Degenkolb

Rating form completed by
Heavenz Kaur, Holly Razzano

Text in green is to be part of UC Santa Cruz building database and may be part of UCOP database

DATE: 2019-06-30

REGISTERED PROFESSIONAL ENGINEER
HOLLY J RAZZANO
No. 4107
EXP. 3/31/21
STRUCTURAL
STATE OF CALIFORNIA

6/28/19

UC Santa Cruz building seismic ratings

Stevenson College House 5

CAAN #7139
541 Stevenson Service Road, Santa Cruz, CA 95604, United States
UCSC Campus: Main Campus

Rating summary	Entry	Notes
UC Seismic Performance Level (rating)	IV (Fair)	
Rating basis	Tier 1	ASCE 41-17[1]
Date of rating	2019	
Recommended UC Santa Cruz priority category for retrofit	None	Priority A=Retrofit ASAP Priority B=Retrofit at next permit application
Ballpark total construction cost to retrofit to IV rating[2]	None	See recommendations on further evaluation and retrofit.
Is 2018-2019 rating required by UCOP?	Yes	Building was not previously rated
Further evaluation recommended?	No	None

[1] We translate this Tier 1 evaluation to a Seismic Performance Level rating using professional judgment. Noncompliant items in the Tier 1 evaluation do not automatically put a building into a particular rating category, but we evaluate such items 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. See Section III B of the UC Seismic Policy and Method B of Section 321 of the 2016 California Existing Building Code.

[2] Per Section 3.A.4.i of the Seismic Program Guidebook, the cost includes all construction cost necessitated by the seismic retrofit, including restoration of finishes and any triggered work on utilities or accessibility. It does not include soft costs such as design fees or campus costs. The cost is in 2019 dollars.

Building information used in this evaluation

- Architectural drawings for Residential College No. 2 by Joseph Esherick and Associate Architects and structural drawings by Rutherford and Chekene dated, January 25, 1965.
- University of California building database information, "Stevenson College," provided by Jose Sanchez (UCSC).

Additional building information known to exist

None

Scope for completing this form

Reviewed structural drawings for original construction and carried out ASCE 41-17 Tier 1 evaluation. We made a site visit on June 5th, 2019. We looked for potentially hazardous nonstructural components during the site visit. No nonstructural hazards were identified.

Brief description of structure

Stevenson House 5 is one of a group of four similar residence halls on campus, Steven House 5- Stevenson House 7. The buildings are located on a sloped site and the lowest level has crawl spaces beneath as the grade slopes down.

Identification of levels: Level 1, Level 2, Level 3, Roof

Foundation system: Shallow continuous wall footings under bearing walls and shear walls forms the foundation system of the building. 4" thick slab on grade occurs at certain usable areas of the crawl space.

Structural system for vertical (gravity) load: 2x12 wood joists at 16" on center span between wood walls at the all three levels including roof. The floors are sheathed with 1 1/8" thick plywood sheathing. The roof is sloped around the perimeter of the building with a flat portion in the central part. The sloped roof has 3" T&G decking overlaid with 3/8" plywood and the central part has 3/8" thick plywood overlaid on 2x framing. Some walls at the third level are discontinuous and are supported by 2x12 joists at 12" on center.

Structural system for lateral forces: Plywood shear walls form the lateral system of the building with 2x4 studs spaced at 16" on center and sheathed with 3/8" plywood. Discontinuous shear walls at the third level have supporting posts or beam at the ends to resist overturning loads generated during a lateral event.

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

1. Discontinuous shear walls occur at Level 3 and some on Level 2. These walls are supported by closely spaced joists and posts but their adequacy for shear wall over turning loads should be verified with Tier 2 checks.

2. Holdowns have been indicated in very limited locations on plans. Lack of holdowns in other locations (at shear wall boundaries) may cause the walls to rock and uplift in case of a seismic event, this should be verified by Tier 2 analysis.

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	Y	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.[3]

None observed

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	N	Unrestrained hazardous materials storage	N
Heavy masonry or stone veneer above exit ways and public access areas	N	Masonry chimneys	N
Unbraced masonry parapets, cornices or other ornamentation above exit ways and public access areas	N	Unrestrained natural gas-fueled equipment such as water heaters, boilers, emergency generators, etc.	N

Discussion of rating

Discontinuous shear walls at level 3 are supported by a post on one end and a perpendicular wall on the other end providing a load path for overturning loads. Presence of holdowns only at one wall in the entire building, seems unusual, but lack of holdowns does not create a significant disruption in load path as most walls are connected to perpendicular walls and in order for a wall to rock (or uplift at one end), a network of walls will have to engage in uplift, which seems unlikely.

