ASCE 41-17 Tier 1 Seismic Evaluation

Building Name: American Baptist Seminary, Academic Building
CAAN ID: 1966
Auxiliary Building ID: N/A
Address: 2515 Hillegass Avenue, Berkeley, CA 94704
Site location coordinates: Latitude 37.8648 Longitudinal -122.2561
Evaluator Name: Heavenz Kaur, Ray Pugliesi

Aerial Photo

North Exterior Elevation

UCOP *SEISMIC PERFORMANCE LEVEL* (OR "RATING") BASED ON TIER 1 EVALUATION: V

BUILDING DATA

ASCE 41-17 Model Building Type (Governing Building Type bolded for Seismic Risk Model when multiple types exist):

a. Longitudinal Direction: RM2: Reinforced Masonry Bearing Walls with Stiff Diaphragms
b. Transverse Direction: RM2: Reinforced Masonry Bearing Walls with Stiff Diaphragms

Square Footage: 18,075 sf (UCB occupies 10,854 sf)
Building Length: 81'-0" (approximately)
Building Width: 63'-0" (approximately)
Building Height: 48'-0"+12'-0" tall roof screen (approximately)
Story Height: 12'-0"
Number of stories *above* grade: 4.
Number of basement stories *below* grade: 0

Year of Original Construction and Code Year: 1962, Unknown
Year of Later Construction and Code Year: None

COST RANGE TO RETROFIT (if applicable): Medium: Between $50-$200 per square foot

BUILDING DESCRIPTION

General

Academic Building is one of the buildings located on the campus of the American Baptist Seminary West in Berkeley. It is a four story reinforced brick masonry building with steel framing. The structure is rectangular in plan, approximately 81 ft by 63 ft, with two re-entrant coroners on the east side. The lowest story is partially below grade and daylights on the south side. It is connected to Karpe Hall on the south side by a two story walkway with a subterranean level and an on grade level.

The University leases the First, Second and the Third Floor of the building.

Structural System

Gravity System of the building consists of concrete over metal deck spanning between steel joists supported on steel columns founded on spread footings. From the limited number of drawings that are available, it seems that the steel frames form an independent gravity system in the building. Steel columns are located inside east and west perimeter masonry walls, which indicates that these walls are non-load bearing. The north and south perimeter walls may be bearing only about 4 ft of tributary width from the concrete decks. The roof screen is about 12 ft tall and is made of cold formed steel studs and siding with rod bracing. A mechanical well is located in the center that houses mechanical equipment on the roof.

Lateral system of the building is composed of stiff concrete diaphragms that are laterally braced on all sides by reinforced masonry walls.

Building Condition

Good, no visible sign of structural or nonstructural damage were observed during the site visit.

Date of Site Visit: 05/31/2019, Ray Pugliesi & Heavenz Kaur, Degenkolb Engineers
Limitations of walk-through: None

SITE INFORMATION

Site Class (A-F): D Basis: Default per ASCE 41-17
Site Specific Ground Motion Study? No
BSE-1N Spectral Accelerations: Basis: USGS Design Summary Report for ASCE 41-17
S_{DS}: 1.614 S_{D1}: 1.007
BSE-2E Spectral Accelerations: Basis: USGS Design Summary Report for ASCE 41-17
S_{XS}: 2.391 S_{X1}: 1.255
Level of Seismicity: High
Performance Level: Collapse Prevention Structural Performance

Geologic Hazards:
Fault Rupture No Basis: Earthquake Zones of Required Investigation- Oakland West Quadrangle https://maps.conservation.ca.gov/cgs/informationwarehouse/regulatorymaps/
Liquefaction No Basis: Earthquake Zones of Required Investigation- Oakland West Quadrangle https://maps.conservation.ca.gov/cgs/informationwarehouse/regulatorymaps/
Landslide No Basis: Earthquake Zones of Required Investigation- Oakland West Quadrangle https://maps.conservation.ca.gov/cgs/informationwarehouse/regulatorymaps/

PREVIOUS RATINGS SUMMARY

1. Fair- Independent Structural Review, dated may 7, 1997, Degenkolb Engineers.

DOCUMENTATION

Architectural Drawings: Academic and Multipurpose Building, Berkeley Baptist Divinity School, by Ratcliff, Slama and Cadwalder Architects, dated October 28,1962. (Incomplete Set)

Structural Drawings: Academic and Multipurpose Building, Berkeley Baptist Divinity School, by Alan R, McKay & Associates Civil and Structural Engineers, dated October 28,1962. (Incomplete Set)

Seismic Evaluations: Independent Structural Review, dated May 7, 1997, by Degenkolb Engineers.

