Rating form completed by:

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

09-19-2019

9/19/2019

UCSF Building Seismic Ratings

Aldea San Miguel 1

CAAN #3014
50 Johnstone Drive, San Francisco, CA 94131
UCSF Campus: Parnassus

Plan

South Elevation

Rating summary	Entry	Notes
UC Seismic Performance Level (rating)	IV	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	N/A	
Ballpark total project cost to retrofit to IV rating	N/A	
Is 2018-2019 rating required by UCOP?	Yes	
Further evaluation recommended?	No	

Building information used in this evaluation

- Architectural drawings by Gordon H. Chong & Partners, “Aldea Housing”, dated 1997-10-29 (71 Sheets)
- Structural drawings by Nishkian & Assoc. Inc, “Aldea Housing,” dated 1997-07-25 (35 sheets).

[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.

Additional building information known to exist

- Geotechnical report by Treadwell & Rollo Environmental and Geotechnical Consultants, "Geotechnical Investigation Aldea Married Student Housing UCSF Medical Center San Francisco, California," dated 8 November 1996.

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 made on July 31, 2019 where the building exterior and crawl space were observed.

Brief description of structure

The building functions as graduate student housing. It was designed in 1997 by Nishkian & Assoc., Inc. to replace an existing student housing building constructed in 1958 of approximately the same footprint. The building is identified in the original drawings as Building B8. The building is 3-stories; the bottom story is only a partial story as the building is built into the hillside. It has an area of approximately 10,000 square feet. The main floor plate is approximately 133 ft north-south by 52 ft east-west.

Identification of Levels: Levels are identified on plan as Ground Floor, Second Floor, Third Floor, and Roof. The site slopes downward toward the east. The Ground Floor (0'-0") is a partial level with dwellings and shared utility spaces on the east side and crawl space on the west. The Second Floor (9'-6") consists of dwellings, a large deck and a roof over the shared utility space. The Third Floor (19'-0") consists of dwellings. The roof is pitched with a slope of 4:12, and average height of 35'-6". The ground level is used as the base of the building for this evaluation.

Foundation system: The far west wall of the crawl space is a CMU retaining wall. The west end of the building is supported on stepped concrete stub walls and concrete strip footings. The foundation on the east side of the building consists of grade beams over drilled piers.

Structural system for vertical (gravity) load: The gravity-load-carrying system at the roof consists of ½" plywood sheathing over roof trusses spanning to wood stud walls. The floor framing consists of ¾" T&G plywood sheathing supported by wood joists spanning to wood stud walls. The floor framing has a light weight concrete topping which varies from ¾" to 1½" thick.

Structural system for lateral forces: The roof diaphragm consists of blocked ½" plywood sheathing. The floor diaphragm consists of blocked ¾" T&G plywood. Vertical elements of the lateral-force-resisting system consists of OSB shear walls. The drawings call for plywood or OSB shear walls; OSB was observed in the crawl space.

Building Code: The structural design drawings are dated July 25, 1997. The structural drawings indicate the 1995 California Building Code governed the structural design.

Building Condition: Good. Minor water staining of sheathing in the crawl space observed. Exterior siding is aged. Other buildings of similar age on the campus are undergoing siding replacement.

Building response in 1989 Loma Prieta Earthquake: Not Applicable.

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

The building was designed under the 1995 CBC, but was not categorized as a benchmark building due to its location on a hillside per Table 1 of the UC Seismic Program Guidebook.

Potential seismic deficiencies identified by the Tier 1 procedure include the following:

- In a quick check of the lateral-force-resisting system, the shear walls do not have adequate shear capacity at the second level in the transverse direction based on wall layout shown on the structural drawings. When 12 feet of additional wall shown on the architectural drawings and verified in the field is considered at level 2 there is sufficient wall to pass the quick check. The second level has the highest wall stresses from the quick check calculation. The quick check shear demand is 976 and 942 plf in the longitudinal and transverse directions respectively, compared to the quick check capacity of 1000 plf.

- On the downhill slope of the building, the exterior longitudinal walls have aspect ratios greater than 1:1 due to window openings. These walls were checked using Tier 2 procedures and verified to generally be adequate for tributary loading. Since there is considerable wall in both the transverse and longitudinal directions in the vicinity of the downhill facing wall, there is a back-up load path should the walls on the downhill side lose strength and/or stiffness.

Structural deficiency	Affects rating?	Structural deficiency	Affects rating?
Lateral system stress check (wall shear, column shear or flexure, or brace axial as applicable)	N	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	Hillside	Y

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

None identified.

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	Unrestrained hazardous materials storage	None
Heavy masonry or stone veneer above exit ways and public access areas	None	Masonry chimneys	None
Unbraced masonry parapets, cornices or other ornamentation above exit ways and public access areas	None	Unrestrained natural gas-fueled equipment such as water heaters, boilers, emergency generators, etc.	None

Basis of Seismic Performance Level Rating

The subject building benefits from being lightweight conventional wood-framed construction. Based on the historic performance of similar buildings, the risk to life safety is judged to be low. The wood shear walls are well-distributed throughout the building plan and interconnected between floors. Based on the anticipated seismic demands, the elements are judged to be adequate to protect against collapse. The sloping hillside condition is mitigated by considerable wall on the downhill side in addition to longitudinal and transverse walls in the vicinity.

Recommendations for further evaluation or retrofit

No further evaluation or retrofit is recommended.

[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.

