Rating form completed by:

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Maryann Phipps, Alix Kottke

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

11-05-2019

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

11/05/2019

UCSF Building Seismic Ratings

University House

CAAN #2407
66 Johnstone Drive, San Francisco, CA 94131
UCSF Campus: Parnassus

Plan

North 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	Priority A = Retrofit ASAP Priority B = Retrofit at next permit application for modification
Ballpark total project cost to retrofit to IV rating	N/A	See recommendations on further evaluation and 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

- Architectural Drawings by Harvey Parke Clark, John F. Beuttler, George T. Rockrise, William J. Watson Architects Associated, "University House," (9 Sheets)
- Structural Drawings by Gilbert, Forsberg, Diekmann, Schmidt Civil and Structural Engineers, "University House," dated 1966-08-01 (4 sheets)

Additional building information known to exist

- Architectural drawings by Worley K. Wong, Ronald G. Brocchini & Associates, "Alterations to the University House," dated 1983-10-24 (3 Sheets)
- Structural Drawings by Butzbach Structural Engineers, "University House ADA Improvements," dated 1998-07-20 (5 Sheets)
- Architectural Drawings by Gary Nelson, "University House: Refurbish and Deferred Maintenance Project," dated 2009-07-01 (5 Sheets)
- Architectural Drawings by DGA Architects, "University House Interior Improvements," dated 2016-08-11 (8 Sheets)
- Architectural and Structural As-Built drawings by George T. Rockrise and Associates, "University House Remodeling and Construction of Carport," dated 1970-03-27 (6 Sheets)

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 October 2, 2019 where the building exterior and crawl space were observed. A site visit of the interior was conducted in 2016 in conjunction with building repairs and remodeling.

Brief description of structure

The building serves as the residence for the Chancellor of UCSF. The building is L-shaped in plan and is on a sloping site. The upper floor contains the living room, dining room, kitchen and guest room. The lower floor has bedrooms, a study and bathrooms. There is an unfinished crawl space under the bedrooms. The building siding is wood shingles.

Identification of Levels: The building has a partial basement crawl space below two levels of living space. Walls in the crawl space are shown on the Lower Level Framing Plan of the existing drawings. The two stories of living space are identified on the existing drawings as Lower Level and Upper Level. In the calculations the floor above the crawl space is listed as Level 1, the Lower Level is listed as Level 2, and the Upper Level is listed as Level 3. The site slopes to the west up to 30°.

Foundation system: The building is founded on continuous wall footings. The existing drawings call for the footings to extend a minimum of 3 inches below bedrock. Where bedrock is less than 1'-6" below grade, the existing drawings call for #6 adhesive dowels anchored into the existing bedrock.

Structural system for vertical (gravity) load: The gravity framing system at the roof consists of plywood on pitched 2-2x8 rafters, spanning to exterior walls and an interior ridge beam and posts. The upper floor ceilings are supported by glulam beams spanning between the exterior walls. The upper and lower floors are typically framed with 2x12 joists spanning to bearing walls.

Structural system for lateral forces: There is a blocked plywood diaphragm at the roof, upper floor, and lower floor with 8d @ 6" on center edge nailing and 8d @ 12" on center field nailing. The vertical component of the lateral force-resisting system is the plywood shear walls. The existing drawings call for 6" edge nailing and connections through to the structure below. The drawings do not show holdowns between floors, and no holdowns were observed in the site visit.

Building Code: The building drawings are dated 1 December 1964. It is presumed the building was designed per the 1961 UBC.

Building Condition: Good. The building appears to be well maintained. There was some minor rusting on the nuts of shear wall anchor bolts, and water staining of wood in the crawl space was observed. Repairs to decks, stairs, and retaining walls were made in 2016.

