ASCE 41-17 Tier 1 Seismic Evaluation
Building Name: Lawrence Hall of Science-Exhibition Halls
CAAN ID: 1800
Auxiliary Building ID: 1800.1
Address: 1 Centennial Drive, Berkeley, CA 94720
Site location coordinates: Latitude 37.8794 Longitudinal -122.2467

Plan Image or Aerial Photo

North Elevation Photo (Inverted Pendulum Structure)

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: **C2, Concrete Shear Wall – rigid diaphragm**
   b. Transverse Direction: **C2, Concrete Shear Wall – rigid diaphragm**
Square Footage: 7,600 sf each. 15,200 out of 134,388 sf total.
Building Length: 117 ft overall length
Building Width: 70 ft overall width
Building Height: 35 ft (at tallest point above Level A)
Story Height: 35 ft.
Number of stories **above** grade: 2
Number of basement stories **below** grade: None
Year of Original Construction and Code Year: 1968, 1964 UBC
Year of Later Construction and Code Year: 1983, 1979 UBC

COST RANGE TO RETROFIT (if applicable): None

BUILDING DESCRIPTION

General
The Lawrence Hall is an unusual building with a combination of precast and cast in place elements that are either light weight or normal weight depending upon the level they have been installed at. It is located on a sloping site and has some partial levels due to the sloped site and tall storey space required at some rooms on Level C. The base structure has an octagonal shape, with another two story part also called the Information Center located at the south end. There are various independent shell structures supported on the building either fully or partially, the Exhibition Halls, the Entrance Foyer and the Memorial Room.

The Exhibition Halls house a children’s museum, a planetarium and various exhibits.

Structural System

Exhibition Halls: These are two, two story shell structures located to the East and West of the Base Structure, separated from the surrounding structures with a 2” seismic joint. These are very similar in construction to the Memorial Room, except that they are supported on their own foundation system with concrete piers and tie beams. These are inverted pendulum structures with a larger plan area at the second level than at the base. The Second floor of this structure consists of the waffle slab system similar to the rest of Level A.

The Lateral system of the building consists of 8” concrete walls (or slabs) spanning between concrete frames spanning across the width of the building.

Building Condition
Good, no visible structural or non-structural damage.
Date of Site Visit: 3/26/2019, Ray Pugliesi and Heavenz Kaur, Degenkolb Engineers
Limitations of walk-through:

SITE INFORMATION
Site Class (A-F): D Basis: Default.
Site Specific Ground Motion Study? No
BSE-1N Spectral Accelerations: Basis: USGS Data
$S_D$: **1.903** $S_D1$: **1.031**
BSE-2E Spectral Accelerations: Basis: USGS Data
$S_X$: **2.473** $S_X1$: **1.29**
Level of Seismicity: High
Performance Level: Collapse Prevention Structural Performance (Risk category II, ASCE 41-17 Table 2-1)

Geologic Hazards:
Fault Rupture No Basis: Earthquake Zones of Required Investigation- Briones Valley
https://maps.conservation.ca.gov/cgs/informationwarehouse/regulatorymaps/
Liquefaction No Basis: Earthquake Zones of Required Investigation- Briones Valley
https://maps.conservation.ca.gov/cgs/informationwarehouse/regulatorymaps/
Landslide No, but surrounded by region prone to landslide Basis: Earthquake Zones of Required Investigation- Briones Valley
https://maps.conservation.ca.gov/cgs/informationwarehouse/regulatorymaps/

PREVIOUS RATINGS SUMMARY

DOCUMENTATION
Lawrence Hall of Science Alterations, Step 1, by ED2 Architects, dated, March 4, 1982.
Lawrence Hall of Science Alterations, Step 1, by Shapiro, Okino & Hom Structural Engineers, dated, March 4, 1982.
Geotechnical Reports: Not available
Other Documents:

CONSTRUCTION DATA
Gravity Load Structural System: 24” deep waffle slab supported on precast walls at Level A. Concrete frames spanning across the width of the building for the shell structure above.
Exterior Transverse Walls: 5” thick precast concrete walls above Level 1. 10” thick cast in place walls below Level A. Opening(s)? Yes
### Exterior Longitudinal Walls:
- Similar to Transverse Walls
- Opening(s)? Yes

### Roof Materials/Framing:
- 5” thick concrete slab

### Intermediate Floors/Framing:
- 24” thick waffle slab

### Ground Floor:
- 4” slab on grade with #3@15” o.c. each way

### Columns:
- None

### Foundation:
- 36” diameter concrete piers

### General Condition of Structure:
- Good

### Evidence of Settling?:
- No

### Special Features & Comments:
- The building is located on a sloping site and is highly irregular in plan. Along with the base structure there are four shell structures located on or around the building.
- The Exhibition halls are inverted pendulum type structures with base area smaller than at Level A.

