Seismic Evaluation

Sunnyvale City Hall Annex

Sunnyvale, California

14 July 2017

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EXECUTIVE SUMMARY – SUNNYVALE CITY HALL ANNEX

Rutherford + Chekene has completed an ASCE 41-13 Tier 1 Screening and evaluation of the Sunnyvale City Hall Annex building in Sunnyvale California. Non structural items, except as noted, were not identified and evaluated. The screening identified the following seismic deficiencies:

- Exterior brick masonry walls and interior full height brick walls are not adequately anchored for out-of-plane forces at the roof level. The connection between the wall panels and the roof diaphragm induces cross-grain bending and tension in the wood and glulam beam ledgers.
- There are inadequate or missing continuous cross ties between the roof diaphragm chords.
- Portions of the plywood roof diaphragm are not adequate to resist design seismic loading.
- Some roof diaphragm chord elements are not continuous and therefore inadequate to resist design seismic loading.
- The base of the 12" brick cavity wall and top of basement concrete wall at the south end of the building is not adequately anchored for out-of-plane forces.
- Suspended ceiling assemblies and light fixtures are inadequately braced for seismic forces.

Except as noted in item 6 above, non-structural items such as bracing and anchorage of MEP components, equipment, elevator, unanchored contents and overhead glass window panes were not identified as part of this report. In addition, items outside the building envelope, such as the entry trellis, underground emergency generator and transformer vaults and basement service ramp retaining walls were not identified.

General recommendations regarding the type of improvements required are provided below. Conceptual Scope of Work to mitigate the deficiencies are annotated as markups to the 1984 Phase 2 Sunnyvale Civic Center Improvement Drawings in Appendix D. Conceptual seismic structural improvements for the Sunnyvale City Hall Annex structure would include:

1. Installation of new out-of-plane wall to roof anchor assemblies.
2. Installation of new HSS steel tubes anchored to brick masonry walls below select roof beams.
3. Installation of new roof diaphragm wood and light steel strap cross-tie assemblies.
4. Installation of new roof plywood diaphragm assemblies to the underside of the existing roof framing.

5. Installation of new roof diaphragm wood chord elements at the North and South end of the roof.
6. Installation of new out-of-plane ground floor anchor assemblies at the base of the south wall. Installation of new roof plywood diaphragm assemblies to the underside of the existing ground level floor framing.
7. The existing ceiling assemblies should be retrofitted or replaced, constructed and braced per current building code requirements.

EXECUTIVE SUMMARY – SUNNYVALE CITY HALL ANNEX

Building Data				
Building Name: Sunnyvale City Hall Annex	Location: Sunnyvale California	Risk Category (I-IV): II	Latitude: 37.3716 N	Longitude: -122.0382 W
Building Use: Ground Floor: Offices Basement: Print Shop, Mechanical, Mail Room, Computers Server Room.	Max Occupancy: Unknown			
Building Dimensions: 152' (NS) x97' (EW)x24'(H)	Year Built: 1970	Building Type: Wood Frame-Commercial (W2), Reinforced Masonry Bearing Walls with Flexible Diaphragms (RM1)		
Area Ground Level: ~14,640 SF Area Basement Level: ~5800 SF	Stories: 1	Basement: Yes	Additions: No	As-built plans? Yes

Seismic Risk			
S_S: 1.5g	S_1:.6g	Site Class: D	Level of Seismicity: High

Structural System Data	
Roof Framing:	Plywood sheathing, wood joists, glulam beams supported by interior steel tube columns and exterior reinforced brick masonry.
Floor Framing	First Floor Level: Slab on Grade. First Floor Level over Basement: (a) Plywood sheathing on joists, supported by basement retaining walls and interior steel beams. (b) Reinforced concrete structural slab, joists and beams supported by basement perimeter concrete walls, concrete columns and beams.
Connection to Wall:	Steel anchors and reinforcing bars.
Foundations:	Continuous shallow reinforced concrete footings at the basement perimeter and retaining walls. Isolated shallow spread footings at basement columns. 20' deep drilled unreinforced concrete piers and continuous shallow grade beams along the North, East and West sides of the First Floor level and at an interior bay near the North end of the building.

Seismic-Force-Resisting System	
Horizontal System:	Plywood wood structural panel sheathing (flexible diaphragm)
Vertical System:	Wood-frame plywood shear walls and reinforced brick masonry shear walls above the ground floor, and reinforced concrete walls in the basement.

Target Performance		
Structural Performance Level: Life Safety	Seismic Hazard S_{xs}: 0.986g (225-year return period)	Target Met? No
Nonstructural Performance Level: Life Safety – (Not Evaluated)	Seismic Hazard Sxs: 0.986g (225-year return period)	Target Met? (Not Evaluated)

Summary of Seismic Deficiencies Based on Tier 1 Screening

1. Exterior brick masonry walls and interior full height brick walls are not adequately anchored for out-of-plane forces at the roof level. The connection between the wall panels and the roof diaphragm induces cross-grain bending and tension in the wood and glulam beam ledgers.
2. There are inadequate or missing continuous cross ties between the roof diaphragm chords.
3. Portions of the plywood roof diaphragm are not adequate to resist design seismic loading.
4. Roof diaphragm chord elements at the North and South end of the roof are not continuous and therefore inadequate to resist design seismic loading.
5. The base of the 12" brick cavity wall and top of the basement concrete wall at the south end of the building is not adequately anchored for out-of-plane forces.

PROJECT OVERVIEW

A. BUILDING SEISMIC RISK ASSESSMENT

The Sunnyvale City Hall Annex Building is a Risk Category II building. See Table 1 below for a description of Risk Categories I-IV.

Table 1: Risk Categories.