Recommendations for further evaluation or retrofit

It is recommended to investigate some of the wall boundary connections at the foundations to confirm the absence of holdowns as shown on the drawings before proceeding with a Tier 2 analysis, that may provide a better rating for the building.

Peer review of rating

The key issues and expected seismic performance of this building are essentially the same as that for building 7135. The peer review of that building, carried out 17 June 2019, applies to this building; reviewers present were Bret Lizundia of Rutherford and Chekene and Joe Maffei of Maffei Structural Engineering.

Additional building data	Entry	Notes
Latitude	36.996494	
Longitude	-122.051488	
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	1	
Building occupiable area (OGSF)	13105 sq ft	

[3] 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.

Risk Category per 2016 CBC Table 1604.5	II	
Building structural height, h_n	28 ft.	Structural height defined per ASCE 7-16 Section 11.2
Coefficient for period, C_t	0.02	Estimated using ASCE 41-17 equation 4-4 and 7-18
Coefficient for period, β	0.75	Estimated using ASCE 41-17 equation 4-4 and 7-18
Estimated fundamental period	0.25 sec	Estimated using ASCE 41-17 equation 4-4 and 7-18
Site data		
975 yr hazard parameters S_s, S_1	1.289, 0.489	
Site class	D	
Site class basis	Geotech[4]	See footnote below
Site parameters F_a, F_v	1.2, 1.811	
Ground motion parameters S_{ds}, S_{d1}	1.546, 0.885	
S_a at building period	1.547	
Site V_{s30}	900 ft/s	
V_{s30} basis	Estimated	Estimated based on site classification of D
Liquefaction potential	Low	
Liquefaction assessment basis	County Map	See footnote below
Landslide potential	Low	
Landslide assessment basis	County map	See footnote below
Active fault-rupture identified at site?	No	
Fault rupture assessment basis	County map	See footnote below
Site-specific ground motion study?	No	
Applicable code		
Applicable code or approx. date of original construction	Built: 1966 Code: 1964 UBC	
Applicable code for partial retrofit	None	
Applicable code for full retrofit	None	
Model building data		
Model building type North-South	Wood,W1a - Wood Light Frame (Multi-Story, Multi-Unit, Residential)	
Model building type East-West	Wood,W1a - Wood Light Frame (Multi-Story, Multi-Unit, Residential)	
FEMA P-154 score	N/A	Not included here because we performed ASCE 41 Tier 1 evaluation.

[4] Determination of site class and assessment of geotechnical hazards are based on correspondence with Pacific Crest Geotechnical Engineers and Nolan, Zinn, and Associates Geologists. [*Revised Geology and Geologic Hazards, Santa Cruz Campus, University of California*, Job # 04003-SC 13 May 2005]. Site class is taken as D throughout the main campus of UC Santa Cruz. The following links provide hazard maps for liquefaction, landslide, and fault rupture:
https://gis.santacruzcounty.us/mapgallery/Emergency%20Management/Hazard%20Mitigation/LiquifactionMap2009.pdf
https://gis.santacruzcounty.us/mapgallery/Emergency%20Management/Hazard%20Mitigation/LandslideMap2009.pdf
https://gis.santacruzcounty.us/mapgallery/Emergency%20Management/Hazard%20Mitigation/FaultZoneMap2009.pdf

Previous ratings		
Most recent rating	Unknown	
Date of most recent rating	Unknown	
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 in Appendix A.

University of California, Santa Cruz
ASCE 41-17 Tier 1 Seismic Evaluation
7139 - Stevenson College House 5

Appendix A
ASCE 41-17 Checklists

UC Campus:	Santa Cruz			Date:	6/11/2019		
Building CAAN:	7135-7141	Auxiliary CAAN:		By Firm:	Degenkolb Engineers		
Building Name:	Stevenson College House 1-7			Initials:	*HK*	Checked:	
Building Address:	Stevenson Service Road, Santa Cruz, CA 95064			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:**

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

UC Campus:	Santa Cruz			Date:	6/11/2019		
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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: Discontinuous shear walls are present at Levels 2 and 3. Closer spaced joists, posts and perpendicular walls support these discontinuous walls at various locations, but Tier 2 analysis should be performed to verify the adequacy of these supporting elements.**
◉	○	○	○	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:**

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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:**

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:50/48=1.04>0.6*1.5470.92 (OK)**
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:** Site class C and slab on grade ties together spread footings.

