UCLA University of California Los Angeles

Thornton Tomasetti

ASCE 41-17 Tier 1 Seismic Evaluation

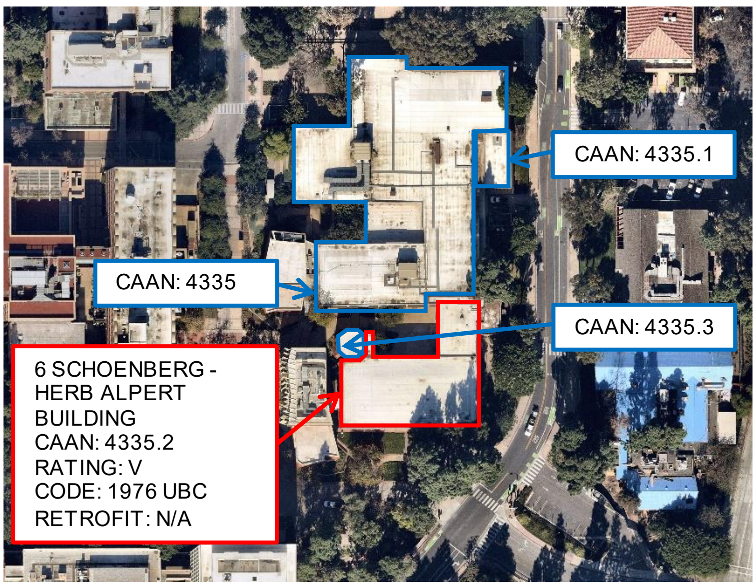
DATE:	**5/18/2021**
UC Campus:	**UCLA**
Building Name:	**6 Schoenberg – Herb Alpert Building**
CAAN ID:	**4335.2**
Auxiliary Building ID:	**4335, 4335.1, 4335.3**

SUMMARY OF INFORMATION PROVIDED BY EVALUATOR: THORNTON TOMASETTI

FURTHER EVALUATION RECOMMENDED: YES

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

Plan Image or Aerial Photo



Exterior Elevation Photo – East Side of Building

The seismic evaluation of this building is being undertaken at the request of UCLA. The ASCE 41-17 evaluation methodology and criteria, as well as the UC's evaluation criteria, are the procedures used to evaluate the seismic performance of the Herb Albert Building. This report represents the findings of the Tier 1 evaluation, which identifies potential deficiencies in the building based on the performance of similar buildings in past earthquakes. Any deficiencies found in the Tier 1 evaluation should be further investigated.

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1. BUILDING INFORMATION:

Site location coordinates:
-Latitude: 34.07024
-Longitude: -118.44014

ASCE 41-17 Model Building Type:

Above Grade:

-Longitudinal Direction: RM2, Masonry Bearing Walls with Stiff Diaphragms at floors and flexible diaphragm at roof
C2, Concrete Bearing Walls with Stiff Diaphragm – Ground Floor to First Floor
-Transverse Direction: RM2, Masonry Bearing Walls with Stiff Diaphragms at floors and flexible diaphragm at roof
C2, Concrete Bearing Walls with Stiff Diaphragm – Ground Floor to First Floor

Note: Original building Architectural and Structural drawings were provided to us but not the “Project Detail Book”. According to the drawings we have, “Project Detail Book” is a separate set of drawings which contains building sections and details. It appears that “Project Detail Book” was not available in current UCLA archives. Also provided was the 1999 Seismic Correction set of Architectural and Structural drawings, but it appears no strengthening work was done to the Herb Alpert Building.

Total Floor Area (sq. ft.): 40,803
Number of Stories:
-Above grade: 2
-Below grade: 1 (Partially below grade on 2 sides)
Year Original Building was Constructed: 1981 (Therefore not an ASCE 41-17 Benchmark Building)
Original Building Design Code and Year: 1976 UBC
Retrofit Building Design Code and Year: N/A

COST RANGE TO RETROFIT (if applicable): **Low (<$50/sf)**

2. GEOTECHNICAL INFORMATION:

Site Information:

Site Class (A-F): D (Basis: Inferred from Geotechnologies, Inc. (2011))
Geologic Hazards:
- Fault Rupture: No (Basis: Inferred from Geotechnologies, Inc. (2011) and CGS Maps)
- Liquefaction: No (Basis: Inferred from Geotechnologies, Inc. (2011) and CGS Maps)
- Landslide: No (Basis: Inferred from Geotechnologies, Inc. (2011) and CGS Maps)