Peer review comments on rating

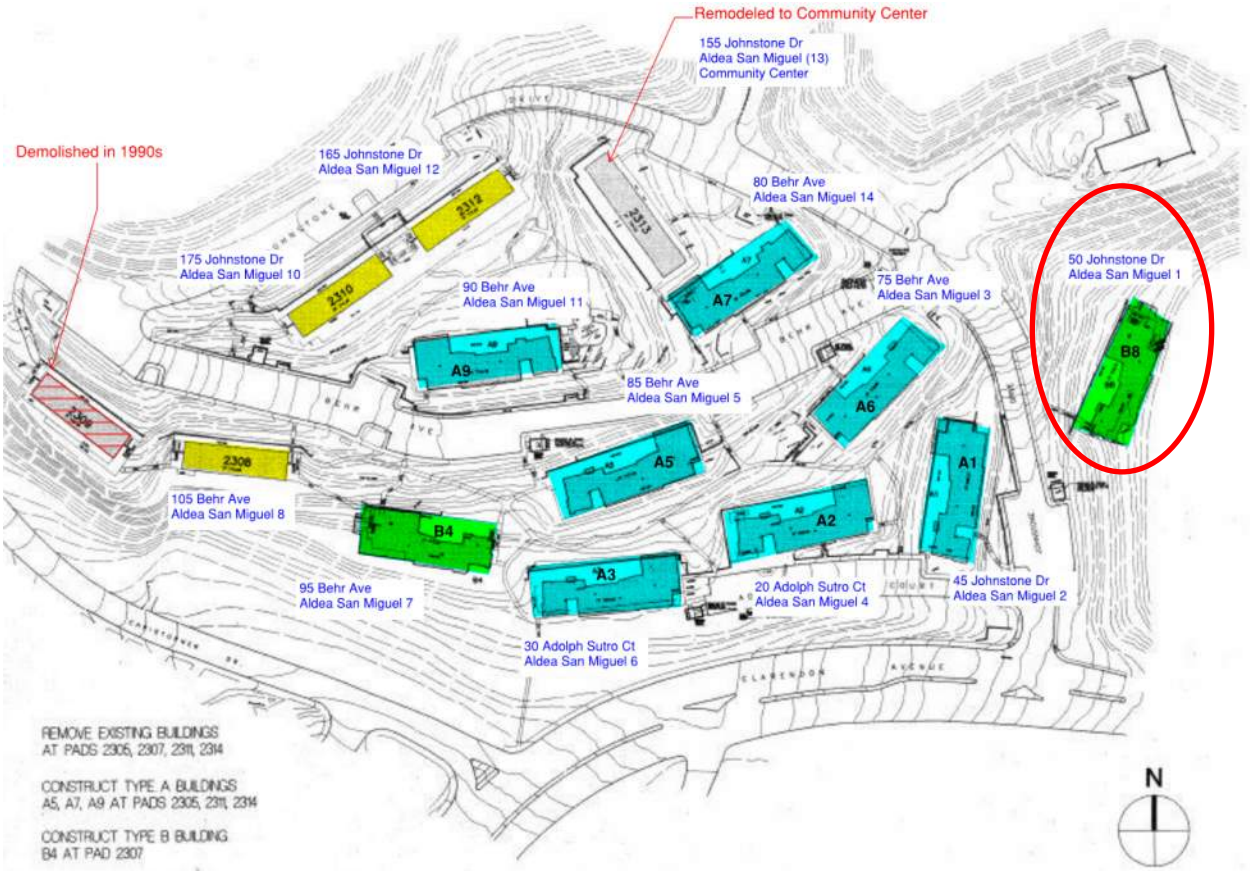
The structural members of the UCSF Seismic Review Committee (SRC) reviewed the evaluation on August 7, 2019 and are unanimous that the rating is IV.

Additional building data	Entry	Notes
Latitude	37.75889	
Longitude	-122.45331	
Are there other structures besides this one under the same CAAN#	No	
Number of stories above lowest perimeter grade	3	
Number of stories (basements) below lowest perimeter grade	0	
Building occupiable area (OGSF)	10,124	
Risk Category per 2016 CBC 1604.5	II	
Building structural height, h_n	35.5 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	0.291 sec	Per ASCE 41-17 equation 4-4
Site data		
975 yr hazard parameters S_s, S_1	1.553,0.604	
Site class	C	
Site class basis	Geotech Parameters	UCSF Group 3 Buildings – Tier 1 Geotechnical Assessment, Egan (2019)
Site parameters F_a, F_v	1.200,1.400	
Ground motion parameters S_{cs}, S_{c1}	1.840,0.846	
S_a at building period	1.840	
Site V_{s30}	730 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	
Site-specific ground motion study?	No	
Applicable code		
Applicable code or approx. date of original construction	Built: 1998 Code: 1995 CBC	Code identified on Sheet S1
Applicable code for partial retrofit	None	No partial retrofit known
Applicable code for full retrofit	None	No full retrofit known

Model building data		
Model building type North-South	W1 : Wood Light Frames	
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		
Most recent rating	IV	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



Key

Building Type A (CBC 1995)

Building Type B (CBC 1995)

Building Type C (original 1958 construction)

