SEISMIC EVALUATION

of

1508-1512 Arizona Avenue
Santa Monica, CA

Prepared for:

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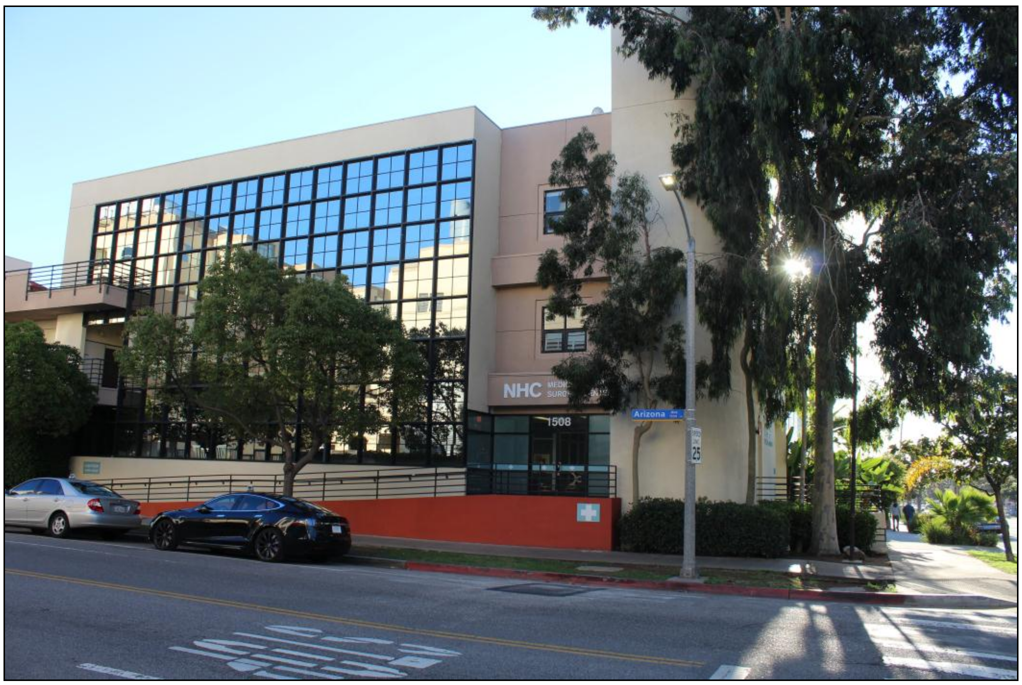

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0.0 EXECUTIVE SUMMARY

This report presents the results of the seismic evaluation of 3-story office building with subterranean parking located at 1508-1512 Arizona Avenue in Santa Monica, California. The building was evaluated in accordance with the University of California (UC) Seismic Safety Policy requirements for leasing.

The building was completed in 1987 and likely designed to the 1982 edition of the Uniform Building Code (UBC). The building consists of a 2-story steel frame with wood roof and floor constructed on a single-story concrete flat-slab podium. The foundation system consists of shallow isolated footings supporting columns and strip footings supporting walls.

The expected seismic performance of the building was determined by a site review of the structure, review of structural drawings, structural calculations and a general seismic hazard analysis for the region.

The following deficiencies were identified based on the results of the analysis:

- The western portion of the plywood roof diaphragm is overstressed in shear.
- The plywood roof and 3rd floor diaphragms are overstressed in flexure.
- The 2nd and 3rd floor plywood shear walls are overstressed in shear and flexure
- The beams of the braced frames have inadequate strength to resist unbalanced brace forces.
- The gusset plates at the brace to column/beam connection have inadequate strength.
- Some of the 2nd floor braces are overstressed.

The results of the analysis indicate that the building does not meet the requirements for UC Seismic Rating IV.

Conceptual strengthening approaches to mitigate the identified deficiencies and improve building performance to UC Seismic Rating IV include the following:

- Overlay new plywood sheathing on western portion of existing plywood sheathing (approximately 30% of roof area).
- Add new continuous steel plates/straps along length of roof and 3rd floors at north and south perimeters.
- Strengthen roof joists and connections to act as diaphragm cross-ties.
- Overlay new plywood sheathing on existing 2nd and 3rd floor plywood walls.
- Add new metal strap or hold-down anchors to ends of existing 2nd and 3rd floor plywood walls.
- Add new steel zipper columns at all brace frames.
- Strengthen existing steel braced frame beams for axial loads.
- Remove and replace existing steel gusset plates with thicker plates.
- Strengthen existing steel braces by welding steel cover plates along all sides of brace.
- Perform geotechnical investigation to verify soil bearing capacity of 2,000 psf assumed for this evaluation.