Building response in 1989 Loma Prieta Earthquake: The report titled "Performance of UCSF Buildings During the October 17, 1989 Loma Prieta Earthquake" dated 2019-11-17 by Impell Corporation states "This is a two-story wood framed structure. The areas inspected include the exterior and the interior. Minor hairline cracks were observed in the foundation. No other structural or architectural damage was observed, and the house was determined safe for occupancy."

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

- There are no holdowns at the shear walls. The distribution of walls and total length of wall will help to reduce the overturning forces. However, local shear wall damage is expected at the ends of some shear walls. Such damage is not expected to pose a significant safety concern.
- The building is located on a hillside. There is a substantial amount of wall in the longitudinal direction at the crawl space level. There are some wall piers at the lower level with aspect ratios greater than 1:1 with a maximum width-to-height ratio of 1.3:1. The amount of wall on this level and relatively low stresses will limit the potential for adverse effects from the sloping site.

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		

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

There is stone facing on the fireplace.

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

[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.

Basis of Seismic Performance Level Rating

The subject building benefits from being lightweight conventional wood-framed construction. The wood shear walls are well-distributed throughout the building plan. Based on the historic performance of similar buildings, the risk to life safety is judged to be low. The building performance would be improved by holdowns for the shear walls, however, based on the anticipated seismic demands, the elements are judged to be adequate to protect against collapse and thus a rating of IV was assigned.

Recommendations for further evaluation or retrofit

None recommended.

Peer review comments on rating

The structural members of the UCSF Seismic Review Committee (SRC) reviewed the evaluation on October 10, 2019 and are unanimous that the seismic performance level is IV.

Additional building data	Entry	Notes
Latitude	37.76177	
Longitude	-122.45912	
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	1	
Building occupiable area (OGSF)	6,683	
Risk Category per 2016 CBC 1604.5	II	
Building structural height, h_n	27.5	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	0.240	Per ASCE 41-17 equation 4-4
Site data		
975 yr hazard parameters S_s, S_1	1.553, 0.612	UCSF Group 3 Buildings – Tier 1 Geotechnical Assessment, Egan (2019)
Site class	C	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	1.200,1.400	
Ground motion parameters S_{cs}, S_{c1}	1.840, 0.846	
S_a at building period	1.840	
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: 1966 Code:	
Applicable code for partial retrofit		
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