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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:**
●	○	○	○	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:**

UC Campus:	Santa Cruz			Date:	6/11/2019		
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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: Holdowns are not provided at wall boundaries for interconnection between floors or at the foundations. Tier 2 analysis is recommended to investigate the rocking behavior of walls in absence of holdowns.**
◉	○	○	○	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:**
◉	○	○	○	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:**
◉	○	○	○	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:**

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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:**

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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: Generator in the plant was well anchored to the mechanical pad on the slab on grade.**
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

University of California, Santa Cruz
ASCE 41-17 Tier 1 Seismic Evaluation
7139 - Stevenson College House 5

Appendix B
Quick Check Calculations

Degenkolb

Subject:	Global Data	**Job Number:**	B9956006.00	**Date:**	06/11/19
Job:	UCSC Tier 1 Seismic Evaluations	**By:**	HK	**Section:**	
		Checked By:		**Page**	

GLOBAL DATA

ASCE 41-17 SEISMIC EVALUATION & RETROFIT OF EXISTING BUILDINGS
CHAPTER 4 - TIER 1 EVALUATION
LINEAR STATIC PROCEDURE
COLLAPSE PREVENTION
BSE-2E HAZARD LEVEL

SITE DATA:

Latitude:		36.99693	°N	532 Stevenson Service Road	*USGS Seismic Design Map Application:*	
Longitude:		122.05190	°W	Santa Cruz, CA 95064	*http://geohazards.usgs.gov/hazardtool/application.php*	
Site Class:		D (default)		(Stiff Soil)	Site Class	[ASCE 41-17, §2.4.1.6]
S_S	=	1.289	g	(USGS) (5% / 50 years)	USGS Mapped (T = 0.2 sec)	[ASCE 41-17, §2.4.1.3]
S_1	=	0.489	g	(USGS) (5% / 50 years)	USGS Mapped (T = 1.0 sec)	[ASCE 41-17, §2.4.1.3]
F_a	=	1.200		(Site Class D)	Site Coefficient (T = 0.2 sec)	[ASCE 7-16, Table 11.4-1]
F_v	=	1.811		(Site Class D)	Site Coefficient (T = 1.0 sec)	[ASCE 7-16, Table 11.4-2]
S_{XS}	=	1.547	g	= F_a S_S	Site-Adjusted Design (T = 0.2 sec)	[ASCE 41-17, Eq. 2-1]
S_{X1}	=	0.886	g	= F_v S_1	Site-Adjusted Design (T = 1.0 sec)	[ASCE 41-17, Eq. 2-2]

BUILDING DATA:

Building Type:	W1A		(Multi-Story, Multi-Unit Residential Wood Frames)	[ASCE 41-17, Table 3-1]
Year Built:	1965			
Number of Stories:	3	stories		
Parapet Height:	0.00	ft		
Roof Height:	29.84	ft		
Total Area:	11,250	sf		

Level	Height [ft]	Elevation [ft]	$Length_{N-S}$ [ft]	$Length_{E-W}$ [ft]	Area [sf]	Diaphragm Stiffness	Diaphragm Description
Roof	11.5	29.8	50	75	3,750	Flexible	Plywood Sheathing
3rd	9.2	18.3	50	75	3,750	Flexible	Plywood Sheathing
2nd	9.2	9.2	50	75	3,750	Flexible	Plywood Sheathing
1st	0.0	0.0	50	75	3,750	-	-

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Subject:	Weight Take Off	**Job Number:**	B9956006.00	**Date:**	06/11/19
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WEIGHT TAKEOFF

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CHAPTER 4 - TIER 1 EVALUATION
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BSE-2E HAZARD LEVEL