CGS = California Geological Survey
Geotechnologies, Inc. 2011 – Soils report for adjacent Evelyn and Mo Ostin Music Center Building

Site-specific Ground Motion Study: No

ASCE 41 Evaluation Criteria (Using ATC Hazard by Location Maps):

Hazard Level BSE-2E, Collapse Prevention
Site-modified Spectral Response (0.2 s): Sds, BSE-2E = 1.554
Site-modified Spectral Response (1.0 s): Sd1, BSE-2E = 0.949

Estimated Fundamental Period (seconds):
- Longitudinal Direction: 0.318 (per ASCE 41-17, Eqn. 4-4, assume h = 40 ft.)
- Transverse Direction: 0.318 (per ASCE 41-17, Eqn. 4-4, assume h = 40 ft.)

(h = building height above first floor)

3. FALLING HAZARDS ASSESSMENT SUMMARY (applicable when box is checked):

☐ Heavy ceilings, features or ornamentation above large lecture halls, auditoriums, lobbies or other areas where large numbers of people congregate
☐ Heavy masonry or stone veneer above exit ways
☐ Unbraced masonry parapets, cornices or other ornamentation above exit ways
☐ Masonry chimneys
☐ Heavy Partitions Braced by Ceilings
☐ Appendages

UCLA staff to verify the following potential falling hazards due to limited interior access:

- Unrestrained hazardous materials storage.
- Unrestrained natural gas-fueled equipment such as water heaters, boilers, emergency generators, etc.

4. TIER 1 SEISMIC EVALUATION SUMMARY OF STRUTURAL NON-COMPLIANCES/FINDINGS SIGNIFICANTLY AFFECTING RATING DETERMINATION (applicable when box is checked):

Non-Compliance items indicate potential significant structural deficiencies potentially affecting the seismic performance level designation (CP) of the building:

<u>Building Basic Configuration Checklist – Collapse Prevention (CP)</u>

Low Seismicity:

☒ Load Path *(Unknown – more information required)*
☒ Adjacent Buildings
☐ Mezzanines
☐ Weak Story
☐ Soft Story
☒ Vertical Irregularities (all elements continuous to foundation check)
☒ Geometry *(Unknown – more information required)*
☐ Mass – Vertical Irregularity
☐ Torsion

Moderate Seismicity:

☐ Liquefaction
☐ Slope Failure
☐ Surface Fault Rupture

High Seismicity:

☐ Overturning

☐ Ties between Foundation Elements

Structural Checklist for Building Type RM2

Low and Moderate Seismicity:

☐ Redundancy

☐ Shear Stress Check

☐ Reinforcing Steel

Stiff Diaphragms:

☐ Topping Slab – Precast

Connections:

☒ Wall Anchorage *(Unknown – more information required)*

☐ Wood Ledgers

☒ Transfer to Shear Walls *(Unknown – more information required)*

☐ Topping Slab to Walls or Frames

☒ Foundation Dowels *(Unknown – more information required)*

☒ Girder-Column Connection *(Unknown – more information required)*

High Seismicity:

Stiff Diaphragms:

☐ Openings at Shear Walls (concrete or masonry)

☐ Openings at Exterior Masonry Shear Walls

Flexible Diaphragms:

☒ Cross Ties

☒ Openings at Shear Walls (concrete or masonry)

☐ Openings at Exterior Masonry Shear Walls

☐ Straight Sheathing

☐ Spans

☐ Diagonally Sheathed and Unblocked Diaphragms

☐ Other Diaphragms

☒ Stiffness of Wall Anchors *(Unknown – more information required)*

Structural Checklist for Building Type C2

Low and Moderate Seismicity:

☐ Complete Frames

☐ Redundancy

☐ Shear Stress Check

☐ Reinforcing Steel

Connections

☐ Wall Anchorage at Flexible Diaphragms

☐ Transfer to Shear Walls

☐ Foundation Dowels

High Seismicity:

☐ Deflection Compatibility

☐ Flat Slabs

☐ Coupling Beams

Stiff or Flexible Diaphragms

☐ Diaphragm Continuity

☐ Openings at Shear Walls

Flexible Diaphragms

☐ Cross Ties

☐ Straight Sheathing

☐ Spans

☐ Diagonally Sheathed and Unblocked Diaphragms

☐ Other Diaphragms

Connections

☐ Uplift at Pile Caps

NON-STRUCTURAL FALLING HAZARD NOTES: No non-structural falling hazards were noted for the Herb Alpert building.

