Rating form completed by:

RICHARD NIEWIAROWSKI
Evaluator: RWN
Date: 07/22/19

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

DATE: 07-22-2019 (Group 1 Building Assessment was performed in December, 2018)

REGISTERED PROFESSIONAL ENGINEER
RICHARD WILLIAM NIEWIAROWSKI
2079
Exp. 12/31/19
STRUCTURAL
STATE OF CALIFORNIA

7/22/2019

UCSF building seismic ratings

Mt. Zion Cancer Research

CAAN #2037
2340 Sutter Street, San Francisco, CA 94115
UCSF Campus: Mt. Zion Hospital

Plan

West elevation of South Section (looking northeast)

Rating summary	Entry	Notes
UC Seismic Performance Level (rating)	IV	Based on drawings review and ASCE 41 Checklists & quick checks[1].
Rating basis	Tier 1	ASCE 41-17
Date of rating	Dec., 2018	
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	
Is 2018-2019 rating required by UCOP?	Yes	
Further evaluation recommended?	No	

Building information used in this evaluation

- Structural drawings, prepared by Rutherford & Chekene, dated February 28, 1994.
- Previous report: "UCSF Building Seismic Survey and Ratings" by UCSF SRC, dated 2013-10-07 (43 pages).

Additional building information known to exist

- Architectural drawings prepared by SMP, dated 2/28/1994.

Scope for completing this form

Review of previous UCSF/SRC report. Review of Structural and Architectural drawings. A site visit was made on 10/09/2018. Discussion of appropriateness and effectiveness of the steel SMRF beam-column welded connections with Tom Sabol & Mark Saunders on 10/10/2018.

Brief description of structure

The structure is a ±109,670 GSF, steel framed building designed in 1994 (construction completed in 1996), with four stories plus significant roof penthouses above grade and one basement level below grade. First story height (18 feet) is taller than upper three stories (15 feet). The rectangular shaped overall footprint is divided into three sections; two 86' x 116' sections north and south of a 24' x 42' central section; separated by 10" seismic separation joints.
Structural System for vertical (gravity) load: Steel framed system of wide-flanged beams, girders, and columns supporting concrete filled composite metal deck floors and roof. Basement perimeter walls are reinforced concrete retaining walls. Exterior cladding composed of EIFS panels and glass curtain walls.

Foundation system: Shallow isolated spread footings at interior columns and continuous strip footings at basement retaining walls. Footings are linked with interconnecting grade beams at SMRF frame lines.

Structural System for lateral forces: Reinforced concrete filled composite metal deck roof and floor diaphragms supported by a steel SMRF system above grade with concrete shear walls in the basement level. The final design of the SMRF was in progress when the Northridge EQ occurred (1/17/94). The beam-column connections were revised and improved to include: tapered cover plates at T&B flanges ($t_p \leq t_f$), CJP welded beam web-to-column flange, removal of top and bottom back-up bars, flange welds back-gouged and fillet welded, and seal welds provided at the intersection of the cover plate and the flange to reduce the chance of stress concentration due to the notch. Although a cover plated connection was not ultimately selected as a pre-qualified connection, they were considered in FEMA 267 and FEMA 350, and are likely to be able to satisfy plastic rotation and drift criteria.

Building code: The structural design drawings are dated 28 February, 1994. The 1991 UBC was the code governing the structural design.

Building condition: Excellent.

Building response in 1989 Loma Prieta Earthquake: Not applicable.

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

The SMRF system is non-compliant in two conditions of the ASCE 41-17 SMRF (S1) checklist:

1. The quick-check calculated drift ratio is non-compliant ($D_r = 0.04 > 0.30$) at the tall ground floor level in the east-west direction. However, the calculated drift ratio is compliant at all upper levels in the east-west direction and at all levels in the north-south direction.
2. The quick-check calculated axial column stress caused by overturning is non-compliant at the north south direction frames ($f_a = 24.6$ ksi ≥ 15.0 ksi). However, the calculated overturning axial stress at east-west direction frames is compliant ($f_a = 10.8$ ksi ≤ 15.0 ksi) and the quick-check calculated column axial stress due to gravity loads is very low ($f_a \leq 2.4$ ksi ≤ 5.0ksi).

Based on discussions with Tom Sabol and Mark Saunders, the SMRF beam-column connections are expected to perform in a ductile manner in a major earthquake.

A small two- or three-story wood frame residential building abuts the northeast side of the north section of the building and an 8-story or taller existing building abuts the west face of the central section of the building. There are no connections to the adjacent buildings as floors do not align. The 10" seismic joints between the three

separate building sections are likely sufficient to prevent pounding, but the separation joints at the adjacent buildings are not likely large enough to prevent pounding of blank wall faces.

