Rating form
completed by:

**ESTRUCTURE**
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UCSF

*Text in green is to be part of UCSF building database and may be part of UCOP database*

REGISTERED PROFESSIONAL ENGINEER
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STRUCTURAL
STATE OF CALIFORNIA

11/05/2019

11-05-2019

**UCSF Building Seismic Ratings**

## Alumni House

CAAN #2032
745 Parnassus Avenue, San Francisco, CA 94122
UCSF Campus: Parnassus


Plan

Northwest Elevation

| Rating summary | Entry | Notes |
|---|---|---|
| UC Seismic Performance Level (rating) | V | Findings based on drawing review, Degenkolb ASCE 41-13 evaluation report (Tier 1 and Tier 2) and Estructure ASCE 41-17 Tier 1 evaluation[1] |
| Rating basis | Tier 2 | ASCE 41-13 |
| Date of rating | 2019 | |
| Recommended UCSF priority category for retrofit | B | Priority A = Retrofit ASAP<br>Priority B = Retrofit at next permit application for modification |
| Ballpark total project cost to retrofit to IV rating | High | See recommendations on further evaluation and retrofit. |
| Is 2018-2019 rating required by UCOP? | Yes | |
| Further evaluation recommended? | No | |

**Building information used in this evaluation**

- Architectural drawings by Masten and Hurd Architects, "Fraternity House for Xi Psi Phi Building Corporation," dated 1926-04-15 (7 Sheets)
- Structural drawings by Degenkolb Engineers, "PHTS Faculty Alumni House Interim Seismic Retrofit," dated 2018-04-04 (10 sheets)

[1] The evaluations at UCSF translate the Tier 1 evaluation to a Seismic Performance Level rating using professional judgment discussed among the Seismic Review Committee. Non-compliant items in the Tier 1 evaluation do not automatically put a building into a particular rating category, but such items are evaluated along with the combination of building features and potential deficiencies, focused on the potential for collapse or serious damage to the gravity supporting structure that may threaten occupant safety.

- Report by Degenkolb Engineers, "University of California San Francisco Alumni House Seismic Evaluation," dated 2017-06-09
- Report by Telesis, "Interim Use Risk Analysis for Alumni House San Francisco, California," dated 2017-08-03

**Additional building information known to exist**

- Architectural Floor Plan Drawings, "Public Programs 745 Parnassus," dated 1981-02-17 (2 Sheets)
- Food Service Equipment Drawings by Berlin Food Company, "Faculty/Alumni House 745 Parnassus S.F. CA," dated 1983-01-04 (2 sheets)
- Architectural Drawings by Alan Lucas + Associates, "UCSF: Alumni House Second Floor," dated 1986-02-07 (11 sheets)
- Architectural Drawings, "ADA Upgrade Works Restroom Modifications Faculty Alumni House," dated 1996-06-07 (4 sheets)

**Scope for completing this form**

Review of Seismic Evaluation report by Degenkolb Engineers and Interim Seismic Retrofit drawings. The Degenkolb report included an ASCE 41-13 Tier 1 and Tier 2 evaluation. The site was visited in 2013 and again in 2017 during construction of the Interim Seismic Retrofit.

The Degenkolb seismic evaluation and report was based on Life Safety structural and non-structural performance objectives in the BSE-1E earthquake and collapse prevention in the BSE-2E earthquake. In the BSE-1E earthquake, $Sxs = 1.036$ and $Sx_1 = 0.60$. In the BSE-2E earthquake, $Sxs = 1.723$ and $Sx_1 = 1.147$.

**Brief description of structure**

The building functions as a meeting and event space on the first floor and office space on the second floor. The building is L-shaped in plan, with approximately 3,000 square foot at the first and second floors and a 600 square foot partial basement. The building was constructed in 1915, and drawings dated 1927 are available. The building has a gabled roof with Spanish clay tile.

<u>Identification of Levels:</u> Building levels are identified on existing drawings as the Basement, First Level and Second Level. The building site slopes moderately (< 15°) downward to the northwest. The partial basement is at the south side of the building and shown on the foundation plan.

<u>Foundation system:</u> The building is primarily founded on continuous concrete footings beneath the bearing walls.

<u>Structural system for vertical (gravity) load:</u> The gabled roof is framed by 1x straight sheathing over 2x6 at 16" o.c. and a flat ceiling below framed with 2x4 @ 16" o.c. sheathed with gypsum wall board. The first and second floors are framed with 1x straight sheathing over 2x12 @ 16" o.c. The joists are supported by bearing walls. The exterior walls are diagonally sheathed 2x6 studs @ 16" o.c. with stucco on the exterior and plaster on the interior. The interior walls are 2x4 studs sheathed with plaster or gypsum wall board.

<u>Structural system for lateral forces:</u> The building relies on straight sheathed, unblocked diaphragms at the roof and floors levels. The interior and exterior wood framed walls serve as the shear walls for resisting lateral forces. In 2018, cripple walls below the first floor were sheathed with plywood and anchored to the foundation as the first phase of seismic retrofitting.

<u>Building Code:</u> The building was constructed in 1915, prior to a building code being enacted.

<u>Building Condition:</u> During the 2018 seismic retrofit, wood decay was discovered at the foundation level. All significant decay was removed, and framing was repaired to restore it to its original condition. Minor cracking was observed in stucco walls.

<u>Building response in 1989 Loma Prieta Earthquake:</u> The report titled "Performance of UCSF Buildings During the October 17, 1989 Loma Prieta Earthquake" dated 2019-11-17 by Impell Corporation states "This is a two-story wood framed structure. The areas inspected include the exterior and the interior. No structural damage was observed. Old ceiling and wall cracks inside the living room did not reopen. Some new and old cracks which reopened were

observed on the exterior stucco, primarily in the south wall. Based on the inspection, the building was determined safe for occupancy."

**Brief description of seismic deficiencies and expected seismic performance including structural behavior modes**

Based on the Degenkolb Seismic Evaluation the following deficiencies exist and have not yet been addressed:

- The diagonally sheathed exterior wall shear strength was determined to be deficient in the Tier 1 and Tier 2 evaluations.
- Based on the age of the structure, it is assumed that the walls are not interconnected between floors.
- The straight sheathed diaphragms exceed the maximum allowable spans in the Tier 1 check and were found to be deficient in the Tier 2 check.
- The roof diaphragms do not have adequate connection to wall top plate to transfer load to shear walls as a chord. Chords also do not provide continuity at the reentrant corner.

The following deficiencies were identified in the Degenkolb Seismic Evaluation and addressed in the Interim Seismic Retrofit project designed by Degenkolb Engineers and completed in 2018. This work is listed in the Seismic Evaluation report as Priority/Phase 1 work.

- Cripple walls were sheathed with plywood, walls were interconnected to the first-floor diaphragm, and mudsills were anchored to the concrete foundations.
- Boiler and hot water heater were restrained.
- Hollow clay tile was removed in the basement mechanical room, and walls were framed with wood studs.
- Tall cabinets at the second floor were restrained.
- Spanish clay tile roofing within 3 feet of the edge of the roof around the patio and building entrance was removed and reinstalled with fasteners to the roof framing.

| Structural deficiency | Affects rating? | Structural deficiency | Affects rating? |
|---|---|---|---|
| Lateral system stress check (wall shear, column shear or flexure, or brace axial as applicable) | Y | Openings at shear walls (concrete or masonry) | N |
| Load path | Y | Liquefaction | N |
| Adjacent buildings | N | Slope failure | N |
| Weak story | N | Surface fault rupture | N |
| Soft story | N | Masonry or concrete wall anchorage at flexible diaphragm | N |
| Geometry (vertical irregularities) | N | URM wall height-to-thickness ratio | N |
| Torsion | N | URM parapets or cornices | N |
| Mass – vertical irregularity | N | URM chimney | N |
| Cripple walls | N | Heavy partitions braced by ceilings | N |
| Wood sills (bolting) | N | Appendages | N |
| Diaphragm continuity | Y | | |

**Summary of review of non-structural life-safety concerns, including at exit routes.** [2]

Masonry chimney is present, but it does not extend very far above the roof.

| UCOP non-structural checklist item | Life safety hazard? | UCOP non-structural checklist item | Life safety hazard? |
|---|---|---|---|
| Heavy ceilings, feature or ornamentation above large lecture halls, auditoriums, lobbies or other areas where large numbers of people congregate | None | Unrestrained hazardous materials storage | None |
| Heavy masonry or stone veneer above exit ways and public access areas | None | Masonry chimneys | Present |
| Unbraced masonry parapets, cornices or other ornamentation above exit ways and public access areas | None | Unrestrained natural gas-fueled equipment such as water heaters, boilers, emergency generators, etc. | None |

### Basis of Seismic Performance Level Rating

The limited capacity in the diaphragm with relatively high loading due to the Spanish Clay Tile, lack of shear walls with sufficient capacity in the First and Second Level, and lack of positive connection between lateral force resisting systems on the First and Second Level contribute to the rating of V. The completion of the Interim Seismic Retrofit work which corrected the most serious risk to occupant life-safety, resulted in assignment to Priority Category B.

### Recommendations for further evaluation or retrofit

Complete seismic improvements identified in the Seismic Evaluation Report by Degenkolb Engineers.

### Peer review comments on rating

The structural members of the UCSF Seismic Review Committee (SRC) reviewed the evaluation on October 10, 2019 and are unanimous that the rating is V.

| Additional building data | Entry | Notes |
|---|---|---|
| Latitude | 37.76214 | |
| Longitude | -122.46159 | |
| Are there other structures besides this one under the same CAAN# | No | |
| Number of stories above lowest perimeter grade | 2 | |
| Number of stories (basements) below lowest perimeter grade | 1 | |
| Building occupiable area (OGSF) | 7,210 | |
| Risk Category per 2016 CBC 1604.5 | II | |
| Building structural height, $h_n$ | 25 ft | Structural height defined per ASCE 7-16 Section 11.2 |
| Coefficient for period, $C_t$ | 0.02 | Per ASCE 41-17 equation 4-4 |
| Coefficient for period, $\beta$ | 0.75 | Per ASCE 41-17 equation 4-4 |
| Estimated fundamental period | 0.224 sec | Per ASCE 41-17 equation 4-4 |
| **Site data** | | |
| 975 yr hazard parameters $S_s$, $S_1$ | 1.561, 0.617 | UCSF Group 3 Buildings – Tier 1 Geotechnical Assessment, Egan (2019) |

[2] For these Tier 1 evaluations, we do not visit all spaces of the building; we rely on campus staff to report to us their understanding of if and where non-structural hazards may occur.

| | | |
|---|---|---|
| Site class | C | UCSF Group 3 Buildings – Tier 1 Geotechnical Assessment, Egan (2019) |
| Site class basis | Geotech Parameters | UCSF Group 3 Buildings – Tier 1 Geotechnical Assessment, Egan (2019) |
| Site parameters $F_a$, $F_v$ | 1.200,1.400 | |
| Ground motion parameters $S_{cs}$, $S_{c1}$ | 1.873, 0.863 | |
| $S_a$ at building period | 1.873 | |
| Site $V_{s30}$ | 430 m/s | |
| $V_{s30}$ basis | Geotech Parameters | UCSF Group 3 Buildings – Tier 1 Geotechnical Assessment, Egan (2019) |
| Liquefaction potential/basis | No | UCSF Group 3 Buildings – Tier 1 Geotechnical Assessment, Egan (2019) |
| Landslide potential/basis | No | UCSF Group 3 Buildings – Tier 1 Geotechnical Assessment, Egan (2019) |
| Active fault-rupture hazard identified at site? | No | UCSF Group 3 Buildings – Tier 1 Geotechnical Assessment, Egan (2019) |
| Site-specific ground motion study? | No | |
| **Applicable code** | | |
| Applicable code or approx. date of original construction | Built: 1915 | |
| Applicable code for partial retrofit | 2016 CEBC | |
| Applicable code for full retrofit | None | No full retrofit known |
| **Model building data** | | |
| Model building type North-South | W1 : Wood Light Frames | |
| Model building type East-West | W1: Wood Light Frames | |
| FEMA P-154 score | N/A | Not included here because we performed ASCE 41 Tier 1 evaluation. |
| **Previous ratings** | | |
| Most recent rating | V | 2017 Degnekolb Report |
| Date of most recent rating | 06/09/2017 | See Report in Appendix D |
| 2nd most recent rating | V | 2013 Report |
| Date of 2nd most recent rating | 10/7/2013 | Basis: Qualitative assessment based on drawing reviewed |
| 3rd most recent rating | - | |
| Date of 3rd most recent rating | - | |
| **Appendices** | | |
| ASCE 41 Tier 1 checklist included here? | Yes | Refer to attached checklist file |

# Appendix A

## Additional Images

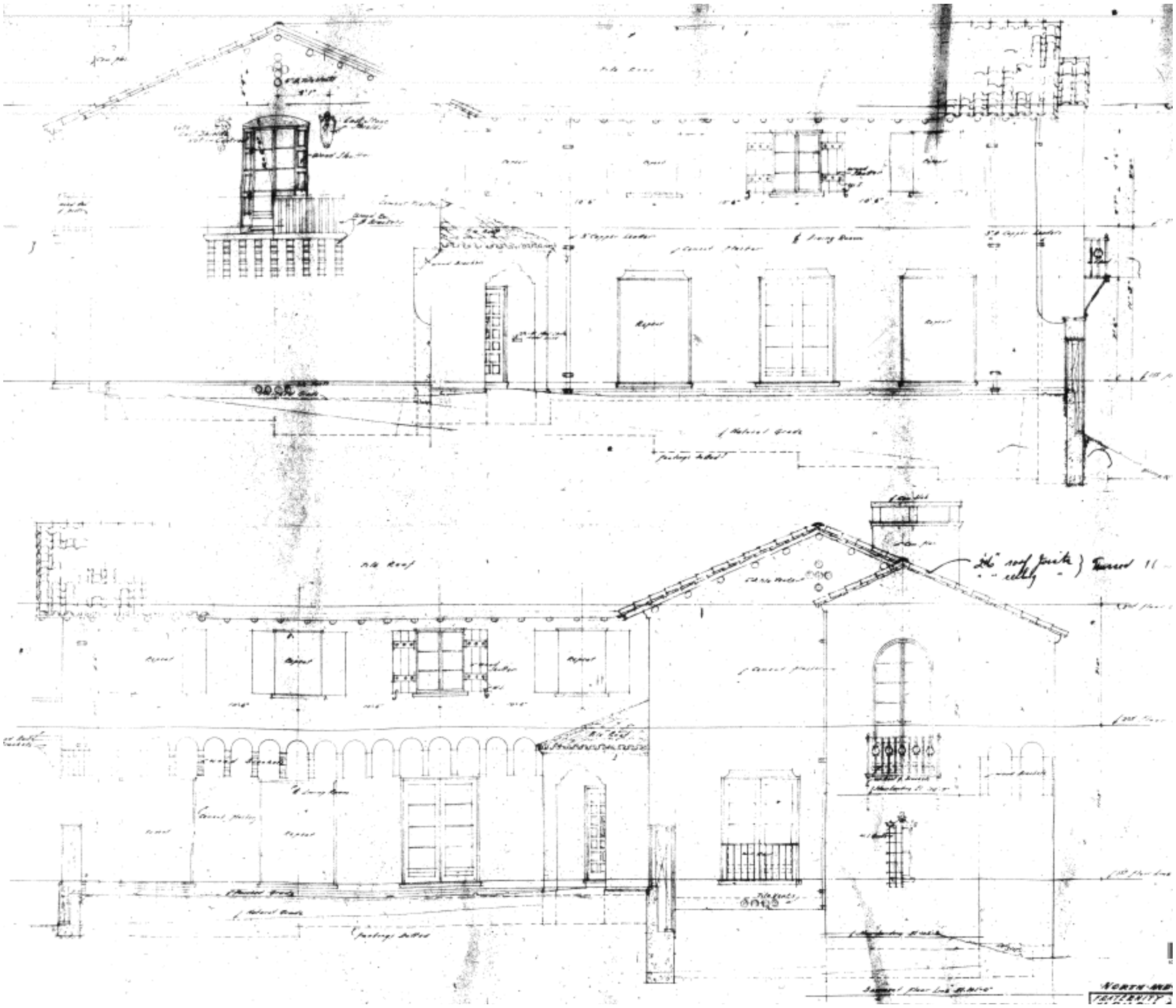

**Figure 1 - 1926 Drawings North (Top) and West (Bottom) Building Elevation**

**Figure 2 - Crawl Space Prior to Interim Seismic Retrofit**

**Figure 3- First Level**

**Figure 4 – Photo Second Level**

**Figure 5- West Building Elevation**

# Appendix B

## ASCE 41- 17 Tier 1 Checklists (Structural)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| UC Campus: | UCSF Parnassus | | | Date: | November 5, 2019 | | |
| Building CAAN: | 2032 | Auxiliary CAAN: | | By Firm: | Estructure | | |
| Building Name: | Alumni House | | | Initials: | *ARK* | Checked: | *MTP* |
| Building Address: | 745 Parnassus Ave, San Francisco, CA 94122 | | | Page: | 1 | of | 3 |

# ASCE 41-17
# Collapse Prevention Basic Configuration Checklist

## LOW SEISMICITY

### BUILDING SYSTEMS - *GENERAL*

| C NC N/A U | Description |
|---|---|
| (•) C ( ) NC ( ) N/A ( ) U | 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)<br><br>**Comments:** |
| ( ) C ( ) NC (•) N/A ( ) U | 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)<br><br>**Comments:** |
| ( ) C ( ) NC (•) N/A ( ) U | 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)<br><br>**Comments:** |

### BUILDING SYSTEMS - *BUILDING CONFIGURATION*

| C NC N/A U | Description |
|---|---|
| (•) C ( ) NC ( ) N/A ( ) U | 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. A2.2.2. Tier 2: Sec. 5.4.2.1)<br><br>**Comments:** |
| (•) C ( ) NC ( ) N/A ( ) U | 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)<br><br>**Comments:** |
| (•) C ( ) NC ( ) N/A ( ) U | 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)<br><br>**Comments:** |

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

| | | | | | | |
|---|---|---|---|---|---|---|
| UC Campus: | UCSF Parnassus | | Date: | November 5, 2019 | | |
| Building CAAN: | 2032 | Auxiliary CAAN: | By Firm: | Estructure | | |
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# ASCE 41-17
# Collapse Prevention Basic Configuration Checklist

| | |
|---|---|
| **C** (selected) **NC** **N/A** **U** | GEOMETRY: 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)<br><br>**Comments:** |
| **C** (selected) **NC** **N/A** **U** | MASS: 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)<br><br>**Comments:** |
| **C** (selected) **NC** **N/A** **U** | TORSION: 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)<br><br>**Comments:** |

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

### GEOLOGIC SITE HAZARD

| | Description |
|---|---|
| **C** (selected) **NC** **N/A** **U** | LIQUEFACTION: 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)<br><br>**Comments:** |
| **C** (selected) **NC** **N/A** **U** | SLOPE FAILURE: 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)<br><br>**Comments:** |
| **C** (selected) **NC** **N/A** **U** | SURFACE FAULT RUPTURE: 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)<br><br>**Comments:** |

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

| UC Campus: | UCSF Parnassus | | | Date: | November 5, 2019 | | |
|---|---|---|---|---|---|---|---|
| Building CAAN: | **2032** | Auxiliary CAAN: | | By Firm: | **Estructure** | | |
| Building Name: | Alumni House | | | Initials: | *ARK* | Checked: | *MTP* |
| Building Address: | 745 Parnassus Ave, San Francisco, CA 94122 | | | Page: | 3 | of | 3 |

# ASCE 41-17
# Collapse Prevention Basic Configuration Checklist

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

### FOUNDATION CONFIGURATION

| | Description |
|---|---|
| **C** (selected) NC N/A U | 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 $0.6S_a$. (Commentary: Sec. A.6.2.1. Tier 2: Sec. 5.4.3.3)<br>**Comments:**<br>Base = 29 feet / Height = 25 feet = 1.16 > 0.6 Sa = 0.6 * 1.87 = 1.12 |
| **C** (selected) NC N/A U | 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)<br>**Comments:**<br>Site Class C |

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

| | | | | | | | |
|---|---|---|---|---|---|---|---|
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| Building CAAN: | 2032 | Auxiliary CAAN: | | By Firm: | Estructure | | |
| Building Name: | Alumni House | | | Initials: | ARK | Checked: | MTP |
| Building Address: | 745 Parnassus Ave, San Francisco, CA 94122 | | | Page: | 1 | of | 4 |

# ASCE 41-17
# Collapse Prevention Structural Checklist For Building Type W1-W1A

## LOW AND MODERATE SEISMICITY

### SEISMIC-FORCE-RESISTING SYSTEM

| | Description |
|---|---|
| C NC N/A U<br>( ) ( ) ( ) (•) | 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)<br><br>**Comments:** |
| C NC N/A U<br>( ) (•) ( ) ( ) | SHEAR STRESS CHECK: The shear stress in the shear walls, calculated using the Quick Check procedure of Section 4.4.3.3, is less than the following values: (Commentary: Sec. A.3.2.7.1. Tier 2: Sec. 5.5.3.1.1)<br><br>Structural panel sheathing — 1,000 lb/ft (14.6 kN/m)<br>Diagonal sheathing — 700 lb/ft (10.2 kN/m)<br>Straight sheathing — 100 lb/ft (1.5 kN/m)<br>All other conditions — 100 lb/ft (1.5 kN/m)<br><br>**Comments:**<br><br>See Degenkolb Seismic Evaluation Report. |
| C NC N/A U<br>(•) ( ) ( ) ( ) | STUCCO (EXTERIOR PLASTER) SHEAR WALLS: Multi-story buildings do not rely on exterior stucco walls as the primary seismic-force-resisting system. (Commentary: Sec. A.3.2.7.2. Tier 2: Sec. 5.5.3.6.1)<br><br>**Comments:** |
| C NC N/A U<br>(•) ( ) ( ) ( ) | GYPSUM WALLBOARD OR PLASTER SHEAR WALLS: Interior plaster or gypsum wallboard is not used for shear walls on buildings more than one story high with the exception of the uppermost level of a multi-story building. (Commentary: Sec. A.3.2.7.3. Tier 2: Sec. 5.5.3.6.1)<br><br>**Comments:** |
| C NC N/A U<br>(•) ( ) ( ) ( ) | NARROW WOOD SHEAR WALLS: Narrow wood shear walls with an aspect ratio greater than 2-to-1 are not used to resist seismic forces. (Commentary: Sec. A.3.2.7.4. Tier 2: Sec. 5.5.3.6.1)<br><br>**Comments:** |

# ASCE 41-17
# Collapse Prevention Structural Checklist For Building Type W1-W1A

| | |
|---|---|
| C NC N/A U<br>Selected: NC | WALLS CONNECTED THROUGH FLOORS: Shear walls have an interconnection between stories to transfer overturning and shear forces through the floor. (Commentary: Sec. A.3.2.7.5. Tier 2: Sec. 5.5.3.6.2)<br><br>**Comments:** |
| C NC N/A U<br>Selected: C | HILLSIDE SITE: For structures that are taller on at least one side by more than one-half story because of a sloping site, all shear walls on the downhill slope have an aspect ratio less than 1-to-1. (Commentary: Sec. A.3.2.7.6. Tier 2: Sec. 5.5.3.6.3)<br><br>**Comments:** |
| C NC N/A U<br>Selected: C | CRIPPLE WALLS: Cripple walls below first-floor-level shear walls are braced to the foundation with wood structural panels. (Commentary: Sec. A.3.2.7.7. Tier 2: Sec. 5.5.3.6.4)<br><br>**Comments:**<br><br>Addressed in interim seismic upgrade. |
| C NC N/A U<br>Selected: N/A | OPENINGS: Walls with openings greater than 80% of the length are braced with wood structural panel shear walls with aspect ratios of not more than 1.5-to-1 or are supported by adjacent construction through positive ties capable of transferring the seismic forces. (Commentary: Sec. A.3.2.7.8. Tier 2: Sec. 5.5.3.6.5)<br><br>**Comments:** |

## CONNECTIONS

| | Description |
|---|---|
| C NC N/A U<br>Selected: N/A | WOOD POSTS: There is a positive connection of wood posts to the foundation. (Commentary: Sec. A.5.3.3. Tier 2: Sec. 5.7.3.3)<br><br>**Comments:** |
| C NC N/A U<br>Selected: C | WOOD SILLS: All wood sills are bolted to the foundation. (Commentary: Sec. A.5.3.4. Tier 2: Sec. 5.7.3.3)<br><br>**Comments:**<br><br>Addressed in interim seismic upgrade. |
| C NC N/A U<br>Selected: N/A | GIRDER-COLUMN CONNECTION: There is a positive connection using plates, connection hardware, or straps between the girder and the column support. (Commentary: Sec. A.5.4.1. Tier 2: Sec. 5.7.4.1)<br><br>**Comments:** |

# ASCE 41-17
# Collapse Prevention Structural Checklist For Building Type W1-W1A

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

### CONNECTIONS

| C NC N/A U | Description |
|---|---|
| C (selected) | WOOD SILL BOLTS: Sill bolts are spaced at 6 ft or less with acceptable edge and end distance provided for wood and concrete. (Commentary: Sec. A.5.3.7. Tier 2: Sec. 5.7.3.3)<br>**Comments:**<br>Addressed in Interim Seismic Upgrade. |

### DIAPHRAGMS

| C NC N/A U | Description |
|---|---|
| C (selected) | 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)<br>**Comments** |
| NC (selected) | ROOF CHORD CONTINUITY: All chord elements are continuous, regardless of changes in roof elevation. (Commentary: Sec. A.4.1.3. Tier 2: Sec. 5.6.1.1)<br>**Comments:** |
| C (selected) | 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)<br>**Comments:** |
| NC (selected) | 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)<br>**Comments:** |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
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| Building Name: | **Alumni House** | | | Initials: | ***ARK*** | Checked: | ***MTP*** |
| Building Address: | **745 Parnassus Ave, San Francisco, CA 94122** | | | Page: | **4** | of | **4** |

# ASCE 41-17
# Collapse Prevention Structural Checklist For Building Type W1-W1A

| | |
|---|---|
| **C NC N/A U** — NC selected | DIAGONALLY SHEATHED AND UNBLOCKED DIAPHRAGMS: All diagonally sheathed or unblocked wood structural panel diaphragms have horizontal spans less than 40 ft (12 m) and have aspect ratios less than or equal to 4-to-1. (Commentary: Sec. A.4.2.3. Tier 2: Sec. 5.6.2)<br><br>**Comments:** |
| **C NC N/A U** — N/A selected | OTHER DIAPHRAGMS: The 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)<br><br>**Comments:** |

# Appendix C

## UCOP Seismic Safety policy Falling Hazards Assessment Summary

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| UC Campus: | **UCSF Parnassus** | | | Date: | **November 5, 2019** | | |
| Building CAAN: | **2032** | Auxiliary CAAN: | | By Firm: | **Estructure** | | |
| Building Name: | **Alumni House** | | | Initials: | ***ARK*** | Checked: | ***MTP*** |
| Building Address: | **745 Parnassus Ave, San Francisco, CA 94122** | | | Page: | **1** | of | **1** |

# UCOP SEISMIC SAFETY POLICY
# Falling Hazard Assessment Summary

| | **Description** |
|---|---|
| **P** ☐ **N/A** ☒ | **Heavy ceilings, features or ornamentation above large lecture halls, auditoriums, lobbies, or other areas where large numbers of people congregate (50 ppl or more)**<br><br>**Comments:** |
| **P** ☐ **N/A** ☒ | **Heavy masonry or stone veneer above exit ways or public access areas**<br><br>**Comments:** Clay tile roof restrained in completed interim seismic upgrade. |
| **P** ☐ **N/A** ☒ | **Unbraced masonry parapets, cornices, or other ornamentation above exit ways or public access areas**<br><br>**Comments:** |
| **P** ☐ **N/A** ☒ | **Unrestrained hazardous material storage**<br><br>**Comments:** |
| **P** ☒ **N/A** ☐ | **Masonry chimneys**<br><br>**Comments:** Masonry chimney is present, but it does not extend very far above the roof. |
| **P** ☐ **N/A** ☒ | **Unrestrained natural gas-fueled equipment such as water heaters, boilers, emergency generators, etc.**<br><br>**Comments:** |
| **P** ☐ **N/A** ☐ | **Other:**<br><br>**Comments:** |
| **P** ☐ **N/A** ☐ | **Other:**<br><br>**Comments:** |
| **P** ☐ **N/A** ☐ | **Other:**<br><br>**Comments:** |

Falling Hazards Risk: *Moderate*

Note: P= Present, N/A = Not Applicable; Falling Hazards Risk: Low, Moderate, or High

# Appendix D

## 2017 Degenkolb Seismic Evaluation Report

Degenkolb

# University of California San Francisco Alumni House Seismic Evaluation.

UCSF Alumni House
Seismic Evaluation

Final

June 9th, 2017
Degenkolb Job Number B7901001.00

Prepared by:


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STRUCTURAL
STATE OF CALIFORNIA

## CONTENTS

## 1.0 INTRODUCTION

This report summarizes the findings of the structural seismic evaluation for the Alumni House on the University of California San Francisco Campus located at 745 Parnassus Avenue. Architectural and structural drawings provided for our review include the following:

- Architectural Plans by Masten and Hurd Architects (UCSF File No 2797)
- Food Service Equipment Drawings by Berlin Food Company (UCSF File No. 2850) dated 01/8/83
- Electrical Plan by Alan Lucas + Associates (UCSF File NO 3122) dated 02/7/85
- Floor Plans by ehdd dated 02/15/13

The Alumni house currently functions as meeting / event spaces on the first floor and contains offices on the second floor. The building is a risk category II building. The structural seismic evaluation was performed per ASCE 41-13 with performance criteria as defined by the UC Seismic Policy.

