ASCE 41-17 Tier 1 Seismic Evaluation

Building Name: American Baptist Seminary, Johnston Hall
CAAN ID: 1928
Auxiliary Building ID: - N/A
Address: 2616 Dwight Way, Berkeley, CA 94704
Site location coordinates: Latitude 37.8653 Longitudinal -122.2557
Evaluator Name: Heavenz Kaur, Ray Pugliesi

REGISTERED PROFESSIONAL ENGINEER RAYMOND S. PUGLIESI No. 3968 STRUCTURAL STATE OF CALIFORNIA

Aerial Photo

North Exterior Elevation

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

BUILDING DATA

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

a. Longitudinal Direction: RM1: Reinforced Masonry Bearing Walls with Flexible Diaphragms
b. Transverse Direction: RM1: Reinforced Masonry Bearing Walls with Flexible Diaphragms

Square Footage: 9,608 sf (UCB occupies 4,558 sf)
Building Length: 100'-0" (approximately)
Building Width: 40'-0" (approximately)
Building Height: 30'-0" (approximately)
Story Height: 10'-0"
Number of stories *above* grade: 2
Number of basement stories *below* grade: 0

Year of Original Construction and Code Year: 1950, Unknown
Year of Later Construction and Code Year: Retrofitted in 2001, 1997 UBC (Assumed)

COST RANGE TO RETROFIT (if applicable): N/A

BUILDING DESCRIPTION

General

Johnston Hall is one of the buildings located on the campus of the American Baptist Seminary West in Berkeley. It is a two story, reinforced brick and wood framed building, with a tall attic, about 10 ft in height. The building is approximately 100 ft in length in the east-west direction and approximately 40 ft in width in the north-south direction. Johnston Hall is structurally connected to the Library Stacks building, which in turn is connected to the Reading Room building. All three buildings share a load bearing wall with the adjacent neighbor.

The University only leases space in Johnston Hall, so adjacent buildings have not been evaluated.

Structural System

Gravity system of the building is composed of wood framed floors with 2x framing overlaid with 1x diagonal sheathing on the First and Second Floors. The Attic and Roof originally had 2x framing with 1x straight sheathing which was retrofitted to have plywood sheathing overlaid in 1998. The 2x framing spans between the 14" thick exterior masonry walls and interior wood corridor walls running in the east-west direction.

Lateral system of the building is composed of wood diaphragms that span between perimeter masonry shear walls. The retrofit performed in 1998 strengthened the wall out of plane connections and reinforced the diaphragms at the Second, Attic and Roof Levels. The walls are founded on shallow, continuous footings.

Building Condition

Good, no visible sign of structural or non structural 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. Very Poor – Independent Structural Review, dated May 7, 1997, Degenkolb Engineers.

DOCUMENTATION

Architectural Drawings: Baptist Divinity School, by Ratcliff, Hayward and Radcliff Architects, dated, May 27, 1952 (Incomplete Set)

Structural Drawings: Baptist Divinity School, by H.J. Brunnier Structural Engineer, dated, May 27, 1952 (Incomplete Set)

American Baptist Seminary of the West, Seismic Upgrades for Johnston Hall, by Jedco Consulting Engineers, dated, September 27, 1998.

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

Geotechnical Reports: Not available

Other Documents: Letter from Jedco Consulting Engineers, Inc. re: Seismic Upgrading for the UMB building at 2606 Dwight, dated February 12, 2001

CONSTRUCTION DATA

Gravity Load Structural System:	2x framing spanning between exterior masonry walls and interior wood corridor walls, supported on spread footings		
Exterior Transverse Walls:	14" thick, punches reinforced masonry walls	Opening(s)?	Yes
Exterior Longitudinal Walls:	Similar to Transverse Walls	Opening(s)?	Yes
Roof Materials/Framing:	Pitched roof rafters spanning between exterior and interior walls, overlaid by 1x straight sheathing and slate shingles.		
Intermediate Floors/Framing:	2x joist framing overlaid by 1x diagonal sheathing.		
Ground Floor:	Concrete slab on grade		
Columns:	None	Foundation:	Continuous footings at walls.
General Condition of Structure:	Good		
Evidence of Settling?:	No		
Special Features & Comments:	Johnston Hall shares a masonry bearing wall with adjacent Library Stacks building		
	A two story covered walkway exists on the west side of Johnston Hall that is connected at both levels and at both ends to Johnston Hall on one side and Hobart Hall (not evaluated) on the other side.		