DEFECTS AND DETERIORATION: The overall condition of the building at the time of this assessment appeared to be in good overall condition. No signs of deterioration of the structure were noted while performing visual observations.

5. BRIEF DESCRIPTION OF ANTICIPATED FAILURE MECHANISM:

The Herb Alpert building is a reinforced masonry building that was built in 1981 under the provisions of the 1976 UBC. The building is separated from the Schoenberg and Teaching/Organ Studio buildings by 3” seismic joints. The Herb Alpert building houses offices, music rooms, classrooms and mechanical spaces. The layout of the building is generally rectangular but in the shape of the backwards letter “z” with the long sides oriented in the east-west direction.

The building has reinforced concrete bearing walls at the ground level where portions of the walls are partially below grade and reinforced brick masonry walls where not retaining earth. The first and second floor levels of the building have reinforced masonry bearing walls. The floor diaphragms of the building are comprised of a pile supported reinforced structural slab at the ground level, reinforced concrete beams and slab at the first level and a composite floor comprised of a 3 inch deep 18 gauge metal deck topped with 3 inch normal weight concrete. The roof is supported with steel joists and has a non-composite 22 gauge, 1-5/16 inch deep metal deck topped with a minimum 4 inch insulating concrete.

Due to the building plan shape there are some reentrant corners subject to force concentration that may be subject to localized damage during intense ground shaking. Additionally, there are vertical irregularities in shear walls between the second floor and lower levels and the force transfer between elements is unclear as connection details for the building have not been provided for review. Lastly, the roof diaphragm configuration is considered flexible whereas floor diaphragms are stiff. The roof diaphragm connections to bearing walls is unknown effecting the seismic performance rating.

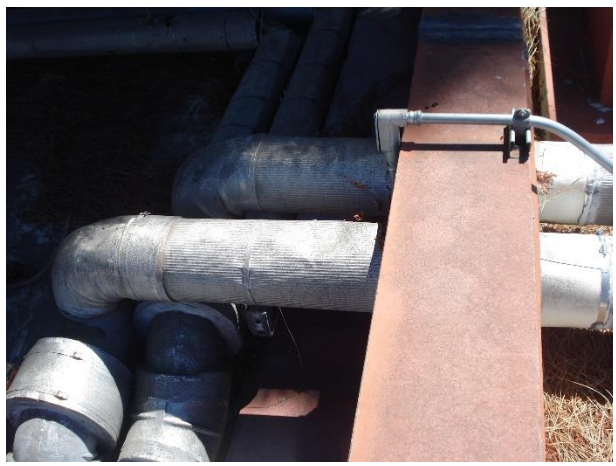
Further analysis and investigation, or the availability of new information, could aid the assessment of the vertical irregularities and connections of the flexible roof diaphragm to reinforced masonry bearing walls which may or may not improve the building's Seismic Performance Level.

6. COMMENTS AND ADDITIONAL DEFICIENCIES:

There are several construction features of the building indicating that additional analysis should be performed to determine the adequacy of the connections of the building's framing members and the overall rating of the building.

6.1. Seismic Separation between Buildings: During intense ground shaking by a seismic event the adjacent structures (Organ Room, Schoenberg Hall) could collide causing localized damage. The damage would likely be limited to the cracking of wall mortar joints and seismic joint cover flashings over the top of the parapet walls. Possible damage on the roof where two water lines and a conduit pass over a seismic joint as they appear to lack flex connections to allow for movement. There is also a pedestrian bridge over to the Evelyn & Mo Ostin Music Center building on the west side of the building that has a seismic joint as well at the 3rd floor. The size of the seismic joint is not known at this time.

Seismic joint / flashing at Organ Chamber Building With Herb Albert Building



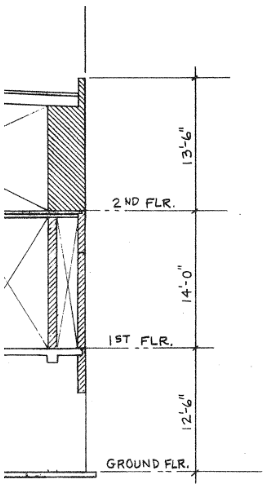
Plumbing lines and conduit crossing over seismic joint at northeast corner of building with Schoenberg Hall

6.2. Re-entrant Corner at 3rd floor: Due to the steel framing member layout at the re-entrant corner of the floor diaphragm there is the probability of cracking in the concrete topping over metal deck. Additional review is required to determine the best way to mitigate potential earthquake damage at this location.