### 1.1 BUILDING DESCRIPTION

The Alumni House is a two-story wood framed building with a partial basement. The building is approximately 3,000 square feet in plan at each floor and is in L-shaped in plan. The building is, 69feet in the east-west direction and 73 feet in the north-south direction. There is a 600 square foot partial basement in the southwest corner of the building.

The exterior wall of the building is framed with 2x6 at 16" oc. The walls are finished with stucco on the exterior and with 5/8" wood lath and plaster on the interior. Interior walls are typically 2x4 construction with plaster or gypsum wall board. The roof is a gabled roof with Spanish clay tile. The roof is framed with 2x6's at 16" oc and 1x straight sheathing. There is a flat ceiling below framed with 2x4's at 16" oc and sheathed with gypsum wall board. The 2$^{nd}$ and first floors are framed with 2x12's @ 16" oc and sheathed with 1x flooring applied directly over the framing. The flooring runs perpendicular to the framing and as such has been treated as straight sheathing. The building is supported on concrete foundations.

### 1.2 DESIGN STANDARDS

The following building code and designed standards were used for the evaluation report:

- UC Interim Seismic Safety Policy (UC-CR-17-0316)
- 2012 International Building Code.
- ASCE 41-13, Seismic Evaluation and Retrofit of Existing Buildings; American Society of Civil Engineers, 2013.

## 2.0 SITE DESCRIPTION AND SEISMICITY

The Alumni House is located on a mildly sloped site. There is no geotechnical report available for this site. Based on other campus sites it is known that the Site Class varies between C and D. For the purposes of this evaluation we have used site class D.

The building is located in an area of very-high seismicity Table 1 below lists the seismic hazard parameters for ASCE 41-13, as obtained from the USGS website.

| Earthquake | Seismic Hazard Parameter |
|---|---|
| ASCE 41 BSE-2E | $S_{XS,2E} = 1.723$ |
| | $S_{X1,2E} = 1.147$ |
| ASCE 41 BSE-1E | $S_{XS,1E} = 1.036$ |
| | $S_{X1,1E} = 0.60$ |

Table 1: USGS Seismic Parameters

## 3.0 SEISMIC EVALUATION

For the evaluation of the Alumni House we have used ASCE 41-13, *Seismic Evaluation and Retrofit of Existing Buildings*, published by the American Society of Civil Engineers. We have evaluated the building per the UC Seismic Policy and developed a retrofit to achieve a Rating Level-III ("Good" under the previous UC Seismic Policy) by meeting the CBC Occupancy Category I-III.  To provide the CBC Occupancy performance, a building performance objective of Life Safety (LS) under the Basic Safety Earthquake-1E seismic hazard, and of Collapse Prevention (CP) under the Basic Safety Earthquake-2E seismic hazard were each considered in the evaluation of the building.

LS building performance indicates significant building damage may occur and some permanent drifts after the seismic event, but sufficient residual building strength and stiffness is expected to remain to resist partial and/or total collapse. Overall risk of life-threatening injuries due to structural damage is expected to be low. Building re-occupancy may need to be restricted until repairs are completed. The building is excepted to be repairable, but economic considerations may be prohibitive. Nonstructural components may experience damage, but falling hazards are not expected. CP building performance indicates severe overall building damage with large permanent drifts after the seismic event. There will be small residual stiffness and strength to resist additional lateral loads, however, gravity load resisting systems are expected to remain functional. Building should not remain occupied. Nonstructural components are expected to experience extensive damage.

The Basic Performance Objective for the Building are summarized in Table 2 below.

| | Seismic Hazard Level | |
|---|---|---|
| Risk Category | BSE-1E | BSE-2E |
| III | Life Safety (LS) Structural Performance | Collapse Prevention (CP) |
| | Life Safety (LS) Non-Structural Performance | Non-Structural Performance Not Considered |

Table 2: Building 8 Performance Objective

The goal of the ASCE 41 seismic evaluation is to identify the "weak links" in a building's seismic-force-resisting-system (SFRS) that can lead to performance below that of the intended building performance objective. The methodology uses a series of checklists that address possible hazards. Checklists included in the Standard are provided for all the major structural systems, nonstructural elements, and geologic hazards. In the Tier 1 level screening, the evaluating engineer addresses each statement and determines whether it is compliant (C), non-compliant (NC), unknown (U), or non-applicable (NA). Compliant statements identify conditions that are acceptable. Non-compliant and unknown statements identify conditions that are in need of further investigation in a Tier 2 level screening. Further investigation may include specific calculations stipulated in the ASCE 41 Standard, or may require a detailed building analysis.

During the Tier 1 evaluation of the Alumni House, several checklist items were found to be NC or U (Tier 1 Checklist provided in Appendix A). Therefore, a more detailed Tier 2 analysis was performed to further evaluate the performance of the building, and specifically, of the NC and U statements from the Tier 1 checklist. The Tier 2 analysis was performed using the Linear Static Procedure in ASCE 41. The acceptance criteria of the potential building deficiency depends on whether the component is considered force-controlled or deformation-controlled by ASCE-41. Force-controlled components (actions) do not demonstrate substantial post yield capacity, and therefore energy dissipation is not expected for the given components. Force-controlled components are evaluated based upon their lower bound capacities and are expected to remain elastic at the seismic hazard considered. Deformation-controlled components (actions) are expected to demonstrate substantial post-yield capacity and energy dissipation. The demand-capacity usage ratio of these components can therefore be exceeded by a specified m-factor representative of the components' inherent nonlinear deformation capacity. The specified m-factor depends also on the acceptable amount of deformation per the performance objected (i.e. LS or CP). The findings of the Tier 2 Evaluation are detailed in Section 3.2 of this report.

Based on the findings of the evaluation the building will require a significant retrofit or replacement of the building in order to achieve a UC Rating Level III.

### 3.1 AS-BUILT INFORMATION

The existing drawings referenced in Section 1.0 of this report were used for the Tier 1 and Tier 2 evaluations. In addition, the detailing shown on the drawings was verified from visual inspection during two site visits. The drawings are relatively incomplete, but provide architectural layouts and dimensions. No structural drawings were available for the building. All structural information was determined through the site investigation.

## 4.0 STRUCTURAL DEFICIENCIES

Based on the ASCE 41 procedure and analysis described above, the following structural deficiencies have been identified. Due to the deficiencies described below, it is expected the building will currently not meet the intended performance objectives of LS and CP under their respective ground shaking hazard. See appendix B for the supporting structural calculations.

### 4.1 Shear Walls

The shear wall stress check found that the existing diagonally sheathed exterior walls could not resist the required seismic loads and are non-compliant under the Tier-1 evaluation. This was further evaluated under the Tier-2 methodology and still found to be deficient and will require retrofit.

No specific inspection of the wall connections through the floors could be made without destructive investigation. However, based on the age of the building it is easily assumed that no hold downs are present at the walls which is considered non-compliant under the Tier-1 evaluation. This deficiency will require retrofit.

On the West side of the basement level there are cripple walls. The remainder of the building is framed directly to the foundation. The cripple walls are not sheathed in plywood and are non-compliant under the Tier-1 evaluation. This deficiency will require retrofit.

### 4.2 Diaphragms

The roof and floor diaphragms are sheathed with straight sheathing and exceed the maximum allowed spans. As such they are non-compliant under the Tier-1 evaluation. This was further evaluated under the Tier-2 methodology and still found to be deficient and will require retrofit.

The roof does not have adequate connection to the wall plates which would act as the diaphragm cords. There is also no continuity of the diaphragm cords through the reentrant corner of the diaphragm. As such the roof chords are non-compliant under the Tier-1 evaluation. This deficiency will require retrofit.

### 4.3 Connections

The building is framed to wood sills that rests on the perimeter building foundations. However, there were no sill bolts present to transfer shear forces into the building foundation. As such the sill connections are non-compliant under the Tier-1 evaluation. This deficiency will require retrofit.

### 4.4 Non-Structural

The following non-structural items were noted as being non-compliant.

- The boiler and hot water heater were both noted as being unrestrained.
- The mechanical room in the basement was constructed using hollow clay tile.

- Tall filing cabinets at the second floor were noted as being unrestrained.
- The Spanish clay tile roofing is anticipated to not be anchored to the roof sheathing or at least not anchored per current standards. This creates a potential falling hazard.

## 5.0 RECOMMENDATIONS AND PROPOSED STRENGTHENING SCHEMES

We have developed a pre-schematic level retrofit scheme for the building. See Appendix A for the structural strengthening plans.

### 5.1 Shear Walls

A number of walls were selected to be sheathed with plywood to provide significantly increased shear capacity. The majority of the walls selected are exterior walls, but a few interior walls were also required. The exterior walls are expected to be sheathed with plywood on the interior face. This will require removal of the gypsum or plaster, installation of the plywood sheathing, and then installing a gypsum board finish. The interior walls can be sheathed from either side and should be dictated by access and existing finishes.

Some of these interior walls do not extend to a foundation. In these cases, a new framed wall and foundation will be constructed in the crawlspace. These same interior walls also do not extend up to the roof diaphragm. A new framed wall will be constructed in the attic space from the ceiling level up to the pitched roof level.

The exterior wall on the East side of the exterior patio on the second level is offset from the first floor. This makes transferring the overturning forces from the 2$^{nd}$ floor shear walls difficult. To alleviate this the complete length of this wall at the 2$^{nd}$ floor will be sheathed and the window openings will be strapped such that the wall acts as one perforated shear wall instead of individual wall segments. This will significantly reduce or eliminate any uplift forces.

Hold downs will be installed at all new shear walls. In addition, sill nails will be installed at all shear walls to supplement the existing nailing.

The West end of the South wing is framed with a cripple wall at the crawlspace level. This portion of the wall will have sill bolts and clips installed as is done at all the other perimeter foundations, but in addition, plywood sheathing will be installed as well.

### 5.2 Diaphragms

The roof diaphragm will be retrofitted using plywood. This will require the removal of the tile roofing, the installation of blocking, plywood, straps at the reentrant corner, and reinstallation of a new tile roof.

The second floor will be retrofitted using plywood over the top of the existing floor sheathing. It will require the removal of the existing flooring, installation of the plywood between the existing partitions, installation of clip angles along the length of the partitions, and installation of new flooring.

The first floor diaphragm does not require retrofit as it is directly attached to the foundation of the building without cripple walls for the majority of the perimeter. This alleviates the need for any diaphragm retrofit work on the first floor.

### 5.3 Connections

Sill bolts are needed around the perimeter of the building. In addition, clip angles will need to be installed between the sill and rim joist as well as between the rim joist and the first floor diaphragm.

### 5.4 Non-Structural

Seismic bracing of non-structural elements is required per ASCE 41. The majority of the existing non-structural equipment was not anchored and braced based on our limited field review. However, most of the equipment and utilizes are exempt from these requirements due to their size.

The non-structural components identified in our site visits that will require anchorage or bracing are as follows:

Boiler – Located in basement

Hot Water heater – Located in basement

Tall filing cabinets (qty – 8) – Located on 2$^{nd}$ floor

In addition, the walls of the mechanical room in the basement are constructed of hollow clay tile. These wall should be demolished and replaced with wood framed walls and sheathed in gypsum board to meet the necessary fire rating.

Finally, when the Spanish clay tile roof is reinstalled it will need to be wire tied and fastened to the roof sheathing per CBC section 1507.3.6.

### 5.5 Interim Seismic Retrofit

The University has funding to implement a portion of the seismic retrofit work, but not the complete retrofit. Since the retrofit work is voluntary and the work to be implemented will improve the seismic performance this is an acceptable approach. The retrofit should be completed in the following phases.

| Priority / Phase | Retrofit Scope |
|---|---|
| 1 | Basement Level Sill bolting, cripple wall sheathing, and non-structural anchorage at all levels. |
| 2 | Roof sheathing, blocking, and reentrant corner collectors. |
| 3 | Shear wall sheathing and hold downs at all levels and new foundations under added walls. |
| 4 | Diaphragm plywood at the 2$^{nd}$ floor. |

The seismic review panel has also studied the probability of a seismic event and the capacity of the partially retrofitted building and found a statistically acceptable time frame for continued use. This was determined for both the building in its current state and after a partial retrofit. Please refer to their Use Plan for further details.

### 5.6 Building Replacement

We understand there is limited space on campus and this building could be demolished and replaced with a new building. The University would need to consider relocation of the services in the building and what potential future use of the site would serve. See the architectural report for additional discussion on alternate uses.

The existing building has a significant number of issues to retrofit. Each piece of the retrofit has fairly significant operational and logistical hurdles. While the retrofit will achieve the required seismic performance objective a new building would likely provide even better performance.

### 5.7 Cost Estimate Information

The following are estimates for schematic structural elements that may be used in developing the cost estimate. The quantities indicated are schematic in nature and are subsequent to change as the design progresses.

| | |
|---|---|
| Wood: | Doug Fir #2 |
| | Struct-1 Plywood |
| | Connection hardware as indicated |
| Concrete: | 4000 psi Normal Weight UON |
| | Grade 60 Reinforcing – 175 lbs/cy |

## 6.0 ARCHITECTURAL EVALUATION

This architectural evaluation begins with a general discussion of elements impacted by the scope of recommended seismic retrofit work. It then considered the impact of four possible scenarios the University may elect to pursue with the Faculty Alumni House:

- **Scenario 1 – No Historic Designation; No Change of Use**: The building will not be registered as a historic building at the state or national level, and will maintain its existing mixed-use business (B) and assembly (A-3) occupancy following completion of structural retrofit work. This scenario will form the basis of the seismic evaluation scope of work and associated cost estimate.
- **Scenario 2 – Historic Designation; No Change of Use:** The building will be registered as a historic building while maintaining its existing mixed-use business (B) and assembly (A-3) occupancy following completion of structural retrofit work.
- **Scenario 3 – No Historic Designation; Change of Use:** The building will not be registered as a historic building at the state or national level, and will be renovated to accommodate a change of use. Consideration is given to possible alternative uses and the impact they will have on the building.
- **Scenario 4 – Historic Designation; Change of Use** The building will be registered as a historic building at the state or national level, and will be renovated to accommodate a change of use. Consideration is given to possible alternative uses and the impact they will have on the building.

### 6.1 General Architectural Considerations for Seismic Retrofit Scope

The following issues apply universally, regardless of the historic designation/use scenario that is undertaken.

#### Potential for Lead and Asbestos-containing Materials

Based on the building's 1915 vintage, it is likely that the building contains hazardous materials such as lead-based paint or asbestos that require careful handling and abatement. Further testing of finish materials, including paint, ceiling texture, gypsum wall board, tape, and mud, shall be performed by the University to identify areas of concern. Abatement procedures shall be defined and carried out by an appropriately licensed party as part of the project scope of work.

#### Shear Walls

The original interior wall finish is comprised of plaster over wood lath totaling approximately 5/8" in thickness, installed directly over wood studs. Where new plywood shear walls are proposed, we recommend removing all plaster and wood lath along the length of the affected wall plane, and installing continuous plywood sheathing from corner to corner, covered with a continuous plane of 5/8" gypsum wall board. Gypsum wall board shall wrap into the opening at all doors, and windows within new shear walls. Wall board shall be skim coated and artistically textured to closely match any existing plaster walls they abut or are proximate to.

At the time of our site investigations, it was unclear if exterior walls were insulated. We recommend an allowance be carried for new R-19 unfaced batt insulation at all exterior wall cavities that are opened for seismic retrofit work. Similarly, new R-30 batt insulation shall be installed at the

**Roof Diaphragm**

To facilitate the installation of a new plywood roof diaphragm as described in the structural evaluation above, the existing Mission style clay tile roof must be carefully removed and retained for reinstallation. According to the 1976 record specification for the re-roofing of the building, the pan tiles are fastened to the roof with a 12d galvanized nail, and cover tiles are fastened to a 12d nail with a 14ga copper wire. Thus, each tile is assumed to be appropriately pre-drilled and prepared for reinstallation using a twisted wire installation system to provide improved seismic performance. Tiles shall be installed over a new adhered underlayment complying with ASTM D1970, such as Grace Ultra, installed over the new plywood sheathing. New 16 ounce copper flashing shall be installed throughout.

**Floor Diaphragm**

All flooring finishes—primarily carpet—shall be removed at the second floor to allow new plywood to be installed over existing 1x subfloor between existing partitions. New floor finish material shall be applied over the plywood.

The added floor thickness created by the installation of plywood will likely require further undercut of existing doors to allow them to open freely, and tapering of plywood where it abuts the existing top stairway tread to eliminate a potential tripping hazard.

### 6.2 Scenario 1 – No Historic Designation; No Change of Use

Under this baseline scenario, the architectural elements of the project will be governed by the applicable provisions of the 2016 California Existing Building Code, the 2016 California Building Code, and the 2016 California Fire Code.

**Existing Occupancy Classification**

The existing occupancy classification of the Faculty Alumni House is mixed use storage (S-2) at the basement, assembly (A-3) occupancy at the first floor common areas, and business (B) at the remainder of the first floor and all second floor spaces.

Egress occupant loads at each floor are as follows:

| Name of Space | Area (SF) | Load Factor | Occupants |
|---|---|---|---|

| | | | |
|---|---|---|---|
| Basement Storage (S-2) | 761 | 300 gross | 3 |
| First Floor Assembly (A-3) | 1,263 | 5 net* | 253 |
| First Floor Business (B) | 1,922 | 100 gross | 20 |
| Second Floor Business (B) | 3,267 | 100 gross | 33 |
| | | **TOTAL** | **309** |

*A load factor of 5 results in the highest potential occupant load in a standing space only scenario, such as a cocktail reception.

By maintaining the existing use and occupancy classifications, and limiting alterations to the scope of seismic retrofit work, no upgrade requirements are triggered to other portions of the building that are not in conformance with the current building code requirements with the exception of required accessibility upgrades as described below. No Fire Sprinkler or Fire Alarm upgrades are required by the CBC or CFC based on use or occupancy type.

**Accessibility Upgrades**

The scope of the seismic retrofit qualifies as an alteration with an adjusted construction cost exceeding the 2017 valuation threshold of $156,162. As such, the project will require additional scope beyond the seismic retrofit to bring the building into compliance with the accessibility provisions of California Building Code Chapter 11B in the following order of priority:

1) An accessible entrance: An accessible ramp currently leads from the public way to the entry patio from which the front door is accessed. The following upgrades to the front door are required to bring it into compliance with accessibility requirements:

    a. Level Landing: The exterior brick landing at the front door slopes away at greater than 1:48 and does not meet the requirement for a level landing. Brick paving shall be removed and regraded to provide a minimum 60-inch deep level landing at the front door, ramping down to meet the existing grade at a maximum slope of 1:12. No handrails are required at the ramping portion because the rise is less than 6-inches (2016 CBC 11B-405.8).

    b. Operating Force: The existing front door requires greater than 5 lbs operating force. Provide a powered door operator with push plate activation devices at interior and exterior approach in accordance with 2016 CBC 11B-404.2.9.

    c. Maneuvering Clearance & Door Hardware: Strike-side maneuvering clearance and accessible hardware is not present on the existing door. Installation of a powered door operator per item b. above will serve as an alternate means of compliance.

2) Accessible Route to the Altered Area: The second level of the Alumni House is included in the altered area, and based on its Business use and

occupancy, an accessible route to the second floor is required via an elevator or lift. A hardship request is unlikely to be entertained based on the anticipated construction cost, expectation that at least 20% of the anticipated construction cost be spent on accessibility compliance, and the high level of priority given to providing an accessible route.

3) At least one accessible restroom: The single-occupant restroom at the first floor, currently designated as an accessible restroom, may be sufficient to serve the requirements of the facility with a few alterations to remove existing barriers. The most challenging of these alterations is to modify the window and the wall adjacent the toilet to eliminate surface hazards posed by the glass being within 12" of the grab bar, and the protruding trim. Additionally, toilet accessories such as paper towel dispensers and toilet paper dispensers shall be relocated to within accessible reach ranges.

We anticipate that the above listed alterations will meet the code intent for reasonable compliance efforts, however, we recommend the following alterations be considered as the budget allows to improve the level of accessibility:

4) Renovation of one additional single-occupancy restroom at the second floor to provide equitable distribution of accessible restroom facilities.

5) Replacement of all interior door hardware with levers

6) Alteration of the primary stair railing to comply with hand and guard rail requirements.

### 6.3 Scenario 2 – Historic Designation; No Change of Use

In this scenario, the architectural elements of the project will be governed by the applicable provisions of the 2016 California Historical Building Code, the 2016 Existing Building Code, the 2016 California Building Code, and the 2016 California Fire Code.

#### Historic Designation Impact

The benefits of historic designation are limited under this scenario. There are no perceived benefits in terms of fire sprinkler, fire alarm, or accessibility requirements. Certain non-compliant elements of the existing building, such as stair rails may be grandfathered in. Other benefits of historic designation such as tax incentives do not apply to The Regents of the University of California.

### 6.4 Scenario 3 – No Historic Designation; Change of Use

In this scenario, the architectural elements of the project will be primarily governed by the applicable provisions of the 2016 California Existing Building Code, the 2016 California Building Code, and the 2016 California Fire Code.

**Alternate Use 1: Transient Lodging (R-1)**

The original use and occupancy of the Alumni House was as a dormitory with three sleeping porches on the second level, thirteen study rooms, and two shared wash rooms. The first level included a living room, dining room, kitchen, guest room, card room, and reception hall. Renovating the Alumni House to provide transient lodging to visiting scholars and guests would represent a return to the historic use of the house.

**Renovation Scope**

Renovating the Alumni House to provide transient housing will require significant investment in new facilities at both the first and second levels. Renovations would be required to meet the current requirements for R-1 occupancies, which include:

- Installation of a sprinkler system in accordance with NFPA 13 and the California Fire Code
- Installation of a compliant fire alarm system
- Provision of restroom facilities at the second floor to serve lodging rooms. To remain attractive relative to other alternative lodging options, we assume rooms will be reconfigured to reflect a hotel-style layout with a single-occupancy restroom serving each lodging room.
- Provision of an accessible/mobility equipped lodging room. If located at the first level of the building, and served by an accessible restroom, the second floor need not be made accessible (2016 CBC 11B-203.8).

Additional consideration should be given to providing individually controlled fan coil units at each lodging room throughout the second level for thermal comfort.

**Alternate Use 2: Child Care Center (I-4)**

Another possible use of the Alumni House is as a Child Care Center serving the Parnassus Campus and the surrounding community. The first floor common spaces could be utilized for group play

**Renovation Scope**

Similar to the R-1 renovation scope, a change in use to I-4 would trigger the following facility upgrades:

- Installation of a sprinkler system in accordance with NFPA 13 and the California Fire Code
- Installation of a fire alarm system

Additional upgrades may be necessary depending on the desired use of the second floor level. Were the second floor to be used as office space serving the administrative functions of this child care center as well as others elsewhere on campus, the second floor would need to be made accessible either by elevator or lift.

### 6.5 Scenario 4 – Historic Designation; Change of Use

In this scenario, the architectural elements of the project will be governed by the applicable provisions of the 2016 California Historical Building Code, the 2016 Existing Building Code, the 2016 California Building Code, and the 2016 California Fire Code.

#### Historic Designation Impact

Among the two alternative uses discussed above, the benefit of historical designation is most beneficial to a transient lodging scenario which fall under Section 8-303 of the 2016 California Historical Code for Residential Occupancies. This section provides exemptions for room sizes, window sizes, and fire escape requirements.