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**LATERAL-FORCE-RESISTING SYSTEM**

<table>
<thead>
<tr>
<th>ASCE 41-17 Building Type:</th>
<th>Longitudinal</th>
<th>Transverse</th>
</tr>
</thead>
<tbody>
<tr>
<td>C2: Concrete SW</td>
<td>C2: Concrete SW</td>
<td></td>
</tr>
<tr>
<td>Diaphragms</td>
<td>24” thick waffle slab Level A, 5” slab at roof.</td>
<td>24” thick waffle slab Level A, 5” slab at roof.</td>
</tr>
<tr>
<td>Vertical Elements</td>
<td>10” thick cast in place walls below Level A, 5” thick precast walls above Level A. The walls span between concrete frames than span the width of the building.</td>
<td>10” thick cast in place walls below Level A, 5” thick precast walls above Level A. The walls span between concrete frames than span the width of the building.</td>
</tr>
<tr>
<td>Connections</td>
<td>Dowelled in cast in place concrete</td>
<td>Dowelled in cast in place concrete</td>
</tr>
</tbody>
</table>

### Details:
- Estimated Fundamental Period, T (sec): 0.288
- BSE-2E Spectral Acceleration, S_n: 2.47g
- Modification Factor, C: 1.3 (C2 – Table 4-7)
- Building Weight, W (kips): 1,660
- Seismic Base Shear, V (kips): 4,516
- System Modification Factor, M_s: 4.5 for reinforced concrete shear wall at CP, per Table 4-8 of ASCE 41-17

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**Significant Structural Deficiencies, Potentially Affecting Seismic Performance Level Designation:**
OVERALL SEISMIC DEFICIENCIES & EXPECTED SEISMIC PERFORMANCE

The major deficiency of this building is related to its overall geometry.
1. Overturning: The base of the structure is smaller than the plan area at Level A. The “inverted pendulum” structure of this building is prone to overturning but is mitigate by the self-weight of the structure that provides a stabilizing force large enough to exceed the overturning moment of the building. Besides, #4@16 EF wall dowels are present throughout the wall along the building perimeter at the foundation, that provide a positive connection between the walls and the foundations.

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

Not applicable
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

Figure A.1 Roof of Exhibition Hall

Figure A.2 View of Exhibition Hall looking North- grade slopes down from the South end to the North end
APPENDIX B

ASCE 41-17 Tier 1 Checklists (Structural)
## ASCE 41-17
Collapse Prevention Basic Configuration Checklist

### LOW SEISMICITY

#### BUILDING SYSTEMS - GENERAL

<table>
<thead>
<tr>
<th>Description</th>
<th>C</th>
<th>NC</th>
<th>N/A</th>
<th>U</th>
</tr>
</thead>
<tbody>
<tr>
<td>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)</td>
<td>C</td>
<td>NC</td>
<td>N/A</td>
<td>U</td>
</tr>
<tr>
<td>Comments: Precast shear walls are doweled into cast in place walls that continue to the building foundation.</td>
<td>C</td>
<td>NC</td>
<td>N/A</td>
<td>U</td>
</tr>
<tr>
<td>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)</td>
<td>C</td>
<td>NC</td>
<td>N/A</td>
<td>U</td>
</tr>
<tr>
<td>Comments: 2&quot; seismic joint at Level A near Exhibition Halls</td>
<td>C</td>
<td>NC</td>
<td>N/A</td>
<td>U</td>
</tr>
<tr>
<td>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)</td>
<td>C</td>
<td>NC</td>
<td>N/A</td>
<td>U</td>
</tr>
<tr>
<td>Comments:</td>
<td>C</td>
<td>NC</td>
<td>N/A</td>
<td>U</td>
</tr>
</tbody>
</table>

