Rating form completed by:

RUTHERFORD + CHEKENE
ruthchek.com
Evaluator: EMG, BL, JM
Date: 06/25/19

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

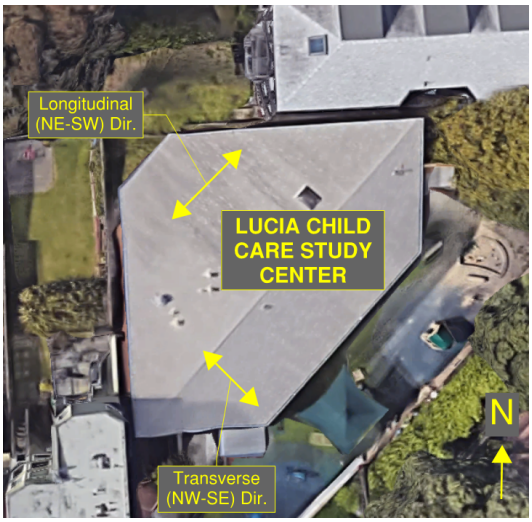
DATE: 2019-06-25

UCSF building seismic ratings

Marilyn Reed Lucia Child Care Study Center

CAAN #2416
610 Parnassus Ave, San Francisco, CA 94122
UCSF Campus: Parnassus Heights

Plan



South elevation (looking northeast)

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	None	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	Does not have a documented previous review
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 and structural drawings by Akol and Yoshii AIA Architects and Engineers, "Child Care Center University of California San Francisco, California U.C. Project No. 920000," as-builts dated 15 August 1977, architectural Sheets A1 to A13 and structural Sheets S1, S2, and S3.
- Architectural drawings by BurksToma Architects, "Lucia Child Care Center Renovation," permit submittal date 11 December 2009, as-built stamp dated 21 April 2011, Sheets A0.0, A0.1, A1.0, A2.0 to A2.4, A3.0, A5.0, A7.0 to A7.3, A8.0, A8.1.
- Structural calculations by Ingraham-DeJesse Associates Consulting Structural Engineers, "Lucia Child Care Center Renovation 610 Parnassus Avenue San Francisco California IDA Project No. 09074," dated 11 December 2009, Pages 1-13.

Additional building information known to exist

It is unclear if structural drawings were prepared for the 2011 renovation. UCSF does not have a record of them. Ingraham-DeJesse Structural Engineers is listed on the title block of the architectural drawings, but there is no listing of structural drawings in the sheet list. Structural work was performed as part of the addition, and structural calculations are available.

Scope for completing this form

The architectural and structural drawings for the original 1977 construction and the architectural drawings for the 2011 renovation were reviewed, and these drawings are used as the basis for the completed ASCE 41-17 Tier 1 evaluation. The structural calculations from 2009 pertain to a deck that was added at the building exterior and are not relevant to the Tier 1 assessment. A site visit was made on 12 June 2019 where the building exterior and portions of the interior were observed.

Brief description of structure

The Lucia Child Care Study Center is a one-story wood framed structure located on the corner of Parnassus Avenue and Third Avenue in San Francisco, California. It was constructed in 1977 and modified in 2011. The original building footprint is shaped like an elongated hexagon. In the longitudinal direction (NE-SW), it measures 72'-0" and in the transverse direction (NW-SE), it measures 32'-0". It has a gable framed roof with a ridge located slightly to the southeast of the building central axis, and the ridge is oriented in the longitudinal direction. The roof slope is 3.5V:12H. The Child Care Center is located on the side of a relatively steep hill. The exterior grade high point is located at Parnassus Avenue to the southeast of the structure. Grade slopes down towards the northwest and changes in elevation by a full story height. The southeast building elevation is one story tall, while the northwest side is two stories tall. An exterior slab-on-grade is located on the southeast side and forms a patio in the play yard for the Child Care Center. This slab is structurally connected to the building floor framing and can help transfer lateral load into the hillside at this elevation. In 2011, a renovation of the building interior was completed. At that time, a small addition was built on the northwest elevation of the structure. With the addition, the completed building footprint approximates a trapezoid in shape.

The structure contains one occupied floor which aligns with the exterior grade located on the high side of the hill. This level holds an activity area, crib area, staff lounge, offices, and a kitchen. The building is occupied by nine permanent staff and approximately 24 children under the age of three. A tall basement story is located below the occupied floor on the southeast side of the structure. An unfinished storage area and small mechanical room are located in the basement. The remaining portion of the basement is unexcavated.

Identification of levels: The building levels are designated as the basement floor (EL. 65.0 ft), first floor (EL. 74 ft), and the roof (EL. 87.83 ft at the high point and 81.12 ft at the low point). The site slopes from a high point located on the southeast elevation to a low point located at the northwest elevation.

Foundation system: The Child Care Center is supported by 18" diameter drilled piers that extend "a minimum of 8'-0" into the clayey sands" per the drawings. The piers are spaced at approximately 16'-0" o.c. in both directions, and they are reinforced with 6-#6 longitudinal bars tied with #3 spiral ties at a 6" pitch. The piers are connected together by sloped grade beams that are 16" wide by 2'-0" and 3'-0" deep. They are reinforced with 3-#8 longitudinal

bars at the top and bottom and #4 ties spaced at 18" o.c. The vertical pier reinforcing extends 1'-8" into the grade beams. The site observation revealed that the existing grade beams on the northwest elevation were partially chipped and exposed to view. It is presumed that this was completed when the building addition was constructed in 2011; however, this is unconfirmed as no documentation showing this structural modification is available.

Structural system for vertical (gravity) load: The roof is sheathed with ½" thick plywood that is supported by 2 x 12 joists spaced at 24" o.c. The joists span 16'-0" between the exterior wall and a 6 x 16 or 6 ¾" x 24 glulam ridge beam. The ridge beam spans between 6 x 6 posts, and the ridge beam length ranges from 16'-8" to 32'-8". The floor is framed with 5/8" plywood sheathing placed over 2 x 12 joists spaced at 16"o.c. The joists at the floor have similar spans to those at the roof. The exterior and interior walls are constructed from 2 x 6 studs spaced at 16" o.c.

Structural system for lateral forces: The lateral force-resisting system is comprised of plywood sheathed shear walls on the exterior and interior of the building. They are framed with ½" thick plywood sheathing that is nailed to 2 x 6 wood stud walls. The nailing along panel edges consists of 8d nails spaced at 4" o.c., and the field nailing consists of 8d nails spaced at 12" o.c. The walls are bolted to the grade beams using 5/8" x 12" long bolts spaced at 2'-8" o.c. The walls are continuous to the foundation and stack vertically between stories. The wall aspect ratios range from 2.12H:1V on the upslope side of the structure and 1.2H:1V on the downslope side of the structure. As such, the wall overturning forces are not expected to be unreasonably high.

