Rating form completed by: **TELESIS**
CC Thiel Jr, PhD, GS Varum, SE

June 26, 2019

UCSF Building Seismic Ratings

50 Kirkham Residence

CAAN #2411

50 Kirkham Street, San Francisco

Campus: Adjacent to Parnassus

REGISTERED PROFESSIONAL ENGINEER GARY S. VARUM No. S3305 Exp. 3/31/21 STRUCTURAL STATE OF CALIFORNIA

Center image is separation gap from building on the north and left image is the separation from retaining wall to the east.

Rating summary	Entry	Notes
UC Seismic Performance Level (rating)	VI	Findings based on drawing review and ASCE 41-17 Tier 1 evaluation[1]
Rating basis	Tier 1	ASCE 41-17, field visit by CC Thiel and GS Varum on June 6, 2019 and GSV on June 19, 2019.
Date of rating basis	2019	
Recommended list UCSF priority category for retrofit	N/A	N/A
Ballpark total project cost to retrofit to IV rating	Low (<$50/sf)	See recommendations on possible retrofit.
Is 2018-2019 rating required by UCOP?	Yes	Building previously rated IV, but has a very seismically weak and vulnerable first story.
Further evaluation recommended?	No	Any further work to evaluate should be done as part of the seismic retrofit design process, if it is undertaken.

[1] The evaluations at UCSF translate the Tier 1 evaluation to a Seismic Performance Level rating using professional judgment discussed among the UCSF 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

- Impel Corp., 1989. *Performance of UCSF Buildings During the October 17, 1989 Loma Prieta Earthquake*, (50 pages), dated November 17, 1989. NB: Report does not list 50 Kirkham building by name or address.
- UCSF, *Report to the President Gardner, UC, October 17, 1989 UCSF Earthquake Report, November 30, 1989*, from CSU Chancellor, November 30, 1989. (175 pages)
- UCSF, 2010. 50 Kirkham, Remodel of Student Housing, Sheets A1-A3, stamped but not signed by Gary Nelson, affiliation unknown.

Additional building information known to exist

None pertinent to seismic evaluation specific to the building.

Scope for completing this form

No original construction drawings were available; remodel architectural drawing from 2010 were available. Site was visited by CC Thiel and GS Varum on June 6, 2019 and by GS Varum on June 19, 2019, when access to the interior was available. ASCE 41-17 Tier 1 evaluation was performed.

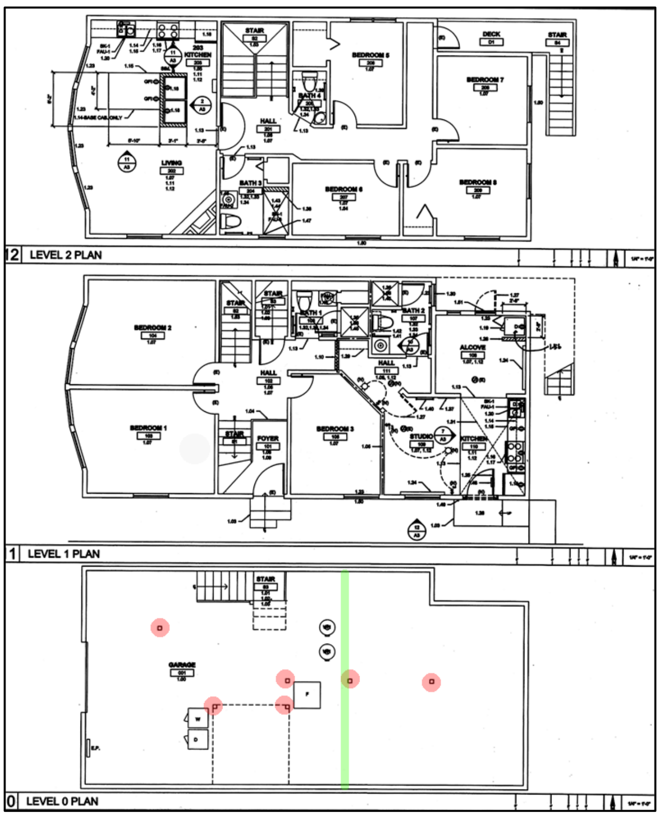

Figure 1. *The floor plans (top image is the third floor) from the 2010 remodel of the building. There was no apparent structural work done. At the bottom floor the locations of timber posts supporting the second floor are indicated in red, and the concrete 3-foot high cut off wall is indicated in green. The parking area has a concrete slab-on-grade, and the area to the right of the green line is a sloping rat-slab.*