Sketches of plans and details for recommended conceptual strengthening are provided in Section 6.

1.0 INTRODUCTION

1.1 General

This report presents the results of the seismic evaluation of the 3-story office building with subterranean parking located at 1508-1512 Arizona Avenue in Santa Monica, California. Figure 1.1 shows a vicinity map of the site.

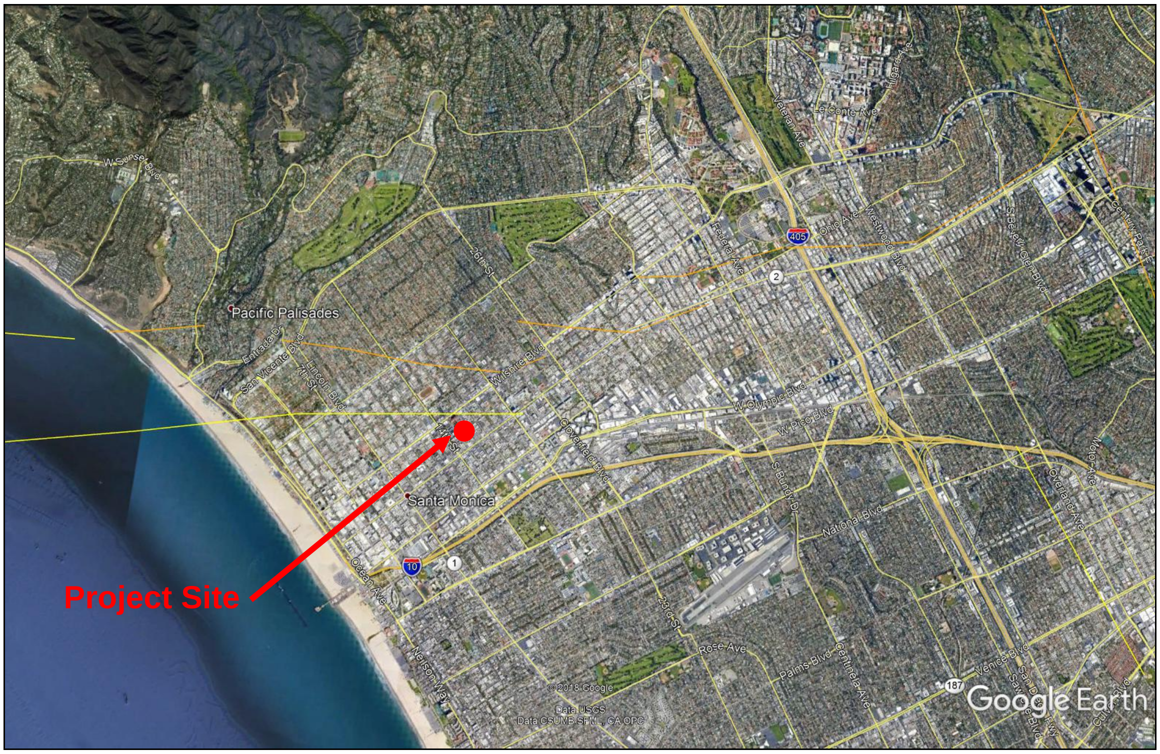

Figure 1.1 - Vicinity Map

The evaluation was performed in accordance with University of California Seismic Safety Policy requirements. The expected seismic performance of the building was determined by a site review of the structure, review of structural drawings, structural calculations and a general seismic hazard analysis for the region.

A description of the construction of the building is provided in Section 2. Observations from the site visit are provided in Section 3. The likelihood of earthquake-induced site failure is discussed in Section 4. The criteria used in the evaluation of the building, analysis assumptions, and a summary of the results are discussed in Section 5. Conceptual strengthening approaches to mitigate the identified deficiencies and improve building performance are provided in Section 6.

This evaluation of the structural system represents the opinion of *Nabih Youssef & Associates (NYA)* based on the available information. This review is not intended to preempt the responsibility of the original design consultants.