The roof and floor diaphragms are comprised of ½" and 5/8" thick sheathing respectively. The plywood panels are staggered, and edges that do not align with joists or studs are blocked with 2 x 4 flat members. The panel edges are nailed with 8d nails spaced at 4" o.c. and the field nailing consists of 8d nails spaced at 12" o.c. In addition, 8d nails spaced at 4" o.c. are used at sill plates, top plates, studs, and posts. Continuous chords are located around the building perimeter at the top of the walls and consist of double 2 x 6 top plates. They are spliced with a minimum 8'-0" lap and 20 - 16d nails are used at each splice.

A slab-on-grade is located on the southwest side of the building. This slab is structurally connected to the building with reinforcing that extends from the slab into the grade beams. The first floor joists are similarly anchored to the grade beams with 16 gage steel straps. This slab will help transfer load into the hillside in the transverse direction. For the Tier 1 Quick Checks, the upper story walls are checked assuming the roof mass is amplified based upon the period of the one-story structure. The lower story walls are conservatively checked using a tributary area approach, assuming that the slab does not draw lateral shear. These walls are checked for the upper story shear plus the force from the first floor mass amplified by the ground acceleration. Soil-structure interaction is ignored for the Tier 1 checks.

Building code: The structural design drawings are dated 15 August 1977, and there is a state fire marshal approval stamp dated 10 October 1977. The design code is not noted on either the architectural or structural drawings. The Authority Having Jurisdiction at the time of design appears to be the University of California, San Francisco. The title block lists both a San Francisco project number and a University project number. A 2016 history of building codes in San Francisco and California is provided in "Abridged History of San Francisco's Bureau of Building Inspection: 1944 to 1992," by Lonnie Haughton of Richard Avelar & Associates and informs the following. In 1978, the State Building Standards Commission was given responsibility for state building codes. The 1981 State Building Code used the 1979 UBC as the basis. It was not until 1989 that the California Building Code (CBC) title was used. The UC system currently uses the CBC as the basis of its building codes. Details regarding UC system requirements at the time of the Child Care Center design are not known. Given the 1977 design and fire marshal stamps, possible building codes include the 1970 UBC, 1973 UBC, or 1976 UBC. Either the 1973 UBC or 1976 UBC may have been likely. Thus, it is not clear if 1976 UBC used as the benchmark code for W2 buildings in UCOP Guidebook Version 1.3 would have been used for design of the Child Care Center. For the purpose of this evaluation, it is assumed that the 1973 UBC was used, the structure is not benchmarked, and thus an ASCE 41 Tier 1 evaluation was completed.

Building condition: Good. Possible dry rot was observed in the exterior wall sill on the west elevation. UCSF facilities staff indicate that, once a year, the structure is closed for maintenance such as painting and replacement of the carpet.

Building response in 1989 Loma Prieta Earthquake: The 17 November 1989 report "Performance of UCSF Buildings During the October 17, 1989 Loma Prieta Earthquake," by Impell Corporation states "The areas inspected included the exterior, interior and the bottom storage area. There was no structural or non-structural damage observed. Based on the inspection, the building was determined to be safe for occupancy."

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

Identified seismic deficiencies of the building include the following:

- The Child Care Center likely contains a torsional irregularity. The one-story walls on the southeast elevation are likely stiffer that the two-story walls on the northwest elevation. This will shift the center of rigidity to the southeast. The Tier 1 Quick Check is based upon an average stress check and does not account for local increases in the wall forces due to this irregularity.

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	Y	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 nonstructural life-safety concerns, including at exit routes. [2]

The Child Care Center contains a natural gas stove and water heater. Bracing of the water heater was observed, and bracing of the gas supply line is unknown.

UCOP nonstructural checklist item	Life safety hazard?	UCOP nonstructural 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 Lucia Child Care Center is well-proportioned and reasonably well-tied together. The diaphragm length-to-width aspect ratio is 2.25L:1W, and the walls have reasonable aspect ratios that are slightly above 1H:1V. The diaphragms contain continuous chords and are blocked. They do not have re-entrant corners or large openings. Similarly, the walls are primarily solid with a few window and door openings located on the southwest and northwest elevations

[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 nonstructural hazards may occur.

in the upper story. The shear walls contain closed spaced boundary nailing with 8d nails spaced at 4" o.c., and the walls stack vertically. Although a slab-on-grade is tied to the first floor and will likely draw load, the walls in the basement story were conservatively checked for the mass of the roof and the mass of the first floor without any reduction allotted from the slab. Where skewed walls are present, the component of the wall length in the direction of loading is used in the calculation. The wall forces per lineal foot are low. In the transverse direction they are 421 plf and 244 plf between the basement and first floor and between the first floor and roof, respectively. In the longitudinal direction, the forces per lineal foot in the shear walls are 346 plf and 312 plf between the basement to first floor and between the first floor and roof, respectively. These are well below the Tier 1 limit of 1,000 plf.

The building is assigned a Seismic Performance Level Rating of IV because the wood-frame building is well tied together, it does not contain any significant irregularities, and the wall forces are low.

