Rating form completed by: Simpson Gumpertz & Heger, SGH.COM
CAO, KDP, KSM
Peer reviewed by: **UCSF Seismic Review Committee**

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

Date: 2020-11-06

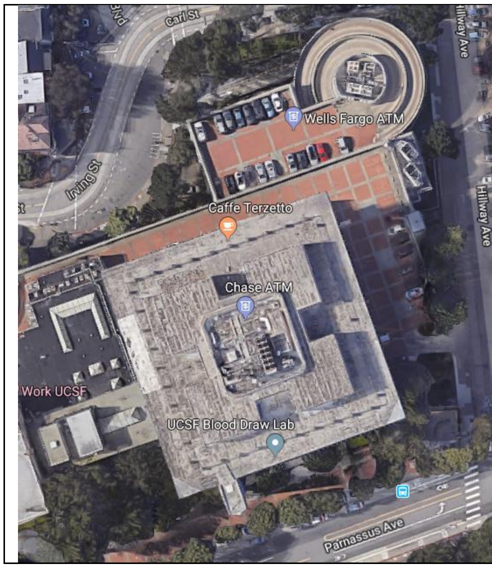
UCSF Building Seismic Ratings

ACC Tower/Garage, Parnassus Avenue

CAAN# *2408*

400 Parnassus Avenue, San Francisco, CA 94131

UCSF Campus Site: *Parnassus*



Rating summary	Entry	Notes
UC Seismic Performance Level (rating)	V	Findings are based on a 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 A	Priority A=Retrofit ASAP Priority B=Retrofit at next modification permit application
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	Building previously rated IV but does not have a fully documented quantifiable review
Further evaluation recommended?	Tier 3	Advanced analysis will increase the reliability of this assessment

[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

- Structural and Foundation Drawings - *Clinics Expansion & Parking Structure,* Reid & Taircs, 43 sheets, dated 4 November 1968.
- Structural Drawings - *Elevator Addition*, Degenkolb, 12 sheets, dated 13 August 2001.

Additional building information known to exist

- *Performance of UCSF Buildings During the October 17, 1989 Loma Prieta Earthquake*, Impell Corporation, dated 17 November 1989.

Scope for completing this form

Reviewed structural construction drawings and performed an ASCE 41-17 Tier 1 evaluation. Made a brief site visit of building exterior and walked through parking garage levels. Did not evaluate nonstructural life-safety hazards.

Brief Description of Structure

The building comprises over 600,000 sq ft in a six-story parking garage with a ten-story tower above. A steel framed penthouse covering approximately 50% of a typical floor area is located at the roof level. The tower footprint is approximately 150 ft square, with the plaza level changing to a rectangular footprint of approximately 320 ft in the east-west direction and 190 ft in the north-south direction. The tower has a 57 ft square reinforced concrete shear wall core structure as the primary later force resisting system. The plaza level is also the roof level of the garage below, which comprises six levels of parking.

Identification of Levels: The building is sited on a significant slope, with the south side of the building and plaza generally at grade with the northernmost elevation extending down to Level F (approximately six levels below the plaza level), which aligns with grade on the north side of the building. The tower rises ten levels above the plaza level/grade on the south side of the building.

Foundation System: The tower foundation (at the base of the tower within the garage) comprises a reinforced concrete mat that is 13.5 ft thick. The plaza and parking garage building columns and walls, are founded on shallow spread footings. A five-story tall retaining wall, founded on a shallow reinforced concrete strip footing, is located along the south elevation of the parking garage.

Structural System for Vertical (Gravity) Load: The typical tower floor framing comprises steel reinforced concrete pan joists spaced at approximately 3 ft supporting a steel reinforced concrete slab that varies between 3.5 and 6 in. in depth. The joist width varies between 8 and 12 in., and joist depth varies between 19 and 32 in. The joist framing is supported on the steel reinforced concrete core wall in the tower center and steel reinforced concrete beams on steel reinforced columns approximately 30 ft away from the core walls. The typical tower joist floor framing cantilevers between 13 and 18 ft beyond the perimeter column lines. Typical floor framing also includes a post-tensioned concrete girder spanning diagonally from each corner of the concrete core wall to the floor plate perimeter. The minimal floor slabs within the concrete core are reinforced with mild steel reinforcement, spanning one-way between 6 and 8-inch- thick concrete walls and the 24 in. core wall. The concrete core wall continues down through the plaza and parking levels to the foundation below the lowest parking level. The perimeter concrete columns are supported by structural steel plate girders or structural steel columns below the plaza level extending to the foundation below the lowest parking level.

Structural System for Lateral Loads: The lateral load-resisting system of comprises 24 in. thick steel reinforced concrete core walls located in the center of the tower building. Internal concrete walls, 6 and 8-inch-thick, partition the core plan, frame out elevator and stair openings and support stair landings. A line of circular perimeter columns regularly spaced at approximately 13 ft are interconnected with arched beams ranging in depth from 55 in. at the center to approximately 72 in. at the columns. These frames will participate with the core walls to provide lateral force resistance. Floor diaphragms comprise a steel reinforced concrete slab and joist system. Below the plaza level, a concrete wall on the south side of the building retains earth and provides lateral force resistance. Walls on the west and east sides of the building are similar and provide primary lateral force resistance. Large circular perimeter columns along the North side of the building have arched beams that span between the columns that comprise frames that will participate in lateral load resistance.

Brief description of seismic deficiencies and Expected Seismic Performance

Identified seismic deficiencies of the building include the following:

- Core walls above the plaza level fail quick checks (maximum shear stress = $22\sqrt{f'_c}$ without M_S System Modification Factor of 4.5). Including M_S and an allowable shear stress ratio of 2, the maximum DCR is above 2.0 at Levels 1 – 4 with most stories being greater than 1.0. Certain dimensional peculiarities in the core walls may negatively affect the capacity of the core walls. The core wall heavily-reinforced boundary elements are confined with reinforcing details that do not satisfy current code requirements for special reinforced concrete walls.
- Floors within the concrete core walls contain numerous openings that are unable to transfer internal diaphragm forces to the core walls. The lateral forces generated by slabs and elevator equipment will be transferred to thin (6 to 8 in.) concrete “partition” walls with significant openings; these walls may lose gravity force resistance when subjected to strong shaking.
- The columns around the tower perimeter do not have adequate shear reinforcing to resist internal shear forces that will result from the formation of plastic hinges.
- Half of the columns around the tower perimeter are discontinuous at the plaza level, supported on structural steel plate girders. These structural steel plate girders and their connections have likely not been designed to resist demands associated with this discontinuity.
- Core and perimeter concrete walls below level A fail the quick shear checks for steel reinforced concrete walls (maximum shear stress = $11\sqrt{f'_c}$ without M_S System Modification Factor of 4.5). Including M_S and an allowable shear stress ratio of 2, the DCRs range between 0.9 and 1.3.
- The lateral force resisting system below the plaza level is not balanced, requiring significant load transfer through a thin diaphragm to two three-foot thick walls on the south side of the building. The diaphragm will likely not be able to transfer forces into the walls. Lateral earth pressure associated with the seismic increment at the south wall is also not included in the calculation of the stress DCRs for the below-grade walls.
- The columns on the north side of the garage do not have adequate shear reinforcing to resist the shear forces resulting from plastic hinges forming at the top and bottom of the columns.
- The wall and column arrangement below the plaza likely represent a torsional irregularity that may exacerbate the issues identified above. Columns are short and stiff and may develop high internal shear stresses, resulting in stress cracking and potential reduction in lateral load resistance.

