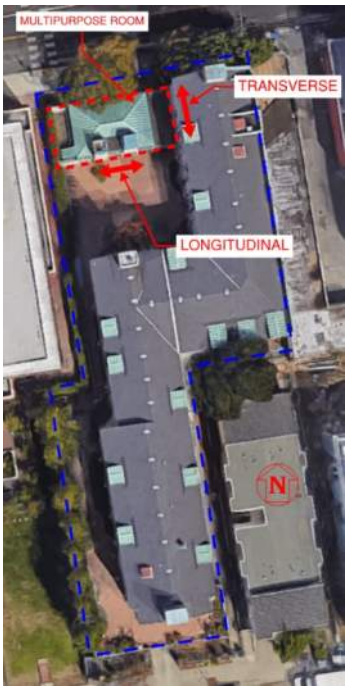
Degenkolb Berkeley UNIVERSITY OF CALIFORNIA

Evaluator: TAB
Date: 02/19/19

ASCE 41-17 Tier 1 Seismic Evaluation

Building Name: Beverly Cleary Hall Multipurpose
CAAN ID: 1002
Auxiliary Building ID: 1002.2
Address: 2424 Channing Way, Berkeley, CA
Site location coordinates: Latitude 37.8664 Longitudinal -122.2595



Aerial Photo

South Elevation from Courtyard

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

BUILDING DATA

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

a. Longitudinal Direction: **W1A: Wood Light Frame**, over C2: Concrete SW and RM2: Masonry SW
b. Transverse Direction: **W1A: Wood Light Frame**, over C2: Concrete SW and RM2: Masonry SW

Square Footage: 1,100 ft^2 out of 58,668 ft^2 total
Building Length: 54' – 9"
Building Width: 24' – 6"
Building Height: 18'-9" (to roof ridgeline)
Story Height: 18'-9" (1^{st})
Number of stories *above* grade: 1
Number of basement stories *below* grade: 1 podium level, partially below grade

Year of Original Construction and Code Year: 1992, 1988 UBC
Year of Later Constuction and Code Year: N/A

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

BUILDING DESCRIPTION

General

This building finished construction in 1992 and is situated on a North to South sloping site. This building is one room with a hip roof. The structure height is approximately 18'-9" feet tall to the roof ridge. The building is rectangular in shape with a footprint of about 24'-6" feet in the NS direction and 54'-9" feet in the EW direction. The building area is approximately 1,100 square feet and is used as a multipurpose room. This structure in on top of a podium structure that also supports the North and South Residence Halls on the site.

Structural System

The structure is a concrete/masonry podium structure with timber framing above. The gravity structural system above the podium consists of a vaulted, plywood sheathed roof structure over glulam member trusses supported on stud bearing walls. This structure, along with the North and South residence halls is on top of a reinforced two-way concrete slab supported by concrete and masonry walls with secondary concrete columns all founded on spread footings. The lateral system above the podium consists of horziontal plywood diaphragms and vertical plywood shear walls. The podium portion of the structure utilize a +12" thick concrete diaphragm at the ground level to transfer lateral forces to masonry and concrete shear walls along the perimeter of the garage level.

Building Condition

Good, no deterioration observed

Date of Site Visit: 02/15/2019, Ray Pugliesi & Torrey Bolden, Degenkolb Engineers
Limitations of walk-through: none

SITE INFORMATION

Site Class (A-F): D Basis: Default per ASCE41-17
Site Specific Ground Motion Study? No
BSE-1N Spectral Accelerations: Basis: https://seismicmaps.org/
S_{DS}: 1.606 S_{D1}: 1.003
BSE-2E Spectral Accelerations: Basis: https://seismicmaps.org/
S_{XS}: 2.412 S_{X1}: 1.368
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. Good – 1997 Preliminary Seismic Evaluation (SAFER), Rutherford & Chekene
2. Fair – 10/26/07 - , Interactive Resources , "Preliminary Seismic Assessment (ASCE 31-03 Evaluation) of Beverly Cleary Hall"