Recommendations for further evaluation or retrofit

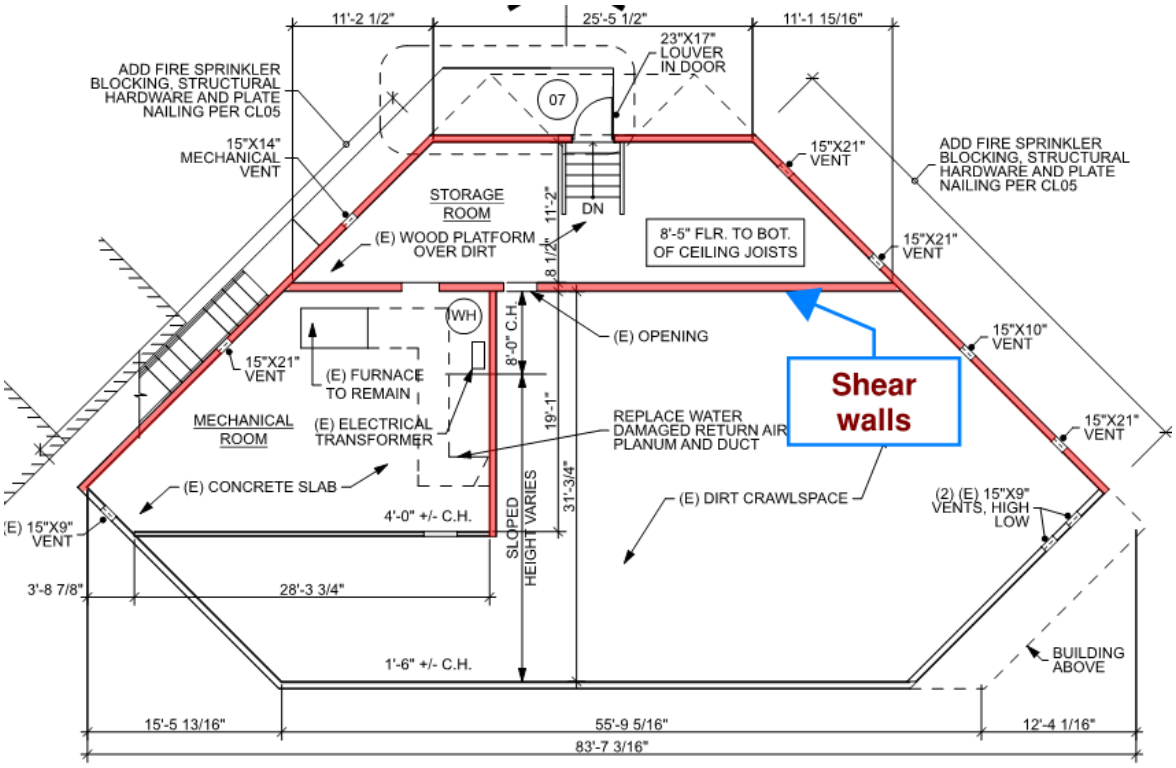
No additional evaluation is required.

Peer review comments on rating

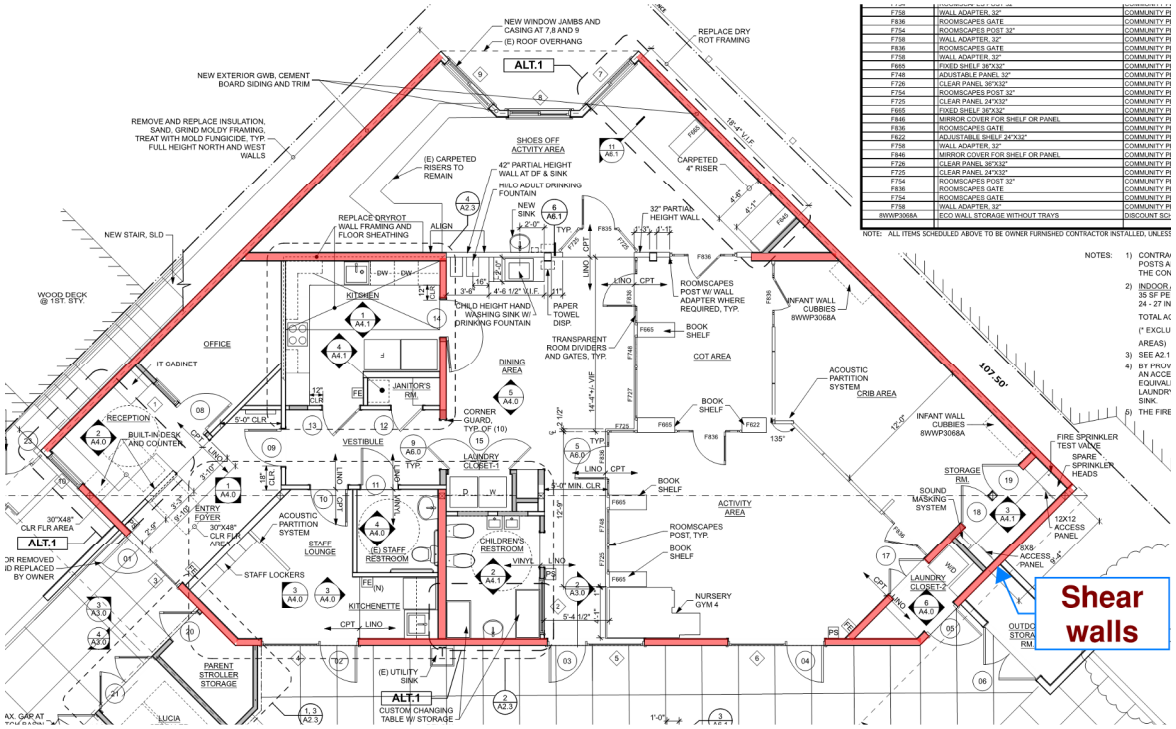
The structural members of the UCSF Seismic Review Committee (SRC) reviewed the evaluation on 25 June 2019 and were unanimous that the Seismic Performance Level Rating is Level IV, and no further study is required.

Additional building data	Entry	Notes
Latitude	37.76315	
Longitude	-122.46021	
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 pad is located on a steep hill
Building occupiable area (OGSF)	2,706	Calculated
Risk Category per 2016 CBC 1604.5	II	
Building structural height, h_n	11.5 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	0.12 sec	Estimated using ASCE 41-17 equation 4-4 and 7-18
Site data		
975-year hazard parameters S_s, S_1	1.552g, 0.612g	Applied Technology Council website
Site class	D	
Site class basis		UCSF Group 2 Buildings – Tier 1 Geotechnical Assessment, Egan (2019)
Site parameters F_a, F_v	1.0, 1.7	Applied Technology Council website

