Rating form completed by:

RUTHERFORD + CHEKENE
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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

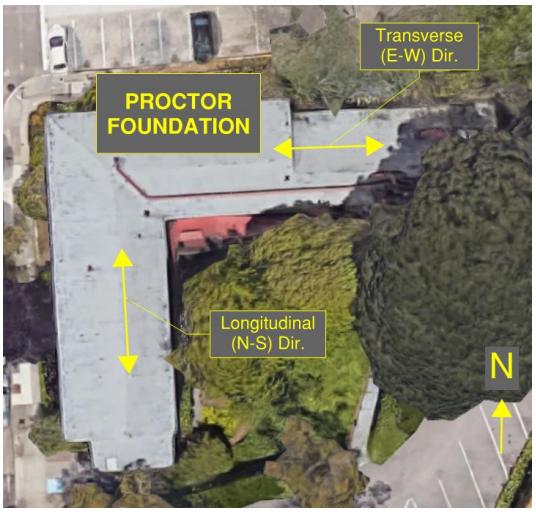
06-25-19

UCSF building seismic ratings

Proctor Foundation

CAAN #2246
95 Kirkham Street, San Francisco, CA 94122
UCSF Campus: Parnassus Heights

Plan



North elevation (looking southeast)

Rating summary	Entry	Notes
UC Seismic Performance Level (rating)	V	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	Priority B	Priority A=Retrofit ASAP Priority B=Retrofit at next permit application for modification
Ballpark total project cost to retrofit to IV rating	Medium ($50-200/sf)	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 Higgins & Root A.I.A. Architects, "Francis I. Proctor Office Building University of California Medical Center San Francisco California," dated 17 December 1954, architectural Sheets A1 to A9 and structural sheets S1 to S7.
- Architectural drawings by William M. Gillis Architect, "Francis I. Proctor Building Alterations San Francisco Medical Center University of California," dated 26 February 1964, Sheets 1 to 3.
- Architectural drawings by William M. Gillis Architect, "Francis I. Proctor Building Alterations San Francisco Medical Center University of California," dated 21 September 64, Sheets 1 to 11.
- Structural drawings by Nicholas Forell & Associates, "Francis I. Proctor Building Alterations San Francisco Medical Center University of California," dated 21 September 64, Sheets S1 to S6.
- Architectural drawings by Blake-Drucker Architects, "95 Kirkham Dr. Cunningham's Laboratory Renovation and Equipment Room 101-109 & 218 UCSF Project # M6342 University of California at San Francisco," dated 7 April 98, Sheets A0, A1, A2.0, A2.1, A3.0.
- Structural drawings by Butzbach Structural Engineering, "95 Kirkham Dr. Cunningham's Laboratory Renovation and Equipment Room 101-109 & 218 UCSF Project # M6342 University of California at San Francisco," dated 7 April 98, Sheets S1 and S2.

Additional building information known to exist

None

Scope for completing this form

The architectural and structural drawings for the original 1954 construction and the 1964 addition were reviewed, and these drawings are used as the basis for the completed ASCE 41-17 Tier 1 evaluation. The laboratory located on the first floor was remodeled in 1998. However, structural work at that time was limited and is not pertinent to the Tier 1 seismic evaluation. 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 Proctor Foundation is a three-story wood framed building that is located on the corner of Kirkham Street and 5th Avenue in San Francisco California. It is currently occupied by researchers for the UCSF Medical Center in the field of ophthalmology. The lowest story is a partial basement located below the northwest corner of the structure. The Proctor Foundation contains an unused lab on the first floor; a patient clinic and offices on the second floor; and labs, offices, and a conference room on the third floor. On a daily basis, there are 12 employees within the building and approximately 40 patients. Once a week a conference is held on the third floor that an additional 10 to 15 people attend. The building administrator indicates that the building function will be relocated to the UCSF Mission Bay campus by early 2020.

The main structure is an "L"-shaped wood framed building that was constructed in 1954. It was originally built as a two-story structure, but a third story was added in 1964. It is located on a steep site, and the grade slopes down by approximately 10 ft from the southeast corner to the northwest corner. The north building wing measures 63'-1" in the east-west direction by 25'-6" in the north-south direction. The west building wing measures 26'-0" in the east-west direction by 85'-4" in the north-south direction. The structure contains a series of long and narrow window openings along the exterior elevations. A steel framed exterior stair is located on its south end. The stair roof is framed with wood and is load bearing on the main building. The stair floors and intermediate landings are precast concrete and are independently supported by steel framing. There is a gap between the stair floors and landings and the main building structure.

In 1964, an additional story was added to the 1954 main building and a two-story rectangular structure was built on the east side of the north building wing. The east structure contains lab space and measures 36'-0" in the east-west direction by 25'-6" in the north-south direction. An additional exterior stair located between the main building and the east lab addition was also constructed in 1964. It is steel framed with precast concrete floors and treads. The wood roof over the stair is load bearing on the adjacent building walls; however, the framing on the west side of the

stair is independently supported with columns and not connected to the east end of the north building wing. Framing at the east end is connected to the addition.

Identification of levels: The building levels are designated as the first floor (EL. 373.92 ft), second floor (EL. 383.64 ft), third floor (EL. 393.52 ft), and the roof (EL. 402.83 at the low point and 405.5 ft at the high point). The low point of the exterior grade is located at the northwest corner of the building at EL. 370 ft. Grade rises towards the southeast and is located slightly below the third floor on the easternmost end of the structure and slightly below the second floor on the southernmost end of the structure. A landscaped courtyard is located at the building re-entrant corner and aligns with the elevation of the second floor.

Foundation system: The original 1954 structure contains a partial basement between the first and second floor located at its northwest corner. It has a 4" thick slab-on-grade reinforced with #3 bars spaced at 18" o.c., e.w. The slab is supported by strip footings located below the exterior and interior stud walls. Reinforced concrete foundation walls were constructed between the sloped grade and the underside of the wood framing at the second floor. The walls are 8", 10" and 15" thick. The 8" walls are reinforced with a single layer of #4 bars spaced at 16" o.c., e.w, while the 10" and 15" walls are reinforced with #4 bars spaced at 16" o.c., e.w. and on each face. They are supported by stepped wall footings that are 1'-0" deep by 1'-0", 1'-6", 1'-8", 2'-0", 2'-4", and 3'-4" wide. The contain 1-#6 or 2-#7 bars oriented parallel to the wall. They typically do not contain transverse reinforcing. The remaining footprint of the structure adjacent to the first floor slab-on-grade is unexcavated. The 1954 drawings indicate that the original structure was designed assuming a future one-story addition. This "future level" is referenced on the drawings.

The 1964 east lab addition is supported by stepped 8" and 12" thick reinforced concrete walls on the north and south elevation respectively. They are reinforced with a single layer of #5 bars at 16" o.c. horizontal and #4 bars at 12" o.c. vertical, and the walls are located over 1'-0 deep by 3'-0" wide reinforced concrete strip footings. The footings contain #4 bars spaced at 16" o.c. oriented perpendicular to the wall. The east elevation is framed with a 12" thick concrete retaining wall that is reinforced with #4 horizontal bars spaced at 16" o.c., each face, and with vertical #5 bars spaced at 12" o.c. on the outside face and vertical #4 bars spaced at 18" o.c. on the inside face. The strip footing below this wall is 1'-0" deep by 5'-0" wide with #6 bars spaced at at 12" o.c in the transverse direction.

Structural system for vertical (gravity) load: The roof framing of the "L"-shaped structure consists of ½" thick plywood sheathing placed over 2x8 joists spaced at 16" and 24" o.c. The joists span from the exterior walls to a ridge beam that is located slightly off the central longitudinal axis of each building wing. The floor framing consists of ¾" thick plywood located over 2x10 and 3x10 joists spaced at 16" o.c. These joists span from the exterior walls to interior load bearing walls located along the corridors in the longitudinal direction. The interior walls are framed with 2 x 4s spaced at 16" o.c., while the exterior walls are framed with 2x6s spaced at 16" o.c. A series of 4'-0" wide window openings are located on the exterior elevations. These are framed with 3x6 posts spaced at 48" o.c.

The roof of the 1964 east lab addition is framed with ½" thick plywood over 2x8 joists that span to an interior 10WF21 steel ridge beam and the exterior walls. The floor is framed with ¾" plywood over 2x10 framing spaced at 16" o.c. that spans between a central 10 WF 33 steel beam and the exterior walls. The exterior walls consist ½" plywood over 2 x 6 wood studs spaced at 16" o.c.