Brief description of structure

Vertical Load-Resisting System: The structure is a three-story building, the rear part of the first story of which is below grade, see elevation image. The building is conventional wood-frame typical of the early 1900s construction. The roof and elevated floors are assumed to be constructed of straight board sheathing supported on the exterior and interior wood stud-frame walls. The second-floor joists are supported on the exterior longitudinal walls and interior dimensional lumber beams (see Photo F). The second-floor beams are supported on dimensional lumber posts.

Foundation System: Foundation support is provided by shallow concrete grade beams and spread footings. The first floor is a concrete slab-on-grade in the garage area facing 5th Avenue, with a low concrete cut-off wall see Figures 1 and 2, beyond which is sloping rat-proof slab.

Lateral Load-Resisting System: The roof and elevated floor straight board-sheathed diaphragms distribute the earthquake loads to the third and second story perimeter walls covered with cement plaster on three open sides and straight wood board siding on the fourth side adjacent to the existing building to the north, see cover figure, and interior walls covered with gypsum plaster. The interior walls of the second story transfer the earthquake loads to the second floor horizontal diaphragm, which distributes them to the perimeter walls. The basement has no interior walls.

Figure 2. *Interior images of the first story showing the framing of the interior, and the water heaters. The left and right images are in opposite longitudinal directions. The green dots indicate dimensional lumber beams, the red are dimensional lumber posts, the purple are the footings, the blue is a low transverse stem wall, and the yellow is gypsum board installed at some locations when the fire sprinklers were installed. In the middle image note the diagonal braces from the ceiling to the water heaters.*

Past seismic performance: The building was in place at the time of the 1989 Loma Prieta earthquake. The PGA at the site in 1989 Loma Prieta earthquake was measured as 0.09*g* horizontal peak acceleration by instruments in the adjacent UCSF Nursing Building. The Impel Corporation 1989 report covered this specific building in its review of UCSF building performance. At the time of the inspection report they state that they had no access to the interior of the 50 Kirkham building. Therefore, the inspection was limited to the exterior. There was no damage or distress to either structural or non-structural exterior members. No ground bulging or other soil distress around the building was observed. Based on the inspection of the exterior, it was determined that the structure was safe for occupancy. The Chancellor's report on the 1989 earthquake's impacts on UCSF facilities mention this building as being damaged. Plaster cracking was reported on interior walls, exterior stucco walls and to ceramic tile in the bathrooms. While these were minor damage they clearly exposed the vulnerability of the building.

Liquefaction hazard: The site is evaluated as not subject to liquefaction hazard. A site soils report was not available for the Group 2 building.

Brief description of seismic deficiencies and expected seismic performance [2]

Very little is known about the structural construction of the building other than the remodel did not change it from its original system. The building was constructed many decades prior to the introduction of modern seismic design practice for low-rise small residential buildings in the City of San Francisco. The roof and elevated floor horizontal diaphragms are of low lateral load-resisting capacity and are presumed to lack appropriate detailing for reliable shear transfer to the walls. The exterior and interior walls are also of low lateral load-resisting capacity and lack positive anchorage to the foundation. Of particular concern is the first story, which has little lateral load-resisting capacity, particularly at the front, and also lacks interior walls. With these serious deficiencies, the building is not expected to remain stable in earthquake loads specified in the 2016 edition of the California Building Code for the subject site and building type. No non-structural life-safety concerns were observed, including at exit routes.

[2] For these Tier 1 evaluations, we did 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.