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	Y	Slope failure	N
Weak story	N	Surface fault rupture	N
Soft story	N	Masonry or concrete wall anchorage at flexible diaphragm	N
Geometry (vertical irregularities)	N	URM wall height-to-thickness ratio	N
Torsion	N	URM parapets or cornices	N
Mass – vertical irregularity	N	URM chimney	N
Cripple walls	N	Heavy partitions braced by ceilings	N
Wood sills (bolting)	N	Appendages	N
Diaphragm continuity	N		

Summary of review of nonstructural life-safety concerns, including at exit routes. [1]

Only exterior cladding (EIFS & glass curtain walls) was reviewed for non-structural life-safety hazards. Based on site visit observations and review of the drawings, the exterior cladding is anchored to the back-up metal stud framing and structural elements of the building, and does not represent a falling hazard.

UCOP non-structural checklist item	Life safety hazard?	UCOP non-structural checklist item	Life safety hazard?
Heavy ceilings, feature or ornamentation above large lecture halls, auditoriums, lobbies or other areas where large numbers of people congregate	None 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

Although the ASCE 41-17 quick-check calculations are non-compliant in two conditions, neither deficiency is considered serious enough to warrant a rating of V. Regarding the non-compliant drift check in the east-west direction, the SMRF system and its beam-column connections are essentially post-Northridge compliant and are likely to perform in a ductile manner in a major earthquake, and the likely pounding against the adjacent buildings is not likely to result in significant structural damage at the impacted surfaces. Regarding the non-compliant column axial stress check, the gravity axial stresses are extremely light and the higher than desired overturning demand is not likely to result in column failure. Therefore, the seismic performance expected to occur in a major earthquake is consistent with a rating of IV.

Recommendations for further evaluation or retrofit

No further evaluation or retrofit is recommended.

[1] 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.

Peer review comments on rating

The four structural members of the UCSF Seismic Review Committee (SRC) reviewed the evaluation in December, 2018 and were unanimous that the Seismic Performance Level Rating is Level IV and no further study is required.