Structural system for lateral forces: The lateral force-resisting system is comprised of plywood sheathed shear walls located around the building exterior along select interior corridors. The exterior walls are comprised of ½" thick plywood sheathing that is nailed to 2 x 6 wood stud walls. The walls are blocked using 2x6 framing spaced at 4'-0" o.c. In the 1954 construction, nailing along panel edges consists of 8d nails spaced at 3" and 4" o.c., and the field nailing consists of 8d nails spaced at 6" o.c. In the 1964 construction, nailing consists of 8d nails spaced at 6" o.c. along panel edges and 8d nails spaced at 12" o.c. in the field. The wood stud walls are bolted to the concrete foundation walls using 3x redwood sills with 5/8" diameter x 1'-0" long bolts spaced at 48" o.c. The short walls oriented in the transverse direction contain 6 x 6 post boundary members that are bolted to the foundation with tie down anchors. The tie down detail consists of 2- ¾" diameter bolts oriented horizontally through the post that connect to the long leg of a 6" x 4" x ½" steel angle. The angle is then bolted to the foundation wall using a ¾" diameter x 1'-8" long bolt. Interior shear walls are similar to the exterior walls, except that the ½" plywood is nailed to 2 x 4 stud framed walls with 2 x 4 blocking and 4 x 4 boundary posts. The exterior walls contain a series of long and narrow window openings that significantly reduce the ability of the exterior walls to transfer shear. Tall, narrow piers are typically located at the ends of the walls. The width-to-building height aspect ratio of these piers is

approximately 1W:4.5H. A 4'-0" long concrete wall pier is located in the end bay between the second to third floor on the south and east elevation of the 1954 structure. It is 9" thick and is reinforced with #4 bars spaced at 16" o.c., e.w. and on each face. The wood stud walls that align with the concrete pier contains a double 3 x 6 top plate. It does not appear that these members were detailed to behave like collector elements for the concrete piers. For the purpose of the Tier 1 assessment, the length of the concrete is included in the total wall length of the plywood shear walls. However, it is recognized that additional capacity is afforded by the concrete which is ignored in this calculation.

The roof and floor diaphragms are comprised of ½" and 3/4" thick sheathing respectively. The roof is blocked with 2 x 6 framing and nailed with 8d nails at 6" o.c. around edges and with 8d nails at 12" o.c. in the field. The roof chords consist of 1-2 x 6 and 1-3 x 6 top plate that are spliced with an 8'-0" lap and contain 8 - 16d nails on each side of the splice. The floor diaphragms are blocked with 3 x 4 flat framing and nailed around edges with 8d nails spaced at 4" o.c. and 8d nails at 8" o.c. in the field. Chords are comprised of 2 - 3 x 6 top plates located at the wood stud walls. They are spliced with an 8'-0" lap length and 12 – 40d nails.

The lateral shear is resisted by plywood sheathed walls that are located between the roof and the second floor. Concrete foundation walls are located in the partial basement between the first and second floor. This Tier 1 assessment is limited to the check of the plywood walls and does not include the concrete foundation walls.

Building condition: Good. No on-going maintenance problems were noted by the building administrator. The roof and roof-top mechanical equipment are showing signs of age.

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 "This is a two-unit wood-frame building founded on independent peripheral concrete wall footings and internal concrete piers. One unit consists of two stories and a basement, and the other consists of two floor levels. Both units were inspected on the exterior and the interior. No structural or architectural damage was observed in the building. There was no evidence of soil distress and no slope movement. Therefore, the building was determined 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 shear walls in the Proctor Foundation are severely overstressed per the Tier 1 Quick Check assessment. In the N-S direction, the maximum Tier 1 demand-to-capacity is 2.55, and in the E-W direction, the maximum demand-to-capacity is 1.57.
- The building contains a weak and soft story in the N-S direction. The length of shear wall reduces from 147 linear feet between the 3rd floor and roof to 52 linear feet between the 2nd and 3rd floors.
- Interior shear walls were added along the central corridors in the upper story addition in 1964. These walls align with stud walls below; however, the stud walls are interior partitions and do not contain plywood sheathing.
- The Proctor Foundation likely contains a torsional irregularity. The two-story walls on the southeast elevation are likely stiffer than the three-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)	Y	Openings at shear walls (concrete or masonry)	N
Load path	N	Liquefaction	N
Adjacent buildings	N	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	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 majority of the lab equipment is unbraced including, but not limited to, refrigerators and fume hoods. Gas supply to the building is unknown as the boiler room was not accessible. No gas fueled equipment was observed; however, a gas meter is located on the north elevation. Access to the mechanical room was not available during the site visit.

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	The majority of the lab equipment is unbraced including refrigerators and fume hoods.
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. See note above.

Basis of Seismic Performance Level rating

The 1954 construction of the Proctor Foundation relies on the exterior wood sheathed shear walls as the primary latera load-resisting elements. The extent of the window openings in these walls greatly reduces the overall shear capacity, and the building relies on tall narrow end wall piers to resist the majority of the load. These piers have story height-to-length aspect ratios on the order 2.35H:1L and overall height-to-length aspect ratios approaching 4.6H:1L. With these proportions, it is expected that the overturning forces in the piers will be high. Although some tie down anchors are located in transverse direction walls, the end wall piers typically do not contain wood post boundary elements and tie downs. In 1964, an additional story was added onto the original structure. This addition utilizes interior shear walls along the central corridors in addition to the exterior shear walls. The corridor walls at the upper story align with existing stud walls below; however, the stud walls below do not contain plywood sheathing. The walls between the 2nd and 3rd floors may help resist overturning loads from the shear walls above, but they do not help resist the shear forces. Due to the interior shear walls in the upper, but not the lower story,

[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.

the Proctor Foundation likely contains a weak and soft story between the 2nd floor and 3rd floor in the N-S direction. Finally, the building does not have sufficient shear capacity to resist the BSE-2E level forces. The average wall forces are 2,551 plf and 546 plf in the N-S direction between the 2nd floor and 3rd floor and the 3rd floor and roof, respectively. In the E-W direction, the average wall forces are 1,572 plf and 1,025 plf between the 2nd floor and 3rd floor and the 3rd floor and roof respectively. These demands substantially exceed the Tier 1 limit of 1,000 plf.

The 1964 east lab addition performs reasonably well. It does not contain any significant structural irregularities and passes in the BSE-2E stress check in the E-W direction with calculated wall forces of 611 plf and 687 plf between the 2nd floor and 3rd floor and the 3rd floor and roof, respectively. In the north-south direction, the calculated wall forces are 1,323 plf and 995 plf in the 2nd floor to 3rd floor walls and the 3rd floor to roof walls, respectively. The lower story walls in this direction exceed the Tier 1 limit of 1,000 plf.

The building is assigned a Seismic Performance Level Rating of V because the main building lacks sufficient shear capacity, relies on tall and narrow wall piers located at the ends of long window openings, and it likely contains a weak and soft story between the 2nd floor and 3rd floor.

Recommendations for further evaluation or retrofit

It is recommended that this structure be retrofit. The as-built condition contains limited lengths of shear resisting elements. It is unlikely that additional analysis will improve the rating without the addition of new walls.

