Rating form completed by:

ESTRUCTURE
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Text in green is to be part of UCSF building database and may be part of UCOP database

04-29-2020

UCSF Building Seismic Ratings

2255 Post Street, San Francisco

CAAN #2033
2255 Post Street, San Francisco, CA 94143
North UCSF Campus: Mount Zion

REGISTERED PROFESSIONAL ENGINEER
MARYANN T. PHIPPS
No. 2995
EXP. 6/30/20
STRUCTURAL
STATE OF CALIFORNIA

4/29/2020

Plan

Elevation (From Post Street looking south)

Rating summary	Entry	Notes
UC Seismic Performance Level (rating)	V	Findings based on drawing review and ASCE 41-17 Tier 1 evaluation[1]
Rating basis	Tier 1	ASCE 41-17
Date of rating	2019	
Recommended UCSF priority category for retrofit	Priority B	Priority A = Retrofit ASAP Priority B = Retrofit at next permit application for modification
Ballpark total project cost to retrofit to IV rating	High	See recommendations for retrofit
Is 2018-2019 rating required by UCOP?	Yes	
Further evaluation recommended?	No	

[1] The evaluations at UCSF translate the Tier 1 evaluation to a Seismic Performance Level rating using professional judgment discussed among the Seismic Review Committee. Non-compliant items in the Tier 1 evaluation do not automatically put a building into a particular rating category, but such items are evaluated along with the combination of building features and potential deficiencies, focused on the potential for collapse or serious damage to the gravity supporting structure that may threaten occupant safety.

Building information used in this evaluation

- Structural Drawings by Ira Kessey Consulting Engineer, San Francisco, Hymn and Appleton and Wolfard, Architects, San Francisco, "Psychiatric Clinic," 8 April 1947 (6 sheets).
- Architectural Plan by Sagar, McCarthy and Kampf, "Existing Conditions "N" Building," 4 December 1984 (1 Sheet)
- Architectural and Structural Drawings by ESS Architects and Rudolf Fehr Consulting Structural Engineer, "UCSF/Mt. Zion 2255 Post St," 18 January 1993 (8 Sheets)
- Structural and Architectural Drawings by UCSF Office of Design and Construction and SJ Engineers "UCSF Mount Zion, 2244 Post Street Pain Management Center Interior Renovations," 30 September 1997, (15 sheets)
- Report by Applied Materials & Engineering, Oakland, California, "Building Inspection – Pain Management Center, 2255 Post Street, San Francisco, CA," 15 March 2013
- Structural drawings by Estructure, "University of California, San Francisco, Mount Zion Campus, Seismic Retrofit of 2255 Post St. ("Building N")," 22 December 2017, (10 sheets), Pricing Set, Work Not Implemented

Scope for completing this form

Architectural and structural drawings for original construction were reviewed and an ASCE 41-17 Tier 1 evaluation was performed. A site visit was conducted in 2017 as part of a seismic retrofit project that was not implemented. A site visit was conducted on November 14, 2018 by Charles Thiel to verify conditions.

Brief description of structure

The building serves as a medical office building. It is rectangular in plan measuring approximately 125 feet in the north-south direction and 30 feet in the east-west direction.

Identification of Levels: The building is two levels. The first story is at grade and has a story-to-story height of 11 feet. The second story has a story-to-story height of 10 feet.

Foundation system: The foundation support is provided by shallow concrete grade beams and spread footings. The first floor is a 4-inch thick concrete slab on-grade reinforced with welded wire fabric. Attachment of the wood frame walls to the foundation is through anchor bolts at most locations. There are concrete retaining walls at the back of the building (south side) where the ground floor is approximately 3'-8" below grade.

Structural system for vertical (gravity) load: The roof framing consists of 2x10 wood joists spanning to steel beams at approximately 14' on center. The steel beams span to exterior wood stud walls along the east and west sides of the building. The second floor is framed with 2x10 wood joists spanning east-west to 9" concrete walls along the east and west side of the building. As part of a limited existing conditions verification study, the concrete walls were scanned by Applied Materials and Engineering in 2013 and existing reinforcing steel was located at 18 to 24 inches on center each way. Steel exit stairs were added at the south side as part of the 1993 renovations.

Structural system for lateral forces: The roof and second floor are constructed of diagonally sheathed diaphragms that distribute earthquake loads to vertical elements of the lateral load resisting system. The exterior wood stud walls with stucco over diagonal sheathing provide shear resistance at the second level. Field investigation showed the typical interior gypsum board walls do not go full height; however, gypsum sheathed rated partition walls at the mechanical shaft, stair and elevator of the second floor will contribute to lateral resistance in the transverse direction and are included in the Tier 1 check. The lateral system on the first floor in the north-south direction is the concrete walls on each side of the building. The lateral system in the east-west direction is plywood shear walls. The plywood shear walls were installed in a seismic upgrade in 1993. In 1997, two walls were removed and replaced as part of the elevator installation.

Building Code: The building drawings are dated April 1947. It is presumed the building was designed under the 1946 UBC.

Building Condition: Good. The building had no observed material degradation. Some doors near the south end of the first floor were reportedly sticking during onsite investigation by Charles Thiel. It was determined that settlement may have caused the sticking. However, there was no observed cracking or obvious settlement of the concrete slab or wood framing in the vicinity.

Building response in 1989 Loma Prieta Earthquake:

- Building N was not reported on in the "October 17, 1989 UCSF Earthquake Report" by Impell Corporation.

Brief description of seismic deficiencies and expected seismic performance including structural behavior modes

- The building was built to the property lines on the longitudinal sides. The building to the east is two stories and has approximately aligned second floor and roof with the subject building. The building on the west side is one story, and its roof is not aligned.
- The building lacks shear capacity in the walls for loading in the transverse direction (east-west). Lateral forces in the second story are resisted by diagonally sheathed exterior walls and rated interior gypsum board walls, which are significantly overstressed. Based on the Tier 1 check the wall stresses are 663 plf, with a capacity of 321 plf. The first floor has interior plywood shearwalls; however, the walls are also overstressed (1062 plf demand vs 920 plf capacity) based on the Tier 1 check.