LATERAL-FORCE-RESISTING SYSTEM

	Longitudinal	Transverse

ASCE 41-17 Building Type:	RM1: Reinforced Masonry Bearing Walls with Flexible Diaphragms	RM1: Reinforced Masonry Bearing Walls with Flexible Diaphragms
Diaphragms:	1x diagonal sheathing on 2x framing on First and Second Levels and Plywood on 2x framing at Attic and Roof Levels	1x diagonal sheathing on 2x framing on First and Second Levels and Plywood on 2x framing at Attic and Roof Levels
Vertical Elements:	14" thick exterior reinforced masonry walls and 4" thick wood walls along corridor.	14" thick exterior reinforced masonry walls and 4" thick wood walls along corridor.
Connections:	See structural drawings	See structural drawings
Details:	See structural drawings	See structural drawings
Estimated Fundamental Period, T (sec):	0.256	0.256
BSE-2E Spectral Acceleration, S_a:	2.39g	2.39g
Modification Factor, C:	1.1 (C2 – Table 4-7)	1.1 (C2 – Table 4-7)
Building Weight, W (kips):	1,815	1,815
Seismic Base Shear, V (kips):	4,775	4,775
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

Johnston Hall does not have any significant structural deficiency per Tier 1 analysis. It shares a load bearing masonry wall with the Library Stacks building. The Library Stacks building is relatively stiffer as compared to Johnston Hall because of lesser openings in the exterior masonry walls and rigid concrete diaphragms. In case of a seismic event the wood diaphragm at this common wall at the Second and Roof Levels, will suffer some damage due to differential movement between the two buildings.

A two story covered walkway connects Johnston Hall with Hobart Hall. The walkway may suffer damage due to differential movement of the two buildings and pounding in case of a seismic event.

Recommended Next Steps

None, since the building has been rated IV.

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

None

Appendices

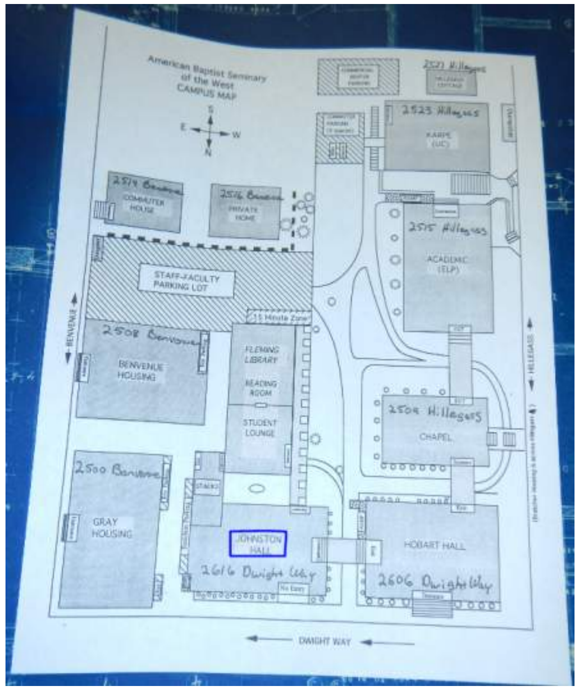
A. Additional Photos

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 of American Baptist Seminary campus

Retrofit at Attic and Roof showing new plywood sheathing and A35 connectors

Retrofit at Attic showing new straps on plywood diaphragm near stair opening

Shared masonry wall between Johnston Hall and Library Stacks with diaphragm connection with steel angle