Building Type#

Building in review

Figure 0. – Site Plan

Figure 1. – Exterior Longitudinal Elevations

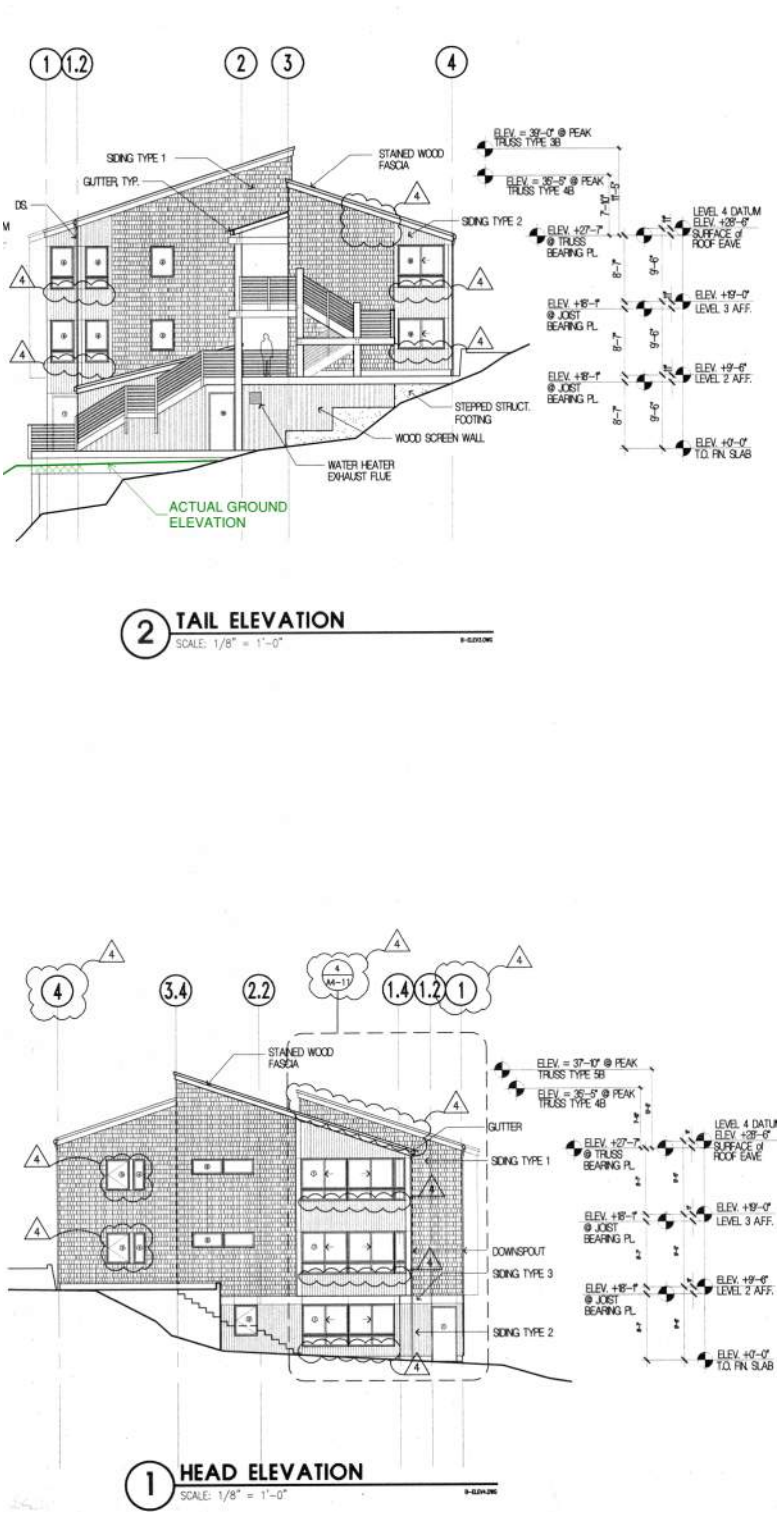
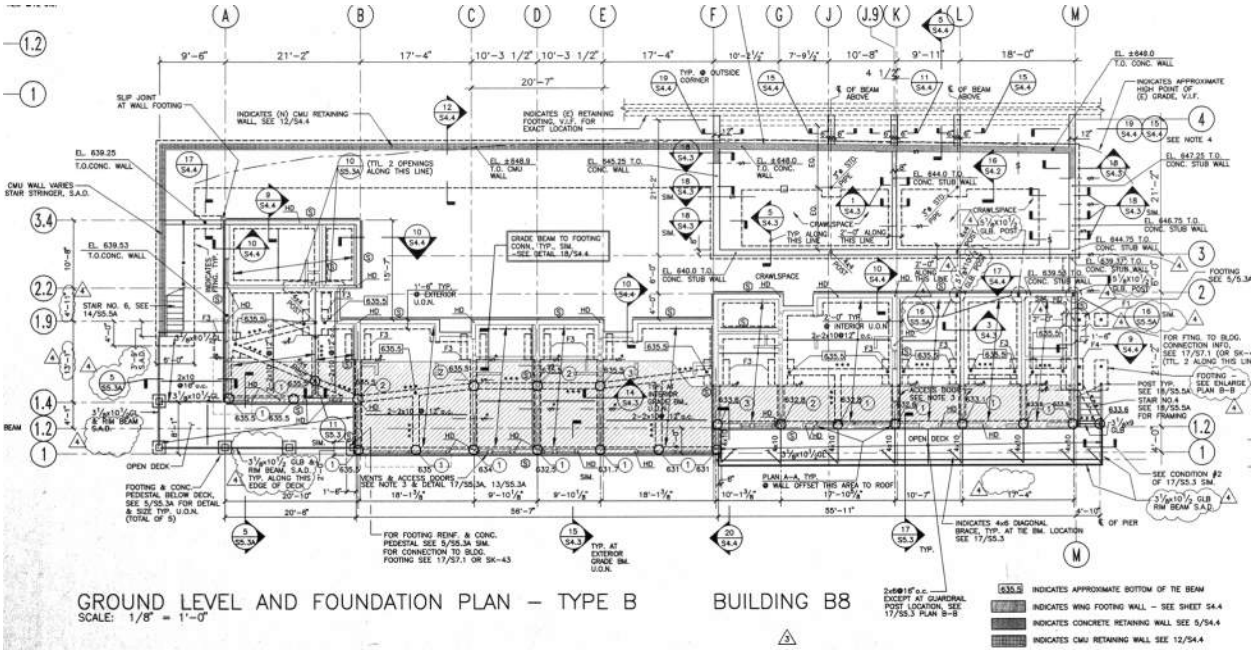


Figure 2. – Exterior Transverse Elevation (Typical Both Sides)