Structural deficiency	Affects rating?	Structural deficiency	Affects rating?
Lateral system stress check (wall shear, column shear or flexure, or brace axial as applicable)	Y	Openings at shear walls (concrete or masonry)	N
Load path	N	Liquefaction	N
Adjacent buildings	N	Slope failure	N
Weak story	N	Surface fault rupture	N
Soft story	N	Masonry or concrete wall anchorage at flexible diaphragm	N
Geometry (vertical irregularities)	N	URM wall height-to-thickness ratio	N
Torsion	N	URM parapets or cornices	N
Mass – vertical irregularity	N	URM chimney	N
Cripple walls	N	Heavy partitions braced by ceilings	N
Wood sills (bolting)	N	Appendages	N
Diaphragm continuity	N		

Summary of review of non-structural life-safety concerns, including at exit routes. [2]

UCOP non-structural checklist item	Life safety hazard?	UCOP non-structural checklist item	Life safety hazard?
Heavy ceilings, feature or ornamentation above large lecture halls, auditoriums, lobbies or other areas where large numbers of people congregate	None Observed	Unrestrained hazardous materials storage	None Observed
Heavy masonry or stone veneer above exit ways and public access areas	None Observed	Masonry chimneys	None Observed
Unbraced masonry parapets, cornices or other ornamentation above exit ways and public access areas	None Observed	Unrestrained natural gas-fueled equipment such as water heaters, boilers, emergency generators, etc.	None Observed

Basis of Seismic Performance Level Rating

The building benefits from long continuous walls in the longitudinal direction, exterior diagonal sheathing and existing plywood shear walls on the first floor. Despite the plywood shear walls, the building lacks shear strength for seismic loading in the transverse (east-west) direction. In particular, the transverse direction shear strength at the second floor comes primarily from rated gypsum board walls around the elevator, stairs and mechanical shafts,

[2] For these Tier 1 evaluations, we do not visit all spaces of the building; we rely on campus staff to report to us their understanding of if and where non-structural hazards may occur.

which are not adequate to satisfy the Tier 1 check. The building is classified as Priority B because historically wood frame buildings have performed well in earthquakes.

Recommendations for further evaluation or retrofit

Seismic retrofit is recommended. The retrofit measures shown in the 2017 Estructure drawings include installation of new plywood shear walls at the first and second floors in the transverse direction. Walls would be interconnected between floors and new interior shear walls would be constructed on new footings.

Peer review comments on rating

The structural members of the UCSF Seismic Review Committee (SRC) reviewed the evaluation on November 6, 2019 and are unanimous that the rating is V.

Additional building data	Entry	Notes
Latitude	37.78427	
Longitude	-122.43891	
Are there other structures besides this one under the same CAAN#	No	
Number of stories above lowest perimeter grade	2	
Number of stories (basements) below lowest perimeter grade	0	
Building occupiable area (OGSF)	7450	
Risk Category per 2016 CBC 1604.5	II	
Building structural height, h_n	21 ft	Structural height defined per ASCE 7-16 Section 11.2
Coefficient for period, C_t	0.02	Per ASCE 41-17 equation 4-4
Coefficient for period, β	0.75	Per ASCE 41-17 equation 4-4
Estimated fundamental period	0.196	Per ASCE 41-17 equation 4-4
Site data		
975 yr hazard parameters S_s, S_1	1.433, 0.558	UCSF Group 1 Buildings – Tier 1 Geotechnical Assessment, Egan (2019)
Site class	D	UCSF Group 3 Buildings – Tier 1 Geotechnical Assessment, Egan (2019)
Site class basis	Geotech Parameters	UCSF Group 3 Buildings – Tier 1 Geotechnical Assessment, Egan (2019)
Site parameters F_a, F_v	1.00, 1.742	
Ground motion parameters S_{cs}, S_{c1}	1.433, 0.972	
S_a at building period	1.433	
Site V_{s30}	733 m/s	
V_{s30} basis	Geotech Parameters	UCSF Group 3 Buildings – Tier 1 Geotechnical Assessment, Egan (2019)
Liquefaction potential/basis	No	UCSF Group 3 Buildings – Tier 1 Geotechnical Assessment, Egan (2019)
Landslide potential/basis	No	UCSF Group 3 Buildings – Tier 1 Geotechnical Assessment, Egan (2019)

Active fault-rupture hazard identified at site?	No	UCSF Group 3 Buildings – Tier 1 Geotechnical Assessment, Egan (2019)
Site-specific ground motion study?	N/A	
Applicable code		
Applicable code or approx. date of original construction	Built: 1947 Code: 1946	1946 Code is presumed based on date on drawings
Applicable code for partial retrofit	1992 UBC	
Applicable code for full retrofit	None	No full retrofit known
Model building data		
Model building type North-South	W1 : Wood Light Frames	Second Story in North-South Direction
	C2a : Concrete Shear Wall	First Story in North – South Direction
Model building type East-West	W1: Wood Light Frames	
FEMA P-154 score	N/A	Not included here because we performed ASCE 41 Tier 1 evaluation.
Previous ratings		
Direction	V	2013 Report
Date of most recent rating	10/7/2013	Basis: Qualitative assessment based on drawing reviewed
2nd most recent rating	-	
Date of 2nd most recent rating	-	
3rd most recent rating	-	
Date of 3rd most recent rating	-	
Appendices		
ASCE 41 Tier 1 checklist included here?	Yes	Refer to attached checklist file