Shared masonry wall between Johnston Hall and Library Stacks

South side extrior wall with window openigns

APPENDIX B

ASCE 41-17 Tier 1 Checklist (Structural)

UC Campus:	BERKELEY		Date:	06/13/2019	
Building CAAN:	1928	Auxiliary CAAN: N/A	By Firm:	DEGENKOLB EGINEERS	
Building Name:	JOHNSTON HALL		Initials:	HK	Checked:
Building Address:	2616 DWIGHT WAY, 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
(●) 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:** Johnston Hall shares a common wall with the Library Stacks building and is connected to Hobart Hall via a two story covered walkway. The building may experience damage due to these neighboring structures being structurally attached to it.
(●) 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*

C NC N/A U	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

UC Campus:	BERKELEY			Date:	06/13/2019	
Building CAAN:	1928	Auxiliary CAAN:	N/A	By Firm:	DEGENKOLB EGINEERS	
Building Name:	JOHNSTON HALL			Initials:	HK	Checked:
Building Address:	2616 DWIGHT WAY, BERKELEY, CA 94704			Page:	2	of 3

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:**
◉ 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:**
◉ 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:**

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:**
◉ 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:**
◉ 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:**

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

UC Campus:	BERKELEY			Date:	06/13/2019		
Building CAAN:	1928	Auxiliary CAAN:	N/A	By Firm:	DEGENKOLB EGINEERS		
Building Name:	JOHNSTON HALL			Initials:	HK	Checked:	
Building Address:	2616 DWIGHT WAY, 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 (●) 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:** 40/30=1.33>0.6*2.391=1.43 (Close). The shear walls along the long side of the building are connected to the transverse perimeter walls, that will help mitigate any overturning or excessive soil bearing stresses under the short walls.
C NC N/A U (●) 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:	BERKELEY			Date:	06/13/2019	
Building CAAN:	1928	Auxiliary CAAN:	N/A	By Firm:	DEGENKOLB EGINEERS	
Building Name:	JOHNSTON HALL			Initials:	HK	Checked:
Building Address:	2616 DWIGHT WAY, 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
◉ C ○ NC ○ N/A ○ U	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:**
◉ C ○ NC ○ N/A ○ U	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:**
◉ C ○ NC ○ N/A ○ U	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:** ½" dia. Rebar @18 EF EW

STIFF DIAPHRAGMS

C NC N/A U	Description
○ C ○ NC ◉ N/A ○ U	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
◉ C ○ NC ○ N/A ○ U	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:** Details on Retrofit drawings (1998) sheets S3 and S4 show through bolting at Second Level with a bearing plate on the outside and holdown on the inside at every 4' on center. Bearing connection with ¾" epoxy bolts at every 4' on center are shown for connection at the Roof Level.

UC Campus:	BERKELEY			Date:	06/13/2019	
Building CAAN:	1928	Auxiliary CAAN:	N/A	By Firm:	DEGENKOLB EGINEERS	
Building Name:	JOHNSTON HALL			Initials:	HK	Checked:
Building Address:	2616 DWIGHT WAY, BERKELEY, CA 94704			Page:	2 of 4	

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:**

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

UC Campus:	BERKELEY			Date:	06/13/2019		
Building CAAN:	1928	Auxiliary CAAN:	N/A	By Firm:	DEGENKOLB EGINEERS		
Building Name:	JOHNSTON HALL			Initials:	HK	Checked:	
Building Address:	2616 DWIGHT WAY, 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:** Retrofit details on Sheets S2-S4 show continuous ties in both directions. (E) longitudinal walls form ties across transverse perimeter walls.
●	○	○	○	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:** Diagonally sheathed second floor diaphragm spans about 100 ft between transverse walls
●	○	○	○	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:**

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

UC Campus:	BERKELEY			Date:	06/13/2019		
Building CAAN:	1928	Auxiliary CAAN:	N/A	By Firm:	DEGENKOLB EGINEERS		
Building Name:	JOHNSTON HALL			Initials:	HK	Checked:	
Building Address:	2616 DWIGHT WAY, BERKELEY, CA 94704			Page:	4	of	4