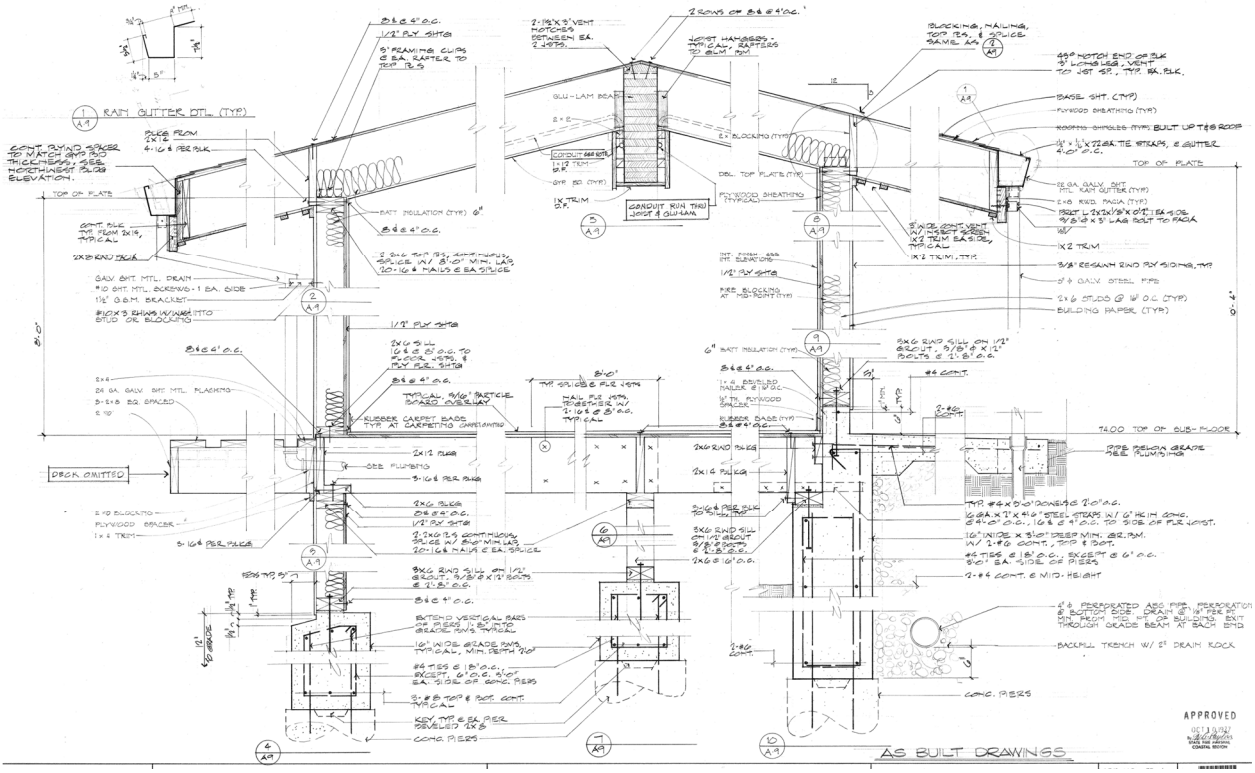
Ground motion parameters S_{cs}, S_{c1}	1.552g, 1.041g	UCSF Group 2 Buildings – Tier 1 Geotechnical Assessment, Egan (2019) W = 82 kips, V base = 165 kips
S_a at building period	1.55g	
Site V_{s30}	305 m/s	
V_{s30} basis	Estimated	UCSF Group 2 Buildings – Tier 1 Geotechnical Assessment, Egan (2019)
Liquefaction potential/basis	No	UCSF Group 2 Buildings – Tier 1 Geotechnical Assessment, Egan (2019)
Landslide potential/basis	No	UCSF Group 2 Buildings – Tier 1 Geotechnical Assessment, Egan (2019)
Active fault-rupture hazard identified at site?	No	UCSF Group 2 Buildings – Tier 1 Geotechnical Assessment, Egan (2019)
Site-specific ground motion study?	No	
Applicable code		
Applicable code or approx. date of original construction	Built: 1977 Code: 1973 UBC Assumed	
Applicable code for partial retrofit	2007 CBC	Building addition (No retrofit)
Applicable code for full retrofit	None	No full retrofit known
Model building data		
Model building type north-south	W2 Wood Frame	
Model building type east-west	W2 Wood Frame	
FEMA P-154 score	N/A	Not applicable as a ASCE 41 Tier 1 evaluation was performed
Previous ratings		
Most recent rating	IV	
Date of most recent rating	2013	2013 “UCSF Building Seismic Survey and Ratings”
2nd most recent rating	Good	Referenced in 2013
Date of 2nd most recent rating	Unknown	“UCSF Building Seismic Survey and Ratings”
3rd most recent rating	-	
Date of 3rd most recent rating	-	
Appendices		
ASCE 41 Tier 1 checklist included here?	Yes	Refer to attached checklist file



Shear walls between the basement and the roof. The walls approaching the high side of the hill (down on the plan) are conservatively ignored in the basement story.



Shear walls between the first floor and the roof



Section (looking northeast)

APPENDIX A

Additional Images


Longitudinal
(NE-SW) Dir.
LUCIA CHILD
CARE STUDY
CENTER
Transverse
(NW-SE) Dir.
N

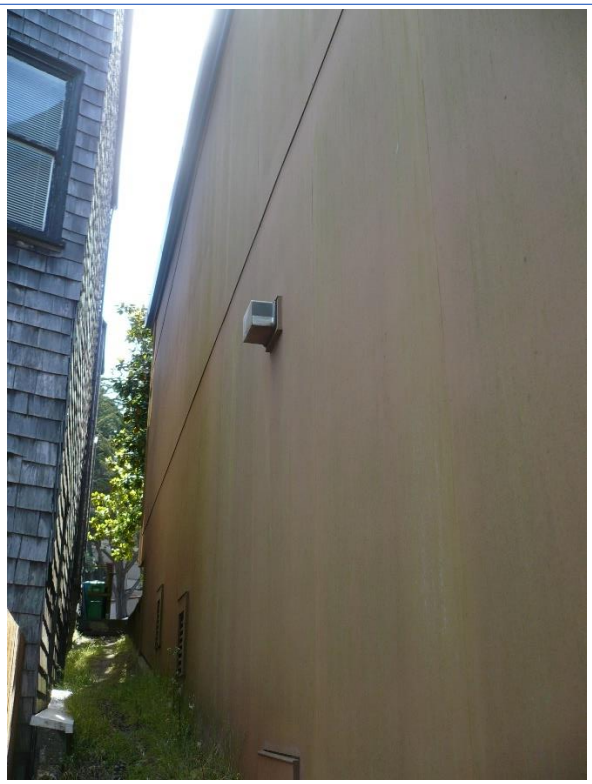
Plan

Partial south elevation (looking northeast)

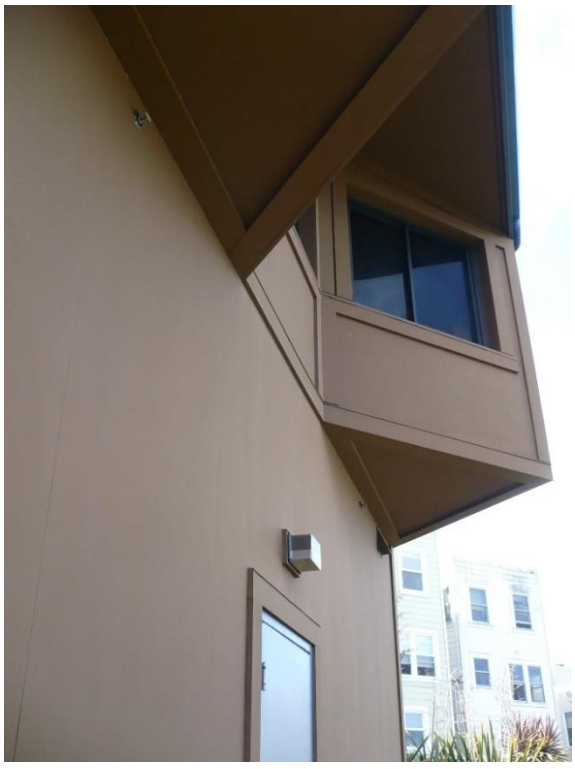
Walkway to main entry on south elevation (looking northeast)