Appendix A

Additional Images

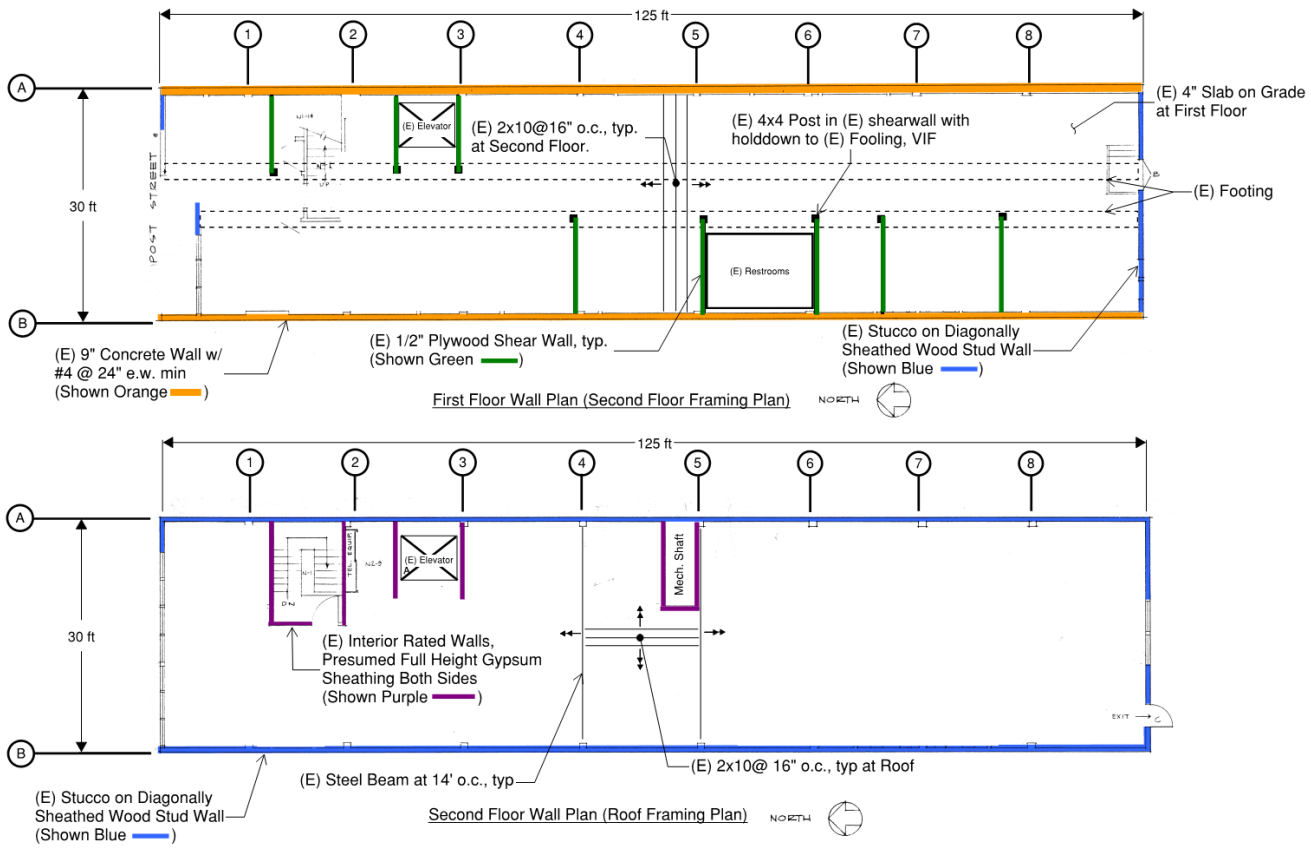

Figure 1 - Structural Framing Plans

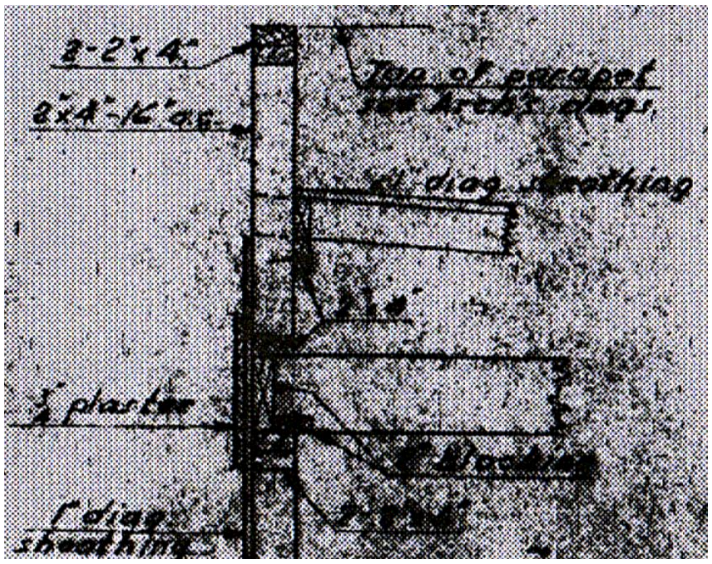

Figure 2 - Exterior Wall Section (1947 Drawings)

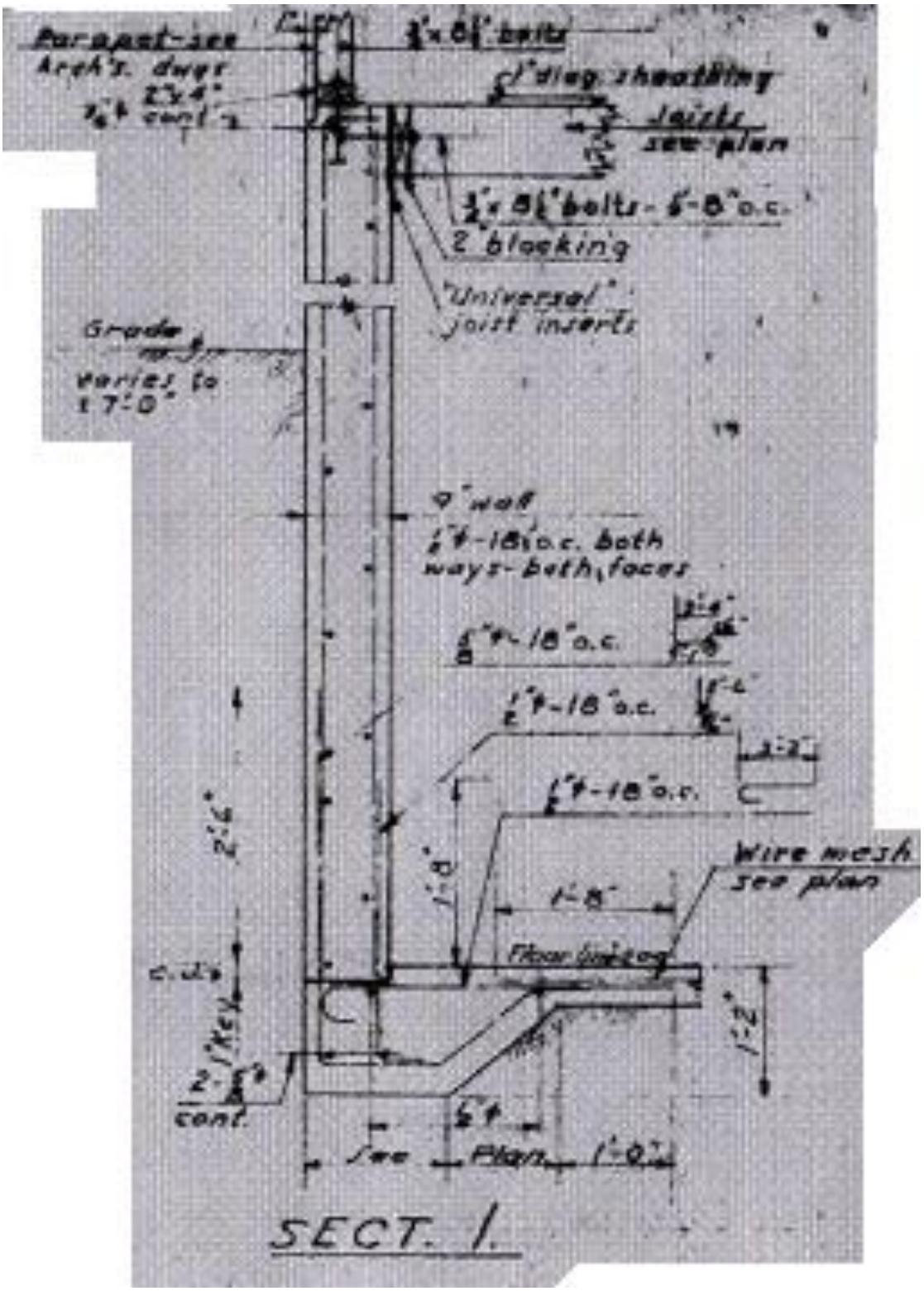

Figure 3 - Exterior Wall Section (1947 Drawings)