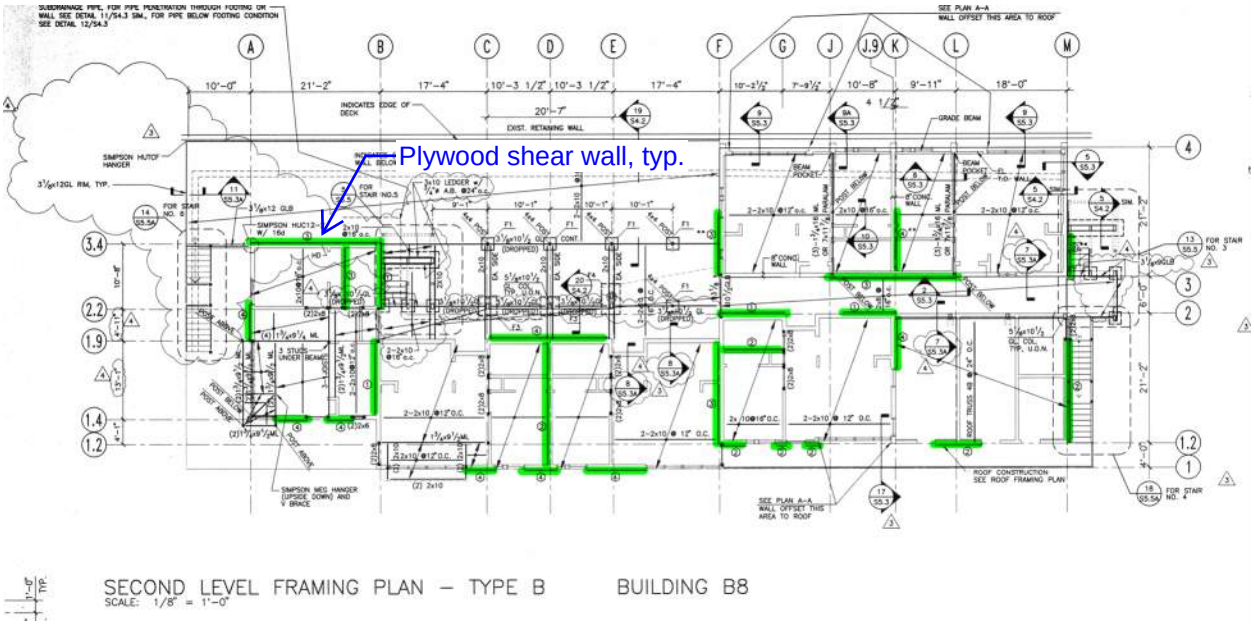
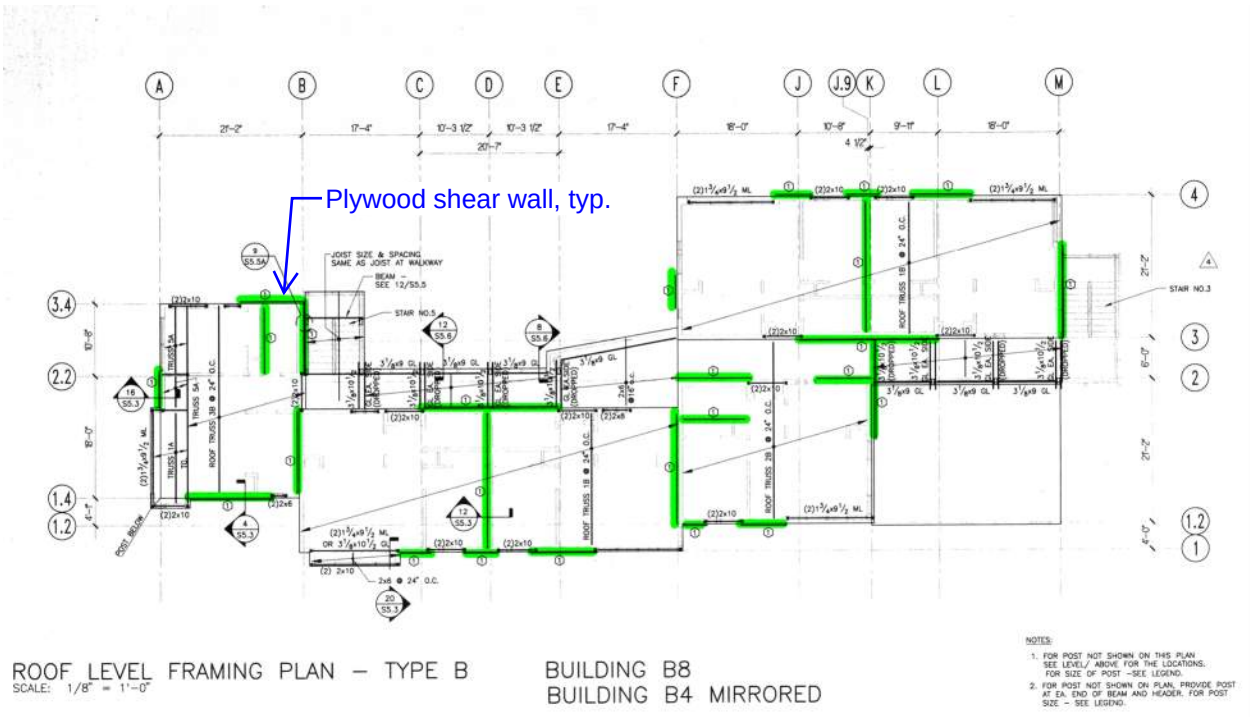