The large number of slab openings within the core and the large openings in the “partition” walls may negatively impact the performance and the gravity-carrying ability of these walls. Inadequately designed steel plate transfer girders and their connections may negatively affect a large portion of the building.

The diaphragms below the plaza may not have adequate capacity to transfer internal shear forces to the reinforced concrete walls. The condition may be exacerbated when lateral earth pressure associated with the potential seismic increment of six levels of soil is included in the seismic analysis. Perimeter columns at the north side of the garage may also be vulnerable to shear failures.

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)	**Y**
Load path	**Y**	Liquefaction	N
Adjacent buildings	N	Slope failure	N
Weak story	N	Surface fault rupture	N
Soft story	N	Masonry or concrete wall anchorage at flexible diaphragm	N
Geometry (vertical irregularities)	**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)	N	Appendages	N
Diaphragm continuity	**Y**		

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

An assessment of the nonstructural systems has not been performed, but will be performed as part of the Tier 2 evaluation.

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

The building rating of V can be attributed to the identified deficiencies and the potential for increased DCRs related to including seismic increment when evaluating the garage structure.

Recommendations for further evaluation or retrofit:

We recommend that the University perform a more detailed seismic evaluation to determine whether retrofitting is required. We recommend a nonlinear response history analysis (NLRHA) that accounts for the behaviors related to the deficiencies, identifying the potential areas of overstress, including wall, slab, column and beam behavior, joint shear behavior, force transfer at the slab to wall interface below the plaza level and the influence of the retained soil south of the building. NLRHA will provide an opportunity to observe changes in building performance as structural elements yield and internal forces are redistributed to stiffer or stronger elements. This is important for the discontinuous columns at the plaza level. Applicable retrofit measures may include thickening slabs, concrete walls or similar elements to locally increase strength or balance a potential torsional response. Structural steel plate girders and their connections may require strengthening to resist seismic forces associated with the discontinuous columns at the plaza level.

Peer review comments on rating

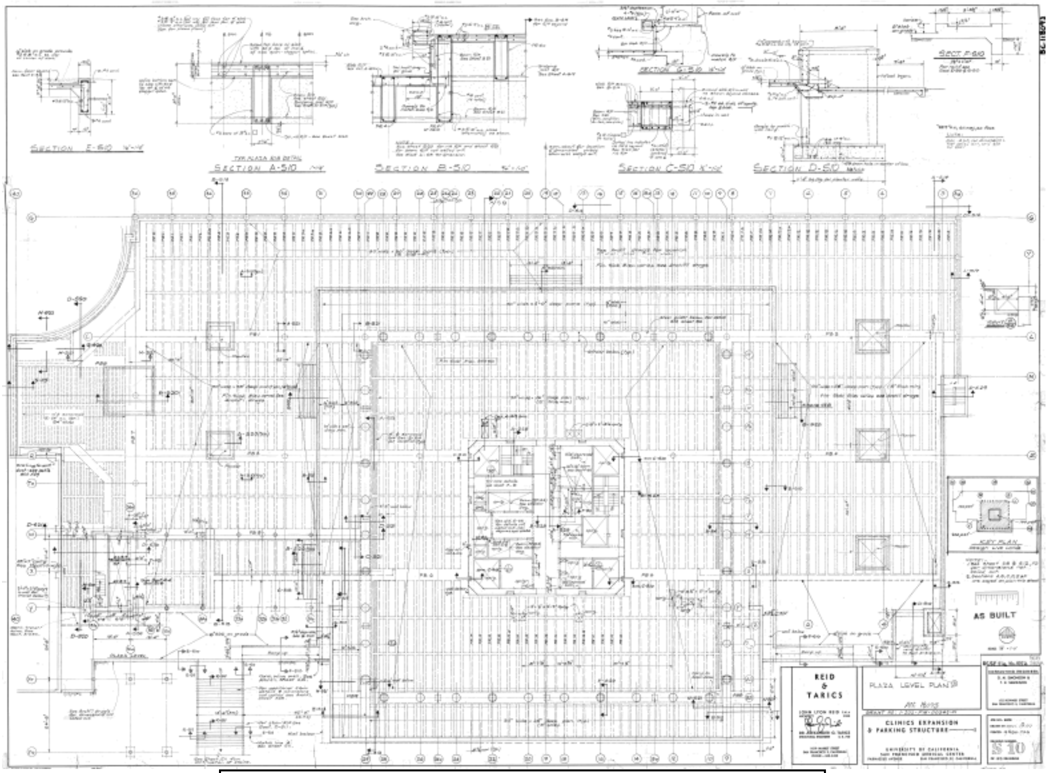
The structural members of the UCSF Seismic Review Committee (SRC) reviewed the evaluation on 25 June 2019 and agree with a rating of V. The SRC agrees that further study, likely a Tier 3 NLRHA, is important for this building.

Additional building data	Entry	Notes
Latitude	37.76407°	
Longitude	-122.4574°	
Are there other structures besides this one under the same CAAN#	No	
Number of stories above lowest perimeter grade	16	
Number of stories (basements) below lowest perimeter grade	0	Site is on a steep slope. South side of garage is six stories below grade on north side
Building occupiable area (OGSF)	621,394	From UCOP spreadsheet
Risk Category per 2016 CBC 1604.5	III	Occupant load > 500 and contains educational occupancy above 12th grade.
Building structural height, h_n	194 ft	As defined per ASCE 7-16 Section 11.2
Coefficient for period, C_t	0.02	ASCE 41-17 equation 4-4 and 7-18
Coefficient for period, ⍰	0.75	ASCE 41-17 equation 4-4 and 7-18
Estimated fundamental period	1.0 sec	ASCE 41-17 equation 4-4 and 7-18
Site data		
975 yr hazard parameters S_s, S_1	1.549g, 0.626g	https://hazards.atcouncil.org/
Site class	D	UCSF Group 2 Buildings, Geotechnical Characteristic and Geohazards (2019)
Site class basis	Estimated	UCSF Group 2 Buildings, Geotechnical Characteristic and Geohazards (2019)
Site parameters F_a, F_v	1.0, 1.7	https://hazards.atcouncil.org/ describes *null for F_v (estimated)
Ground motion parameters S_{cs}, S_{c1}	1.537, 1.030	UCSF Group 2 Buildings, Geotechnical Characteristic and Geohazards (2019)
S_a at building period	0.99	Calculated
Site V_{s30}	310 m/s	UCSF Group 2 Buildings, Geotechnical Characteristic and Geohazards (2019)
V_{s30} basis	Estimated	UCSF Group 2 Buildings, Geotechnical Characteristic and Geohazards (2019)
Liquefaction potential	No	UCSF Group 2 Buildings, Geotechnical Characteristic and Geohazards (2019)