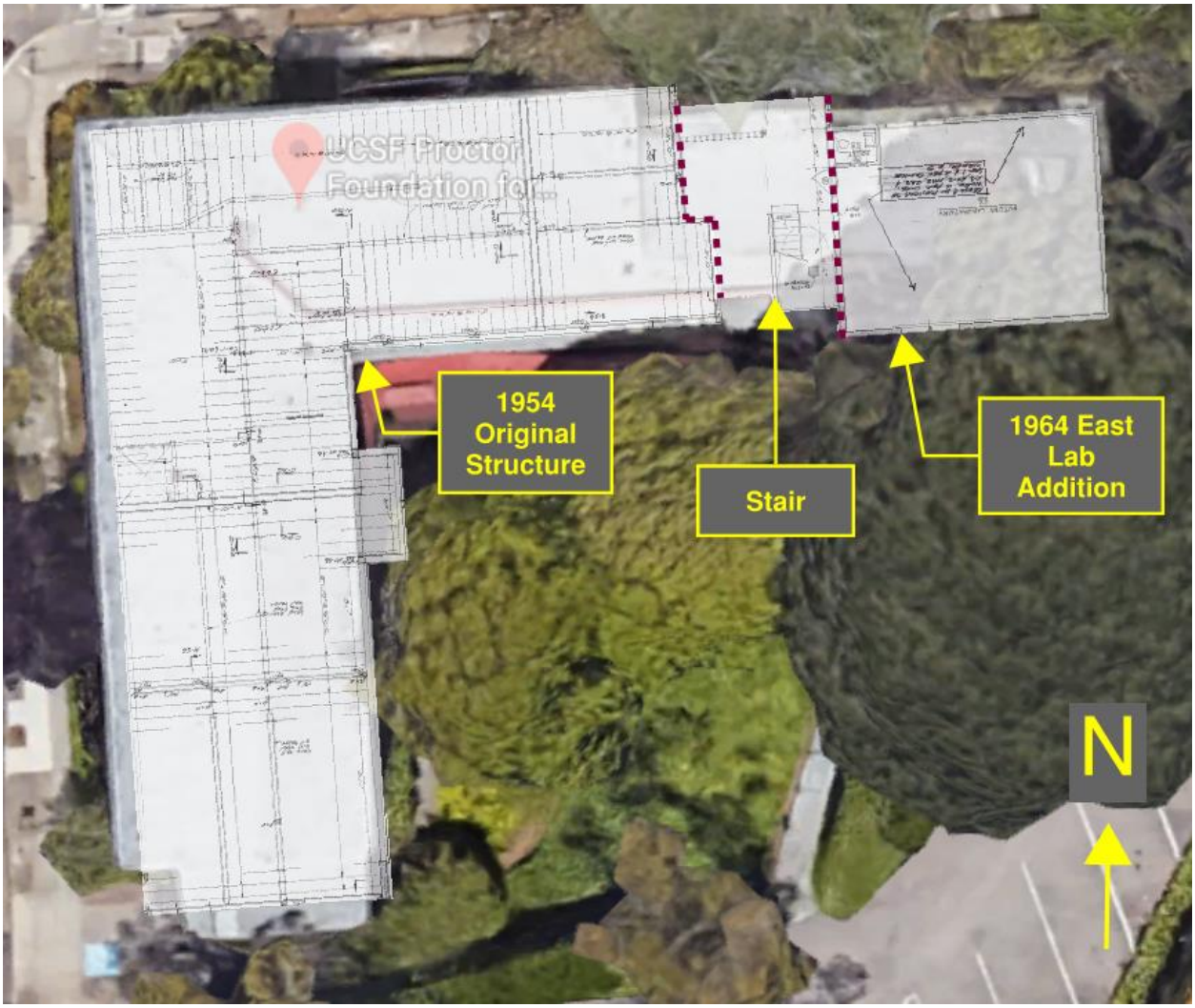
Peer review comments on rating

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 V. It is recommended to retrofit the building due to the severity of the deficiencies and high demand to capacity ratios. It is unlikely that further analysis will be beneficial or revise the rating.

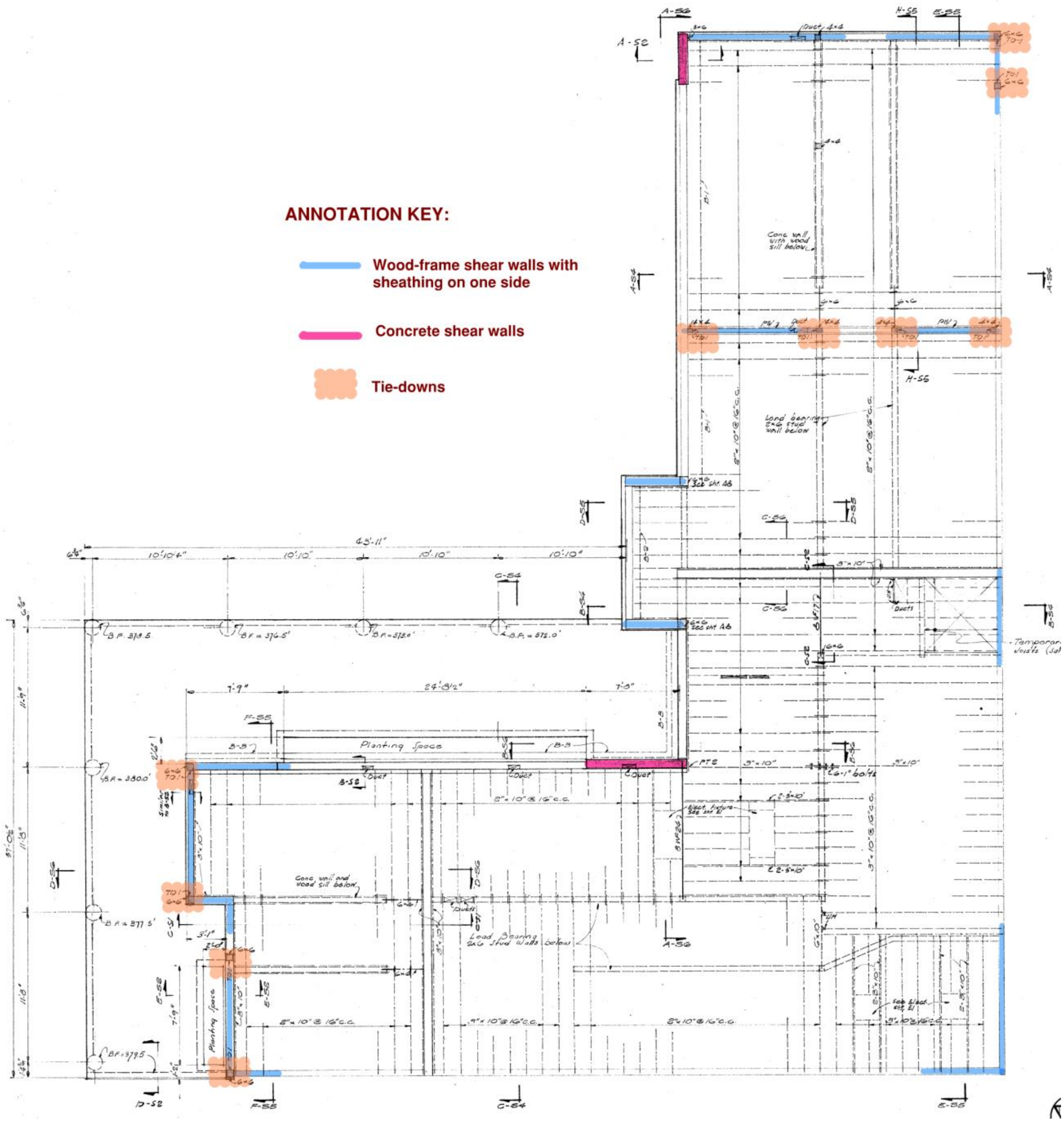
Additional building data	Entry	Notes
Latitude	37.76036	
Longitude	-122.46162	
Are there other structures besides this one under the same CAAN#	No	
Number of stories above lowest perimeter grade	3	
Number of stories (basements) below lowest perimeter grade	0	Building pad is located on a steep hill
Building occupiable area (OGSF)	13,944	Calculated
Risk Category per 2016 CBC 1604.5	II	
Building structural height, h_n	21.8 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	0.20 sec	Estimated using ASCE 41-17 equation 4-4 and 7-18
Site data		
975-year hazard parameters S_s, S_1	1.566g, 0.619g	Applied Technology Council website

Site class	C	
Site class basis	Estimated	UCSF Group 2 Buildings – Tier 1 Geotechnical Assessment, Egan (2019)
Site parameters F_a, F_v	1.2, 1.4	Applied Technology Council website
Ground motion parameters S_{cs}, S_{c1}	1.879g, 0.867g	UCSF Group 2 Buildings – Tier 1 Geotechnical Assessment, Egan (2019)
S_a at building period	1.88g	W = 286 kips, V base = 591 kips (Main Building) W = 73 kips, V base = 152 kips (East Lab Addition)
Site V_{s30}	540 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: 1954 Code: 1952 UBC Assumed	
Applicable code for partial retrofit	Built 1964 Code: 1962 UBC Assumed	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	-	