Risk Category	Description	Acceptable Risk
I	Buildings and structures that normally are not subject to human occupancy and that do not contain a substantial quantity of hazardous material.	Low probability of earthquake-induced collapse.
II	Most buildings and structures of ordinary occupancy except those buildings contained in other categories.	Low probability of earthquake-induced collapse. Limited probability that shaking-imposed damage to nonstructural components will pose a significant risk to building occupants.
III	Buildings and structures that have large numbers of occupants or contain materials that pose some risk to the public if released.	Reduced risk of earthquake-induced collapse relative to Occupancy Category II structures. Reduced risk of shaking-imposed damage to nonstructural components relative to Occupancy Category II structures. Low risk of release of hazardous materials.
IV	Immediate Occupancy (IO) buildings	Very low risk of earthquake induced collapse. Low risk that the building or structure will be damaged sufficiently to impair post-earthquake use.

B. PROJECT SCOPE

The objective of this project is to evaluate the structural seismic risk of the Sunnyvale City Hall Annex Building. The evaluation findings will be used by the City of Sunnyvale as an aid in developing the *City of Sunnyvale Civic Center Modernization Project Master Plan.* The Project Architect is SmithGroup JJR San Francisco, California.

C. EVALUATION CRITERIA AND METHODOLOGY

A seismic evaluation was conducted using the ASCE 41-13 Standard, *"American Society of Civil Engineers – Seismic Evaluation and Retrofit of Existing Buildings*". This document is a performance-based design tool that allows seismic evaluation to be performed to

assess conformance with either of two performance objectives - Immediate Occupancy or Life Safety, of which Life Safety was identified as the appropriate performance objective for this study. An Immediate Occupancy performance objective is a higher standard that predicts less damage and lower safety risk in the event of a significant seismic event. ASCE 41 contains three tiers of analysis, Tiers 1 through 3, each representing increasing levels of analytical sophistication and decreasing levels of conservatism.

The scope of this evaluation included an initial Tier 1 screening and evaluation utilizing standardized checklists to afford a quick identification of potential deficiencies. Most of these deficiencies are related to the manner in which the existing out-of-plane wall anchorage detailing and the roof diaphragm chords and ties were constructed. Further analysis will not result in a different conclusion. Therefore, a Tier 2 analysis for these items was not performed. It should be noted that some of the detailing requirements were added to the Building Code after the 1989 Loma Prieta Earthquake.

A deficiency-based Tier 2 seismic evaluation of the roof diaphragm was performed to afford a more realistic assessment of the diaphragm capability to resist lateral loads. The evaluation methodology employed in this project can be summarized as the following:

- **Tier 1 Screening** consisting of checklists, used to rapidly identify building features judged to present an unacceptable hazard to Life Safety. Applicable checklists were completed as part of the evaluation and are included in Appendix C.
- **Tier 2 Deficiency-Based Evaluation** was limited to using linear-static procedures, performed to better understand roof diaphragm deficiency identified in the Tier 1 Evaluation.

D. SITE DESCRIPTION AND SEISMICITY

The Sunnyvale City Hall Annex building is located at 650 West Olive Avenue in Sunnyvale California. Figure 1a shows a Google Vicinity Map image of the location of the building. Figure 1b shows a 3d Google Map image of the location of the building and civic center area.

Site Class D was chosen to characterize the site due to a lack of sufficient data to classify a site-specific soil profile. R+C has not received geotechnical documentation for the site. The original 1969 drawings reference a geotechnical report by Woodward Clyde Associates dated August 4, 1969.

The site is assumed to have a low susceptibility to liquefaction. See Figures 1c and 1d for USGS maps of liquefaction probability. Liquefaction-related phenomena (e.g., soil strength loss, bearing capacity reduction, settlement, lateral spreading should be

considered to have a low probability of occurrence for the ground shaking conditions associated with the hazard levels considered for the site.

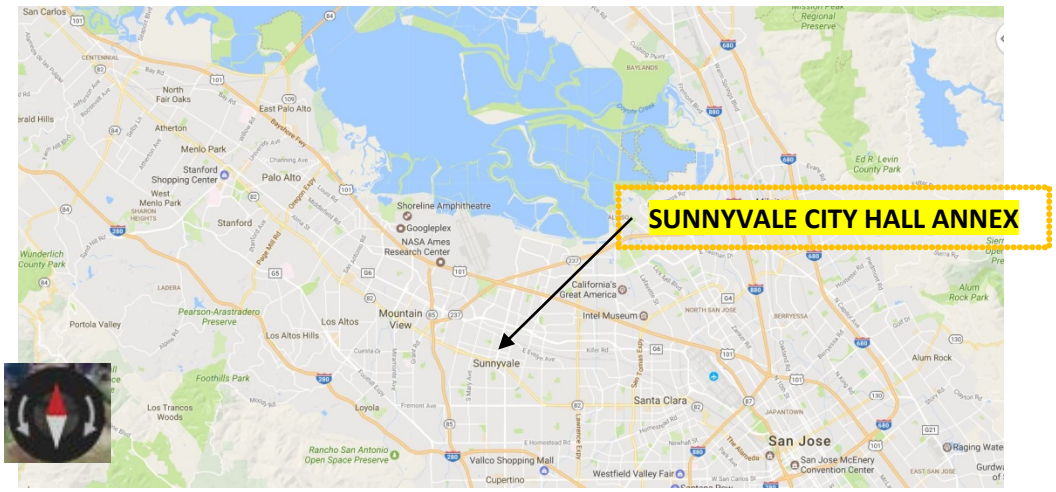

Figure 1a: Vicinity Map for Sunnyvale City Hall Annex, 650 West Olive Avenue Sunnyvale, CA.