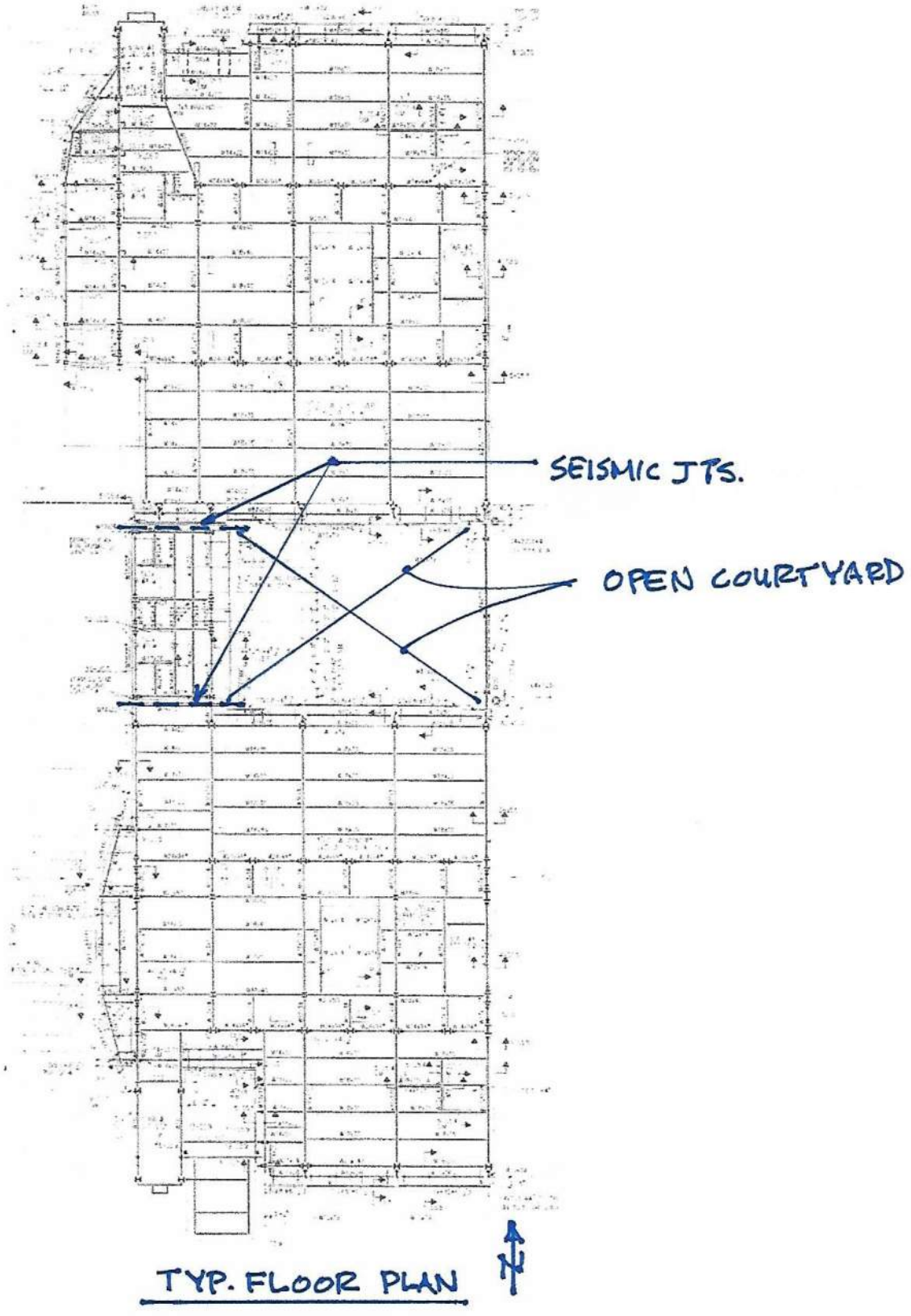
Additional building data	Entry	Notes
Latitude	37.7856	UCSF Group 1 Buildings Geotechnical Characteristics and Geohazards, Egan (2019)
Longitude	-122.4389	UCSF Group 1 Buildings Geotechnical Characteristics and Geohazards, Egan (2019)
Are there other structures besides this one under the same CAAN#	No	
Number of stories above lowest perimeter grade	4	Significant roof equipment and associated screens exist on the north and south sections.
Number of stories (basements) below lowest perimeter grade	1	
Building occupiable area (OGSF)	109,670	UCSF Data
Risk Category per 2016 CBC 1604.5	III	
Building structural height, h_n	62.5 ft	ASCE 7-16 Section 11.2
Coefficient for period, C_t	0.035	ASCE 41-17 Section 4.4.2.4
Coefficient for period, β	0.80	ASCE 41-17 Section 4.4.2.4
Estimated fundamental period	0.96 sec	Estimated using ASCE 41-17 equation 4-4
Site data		
975-year hazard parameters S_s, S_1	1.430g, 0.557g	SEAOC/OSHPD Seismic Design Maps Tool
Site class	D	
Site class basis	Geotech Parameters	UCSF Group 1 Buildings Geotechnical Characteristics and Geohazards, Egan (2019)
Site parameters F_a, F_v	1.000, 1.743	SEAOC/OSHPD Seismic Design Maps Tool
Ground motion parameters S_{cs}, S_{c1}	1.430g, 0.970g	UCSF Group 1 Buildings Geotechnical Characteristics and Geohazards, Egan (2019) W = 5120 kips, V base = 5172 kips
S_a at building period	0.97g	
Site V_{s30}	305 m/s	
V_{s30} basis	Estimated	UCSF Group 1 Buildings Geotechnical Characteristics and Geohazards, Egan (2019)
Liquefaction potential/basis	No	UCSF Group 1 Buildings Geotechnical Characteristics and Geohazards, Egan (2019)
Landslide potential/basis	No	UCSF Group 1 Buildings Geotechnical Characteristics and Geohazards, Egan (2019)
Active fault-rupture hazard identified at site?	No	UCSF Group 1 Buildings Geotechnical Characteristics and Geohazards, Egan (2019)
Site-specific ground motion study?	No	

Applicable code		
Applicable code or approx. date of original construction	CBC 1991	SMRF connections were revised and improved post-Northridge EQ (see Bldg. description above). Construction completed in 1996.
Applicable code for partial retrofit	None	No prior partial retrofit known
Applicable code for full retrofit	None	No prior full retrofit known
Model building data		
Model building type North-South	S1	Steel SMRF with rigid diaphragms
Model building type East-West	S1	Steel SMRF with rigid diaphragms
FEMA P-154 score	N/A	ASCE 41 Tier 1 evaluation was performed instead.
Previous ratings		
Most recent rating	IV	By UCSF Seismic Review Committee; as part of 2013 campus Buildings Rating Program
Date of most recent rating	2013	"UCSF Building Seismic Survey and Ratings"
2nd most recent rating	--	
Date of 2nd most recent rating	--	
3rd most recent rating	--	
Date of 3rd most recent rating	--	
Appendices		
ASCE 41 Tier 1 checklist included here?	Yes	Refer to attached checklist file

Appendix A

Additional Images

RICHARD NIEWIAROWSKI
STRUCTURAL ENGINEER



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Appendix B

ASCE 41- 17 Tier 1 Checklists (Structural)