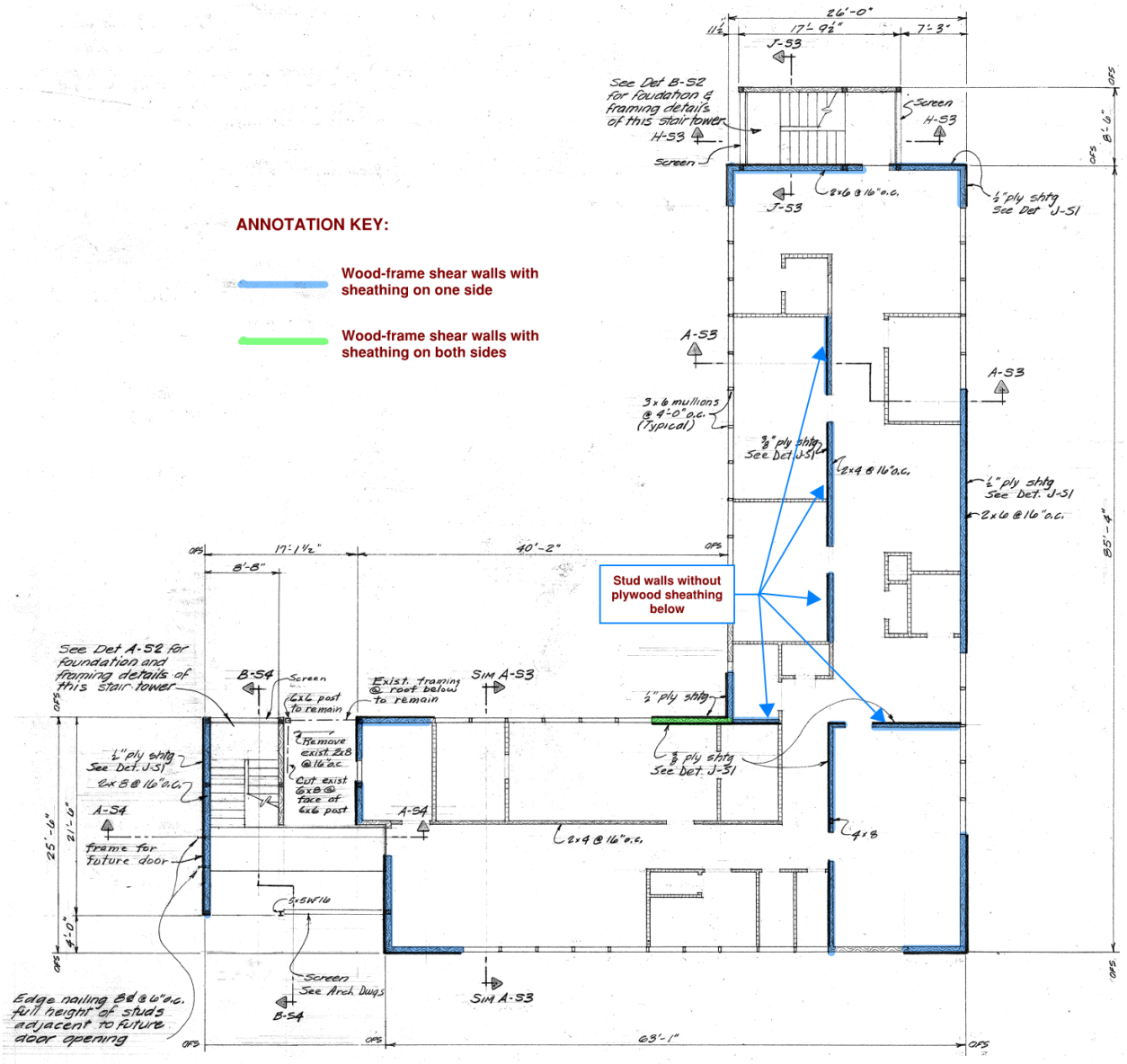
Appendices		
ASCE 41 Tier 1 checklist included here?	Yes	Refer to attached checklist file