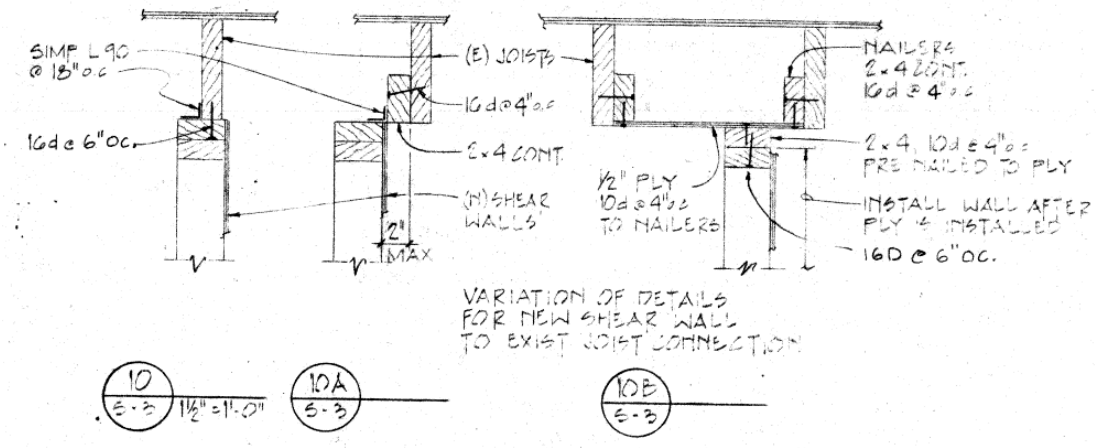

Figure 4 - Top of Shear Wall Details (1993 Renovation)

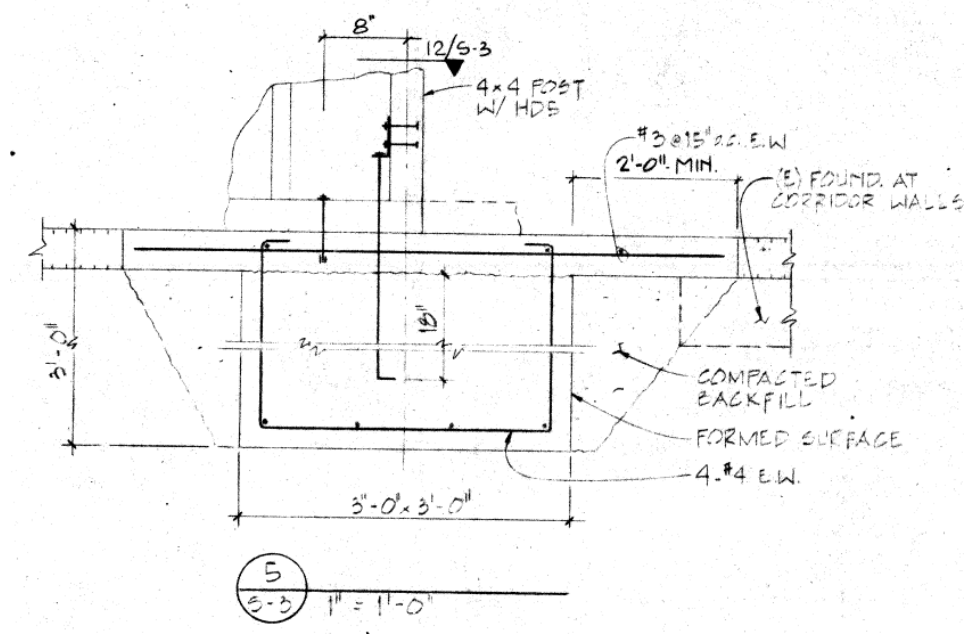

Figure 5 - Hold-down Detail at (E) Shear Walls (1993 Renovation)

Figure 6 - Building Exterior (South Elevation)

Figure 7 - Interior Partition Wall with Gypsum Board Sheathing Stopping Below Structure

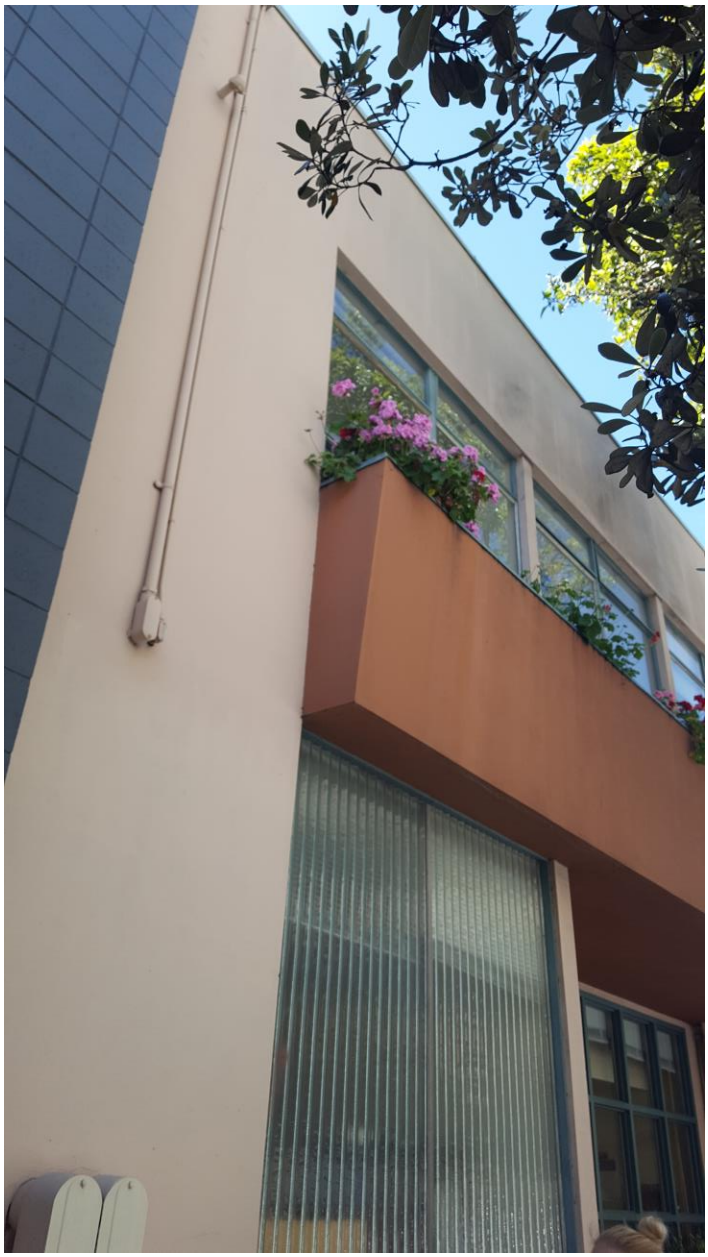

Figure 8 – Building Exterior (North Elevation)