# 7.0 COST ESTIMATE

# UCSF - Alumni House

San Francisco, CA

Rough Order of Magnitude (Rev 1)
May 23, 2017
Cumming Project No. 17-00372.00

Prepared for Degenkolb

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## SUMMARY

| Element | Area | Cost / SF | Total |
|---|---|---|---|
| **Seismic Solution & Scenario-1** | **7,133** | **$172.16** | **$1,228,020** |
| Priority / Phase 1 - Basement & Associated Work | 7,133 | $12.40 | $88,483 |
| Priority / Phase 2 - Roof & Associated Work | 7,133 | $36.39 | $259,575 |
| Priority / Phase 3 - Walls & Associated Work | 7,133 | $66.07 | $471,290 |
| Priority / Phase 4 - Floors & Associated Work | 7,133 | $17.05 | $121,646 |
| ADA Compliance - Scope | 7,133 | $40.24 | $287,025 |
| **Scenario 2** | | | |
| Total estimated construction cost assumed the same as Scenario 1 - no information for alternate measure. | | | |
| **Scenario 3.1** | | | |
| Scenario 3.1 - Additional Scope to Scenario 1 | 2,670 | $483.11 | $1,289,901 |
| Scenario 1 - Associated Scope | 7,133 | $172.16 | $1,228,020 |
| Credit for Scenario 1 - Unassociated Scope | | | -$140,000 |
| **Seismic Solution & Scenario 3.1 - Full Scope** | **7,133** | **$333.37** | **$2,377,920** |
| **Scenario 3.2** | | | |
| Renovation for Child Care Facility | 7,133 | $300.00 | $2,139,900 |
| Scenario 1 - Associated Scope | 7,133 | $172.16 | $1,228,020 |
| Credit for Scenario 1 - Unassociated Scope | | | -$140,000 |
| Fire Sprinklers to Entire Building | 7,133 | $11.00 | $78,463 |
| Fire Alarm to Entire Building - *Included Below* | | | *Included* |
| **Seismic Solution & Scenario 3.2 - Full Scope** | **7,133** | **$463.53** | **$3,306,383** |
| **Scenario 4** | | | |
| Total estimated construction cost assumed the same as Scenario 1 - no information for alternate measure. | | | |
| **Demolition** | **9,603** | **$30.85** | **$296,230** |

## SUMMARY MATRIX

| | | Seismic Solution & Scenario-1 7,133 SF | | Scenario 3.1 - Additional Scope to Scenario 1 2,670 SF | | Demolition 9,603 SF | |
|---|---|---|---|---|---|---|---|
| **Element** | | **Total** | **Cost/SF** | **Total** | **Cost/SF** | **Total** | **Cost/SF** |
| 01 General Requirements | | | | | | | |
| 02 Existing Conditions | | $73,109 | $10.25 | $36,700 | $13.75 | $209,220 | $21.79 |
| 03 Concrete | | $23,852 | $3.34 | | | | |
| 04 Masonry | | $9,250 | $1.30 | | | | |
| 05 Metals | | $161,899 | $22.70 | | | | |
| 06 Wood, Plastics, And Composites | | $124,393 | $17.44 | $5,340 | $2.00 | | |
| 07 Thermal And Moisture Protection | | $120,787 | $16.93 | | | | |
| 08 Openings | | $61,750 | $8.66 | $58,800 | $22.02 | | |
| 09 Finishes | | $139,283 | $19.53 | $192,240 | $72.00 | | |
| 10 Specialties | | $2,381 | $0.33 | $125,000 | $46.82 | | |
| 11 Equipment | | | | | | | |
| 12 Furnishings | | | | $40,050 | $15.00 | | |
| 14 Conveying Systems | | $80,000 | $11.22 | | | | |
| 21 Fire Suppression | | | | $57,064 | $21.37 | | |
| 22 Plumbing | | $9,375 | $1.31 | $112,180 | $42.01 | | |
| 23 HVAC | | | | $120,150 | $45.00 | | |
| 26 Electrical | | $35,665 | $5.00 | $133,500 | $50.00 | | |
| 31 Earthwork | | $5,615 | $0.79 | | | | |
| 32 Exterior Improvements | | $19,960 | $2.80 | | | | |
| 33 Utilities | | | | $30,000 | $11.24 | | |
| Subtotal Cost | | $867,319 | $121.59 | $911,024 | $341.21 | $209,220 | $21.79 |
| General Conditions | 12.0% | $104,078 | $14.59 | $109,323 | $40.94 | $25,106 | $2.61 |
| Bonds & Insurance | 2.0% | $17,346 | $2.43 | $18,220 | $6.82 | $4,184 | $0.44 |
| Contractor's Fee | 8.0% | $79,099 | $11.09 | $83,085 | $31.12 | $19,081 | $1.99 |
| Design Contingency | 15.0% | $160,176 | $22.46 | $168,248 | $63.01 | $38,639 | $4.02 |
| Escalation: Pending Schedule | | | | | | | |
| **Total Estimated Construction Cost** | | **$1,228,020** | **$172.16** | **$1,289,901** | **$483.11** | **$296,230** | **$30.85** |

# Seismic Solution & Scenario-1

## SUMMARY - SEISMIC SOLUTION & SCENARIO-1

| Element | | | Total | Cost / SF |
|---|---|---|---|---|
| 01 | General Requirements | | | |
| 02 | Existing Conditions | | $73,109 | $10.25 |
| 03 | Concrete | | $23,852 | $3.34 |
| 04 | Masonry | | $9,250 | $1.30 |
| 05 | Metals | | $161,899 | $22.70 |
| 06 | Wood, Plastics, And Composites | | $124,393 | $17.44 |
| 07 | Thermal And Moisture Protection | | $120,787 | $16.93 |
| 08 | Openings | | $61,750 | $8.66 |
| 09 | Finishes | | $139,283 | $19.53 |
| 10 | Specialties | | $2,381 | $0.33 |
| 11 | Equipment | | | |
| 12 | Furnishings | | | |
| 13 | Special Construction | | | |
| 14 | Conveying Systems | | $80,000 | $11.22 |
| 21 | Fire Suppression | | | |
| 22 | Plumbing | | $9,375 | $1.31 |
| 23 | HVAC | | | |
| 25 | Integrated Automation | | | |
| 26 | Electrical | | $35,665 | $5.00 |
| 27 | Communications | | | |
| 28 | Electrical Safety And Security | | | |
| 31 | Earthwork | | $5,615 | $0.79 |
| 32 | Exterior Improvements | | $19,960 | $2.80 |
| 33 | Utilities | | | |
| 34 | Transportation | | | |
| 40 | Process Integration | | | |
| 41 | Material Processing And Handling Equipment | | | |
| 44 | Pollution Control Equipment | | | |
| 48 | Electrical Power Generation | | | |
| | Subtotal | | $867,319 | $121.59 |
| | General Conditions | 12.00% | $104,078 | $14.59 |
| | Subtotal | | $971,397 | $136.18 |
| | Bonds & Insurance | 2.00% | $17,346 | $2.43 |
| | Subtotal | | $988,744 | $138.62 |
| | Contractor's Fee | 8.00% | $79,099 | $11.09 |
| | Subtotal | | $1,067,843 | $149.70 |
| | Design Contingency | 15.00% | $160,176 | $22.46 |
| | Subtotal | | $1,228,020 | $172.16 |
| | Escalation: Pending Schedule | | | |
| | **TOTAL ESTIMATED CONSTRUCTION COST** | | **$1,228,020** | **$172.16** |

Total Area: 7,133 SF

## DETAIL ELEMENTS - SEISMIC SOLUTION & SCENARIO-1

| Element | Quantity | Unit | | Total |
|---|---|---|---|---|
| **01 General Requirements** | | | | |
| **Total - General Requirements** | | | | |
| **02 Existing Conditions** | | | | |
| Facility Remediation | | | | |
| Lead & Asbestos Remediation | | | | |
| HAZMAT abatement, allow | 7,133 | sf | $9.38 | $66,872 |
| Demolition | | | | |
| Paving Removal | | | | |
| Remove & set aside existing clay pavers | 1,996 | sf | $3.13 | $6,238 |
| **Total - Existing Conditions** | | | | **$73,109** |
| **03 Concrete** | | | | |
| Concrete Reinforcing | | | | |
| Foundation reinforcing | 2,275 | lbs | $3.13 | $7,109 |
| Cast-In-Place Concrete | | | | |
| Excavation, by hand, including offhaul | 13 | cy | $562.50 | $7,313 |
| Concrete Layout | 174 | sf | $7.50 | $1,305 |
| Structural Concrete | | | | |
| Concrete, continuous footings, 4000 psi | 13 | cy | $625.00 | $8,125 |
| **Total - Concrete** | | | | **$23,852** |
| **04 Masonry** | | | | |
| Clay Masonry Units | | | | |
| Remove existing clay masonry units | 148 | sf | $62.50 | $9,250 |
| **Total - Masonry** | | | | **$9,250** |
| **05 Metals** | | | | |
| Miscellaneous Shoring of Existing Structure | 1 | ls | $6,250.00 | $6,250 |
| Interior Partitions | | | | |
| Metal studs, 6", 18 Ga., at 16" o.c. | 146 | sf | $18.75 | $2,738 |
| Metal Railings | | | | |
| Remove existing uncompliant guardrails & handrails | 62 | lf | $12.50 | $775 |
| Guardrails | 22 | lf | $312.50 | $6,875 |
| Handrails | 40 | lf | $143.75 | $5,750 |
| Metal Premiums | | | | |
| Hold down anchor bolts to underside concrete footing & Simpsons HD9 at walls | | | | |

## DETAIL ELEMENTS - SEISMIC SOLUTION & SCENARIO-1

| Element | Quantity | Unit | | Total |
|---|---|---|---|---|
| Foundation work - excavation, hold downs, etc. | 47 | loc | $1,250.00 | $58,750 |
| Tie-down between floors | 70 | loc | $500.00 | $35,000 |
| Tie-down between at roof | 21 | loc | $500.00 | $10,500 |
| Miscellaneous Metals | | | | |
| 16 GA metal angle, nailed | 898 | lf | $8.75 | $7,858 |
| 1/4" Bent plate connection to sill w/ (6) No 14 4" wood screws | 89 | ea | $56.25 | $5,006 |
| 5/8" Dia epoxy anchors, complete | 89 | ea | $81.25 | $7,231 |
| Miscellaneous clip angles, sill bolts, etc., allow | 7,133 | gsf | $1.25 | $8,916 |
| Anchorage / Bracing | | | | |
| Anchorage / bracing of existing boiler | 1 | ea | $625.00 | $625 |
| Anchorage / bracing of existing hot water heater | 1 | ea | $625.00 | $625 |
| Anchorage / bracing of existing filing cabinets | 8 | ea | $625.00 | $5,000 |
| **Total - Metals** | | | | **$161,899** |

### 06 Wood, Plastics, And Composites

| Element | Quantity | Unit | | Total |
|---|---|---|---|---|
| Rough Carpentry | | | | |
| Wall Framing, Wood Studs | | | | |
| Wood studs, 2" x 6" at 16" o.c., partitions | 693 | sf | $11.25 | $7,796 |
| Sill nailing w/ 1/4' wood screws at 4" o.c | 251 | lf | $8.75 | $2,196 |
| Sill nailing w/ A35 clips at 16" o.c & wood screws at 4" o.c | 263 | lf | $22.50 | $5,918 |
| Roof Framing | | | | |
| Reentrant corner collectors, allow | 1 | ls | $3,750.00 | $3,750 |
| Roof blocking w/ A35 clips at 16" o.c | 3,053 | sf | $2.50 | $7,633 |
| Plywood Sheathing | | | | |
| Shear walls, 1/2", cripple walls | 113 | sf | $15.00 | $1,695 |
| Shear walls, 1/2", interior of exterior walls | 2,645 | sf | $6.25 | $16,531 |
| Interior partitions, 1/2" | 3,414 | sf | $6.25 | $21,338 |
| Roof sheathing, 1/2" | 3,053 | sf | $6.25 | $19,081 |
| Gable end roof sheathing, 1/2" | 153 | sf | $6.25 | $956 |
| Plywood floor sheathing, 1/2" | 2,635 | sf | $7.50 | $19,763 |
| Tapering plywood sheathing at stair edge | 15 | lf | $18.75 | $281 |
| Roof underlayment | 3,053 | sf | $3.75 | $11,449 |
| Miscellaneous Rough Carpentry: | | | | |
| Miscellaneous blocking/strapping and backing | 12,013 | sf | $0.25 | $3,003 |
| Miscellaneous rough hardware | 12,013 | sf | $0.25 | $3,003 |
| **Total - Wood, Plastics, And Composites** | | | | **$124,393** |

### 07 Thermal And Moisture Protection

| Element | Quantity | Unit | | Total |
|---|---|---|---|---|
| Exterior Wall Insulation | | | | |
| R-19 batt insulation, exterior walls and returns, semi-rigid incl. foil backing | 113 | sf | $2.50 | $283 |
| R-19 batt insulation, exterior walls and returns, semi-rigid incl. foil backing | 2,645 | sf | $2.50 | $6,613 |
| Interior Wall Insulation | | | | |
| Fiberglass batt insulation, unbacked | 1,785 | sf | $2.50 | $4,463 |
| Mineral wool insulation, unbacked | 146 | sf | $3.44 | $502 |

## DETAIL ELEMENTS - SEISMIC SOLUTION & SCENARIO-1

| Element | Quantity | Unit | | Total |
|---|---|---|---|---|
| Roof Insulation | | | | |
| R-30 batt roof insulation to U/S of structure | 3,053 | sf | $3.13 | $9,541 |
| Tile Roofing | | | | |
| Carefully remove existing Spanish clay tile roofing | 3,053 | sf | $6.25 | $19,081 |
| Carefully reinstall existing Spanish clay tile roofing, w/ wire ties, fastened | 3,053 | sf | $12.50 | $38,163 |
| Flashing/Counterflashing | | | | |
| Copper flashing, 16 oz. | 277 | sf | $68.75 | $19,064 |
| Roof Accessories | | | | |
| Aluminum gutters | 241 | lf | $37.50 | $9,038 |
| Aluminum downspouts | 130 | lf | $37.50 | $4,875 |
| Miscellaneous anchors and supports | 3,053 | sf | $1.25 | $3,816 |
| Miscellaneous | | | | |
| Caulking allowance | 7,133 | gfa | $0.75 | $5,350 |
| **Total - Thermal And Moisture Protection** | | | | **$120,787** |

### 08 Openings

| Element | Quantity | Unit | | Total |
|---|---|---|---|---|
| Exterior Doors | | | | |
| Premiums | | | | |
| Automatic door opener w/ push plate activation at int & ext. | 1 | ea | $10,000.00 | $10,000 |
| Interior Doors | | | | |
| Adjust existing door floor clearance | 33 | ea | $437.50 | $14,438 |
| Hardware | | | | |
| Replace existing hardware with new ADA compliant opening levers | 45 | ea | $562.50 | $25,313 |
| Premiums | | | | |
| Electronic hold open, per leaf | 1 | ea | $1,000.00 | $1,000 |
| Exterior Glazing | | | | |
| Strapping / framing of exisitng windows at 2nd level east façade | 4 | ea | $2,125.00 | $8,500 |
| Modifications to existing window at 1st level ADA bathroom | 1 | ls | $2,500.00 | $2,500 |
| **Total - Openings** | | | | **$61,750** |

### 09 Finishes

| Element | Quantity | Unit | | Total |
|---|---|---|---|---|
| Exterior Walls And Parapets | | | | |
| Gypsum Board to Interior of Exterior | | | | |
| Remove existing interior of exterior gypsum board & wood lath | 2,645 | sf | $2.50 | $6,613 |
| Interior of exterior, 5/8" thick gypsum board X, artistically textured finish | 2,645 | sf | $8.13 | $21,491 |
| Interior of exterior, 5/8" thick gypsum board X, finished | 113 | sf | $6.25 | $706 |
| Interior of exterior, 5/8" thick gypsum board X, finished, returns, jambs | 142 | sf | $12.50 | $1,771 |
| Interior Partitions | | | | |
| Gypsum Board | | | | |
| Remove existing gypsum board & wood lath | 2,185 | sf | $3.75 | $8,194 |
| Gypsum board, 5/8" thick, artistically textured finish, type X | 2,185 | sf | $8.13 | $17,753 |
| Gypsum board, 5/8" thick, finished, type X | 1,674 | sf | $6.25 | $10,463 |
| Tiling | | | | |

## DETAIL ELEMENTS - SEISMIC SOLUTION & SCENARIO-1

| Element | Quantity | Unit | | Total |
|---|---|---|---|---|
| Floors | | | | |
| Remove existing ceramic floor tiles | 185 | sf | $3.75 | $694 |
| Ceramic tile, floor | 185 | sf | $28.75 | $5,319 |
| Base | | | | |
| Remove existing tile base | 112 | lf | $3.13 | $350 |
| Ceramic tile, base | 112 | lf | $31.25 | $3,500 |
| Walls | | | | |
| Ceramic tile, walls | 70 | sf | $31.25 | $2,188 |
| Flooring | | | | |
| Floors | | | | |
| Remove existing floor & base finishes | 2,450 | sf | $2.50 | $6,125 |
| Allow for prep | 2,635 | sf | $1.25 | $3,294 |
| Carpet tile | 2,450 | sf | $7.50 | $18,375 |
| Base | | | | |
| Rubber base | 1,050 | lf | $7.50 | $7,875 |
| Painting and Coating | | | | |
| Walls | | | | |
| Paint walls | 4,830 | sf | $2.50 | $12,075 |
| Miscellaneous Finishes | | | | |
| Alterations to new ADA 2nd level bathroom | 1 | ls | $12,500.00 | $12,500 |
| **Total - Finishes** | | | | **$139,283** |

**10 Specialties**

| Element | Quantity | Unit | | Total |
|---|---|---|---|---|
| Interior Specialties | | | | |
| Toilet / Restroom Specialties | | | | |
| Remove, relocate and reinstall paper towel dispenser combo unit | 1 | ea | $156.25 | $156 |
| Remove, relocate and reinstall seat cover dispenser | 1 | ea | $156.25 | $156 |
| Remove, relocate and reinstall soap dispenser | 1 | ea | $156.25 | $156 |
| Remove, relocate and reinstall toilet paper dispenser | 1 | ea | $156.25 | $156 |
| Grab bars | 3 | ea | $281.25 | $844 |
| Paper towel dispenser combo unit | 1 | ea | $375.00 | $375 |
| Seat cover dispenser | 1 | ea | $250.00 | $250 |
| Soap dispenser | 1 | ea | $156.25 | $156 |
| Toilet paper dispenser | 1 | ea | $131.25 | $131 |
| **Total - Specialties** | | | | **$2,381** |

**14 Conveying Systems**

| Element | Quantity | Unit | | Total |
|---|---|---|---|---|
| Wheelchair Lifts | | | | |
| Vertical lift, Garaventa Genesis, allow | 1 | ls | $80,000.00 | $80,000 |
| **Total - Conveying Systems** | | | | **$80,000** |

## DETAIL ELEMENTS - SEISMIC SOLUTION & SCENARIO-1

| Element | Quantity | Unit | | Total |
|---|---|---|---|---|
| **21 Fire Suppression** | | | | *No Work Anticipated* |
| **Total - Fire Suppression** | | | | |
| **22 Plumbing** | | | | |
| Allowance for Work at Existing Restroom | 1 | ls | $9,375.00 | $9,375 |
| **Total - Plumbing** | | | | **$9,375** |
| **23 HVAC** | | | | *No Work Anticipated* |
| **Total - HVAC** | | | | |
| **25 Integrated Automation** | | | | *No Work Anticipated* |
| **Total - Integrated Automation** | | | | |
| **26 Electrical** | | | | |
| Allowance for Incidental Scope Associated with Upgrades | 7,133 | gsf | $5.00 | $35,665 |
| **Total - Electrical** | | | | **$35,665** |
| **27 Communications** | | | | *No Work Anticipated* |
| **Total - Communications** | | | | |
| **28 Electrical Safety And Security** | | | | *No Work Anticipated* |
| **Total - Electrical Safety And Security** | | | | |
| **31 Earthwork** | | | | |
| Grading, Cut and Fill | | | | |

## DETAIL ELEMENTS - SEISMIC SOLUTION & SCENARIO-1

| Element | Quantity | Unit | | Total |
|---|---|---|---|---|
| Fine grading | 1,996 | sf | $2.50 | $4,990 |
| Haul excess | 1 | ls | $625.00 | $625 |
| **Total - Earthwork** | | | | **$5,615** |
| **32 Exterior Improvements** | | | | |
| Paving | | | | |
| Relay existing clay pavers, incl sand layer | 1,996 | sf | $10.00 | $19,960 |
| **Total - Exterior Improvements** | | | | **$19,960** |

# Scenario 3.1 - Additional Scope to Scenario 1

## SUMMARY - SCENARIO 3.1 - ADDITIONAL SCOPE TO SCENARIO 1

| Element | | | Total | Cost / SF |
|---|---|---|---|---|
| 01 | General Requirements | | | |
| 02 | Existing Conditions | | $36,700 | $13.75 |
| 03 | Concrete | | | |
| 04 | Masonry | | | |
| 05 | Metals | | | |
| 06 | Wood, Plastics, And Composites | | $5,340 | $2.00 |
| 07 | Thermal And Moisture Protection | | | |
| 08 | Openings | | $58,800 | $22.02 |
| 09 | Finishes | | $192,240 | $72.00 |
| 10 | Specialties | | $125,000 | $46.82 |
| 11 | Equipment | | | |
| 12 | Furnishings | | $40,050 | $15.00 |
| 13 | Special Construction | | | |
| 14 | Conveying Systems | | | |
| 21 | Fire Suppression | | $57,064 | $21.37 |
| 22 | Plumbing | | $112,180 | $42.01 |
| 23 | HVAC | | $120,150 | $45.00 |
| 25 | Integrated Automation | | | |
| 26 | Electrical | | $133,500 | $50.00 |
| 27 | Communications | | | |
| 28 | Electrical Safety And Security | | | |
| 31 | Earthwork | | | |
| 32 | Exterior Improvements | | | |
| 33 | Utilities | | $30,000 | $11.24 |
| 34 | Transportation | | | |
| 40 | Process Integration | | | |
| 41 | Material Processing And Handling Equipment | | | |
| 44 | Pollution Control Equipment | | | |
| 48 | Electrical Power Generation | | | |
| | Subtotal | | $911,024 | $341.21 |
| | General Conditions | 12.00% | $109,323 | $40.94 |
| | Subtotal | | $1,020,347 | $382.15 |
| | Bonds & Insurance | 2.00% | $18,220 | $6.82 |
| | Subtotal | | $1,038,567 | $388.98 |
| | Contractor's Fee | 8.00% | $83,085 | $31.12 |
| | Subtotal | | $1,121,653 | $420.09 |
| | Design Contingency | 15.00% | $168,248 | $63.01 |
| | Subtotal | | $1,289,901 | $483.11 |
| | Escalation: Pending Schedule | | | |
| | **TOTAL ESTIMATED CONSTRUCTION COST** | | **$1,289,901** | **$483.11** |

Total Area: 2,670 SF

## DETAIL ELEMENTS - SCENARIO 3.1 - ADDITIONAL SCOPE TO SCENARIO 1

| Element | Quantity | Unit | Unit Cost | Total |
|---|---|---|---|---|
| **02 Existing Conditions** | | | | |
| Demolition | | | | |
| Structure Demolition | | | | |
| Demoliton and removal of internal partitions, floor and ceiling finishes | 2,670 | sf | $10.00 | $26,700 |
| Demolition and removal of existing kitchen, allow | 1 | ls | $10,000.00 | $10,000 |
| **Total - Existing Conditions** | | | | **$36,700** |
| **03 Concrete** | | | | *No Work Anticipated* |
| **Total - Concrete** | | | | |
| **04 Masonry** | | | | *No Work Anticipated* |
| **Total - Masonry** | | | | |
| **05 Metals** | | | | *No Work Anticipated* |
| **Total - Metals** | | | | |
| **06 Wood, Plastics, And Composites** | | | | |
| Miscellaneous alterations / infill of existing openings / new openings | 2,670 | gsf | $2.00 | $5,340 |
| **Total - Wood, Plastics, And Composites** | | | | **$5,340** |
| **07 Thermal And Moisture Protection** | | | | *No Work Anticipated* |
| **Total - Thermal And Moisture Protection** | | | | |
| **08 Openings** | | | | |
| Interior Doors | | | | |
| SC door in HM frame, including hardware & finish, single | 14 | ea | $2,400.00 | $33,600 |
| SC door in HM frame, including hardware & finish, single, restroom | 14 | ea | $1,800.00 | $25,200 |

## DETAIL ELEMENTS - SCENARIO 3.1 - ADDITIONAL SCOPE TO SCENARIO 1

| Element | Quantity | Unit | Unit Cost | Total |
|---|---|---|---|---|
| **Total - Openings** | | | | **$58,800** |
| **09 Finishes** | | | | |
| Interior Partitions | 2,670 | gsf | $35.00 | $93,450 |
| Tiling | | | | |
| Floors | | | | |
| Bathrooms | 2,670 | gsf | $5.00 | $13,350 |
| Walls | | | | |
| Bathrooms | 2,670 | gsf | $15.00 | $40,050 |
| Flooring | | | | |
| Floor finishes & bases | 2,670 | gsf | $6.00 | $16,020 |
| Ceilings | 2,670 | gsf | $8.00 | $21,360 |
| Painting and Coating | 2,670 | gsf | $3.00 | $8,010 |
| **Total - Finishes** | | | | **$192,240** |
| **10 Specialties** | | | | |
| Interior Specialties | | | | |
| Bedroom & bathroom specialties, allow | 14 | ea | $2,500.00 | $35,000 |
| Kitchens | | | | |
| Remodel of existing kitchen, allow | 1 | ls | $90,000.00 | $90,000 |
| **Total - Specialties** | | | | **$125,000** |
| **11 Equipment** | | | | *No Work Anticipated* |
| **Total - Equipment** | | | | |
| **12 Furnishings** | | | | |
| Allowance | 2,670 | gsf | $15.00 | $40,050 |
| **Total - Furnishings** | | | | **$40,050** |
| **21 Fire Suppression** | | | | |
| Fire protection systems | 7,133 | sf | $8.00 | $57,064 |
| **Total - Fire Suppression** | | | | **$57,064** |

## DETAIL ELEMENTS - SCENARIO 3.1 - ADDITIONAL SCOPE TO SCENARIO 1

| Element | Quantity | Unit | Unit Cost | Total |
|---|---|---|---|---|
| **22 Plumbing** | | | | |
| Plumbing Fixtures | | | | |
| WC, allow 1 per bathroom indicated | 14 | ea | $2,250.00 | $31,500 |
| Lavatory, allow 1 per bathroom indicated | 14 | ea | $2,250.00 | $31,500 |
| Shower, allow 1 per bathroom indicated | 14 | ea | $2,750.00 | $38,500 |
| General Plumbing | 2,670 | sf | $4.00 | $10,680 |
| Natural Gas, Roof Drainage, Etc. | | | | *Excluded* |
| **Total - Plumbing** | | | | **$112,180** |
| **23 HVAC** | | | | |
| HVAC | 2,670 | sf | $45.00 | $120,150 |
| **Total - HVAC** | | | | **$120,150** |
| **26 Electrical** | | | | |
| Electrical | 2,670 | sf | $50.00 | $133,500 |
| **Total - Electrical** | | | | **$133,500** |
| **33 Utilities** | | | | |
| Allowance for Upgraded Utilities (not including electrical service) | 1 | ls | $30,000.00 | $30,000 |
| **Total - Utilities** | | | | **$30,000** |

# Demolition

## SUMMARY - DEMOLITION

| Element | | | Total | Cost / SF |
|---|---|---|---|---|
| 01 | General Requirements | | | |
| 02 | Existing Conditions | | $209,220 | $21.79 |
| 03 | Concrete | | | |
| 04 | Masonry | | | |
| 05 | Metals | | | |
| 06 | Wood, Plastics, And Composites | | | |
| 07 | Thermal And Moisture Protection | | | |
| 08 | Openings | | | |
| 09 | Finishes | | | |
| 10 | Specialties | | | |
| 11 | Equipment | | | |
| 12 | Furnishings | | | |
| 13 | Special Construction | | | |
| 14 | Conveying Systems | | | |
| 21 | Fire Suppression | | | |
| 22 | Plumbing | | | |
| 23 | HVAC | | | |
| 25 | Integrated Automation | | | |
| 26 | Electrical | | | |
| 27 | Communications | | | |
| 28 | Electrical Safety And Security | | | |
| 31 | Earthwork | | | |
| 32 | Exterior Improvements | | | |
| 33 | Utilities | | | |
| 34 | Transportation | | | |
| 40 | Process Integration | | | |
| 41 | Material Processing And Handling Equipment | | | |
| 44 | Pollution Control Equipment | | | |
| 48 | Electrical Power Generation | | | |
| | Subtotal | | $209,220 | $21.79 |
| | General Conditions | 12.00% | $25,106 | $2.61 |
| | Subtotal | | $234,326 | $24.40 |
| | Bonds & Insurance | 2.00% | $4,184 | $0.44 |
| | Subtotal | | $238,511 | $24.84 |
| | Contractor's Fee | 8.00% | $19,081 | $1.99 |
| | Subtotal | | $257,592 | $26.82 |
| | Design Contingency | 15.00% | $38,639 | $4.02 |
| | Subtotal | | $296,230 | $30.85 |
| | Escalation: Pending Schedule | | | |
| | **TOTAL ESTIMATED CONSTRUCTION COST** | | **$296,230** | **$30.85** |

Total Area: 9,603 SF

## DETAIL ELEMENTS - DEMOLITION

| Element | Quantity | Unit | Unit Cost | Total |
|---|---|---|---|---|
| **02 Existing Conditions** | | | | |
| Demolition | | | | |
| Site Demolition | | | | |
| Demolition and removal of existing site improvements | 2,470 | sf | $7.50 | $18,525 |
| Structure Demolition | | | | |
| Demolition and removal of existing Alumni House building | 7,133 | sf | $15.00 | $106,995 |
| Fill / Planting to Footprint | 5,580 | sf | $15.00 | $83,700 |
| **Total - Existing Conditions** | | | | **$209,220** |

## APPENDIX 1 - QUALIFICATIONS

**Basis of Estimate**

- Degenkolb - UCSF Alumni House - Seismic Evaluation (95% Draft) - Dated 04/24/2017
- Taylor Design - Drawing - Scenario 1-Wheelchair lift study
- Taylor Design - Drawing - Scenario 3.1-Hotel-living study

**Cost Mark Ups**

The following % mark ups have been included in each design option:

- General Conditions (12.00% on direct costs)
- Bonds & Insurance (2.00% on direct costs)
- Contractor's Fee (8.00% compound)
- Design Contingency (15.00% compound)

**Design Contingency**

An allowance of 15.00% for undeveloped design details has been included in this estimate. As the design of each system is further developed, details which historically increase cost become apparent and must be incorporated into the estimate while decreasing the % burden.