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

CONNECTIONS

C NC N/A U	Description
(●) 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:	1928	Auxiliary CAAN:	N/A	By Firm:	DEGENKOLB ENGINEERS		
Building Name:	JOHNSTON HALL			Initials:	HK	Checked:	
Building Address:	2616 DWIGHT WAY, 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, 2616 Dwight Way- Johnston Hall	**By:**	HK	**Section:**	
		Checked By:		**Page/of:**	

Second Level

	Area (ft2)	Thickness (in)	Weight (pcf)		Flat Load (psf)	
Floor Finish (Carpet/linoleum)	4000				3	
1x diagonal sehathing					4	
2x framing					4	
Ceiling/Misc					5	
		Length (ft)	Height (ft)	Weight (psf)	Weight (lbs)	Convert to Flat Load (psf)
14" Perimeter Wall	4000	280	10	175	490000	123
Total Flat Load: (Slab)*(Area - Open)+Beams+Girder+Col+Ext.Panel+5 psf				570	kips	
Effective Flat Dead Load (includes 10psf Partition)				153	psf	

Roof+Attic

	Area (ft2)	Thickness (in)	Weight (pcf)		Flat Load (psf)		
Gable Roof							
Roof Slate Shingles (1/4")					12		20% increas due to gable roof
2x framing					5		20% increas due to gable roof
1x straight sheathing					4		20% increas due to gable roof
Added Plywood					3		20% increas due to gable roof
Attic Floor							
2x framing					4		
1x straight sheathing					3		
Added Plywood					3		
Wood Walls					5		
		Length (ft)	Height (ft)	Weight (psf)	Weight (lbs)	Convert to Flat Load (psf)	
14" Perimeter Wall	4000	280	15	175	735000	184	
Total Flat Load: (Slab)*(Area - Open)+Beams+Girder+Col+Ext.Panel				887	kips		
Effective Flat Dead Load				222	psf		

Total Building Weight 1457 kips

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

INPUT DATA

C:	Modification factor (Table 4-7) =	1.1		
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 =	1457	kips	
hn:	Total Building Height =	30	feet	
n:	Number of Stories =	2		

CALCULATE BASE SHEAR FOR BSE-2E (MCE)

T:	Fundamental Period of Vibration = $C_t * h^{\beta}$ =	0.256	sec.	(4-4)
S_a:	Spectral Acceleration at Building Period =	2.39		(4-3)
V:	Pseudo Seismic Force =	3831	kips	(4-1)

Degenkolb

Subject:	ASCE 41 Shear Stress check, Section 4.4.3.3	**Job Number:**	B8114004.00	**Date:**	06/14/19
Job:	UCB, 2616 Dwight Way- Johnston Hall	**By:**	HK	**Section:**	
Model:	ASCE 41, TIER 1	**Checked By:**		**Page**	**of**

Story Shears

Base Shear V **3831** 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	887	25	22165	3047	3047
Level 2	570	10	5700	784	3831
	1457		27865	3831	

Level	Wall Length		Average Wall thickness	f'c	2sqrt(f'cE) (psi)	Demand (psi)		D/C- Tier 1	
	N/S	E/W				N/S	E/W	N/S	E/W
Roof	150.00	68.00	14.00		70.00	26.87	59.28	0.38	0.85
Level 2	150.00	68.00	14.00		70.00	33.78	74.52	0.48	1.06

Check OOP wall anchorage at Roof Level
(This calc is a general estimate of capacity)

Company:		Page:	1
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	Concrete - Jun 21, 2019	Date:	6/21/2019
Fastening point:			