Figure 1b: Location of Sunnyvale City Hall Annex, 650 West Olive Avenue Sunnyvale, CA.

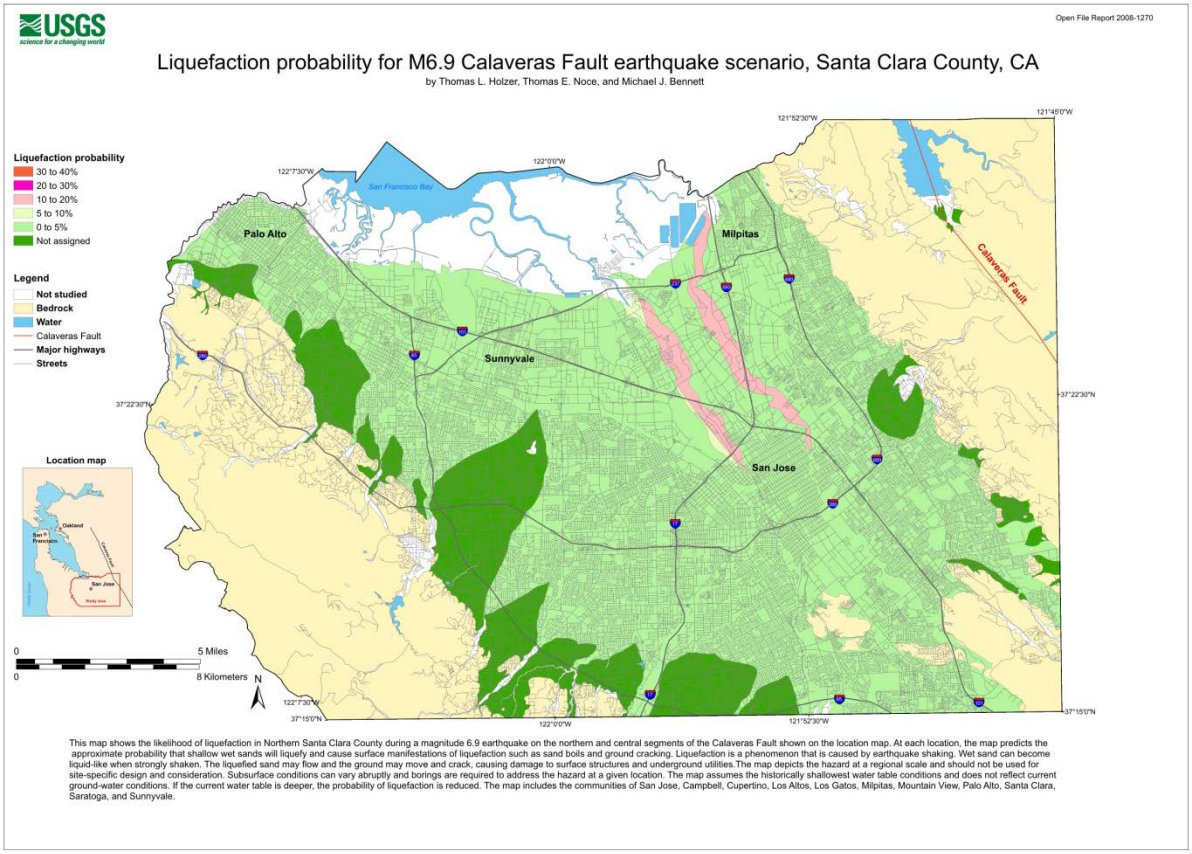

Figure 1c: USGS map of liquefaction probability for M6.9 Calaveras Fault earthquake scenario.