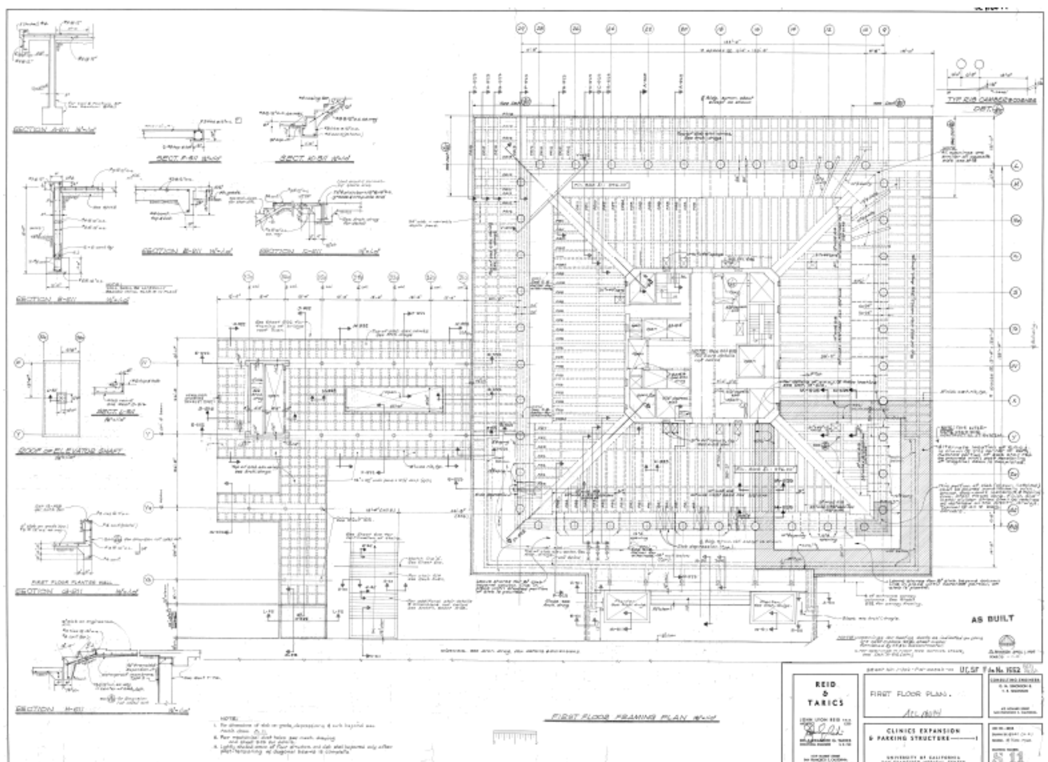
Additional building data	Entry	Notes
Liquefaction assessment basis	Estimated	UCSF Group 2 Buildings, Geotechnical Characteristic and Geohazards (2019)
Landslide potential	No	UCSF Group 2 Buildings, Geotechnical Characteristic and Geohazards (2019)
Landslide assessment basis	Estimated	Rutherford + Chekene Study, 2006
Active fault-rupture hazard identified at site?	No	UCSF Group 2 Buildings, Geotechnical Characteristic and Geohazards (2019)
Site-specific ground motion study?	No	
Applicable code		
Applicable code or approx. date of original construction	Drawings Dated: 1968	Same set of drawings for Tower and Garage
Applicable code for partial retrofit	None	No partial retrofit known
Applicable code for full retrofit	None	No full retrofit known
Model building data		
Model building type North-South	C2 Conc. wall	C1 Conc. Moment frame (potentially)
Model building type East-West	C2 Conc. wall	C1 Conc. Moment frame (potentially)
FEMA P-154 score	N/A	Not included here because we performed ASCE 41 Tier 1 evaluation.
Previous ratings		
Most recent rating	IV	In spreadsheet. Basis for rating is unknown
Date of most recent rating	-	Rating date is unknown
2nd most recent rating	-	
Date of 2nd most recent rating	-	
Appendices		
ASCE 41 Tier 1 checklist included here?	Yes	Refer to attached checklist file