**Construction Contingency**

It is prudent for all program budgets to include an allowance for change orders which occur during the construction phase. These change orders normally increase the cost of the project. It is recommended that a 5-10% construction contingency is carried in this respect. This cost is not included within the estimate.

**Bid Conditions**

This estimate has been based upon competitive bid situations (minimum of 3 bidders) for all items of subcontracted work.

**Basis For Quantities**

Wherever possible, this estimate has been based upon the actual measurement of different items of work. For the remaining items, parametric measurements were used in conjunction with other projects of a similar nature.

**Basis for Unit Costs**

Unit costs as contained herein are based on current bid prices in San Francisco, CA. Sub overheads and profit are included in each line item unit cost. Their overhead and profit covers each sub's cost for labor burden, materials, and equipment, sales taxes, field overhead, home office overhead, and profit. The general contractor's overhead is shown separately on the master summary.

**Sources for Pricing**

This estimate was prepared by a team of qualified cost consultants experienced in estimating construction costs at all stages of design. These consultants have used pricing data from Cumming's database for office and educational facility construction, updated to reflect current conditions in San Francisco, CA.

**Key Exclusions**

The following items have been excluded from our estimate:

- Project Soft Costs
- AV Equipment
- Testing and inspection fees
- Furnishing, equipment, and associated special construction unless noted in estimate
- Owner-furnished items

**Key Qualifications**

The following items are qualified within our estimate:

- An adjustment has been made to allow for work within an occupied facility, this is based on reduced productivity and phasing of work within the various areas and minor off-hour work

**Items Affecting Cost Estimate**

Items which may change the estimated construction cost include, but are not limited to:

## APPENDIX 1 - QUALIFICATIONS

- Modifications to the scope of work included in this estimate.
- Unforeseen sub-surface conditions.
- Restrictive technical specifications or excessive contract conditions.
- Any specified item of material or product that cannot be obtained from 3 sources.
- Any other non-competitive bid situations.
- Bids delayed beyond the projected schedule.

**Statement of Probable Cost**

Cumming has no control over the cost of labor and materials, the general contractor's or any subcontractor's method of determining prices, or competitive bidding and market conditions. This estimate is made on the basis of the experience, qualifications, and best judgement of a professional consultant familiar with the construction industry. Cumming, however, cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from this or subsequent cost estimates.

Cumming's staff of professional cost consultants has prepared this estimate in accordance with generally accepted principles and practices. This staff is available to discuss its contents with any interested party.

Pricing reflects probable construction costs obtainable in the project locality on the target dates specified and is a determination of fair market value for the construction of this project. The estimate is not a prediction of low bid. Pricing assumes competitive bidding for every portion of the construction work for all sub and general contractors with a range of 3 - 4 bidders for all items of work. Experience and research indicates that a fewer number of bidders may result in higher bids. Conversely, an increased number of bidders may result in more competitive bid day responses.

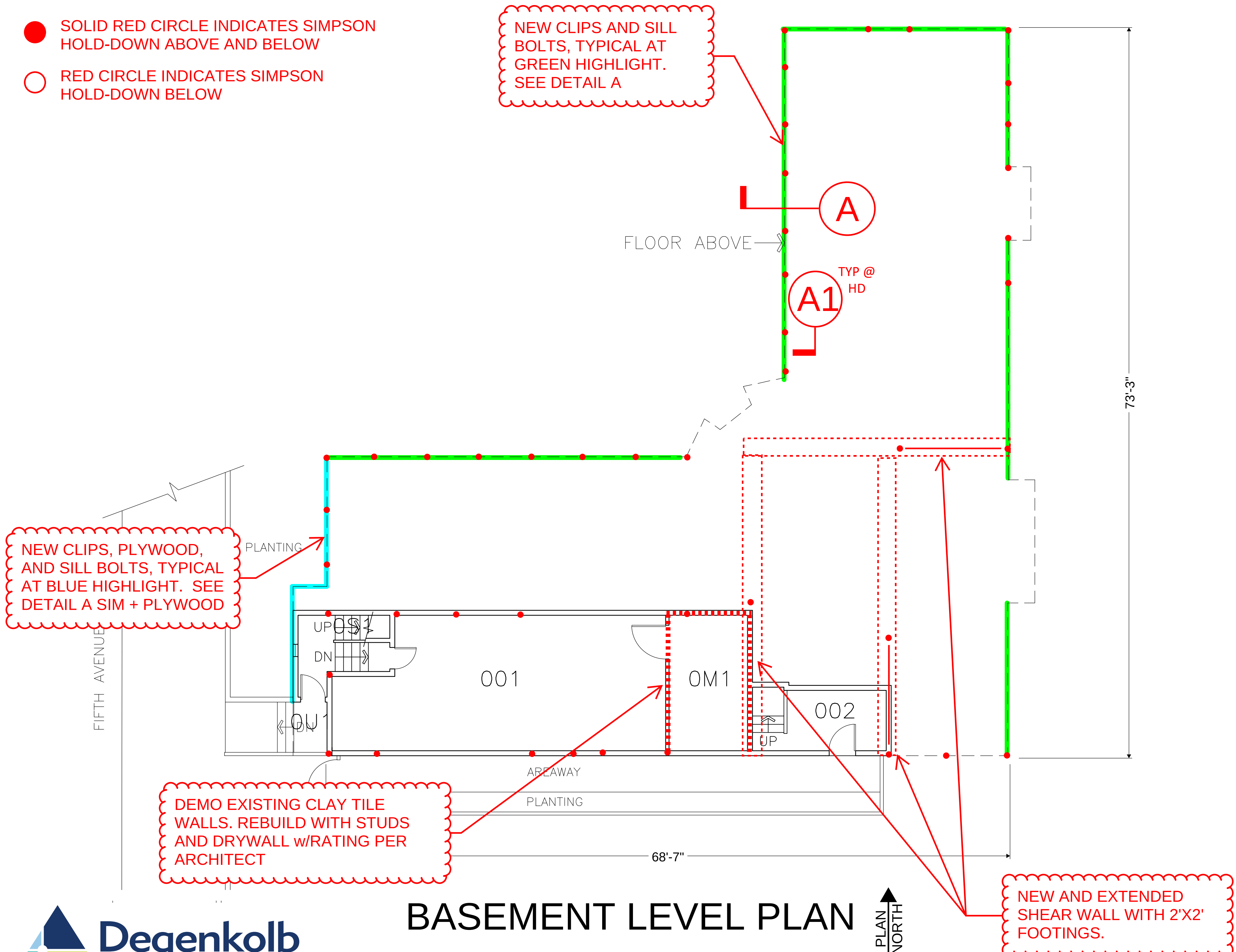
**Recommendations**

Cumming recommends that the Owner and the Architect carefully review this entire document to ensure it reflects their design intent. Requests for modifications of any apparent errors or omissions to this document must be made to Cumming within ten days of receipt of this estimate. Otherwise, it will be assumed that its contents have been reviewed and accepted. If the project is over budget or there are unresolved budget issues, alternate systems / schemes should be evaluated before proceeding into further design phases.

It is recommended that there are preparations of further cost estimates throughout design by Cumming to determine overall cost changes since the preparation of this preliminary estimate. These future estimates will have detailed breakdowns indicating materials by type, kind, and size, priced by their respective units of measure.

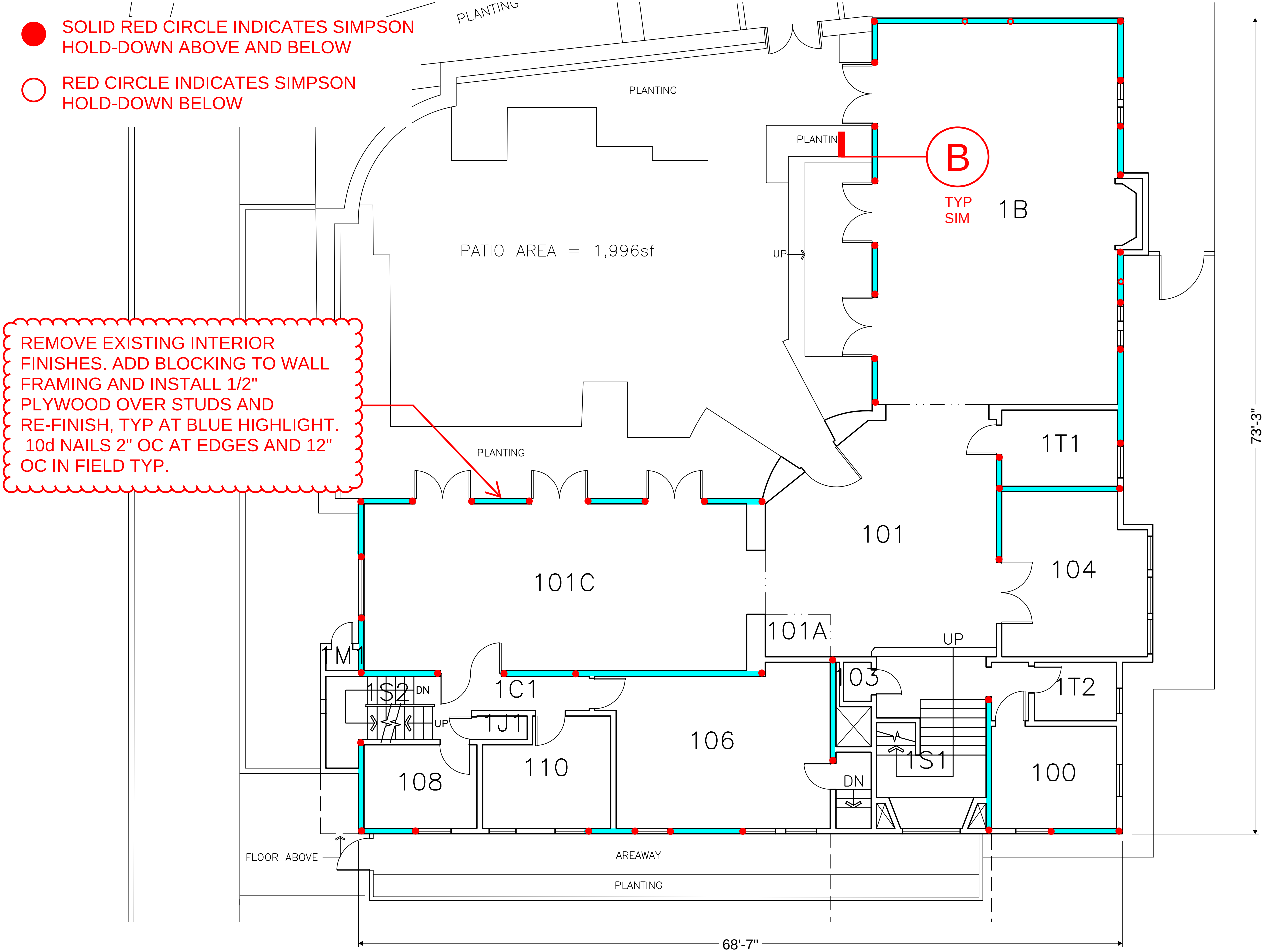
# APPENDIX A

## Seismic Retrofit Figures




# BASEMENT LEVEL PLAN

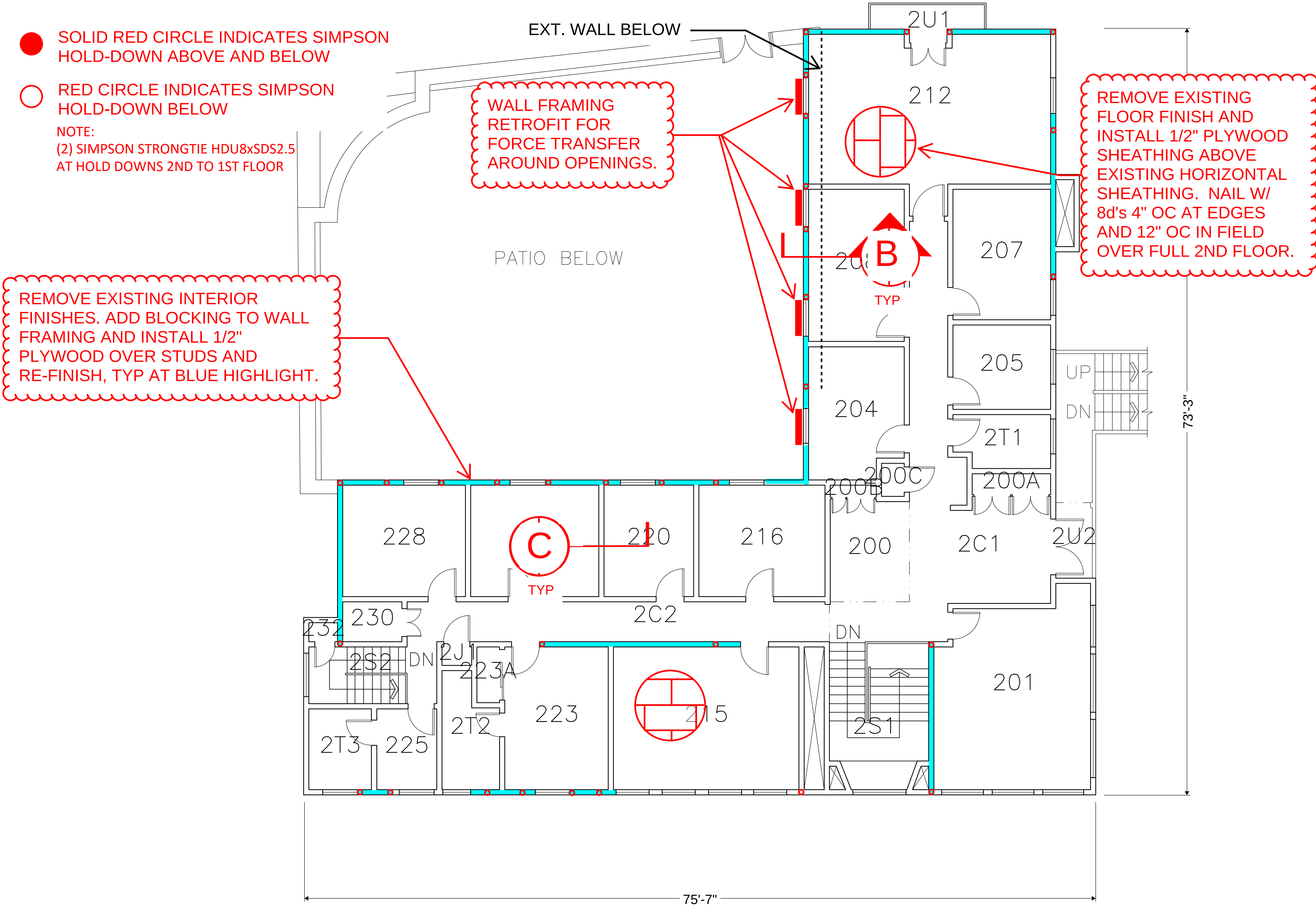
Degenkolb




FIRST LEVEL PLAN

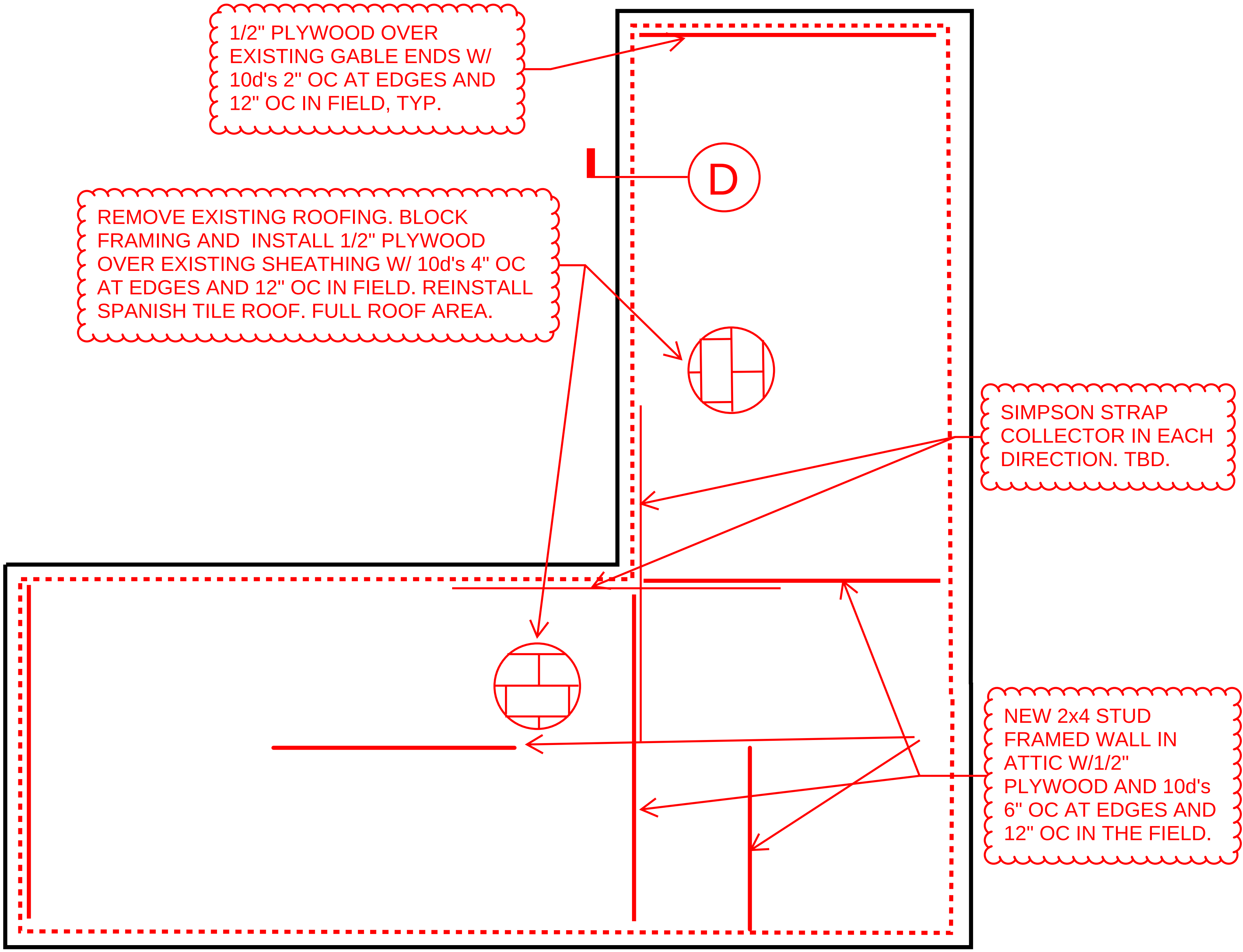
PLAN NORTH

Degenkolb



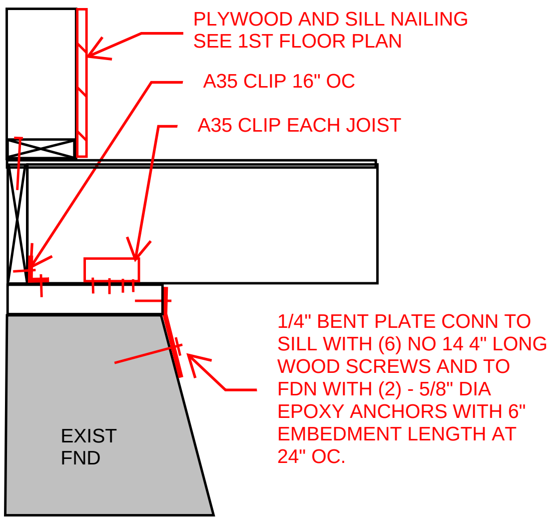

# SECOND LEVEL PLAN

Degenkolb

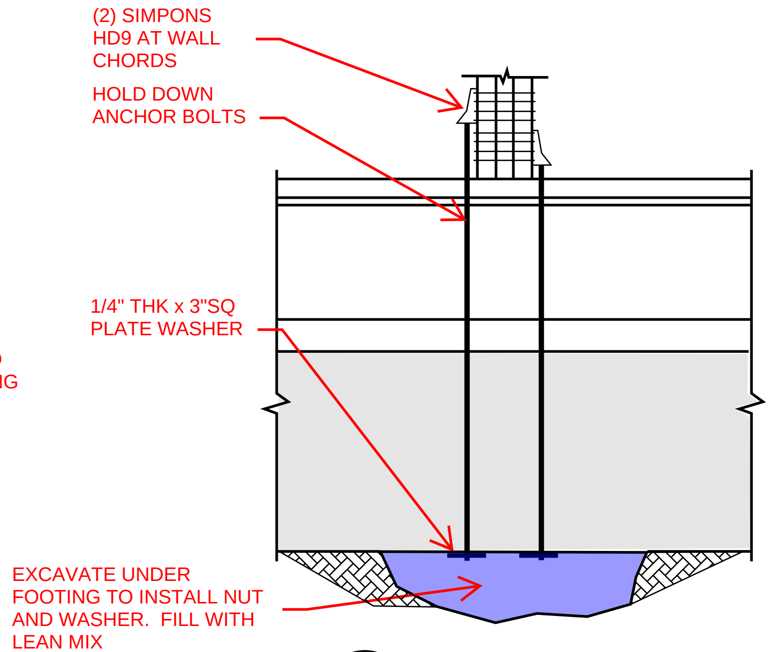



ROOF LEVEL PLAN

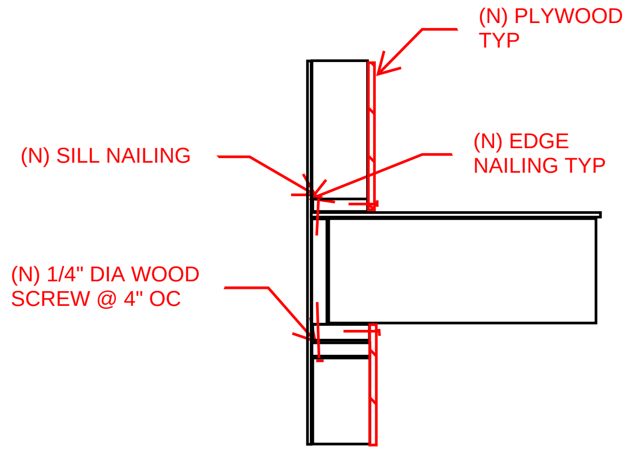
Degenkolb



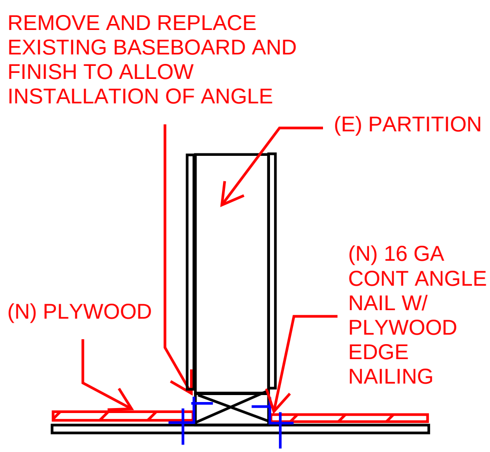

A FOUNDATION CONN



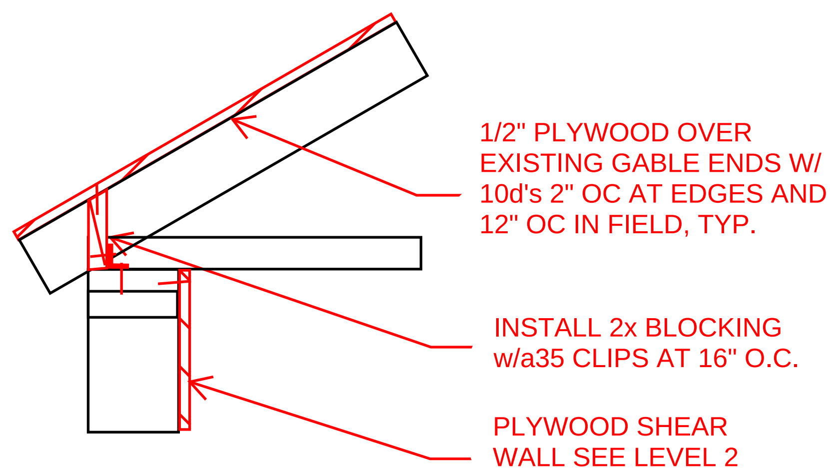

A1 HOLD DOWN ANCHORAGE




B SHEAR WALL CONN




C PARTITION DIAPHRAGM CONN




D ROOF DIAPHRAGM CONN

Degenkolb

# DETAILS

# APPENDIX B

# ASCE 41 Checklist

| | | | |
|---|---|---|---|
| Building Name: UCSF Alumni House | | Date: 3/29/17 | |
| Building Address: 745 Parnassus Ave, San Francisco CA | | Page: 1 of 2 | |
| Job Number: B7901001.00 | Job Name: UCSF Alumni House Seismic Evaluation | By: | Checked: |

# ASCE 41-13 Life Safety Structural Checklist for Building Type W1: Wood Light Frames and W1A: Multi-Story, Multi-Unit Residential Wood Frame

| C | NC | N/A | U | | Comments |
|---|---|---|---|---|---|

## LOW AND MODERATE SEISMICITY

### *Seismic-Force-Resisting System*

| C | NC | N/A | U | | Comments |
|---|---|---|---|---|---|
| ☒ | ☐ | ☐ | ☐ | 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) | |
| ☐ | ☒ | ☐ | ☐ | SHEAR STRESS CHECK: The shear stress in the shear walls, calculated using the Quick Check procedure of Section 4.5.3.3, is less than the following values: (Commentary: Sec. A.3.2.7.1. Tier 2: Sec. 5.5.3.1.1)<br>Structural panel sheathing: 1,000 plf<br>Diagonal sheathing: 700 plf<br>Straight sheathing: 100 plf<br>All other conditions: 100 plf | |
| ☒ | ☐ | ☐ | ☐ | STUCCO (EXTERIOR PLASTER) SHEAR WALLS: Multi-story buildings do not rely on exterior stucco walls as the primary seismic force-resisting system. (Commentary: Sec. A.3.2.7.2. Tier 2: Sec. 5.5.3.6.1) | |
| ☒ | ☐ | ☐ | ☐ | GYPSUM WALLBOARD OR PLASTER SHEAR WALLS: Interior plaster or gypsum wallboard are not used as shear walls on buildings over one story in height with the exception of the uppermost level of a multi-story building. (Commentary: Sec. A.3.2.7.3. Tier 2: Sec. 5.5.3.6.1) | |
| ☒ | ☐ | ☐ | ☐ | NARROW WOOD SHEAR WALLS: Narrow wood shear walls with an aspect ratio greater than 2-to-1 are not used to resist seismic forces. (Commentary: Sec. A.3.2.7.4. Tier 2: Sec. 5.5.3.6.1) | |
| ☐ | ☒ | ☐ | ☐ | WALLS CONNECTED THROUGH FLOORS: Shear walls have an interconnection between stories to transfer overturning and shear forces through the floor. (Commentary: Sec. A.3.2.7.5. Tier 2: Sec. 5.5.3.6.2) | |
| ☒ | ☐ | ☐ | ☐ | HILLSIDE SITE: For structures that are taller on at least one side by more than one-half story due to a sloping site, all shear walls on the downhill slope have an aspect ratio less than 1-to-1. (Commentary: Sec. A.3.2.7.6. Tier 2: Sec. 5.5.3.6.3) | |
| ☐ | ☒ | ☐ | ☐ | CRIPPLE WALLS: Cripple walls below first-floor-level shear walls are braced to the foundation with wood structural panels. (Commentary: Sec. A.3.2.7.7. Tier 2: Sec. 5.5.3.6.4) | |
| ☐ | ☐ | ☒ | ☐ | OPENINGS: Walls with openings greater than 80 percent of the length are braced with wood structural panel shear walls with aspect ratios of not more than 1.5-to-1 or are supported by adjacent construction through positive ties capable of transferring the seismic forces. (Commentary: Sec. A.3.2.7.8. Tier 2 Sec. 5.5.3.6.5) | |