Figure 3. *The upper image shows the bottom section of the north party line wall foundation and original straight-board sheathing. The lower image is of the corner of the building to the right of the above image.*

The building has both favorable and unfavorable features that influence its seismic behavior:

Favorable:

- The building is light weight and has no significant vertical or horizontal configurational irregularities of the exterior walls.
- The building is fully fire sprinkled by a modern office-type system.
- Early wood framed construction without major configurational irregularities has tended to perform in a life-safe manner in California earthquakes since the 1880s. Damageability may be significant, but not life threatening if there are no serious irregularities in the lateral load-resisting system, which there are here.
- The building is separated by a few inches from the adjacent building to the north, see cover figure middle image. The adjacent building's floor diaphragms are modestly aligned, see Figure 3.

Unfavorable:

- We have no reliable information on the wood framing of the building. However, the framing is visible in parts of the first level and inferable for the upper stories by knowledge of common practice at the time of construction.
- The first (garage) story has no reliable lateral load-resisting system on the north wall, with straight board sheathing on the exterior in a dilapidated condition, and gypsum board over some of interior walls.
- The 5th Avenue front of the building is a soft story, see cover figure where the front is heavily fenestrated.
- The three-sided stucco exteriors appear to be original. Common practice at the time of construction did not provide a wood substrate. Therefore, this is a very brittle lateral load-resisting system of unreliable attachment to its framing.
- It was observed in the basement that there are no interior walls to support the second floor diaphragm, but there are dimensional lumber elements on the interior, see Figure 2. The posts are supported on concrete elements, but there is no positive attachment to the foundation. The posts support segmented beams at the top which are toe-nailed into the posts, and have no reliable tension connection to each other or to the posts.
- Wood siding on the north side is straight board sheathing and deteriorated. There is no flashing at the separation between the buildings.
- There are two gas-fired water heaters in the garage, see Figure 2, that have bracing to the second floor framing and are supported on pedestals that have limited lateral force-resistance capacity, see Figure 2.
- The building is located a few inches at most from the adjacent building on the north, see cover figure. The condition of the north wall is unknown as too close to the adjacent building to be assessed, see the middle image of the front illustration and cover figure. Unless the wood sheathing boards are redwood, they are likely to be deteriorated. It would be prudent to install deformable flashing on the full perimeter of the separation between this building and the one to the immediate north

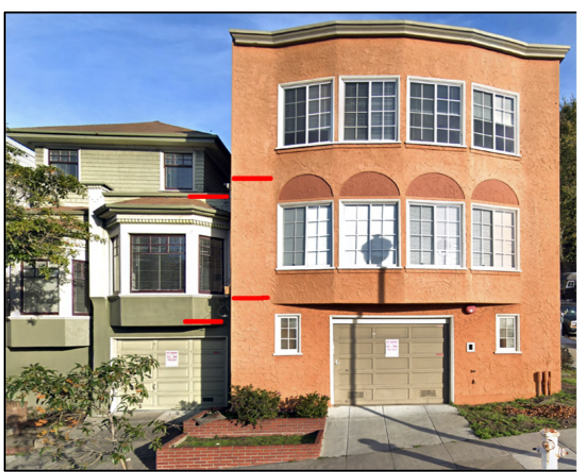

Figure 4. *Street view from Fifth Avenue showing the adjacent building to the north and the approximate floor levels for the two buildings in red.*

- The concrete stem wall on the northwest side was observed to be cracked, see cover figure.

Structural deficiency	Affects rating? (Y/N)	Structural deficiency	Affects rating? (Y/N)
Discontinuous Shear Walls	Y	Quick Shear Stress Check	Y
Wall Aspect Ratios	Y		
Lateral system stress check (wall shear, column shear or flexure, or brace axial as applicable)	Y	Openings at shear walls (concrete or masonry)	N
Load path	Y	Liquefaction	N
Adjacent buildings	Y	Slope failure	N
Weak story	Y	Surface fault rupture	N
Soft story	Y	Masonry or concrete wall anchorage at flexible diaphragm	N
Geometry (vertical irregularities)	Y	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)	Y	Appendages	N
Diaphragm continuity	N		

Transverse Direction						
Story	Story Shear (k)	Length of Wall (ft)	Ms factor	Average shear stress (plf)	Quick check shear capacity (plf)	Pass? (Y/N)
1	77.5	12	4.5	1,435	350	N
2						
3						

The subject building is an older wood-frame structure built before the enactment of seismic regulations. Its construction lacks the minimum expected feature of a reliable wood-frame building, such as wall anchorage to the foundation, continuous walls, and acceptable wall aspect ratio of the shear walls. Further, the 2nd and 3rd story interior walls terminate at the 2nd floor diaphragm resulting in vertical discontinuity.