Figure 3. – Structural Foundation, Ground Level, and Second Level Plan



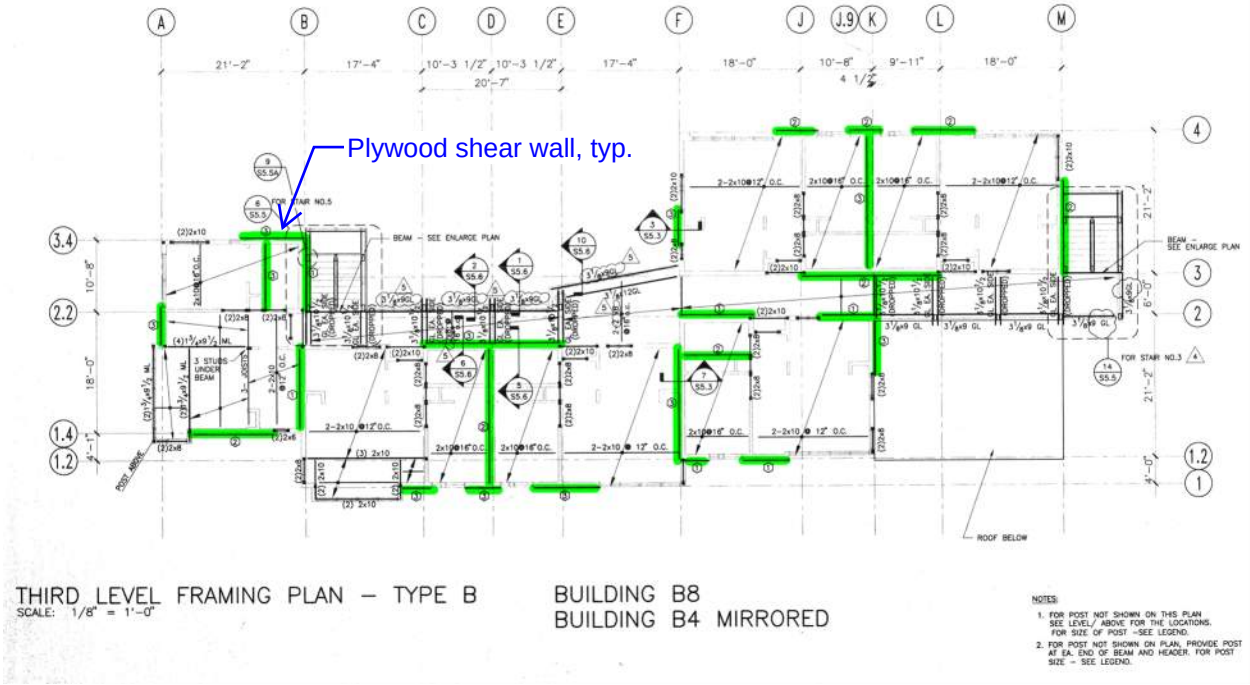
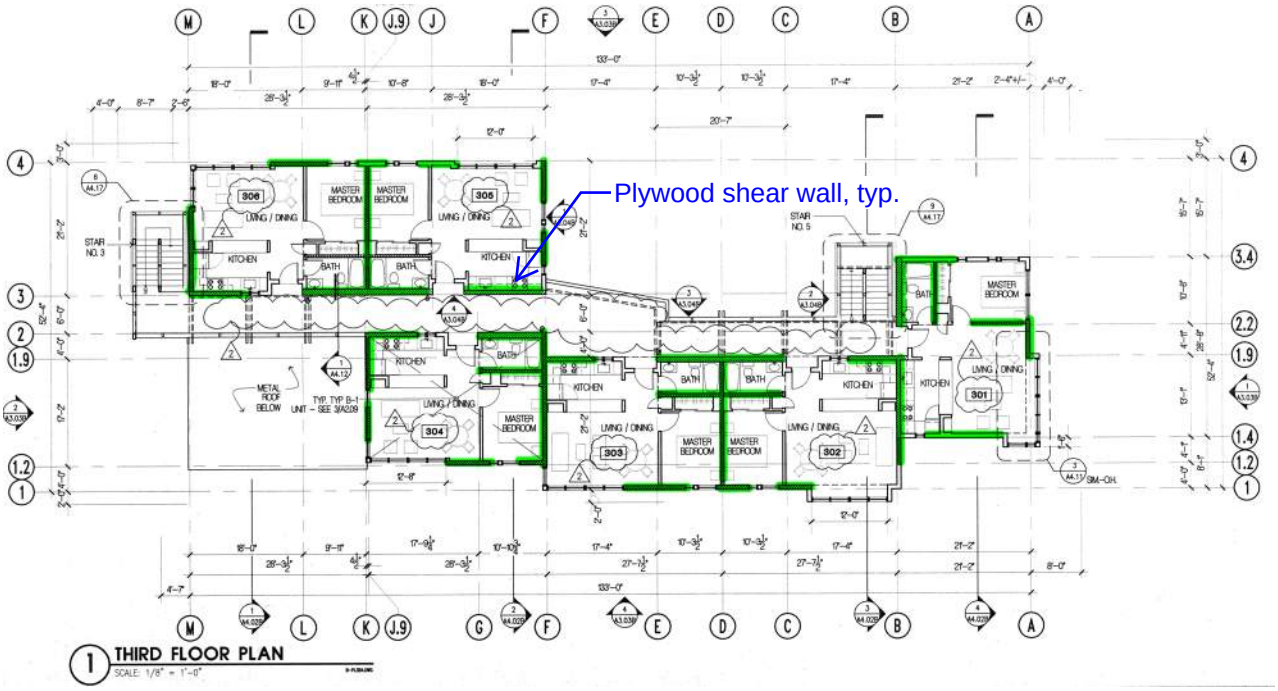