ROOF TYPE: ROOF

	Shingles	(Asphalt)	@	2.0	psf	2.0 psf	y
	Waterproofing Membranes	(Smooth Bituminous)	@	1.5	psf	1.5 psf	y
	Roof Insulation		@	1.0	psf	1.0 psf	y
1 in	Plywood		@	3.2	psf per inch	3.2 psf	y
1.33 ft O.C.	Wood Purlins		@	3.0	plf	2.3 psf	y
	Ceiling		@	5.0	psf	5.0 psf	y
100% floor area	Interior Partitions	(Below)	@	5.0	psf	5.0 psf	y
	M.E.P.		@	5.0	psf	5.0 psf	y
	Miscellaneous		@	1.0	psf	1.0 psf	y
					ROOF WEIGHT =	**34.0 psf**	

FLOOR TYPE: FLR-3

0.75 in	Wood Flooring	(Hardwood)	@	4.6	psf per inch	3.4 psf	y
	Floor Insulation		@	1.0	psf	1.0 psf	y
1 in	Plywood		@	3.2	psf per inch	3.2 psf	y
1.33 ft O.C.	Wood Purlins		@	3.0	plf	2.3 psf	y
	Ceiling		@	5.0	psf	5.0 psf	y
100% floor area	Interior Partitions	(Above & Below)	@	10.0	psf	10.0 psf	y
	M.E.P.		@	5.0	psf	5.0 psf	y
					FLR-3 WEIGHT =	**29.9 psf**	

FLOOR TYPE: FLR-2

0.75 in	Wood Flooring	(Hardwood)	@	4.6	psf per inch	3.4 psf	y
	Floor Insulation		@	1.0	psf	1.0 psf	y
1 in	Plywood		@	3.2	psf per inch	3.2 psf	y
1.33 ft O.C.	Wood Purlins		@	3.0	plf	2.3 psf	y
	Ceiling		@	5.0	psf	5.0 psf	y
100% floor area	Interior Partitions	(Above & Below)	@	10.0	psf	10.0 psf	y
	M.E.P.		@	5.0	psf	5.0 psf	y
					FLR-2 WEIGHT =	**29.9 psf**	

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WEIGHT TAKEOFF

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BSE-2E HAZARD LEVEL

WALL TYPE: WALL-P

1	in	Exterior Stucco		@	11.4 psf per inch.	11.4 psf	y
		Wall Insulation		@	1.0 psf	1.0 psf	y
0.5	in	Plywood		@	3.2 psf per inch	1.6 psf	y
16	in O.C.	Wood Studs	(2 x 4)	@	1.1 plf	0.9 psf	y
		Miscellaneous		@	1.1 psf	1.1 psf	y

Solid Wall Weight = 16.0 psf
Window & Door Weight = 8.0 psf
% Solid Wall = 100%
WALL-P WEIGHT = 16.0 psf

WALL TYPE: WALL-R

1	in	Exterior Stucco		@	11.4 psf per inch.	11.4 psf	y
		Wall Insulation		@	1.0 psf	1.0 psf	y
0.5	in	Plywood		@	3.2 psf per inch	1.6 psf	y
16	in O.C.	Wood Studs	(2 x 4)	@	1.1 plf	0.9 psf	y
		Miscellaneous		@	1.1 psf	1.1 psf	y

Solid Wall Weight = 16.0 psf
Window & Door Weight = 8.0 psf
% Solid Wall = 100%
WALL-R WEIGHT = 16.0 psf

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Subject:	Seismic Mass	**Job Number:**	B9956006.00	**Date:**	06/11/19
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SEISMIC MASS

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BSE-2E HAZARD LEVEL

ROOF/FLOOR WEIGHT SUMMARY:

Level Type	Weight [psf]
ROOF	34
FLR-3	29.88891
FLR-2	29.88891

WALL WEIGHT SUMMARY:

Wall Type	Weight [psf]		
	Net	Solid	Openings
WALL-P	16.0	16	8
WALL-R	16	16	8
WALL-3	16	16	8
WALL-2	16	16	8

SEISMIC MASS SUMMARY:

Level	FLOOR			WALL ABOVE				WALL BELOW				TOTAL
	Level Type	Weight [psf]	Area [sf]	Wall Type	Weight [psf]	Length [ft]	Height [ft]	Wall Type	Weight [psf]	Length [ft]	Height [ft]	WEIGHT [kips]
Roof	ROOF	34	3,750	WALL-P	16.0	0	0.00	WALL-P	16.0	0	5.75	128
3rd	FLR-3	29.88891	3,750	WALL-P	16.0	250	5.75	WALL-P	16.0	250	4.59	153
2nd	FLR-2	29.88891	3,750	WALL-P	16.0	250	4.59	WALL-P	16.0	250	4.59	149
											TOTAL	430