These observations lead to the conclusion that the 50 Kirkham building is expected to exhibit poor damageability performance when subject to moderately strong earthquake site ground motions, consistent with Level VI in the UC lexicon. As an observation, it is expected that the building can be retrofitted to Level IV by work limited to the first story.

Stability: It is expected that the 50 Kirkham building will not remain stable under earthquake loads specified in the 2016 edition of the California Existing Building Code for the subject building type and site.

Expected Damage: At relatively moderate levels site ground motions damage to the 50 Kirkham building is expected to be significant and approach economically repairable limits. At site ground motions approaching code-level values, damage to the building is expected to exceed economically repairable limits.

Summary of review of nonstructural life-safety concerns, including at exit routes. [3]

The UCOP non-structural checklist item check list for *Life Safety Hazard* concludes that there are no nonstructural issues of concern in evaluating this building's expected seismic performance.

UCOP non-structural checklist item	Hazard"	UCOP non-structural checklist item	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.	Yes, water heaters, whose top restraint is inadequate.

Basis of Seismic Performance Level rating

[Fill]

Recommendations for further evaluation or retrofit

Further study is recommended for this building to determine if a seismic retrofit is economically viable versus complete replacement.

Peer review comments on rating

The structural members of the UCSF Seismic Review Committee (SRC) reviewed the evaluation and are in unanimous agreement with the rating. The Committee concurs that no further study is required

Additional building data	Entry	Notes
Latitude	37.760660°	Google Earth
Longitude	-122.461598°	
Are there other structures besides this one under the same CAAN#	No	
Number of stories above lowest perimeter grade	3	
Number of stories (basements) below lowest perimeter grade	0	First floor is partially below sloping grade to the east.
Building occupiable area (OGSF)	3,500	Estimate.
Risk Category per 2016 CBC 1604.5	II	No educational use.
Building structural height, h_n	~30 ft	Structural height defined per ASCE 7-16 Section 11.2
Coefficient for period, C_t	0.02	Per ASCE 41-17 equation 4-4
Coefficient for period, β	0.75	Per ASCE 41-17 equation 4-4

[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.

Estimated fundamental period	0.25 sec	Per ASCE 41-17 equation 4-4
Site data		
975 yr. hazard parameters S_s, S_1	1.70, 0.80	
Site class	D	
Site class basis		Consultation with John Egan
Site parameters F_a, F_v	1.0, 1.3	
Ground motion parameters S_{cs}, S_{c1}	0.65, 0.40	
S_a at building period	1.6	
Site V_{s30}	760m/s	
V_{s30} basis		Determined by John Egan for UCSF site
Liquefaction potential	None	EGAN and CGS maps
Liquefaction assessment basis	Assessment	CGS AP fault maps mapped as not required by State Law, site has a thin soil layer on a sloped rock basis, therefore no water saturated sands of loose soils.
Landslide potential	None	
Landslide assessment basis		Topography is flat
Active fault-rupture hazard identified at site?	No	CGS AP fault maps and consultation with John Egan
Site-specific ground motion study?	No	
Applicable code		
Applicable code or approx. date of original construction	1910s	Age estimated based on appearance
Applicable code for partial retrofit	NA	
Applicable code for full retrofit	CEBC	Section 317
FEMA P-154 data		
Model building type North-South	W1	Wood Light Frame
Model building type East-West	W1	Wood Light Frame
FEMA P-154 score	N/A	Not included here because an ASCE 41-17 Tier 1 evaluation was conducted.
Previous ratings		
Most recent rating	IV	2013 UCSF SRC Rating
Date of most recent rating	10/7/2013	
2nd most recent rating	NA	
Date of 2nd most recent rating		
3rd most recent rating	NA	
Date of 3rd most recent rating		
Appendices		
ASCE 41 Tier 1 checklist included here?	Yes	Refer to attached checklist file