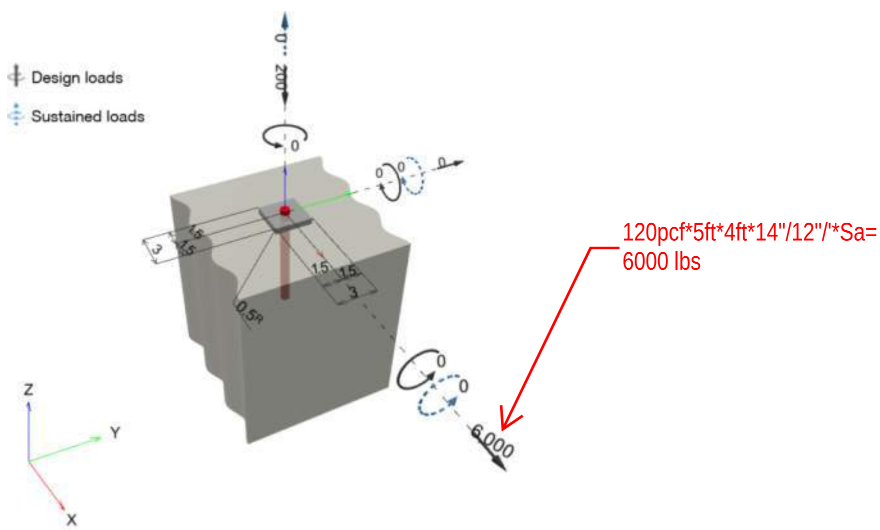
Specifier's comments:

1 Input data

Anchor type and diameter:	**HIT-HY 200 + Rebar A 615 Gr.40 #6**
Item number:	not available (element) / 2022793 HIT-HY 200-R (adhesive)
Effective embedment depth:	$h_{ef,act}$ = 8.000 in. ($h_{ef,limit}$ = - in.)
Material:	ASTM A 615 GR.40
Evaluation Service Report:	ESR-3187
Issued I Valid:	3/1/2018 | 3/1/2020
Proof:	Design Method ACI 318-08 / Chem
Stand-off installation:	e_b = 0.000 in. (no stand-off); t = 0.500 in.
Anchor plate[R] :	l_x x l_y x t = 3.000 in. x 3.000 in. x 0.500 in.; (Recommended plate thickness: not calculated)
Profile:	no profile
Base material:	cracked concrete, , f_c' = 2,500 psi; h = 120.000 in., Temp. short/long: 32/32 °F
Installation:	**hammer drilled hole, Installation condition: Dry**
Reinforcement:	tension: condition B, shear: condition B; no supplemental splitting reinforcement present
	edge reinforcement: > No. 4 bar
Seismic loads (cat. C, D, E, or F)	no

[R] - The anchor calculation is based on a rigid anchor plate assumption.

Geometry [in.] & Loading [lb, in.lb]



www.hilti.com

Company:		Page:	2
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	Concrete - Jun 21, 2019	Date:	6/21/2019
Fastening point:			

1.1 Design results

Case	Description	Forces [lb] / Moments [in.lb]	Seismic	Max. Util. Anchor [%]
1	Combination 1	N = -200; V_x = 6,000; V_y = 0; M_x = 0; M_y = 0; M_z = 0; N_{sus} = 0; $M_{x,sus}$ = 0; $M_{y,sus}$ = 0;	no	84

2 Load case/Resulting anchor forces

Load case: Design loads

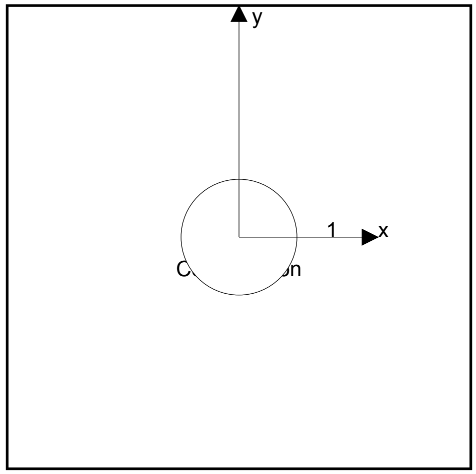
Anchor reactions [lb]

Tension force: (+Tension, -Compression)

Anchor	Tension force	Shear force	Shear force x	Shear force y
1	0	6,000	6,000	0

max. concrete compressive strain: 0.01 [‰]
max. concrete compressive stress: 22 [psi]
resulting tension force in (x/y)=(0.000/0.000): 0 [lb]
resulting compression force in (x/y)=(0.000/0.000): 200 [lb]

Anchor forces are calculated based on the assumption of a rigid anchor plate.