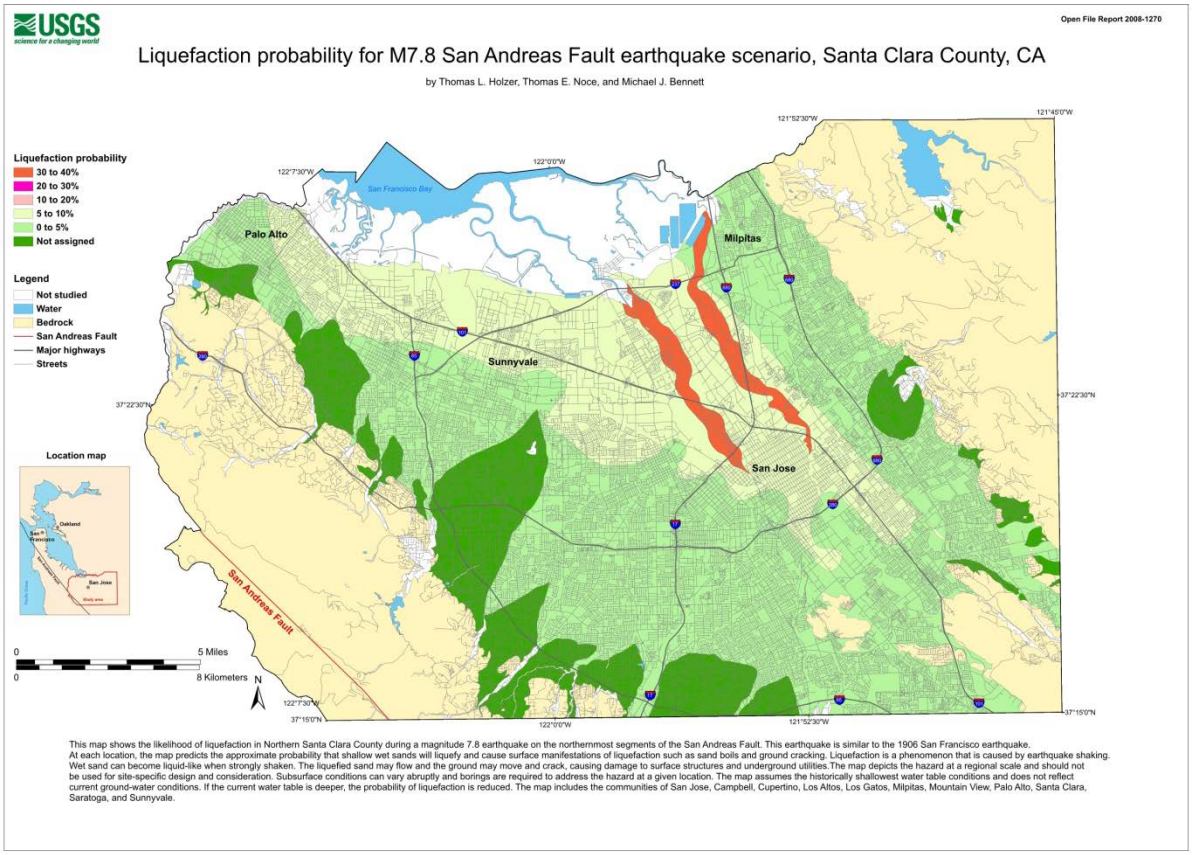

Figure 1d: USGS map of liquefaction probability for M7.8 San Andreas Fault earthquake scenario.

The ground surface at and in the vicinity of the building site is generally flat Since there is no evidence of slope instability or mapped landslides near the site, the hazard from seismically-induced land sliding or slope instability to the site is considered to be low.

No active or potentially-active faults have been identified in the immediate vicinity of the Sunnyvale City Hall Annex's site. The nearest fault is the Calaveras Fault approximately 10 miles to the East and therefore the site lies outside any identified potential earthquake fault rupture zones. Based on this information, the potential for surface fault rupture at the site is considered to be low to negligible.

Seismic response acceleration parameters were determined for an Earthquake Hazard Level of BSE-1E using the USGS Seismic design tool located at https://earthquake.usgs.gov/designmaps/us/application.php?. See Figure 1e for the BSE-1E USGS Design Maps Summary Report. The tool returned results for S_{DS}=1.0 g and S_{D1}=0.6g. Based on these parameters the Level of Seismicity is categorized as *High*.

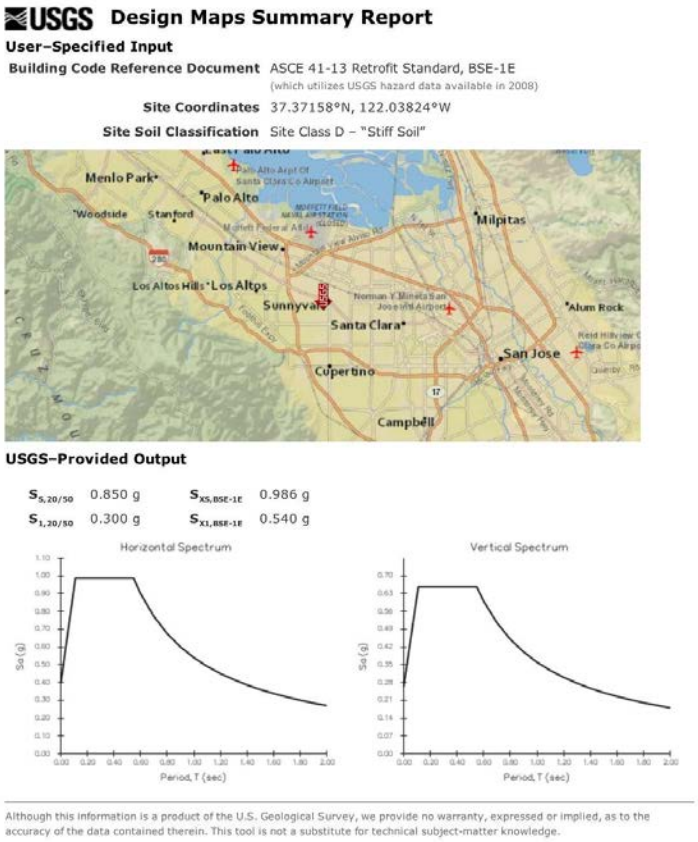

Figure 1e: USGS BSE-1E USGS Design Maps Summary Report.

In establishing the seismic demand for the Tier 1 screening and Tier 2 evaluation, the spectral response acceleration parameters are based on ground shaking with a 20% probability of exceedance in 50 years in accordance with ASCE 41-13. For the Sunnyvale City Hall Annex site the design short-period spectral response acceleration parameter, S_{XS}, is equal to 0.986g.

E. BUILDING DESCRIPTION

The Sunnyvale City Hall Annex is a one story building over a partial basement as shown in Figures 2a and 2b. The ground floor is approximately 14,700 square feet and the Basement is approximately 5800 square feet. The building is fairly symmetric in plan with offsets on each side. The overall length in the North-South direction is approximately 152' and has an East-West width of approximately 97 ft. See Appendix B for representative photos of the building.