Limitations:

The purpose of this report is to evaluate the expected damageability performance of the building and potential hazards of the site. Telesis performed an estimate of damageability to 50 Kirkham Avenue Building from earthquakes in conformance with the scope and requirements for Building Damageability at ASTM Level 1 by Senior Field Assessors CC Thiel and GS Varum of Standard Practice Probable Maximum Loss (PML) Evaluations for Earthquake Due-Diligence Assessments [ASTM E2557-16a] for the property located at 50 Kirkham Avenue, San Francisco, California. The assessment was performed and reported in a format required by the UC consistent with an ASCE 41-17 Level 1 assessment that does not include many ASTM reporting requirements.

This report is for the exclusive use of the University of California, its assigns and successors, and no other party shall have any right to rely on any service provided by Telesis without prior written consent.

Services were performed by Telesis in a manner consistent with the level of care and skill ordinarily exercised by members of the profession currently practicing under similar conditions. No other warranty, expressed or implied, is made. This report is based on a limited review of the building's available design documents. Building permit drawings, shop drawings, construction testing reports, computations and assumptions that would have been useful in the analysis were not available. Further, the actual seismic resistance characteristics of the building could not be fully assessed since architectural finishes did not allow detailed inspection of the quality of construction. Information not available under these conditions to Telesis and hidden construction quality conditions could alter the expected seismic vulnerability of the building from those assumed in this report. The assessment of earthquake performance and the assignment of a Level estimation process reflects uncertainty in both the seismic environment and the building's performance. There is no assurance that damage observed to the building in a future earthquake will be less than the estimates given.

Charles C. Thiel Jr., Ph.D.   Gary S. Varum, S.E.

UC Campus:	**University of California San Francisco**		Date:	**June 26, 2019**
Building CAAN:	**2411**	Auxiliary CAAN:	By Firm:	**Telesis**
Building Name:	**50 Kirkham Residence**		Initials: **GSV**	Checked: **CCT**
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ASCE 41-17
Collapse Prevention Structural Checklist For Building Type W1-W1A

LOW AND MODERATE SEISMICITY

SEISMIC-FORCE-RESISTING SYSTEM

Description

C NC N/A U (selected: C)

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: Technically this is conforming, but none of the walls have ductile behavior.

C NC N/A U (selected: NC)

SHEAR STRESS CHECK: The shear stress in the shear walls, calculated using the Quick Check procedure of Section 4.4.3.3, is less than the following values: (Commentary: Sec. A.3.2.7.1. Tier 2: Sec. 5.5.3.1.1)

Structural panel sheathing	1,000 lb/ft (14.6 kN/m)
Diagonal sheathing	700 lb/ft (10.2 kN/m)
Straight sheathing	100 lb/ft (1.5 kN/m)
All other conditions	100 lb/ft (1.5 kN/m)

Comments: The shear walls are constructed of cement plaster, gypsum plaster, and straight-board sheathing. The shear stress in the front wall is in excess of 100 lbs./ft., see attached computations. See calculations attached that provide the basis for this response as well as other characteristics of the seismic .

C NC N/A U (selected: NC)

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: this 3-story building relies on exterior stucco walls with some straight-board sheathing as the primary seismic-force-resisting system.

C NC N/A U (selected: NC)

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: This 3-story building relies on plaster walls and gypsum wallboard in some locations as shear walls.

C NC N/A U (selected: NC)

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: The front shear wall facing 5th Avenue (cement plaster) have aspect ratio greater than 2-to-1.

C NC N/A U (selected: NC)

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: The shear walls do not have positive interconnection between stories as such hardware did not exist at the time of original construction.

