)	9'-2" (2794)	9'-2" (2794)	5'-7 3/32" (1704)	7'-7 29/32" (2335)	4'-0" (1219)	Yes
		4500 (2041)	2SP	7'-8" (2337)	7'-8" (2337)	9'-8" (2946)	9'-8" (2946)	5'-7 3/32" (1704)	8'-1 13/16" (2485)	4'-0" (1219)	Yes
		5000 (2268)[9]	2SP	7'-10" (2388)	7'-10" (2388)	10'-2 ½" (3112)	10'-2 ½" (3112)	5'-7 3/32" (1704)	8'-9 21/32" (2684)	4'-6" (1372)[9]	Yes
		5000 AIA (2268)	2SP	7'-10 5/16" (2396)	7'-11 ½" (2426)	10'-5 1/16" (3177)	10'-5 1/16" (3177)	5'-9 13/32" (1763)	9'-0 7/16" (2755)	4'-6" (1372)[9]	Yes
Front & Reverse Opening	PASSENGER	2000 (907)	SSP	7'-6" (2286)	7'-11" (2413)	6'-3 ¾" (1924)	6'-3 ¾" (1924)	5'-8 57/64" (1750)	4'-4 27/64" (1332)	3'-0" (914)	No
		2500 (1134)	SSP-CO	8'-6" (2591)	8'-11" (2718)	6'-3 ¾" (1924)	6'-3 ¾" (1924)	6'-8 29/32" (2055)	4'-4 27/64" (1332)	3'-6" (1067)	No
		2500 IBC (1134)[5][10]	SSP	8'-11" (2718)	9'-5" (2870)	6'-3 ¾" (1924)	6'-3 ¾" (1924)	6'-11 47/64" (2127)	4'-4 27/64" (1332)	3'-6" (1067)	Yes
		3000 (1361)	SSP-CO	8'-6" (2591)	8'-9" (2667)	6'-11 ¾" (2127)	6'-11 ¾" (2127)	6'-5 19/32" (1971)	5'-0 29/64" (1536)	3'-6" (1067)	No
		3500 (1588)[10]	SSP-CO	8'-6" (2591)	8'-9" (2667)	7'-6" (2286)	7'-6" (2286)	6'-5 19/32" (1971)	5'-6 5/8" (1693)	3'-6" (1067)	Yes*
		4000 (1814)	CO	9'-8" (2947)	9'-8" (2947)	7'-6" (2286)	7'-6" (2286)	7'-6 45/64" (2304)	5'-6 5/8" (1693)	4'-0" (1219)	Yes
	SERVICE	4000 (1814)	2SP	7'-8" (2337)	7'-8" (2337)	10'-2 1/8" (3102)	10'-2 1/8" (3102)	5'-7 3/32" (1704)	7'-7 29/32" (2335)	4'-0" (1219)	Yes
		4500 (2041)	2SP	7'-8" (2337)	7'-8" (2337)	10'-8 1/16" (3252)	10'-8 1/16" (3252)	5'-7 3/32" (1704)	8'-1 13/16" (2485)	4'-0" (1219)	Yes
		5000 (2268)[9]	2SP	7'-10" (2388)	7'-10" (2388)	11'-3 7/8" (3451)	11'-3 7/8" (3451)	5'-7 3/32" (1704)	8'-9 21/32" (2684)	4'-6" (1372)[9]	Yes
		5000 AIA (2268)	2SP	7'-10 5/16" (2396)	7'-11 ½" (2426)	11'-6 1/16" (3522)	11'-6 1/16" (3522)	5'-9 13/32" (1763)	9'-0 7/16" (2755)	4'-6" (1372)[9]	Yes

Visit kone.us for the latest project-specific details, CAD drawings, BIM models, CSI specifications, electrical data, reaction loads and building access requirements.

CLEAR OVERHEAD H AND PIT DEPTH I

Per Revit Model, Pass Elev 1 existing pit depth is 4'-0"

Per Revit Model, if Pass Elev 1 Car Height is 8'-0", the overhead would be 4'-11"

	150 FPM (0.75 M/S)		200 FPM (1.00 M/S)		350 FPM (1.78 M/S)	
CAPACITY LBS. (kg)	PIT DEPTH (mm)	CLEAR OVERHD (mm)	PIT DEPTH (mm)	CLEAR OVERHD (mm)	PIT DEPTH (mm)	CLEAR OVERHD (mm)
2000 to 2500 (907 to 1134)	5'-0" (1524)	13'-0" (3962)	5'-0" (1524)	13'-4" (3988)	5'-6" (1676)	13'-6" (4115)
3000 to 3500 (1361 to 1588)	5'-0" (1524)	13'-0" (3962)	5'-0" (1524)	13'-4" (3988)	5'-6" (1676)	13'-6" (4115)
4000 to 5000 AIA (1814 to 2268)	5'-0" (1524)	13'-8" (4166)	5'-0" (1524)	13'-8" (4166)	5'-6" (1676)	13'-8" (4166)

CONTROL SPACE [11]

		J	K	L
CAPACITY LBS. (kg)	CONTROLLER SPACE	WIDTH (mm)	DEPTH (mm)	DOOR WIDTH (mm)
2000 to 5000 AIA (907 to 2268)	remote closet	4'-0" (1219)[11]	1'-8" (508)[11]	3'-6" (1067)[11]
2000 to 5000 AIA (907 to 2268)	adjacent or remote room	5'-0" (1524)	dimension (B)	3'-0" (914)[11]

Notes

(1) A hoist beam (by KONE) is required for installation (by others). Dimension H reflects clear under hoist beam.

(2) If an Emergency Battery Device (EBD) is required, please contact your KONE Sales Professional for further detail regarding dimensions H, J, and L.

(3) The published A hoistway dimension represents the optimum clear inside requirements and maybe reduced by up to 2" (51mm). However, this may result in construction inefficiencies.

(4) The published interior width C and depth D dimensions represent the minimum clear inside requirements without raised panels. For interior width C and depth D dimensions with raised panels please contact a KONE Sales Professional.

(5) 2500 LB. IBC reverse opening must be diagonally opposed. For all other front and reverse opening configurations, hoistway width A is valid for directly opposed openings only. If diagonally opposed openings are required, please contact your KONE Sales Professional.

(6) The published minimum pit depth I dimension is based upon slide guides. For minimum pit depth I with roller guides please contact a KONE Sales Professional.

(7) All dimensions are based on an 8'-0" (2438 mm) cab with a 7'-0" (2134 mm) door. Alternate car and door heights are available, but will affect dimension H.

(8) 150 fpm (.75 m/s) only available up to 85 ft. (25 m) of travel and 10 landings. 200 fpm (1.00 m/s) available up to 100 ft. (30.5 m) of travel and 12 landings.

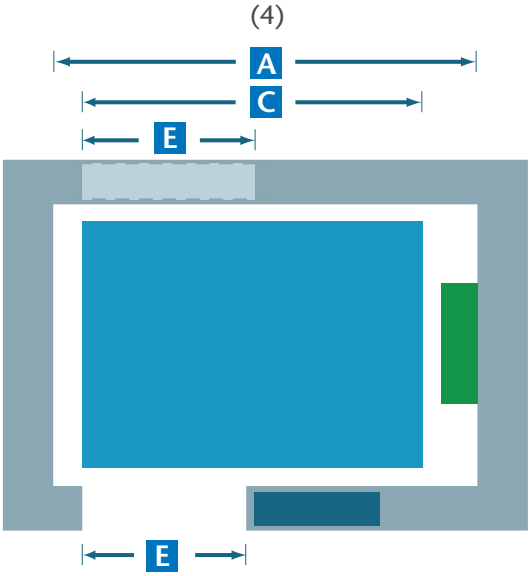
(9) 4'-0" (1219 mm) door width also available.

(10) Stretcher accessibility based on international building code (IBC) and California Building Code specified, 24 inch by 84 inch stretcher — with 5-inch radius corners. Elevator car must utilize a side slide door with the exception of the 4000 LB. passenger shaped car. In Canada (NBCC) 2500 LB. and larger elevators with single slide doors meet Canadian stretcher rule of 2010mm x 610mm.

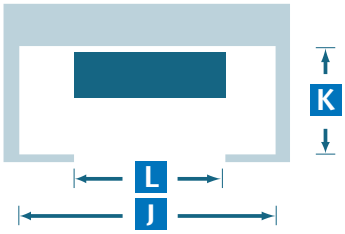
(11) If IBC 2018 or ASME A17.1-2019/CSA B44-19 code is applicable, contact your local sales professional for controller space configurations.

*3,500 LB. Front / reverse elevators needs to have diagonal opposed doors and a wider hoistway width of 8'-9" (8'-11" if seismic) to accommodate a stretcher. Please contact a KONE Sales Professional for more information.

Plan views

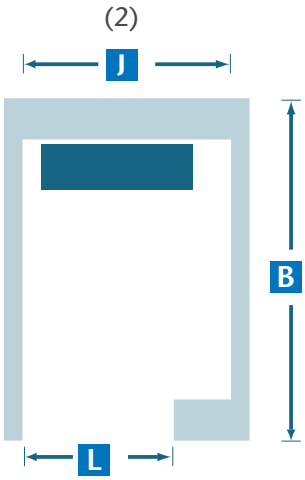


Integral Control Solution (standard)



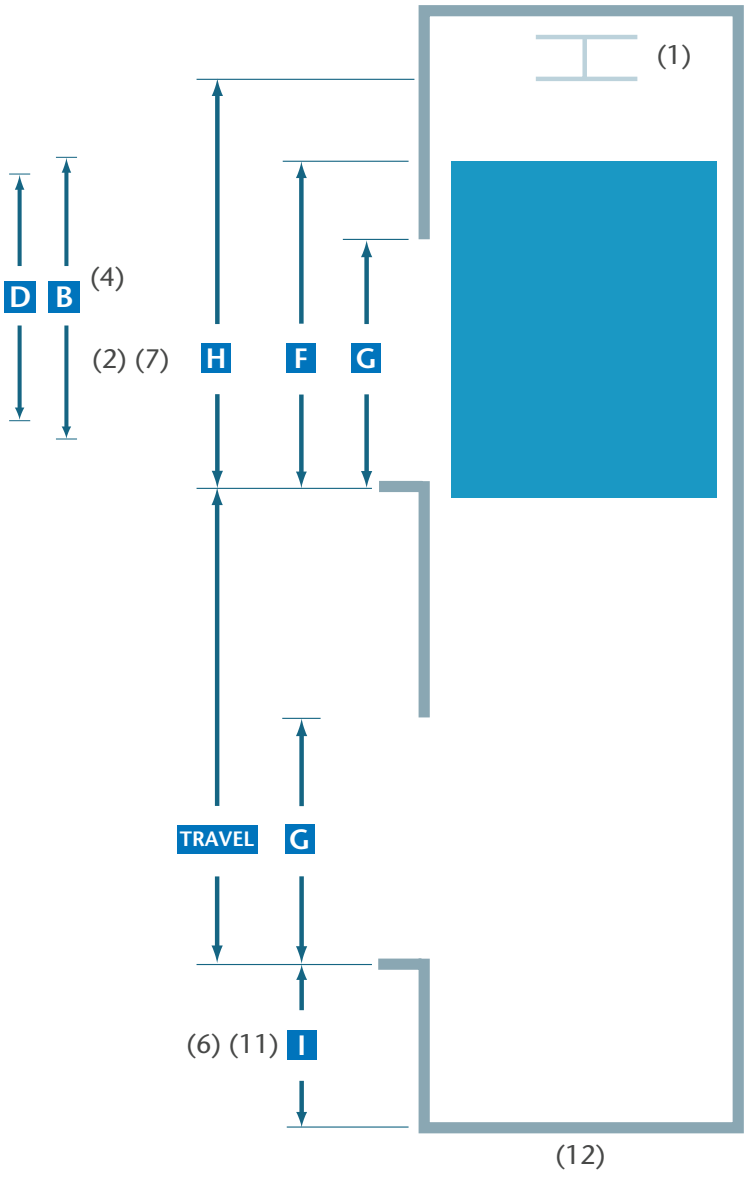
(2)

Remote Control Closet (option 1)



Adjacent or Remote Control Room (option 2)

Section view



Notes, continued:

Please consult a KONE Sales Professional regarding:

(11) Pit depths less than 5'-0" (1524 mm).

(12) Occupied space beneath the hoistway.

(13) Local code variations when utilizing the integrated, integral and remote closet options.

KONE
kone.us

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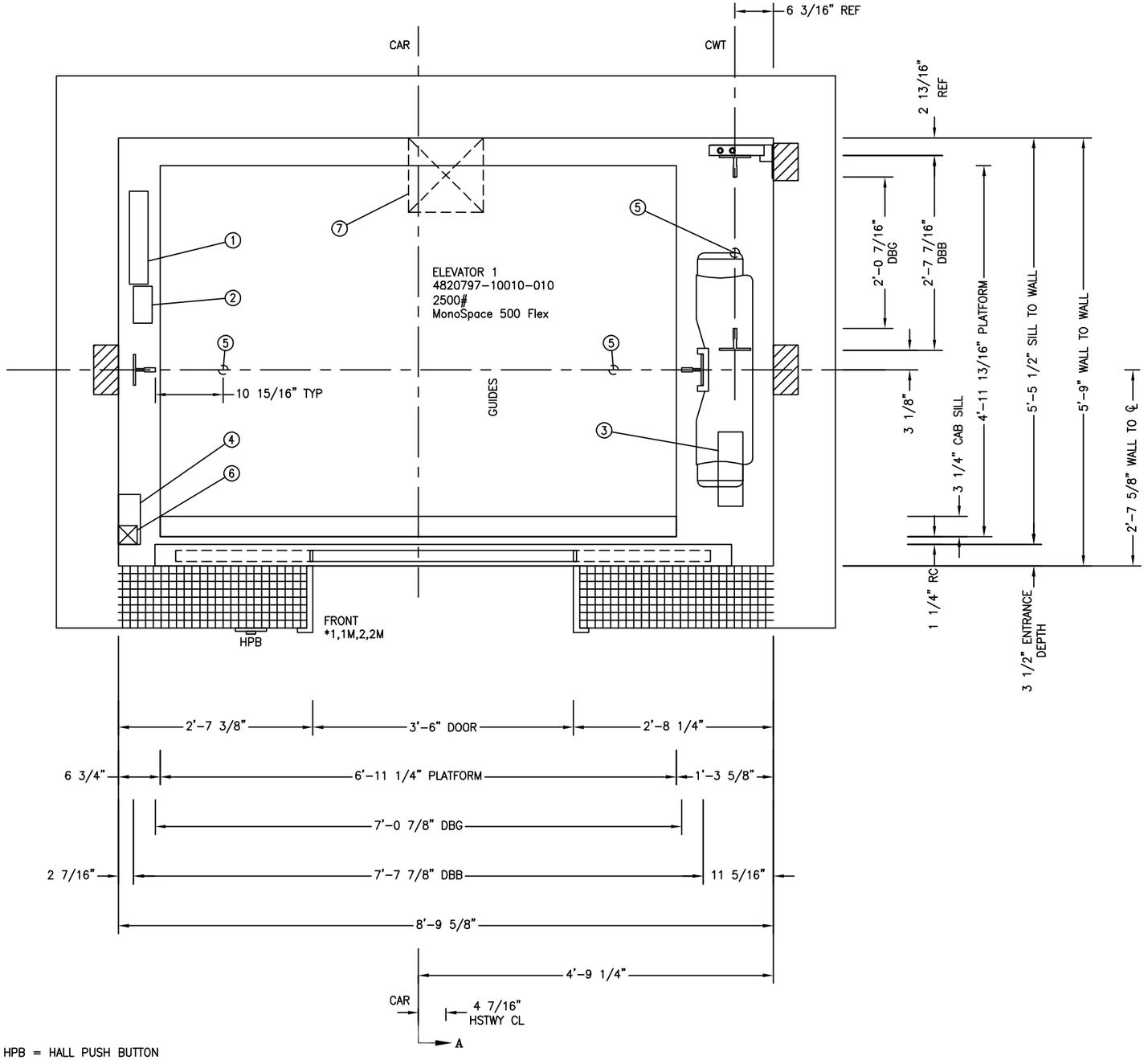

NOTE: HPB = HALL PUSH BUTTON

NOTES:
A. GOVERNOR TO BE POSITIONED WITH ELECTRICAL BOXES TOWARDS CAR SIDE AND ENCODER TOWARDS FRONT SIDE.

B. TERMINATE WIRE DUCT 48" [1220] ABOVE LOWEST LANDING. PIT LADDER TO BE POSITIONED DIRECTLY BELOW DUCT.

C. REFER TO THE DATA SHEET FOR FURTHER DETAILS CONCERNING ALLOWABLE CLEAR HOISTWAY TOLERANCES.

D. MINIMUM CLEAR HOISTWAY WIDTH SHOWN. CONTACT KONE FOR MAXIMUM ALLOWABLE CLEAR HOISTWAY.

E. ALL CAR AND CWT RAIL BRACKETS ATTACH TO SIDE HOISTWAY WALLS.

F. FILLER BIT HEIGHTS ARE BASED ON A COMPLETE CAB INSTALLATION.

INSTALLATION NOTES:

1) DBG TELESCOPE POLE SETTINGS = 7'-10 13/16"

2) BALANCE WEIGHTS: 0LBS QTY: 0
TRACTION WEIGHTS: 292LBS QTY: 71

NOTE: ALL TRACTION WEIGHTS MUST BE INSTALLED FOR TRACTION PURPOSES.

SPLIT FILLER BIT HT (STEEL): 6"
FULL FILLER BIT HT (STEEL)THIN: 5'-9 1/8"
FULL FILLER BIT HT (STEEL)THK: 90'-2 1/4"

① TRAVELING CABLE
② DEAD-END HITCH
③ CAR GOVERNOR / TENSION WT ASSEMBLY (SEE NOTE A)
④ PIT LADDER (KONE SUPPLIED/INSTALLED)
MIN. CLEARANCE FROM FRONT WALL:
SS/CO 8.25"[210mm], 2S 10.25"[260mm]
⑤ TYP BUFFER LOCATION / SEE DATA SHEET FOR REACTIONS
⑥ WIRE DUCT (SEE NOTE B)
⑦ RECOMMENDED DRAIN/SUMP PUMP LOCATION (IF REQUIRED) SEE "WORK BY OTHERS" SHEET, NOTE 38.

FOR APPROVAL – NOT FOR CONSTRUCTION

APPROVED BY

APPROVAL SPACE

PROJECT:
CABLE CAR BARN MODERNIZATION
LOCATION:
20067350
ENG/ARCH:
CITY & COUNTY OF SAN FRANCISCO
CONTRACTOR:
CITY & COUNTY OF SAN FRANCISCO

UNIT INFO

ITEM NO.	NETWORK NO.	EQUIPMENT NO.

REVISIONS

DATE	NO	BY	CK	DESCRIPTION
2021-07-14	–	KUR		PRELIMINARY

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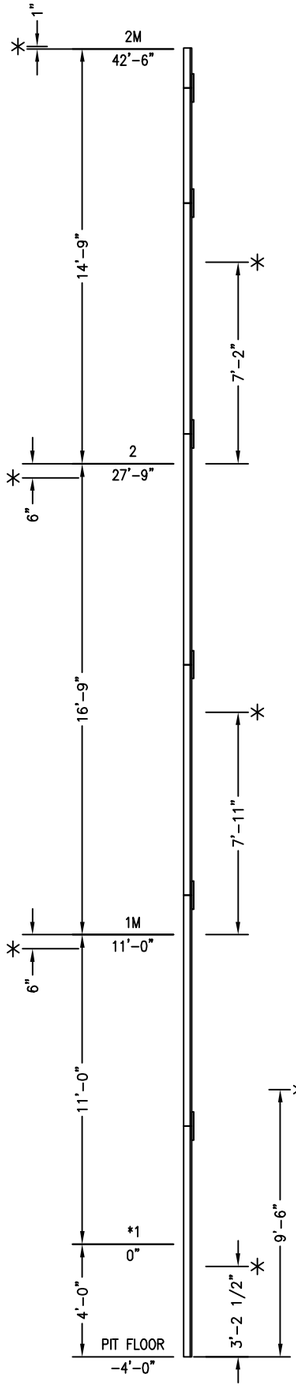
KONE

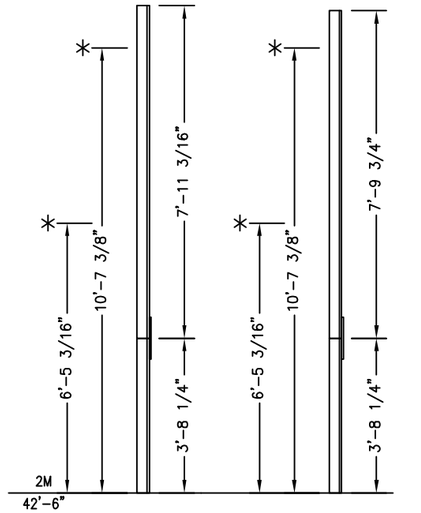
GENERATED ON: 07/14/21	BY: KSC	REV –
UNITS: IMPERIAL	1-20.2	
DRAWING M-4820797-10010-010	DESCRIPTION HOISTWAY	SHEET 1 of 16

FLOOR NUM	FRONT	REAR	DISTANCE
1	*1		11'-0"
2	1M		16'-9"
3	2		14'-9"
4	2M		

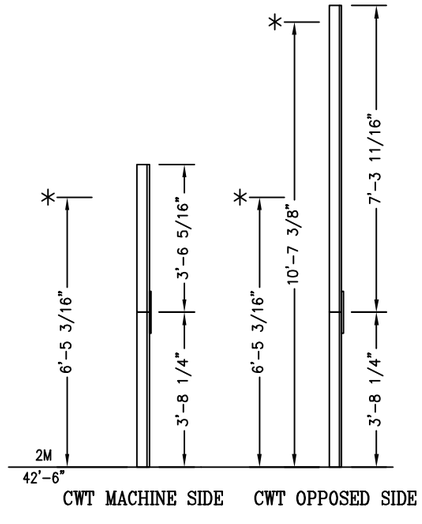


RAILSTACK

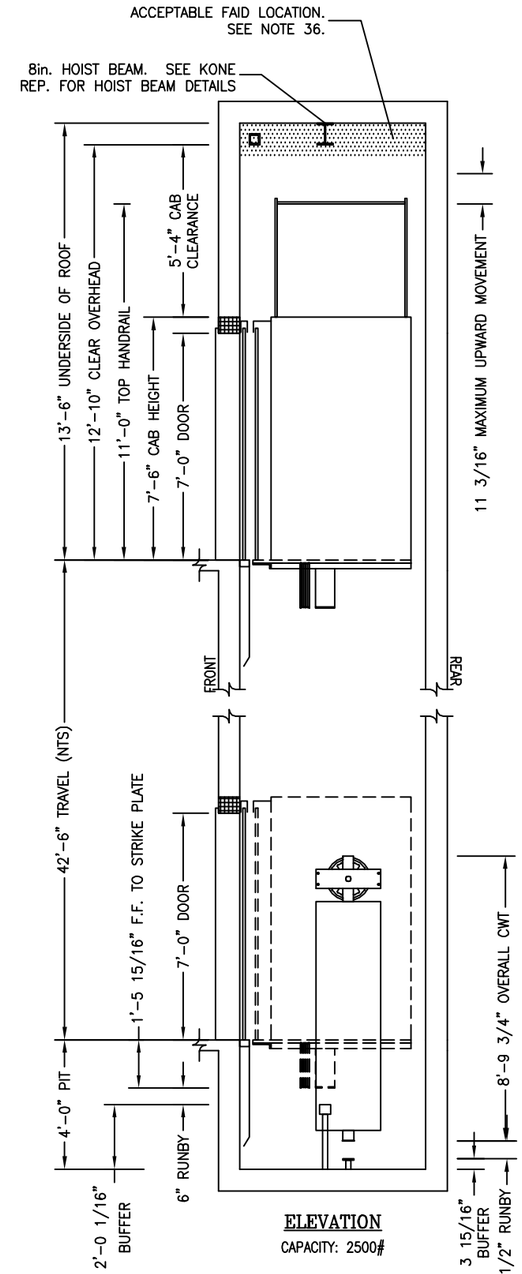
MAXIMUM BRACKET SPACING – 147"



RAIL SCHEDULE		
LOCATION	RAIL LENGTH	QTY
FILLER RAIL	5'-0 15/16"	1
MIDDLE	8'-2 7/16"	5
STARTER	8'-2 7/16"	1



"*" DENOTES CENTER LINE OF BRACKETS.
BRACKET SUPPORTS ARE REQUIRED AT THESE POINTS.