### *Connections*

| C | NC | N/A | U | | Comments |
|---|---|---|---|---|---|
| ☐ | ☐ | ☒ | ☐ | WOOD POSTS: There is a positive connection of wood posts to the foundation. (Commentary: Sec. A.5.3.3. Tier 2: Sec. 5.7.3.3) | |

Building Name: UCSF Alumni House Date: 3/29/17

Building Address: 745 Parnassus Ave, San Francisco CA Page: 2 of 2

Job Number: B7901001.00 Job Name: UCSF Alumni House Seismic Evaluation By: ____ Checked: ____

# ASCE 41-13 Life Safety Structural Checklist for Building Type W1: Wood Light Frames and W1A: Multi-Story, Multi-Unit Residential Wood Frame

| C | NC | N/A | U | | Comments |
|---|---|---|---|---|---|
| | | | | **LOW AND MODERATE SEISMICITY** | |
| ☐ | ☒ | ☐ | ☐ | WOOD SILLS: All wood sills are bolted to the foundation. (Commentary: Sec. A.5.4.3.4. Tier 2: Sec. 5.7.3.3) | |
| ☐ | ☐ | ☒ | ☐ | GIRDER/COLUMN CONNECTION: There is a positive connection utilizing plates, connection hardware, or straps between the girder and the column support. (Commentary: Sec. A.5.4.1. Tier 2: Sec. 5.7.4.1 | |
| | | | | **HIGH SEISMICITY (Complete the following items in addition to the items for Low and Moderate Seismicity)** | |
| | | | | ***Connections*** | |
| ☐ | ☒ | ☐ | ☐ | WOOD SILL BOLTS: Sill bolts are spaced at 6 feet or less with proper edge and end distance provided for wood and concrete. (Commentary: Sec. A.5.3.7 Tier 2: Sec. 5.7.3.3) | |
| | | | | ***Diaphragms*** | |
| ☒ | ☐ | ☐ | ☐ | 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) | |
| ☐ | ☒ | ☐ | ☐ | ROOF CHORD CONTINUITY: All chord elements are continuous, regardless of changes in roof elevation. (Commentary: Sec. A.4.1.3 Tier 2: Sec. 5.6.1.1) | |
| ☒ | ☐ | ☐ | ☐ | 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. 5.6.1) | |
| ☐ | ☒ | ☐ | ☐ | SPANS: All wood diaphragms with spans greater than 24 feet consist of wood structural panels or diagonal sheathing. (Commentary: Sec. A.4.2.2. Tier 2: Sec. 5.6.2) | |
| ☐ | ☒ | ☐ | ☐ | UNBLOCKED DIAPHRAGMS: All diagonally sheathed or unblocked wood structural panel diaphragms have horizontal spans less than 40 feet and shall have aspect ratios less than or equal to 4-to-1. (Commentary: Sec. A.4.2.3. Tier 2: Sec. 5.6.2) | |
| ☐ | ☐ | ☒ | ☐ | OTHER DIAPHRAGMS: The 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) | |

# APPENDIX C

# Structural Calculations

Degenkolb

# UCSF Alumni House Seismic Study
# California

## Structural Calculations Package

April 24, 2017

Degenkolb Job Number: B7901001.00

**Degenkolb Engineers**

375 Beale Street, Suite 500
San Francisco, CA 94105

www.degenkolb.com

415 392.6952 phone
981.3157 fax

# TABLE OF CONTENTS

UCSF Alumni House Seismic Study
Structural Calculations Package
UCSF Alumni House

# SECTION 1.0
# PROJECT NARRATIVE

Degenkolb Engineers
235 Montgomery Street, Suite 500
San Francisco, CA 94104-2908
Phone: 415.392.6952
Fax: 415.981.3157

| | | | | | |
|---|---|---|---|---|---|
| **Subject:** | Project Narrative | **Job Number:** | **B7901001.00** | **Date:** | 04/20/2017 |
| **Job:** | UCSF Alumni Building Seismic Evaluation | **By:** | **MXN** | **Section:** | 1.0 |
| | | **Checked By:** | **RMG** | | |

**USCF Alumni Building:**

The Alumni House, located at 745 Parnassus Avenue in San Francisco California, is a two-story wood framed building with a partial basement. The building is approximately 3,000 square feet in plan at each floor and is in L-shaped in plan. The building is, 76 feet in the east-west direction and 73 feet in the north-south direction. There is a 600 square foot partial basement in the southwest corner of the building.

The exterior wall of the building is framed with 2x6 at 16" oc. The walls are finished with stucco on the exterior and with 5/8" wood lath and plaster on the interior. Interior walls are typically 2x4 construction with plaster or gypsum wall board. The roof is a gabled roof with Spanish clay tile. The roof is framed with 2x6's at 16" oc and 1x straight sheathing. There is a flat ceiling below framed with 2x4's at 16" oc and sheathed with gypsum wall board. The $2^{nd}$ and first floors are framed with 2x12's @ 16" oc and sheathed with 1x flooring applied directly over the framing. The flooring runs perpendicular to the framing and as such has been treated as straight sheathing. The building is supported on concrete foundations.

The Alumni house currently functions as meeting / event spaces on the first floor and contains offices on the second floor. The Alumni House is Risk Category III.

**Project Purpose:**

Previous evaluations of the Alumni House have concluded that the structure is seismically deficient. UCSF has engaged Degenkolb to perform a seismic study of the Alumni building structure. The seismic study will consist of structural and architectural evaluation of the retrofit necessary to bring the Alumni house into compliance with the UC Interim Seismic Safety Policy. In addition, the seismic study will provide a rough order of magnitude cost estimate for the recommended structural and architectural retrofits.

**Code Reference:**

- 2012 International Building Code (2012 IBC),
- 2010 California Building Code (2010 CBC),
- 2013 ASCE 41 Seismic Evaluation and Retrofit of Existing Buildings,

**Existing Drawing Reference:**

- Architectural Plans by Masten and Hurd Architects (UCSF File No 2797)
- 01/8/83 Food Service Equipment Drawings by Berlin Food Company (UCSF File No. 2850)
- 02/7/85 Electrical Plan by Alan Lucas + Associates (UCSF File NO 3122)
- 02/15/13 Floor Plans by ehdd

# SECTION 2.0
# SCOPE AND PERFORMANCE OBJECTIVE

Degenkolb

Degenkolb Engineers

235 Montgomery Street, Suite 500
San Francisco, CA 94104-2908
Phone: 415.392.6952
Fax: 415.981.3157

| | | | | | |
|---|---|---|---|---|---|
| **Subject:** | Scope and Performance Objective | **Job Number:** | **B7901001.00** | **Date:** | 04/20/2017 |
| **Job:** | UCSF Alumni Building Seismic Evaluation | **By:** | **MXN** | **Section:** | 2.0 |
| | | **Checked By:** | **RMG** | | |

## Calculations Scope:

These calculations consist of the structural portion of the seismic study. The structural calculations provide a ASCE 41 Tier 2 seismic evaluation of the Alumni House and a conceptual retrofit design to bring the building into compliance.

## Performance Objective:

Per the UC Interim Seismic Safety Policy (UC Seismic Policy) establishes a seismic rehabilitation Performance Level Rating III (or *Good* per the historic UC Ratings) for a Occupancy Category III building.

The UC Seismic Policy indicates that this rating is equivalent to the performance criteria indicated in Chapter 34 of the 2010 edition of the California Building Code (2010 CBC). For a State-Owned building such as the Alumni House, the 2010 CBC establishes the following performance criteria at two different seismic hazards:

1. At the BSE-R Seismic Hazard: Life Safety (LS) structural performance and hazards reduced (N-D) nonstructural performance.

2. At the BSE-C Seismic Hazard: Collapse Prevention (CP) structural performance with no consideration of nonstructural performance (N-E).

Per the 2010 CBC the BSE-R ground motion parameters are developed for a seismic hazard level of 20-percent probability of exceedance in 50 years. For the purposes of this evaluation, this is considered equivalent to the ASCE-41 Basic Safety Earthquake-1 (BSE-1E). The BSE-C ground motion parameters are developed for a seismic hazard level of 5-percent probability of exceedance in 50 years. For the purposes of this evaluation, this is considered equivalent to the ASCE-41 Basic Safety Earthquake-2 (BSE-2E).

Per the 2010 CBC the hazards reduced nonstructural performance criteria refers to a performance criteria that is no longer evaluated in the current edition of ASCE-41 (2013). For the purposes of this evaluation, the life safety (N-C) nonstructural performance criteria will be considered.

# SECTION 3.0
# GENERAL BUILDING INFORMATION

| | | | | | |
|---|---|---|---|---|---|
| **Subject:** | Global Data | **Job Number:** | B7901001.00 | **Date:** | 04/20/17 |
| **Job:** | UCSF Alumni House | **By:** | RMG | **Section:** | 3.0 |
| | | **Checked By:** | RMG | **Page** | |

**GLOBAL DATA**

ASCE 41-13 SEISMIC EVALUATION & RETROFIT OF EXISTING BUILDINGS
CHAPTER 6 - TIER 1 EVALUATION
LINEAR STATIC PROCEDURE
LIFE SAFETY PERFORMANCE LEVEL
BSE-1E HAZARD LEVEL

**SITE DATA:**

| | | | | | |
|---|---|---|---|---|---|
| Latitude: | | 37.76216 °N | Parnasus and 5th Ave | *USGS Seismic Design Map Application:* | |
| Longitude: | | 122.46161 °W | San Francisco CA | *http://geohazards.usgs.gov/hazardtool/application.php* | |
| Site Class: | | D | ( Stiff Soil ) | Site Class | [ ASCE 41-13, §2.4.1.6.1 ] |
| $S_S$ | = | 0.913 g | ( USGS ) ( 20% / 50 years ) | USGS Mapped ( T = 0.2 sec ) | [ ASCE 41-13, §2.4.1.4 ] |
| $S_1$ | = | 0.356 g | ( USGS ) ( 20% / 50 years ) | USGS Mapped ( T = 1.0 sec ) | [ ASCE 41-13, §2.4.1.4 ] |
| $F_a$ | = | 1.135 | ( Site Class D ) | Site Coefficient ( T = 0.2 sec ) | [ ASCE 41-13, Table 2-3 ] |
| $F_v$ | = | 1.688 | ( Site Class D ) | Site Coefficient ( T = 1.0 sec ) | [ ASCE 41-13, Table 2-4 ] |
| $S_{XS}$ | = | 1.036 g | $= F_a S_S$ | Site-Adjusted Design ( T = 0.2 sec ) | [ ASCE 41-13, Eq. 2-4 ] |
| $S_{X1}$ | = | 0.601 g | $= F_v S_1$ | Site-Adjusted Design ( T = 1.0 sec ) | [ ASCE 41-13, Eq. 2-5 ] |

**BUILDING DATA:**

| | | | |
|---|---|---|---|
| Building Type: | W1 | ( Wood Light Frames ) | [ ASCE 41-13, Table 3-1 ] |
| Year Built: | 1915 | | |
| Number of Stories: | 3 stories | | |
| Parapet Height: | 0.00 ft | | |
| Roof Height: | 25.0 ft | | |
| Total Area: | 11,753 sf | | |

| Level | Height [ ft ] | Elevation [ ft ] | $Length_{N-S}$ [ ft ] | $Length_{E-W}$ [ ft ] | Area [ sf ] | Diaphragm Stiffness | Diaphragm Description |
|---|---|---|---|---|---|---|---|
| Roof | 11 | 25 | 73 | 76 | 3,053 | Flexible | Diagonal Sheathing |
| 2nd | 10 | 14 | 73 | 69 | 2,900 | Flexible | Diagonal Sheathing |
| 1st | 4 | 4 | 73 | 69 | 2,900 | Flexible | Diagonal Sheathing |
| Bsmt | 0 | 0 | 73 | 69 | 2,900 | Rigid | Concrete Slab |

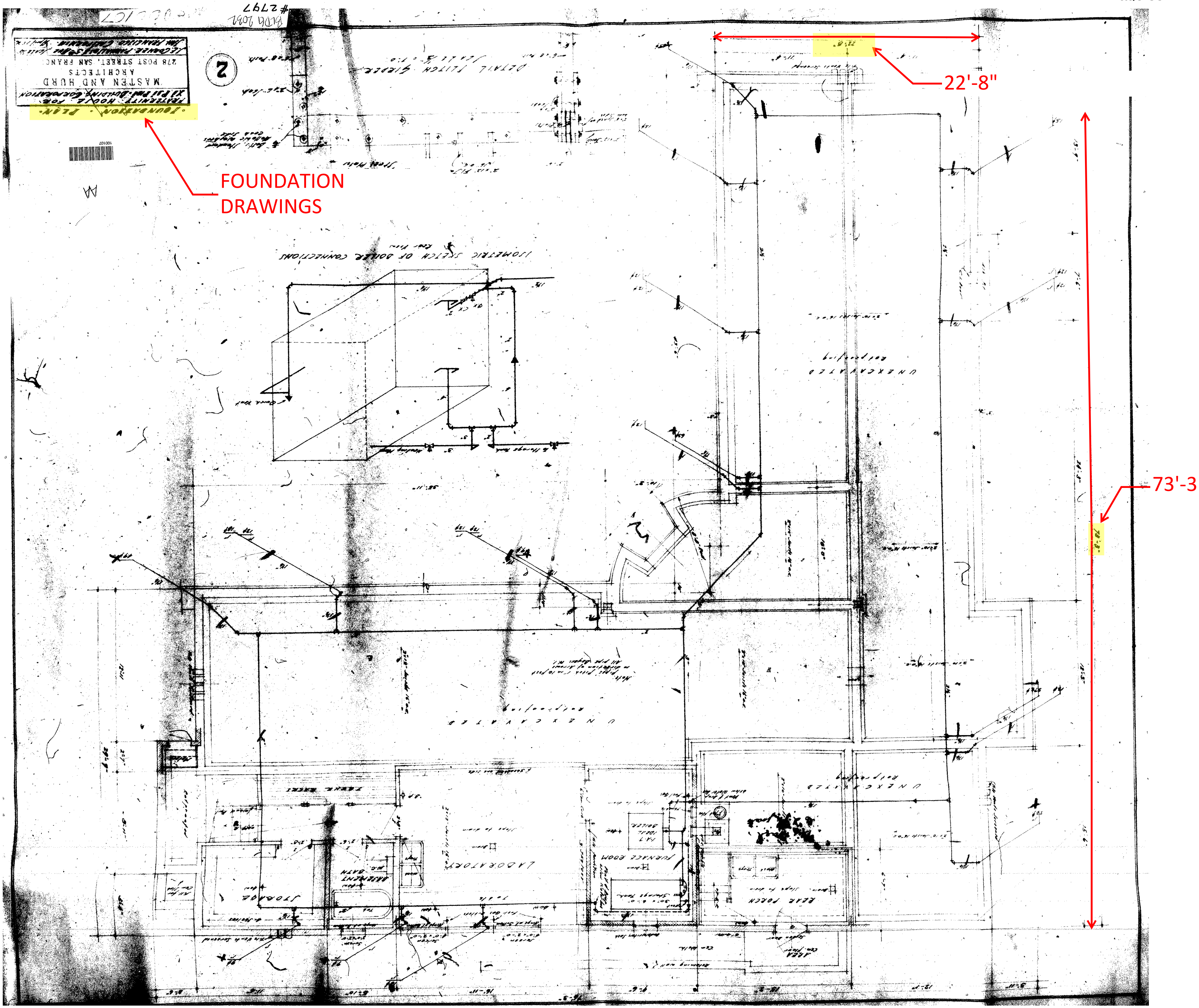
# Section 3.1
# Plan Dimensions and Story Heights

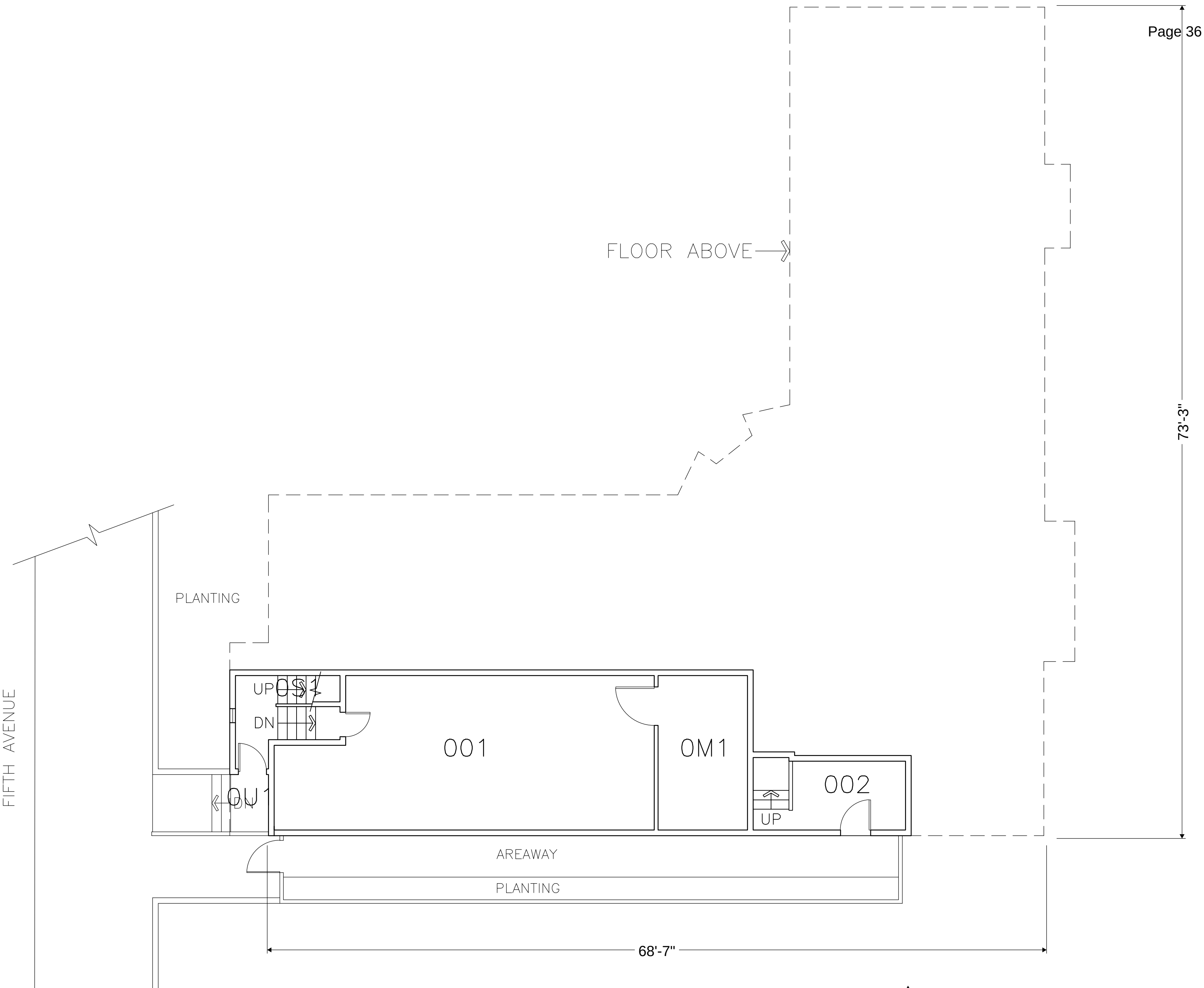
| Subject: | BUILDING INFORMATION | Job Number: | B7901001.00 | Date: | 04/12/17 |
|---|---|---|---|---|---|
| Job: | UCSF Alumni House | By: | RMG | Section: | 3.1 |
| | | Checked By: | RMG | Page | |

The current building plans from ehdd were scaled to determine the building dimensions at each level, shear wall locations, appropriate locations for shear wall segments, appropriate location for interior shear walls, and diaphragm spans.

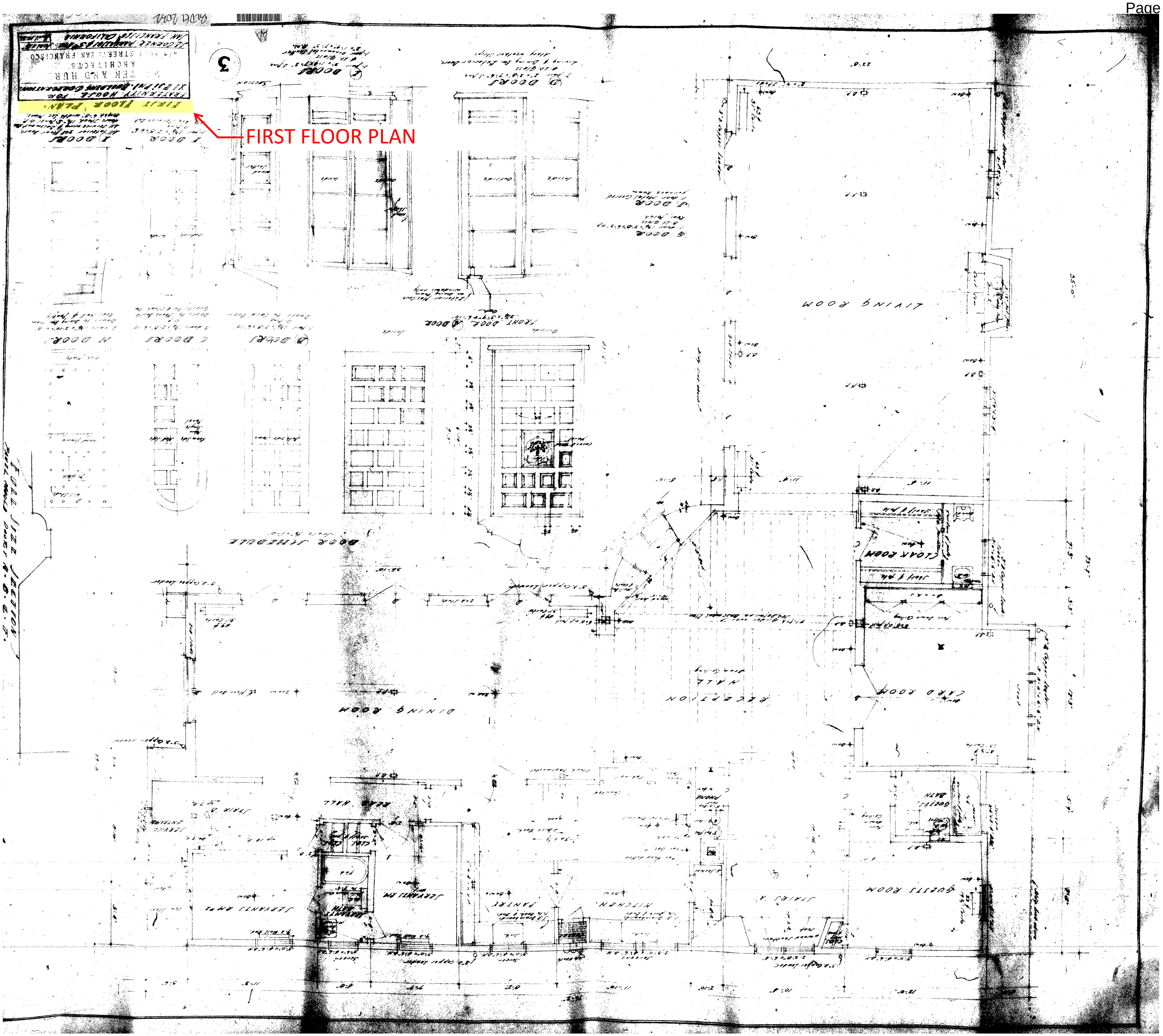
The story heights are based off of field observations and measurements indicated in the Berlin Food Equipment Company drawings.

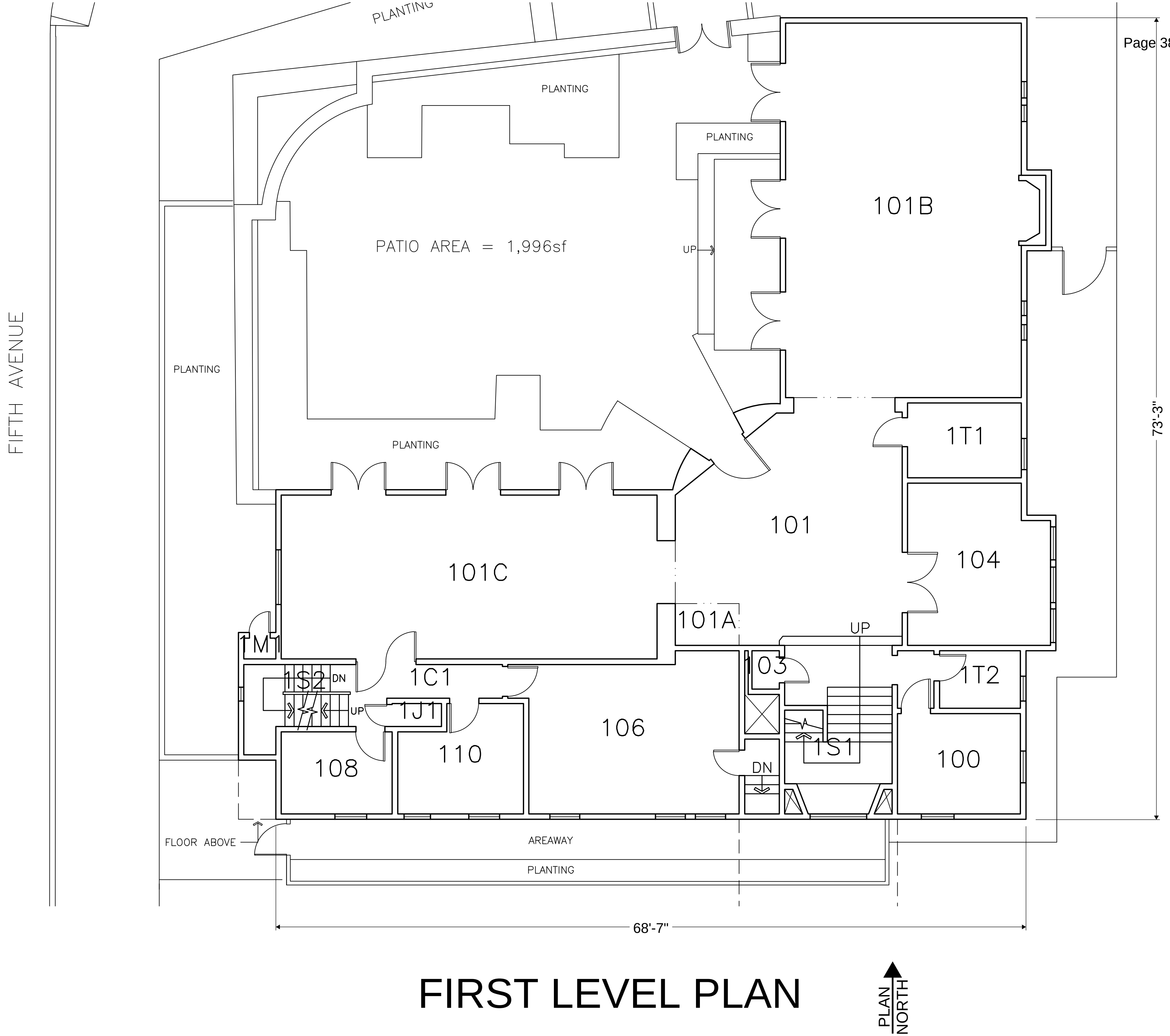
The relevant drawings and dimensions are shown on the following pages.