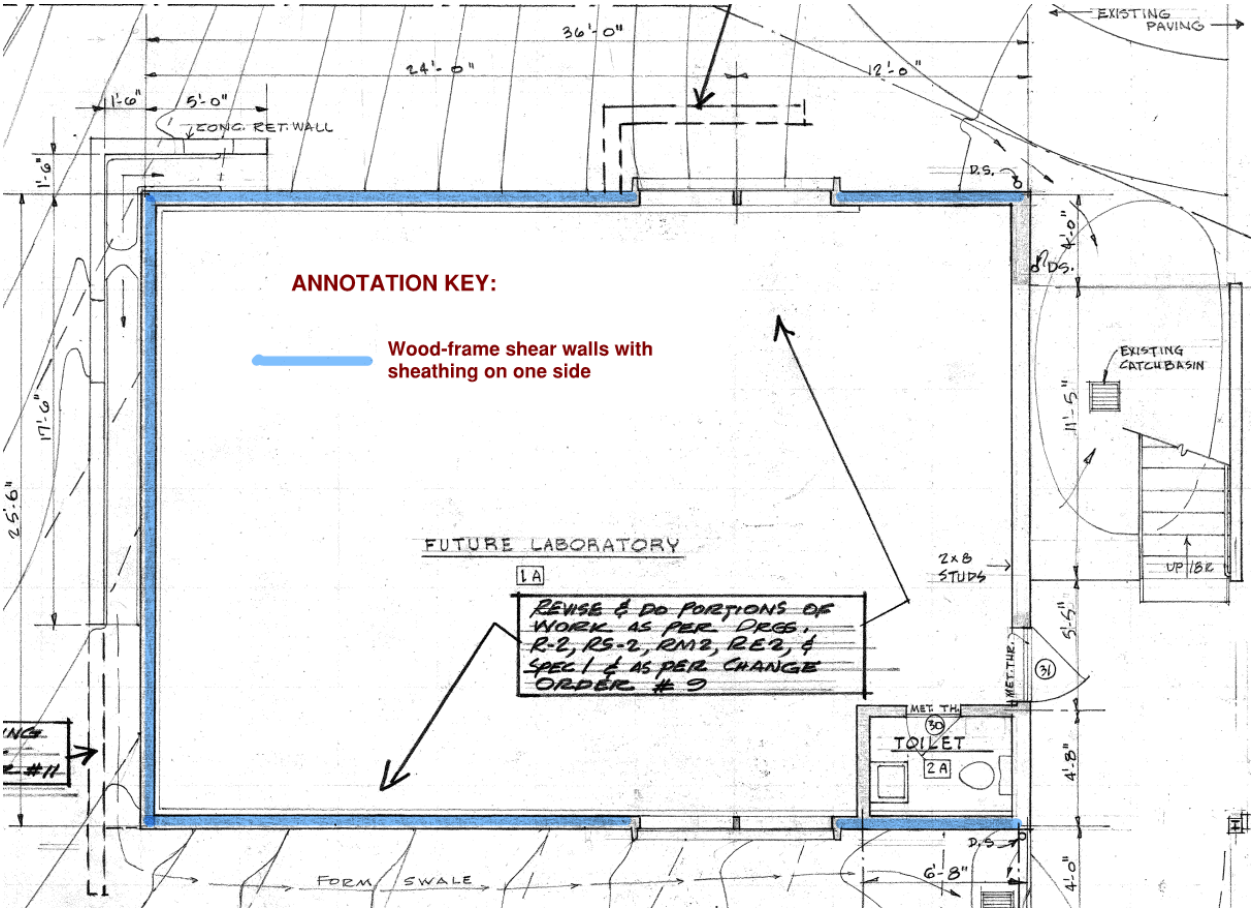
2nd floor plan



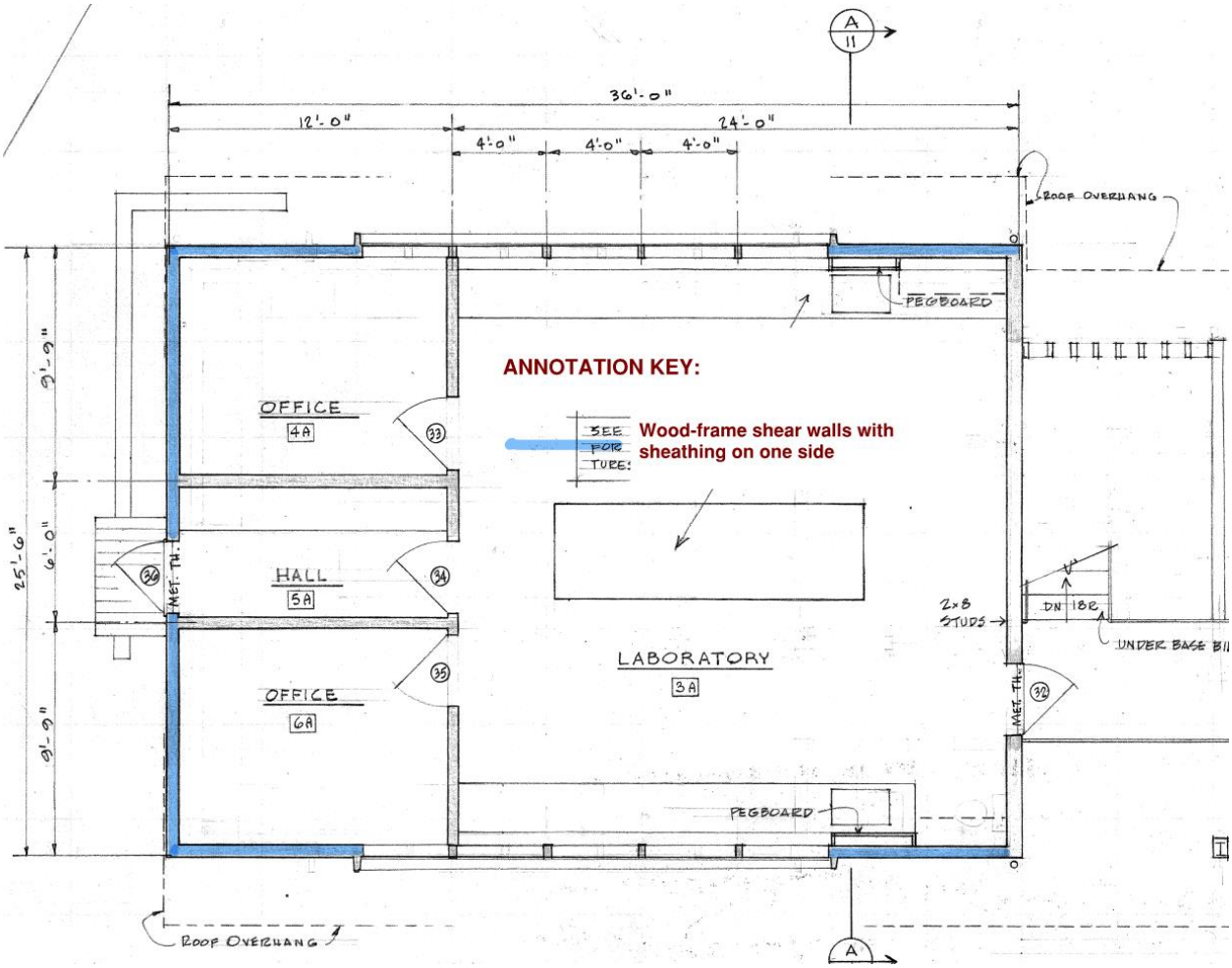
Shear walls between the second and third floor in the main building (1954 construction)



Shear walls between the third floor and the roof in the main building (1964 construction)



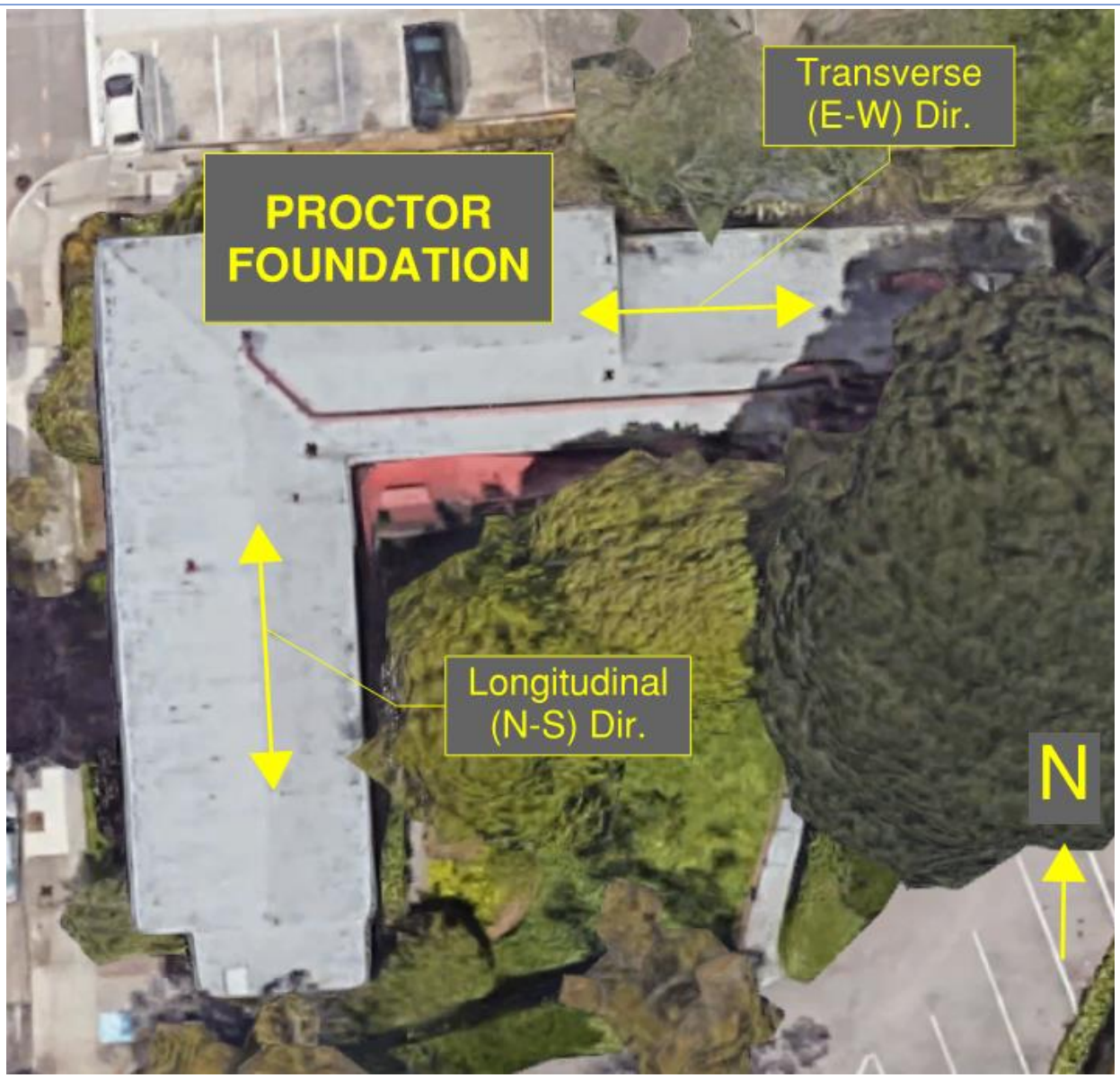
Shear walls between the second and third floor in the east wing (1964 construction). Note that the wall on the west (right) side is not shaded as the drawings have a bid alternate without plywood on this wall. There is stucco on the exterior.



Shear walls between the third floor and the roof in the east wing (1964 construction). Note that the wall on the west (right) side is not shaded as the drawings have a bid alternate without plywood on this wall. There is stucco on the exterior.

APPENDIX A

Additional Images


Transverse
(E-W) Dir.
PROCTOR
FOUNDATION
Longitudinal
(N-S) Dir.
N

Plan

West elevation (looking northeast)

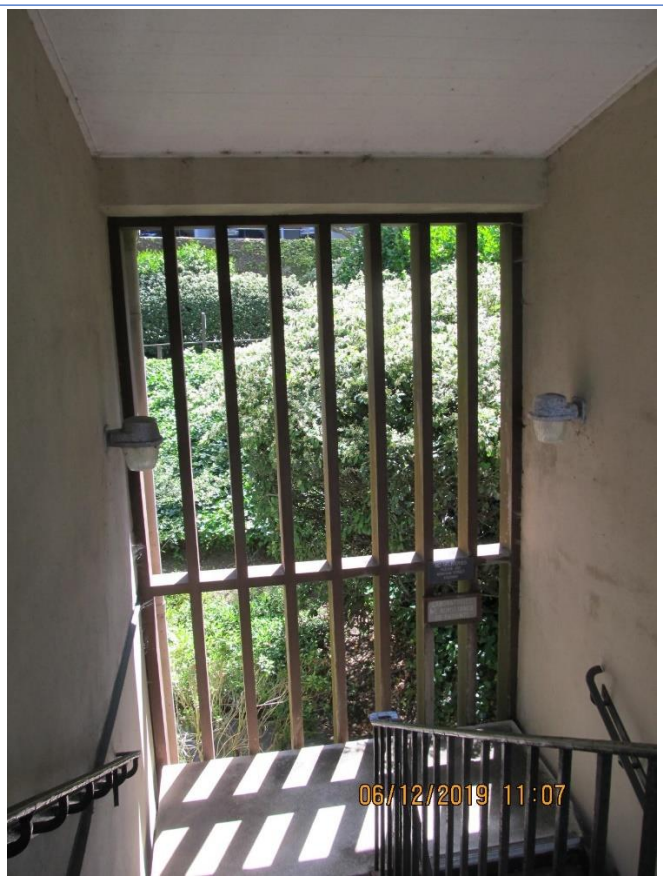
North and west elevation (looking southeast)

