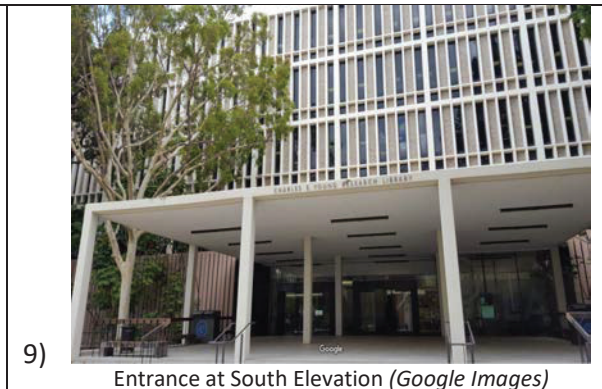


BUILDING REPORT

- 1) UC Campus: UCLA
- 2) Building Name: Charles E. Young Research Library
- 3) Building CAAN ID: 4203
- 4) Auxiliary Building ID¹:N/A
- 5) Date of Evaluation: November 29, 2018
- 6) Evaluation by (Firm, Evaluator Initials): Englekirk Institutional, HK, TAS
- 7) Seismic Performance Level (SPL)² Rating and Basis of Rating: V, ASCE 41-17 (Tier 1/Tier 2 evaluation). Tier 1 evaluation shows some potential deficiencies. All but one deficiency, regarding column tie spacing, have been eliminated by performing a limited Tier 2 deficiency-based analysis. A material testing program (Appendix C) was undertaken but was unable to eliminate the large column tie spacing deficiency.



2/22/2019



10) Site Location

- a. Latitude Decimal Coordinates: 34.07
- b. Longitude Decimal Coordinates: -118.44

11) ASCE 41-17 Model Building Type and Description³

- a. Longitudinal Direction: Building Type C2.

This Building was built in two phases, Unit 1 in 1962 and Unit 2 in 1968. The two units have been connected by supporting brackets built of steel beams at the first level and concrete corbels at the remaining levels. These brackets were built during the construction of Unit 2 and provide a bearing connection at Unit 2 and are dowelled into the columns and slabs in Unit 1. This is a six story concrete shear wall building with a basement. 8" thick concrete flat slab with 4" drop panels at concrete columns spaced at 21'-8" on center in the East-West direction and 22'-8" on center in the North South direction form the gravity system of the building. Lateral loads are

¹ Applicable only for individual buildings that are structurally separate units within a building complex. Each auxiliary building shall be designated with the main building CAAN ID with a decimal number suffix (i.e. main building CAAN ID 5534; auxiliary building CAAN ID 5534.1). Auxiliary building ID is null for a single building or the main building in a building complex.

² The designated Seismic Performance Level shall be a Roman numeral associated with the most applicable performance description from Table A.1 in Appendix A of the UC Seismic Safety Policy.

³ If a building has multiple building types in one story, the model building type should be designated based on engineering judgement as the lateral system that would have the most predominantly negative effect on the seismic behavior of the building in that respective direction.

resisted by concrete shear walls ranging in thickness from 16" at the basement to 8" at the roof. The columns and walls rest on belled caissons tied together with concrete tie beams.

- b. Transverse Direction: Building Type C2. Building system as described in Section 11a.

12) Number of Stories

- a. Above grade: Six stories above grade at lowest exterior grade elevation. The building is located on a sloping site; therefore, the ground level is partially below grade along the North elevation and at grade level along the South elevation. The grade slopes down from North to South along the East and West elevations. The soil is retained by peripheral site retaining walls at the ground level not causing any unbalanced soil pressure on the lateral system of the building.
- b. Below grade: One story below grade.

13) Original Building Design Code & Year: 1952 Uniform Building Code (Unit 1) and 1964 Uniform Building Code (Unit 2)

14) Retrofit Building Design Code & Year (if applicable): Not Applicable

15) Cost Range to Retrofit (if applicable)⁴ (Low, Medium, High or Very High): Low

Please assume a "Low" cost-range corresponds to a complete retrofit cost less than \$50 per square foot (sf), a "Medium" cost-range corresponds to a complete retrofit cost greater than \$50 per sf and less than \$200 per sf, a "High" cost-range corresponds to a complete retrofit cost greater than \$200 per sf and less than \$400 per sf, and a "Very High" cost-range corresponds to a complete retrofit cost greater than \$400 per sf.