Appendix B

ASCE 41- 17 Tier 1 Checklists (Structural)

UC Campus:	UC San Francisco			Date:	04/22/2020		
Building CAAN:	2033	Auxiliary CAAN:		By Firm:	Estructure		
Building Name:	Building N			Initials:	*ARK*	Checked:	*MTP*
Building Address:	2255 Post Street, San Francisco			Page:	1	of	3

ASCE 41-17
Collapse Prevention Basic Configuration Checklist

LOW SEISMICITY

BUILDING SYSTEMS - *GENERAL*

C	NC	N/A	U	Description
●	○	○	○	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. (Commentary: Sec. A.2.1.1. Tier 2: Sec. 5.4.1.1) **Comments:** Roof and second floor framing span to bearing walls on the east and west sides of the building.
○	●	○	○	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. (Commentary: Sec. A.2.1.2. Tier 2: Sec. 5.4.1.2) **Comments:** Adjacent buildings to the east and west are less than 3.8” clear to the subject building.
○	○	●	○	MEZZANINES: Interior mezzanine levels are braced independently from the main structure or are anchored to the seismic-force-resisting elements of the main structure. (Commentary: Sec. A.2.1.3. Tier 2: Sec. 5.4.1.3) **Comments:** There are no mezzanines in the structure.

BUILDING SYSTEMS - *BUILDING CONFIGURATION*

C	NC	N/A	U	Description
●	○	○	○	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. (Commentary: Sec. A2.2.2. Tier 2: Sec. 5.4.2.1) **Comments:** In the east-west direction, the length of wall increases from the second story to the first. In the north-south direction, the length of wall remains the same but changes from wood to concrete from the second to first floor.
●	○	○	○	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. (Commentary: Sec. A.2.2.3. Tier 2: Sec. 5.4.2.2) **Comments:** In the east-west direction, the length of wall increases from the second story to the first. In the north-south direction, the length of wall remains the same but changes from wood to concrete from the second to first floor.

ASCE 41-17
Collapse Prevention Basic Configuration Checklist

C	NC	N/A	U	
◉	○	○	○	VERTICAL IRREGULARITIES: All vertical elements in the seismic-force-resisting system are continuous to the foundation. (Commentary: Sec. A.2.2.4. Tier 2: Sec. 5.4.2.3) **Comments:** Walls at the second floor align with walls on the first floor.
◉	○	○	○	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. (Commentary: Sec. A.2.2.5. Tier 2: Sec. 5.4.2.4) **Comments:** The building is rectangular in plan. Exterior walls are continuous between levels.
◉	○	○	○	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. (Commentary: Sec. A.2.2.6. Tier 2: Sec. 5.4.2.5) **Comments:** The building is lightly framed and floor framing is similar from the roof to the second floor.
○	○	◉	○	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. (Commentary: Sec. A.2.2.7. Tier 2: Sec. 5.4.2.6) **Comments:** The building has a flexible diaphragm, so seismic forces will be distributed to walls based on tributary area.

MODERATE SEISMICITY (COMPLETE THE FOLLOWING ITEMS IN ADDITION TO THE ITEMS FOR LOW SEISMICITY)

GEOLOGIC SITE HAZARD

C	NC	N/A	U	Description
◉	○	○	○	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 (15.2m) under the building. (Commentary: Sec. A.6.1.1. Tier 2: 5.4.3.1) **Comments:** Per "UCSF Group 1 - Buildings Geotechnical Characteristics and Geohazards" by Egan (2019), the site has moderate mapped liquefaction susceptibility, but it probably low.
◉	○	○	○	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. (Commentary: Sec. A.6.1.2. Tier 2: 5.4.3.1) **Comments:** Per "UCSF Group 1 - Buildings Geotechnical Characteristics and Geohazards" by Egan (2019), the site is flat and not susceptible to slope failure.

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Building Address:	2255 Post Street, San Francisco			Page:	3	of	3

ASCE 41-17
Collapse Prevention Basic Configuration Checklist

MODERATE SEISMICITY (COMPLETE THE FOLLOWING ITEMS IN ADDITION TO THE ITEMS FOR LOW SEISMICITY)

GEOLOGIC SITE HAZARD

C	NC	N/A	U	
◉	○	○	○	SURFACE FAULT RUPTURE: Surface fault rupture and surface displacement at the building site are not anticipated. (Commentary: Sec. A.6.1.3. Tier 2: 5.4.3.1) **Comments:** Per "UCSF Group 1 - Buildings Geotechnical Characteristics and Geohazards" by Egan (2019), the site is not susceptible to surface fault rupture.

HIGH SEISMICITY (COMPLETE THE FOLLOWING ITEMS IN ADDITION TO THE ITEMS FOR MODERATE SEISMICITY)

FOUNDATION CONFIGURATION

	Description
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 $0.6S_a$. (Commentary: Sec. A.6.2.1. Tier 2: Sec. 5.4.3.3) **Comments:** 0.6 Sa = 0.6 * 1.433 = 0.86 Base = 30 ft Height = 21 ft B/H = 1.43 > 0.6 Sa = 0.86
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. (Commentary: Sec. A.6.2.2. Tier 2: Sec. 5.4.3.4) **Comments:** Walls have continuous footings and there is a continuous footing around the perimeter of the building.