UC Campus:	Mount Zion Hospital			Date:	12/21/2018		
Building CAAN:	2037	Auxiliary CAAN:		By Firm:	Richard Niewiarowski, SE		
Building Name:	Mt. Zion Cancer Research			Initials:	*RWN*	Checked:	
Building Address:	2340 Sutter Street, San Francisco, CA			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:**
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:**
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:**

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:**
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:**
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:**

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

ASCE 41-17
Collapse Prevention Basic Configuration Checklist

C	NC	N/A	U	
☉	☐	☐	☐	GEOMETRY: There are no changes in the net horizontal dimension of the seismic-force-resisting system of more than 30% in a story relative to adjacent stories, excluding one-story penthouses and mezzanines. (Commentary: Sec. A.2.2.5. Tier 2: Sec. 5.4.2.4) **Comments:**
☉	☐	☐	☐	MASS: There is no change in effective mass of more than 50% from one story to the next. Light roofs, penthouses, and mezzanines need not be considered. (Commentary: Sec. A.2.2.6. Tier 2: Sec. 5.4.2.5) **Comments:**
☉	☐	☐	☐	TORSION: The estimated distance between the story center of mass and the story center of rigidity is less than 20% of the building width in either plan dimension. (Commentary: Sec. A.2.2.7. Tier 2: Sec. 5.4.2.6) **Comments:**

MODERATE SEISMICITY (COMPLETE THE FOLLOWING ITEMS IN ADDITION TO THE ITEMS FOR LOW SEISMICITY)

GEOLOGIC SITE HAZARD

C	NC	N/A	U	Description
☉	☐	☐	☐	LIQUEFACTION: Liquefaction-susceptible, saturated, loose granular soils that could jeopardize the building's seismic performance do not exist in the foundation soils at depths within 50 ft (15.2m) under the building. (Commentary: Sec. A.6.1.1. Tier 2: 5.4.3.1) **Comments: Liquefaction potential of site soils is moderate, but risk to building is likely to be very low.**
☉	☐	☐	☐	SLOPE FAILURE: The building site is located away from potential earthquake-induced slope failures or rockfalls so that it is unaffected by such failures or is capable of accommodating any predicted movements without failure. (Commentary: Sec. A.6.1.2. Tier 2: 5.4.3.1) **Comments:**
☉	☐	☐	☐	SURFACE FAULT RUPTURE: Surface fault rupture and surface displacement at the building site are not anticipated. (Commentary: Sec. A.6.1.3. Tier 2: 5.4.3.1) **Comments:**

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

UC Campus:	Mount Zion Hospital			Date:	12/21/2018		
Building CAAN:	2037	Auxiliary CAAN:		By Firm:	Richard Niewiarowski, SE		
Building Name:	Mt. Zion Cancer Research			Initials:	*RWN*	Checked:	
Building Address:	2340 Sutter Street, San Francisco, CA			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

	Description
C ☑ **NC** ☐ **N/A** ☐ **U** ☐	OVERTURNING: The ratio of the least horizontal dimension of the seismic-force-resisting system at the foundation level to the building height (base/height) is greater than $0.6S_a$. (Commentary: Sec. A.6.2.1. Tier 2: Sec. 5.4.3.3) **Comments:**
C ☑ **NC** ☐ **N/A** ☐ **U** ☐	TIES BETWEEN FOUNDATION ELEMENTS: The foundation has ties adequate to resist seismic forces where footings, piles, and piers are not restrained by beams, slabs, or soils classified as Site Class A, B, or C. (Commentary: Sec. A.6.2.2. Tier 2: Sec. 5.4.3.4) **Comments:**

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

UC Campus:	Mt. Zion Hospital			Date:	12/13/2018		
Building CAAN:	2037	Auxiliary CAAN:		By Firm:	Richard Niewiarowski, S.E.		
Building Name:	Mt. Zion Cancer Research			Initials:	*RWN*	Checked:	
Building Address:	2340 Sutter Street, San Francisco, CA 94115			Page:	1	of	4