Appendix A

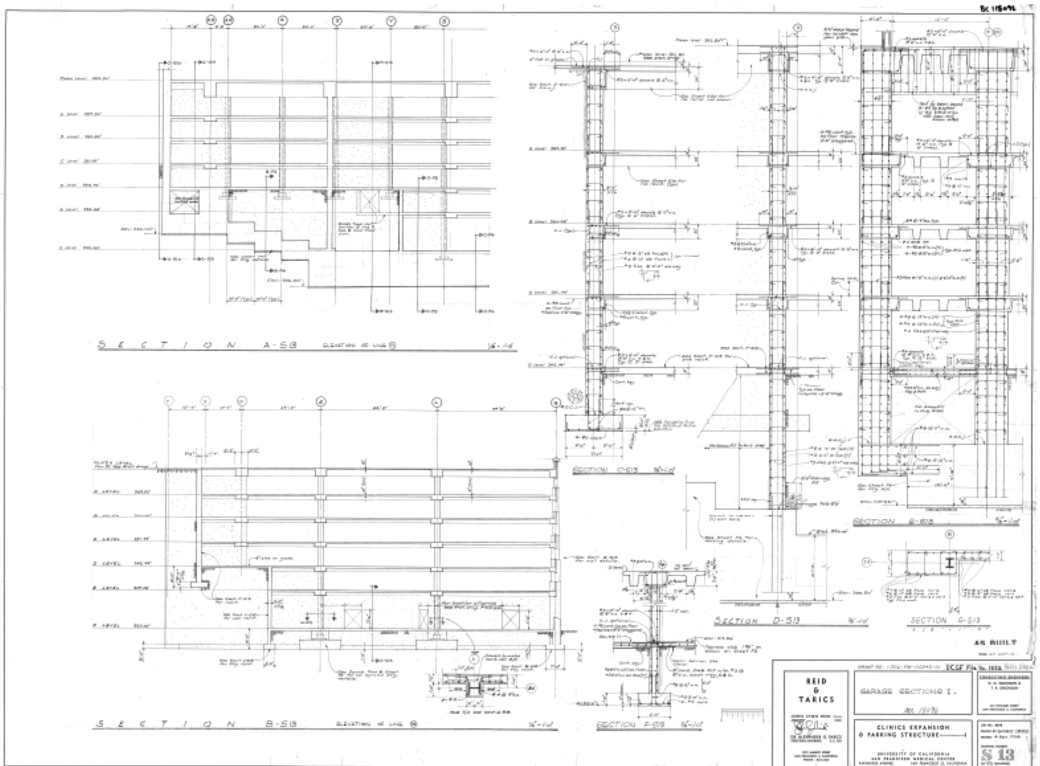
Drawing Images



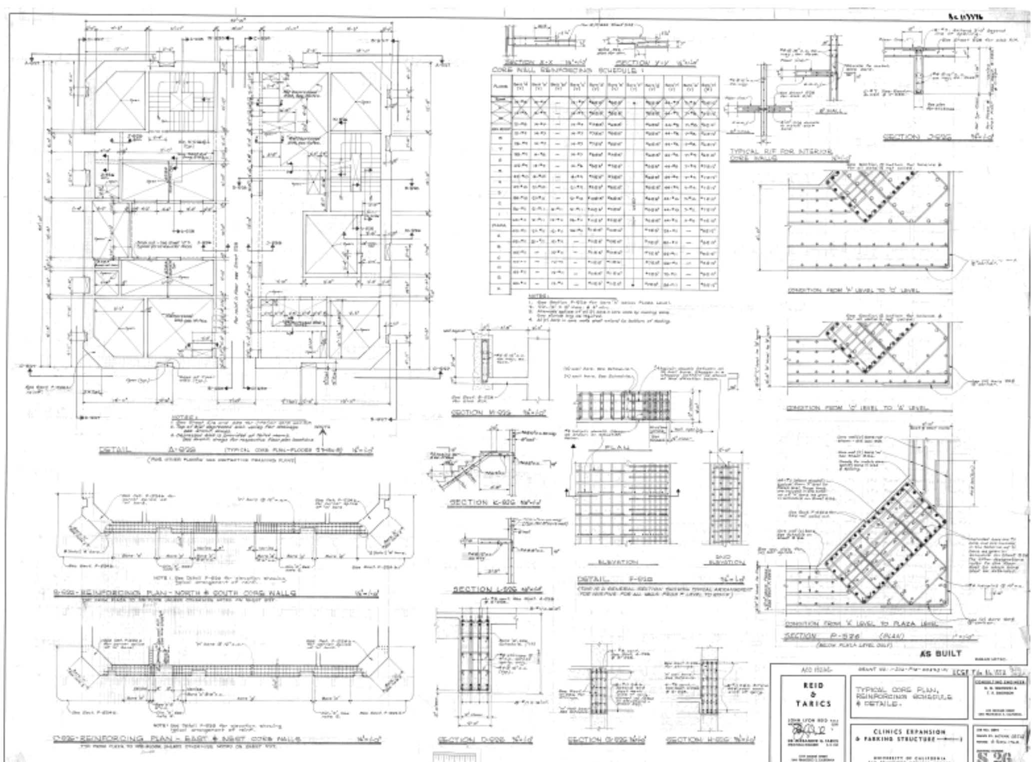
Plaza Level – Top of Garage/Base of Tower