ELEVATION

CAPACITY: 2500#

COUNTERWEIGHT SAFETIES HAVE NOT BEEN PROVIDED.
KONE IS NOT AWARE OF ANY ACCESSIBLE SPACE BELOW THE PIT.

ELEVATIONS OR FLOOR MARKINGS OF THE FOLLOWING MUST BE NOTED WHEN APPLICABLE.

DESIGNATION	FLOOR MARKING
MAIN ELEVATION LOBBY	*1
FIRE SERVICE RETURN	*1
ALTERNATE FIRE SERVICE RETURN	1M
EMERGENCY POWER RETURN	N/A

APPROVED BY

APPROVAL SPACE

PROJECT:
CABLE CAR BARN MODERNIZATION
LOCATION:
20067350
ENG/ARCH:
CITY & COUNTY OF SAN FRANCISCO
CONTRACTOR:
CITY & COUNTY OF SAN FRANCISCO

UNIT INFO

ITEM NO.	NETWORK NO.	EQUIPMENT NO.

REVISIONS

DATE	NO	BY	CK	DESCRIPTION
2021-07-14	–	KUR		PRELIMINARY

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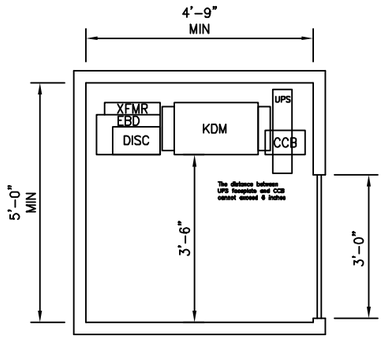
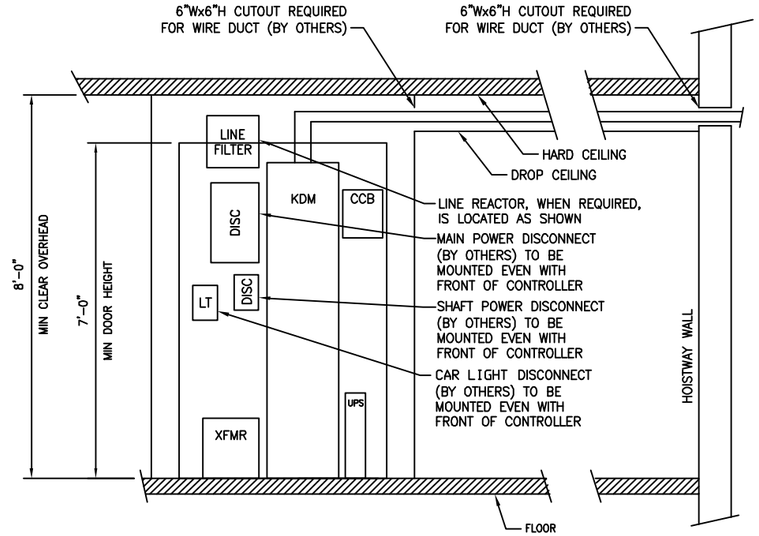
KONE

GENERATED ON: 07/14/21	BY: KSC	REV
UNITS: IMPERIAL	1-20.2	–
DRAWING	DESCRIPTION	SHEET
M-4820797-10010	RAILSTACK	2 of 16

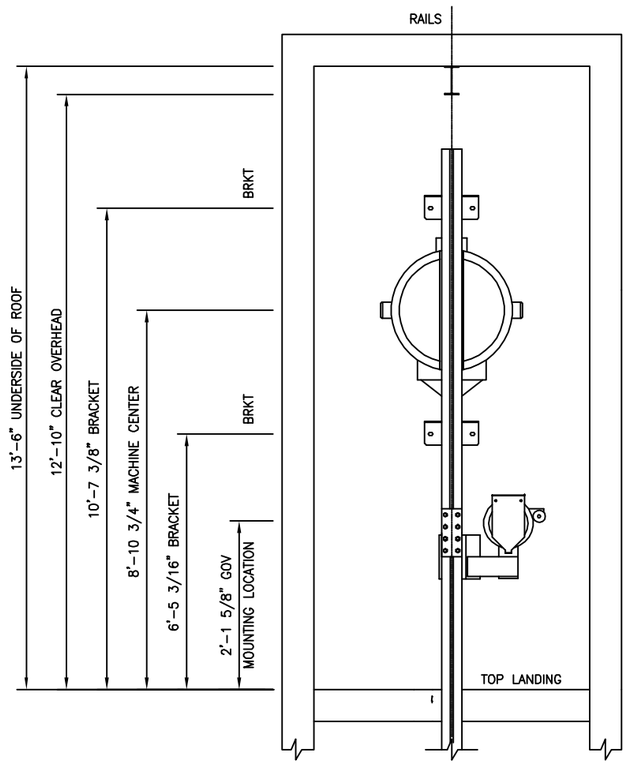
NOTES:
A. THE TEMPERATURE IN THE CONTROL SPACE MUST MAINTAIN BETWEEN 41° F [5° C] and 104° F [40° C].



REMOTE CONTROLLER ROOM PLAN VIEW
MINIMUM ROOM SIZE IS SHOWN
LOCATED AT FLOOR #1



ELEVATION AT CONTROLLER



ELEVATION VIEW
SECTION A-A

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CABLE CAR BARN MODERNIZATION
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20067350
ENG/ARCH:
CITY & COUNTY OF SAN FRANCISCO
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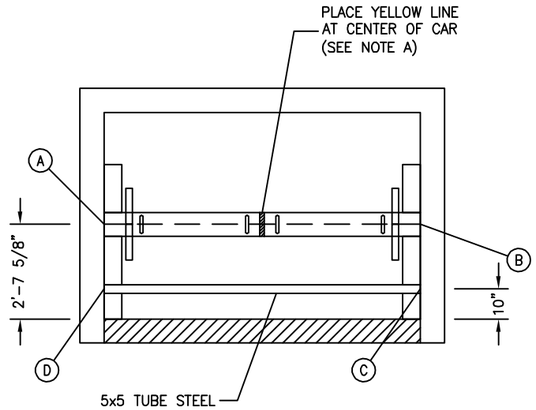
UNITS: IMPERIAL	1-20.2	–
DRAWING	DESCRIPTION	SHEET
M-4820797-10010	CONTROLLER	3 of 16

4820797-10010-010
ELEVATOR 1
2500#



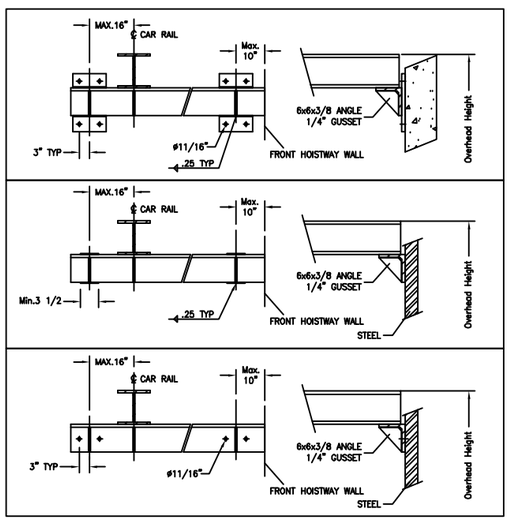
BUILDING LOADS FOR HOISTING BEAM & TUBE STEEL SUPPORT

FOR ADJACENT HOISTWAYS COMBINED LOADS ON A COMMON STRUCTURAL SUPPORT SHOULD BE TAKEN INTO CONSIDERATION. REACTIONS SHOWN BELOW ARE FOR THIS ELEVATOR ONLY. THE REACTION LOADS BELOW ARE ASD LEVEL & UNFACTORED.

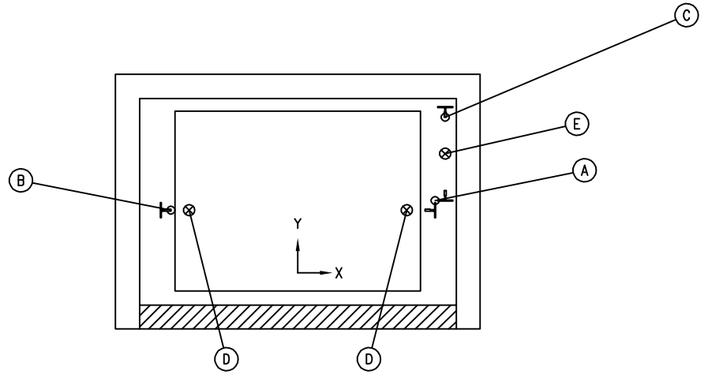
PLANVIEW IS AT TOP OF OVERHEAD LOOKING DOWN ON THE BEAMS
ALL U-BOLTS HANG DOWN TOWARDS THE PIT FLOOR
SEE BRACKET SHEET FOR THE ELEVATION OF SUPPORTS

VERTICAL FORCES* (lbf)				
REACTION LOCATION	A	B	C	D
Z DIRECTION	5610	4840	5000	5000

*REACTIONS A AND B ARE SIZED TO SUPPORT THE MAXIMUM WORKING LOAD OF THE INSTALLATION HOIST. REACTIONS D AND C SUPPORT FALL ARREST LIFELINES PER OSHA MINIMUM SUPPORT LOADS. REACTIONS A & B MAY BE CONSIDERED TO OCCUR SEPARATELY FROM C & D.



ATTACHMENT DETAILS



GUIDE RAIL REACTIONS*

FOR ADJACENT HOISTWAYS COMBINED LOADS ON A COMMON STRUCTURAL SUPPORT SHOULD BE TAKEN INTO CONSIDERATION. REACTIONS SHOWN BELOW ARE FOR THIS ELEVATOR ONLY. THE REACTION LOADS BELOW ARE ASD LEVEL & UNFACTORED.

NON-SEISMIC REACTIONS

BRKTS ABOVE TOPMOST LANDING - IMPACT LOADING REACTIONS (lbf)			
REACTION LOCATION	A	B	C
X DIRECTION	970	230	50
Y DIRECTION	320	1020	100
MAX STRESS NOT TO EXCEED 27,500psi DUE TO APPLIED LOADS			

BRKTS BELOW TOPMOST LANDING - RUNNING REACTIONS (lbf)			
REACTION LOCATION	A	B	C
X DIRECTION	280	230	50
Y DIRECTION	190	90	100
MAX DEFLECTION NOT TO EXCEED 0.125" DUE TO APPLIED LOADS			

*Governor system related loads are included in the rail reactions.

SEISMIC REACTIONS

ALL BRKT LOCATIONS - SEISMIC LOADING (lbf)			
REACTION LOCATION	A	B	C
X DIRECTION	1600	1100	600
Y DIRECTION	1700	1000	1100
MAX DEFLECTION NOT TO EXCEED 0.25" DUE TO APPLIED LOADS			

*ORTHOGONAL SEISMIC REACTIONS DO NOT OCCUR SIMULTANEOUSLY.
*Governor system related loads are included in the rail reactions.

PIT FLOOR REACTIONS**

VERTICAL FORCES ONTO PIT FLOOR (lbf)					
REACTION LOCATION	A	B	C	D	E
Z DIRECTION	11600	5500	2800	8900	12900

**VERTICAL REACTIONS A B & C OCCUR SIMULTANEOUSLY. VERTICAL REACTIONS D & E OCCUR INDIVIDUALLY AND SEPARATELY FROM A B & C.

SEISMIC DESIGN CRITERIA

BUILDING CODE: UBC
SEISMIC DESIGN REQUIRED: YES
SEISMIC ZONE: 4

NOTE A: AFTER INSTALLATION, THE MOVABLE HOISTBEAM MUST BE RELOCATED TO THE FRONT OR REAR OF THE HOISTWAY AND MUST NOT BE POSITIONED DIRECTLY ABOVE CAR TOP OR IT WILL VIOLATE CODE MANDATED "REFUGE SPACE" REQUIREMENT.

APPROVED BY

APPROVAL SPACE

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ENG/ARCH:
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CITY & COUNTY OF SAN FRANCISCO

UNIT INFO

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REVISIONS

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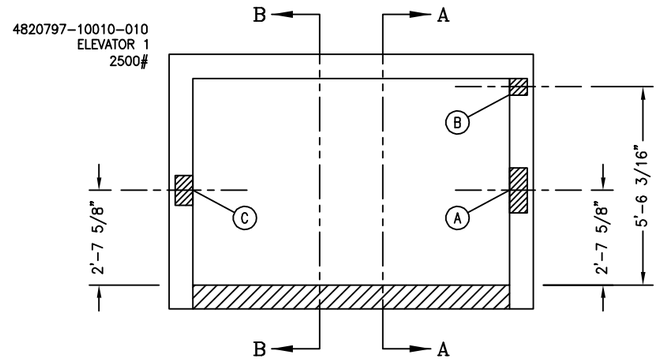
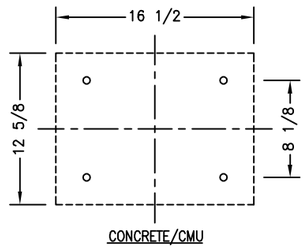
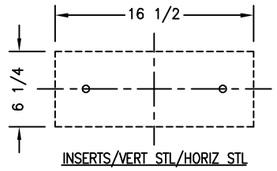
KONE

GENERATED ON: 07/14/21	BY: KSC	REV -
UNITS: IMPERIAL	1-20.2	
DRAWING	DESCRIPTION	SHEET
M-4820797-10010-010	REACTION	4 of 16

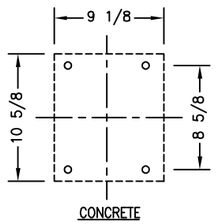


BRACKET ATTACHMENT LOCATIONS

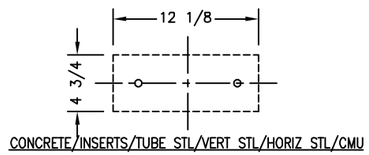




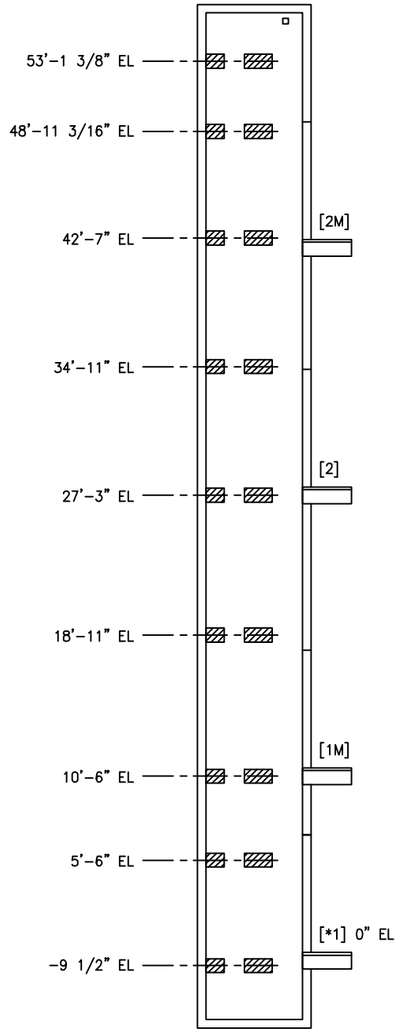
KONE SUPPLIED BRACKET FOOTPRINT AT POINT A (COMBO BRACKETS)



KONE SUPPLIED BRACKET FOOTPRINT AT POINT B (CWT BRACKETS)

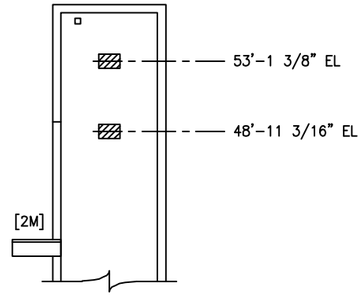


KONE SUPPLIED BRACKET FOOTPRINT AT POINT C (CAR BRACKETS)



SECTION A-A

BRACKET ELEVATIONS ARE AT THE CENTERLINE OF BEARING AREA OF WALL FASTENERS



SECTION B-B

BRACKET ELEVATIONS ARE AT THE CENTERLINE OF BEARING AREA OF WALL FASTENERS

ELEVATIONS BELOW TOP LANDING ARE THE SAME AS SECTION A-A

APPROVED BY

APPROVAL SPACE

PROJECT:
CABLE CAR BARN MODERNIZATION
LOCATION:
20067350
ENG/ARCH:
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CITY & COUNTY OF SAN FRANCISCO

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KONE

GENERATED ON: 07/14/21	BY: KSC	REV
UNITS: IMPERIAL	1-20.2	-
DRAWING	DESCRIPTION	SHEET
M-4820797-10010-010	BRACKET	5 of 16

ELEVATOR: 1

RATED CAPACITY:	2500LB(1134KG)
RATED SPEED:	150FPM(0.75MPS)
ELEVATOR RANGE OF USE:	PASSENGER
CLASS OF LOADING:	PASSENGER
CODE:	A17.1 2004
NO OF LANDINGS:	4
NO OF OPENINGS:	4
ADA–COMPLIANT:	COMPLIANT
OPERATION:	SIMPLEX
MECH. POWER REQUIRED:	4.9KW(6.6HP)
CONTROLLER/DRIVE TYPE:	KCM831 W/KDM–40A
MACHINE/MOTOR TYPE:	NMX11/04:V001–6
EST WT MACHINE W/MOTOR:	820 LBS
RATED MOTOR OUTPUT:	5.2KW(7.0HP) – 69RPM
RATED CONTROLLER OUTPUT:	6.0KW(8.0HP)
SLING:	ISCS13
EST. CAR WT.:	2045 LBS
CWT GUIDE TYPE:	SLG10A
CAR GUIDE TYPE:	SLG20
CAR SAFETY:	AQ32KC–TYPE B
CWT GOVERNOR TYPE:	NONE
CAR GOVERNOR TYPE:	OL35
EST WT INCL. 50% OV'BAL.:	3295
CWT SAFETY:	NONE
CWT FRAME TYPE:	CWT3PS
MIDDLE WEIGHT WIDTH:	11"
FRONT DOORS:	SINGLE SPEED – CENTER
REAR DOORS:	N/A
INTERLOCKS:	AMD
HOIST ROPES:	(6)8mm
ROPING TYPE	2:1
CAR GOVERNOR ROPE:	6.0mm
COMPENSATION:	NONE
CWT GOVERNOR ROPE:	NONE
CAR BUFFER TYPE:	POLYURETHANE
CAR BUFFER QTY:	2
CAR BUFFER STROKE	3.54"
CWT BUFFER TYPE:	POLYURETHANE
CWT BUFFER STROKE:	3.54"
CWT BUFFER QTY:	1
CAR GUIDE RAILS:	12 LB/FT (T127–1/B)
CWT GUIDE RAILS:	12 LB/FT (T127–1/B)
EMERGENCY PWR PROVISION:	NO
EMERGENCY BATTERY DRIVE:	YES

ELECTRICAL

MAXIMUM ALLOWABLE VOLTAGE VARIATION IS +/– 10%
KONE CALC THE FOLLOWING FOR THIS ELEVATOR DUTY

NAMEPLATE AMPS:	12
MAX ACCEL AMPS:	17

PROTECTION DEVICE REQUIRED PRIOR TO INSTALLATION
MAX MOTOR BRANCH SHORT–CIRCUIT PROTECTION IS

UL CLASS RK1 FUSE (AMP):	15
TRANS RATED VOLTAGE:	480, 3 PH, 60 HZ
SUPPLIED VOLTAGE:	480

HEAT OUTPUTS ARE

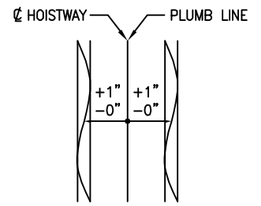
CONTROL/TRANS:	1.1KBTU/HR(0.32KW)
MACHINE/MOTOR:	1.1KBTU/HR(0.32KW)

THE TEMPERATURE IN THE CONTROL SPACE MUST MAINTAIN BETWEEN 41° F [5° C] and 104° F [40° C].

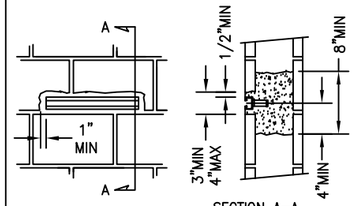
FLOOR, CAB & DOOR WEIGHTS

IF THE ACTUAL CAB & FLOOR WEIGHT DEVIATES, THE EQUIPMENT MAY NEED TO BE REVISED

EST CAB WEIGHT:	1868.0 LBS
EST FINISH FLOOR WEIGHT:	6.0 LBS/FT^2
EST FLOOR TOTAL WEIGHT:	177.0 LBS
CAB & FLOOR WEIGHT:	2045 LBS
MOVING MASS OF DOORS:	234 LBS



HOISTWAY TOLERANCES



SECTION A–A

Inserts: Min. 24" [611mm] width

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UNITS: IMPERIAL	1–20.2	
DRAWING M–4820797–10010	DESCRIPTION DATA	SHEET 6 of 16

Site Safety Requirements / Work by Others
KONE EcoSpace / KONE MonoSpace 500 Bid Attachment "B"

Purchaser to provide the following in accordance with code requirements. NOTE: All site preparation required to be in place prior to KONE's start must be ready two (2) weeks prior to the start of installation.

General

1. Provide sufficient on-site refuse containers for the disposal of the elevator packing material. Should sufficient containers not be provided, the removal of the elevator packing material shall become the responsibility of others.
2. Provide forklift for KONE's exclusive use during the unloading of the elevator at time of delivery.
3. Provide any cutouts to accommodate the elevator equipment (see notes below).
4. Provide and install finished elevator cab flooring prior to balancing cabs (coordinate with KONE). Cab flooring/weight allowance shall be in accordance with KONE's approved layouts. Owner must provide certification (to the elevator inspector at time of inspection) that flooring meets flame spread and smoke density requirements. (ASME A17.1/CSA B44 sec 2.14.2.1).
5. Provide permanent elevator lobby lighting, ceiling and flooring prior to inspection date.
6. Owner must provide certification (to the elevator inspector at time of inspection) that owner-supplied elevator interior finishes meet flame spread and smoke density requirements (ASME A17.1/CSA B44 sec. 2.14.2.1). In the case of using glass, transparent or translucent plastic panels for car interiors, they shall meet the requirements of ASME A17.1/CSAB44 sec. 2.14.1.8, ANSI Z97.1/ CGSB 12.1 in Canada.
7. Provide cutting/ coring of all openings and penetrations required to install hall push buttons, signal fixtures, wiring duct and piping, and sleeves. Sleeves will be required in the hoistway wall for EACH elevator.
8. Provide any repairs such as grouting, patching and painting made necessary by such cutting/coring. Provide fire caulking around all fixtures and as needed to satisfy NFPA 70 article 300.21, or any applicable local code.
9. Please note that none of the elevator components are weatherproof and that the elevator entrances do not seal the hoistway from inclement weather. The entire elevator, hoistway, and controls must remain protected from inclement weather prior to and throughout the installation.