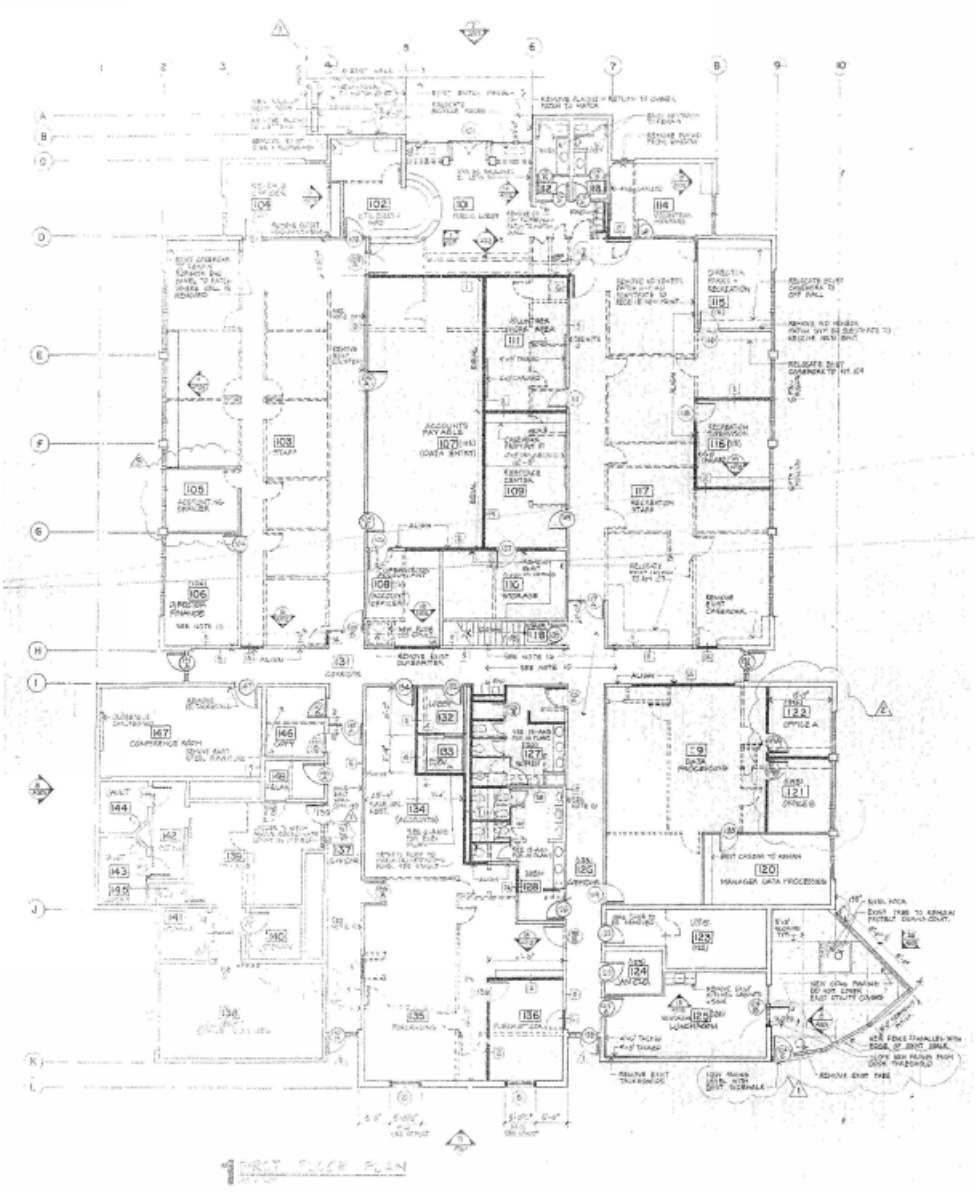

Figure 2a: Sunnyvale City Hall Annex schematic ground floor plan from 1985 renovation drawings.