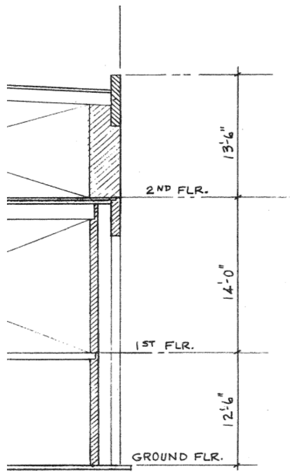
6.3. Roof Flexible Diaphragm: The roof diaphragm is a 1-5/16 inch, 22 gauge, metal deck and is considered flexible as it has an insulating concrete topping and not a lightweight or normal weight concrete topping. The "Project Detail Book" is not available to review to understand how the roof metal deck is anchored to brick walls. The attachment is assumed to be a steel ledger angle and the anchor bolts spaced uniformly along the length of the masonry lintel. Adjacent to the "Teaching/Organ" building the diaphragm width is 35 feet and at the south end of this bay, the diaphragm is divided into sub-diaphragms to provide additional wall/lintel anchorage. At the north end of this bay there is no sub-diaphragm framing and it should be added.

Seismic Concern: Out-of-Plane anchors from wall to roof diaphragm should be occurring every 48" O.C. or so along the length of the wall. The axial capacity of the roof diaphragm and welding of the deck to the ledger angle may be insufficient to prevent the brick wall from separating from the diaphragm during an earthquake.

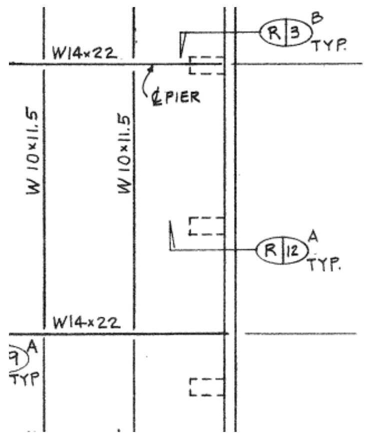
6.4. Perimeter Masonry Wall stacking is discontinuous: Ideally, the masonry walls at each floor level would stack directly on top of each other. At the perimeter of the building, the shear walls on the east, south and west sides have discontinuous features. Shown below are examples of discontinuous south walls.



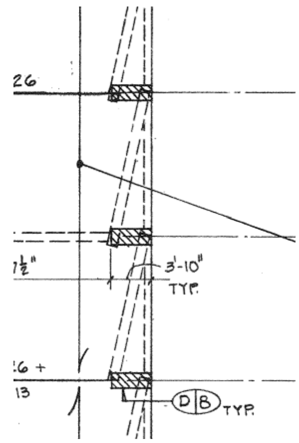
2nd floor wall straddles two wall



2nd floor wall straddles wall and beam



Roof Plan – some piers braced by beams



2nd floor plan – pier straddles two walls below

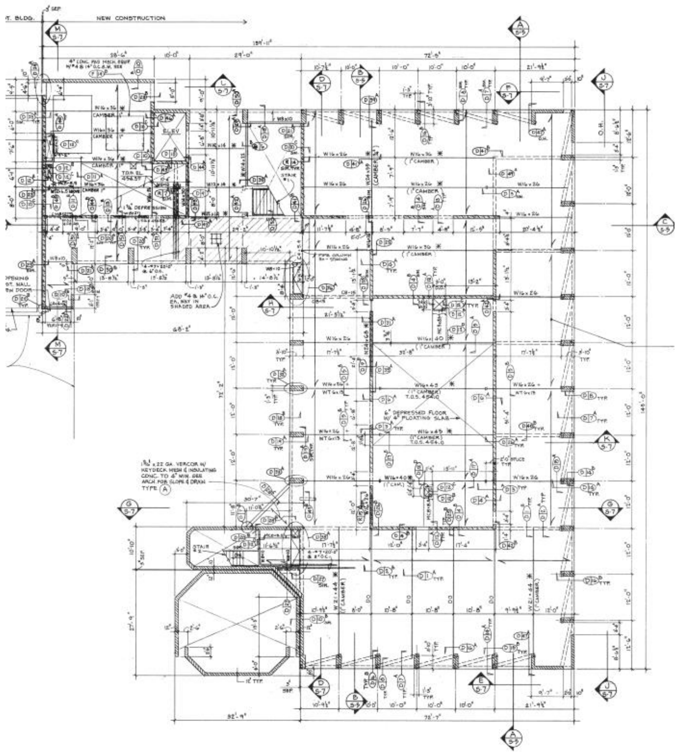
Examples of discontinuous brick masonry walls

West side of building - Brick piers at 2nd floor

West side of building: Brick piers at 2nd floor, skewed walls at first floor

East side of building – Discontinuous piers, skewed walls and skewed wall sits on lintel.