Safety

10. Provide adequate, roll-able access (clear path without obstructions, walls, etc.) into the building for delivery of the elevator material. Clean, safe, secure and dry storage is required adjacent to the hoistway at grade level with minimum space of 20' x 20' [6m x 6m] per elevator.
11. Provide free-standing, removable, OSHA-compliant barricades capable of withstanding 200lb (890N) of force in all directions around all hoistway openings per OSHA 29 CFR 1926.502, and/or any applicable local code.
12. Provide and install full-covering entry protection as per local requirements and manufacturer's requirements. Protection to be made of nylon mesh or reinforced plastic,at all hoistway openings to prevent materials or tooling from falling into the elevator shaft during installation per Federal OSHA requirements listed in 29 CFR 1926.502(j). In Canada, where required by Provincial regulation, enclose the front of the hoistway with removable hoarding or screening to prevent material from entering the hoistway. Design and install entrance protection in such a way as to allow quick accessibility in and out of the hoistway.
13. Provide two (2) lifeline attachments at the top, front of the hoistway. Each must be capable of withstanding a 5000 lb [2250 Kg] load per OSHA 29 CFR 1926.502, or any applicable local code. For machine-room-less applications, provide attachments as described above, or install KONE-provided 5" x 5" x 3/8" (127mm x 127mm x 9.6mm) tube steel lifeline beam in the elevator hoistway overhead 10 inches (254 mm) from front of hoistway to center line, with bottom of lifeline beam at same elevation as bottom of hoisting I-beam. Lifeline tube steel supplied by KONE by request at no additional cost. Engineering details, attachment details and/or modifications, or any beam(s) alterations in the field for installation is by others.
14. Provide proper lighting in all work areas and stairways, including access to all floors and machine rooms per OSHA 29.CFR1926.1052 or any applicable local code.
15. Provide and maintain 6-foot (1800 mm) clear work area in front of all entrance openings per OSHA 29.CFR1926.502 or any applicable local code.

Hoistway

16. Provide a clear and plumb hoistway of size shown on approved KONE final layout drawings. Any variations from the detailed dimensions may not exceed 2" [50 mm] greater and may not be less than the clear dimensions detailed. (Tolerance: -0" + 2" [-0 mm +50 mm]).
17. Provide hoistway ventilation per local building code requirements as applicable. For proper equipment operation, the machine space in machine room or at the top of the hoistway must maintain a temperature between 41° F [5° C] and 104° F [40° C]. Maximum allowed humidity is 95% non-condensing.
18. Provide any partitions between common hoistways if applicable.
19. Provide for installation of hoisting I-beam in the elevator hoistway overhead per the KONE final layout drawings. Beam supplied by KONE unless otherwise noted on the layout drawings. Engineering details, attachment details and/or modifications, or any beam(s) alterations in the field for installation is by others.
20. In cases where multiple elevators are in a common hoistway, and the counterweights are located between elevators, the entire length of counterweight runway must be guarded. The guard shall extend at least 6 inches (150mm) horizontally beyond each counterweight rail. The guard shall be made from wire-mesh material equal to or stronger than .048-inch diameter wire with openings not exceeding 1/2 inch (13 mm), securely fastened to keep the guard taut and plumb. (A17.1 – 2019 / B44 – 19 : General Requirements.)
21. On applications where working platforms are required, working platforms provided shall comply with the requirements of the current ASME A17.1 / CSA-B44 code edition in effect at the time of installation and /or any applicable local code.
22. Provide adequate support for guide rail brackets from pit floor to the top of the hoistway. Locate rail backing per KONE final approved layout drawings. When maximum bracket span is exceeded, additional support shall be provided at purchaser's expense. Any bracket mounting surface that is not in line with the clear hoistway dimension detailed on the approved KONE final layout drawings may need to be corrected to meet the proper dimension at purchaser's expense.
23. If guide rail brackets are to attach to steel, ensure all brackets are installed prior to applying fireproofing to the steel. Otherwise, removal and reapplication of fireproofing will be at purchaser's expense.
24. All offsets, ledges or projections within the hoistway shall be addressed in accordance with applicable local code. All offsets, ledges or projections within the hoistway greater than 4 inches (100mm) must be tapered to not less than 75 degrees (ASME A17.1/CSA B44 sec 2.1.6.2). Maximum ledge or projection is 2 inches (50mm) in California and District of Columbia.
25. If concrete block wall construction, refer to the approved KONE final approved layout drawings for proper installation of rail bracket attachments. Inserts provided by KONE unless otherwise noted on the approved KONE final approved layout drawings. Insert type must be approved by KONE. Concrete masonry units, mortar and grout, shall conform to IBC 2000 or any applicable local code. Concrete masonry units shall have a minimum compressive strength of 1500 PSI (10.5 MPa). Mortar and grout shall have a minimum compressive strength of 2000 PSI (13.8 MPa).
26. KONE entrance jambs are non-ferrous and material may not be attached to them (i.e. fire doors/curtains).
27. Arrange for entrance walls to be constructed at the time doorframes and sills are installed to facilitate timely installation of hall fixture faceplates. Entire front wall must be left open at top and bottom landings until elevator equipment is installed. Intermediate landings must have rough openings of the size and location shown on KONE final approved layout drawings to allow installation of entrances. All entrance openings must be aligned vertically. Adequate support for entrance attachment points shall be provided at all landings. Any marble, stone or similar wall material must be prepared after the entrance frames are installed. Provide corridor lines for any marble or special finish walls. NOTE: If concrete block wall construction to prevent overloading entrance frames, top of entrances should not receive more than one row of block. A lintel must be installed to support additional rows of block.
28. Provide elevator landings suitably prepared to accept entrance sill installation per KONE final layout drawings. Grouting to be done by purchaser after sills are installed. NOTE: Traditional angle or concrete sill support is not required.
29. Provide finished-floor height marks visible from hoistway openings at all landings minimum one week prior to beginning entrance installation. Placing floor height mark on hoistway wall is desirable. Complete "Contractor Verification Form of Sill to Sill Heights and Remote Machine Piping, CONSTR-07-0675.
30. Provide suitable, permanent lighting for control space with light switch located within 18" [457 mm] of strike jamb side of control space door where practical.
31. Electric lighting shall have a minimum lighting intensity of 200 lx (19 fc) at the floor level. When permitted by state and local code the light switch should also control the machine space lighting if control space is adjacent to the hoistway at the top landing.
32. If the control space is located remote from the elevator hoistway top landing the following may apply:
    a. If applicable, provide machine space access door of the size and in the location shown on the KONE final layout drawings. The access door shall be secured against unauthorized access. It shall be self-closing, self-locking and operable from the inside without a key.
    b. Provide suitable lighting in or above the machine space access with light switch located within 18" [457 mm] of strike jamb side of access space door where practical.
    c. When permitted by state and local code the light switch should also control the machine space lighting.
    d. In cases where a battery lowering device is provided, control closet may not be adequate. Please consult KONE representative.
33. Provide and install GFCI-type receptacle located at machine in the top of the hoistway or in machine room as applicable (NFPA 70 article 620.85 or CEC article 38.85 whichever is applicable).
34. Provide and install light switch located at manual brake release location: may also be required in control space per local jurisdiction.
35. Where a single elevator is installed in a hoistway and a portion of the travel extends higher that 11m (36 ft.) between entrances (single blind hoistway), emergency door(s) must be provided. Emergency doors and their electrical contacts shall comply with the current ASME A17.1/CSA-B44 code edition in effect at the time of installation and/or any applicable local code. ASME A17.1-2019/B44-19 requirement Section 2.11.1.2 covers Emergency Doors in Blind Hoistways and Section 2.26.2 covers Electrical Protective Devices. Each emergency door must be provided with an electrical contact with minimum UL/CSA NEMA A300 rating suitable for use in a 3 amp 230VAC circuit. Consult KONE representative if there are any questions concerning the code requirements.
36. In jurisdictions enforcing the NBCC and in jurisdictions enforcing NFPA 72, the means for testing and maintenance of fire alarm initiating devices without having to enter the hoistway shall be permitted. When this means is provided it must comply with A17.1-2019/B44-19 requirement 2.8.2.4 and the location of equipment inside the elevator hoistway must be coordinated with KONE sales and/or operations representative.

Pit

37. Provide a legal, dry and clean pit with level pit floor, built per KONE final layout drawings. Pit shall be reinforced to sustain vertical forces detailed on KONE final layout drawings (vertical forces detailed are two times the static loads.)
38. Sumps and/or sump pumps (where permitted) located within the pit may not interfere with the elevator equipment. Sumps to be covered with flush mounted, non-combustible cover capable of withstanding 150 lbs. per square foot (7 kPa). The sump pump/drain must, at minimum, remove 3,000 gal/h (11.4 m3/h):
    a. A17.1-2016/B44-16 and earlier, per elevator.
    b. A17.1-2019/B44-19 and later, per single hoistway or multiple car hoistway.

APPROVED BY

APPROVAL SPACE

PROJECT:
CABLE CAR BARN MODERNIZATION
LOCATION:
20067350
ENG/ARCH:
CITY & COUNTY OF SAN FRANCISCO
CONTRACTOR:
CITY & COUNTY OF SAN FRANCISCO

UNIT INFO

ITEM NO.	NETWORK NO.	EQUIPMENT NO.

REVISIONS

DATE	NO	BY	CK	DESCRIPTION
2021-07-14	-	KUR		PRELIMINARY

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39. Provide a pit light fixture with switch and guards with an illumination level equal to or greater than that required by ASME A17.1/CSA B44 2000, or applicable version. Recommended to provide minimum 4–foot double tube fluorescent fixture, with suitable guard and mounted to rear wall of pit per KONE installation representative's direction.
40. Provide a dedicated pit circuit with GFCI–protected 15 or 20 amp 120VAC duplex outlet. Location to be coordinated with the KONE project team using the KONE final approve layout drawings (NFPA 70 article 620.85; CEC article 38.85 whichever is applicable).
41. Provide non–GFCI–protected single receptacle for sump pumps (NFPA 70 article 620.85, NFPA 70 article 620.85 or CEC article 38.85 whichever is applicable).
42. Pit ladder to be constructed of non–combustible material extending from pit floor to 48" [1200 mm] above the sill of the access landing. Pit ladder is supplied by KONE; provided by purchaser on other KONE products unless otherwise noted on the layout drawing. Locate per KONE final layout drawings. Coordinate ladder sizing and location with KONE representative to assure proper fit in hoistway.
43. When a separate pit access door is provided, it must conform to A17.1 section requirement 2.2.4.5. When an electric contact is required, it shall comply with A17.1, requirement 2.2.4.5(b)(1).

Electrical

44. US Applications – Purchaser provides in accordance with National Electrical Code, NFPA 70 (NEC) Article 620 or any applicable local code.
45. Canadian Applications – Purchaser provides in accordance with Canadian Electrical Code, C22.1 Section 38 or any applicable local code.
46. Provide dedicated GFCI–protected 20 amp 120VAC duplex (15 amp in Canada) outlet next to each ICS panel control cabinet located as shown on layouts
47. Provide for all electrical branch circuits/disconnects to be labeled (NFPA 70 article 620.54 / 620.53 / 620.51d, CEC articles 38.54/ 38.53/ 36.51d).
48. Provide 480/208VAC (USA) or 575/208VAC (Canada) three–phase permanent power, including piping, wiring and fused disconnect, to controller location to facilitate elevator installation prior to start of project.
49. Provide 220VAC single–phase temp. power and 115VAC single–phase temp. power, of permanent characteristics at each elevator landing for lighting and installation method tools. Locate connection points at elevator hoistway. Consult your KONE representative for confirmation of location and type of temporary power.
50. When generator is used to provide 3–phase 480/208VAC (USA) or 575/208VAC (Canada) power for installation, purchaser to accept change notice for additional costs, estimated locally by installing office, to cover inefficiencies and any damages resulting from installing without permanent power present.
    NOTE: Our elevator controllers require Wye configuration transformers. It is also the responsibility of the purchaser to provide consistent three–phase voltages balanced within +/– 10% when measured phase–to–phase and +/–10% when measured phase–to–ground.
51. Provide a dedicated 20 amp 115VAC circuit in the fire command room piped and wired to the lobby panel where applicable.
52. Provide a dedicated 15–amp,115VAC fused service with ground (supplied through automatic emergency lighting supply if available in building) connected to each elevator signal control cabinet for car lighting. Must include the means to disconnect this service and lock–off in the "open" position (NFPA 70 article 620.22 and 620.53 or CEC article 38.22 and 38.53).
53. Provide a separate15–amp, 115 VAC fused service with ground (powered by building emergency power system, when available) for KONE 24/7 Emergency Communications, when specified. Must include the means to disconnect each service and lock–off in the "open" position (NFPA 70 article 620.22 and 620.53 or CEC article 38.22 and 38.53).

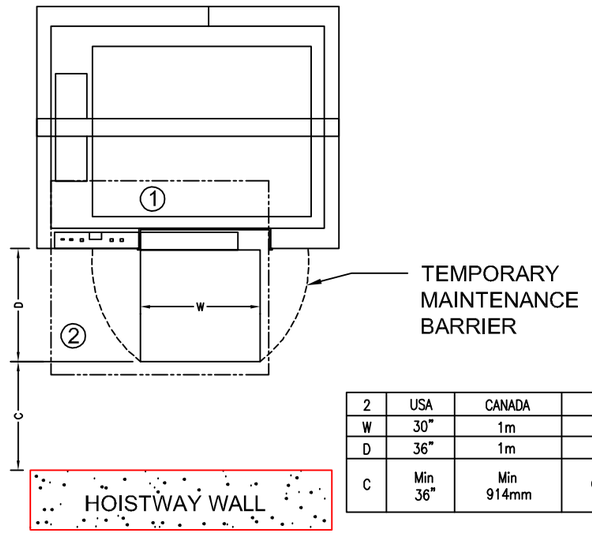
Control Space/ Integrated Controls Solution (ICS)

54. Provide a legal control space/ machine room with access as indicated on the KONE final layout drawings. To include a temporary or permanent door that can be locked from outside. Permanent door must be self–closing, self–locking, and require a key to open from outside. Must have adequate temporary or permanent lighting for installation purposes. For proper equipment operation, the temperature in the control space must maintain between 41˚ F [5˚ C] and 104˚ F [40˚ C]. Maximum allowed humidity is 95% non–condensing.
55. Provide safe and convenient access to control space/machine room including provisions for necessary lighting for access path (ASME A17.1/CSA B44 sec 2.8.1, ASME A17.1 / CSA B44 sec 2.7.3).
56. Provide a clean and dry elevator control room.
57. Provide suitable lighting for control space with light switch located within 18" [457 mm] of strike jamb side of control space door where practical. When permitted by state and local code the light switch should also control the machine space lighting if control space is adjacent to the hoistway at the top landing.
58. Provide dedicated GFCI–protected 120VAC 20–amp duplex (15 amp in Canada) outlet next to each signal control cabinet.
59. Provide a single means of disconnecting all ungrounded main power conductors for each elevator by an enclosed, externally operable, fused motor circuit switch with UL/CSA Class RK1 fuses. Must be lockable in the open position. This disconnecting means shall disconnect the normal power service as well as emergency power service, when provided.
    Note 1: If a battery–powered rescue device is required, the above–mentioned disconnect must have an auxiliary contact monitored by elevator controller that is positively opened mechanically and is normally closed (NC) when the main power is in the ON position, and is normally open (NO) when power is in the OFF position.
    Note 2: If a battery–powered rescue device is required and a separate shunt trip breaker which is subject to either the hoistway or control space sprinkler system is provided, the shunt trip breaker must have an auxiliary contact that is positively opened mechanically and is NC when the main power is in the ON position.
    Note 3: Shunt trip not allowed for Fire Service Access / Occupation Evacuation elevators or in Canada and some US jurisdictions.

60. Provide a Direct–in–dial (DID) analog phone line, activated at least one week prior to inspection, terminated at the appropriate phone jacks in the elevator control room. GC/ Owner may elect to have a separate analog line installed (one per elevator), or GC/ Owner may elect to provide DID lines from an Analog Station Card in the building's PBX system. If GC/Owner provides a Direct–in–Dial analog phone line or lines off an existing PBX phone system, a backup power source must also be provided. All phone and associated equipment provided by GC/ Owner shall be in compliance with the requirements of ASME A17.1/ CSA B44, local codes and applicable law, as amended.
61. Provide all fire alarm initiating signals as required by all national, state and local codes for termination at the primary elevator signal control cabinet in each group.
62. With emergency power service provide emergency power transfer switch and power change pending signals as required; 2 normally open dry contacts from transfer switch to controller (2 pairs plus ground wire). One contact closes to signal emergency power is present, the other contact closes to give 30 second pre–signal prior to transfer switch change. Termination of these wires is at the primary elevator signal control cabinet in each group (2 pairs plus ground wire).
63. Furnish and install smoke detectors and fire operation per ASME A17.1/CSA B44 sec 2.27.3.2, NFPA 72; one for lobby detector, machine room detector, hoistway detector (hoistway detector requirement determined by local code), and one for all grouped non–lobby detectors are required. Provide normally–closed dry contacts, with wiring, to controller for each group listed above.
64. Provide and install smoke detector in hoistway as required per local codes, and in all elevator lobbies, machine room and controller space.
65. Provide heat detectors and "shunt–trip operation" when sprinklers are required in machine room or hoistway, (ASME A17.1 sec 2.8.2.1.2, NFPA 13 sec 4–13.5, ASME A17.1 sec 2.8.2.3.1, ASME A17.1 sec 2.8.2.3.2, NFPA 72).
66. If Fire Status Panel or Security panels are required, all remote conduit runs from elevator equipment room/machine space to these panels shall be by others.
67. Non–elevator related piping and equipment is prohibited in machine room or hoistway (ASME A17.1/CSA B44 sec 2.8.1, ASME A17.1/CSA B44 sec 2.8.2).
68. Provide and mount at minimum a 10–pound, ABC–type fire extinguisher in control space (ASME A17.1 sec 8.6.1.6.5). (Not required in Canada).

Applicable for Integrated Control Solution (ICS)

69. Provide a completely open front wall at top landing with access as indicated on the KONE Final Approved Layout Drawings. Must have adequate temporary or permanent lighting for installation purposes. NOTE: The lobby side of the ICS control cabinet must be faced with 2 layers of dry wall to comply with UL certification, regardless of front type. See KONE Final Approved Layout Drawings for details and wall type and minimum dimensions.
70. Provide environment for proper equipment operation during installation and after acceptance, the temperature at the top floor elevator lobby must maintain between 41˚ F [5˚ C] and 104˚ F [40˚ C]. Maximum allowed humidity is 95% non–condensing.
71. Provide safe and convenient roll–able access to top floor elevator lobby area. (ASME A17.1/CSA B44 sec 2.8.1, ASME A17.1/CSA B44 sec 2.7.3).
72. Provide 480/208VAC (USA) or 575/208VAC (Canada), three–phase permanent power, including piping, and wiring from fused disconnect, to junction box located in hoistway at top landing to facilitate elevator installation.
73. FIRE ALARM INITIATING DEVICE (FAID). FAID is a requirement of A17.1/B44, rules 2.27.3.2.1 (b) and 2.27.3.2.2 (b).



2	USA	CANADA	COMMENT
W	30"	1m	NEC2014. CE2015
D	36"	1m	NEC2014. CE2015
C	Min 36"	Min 914mm	Minimum recommended. Consult ADA requiements for exact building clearance.

1) Since ICS control enclosure is vented into the hoistway, a fire alarm initiating device (FAID) is required in this portion of the control space.
2) A fire alarm initiation device (FAID) is required in the lobby area to protect the control space when ICS is open.

Site Safety Requirements / Work by Others (Bid Attachment "B")
CONSTR–007–0664 (2020–02–04) KONE EcoSpace / KONE MonoSpace 500

APPROVED BY

APPROVAL SPACE

PROJECT:
CABLE CAR BARN MODERNIZATION
LOCATION:
20067350
ENG/ARCH:
CITY & COUNTY OF SAN FRANCISCO
CONTRACTOR:
CITY & COUNTY OF SAN FRANCISCO

UNIT INFO

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Fire Service Access and Occupant evacuation Operation IBC 2018

74. Fire service access elevators per code requirements (IBC 403.6) shall be provided with hoistway lighting per code requirements (IBC 3007). The hoistway lighting shall illuminate the entire height of the hoistway and shall be located such that it does not interfere with the operation of the elevator or reduce any clearances below applicable code requirements (applicable only in jurisdictions enforcing the IBC, International Building Code). Consult KONE representative to assure required clearances are provided.
75. Conductors and cables located outside of the elevator hoistway, machine space and control space, that provide normal or standby power, car lighting power, car ventilation power, car heating power, car air conditioning power, control signals, communication with the car and fire/heat-detecting systems control signals to Fire Service Access Elevators, shall be protected by construction having a fire-resistance rating of not less than 2 hours (applicable only in jurisdictions enforcing the IBC, International Building Code, or any applicable local codes).
76. Fire Service Access elevators shall be provided with hoistway lighting.
77. Prevent water from the operation of an automatic sprinkler system outside the enclosed lobby from infiltrating the hoistway enclosure in accordance with an approved method per rule 3008.
78. Means for elevator shutdown in accordance with Section 3005 shall not be installed on elevator systems used for Fire Service Access and/or Occupant Evacuation Elevators per rule 3008.
79. Occupant Evacuation elevators shall be continuously monitored at the fire command center or a central control point approved by the fire department and arranged to display all of the following information per rule 3008.
    a. Floor location of each elevator car.
    b. Direction of travel of each elevator car.
    c. Status of each elevator car with respect to whether it is Occupied.
    d. Status of normal power to the elevator equipment, elevator machinery and electrical apparatus cooling equipment where provided, elevator machine room, control room and control space ventilation and cooling equipment.
    e. Status of standby or emergency power system that provides backup power to the elevator equipment, elevator machinery and electrical cooling equipment where provided, elevator machine room, control room and control space ventilation and cooling equipment.
    f. Activation of any fire alarm initiating device in any elevator lobby, elevator machine room, machine space containing a motor controller or electric driving machine, control space, control room or elevator hoistway.
80. Each Fire Service and /or Occupant Evacuation elevator shall be supplied by both normal power and Type 60/Class 2/Level 1 standby power per rule 3008.
    a. Elevator equipment.
    b. Ventilation and cooling equipment for elevator machine rooms, control rooms, machinery spaces and control spaces.
    c. Elevator car lighting.
81. Standby power loads shall be based on the determination of the number of occupant evacuation elevators in Sections 3008.1.1 and 3008.8.1.
82. Wires or cables that are located outside of the elevator hoistway, machine room, control room and control space and that provide normal or standby power, control signals, communication with the car, lighting, heating, air conditioning, ventilation and fire-detecting systems to occupant evacuation elevators shall be protected using one of the following methods 3008.
    a. Cables used for survivability of required critical circuits shall be listed in accordance with UL 2196 and shall have a fire-resistance rating of not less than 2 hours.
    b. Two electrical circuit protective systems shall have a fire-resistance rating of not less than 2 hours. Electrical circuit protective systems shall be installed in accordance with their listing requirements.
    c. Construction having a fire-resistance rating of not less than 2 hours.
    Exception: Wiring and cables to control signals are not required to be protected provided that wiring and cables do not serve Phase II emergency in-car operation.

Site Safety Requirements / Work by Others (Bid Attachment "B")
CONSTR-007-0664 (2020-02-04) KONE EcoSpace / KONE MonoSpace 500

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APPROVAL SPACE

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UNIT INFO

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UNITS: IMPERIAL	1-20.2	-

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Bid Attachment "B" People Flow Intelligence (PFI) Work by Others

Purchaser to provide the following in accordance with code requirements.
NOTE: All Work by Others is requited to be completed two (2) weeks prior to the start of PFI installation.

KONE Access Control (if provided)

1. Provide two (2) dedicated 15 amp 120VAC fused service with ground in the control space connected to designated ACS cabinet(s) per the ACS wiring diagrams. Must include the means to disconnect this service and lock–off in the "open" position (NFPA 70 article 620.22 and 620.53or CEC article 38.22 and 38.53).
2. If Mobile Device feature is provided, the customer provides the site–specific configuration cards and two valid mobile credentials for testing to KONE during installation.
3. Provide IP addresses per KONE LAN schedule. IP addresses are required, but not limited to, KONE Group controllers (KGC), KONE Interface Controllers (KIC), LAN Destination Operating Panels (DOP), LAN Destination Guidance Displays (DGD) and LAN InfoScreen.

Turnstile Integration for KONE Destination (If provided)

4. Provide one (1) dedicated GFCI protected 120VAC 20–amp (15 am in Canada) duplex outlet for PeopleFlow Servers per the wiring diagrams.
5. KONE recommends a minimum 100 Mbit/s Ethernet for each of the following application(s): Security Integrated Touchscreen/Keypad Destination Operating Panels, Monitoring System, Multi–Media Equipment, and Card Readers.
6. Provide IP addresses per KONE LAN schedule. IP addresses are required, but not limited to, KONE Group controllers (KGC), KONE Interface Controllers (KIC), LAN Destination Operating Panels (DOP), LAN Destination Guidance Displays (DGD) and LAN InfoScreen.
7. Provide and install the required number and size conduit runs from elevator hoistways to turnstile banks. See turnstile integration specifications for site specific requirements.