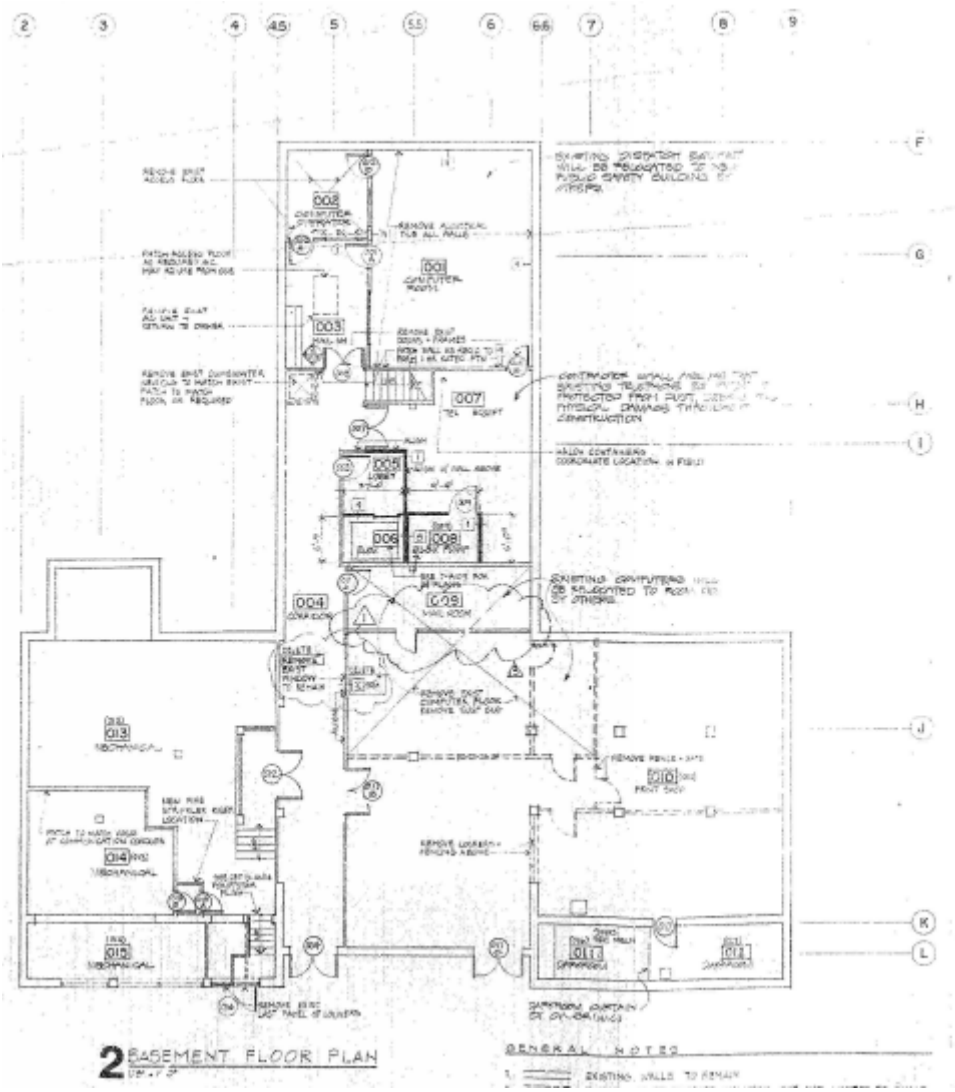

Figure 2b: Sunnyvale City Hall Annex ground basement level plan from 1985 renovation drawings.

The structural system of the building can be characterized as follows:

Foundation:

The building is supported on the following foundation types:

1. Continuous shallow reinforced concrete footings at the basement perimeter and retaining walls.
2. Isolated spread footings at basement columns.
3. 20’ deep drilled unreinforced concrete piers and shallow reinforced grade beams along the North, East and West sides of the First Floor level and at an interior bay near the North end of the building.

Basement Floor:

The basement floor is a concrete slab on grade. The elevation of the mechanical room is 3’ below the main basement level. The elevation of basement slab at the server computer room is 1’ below the main basement floor to allow for an access floor.

Ground Floor:

The ground floor consists of 3 floor framing systems:

1. Concrete slab on grade, except where noted below.
2. Plywood sheathing on joists, supported by basement retaining walls and interior steel beams located over the middle third o f the floor.
3. Reinforced concrete structural slab, joists and beams supported by basement perimeter concrete walls, concrete columns and beams located over the south-east and south-west corners of the building.

Roof:

The roof framing consists plywood sheathing, wood joists and glulam beams supported by interior steel tube columns and exterior reinforced brick masonry walls. The roofing material is a clay or concrete shingled tile.

Walls:

The exterior walls are typically 8” thick reinforced brick masonry units. The south wall that extends to the ridge is a 12” thick reinforced brick cavity wall. The interior walls consist of 8” reinforced brick walls and wood framed walls.

Seismic Force-Resisting System:

The seismic force-resisting system consists of:

1. Plywood roof diaphragm.

2. Plywood Shear Walls.
3. 12” thick reinforced cavity brick masonry wall at the south end of the building at the tall middle portion of the building.
4. 8” thick reinforced brick wall. (Grouted hollow masonry units made from brick.)

F. SITE AND STRUCTURE INVESTIGATION

The Tier 1 screening was performed based on available construction documents for the subject building. The available documents are as follows:

- Original Public Safety Headquarters Construction Drawings dated October 29, 1969 and Addendum 2 Sheet S5 dated November 25, 1969 and Sheet S12 dated November 26, 1969. (58 sheets total)
- Phase 2 Sunnyvale Civic Center Improvement City Hall and Annex Construction Drawings dated December 1984. (50 sheets total.)
- Sunnyvale City Hall Annex Computer Room Air Conditioner Replacement Project dated 5/17/2000 (7 sheets total)
- Sunnyvale City Hall Annex Building HVAC Replacement Project dated 9/5/2003 (19 sheets total)
- Public Safety Building HVAC Equipment Replacement & Roofing Improvements Project dated 5/9/2009 and 8/23/2011. (34 sheets total)

An on-site investigation was conducted in accordance with ASCE 41, Sections 4.2 and 5.2, to verify general conformance of existing conditions to those described in the available documents, to identify significant alterations or deviations from available documents, to supplement incomplete documents, and to confirm the general quality of construction and maintenance.

An initial site visit was conducted on June 6, 2017, by Walterio Lopez, SE and Jeff Smith, SE of Rutherford + Chekene. Two additional site visits were conducted by Jeff Smith, SE on June 13 and June 20, 2017. The following building areas were observed: All exterior elevations, interior office areas including utilities rooms, lunchroom and UPS room. Limited areas above the ceiling were observed at one access hatch and above four acoustic ceiling tiles. Also observed were accessible areas in the basement that includes the print shop area, the mechanical room and the server room. During the site visit, the observations generally matched the information shown on the available drawings.

Modifications:

There have been no significant structural additions made to the building since the original construction. There was significant structural and architectural work made to the building as shown on the Phase 2 Sunnyvale Civic Center Improvement City Hall and

Annex Construction Drawings dated December 1984. See Section II-A for a description of the structural improvements.

Condition Assessment:

On-site investigations confirmed that the building is fairly well maintained, and appears to be in good condition. There is no evidence of deterioration of structural materials that would have significant effect on seismic performance. Portions of the ends of cantilever roof beams show signs of significant deterioration. Some appear to have been modified as part of a repair. This is a nonstructural item. However, repair of the condition should be included in the scope of work. See Photo 19 in Appendix D.

Limitations:

On-site investigations were limited to visual observations with the following exception: In the UPS room on the ground floor 3 3/8" diameter x 4" deep holes were drilled into the brick wall. One hole was into the brick face and 2 holes were into a mortar joint. No destructive or nondestructive testing was performed.

II. SUMMARY OF FINDINGS

A. TIER 1 SCREENING SUMMARY

The ground level portion of the building structure is classified per Table 3-1 ASCE 41-13 as Wood Frames, Commercial and Industrial - Type W2 and Reinforced Masonry Bearing Walls with Flexible Diaphragms - Type RM1. The basement portion of the structure is classified as Concrete Shear Walls – Type C2 (with Stiff Diaphragms) and Concrete Shear Walls - Type C2a (with Flexible Diaphragms).For this evaluation the roof diaphragm was assumed to be classified as flexible.