3 Tension load

	Load N_{ua} [lb]	Capacity ϕ N_n [lb]	Utilization β_N = N_{ua}/ϕ N_n	Status
Steel Strength*	N/A	N/A	N/A	N/A
Bond Strength**	N/A	N/A	N/A	N/A
Sustained Tension Load Bond Strength*	N/A	N/A	N/A	N/A
Concrete Breakout Failure**	N/A	N/A	N/A	N/A

* highest loaded anchor **anchor group (anchors in tension)

Company:		Page:	3
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	Concrete - Jun 21, 2019	Date:	6/21/2019
Fastening point:			

4 Shear load

	Load V_{ua} [lb]	Capacity ϕV_n [lb]	Utilization $\beta_V = V_{ua}/\phi V_n$	Status
Steel Strength*	6,000	9,504	64	OK
Steel failure (with lever arm)*	N/A	N/A	N/A	N/A
Pryout Strength (Concrete Breakout Strength controls)**	6,000	13,744	44	OK
Concrete edge failure in direction x+**	6,000	7,147	84	OK

* highest loaded anchor **anchor group (relevant anchors)

f'm<2500 psi. (900*1.3 (exp.) psi.)
Max utilization = 84*sqrt(2500)/sqrt(900*1.3)*0.7(phi=1.0)=86%
(Approx.)

4.1 Steel Strength

$V_{sa} = (0.6\ A_{se,V}\ f_{uta})$ refer to ICC-ES ESR-3187
$\phi\ V_{steel} \geq V_{ua}$ ACI 318-08 Eq. (D-2)

Variables

$A_{se,V}$ [in.^{2}]	f_{uta} [psi]	$(0.6\ A_{se,V}\ f_{uta})$ [lb]
0.44	60,000	15,840

Calculations

V_{sa} [lb]
15,840

Results

V_{sa} [lb]	ϕ_{steel}	$\phi\ V_{sa}$ [lb]	V_{ua} [lb]
15,840	0.600	9,504	6,000

phi=1

4.2 Pryout Strength (Concrete Breakout Strength controls)

$V_{cp} = k_{cp} \left[\left(\frac{A_{Nc}}{A_{Nc0}}\right) \psi_{ed,N}\ \psi_{c,N}\ \psi_{cp,N}\ N_b\right]$	ACI 318-08 Eq. (D-30)
$\phi\ V_{cp} \geq V_{ua}$	ACI 318-08 Eq. (D-2)
A_{Nc} see ACI 318-08, Part D.5.2.1, Fig. RD.5.2.1(b)	
$A_{Nc0} = 9\ h_{ef}^2$	ACI 318-08 Eq. (D-6)
$\psi_{ed,N} = 0.7 + 0.3 \left(\frac{c_{a,min}}{1.5h_{ef}}\right) \leq 1.0$	ACI 318-08 Eq. (D-11)
$\psi_{cp,N} = \text{MAX}\left(\frac{c_{a,min}}{c_{ac}}, \frac{1.5h_{ef}}{c_{ac}}\right) \leq 1.0$	ACI 318-08 Eq. (D-13)
$N_b = k_c\ \lambda\ \sqrt{f'_c}\ h_{ef}^{1.5}$	ACI 318-08 Eq. (D-7)