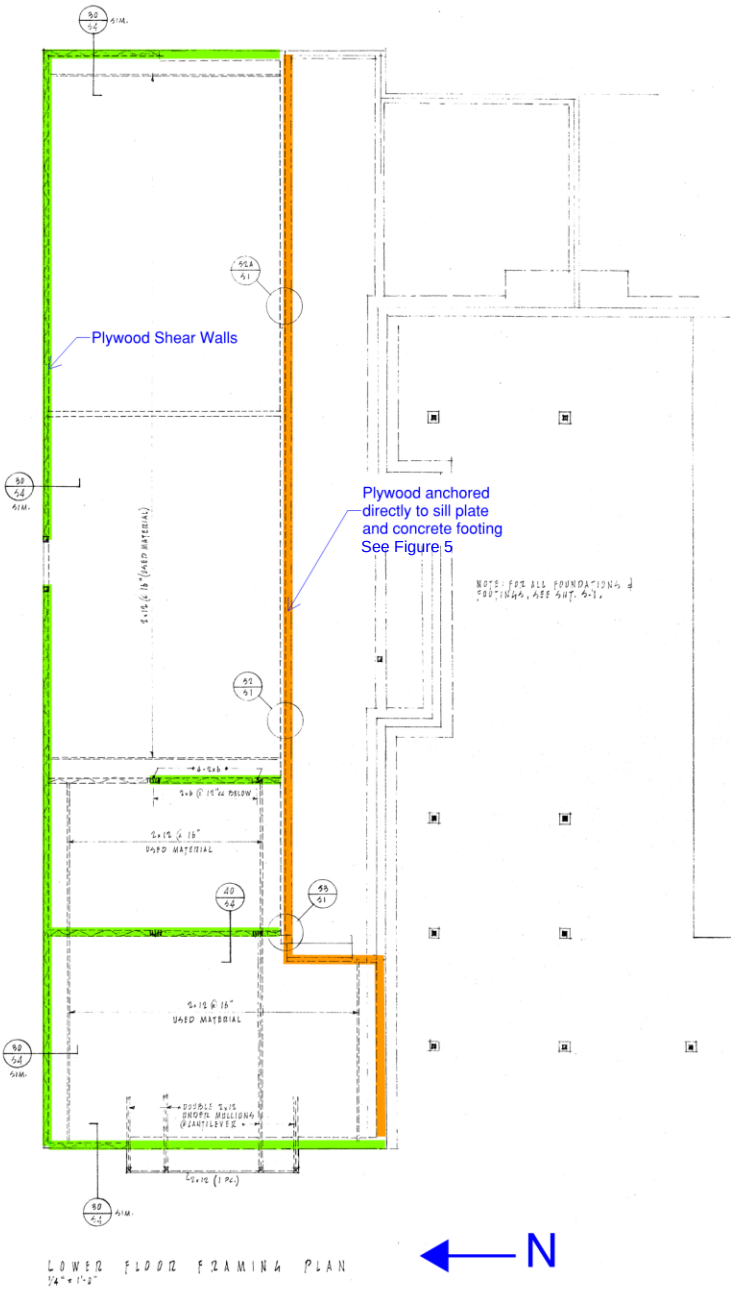

Figure 1 - Lower Floor Framing Plan

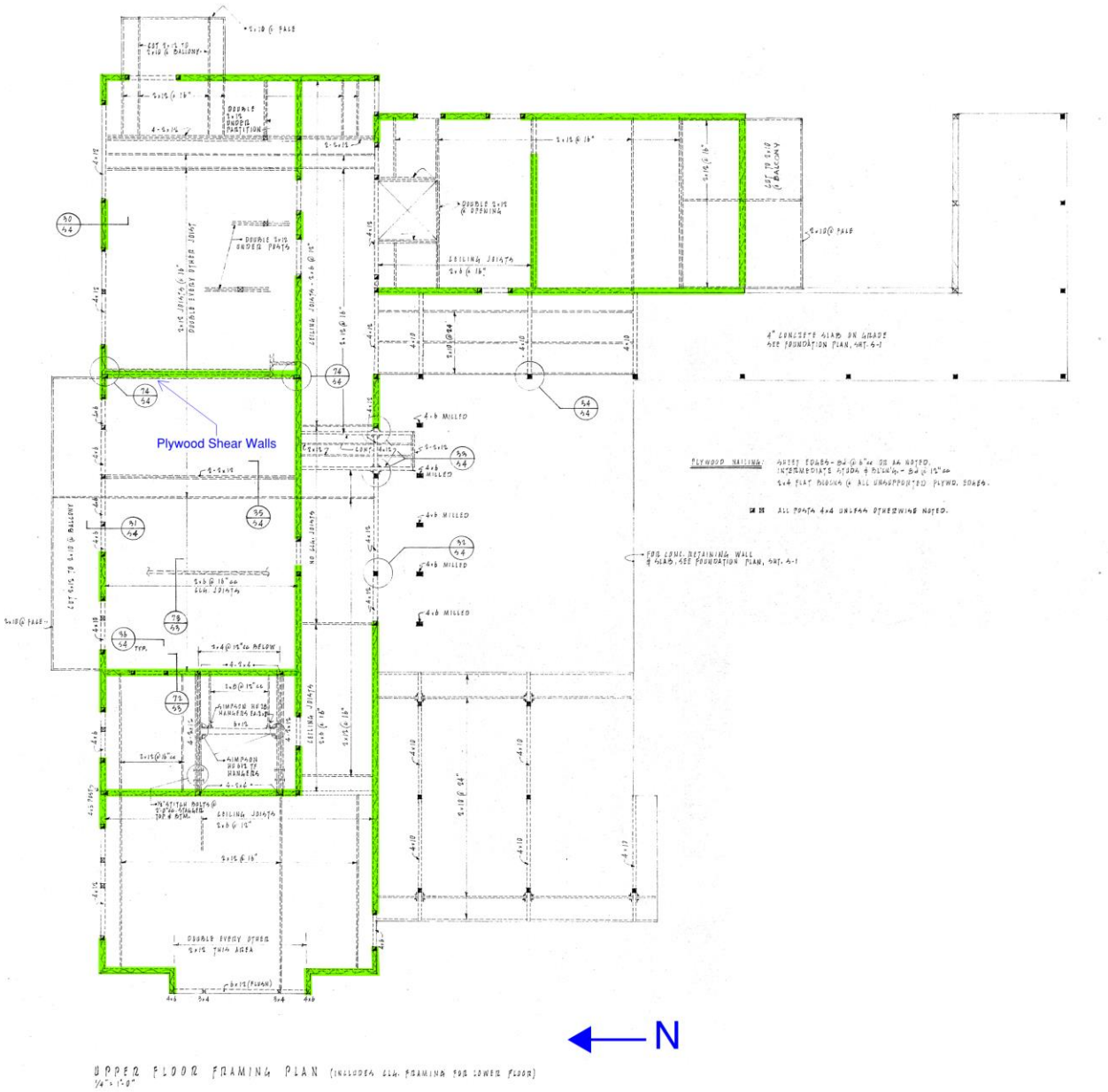