Geotechnical Reports: Not available

Other Documents: None

CONSTRUCTION DATA

Gravity Load Structural System:	Concrete over metal deck supported over steel joists spanning between steel columns and perimeter masonry walls.		
Exterior Transverse Walls:	12" thick, punched reinforced masonry walls	Opening(s)?	Yes
Exterior Longitudinal Walls:	Similar to Transverse Walls	Opening(s)?	Yes
Roof Materials/Framing:	Steel joists overlaid by concrete over metal deck supporting perimeter screen wall built with cold formed steel and siding.		
Intermediate Floors/Framing:	Concrete over metal deck supported by steel joists.		
Ground Floor:	Concrete slab on grade		
Columns:	Steel	Foundation:	Continuous footings at walls and isolated spread footings at columns.
General Condition of Structure:	Good		
Evidence of Settling?:	No		
Special Features & Comments:	Academic Building is connected to the Karpe Hall by a subterranean passage and a covered walkway on the North side of the building. The roof structure of the covered walkway is an independent structure, presumably supported by Basement Walls of the passage below. This concrete roof structure is supported on four cantilever, reinforced masonry, cruciform columns		

LATERAL-FORCE-RESISTING SYSTEM

	Longitudinal	Transverse
ASCE 41-17 Building Type:	RM2: Reinforced Masonry Bearing Walls with Stiff Diaphragms	RM2: Reinforced Masonry Bearing Walls with Stiff Diaphragms

Diaphragms:	Concrete over metal deck spanning between steel joists	Concrete over metal deck spanning between steel joists
Vertical Elements:	12" thick exterior reinforced masonry walls and steel interior columns.	12" thick exterior reinforced masonry walls and steel interior columns.
Connections:	See structural drawings	See structural drawings
Details:	See structural drawings	See structural drawings
Estimated Fundamental Period, T (sec):	0.356	0.356
BSE-2E Spectral Acceleration, S_a:	2.39g	2.39g
Modification Factor, C:	1.0 (C2 – Table 4-7)	1.0 (C2 – Table 4-7)
Building Weight, W (kips):	3,480	3,480
Seismic Base Shear, V (kips):	8,320	8,320
System Modification Factor, M_s:	4.5 - Collapse Prevention	4.5 - Collapse Prevention

Significant Structural Deficiencies, Potentially Affecting *Seismic Performance Level* Designation:

- ☑ Lateral System Stress Check (wall shear, column shear or flexure, or brace axial as applicable)
- ☐ Load Path
- ☑ Adjacent Buildings
- ☐ Weak Story
- ☐ Soft Story
- ☐ Geometry (vertical irregularities)
- ☐ Torsion
- ☐ Mass – Vertical Irregularity
- ☐ Cripple Walls
- ☐ Wood Sills (bolting)
- ☐ Diaphragm Continuity
- ☐ Openings at Shear Walls (concrete or masonry)
- ☐ Liquefaction
- ☐ Slope Failure
- ☐ Surface Fault Rupture
- ☐ Masonry or Concrete Wall Anchorage at Flexible Diaphragm
- ☐ URM wall height to thickness ratio
- ☐ URM Parapets or Cornices
- ☐ URM Chimney
- ☐ Heavy Partitions Braced by Ceilings
- ☐ Appendages

OVERALL SEISMIC DEFICIENCIES & EXPECTED SEISMIC PERFORMANCE

The below items have been identified as non-compliant:

1. *Lateral System Stress Check:* Exterior shear walls are deficient in shear capacity primarily due to the large number of window openings in the building.
2. *Adjacent Buildings:* Academic Building is connected to the Karpe Hall via a two story, covered walkway. The walkway roof almost aligns with the Roof of Karpe Hall and Second Floor of Academic Building. Due to a small joint, pounding is expected between the walkway roof and Academic Building in the north-south direction, but minimal structural damage is anticipated since the floor levels almost align. Although there is a structural separation between the walkway roof and Karpe Hall, in the east-west direction, the canopy roof is 'locked' into the door cavity of the Academic Building. The Academic Building is structurally stiffer than the walkway cantilever columns, and will resist movement of the walkway roof, but the far side of the roof (near Karpe Hall) is free to move. This will cause significant torsion in the walkway roof and increased demands and damage to the cantilevered columns. Some cracks may appear in the roof slab and columns due to unequal load distribution due to torsion.

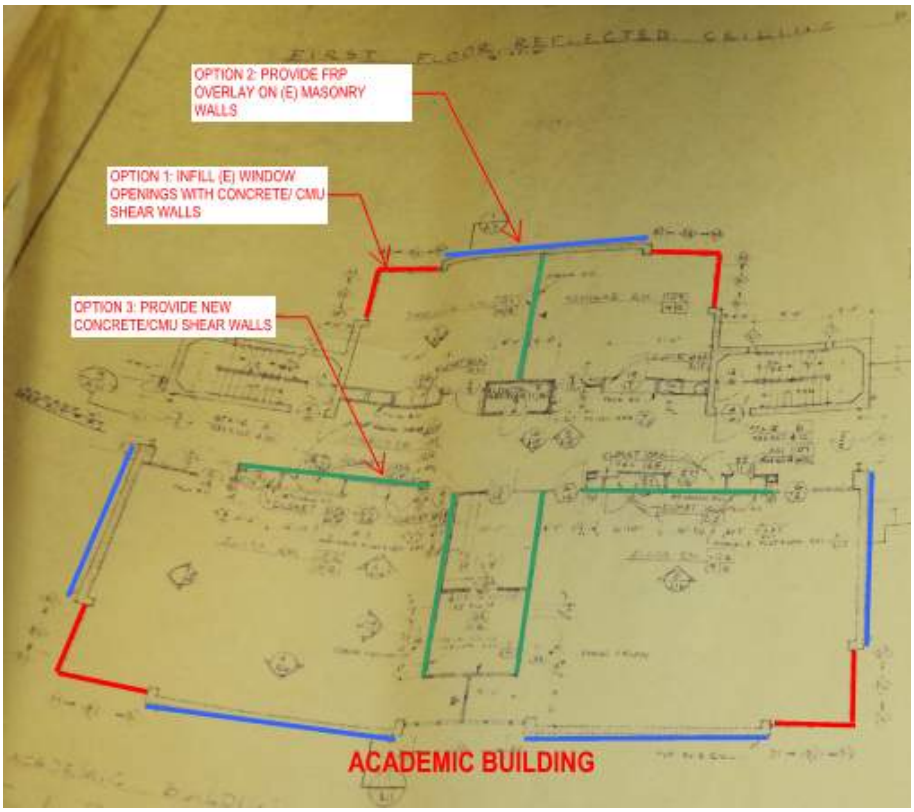
As a result of these deficiencies, the structure has been assigned a SPL V rating.

Recommended Next Steps

Due to lack of as built drawings, it is recommended that investigative and materials testing should be performed to understand the constitution of the shear walls, followed by a Tier 2 analysis. A limited retrofit to increase the shear capacity of shear walls may be necessary to address the identified deficiencies and improve the SPL rating to IV.

Seismic Retrofit Concept Sketches/Description (only if above-listed rating is V or greater):

In order to increase the shear capacity of shear walls some of the window openings can be infilled with concrete or masonry, additional interior masonry walls can be built, or Fiber Reinforced Polymer (FRP) overlay can be applied to existing walls to increase shear capacity.