3rd Party Access Integration/Security (If provided)

8. Our proposal includes KONE logic and provisions for the specified Touchscreen(s), Keypad Destination Operating Panel(s), Monitoring System(s) and Multi–Media Equipment.
9. Card Readers and/or any additional required hardware & software for proper functionality of access control/security system(s) shall be furnished and installed by others.
10. A designated 115V 15A circuit is required at each of the remote monitoring stations.
11. Any required interface software to ensure proper communication between KONE control system(s) and building system(s) shall be the responsibility of others.
12. KONE recommends a minimum 100 Mbit/s Ethernet foreach of the following application(s): Security Integrated Touchscreen/Keypad Destination Operating Panels, Monitoring System, Multi–Media Equipment, and Card Readers.

KONE Destination Dispatching (If provided)

13. When KONE Destination (Destination Dispatch) is used, provide one (1) dedicated 15 amp 120V AC fused service with ground (supplied through automatic emergency lighting supply if available in building) connected to each elevator signal control cabinet for shaft power. Must include the means to disconnect this service and lock–off in the "open" position (NFPA 70 article 620.22 and 620.53 or CEC article 38.22 and 38.53).
14. When KONE Destination (Destination Dispatch) is used, provide 2 (two) separate 115 VAC 15 amp branch circuit for KGCs (KONE Group Controls), one for each KGC, powered by building emergency power system, when applicable.
15. Provide IP addresses per KONE LAN schedule. IP addresses are required, but not limited to, KONE Group Controllers (KGC), KONE Interface Controllers (KIC), LAN Destination Operating Panels (DOP), LAN Destination Guidance Displays (DGD) and LAN InfoScreen.

E–Link (If provided)

16. A designated 115V 15A circuit is required at each of the remote monitoring stations.
17. KONE recommends a minimum 100 Mbit/s Ethernet for each of the following application(s): Security Integrated Touchscreen/Keypad Destination Operating Panels, Monitoring System, Multi–Media Equipment, and Card Readers.
18. Provide IP addresses per KONE LAN schedule. IP addresses are required, but not limited to, KONE Group Controllers (KGC), KONE Interface Controllers (KIC), LAN Destination Operating Panels (DOP), LAN Destination Guidance Displays (DGD) and LAN InfoScreen.
19. BACnet Additional requirements (if provided)
    a. All E–Link features required
    b. Provide BACnet Device IDs for Devices
    c. Provide BACnet Revision Level requested for the site (PR–18 supported or not)

KONE RemoteCall (If provided)

20. Provide one (1) dedicated CFCI protected 120VAC 20– amp duplex (15 am in Canada) outlet per the Remote Call wiring diagrams.
21. KONE recommends a minimum 100 Mbit/s Ethernet for each of the following application(s): Security Integrated Touchscreen/Keypad Destination Operating Panels, Monitoring System, Multi–Media Equipment, and Card Readers.
22. Provide one (1) public IP v4 address that can be accessed via the Internet.
23. Provide IP addresses per KONE LAN schedule. IP addresses are required, but not limited to, KONE Group Controllers (KGC), KONE Interface Controllers (KIC), LAN Destination Operating Panels (DOP), LAN.

InfoScreen (If provided)

24. If InfoScreen is Offline, none of the below is applicable.
25. Provide one RJ45 CAT6 jack and network switch in each elevator machine room/control space that has an InfoScreen server. This jack is wired to a building LAN network with internet access. In the machine room/control space, pipe and wire CAT6 cable from the switch to the InfoScreen Server Box.
26. Provide one IP address for each InfoScreen server.
27. Provide another RJ45 CAT6 jack and VLAN configuration to the next elevator machine room/control space that has elevators with InfoScreens. This is to connect two Group Connection Boxes from two elevator machine rooms/ control space.
28. Provide a dedicated 115VAC, 15 Amp fused disconnect with ground PE per machine room/control space piped and wired to the first InfoScreen Group Connection Box.
29. If InfoScreen TV Streaming Video is to be used, the equipment and converters will be located in a building IT room as shown in the wiring diagram. Provide another RJ45 CAT6 jack and VLAN configuration in InfoScreen IP network range for video Encoder Board in the machine room/control space that has the last Group Connection Box. Provide a Cable TV Box as needed, or other device that will stream composite video output.

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UNIT INFO			
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2021–07–14	–	KUR		PRELIMINARY
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UNITS: IMPERIAL	1–20.2	–
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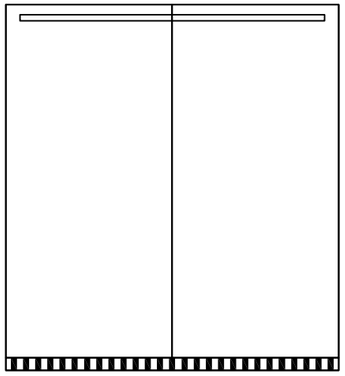
NOTE:

A. EMERGENCY CAR LIGHTING IS PROVIDED

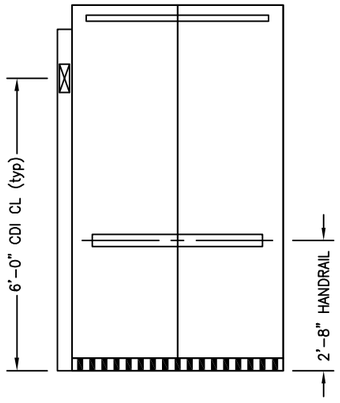
B. CAB INTERIOR COMPLIES WITH THE LATEST EDITION ASME A17.1/CSA B44 INCLUDING SMOKE AND FLAME RATING CLASS A.

C. CAB RELATED DIMENSIONS OTHER THAN DOOR OPENING WIDTH AND DOOR OPENING HEIGHT ARE NOMINAL DIMENSIONS. THEY DO NOT ACCOUNT FOR MANUFACTURING TOLERANCES NOR FOR FINISHED FLOOR THICKNESS.

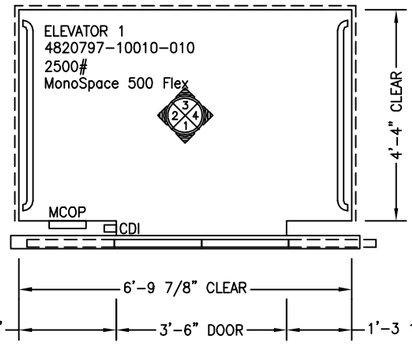


ELEVATION 3

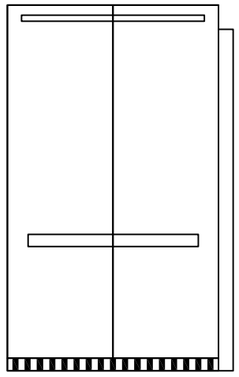
ITEM	TYPE	DESCRIPTION
SUSPENDED CEILING	CL98	DIRECT LGHTG, RECT LED SPOTS
CEILING PANEL FINISH	–	BRUSHED STAINLESS
FRONT DOOR FINISH	4SS	#4 STAINLESS
FRONT DOOR MATL. THICKNESS	–	16 GA
CAB FRONT WALL MATERIAL	4SS	#4 STAINLESS
CAB SIDE WALL MATERIAL	L422	SPECTRUM RED
CAB SIDE WALL ORIENTATION	–	VERTICAL
CAB REAR WALL MATERIAL	ST41S	"SILVER BAMBOO
CAB REAR WALL ORIENTATION	–	VERTICAL
SKIRTING MATERIAL	4SS	BRUSHED STAINLESS STEEL
CAR SILL MATERIAL	AL	ALUMINUM
SIDE CAR HANDRAIL	HR64	ROUND: D38 – 4SS
SIDE HANDRAIL ENDS	–	BENT ENDS
PLASTIC LAMINATE FIRE RATING	AS	CLASS A RATING (STD COLOR)
CAR FAN TYPE	1	FAN REQUIRED
EMERGENCY EXIT SWITCH	–	REQUIRED
FINISH FLOOR THICKNESS		1 1/4"
FLOOR WEIGHT		6.0 LBS/SQ FT
CAB & FLOOR WEIGHT		2045 LBS
PROTECTION PADS	–	PADS REQUIRED



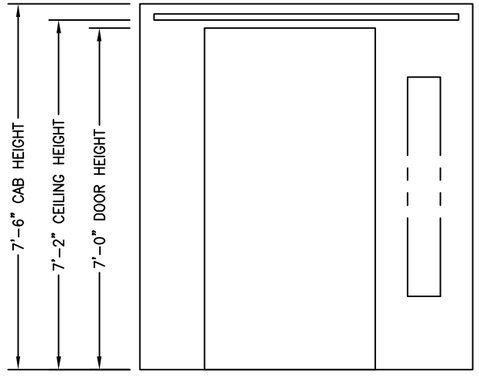
ELEVATION 2



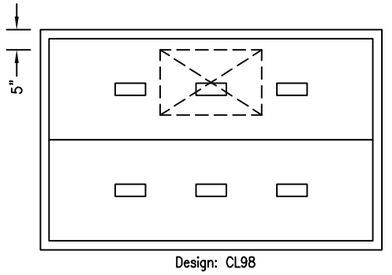
PLAN VIEW



ELEVATION 4



ELEVATION 1



Design: CL98

REFLECTED CEILING
EMERGENCY EXIT 25"x16"

NOTE:
MCOP = MAIN CAR OPERATION PANEL

APPROVED BY

APPROVAL SPACE

PROJECT:
CABLE CAR BARN MODERNIZATION
LOCATION:
20067350
ENG/ARCH:
CITY & COUNTY OF SAN FRANCISCO
CONTRACTOR:
CITY & COUNTY OF SAN FRANCISCO

UNIT INFO

ITEM NO.	NETWORK NO.	EQUIPMENT NO.

REVISIONS

DATE	NO	BY	CK	DESCRIPTION
2021-07-14	–	KUR		PRELIMINARY

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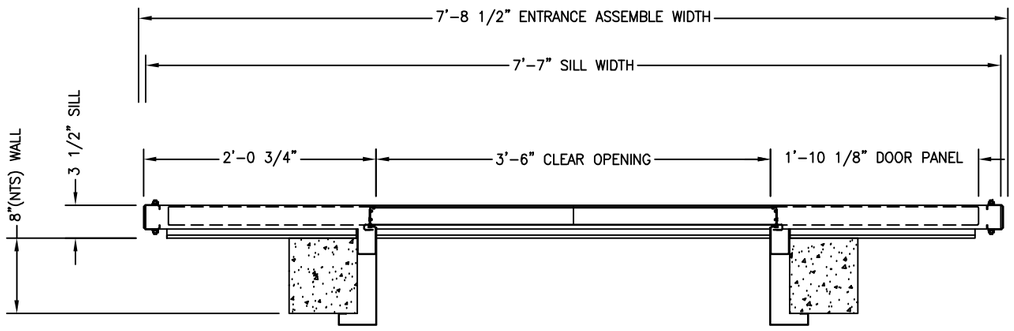
KONE

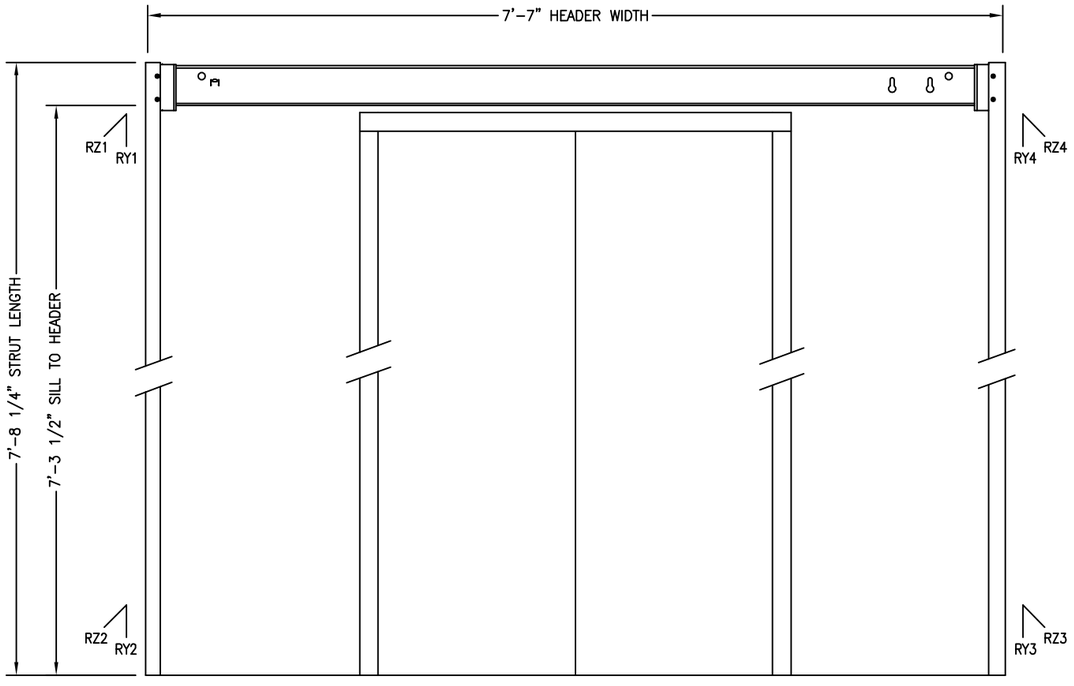
GENERATED ON: 07/14/21	BY: KSC	REV
UNITS: IMPERIAL	1-20.2	–

DRAWING	DESCRIPTION	SHEET
C-4820797-10010-010	CAB	11 of 16

ITEM	TYPE	DESCRIPTION
ELEVATOR I.D.		ELEVATOR 1
ENTRANCE LANDINGS	–	*1, 2M
ENTRANCE DESIGN NUM	1	AMDY / SINGLE SPEED / CENTER OPENING
FIXTURES	KSS570	–
KEYWAY CUTOUT	–	NONE
ACCESS SWITCH	–	NONE
FIRE RECALL	–	NONE
STAR OF LIFE	–	NONE
FRAME	16 GA	#4 STAINLESS STEEL
FRAME CONSTRUCTION	–	KNOCK–DOWN STYLE BOLTED
SOUND DEADENING	–	NONE
DOOR PANEL	16 GA	#4 STAINLESS STEEL
SILL	NARROW	EXTRUDED ALUMINUM
FASCIA / TOE–GUARD	16 GA	GALVANIZED STEEL 48" WIDE
JAMB BRAILLE	CJ6S	SURFACE MOUNTED, WHITE ON BLACK
LABELS	–	2 HOUR U.L. – CLASS B

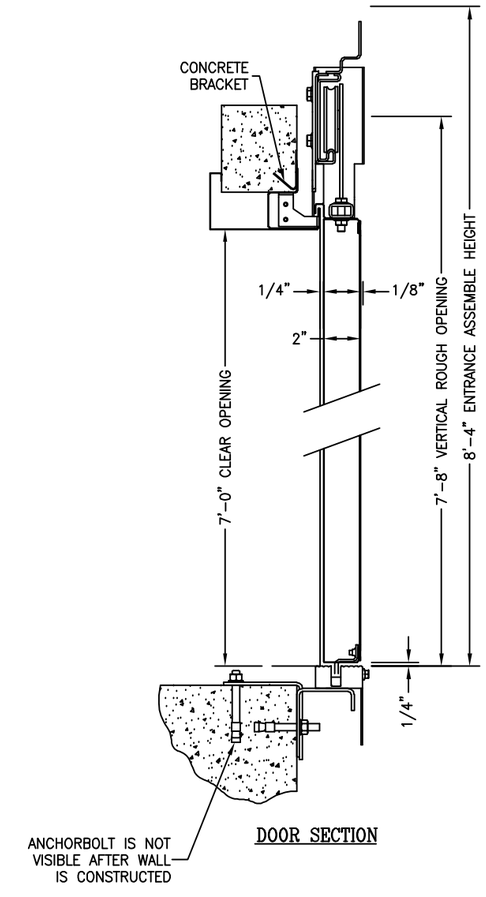


PLAN VIEW



ELEVATION VIEW

REACT. PT.	RZ (LBF)	RY (LBF)
1	305	55
2	260	55
3	260	55
4	305	55



DOOR SECTION

NOTES:

A. DO NOT CONSTRUCT WALLS UNTIL DOOR FRAMES ARE SET.

APPROVED BY

APPROVAL SPACE

PROJECT:
CABLE CAR BARN MODERNIZATION
LOCATION:
20067350
ENG/ARCH:
CITY & COUNTY OF SAN FRANCISCO
CONTRACTOR:
CITY & COUNTY OF SAN FRANCISCO

UNIT INFO

ITEM NO.	NETWORK NO.	EQUIPMENT NO.

REVISIONS

DATE	NO	BY	CK	DESCRIPTION
2021–07–14	–	KUR		PRELIMINARY

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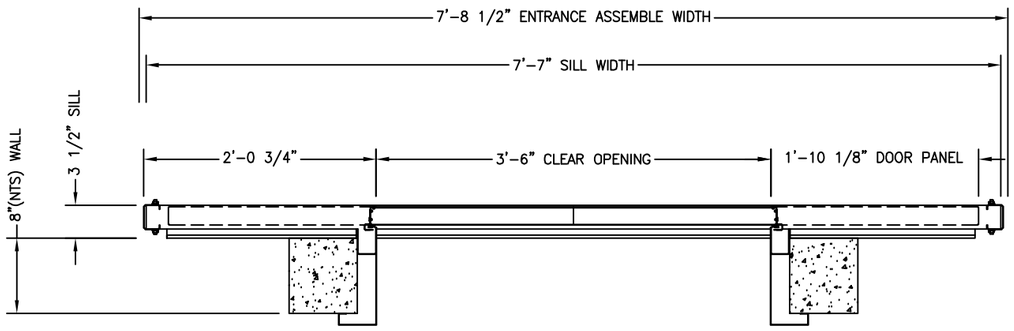
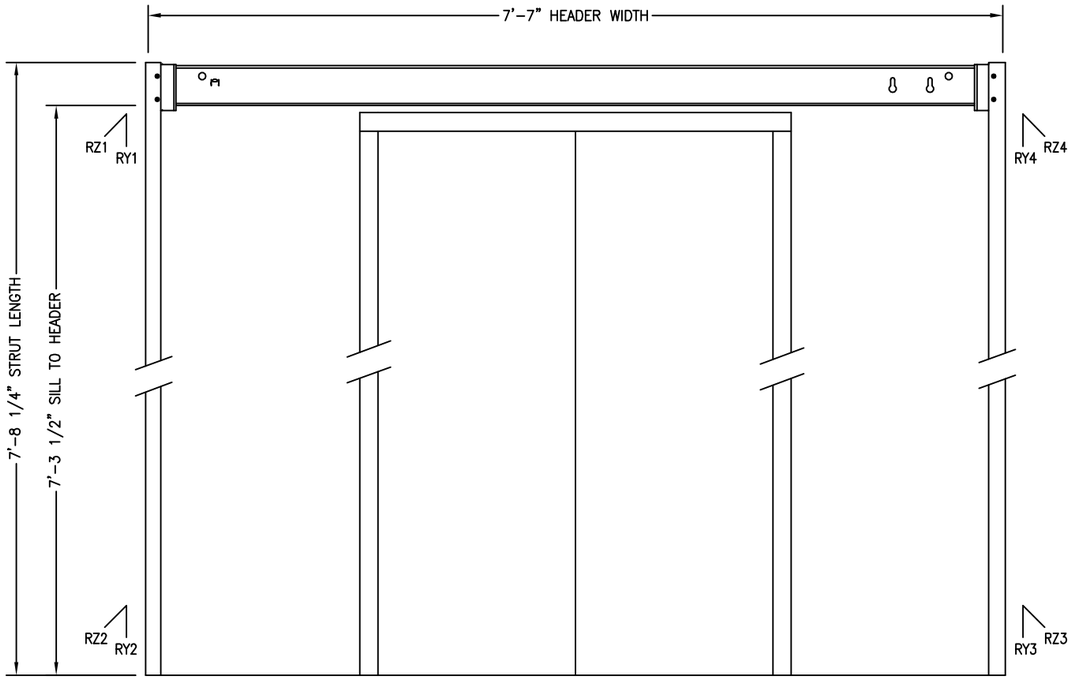
KONE

GENERATED ON: 07/14/21	BY: KSC	REV –
UNITS: IMPERIAL	1–20.2	
DRAWING E–4820797–10010–010	DESCRIPTION ENTRANCE	SHEET 12 of 16

ITEM	TYPE	DESCRIPTION
ELEVATOR I.D.		ELEVATOR 1
ENTRANCE LANDINGS	–	1M, 2
ENTRANCE DESIGN NUM	2	AMDY / SINGLE SPEED / CENTER OPENING
FIXTURES	KSS570	–
KEYWAY CUTOUT	–	NONE
ACCESS SWITCH	–	NONE
FIRE RECALL	–	NONE
STAR OF LIFE	–	NONE
FRAME	16 GA	#4 STAINLESS STEEL
FRAME CONSTRUCTION	–	KNOCK–DOWN STYLE BOLTED
SOUND DEADENING	–	NONE
DOOR PANEL	16 GA	#4 STAINLESS STEEL
SILL	NARROW	EXTRUDED ALUMINUM
FASCIA / TOE–GUARD	16 GA	GALVANIZED STEEL 48" WIDE
JAMB BRAILLE	CJ6S	SURFACE MOUNTED, WHITE ON BLACK
LABELS	–	2 HOUR U.L. – CLASS B

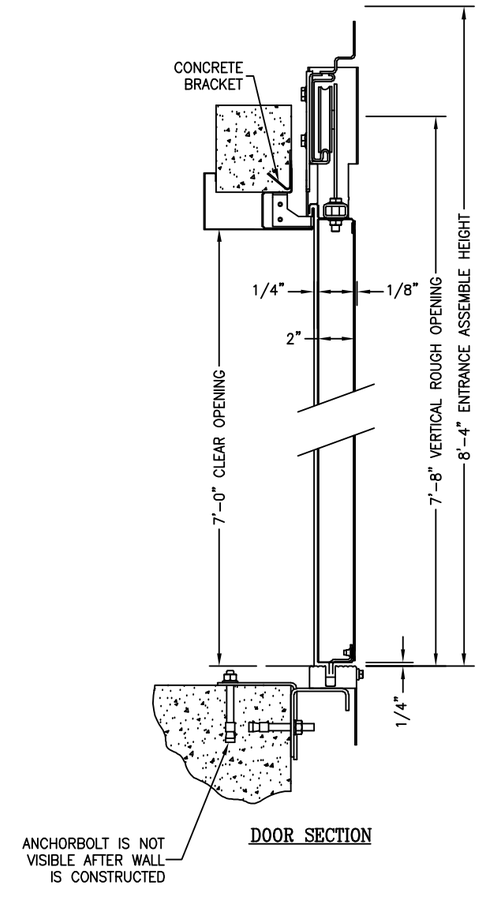


PLAN VIEW



ELEVATION VIEW

REACT. PT.	RZ (LBF)	RY (LBF)
1	305	55
2	260	55
3	260	55
4	305	55



DOOR SECTION

NOTES:

A. DO NOT CONSTRUCT WALLS UNTIL DOOR FRAMES ARE SET.

APPROVED BY

APPROVAL SPACE

PROJECT:
CABLE CAR BARN MODERNIZATION
LOCATION:
20067350
ENG/ARCH:
CITY & COUNTY OF SAN FRANCISCO
CONTRACTOR:
CITY & COUNTY OF SAN FRANCISCO

UNIT INFO

ITEM NO.	NETWORK NO.	EQUIPMENT NO.