#### BUILDING SYSTEMS - BUILDING CONFIGURATION

<table>
<thead>
<tr>
<th>Description</th>
<th>C</th>
<th>NC</th>
<th>N/A</th>
<th>U</th>
</tr>
</thead>
<tbody>
<tr>
<td>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. A.2.2.2. Tier 2: Sec. 5.4.2.1)</td>
<td>C</td>
<td>NC</td>
<td>N/A</td>
<td>U</td>
</tr>
<tr>
<td>Comments:</td>
<td>C</td>
<td>NC</td>
<td>N/A</td>
<td>U</td>
</tr>
<tr>
<td>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)</td>
<td>C</td>
<td>NC</td>
<td>N/A</td>
<td>U</td>
</tr>
<tr>
<td>Comments:</td>
<td>C</td>
<td>NC</td>
<td>N/A</td>
<td>U</td>
</tr>
<tr>
<td>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)</td>
<td>C</td>
<td>NC</td>
<td>N/A</td>
<td>U</td>
</tr>
<tr>
<td>Comments: Precast shear walls are doweled into cast in place walls that continue to the building foundation.</td>
<td>C</td>
<td>NC</td>
<td>N/A</td>
<td>U</td>
</tr>
</tbody>
</table>

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**Note:**  
C = Compliant  
NC = Noncompliant  
N/A = Not Applicable  
U = Unknown
### ASCE 41-17
**Collapse Prevention Basic Configuration Checklist**

**UC Campus:** BERKELEY  
**Date:** 03/29/2019  
**Building CAAN:** 1800.1  
**Auxiliary CAAN:** N/A  
**By Firm:** DEGENKOLB ENGINEERS  
**Building Name:** LAWRENCE HALL OF SCIENCE-EXHIBITION  
**Initials:** HK  
**Page:** 2 of 3

#### GEOMETRY
- **Description:** 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:** At Level A, the precast walls are longer in the East-West direction by almost 30%

#### MASS
- **Description:** 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
- **Description:** 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

<table>
<thead>
<tr>
<th>Description</th>
<th>Status</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LIQUEFACTION:</strong> 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)</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td><strong>SLOPE FAILURE:</strong> 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)</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td><strong>SURFACE FAULT RUPTURE:</strong> 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)</td>
<td>C</td>
<td></td>
</tr>
</tbody>
</table>

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

### FOUNDATION CONFIGURATION

<table>
<thead>
<tr>
<th>Description</th>
<th>C</th>
<th>NC</th>
<th>N/A</th>
<th>U</th>
</tr>
</thead>
<tbody>
<tr>
<td>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 0.6(S_a). (Commentary: Sec. A.6.2.1. Tier 2: Sec. 5.4.3.3)</td>
<td>C</td>
<td>NC</td>
<td>N/A</td>
<td>U</td>
</tr>
<tr>
<td>Comments: Base/Height = 21/24'(=0.875\lt0.6\times2.47)(\times(Sa)=1.48)</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>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)</td>
<td>C</td>
<td>NC</td>
<td>N/A</td>
<td>U</td>
</tr>
<tr>
<td>Comments: Tie beams are present between foundation piers.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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## Low And Moderate Seismicity

### Seismic-Force-Resisting System

<table>
<thead>
<tr>
<th>Description</th>
<th>C</th>
<th>NC</th>
<th>N/A</th>
<th>U</th>
</tr>
</thead>
<tbody>
<tr>
<td>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)</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>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)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>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√f'c. (Commentary: Sec. A.3.2.2.1. Tier 2: Sec. 5.5.3.1.1)</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>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)</td>
<td></td>
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</tr>
</tbody>
</table>

### Connections

<table>
<thead>
<tr>
<th>Description</th>
<th>C</th>
<th>NC</th>
<th>N/A</th>
<th>U</th>
</tr>
</thead>
<tbody>
<tr>
<td>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)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>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)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>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)</td>
</tr>
</tbody>
</table>

Comments:

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

**Seismic-Force-Resisting System**

<table>
<thead>
<tr>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>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)</td>
</tr>
</tbody>
</table>

Comments:

<table>
<thead>
<tr>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>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)</td>
</tr>
</tbody>
</table>

Comments:

<table>
<thead>
<tr>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>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)</td>
</tr>
</tbody>
</table>

Comments:

**Diaphragms (Stiff Or Flexible)**

<table>
<thead>
<tr>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>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)</td>
</tr>
</tbody>
</table>