Figure 2 - Upper Floor Framing Plan

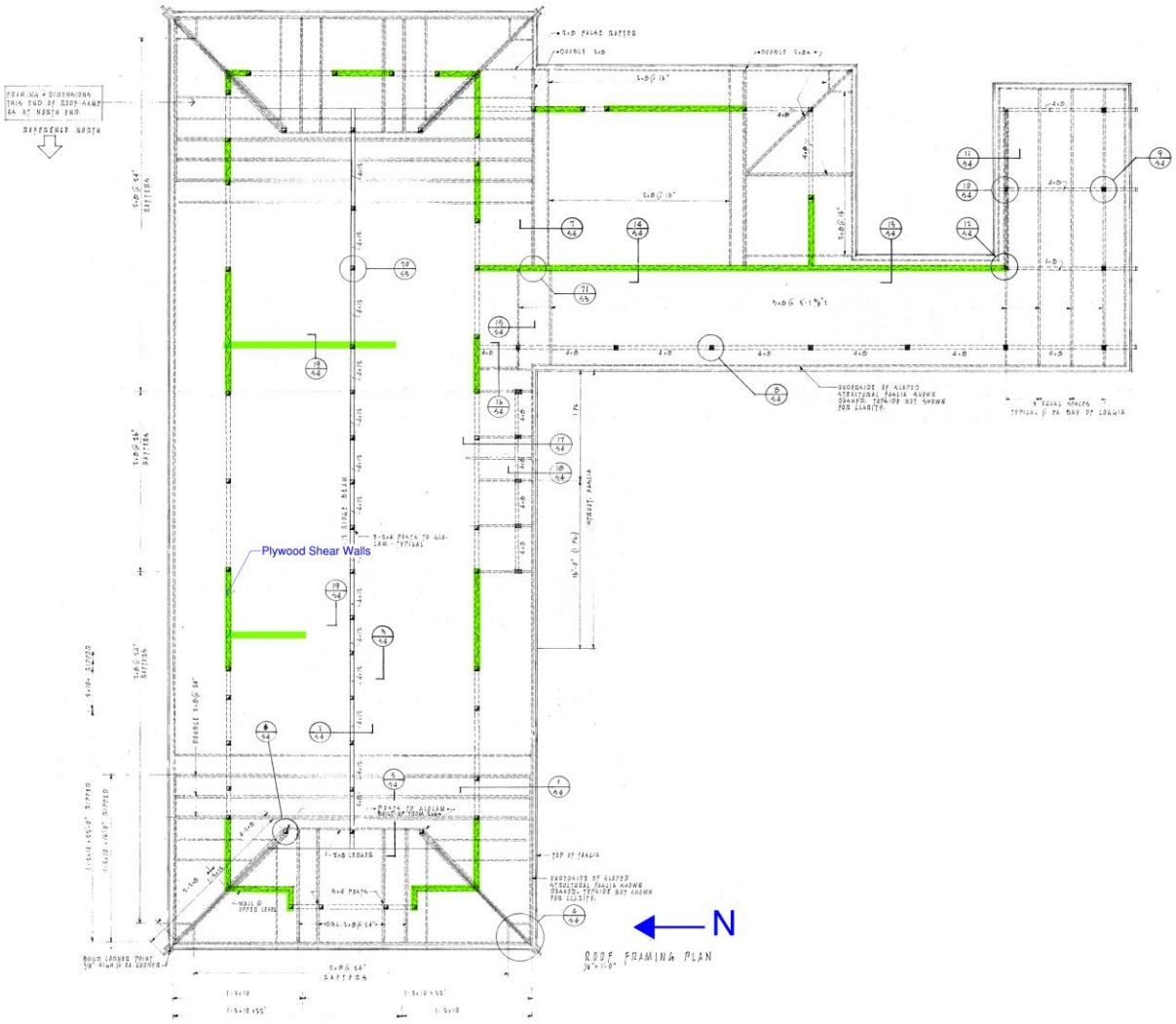

Figure 3 - Roof Framing Plan

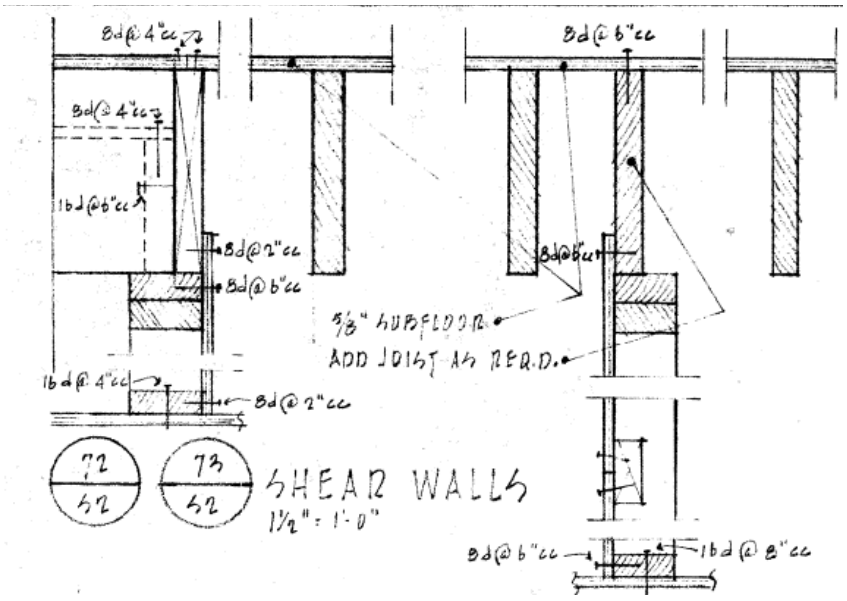