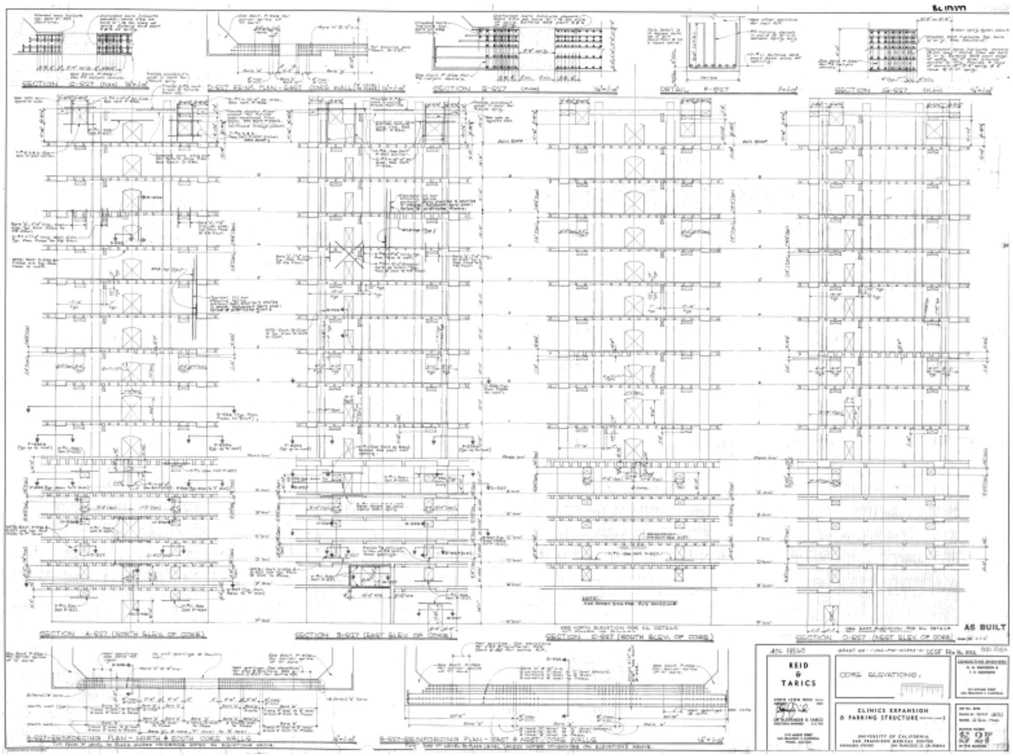
Lower Level of Tower



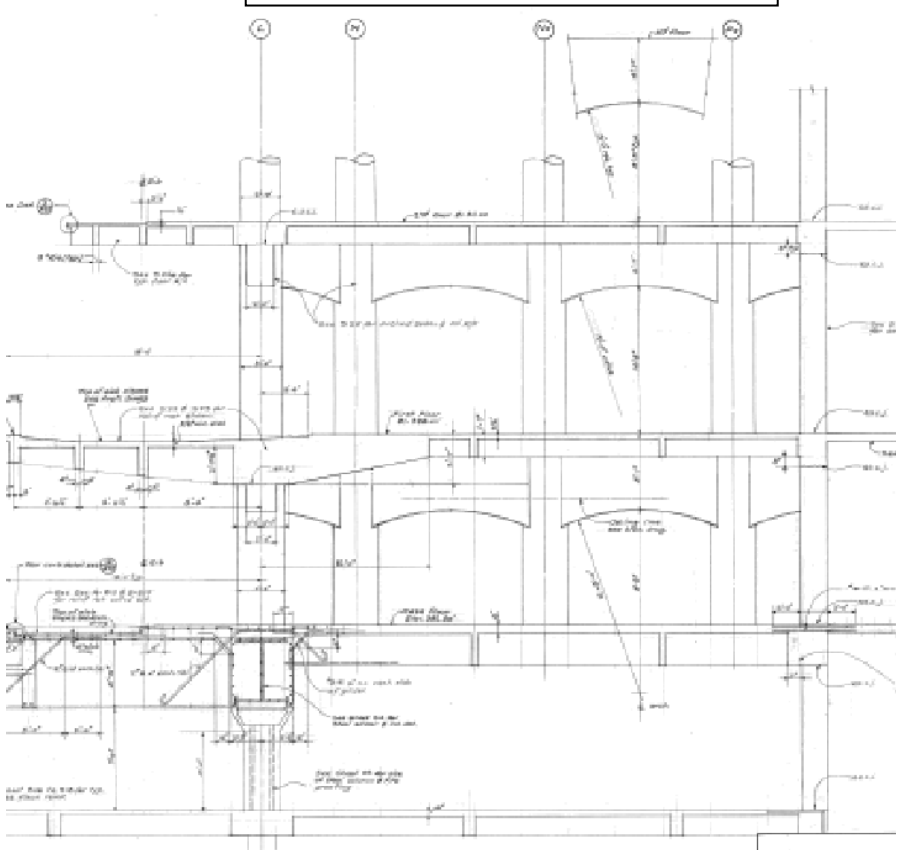
Elevations/Sections

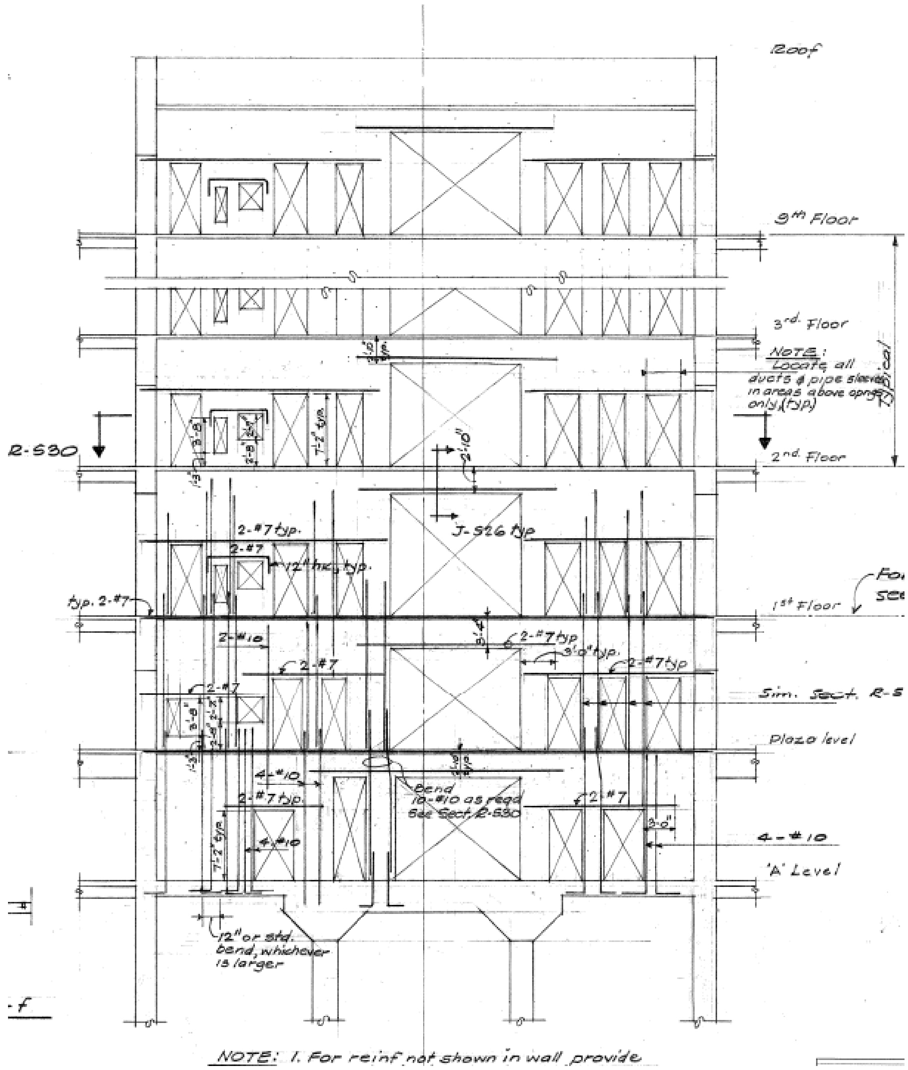


Core Wall Reinforcing Details



Wall Elevations and Frame Elevations





Interior Core Wall Elevations

Appendix B

Checklists

UC Campus:	UCSF – Parnassus		Date:	25 June 2019		
Building CAAN:	2408	Auxiliary CAAN:	By Firm:	Simpson Gumpertz & Heger		
Building Name:	ACC and ACC Garage		Initials:	*KSM*	Checked:	*KSM*
Building Address:	400 Parnassus Avenue, San Francisco, CA 94133		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: Some columns are discontinuous, but the load path for all elements is clear and well defined.**
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: The garage is integrated with Millberry Garage; this condition is not a deficiency**
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: The building does not have mezzanine levels.**

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: No weak stories exist in the building as each floor has similar seismic force resisting systems and elements.**
C ◉ NC ○ N/A ○ U ○	SOFT STORY: The stiffness of the seismic-force-resisting system in any story is not less than 70% of the seismic-force-resisting system stiffness in an adjacent story above or less than 80% of the average seismic-force-resisting system stiffness of the three stories above. (Commentary: Sec. A.2.2.3. Tier 2: Sec. 5.4.2.2) **Comments: The building does not have a soft story; stiffness is similar up the building, with softer stories of the tower located above the stiffer garage structure.**
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: Perimeter columns are supported on steel plate girders. This irregularity requires further study.**

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

ASCE 41-17
Collapse Prevention Basic Configuration Checklist

C NC N/A U	
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: Seismic force resisting system is regular and consistent at each level.**
C ☑ NC ☐ N/A ☐ U ☐	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 is consistent up the height of the building.**
C ☐ NC ☑ N/A ☐ U ☐	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: Tower is balanced and will likely not exhibit a torsional response, but the garage will likely have a torsional response because of the north frame elevation.**

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

GEOLOGIC SITE HAZARD

	Description
C ☐ NC ☑ N/A ☐ U ☐	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: Indicated as moderate, but likely very low based on input from John Egan**
C ☑ NC ☐ N/A ☐ U ☐	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: Low probability based on work by Rutherford + Chekene**
C ☑ NC ☐ N/A ☐ U ☐	SURFACE FAULT RUPTURE: Surface fault rupture and surface displacement at the building site are not anticipated. (Commentary: Sec. A.6.1.3. Tier 2: 5.4.3.1) **Comments: No potential for surface fault rupture**