South elevation (looking north)

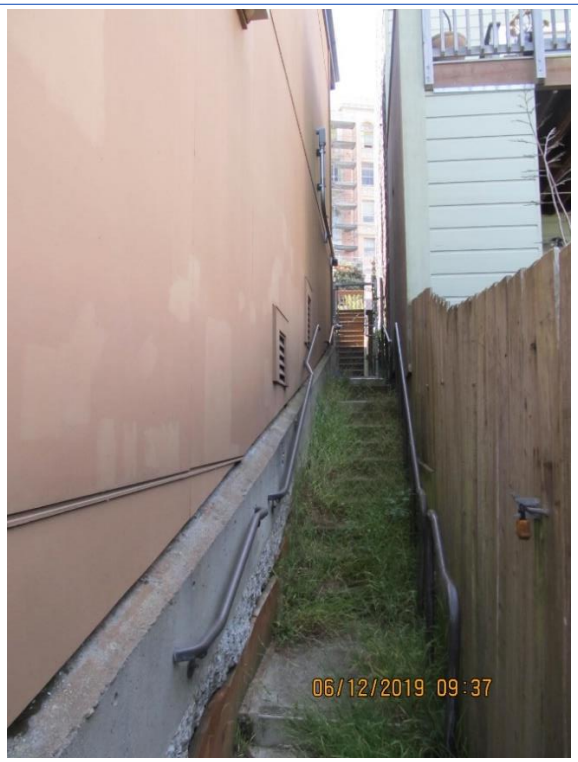
Partial east elevation (looking north)



North elevation (looking east)



West elevation (looking southwest)



West elevation (looking south)

Roof (looking northeast)

Existing chipped and sloped grade beams on west elevation (possibly to install the stairs in the narrow space available). Beams span to piers.

Interior play area (looking northeast)

Interior play area (looking southwest)

Basement storage area (looking northeast)

Basement mechanical area with rat slab beyond (looking east)

APPENDIX B

ASCE 41-17 Tier 1 Checklists (Structural)

UC Campus:	San Francisco			Date:	06/25/2019		
Building CAAN:	2416	Auxiliary CAAN:		By Firm:	RUTHERFORD + CHEKENE		
Building Name:	Marilyn Reed Lucia Child Care Study Center			Initials:	EGM	Checked:	BL
Building Address:	610 Parnassus Ave, San Francisco, CA 94122			Page:	1	of	3

ASCE 41-17
Collapse Prevention Basic Configuration Checklist

LOW SEISMICITY

BUILDING SYSTEMS - *GENERAL*

	Description
C ● NC ○ N/A ○ U ○	LOAD PATH: The structure contains a complete, well-defined load path, including structural elements and connections, that serves to transfer the inertial forces associated with the mass of all elements of the building to the foundation. (Commentary: Sec. A.2.1.1. Tier 2: Sec. 5.4.1.1) **Comments:** Plywood sheathing over wood framing functions as diaphragm and deliver loads to exterior wood-frame shear walls; the structural elements contain nails and blocking members to facilitate load transfer. The wood walls are founded on grade beams that span to piers.
C ○ NC ○ N/A ● U ○	ADJACENT BUILDINGS: The clear distance between the building being evaluated and any adjacent building is greater than 0.25% of the height of the shorter building in low seismicity, 0.5% in moderate seismicity, and 1.5% in high seismicity. (Commentary: Sec. A.2.1.2. Tier 2: Sec. 5.4.1.2) **Comments:** There are no structures in close proximity to the Child Care Center.
C ○ NC ○ N/A ● U ○	MEZZANINES: Interior mezzanine levels are braced independently from the main structure or are anchored to the seismic-force-resisting elements of the main structure. (Commentary: Sec. A.2.1.3. Tier 2: Sec. 5.4.1.3) **Comments:** There are no mezzanines in the Child Care Center.

BUILDING SYSTEMS - *BUILDING CONFIGURATION*

	Description
C ● NC ○ N/A ○ U ○	WEAK STORY: The sum of the shear strengths of the seismic-force-resisting system in any story in each direction is not less than 80% of the strength in the adjacent story above. (Commentary: Sec. A2.2.2. Tier 2: Sec. 5.4.2.1) **Comments:** The walls do not contain a significant number of openings and are essentially solid in the lower story.
C ● NC ○ N/A ○ U ○	SOFT STORY: The stiffness of the seismic-force-resisting system in any story is not less than 70% of the seismic-force-resisting system stiffness in an adjacent story above or less than 80% of the average seismic-force-resisting system stiffness of the three stories above. (Commentary: Sec. A.2.2.3. Tier 2: Sec. 5.4.2.2) **Comments:** The walls do not contain a significant number of openings and are essentially solid in the lower story. The upper story is 8'-0" tall, and the lower story is 9'-0" tall.
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:** Wood-frame shear walls are continuous to the foundation.

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:** Plan dimensions remain virtually unchanged from the roof down to the basement.
●	○	○	○	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 roof and first floor mass are similar.
○	●	○	○	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 is located on a sloping side with two stories above grade on the northwest side and one story above grade on the southeast side. The center of rigidity will shift to the stiffer walls on the southeast, while the center of mass is remains near the building center.

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 the UCSF Group 2 Buildings – Tier 1 Geotechnical Assessment, Egan (2019).
●	○	○	○	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 the UCSF Group 2 Buildings – Tier 1 Geotechnical Assessment, Egan (2019).
●	○	○	○	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 the UCSF Group 2 Buildings – Tier 1 Geotechnical Assessment, Egan (2019).

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Building Address:	610 Parnassus Ave, San Francisco, CA 94122			Page:	3	of	3

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:** The building width is B = 43'-6" in the NW-SE direction, building height from the basement to the top of the roof ridge is H = 23'-0", B/H = 1.89. Sa = 1.552g for UCSF at BSE-2E 0.6x Sa = 0.93 B/H > 0.6 Sa.
●	○	○	○	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 is classified as D. Concrete grade beams tie the concrete piers together in both directions.