The structure was not originally designed in accordance with one of the benchmark documents listed in Table 4-6 (Section 4.3), it is on a site of High Seismicity and is evaluated to a Life Safety performance objective. The building was upgraded per the 1982 UBC for which Benchmark Buildings are based on the 1976 UBC for Life Safety for type W2 Building Types. We have not found any records indicating that seismic improvements were made for bracing and anchoring non-structural items. Thus, the Tier 1 Screening for this building involves completing the following checklists (Section 4.4):

- Life Safety Basic Configuration Checklist (Section 16.1.2LS)
- Life Safety Checklist for Building Type W2 (Section 16.3LS)
- Life Safety Checklist for Building Type RM1 (Section 16.15LS)
- Life Safety Checklist for Building Type C2 (Basement only) (Section 16.10LS)

The completed checklists are included in Appendix C. The following structural deficiencies were identified:

Structural:

- Roof Chord Continuity: The roof diaphragm does not have continuous chord elements at the North and South ends of the building.
- Exterior brick masonry walls and interior full height brick walls are not adequately anchored for out-of-plane forces at the roof level. The connection between the wall panels and the roof diaphragm induces cross-grain bending and tension in the wood and glulam beam ledgers.
- There are inadequate or missing continuous cross ties between the roof diaphragm chords.
- Diaphragm Spans: The unblocked wood roof diaphragm spans more than 40 ft. for seismic loads in the E-W direction. Portions of the plywood roof diaphragm are not adequate to resist design seismic loading.

- The base of the south exterior brick masonry wall and the top of the basement concrete wall is not adequately anchored for out-of-plane forces. The ground level floor at this location is a wood framed diaphragm.

Nonstructural Components:

- Non Structural Components have not been evaluated.
- Suspended ceiling assemblies and light fixtures are inadequately braced for seismic forces.

B. TIER 2 EVALUATION RESULTS

A deficiency-based Tier 2 seismic evaluation of the roof diaphragm was performed to afford a more realistic assessment of the diaphragm capability to resist lateral loads. The diaphragm was confirmed to be inadequate as follows:

- Diaphragm Spans: The unblocked wood roof diaphragm spans more than 40 ft. for seismic loads in the E-W direction. Portions of the plywood roof diaphragm are not adequate to resist design seismic loading.

C. EVALUATION SUMMARY

The Sunnyvale City Hall Annex does not meet the Life Safety Performance Objective after completion of a ASCE 41-13 Tier 1 Screening and Tier 2 Deficiency-Based evaluation limited to the roof diaphragm. The deficiencies will need to be remediated in order for the building to be made compliant with the Basic Performance Objective of ASCE 41-13. Noted below are conceptual structural improvements that will bring the Sunnyvale City Hall Annex in compliance with the Basic Performance Objective of ASCE 41-13:

1. Continuous chord elements are to be provided at the North and South ends of the building.
2. Exterior brick masonry walls and interior full height brick walls are to be anchored for out-of-plane forces at the roof level. The connection between the top of the brick wall panels are to be detailed in a manner that does not induces cross-grain bending and tension in the wood and glulam beam ledgers.
3. Where continuous diaphragm cross ties are missing, new continuous cross ties are to be provided between the roof diaphragm chords.
4. The unblocked plywood roof diaphragm is to be strengthened at select locations to resist design seismic loading.

5. Installation of new out-of-plane ground floor anchor assemblies at the base of the south wall. Installation of new roof plywood diaphragm assemblies to the underside of the existing ground level floor framing.
6. The existing ceiling assemblies should be retrofitted or replaced, constructed and braced per current building code requirements.

In addition to items noted above, we recommend that HSS steel tubes are installed to the inside face of the brick walls supporting the roof glulam beams where the beams occur at the end of the wall next to an opening. The structural analysis to evaluate the adequacy of the brick walls and connections at these locations is beyond the scope of this report. Installation of these HSS steel tubes will remedy potential deficiencies and are noted as the following conceptual improvement:

7. Installation of new HSS steel tubes below select roof beams, anchored to brick masonry walls at locations adjacent to openings.

D. CONCEPTUAL MITIGATION RECOMMENDATIONS

See Appendix D for building plan annotations describing conceptual seismic improvements to the building.

The conceptual improvements noted in Appendix D do not include non-structural improvements that are required for the building to be compliant with the Basic Performance Objective of ASCE 41-13, except as noted in item 6. Other examples of non-structural improvements include bracing and anchorage of MEP components, equipment, tall shelving and non-laminated overhead glazing. These items are assumed to be removed replaced per current building code as part of the overall modernization and renovation of the building.

III. APPENDICES

APPENDIX A –

SUMMARY DATA SHEET

SUMMARY DATA SHEET

BUILDING DATA

Building Name:	Sunnyvale City Hall Annex			Date:	6/26/2017
Building Address:	650 West Olive Street, Sunnyvale, CA 94088				
Latitude:	37.3716N	Longitude:	122.0382W	By:	JJS/WAL
Year Built:	1970	Year(s) Remodeled:	1984	Original Design Code:	1967 UBC
Area (sf):	20,000 including basement	Length (ft):	152	Width (ft):	97
No. of Stories:	1 (w/ basement)	Story Height (ft):	10	Total Height (ft):	25

USE ☐ Industrial ☒ Office ☐ Warehouse ☐ Residential ☐ Educational ☒ Other: Basement