UC Campus:	UCSF – Parnassus			Date:	25 June 2019		
Building CAAN:	2408	Auxiliary CAAN:		By Firm:	Simpson Gumpertz & Heger		
Building Name:	ACC and ACC Garage			Initials:	*KSM*	Checked:	*KSM*
Building Address:	400 Parnassus Avenue, San Francisco, CA 94133			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 (selected) **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: The garage is significantly wider than necessary to resist global overturning, with special consideration of integration into the hillside.**
C (selected) **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: Foundation elements are well tied together with grade beams and base level concrete slab.**

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

UC Campus:	**UCSF - Parnassus**			Date:	**25 June 2019**	
Building CAAN:	**2408**	Auxiliary CAAN:		By Firm:	**Simpson Gumpertz & Heger**	
Building Name:	**ACC and ACC Garage**			Initials:	***KDP***	Checked: ***KSM***
Building Address:	**400 Parnassus Avenue, San Francisco, CA 94133**			Page:	**1** of **3**	

ASCE 41-17
Collapse Prevention Structural Checklist For Building Type C2-C2A

Low and Moderate Seismicity

Seismic-Force-Resisting System

C NC N/A U	Description
C NC N/A U Selected: C	COMPLETE FRAMES: Steel or concrete frames classified as secondary components form a complete vertical-load-carrying system. (Commentary: Sec. A.3.1.6.1. Tier 2: Sec. 5.5.2.5.1) **Comments: Concrete pan joists support a concrete slab. Joists span to core walls and beams and columns at the building exterior. Perimeter concrete columns land on deep steel plate girder transfer beams or steel columns extending through the parking garage.**
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: The central core is a rectangular tube wall structure. Exterior columns will participate in the lateral load resistance for the building, but are not relied upon in the Tier 1.**
C NC N/A U Selected: NC	SHEAR STRESS CHECK: The shear stress in the concrete shear walls, calculated using the Quick Check procedure of Section 4.4.3.3, is less than the greater of 100 lb/in.^{2} (0.69 MPa) or $2\sqrt{f'_c}$. (Commentary: Sec. A.3.2.2.1. Tier 2: Sec. 5.5.3.1.1) **Comments: The lower six stories exceed the shear stress check. Certain details in the walls require further evaluation to ensure adequate capacity. Core and perimeter concrete walls below Level A also fail the quick stress check (without considering soil loading).**
C NC N/A U Selected: C	REINFORCING STEEL: The ratio of reinforcing steel area to gross concrete area is not less than 0.0012 in the vertical direction and 0.0020 in the horizontal direction. (Commentary: Sec. A.3.2.2.2. Tier 2: Sec. 5.5.3.1.3) **Comments: Wall steel exceeds minimum ratios.**

Connections

C NC N/A U	Description
C NC N/A U Selected: N/A	WALL ANCHORAGE AT FLEXIBLE DIAPHRAGMS: Exterior concrete or masonry walls that are dependent on flexible diaphragms for lateral support are anchored for out-of-plane forces at each diaphragm level with steel anchors, reinforcing dowels, or straps that are developed into the diaphragm. Connections have strength to resist the connection force calculated in the Quick Check procedure of Section 4.4.3.7. (Commentary: Sec. A.5.1.1. Tier 2: Sec. 5.7.1.1) **Comments: not applicable to this building**
C NC N/A U Selected: C	TRANSFER TO SHEAR WALLS: Diaphragms are connected for transfer of seismic forces to the shear walls. (Commentary: Sec. A.5.2.1. Tier 2: Sec. 5.7.2) **Comments: Larger diaphragm to core wall connection is adequate. Interior diaphragms (within the core wall) are not adequately tied to core walls (excessive openings).**

UC Campus:	**UCSF - Parnassus**			Date:	**25 June 2019**		
Building CAAN:	**2408**	Auxiliary CAAN:		By Firm:	**Simpson Gumpertz & Heger**		
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ASCE 41-17
Collapse Prevention Structural Checklist For Building Type C2-C2A

C NC N/A U	
(C selected)	FOUNDATION DOWELS: Wall reinforcement is doweled into the foundation with vertical bars equal in size and spacing to the vertical wall reinforcing directly above the foundation. (Commentary: Sec. A.5.3.5. Tier 2: Sec. 5.7.3.4) **Comments: Wall steel is doweled into the foundation (wall bars extend into foundation elements)**

High Seismicity (Complete the Following Items in Addition To The Items For Low And Moderate Seismicity)

Seismic-Force-Resisting System

C NC N/A U	Description
(NC selected)	DEFLECTION COMPATIBILITY: Secondary components have the shear capacity to develop the flexural strength of the components. (Commentary: Sec. A.3.1.6.2. Tier 2: Sec. 5.5.2.5.2) **Comments: The tower perimeter moment frame columns, if considered secondary components, do not have adequate shear reinforcing to develop column flexural strength.**
(N/A selected)	FLAT SLABS: Flat slabs or plates not part of the seismic-force-resisting system have continuous bottom steel through the column joints. (Commentary: Sec. A.3.1.6.3. Tier 2: Sec. 5.5.2.5.3) **Comments: no flat slabs in the building**
(N/A selected)	COUPLING BEAMS: The ends of both walls to which the coupling beam is attached are supported at each end to resist vertical loads caused by overturning. (Commentary: Sec. A.3.2.2.3. Tier 2: Sec. 5.5.3.2.1) **Comments: no coupling beams in the building**

Diaphragms (Stiff or Flexible)

C NC N/A U	Description
(C selected)	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: Diaphragms are generally continuous, without joints.**
(C selected)	OPENINGS AT SHEAR WALLS: Diaphragm openings immediately adjacent to the shear walls are less than 25% of the wall length. (Commentary: Sec. A.4.1.4. Tier 2: Sec. 5.6.1.3) **Comments: Larger diaphragm conditions are adequate. Interior diaphragms (within the core wall) have very large openings.**

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

ASCE 41-17
Collapse Prevention Structural Checklist For Building Type C2-C2A

Flexible Diaphragms

C NC N/A U	Description
N/A	CROSS TIES: There are continuous cross ties between diaphragm chords. (Commentary: Sec. A.4.1.2. Tier 2: Sec. 5.6.1.2) **Comments: not applicable to this building**
N/A	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: not applicable to this building**
N/A	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: not applicable to this building**
N/A	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: not applicable to this building**
C	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: Diaphragms are all reinforced concrete**

Connections

C NC N/A U	Description
N/A	UPLIFT AT PILE CAPS: Pile caps have top reinforcement, and piles are anchored to the pile caps. (Commentary: Sec. A.5.3.8. Tier 2: Sec. 5.7.3.5) **Comments: This building does not have pile caps.**