REVISIONS

DATE	NO	BY	CK	DESCRIPTION
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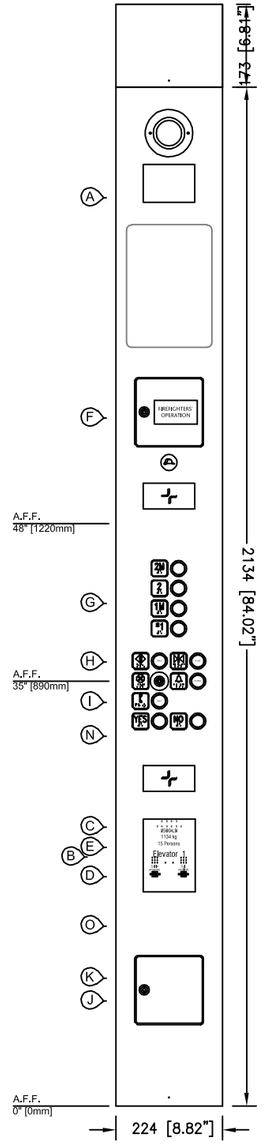
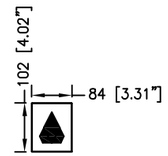
KONE

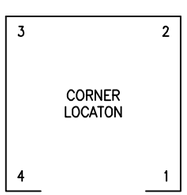
GENERATED ON: 07/14/21	BY: KSC	REV –
UNITS: IMPERIAL	1–20.2	
DRAWING E–4820797–10010–010	DESCRIPTION ENTRANCE	SHEET 13 of 16

	GENERAL INFORMATION
	ELEVATOR CODE YEAR 2004
	CORNER LOCATION 4
	SIGNALIZATION SERIES
	KSS570
	COP MOUNTING TYPE
	FLUSHED
A	**POSITION INDICATOR**
	DIRECTION OF TRAVEL ARROW
	WHITE ILLUMINATION
	KONE 24/7 EMERGENCY COMMUNICATIONS
B	**EMERGENCY COMMUNICATION MICROPHONE AND SPEAKER**
C	**LOAD PLATE**
	2500 LB
	1134kg
	15 PERSONS
D	**EMERGENCY COMMUNICATION INFORMATION TEXT**
E	**ELEVATOR ID**
	1
F	**FIRE FIGHTERS OPERATION PANEL**
	CALL CANCEL
	ASME EMERGENCY KEYSWITCH
	STOP SWITCH
	DOOR OPEN BUTTON
	PHASE II FIRE INDICATOR
	DOOR CLOSE BUTTON
G	**CALL BUTTONS**
	CALIFORNIA PROJECTING
	WHITE ILLUMINATION
H	**CONTROL BUTTONS**
	DOOR OPEN BUTTON
	DOOR CLOSE BUTTON
I	**EMERGENCY PHONE HELP BUTTON**
J	**OPTIONAL DEVICES**
	ACCESS ENABLE
	LIGHT SWITCH
	FAN SWITCH
	INDEPENDENT SERVICE
K	**OUTLOOK**
	441 BRUSHED STAINLESS STEEL
M	**ACS CARD READER**
N	**COP's EMERGENCY LIGHT**
O	**ACU SPEAKER GRILL**





CAR DIRECTION LANTERN
QUANTITY: 1



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LOCATION:
20067350
ENG/ARCH:
CITY & COUNTY OF SAN FRANCISCO
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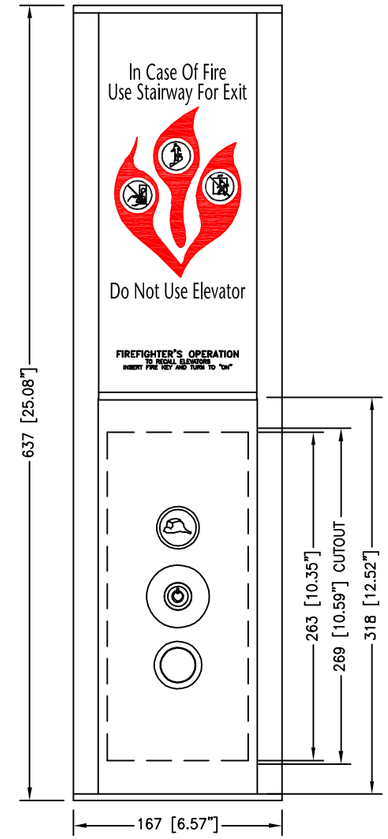
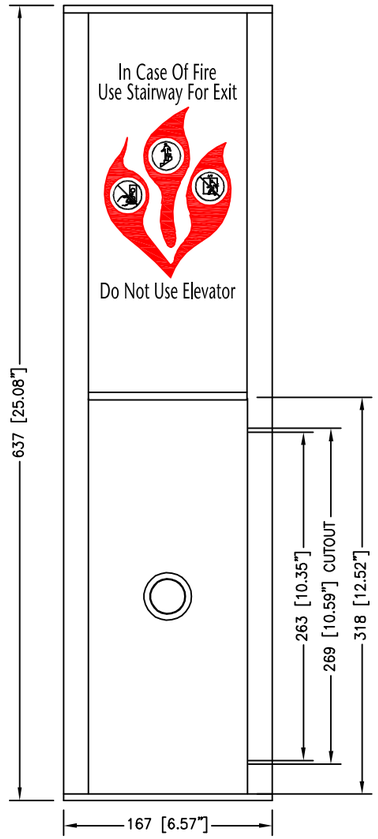
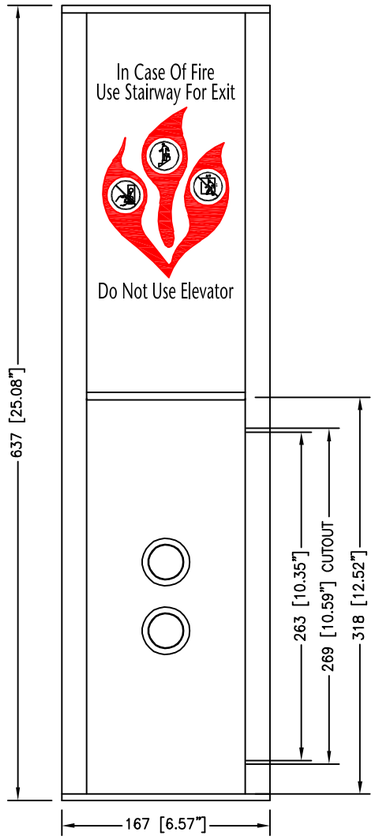
KONE

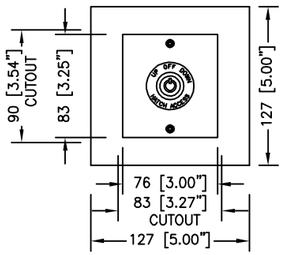
GENERATED ON: 07/14/21	BY: KSC	REV
UNITS: IMPERIAL	1-20.2	–

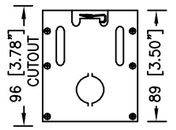
DRAWING	DESCRIPTION	SHEET
F-4820797-10010-010	COP	14 of 16

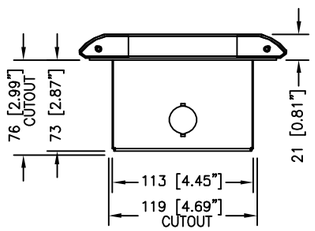












QUANTITY: 1
LOCATIONS
*1
OUTLOOK
WHITE ILLUMINATION
BRUSHED STAINLESS STEEL FACEPLATE
SIGNAGE
PHASE 1 ASME A17.1
CA TITLE 8
DEVICES
PILOT LIGHT
FRD KEY SWITCH
UP CALL BUTTON
PHASE I FIRE RECALL KEY
ASME EMERGENCY KEYSWITCH
SIGNALISATION SERIES: KSS570

QUANTITY: 1
LOCATIONS
2M
OUTLOOK
WHITE ILLUMINATION
BRUSHED STAINLESS STEEL FACEPLATE
SIGNAGE
CA TITLE 8
DEVICES
DOWN CALL BUTTON
SIGNALISATION SERIES: KSS570

QUANTITY: 2
LOCATIONS
1M, 2
OUTLOOK
WHITE ILLUMINATION
BRUSHED STAINLESS STEEL FACEPLATE
SIGNAGE
CA TITLE 8
DEVICES
UP CALL BUTTON
DOWN CALL BUTTON
SIGNALISATION SERIES: KSS570

QUANTITY: 2
LOCATIONS
*1, 2M
HAC STATION TYPE
SEPARATE HAC STATION
OUTLOOK
BRUSHED STAINLESS STEEL FACEPLATE
SIGNALISATION SERIES: KSS570

APPROVED BY

APPROVAL SPACE

PROJECT:
CABLE CAR BARN MODERNIZATION
LOCATION:
20067350
ENG/ARCH:
CITY & COUNTY OF SAN FRANCISCO
CONTRACTOR:
CITY & COUNTY OF SAN FRANCISCO

UNIT INFO

ITEM NO.	NETWORK NO.	EQUIPMENT NO.

REVISIONS

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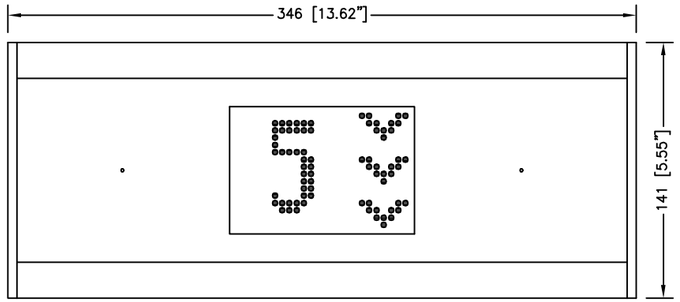
KONE

GENERATED ON: 07/14/21	BY: KSC	REV
UNITS: IMPERIAL	1-20.2	–

DRAWING	DESCRIPTION	SHEET
F-4820797-10010	HPB	15 of 16

QUANTITY: 1
ELEVATOR ID: 1
LOCATIONS
*1
OUTLOOK
POSITION INDICATOR
WHITE ILLUMINATION
BRUSHED STAINLESS STEEL FACEPLATE
HORIZONTAL ORIENTATION
SIGNALISATION SERIES: KSS570



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PROJECT:
CABLE CAR BARN MODERNIZATION
LOCATION:
20067350
ENG/ARCH:
CITY & COUNTY OF SAN FRANCISCO
CONTRACTOR:
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UNITS: IMPERIAL	1-20.2	–
DRAWING	DESCRIPTION	SHEET
F-4820797-10010-010	HL	16 of 16

PFLOW INDUSTRIES

Leading Innovator of Vertical Solutions

Unique product features that deliver efficiency, performance and safety.

Leading the Industry, Now and Always

PFlow pioneered the vertical reciprocating conveyor industry in 1977. We've never looked back. Every day, we're innovating products that lift success.

Our engineering team – by far the largest in the market – will solve any vertical lifting challenge. From aeronautics to automotive, petrochemical to printing, PFlow creates solutions for every industry.

Each project is unique. That's why, at PFlow, innovation never ends. Others copy us. They'll never catch us.

Best Lifecycle Costs: PFlow uses heavier-gauge steel, larger shafts, stronger bearings and industrial-grade motors in its vertical lifting systems. The results? Greater durability, less maintenance, and the lowest lifecycle costs.

Singular Focus: PFlow created the vertical reciprocating conveyor (VRC) industry. Our sole focus is lifting products. All of PFlow's research, development and design centers around manufacturing the strongest, safest, most reliable VRCs on the market.

Strength in Numbers: PFlow has manufactured and sold over 18,000 VRCs, more than double its combined competitors. Customers recognize quality. PFlow delivers it.

Custom Design: All PFlow products are custom designed and built to exact specifications – no "one size fits all" here. Dimensions and capacities match customers' unique needs. Applications are engineered to order.

Superior Safety: Safety is built into every element of a PFlow lifting system. All products are built 3-to-1 over yield on structure, and all lifting components exceed industry design standards. The patented DeckLock system increases safety during load handling and unloading. The DeckLock Systems also protects materials and equipment. Unparalleled design, coupled with stronger components, builds superior safety into all PFlow VRCs.

Largest Product Selection: PFlow offers the greatest variety of VRCs on the market, all with greater capacities, faster speeds and longer lifespans than competitors' products. Every PFlow VRC is custom built to match the customer's exact specifications and needs.

Unmatched Installation Capability: PFlow offers complete installation service for all its products, or assistance with the installation process. PFlow can help customers find certified local installers, many of whom were trained by PFlow, through its long-term relationships with distributors.

Spectacular Service: The dedicated, highly-trained service team at PFlow has more than 75 years combined experience – far and away, the most in the VRC industry! You're never on your own, whether for product installation, on-site troubleshooting, shipping parts overnight, or any other need.

Hands-On Product Training: PFlow offers on-site training for customers in operation and maintenance of its products. Educated employees are critical to safe and efficient use of VRCs.

Low-Risk Code Compliance: PFlow helped shape safety and regulatory codes governing the VRC industry, and guarantees that its products meet all federal, state and local requirements. PFlow is the only VRC manufacturer with a full-time code specialist on staff, who continuously monitors legislation and compliance, and is available for on-site consultation with customers.

Engineering Expertise: The expert, award-winning engineering team at PFlow has hundreds of years of VRC industry experience, far exceeding any competitor. Its collective expertise and know-how ensures that cost-effective solutions can be found for any challenge, no matter how complicated.

Fast Order Processing: PFlow's emphasis on lean manufacturing means that, when customers place an order, their product is delivered expediently – custom built, and ready to perform.

Global Footprint: PFlow has installed VRCs in five of the world's seven continents. Wherever you are, PFlow will provide vertical lifting solutions that meet your material handling needs.

Persistent Problem-Solving: Everyone at PFlow is completely dedicated to the design, manufacture and servicing of VRCs. They've overcome the toughest challenges. No problem is too large, or too hard, to solve. As a PFlow customer, this team is on your side.

We don't "make sales." We create solutions.

Meet the team working for you.

For more than four decades, everyone at PFlow has focused solely on serving customers. Their continuous dedication to innovation – and your success – is unmatched.

Industry-Leading Service and Product Support

PFlow's unparalleled service and product support mean that you're never on your own.

From pre-installation planning, to installation, or trouble shooting, we're here for you. Service begins immediately, and never ends. Our experienced, professional team is always ready to help.

Unlike some competitors, we embrace the concept of "service after the sale." Why? Because, to us, you're a customer - not a "sale." It's a distinction we never forget.

PFlow takes tremendous pride in our products' performance and durability. Our service team is committed to providing the best customer support anywhere – no questions asked.

With lifts operating in five of the world's seven continents, our highly-trained technicians are available for consultation 24/7.

Contact the PFlow service team for assistance with:

- Installation Supervision
- Start-up
- Maintenance Training
- Operator Training
- Maintenance Contracts
- Safety Inspections
- Code Compliance Inspections

Our web site (www.pflow.com) contains a wealth of easily-accessible resources: owners manuals, installation manuals, CAD drawings, dimensions and data, CSI specifications, comprehensive AIA (American Institute of Architects) specifications, and more.

Our people make the big difference. For troubleshooting, field training or any other needs, the PFlow service and support team stands ready. You'll work with people who know how to help and, as importantly, want to help – because, above all, we value our relationship with you.

PFlow leads, collaborates, and stays current on industry trends though various associations. PFlow and its employees are members of APICS, ASQ, ASME, AWS, CSS, MHIA, MHI, NAEC, NFIB, NSPE, SME, and TEC.

PFlow Sales School

State-of-the-Art PFlow Showroom

OVER 40 YEARS

CUSTOM VRC INSTALLATIONS

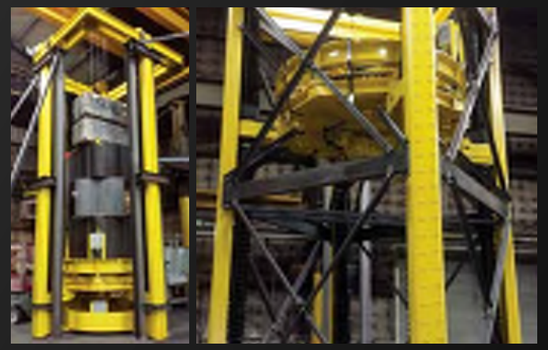
Movable Platform – Custom 4-Post VRC
Includes a retractable lower aluminum ramp and power roll-up doors. 3500 lbs. capacity.

Moving Floor System – Custom Design
390’ x 25’ moving-floor, weighs in at just under one million lbs. and uses a string of wheeled carts, with a working surface of steel plates. 20,000 lbs. point loads; 4’ per minute horizontal travel speed.

Mirror Lift System – 6-Post Mechanical VRC
Winner of 2016 Governor’s New Product Award. 161,000 lbs. lifting capacity; 78’ lift travel; 4 levels of service; 10’ per minute travel speed.

Stadium Concourse Lift – F Series Mechanical VRC
12’ high clearance for the University of Texas Longhorns; 12,000 lbs. lifting capacity; fully ascends/descends in 30 seconds.

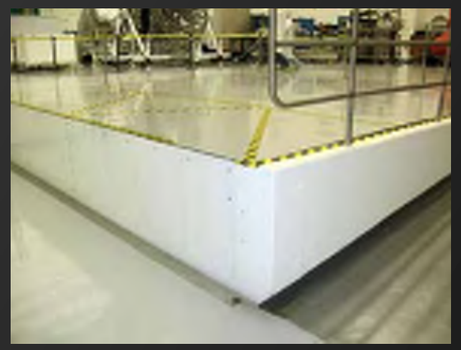
Missile Work Platform – Custom Screw Lift
Vertical travel is controlled via screw lifts. Travels laterally on 18” wheels. 6,500 lbs. lifting capacity.



University Research – High-Capacity Lift – Custom 4-Post VRC
This precise vertical and circular motion lift is installed in a scientific accelerator facility for nuclear science. 26,000 lbs. lifting capacity; 19’ lift travel; 5’ per minute travel speed.

Aeronautics Lift – M Series Mechanical VRC
Moves materials to assist with the production of airplanes. 5,000 lbs. lifting capacity; 18’ 7” lift travel; 3 levels of service; 27’ per minute travel speed.

Boat Mold Lift – F Series Mechanical VRC
Retrofitted design doubled storage space for fiberglass mold dollies in lamination production area. 5,000 lbs. lifting capacity.



Screw Lift – Custom Platform
Rectangular 18.5’ x 20’ platform provides absolute stability needed to move satellites. 80,000 lbs. lifting capacity; 3’ per minute travel speed.

Winery Lift – F Series Mechanical VRC
This through-floor application is in service year-round, and in constant use 12-14 hours each day. 20,000 lbs. lifting capacity; 26’ lift travel; 3 levels of service.

Robotic Parking System – High-Speed Vertical Lifts
7-level, high-speed vertical parking garage stores 325 cars. Programmable controls ensure uninterrupted operation. Lifts send and retrieve automobiles at a rate of 400 FPM.

Fuel Cell Energy Material Lifts – F Series Mechanical VRC
Combination of two material lifts. The first is a screw lift mechanism. The second is a material lift that traverses sideways and lowers onto the first lift. 5,000 lbs. lifting capacity; 18’ lift travel; 3 levels of service; 17’ per minute travel speed.

OVER 40 YEARS

VRC INDUSTRY SOLUTIONS

Aeronautics & Aerospace
Automotive
Car Dealership Parts Rooms
Chemical Manufacturing
Computer & Electronics
Distribution Centers
Food & Beverage
Government
Hospitals
Manufacturing
Material Handling & Processing
Military & Defense Industry
Packaging & Converting
Petrochemical
Pharmaceutical
Printing
Pulp & Paper (Roll Handling)
Retail Back Rooms
Schools & Municipalities
Telecommunications

PFLOW INDUSTRIES

Telescope Lift – Custom Designed 4-Post VRC
19’ x 19’ lift carriage and dual motor drive transport the telescope’s delicate mirror. 54,000 lbs. lifting capacity (44,000 lb. mirror/10,000 lb. carriage); 76’ lift travel; 5’ per minute travel speed.

Distribution Center Material Lifts – F Series Mechanical VRC
Global logistics distribution center relies heavily on 20 high-capacity VRCs with state-of-the-art sorting capabilities. 15,000 lbs. lifting capacity per lift.

9-Ton Window Operators – Special Application
Two windows in private Florida residence split like freight elevator doors, and can be completely hidden in the walls. 33’ wide x 22’ high.

Beer Keg Lift – M Series Mechanical Cantilever VRC
These four lifts assist in the movement of 1,600 kegs throughout an NFL game. 40’ per minute travel speed.

Telecommunications Lift – High-Capacity VRC
Designed to move 20’ shipping containers into a secure underground facility. 50,000 lbs. lifting capacity; 40’ lift travel.

Home Appliance Lifts – M Series Mechanical VRC
Ten lifts installed as a mezzanine application, including a conveyorized system. 1,200 lbs. lifting capacity; 200’ per minute travel speed.

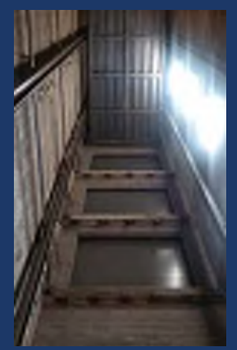
Waste Incinerator Lift – F Series Mechanical VRC
Lift moves contraband materials seized by law enforcement authorities from the ground level to an elevated incinerator. 15,000 lbs. lifting capacity; 79’ lift travel; 37’ per minute travel speed.

Naval Shipyard Drydock – F Series Mechanical VRC
High-capacity lift moves materials and equipment used to build, repair and modernize the Navy’s largest ships. 30,000 lbs. lifting capacity; 50’ lift travel; 30’ per minute travel speed.

Motorcycle Lift – 21 Series Hydraulic VRC
Transports motorcycles and parts between service and storage levels. 2,000 lbs. lifting capacity.

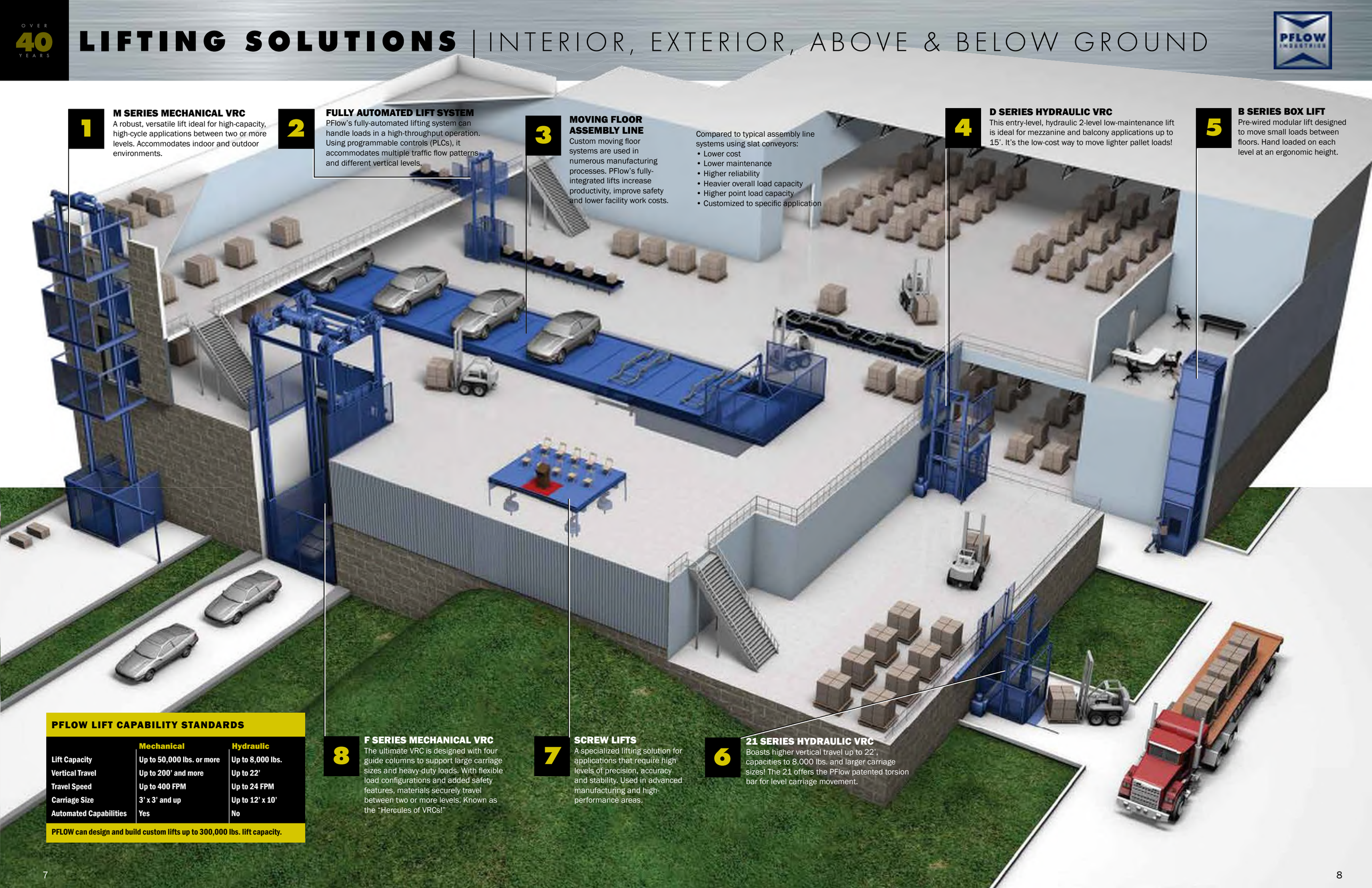
Mini Dealership Lift – F Series Mechanical VRC
Shaftway application uses 14’ x 20’ carriage to move vehicles. 10,000 lbs. lifting capacity.