CONSTRUCTION DATA

Gravity Load Structural System:	Wood Framing, Steel and Concrete Columns, Reinforced masonry bearing walls		
Exterior Transverse Walls:	Reinforced brick masonry	Openings?	Yes
Exterior Longitudinal Walls:	Reinforced brick masonry	Openings?	Yes
Roof Materials/Framing:	Glulam beams, wood joists		
Intermediate Floors/Framing:	N/A		
Ground Floor:	Plywood sheathing on joists, slab on grade, structural concrete slab, joists and beams		
Columns:	Steel tube, reinforced concrete, wood posts	Foundations:	Concrete
General Condition of Structure:	Good		
Levels Below Grades:	Basement		

LATERAL FORCE-RESISTING SYSTEM

	Longitudinal	Transverse
System:	Wood-frame/Reinforced Brick Masonry	Wood-frame/Reinforced Brick Masonry
Vertical Elements:	Plywood & masonry shearwalls	Plywood & masonry shear walls
Diaphragms:	plywood sheathing	plywood sheathing
Connections:	Anchors, steel plates, wood framing hardware	Anchors, steel plates, wood framing hardware

EVALUATION DATA

BSE-1N Spectral Response Accelerations:	S_{DS} =	1.0	S_{D1} =	0.6*g*	
Soil Factors:	Class =	D	F_a =	1.000	F_v = 1.5
BSE-1E Spectral Response Accelerations:	S_{XS} =	0.986*g*	S_{x1} =	0.540*g*	
Level of Seismicity:		High	Performance Level	Life Safety	
Building Period:	T =	0.21 (s) (using an average height of 23'-0")			
Spectral Acceleration:	S_a =	0.986*g*			
Modification Factor:	$C_mC_1C_2$ =	1.4 (use C value from Table 7-3 ASCE 41-13)	Building Weight: W =	810 *kips*	
Pseudo Lateral Force:	V =	$C_mC_1C_2\,S_a\,W$ = 967.8 *kips*			

BUILDING CLASSIFICATION: W2/ RM1/ C2

TIER 1 CHECKLISTS	**Yes**	**No**
Basic Configuration Checklist	☒	☐
Building Type W2 Structural Checklist	☒	☐
Building Type RM1 Structural Checklist	☒	☐
Building Type C2 Structural Checklist	☒	☐
Nonstructural Component Checklist	☐	☒

APPENDIX B –

SITE PHOTOGRAPHS

Photo 1: North Exterior entrance.

Photo 2: South exterior.

Photo 3: South exterior.

Photo 4: South exterior at basement service ramp and retaining wall.

Photo 5: West exterior.

Photo 6: Space above ceiling and below roof ridge.

Photo 7: North exterior brick wall at roof glulam beam ledger.

Photo 8: Glulam roof beam at exterior concrete column.

Photo 9: Space above ceiling above west offices.

Photo 10: Space above ceiling above west offices.

Photo 11: Hole in exterior brick masonry wall in UPS room.

Photo 12: Hole in exterior brick masonry wall in UPS room.

Photo 13: Roof framing above ceiling level.

Photo 14: Concrete ceiling over interior brick walls.

Photo 15: Glulam beam at exterior brick wall corner.

Photo 16: Tile roof.

Photo 17: Scanning for rebar with Zircon MT6 metal detector.

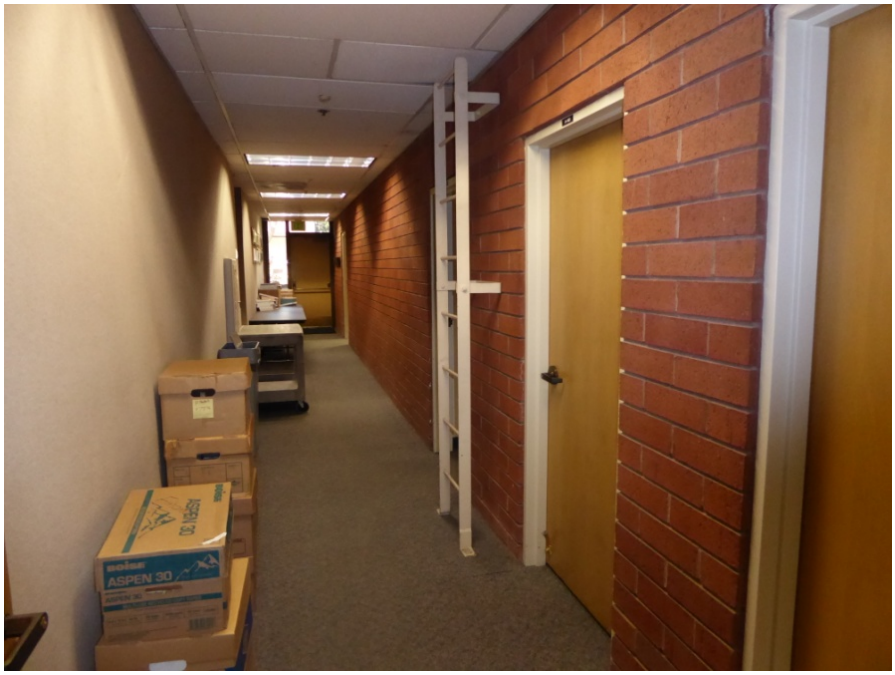

Photo 18: South West Ground Level corridor with above-ceiling access hatch and ladder. The ceiling to the right of the brick walls is a 6" reinforced concrete ceiling. See Photo 14.

Photo 19: Damaged exterior roof beam.

Photo 20: Basement Print Shop.

Photo 21: View from Basement Print Shop of Ground Level Concrete Floor framing.

Photo 22: Mechanical Room in Basement.

Photo 23: Mechanical Room in Basement.

APPENDIX C –

TIER 1 CHECKLISTS

APPENDIX D –

CONCEPTUAL SCOPE OF WORK TO MITIGATE DEFICIENCIES