Comments:

<table>
<thead>
<tr>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>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)</td>
</tr>
</tbody>
</table>

Comments:

**Flexible Diaphragms**

<table>
<thead>
<tr>
<th>Description</th>
</tr>
</thead>
</table>

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### Cross Ties

There are continuous cross ties between diaphragm chords. (Commentary: Sec. A.4.1.2. Tier 2: Sec. 5.6.1.2)

**Comments:**

### Straight Sheathing

All straight-sheathed diaphragms have aspect ratios less than 2-to-1 in the direction being considered. (Commentary: Sec. A.4.2.1. Tier 2: Sec. 5.6.2)

**Comments:**

### Spans

All wood diaphragms with spans greater than 24 ft (7.3 m) consist of wood structural panels or diagonal sheathing. (Commentary: Sec. A.4.2.2. Tier 2: Sec. 5.6.2)

**Comments:**

### Diagonally Sheathed and Unblocked Diaphragms

All diagonally sheathed or unblocked wood structural panel diaphragms have horizontal spans less than 40 ft (12.2 m) and aspect ratios less than or equal to 4-to-1. (Commentary: Sec. A.4.2.3. Tier 2: Sec. 5.6.2)

**Comments:**

### Other Diaphragms

Diaphragms do not consist of a system other than wood, metal deck, concrete, or horizontal bracing. (Commentary: Sec. A.4.7.1. Tier 2: Sec. 5.6.5)

**Comments:**

### Connections

<table>
<thead>
<tr>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Uplift at Pile Caps:</strong> 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)</td>
</tr>
</tbody>
</table>

**Comments:** Wall rebar has been directly developed into the piles. No pile caps are present in the building.

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APPENDIX C

UCOP Seismic Safety Policy Falling Hazards Assessment
Summary
# UCOP Seismic Safety Policy

## Falling Hazard Assessment Summary

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

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

Falling Hazards Risk: Low
## APPENDIX D
### Quick Check Calculations

**Degenkolb Engineers**  
1300 Clay St, 8th Floor  
Oakland, CA 94612-2047  
Phone: 510.272.1648  
Fax: 510.272.9020

<table>
<thead>
<tr>
<th>Subject</th>
<th>Weight Take Off</th>
<th>Job Number</th>
<th>Date</th>
<th>Checked By</th>
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<tbody>
<tr>
<td>Job:</td>
<td>UCB, LAWRENCE HALL</td>
<td>3011464.00</td>
<td>3/29/19</td>
<td>HK</td>
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### Level C
- Effective Flat Dead Load+Mem: 120 psf
- Floor Weight: 1651 kips

### Level B Mezz
- Effective Flat Dead Load: 127 psf
- Floor Weight: 2412 kips

### Level A
- Effective Flat Dead Load+ Floor Pouring (60 psf overall): 300 psf
- Floor Weight+Entry Foyer+Library Roof+Memorial Hall: 3065 kips

### Information Center Roof
- Effective Flat Dead Load: 50 psf
- Floor Weight+Memorial Hall: 1296 kips

<table>
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<tr>
<th>Area (ft²)</th>
<th>Thickness (in)</th>
<th>Weight (psf)</th>
<th>Flat Load (psf)</th>
<th>Weight (kips)</th>
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</thead>
<tbody>
<tr>
<td>Entry Foyer, Memorial Rooms (Exhibition Halls)</td>
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<tr>
<td>2900</td>
<td>9</td>
<td>160</td>
<td>160</td>
<td>4356</td>
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<td>Entry Foyer</td>
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<td>9</td>
<td>160</td>
<td>160</td>
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<tr>
<td>Memorial Hall</td>
<td>1820</td>
<td>9</td>
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<td>160</td>
</tr>
<tr>
<td>5th Exhibition Halls</td>
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<tr>
<td>Total Building Weight</td>
<td>35605 kips</td>
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</tbody>
</table>

### Overturning Check
- OT Moment:
  - Force: 4106 kips
  - Tier 2: C1C2Cm=SwW
  - Hx: 47.5 ft
  - Base Width: 28 ft
  - Total length of wall resisting OT: 90 ft
  - Mat: 195054.82 kips
  - Mat: 24073.625 kips
  - Mat: 0.9m
  - Wall bottom: 4X10/16(SF)

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