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 W2

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:** The building has 2 lines of shear walls in the longitudinal NE-SW direction, and 4 lines of skewed shear walls in the N-S and E-W direction. The skewed walls contribute to the shear resistance in both the longitudinal (NE-SW) and transverse (NW-SE) directions.
◉	○	○	○	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 Diagonal sheathing: 700 lb/ft Straight sheathing: 100 lb/ft All other conditions: 100 lb/ft **Comments:** In the transverse direction, the calculated wall forces are 346 lb/ft and 312 lb/ft from the basement to first floor and from the first floor to roof respectively. In the longitudinal direction, the calculated wall forces are 421 lb/ft and 244 lb/ft from the basement to first floor and from the first floor to roof, respectively. These are well below the the ASCE 41 limit of 1,000 lb/ft for buildings with structural panel sheathing.
◉	○	○	○	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:** Plywood sheathed walls comprise the lateral force-resisting system.
◉	○	○	○	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:** Interior walls are limited and are not considered to participate in the lateral load-carrying system.
○	◉	○	○	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:** Considering the average story height of 11'-6" for the first floor up to the roof, the minimum shear wall length required is 5'-9". Even though the majority of the shear walls exceed this length, there are three walls that measure from 4'-3" to 5'-9" that are part of the seismic force-resisting system.

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Collapse Prevention Structural Checklist For Building Type W2

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:** Details 4/A9 and 11/A10 show the plywood sheathing stops at the top and bottom of the floor joists.
●	○	○	○	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 is located on a sloping side with two stories above grade on the northwest side and one story above grade on the southwest. On the downhill side, exterior shear walls are mostly solid and their height-to-width aspect ratio is approximately equal to 1:1.
●	○	○	○	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:** Per Details 4,10/A9 and 5,8/A10, plywood sheathing is provided in the basement story on exterior walls and one interior wall. There is an additional interior wall that does not contain sheathing; however, this wall is provided to reduce the joist span for gravity and does not support a shear wall above.
●	○	○	○	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:** Most of the openings occur at the front of the building on the southeast elevation; however, the openings are less than 80% of the length of the wall and the adjacent shear walls have aspect ratios less than 2:1.

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:** There are four 6 x 6 posts in the structure and their connection to the foundations is unknown.
●	○	○	○	WOOD SILLS: All wood sills are bolted to the foundation. (Commentary: Sec. A.5.3.4. Tier 2: Sec. 5.7.3.3) **Comments:** Per carpentry notes on Sheet S1 in 1977 drawings, the sill plates at bearing and plywood sheathed walls are bolted to the concrete with 5/8"Φ x 12" long bolts spaced at 2'-8" o.c.

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Collapse Prevention Structural Checklist For Building Type W2

C	NC	N/A	U	
●	○	○	○	GIRDER/COLUMN CONNECTION: There is a positive connection using plates, connection hardware, or straps between the girder and the column support. (Commentary: Sec. A.5.4.1. Tier 2: Sec. 5.7.4.1) **Comments:** Per Details 4, 5 and 6 on Sheet S3 in 1977 drawings, beam-to-column connections consist of steel plate hardware with bolts.

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 (1.8 m) or less with acceptable edge and end distance provided for wood and concrete. (Commentary: A.5.3.7. Tier 2: Sec. 5.7.3.3) **Comments:** Per carpentry notes on Sheet S1 in 1977 drawings, the sill plates at bearing and plywood sheathed walls are bolted to the concrete with 5/8"Φ x 12" long bolts spaced at 2'-8" o.c.

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:** The diaphragms are continuous throughout floors.
●	○	○	○	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:** Per sections on Sheets A9 and A10 in 1977 drawings, double 2x6 top plates function as roof chords along the perimeter walls. Detail 2/A9 indicates the typical condition: 2-2x6 top plates, continuous, splices with 8'-0 minimum lap, and 20-16d nails at each splice.
○	○	●	○	DIAPHRAGM REINFORCEMENT AT OPENINGS: There is reinforcing around all diaphragm openings larger than 50% of the building width in either major plan dimension. (Commentary: Sec. A.4.1.8. Tier 2: Sec. 5.6.1.5) **Comments:** There are no large diaphragm openings in the building.
○	○	●	○	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:** There are no straight-sheathed diaphragms. All the diaphragms are composed of plywood sheathing.

UC Campus:	San Francisco			Date:	06/25/2019		
Building CAAN:	2416	Auxiliary CAAN:		By Firm:	RUTHERFORD + CHEKENE		
Building Name:	Marilyn Reed Lucia Child Care Study Center			Initials:	EGM	Checked:	BL
Building Address:	610 Parnassus Ave, San Francisco, CA 94122			Page:	4	of	4

ASCE 41-17
Collapse Prevention Structural Checklist For Building Type W2

C	NC	N/A	U	
○	○	◉	○	SPANS: All wood diaphragms with spans greater than 24 ft (7.3 m) consist of wood structural panels or diagonal sheathing. (Commentary: Sec. A.4.2.2. Tier 2: Sec. 5.6.2) **Comments:** Wood diaphragms consist of structural panels with ½" plywood sheathing at the roof and 5/8" plywood sheathing at the first floor.
○	○	◉	○	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 have aspect ratios less than or equal to 4-to-1. (Commentary: Sec. A.4.2.3. Tier 2: Sec. 5.6.2) **Comments:** Neither diagonally sheathed nor unblocked wood structural panel diaphragms occur in the building.
○	○	◉	○	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:** All diaphragms consist of plywood sheathing over wood framing.

APPENDIX C

UCOP Seismic Safety Policy Falling Hazards Assessment Summary

UC Campus:	San Francisco			Date:	06/25/2019		
Building CAAN:	2416	Auxiliary CAAN:		By Firm:	Rutherford+Chekene		
Building Name:	Lucia Child Care Study Center			Initials:	*EGM*	Checked:	*BL*
Building Address:	610 Parnassus Ave, San Francisco, CA 94122			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:** No areas of congregation for 50 or more people are located within the building.
P ☐ N/A ☒	**Heavy masonry or stone veneer above exit ways or public access areas** **Comments:** No masonry or stone veneer is located near exit ways or public access areas.
P ☐ N/A ☒	**Unbraced masonry parapets, cornices, or other ornamentation above exit ways or public access areas** **Comments:** There are no masonry parapets, cornices, or other ornamentation.
P ☐ N/A ☒	**Unrestrained hazardous material storage** **Comments:** Staff from the child care center indicated that no hazardous materials are stored in the building.
P ☐ N/A ☒	**Masonry chimneys** **Comments:** There are no masonry chimneys are in the building.
P ☐ N/A ☒	**Unrestrained natural gas-fueled equipment such as water heaters, boilers, emergency generators, etc.** **Comments:** The building contains a gas stove and a gas water heater. Bracing of the water heater was observed, and the bracing of the gas distribution lines is unknown.
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