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Engineering of Structures and Building Enclosures

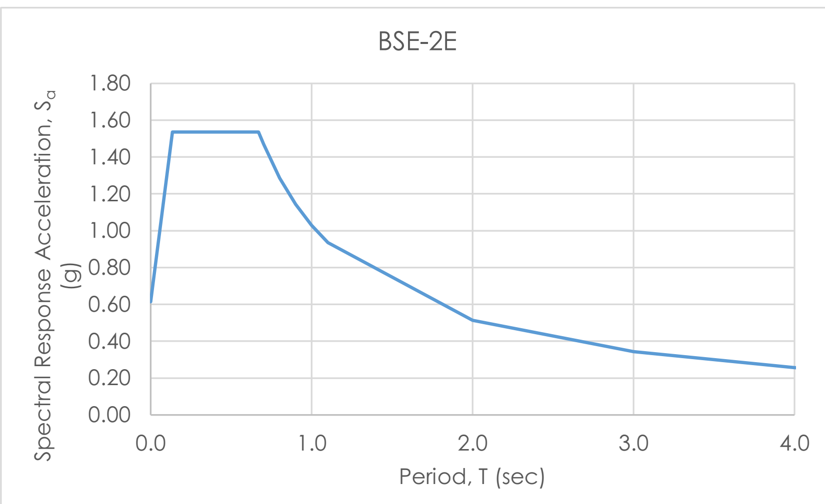
Appendix C

Tier 1 Calculations

Hazard Level BSE-2E

MCE_R ground motion (period=0.2s)	S_S	1.535 g
MCE_R ground motion (period=1.0s)	S_1	0.605 g
Site amplification factor at 0.2s	F_a	1.0
Site amplification factor at 1.0s	F_v	1.7
Site modified spectral response (0.2s)	S_{XS}	1.535 g
Site modified spectral response (1.0s)	S_{X1}	1.029 g
Long-period transition period (s)	T_L	12 sec
	T_0	0.134 sec
	T_S	0.670 sec

T	S_a
sec	g
0.0	0.614
0.134	1.535
0.670	1.535
0.70	1.469
0.80	1.286
0.90	1.143
1.00	1.029
1.1	0.935
2.0	0.514
3.0	0.343
4.0	0.257
6.0	0.171
8.0	0.129
10.0	0.103
12.0	0.086



Approximate Period of Structure

System // Reinforced Concrete Shear Wall

h_n	194.00 ft
β	0.75 [All other framing systems]
C_t	0.02 [All other framing systems]

T	1.040 sec
S_a	0.989 g

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Engineering of Structures and Building Enclosures

CLIENT UCSF
SUBJECT Tier 1 - Quick Checks - ACC Garage (Plaza and Below)

SHEET NO. 2
PROJECT NO. 197042.00
DATE 11/04/2020
BY KDP
CHECKED KSM

Floor	Height (ft)	ColumnØ (in)	L_{girder} (ft)	$L_{retaining}$ (ft)	Area (ft^2)
Plaza	13.5	28	1107.7		48356
A	13	28	1190.2	713.42	56526
B	8.85	30	1272.7	713.42	56526
C	8.85	32	1272.7	713.42	56526
D	8.85	36	1272.7	713.42	56526
E	8.85	40	1115.3	713.42	47086
F	14.08	44			

Unit: lbs — Unit: kip

Floor	W_{beam}	W_{girder}	W_{slab}	W_{column}	W_{wall}	$W_{retaining}$	W_{other}	W*
Plaza	3626663	1370738	3634584	271957	842700	1753666	725333	12567
A	4239431	1472832	4094161	237675	694830	3507331	847886	15402
B	4239431	1574925	4094161	222888	562860	2841179	847886	14662
C	4239431	1574925	4094161	268763	562860	2841179	847886	14708
D	4239431	1574925	4094161	335491	562860	2841179	847886	14775
E	3531431	1380226	3386161	542256	729280	3681227	706286	14273
F				356902	447850	1840613		2744

* Includes weight calculated for walls and slabs within the core shown on different sheet

W	89132	kip

Masses

Reinforced concrete beams

b	11.25	in	
d	16	in	
s	30	in	[spacing]
γ	150	pcf	

Reinforced concrete girders

b	4.5	ft
d	22	in
γ	150	pcf

Reinforced concrete slab

γ 150 pcf

Reinforced concrete wall

n	4		[number]
t	2	ft	
L	53	ft	
γ	150	pcf	

Reinforced concrete retaining wall

γ	150	pcf
t	3	ft

Other weight (superimposed dead load)

15 psf

SIMPSON GUMPERTZ & HEGER
Engineering of Structures
and Building Enclosures

SHEET NO. 2
PROJECT NO. 197042.00
DATE 11/04/2020
BY KDP
CHECKED KSM

CLIENT UCSF
SUBJECT Tier 1 - Quick Checks - ACC Tower (Above Plaza)

Floor	Height (ft)	ColumnØ (in)	NS (ft)	EW(ft)	Area (ft^2)
Roof	12.83	26	133.33	133.33	14969
8	13	26	166.00	169.33	25300
7	13	26	166.00	169.33	25300
6	13	28	166.00	169.33	25300
5	13	32	166.00	169.33	25300
4	13	32	166.00	169.33	25300
3	13	34	166.00	169.33	25300
2	13	34	166.00	169.33	25300
1	15	36	166.00	169.33	25300
Plaza	13.5	38			

Unit: lbs — Unit: kip

Floor	W_{beam}	W_{girder}	W_{slab}	W_{column}	W_{wall}	W_{other}	W*
Roof	966734	347750	654884	285743	821500	224532	3637
8	1633980	347750	1106890	287587	826800	379505	4920
7	1633980	347750	1106890	310560	826800	379505	4943
6	1633980	347750	1106890	384583	826800	379505	5017
5	1633980	347750	1106890	435634	826800	379505	5068
4	1633980	347750	1106890	463712	826800	379505	5096
3	1633980	347750	1106890	491790	826800	379505	5124
2	1633980	347750	1106890	563981	890400	379505	5274
1	1633980	347750	1106890	637056	906300	379505	5367
Plaza				318970	429300		843

* Includes weight calculated for walls and slabs within the core shown on different sheet

W 45290 kip

Masses

Reinforced concrete beams

b	10 in	
d	15.5 in	
s	30 in	[spacing]
γ	150 pcf	

Reinforced concrete girders [diagonal]

n	4	[number]
L	53.5 ft	
b	5 ft	
d	26 in	
γ	150 pcf	

Reinforced concrete slab

d	3.5 in
γ	150 pcf

Reinforced concrete wall

n	4	[number]
t	2 ft	
L	53 ft	
γ	150 pcf	

Other weight (superimposed dead load)