DOCUMENTATION

Architectural Drawings: Haste/Channing Student Housing & Parking, Cygna Engineers, Tai Associates/Architects, 5/10/91, A0.0-A9.9
Structural Drawings: Haste/Channing Student Housing & Parking, Cygna Engineers, 5/10/91, S0.0-S4.3
Seismic Evaluations:
"1997 Preliminary Seismic Evaluation (SAFER)", Rutherford & Chekene, 07/17/97, Tier 1
"Preliminary Seismic Assessment (ASCE 31-03 Evaluation) of Beverly Cleary Hall located at 2525 Channing, Berkeley, CA IR 2007-044-01", Donald A Cushing Jr., 10/26/07, ASCE 31-03 Tier 1 with Limited Tier 2
Geotechnical Reports: N/A
Other Documents: N/A

CONSTRUCTION DATA

Gravity Load Structural System:	Plywood sheathing on glulam roof trusses supported by stud bearing walls		
Exterior Transverse Walls:	Plywood Sheathing w/ Stucco	Opening(s)?	Yes
Exterior Longitudinal Walls:	Plywood Sheathing w/ Stucco	Opening(s)?	Yes
Roof Materials/Framing:	Composition Shingles w/ ½" plywood supported by Glulam Trusses		
Intermediate Floors/Framing:	N/A		
Ground Floor:	12" – 15" Concrete Slab		
Columns:	N/A	Foundation:	Spread footings
General Condition of Structure:	Good		
Evidence of Settling? :	No		
Special Features & Comments:			

LATERAL-FORCE-RESISTING SYSTEM

	Longitudinal	Transverse
ASCE 41-17 Building Type:	W1A: Wood Light Frames	W1A: Wood Light Frames
Diaphragms:	Plywood	Plywood
Vertical Elements:	Plywood Stud Shear Walls	Plywood Stud Shear Walls
Connections:	Nailing, Sill Bolts, HDs	Nailing, Sill Bolts, HDs
Details:	9/S0.2 Wall Sheathing 5/S0.2 Diaphragm Sheathing	9/S0.2 Wall Sheathing 5/S0.2 Diaphragm Sheathing
Estimated Fundamental Period, T (sec):	0.145	0.145
BSE-2E Spectral Acceleration, S_a:	2.41g	2.41g
Modification Factor, C:	1.3 (W1A – Table 4-7)	1.3 (W1A – Table 4-7)
Building Weight, W (kips):	57	57
Seismic Base Shear, V (kips):	179	179
System Modification Factor, M_s:	4.5 for wood framing at CP per TBL 4-8	4.5 for wood framing at CP per TBL 4-8

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. *CMU Shear Wall Stress Check:* In the east west direction loading of the building both CMU and Concrete walls are utilized to resist seismic forces in the podium level. The average shear stress of the wall is 119 psi which is greater than the 70 psi prescribed by the quick check procedure. When the CMU wall contribution is taken from the base shear and the remaining concrete wall is evaluated the wall stress is less than the $2\sqrt{f'_{ce}}$ and greater than $2\sqrt{f'_{c}}$. The inadequacy of the CMU wall in the lateral system is not believed to be a hazard to the overall stability of the system, as the concrete wall can support the resulting shear demand.
2. *Adjacent Buildings:* The timber structures atop the podium are structurally separated by a 4" seismic gap between the North and South superstructures and 2" between the North and multipurpose structure. These gap dimensions are insufficient to preclude pounding during an intense seismic event. These structures benefit from the floor levels aligning with the adjacent structure, which is expected to mitigate structural damage. This deficiency is not considered to be a life-safety issue.
3. *Redundancy:* The timber frame portion of this structure does not have a shear wall on the south elevation making it a three sided box. The structural diaphragm has an aspect ratio less than 1.5:1 which meets current NDS code provisions for open front structures. The shear stress is low in these walls, and as a result this deficiency is not expected to be a life safety issue.

To summarize, the roof of this structure aligns with the floor of the adjacent building. This mitigates the effects of pounding on the structures. In the podium, the concrete shear walls are capable of compensating for the CMU walls that do not meet the criteria for the quick check procedures. The redundancy is not a concern as the diaphragm is capable of distributing the loads shear walls on three sides. For these reasons, the deficiencies are not expected to cause a life safety hazard and this structure has been assigned a SPL rating of IV. This was concurred by the peer review group comprising of Rutherford + Chekene, Degenkolb Engineers, and Forell/Elsesser Engineers on February, 28, 2019.

The building manager indicated there has been on-going plumbing issues in the community restrooms. A portion of the bathroom was exposed during the site visit, and did not appear to have any significant structural deterioration due to the related plumbing issues. This is not believed to be structural issue at this time.