Figure 4 - Typical Shear Wall Details

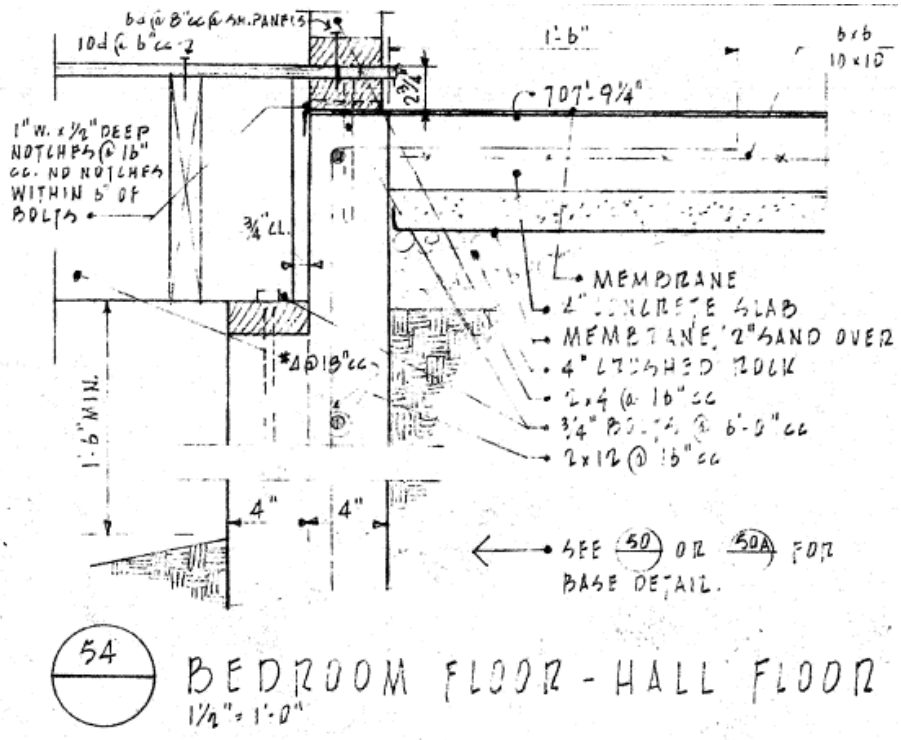

Figure 5 - Lower Floor