Figure 4. – Structural Third Level and Roof Plan



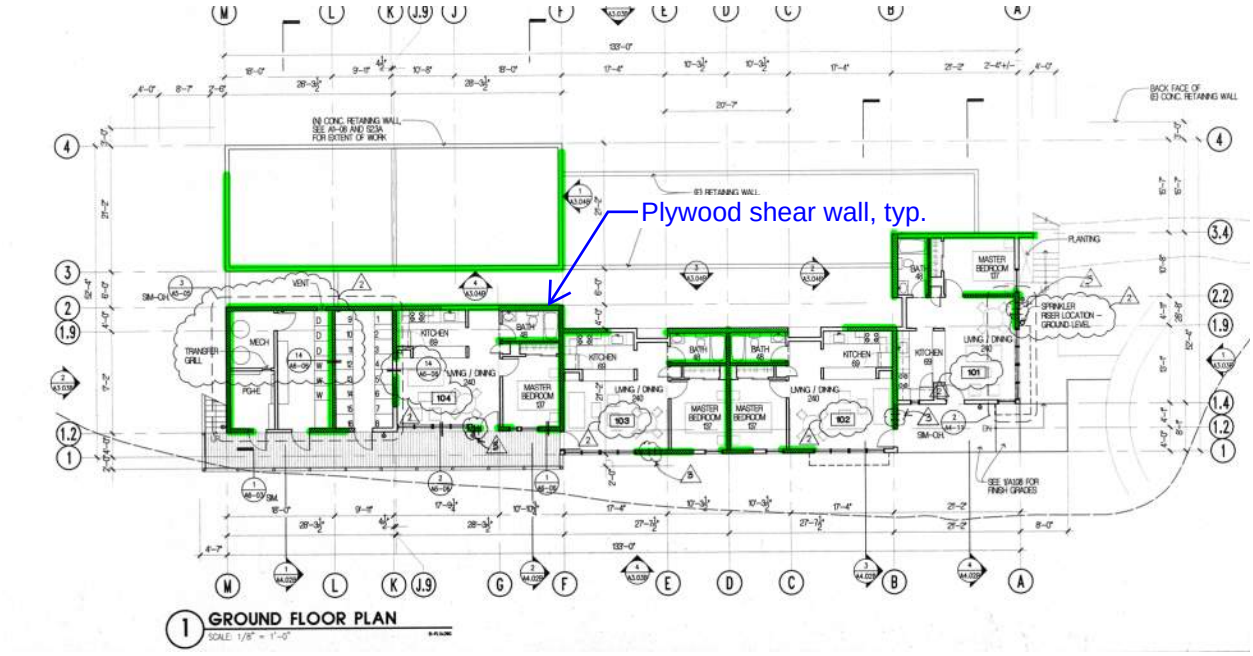


Figure 5. – Architechural Typical Floor and Ground Level Plan

Figure Key

Figure 6. – Southern elevation from deck (facing north)

Figure 7. – Northern elevation and walkway on eastern side

Figure 8. – Southern elevation from eastern side

Figure 8. – Walls in crawlspace

Figure 9. – Typical holdown in crawlspace

Appendix B

ASCE 41- 17 Tier 1 Checklists (Structural)

UC Campus:	UCSF Parnassus			Date:	August 6, 2019		
Building CAAN:	3014	Auxiliary CAAN:		By Firm:	Estructure		
Building Name:	Aldea San Miguel 1			Initials:		Checked:	
Building Address:	50 Johnstone Drive, San Francisco 94131			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:**
○	○	●	○	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:**
○	○	●	○	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:**

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:**
●	○	○	○	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:**
●	○	○	○	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 overlaid from architectural and structural drawings between levels to confirm they stack between levels.

Note: **C =** Compliant **NC =** Noncompliant **N/A =** Not Applicable **U =** Unknown

ASCE 41-17
Collapse Prevention Basic Configuration Checklist

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. (Commentary: Sec. A.2.2.5. Tier 2: Sec. 5.4.2.4) **Comments:**
◉	○	○	○	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:**
○	○	◉	○	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:** Plywood diaphragm is considered flexible and walls are present throughout the floor plan. See comment on “Hillside” for additional discussion.

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:**
◉	○	○	○	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:**
◉	○	○	○	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:**

Note: **C =** Compliant **NC =** Noncompliant **N/A =** Not Applicable **U =** Unknown

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ASCE 41-17
Collapse Prevention Basic Configuration Checklist

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

FOUNDATION CONFIGURATION

C	NC	N/A	U	Description
◉	○	○	○	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:**
◉	○	○	○	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:**

Note: **C =** Compliant **NC =** Noncompliant **N/A =** Not Applicable **U =** Unknown

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

LOW AND MODERATE SEISMICITY

SEISMIC-FORCE-RESISTING SYSTEM

C	NC	N/A	U	Description
◉	○	○	○	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:**
◉	○	○	○	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:** There are inconsistencies between structural and architectural drawing shear wall locations. The second floor in the transverse direction did not pass the shear stress check based on the walls shown on the structural drawings. When 12 feet of additional wall shown on the architectural drawings and observed in the field was considered the wall stress was below the allowable listed above.
○	○	◉	○	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:**
○	○	◉	○	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:**
○	◉	○	○	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:** Story height is 9'-6". There are some walls which are 3 walls with aspect ratios greater than 2:1, the narrowest being approximately 2'-3" and the widest being 4'-6" based on scaled dimensions on the structural drawings.

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:**
○	◉	○	○	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:** Longitudinal walls on downhill side of building checked using Tier 2 procedure. See attached calculations. Narrow walls on downhill side are slightly overstressed in the Tier 2 check (DCR = 1.16). There is considerable longitudinal and transverse wall should the walls on the downhill side loos strength and/or stiffness and redistribute.
◉	○	○	○	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:**
○	○	◉	○	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
C	NC	N/A	U	
◉	○	○	○	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**
◉	○	○	○	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:**
○	○	◉	○	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:**

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

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 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:**
○	○	◉	○	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:**

Appendix C

UCOP Seismic Safety policy Falling Hazards Assessment Summary

UC Campus:	UCSF Parnassus			Date:	August 6, 2019		
Building CAAN:	3014	Auxiliary CAAN:		By Firm:	Estructure		
Building Name:	Aldea San Miguel 1			Initials:		Checked:	*MTP*
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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

Quick Check Calculations

Dead loads & Seismic Weight Calculation				
Roof Level				
Roofing		3	*psf*	*Fiberglass Composite Shingles or Metal Decking*
Insulation		1	*psf*	*R-30 Batt Insulation*
Sheathing		1.5	*psf*	*1/2" Plywood*
Roof Truss		2.5	*psf*	*Roof Truss @ 24" o.c.*
Ceiling		5.5	*psf*	*2 x 5/8'' Gyp Board*
MEP		0.5	*psf*	
Misc		0.5	*psf*	
Walls		*5*	*psf*	
Total	$\sum$	**20**	**psf**	
Area	A_{roof}	4800	ft^2	
Seismic Weight	W_{R4}	**94**	**kips**	

Third Floor Level				
Flooring		2	*psf*	*Carpet or Sheet Vinyl*
Topping		10	*psf*	*Gypsum Concrete (varies in depth from 3/4" - 1.5")*
Insulation		0.5	*psf*	*R-11 Acoustical Insulation*
Sheathing		2.2	*psf*	*3/4" Plywood*
Wood Framing		5	*psf*	*Joists = 2x10 @ 16" o.c., (2) 2x10 @ 12" o.c.*
Ceilings		2.25	*psf*	*5/8" Gyp Board*
MEP		0.5	*psf*	
Misc		0.5	*psf*	
Walls		*10*	*psf*	
Total	$\sum$	**33**	**psf**	
Area	A_3	4800	ft^2	
Seismic Weight	W_{typ}	**158**	**kips**	