Preliminary proposed retrofit schemes

Appendices

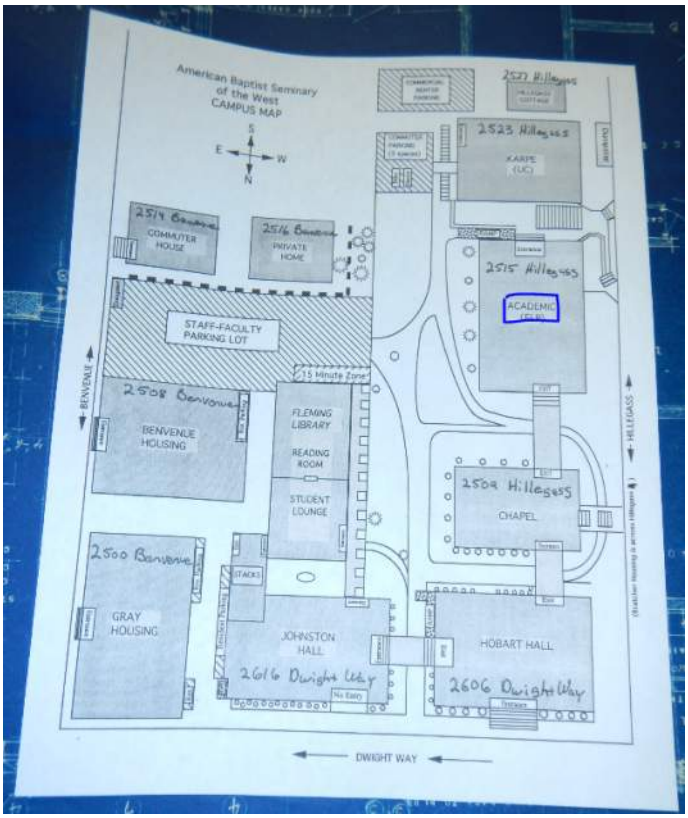
A. Additional Photos

B. ASCE 41-17 Tier 1 Checklists (Structural)

C. UCOP Seismic Safety Policy Falling Hazards Assessment Summary

D. Quick Check Calculations

APPENDIX A
Additional Photos



Keyplan for American Baptist Seminary campus

Roof screen at roof perimeter with a mechnical well in the center

Walkway between Academic Building and Karpe Hall

APPENDIX B
ASCE 41-17 Tier 1 Checklist (Structural)

UC Campus:	BERKELEY			Date:	06/14/2019		
Building CAAN:	1966	Auxiliary CAAN:	N/A	By Firm:	DEGENKOLB EGINEERS		
Building Name:	ACADEMIC BUILDING			Initials:	*HK*	Checked:	
Building Address:	2515 HILLEGASS AVENUE, BERKELEY, CA 94704			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:**.
○	●	○	○	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 walkway located south of the building may pound against the south masonry wall of the building in case of a seismic event.
●	○	○	○	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*

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:**
●	○	○	○	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:**
●	○	○	○	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

UC Campus:	BERKELEY			Date:	06/14/2019		
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Building Name:	ACADEMIC BUILDING			Initials:	*HK*	Checked:	
Building Address:	2515 HILLEGASS AVENUE, BERKELEY, CA 94704			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:**
◉	○	○	○	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:**
◉	○	○	○	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:**

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Building Address:	2515 HILLEGASS AVENUE, BERKELEY, CA 94704			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:** 63/48=1.31<0.6*2.39=1.434 (Close). In order for the building to overturn, it will have to rip out of the one story of dirt on three sides, which seems highly unlikely.
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:** It is assumed that the 6” thick concrete SOG ties the footings together.