Anchorage to Foundation at South Wall

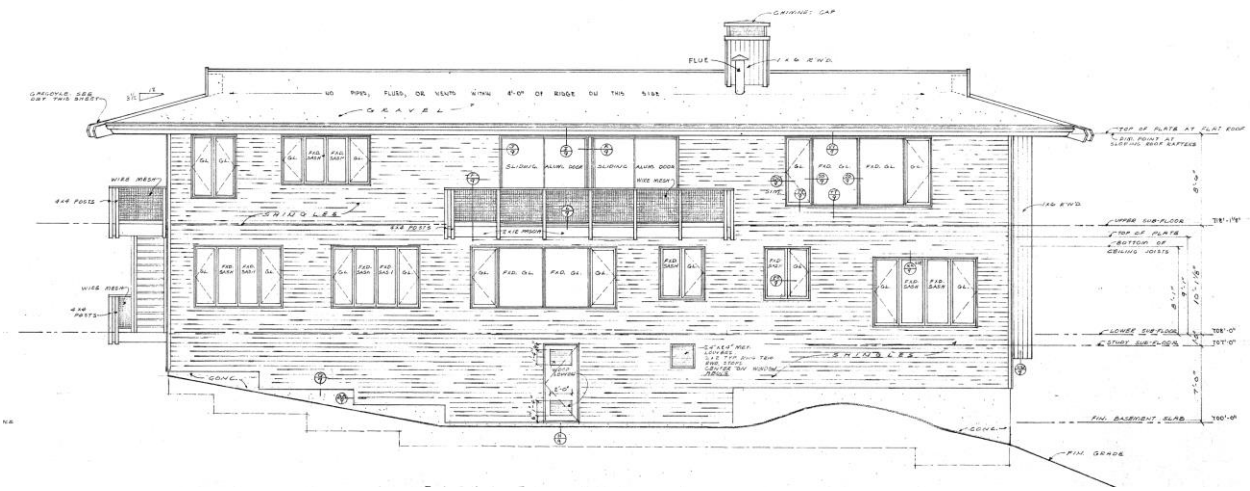

Figure 6 - North Elevation (Downhill Elevation)