15 psf

Floor	W_i [kip]	h_i [ft]	$(h_i)^k$ [ft]	$W_i(h_i)^k$ [kip-ft]	C_{vi}	F_i [kip]	V_i [kip]
Roof	3637	194.8	194.8	708637	0.068	9074	9074
8	4920	182.0	182.0	895357	0.086	11465	20539
7	4943	169.0	169.0	835280	0.080	10696	31235
6	5017	156.0	156.0	782567	0.075	10021	41256
5	5068	143.0	143.0	724646	0.070	9279	50535
4	5096	130.0	130.0	662411	0.064	8482	59017
3	5124	117.0	117.0	599446	0.058	7676	66693
2	5274	104.0	104.0	548415	0.053	7022	73716
1	5367	91.0	91.0	488268	0.047	6252	79968
Plaza	13410	76.0	76.0	1018930	0.098	13047	93015
A	15402	62.5	62.5	962395	0.093	12324	105339
B	14662	49.5	49.5	725545	0.070	9291	114629
C	14708	40.6	40.6	597646	0.058	7653	122282
D	14775	31.8	31.8	469599	0.045	6013	128296
E	14273	22.9	22.9	327322	0.032	4191	132487
F	2744	14.1	14.1	38651	0.004	495	132982
	134422			10385116	1.00	132982	

T	1.040	sec
k	1.00	
W	134422	kip
C	1.0	[Modification factor, buildings 4 stories or greater]
S_a	0.989	g
V	132982	kip

SHEAR STRESS CHECK: The shear stress in the concrete shear walls, calculated using the Quick Check procedure of Section 4.4.3.3, is less than the greater of 100 lb/in.^{2} (0.69 MPa) or $2\sqrt{f'_c}$.

	[kip]	[kip]
Floor	**V_i**	**V_i/M_s**
Roof	9074	2016
8	20539	4564
7	31235	6941
6	41256	9168
5	50535	11230
4	59017	13115
3	66693	14821
2	73716	16381
1	79968	17771
Plaza	93015	20670
A	105339	23409
B	114629	25473
C	122282	27174
D	128296	28510
E	132487	29442
F	132982	29552

N-S		E-W	
[in^2]	[psi]	[in^2]	[psi]
A_w	**σ**	**A_w**	**σ**
36896	54.7	SANS*	SANS
36896	123.7	SANS	SANS
36896	188.1	SANS	SANS
40352	227.2	SANS	SANS
48032	233.8	SANS	SANS
48032	273.0	SANS	SANS
52256	283.6	SANS	SANS
52256	313.5	SANS	SANS
56736	313.2	SANS	SANS
180864	114.3	188388	109.7
180864	129.4	188388	124.3
180864	140.8	188388	135.2
180864	150.2	188388	144.2
180864	157.6	188388	151.3
180864	162.8	188388	156.3
180864	163.4	188388	156.9

* Same as N-S

M_s 4.5 ASCE 41-17 Table 4-8

f_c 4000 psi
$\sqrt{f_c}$ 63.2 psi

Floor	$\sigma/\sqrt{f_c}$		DCR
Roof	0.86		0.43
8	1.96		0.98
7	2.97	NG	1.49
6	3.59	NG	1.80
5	3.70	NG	1.85
4	4.32	NG	2.16
3	4.48	NG	2.24
2	4.96	NG	2.48
1	4.95	NG	2.48
Plaza	1.81		0.90
A	2.05	NG	1.02
B	2.23	NG	1.11
C	2.38	NG	1.19
D	2.49	NG	1.25
E	2.57	NG	1.29
F	2.58	NG	1.29

Floor	Height (ft)	Area (ft^2)
Plaza	13.5	1585
A	13	1585
B	8.85	1585
C	8.85	1585
D	8.85	1585
E	8.85	1585
F	14.08	

Unit: lbs

Floor	W_{slab}	$W_{corewall}$	W_{walls}	W_{other}
Plaza	138665	0	186492	15847
A	138665	0	153768	15847
B	138665	0	124563	15847
C	138665	0	124563	15847
D	138665	0	124563	15847
E	138665	0	161392	15847
F		0	99111	

Unit: kip

W
341
308
279
279
279
316
99

W	1902	kip

Masses

Reinforced concrete slab

d	7	in
Y	150	pcf

Reinforced concrete wall

n	4		[number]
t	2	ft	
L	53	ft	
Y	0	pcf	

Other weight (superimposed dead load)
10 psf

Openings

(ft^2)

Areas	A_{slab}
1	94
2	118
3	10
4	116
5	71
6	19
7	116
8	94
9	109
10	5
11	4
12	13
13	94
14	10
15	102
16	99
17	94
18	46
19	5
20	2
	1224 (ft^2)

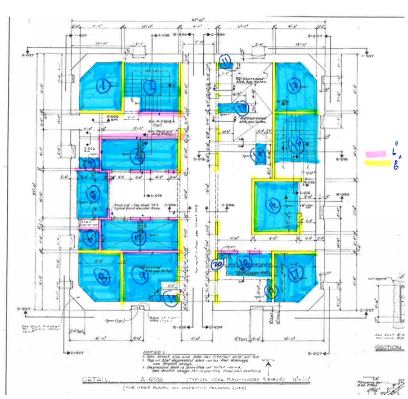
Wall Length

N-S

Thickness (in)	L_{wall} (ft)
6	17
8	128

E-W

Thickness (in)	L_{wall} (ft)
6	72
8	58



Floor	Height (ft)	Area (ft^2)
Roof	12.83	1585
8	13	1585
7	13	1585
6	13	1585
5	13	1585
4	13	1585
3	13	1585
2	13	1585
1	15	1585
Plaza	13.5	

Unit: lbs

Floor	W_{slab}	$W_{corewall}$	W_{walls}	W_{other}
Roof	138665	0	181801	15847
8	138665	0	182974	15847
7	138665	0	182974	15847
6	138665	0	182974	15847
5	138665	0	182974	15847
4	138665	0	182974	15847
3	138665	0	182974	15847
2	138665	0	197049	15847
1	138665	0	200567	15847
Plaza		0	95006	

Unit: kip

W
336
337
337
337
337
337
337
352
355
95

W	3163	kip

Masses

Reinforced concrete slab and walls within core (excluding core shear walls)

d	7	in
γ	150	pcf

Reinforced concrete corewall

n	4	[number]
t	2	ft
L	53	ft
γ	0	pcf

Other weight (superimposed dead load)

10 psf

Openings

(ft^2)

Areas	A_{slab}
1	94
2	118
3	10
4	116
5	71
6	19
7	116
8	94
9	109
10	5
11	4
12	13
13	94
14	10
15	102
16	99
17	94
18	46
19	5
20	2
	1224 (ft^2)

Wall Length

N-S

Thickness (in)	L_{wall} (ft)
6	17
8	128

E-W

Thickness (in)	L_{wall} (ft)
6	72
8	58