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Building Name:	ACADEMIC BUILDING			Initials:	HK	Checked:	
Building Address:	2515 HILLEGASS, BERKELEY, CA 94704			Page:	1	of	4

ASCE 41-17
Collapse Prevention Structural Checklist For Building Type RM1-RM2

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:**
○	◉	○	○	SHEAR STRESS CHECK: The shear stress in the reinforced masonry shear walls, calculated using the Quick Check procedure of Section 4.4.3.3, is less than 70 lb/in.^{2} (0.48 MPa). (Commentary: Sec. A.3.2.4.1. Tier 2: Sec. 5.5.3.1.1) **Comments:** Shear walls in the bottom 3 levels have D/C>1.00, ranging from 1.2 to 2.9.
○	○	○	◉	REINFORCING STEEL: The total vertical and horizontal reinforcing steel ratio in reinforced masonry walls is greater than 0.002 of the wall with the minimum of 0.0007 in either of the two directions; the spacing of reinforcing steel is less than 48 in. (1220 mm), and all vertical bars extend to the top of the walls. (Commentary: Sec. A.3.2.4.2. Tier 2: Sec. 5.5.3.1.3) **Comments:**

STIFF DIAPHRAGMS

C	NC	N/A	U	Description
○	○	◉	○	TOPPING SLAB: Precast concrete diaphragm elements are interconnected by a continuous reinforced concrete topping slab. (Commentary: Sec. A.4.5.1. Tier 2: Sec. 5.6.4) **Comments:**

CONNECTIONS

C	NC	N/A	U	Description
◉	○	○	○	WALL ANCHORAGE: Exterior concrete or masonry walls that are dependent on the diaphragm 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:**

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ASCE 41-17
Collapse Prevention Structural Checklist For Building Type RM1-RM2

C	NC	N/A	U	
◉	○	○	○	WOOD LEDGERS: The connection between the wall panels and the diaphragm does not induce cross-grain bending or tension in the wood ledgers. (Commentary: Sec. A.5.1.2. Tier 2: Sec. 5.7.1.3) **Comments:**
◉	○	○	○	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:**
○	○	◉	○	TOPPING SLAB TO WALLS OR FRAMES: Reinforced concrete topping slabs that interconnect the precast concrete diaphragm elements are doweled for transfer of forces into the shear wall or frame elements. (Commentary: Sec. A.5.2.3. Tier 2: Sec. 5.7.2) **Comments:**
○	○	○	◉	FOUNDATION DOWELS: Wall reinforcement is doweled into the foundation. (Commentary: Sec. A.5.3.5. Tier 2: Sec. 5.7.3.4) **Comments:**
○	○	◉	○	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:**

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

STIFF DIAPHRAGMS

C	NC	N/A	U	Description
○	○	◉	○	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:**
○	○	◉	○	OPENINGS AT EXTERIOR MASONRY SHEAR WALLS: Diaphragm openings immediately adjacent to exterior masonry shear walls are not greater than 8 ft (2.4 m) long. (Commentary: Sec. A.4.1.6. Tier 2: Sec. 5.6.1.3) **Comments:**

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Building Address:	2515 HILLEGASS, BERKELEY, CA 94704			Page:	3	of	4

ASCE 41-17
Collapse Prevention Structural Checklist For Building Type RM1-RM2

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:**
○	○	◉	○	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:**
○	○	◉	○	OPENINGS AT EXTERIOR MASONRY SHEAR WALLS: Diaphragm openings immediately adjacent to exterior masonry shear walls are not greater than 8 ft (2.4 m) long. (Commentary: Sec. A.4.1.6. Tier 2: Sec. 5.6.1.3) **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:**

CONNECTIONS

C	NC	N/A	U	Description

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

UC Campus:	BERKELEY			Date:	06/13/2019		
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Building Address:	2515 HILLEGASS, BERKELEY, CA 94704			Page:	4	of	4

ASCE 41-17
Collapse Prevention Structural Checklist For Building Type RM1-RM2

C	NC	N/A	U	
○	○	◉	○	STIFFNESS OF WALL ANCHORS: Anchors of concrete or masonry walls to wood structural elements are installed taut and are stiff enough to limit the relative movement between the wall and the diaphragm to no greater than 1/8 in. (3 mm) before engagement of the anchors. (Commentary: Sec. A.5.1.4. Tier 2: Sec. 5.7.1.2) **Comments:**

APPENDIX C

UCOP Seismic Safety Policy Falling Hazards Assessment Summary

UC Campus:	BERKELEY			Date:	6/13/2019		
Building CAAN:	1966	Auxiliary CAAN:	N/A	By Firm:	DEGENKOLB ENGINEERS		
Building Name:	ACADEMIC BUILDING			Initials:	*HK*	Checked:	
Building Address:	2515 HILLEGASS AVENUE, BERKELEY, CA 94704			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