East elevation of west wing (looking southwest)

South elevation of east wing (looking northwest)

North elevation (looking southwest)

Exterior stair on south elevation (looking northeast)



Stair on south elevation (looking east)

Terrace on the south elevation

Lab interior

Interior shear wall at underside of roof

Conference room

Interior corridor (looking west)

Chained tanks

Unbraced fume hood

North elevation of lab 1964 addition (looking southwest)

South elevation of 1964 lab addition (looking northwest)

North elevation of stair between original 1954 structure and the 1964 lab addition (looking southwest)

Stair between original 1954 structure and 1964 lab addition (looking east at west elevation of the addition)

Stair between original 1954 structure and the 1964 lab addition (looking west at the east elevation of the original structure)

Interior of the 1964 lab addition (looking north)

APPENDIX B

ASCE 41-17 Tier 1 Checklists (Structural)

UC Campus:	San Francisco			Date:	06/25/2019		
Building CAAN:	2264	Auxiliary CAAN:		By Firm:	RUTHERFORD + CHEKENE		
Building Name:	Proctor Foundation			Initials:	EGM	Checked:	BL
Building Address:	95 Kirkham St, San Francisco, CA 94122			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:** Plywood sheathing over wood framing functions as floor and roof diaphragms and deliver loads to wood-framed shear walls. The exterior wood shear walls are supported by concrete foundation walls, which are founded on concrete strip footings.
○	○	●	○	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 adjacent buildings.
○	○	●	○	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.

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:** In the N-S direction, the length of shear wall reduces by 60% between the 2nd floor and 3rd floor as compared to the story above.
○	●	○	○	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:** In the N-S direction, the length of shear wall reduces by 60% between the 2nd floor and 3rd floor as compared to the story above.
○	●	○	○	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:** Interior walls located in the upper story along the corridors align with stud partition walls below. However, these partition walls do not contain plywood sheathing and do not resist shear forces.

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

UC Campus:	San Francisco			Date:	06/25/2019		
Building CAAN:	2264	Auxiliary CAAN:		By Firm:	RUTHERFORD + CHEKENE		
Building Name:	Proctor Foundation			Initials:	EGM	Checked:	BL
Building Address:	95 Kirkham St, San Francisco, CA 94122			Page:	2	of	3

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 1st floor.
●	○	○	○	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:** Effective mass has a slight increase from the 2nd floor to the 1st floor; however, this increase is approximately 30%.
○	●	○	○	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 south and east elevations and three stories above grade on the north and west elevations. The center of rigidity is shifted to the southeast re-entrant corner, while the center of mass is located further to the northwest.

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:** UCSF Group 2 Buildings – Tier 1 Geotechnical Assessment, Egan (2019)

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

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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 = 25'-6". The building height from the 2nd floor to the roof high point is H = 21.88", B/H = 1.165 Sa = 1.88g for at BSE-2E 0.6x Sa = 1.13 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:** The soil is classified as Site Class C.

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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:** There are 5 lines of shear walls in the N-S direction and 3 lines of walls in the E-W direction.
○	◉	○	○	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 N-S direction, the calculated wall forces are 2,551 lb/ft, and 546 lb/ft from the 2nd and 3rd floor and 3rd floor and roof, respectively. In the E-W direction, the calculated wall forces are 1,025 lb/ft, and 1,572 lb/ft from the 2nd and 3rd floor and 3rd floor and roof, respectively. These exceed the ASCE 41 limit of 1,000 lb/ft for buildings with structural panel sheathing. The wall stress in the 1964 east lab addition are below 1,000 plf except between the 2nd floor and 3rd floor where they are 1,323 plf in the N-S direciton.
◉	○	○	○	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:** Wood-frame shear walls have 3/8" and ½" plywood sheathing to resist seismic forces and do not rely on exterior stucco.
◉	○	○	○	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:** Although plaster finish and gypsum partition walls are located within the structure, they are not utilized as lateral force-resisting elements. The shear walls are comprised of plywood-sheathed stud walls.

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Collapse Prevention Structural Checklist For Building Type W2

C	NC	N/A	U	
○	●	○	○	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:** Long and narrow window openings are located on the exterior elevations. The remaining end wall piers which resist lateral load are tall and narrow with a story height-to-length aspect ratio that approach 2.35 H:1 L.
○	●	○	○	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:** In the 1954 construction, the exterior plywood sheathing runs continuously past the outside face of the floor joists. In the 1964 construction where a new story was added to the existing structure, the sills of the stud walls are nailed to the exterior floor joist with 16d nails at 6" o.c. Although a nailed connection exists, a more substantial connection using hold downs was not provided. Given the narrow wall aspect ratios, it is likely that the overturning forces will be high.
○	●	○	○	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 south and east side and three stories above grade on the northwest corner. On the northwest corner, the story height-to-wall length aspect ratio is 1.45 H: 1 L.
●	○	○	○	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:** The plywood walls typically transition to reinforced concrete walls below the 2nd floor framing. The exception is on the north and west elevation where the exterior plywood walls extend to the foundation.
○	●	○	○	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:** Long and narrow window openings are located on the exterior elevations. The remaining end wall piers which resist lateral load are tall and narrow with a story height-to-length aspect ratio that approach 2.35 H:1 L.

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:** Per general notes on Sheet S7 in 1954 drawings, wood posts have hold downs that anchor them to the foundation.

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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:** Per carpentry notes on Sheet S7 in 1954 drawings, the sills on concrete shall be anchored with 5/8 x 12" bolts spaced at 48" o.c.
○	◉	○	○	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 the connection details on Sheet S7 in 1954 drawings, studs parallel to ceiling joists are nailed down using 2-16d nails. Details E-S1 and F-S1 include nailing at top plates for the connections after the 1964 alterations. Plates or straps are not used.

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 S7 in 1954 drawings, the sills on concrete shall be anchored within 9" of each end of each stick and spacing not over 48" on centers between.

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:** Diaphragm is continuous throughout the 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 Section A-S3 and Detail B-S3 in 1964 drawings, 2x6 and 3x6 top plates function as roof chords along perimeter of the wall, which are nailed to the roof's blocking elements, and to the plywood wall sheathing.

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C	NC	N/A	U	
○	○	◉	○	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 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.
◉	○	○	○	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 are comprised of plywood sheathing.
◉	○	○	○	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 are located 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

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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:** No areas of congregation of over 50 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:** Lab spaces contain hazardous materials. No bracing was observed for large pieces of equipment such as refrigerators and fume hoods.
P ☐ N/A ☒	**Masonry chimneys** **Comments:** No masonry chimneys are in the building.
P ☒ N/A ☐	**Unrestrained natural gas-fueled equipment such as water heaters, boilers, emergency generators, etc.** **Comments:** It is unknown if the building is supplied by natural gas. A natural gas meter was observed on the exterior of the north elevation, but the building administrator did not indicate what it supplied. The boiler room could not be accessed.
P ☐ N/A ☐	**Other:** **Comments:**
P ☐ N/A ☐	**Other:** **Comments:**
P ☐ N/A ☐	**Other:** **Comments:**

Falling Hazards Risk: Moderate, lab equipment is unbraced.

Note: P= Present, N/A = Not Applicable

APPENDIX D

Quick Check Calculations

Flat Load Tables - 1954 Original Structure

	Seismic Weight	Dead Load	
ROOF **1964 Alteration**	psf	psf	**Remarks**
Roofing	2.3	2.3	Built-up roofing system, 3-ply and smooth-surfaced assumed
Waterproofing + insulation	1.6	1.6	2" batt insulation and waterproofing membrane assumed
Sheathing	1.7	1.7	1/2" plywood sheathing
Wood framing	1.8	1.8	2x8" wood joists at 24" o.c. + 0.5 psf blocking and bridging
MEP	5.0	5.0	MEP hung from underside of floor slab
Ceiling, lighting and misc.	4.0	4.0	Lay-in ceiling assumed
Columns	0.0	0.0	Additional wood posts are included in wood walls
Walls	12.5	0.0	
Total	28.9	16.4	

1 - Flat load occurs at entire roof level, except for the roof below the stairways, and the laboratory on the east wing added after the 1964 alterations.