22'-8"
FOUNDATION DRAWINGS
73'-3"




# BASEMENT LEVEL PLAN

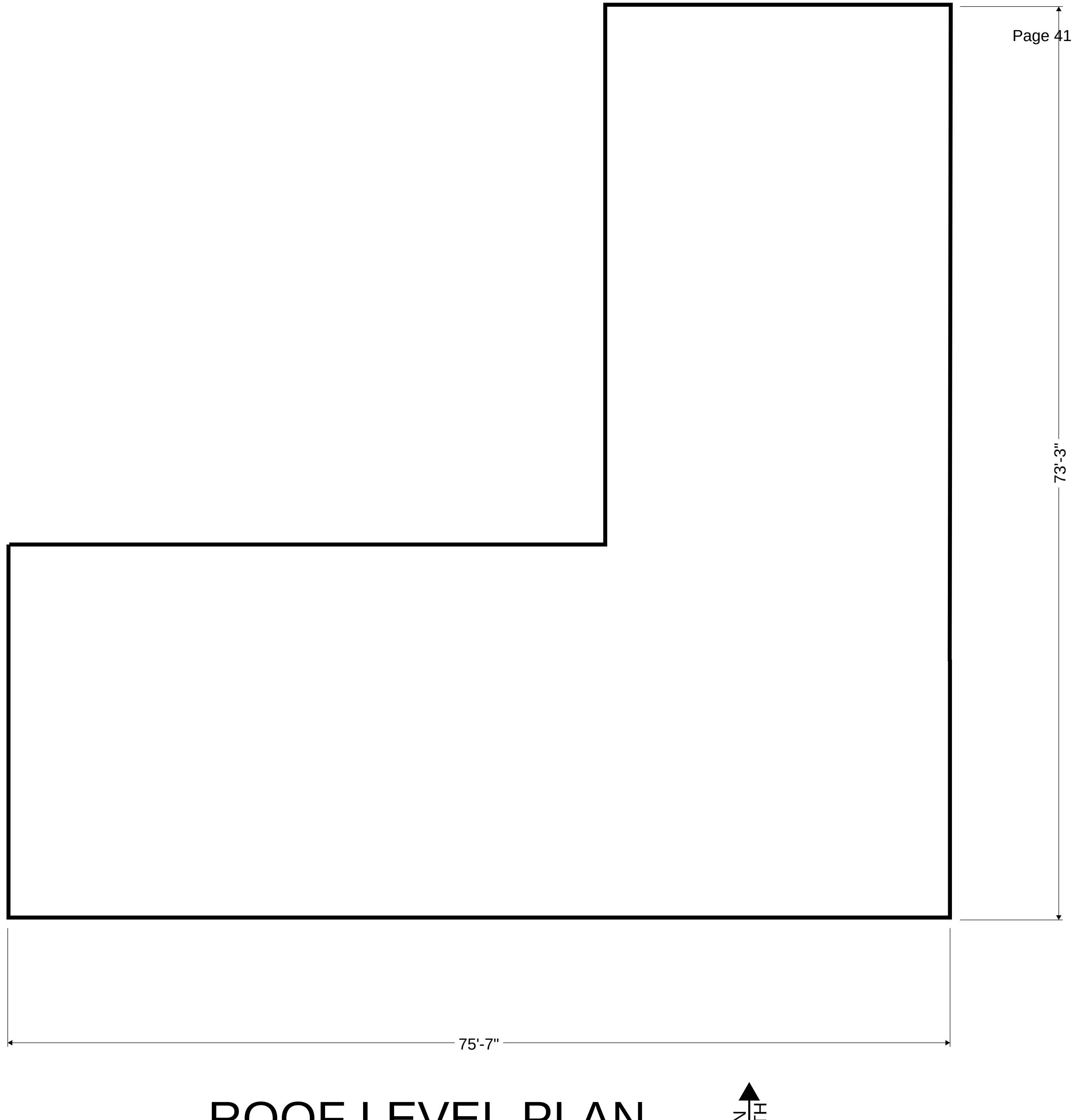

FIRST FLOOR PLAN




# FIRST LEVEL PLAN


SECOND FLOOR PLAN
73'-3"
STUDY
CORRIDOR
WASH ROOM
SLEEPING PORCH #1
SLEEPING PORCH #2
SLEEPING PORCH #3
STAIRS

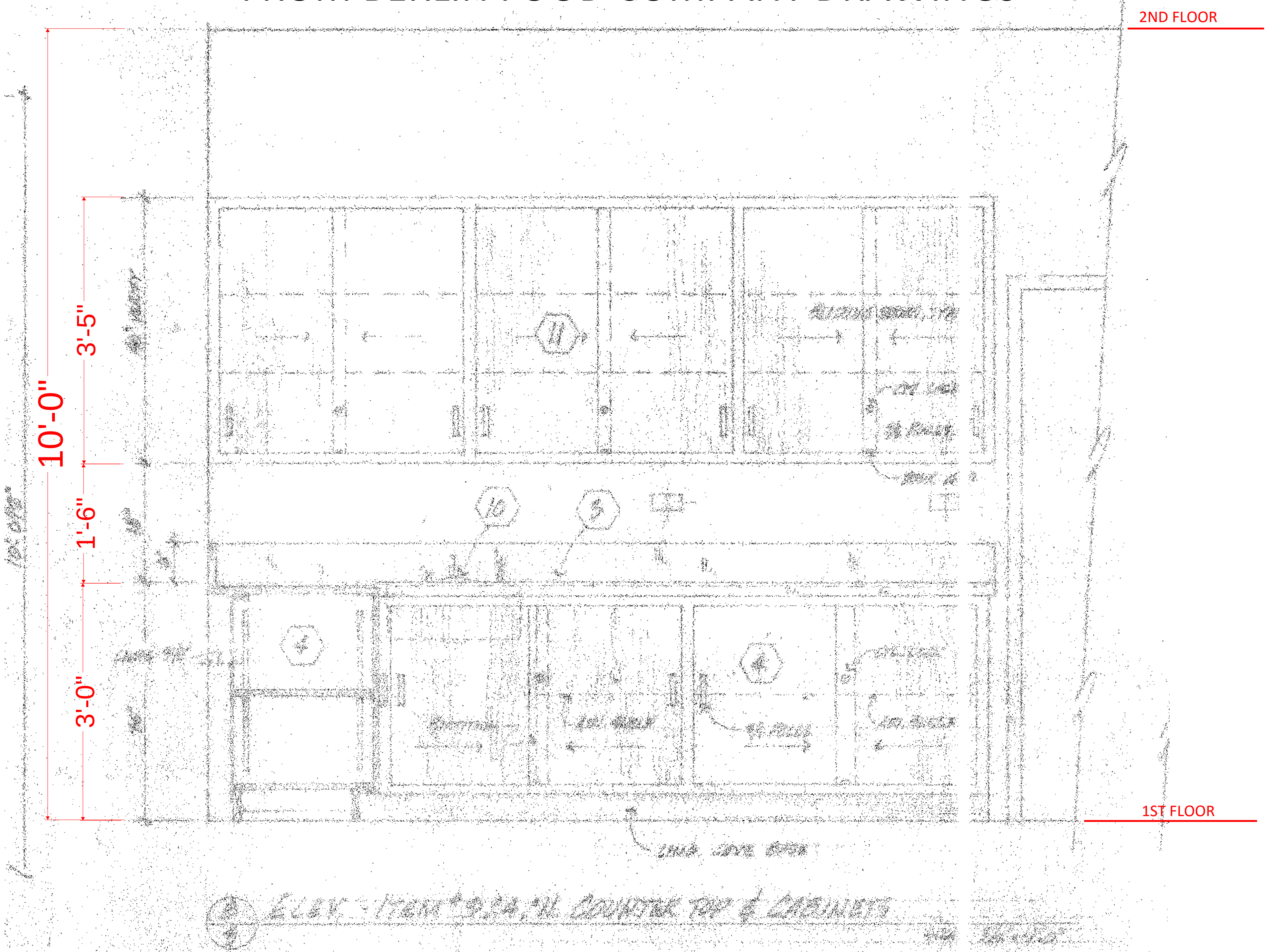

# SECOND LEVEL PLAN




# ROOF LEVEL PLAN

# FROM BERLIN FOOD COMPANY DRAWINGS






- FIRST FLOOR TO SECOND FLOOR HEIGHT SHOWN TO BE 10'-0 1/8" IN SECTION.
- AVERAGE SLOPED ROOF HEIGHT CONSIDERED 11'-0" BASED OFF SITE VISIT AND PHOTOS
- CRAW SPACE AVERAGE HEIGHT CONSIDERED 4'-0" BASED OFF SITE VISIT

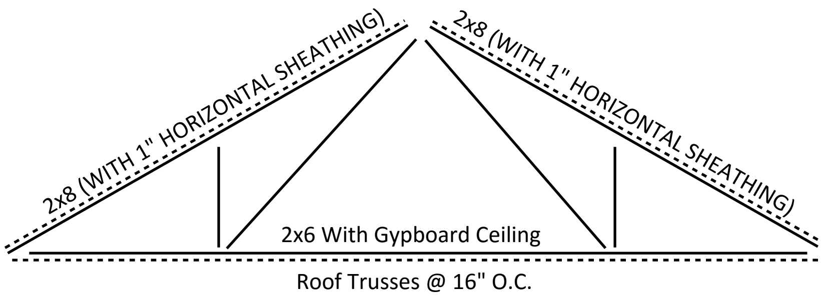
# Section 3.2
# Existing Building Structure

No structural drawings were available for review. The Alumni House structure has been inferred based off of the time of construction (1915), structure type (wood frame), and site visit observations as cataloged below.

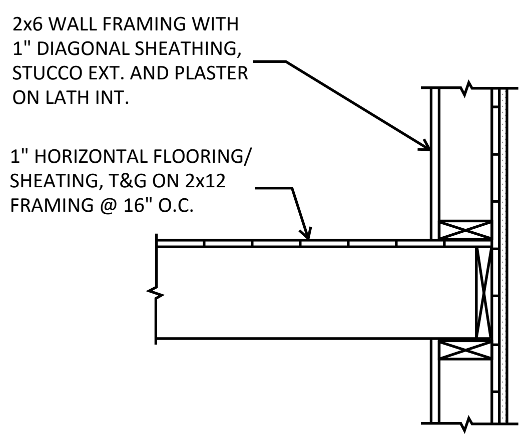
PHOTO - Observed Roof Structure

PHOTO - Roof 1" Horizontal Sheathing

PHOTO - 1st Floor Framing (2x12@16" O.C.) on SIll Plate with not Shear Connection to Foundation




SKETCH - Observed Roof Structure (web verticals not shown)




SKETCH - Observed/Deduced Wall and Floor Structure

# Section 3.3
# Building Weight Takeoff and Seismic Mass

Degenkolb

| | | | | | |
|---|---|---|---|---|---|
| **Subject:** Weight Take Off | | **Job Number:** | B7901001.00 | **Date:** | 04/20/17 |
| **Job:** UCSF Alumni House | | **By:** | RMG | **Section:** | 3.3 |
| | | **Checked By:** | MXN | **Page** | |

**WEIGHT TAKEOFF**

ASCE 41-13 SEISMIC EVALUATION & RETROFIT OF EXISTING BUILDINGS
CHAPTER 6 - TIER 1 EVALUATION
LINEAR STATIC PROCEDURE
LIFE SAFETY PERFORMANCE LEVEL
BSE-1E HAZARD LEVEL

**ROOF TYPE:** **ROOF**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Clay Tiles | ( Spanish ) | | @ | 19.0 | psf | 19.0 psf | y |
| 1 in | Wood Decking | | | @ | 2.5 | psf per inch | 3.0 psf | y |
| 1.33 ft O.C. | Wood Sub-Purlins | 2 x | 6 | @ | 1.8 | plf | 1.3 psf | y |
| 1.33 ft O.C. | Wood Purlins | 2 x | 8 | @ | 2.4 | plf | 1.8 psf | y |
| 0.625 in | Gypsum Board Ceiling | | | @ | 4.4 | psf per inch | 2.8 psf | y |
| 100% floor area | Interior Partitions | ( Below ) | | @ | 5.0 | psf | 5.0 psf | y |
| | M.E.P. | | | @ | 2.0 | psf | 1.0 psf | y |
| | Miscellaneous | | | @ | 1.2 | psf | 1.5 psf | y |
| | | | | | | **ROOF WEIGHT =** | **35.4 psf** | |

**FLOOR TYPE:** **FLR-2**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1 in | Floor Tiles | ( Linoleum Tile ) | | @ | 4.0 | psf per inch | 4.0 psf | y |
| 1 in | Wood Sheathing | | | @ | 3.0 | psf per inch | 3.0 psf | y |
| 1.33 ft O.C. | Wood Sub-Purlins | 2 x | 12 | @ | 3.7 | plf | 2.8 psf | y |
| 0.625 in | Gypsum Board Ceiling | | | @ | 4.4 | psf per inch | 2.8 psf | y |
| 100% floor area | Interior Partitions | ( Above & Below ) | | @ | 10.0 | psf | 10.0 psf | y |
| | M.E.P. | | | @ | 5.0 | psf | 1.0 psf | y |
| | Miscellaneous | | | @ | #REF! | psf | 1.5 psf | y |
| | | | | | | **FLR-2 WEIGHT =** | **25.1 psf** | |

**FLOOR TYPE:** **FLR-1**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1 in | Floor Tiles | ( Linoleum Tile ) | | @ | 4.0 | psf per inch | 4.0 psf | y |
| 1 in | Wood Decking | | | @ | 2.5 | psf per inch | 3.0 psf | y |
| 1.33 ft O.C. | Wood Sub-Purlins | 2 x | 12 | @ | 3.7 | plf | 2.8 psf | y |
| 0.625 in | Gypsum Board Ceiling | | | @ | 4.4 | psf per inch | 2.8 psf | y |
| 100% floor area | Interior Partitions | ( Above ) | | @ | 5.0 | psf | 5.0 psf | y |
| | M.E.P. | | | @ | 5.0 | psf | 1.0 psf | y |
| | Miscellaneous | | | @ | #REF! | psf | 1.5 psf | y |
| | | | | | | **FLR-1 WEIGHT =** | **20.1 psf** | |

**WALL TYPE:** **WALL-0**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0.75 in | Exterior Stucco | | @ | 11.4 | psf per inch. | 8.6 psf | y |
| 1 in | Wood Sheathing | | @ | 3.0 | psf per inch | 3.0 psf | y |
| 0.625 in | Gypsum Wallboard | | @ | 4.4 | psf per inch | 2.8 psf | y |
| | Wall Insulation | | @ | 1.0 | psf | 1.0 psf | y |
| 16 in O.C. | Wood Studs | ( 2 x 6 ) | @ | 1.8 | plf | 1.3 psf | y |
| | Miscellaneous | | @ | 1.6 | psf | 1.5 psf | y |
| | | | | | Solid Wall Weight = | 18.1 psf | |
| | | | | | Window & Door Weight = | 8.0 psf | |
| | | | | | % Solid Wall = | 100% | |
| | | | | | **WALL-0 WEIGHT =** | **18.1 psf** | |

| Subject: | Seismic Mass | Job Number: | B7901001.00 | Date: | 04/20/17 |
|---|---|---|---|---|---|
| Job: | UCSF Alumni House | By: | RMG | Section: | 3.3 |
| | | Checked By: | | Page | |

**SEISMIC MASS**

ASCE 41-13 SEISMIC EVALUATION & RETROFIT OF EXISTING BUILDINGS
CHAPTER 6 - TIER 1 EVALUATION
LINEAR STATIC PROCEDURE
LIFE SAFETY PERFORMANCE LEVEL
BSE-1E HAZARD LEVEL

**ROOF/FLOOR WEIGHT SUMMARY:**

| Level Type | Weight [ psf ] |
|---|---|
| ROOF | 35.4 |
| FLR-2 | 25.1 |
| FLR-1 | 20.1 |

**WALL WEIGHT SUMMARY:**

| Wall | Weight [ psf ] | | |
|---|---|---|---|
| Type | Net | Solid | Openings |
| WALL-0 | 18.1 | 18.1 | 8 |

**SEISMIC MASS SUMMARY:**

| Level | FLOOR | | | WALL ABOVE | | | | WALL BELOW | | | | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Level Type | Weight [ psf ] | Area [ sf ] | Wall Type | Weight [ psf ] | Length [ ft ] | Height [ ft ] | Wall Type | Weight [ psf ] | Length [ ft ] | Height [ ft ] | WEIGHT [ kips ] |
| Roof | ROOF | 35.4 | 3,053 | WALL-0 | 18.1 | 299 | 0.00 | WALL-0 | 18.1 | 299 | 5.50 | 137.9 |
| 2nd | FLR-2 | 25.1 | 2,900 | WALL-0 | 18.1 | 284 | 5.50 | WALL-0 | 18.1 | 284 | 5.00 | 126.7 |
| 1st | FLR-1 | 20.1 | 2,900 | WALL-0 | 18.1 | 284 | 5.00 | WALL-0 | 18.1 | 284 | 2.00 | 94.2 |
| | | | | | | | | | | | Σ | 358.7 |

N-S MASS DISTRIBUTION (FLEXIBLE DIAPHRAGM)

| Level | Grid | FLOOR | | | WALL ABOVE | | | | WALL BELOW | | | | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Level Type | Weight [ psf ] | Area [ sf ] | Wall Type | Weight [ psf ] | Length [ ft ] | Height [ ft ] | Wall Type | Weight [ psf ] | Length [ ft ] | Height [ ft ] | WEIGHT [ kips ] |
| Roof | 1 | ROOF | 35.4 | 715 | WALL-0 | 18.1 | 74.4 | 0 | WALL-0 | 18.1 | 74.4 | 5.5 | 32.7 |
| | 2 | | 35.4 | 981 | WALL-0 | 18.1 | 93.5 | 0 | WALL-0 | 18.1 | 93.5 | 5.5 | 44.0 |
| | 3 | | 35.4 | 874 | WALL-0 | 18.1 | 45.6 | 0 | WALL-0 | 18.1 | 45.6 | 5.5 | 35.5 |
| | 4 | | 35.4 | 484 | WALL-0 | 18.1 | 85.0 | 0 | WALL-0 | 18.1 | 85.0 | 5.5 | 25.6 |
| 2nd | 1 | FLR-2 | 25.1 | 667 | WALL-0 | 18.1 | 74.4 | 5.5 | WALL-0 | 18.1 | 74.4 | 5 | 30.9 |
| | 2 | | 25.1 | 929 | WALL-0 | 18.1 | 93.5 | 5.5 | WALL-0 | 18.1 | 93.5 | 5 | 41.1 |
| | 3 | | 25.1 | 874 | WALL-0 | 18.1 | 45.6 | 5.5 | WALL-0 | 18.1 | 45.6 | 5 | 30.6 |
| | 4 | | 25.1 | 430 | WALL-0 | 18.1 | 85.0 | 5.5 | WALL-0 | 18.1 | 85.0 | 5 | 27.0 |
| 1st | 1 | FLR-1 | 20.1 | 667 | WALL-0 | 18.1 | 74.4 | 5 | WALL-0 | 18.1 | 74.4 | 2 | 22.8 |
| | 2 | | 20.1 | 929 | WALL-0 | 18.1 | 93.5 | 5 | WALL-0 | 18.1 | 93.5 | 2 | 30.5 |
| | 3 | | 20.1 | 874 | WALL-0 | 18.1 | 45.6 | 5 | WALL-0 | 18.1 | 45.6 | 2 | 23.3 |
| | 4 | | 20.1 | 430 | WALL-0 | 18.1 | 85.0 | 5 | WALL-0 | 18.1 | 85.0 | 2 | 19.4 |

E-W MASS DISTRIBUTION (FLEXIBLE DIAPHRAGM)

| Level | Grid | FLOOR | | | WALL ABOVE | | | | WALL BELOW | | | | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Level Type | Weight [ psf ] | Area [ sf ] | Wall Type | Weight [ psf ] | Length [ ft ] | Height [ ft ] | Wall Type | Weight [ psf ] | Length [ ft ] | Height [ ft ] | WEIGHT [ kips ] |
| Roof | A | ROOF | 35.4 | 537 | WALL-0 | 18.1 | 89.8 | 0 | WALL-0 | 18.1 | 89.8 | 5.5 | 28.0 |
| | B | | 35.4 | 960 | WALL-0 | 18.1 | 30.1 | 0 | WALL-0 | 18.1 | 30.1 | 5.5 | 37.0 |
| | C | | 35.4 | 1043 | WALL-0 | 18.1 | 127.2 | 0 | WALL-0 | 18.1 | 127.2 | 5.5 | 49.6 |
| | D | | 35.4 | 514 | WALL-0 | 18.1 | 67.2 | 0 | WALL-0 | 18.1 | 67.2 | 5.5 | 24.9 |
| 2nd | A | FLR-2 | 25.1 | 487 | WALL-0 | 18.1 | 82.0 | 5.5 | WALL-0 | 18.1 | 82 | 5 | 27.8 |
| | B | | 25.1 | 857 | WALL-0 | 18.1 | 30.1 | 5.5 | WALL-0 | 18.1 | 30.1 | 5 | 27.2 |
| | C | | 25.1 | 1043 | WALL-0 | 18.1 | 127.2 | 5.5 | WALL-0 | 18.1 | 127.2 | 5 | 50.4 |
| | D | | 25.1 | 514 | WALL-0 | 18.1 | 67.2 | 5.5 | WALL-0 | 18.1 | 67.2 | 5 | 25.7 |
| 1st | A | FLR-1 | 20.1 | 487 | WALL-0 | 18.1 | 82.0 | 5 | WALL-0 | 18.1 | 82 | 2 | 20.2 |
| | B | | 20.1 | 857 | WALL-0 | 18.1 | 30.1 | 5 | WALL-0 | 18.1 | 30.1 | 2 | 21.0 |
| | C | | 20.1 | 1043 | WALL-0 | 18.1 | 127.2 | 5 | WALL-0 | 18.1 | 127.2 | 2 | 37.1 |
| | D | | 0.0 | 514 | WALL-0 | 18.1 | 67.2 | 5 | WALL-0 | 18.1 | 67.2 | 2 | 8.5 |

# Section 3.4
# BSE-1E Seismic Forces

Degenkolb

| **Subject:** | Seismic Forces BSE-1E | **Job Number:** | B7901001.00 | **Date:** | 03/22/17 |
|---|---|---|---|---|---|
| **Job:** | UCSF Alumni House | **By:** | RMG | **Section:** | 3.4 |
| | | **Checked By:** | | **Page** | |

**SEISMIC FORCES**

ASCE 41-13 SEISMIC EVALUATION & RETROFIT OF EXISTING BUILDINGS
CHAPTER 6 - TIER 2 EVALUATION
LINEAR STATIC PROCEDURE
LIFE SAFETY PERFORMANCE LEVEL
BSE-1E HAZARD LEVEL

| | | | |
|---|---|---|---|
| **BUILDING TYPE:** | W1 | ( Wood Light Frames ) | [ ASCE 41-13, Table 3-1 ] |
| **SITE CLASS:** | D | ( Stiff Soil ) | [ ASCE 41-13, §2.4.1.6.1 ] |

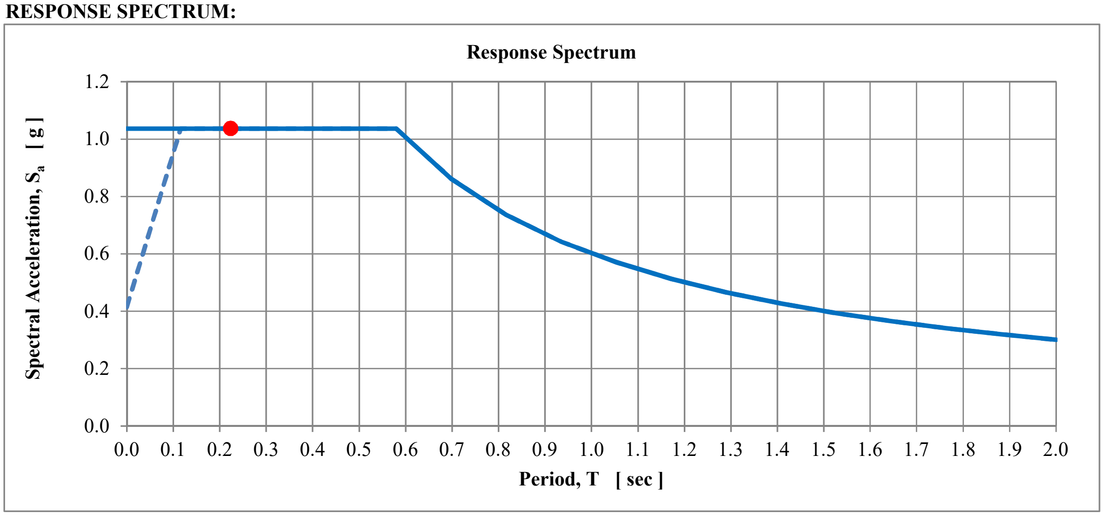
**DESIGN SPECTRAL ACCELERATIONS:**

| | | | | | |
|---|---|---|---|---|---|
| $S_{XS}$ | = | 1.0360724 g | ( BSE-1E ) | Site-Adjusted Design ( T = 0.2 sec ) | [ ASCE 41-13, Eq. 2-4 ] |
| $S_{X1}$ | = | 0.600928 g | ( BSE-1E ) | Site-Adjusted Design ( T = 1.0 sec ) | [ ASCE 41-13, Eq. 2-5 ] |

**BUILDING PERIOD:**

| | | | | | |
|---|---|---|---|---|---|
| $h_n$ | = | 25 ft | ( Base to Roof ) | Building Height | [ ASCE 41-13, §4.5.2.4 ] |
| $C_t$ | = | 0.02 | ( Building Type W1 ) | Period Coefficient | [ ASCE 41-13, §4.5.2.4 ] |
| β | = | 0.75 | ( Building Type W1 ) | Period Exponent | [ ASCE 41-13, §4.5.2.4 ] |
| T | = | 0.22 sec | $= C_t h_n^{\beta}$ | Fundamental Period | [ ASCE 41-13, Eq. 4-5 ] |

**RESPONSE SPECTRUM:**




**PSEUDO LATERAL FORCE:**

| | | | | | |
|---|---|---|---|---|---|
| n | = | 3 | ( n = 3 ) | Total Number of Stories | [ ASCE 41-13, §4.5.2.1 ] |
| Cm | = | 1.0 | W1 / ( n = 3 ) | Effective Mass Factor | [ ASCE 41-13, Table 7-4 ] |
| $DCR_{max}$ | = | 2.0 | Max DCR w/ $C_1C_2C_m$=1.0 | | |
| $\mu_{strength}$ | = | 1.3 | DCRmax/1.5*Cm | | [ASCE 41-13, EQ C7-3] |
| a | = | 60.0 | | Site Class Factor | [ASCE 41-13, 7.4.1.3] |
| $C_1$ | = | 1.11 | | | [ASCE 41-13, EQ 7-22] |
| $C_2$ | = | 1.00 | | | [ASCE 41-13, EQ 7-23] |
| $C_1C_2$ | = | 1.11 | | Modificaiton Factors | [ ASCE 41-13, Table 7-3 ] |
| $S_a$ | = | 1.04 g | = MIN { $S_{X1}$ / T , $S_{XS}$ } | Spectral Acceleration | [ ASCE 41-13, Eq. 4-4 ] |
| **V** | **=** | **1.154 W** | $= C_1C_2C_m S_a W$ | Pseudo Lateral Force | [ ASCE 41-13, Eq. 4-1 ] |

| Subject: | Seismic Forces BSE-1E | Job Number: | B7901001.00 | Date: | 03/22/17 |
|---|---|---|---|---|---|
| Job: | UCSF Alumni House | By: | RMG | Section: | 3.4 |
| | | Checked By: | | Page | |

**BSE 1E - VERTICAL DISTRIBUTION OF SEISMIC FORCES:**

k = 1.00 ( T ≤ 0.5 sec ) Seismic Distribution Exponent [ ASCE 41-13, §4.5.2.2 ]

$F_x = C_{vx} V = [ w_x h_x^k / \Sigma ( w_x h_x^k$ [ ASCE 41-13, Eq. 4-3a ]

$V_j = \Sigma F_x$ [ ASCE 41-13, Eq. 4-3b ]

| Level | $h_x$ [ ft ] | $w_x$ [ kips ] | $w_x h_x^k$ | $C_{vx}$ | $F_x$ [ kips ] | $V_j$ [ kips ] | Fpx [ kips ] |
|---|---|---|---|---|---|---|---|
| Roof | 25.0 | 138 | 3,446 | 0.62 | 255 | 255 | 255 |
| 2nd | 14.0 | 127 | 1,773 | 0.32 | 131 | 386 | 185 |
| 1st | 4.0 | 94 | 377 | 0.07 | 28 | 414 | 109 |
| TOTAL | - | 359 | 5,597 | 1.00 | 414 | - | |