Second Floor Level				
Interior Area				
Flooring		2	*psf*	*Carpet or Sheet Vinyl*
Topping		10	*psf*	*Gypsum Concrete (varies in depth from 3/4" - 1.5")*
Insulation		0.5	*psf*	*R-11 Acoustical Insulation*
Sheathing		2.2	*psf*	*3/4" Plywood*
Wood Framing		5	*psf*	*Joists = 2x10 @ 16" o.c., (2) 2x10 @ 12" o.c.*
Ceilings		2.25	*psf*	*5/8" Gyp Board*
MEP		0.5	*psf*	
Misc		0.5	*psf*	
Walls		*10*	*psf*	
Subtotal	$\sum$	**33**	**psf**	
Area	A_{2f}	3500	ft^2	

		Deck		
Sheathing		2.5	*psf*	*1 x Decking*
Wood Framing		8	*psf*	*(2) 2x10 @ 12" o.c.*
Subtotal	$\sum$	**11**	**psf**	
Area	A_{2d}	2640	ft^2	
		Metal Deck Roof		
Roofing		3	*psf*	*Metal Decking*
Insulation		1	*psf*	*R-30 Batt Insulation*
Sheathing		1.5	*psf*	*1/2" Plywood*
Wood Framing		2.5	*psf*	*Roof Truss*
Ceiling		2.25	*psf*	*5/8'' Gyp Board*
MEP		0.5	*psf*	
Misc		0.5	*psf*	
Walls		*5*	*psf*	
Subtotal	$\sum$	**16**	**psf**	
Area	A_{2d}	630	ft^2	
Seismic Weight	W_{typ}	**153**	**kips**	

Earthquake	Site Parameters - UCSF Group 3 Buildings – Tier 1 Geotechnical Assessment, Egan (2019)		
BSE-C	S_s = 1.553	F_a = 1.2	S_{Cs} = 1.84
	S_1 = 0.604	F_v = 1.4	S_{C1} = 0.846

Building Period			
Empirical factor	C_t	0.02	*ASCE 41-17 Sec. 4.4.2.4*
Roof level height	h	35.5 ft	
Empirical factor	β	0.75	*ASCE 41-17 Sec. 4.4.2.4*
Fundamental period, $T= C_t h_n^{\beta}$ = *ASCE 41-17 Sec. 4.4.2.4 eqn. 4-4*		0.291 sec	

Calculate Base Shear				
Spectral Acceleration	$S_a = S_{X1} / T$ =	2.91		*ASCE 41-17, 4.4.2.3*
	$S_{a,max} = S_{XS}$ =	1.84	*governs*	*ASCE 41-17, 4.4.2.3*
Modification Factor	C =	1.00		*ASCE 41-17, Table 4-7*
Pseudo Seismic Force	$V = S_a \times C \times W$ =	1.84 W		*ASCE 41-17, Eqn. 4-1*
	V =	**745 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	94	35.5	3323	0.43	318	318
3rd	158	19	3005	0.39	288	606
2nd	153	9.5	1456	0.19	139	745
1st		0	0	0.00	0	745
∑	*405*	∑	*7784*	*1.00*	*745*	

Longitudinal Direction (North - South)						
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 Capacity (plf)	Pass? (Y/N)
3	318	138	4.5	512	1000	Y
2	606	138	4.5	976	1000	Y
1	745	240	4.5	690	1000	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 Capacity (plf)	Pass? (Y/N)
3	318	131	4.5	540	1000	Y
2	606	131	4.5	1028	1000	Y
2*		143		942	1000	Y
1	745	190	4.5	872	1000	Y

*Wall length based on shear walls identified in architectural floor plans

Tier 2 Check: Plywood Shear Wall, Hillside Condition

Ref: ASCE 41-17 § 5.5.3.6.3

Analytical Procedure: Linear Static Procedure (LSP) §7.2

Calculate Base Shear			
Psudeo Seismic Force	$V = C_1C_2C_mS_aW$ =	2.576 W	
	V =	1043 kips	
	C_1C_2 =	1.4	Table 7-3
	C_m =	1.0	Table 7-4
	S_a =	1.84	

Seismic Force Vertical Distribution						
Level	Weight (kips)	Height (ft)	w_xh_x (kip_ft)	C_{vx} $=w_xh_x$ $/\sum w_xh_x$	F_x $=C_{vx}V$ (kips)	Story Shear, V (kips)
Roof	94	35.5	3323	0.43	445	445
3rd	158	19	3005	0.39	403	848
2nd	153	9.5	1456	0.19	195	1043
1st		0	0	0.00	0	1043
∑	*405*	∑	*7784*	*1.00*	*1043*	

Wall Capacity			
m-factor:	m =	4.5	Table 12-3, CP
Knowledge Factor:	κ =	0.9	Table 6-1
Expected Shear Strength	Q_{CE} =	840	Mark 1 - 1/2" w/ 8d @ 6"
*(1.5 * Shear Capacity from*		1290	Mark 2 - 1/2" w/ 8d @ 4"
SDPWS-2008)		1650	Mark 3 - 1/2" w/ 8d @ 3"
		2190	Mark 4 - 1/2" w/ 8d @ 2"