ASCE 41-17
Collapse Prevention Structural Checklist For Building Type S1-S1A

LOW SEISMICITY

SEISMIC-FORCE-RESISTING SYSTEM

	Description
C ☑ NC ☐ N/A ☐ U ☐	REDUNDANCY: The number of lines of moment frames in each principal direction is greater than or equal to 2. (Commentary: Sec. A.3.1.1.1. Tier 2: Sec. 5.5.1.1) **Comments:**
C ☐ NC ☑ N/A ☐ U ☐	DRIFT CHECK: The drift ratio of the steel moment frames, calculated using the Quick Check procedure of Section 4.4.3.1, is less than 0.030. (Commentary: Sec. A.3.1.3.1. Tier 2: Sec. 5.5.2.1.2) **Comments: Quick-check calculation for drift is N/C only for drift in the east-west direction at the tall ground floor level (Dr = 0.040 ≥ 0.030). The calculated drift ratio is compliant at all upper levels in the east-west direction and at all levels in the north-south direction..**
C ☐ NC ☑ N/A ☐ U ☐	COLUMN AXIAL STRESS CHECK: The axial stress caused by gravity loads in columns subjected to overturning forces is less than $0.10F_y$. Alternatively, the axial stress caused by overturning forces alone, calculated using the Quick Check procedure of Section 4.4.3.6, is less than $0.30F_y$. (Commentary: Sec. A.3.1.3.2. Tier 2: Sec. 5.5.2.1.3) **Comments: Quick-check calculation of gravity axial stress is Compliant (fa = 2.5 ksi ≤ 5.0 ksi. Quick-check calculation of overturning axial stress is Compliant in the east-west direction frames (fa = 10.8 ksi ≤ 15.0 ksi), but is N/C in the north-south direction frames (fa = 24.6 ksi ≥ 15.0 ksi).**
C ☑ NC ☐ N/A ☐ U ☐	FLEXURAL STRESS CHECK: The average flexural stress in the moment frame columns and beams, calculated using the Quick Check procedure of Section 4.4.3.9, is less than F_y. Columns need not be checked if the strong column–weak beam checklist item is compliant. (Commentary: Sec. A.3.1.3.3. Tier 2: Sec. 5.5.2.1.2) **Comments: Quick-check calculations for flexural stresses are compliant for moment frame columns and beams in both directions at all levels (f_{max} = 24.7 ≤ 50.0 ksi).**

CONNECTIONS

	Description
C ☑ NC ☐ N/A ☐ U ☐	TRANSFER TO STEEL FRAMES: Diaphragms are connected for transfer of seismic forces to the steel frames. (Commentary: Sec. A.5.2.2. Tier 2: Sec. 5.7.2) **Comments:**

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

ASCE 41-17
Collapse Prevention Structural Checklist For Building Type S1-S1A

LOW SEISMICITY

SEISMIC-FORCE-RESISTING SYSTEM

C	NC	N/A	U	
☑	☐	☐	☐	STEEL COLUMNS: The columns in seismic-force-resisting frames are anchored to the building foundation. (Commentary: Sec. A.5.3.1. Tier 2: Sec. 5.7.3.1) **Comments:**

MODERATE SEISMICITY (COMPLETE THE FOLLOWING ITEMS IN ADDITION TO THE ITEMS FOR LOW SEISMICITY)

SEISMIC-FORCE-RESISTING SYSTEM

				Description
C	NC	N/A	U	
☑	☐	☐	☐	REDUNDANCY: The number of bays of moment frames in each line is greater than or equal to 2. (Commentary: Sec. A.3.1.1.1. Tier 2: Sec. 5.5.1.1) **Comments:**
C	NC	N/A	U	
☑	☐	☐	☐	INTERFERING WALLS: All concrete and masonry infill walls placed in moment frames are isolated from structural elements. (Commentary: Sec. A.3.1.2.1. Tier 2: Sec. 5.5.2.1.1) **Comments:**
C	NC	N/A	U	
☑	☐	☐	☐	MOMENT-RESISTING CONNECTIONS: All moment connections can develop the strength of the adjoining members based on the specified minimum yield stress of steel. (Commentary: Sec. A.3.1.3.4. Tier 2: Sec. 5.5.2.2.1). **Comments:**

HIGH SEISMICITY (COMPLETE THE FOLLOWING ITEMS IN ADDITION TO THE ITEMS FOR LOW AND MODERATE SEISMICITY)