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Subject:	Seismic Forces	**Job Number:**	B9956006.00	**Date:**	06/11/19
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SEISMIC FORCES

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BSE-2E HAZARD LEVEL

BUILDING TYPE: W1A (Multi-Story, Multi-Unit Residential Wood Frames) [ASCE 41-17, Table 3-1]
SITE CLASS: D (default) #N/A [ASCE 41-17, §2.4.1.6]

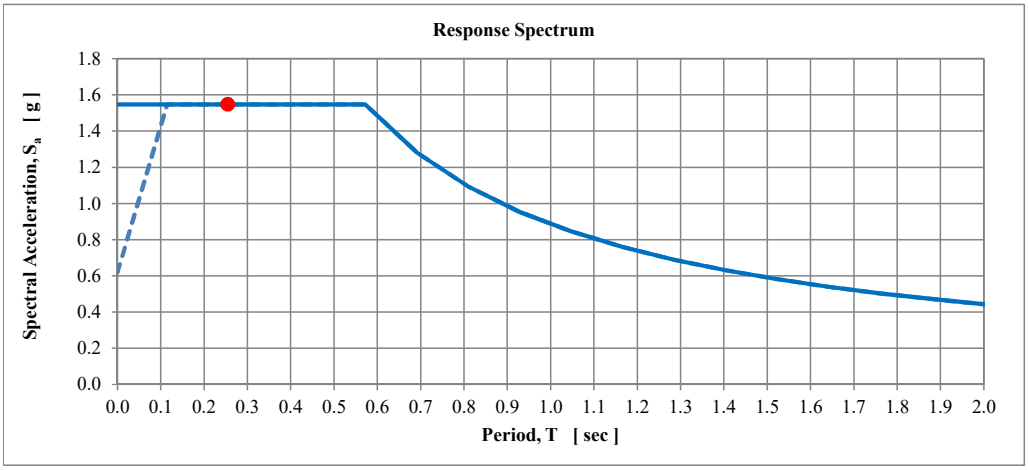
DESIGN SPECTRAL ACCELERATIONS:

S_{XS}	=	1.547 g	(BSE-2E)	Site-Adjusted Design (T = 0.2 sec)	[ASCE 41-17, Eq. 2-1]
S_{X1}	=	0.886 g	(BSE-2E)	Site-Adjusted Design (T = 1.0 sec)	[ASCE 41-17, Eq. 2-2]

BUILDING PERIOD:

h_n	=	29.8 ft	(Base to Roof)	Building Height	[ASCE 41-17, §4.4.2.4]
C_t	=	0.020	(Building Type W1A)	Period Coefficient	[ASCE 41-17, §4.4.2.4]
β	=	0.750	(Building Type W1A)	Period Exponent	[ASCE 41-17, §4.4.2.4]
T	=	0.255 sec	$= C_t h_n^{\beta}$	Fundamental Period	[ASCE 41-17, Eq. 4-4]

RESPONSE SPECTRUM:



PSEUDO LATERAL FORCE:

n	=	3	(n = 3)	Total Number of Stories	
C	=	1.0	(Building Type W1A)	Modification Factor	[ASCE 41-17, Table 4-7]
S_a	=	1.547 g	$= MIN \{ S_{X1} / T , S_{XS} \}$	Spectral Acceleration	[ASCE 41-17, Eq. 4-3]
V	**=**	**1.547 W**	$= C S_a W$	Pseudo Lateral Force	[ASCE 41-17, Eq. 4-1]

VERTICAL DISTRIBUTION OF SEISMIC FORCES:

k = 1.00 (T ≤ 0.5 sec) Seismic Distribution Exponent [ASCE 41-17, §4.4.2.2]

$F_x = C_{vx} V = [w_x h_x^{k} / \Sigma (w_x h_x^{k})] V$ [ASCE 41-17, Eq. 4-2a]

$V_j = \Sigma F_x$ [ASCE 41-17, Eq. 4-2b]

Level	h_x [ft]	w_x [kips]	$w_x h_x^{k}$	C_{vx}	F_x [kips]	V_j [kips]
Roof	29.8	128	3,805	0.48	317	317
3rd	18.3	153	2,814	0.35	234	551
2nd	9.2	149	1,364	0.17	114	665
TOTAL	-	430	7,983	1.00	665	-