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

Glulam Truss

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

UC Campus:	Berkeley			Date:	2/20/2019		
Building CAAN:	1002	Auxiliary CAAN:	1002.2	By Firm:	Degenkolb Engineers		
Building Name:	Beverly Cleary Hall - Multipurpose			Initials:	TAB	Checked:	
Building Address:	2424 Channing Way, Berkeley, CA			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 seismic gap between structure and adjacent building inadequate.
☐	☐	☒	☐	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:** Timber frame shear walls discontinuous at podium level. Podium diaphragm adequate to transfer seismic forces from system above. Not considered non-compliant

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

ASCE 41-17
Collapse Prevention Basic Configuration Checklist

C	NC	N/A	U	
☐	☑	☐	☐	GEOMETRY: There are no changes in the net horizontal dimension of the seismic-force-resisting system of more than 30% in a story relative to adjacent stories, excluding one-story penthouses and mezzanines. (Commentary: Sec. A.2.2.5. Tier 2: Sec. 5.4.2.4) **Comments:** Structure is regular on top of the podium. Change is SFRS dimensions >30% at the podium level.
☐	☑	☐	☐	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:** The structure is regular above the podium level. Change is mass at the podium level relative to superstructure level
☐	☑	☐	☐	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:** Structure is a three sided box, and torsionally irregular in the East-West direction.

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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Collapse Prevention Basic Configuration Checklist

HIGH SEISMICITY (COMPLETE THE FOLLOWING ITEMS IN addition TO THE ITEMS FOR MODERATE SEISMICITY)

FOUNDATION CONFIGURATION

	Description
C ☒ NC ☐ N/A ☐ U ☐	OVERTURNING: The ratio of the least horizontal dimension of the seismic-force-resisting system at the foundation level to the building height (base/height) is greater than $0.6S_a$. (Commentary: Sec. A.6.2.1. Tier 2: Sec. 5.4.3.3) **Comments:**
C ☒ NC ☐ N/A ☐ U ☐	TIES BETWEEN FOUNDATION ELEMENTS: The foundation has ties adequate to resist seismic forces where footings, piles, and piers are not restrained by beams, slabs, or soils classified as Site Class A, B, or C. (Commentary: Sec. A.6.2.2. Tier 2: Sec. 5.4.3.4) **Comments:** Spread footings tied together with 6” slab on grade

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ASCE 41-17
Collapse Prevention Structural Checklist For Building Type W1-W1A

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:** South elevation is open making it a three sided box.
☑	☐	☐	☐	SHEAR STRESS CHECK: The shear stress in the shear walls, calculated using the Quick Check procedure of Section 4.4.3.3, is less than the following values: (Commentary: Sec. A.3.2.7.1. Tier 2: Sec. 5.5.3.1.1) Structural panel sheathing: 1,000 lb/ft (14.6 kN/m) Diagonal sheathing: 700 lb/ft (10.2 kN/m) Straight sheathing: 100 lb/ft (1.5 kN/m) All other conditions: 100 lb/ft (1.5 kN/m) **Comments:** Check considering a flexible diaphragm. Tributary area to each wall.
☑	☐	☐	☐	STUCCO (EXTERIOR PLASTER) SHEAR WALLS: Multi-story buildings do not rely on exterior stucco walls as the primary seismic-force-resisting system. (Commentary: Sec. A.3.2.7.2. Tier 2: Sec. 5.5.3.6.1) **Comments:**
☑	☐	☐	☐	GYPSUM WALLBOARD OR PLASTER SHEAR WALLS: Interior plaster or gypsum wallboard is not used for shear walls on buildings more than one story high with the exception of the uppermost level of a multi-story building. (Commentary: Sec. A.3.2.7.3. Tier 2: Sec. 5.5.3.6.1) **Comments:**
☑	☐	☐	☐	NARROW WOOD SHEAR WALLS: Narrow wood shear walls with an aspect ratio greater than 2-to-1 are not used to resist seismic forces. (Commentary: Sec. A.3.2.7.4. Tier 2: Sec. 5.5.3.6.1) **Comments:**

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Collapse Prevention Structural Checklist For Building Type W1-W1A