2 - 3x10" at 16" o.c. and double 2x8" joists at mechanical equipment hangers also occur in some areas of this flat load.

3 - Includes exterior stucco walls, interior shear walls, and interior partition walls

	Seismic Weight	Dead Load	
STAIR ROOF **1964 Alterations**	psf	psf	**Remarks**
Roofing	2.3	2.3	Built-up roofing system, 3-ply and smooth-surfaced assumed
Waterproofing + insulation	1.6	1.6	2" batt insulation and waterproofing membrane assumed
Sheathing	1.7	1.7	1/2" plywood sheathing
Wood framing	2.4	2.4	2x8" wood joists at 16" o.c. + 0.5 psf for blocking and bridging
Steel subframing	10.0	10.0	Steel beams and columns
Lighting, sprinklers, and misc.	3.0	3.0	
Total	21.0	21.0	

1 - Flat load occurs below two stairways, one on the south elevation and the other between the original structure and the lab addition in 1964.

2 - 5x5WF16 columns and 6x6WF15.5 girders conform the steel subframing.

	Seismic Weight	Dead Load	
TYP. FLOOR **2nd & 3rd**	psf	psf	**Remarks**
Flooring	2.0	2.0	Carpet and vinyl tile assumed
Sheathing	2.5	2.5	3/4" plywood subfloor
Wood framing	2.9	2.9	2x10" wood joists at 16" o.c. + 0.5 psf for blocking, misc.
MEP	5.0	5.0	MEP hung from underside of floor slab
Ceiling, lighting and misc.	4.0	4.0	Lay-in ceiling assumed
Columns	0.0	0.0	Additional wood posts are included in wall weight
Walls	25.0	25.0	
Total	41.4	41.4	

1 - Flat load occurs at entire 2nd and 3rd floor, except for the roof below the stairways, the canopy, and the laboratory on the east wing added after the 1964 alterations.

2 The typical floor area at 3rd floor used to be the roof until an additional story was built after the 1964 alterations.

3 - Includes exterior stucco walls, interior shear walls, and interior partition walls.

4 - 3"x10" at 16" o.c. joists also occur in some areas of this flat load.

	Seismic Weight	Dead Load	
STAIR FLOOR **1964 Alteration**	psf	psf	**Remarks**
Slab	37.5	37.5	3" NWC concrete slab for landing and concrete steps
Steel subframing	10.0	10.0	Steels beams and columns
Lighting, sprinklers, and misc.	3.0	3.0	MEP hung from underside of floor slab
Total	50.5	50.5	

1 - Flat load occurs below two stairways, one on the south elevation and the other between the original structure and the lab addition in 1964. The stair floor is tributary to the 3rd floor of the building.

2 - 5x5WF16 columns and 6x6WF15.5 girders conform the steel subframing.

3 - 3.5" concrete slab also occurs in some areas of this flat load.

	Seismic Weight	Dead Load	
CANOPY **3rd floor**	psf	psf	**Remarks**
Roofing	2.3	2.3	Built-up roofing system, 3-ply and smooth-surfaced assumed
Waterproofing	1.5	1.5	Waterproofing membrane assumed
Sheathing	2.5	2.5	3/4" plywood sheathing
Wood framing	2.4	2.4	2x8" wood joists at 16" o.c. + 0.5 psf for blocking and bridging
Lighting, sprinklers, and misc.	3.0	3.0	MEP hung from underside of floor slab
Plaster finish	4.0	4.0	On underide of canopy
Columns	0.3	0.0	Exterior wood posts at 10'-10" o.c.
Total	16.0	15.7	

1 - Flat load occurs at 3rd floor, where the canopy on the re-entrant corner is located.

2 - 6x6 redwood wood posts at 10'-10" are supported the roof on the exposed side of the canopy.

Flat Load Tables - East Lab from 1964 Alteration

	Seismic Weight	Dead Load	
EAST LAB ROOF **1964 Alteration**	**psf**	**psf**	**Remarks**
Roofing	2.3	2.3	Built-up roofing system, 3-ply and smooth-surfaced assumed
Waterproofing + insulation	2.5	2.5	2" batt insulation and waterproofing membrane assumed
Sheathing	1.7	1.7	1/2" plywood sheathing
Steel ridge beam	0.8	0.8	10WF21 Steel beam running in E-W direction
Wood framing	1.8	1.8	2x8" wood joists at 24" o.c. + 0.5 psf for blocking and bridging
MEP	5.0	5.0	MEP hung from underside of floor slab
Ceiling, lighting and misc.	4.0	4.0	Lay-in ceiling assumed
Columns	0.0	0.0	Included in wall weight
Walls	7.0	0.0	
Total	25.2	18.2	

1 - Flat load occurs at roof level, below the laboratory area on the east wing added after 1964 alterations.

2 - Single 6x6" wood post occur in flat load, weight is included in wood walls.

3 - Includes exterior stucco walls, interior shear walls, and interior partition walls.

	Seismic Weight	Dead Load	
EAST LAB FLOOR **3rd floor**	**psf**	**psf**	**Remarks**
Flooring	2.0	2.0	Carpet and vinyl tile assumed
Sheathing	2.5	2.5	3/4" plywood sheathing
Steel ridge beam	1.3	1.3	10WF33 Steel beam running in E-W direction
Wood framing	2.9	2.9	2x10" wood joists at 16" o.c. + 0.5 psf blocking and bridging
MEP	5.0	5.0	MEP hung from underside of floor slab
Ceiling, lighting and misc.	4.0	4.0	Lay-in ceiling assumed
Columns	0.0	0.0	Included with wall weight
Walls	14.0	14.0	
Total	31.7	31.7	

1 - Flat load occurs at 3rd level where the laboratory area is located, on the east wing added after the 1964 alterations.

2 - Single 6x6" wood post occur in flat load, weight is included in wood walls.

3 - Includes exterior stucco walls, interior shear walls, and interior partition walls.

Story Weight

1954 Original Structure

	Floor Area (ft^2)[1,2,3]					Floor Weight (psf)					Height[4]		
Floor Levels	ROOF 1964 Alteration	STAIR ROOF 1964 Alterations	TYP. FLOOR 2nd & 3rd	STAIR FLOOR 1964 Alteration	CANOPY 3rd floor	ROOF 1964 Alteration	STAIR ROOF 1964 Alterations	TYP. FLOOR 2nd & 3rd	STAIR FLOOR 1964 Alteration	CANOPY 3rd floor	Elevation (ft)	Height below floor level (ft)	Total Seismic Weight (kips)
Roof	3,898	299	0	0	0	29	21	41	51	16	405.52	12.00	119
3rd Floor	0	0	3,224	399	830	29	21	41	51	16	393.52	9.88	167
2nd Floor											383.64	9.72	
1st Floor											373.92		

Total Weight = 286

East Lab from 1964 Alteration

	Floor Area (ft^2)[1,2,3]				Floor Weight (psf)				Height[4]		
Floor Levels	EAST LAB ROOF 1964 Alteration	STAIR ROOF 1964 Alterations	EAST LAB FLOOR 3rd floor	STAIR FLOOR 1964 Alteration	EAST LAB ROOF 1964 Alteration	STAIR ROOF 1964 Alterations	EAST LAB FLOOR 3rd floor	STAIR FLOOR 1964 Alteration	Elevation (ft)	Height below floor level (ft)	Total Seismic Weight (kips)
Roof	1,056	299	0	0	25	21	32	51	405.52	12.00	33
3rd Floor	0	0	918	228	25	21	32	51	393.52	9.88	41
2nd Floor									383.64		

Total Weight = 73

Notes:

1 - Seismic base is set at 2nd floor for the 1954 original structure and the 1964 east lab alteration. 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 2.3% to account for slope towards the exterior walls.

4 - Elevations and roof height are based on Details A/5 & A/6 in 1964 drawings. For the roof, an average between the high and low elevations of the typical roof was used for the story height.

5 - The East lab, central stair, and upper story were added to the original structure in 1965.