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Subject:	Quick Checks	**Job Number:**	B9956006.00	**Date:**	06/11/19
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QUICK CHECKS

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BSE-2E HAZARD LEVEL

BUILDING TYPE: W1A (Multi-Story, Multi-Unit Residential Wood Frames) [ASCE 41-17, Table 3-1]

AVERAGE SHEAR STRESS CHECK: [ASCE 41-17, §A.3.2.7.1]

v_n	=	1,000 plf	(Structural Panel Sheathing)	Shear Wall Capacity	[ASCE 41-17, §A.3.2.7.1]
M_s	=	4.5	COLLAPSE PREVENTION	System Modification Factor	[ASCE 41-17, Table 4-8]
$v_{j,\,avg}$	=	$(1 / M_s) (V_j / L_w)$		Average Shear Wall Stress	[ASCE 41-17, Eq. 4-8]
L_w	=	$L_{w,\,total} - L_{w,\,openings}$		Net Wall Length	[ASCE 41-17, §4.4.3.3]

North-South Direction:

Level	V_j [kips]	$L_{w,\,total}$ [ft]	$L_{w,\,openings}$ [ft]	L_w [ft]	$v_{j,\,avg}$ [plf]	DCR	Quick Check
Roof	317	260	78	182	387	0.39	OK
3rd	551	260	78	182	673	0.67	OK
2nd	665	260	78	182	812	0.81	OK

East-West Direction:

Level	V_j [kips]	$L_{w,\,total}$ [ft]	$L_{w,\,openings}$ [ft]	L_w [ft]	$v_{j,\,avg}$ [plf]	DCR	Quick Check
Roof	317	320	64	256	275	0.27	OK
3rd	551	230	46	184	666	0.67	OK
2nd	665	230	46	184	803	0.80	OK

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7139 - Stevenson College House 5

Appendix C
Photos and Details

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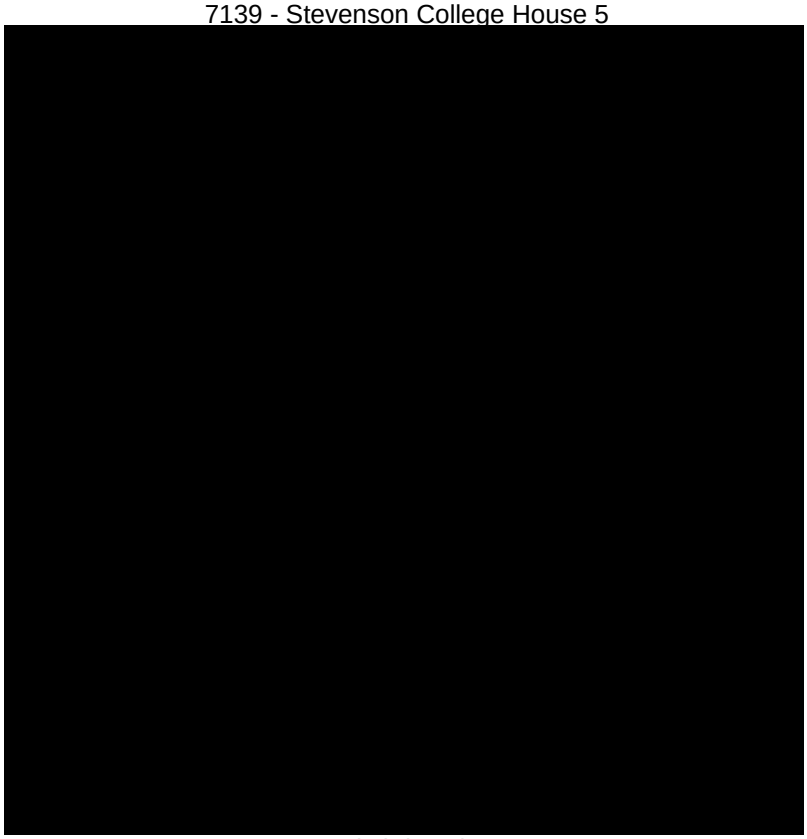

Typical Floor Plan

Typical plywood sheathing on building floors

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Framing in crawl spaced supported on perimeter retaining walls.

Stepped footing at crawl space