Variables

k_{cp}	h_{ef} [in.]	$c_{a,min}$ [in.]	$\psi_{c,N}$
2	8.000	7.000	1.000

c_{ac} [in.]	k_c	λ	f'_c [psi]
12.214	17	1	2,500

Calculations

A_{Nc} [in.^{2}]	A_{Nc0} [in.^{2}]	$\psi_{ed,N}$	$\psi_{cp,N}$	N_b [lb]
336.00	576.00	0.875	1.000	19,233

Results

V_{cp} [lb]	$\phi_{concrete}$	$\phi\ V_{cp}$ [lb]	V_{ua} [lb]
19,634	0.700	13,744	6,000

phi=1

4.3 Concrete edge failure in direction x+

$V_{cb} = \left(\frac{A_{Vc}}{A_{Vc0}}\right) \psi_{ed,V}\ \psi_{c,V}\ \psi_{h,V}\ \psi_{parallel,V}\ V_b$	ACI 318-08 Eq. (D-21)
$\phi\ V_{cb} \geq V_{ua}$	ACI 318-08 Eq. (D-2)
A_{Vc} see ACI 318-08, Part D.6.2.1, Fig. RD.6.2.1(b)	
$A_{Vc0} = 4.5\ c_{a1}^2$	ACI 318-08 Eq. (D-23)
$\psi_{ed,V} = 0.7 + 0.3\left(\frac{c_{a2}}{1.5c_{a1}}\right) \leq 1.0$	ACI 318-08 Eq. (D-28)
$\psi_{h,V} = \sqrt{\frac{1.5c_{a1}}{h_a}} \geq 1.0$	ACI 318-08 Eq. (D-29)
$V_b = \left(7\left(\frac{l_e}{d_a}\right)^{0.2} \sqrt{d_a}\right) \lambda\ \sqrt{f'_c}\ c_{a1}^{1.5}$	ACI 318-08 Eq. (D-24)

Variables

c_{a1} [in.]	c_{a2} [in.]	$\psi_{c,V}$	h_a [in.]	l_e [in.]
7.000	-	1.200	120.000	6.000

λ	d_a [in.]	f'_c [psi]	$\psi_{parallel,V}$
1.000	0.750	2,500	1.000

Calculations

A_{Vc} [in.^{2}]	A_{Vc0} [in.^{2}]	$\psi_{ed,V}$	$\psi_{h,V}$	V_b [lb]
220.50	220.50	1.000	1.000	8,509

Results

V_{cb} [lb]	$\phi_{concrete}$	$\phi\ V_{cb}$ [lb]	V_{ua} [lb]
10,210	0.700	7,147	6,000

phi=1

5 Warnings

- The anchor design methods in PROFIS Engineering require rigid anchor plates per current regulations (AS 5216:2018, ETAG 001/Annex C, EOTA TR029 etc.). This means load re-distribution on the anchors due to elastic deformations of the anchor plate are not considered - the anchor plate is assumed to be sufficiently stiff, in order not to be deformed when subjected to the design loading. PROFIS Engineering calculates the minimum required anchor plate thickness with CBFEM to limit the stress of the anchor plate based on the assumptions explained above. The proof if the rigid anchor plate assumption is valid is not carried out by PROFIS Engineering. Input data and results must be checked for agreement with the existing conditions and for plausibility!
- Condition A applies where the potential concrete failure surfaces are crossed by supplementary reinforcement proportioned to tie the potential concrete failure prism into the structural member. Condition B applies where such supplementary reinforcement is not provided, or where pullout or pryout strength governs.
- Design Strengths of adhesive anchor systems are influenced by the cleaning method. Refer to the INSTRUCTIONS FOR USE given in the Evaluation Service Report for cleaning and installation instructions.
- The present version of the software does not account for special design provisions for overhead applications. Refer to related approval (e.g. section 4.1.1 of the ICC-ESR 2322) for details.
- For additional information about ACI 318 strength design provisions, please go to https://submittals.us.hilti.com/PROFISAnchorDesignGuide/

Company:		Page:	6
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	Concrete - Jun 21, 2019	Date:	6/21/2019
Fastening point:			

Fastening meets the design criteria!