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ASCE 41-17
Collapse Prevention Structural Checklist For Building Type W1-W1A

LOW AND MODERATE SEISMICITY

SEISMIC-FORCE-RESISTING SYSTEM

	Description
C ● NC ○ N/A ○ U ○	REDUNDANCY: The number of lines of shear walls in each principal direction is greater than or equal to 2. (Commentary: Sec. A.3.2.1.1. Tier 2: Sec. 5.5.1.1) **Comments:** There are two lines of wall in the north-south direction. In the east-west direction, there are eight lines of resistance at the second floor, including gypsum board walls at the rated stair, elevator, and mechanical shaft. The first floor has several walls in the east-west direction.
C ○ NC ● N/A ○ U ○	SHEAR STRESS CHECK: The shear stress in the shear walls, calculated using the Quick Check procedure of Section 4.4.3.3, is less than the following values: (Commentary: Sec. A.3.2.7.1. Tier 2: Sec. 5.5.3.1.1) Structural panel sheathing: 1,000 lb/ft (14.6 kN/m) Diagonal sheathing: 700 lb/ft (10.2 kN/m) Straight sheathing: 100 lb/ft (1.5 kN/m) All other conditions: 100 lb/ft (1.5 kN/m) **Comments:** The length of wall is sufficient to pass the shear stress quick check in the north-south direction second floor, the first floor is framed with concrete walls, see attached C2A checklist. There is not sufficient wall to pass the quick check in the east-west direction at the first and second floor. The average story shear stress is 663 plf at the second floor compared with 321 plf allowable for diagonally sheathed walls. The average story shear stress is 1062 plf in the first floor compared with 920 plf allowable for structural panel sheathing.
C ● NC ○ N/A ○ U ○	STUCCO (EXTERIOR PLASTER) SHEAR WALLS: Multi-story buildings do not rely on exterior stucco walls as the primary seismic-force-resisting system. (Commentary: Sec. A.3.2.7.2. Tier 2: Sec. 5.5.3.6.1) **Comments:** Stucco walls have diagonally sheathing which serves at the seismic force resisting system for the second-floor walls.
C ○ NC ● N/A ○ U ○	GYPSUM WALLBOARD OR PLASTER SHEAR WALLS: Interior plaster or gypsum wallboard is not used for shear walls on buildings more than one story high with the exception of the uppermost level of a multi-story building. (Commentary: Sec. A.3.2.7.3. Tier 2: Sec. 5.5.3.6.1) **Comments:** Gypsum wallboard at second floor rated walls is relied on for lateral resistance.
C ○ NC ● N/A ○ U ○	NARROW WOOD SHEAR WALLS: Narrow wood shear walls with an aspect ratio greater than 2-to-1 are not used to resist seismic forces. (Commentary: Sec. A.3.2.7.4. Tier 2: Sec. 5.5.3.6.1) **Comments:** Shear walls on the north side of the second level are 4.5 ft wide and 10 feet tall. The aspect ratio is great than 2 to 1.

ASCE 41-17
Collapse Prevention Structural Checklist For Building Type W1-W1A

C	NC	N/A	U	
○	◉	○	○	WALLS CONNECTED THROUGH FLOORS: Shear walls have an interconnection between stories to transfer overturning and shear forces through the floor. (Commentary: Sec. A.3.2.7.5. Tier 2: Sec. 5.5.3.6.2) **Comments:** Hold-downs not provided between floors to resist overturning.
○	○	◉	○	HILLSIDE SITE: For structures that are taller on at least one side by more than one-half story because of a sloping site, all shear walls on the downhill slope have an aspect ratio less than 1-to-1. (Commentary: Sec. A.3.2.7.6. Tier 2: Sec. 5.5.3.6.3) **Comments:** The building site is flat. See "UCSF Group 1 - Buildings Geotechnical Characteristics and Geohazards" by Egan (2019).
○	○	◉	○	CRIPPLE WALLS: Cripple walls below first-floor-level shear walls are braced to the foundation with wood structural panels. (Commentary: Sec. A.3.2.7.7. Tier 2: Sec. 5.5.3.6.4) **Comments:** No cripple walls present. The first floor of the building is founded on a slab on grade.
◉	○	○	○	OPENINGS: Walls with openings greater than 80% of the length are braced with wood structural panel shear walls with aspect ratios of not more than 1.5-to-1 or are supported by adjacent construction through positive ties capable of transferring the seismic forces. (Commentary: Sec. A.3.2.7.8. Tier 2: Sec. 5.5.3.6.5) **Comments:**

CONNECTIONS

				Description
◉	○	○	○	WOOD POSTS: There is a positive connection of wood posts to the foundation. (Commentary: Sec. A.5.3.3. Tier 2: Sec. 5.7.3.3) **Comments:**
◉	○	○	○	WOOD SILLS: All wood sills are bolted to the foundation. (Commentary: Sec. A.5.3.4. Tier 2: Sec. 5.7.3.3) **Comments:**
◉	○	○	○	GIRDER-COLUMN CONNECTION: There is a positive connection using plates, connection hardware, or straps between the girder and the column support. (Commentary: Sec. A.5.4.1. Tier 2: Sec. 5.7.4.1) **Comments:**

ASCE 41-17
Collapse Prevention Structural Checklist For Building Type W1-W1A

HIGH SEISMICITY (COMPLETE THE FOLLOWING ITEMS IN ADDITION TO THE ITEMS FOR LOW AND MODERATE SEISMICITY)

CONNECTIONS

C	NC	N/A	U	Description
◉	○	○	○	WOOD SILL BOLTS: Sill bolts are spaced at 6 ft or less with acceptable edge and end distance provided for wood and concrete. (Commentary: Sec. A.5.3.7. Tier 2: Sec. 5.7.3.3) **Comments:**

DIAPHRAGMS

C	NC	N/A	U	Description
◉	○	○	○	DIAPHRAGM CONTINUITY: The diaphragms are not composed of split-level floors and do not have expansion joints. (Commentary: Sec. A.4.1.1. Tier 2: Sec. 5.6.1.1) **Comments** No split-level floors or expansion joints in the floor diaphragms.
◉	○	○	○	ROOF CHORD CONTINUITY: All chord elements are continuous, regardless of changes in roof elevation. (Commentary: Sec. A.4.1.3. Tier 2: Sec. 5.6.1.1) **Comments:** The roof is flat. The top plate of the walls is at one level and expected to be continuous.
○	○	◉	○	STRAIGHT SHEATHING: All straight-sheathed diaphragms have aspect ratios less than 2-to-1 in the direction being considered. (Commentary: Sec. A.4.2.1. Tier 2: Sec. 5.6.2) **Comments:** Roof and floor diaphragms are diagonally sheathed.
◉	○	○	○	SPANS: All wood diaphragms with spans greater than 24 ft (7.3 m) consist of wood structural panels or diagonal sheathing. (Commentary: Sec. A.4.2.2. Tier 2: Sec. 5.6.2) **Comments:**
○	◉	○	○	DIAGONALLY SHEATHED AND UNBLOCKED DIAPHRAGMS: All diagonally sheathed or unblocked wood structural panel diaphragms have horizontal spans less than 40 ft (12 m) and have aspect ratios less than or equal to 4-to-1. (Commentary: Sec. A.4.2.3. Tier 2: Sec. 5.6.2) **Comments:** The roof diaphragm is diagonally sheathed and has an aspect ratio of 5.2 to 1.