1.2 Evaluation References

The following documents and available information were examined in the evaluation:

- Structural drawings for Outpatient Surgical/Medical Unit of Santa Monica, Hillman, Biddison & Loevenguth, September 9, 1985.
- *Seismic Evaluation and Retrofit of Existing Buildings*, American Society of Civil Engineers, 41-17, 2017.
- *California Code of Regulations, Title 24, Part 2, Volume 2*, California Building Standards Commission, 2010.
- *University of California, Seismic Safety Policy*, May 19, 2017.
- *City of Santa Monica Fault Hazard Management Zone*, January 2014.
- State of California Earthquake Zone of Required Investigation, Beverly Hills Quadrangle, California Geological Survey, January 11, 2018.

2.0 BUILDING DESCRIPTION

2.1 General

The 3-story irregular-shaped building was completed in 1987 and likely designed to the 1982 edition of the Uniform Building Code (UBC).

2.2 Gravity System

The roof and 3rd floor are constructed of structural plywood spanning to TJI joists supported by wide flange steel beams on the interior and perimeter bearing wood stud walls. The beams are supported by steel tube columns.

The stud walls and tube steel columns are supported by the two-way reinforced concrete slab at the 2nd floor. The slab is supported by reinforced concrete columns and bearing reinforced masonry walls along the perimeter. The columns and walls are continuous to the foundation.

The subterranean parking level is constructed of a 4″ thick reinforced concrete slab. The foundation system consists of shallow isolated footings supporting columns and strip footings supporting walls.

2.3 Lateral System

The lateral-force-resisting system consists of the plywood sheathed roof and 3rd floor acting as a structural diaphragm to transfer seismic inertial forces to a combination of plywood shear walls and steel concentric braced frames. Seismic forces are transferred through the 2nd floor concrete slab to perimeter reinforced masonry walls.

3.0 FIELD OBSERVATIONS

3.1 General

A site visit was performed by Maurizio Trevellin of NYA on December 13, 2018, to assess the actual field conditions of the subject building. The majority of the structural connections was covered and was not visually observable. Observation was limited to the visible areas of the structure.

3.2 Structural Observations

- The building structure appeared to be in general conformance with the original structural drawings.
- In general, the building appeared to be in fair condition; there were no signs of significant structural cracking, spalling or deterioration of the structural framing.
- No permanent offset of the building that would indicate structural distress was observed.

3.3 Nonstructural Observations

- Mechanical equipment was observed to be generally anchored and pipe systems were observed to be generally braced.
- No potential falling hazards that pose a life-safety threat to building occupants were observed in occupied or common areas within the building.

4.0 EARTHQUAKE INDUCED SITE FAILURE

4.1 Geologic Hazard

The likelihood of earthquake-induced site failure is discussed below. An extensive report on the seismic hazards for this area has been published in *Seismic Hazard Report for the Beverly Hills 7.5-Minute Quadrangle, Los Angeles County*.

Site-specific information on subsurface soil conditions was not available for this review.

4.1.1 Ground Fault Rupture

Ground fault rupture is the direct manifestation of the movement along a fault, projected to the ground surface. It consists of a concentrated, permanent deformation of the ground surface, which in major earthquakes can extend many miles along the trace of the fault. This deformation can be in either horizontal and/or vertical direction. A ground-surface rupture involving more than a few inches of movement within a concentrated area can result in major damage to structures that cross it.

The subject building is not located at a site subject to the jurisdiction of the Alquist-Priolo Special Studies Zone Act (this Act prohibits the location of most structures for human occupancy across the traces of active faults and thereby mitigates the hazard of fault rupture). However, the site is located within the City of Santa Monica Fault Hazard Management Zone. The closest identified active fault to the site is the Santa Monica fault, which is approximately 0.4 mile away. The potential for ground surface rupture is moderate.

4.1.2 Landsliding

A landslide is the downhill movement of masses of earth under the force of gravity. Earthquakes can trigger landslides in areas that are already landslide prone. Landslides are most common on slopes of more than 15 degrees and can generally be anticipated along the edges of mesas and on slopes adjacent to drainage courses.

The subject building is located on a flat piece of land. Therefore, the potential for landsliding is very low.

4.1.3 Liquefaction

Liquefaction is the sudden loss of bearing strength that can occur when saturated, cohesionless soils (sands and silts) are strongly and repetitively vibrated. Damage from liquefaction results primarily from horizontal and vertical displacement of the ground. These displacements occur because sand/water mixtures in a liquefied condition have virtually no strength and provide little or no resistance to compaction, lateral spreading, or down slope movement. This movement of the land surface can damage buildings, and buried utilities, such as gas mains, water lines and sewers, particularly at their connection to the building.