Public Utility High-Capacity Lift – F Series Mechanical VRC
Mezzanine application services a hydroelectric dam for moving components and parts. 20,000 lbs. lifting capacity; 40’ lift travel.



Auto Dealership High Rise Lift – F Series Mechanical VRC
High-capacity lift moves luxury automobiles to storage and service levels. 8,000 lbs. lifting capacity; 73’ lift travel; 6 levels of service.

LIFTING SOLUTIONS | INTERIOR, EXTERIOR, ABOVE & BELOW GROUND



1 M SERIES MECHANICAL VRC
A robust, versatile lift ideal for high-capacity, high-cycle applications between two or more levels. Accommodates indoor and outdoor environments.

2 FULLY AUTOMATED LIFT SYSTEM
PFlow's fully-automated lifting system can handle loads in a high-throughput operation. Using programmable controls (PLCs), it accommodates multiple traffic flow patterns and different vertical levels.

3 MOVING FLOOR ASSEMBLY LINE
Custom moving floor systems are used in numerous manufacturing processes. PFlow's fully-integrated lifts increase productivity, improve safety and lower facility work costs.

Compared to typical assembly line systems using slat conveyors:
- Lower cost
- Lower maintenance
- Higher reliability
- Heavier overall load capacity
- Higher point load capacity
- Customized to specific application

4 D SERIES HYDRAULIC VRC
This entry-level, hydraulic 2-level low-maintenance lift is ideal for mezzanine and balcony applications up to 15'. It's the low-cost way to move lighter pallet loads!

5 B SERIES BOX LIFT
Pre-wired modular lift designed to move small loads between floors. Hand loaded on each level at an ergonomic height.

8 F SERIES MECHANICAL VRC
The ultimate VRC is designed with four guide columns to support large carriage sizes and heavy-duty loads. With flexible load configurations and added safety features, materials securely travel between two or more levels. Known as the "Hercules of VRCs!"

7 SCREW LIFTS
A specialized lifting solution for applications that require high levels of precision, accuracy and stability. Used in advanced manufacturing and high-performance areas.

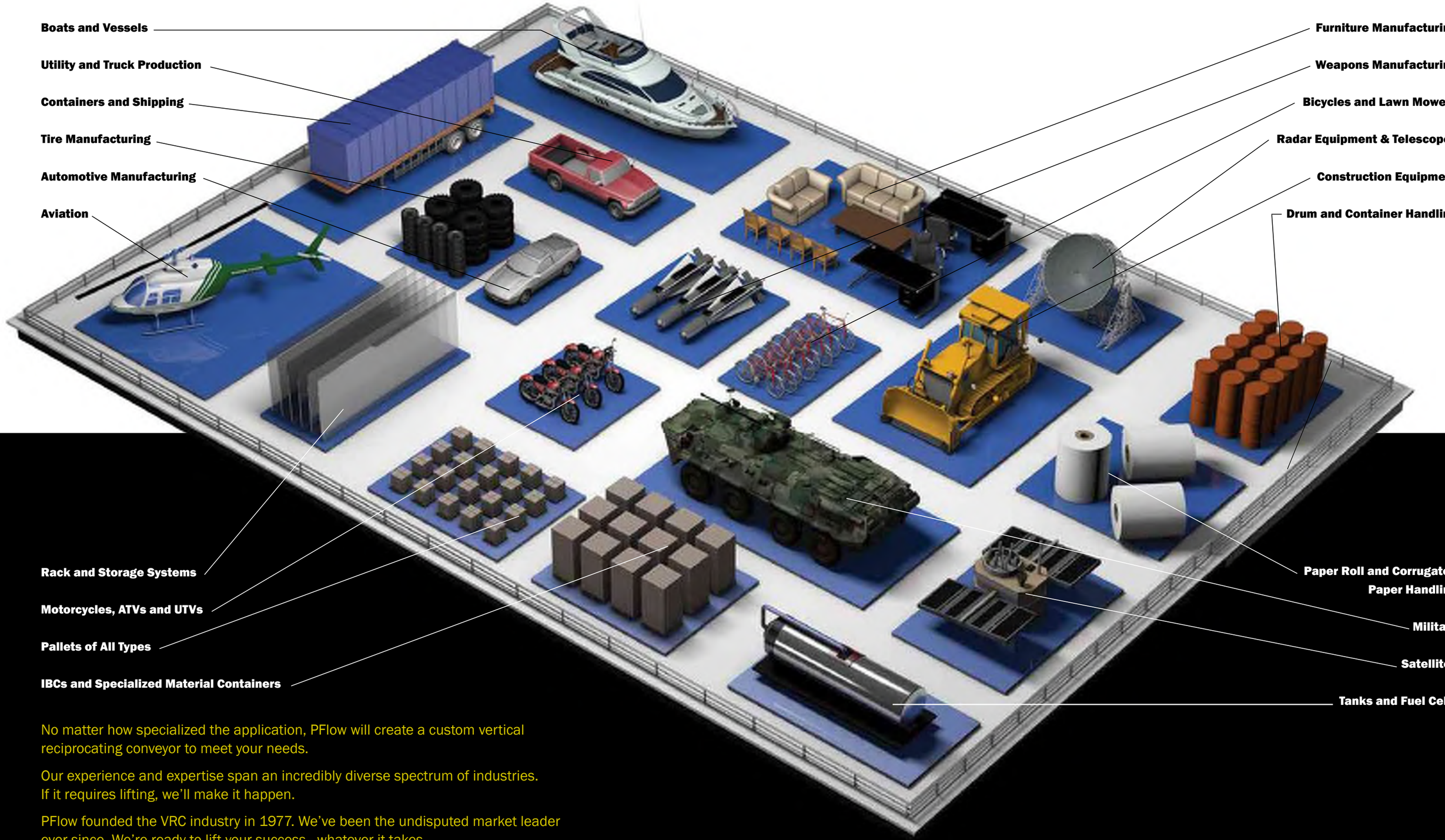
6 21 SERIES HYDRAULIC VRC
Boasts higher vertical travel up to 22', capacities to 8,000 lbs. and larger carriage sizes! The 21 offers the PFlow patented torsion bar for level carriage movement.

PFLOW LIFT CAPABILITY STANDARDS

	Mechanical	Hydraulic
Lift Capacity	Up to 50,000 lbs. or more	Up to 8,000 lbs.
Vertical Travel	Up to 200' and more	Up to 22'
Travel Speed	Up to 400 FPM	Up to 24 FPM
Carriage Size	3' x 3' and up	Up to 12' x 10'
Automated Capabilities	Yes	No

PFLOW can design and build custom lifts up to 300,000 lbs. lift capacity.

UNIQUE VRC APPLICATIONS



No matter how specialized the application, PFlow will create a custom vertical reciprocating conveyor to meet your needs.

Our experience and expertise span an incredibly diverse spectrum of industries. If it requires lifting, we'll make it happen.

PFlow founded the VRC industry in 1977. We've been the undisputed market leader ever since. We're ready to lift your success - whatever it takes.

OVER 40 YEARS

M SERIES | 2-POST MECHANICAL LIFT

Transports large, heavy loads between two or more levels.

Ideal for high-speed or high-cycle automated systems.

- Lifts loads up to 10,000 lbs.* Carriage size 12’ x 12’ standard. Customization available for larger sizes.
- Vertical rise to 200’ or more. Standard travel speed is 25-30 FPM.
- Straddle or cantilever.
- Indoor or outdoor use.

- Lifetime structural warranty.
- ASME B20.1 compliant.
- Superior strength, reliability and long-term performance.
- Carriage is lifted and lowered by heavy-duty roller chain using a shaft-mounted gear reducer and motor, mounted atop 6” guide columns.
- Advanced built-in safety features protect workers and materials.
- Certified safety cams prevent carriage descent in the event of a chain failure.

- DeckLock Safety System available for added security at critical upper levels.
- Optional hot-dipped galvanized or epoxy finish available for outdoor or wash-down environments.
- Explosion-proof components available for classified environments.

Weight capacity based on carriage size and added options. Contact a PFlow representative for more information.

GENERAL
Principal components of the M Series are guide columns, carriage and a motor-gear reducer drive.

STRUCTURE
Guide columns are 6” wide flange sections. Carriage is fabricated with heavy structural steel members and a steel deck plate. Other deck surfaces can be supplied. Straddle or cantilever carriage available, depending on application.

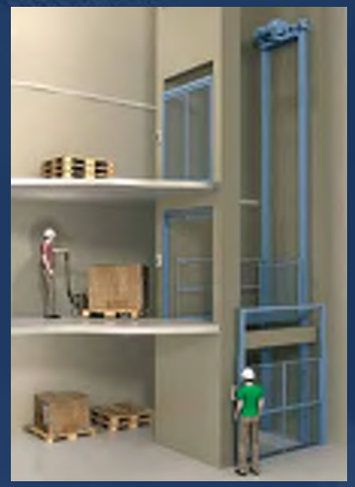
OPERATION
Carriage is lifted and lowered by roller chain attached to an electric motor/reducer assembly mounted on the guide columns. Standard units employ 2 HP to 15 HP TEFC brake motors.

ELECTRICAL
Standard power requirements are 230/460VAC, 3-phase. Control voltage is 110VAC. Standard control panels and push button stations are NEMA 12 rated. Push button stations provided at each level include momentary contact, call/send operators and mushroom head emergency stop.

SAFETY FEATURES
Travel of the carriage is controlled by a limit switch. When the switch is tripped or power is lost, the motor shuts off and the mechanically actuated brake is engaged. Overload protection is provided by a relay that measures the motor current. If the current exceeds the amount required to move the maximum load, it will shut the unit down and engage the brake. Chain sensors shut down the lift if chain tension is lost. Chain tensioners and guides prevent chains from jumping on sprockets. NO RIDER signs posted at each point of operation.

CARRIAGE SIDE GUARDS
Carriage is equipped with safety rails on non-operating sides, and a safety chain, drop bars or gates on operating ends. Optional expanded metal or sheet metal carriage side guards available.

SAFETY ENCLOSURES / GATES
Safety codes (ASME B20.1) require interlocked gates with enclosures on all sides of the lift. Enclosures must be a minimum of 8’ high and reject a ball 2” in diameter. See page 23 for additional information.



F SERIES | 4-POST MECHANICAL LIFT

Transports multiple pallets, oversized materials, large carts or heavy machinery between two or more levels. Ideal for high-speed, high-cycle or automated systems.

- Lifts loads up to 50,000 lbs.* Customization available for heavier loads.
- Unlimited carriage sizes.
- Unlimited vertical rise.
- Standard travel speed is 20 FPM.
- Indoor or outdoor use.
- Lifetime structural warranty.
- ASME B20.1 compliant.
- Carriage is lifted and lowered by heavy-duty roller chain attached to mechanical lifting mechanism, mounted atop guide columns. Guide columns vary from 6" to 12".
- Four-post design allows loading and unloading from all sides with flexible traffic patterns.
- Advanced built-in safety features protect workers and materials.
- Certified safety cams prevent carriage descent in the event of a chain failure.
- DeckLock Safety System available for added security at critical upper levels.
- Optional hot-dipped galvanized or epoxy finish available for outdoor or wash-down environments.
- Explosion-proof components available for classified environments.

**Weight capacity based on carriage size and added options. Contact a PFlow representative for more information.*

GENERAL
Principal components of the F Series are guide columns, carriage and a mechanical lifting mechanism.

STRUCTURE
Guide columns are built from wide-flange beams. Carriage is fabricated of heavy-duty structural steel members and deck plate. Other deck surfaces available.

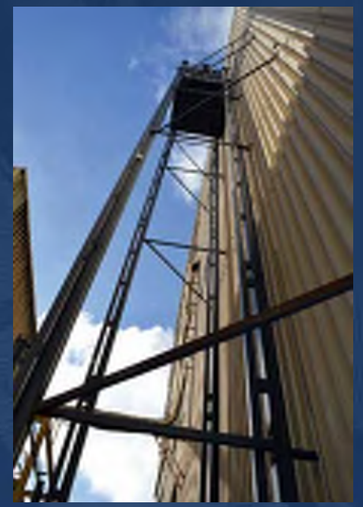
OPERATION
Carriage is lifted and lowered by roller chain attached to an electric motor-reducer assembly mounted on the guide columns. Standard units employ 2 HP to 15 HP TEFC brake motors.

ELECTRICAL
Standard power requirements are 230/460VAC, 3-phase. Control voltage is 110VAC. Standard control panels and push button stations are NEMA 12 rated. Push button stations provided at each level include momentary contact, call/send operators and mushroom head emergency stop.

SAFETY FEATURES
Travel of the carriage is controlled by a limit switch. When switch is tripped or power is lost, the motor shuts off and the mechanically actuated brake engages. Overload protection provided by a relay that measures motor current. If the current exceeds the amount required to move the maximum load, it will shut the unit down and engage the brake. Chain sensors shut down the lift if chain tension is lost. Chain tensioners and guides prevent chains from jumping on sprockets. NO RIDER signs posted at each point of operation.

CARRIAGE SIDE GUARDS
Carriage is equipped with safety rails on non-operating sides, and a safety chain, drop bars or gates on operating ends. Optional expanded metal or sheet metal carriage side guards available.

SAFETY ENCLOSURES / GATES
Safety codes (ASME B20.1) require interlocked gates with enclosures on all sides of the lift. Enclosures must be a minimum of 8' high and reject a ball 2" in diameter. See page 23 for additional information.



OVER 40 YEARS

21 SERIES | 2-POST HYDRAULIC LIFT

Transports materials between two levels. Carriage remains level regardless of load placement.

- Lifts loads up to 6,000 lbs.* Carriage sizes up to 12’ x 10’.
- Vertical rise to 22’. Standard vertical travel is 24 FPM.
- Straddle or cantilever.
- Indoor or outdoor use.
- Lifetime structural warranty.
- ASME B20.1 compliant.

- Carriage is lifted and lowered by chain over sprockets actuated by column-mounted cylinders. Synchronized shaft ensures that carriage stays level at all times.
- Highly stable loading and unloading operations maintained by pressure switch that prevents carriage from drifting or sinking.
- Check valves hold carriage in place in event of power loss
- Certified safety cams prevent carriage descent in the event of a chain failure.

- Velocity fuses prevent uncontrolled carriage descent in the event of a hose rupture.
- Field wiring costs greatly reduced by optional quick-connect cabling for push-button stations and gate interlocks.
- Optional hot-dipped galvanized or epoxy finish available for outdoor or wash-down environments.
- Explosion-proof components available for classified environments.
- DeckLock Safety System available for added security at critical upper levels.

**Weight capacity based on carriage size and added options. Contact a PFlow representative for more information.*

GENERAL
Principal components of the 21 Series are guide columns, carriage and hydraulic actuating mechanism.

STRUCTURE
Guide columns are 6” wide flange. Carriage is fabricated of heavy-duty structural members with steel deck plate. Other deck surfaces available. Straddle or cantilever carriage available, depending on application.

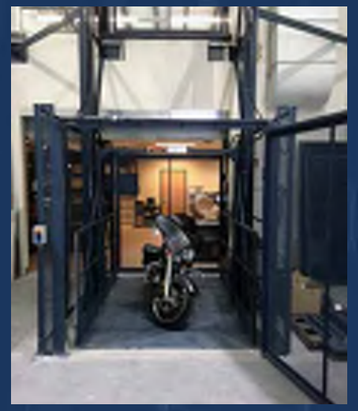
OPERATION
Carriage is lifted and lowered by two hydraulic cylinders mounted on guide columns. Cylinders are actuated by a remote mounted hydraulic pump. Transmission of the lifting force is through roller chain attached to the cylinders and carriage. A torsion bar links the two cylinders to equalize the load and ensure carriage remains level at all times.

ELECTRICAL
Standard power requirements are 208/230/460VAC, 3-phase (single-phase available). Control voltage is 24VAC. Push button stations and pump mounted pre-wired control panel are NEMA 12 rated. Push button stations provided at each level and include call/send operators and mushroom head emergency stop. Quick connect pre-wiring is optional.

SAFETY FEATURES
Upward travel of carriage limited by mechanical stops that ensure positive leveling with upper deck. Positive mechanical stops prevent overtravel. Pressure builds to “lock” carriage into position at upper level. NO RIDER signs posted at each point of operation. DeckLock Safety System available for added security at critical upper levels.

CARRIAGE SIDE GUARDS
Carriage is equipped with safety rails on non-operating sides, and a safety chain, drop bars or gates on operating ends. Optional expanded metal or sheet metal carriage side guards are available.

SAFETY ENCLOSURES / GATES
Safety codes (ASME B20.1) require interlocked gates with enclosures on all sides of the lift. Enclosures must be a minimum of 8’ high and reject a ball 2” in diameter. See page 23 for additional information.



OVER 40 YEARS

D SERIES | HYDRAULIC LIFT

Transports materials between two levels. Innovative design ensures highly-stable loading and unloading operations.

- Lifts loads up to 3,000 lbs.* Carriage sizes up to 6’ x 6’.
- Vertical rise to 15’. Standard vertical travel is 17 FPM.
- Indoor or outdoor use.
- Lifetime structural warranty.
- ASME B20.1 compliant.

**Weight capacity based on carriage size and added options. Contact a PFlow representative for more information.*

- Guided Dual-Pak design is direct action, with no cables, chains, sheaves, sprockets or bearings that can break.
- Highly-stable loading and unloading operations maintained by pressure switch that prevents carriage from drifting or sinking.
- Ultra-high molecular weight, polyethylene cylinder guide improves cylinder life by preventing cylinders from twisting.
- Check valves hold carriage in place in event of power loss.
- Velocity fuses prevent uncontrolled carriage descent in the event of a hose rupture.
- Field wiring costs greatly reduced by optional quick-connect cabling for push-button stations and gate interlocks.
- DeckLock Safety System available for added security at critical upper levels.
- Optional hot-dipped galvanized or epoxy finish available for outdoor or wash-down environments.
- Explosion-proof components available for classified environments.

GENERAL
Principal components of the D Series are guide columns, carriage and hydraulic actuating mechanism.

STRUCTURE
Guide columns are 6” wide flange. Carriage is fabricated of heavy-duty structural members with steel deck plate. Other deck surfaces available. Carriage is cantilever design and can be loaded from any of three operating sides, depending on application.

OPERATION
Carriage is lifted and lowered by two direct-acting hydraulic cylinders. Cylinders are actuated by a remote mounted hydraulic pump. Transmission of the lifting force is direct from the base of guide columns to the carriage, using a Dual-Pak ram.

ELECTRICAL
Standard power requirements are 208/230/460VAC, 3-phase (single-phase available). Control voltage is 24VAC. Push button stations are NEMA 12 rated. Pump mounted, pre-wired control panel is NEMA 12 rated. Push button stations provided at each level include call/send operators and mushroom head emergency stop. Quick connect pre-wiring is optional.

SAFETY FEATURES
Upward travel of carriage limited by mechanical stops that ensure positive leveling with upper deck. Positive mechanical stops prevent overtravel. Pressure builds to “lock” carriage into position at upper level. NO RIDER signs posted at each point of operation. DeckLock Safety System available for added security at critical upper levels.

CARRIAGE SIDE GUARDS
Carriage is equipped with safety rails on non-operating sides, and a safety chain, drop bars or gates on operating ends. Optional expanded metal or sheet metal carriage side guards are available.

SAFETY ENCLOSURES / GATES
Safety codes (ASME B20.1) require interlocked gates with enclosures on all sides of the lift. Enclosures must be a minimum of 8’ high and reject a ball 2” in diameter. See page 23 for additional information.

B SERIES | BOX LIFT

Transports loads to mezzanines and between floors. Ideal for lifting boxes, totes, cartons, barrels, sacks, cases and individual parts.

- Lifts loads up to 500 lbs.
- Standard carriage size is 3’ x 3’.
- Vertical rise up to 15’ 9”. 30” above floor loading position.
- Standard travel speed is 30 FPM.
- Indoor use only.
- ASME B20.1 compliant.

- Design allows loading and unloading from one of three sides at each level.
- Integral access gates provided at each level and interlocked with lift operation.
- Mechanical motor, electrical components and gear reducer located at base of unit; access panel creates ease of maintenance.
- Unit ships in modular sections pre-wired with “quick connect” wiring.
- Pre-assembled shipment is available, saving time and money on installation.
- Durable, high-quality materials and design ensure reliable long-term performance.
- Advanced built-in safety features protect workers and loads.
- Unit is positioned to load/unload at ergonomic heights on each level.

GENERAL
Principal components of the B Series are modular steel enclosure frame, mechanical drive assembly and lift carriage.

STRUCTURE
Stackable modular-formed steel panels provide full-height guarding, and internal guide for carriage assembly. Gate arrangement can be easily changed for right-hand or left-hand swing open pattern.

OPERATION
Carriage is lifted and lowered by dual roller chains connected to electric motor-reducer assembly. Motor-reducer assembly is mounted within lift enclosure at floor level, with easy-access door for maintenance.

ELECTRICAL
Standard power requirements are 230V single-phase or 230V/460V 3-phase. Low voltage controls. NEMA 12 rated momentary contact push button stations are provided for each level and include mushroom head E-stop. Quick-connect wiring is provided, and ships partially pre-wired to expedite installation.

SAFETY FEATURES
The B Series Box Lift is the safest small modular package lift on the market Its safety elements include exclusive spring-loaded dual safety pins to prevent uncontrolled descent in case of chain failure, electro-mechanical door interlocks, full-height safety enclosures, and overload protection.

SAFETY ENCLOSURES / GATES
Standard units include interlocked swing gates, and full-height enclosures on all sides. See page 23 for additional information.

OVER 40 YEARS

DB SERIES | PACKAGE HANDLING LIFT

Transports loads to mezzanines, between floors or between conveyor levels. Ideal for high-speed applications that require lifting boxes, cartons, packages, totes, containers or cases.

- Lifts loads up to 100 lbs.
- Standard carriage size is 3’ x 3’.
- Standard travel speed is 60 FPM.
- Indoor use only.
- Loading and unloading accessible from three sides.

- Saves space by handling loads often transported on an inclined conveyor.
- Smooth, quiet counterweight lifting mechanism minimizes horsepower requirements and saves energy.
- Completely self-contained, self-supporting and economical.
- Durable, high-quality materials and design ensure safe, reliable long-term performance.

GENERAL
Principal components of the DB Series are guide columns, carriage and mechanical actuating mechanism. All components are pre-assembled for ease of installation.

STRUCTURE
Frame is constructed of structural steel, and designed to be self-supporting. Carriage is typically supplied with powered roller conveyor deck. Carriage is a cantilever design, and can be loaded from any of three operating sides, depending on the application.

OPERATION
Carriage is lifted and lowered by dual chains connected to electric motor-reducer assembly. Power unit employs a fractional HP brake motor mounted to top of lift frame.

ELECTRICAL
Standard power requirements are 230V/460V, 3-phase. Control voltage is 110VAC. Standard push button stations and control panel are NEMA 12 rated. Control panel is designed to be mounted to back of frame; all control devices are pre-wired by manufacturer. A variety of control options are available, from basic interface to PLC automated controls.