APPENDIX D
ASCE 41-17 Quick Check Calculations

Degenkolb Engineers
1300 Clay St, 9th Floor
Oakland, CA 94612-2047
Phone: 510.272.9040
Fax: 510.272.9526

Subject:	Weight Take Off	**Job Number:**	B8114004.00	**Date:**	6/14/2019
Job:	UCB, 2515 Hillegass Avenue-Academic Building	**By:**	HK	**Section:**	
		Checked By:		**Page/of:**	

First Level

	Area (ft2)	Thickness (in)	Weight (pcf)		Flat Load (psf)	
Floor Finish (Carpet/linoleum)	4862				3	
Concrete over metal deck					67	
Steel Joist Framing					5	
Ceiling/Misc					5	
		Length (ft)	Height (ft)	Weight (psf)	Weight (lbs)	Convert to Flat Load (psf)
12" Perimeter Wall	4862	288	12	150	518400	107
Total Flat Load: (Slab)*(Area - Open)+Beams+Girder+Col+Ext.Panel+5 psf				929	kips	
Effective Flat Dead Load (includes 10psf Partition)				201	psf	

Second Level

	Area (ft2)	Thickness (in)	Weight (pcf)		Flat Load (psf)	
Floor Finish (Carpet/linoleum)	4862				3	
Concrete over metal deck					67	
Steel Joist Framing					5	
Ceiling/Misc					5	
		Length (ft)	Height (ft)	Weight (psf)	Weight (lbs)	Convert to Flat Load (psf)
12" Perimeter Wall	4862	288	12	150	518400	107
Total Flat Load: (Slab)*(Area - Open)+Beams+Girder+Col+Ext.Panel+5 psf				929	kips	
Effective Flat Dead Load (includes 10psf Partition)				201	psf	

Third Level

	Area (ft2)	Thickness (in)	Weight (pcf)		Flat Load (psf)	
Floor Finish (Carpet/linoleum)	4862				3	
Concrete over metal deck					67	
Steel Joist Framing					5	
Ceiling/Misc					5	
		Length (ft)	Height (ft)	Weight (psf)	Weight (lbs)	Convert to Flat Load (psf)
12" Perimeter Wall	4862	288	12	150	518400	107
Total Flat Load: (Slab)*(Area - Open)+Beams+Girder+Col+Ext.Panel+5 psf				929	kips	
Effective Flat Dead Load (includes 10psf Partition)				201	psf	

Roof+Roof Screen

	Area (ft2)	Thickness (in)	Weight (pcf)		Flat Load (psf)	
Roof Screen	4862				5	
MISC mep Eqpt					5	
Roof Floor						
Roofing					2	
Concrete over metal deck					67	
Steel Joist Framing					5	
Ceiling+Misc					5	
		Length (ft)	Height (ft)	Weight (psf)	Weight (lbs)	Convert to Flat Load (psf)
12" Perimeter Wall	4862	288	6	150	259200	53
Total Flat Load: (Slab)*(Area - Open)+Beams+Girder+Col+Ext.Pane				692	kips	
Effective Flat Dead Load				142	psf	

Total Building Weight 3480 kips

Degenkolb

Subject:	Base forces	**Job Number:**	B8114004.00	**Date:** 19-Jun-2019
Job:	UCB, 2515 Hillegass Avenue-Academic Building	**By:**	HK	
	Tier 1 evaluation, RC shear walls	**Checked By:**		

ASCE 41-17 Linear Static Base Shear & Vertical Force Distribution
Tier 1

INPUT DATA

C:	Modification factor (Table 4-7) =	1.0		
S_1:	Spectral Response Acceleration @ 1 sec. =	0.74		(from MCE maps or Site Specific)
S_s:	Short Period Response Acceleration =	1.99		(from MCE maps or Site Specific)
SC:	Soil Class =	D		(A through F), 1.6.1.4.1