No geotechnical report was available for the property. Examination of the *Beverly Hills Seismic Hazard Zone Map* indicates that the site is not located in an area recognized by the State of California where historic occurrence of liquefaction, or local geological, geotechnical and groundwater conditions indicate a potential for permanent ground displacement. These maps are intended to identify sites where geotechnical investigations for new construction are required to address the liquefaction hazard and recommend appropriate mitigation measures. Thus, the liquefaction susceptibility of the site is low.

5.0 BUILDING PERFORMANCE IN EARTHQUAKES

5.1 Evaluation Criteria

The University of California (UC) policy requires that all facilities considered for lease for more than 24 months, shall be rated, at a minimum, Seismic Performance Rating II or IV, depending on occupancy. For the subject building and occupancy, the policy requires a IV rating.

This level of seismic performance is equivalent to the performance of Risk Category I-III for existing buildings as established in Chapter 3 of the 2016 California Existing Building Code (CEBC). The CEBC uses, by reference, the methodology and procedures of ASCE 41-17, *Seismic Evaluation and Retrofit of Existing Buildings*. ASCE 41-17 is national standard for the seismic rehabilitation of buildings.

The building was evaluated in accordance with Section 317 of the 2016 CEBC with modified earthquake hazard levels per the UC Seismic Safety Policy. A two tier evaluation was performed using the performance criteria specified in Table 317.5 for Occupancy Categories I-III. The criteria used are presented in Table 5.1.

Table 5.1 Seismic Performance Criteria

Evaluation Tier	Earthquake Hazard Level	Structural Performance Level	Nonstructural Performance Level
1	BSE-1E (20/50 – 225 yr)	Life Safety	Hazard Reduced
2	BSE-2E (5/50 – 975 yr)	Collapse Prevention	Not Considered

5.2 Analysis Assumptions

The linear static procedure of ASCE 41-17 was used to analyze the seismic performance of the building. The roof and floor diaphragms were assumed to be flexible and seismic forces were distributed to vertical elements of the seismic system based on tributary area.

The default soil profile, Class D, was used since site specific soil data was not available. The response acceleration parameters for the BSE-1E and BSE-2E earthquake hazard level, adjusted for the site soil conditions, are:

Earthquake Hazard Level	S_{XS}	S_{X1}
BSE-1E (20/50 – 225 yr)	0.88g	0.49g
BSE-2E (5/50 – 975 yr)	1.49g	0.80g

5.3 Evaluation of Building Performance

The results indicate that the plywood 3rd floor and roof diaphragms, 2nd and 3rd floor plywood shear walls and steel braced frames are deficient. The following is a list of specific deficiencies:

- The western portion of the plywood roof diaphragm is overstressed in shear.
- The plywood roof and 3rd floor diaphragms are overstressed in flexure.

- The 2nd and 3rd floor plywood shear walls are overstressed in shear and flexure
- The beams of the braced frames have inadequate strength to resist unbalanced brace forces.
- The gusset plates at the brace to column/beam connection have inadequate strength.
- Some of the 2nd floor braces are overstressed.

5.4 Conclusion

The results of the analysis indicate that the building does not satisfy the requirements for UC seismic rating level IV.

6.0 RECOMMENDATIONS

Conceptual strengthening to mitigate the identified deficiencies and improve building performance to UC seismic rating level IV includes the following:

- Overlay new plywood sheathing on western portion of existing plywood sheathing (approximately 30% of roof area).
- Add new continuous steel plates/straps along length of roof and 3rd floors at north and south perimeters.
- Strengthen roof joists and connections to act as diaphragm cross-ties.
- Overlay new plywood sheathing on existing 2nd and 3rd floor plywood walls.
- Add new metal strap or hold-down anchors to ends of existing 2nd and 3rd floor plywood walls.
- Add new steel zipper columns at all brace frames.
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- Perform geotechnical investigation to verify soil bearing capacity of 2,000 psf assumed for this evaluation.

Figures 6.1 through 6.3 show floor plans indicating locations of proposed strengthening for second floor through roof. Figures 6.4 through 6.9 show sketches of proposed strengthening.