Flat Load Tables

	Seismic Weight	Dead Load	
TYPICAL ROOF	**psf**	**psf**	**Remarks**
Roofing	3.0	3.0	Asphalt shingle roof
Waterpoofing / insulation	1.8	1.8	6" batt insulation and waterproofing membrane assumed
Sheathing	1.7	1.7	1/2" plywood sheathing
Glulam ridge beam	0.9	0.9	6 3/4"x24" gluelam ridge beam
Wood framing	2.0	2.0	2x12" wood joists at 24" o.c.
MEP	5.0	5.0	MEP hung from underside of floor slab
Ceiling, lighting and misc.	4.0	4.0	Gypsum board ceiling, lighting, and misc. hung from underside of floor slab
Columns	0.0	0.0	Additional wood posts are included in wood walls
Wood-frame shear walls and partitions	6.0	0.0	Stud walls below wood framing
Total	24.4	18.4	

1 - Flat load occurs at entire roof level. West area of the building was added after 2009 renovation, structural drawings were not available and framing was assumed to be the same as original roof.

2 - Wood-frame shear walls and partitions flat loads are estimated based upon exterior walls weighting 12 psf and 17 psf on their vertical face, and interior walls weighting 12 psf on their vertical face.

	Seismic Weight	Dead Load	
TYPICAL FLOOR	**psf**	**psf**	**Remarks**
Flooring	5.0	5.0	Carpet and vinyl composition tiles (VCT)
Sheathing	2.1	2.1	5/8" plywood subfloor
Wood framing	2.9	2.9	2x12" wood joists at 16" o.c.
MEP	5.0	5.0	MEP hung from underside of floor slab
Ceiling, lighting and misc.	4.0	4.0	Gypsum board ceiling, lighting, and misc. hung from underside of floor slab
Columns	0.0	0.0	Additional wood posts are included in wood walls
Wood-frame shear walls and partitions	14.0	14.0	Stud walls below wood framing
Total	33.0	33.0	

1 - Flat load occurs at entire floor level. West area of the building, i.e. the shoes off activity area and the laundry closet 2, were added after 2009 renovation, structural drawings were not available and framing was assumed to be the same as original floor.

2 - Wood-frame shear walls and partitions flat loads are estimated based upon exterior walls weighting 12 psf and 17 psf on their vertical face, and interior walls weighting 12 psf on their vertical face.

Story Weight

	Floor Area (ft^2)[1,2,3]		Floor Weight (psf)		Height[4]		
Floor Levels	TYPICAL ROOF	TYPICAL FLOOR	TYPICAL ROOF	TYPICAL FLOOR	Elevation (ft)	Height below floor level (ft)	Total Seismic Weight (kips)
Roof	3,347	0	24	33	85.50	11.50	82
First Floor	0	2,706	24	33	74.00	9.00	89
Basement					65.00		

Seismic Weight = **82** kips

Notes:

1 - Seismic base is set at the First floor. This level is expected to have the same acceleration as the ground. Soil-structure interaction is ignored for Tier 1 check.

2 - Wood-frame wall weight contribution is included in flat load tables.

3 - Roof area is increased 4.2% to account for slope towards the exterior walls.

4 - Elevations and roof height are based on Details A&B/A8 and A9 in 1977 drawings. The story between the First floor and the roof is assumed as 11'-6" tall, which is the average of the height up to the top of the ridge.

5 - Floors have been renamed as follows:

Elevation	1977 Drawings	2009 Drawings
varies	Roof	Roof
74'-0"	Floor	First Floor
65'-0"	-	Basement

Period

C_t=	0.02
h_n (ft)=	11.50
B=	0.75

T=	0.12	sec

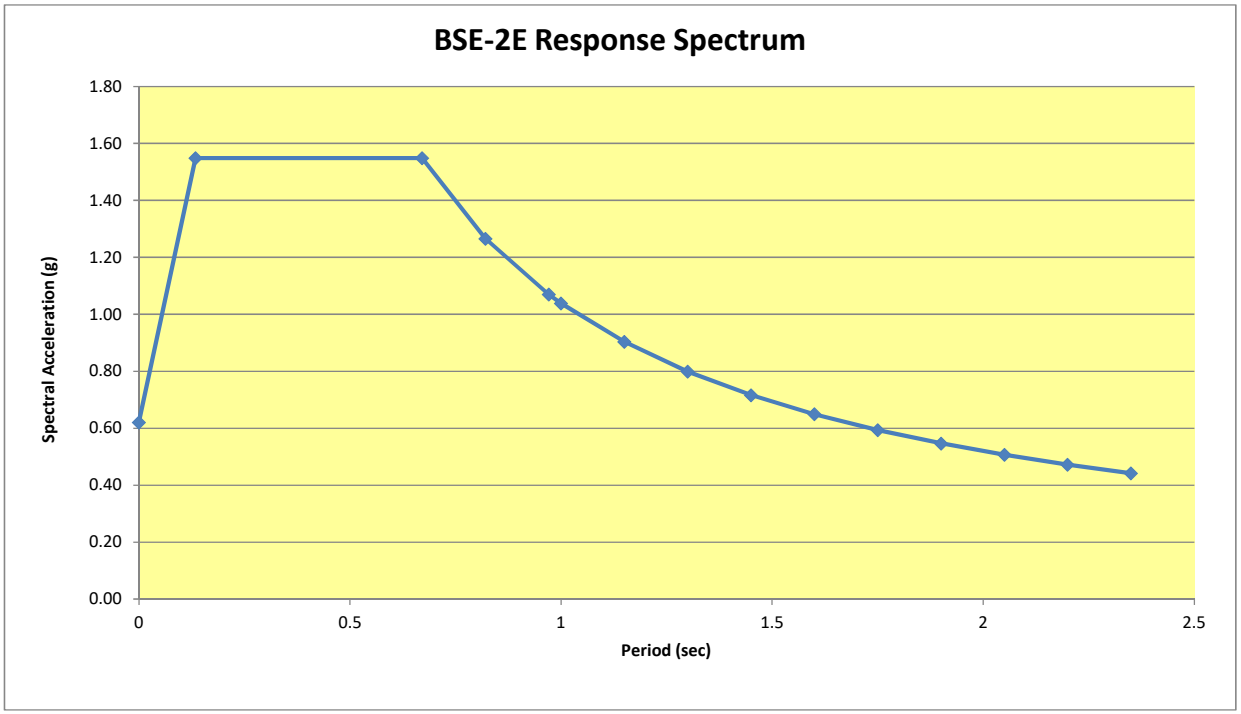
Notes:
1- The period calculated per ASCE 41-17 Equation 4-4.

$$T = C_t \cdot h_n^{\ B}$$

2- Ct and B are for "all other framing system" per ASCE 41-17 Section 4.4.2.4.
3- The building height is taken from the First floor to the average top of roof.