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

C NC N/A U	
C NC N/A U ○ ◉ ○ ○	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 front shear wall facing Kirkham Street has several piers with aspect ratio more than 1-to-1.**
C NC N/A U ○ ◉ ○ ○	CRIPPLE WALLS: Cripple walls below first-floor-level shear walls are braced to the foundation with wood structural panels. (Commentary: Sec. A.3.2.7.7. Tier 2: Sec. 5.5.3.6.4) **Comments: No wood structural panels are used for cripple walls as such material did not exist at the time of original construction.**
C NC N/A U ○ ◉ ○ ○	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: The front wall facing 5th Avenue has openings greater than 80% of the length, and is not braced with structural wood panels as such material did not exist at the time of original construction.**

CONNECTIONS

	Description
C NC N/A U ○ ◉ ○ ○	WOOD POSTS: There is a positive connection of wood posts to the foundation. (Commentary: Sec. A.5.3.3. Tier 2: Sec. 5.7.3.3) **Comments: The wood posts lack positive connection to the foundation.**
C NC N/A U ○ ◉ ○ ○	WOOD SILLS: All wood sills are bolted to the foundation. (Commentary: Sec. A.5.3.4. Tier 2: Sec. 5.7.3.3) **Comments: The wood sills are not bolted to the foundation as such practice was not in use at the time of original construction.**
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: The girder-column connections lack positive connection as such practice was not in use at the time of original construction.**

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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

	Description
C ( ) NC (•) N/A ( ) U ( )	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: The wood sills are not bolted to the foundation as such practice was not in use at the time of original construction.**

DIAPHRAGMS

	Description
C (•) NC ( ) N/A ( ) U ( )	DIAPHRAGM CONTINUITY: The diaphragms are not composed of split-level floors and do not have expansion joints. (Commentary: Sec. A.4.1.1. Tier 2: Sec. 5.6.1.1) **Comments: The roof and elevated floor diaphragms are continuous and believed to have no expansion joints.**
C ( ) NC (•) N/A ( ) U ( )	ROOF CHORD CONTINUITY: All chord elements are continuous, regardless of changes in roof elevation. (Commentary: Sec. A.4.1.3. Tier 2: Sec. 5.6.1.1) **Comments: The roof and elevated floor diaphragms are not believed to have reliable chord elements as such practice was not in use at the time of original construction.**
C (•) NC ( ) N/A ( ) U ( )	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: The roof and elevated floor diaphragms have aspect ratios less than 2-to-1.**
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: The roof and elevated floor diaphragms consist of straight board sheathing.**
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: This building is believed to have no diagonally sheathed or unblocked structural wood panel diaphragms.**

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

C NC N/A U	
(•) C ( ) NC ( ) N/A ( ) U	OTHER DIAPHRAGMS: The diaphragms do not consist of a system other than wood, metal deck, concrete, or horizontal bracing. (Commentary: Sec. A.4.7.1. Tier 2: Sec. 5.6.5) **Comments: All are wood.**

Building size 25'×50' Height 3×10'

Roof load 15psf

Floor load 20psf

Walls & part. 10psf

$W_R = 15 \times 25 \times 50 + 10 \times 25 \times 50 \times 1/2 = 25\,000^{\#}$

$W_3 = (20+10) \times 25 \times 50 = 37500^{\#}$

$W_2 = (20 + 10 \times 0.75) \times 25 \times 50 = 34375^{\#}$

$W_T = 96875^{\#}$

$V = C\,S_a W$

$C = 1.0$ $S_a = 1.6$

$V = 1.0 \times 1.6 \times 96875 = 155\,000^{\#}$

Level	h	W	W·h	$\frac{W \cdot h}{\Sigma W \cdot h}$	Fx
Roof	30	25 000	750 000	0.407	63 085
3	20	37500	750 000	0.407	63085
2	10	34375	343 750	0.186	28830
Total		96875	1843 750	1.000	155 000

Front shear wall

$M_S = 4.5$ (CP)

1st story $\quad V = 155\,000 \times 1/2 = 77500^{\#}$

$$v = \frac{1}{M_S}\left(\frac{V_j}{A_w}\right)$$

$$v = \frac{1}{4.5} \times \left(\frac{77500}{(3.3+2.7)\times 2}\right) = 1435^{\#}/ft.$$

Maximum default expected strength (Table 12-1)
350 #/ft. (stucco)