C	NC	N/A	U	
☒	☐	☐	☐	WALLS CONNECTED THROUGH FLOORS: Shear walls have an interconnection between stories to transfer overturning and shear forces through the floor. (Commentary: Sec. A.3.2.7.5. Tier 2: Sec. 5.5.3.6.2) **Comments:** Hold downs and sill plate at podium level
☒	☐	☐	☐	HILLSIDE SITE: For structures that are taller on at least one side by more than one-half story because of a sloping site, all shear walls on the downhill slope have an aspect ratio less than 1-to-1. (Commentary: Sec. A.3.2.7.6. Tier 2: Sec. 5.5.3.6.3) **Comments:**
☐	☐	☒	☐	CRIPPLE WALLS: Cripple walls below first-floor-level shear walls are braced to the foundation with wood structural panels. (Commentary: Sec. A.3.2.7.7. Tier 2: Sec. 5.5.3.6.4) **Comments:**
☐	☐	☒	☐	OPENINGS: Walls with openings greater than 80% of the length are braced with wood structural panel shear walls with aspect ratios of not more than 1.5-to-1 or are supported by adjacent construction through positive ties capable of transferring the seismic forces. (Commentary: Sec. A.3.2.7.8. Tier 2: Sec. 5.5.3.6.5) **Comments:**

CONNECTIONS

				Description
C	NC	N/A	U	
☒	☐	☐	☐	WOOD POSTS: There is a positive connection of wood posts to the foundation. (Commentary: Sec. A.5.3.3. Tier 2: Sec. 5.7.3.3) **Comments:** Detail 2/S0.5
☒	☐	☐	☐	WOOD SILLS: All wood sills are bolted to the foundation. (Commentary: Sec. A.5.3.4. Tier 2: Sec. 5.7.3.3) **Comments:** Detail 2/S0.2
☒	☐	☐	☐	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:** Steel beam to wood post detail 10/S4.2. Typical framing is TJI joists between load bearing walls

ASCE 41-17
Collapse Prevention Structural Checklist For Building Type W1-W1A

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

CONNECTIONS

C	NC	N/A	U	Description
●	○	○	○	WOOD SILL BOLTS: Sill bolts are spaced at 6 ft or less with acceptable edge and end distance provided for wood and concrete. (Commentary: Sec. A.5.3.7. Tier 2: Sec. 5.7.3.3) **Comments:** Detail 2/S0.2

DIAPHRAGMS

C	NC	N/A	U	Description
●	○	○	○	DIAPHRAGM CONTINUITY: The diaphragms are not composed of split-level floors and do not have expansion joints. (Commentary: Sec. A.4.1.1. Tier 2: Sec. 5.6.1.1) **Comments**
●	○	○	○	ROOF CHORD CONTINUITY: All chord elements are continuous, regardless of changes in roof elevation. (Commentary: Sec. A.4.1.3. Tier 2: Sec. 5.6.1.1) **Comments:**
○	○	●	○	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:**

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Collapse Prevention Structural Checklist For Building Type W1-W1A

C	NC	N/A	U	
◉	○	○	○	DIAGONALLY SHEATHED AND UNBLOCKED DIAPHRAGMS: All diagonally sheathed or unblocked wood structural panel diaphragms have horizontal spans less than 40 ft (12 m) and have aspect ratios less than or equal to 4-to-1. (Commentary: Sec. A.4.2.3. Tier 2: Sec. 5.6.2) **Comments:**
○	○	◉	○	OTHER DIAPHRAGMS: The diaphragms do not consist of a system other than wood, metal deck, concrete, or horizontal bracing. (Commentary: Sec. A.4.7.1. Tier 2: Sec. 5.6.5) **Comments:**

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

Low And Moderate Seismicity

Seismic-Force-Resisting System

	Description
C ☒ NC ☐ N/A ☐ U ☐	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:**
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 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:** See quick checks
C ☒ NC ☐ N/A ☐ U ☐	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:** Vertical rho min = 0.0028, Horizontal rho min = 0.0021 See quick checks

Connections

	Description
C ☒ NC ☐ N/A ☐ U ☐	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:**
C ☒ NC ☐ N/A ☐ U ☐	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:**

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

C	NC	N/A	U	
☒	☐	☐	☐	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:**

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

Seismic-Force-Resisting System

				Description
C	NC	N/A	U	
☒	☐	☐	☐	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:** Columns have adequate shear capacity to develop shear demands from flexural mechanism. See quick checks.
C	NC	N/A	U	
☒	☐	☐	☐	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:** Proper lap splice length provided at the column joints.
C	NC	N/A	U	
☒	☐	☐	☐	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:**