SEISMIC-FORCE-RESISTING SYSTEM

				Description

ASCE 41-17
Collapse Prevention Structural Checklist For Building Type S1-S1A

C	NC	N/A	U	
☑	☐	☐	☐	MOMENT-RESISTING CONNECTIONS: All moment connections are able to develop the strength of the adjoining members or panel zones based on 110% of the expected yield stress of the steel in accordance with AISC 341, Section A3.2. (Commentary: Sec. A.3.1.3.4. Tier 2: Sec. 5.5.2.2.1) **Comments: The beam-column connections were designed immediately post-Northridge and, although they are not one of the pre-approved types ultimately selected, they were considered in FEMA 267 and FEMA 350, and are likely to be able to satisfy plastic rotation and drift criteria. As such, they are presumed capable of developing 110% of the yield strength of connecting members.**
☑	☐	☐	☐	PANEL ZONES: All panel zones have the shear capacity to resist the shear demand required to develop 0.8 times the sum of the flexural strengths of the girders framing in at the face of the column. (Commentary: Sec. A.3.1.3.5. Tier 2: Sec. 5.5.2.2.2) **Comments: The beam-column connections were designed immediately post-Northridge and, although they are not one of the pre-approved types ultimately selected, they were considered in FEMA 267 and FEMA 350, and are likely to be able to satisfy plastic rotation and drift criteria. As such, they are presumed capable of developing 0.80 times the sum of the flexural strengths ofm girders framing into the column.**
☑	☐	☐	☐	COLUMN SPLICES: All column splice details located in moment-resisting frames include connection of both flanges and the web. (Commentary: Sec. A.3.1.3.6. Tier 2: Sec. 5.5.2.2.3) **Comments:**
☑	☐	☐	☐	STRONG COLUMN—WEAK BEAM: The percentage of strong column–weak beam joints in each story of each line of moment frames is greater than 50%. (Commentary: Sec. A.3.1.3.7. Tier 2: Sec. 5.5.2.1.5) **Comments:**
☑	☐	☐	☐	COMPACT MEMBERS: All frame elements meet section requirements in accordance with AISC 341, Table D1.1, for moderately ductile members. (Commentary: Sec. A.3.1.3.8. Tier 2: Sec. 5.5.2.2.4) **Comments:**

DIAPHRAGMS (STIFF OR FLEXIBLE)

				Description
☑	☐	☐	☐	OPENINGS AT FRAMES: Diaphragm openings immediately adjacent to the moment frames extend less than 25% of the total frame length. (Commentary: Sec. A.4.1.5. Tier 2: Sec. 5.6.1.3) **Comments:**

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

UC Campus:	Mt. Zion Hospital			Date:	12/13/2018		
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ASCE 41-17
Collapse Prevention Structural Checklist For Building Type S1-S1A

FLEXIBLE DIAPHRAGMS

C	NC	N/A	U	Description
☐	☐	☑	☐	CROSS TIES: There are continuous cross ties between diaphragm chords. (Commentary: Sec. A.4.1.2. Tier 2: Sec. 5.6.1.2) **Comments:**
☐	☐	☑	☐	STRAIGHT SHEATHING: All straight-sheathed diaphragms have aspect ratios less than 2-to-1 in the direction being considered. (Commentary: Sec. A.4.2.1. Tier 2: Sec. 5.6.2) **Comments:**
☐	☐	☑	☐	SPANS: All wood diaphragms with spans greater than 24 ft (7.3 m) consist of wood structural panels or diagonal sheathing. (Commentary: Sec. A.4.2.2. Tier 2: Sec. 5.6.2) **Comments:**
☐	☐	☑	☐	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 aspect ratios less than or equal to 4-to-1. (Commentary: Sec. A.4.2.3. Tier 2: Sec. 5.6.2) **Comments:**
☐	☐	☑	☐	OTHER DIAPHRAGMS: Diaphragms do not consist of a system other than wood, metal deck, concrete, or horizontal bracing. (Commentary: Sec. A.4.7.1. Tier 2: Sec. 5.6.5) **Comments:**

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Appendix C

UCOP Seismic Safety policy Falling Hazards Assessment Summary

UC Campus:	UCSF Mount Zion			Date:	07/24/2019		
Building CAAN:	2037	Auxiliary CAAN:		By Firm:	Richard Niewiarowski		
Building Name:	Mt. Zion Cancer Research			Initials:	*RWN*	Checked:	
Building Address:	2340 Sutter Street, San Francisco, CA 94115			Page:	1	of	1

UCOP SEISMIC SAFETY POLICY
Falling Hazard Assessment Summary

	Description
P ☐ N/A ☒	**Heavy ceilings, features or ornamentation above large lecture halls, auditoriums, lobbies, or other areas where large numbers of people congregate (50 ppl or more)** **Comments:**
P ☐ N/A ☒	**Heavy masonry or stone veneer above exit ways or public access areas** **Comments:**
P ☐ N/A ☒	**Unbraced masonry parapets, cornices, or other ornamentation above exit ways or public access areas** **Comments:**
P ☐ N/A ☒	**Unrestrained hazardous material storage** **Comments:**
P ☐ N/A ☒	**Masonry chimneys** **Comments:**
P ☐ N/A ☒	**Unrestrained natural gas-fueled equipment such as water heaters, boilers, emergency generators, etc.** **Comments:**
P ☐ N/A ☒	**Other:** **Comments:**
P ☐ N/A ☒	**Other:** **Comments:**
P ☐ N/A ☒	**Other:** **Comments:**

Falling Hazards Risk: *Low*

Note: P= Present, N/A = Not Applicable; Falling Hazards Risk: Low, Moderate, or High