SAFETY FEATURES
Travel of the carriage is controlled by a limit switch. When the switch is tripped or power is lost, the motor shuts off and the mechanically actuated brake is engaged. Overload and carriage over-travel protection is provided.

SAFETY ENCLOSURES / GATES
Standard units include integral, full-height enclosures on all sides made of 1/2” expanded metal. See page 23 for additional information.

VRC | GATES & ENCLOSURES

Code approved, space efficient, and built for maximum protection and performance.

PFlow safety gates are equipped with a mechanical lock and electric contact, meeting code requirements for manual loading applications.

Single & Bi-Parting Swing Gates
- Standard single and bi-parting swing gates provide 7’ 0” H load clearance.
- Maximum single panel width: 6’ W (overall) mounted on a 5’ 0” W carriage.
- Standard bi-parting panel width: Up to 11’ 0” W (overall) mounted on a 10’ 0” W carriage.

Single & Bi-Parting Sliding Gates
- Pneumatic operators available for push-button operation.
- Standard single and bi-panel slide gates provide 7’ 0” H load clearance.
- Standard single panel width: Up to 11’ 0” W (overall) mounted on a 10’ 0” W carriage.
- Standard bi-parting width: Up to 22’ 0” W (overall) mounted on a 20’ 0” W carriage.

Single & Bi-Panel Vertical Acting Gates
- Pneumatic or motorized operators available for push-button operation.
- Counterbalanced with an exclusive cross-shaft design to always keep gate level.
- Non-binding UHMW sliding guides offer superior damage resistance.
- Chain, instead of cable, provides greater durability.
- Standard single panel height and bi-panel closed height is 6’ 0” H and provides 7’ 0” H clearance.
- Standard width: Up to 14’ 0” W for 12’ 0” W carriage.

Swing Gate

Sliding Gate

Vertical Acting Gate

Innovative product designs ensure safe loading and unloading for workers and materials.

PFlow enclosures are code approved and made of ½” flattened expanded metal for superior strength and longevity.

Enclosures Built to Protect and Last
- PFlow standard panels are 6” to 5’ wide.
- Panels are painted PFlow Blue. Custom paint colors available upon request.
- All mounting hardware included.
- Non-standard sizes, custom finishes and galvanized panels available upon request.

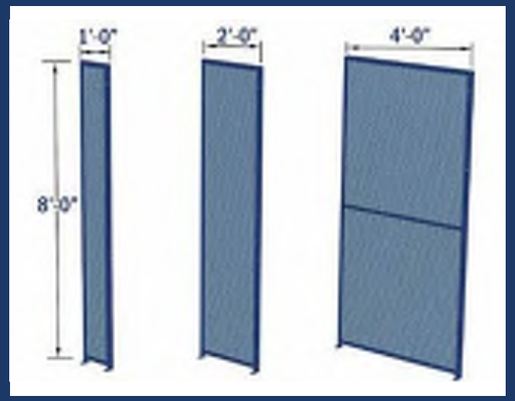
Required Design Standards for Lifts and Gates
All accessible sides of a unit not used for loading or unloading must be protected by enclosures at least 8’ high, and capable of rejecting a ball 2” in diameter at each level. Any combination of shaftways, walls or permanent enclosures that provide equivalent protection is acceptable. If lift service is to the edge of a mezzanine or balcony, only minimal enclosures are required because the equipment is guarded by location.

Fire Code Requirements
If a floor is penetrated, contact your insurance company or local fire authorities to determine if a fire-rated enclosure is required.

Optional Visual Safety Barrier
Additional safety at upper most level can be provided when the access gate is open and the carriage is not present.

Shaftway Applications
When a VRC is penetrating floors that are rated due to fire breaks or environmental conditions, walls and doors configured by others to meet the required conditions may be required. The term typically used is “shaftway.” PFlow VRCs can regularly be found behind interlocked doors in new installations, or replacing freight and service elevators, ash lifts, dumbwaiters and other lifting devices.

Enclosures



PFlow enclosure panels are designed to fit your custom application and comply with local guarding requirements.

Optional Visual Safety Barrier

Lowered barrier

Raised barrier for access

Safety Features that Perform and Protect

As the pioneering company of the VRC industry, PFlow has engineered safety as a top priority in all its products. Our tremendous research and development emphasis on safety has generated many unique product features, all which meet or exceed code requirements.

Certified Safety Cams

- In the unlikely event of a lifting chain break, the safety cam will immediately and automatically rotate into position.
- Safety cams are mounted on the carriage and positioned between the flanges of the guide column.
- Spring-loaded and designed with a series of hardened teeth.

As the safety cams rotate into position, the downward pressure of the carriage forces them into the flanges of the guide columns, preventing carriage descent. When chain tension is returned to normal, the cams rotate back to their inoperative position, allowing the VRC to resume operation. On the M Series and F Series, slack or broken chain conditions are sensed by a switch on the chain tensioner assembly, which cuts power to the drive. All units should be fully inspected before resuming service.

DeckLock System (Optional)

- Protects workers, materials and machines by eliminating accidents caused by carriage drop.
- High-capacity DeckLocks automatically extend to prevent uncontrolled descent at critical upper levels.
- Ensures safe loading and unloading with a forklift.
- Prevents uncontrolled descent in the case of overload or brake malfunction during loading/unloading operations.
- Gate-operated mechanical, pneumatic and electric versions available.
- Can provide absolute positioning if required.

PFlow VRCs are built with a substantial safety factor, but inadvertent overload or lack of maintenance can result in dangerous, unintentional carriage descent. Mechanical VRCs depend upon spring-set brakes to maintain the carriage position. These brakes are sized to provide a minimum of 150% of maximum load capacity; however, wear and lack of brake maintenance can reduce that capacity. Overload of the carriage can cause brake slippage. The exclusive PFlow patented DeckLock system provides additional safety under these conditions.

Maintenance Pins (Optional)

Optional, manually-actuated maintenance pins provide additional safety when performing service on the VRC. The pins extend under the carriage structure to provide one-way assurance that the VRC carriage is properly secured.

Note: Two means to secure the carriage is normally required.

Product Patents Reflecting a Never-ending Commitment to Innovation

PFlow holds more than 20 patents, far exceeding all competitors. It's no surprise. With the largest engineering team in the industry, and a culture focused on innovation, PFlow continues to create new breakthroughs in vertical lift performance and safety.

Quantum Drive

Exceptional performance, durability, increased capacity and faster speeds! This quantum leap in chain-driven technology features reduced vibration and less maintenance. Patent pending.

DeckLock

This exclusive safety system protects workers, materials and machines by preventing uncontrolled carriage descent from upper levels due to overload or brake malfunction.

Moving Floor System

High productivity, coupled with improved safety, are built into this ultra-efficient moving floor assembly line. The flexible design especially lends itself to assembly of large machinery.

Vehicle Display System

Car shopping reaches new heights with this innovative structure, which is custom built for vehicles from small cars to large buses. Vehicles are loaded and unloaded with minimal labor and maximum exposure.

PFlow Patents

1	9,598,242	Moving floor system
2	8,789,661	Visual warning barrier for door assembly
3	8,328,003	Shopping cart conveyor with gate assembly
4	8,075,237	Multi-level vehicle lift
5	7,931,136	Jam sensor for shopping cart conveyor
6	7,779,992	Shopping cart conveyor system with pivoting lug
7	7,453,358	Shopping cart conveyor with gated access
8	7,131,532	Belt attachment device and method
9	6,896,125	Belt attachment device and method
10	6,644,210	Shopping cart conveyor/front wheel alignment/turning system
11	6,490,979	Inclined shopping cart conveyor system
12	6,394,260	Conveyor system including roller-guided carriage assemblies
13	6,360,848	Safety system for a vertical reciprocating conveyor
14	5,941,347	Portable lift
15	5,908,088	Hydraulic drive mechanism for a vertical conveyor
16	5,601,157	DeckLock
17	5,408,789	Overhead security door
18	5,228,537	Safety mechanism for a vertical reciprocating conveyor
19	5,205,379	Vertical conveyor
20	4,987,992	Material transfer apparatus
21	4,227,463	Apparatus for removing and installing batteries

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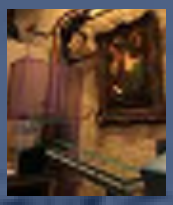
from Truffles  **to Toyotas** **to Telescopes** **and more.**

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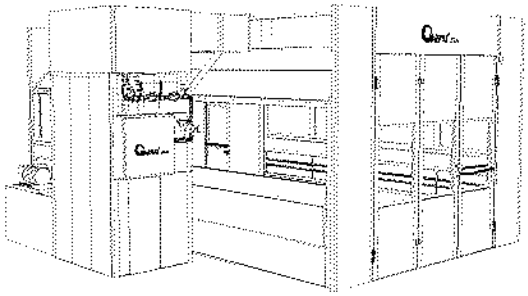
A12 - Paint Booth Drawings



Date: **06-08-05**

To: **Whom It May Concern**

From: **Bruce Williams – Garmat USA, Inc. Design Engineer**

Subject: **Booth Anchoring Requirements**

Although it is not specifically called out in the Intertek Testing (ETL) Reports, NFPA 33 Requirements or the Garmat USA, Inc Contractors Packages, we suggest the following for attaching / anchoring Garmat equipment to the concrete floor at the installation location:

Front and rear thresholds should be attached to the 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, the floor track should be anchored using powder actuated or equivalent pin anchors at 36” increments.

Examples: Remington ¾” to 1-1/2”” Low Velocity Power Fastener or
Hilti 1” Sheet Metal Fastener

Additional anchoring may be necessary based on local jurisdiction requirements.

The Kwik Bolt TZ® KB–TZ is a torque controlled expansion anchor which is especially suited to seismic and cracked concrete applications.

Torque controlled expansion anchors shall be Kwik Bolt TZ® KB–TZ supplied by Hilti meeting the description in Federal Specification A_A 1923A, Type 4.

The Carbon steel anchor body, nut, and washer have an electroplated zinc coating conforming to ASTM B 633 to minimum thickness of 5µm. The stainless steel expansion sleeve conforms to AISI 316. Bolt meets ductility requirements of ACI 318–05 Section D1.

Design strengths are determined in accordance with ACI 318–05 Appendix D and ICC Evaluation Service ESR–1917 Hilti Kwik Bolt TZ Carbon Steel anchors in concrete.

Listing / Approvals:
ICC–ES® International Code Council ESR–1917
FM® Factory Mutual
ULC® Underwriters Laboratories
2006 International Building Code® IBC
2006 International Residential Code® IRC
1997 Uniform Building Code® UBC

Installation:
Drill hole in base material to appropriate depth using carbide tipped drill bit. Drive anchor into the hole using hammer. A minimum of four threads must be below the fastening surface prior to applying installation torque.

Table 2 — Carbon Steel Kwik Bolt TZ Design Information

DESIGN INFORMATION	Symbol	Units	Nominal anchor diameter											
			3/8			1/2			5/8			3/4		
Anchor O.D.	d_a	in. (mm)	0.375 (9.5)			0.5 (12.7)			0.625 (15.9)			0.75 (19.1)		
Hilti KH-EZ														
Hilti HVZ	h_{ef}	in. (mm)	2 (51)	2-1/4 (57)	3 (76)	2-1/2 (64)	3-1/4 (83)	4 (102)	3 (76)	3-3/4 (95)	5 (127)	3-3/4 (95)	4-1/2 (114)	6 (152)
Min. member thickness	h_{min}	in. (mm)	4 (102)	4-1/2 (114)	5 (127)	5 (127)	6-1/2 (165)	7 (178)	6 (152)	7-1/2 (191)	9-1/2 (241)	7-1/2 (191)	9 (229)	11-1/2 (292)
Critical edge distance	c_{ac}	in. (mm)	4 (102)	4-1/2 (114)	5 (127)	5 (127)	6-1/2 (165)	7 (178)	6 (152)	7-1/2 (191)	9-1/2 (241)	7-1/2 (191)	9 (229)	11-1/2 (292)
Min. edge distance	c_{min}	in. (mm)	2 (51)	2-1/4 (57)	3 (76)	2-1/2 (64)	3-1/4 (83)	4 (102)	3 (76)	3-3/4 (95)	5 (127)	3-3/4 (95)	4-1/2 (114)	6 (152)
	s_{min}	in. (mm)	1-3/4 (45)	2 (51)	3 (76)	2-1/2 (64)	3-1/4 (83)	4 (102)	3 (76)	3-3/4 (95)	5 (127)	3-3/4 (95)	4-1/2 (114)	6 (152)
Min. anchor spacing	s_{min}	in. (mm)	2 (51)	2-1/4 (57)	3 (76)	2-1/2 (64)	3-1/4 (83)	4 (102)	3 (76)	3-3/4 (95)	5 (127)	3-3/4 (95)	4-1/2 (114)	6 (152)
	c_{min}	in. (mm)	1-3/4 (45)	2 (51)	3 (76)	2-1/2 (64)	3-1/4 (83)	4 (102)	3 (76)	3-3/4 (95)	5 (127)	3-3/4 (95)	4-1/2 (114)	6 (152)
Dia. hex depth	h_s	in. (mm)	2 3/8 (60)			2 3/8 (60)			2 3/8 (60)			2 3/8 (60)		
Concrete			f'c ≥ 2500 psi (17.2 MPa)											
Std. specified yield strength	f_y	ksi (N/mm²)	130000 (896)			116000 (800)			105000 (724)			94000 (648)		
Min. specified ult. strength	f_u	ksi (N/mm²)	150000 (1034)			145000 (1000)			130000 (896)			125000 (862)		
Effective tensile stress area	A_{se}	in² (mm²)	0.078 (50.3)			0.142 (91.6)			0.226 (145.8)			0.334 (215.5)		
Steel strength in tension	N_{sa}	lb (kN)	10140 (45.1)			16540 (73.6)			23730 (105.6)			31410 (139.7)		
Steel strength in shear	V_{sa}	lb (kN)	5265 (23.4)			8990 (40.0)			12320 (54.8)			14745 (65.6)		
Steel, bending	M_s	in-lb (N-m)	176 (19.9)			354 (40.0)			747 (84.4)			1325 (149.7)		
Load bearing length of anchor	l_e	in. (mm)	1.50 (38.1)	1.75 (44.5)	2.50 (63.5)	2.00 (50.8)	2.63 (66.8)	3.38 (85.9)	2.50 (63.5)	3.13 (79.5)	4.25 (108.0)	3.13 (79.5)	3.75 (95.3)	5.00 (127.0)
Concrete cone failure														
Effectiveness factor k_{cr} cracked concrete	k_{cr}	SI (in-lb)	7.1 (17)											
Effectiveness factor k_{uncr} uncracked concrete	k_{uncr}	SI (in-lb)	10.1 (24)											
$\psi_{c,N}$ = 1.0														
Strength reduction factor ϕ for tension, steel failure modes			0.75											
Strength reduction factor ϕ for shear, steel failure modes			0.65											
Splitting failure														
Strength reduction factor ϕ for tension, splitting failure modes (condition B)[4]			0.65											
Strength reduction factor ϕ for shear, splitting failure modes			0.70											

1 See Fig. 1.
2 NP (not permitted) denotes that the condition is not supported.
3 NA (not applicable) denotes that this value does not control for design.
4 NP (not permitted) denotes that the condition is not supported. Values are for cracked concrete. Values are applicable to both static and seismic load combinations.
5 See ACI 318 D.4.4.
6 See ACI 318 D.5.2.2.
7 See ACI 318 D.5.2.6
8 The KB TZ is a ductile steel element as defined by ACI 318 D.1
9 For use with the load combinations of ACI 318 D.3. Condition B applies where supplementary reinforcement in conformance with ACI 318 D.4.4 is not provided, or where pullout or pryout strength governs. For cases where the presence of supplementary reinforcement can be verified, the strength reduction factors associated with Condition A may be used.

Table 8 - Kwik Bolt TZ Carbon and Stainless Steel Allowable Static Shear (ASD), Steel (lb)[1,2]

Nominal Anchor Diameter	Allowable Steel Capacity, Static Shear	
	Carbon Steel	Stainless Steel
3/8	1580	2551
1/2	2934	3394
5/8	4961	5495
3/4	7396	9309

1 Values are for single anchors with no edge distance or spacing reduction due to concrete failure.
2 Allowable static shear loads are calculated by multiplying V_{sa} by the strength reduction ϕ factor and then dividing by an $\alpha_{V,seis}$ according to ACI 318–05 Section 4.2. See Table 2 for V_{sa}.

Table 9 - Kwik Bolt TZ Carbon and Stainless Steel Allowable Seismic Tension (ASD), Normal-Weight Cracked Concrete, Condition B (lb)[1,2,3,4]

Nominal Anchor Diameter	Embedment Depth h_{ef} (in.)	Concrete Compression Strength[5]							
		f'c = 2500 psi		f'c = 3000 psi		f'c = 4000 psi		f'c = 6000 psi	
		Carbon Steel	Stainless Steel	Carbon Steel	Stainless Steel	Carbon Steel	Stainless Steel	Carbon Steel	Stainless Steel
3/8	2	1099	1521	1165	1136	1273	1312	1559	1607
1/2	2	1099	1212	1167	1328	1348	1533	1651	1878
	2-1/4	2178	2520	2386	2416	2755	2792	3373	3419
5/8	3-1/8	2061	2581	2260	2650	2609	3062	3194	3924
	4	2614	2585	3051	2635	3612	3274	4669	4010
3/4	3-1/4	2138	2892	2997	3037	3460	4508	4238	5568
	4-3/4	3306	3900	4277	4277	4935	4935	6042	6042

1 Values are for single anchors with no edge distance or spacing reduction.
2 Values are for normal weight concrete. For sand lightweight concrete, multiply values by 0.81. See ACI 318-05 D.3.4.
3 Condition B applies where supplementary reinforcement in conformance with ACI 318-05 D.4.4 is not provided, or where pullout or pryout strength governs. For cases where the presence of supplementary reinforcement can be verified, the strength reduction factors associated with Condition A may be used.
4 Allowable seismic tension loads are calculated by multiplying the tabular strength N_n by the strength reduction ϕ factor of 0.65 then multiplying by a 0.75 factor described in ACI 318-05 D.3.3.3 and dividing by an α of 1.3 according to ACI 318-05 / Section 4.2. See Table 2 for N_n. The load may be adjusted for other concrete strengths according to ICC ES ESR-1917 Section 4.1.3 by using the following equation:

$$N_{actual} = N_{tab}\sqrt{\frac{f'c}{2500}}$$

Table 10 - Kwik Bolt TZ Carbon and Stainless Steel Allowable Seismic Shear (ASD), Steel (lb)[1,2]

Nominal Anchor Diameter	Allowable Steel Capacity, Seismic Shear	
	Carbon Steel	Stainless Steel
3/8	999	1252
1/2	2629	2949
5/8	4636	5245
3/4	6915	8877

1 Values are for single anchors with no edge distance or spacing reduction due to concrete failure.
2 Allowable seismic shear loads are calculated by multiplying V_{sa} by the strength reduction ϕ factor of 0.65 then multiplying by 0.75 as per ACI 318-05 D.3.3.3 and dividing by an α of 1.4 according to ACI 318-05 / Section 4.2. See Table 2 for V_{sa}.

Calculation per ACI 318-05 Appendix D and ICC ESR-1358.	Code Ref.	Reference
Step 1. Calculate steel strength of anchor in tension: $\phi N_{sa} = \phi n \cdot A_{se} \cdot f_{uta} = 0.75 \cdot 2 \cdot 12,706 = 19,059$ lb	D.5.1.2 D.4.4	Table 2
Step 2. Calculate concrete breakout strength of anchor in tension. See ESR-1917 for edge factor $\Psi_{c,N}$: $N_{cbg} = \frac{A_{Nc}}{A_{Nco}} \Psi_{ec,N} \Psi_{ed,N} \Psi_{c,N} N_b$	D.5.2.1	ESR-1917 4.1.2
Step 2a. Verify conditions for edge distance, spacing and edge distance: $c_{min} = 2$ in. < 6 in. ∴ ok; slope $= \frac{2.375 - 2.25}{3.5 - 2.375} = .3 < 3$; for $c_{min} = 4$ in. $\Rightarrow y_1, y_2 = 0$ [$y_1 \cdot y_2$]; $c_{min} = 5.75 \cdot [2.375 - 4(3 \cdot (5.06 \cdot 0.875 < 2.375$ in. < 6 in. ∴ ok	D.6	Table 2 Fig 2
Step 2b. Check $1.5h_{ef} = (1.5)(3.25) = 4.88$ in. $> c$ $\quad$ $3.0h_{ef} = (3.0)(3.25) = 9.75$ in. $> s$	D.5.2.1	Table 2
Step 2c. Calculate A_{Nco} and A_{Nc} for the anchorage: $A_{Nco} = 9h_{ef}^2 = (9)(3.25)^2 = 95.1$ in² $A_{Nc} = (1.5h_{ef} + c)(3h_{ef} + s) = (4.88)(9.75) + 9.00 \times 3.25 = 66 - 156.8$ in² $< nA_{Nco}$ ∴ ok	D.5.2.1	Table 2
Step 2d. Calculate: $\Psi_{ec,N} = \Psi_{c,N} = 1.0$, $\Psi_{ed,N} = 1$	D.5.2.4	
Step 2e. Calculate $N_b = N_p = \gamma_2 \sqrt{f'_c} \cdot (h_{ef})^{1.5} = 17 \sqrt{3000} (3.25)^{1.5} = 5,456$ lb	D.5.2.2	Table 2
Step 2f. Calculate modification factor for edge distance: $\Psi_{ed,N} = 0.7 + 0.3 \frac{c}{(1.5)(3.25)} = 0.95$	D.5.2.5	Table 2
Step 2g. $\Psi_{c,N} = 1.4$ (uncracked concrete)	D.5.2.6	Table 2
Step 2h. Calculate modification factor for spacing: $\Psi_{ec,N} = \frac{1}{\frac{s_{crit}}{s_{act}}} \leq \frac{1.5h_{ef}}{s_{act}}$ check: $\frac{s}{7.5} = 0.05 \cdot \frac{(1.5)(3.25)}{7.5} = 0.65 \Rightarrow 0.65 < 0.65$ ∴ $\frac{1.5h_{ef}}{s_{act}}$ controls	D.5.2.7	Table 2
Step 2i. Calculate: $N_{cbg} = \left(\frac{156.8}{95.1}\right)(1.0)(0.95)(1.4)(5,456) = 8,653$ lb	D.5.2.1	Table 2
Step 3. Check pullout strength. See ESR-1917 for adjustment to concrete strength: $\Psi_{ed,N} = 0.7 + 0.3 \left(\frac{c_{min}}{1.5h_{ef}}\right) = 2 \left[6,615 \sqrt{\frac{f'_c}{2500}}\right] = 2 \left[6,615 \sqrt{\frac{3000}{2500}}\right] = 12,082$ lb	D.5.3.2	Table 2 ESR-1917 4.1.6
Step 4. Controlling strength: $\phi N_{cbg} = (0.65)(8,653) = 4,339$ lb $< \phi N_s$ ∴ ϕN_{cbg} controls	D.4.4(c)	Table 2
Step 5. Convert value to ASD: $T_{allow} = \frac{4,339}{1.2} = 3,249$ lb		Table 5

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CAROL NELSON
Drawn by:
Approved by:
Date

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FLOOR TRACK ANCHORING DIAGRAM

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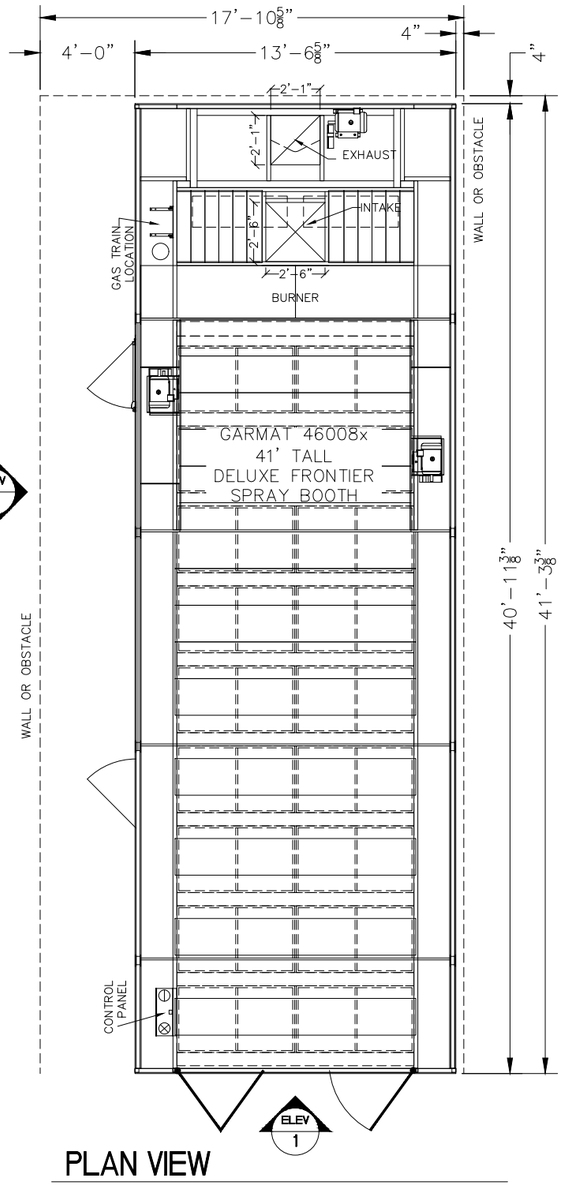
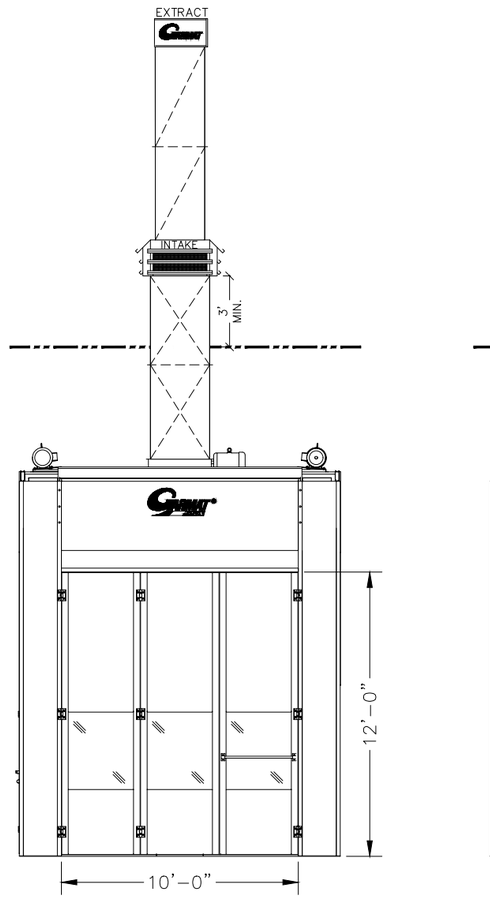
GARMAT USA, INC.