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Collapse Prevention Structural Checklist For Building Type W1-W1A

C	NC	N/A	U	
○	○	◉	○	OTHER DIAPHRAGMS: The diaphragms do not consist of a system other than wood, metal deck, concrete, or horizontal bracing. (Commentary: Sec. A.4.7.1. Tier 2: Sec. 5.6.5) **Comments:** No “other” diaphragm systems.

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ASCE 41-17
Collapse Prevention Structural Checklist For Building Type C2-C2A

Low And Moderate Seismicity

Seismic-Force-Resisting System

	Description
C NC N/A U ○ ○ ◉ ○	COMPLETE FRAMES: Steel or concrete frames classified as secondary components form a complete vertical-load-carrying system. (Commentary: Sec. A.3.1.6.1. Tier 2: Sec. 5.5.2.5.1) **Comments:**
C NC N/A U ◉ ○ ○ ○	REDUNDANCY: The number of lines of shear walls in each principal direction is greater than or equal to 2. (Commentary: Sec. A.3.2.1.1. Tier 2: Sec. 5.5.1.1) **Comments:**
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 $2\sqrt{f'_c}$. (Commentary: Sec. A.3.2.2.1. Tier 2: Sec. 5.5.3.1.1) **Comments:** Calculations are attached. 1947 drawings show 2200 psi concrete. 100 psi is used for the quick check.
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. (Commentary: Sec. A.3.2.2.2. Tier 2: Sec. 5.5.3.1.3) **Comments:** Reinforcing steel is #4 @ 18 inches on center each way, each face, Reinforcing ratio = 2 * 0.2 in2 / (18 in * 9 in) = 0.0024

Connections

	Description
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. (Commentary: Sec. A.5.1.1. Tier 2: Sec. 5.7.1.1) **Comments:** Tc = 1.0 * 1.43 * 150 pcf * 6.67 ft * 11 ft /2 = 7867 lbs. See Hiliti Profis Output for Anchor Check, and figure 3 for detail from original drawings.
C NC N/A U ◉ ○ ○ ○	TRANSFER TO SHEAR WALLS: Diaphragms are connected for transfer of seismic forces to the shear walls. (Commentary: Sec. A.5.2.1. Tier 2: Sec. 5.7.2) **Comments:**

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Collapse Prevention Structural Checklist For Building Type C2-C2A

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. (Commentary: Sec. A.5.3.5. Tier 2: Sec. 5.7.3.4) **Comments:**

High Seismicity (Complete The Following Items In Addition To The Items For Low And Moderate Seismicity)

Seismic-Force-Resisting System

				Description
C	NC	N/A	U	
◉	○	○	○	DEFLECTION COMPATIBILITY: Secondary components have the shear capacity to develop the flexural strength of the components. (Commentary: Sec. A.3.1.6.2. Tier 2: Sec. 5.5.2.5.2) **Comments:**
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. (Commentary: Sec. A.3.1.6.3. Tier 2: Sec. 5.5.2.5.3) **Comments:**
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. (Commentary: Sec. A.3.2.2.3. Tier 2: Sec. 5.5.3.2.1) **Comments:**

Diaphragms (Stiff Or Flexible)

				Description
C	NC	N/A	U	
◉	○	○	○	DIAPHRAGM CONTINUITY: The diaphragms are not composed of split-level floors and do not have expansion joints. (Commentary: Sec. A.4.1.1. Tier 2: Sec. 5.6.1.1) **Comments:**
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. (Commentary: Sec. A.4.1.4. Tier 2: Sec. 5.6.1.3) **Comments:**

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Collapse Prevention Structural Checklist For Building Type C2-C2A

Flexible Diaphragms

C	NC	N/A	U	Description
◉	○	○	○	CROSS TIES: There are continuous cross ties between diaphragm chords. (Commentary: Sec. A.4.1.2. Tier 2: Sec. 5.6.1.2) **Comments:** Continuous joists between walls.
○	○	◉	○	STRAIGHT SHEATHING: All straight-sheathed diaphragms have aspect ratios less than 2-to-1 in the direction being considered. (Commentary: Sec. A.4.2.1. Tier 2: Sec. 5.6.2) **Comments:**
◉	○	○	○	SPANS: All wood diaphragms with spans greater than 24 ft (7.3 m) consist of wood structural panels or diagonal sheathing. (Commentary: Sec. A.4.2.2. Tier 2: Sec. 5.6.2) **Comments:**
○	◉	○	○	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. (Commentary: Sec. A.4.2.3. Tier 2: Sec. 5.6.2) **Comments:** The roof diaphragm is diagonally sheathed and has an aspect ratio of 5.2 to 1.
○	○	◉	○	OTHER DIAPHRAGMS: Diaphragms do not consist of a system other than wood, metal deck, concrete, or horizontal bracing. (Commentary: Sec. A.4.7.1. Tier 2: Sec. 5.6.5) **Comments:**

Connections

C	NC	N/A	U	Description
○	○	◉	○	UPLIFT AT PILE CAPS: Pile caps have top reinforcement, and piles are anchored to the pile caps. (Commentary: Sec. A.5.3.8. Tier 2: Sec. 5.7.3.5) **Comments:**

Appendix C

UCOP Seismic Safety policy Falling Hazards Assessment Summary

UC Campus:	San Francisco			Date:	10/31/2019		
Building CAAN:	2033	Auxiliary CAAN:		By Firm:	Estructure		
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UCOP SEISMIC SAFETY POLICY
Falling Hazard Assessment Summary

	Description
P ☐ N/A ☒	**Heavy ceilings, features or ornamentation above large lecture halls, auditoriums, lobbies, or other areas where large numbers of people congregate (50 ppl or more)** **Comments:**
P ☐ N/A ☒	**Heavy masonry or stone veneer above exit ways or public access areas** **Comments:**
P ☐ N/A ☒	**Unbraced masonry parapets, cornices, or other ornamentation above exit ways or public access areas** **Comments:**
P ☐ N/A ☒	**Unrestrained hazardous material storage** **Comments:**
P ☐ N/A ☒	**Masonry chimneys** **Comments:**
P ☐ N/A ☒	**Unrestrained natural gas-fueled equipment such as water heaters, boilers, emergency generators, etc.** **Comments:**
P ☐ N/A ☐	**Other:** **Comments:**
P ☐ N/A ☐	**Other:** **Comments:**
P ☐ N/A ☐	**Other:** **Comments:**