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Appendix D

Quick Check Calculations

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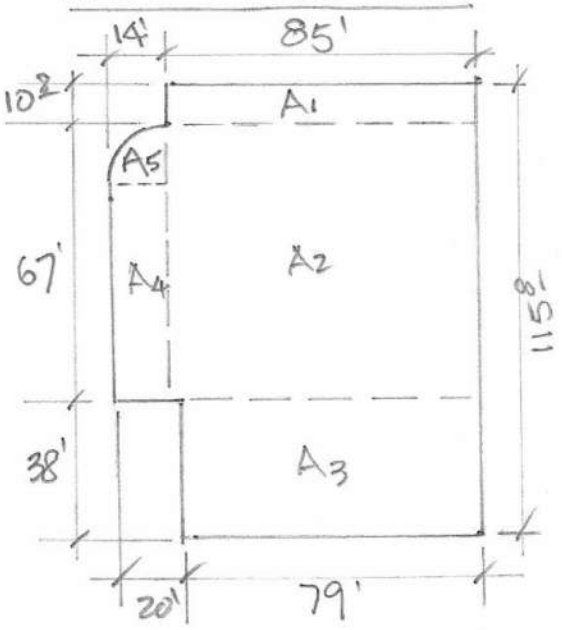
MT. ZION CANCER RESEARCH
2340 SUTTER ST., SF

NORTH SECTION (N & S sections are essentially the same)

TYPICAL FLOOR AREA



A1: 85×10.67 = 907 ☐
A2: 85×67 = 5,695
A3: 79×38 = 3002
A4: 14×53 = 742
A5: π(14²)/4 = 154
ΣA = 10,500 ☐

STORY HTS: 1-2 : 18'
2-3 : 15'
3-4 : 15'
4-R : 14.5
h_n = 62.5'

TYP. FLOOR WEIGHT

3½ LT. WT. CONC on 3" comp. deck	: 48 psf
Fl. finishes	: 5
steel (bms=5/girders=10/cols=5)	: 25
fireproofing	: 2
ceilings & lights	: 5
partitions	: 15
MEP/ equipment	: 10
W_f	= 110 psf

EXTERIOR WALLS

L = 85+115+99+10+91+22
= 423'
USE 15psf {for EIFS panels, or glass}

AT ROOF: Add 50psf on ±½ Area ⇒ 5000 ☐ @ 50# = 250^K

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FLOOR WEIGHTS

Roof: $(10{,}500)(110^{\#}) + 250^{k} + (7.5')(423' \times 15^{\#}) = 1455^{k}$

4th: $(10{,}500)(110^{\#}) + (15')(423)(15^{\#}) = 1250^{k}$

3rd: (same as 4th) $= 1250^{k}$

2ND: $(10{,}500)(110^{\#}) + (16.5')(423)(15^{\#}) = 1165^{k}$

$W = 5120^{k}$

Eq 4-1: $V = C S_a W$ $\quad C = 1.0$ (Table 4-7)

(BSE-C/2E): $S_a = \frac{S_a}{T} \le S_{cs}$ $\quad [S_{cs} = 1.43 ; S_a = 0.97]$

$T \approx C_t h_n^{\beta}$ $\quad [C_t = 0.035, \beta = 0.80 ; h_n = 62.5']$

$T \approx 0.96s$

$S_a = 0.97/0.96 = 1.01 < 1.43$

$S_a = 1.01\,g.$

$\therefore V = (1.0)(1.01)(5120) = 5172^{k}$

LEVEL	W_i	h_i	h_i^k	$w_i h_i^k$	$wh^k/\Sigma wh^k$	F_i	V_i
R	1455	62.5	76.9	111,890	0.43	2224	2224
4	1250	48	59.0	73,750	0.28	1448	3672
3	1250	33	40.6	50,750	0.19	983	4655
2	1165	18	22.1	25750	0.10	517	5172
—	5120	—	—	262,140	1.00	5172	—

Shear Forces per Eq. 4-2a: $k = 1.0 + (0.46/2.0)1.0 = 1.23$

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Drift Check (Section 4.4.3.1)

EW direction: 12 cols W14×176 ($I=2140; S_x=281; Z=320; A=51.8$)
Beams W24×94 ($I=2700; S_x=222; Z=254; A_w=126$)

check for level 1-2; $h=18'=216"$; $L_b=10^{10}/12^2/9^6$ > use 10^{10} avg.
$L_b=130"$

Eq. 4-6: $D_{r_{ew}}=\left(\frac{K_b+K_c}{K_b K_c}\right)\left(\frac{h}{12E_s}\right)V_c$

$K_b=\frac{2700}{130}=20.77$; $K_c=\frac{2140}{216}=9.91$

$V_c=5172/12=431^K$

$D_{r_{ew}}=\left(\frac{20.77+9.91}{20.77\times 9.91}\right)\left(\frac{216}{12\times 29000}\right)(431)$