STATUS – PERMIT	
REVISION – 2	
SHEET SIZE – D	
DWG. NO.	
FLOOR TRACK ANCHORING DIAGRAM r2	
DATE 6/1/08	SHEET NO. A
SCALE: NTS	

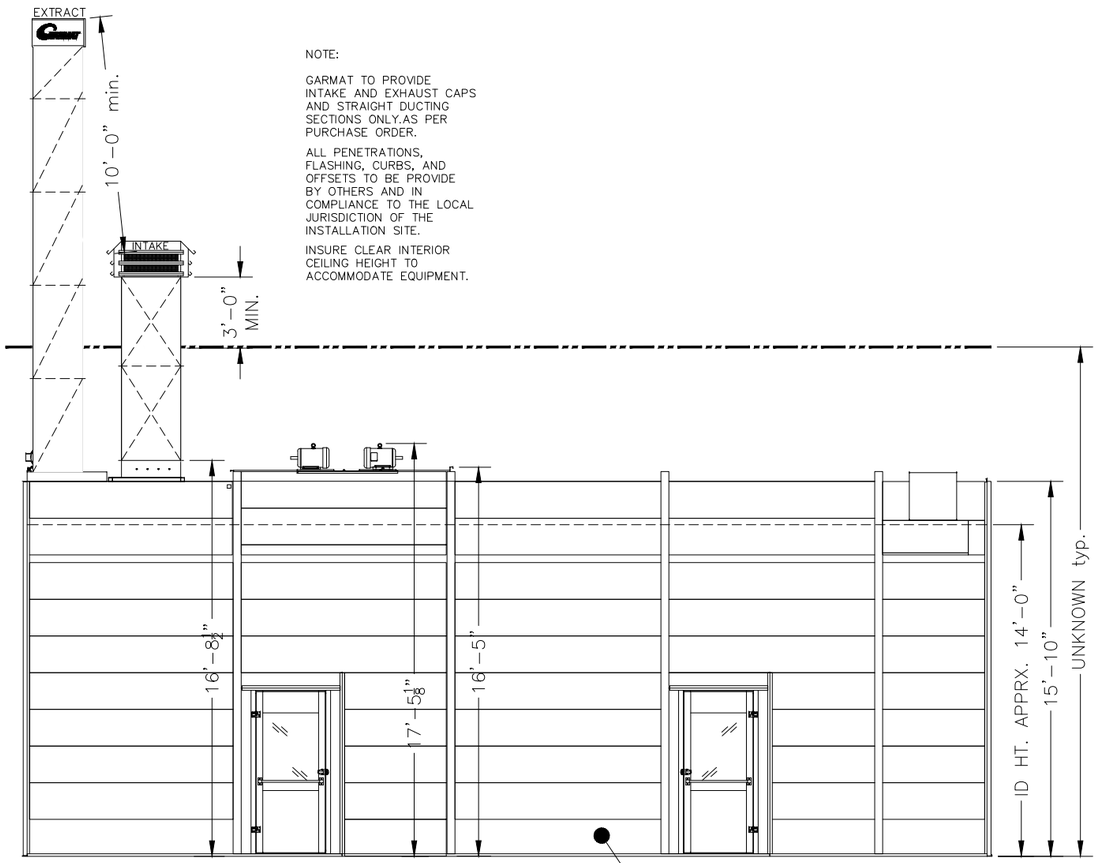


PLAN VIEW



ELEVATION 1

NOT TO SCALE



ELEVATION 2

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INSURE CLEAR INTERIOR CEILING HEIGHT TO ACCOMMODATE EQUIPMENT.

MIKE ONEPENG
Drawn by:
Approved by:
Date

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EQUIPMENT PLAN VIEW & ELEVATIONS

SF CABLE BARN

DIST. – PRIOR
STATUS – PROPOSAL
CUST. – 034
REVISION – 0
SHEET SIZE – D

DWG. NO. PRP034A0

DATE 7/22/21
SCALE: 1/4"=1'0"
SHEET NO. A

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A13 - Cost Estimate

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 TRANSPORATION AGENCY
Attention:
Email:

Prepared for
SAN FRANCISCO PUBLIC WORKS
Attention: EunJoo Cho, RA, NCARB, LEED BD+C
Email: eunjoo.cho@sfdpw.org

Prepared by:
M LEE CORPORATION
Attn: Franklin Lee, PE, LEED AP BD+C, CEP
Certified Estimating Professional
415-693-0236; flee@mleecorp.com

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

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

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

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 **Date: 07/22/2022 Final**
(AN OPINION OF PROBABLE CONSTRUCTION COSTS)
BASED ON FINAL MASTERPLAN DOCUMENTS
1.1 ESCALATION CALCULATION

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	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 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	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 **Date: 07/22/2022 Final**
(AN OPINION OF PROBABLE CONSTRUCTION COSTS)
BASED ON FINAL MASTERPLAN DOCUMENTS
1.1 ESCALATION CALCULATION

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	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

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	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 **Date: 07/22/2022 Final**
(AN OPINION OF PROBABLE CONSTRUCTION COSTS)
BASED ON FINAL MASTERPLAN DOCUMENTS
1.1 ESCALATION CALCULATION

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 **Date: 07/22/2022 Final**
(AN OPINION OF PROBABLE CONSTRUCTION COSTS)
BASED ON FINAL MASTERPLAN DOCUMENTS
1.1 ESCALATION CALCULATION

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

						Exterior
1.1	**Phase 1A 12KV Switchgear Upgrade**	**SF**	**Footprint**	**Fl-Fl**	**Perimeter**	**Enclosure**
1.2	Total	846				
1.3	Level 1		846	15	616	9,240

						Exterior
2.1	**Phase 1B: Bridge Crane Upgrade**	**SF**	**Footprint**	**Fl-Fl**	**Perimeter**	**Enclosure**
2.2	Total	4,434				
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**	**SF**	**Footprint**	**Fl-Fl**		
3.2	Total	10,471				
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

						Exterior
4.1	**Phase 3A: Program Restructuring**	**SF**	**Footprint**	**Fl-Fl**	**Perimeter**	**Enclosure**
4.2	Total	7,766				
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

						Exterior
5.1	**Phase 3B: Carpentry Improvements**	**SF**	**Footprint**	**Fl-Fl**	**Perimeter**	**Enclosure**
5.2	Total	3,440				
5.3	Level 2		3,440	15	616	9,240

						Exterior
6.1	**Phase 4: Roof Replacement**	**SF**	**Footprint**	**Fl-Fl**	**Perimeter**	**Enclosure**
6.2	Total	33,770				
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**

						Exterior
7.1	**Phase 5: Seismic Improvements**	**SF**	**Footprint**	**Fl-Fl**	**Perimeter**	**Enclosure**
7.2	Total	20,700				
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**	**SF**
8.2	Brick masonry exterior wall	15,579
8.3	Exterior windows	3,350
8.4	Exterior clerestory windows	510

9.1	**Winding Motors**	**SF**
	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

		CONCURRENT		PHASED			CONCURRENT	PHASED
	ELEMENT / LOCATION	BASE CONSTRUCTION COST	CONSTRUCTION COST, ESCALATED TO MID POINT $	BASE CONSTRUCTION COST	CONSTRUCTION COST, ESCALATED TO MID POINT $	GSF	$/GSF Escalated to Midpt	$/GSF Escalated to Midpt
				Phasing Premium	Phasing Premium			
	ESTIMATE SUMMARY:			10%	10%			
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
ROM ESTIMATE OF PROBABLE CONSTRUCTION COST
(AN OPINION OF PROBABLE CONSTRUCTION COSTS)
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					
	92					
C1010	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					
	103					
C1020	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					
	119					
C3010	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					
	131					
C3030	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					
	138					
D1010	139	**ELEVATORS & LIFTS**				
	140					
	141	See Phase 2				
	142					
	143	**ELEVATORS & LIFTS**				
	144					
	145					
D1520	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					
	185					
D5010	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

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
	215	Project requirements, project management, detailing, coordination, etc	1	LS	354,313.98	354,314
	216					
	217	**ELECTRICAL DISTRIBUTION**				2,342,725
	218					
	219					
D5020	220	**LIGHTING & BRANCH WIRING**				
	221					
	222	Lighting				Existing
	223					
	224	**LIGHTING & BRANCH WIRING**				
	225					
	226					
D5030	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					
	34					
B1010	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 - a	2,539	SF	15.00	38,085
	47					
	48	**FLOOR CONSTRUCTION**				1,383,158
	49					
	86					
C1010	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

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
	93	Acoustic sealant	844	LF	5.00	4,220
	94	Interior glazing	493	SF	150.00	73,950
	95					
	96	**PARTITIONS**				218,518
	97					
	98					
C1020	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					
	109					
C1030	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					
	118					
C3010	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
	131					
	132					
C3030	133	**CEILING FINISHES**				
	134					
	135	New ceiling finish at build-out - allow	2,539	SF	20.00	50,780
	136					
	137	**CEILING FINISHES**				50,780
	138					
	145					
D1520	146	**PLUMBING**				
	147					
	148	Not Required				
	149					
	150	**PLUMBING**				
	151					
	152					
D1530	153	**HVAC**				
	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					
	177					
D1540	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					
	184					
D5010	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					
	209					
D5020	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					
	216					
D5030	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					
	225					
D5040	226	**AUDIO VISUAL SYSTEM**				
	227					
	228	A/V conduit only	4,434	SF	5.00	22,170
	229					
	230	**AUDIO VISUAL SYSTEM**				22,170
	231					
E10	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)
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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					
	239					
E20	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					
	31					
B1010	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					
	75					
C1010	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					
	90					
C1020	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

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
	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
	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					
	104					
C1030	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					
	123					
C3010	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					
	137					
C3030	138	**CEILING FINISHES**				
	139					
	140	New ceiling finish - allow	10,471	SF	20.00	209,420
	141					
	142	**CEILING FINISHES**				209,420
	143					
D1010	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
	150					
	151					
D1520	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
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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
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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	Galvanized sheetmetal ductwork, exhaust	10,471	SF	3.00	31,413
	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					
	233					
D1540	234	**FIRE PROTECTION**				
	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
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(AN OPINION OF PROBABLE CONSTRUCTION COSTS)
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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					
	243					
D5010	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					
	268					
D5020	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
	283					
	284					
D5040	285	**AUDIO VISUAL SYSTEM**				
	286					
	287	A/V conduit only	10,471	SF	5.00	52,355
	288					
	289	**AUDIO VISUAL SYSTEM**				52,355
	290					
E10	291	**OTHER EQUIPMENT**				
	292					
	293	Residential grade kitchen appliances - allow	1	LS	10,000.00	10,000
	294	Bicycle rack	1	LS	3,500.00	3,500
	295	Miscellaneous equipment (AV, etc.) - allow	10,471	SF	10.00	104,710
	296					
	297	**OTHER EQUIPMENT**				118,210
	298					
	299					
E20	300	**CASEWORK**				
	301					
	302	Built-in casework	43	LF	600.00	25,800
	303	Miscellaneous fixed furnishings - allow	10,471	SF	3.00	31,413
	304					
	305	**CASEWORK**				57,213

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
	1					
A1010	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					
	72					
C1020	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)
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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
	83	Card readers, etc. - allow	1	EA	5,000.00	5,000
	84					
	85	**INTERIOR DOORS**				62,100
	86					
	87					
C1030	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					
	95					
C3010	96	**WALL FINISHES**				
	97					
	98	Paint to walls	6,088	SF	3.50	21,308
	99					
	100	**WALL FINISHES**				21,308
	101					
	102					
C3020	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					
	109					
C3030	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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(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
	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
(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
	167					
D1530	168	**HVAC**				
	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					
	203					

SAN FRANCISCO CABLE CAR BARN
ROM ESTIMATE OF PROBABLE CONSTRUCTION COST
(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
D1540	204	**FIRE PROTECTION**				
	205					
	206	Automatic wet sprinkler system - modify and reuse existing	7,766	SF	12.00	93,192
	207					
	208	**FIRE PROTECTION**				93,192
	209					
	210					
D5010	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					

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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
	242					
	243					
D5030	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
	249					
	250	**COMMUNICATION & SECURITY**				186,384
	251					
	252					
D5040	253	**AUDIO VISUAL SYSTEM**				
	254					
	255	A/V conduit only	7,766	SF	5.00	38,830
	256					
	257	**AUDIO VISUAL SYSTEM**				38,830
	258					
E10	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

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Floor Area: **7,766 GSF**

Elem.	#	Description	Quantity	Unit	Unit Cost	Total
	272	Vertical band saw	1	EA		Relocate Existing
	273	Horizontal band saw	1	EA		Relocate Existing
	274	Hydraulic ironworker	1	EA		Relocate Existing
	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

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Floor Area: **7,766 GSF**

Elem.	#	Description	Quantity	Unit	Unit Cost	Total
	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
	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

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Floor Area: **7,766 GSF**

Elem.	#	Description	Quantity	Unit	Unit Cost	Total
	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
	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					
	380					
E20	381	**CASEWORK**				
	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

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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
	1					
A1010	2	**TRADE DEMOLITION**				
	3					
	4	Demolition as required - allow	3,440	SF	12.50	43,000
	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					
	106					
C1020	107	**INTERIOR DOORS**				
	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					
	117					
C1030	118	**SPECIALTIES**				
	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

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Roof Area **3,440 GSF**

Elem.	#	Description	Quantity	Unit	Unit Cost	Total
	122	Miscellaneous interior fittings - allow	3,440	SF	2.50	8,600
	123					
	124	**SPECIALTIES**				137,200
	125					
	126					
C3010	127	**WALL FINISHES**				
	128					
	129	Paint to walls	6,240	SF	3.50	21,840
	130					
	131	**WALL FINISHES**				21,840
	132					
	133					
C3020	134	**FLOOR FINISHES**				
	135					
	136	New flooring finish with base - allow	3,440	SF	15.00	51,600
	137					
	138	**FLOOR FINISHES**				51,600
	139					
	140					
C3030	141	**CEILING FINISHES**				
	142					
	143	New ceiling finish - allow	3,440	SF	20.00	68,800
	144					
	145	**CEILING FINISHES**				68,800
	146					
	147					
D1520	166	**PLUMBING**				
	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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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					
	207					
D1530	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					

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Roof Area **3,440 GSF**

Elem.	#	Description	Quantity	Unit	Unit Cost	Total
	216	Air distribution and return				
	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					
	243					
D1540	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
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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
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					
	275					
D5020	276	**LIGHTING & BRANCH WIRING**				
	277					
	278	Lighting	3,440	SF	30.00	103,200
	279					
	280	**LIGHTING & BRANCH WIRING**				103,200
	281					
	282					
D5030	283	**COMMUNICATION & SECURITY**				
	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

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Roof Area **3,440 GSF**

Elem.	#	Description	Quantity	Unit	Unit Cost	Total
	287	Security system, including access control, video surveillance monitoring, conduit and cable	3,440	SF	6.00	20,640
	288					
	289	**COMMUNICATION & SECURITY**				82,560
	290					
	291					
D5040	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					
	298					
E10	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

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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
	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
	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					
	351					
E20	352	**CASEWORK**				
	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					
	7					
B1020	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					
	80					
B3010	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					
	91					
B3020	92	**ROOF OPENINGS**				
	93					
	94	New skylight	240	SF	550.00	132,000
	95					
	96	**ROOF OPENINGS**				132,000
	97					
	134					
D1010	135	**ELEVATORS & LIFTS**				
	136	See Phase 2				
	137					
	138	**ELEVATORS & LIFTS**				
	139					

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
D1520	153	**PLUMBING**				
	154					
	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
	1					
B2010	2	**EXTERIOR WALLS**				
	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					
	16					
B2020	17	**EXTERIOR WINDOWS**				
	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					
	31					
B3010	32	**ROOF COVERINGS**				
	33					
	34	New membrane roofing - see Phase 4				
	35					
	36	**ROOF COVERINGS**				
	37					
	38					
B3020	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

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Reference Documents

1. Program Requirements and Existing Conditions

1.1 Cable Car Barn Existing Plans | February 1, 2019
Prepared by SFMTA

1.2 Barn Staffing and Building Improvements | July 1, 2020
Prepared by SFMTA

File: 2020-0701_Barn Staffing Bldg Improvements DRAFT - from Eric.xlsx

1.3 Existing Conditions Dataset| August 8, 2020
Prepared by SFMTA

File: 2020-0820_Existing Conditions Dataset - In Progress 8-19-2020 - from Eric.xlsx

2. SFMTA Standards

2.1 SFMTA Facility Space Planning Standards | January, 2017
Prepared by HDR | Maintenance Design Group

File: 2021-0518_SFMTA Facility Space Planning Standards

2.2 SFMTA Facilities Assessment and Workplace Planning Report | January 20, 2017
Prepared by Owen Adams Consulting with Laura Blake Architect

2.3 Bus Facility Design Criteria Document | February, 2021
Prepared by HDR | Maintenance Design Group

File: 2021-0525_MTA Space Standards Locker Sheets

3. Existing Equipment Inventory

3.1 Machine Shop Equipment List | April 28, 2021
Prepared by SFMTA

File: Machine Shop Equipment List 4-28-2021.xlsx

3.2 Weld Shop Equipment List | April 29, 2021
Prepared by SFMTA

File: Weld Shop Data for Stantec 4-29-2021.xlsx

3.3 Machine Shop Equipment List - Updated | May 10, 2021
Prepared by SFMTA

File: Machine Shop Equipment List 5-10-2021.xlsx

3.4 New Inspection Room Desired Equipment | May 10, 2021
Prepared by SFMTA

File: New Inspection Room Data for Stantec 5-10-2021.xlsx

3.5 Other Workspace Equipment | May 10, 2021
Prepared by SFMTA

File: Other Workspace Equipment Data for Stantec 5-10-2021.xlsx

3.6 Carpentry and Paint Space Equipment | June 3, 2021
Prepared by SFMTA

File: Carpentry Equipment List 6-3-2021.xlsx

3.7 CCB Equipment Inventory | June 14, 2021
Prepared by SFMTA

File: SFMTA Response to Stantec Questions Equipment Inventory 6-14-2021.xlsx

3.8 CCB Equipment Inventory – Revised | June 15, 2021
Prepared by SFMTA

File: SFMTA Response to Stantec Questions Equipment Inventory 6-15-2021.xlsx

4. Existing Drawings

4.1 Washington-Mason Carhouse – Electrical Drawings | December 5, 1950
Prepared by SFPUC Utilities Engineering Bureau

4.2 Rehabilitation of Cable Car Barn | March 1, 1956
Prepared by Chin & Hensolt Engineers, Inc.

4.3 Washington-Mason Carhouse – Installation of Power Equipment | September, 1956
Prepared by SFPUC Utilities Engineering Bureau

4.4 Washington-Mason Carhouse – Alterations & Additions | May 12, 1958
Prepared by SFPUC Utilities Engineering Bureau

4.5 Washington-Mason Cable Carbarn – Sandblasting, Waterproofing & Painting | February, 1967
Prepared by SFPUC Utilities Engineering Bureau

4.6 Washington-Mason Cable Carbarn – Retaining Wall | September, 1967
Prepared by SFPUC

4.7 Cable Car Barn – Visitors Facility | March, 1968
Prepared by SFPUC Utilities Engineering Bureau

4.8 Washington-Mason Cable Carbarn – Interior Painting | June, 1968
Prepared by SFPUC Utilities Engineering Bureau

4.9 Reconstruction of Mason & Washington Turntable | November 8, 1968
Prepared by SFPUC

4.10 Cable Car Machinery | September 18, 1975
Prepared by SFPUC

4.11 Cable Car System – Improved Lighting | December 19, 1979
Prepared by SFPUC

4.12 Value Engineering Study for Cable Car Barn Renovation | September, 1981
Prepared by O'Brien-Kreitzberg & Associates, Inc.

4.13 Rehabilitation of Cable Car Barn | March 1, 1982
Prepared by Chin & Hensolt Engineers, Inc.

4.14 Rehabilitation of Cable Car Trackway – Main Sheave Room| June 6, 1982
Prepared by Chin & Hensolt Engineers, Inc.

4.15 Cable Car Barn – Fire Sprinkler Drawings | March 15, 1983
Prepared by ZURN, COSCO Fire Protection Division

4.16 MUNI Cable Car Barn Halon Fire Suppression System Work | September, 1985
Prepared by SFPUC Utilities Engineering Bureau

4.17 Cable Car Barn – Halon System | September 3, 1986
Prepared by Fire, Inc.

4.18 Cable Car Enhancement – Second Floor Office Addition | February 10, 1987
Prepared by SFPUC Utilities Engineering Bureau

4.19 Cable Car Barn – Install Oil Separator | January 18, 1990
Prepared by AGS, Inc.

4.20 Cable Car Barn – Office Addition (not built) | September 21, 1990
Prepared by SFPUC Utilities Engineering Bureau

4.21 SF Cable Car Museum – Facilities Modifications and Exhibit Design | December 19, 1990
Prepared by Barcelon + Jang Architects

4.22 Cable Car Barn – Radio Replacement Project | February, 2013
Prepared by Jacobs Engineering Group, Inc.

5. Facility Condition Assessment | February 1, 2016
Prepared by EMG (now Bureau Veritas)

6. Paint Booth Quote No. 21-030 | July 25, 2021
Prepared by MBN Spray Booth Solutions Inc.