6 - Seismic weight of stairway on the north wing is equally distributed between the original L-shaped 1954 construction and the 1964 east lab addition. The seismic weight of stairway on south end is tributary to the original 1954 structure.

7 - Floors have been renamed as follows:

Elevation	1965 Drawings	1965 Drawings	Current Name
402'-10" (Low point) 405'-6" (High point)	-	Roof	Roof
393'-6"	Roof	Third Floor	Third Floor
383'-7.5"	Second Floor	Second Floor	Second Floor
373'-11"	First Floor	First Floor	First Floor

Period

1954 Original Structure

C_t=	0.02
h_n (ft)=	21.88
B=	0.75

T=	0.20	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 2nd floor to the high point of the roof.

East Lab from 1964 Alteration

C_t=	0.02
h_n (ft)=	21.88
B=	0.75

T=	0.20	sec

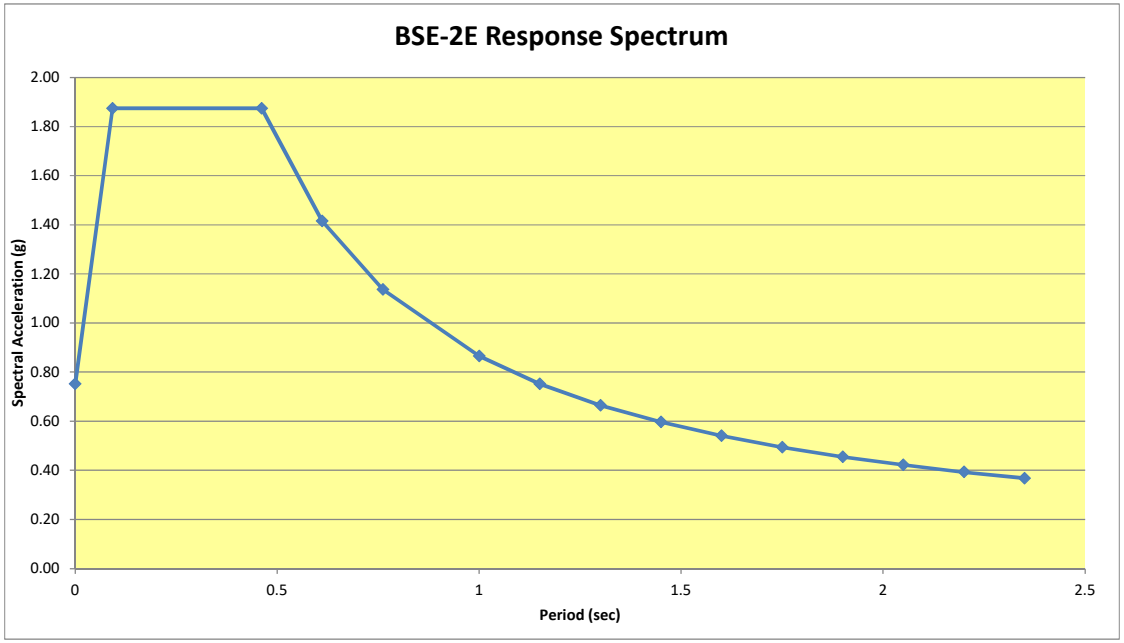
Notes:
1- The period calculated per ASCE 41-17 Equation 4-4.

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

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 2nd floor to the high point of the roof.

Site Parameters

Period (s)	Sa (g)
0	0.75
0.09	1.87
0.46	1.87
0.61	1.41
0.76	1.14
1.00	0.86
1.15	0.75
1.30	0.67
1.45	0.60
1.60	0.54
1.75	0.49
1.90	0.46
2.05	0.42
2.20	0.39
2.35	0.37



β =	0.05	
B_1 =	1.00	
Site Class =	C	
S_{XS} =	1.879	g
S_{X1} =	0.867	g
T_0 =	0.09	sec
T_s =	0.46	sec

1954 Original Structure

T =	0.20	sec	
S_a =	1.87	g	(See Note 2)
Tier 1 S_a =	1.88	g	(See Note 3)

East Lab from 1964 Alteration

T =	0.20	s	
S_a =	1.87	g	(See Note 2)
Tier 1 S_a =	1.88	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 - 1954 Original Structure

ATC Horizontal Response Spectrum Seismic Parameters		
Hazard Level	BSE-2E	
Site Class	C	
S_{XS}=	1.879 g	(See Note 2)
S_{X1}=	0.867 g	(See Note 2)

T=	0.20	s
Sa=	1.879	g
W=	286	kips
C=	1.1	Per ASCE 41-17 Table 4-7

V=	591	kips

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 inbetween 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	12.00	21.88	119	2,605	0.61	362	362
3rd Floor	9.88	9.88	167	1,649	0.39	229	591
2nd Floor							
	21.9		286	4,254	1	591	

Notes:

1- Base of building is assumed to be at the 2nd Floor.

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.

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) Moment frame (S1, S3, C1, PC2a)	1.3	1.1	1.0	1.0
Shear wall (S4, S5, C2, C3, PC1a, PC2, RM2, URMa) Braced frame (S2) Cold-formed steel strap-brace wall (CFS2)	1.4	1.2	1.1	1.0
Unreinforced masonry (URM) Flexible diaphragms (S1a, S2a, S5a, C2a, C3a, PC1, RM1)	1.0	1.0	1.0	1.0

[a] Defined in Table 3-1.

Seismic Force Distribution - 1964 East Lab Addition

ATC Horizontal Response Spectrum Seismic Parameters		
Hazard Level	BSE-2E	
Site Class	C	
S_{XS}=	1.879 g	(See Note 2)
S_{X1}=	0.867 g	(See Note 2)

T=	0.20	s
Sa=	1.879	g
W=	73	kips
C=	1.1	Per ASCE 41-17 Table 4-7

V=	152	kips

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 inbetween 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	12.00	21.88	33	718	0.64	97	97
3rd Floor	9.88	9.88	41	401	0.36	54	152
2nd Floor							
	21.9		73	1,120	1	152	

Notes:

1- Base of building is assumed to be at the 2nd Floor.

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.

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) Moment frame (S1, S3, C1, PC2a)	1.3	1.1	1.0	1.0
Shear wall (S4, S5, C2, C3, PC1a, PC2, RM2, URMa) Braced frame (S2) Cold-formed steel strap-brace wall (CFS2)	1.4	1.2	1.1	1.0
Unreinforced masonry (URM) Flexible diaphragms (S1a, S2a, S5a, C2a, C3a, PC1, RM1)	1.0	1.0	1.0	1.0

[a] Defined in Table 3-1.

Average Wall Stress Check - 1954 Original Structure

Average Stresses

Ms = 4.5

Longitudinal (N-S direction)					
Story	**Story Shear**	**Wall Length**	**Average Shear Demand**	**Tier 1 Shear Limit**	**Wall OK?**
	(kips)	(ft)	(lb/ft)	(lb/ft)	
Roof - 3rd Floor	362	147	546	1000	OK
3rd Floor - 2nd Floor	591	52	2551	1000	NG

Transverse (E-W direction)					
Story	**Story Shear**	**Wall Length**	**Average Shear Demand**	**Tier 1 Shear Limit**	**Wall OK?**
	(kips)	(ft)	(lb/ft)	(lb/ft)	
Roof - 3rd Floor	362	79	1025	1000	NG
3rd Floor - 2nd Floor	591	84	1572	1000	NG

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 - Stud-frame shear walls with sheathing on both sides are estimated to have double the capacity to resist shear stress; thus, the length of these walls is doubled in the calculation.

5 - Length of reinforced concrete piers in story between 2nd - 3rd floor is included for the shear stress check.

Average Wall Stress - 1964 East Lab Addition

Average Stresses

Ms = 4.5

Longitudinal (N-S direction)					
Story	**Story Shear**	**Wall Length**	**Average Shear Demand**	**Tier 1 Shear Limit**	**Wall OK?**
	(kips)	(ft)	(lb/ft)	(lb/ft)	
Roof - 3rd Floor	97	22	995	1000	OK
3rd Floor - 2nd Floor	152	26	1323	1000	NG

Transverse (E-W direction)					
Story	**Story Shear**	**Wall Length**	**Average Shear Demand**	**Tier 1 Shear Limit**	**Wall OK?**
	(kips)	(ft)	(lb/ft)	(lb/ft)	
Roof - 3rd Floor	97	32	687	1000	OK
3rd Floor - 2nd Floor	152	55	611	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.