6 Installation data

Anchor type and diameter: HIT-HY 200 + Rebar A 615 Gr.40 #6

Profile: no profile

Item number: not available (element) / 2022793 HIT-HY 200-R (adhesive)

Hole diameter in the fixture: d_f = 0.750 in.

Installation torque: -

Plate thickness (input): 0.500 in.

Hole diameter in the base material: 0.875 in.

Recommended plate thickness: not calculated

Hole depth in the base material: 8.000 in.

Drilling method: Hammer drilled

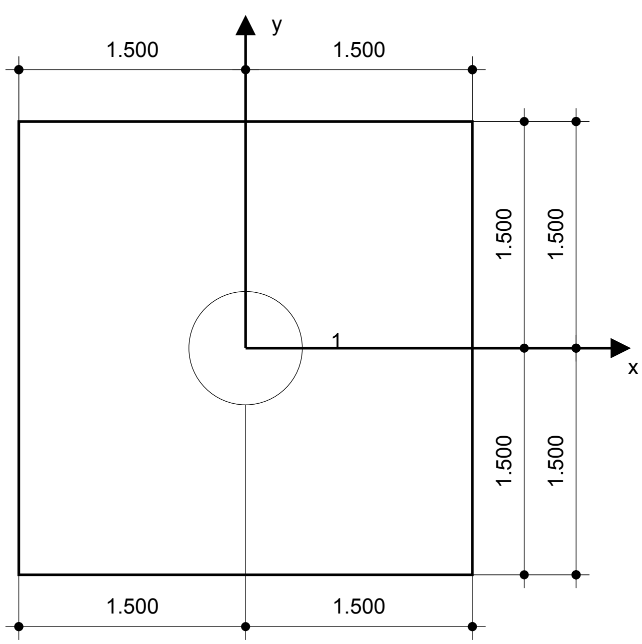
Minimum thickness of the base material: 9.750 in.

Cleaning: Compressed air cleaning of the drilled hole according to instructions for use is required

#6 Rebar with Hilti HIT-HY 200 Safe Set System

6.1 Recommended accessories

Drilling	Cleaning	Setting
• Suitable Rotary Hammer • Properly sized drill bit	• Compressed air with required accessories to blow from the bottom of the hole • Proper diameter wire brush	• Dispenser including cassette and mixer • For deep installations, a piston plug is necessary • Torque wrench



Coordinates Anchor in.

Anchor	x	y	c_{-x}	c_{+x}	c_{-y}	c_{+y}
1	0.000	0.000	7.000	7.000	-	-

Company:		Page:	8
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	Concrete - Jun 21, 2019	Date:	6/21/2019
Fastening point:			

7 Remarks; Your Cooperation Duties

- Any and all information and data contained in the Software concern solely the use of Hilti products and are based on the principles, formulas and security regulations in accordance with Hilti's technical directions and operating, mounting and assembly instructions, etc., that must be strictly complied with by the user. All figures contained therein are average figures, and therefore use-specific tests are to be conducted prior to using the relevant Hilti product. The results of the calculations carried out by means of the Software are based essentially on the data you put in. Therefore, you bear the sole responsibility for the absence of errors, the completeness and the relevance of the data to be put in by you. Moreover, you bear sole responsibility for having the results of the calculation checked and cleared by an expert, particularly with regard to compliance with applicable norms and permits, prior to using them for your specific facility. The Software serves only as an aid to interpret norms and permits without any guarantee as to the absence of errors, the correctness and the relevance of the results or suitability for a specific application.
- You must take all necessary and reasonable steps to prevent or limit damage caused by the Software. In particular, you must arrange for the regular backup of programs and data and, if applicable, carry out the updates of the Software offered by Hilti on a regular basis. If you do not use the AutoUpdate function of the Software, you must ensure that you are using the current and thus up-to-date version of the Software in each case by carrying out manual updates via the Hilti Website. Hilti will not be liable for consequences, such as the recovery of lost or damaged data or programs, arising from a culpable breach of duty by you.