Falling Hazards Risk: *Low*

Note: P= Present, N/A = Not Applicable; Falling Hazards Risk: Low, Moderate, or High

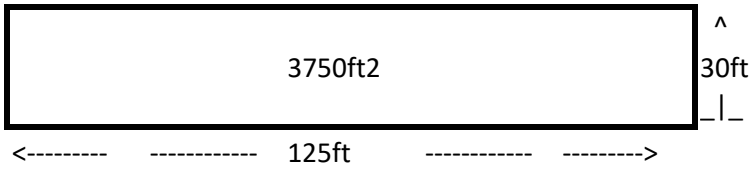
Appendix D

Tier 1 Quick Check Calculations

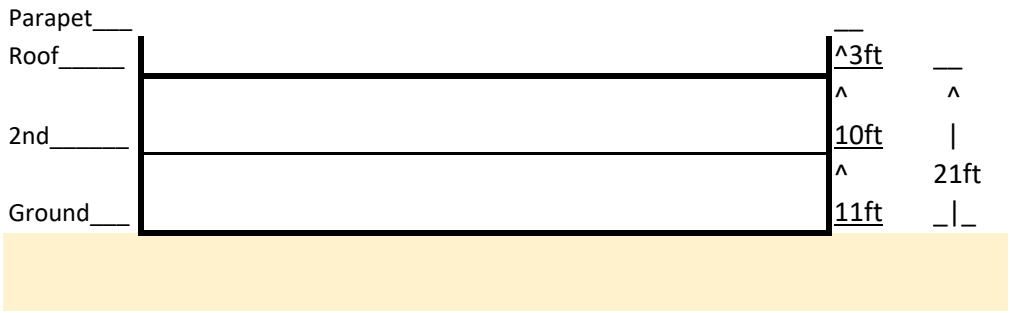
Building Dimensions			
Length	L	125	ft
Width	w	30	ft
Floor area	A	3750	ft^2
Conc. thickness	t	9	in
Ground to 2nd	h_1	11	ft
2nd to Roof	h_2	10	ft
Building Height	h	21	ft
2nd to T.O.P.	h_p	3	ft

Dead loads & Seismic Weight Calculation				
Roof Level				
Roofing		*6*	*psf*	*Tar & Gravel*
Insulation		*1*	*psf*	
Sheathing		*1.4*	*psf*	*1/2" plywood*
Wood framing		*2.6*	*psf*	*2x10 @ 16"*
Steel framing		*4*	*psf*	*Unknown*
Ceiling		*4*	*psf*	*Unknown*
Wood walls		*9.9*	*psf*	*15 psf around perimeter*
MEP		*4*	*psf*	
Miscellaneous		*1*	*psf*	
Total	∑	**34**	**psf**	
Seismic Weight	W_R	**127**	**kips**	

2nd Floor Level				
Sheathing		*1.4*	*psf*	*1/2" plywood or diag*
Partitions		*10*	*psf*	
Wood framing		*2.6*	*psf*	*2x10 @ 16"*
Steel roof framing		*5*	*psf*	*Unknown*
Wood walls		*6.2*	*psf*	*15 psf around perimeter*
Concrete walls		*41.3*	*psf*	*Along two long walls*
Ceiling		*4*	*psf*	*Unknown*
MEP		*4*	*psf*	
Miscellaneous		*1*	*psf*	
Total	∑	**75**	**psf**	
Seismic Weight	W_2	**283**	**kips**	



PLAN



ELEVATION

Seismic Force Vertical Distribution (7.4.1.3.2)				
Level	Weight (kips)	Height (ft)	$w_x h_x$ (kip_ft)	$C_{vx} = w_x h_x / \sum w_x h_x$
Roof	127	21	2671	0.46
2nd Level	283	11	3112	0.54
∑	*410*	∑	*5784*	

Building Period (7.4.1.2.2.)			
Empirical factor	C_t	0.020	ASCE 41-17 Sec. 4.4.2.4
Roof level height	h	21	ft
Empirical factor	B	0.75	*ASCE 41-17 Sec. 4.4.2.4*
Fundamental period, $T = C_t h_n^{\beta}$ =		0.196	sec

Earthquake	Site Parameters -		
BSE-C	S_s = 1.433	F_a = 1.00	S_{Cs} = 1.433
	S_1 = 0.558	F_v = 1.742	S_{C1} = 0.972

Calculate Base Shear				
Spectral Acceleration	$S_a = S_{X1} / T$ =	4.95		*ASCE 41-17, 4.4.2.3*
	$S_{a,max} = S_{XS}$ =	1.433	*governs*	*ASCE 41-17, 4.4.2.3*
Modification Factor	C =	1.00		*ASCE 41-17, Table 4-7*
Pseudo Seismic Force	$V = S_a \times C \times W$ =	1.43	W	*ASCE 41-17, Eqn. 4-1*
	V =	**588**	**kips**	

Seismic Force Vertical Distribution						
Level	Weight (kips)	Height (ft)	$w_x h_x$ (kip_ft)	$C_{vx} = w_x h_x / \sum w_x h_x$	$F_x = C_{vx} V$	Story Shear, V
Roof	127	21	2671	0.46	271	271
2nd	283	11	3112	0.54	316	588
∑	*410*	∑	*5784*	*1.00*	*588*	

Longitudinal Direction (North - South)*							
Story	Story Shear (kips)	Length/Area of Wall	M_s Factor (ASCE 41-17, Table 4-8)	Average Story Shear Stress		Quick Check Shear	Pass? (Y/N)
2	271	250 ft	4.5	241	plf	700 plf	Y
1	588	27000 in^2	4.5	5	psi	100 psi	Y

Transverse Direction (East - West) **						
Story	Story Shear (kips)	Length of Wall (ft)	M_s Factor (ASCE 41-17, Table 4-8)	Average Story Shear Stress (plf)	Quick Check Shear	Pass? (Y/N)
2	271	91	4.5	663	321 plf	N
1	588	123	4.5	1062	920 plf	N

* The lateral force resisitng system for lateral forces in the north-south direction is diagonally sheathed exterior walls on the second floor and concrete walls on the first floor.

** The lateral force resisitng system for seismic forces in the east-west direction is diagonally sheathed walls at the front and back of the building, plywood shear walls on the first floor, and interior gypsum board walls on the second floor.

Second Floor Quick Check Shear based on Exterior Diagonally Sheathed Walls and Interior Full Height Gypsum Board Walls

22 ft * 700 plf + 69 ft * 200 plf / 91 ft = 321 plf

First Floor Quick Check Shear based on Exterior Daigonally Sheated Walls and Interior Plywood Shear Walls

90 ft * 1000 plf + 33 ft * 700 plf / 123 ft = 920 plf