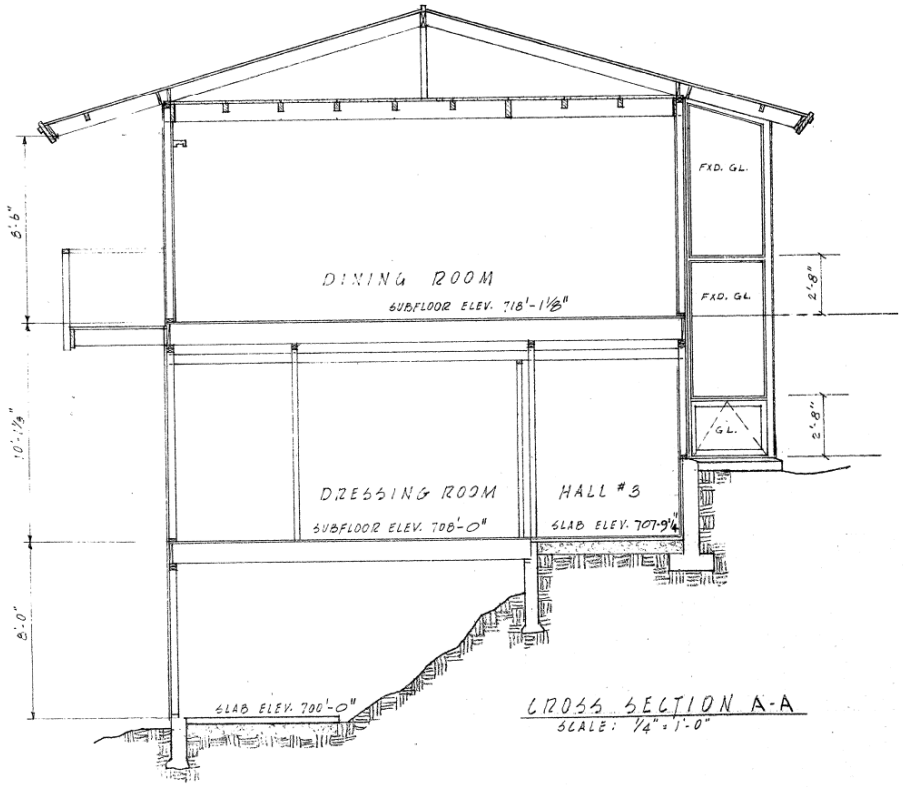

Figure 7 - Building Cross Section

Figure 8 - Plywood Grade Stamp in Crawl Space

Figure 9 - Braced Water Heater

Figure 10 - Crawl Space Anchor Bolts, Plywood Sheathing

Figure 11 - North Building Elevation (Looking South)

Appendix B

ASCE 41- 17 Tier 1 Checklists (Structural)

UC Campus:	UCSF Parnassus			Date:	November 5, 2019		
Building CAAN:	2407	Auxiliary CAAN:		By Firm:	Estructure		
Building Name:	University House			Initials:	*ARK*	Checked:	*MTP*
Building Address:	66 Johnstone Drive, San Francisco, CA 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:**

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:**

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:**

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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:** Base = 24.25 feet / Height = 27 feet = 0.9 < 0.6 Sa = 0.6 * 1.84 = 1.1 Overturning check based on minimum dimension from end of leg of the building. Overturning will be resisted by positive anchorage of foundation into bedrock and distribution of wall at long leg of L in the transverse direction at the west side of the building.
◉	○	○	○	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:**

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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:** See attached structural calculations.
○	○	◉	○	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:**

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:** Walls are connected to transfer shear forces, however there are no holdowns. The total length of wall and distribution of walls will reduce overturning forces.
○	◉	○	○	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 downhill elevation has wall piers at the lower level with an aspect ratio of 1.3:1. The crawl space below has significant wall length to resist any adverse effects from the sloping site.
◉	○	○	○	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