Table 1-5:	S_1 <= 0.1	S_1 = 0.2	S_1 = 0.3	S_1 = 0.4	S_1 >= 0.5
Soil Class D	2.4	2.2	2.0	1.9	1.8
F_v	-	-	-	-	1.80

F_v:	Site Coefficient for S_1 =	1.70		(Table 11.4-1)

Table 1-4:	S_s <= 0.25	S_s = 0.50	S_s = 0.75	S_s = 1.00	S_s >= 1.25
Soil Class D	1.6	1.4	1.2	1.1	1.0
F_a	-	-	-	-	1.00

F_a:	Site Coefficient for S_s =	1.20		(Table 11.4-2)
S_{X1}:	Spectral Response Acceleration @ 1 sec. =	1.255		USGS
S_{xs}:	Short Period Acceleration =	2.391		USGS
β:	Building System Exponent =	0.75		(4.4.2.4)
C_t:	Building System Coefficient =	0.02		(4.4.2.4)
W:	Total Building Weight =	3480	kips	
hn:	Total Building Height =	48	feet	
n:	Number of Stories =	2		

CALCULATE BASE SHEAR FOR BSE-2E (MCE)

T:	Fundamental Period of Vibration = $C_t * h^{\beta}$ =	0.365	sec.	(4-4)
S_a:	Spectral Acceleration at Building Period =	2.39		(4-3)
V:	Pseudo Seismic Force =	8320	kips	(4-1)

CALCULATE BASE SHEAR FOR BSE-2E (MCE) Tier 2

C_1C_2:	Modification Factors =	1.1	(Table 7-3)
C_m:	Effective Mass Factor =	1	(Table 7-4)
V:	Pseudo Seismic Force =	9152	kips

Degenkolb

Subject:	ASCE 41 Shear Stress check, Section 4.4.3.3	**Job Number:**
Job:	UCB, 2515 Hillegass Avenue-Academic Building	**By:**
Model:	ASCE 41, TIER 1	**Checked By:**

Story Shears

Base Shear V **8320** kips
k 1
Ms 4.5 for RC wall, Collapse Prevention

x	w_x	h_x	$w_x h_x^k$	F_x	V_j
Roof	692	48	33212	2760	2760
Level 3	929	36	33452	2780	5540
Level 2	929	24	22302	1853	7393
Level 1	929	12	11151	927	8320
	3480		100117	8320	

Level	Wall Length N/S	Wall Length E/W	Average Wall thickness	f'c	70 psi	Demand (psi) N/S	Demand (psi) E/W	D/C- Tier 1 N/S	D/C- Tier 1 E/W
Roof	98.00	62.00	12.00		70.00	43.46	68.70	0.62	0.98
Level 3	98.00	62.00	12.00		70.00	87.24	137.89	1.25	1.97
Level 2	98.00	62.00	12.00		70.00	116.420	184.02	1.66	2.63
Level 1	98.00	62.00	12.00		70.00	131.011	207.08	1.87	2.96

Tier 2

Base Shear V **9152** kips
k 1
m 3 (Table 10-22)

x	w_x	h_x	$w_x h_x^k$	F_x	V_j
Roof	692	48	33212	3036	3036
Level 3	929	36	33452	3058	6094
Level 2	929	24	22302	2039	8132
Level 1	929	12	11151	1019	9152
	2550		100117	9152	

Level	Wall Length N/S	Wall Length E/W	Average Wall thickness	Ast (Assumed)	Vnm+Vns	Demand (psi) N/S	Demand (psi) E/W	D/C- Tier 2 N/S	D/C- Tier 2 E/W
Roof	98.00	62.00	12.00	#4@18 EF EW min	117.91	71.71	113.35	0.61	0.96
Level 3	98.00	62.00	12.00	#4@18 EF EW min	120.66	143.94	227.52	1.19	1.89
Level 2	98.00	62.00	12.00	#4@18 EF EW min	123.41	192.09	303.63	1.56	2.46
Level 1	98.00	62.00	12.00	#4@18 EF EW min	115.84	216.17	341.69	1.87	2.95

From Johnston hall drawings