Diaphragms (Stiff Or Flexible)

				Description
C	NC	N/A	U	
☒	☐	☐	☐	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:**
C	NC	N/A	U	
☒	☐	☐	☐	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:**

UC Campus:	Berkeley			Date:	2/20/2019		
Building CAAN:	1002	Auxiliary CAAN:	-	By Firm:	Degenkolb Engineers		
Building Name:	Beverly Cleary Hall, Podium			Initials:	TAB	Checked:	
Building Address:	2424 Channing Way, Berkley, CA			Page:	3	of	3

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

Flexible Diaphragms

	Description
C ☐ NC ☐ N/A ☒ U ☐	CROSS TIES: There are continuous cross ties between diaphragm chords. (Commentary: Sec. A.4.1.2. Tier 2: Sec. 5.6.1.2) **Comments:**
C ☐ NC ☐ N/A ☒ U ☐	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:**
C ☐ NC ☐ N/A ☒ U ☐	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:**
C ☐ NC ☐ N/A ☒ U ☐	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:**
C ☐ NC ☐ N/A ☒ U ☐	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

	Description
C ☐ NC ☐ N/A ☒ U ☐	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:** Shallow spread footings

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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:** CMU walls in the East-West Direction contribute to shear resistance and have stresses > 70 psi See Quick Checks
☒	☐	☐	☐	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:**

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:**

UC Campus:	Berkeley			Date:	2/20/2019		
Building CAAN:	1002	Auxiliary CAAN:	-	By Firm:	Degenkolb Engineers		
Building Name:	Beverly Cleary Hall - Podium			Initials:	TAB	Checked:	
Building Address:	2424 Channing Way, Berkeley, CA			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:**

UC Campus:	Berkeley			Date:	2/20/2019		
Building CAAN:	1002	Auxiliary CAAN:	-	By Firm:	Degenkolb Engineers		
Building Name:	Beverly Cleary Hall - Podium			Initials:	*TAB*	Checked:	
Building Address:	2424 Channing Way, Berkeley, CA			Page:	4	of	4

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

CONNECTIONS

	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:	2/14/2019		
Building CAAN:	1002	Auxiliary CAAN:	1002.2	By Firm:	DEGENKOLB ENGINEERS		
Building Name:	Beverly Cleary Hall - Multipurpose			Initials:	*TAB*	Checked:	
Building Address:	2424 Channing Way, Berkeley, CA			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 Hazard Risk: Low

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

APPENDIX D
ASCE 41-17 Quick Check Calculations

Degenkolb Engineers
375 Beale St. Ste 500
San Francisco, CA 94105
Phone: 415.392.6952

Subject:	Weight Take Off	**Job Number:**	B8114004.00	**Date:**	3/7/2019
Job:	Cleary Hall Multipurpose	**By:**	TAB	**Section:**	
		Checked By:		**Page/of:**	

Third Floor

Item	Area	Length	Height	Area Weight	Weight	
	ft2	ft	ft	psf	lbf	
Roof	1100.0			21	23100.0	
Exterior Walls - Aux		137	4.6	18	11343.6	
				ΣW_{floor}	**34.4**	**kip**

Second

Item	Area	Length	Height	Area Weight	Weight	
	ft2	ft	ft	psf	lbf	
Exterior Walls - Aux		137	9.2	18	22687.2	
				ΣW_{floor}	**22.7**	**kip**

Building Weight = **57.1** kip

Degenkolb

Subject:	Base forces	**Job Number:**	B8114004	**Date:** 7/11/2019
Job:	Cleary Hall Multipurpose	**By:**	TAB	
		Checked By:		

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

INPUT DATA

C:	Modification factor (Table 4-7) =	1.3		
S_1:	Spectral Response Acceleration @ 1 sec. =	1.00		(from MCE maps or Site Specific)
S_s:	Short Period Response Acceleration =	2.41		(from MCE maps or Site Specific)
SC:	Soil Class =	C		(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 C	1.7	1.6	1.5	1.4	1.3
F_v	-	-	-	-	1.30

F_v:	Site Coefficient for S_1 =	1.30		(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 C	1.2	1.2	1.1	1.0	1.0
F_a	-	-	-	-	1.00