C	NC	N/A	U	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:** Wood sills are anchored at 4' on center. This is shown on the drawings and was verified in the field.
◉	○	○	○	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:**

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

Appendix C

UCOP Seismic Safety policy Falling Hazards Assessment Summary

UC Campus:	**UCSF Parnassus**			Date:	**October 3, 2019**		
Building CAAN:	**2407**	Auxiliary CAAN:		By Firm:	**Estructure**		
Building Name:	**University House**			Initials:	***ARK***	Checked:	***MTP***
Building Address:	**66 Johnstone Drive, San Francisco, CA 94131**			Page:	**1**	of	**1**

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:** There is a stone faced fireplace between the living and dining room.
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

Dead loads & Seismic Weight Calculation				
Roof Level				
Roofing		3	*psf*	*Shingles*
Insulation		1	*psf*	*R-30 Batt Insulation*
Sheathing		1.5	*psf*	*1/2" Plywood*
Roof Framing		1.5	*psf*	*2x8 @ 24" typical*
CeilingFraming		4	*psf*	*5.25x11.25 Glulams @ 48" o.c.*
MEP		0.5	*psf*	
Misc		0.5	*psf*	
Walls		5	*psf*	
Total	$\sum$	**17**	**psf**	
Area	A_{roof}	4600	ft^2	
Seismic Weight	W_{R4}	**78**	**kips**	

Upper Floor Level				
Flooring		4	*psf*	*Hardwood Flooring*
Insulation		0.5	*psf*	*R-11 Acoustical Insulation*
Sheathing		1.8	*psf*	*5/8" Plywood*
Wood Framing		3	*psf*	*2x12 @ 16" o.c.*
Ceilings		2.6	*psf*	*5/8" Gyp Board*
MEP		0.5	*psf*	
Misc		0.5	*psf*	
Walls		*10*	*psf*	
Total	$\sum$	**23**	**psf**	
Area	A_3	2640	ft^2	
Seismic Weight	W_{typ}	**60**	**kips**	

Lower Floor Level				
Flooring		4	*psf*	*Hardwood Floor*
Insulation		0.5	*psf*	*R-11 Acoustical Insulation*
Sheathing		1.8	*psf*	*5/8" Plywood*
Wood Framing		3	*psf*	*2x12 @ 16" o.c.*
Ceilings		2.6	*psf*	*5/8" Gyp Board*
MEP		0.5	*psf*	
Misc		0.5	*psf*	
Walls		*10*	*psf*	
Subtotal	$\sum$	**23**	**psf**	
Area	A_{2f}	1900	ft^2	
Seismic Weight	W_{typ}	**44**	**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	27.5 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*		0.240 sec	

Calculate Base Shear				
Spectral Acceleration	$S_a = S_{X1} / T$ =	3.52		*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 =	**335 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	78	27.5	2151	0.60	201	201
3rd	60	18	1088	0.30	102	303
2nd	44	8	348	0.10	33	335
1st		0	0	0.00	0	335
∑	*182*	∑	*3587*	*1.00*	*335*	

Longitudinal 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)	D/C Ratio	Pass? (Y/N)
3	201	82.5	4.5	541	1000	0.54	Y
2 (South)	87	28	4.5	691	1000	0.69	Y
2 (North)	216	122	4.5	393	1000	0.39	Y
1 (North)	241	152	4.5	353	1000	0.35	Y

Transverse 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)	Pass? (Y/N)
3	201	95	4.5	470	1000	0.47	Y
2 (South)	87	57	4.5	340	1001	0.34	Y
2 (North)	216	81	4.5	591	1000	0.59	Y
1 (North)	241	66	4.5	812	1000	0.81	Y

Note: Due to the sloping site the north portion of the building is over the crawl space and the south portion of the building lands on grade at the lower level. For this quick check calculation, seismic forces are distributed seperately at Level 2 and 1 (lower level and crawl space) based on area.