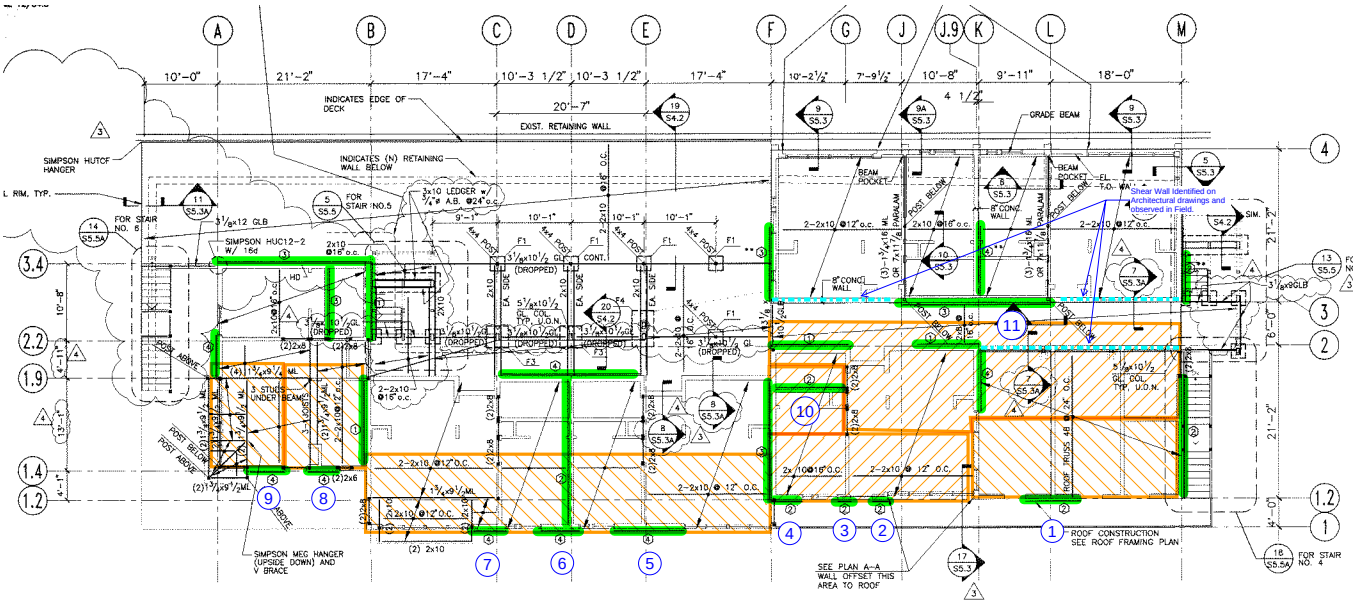
Base Shear Distribution on First Floor by Area				
	Area (ft^2)	Weight (psf)	Weight (kips)	Story Shear, kips
Deck	2640	11	29	198
Metal Deck Roof	630	16	10	69
Living Space	3500	33	115	785

Distribute seismic force based on tributary area to walls.

Wall Check - Structural Drawing Walls						
Wall Label	Wall Mark	Wall Length, ft	Tributary Area, sf	Wall Shear, plf	Wall Capacity, plf	DCR
1	2	7.6	325	4657	5225	0.89
234	2	8.5	230	6069	5225	1.16
567	4	20.5	650	7112	8870	0.80
8	4	4.75	160	7555	8870	0.85
9	4	4.75	180	8499	8870	0.96
10	1	45.6	735	2365	3402	0.70
10*	1	45.6	880	3029	3402	0.89
11	2	9.25	125	3031	5225	0.58
11**	2	9.25	207	5019	5225	0.96

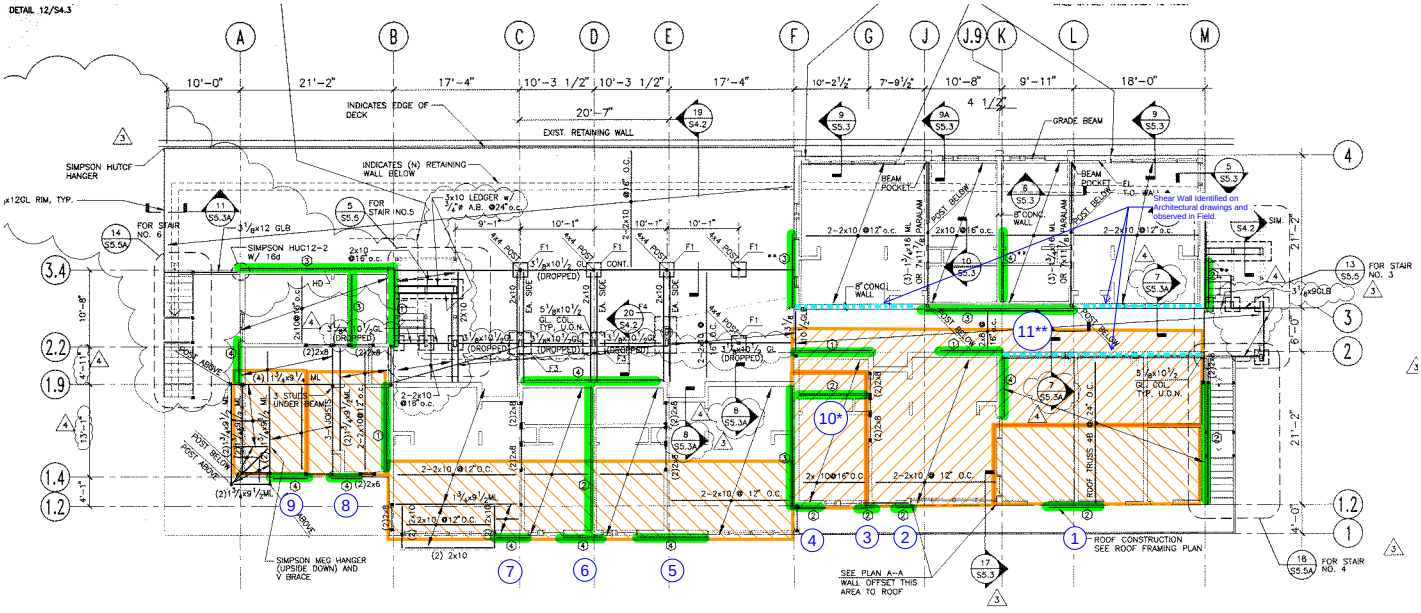
* - Wall 10 taking additional tributary load from wall 234 assuming wall 234 is overstressed and redistributes to Wall 10

* - Wall 11 taking additional tributary load from wall 234 assuming wall 234 is overstressed and transfers to Wall 11



SECOND LEVEL FRAMING PLAN – TYPE B BUILDING B8
SCALE: 1/8" = 1'-0"

PLAN WITH LOAD DISTRIBUTED TO WALL 234



SECOND LEVEL FRAMING PLAN – TYPE B BUILDING B8
SCALE: 1/8" = 1'-0"

PLAN WITH LOAD FROM WALL 234 REDISTRIBUTED TO WALL 10 AND 11