F_a:	Site Coefficient for S_s =	1.00		(Table 11.4-2)
S_{X1}:	Spectral Response Acceleration @ 1 sec. =	1.30		(2-2)
S_{xs}:	Short Period Acceleration = F_a*S_s =	2.41		(2-1)
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 =	57	kips	
hn:	Total Building Height =	14.0	feet	
n:	Number of Stories =	1		

CALCULATE BASE SHEAR FOR BSE-2 (MCE)

T:	Fundamental Period of Vibration = C_t * h^{β} =	0.145	sec.	(4-4)
S_a:	Spectral Acceleration at Building Period =	2.41		(4-3)
V:	Pseudo Seismic Force =	179	kips	(4-1)

Subject:	Shear Stress Check *4.4.3.3*	**Job Number:**	B8114004	**Date:**	3/7/2019
Job:	Cleary Hall Multipurpose	**By:**	TAB		
		Checked By:			

Considering Double Sided Walls

North-South Loading

Lwall =	56	ft
Ms =	4.5	for wood wall, Collapse Prevention
Aw =	56	
V_{base}=	179	kip
vj-avg =	710	plf

East-West Loading

Lwall =	68	ft
Ms =	4.5	for wood wall, Collapse Prevention
Aw =	68	
V_{base}=	179	kip
vj-avg =	585	plf

Degenkolb Engineers
375 Beale St. Ste 500
San Francisco, CA 94105
Phone: 415.392.6952

Subject:	Weight Take Off	**Job Number:**	B8114004.00	**Date:**	7/11/2019
Job:	Cleary Hall Podium	**By:**	TAB	**Section:**	
		Checked By:		**Page/of:**	

Roof

South Building	158.1	kip
North Building	149	kip
Σ W_{floor}	**307**	**kip**

Fourth Floor

South Building	210.4	kip
North Building	193	kip
Σ W_{floor}	**403**	**kip**

Third Floor

South Building	210.4	kip
North Building	227	kip
Σ W_{floor}	**438**	**kip**

Second Floor

South Building	210.4	kip
North Building	215	kip
Σ W_{floor}	**425.8**	**kip**

First Floor

Item	Total	Area	Length	Height	Area Weight	Weight	
	#	ft2	ft	ft	psf	lbf	
Exterior Walls - Main			731	4.6	18	60527	
Exterior Walls - Aux			137	4.6	18	11344	
Interior Bearing			926	4.6	10	42596	
Interior Non-Bearing			342	4.6	7	11012	
12.5" Conc. Slab		32000		1.04	156.25	5000000	
2.5" Conc. Topping		14500		0.21	31.25	453125	
18" Ø Column	18	1.77		6.13	918.75	29224	
Concrete Wall			400.25	6.13	150	367730	
CMU Wall			475.75	6.13	150	437095	
					Σ W_{floor}	**6413**	**kip**

Total Building Weight = **7986** **kip**

Degenkolb

Subject:	Base forces	**Job Number:**	B8114004	**Date:** 7/11/2019
Job:	Cleary Hall Podium	**By:**	TAB	
		Checked By:		

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

INPUT DATA

C:	Modification factor (Table 4-7) =	1			
S_1:		1.00			(from MCE maps or Site Specific)
S_s:	Short Period Response Acceleration =	2.41			(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	2.0	1.8	1.6	1.5
F_v	-	-	-	-	1.50

F_v:	Site Coefficient for S_1 =	1.50			(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 =	1.00			(Table 11.4-2)
S_{X1}:	Spectral Response Acceleration @ 1 sec. =	1.50			(2-2)
S_{xs}:	Short Period Acceleration = F_a*S_s =	2.41			(2-1)
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 =	7986	kips		
hn:	Total Building Height =	67.9	feet		
n:	Number of Stories =	4			

CALCULATE BASE SHEAR FOR BSE-2 (MCE)

T:	Fundamental Period of Vibration = C_t * h^{β} =	0.473	sec.	(4-3)
S_a:	Spectral Acceleration at Building Period =	2.41	g	(4-1)
V	Pseudo Seismic Force =	19247	kips	

Degenkolb

Subject:	Shear Stress Check *4.4.3.3*	**Job Number:**	B8114004	**Date:**	7/11/2019
Job:	Cleary Hall Podium	**By:**	TAB		
		Checked By:			