Site Parameters

Period (s)	Sa (g)
0	0.62
0.13	1.55
0.67	1.55
0.82	1.27
0.97	1.07
1.00	1.04
1.15	0.90
1.30	0.80
1.45	0.72
1.60	0.65
1.75	0.59
1.90	0.55
2.05	0.51
2.20	0.47
2.35	0.44



β =	0.05	
B_1 =	1.00	
Site Class =	D	
S_{XS} =	1.552	g
S_{X1} =	1.041	g
T_0 =	0.13	s
T_s =	0.67	s
T =	0.12	s
S_a =	1.48	g (See Note 2)
Tier 1 S_a =	1.55	g (See Note 3)

Notes:

1- Spectral accelerations based upon site class provided in report "UCSF Group 2 Buildings - Assessment of Geotechnical Characteristics and Geohazards". Procedure as specified in ASCE 41-17, Section 2.4.1.7 is used to develop General Response Spectrum shown above.

2 - Per 2.4.1.7 / ASCE 41-17, use of spectral response acceleration in the extreme short-period range ($T < T_0$) shall only be permitted in dynamic analysis procedures and only for modes other than the fundamental mode.

3- Per Section 4.4.2.3 for Tier 1 screening in ASCE 41-17, the spectral acceleration, Sa, is computed as the least value of S_{X1}/T, and S_{XS}.

Seismic Force Distribution

ATC Horizontal Response Spectrum Seismic Parameters		
Hazard Level	BSE-2E	
Site Class	D	
S_{CS}=	1.552 g	(See Note 2)
S_{C1}=	1.041 g	(See Note 2)

T=	0.12	s
Sa=	1.552	g
W=	82	kips
C=	1.3	Per ASCE 41-17 Table 4-7

V=	165	kips	(Shear transferred from roof down to the seismic base, see Note 1)

k= 1.00 Per ASCE 41-17 Section 4.4.2.2, K = 1.0 for periods less than 0.5 sec and K = 2.0 for T >2.5 sec. It varies linearly in between 0.5 sec and 2.5 sec period.

Floor Levels	Story Height (ft)	Total Height, H (ft)	Weight, W (kips)	W x H^k	coeff	Fx (kips)	Story Shear, V (kips)
Roof	11.50	11.50	82	941	1.00	165	165
First Floor			89			55	220
Basement							
	11.5		171	941	1	220	

Notes:

1- The seismic base of building is set at the First floor where grade on the east side is located. The walls between the First floor and the roof are checked for the amplified roof mass based upon the period of a one-story superstructure. The mass of the First floor is partly anchored to the ground and is assumed to have the same acceleration as the grade. Therefore, the seismic force acting at the First floor is Fx = 0.4*S_{CS}*$W_{First\ Flr.}$ The walls between the basement and the first floor are checked for the amplified roof mass plus the mass of the first floor oscillating with grade.

2- S_{XS} and S_{X1} refer to the spectral response at 0.2s and 1.0s, respectively, after applying site amplification factors. These values match S_{CS} and S_{C1} for the building, per the table UCSF Group 2 Buildings - Assessment of Geotechnical Characteristics and Geohazards.

3- Per Section 4.4.2.3 in ASCE 41-17, the spectral acceleration, Sa, is computed as the least value of S_{X1}/T, and S_{XS}.

4- Modification Factor, C, per ASCE 41-17, Table 4-7. Even though structure has two stories, the seismic base is set at the attic level, leading to a 1-story tall for the sake of the modification factor.

Table 4-7. Modification Factor, *C*

	Number of Stories			
Building Type[a]	**1**	**2**	**3**	**≥4**
Wood and cold-formed steel shear wall (W1, W1a, W2, CFS1)	1.3	1.1	1.0	1.0
Moment frame (S1, S3, C1, PC2a)				
Shear wall (S4, S5, C2, C3, PC1a, PC2, RM2, URMa)	1.4	1.2	1.1	1.0
Braced frame (S2)				
Cold-formed steel strap-brace wall (CFS2)				
Unreinforced masonry (URM)	1.0	1.0	1.0	1.0
Flexible diaphragms (S1a, S2a, S5a, C2a, C3a, PC1, RM1)				

[a] Defined in Table 3-1.

Average Wood Shear Wall Stress Check

Average Stresses

Ms = 4.5

Longitudinal (NE-SW direction)						
Story	**Total Story Shear**	**Effective Story Shear**	**Wall Length**	**Average Shear Demand**	**Tier 1 Shear Limit**	**Wall OK?**
	(kips)	(kips)	(ft)	(lb/ft)	(lb/ft)	
Roof - First Floor	165	165	150	244	1000	OK
First Floor - Basement	220	220	116	421	1000	OK

Transverse (NW-SE direction)						
	Total Story Shear	**Effective Story Shear**	**Wall Length**	**Average Shear Demand**	**Tier 1 Shear Limit**	**Wall OK?**
	(kips)	(kips)	(ft)	(lb/ft)	(lb/ft)	
Roof - First Floor	165	165	117	312	1000	OK
First Floor - Basement	220	110	71	346	1000	OK

Notes:
1 - Shear stress check is performed following the ASCE 41-17 Tier 1 screening criteria, and the BSE-2E site modified spectral response parameters.
2 - Ms factor per ASCE 41-17 Table 4-8.

Table 4-8. M_s Factors for Shear Walls

	Level of Performance		
Wall Type	**CP[a]**	**LS[a]**	**IO[a]**
Reinforced concrete, precast concrete, wood, reinforced masonry, and cold-formed steel	4.5	3.0	1.5
Unreinforced masonry	1.75	1.25	1.0

[a] CP = Collapse Prevention, LS = Life Safety, IO = Immediate Occupancy.

3 - Tier 1 shear stress limit of 1,000 lb/ft is defined for buildings with structural panel sheathing based upon Table 17-4/ASCE 41-17.
4 - In the transverse direction, the basement story wall on the northwest elevation is assumed to resist 1/2 of the story shear from the roof plus the first floor mass, and the concrete on the southeast elevation resists the other 1/2 of the story shear. In the longitudinal direction, the walls on the east and west direction are assumed to resist the full story shear from the roof plus the first floor mass.