⁴ Assume a complete retrofit conforming to the current UC Seismic Safety Policy. Note this range includes all construction costs, including code upgrades (e.g., ADA, fire and life safety, mechanical, electrical, plumbing) triggered by the seismic retrofit. No specific estimate is required to be supplied at this time (i.e., provide an approximate cost to retrofit using Low, Medium, High or Very High cost-range categories). It is acknowledged that such a cost range is assumed to be based only on the engineer's rough estimate and is not intended to require input from a professional cost estimator. For estimation purposes, CSEs may judgmentally determine an approximate cost range for seismic retrofits based on recent relevant experience, and then apply a multiplier to approximate total construction costs.

BACKGROUND INFORMATION

Site Information

16) Site Class (A – F) and Basis of Assessment: Site Class D, default site class per code, also based on geotechnical reports available for other sites on campus, within half mile radius from this building.

17) Geologic Hazards

- a. Fault Rupture (Yes, No or Unknown) and Basis of Assessment: No, per “Earthquake Zones of Required Investigation Beverly Hills Quadrangle” map published by the California Geological Survey, dated January 11, 2018.
- b. Liquefaction (Low, Moderate or High) and Basis of Assessment: Low, per reference provided in Section 17a.
- c. Landslide (Low, Moderate or High) and Basis of Assessment: Low, per reference provided in Section 17a.

18) Site-specific Ground Motion Study? (Yes or No): No

The seismic design acceleration parameters of interest are S_{D5} and S_{D1} for BSE-1N and S_{X5} and S_{X1} for BSE-1E.: $S_{D5}=1.517g$, $S_{D1}=0.825g$, $S_{X5}=0.940g$, $S_{X1}=0.522g$

19) Estimated Fundamental Period (seconds)

- a. Longitudinal: 0.54sec
- b. Transverse: 0.54sec

20) Falling Hazards Assessment Summary

This building does not appear to possess significant falling hazards. The decorative concrete panels on the building exterior are dowelled into the adjacent slabs and columns and cast with the rest of the building minimizing chances of separation from the building during a seismic event.

21) Structural Non-Compliances/Findings Significantly Affecting Rating Determination Summary Significant Structural Deficiencies, Potentially Affecting *Seismic Performance Level* Designation:

- a. Deflection compatibility of secondary components due to insufficient ties in reinforced concrete columns.

Concrete gravity columns in Unit 1 extending from Level 3 to the Roof and all columns in Unit 2 have #3 ties spaced at 16” on center. This tie spacing does not provide sufficient shear capacity to the columns to resist lateral movement due to deflection compatibility in the structure during a BSE-2E level seismic event, for a Limited Safety performance objective per the University Seismic Policy.

A limited material testing program was undertaken following the initial evaluation (Appendix C). The results of the testing program showed no or relatively little increase above the expected concrete strengths assumed in the analysis using ASCE 41. As a result, the recommended Seismic the Seismic Performance Level is V.

The Basement columns in Unit 2 can be eliminated from this deficiency on the premise that there would be limited lateral displacement in the below-grade story because it is confined by concrete retaining walls on all sides. Nevertheless, in the absence of more comprehensive analytical efforts to assess the significance of the deficiency, it is recommended that all columns with the widely spaced ties receive seismic upgrading.

22) Brief Description of Anticipated Failure Mechanism

Limited shear capacity due to insufficient column ties in reinforced concrete columns may cause column failure during a seismic event when the building experiences a lateral inter-story drift of more than 0.5%.

23) Seismic Retrofit Concept Sketches/Description (only required for buildings rated SPL V or worse)
Wrap the deficient reinforced concrete columns with layers of Fiber reinforced polymer (FRP).

Attachment 3 Appendices

- A. ASCE 41-17 Tier 1 Checklists (Structural only)
- B. Quick Check Calculations
- C. Material Testing Program