South side of Building – Discontinuous 2nd floor pier straddling skewed walls from ground to 2nd floor.



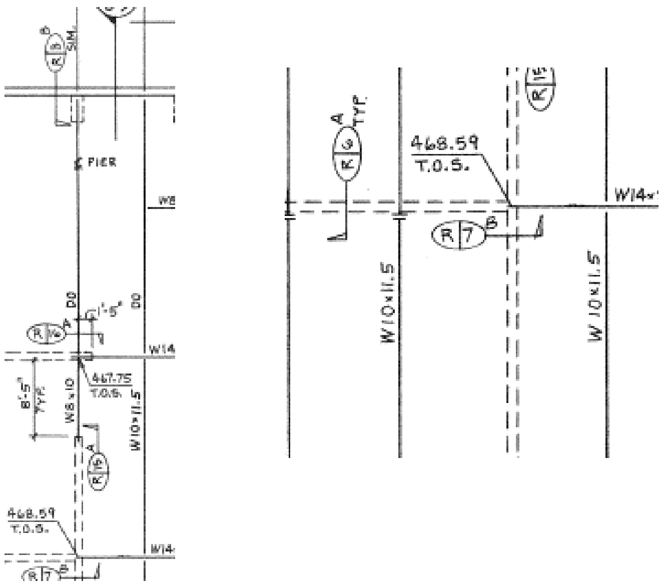
Floor Structural Framing Plan – 2nd Floor

Herb Albert 2nd floor plan showing extent of discontinuous piers above and skewed walls below along east, south and west faces of the building. With these discontinuities in the wall framing, further analysis is needed beyond a Tier 1 evaluation. At the first floor courtyard, the building perimeter appears to be two story masonry frames. As reinforcing details are not available, it’s unclear how this frame will perform as lintels are offset to the edge of the columns/piers.

Westside of Building - Courtyard Elevation at first floor

At the ground floor there appear to be sufficient shear walls. At the first floor, the number of shear walls decreases compared to the ground floor, and decreases further at the second floor. Additional analysis is required to understand the load path of how seismic forces are distributed between shear walls above and below the floor diaphragms.

6.5. Drag Lines and Collectors w/ Flexible Diaphragm: Beam collector connections to ends of shear walls should be reviewed to determine if they have sufficient capacity to not pull away from the shear walls and piers. Connection details are not available to review.



Partial Roof Framing Plans – collector steel beams to brick masonry walls

7. SEISMIC RETROFIT CONCEPT SKETCHES/DESCRIPTIONS (only required for buildings rated SPL V or worse):

Description:

Tier 1 deflection checks show that the existing 3” seismic gap is not adequate, but a more detailed analysis could rule out this potential deficiency. Additionally, new information on the connections of the roof diaphragm to bearing walls, along with more information regarding load transfer at second floor vertical irregularities, could improve the Seismic Performance Level rating. The utilization of the existing lateral system is not a concern but the lack of details for review at the roof diaphragm-to-wall connections, wall-to-foundation connections and load transfer at second floor vertical irregularities supports a SPL V rating. If a more detailed analysis shows the connections to be inadequate a retrofit may require adding post-installed anchorage to provide more positive connections between elements. At the roof diaphragm additional framing members may be required to provide a sub-diaphragm connection between the existing metal deck and masonry walls.

8. LIMITATIONS

Thornton Tomasetti’s professional services have been performed in accordance with the standards of skill and care generally exercised by other professional consultants acting under similar circumstances and conditions at the time the services were performed. Thornton Tomasetti’s findings, conclusions and opinions are based on Thornton Tomasetti’s visual observations, professional experience and evaluation of documentation provided. This report shall not be construed to warrant or guarantee the building and/or any of its components under any circumstances. No other warranty, expressed or implied, is made as to the professional advice presented in this report.

9. APPENDICES

A. ATC Hazards by Location Data
   a. Geotechnical Information
   b. CGS map
B. ASCE 41-17 Tier 1 Checklists (Structural Only)
   a. Building Basic Configuration
   b. Structural Checklist for Building Type RM1-RM2
   c. Structural Checklist for Building Type C2
C. Quick Check Calculations

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