**Wall Forces**

N-S FORCE DISTRIBUTION (FLEXIBLE DIAPHRAGM)

| Level | Grid | TOTAL WEIGHT [ kips ] | Acel % | $F_x$ [ kips ] | $V_j$ [ kips ] |
|---|---|---|---|---|---|
| Roof | 1 | 33 | 1.850 | 60.6 | 60.6 |
| | 2 | 44 | | 81.5 | 81.5 |
| | 3 | 35 | | 65.6 | 65.6 |
| | 4 | 26 | | 47.4 | 47.4 |
| 2nd | 1 | 31 | 1.036 | 32.0 | 92.5 |
| | 2 | 41 | | 42.6 | 124.0 |
| | 3 | 31 | | 31.7 | 97.3 |
| | 4 | 27 | | 27.9 | 75.3 |
| 1st | 1 | 23 | 0.296 | 6.8 | 99.3 |
| | 2 | 31 | | 9.0 | 133.1 |
| | 3 | 23 | | 6.9 | 104.2 |
| | 4 | 19 | | 5.7 | 81.1 |
| TOTAL | - | 363 | - | 418 | - |

E-W MASS DISTRIBUTION (FLEXIBLE DIAPHRAGM)

| Level | Grid | TOTAL WEIGHT [ kips ] | Acel % | $F_x$ [ kips ] | $V_j$ [ kips ] |
|---|---|---|---|---|---|
| Roof | A | 28 | 1.850 | 51.7 | 51.7 |
| | B | 37 | | 68.4 | 68.4 |
| | C | 50 | | 91.8 | 91.8 |
| | D | 25 | | 46.0 | 46.0 |
| 2nd | A | 28 | 1.036 | 28.8 | 80.5 |
| | B | 27 | | 28.2 | 96.6 |
| | C | 50 | | 52.2 | 143.9 |
| | D | 26 | | 26.6 | 72.6 |
| 1st | A | 20 | 0.296 | 6.0 | 86.5 |
| | B | 21 | | 6.2 | 102.8 |
| | C | 37 | | 11.0 | 154.9 |
| | D | 9 | | 2.5 | 75.1 |
| TOTAL | - | 357 | - | 419 | - |

Degenkolb

| Subject: | Seismic Forces BSE-1E | Job Number: | B7901001.00 | Date: | 03/22/17 |
|---|---|---|---|---|---|
| Job: | UCSF Alumni House | By: | RMG | Section: | 3.4 |
| | | Checked By: | | Page | |

**BSE-1E Diaphragm Forces**

N-S FORCE DISTRIBUTION (FLEXIBLE DIAPHRAGM)

| Level | Sub Diaph | Sub Diaph Area Sqft | % | $Fp_x$ [ kips ] |
|---|---|---|---|---|
| Roof | West | 1,385 | 0.454 | 115.6 |
| | East | 1,668 | 0.546 | 139.4 |
| 2nd | West | 1,385 | 0.454 | 83.9 |
| | East | 1,668 | 0.546 | 101.1 |
| 1st | West | 1,385 | 0.454 | 49.3 |
| | East | 1,668 | 0.546 | 59.4 |

E-W FORCE DISTRIBUTION (FLEXIBLE DIAPHRAGM)

| Level | Sub Diaph | Sub Diaph Area Sqft | % | $Fp_x$ [ kips ] |
|---|---|---|---|---|
| Roof | North | 983 | 0.322 | 82.1 |
| | South | 2,070 | 0.678 | 172.9 |
| 2nd | North | 983 | 0.322 | 59.6 |
| | South | 2,070 | 0.678 | 125.4 |
| 1st | North | 983 | 0.322 | 35.0 |
| | South | 2,070 | 0.678 | 73.7 |

# Section 3.5
# BSE-2E Seismic Forces

| Subject: | Seismic Forces - BSE 2E | Job Number: | B7901001.00 | Date: | 03/22/17 |
|---|---|---|---|---|---|
| Job: | UCSF Alumni House | By: | RMG | Section: | 3.5 |
| | | Checked By: | | Page | |

**SEISMIC FORCES**

ASCE 41-13 SEISMIC EVALUATION & RETROFIT OF EXISTING BUILDINGS
CHAPTER 6 - TIER 2 EVALUATION
LINEAR STATIC PROCEDURE
LIFE SAFETY PERFORMANCE LEVEL
BSE-2E HAZARD LEVEL

| | | | | |
|---|---|---|---|---|
| **BUILDING TYPE:** | W1 | ( Wood Light Frames ) | | [ ASCE 41-13, Table 3-1 ] |
| **SITE CLASS:** | D | ( Stiff Soil ) | | [ ASCE 41-13, §2.4.1.6.1 ] |

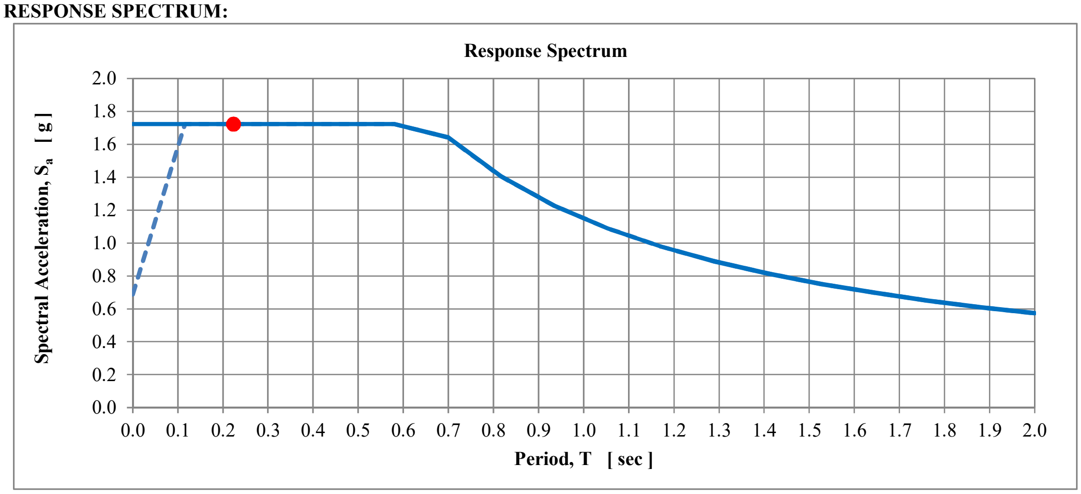
**DESIGN SPECTRAL ACCELERATIONS:**

| | | | | | |
|---|---|---|---|---|---|
| $S_{XS}$ | = | 1.723 g | ( BSE-2E ) | Site-Adjusted Design ( T = 0.2 sec ) | [ ASCE 41-13, Eq. 2-4 ] |
| $S_{X1}$ | = | 1.147 g | ( BSE-2E ) | Site-Adjusted Design ( T = 1.0 sec ) | [ ASCE 41-13, Eq. 2-5 ] |

**BUILDING PERIOD:**

| | | | | | |
|---|---|---|---|---|---|
| $h_n$ | = | 25 ft | ( Base to Roof ) | Building Height | [ ASCE 41-13, §4.5.2.4 ] |
| $C_t$ | = | 0.02 | ( Building Type W1 ) | Period Coefficient | [ ASCE 41-13, §4.5.2.4 ] |
| $\beta$ | = | 0.75 | ( Building Type W1 ) | Period Exponent | [ ASCE 41-13, §4.5.2.4 ] |
| T | = | 0.22 sec | $= C_t \, h_n{}^{\beta}$ | Fundamental Period | [ ASCE 41-13, Eq. 4-5 ] |

**RESPONSE SPECTRUM:**




**PSEUDO LATERAL FORCE:**

| | | | | | |
|---|---|---|---|---|---|
| n | = | 3 | ( n = 3 ) | Total Number of Stories | [ ASCE 41-13, §4.5.2.1 ] |
| Cm | = | 1.0 | W1 / ( n = 3 ) | Effective Mass Factor | [ ASCE 41-13, Table 7-4 ] |
| $DCR_{max}$ | = | 3.2 | Max DCR w/ $C_1C_2C_m$=1.0 | | |
| $\mu_{strength}$ | = | 2.1 | DCRmax/1.5*Cm | | [ASCE 41-13, EQ C7-3] |
| a | = | 60.0 | | Site Class Factor | [ASCE 41-13, 7.4.1.3] |
| $C_1$ | = | 1.38 | | | [ASCE 41-13, EQ 7-22] |
| $C_2$ | = | 1.03 | | | [ASCE 41-13, EQ 7-23] |
| $C_1C_2$ | = | 1.42 | | Modificaiton Factors | [ ASCE 41-13, Table 7-3 ] |
| $S_a$ | = | 1.723 g | $= MIN \{ S_{X1} / T , S_{XS} \}$ | Spectral Acceleration | [ ASCE 41-13, Eq. 4-4 ] |
| **V** | **=** | **2.450 W** | $= C_1C_2C_m \, S_a \, W$ | Pseudo Lateral Force | [ ASCE 41-13, Eq. 4-1 ] |

| Subject: | Seismic Forces - BSE 2E | Job Number: | B7901001.00 | Date: | 03/22/17 |
|---|---|---|---|---|---|
| Job: | UCSF Alumni House | By: | RMG | Section: | 3.5 |
| | | Checked By: | | Page | |

**BSE-2E VERTICAL DISTRIBUTION OF SEISMIC FORCES:**

k = 1.00 ( T $\leq$ 0.5 sec ) Seismic Distribution Exponent [ ASCE 41-13, §4.5.2.2 ]

$F_x = C_{vx} V = [ w_x h_x^k / \Sigma ( w_x h_x^k$ [ ASCE 41-13, Eq. 4-3a ]

$V_j = \Sigma F_x$ [ ASCE 41-13, Eq. 4-3b ]

| Level | $h_x$ [ ft ] | $w_x$ [ kips ] | $w_x h_x^k$ | $C_{vx}$ | $F_x$ [ kips ] | $V_j$ [ kips ] | Fpx [ kips ] |
|---|---|---|---|---|---|---|---|
| Roof | 25.0 | 138 | 3,446 | 0.62 | 541 | 541 | 541 |
| 2nd | 14.0 | 127 | 1,773 | 0.32 | 278 | 820 | 393 |
| 1st | 4.0 | 94 | 377 | 0.07 | 59 | 879 | 231 |
| TOTAL | - | 359 | 5,597 | 1.00 | 879 | - | |

**Wall Forces**

N-S FORCE DISTRIBUTION (FLEXIBLE DIAPHRAGM)

| Level | Grid | TOTAL WEIGHT [ kips ] | Acel % | $F_x$ [ kips ] | $V_j$ [ kips ] |
|---|---|---|---|---|---|
| Roof | 1 | 33 | 3.926 | 128.5 | 128.5 |
| | 2 | 44 | | 172.9 | 172.9 |
| | 3 | 35 | | 139.3 | 139.3 |
| | 4 | 26 | | 100.6 | 100.6 |
| 2nd | 1 | 31 | 2.199 | 67.9 | 196.4 |
| | 2 | 41 | | 90.4 | 263.2 |
| | 3 | 31 | | 67.2 | 206.5 |
| | 4 | 27 | | 59.3 | 159.9 |
| 1st | 1 | 23 | 0.628 | 14.3 | 210.8 |
| | 2 | 31 | | 19.2 | 282.4 |
| | 3 | 23 | | 14.6 | 221.1 |
| | 4 | 19 | | 12.2 | 172.1 |
| TOTAL | - | 363 | - | 886 | - |

E-W MASS DISTRIBUTION (FLEXIBLE DIAPHRAGM)

| Level | Grid | TOTAL WEIGHT [ kips ] | Acel % | $F_x$ [ kips ] | $V_j$ [ kips ] |
|---|---|---|---|---|---|
| Roof | A | 28 | 3.926 | 109.8 | 109.8 |
| | B | 37 | | 145.2 | 145.2 |
| | C | 50 | | 194.8 | 194.8 |
| | D | 25 | | 97.7 | 97.7 |
| 2nd | A | 28 | 2.199 | 61.2 | 170.9 |
| | B | 27 | | 59.8 | 205.0 |
| | C | 50 | | 110.7 | 305.5 |
| | D | 26 | | 56.4 | 154.1 |
| 1st | A | 20 | 0.628 | 12.7 | 183.6 |
| | B | 21 | | 13.2 | 218.2 |
| | C | 37 | | 23.3 | 328.8 |
| | D | 9 | | 5.4 | 159.5 |
| TOTAL | - | 357 | - | 890 | - |

| Subject: | Seismic Forces - BSE 2E | Job Number: | B7901001.00 | Date: | 03/22/17 |
|---|---|---|---|---|---|
| Job: | UCSF Alumni House | By: | RMG | Section: | 3.5 |
| | | Checked By: | | Page | |

**BSE-2E Diaphragm Forces**

N-S FORCE DISTRIBUTION (FLEXIBLE DIAPHRAGM)

| Level | Sub Diaph | Sub Diaph Area Sqft | % | $Fp_x$ [ kips ] |
|---|---|---|---|---|
| Roof | West | 1,385 | 0.454 | 245.5 |
| | East | 1,668 | 0.546 | 295.8 |
| 2nd | West | 1,385 | 0.454 | 178.0 |
| | East | 1,668 | 0.546 | 214.5 |
| 1st | West | 1,385 | 0.454 | 104.6 |
| | East | 1,668 | 0.546 | 126.1 |

E-W FORCE DISTRIBUTION (FLEXIBLE DIAPHRAGM)

| Level | Sub Diaph | Sub Diaph Area Sqft | % | $Fp_x$ [ kips ] |
|---|---|---|---|---|
| Roof | North | 983 | 0.322 | 174.3 |
| | South | 2,070 | 0.678 | 366.9 |
| 2nd | North | 983 | 0.322 | 126.4 |
| | South | 2,070 | 0.678 | 266.1 |
| 1st | North | 983 | 0.322 | 74.3 |
| | South | 2,070 | 0.678 | 156.4 |

# SECTION 4.0
# TIER 1 SHEAR CHECK

| Subject: | TIER 1 Quick Shear Check | Job Number: | B7901001.00 | Date: | 04/21/17 |
|---|---|---|---|---|---|
| Job: | UCSF Alumni House | By: | RMG | Section: | 4.0 |
| | | Checked By: | | Page | |

**QUICK CHECKS**

ASCE 41-13 SEISMIC EVALUATION & RETROFIT OF EXISTING BUILDINGS
CHAPTER 6 - TIER 1 EVALUATION
LINEAR STATIC PROCEDURE
LIFE SAFETY PERFORMANCE LEVEL
BSE-1E HAZARD LEVEL

**BUILDING TYPE:** W1 ( Wood Light Frames ) [ ASCE 41-13, Table 3-1 ]

**AVERAGE SHEAR STRESS CHECK:** [ ASCE 41-13, §A.3.2.7.1 ]

| | | | | | |
|---|---|---|---|---|---|
| $v_n$ | = | 700 plf | ( Diagonal Sheathing ) | Shear Wall Capacity | [ ASCE 41-13, §A.3.2.7.1 ] |
| $M_s$ | = | 4.0 | ( Life Safety ) | System Modification Factor | [ ASCE 41-13, Table 4-9 ] |
| $v_{j, avg}$ | = | $( 1 / M_s ) ( V_j / L_w )$ | | Average Shear Wall Stress | [ ASCE 41-13, Eq. 4-9 ] |
| $L_w$ | = | $L_{w, total} - L_{w, openings}$ | | Net Wall Length | [ ASCE 41-13, §4.5.3.3 ] |

**North-South Direction:**

| Level | $V_j$ [ kips ] | $L_{w, total}$ [ ft ] | $L_{w, openings}$ [ ft ] | $L_w$ [ ft ] | $v_{j, avg}$ [ plf ] | DCR | Quick Check |
|---|---|---|---|---|---|---|---|
| Roof | 255 | 147 | 67 | 80 | 802 | 1.15 | NO GOOD |
| 2nd | 386 | 147 | 79 | 68 | 1,420 | 2.03 | NO GOOD |
| 1st | 414 | 147 | 23 | 123 | 839 | 1.20 | NO GOOD |

**East-West Direction:**

| Level | $V_j$ [ kips ] | $L_{w, total}$ [ ft ] | $L_{w, openings}$ [ ft ] | $L_w$ [ ft ] | $v_{j, avg}$ [ plf ] | DCR | Quick Check |
|---|---|---|---|---|---|---|---|
| Roof | 255 | 152 | 64 | 88 | 724 | 1.03 | NO GOOD |
| 2nd | 386 | 137 | 51 | 86 | 1,123 | 1.60 | NO GOOD |
| 1st | 414 | 137 | 34 | 103 | 1,005 | 1.44 | NO GOOD |

# SECTION 5.0
# RETROFIT DESIGN

# Section 5.1
# Shear Wall Type and Location

Degenkolb

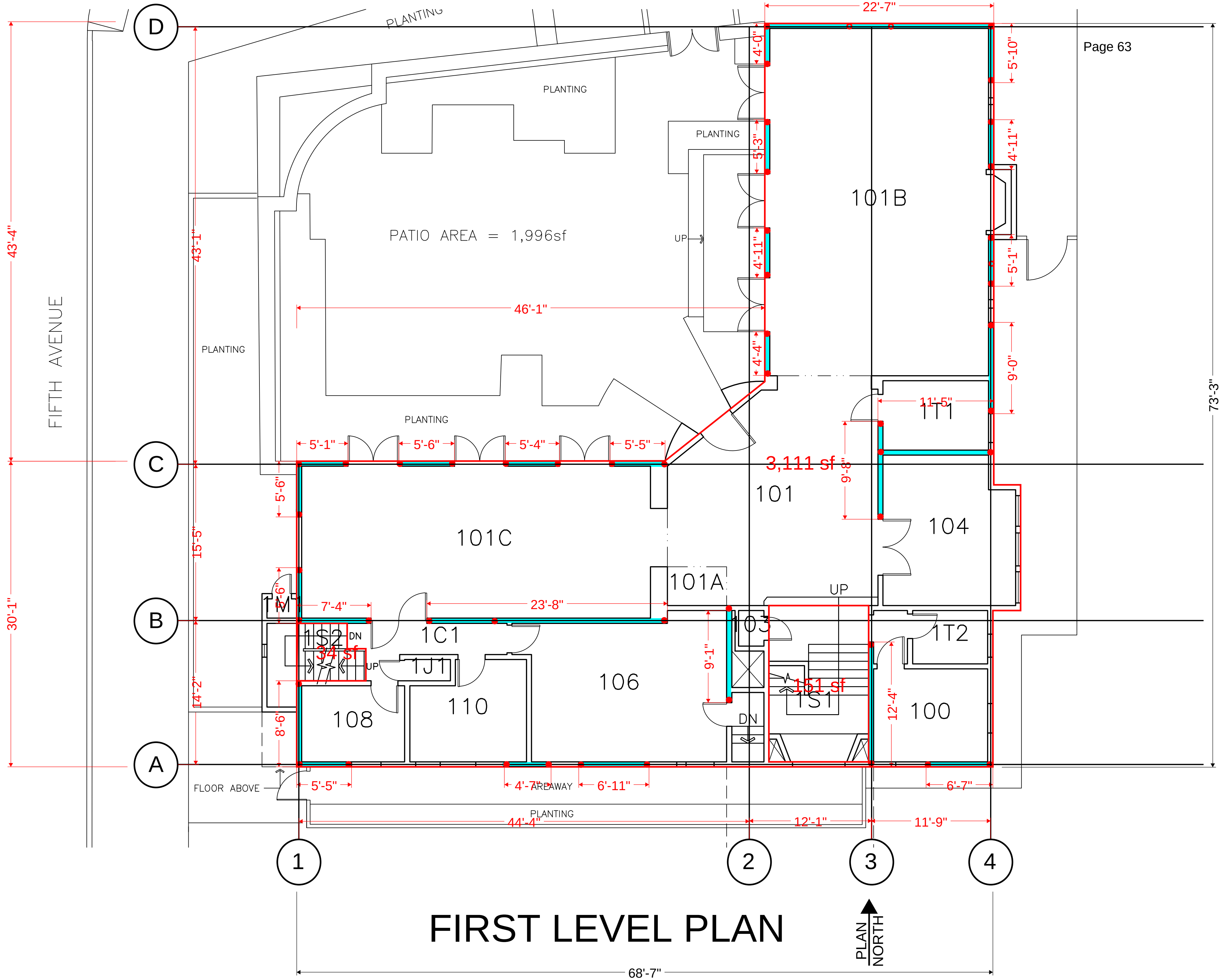
| Subject: | Shear Wall Layout and Design BSE-1E | Job Number: | B7901001.00 | Date: | 03/22/17 |
|---|---|---|---|---|---|
| Job: | UCSF Alumni House | By: | RMG | Section: | 5.1 |
| | | Checked By: | | Page | |

SHEAR WALL LINES AND WALL LENGTHS ESTABLISHED ON 2ND AND FIRST FLOOR PLANS BELOW.

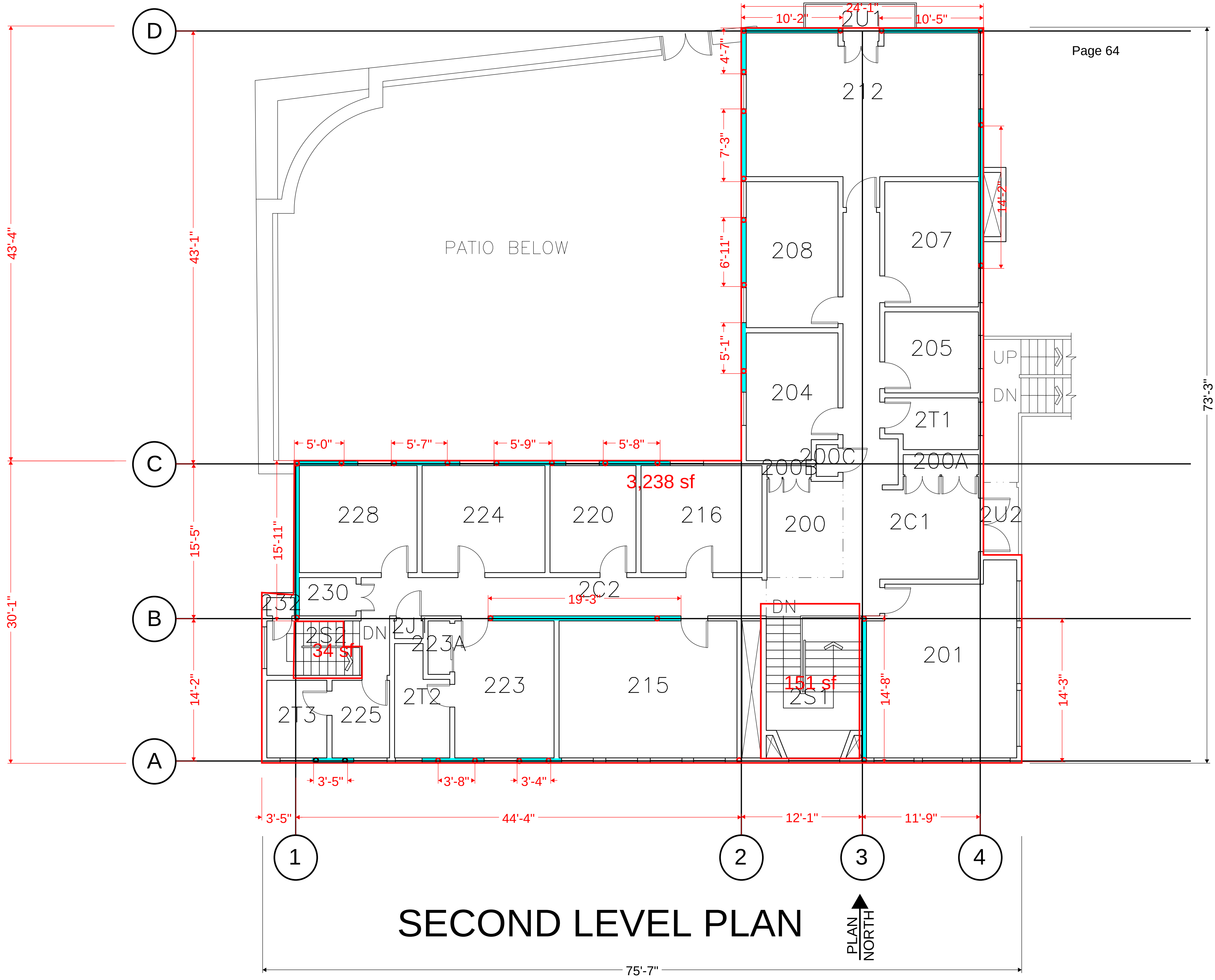
PROPOSED LAYOUTS WERE VERIFIED FOR CAPACITY AT BOTH BSE-1N LIFE SAFETY AND BSE-2N COLLAPSE PREVENTIONS AS SHOWN IN CALCULATIONS.

THE WALL LINES HAVE BEEN SUPERIMPOSED ON THE BUILDING EXTERIOR TO VERIFY COMPATABILITY BETWEEN FLOOR LAYOUTS.

SOME PRELIMINARY SHEAR WALL DETAILS HAVE BEEN DEVELOPED IN LATER SECTIONS OF CALCULATIONS PACKAGE.