Considering CMU and Concrete Wall

North-South Loading

Lwall =	679	ft	
twall =	12	in	
Ms =	4.5	for Concrete o/ CMU wall, Collapse Prevention	
Aw =	97776	in^2	
V_{base}=	19247	kip	
vj-avg =	44	psi	

East-West Loading

Lwall =	249	ft	
twall =	12	in	
Ms =	4.5	for Concrete o/ CMU wall, Collapse Prevention	
Aw =	35856		
V_{base}=	19247	kip	
vj-avg =	119	psi	

East-West Loading

Lwall =	196	ft	Only Considering Concrete
twall =	12	in	
Ms =	4.5	for Concrete o/ CMU wall, Collapse Prevention	
Aw =	28224		
V_{base}=	19247	kip	
Veff=	18710	kip	*subtracted CMU contribution based on 70psi*
vj-avg =	147	psi	

f'ce=	6000	psi	f'ce=	4000	psi
2 √f'ce =	155	psi	2 √f'c =	126	psi

Degenkolb

Subject:	Wall Steel Reinforcement Ratio	**Job Number:**	B8114004	**Date:**	7/11/2019
Job:	Cleary Hall Podium	**By:**	TAB		
		Checked By:			

Concrete Walls

Wall Type 'A'

Vertical: #4 at 12" o.c., each way, both faces

twall =	12	in	
Abar =	0.2	in2	
spacing =	12	in	
rho =	0.0028	OK	> 0.0012 vertical minimum ratio

Vertical: #4 at 12" o.c., each way, both faces

twall =	12	in	
Abar =	0.2	in2	
spacing =	16	in	
rho =	0.0021	OK	> 0.002 horizontal minimum ratio

Wall Type 'E'

Vertical: #4 at 12" o.c., each way, both faces

twall =	12	in	
Abar =	0.2	in2	
spacing =	12	in	
rho =	0.0028	OK	> 0.0012 vertical minimum ratio

Vertical: #4 at 12" o.c., each way, both faces

twall =	12	in	
Abar =	0.2	in2	
spacing =	12	in	
rho =	0.0028	OK	> 0.002 horizontal minimum ratio

CMU Walls

Wall Type 'B'

Vertical: #4 at 16" o.c., each way, both faces

twall =	12	in	
Abar =	0.2	in2	
spacing =	16	in	
rho =	0.0021	OK	> 0.0007 minimum ratio

Horziontal #4 at 24" o.c., each way, both faces

twall =	12	in	
Abar =	0.2	in2	
spacing =	24	in	
rho =	0.0014	OK	> 0.0007 minimum ratio

rho_{total} = 0.0035 > 0.002 combined horz/vert

Wall Type 'C'

Vertical: #4 at 16" o.c., each way, both faces

twall =	12	in	
Abar =	0.2	in2	
spacing =	16	in	
rho =	0.0021	OK	> 0.0007 minimum ratio

Vertical: #4 at 24" o.c., each way, both faces

twall =	12	in	
Abar =	0.2	in2	
spacing =	24	in	
rho =	0.0014	OK	> 0.0007 minimum ratio

rho_{total} = 0.0035 > 0.002 combined horz/vert

Degenkolb

Subject:	Column Deflection Compatability	**Job Number:**	B8114004	**Date:**	7/11/2019
Job:	Cleary Hall Podium	**By:**	TAB		
		Checked By:			

Material Properties

f_y =	60	ksi	f'_c =	4000	psi
f_{ye} =	75	ksi	f'_{ce} =	6000	psi

Section Moment Capacity

Using Expected Material Properties

M_{max} =	322	k-ft	@ 242 k	Axially
l =	10.25	ft		
Vlsa =	62.8	kip		
Ø	18			

Shear Capacity

Shear Design @ Hinge

3 #3 @ 12" oc

Av =	0.33	in^2		
s =	12	in		
d =	14.4	in	0.8 x Ø	(column diameter)
fyE =	75	ksi		
λ =	1			
knl =	1	displacement ductility factor		
Mud/Vud*d =	4			
αcol =	1			
Ag =	254	in^2		
Vcol =	111.7	kip		ASCE 41-17, EQ (10-3)

Axial Load

Timber Structure	172	psf
Podium Weight	200	psf

L1	22	ft
L2	25.66	ft
A_{trib}	565	ft^2
W_{struct}	97	kip
W_{podium}	113	kip
W_{colum}	210	kip