$D_{r_{ew}}=0.0399>0.030$ (N/C)

Drift check at upper floors, for $h_c=15.0'$
$D_r=0.029<0.03$ (see pg 5)

NS direction: bms $\begin{cases} W27\times102 & (L_b=8'\text{-}8";\ I=3620;\ Z_x=305) \\ W27\times129 & (L_b=23'\text{-}6";\ I=4760;\ Z_x=395) \end{cases}$
8 cols: W24×146 ($I=4580, Z_x=418, A_c=43.0$)

$Dr_{ns}=\left(\frac{34.81+21.20}{34.81\times 21.20}\right)\left(\frac{216}{12\times 29000}\right)(646.5)$

$K_b=\frac{3620}{104}=34.81$
$K_c=4580/216=21.20$
$V_c=5172/8=646.5$

$Dr_{ns}=0.030=0.030$ (C)

Column Axial (overturning) stress check

Eq 4-11: $P_{ot}=\frac{1}{M_s}\left(\frac{2}{3}\right)\left(\frac{Vh_n}{Ln_f}\right)\left(\frac{1}{A_c}\right)$

	EW	NS
n_f	2	2
L_f	77.2'	40.8
A_c	51.8	43.0
M_s (CP)	2.5	2.5

$F_y=50^{ksi}$

EW Dir.: $P_{ot}=\frac{1}{2.5}\left(\frac{2}{3}\right)\left(\frac{5172\times 62.5}{2\times 77.2}\right)\left(\frac{1}{51.8}\right)$

$P_{ot_{ew}}=10.8^{ksi}<15^{ksi}$ (C)

NS Dir.: $P_{ot}=\left(\frac{1}{2.5}\right)\left(\frac{2}{3}\right)\left(\frac{5172\times 62.5}{2\times 40.8}\right)\left(\frac{1}{43.0}\right)$

$P_{ot_{NS}}=24.6^{ksi}>15.0^{ksi}$ (N/C)

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Flexural Stress (Section 4.4.3.9)

Eq 4-14: $f_i^{avg} = V_i \left(\frac{1}{M_s}\right)\left(\frac{n_c}{n_c - n_f}\right)\left(\frac{h_i}{2}\right)\left(\frac{1}{\bar{z}}\right)$

	EW	NS
n_c	12	8
n_f	2	2
z_c	320 x12	418 x8
Σz_c	3840	3344
z_b	254 (x22)	305x8 395x4
Σz_b	5588	4020
M_s (cp)	9.0	9.0

EW Dir. (Level 1-2)

$f_{cols}^{avg} = (5172)\left(\frac{1}{9}\right)\left(\frac{12}{12-2}\right)\left(\frac{216}{2}\right)\left(\frac{1}{3840}\right)$

$= 19.4^{ksi} < 50$ ✓

$f_{bms}^{avg} = (5172)\left(\frac{1}{9}\right)\left(\frac{12}{12-2}\right)\left(\frac{216}{2}\right)\left(\frac{1}{5588}\right)$

$= 13.3^{ksi} < 50$ ✓

NS (Level 1-2)

$f_{cols}^{avg} = (5172)\left(\frac{1}{9}\right)\left(\frac{8}{8-2}\right)\left(\frac{216}{2}\right)\left(\frac{1}{3344}\right)$

$= 24.7^{ksi} < 50$ ✓

$f_{beams}^{avg} = 20.6^{ksi} < 50$ ✓

Gravity (DeadLoad) Check for SMRF cols. (ignore LL)

Trib. Area (max) $\approx \left(\frac{32.5+8.67}{2}\right)(10.83) = 212^{\#}$

$P_{DL} \approx (212)\left(\frac{110 \times 4 + 50}{1000}\right) = 104^{k}$

for W14x176 col: $f_a = 104/51.8 = 2.0\ ksi < 5$ ✓

for W24x146 col: $f_a \leq 104/43.0 = 2.4^{ksi} < 5$ ✓

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Check Drift @ upper floor level ($h \leq 15.0'$)

$$D_{rew} = \left(\frac{20.77+11.89}{20.77\times 11.89}\right)\left(\frac{180}{12\times 24000}\right)(431)$$

$$= 0.029 < 0.030 \checkmark$$

$k_b = 20.77$

$k_c = 2140/15\times 12 = 11.89$

Based on Quick-check calculations, The SMRF structure is non-compliant in two checks:

1) Drift in E-W direction @ Level 1-2 : $D_r = 0.04 > 0.03$

2) Column-Axial overturning stress in N-S direction:

$P_t = 24.6^{ksi} > 15.0 \quad (0.3F_y)$