# FIRST LEVEL PLAN




# SECOND LEVEL PLAN


PHOTO - Alumni House North and East Elevations


PHOTO - Alumni House South Elevation

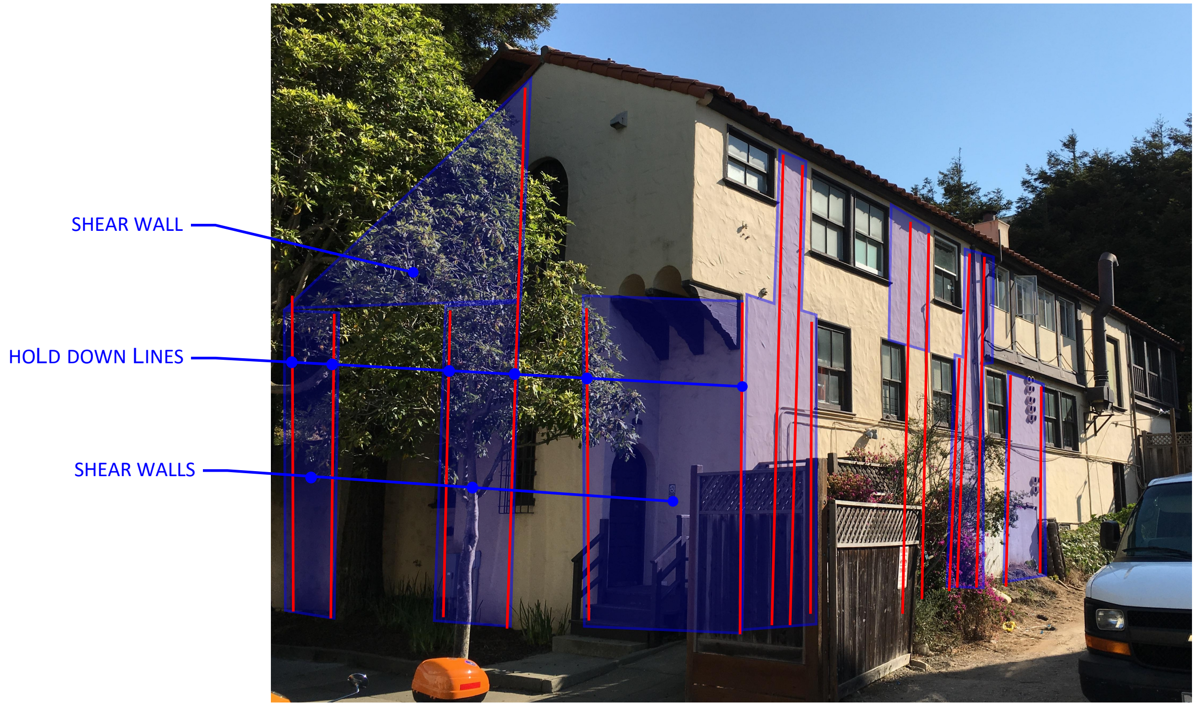



PHOTO - Alumni House South and West Elevations

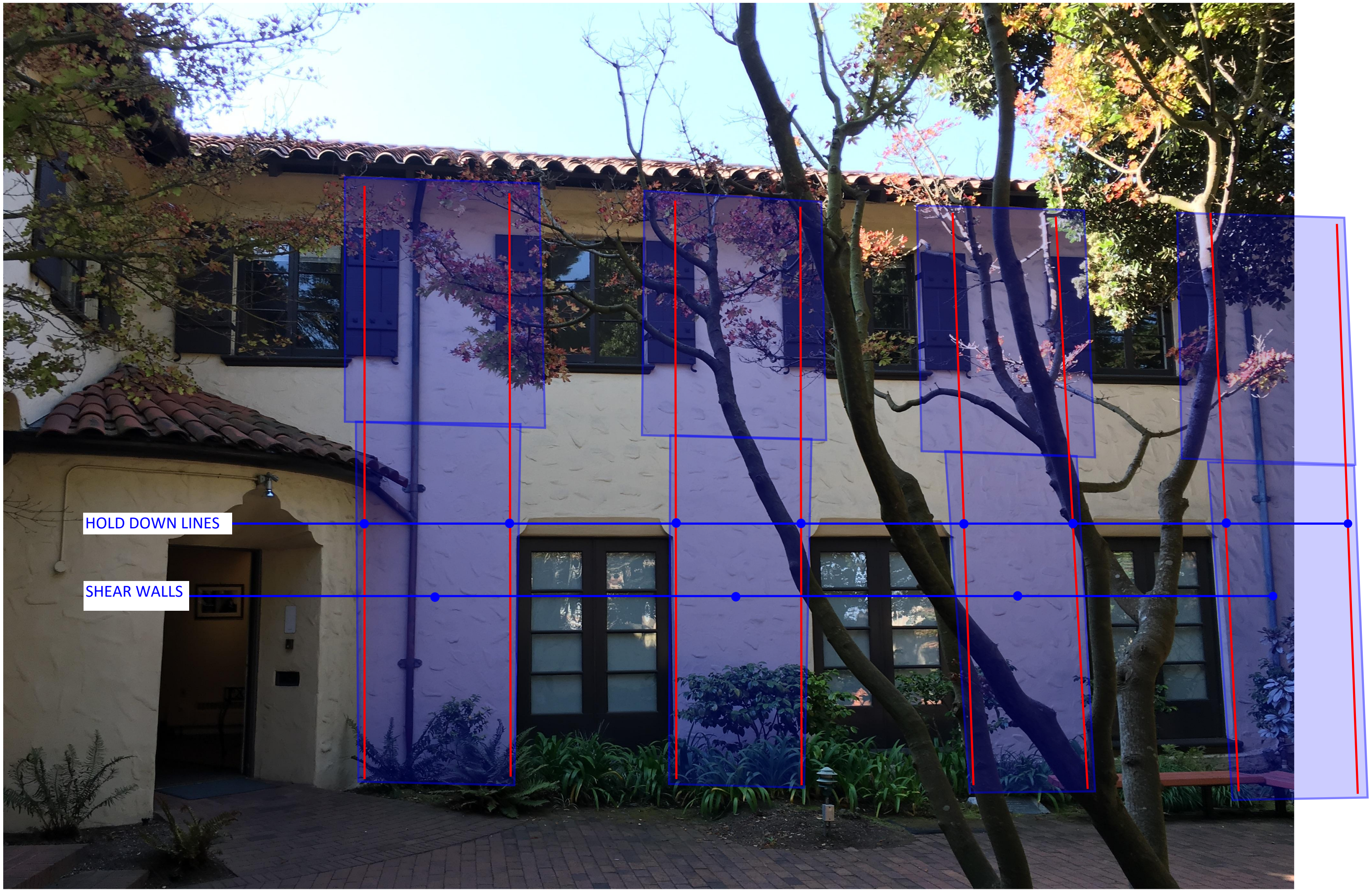



PHOTO - Alumni House Elevation Looking South from Patio

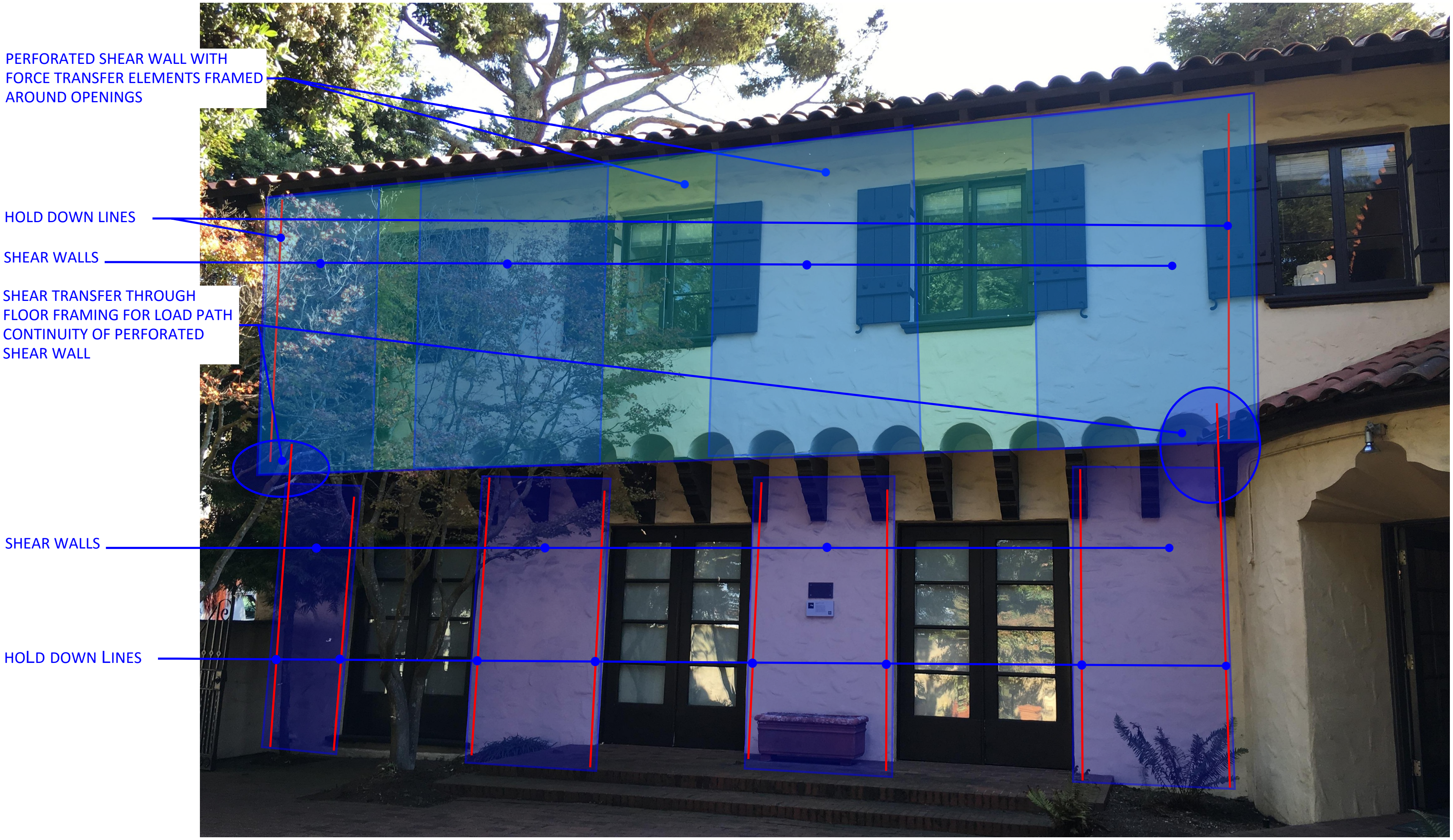



PHOTO - Alumni House Elevation Looking East from Patio

Degenkolb

| Subject: | Shear Wall Layout and Design BSE-1E LS | Job Number: | B7901001.00 | Date: | 03/22/17 |
|---|---|---|---|---|---|
| Job: | UCSF Alumni House | By: | RMG | Section: | 5.1 |
| | | Checked By: | | Page | |

N-S FORCE DISTRIBUTION (FLEXIBLE DIAPHRAGM)

| Level | Grid | $V_j$ [ kips ] |
|---|---|---|
| Roof | 1 | 60.6 |
| | 2 | 81.5 |
| | 3 | 65.6 |
| | 4 | 47.4 |
| 2nd | 1 | 92.5 |
| | 2 | 124.0 |
| | 3 | 97.3 |
| | 4 | 75.3 |
| 1st | 1 | 99.3 |
| | 2 | 133.1 |
| | 3 | 104.2 |
| | 4 | 81.1 |

No Hold Donws -> Ignored

| Wall Type | Ext Sheathing | Vexp[1] | $G_d$[1] | Int Sheating | Vnom[2] | $G_a$[2] | $e_n$ | ΣVexp[3] | ΣGexp[4] |
|---|---|---|---|---|---|---|---|---|---|
| NONE | Diagonal | 0 | 0 | | 0 | 0 | | 0 | 0 |
| Diagonal | Diagonal | 700 | 8000 | - | 0 | 0 | | 700 | 8000 |
| Ply 1 | Diagonal | 700 | 8000 | 1/2" ply w/ 8d @ 4" | 860 | 18000 | 0.08 | 1400 | 22000 |
| Ply 2 | Diagonal | 700 | 8000 | 1/2" ply w/ 10d @ 3" | 1330 | 36000 | 0.08 | 1995 | 40000 |
| Ply 3 | Diagonal | 700 | 8000 | 1/2" ply w/10d @ 2" | 1740 | 51000 | 0.08 | 2610 | 55000 |

Notes

1 Vexp and $G_d$ from ASCE-41 T12-1
2 Vnom and $G_a$ from AWC NDS as referred to in ASCE-41 12.4.4.6
3 ΣVexp for 2-sided walls = max [2*diagonal sheathing or 1.5 x wood sheathing]
4 ΣGexp for 2-sided shear walls = sum 1/2 diagonal stiffness with wood sheathing stiffness.

General Wall Information

H 2nd-Roo 11 ft
H 1st-2nd 10 ft

E 1700000 psi — Per NDS for DF No 1
$A_{chord}$ 16.5 $in^2$ — Assumed (2)2x6

E-W FORCE DISTRIBUTION (FLEXIBLE DIAPHRAGM)

| Level | Grid | $V_j$ [ kips ] |
|---|---|---|
| Roof | A | 51.7 |
| | B | 68.4 |
| | C | 91.8 |
| | D | 46.0 |
| 2nd | A | 80.5 |
| | B | 96.6 |
| | C | 143.9 |
| | D | 72.6 |
| 1st | A | 86.5 |
| | B | 102.8 |
| | C | 154.9 |
| | D | 75.1 |

Degenkolb

| | | | | | |
|---|---|---|---|---|---|
| **Subject:** | Shear Wall Layout and Design BSE-1E LS | **Job Number:** | B7901001.00 | **Date:** | 03/22/17 |
| **Job:** | UCSF Alumni House | **By:** | RMG | **Section:** | 5.1 |
| | | **Checked By:** | | **Page** | |

**2nd to Roof -North South**

| Parallel grid | Wall Seg # | Wall length | h/b | Wall type | Capacity | G | K | %V | Vpanel | Vs | DCR | M | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | ft | | | plf | lbs/in per ft | lbs/in | | kips | kips/ft | | | |
| 1 | | 9.5 | 0.86 | NONE | 0 | 0 | 0 | 0.00 | 0.0 | 0.0 | 0.0 | 3.8 | OK |
| 1 | | 15.9 | 1.45 | Ply 2 | 1995 | 40000 | 636000 | 1.00 | 60.6 | 3.8 | 1.9 | 3.8 | OK |
| | | | 0.00 | | | | | | | | | | |
| 2 | | 4 | 0.36 | NONE | 0 | 0 | 0 | 0.00 | 0.0 | 0.0 | 0.0 | 3.8 | OK |
| 2 | | 5.1 | 0.46 | Ply 2 | 1995 | 40000 | 204000 | 0.21 | 17.3 | 3.4 | 1.7 | 3.8 | OK |
| 2 | | 6.9 | 0.63 | Ply 2 | 1995 | 40000 | 276000 | 0.29 | 23.4 | 3.4 | 1.7 | 3.8 | OK |
| 2 | | 7.3 | 0.66 | Ply 2 | 1995 | 40000 | 292000 | 0.30 | 24.8 | 3.4 | 1.7 | 3.8 | OK |
| 2 | | 4.7 | 0.43 | Ply 2 | 1995 | 40000 | 188000 | 0.20 | 16.0 | 3.4 | 1.7 | 3.8 | OK |
| | | | 0.00 | | | | | | | | | | |
| 3 | | 14.7 | 1.34 | Ply 3 | 2610 | 55000 | 808500 | 1.00 | 65.6 | 4.5 | 1.7 | 3.8 | OK |
| | | | | | | | | | | | | | |
| 4 | | 6.25 | 0.57 | NONE | 0 | 0 | 0 | 0.00 | 0.0 | 0.0 | 0.0 | 3.8 | OK |
| 4 | | 14.1 | 1.28 | Ply 3 | 2610 | 55000 | 775500 | 1.00 | 47.4 | 3.4 | 1.3 | 3.8 | OK |
| 4 | | 4.66 | 0.42 | NONE | 0 | 0 | 0 | 0.00 | 0.0 | 0.0 | 0.0 | 3.8 | OK |

**2nd to Roof - East West**

| Parallel grid | Wall Seg # | Wall length | h/b | Wall type | Capacity | G | K | %V | Vpanel | Vs | DCR | M | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | ft | | | plf | lbs/in | | | kips | kips/ft | | | |
| A | | 3.4 | 0.31 | Ply 3 | 2610 | 55000 | 187000 | 0.33 | 16.9 | 5.0 | 1.9 | 3.8 | OK |
| A | | 3.7 | 0.34 | Ply 3 | 2610 | 55000 | 203500 | 0.36 | 18.4 | 5.0 | 1.9 | 3.8 | OK |
| A | | 3.3 | 0.30 | Ply 3 | 2610 | 55000 | 181500 | 0.32 | 16.4 | 5.0 | 1.9 | 3.8 | OK |
| A | | 6.4 | 0.58 | NONE | 0 | 0 | 0 | 0.00 | 0.0 | 0.0 | 0.0 | 3.8 | OK |
| | | | | | | | | | | | | | |
| B | | 7.3 | 0.66 | NONE | 0 | 0 | 0 | 0.00 | 0.0 | 0.0 | 0.0 | 3.8 | OK |
| B | | 19.3 | 1.75 | Ply 2 | 1995 | 40000 | 772000 | 1.00 | 68.4 | 3.5 | 1.8 | 3.8 | OK |
| | | | | 0 | | | | | | | | | |
| C | | 5 | 0.45 | Ply 3 | 2610 | 55000 | 275000 | 0.23 | 20.8 | 4.2 | 1.6 | 3.8 | OK |
| C | | 5.6 | 0.51 | Ply 3 | 2610 | 55000 | 308000 | 0.25 | 23.3 | 4.2 | 1.6 | 3.8 | OK |
| C | | 5.8 | 0.53 | Ply 3 | 2610 | 55000 | 319000 | 0.26 | 24.1 | 4.2 | 1.6 | 3.8 | OK |
| C | | 5.7 | 0.52 | Ply 3 | 2610 | 55000 | 313500 | 0.26 | 23.7 | 4.2 | 1.6 | 3.8 | OK |
| | | | | 0 | | | | | | | | | |
| D | | 10.2 | 0.93 | Ply 1 | 1400 | 22000 | 224400 | 0.50 | 22.8 | 2.2 | 1.6 | 3.8 | OK |
| D | | 10.4 | 0.95 | Ply 1 | 1400 | 22000 | 228800 | 0.50 | 23.2 | 2.2 | 1.6 | 3.8 | OK |

Degenkolb

| Subject: | Shear Wall Layout and Design BSE-1E LS | Job Number: | B7901001.00 | Date: | 03/22/17 |
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| | | Checked By: | | Page | |

**1st to 2nd - North South**

| Parallel grid | Wall Seg # | Wall length | h/b | Wall type | Capacity | G | K | %V | Vpanel | Vs | DCR | M | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | ft | | | plf | lbs/in | | | kips | kips/ft | | | |
| 1 | | 8.5 | 0.77 | Ply 3 | 2610 | 55000 | 467500 | 0.44 | 40.3 | 4.7 | 1.8 | 3.8 | OK |
| 1 | | 5.5 | 0.50 | Ply 3 | 2610 | 55000 | 302500 | 0.28 | 26.1 | 4.7 | 1.8 | 3.8 | OK |
| 1 | | 5.5 | 0.50 | Ply 3 | 2610 | 55000 | 302500 | 0.28 | 26.1 | 4.7 | 1.8 | 3.8 | OK |
| | | | | | | | | | | | | | |
| 2 | | 9.1 | 0.83 | Ply 3 | 2610 | 55000 | 500500 | 0.33 | 40.9 | 4.5 | 1.7 | 3.8 | OK |
| 2 | | 4.3 | 0.39 | Ply 3 | 2610 | 55000 | 236500 | 0.16 | 19.3 | 4.5 | 1.7 | 3.8 | OK |
| 2 | | 4.9 | 0.45 | Ply 3 | 2610 | 55000 | 269500 | 0.18 | 22.0 | 4.5 | 1.7 | 3.8 | OK |
| 2 | | 5.3 | 0.48 | Ply 3 | 2610 | 55000 | 291500 | 0.19 | 23.8 | 4.5 | 1.7 | 3.8 | OK |
| 2 | | 4.0 | 0.36 | Ply 3 | 2610 | 55000 | 220000 | 0.14 | 18.0 | 4.5 | 1.7 | 3.8 | OK |
| | | | | | | | | | | | | | |
| 3 | | 12.3 | 1.12 | Ply 3 | 2610 | 55000 | 676500 | 0.56 | 54.4 | 4.4 | 1.7 | 3.8 | OK |
| 3 | | 9.7 | 0.88 | Ply 3 | 2610 | 55000 | 533500 | 0.44 | 42.9 | 4.4 | 1.7 | 3.8 | OK |
| | | | | | | | | | | | | | |
| 4 | | 5.1 | 0.46 | Ply 3 | 2610 | 55000 | 280500 | 0.20 | 15.4 | 3.0 | 1.2 | 3.8 | OK |
| 4 | | 4.9 | 0.45 | Ply 3 | 2610 | 55000 | 269500 | 0.20 | 14.8 | 3.0 | 1.2 | 3.8 | OK |
| 4 | | 5.9 | 0.54 | Ply 3 | 2610 | 55000 | 324500 | 0.24 | 17.8 | 3.0 | 1.2 | 3.8 | OK |
| 4 | | 9 | 0.82 | Ply 3 | 2610 | 55000 | 495000 | 0.36 | 27.2 | 3.0 | 1.2 | 3.8 | |

**1st to 2nd - East West**

| Parallel grid | Wall Seg # | Wall length | h/b | Wall type | Capacity | G | K | %V | Vpanel | Vs | DCR | M | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | ft | | | plf | lbs/in | | | kips | kips/ft | | | |
| A | | 5.5 | 0.50 | Ply 3 | 2610 | 55000 | 302500 | 0.2 | 18.8 | 3.4 | 1.3 | 3.8 | OK |
| A | | 4.6 | 0.42 | Ply 3 | 2610 | 55000 | 253000 | 0.2 | 15.7 | 3.4 | 1.3 | 3.8 | OK |
| A | | 6.9 | 0.63 | Ply 3 | 2610 | 55000 | 379500 | 0.3 | 23.5 | 3.4 | 1.3 | 3.8 | OK |
| A | | 7.75 | 0.70 | NONE | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 3.8 | OK |
| A | | 5 | 0.45 | NONE | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 3.8 | OK |
| A | | 6.6 | 0.60 | Ply 3 | 2610 | 55000 | 363000 | 0.3 | 22.5 | 3.4 | 1.3 | 3.8 | OK |
| | | | | | | | | | | | | | |
| B | | 7.3 | 0.66 | Ply 2 | 1995 | 40000 | 292000 | 0.2 | 22.7 | 3.1 | 1.6 | 3.8 | OK |
| B | | 23.7 | 2.15 | Ply 2 | 1995 | 40000 | 948000 | 0.8 | 73.8 | 3.1 | 1.6 | 3.8 | OK |
| | | | | | | | | | | | | | |
| C | | 5.1 | 0.46 | Ply 3 | 2610 | 55000 | 280500 | 0.2 | 22.4 | 4.4 | 1.7 | 3.8 | OK |
| C | | 5.5 | 0.50 | Ply 3 | 2610 | 55000 | 302500 | 0.2 | 24.2 | 4.4 | 1.7 | 3.8 | OK |
| C | | 5.3 | 0.48 | Ply 3 | 2610 | 55000 | 291500 | 0.2 | 23.3 | 4.4 | 1.7 | 3.8 | OK |
| C | | 5.4 | 0.49 | Ply 3 | 2610 | 55000 | 297000 | 0.2 | 23.8 | 4.4 | 1.7 | 3.8 | OK |
| C | | 11.4 | 1.04 | Ply 3 | 2610 | 55000 | 627000 | 0.3 | 50.2 | 4.4 | 1.7 | 3.8 | OK |
| | | | | | | | | | | | | | |
| D | | 22.6 | 2.05 | Ply 3 | 2610 | 55000 | 1243000 | 1.0 | 96.6 | 4.3 | 1.6 | 3.8 | OK |

Degenkolb

| **Subject:** | Tier 2 Wall Checks at BSE-2E CP | **Job Number:** | B7901001.00 | **Date:** | 03/22/17 |
|---|---|---|---|---|---|
| **Job:** | UCSF Alumni House | **By:** | RMG | **Section:** | 5.1 |
| | | **Checked By:** | | **Page** | |

N-S FORCE DISTRIBUTION (FLEXIBLE DIAPHRAGM)

| Level | Grid | $V_j$ [ kips ] |
|---|---|---|
| Roof | 1 | 128.5 |
| | 2 | 172.9 |
| | 3 | 139.3 |
| | 4 | 100.6 |
| 2nd | 1 | 196.4 |
| | 2 | 263.2 |
| | 3 | 206.5 |
| | 4 | 159.9 |
| 1st | 1 | 210.8 |
| | 2 | 282.4 |
| | 3 | 221.1 |
| | 4 | 172.1 |

No Hold Donws -> Ignored

| Wall Type | Ext Sheathing | Vexp[1] | $G_d$[1] | Int Sheating | Vnom[2] | $G_a$[2] | $e_n$ | ΣVexp[3] | ΣGexp[4] |
|---|---|---|---|---|---|---|---|---|---|
| NONE | Diagonal | 0 | 0 | | 0 | 0 | | 0 | 0 |
| Diagonal | Diagonal | 700 | 8000 | - | 0 | 0 | | 700 | 8000 |
| Ply 1 | Diagonal | 700 | 8000 | 1/2" ply w/ 8d @ 4" | 860 | 18000 | 0.08 | 1400 | 22000 |
| Ply 2 | Diagonal | 700 | 8000 | 1/2" ply w/ 10d @ 3" | 1330 | 36000 | 0.08 | 1995 | 40000 |
| Ply 3 | Diagonal | 700 | 8000 | 1/2" ply w/10d @ 2" | 1740 | 51000 | 0.08 | 2610 | 55000 |

Notes

1 Vexp and $G_d$ from ASCE-41 T12-1
2 Vnom and $G_a$ from AWC NDS as referred to in ASCE-41 12.4.4.6
3 ΣVexp for 2-sided walls = max [2*diagonal sheathing or 1.5 x wood sheathing]
4 ΣGexp for 2-sided shear walls = sum 1/2 diagonal stiffness with wood sheathing stiffness.

General Wall Information

| | | | |
|---|---|---|---|
| H 2nd-Roo | 11 | ft | |
| H 1st-2nd | 16 | ft | Includes craw space |
| E | 1700000 | psi | Per NDS for DF No 1 |
| $A_{chord}$ | 16.5 | $in^2$ | Assumed (2)2x6 |

E-W FORCE DISTRIBUTION (FLEXIBLE DIAPHRAGM)

| Level | Grid | $V_j$ [ kips ] |
|---|---|---|
| Roof | A | 109.8 |
| | B | 145.2 |
| | C | 194.8 |
| | D | 97.7 |
| 2nd | A | 170.9 |
| | B | 205.0 |
| | C | 305.5 |
| | D | 154.1 |
| 1st | A | 183.6 |
| | B | 218.2 |
| | C | 328.8 |
| | D | 159.5 |

Degenkolb

| | | | | | |
|---|---|---|---|---|---|
| **Subject:** | Tier 2 Wall Checks at BSE-2E CP | **Job Number:** | B7901001.00 | **Date:** | 03/22/17 |
| **Job:** | UCSF Alumni House | **By:** | RMG | **Section:** | 5.1 |
| | | **Checked By:** | | **Page** | |

**2nd to Roof -North South**

| Parallel grid | Wall Seg # | Wall length | h/b | Wall type | Capacity | G | K | %V | Vpanel | Vs | DCR | M | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | ft | | | plf | lbs/in per ft | lbs/in | | kips | kips/ft | | | |
| 1 | | 9.5 | 0.86 | NONE | 0 | 0 | 0 | 0.00 | 0.0 | 0.0 | 0.0 | 4.5 | OK |
| 1 | | 15.9 | 1.45 | Ply 2 | 1995 | 40000 | 636000 | 1.00 | 128.5 | 8.1 | 4.1 | 4.5 | OK |
| | | | 0.00 | | | | | | | | | | |
| 2 | | 4 | 0.36 | NONE | 0 | 0 | 0 | 0.00 | 0.0 | 0.0 | 0.0 | 4.5 | OK |
| 2 | | 5.1 | 0.46 | Ply 2 | 1995 | 40000 | 204000 | 0.21 | 36.7 | 7.2 | 3.6 | 4.5 | OK |
| 2 | | 6.9 | 0.63 | Ply 2 | 1995 | 40000 | 276000 | 0.29 | 49.7 | 7.2 | 3.6 | 4.5 | OK |
| 2 | | 7.3 | 0.66 | Ply 2 | 1995 | 40000 | 292000 | 0.30 | 52.6 | 7.2 | 3.6 | 4.5 | OK |
| 2 | | 4.7 | 0.43 | Ply 2 | 1995 | 40000 | 188000 | 0.20 | 33.9 | 7.2 | 3.6 | 4.5 | OK |
| | | | 0.00 | | | | | | | | | | |
| 3 | | 14.7 | 1.34 | Ply 3 | 2610 | 55000 | 808500 | 1.00 | 139.3 | 9.5 | 3.6 | 4.5 | OK |
| | | | | | | | | | | | | | |
| 4 | | 6.25 | 0.57 | NONE | 0 | 0 | 0 | 0.00 | 0.0 | 0.0 | 0.0 | 4.5 | OK |
| 4 | | 14.1 | 1.28 | Ply 3 | 2610 | 55000 | 775500 | 1.00 | 100.6 | 7.1 | 2.7 | 4.5 | OK |
| 4 | | 4.66 | 0.42 | NONE | 0 | 0 | 0 | 0.00 | 0.0 | 0.0 | 0.0 | 4.5 | OK |

**2nd to Roof - East West**

| Parallel grid | Wall Seg # | Wall length | h/b | Wall type | Capacity | G | K | %V | Vpanel | Vs | DCR | M | OK |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | ft | | | plf | lbs/in | | | kips | kips/ft | | | |
| A | | 3.4 | 0.31 | Ply 3 | 2610 | 55000 | 187000 | 0.33 | 35.9 | 10.6 | 4.0 | 4.5 | OK |
| A | | 3.7 | 0.34 | Ply 3 | 2610 | 55000 | 203500 | 0.36 | 39.1 | 10.6 | 4.0 | 4.5 | OK |
| A | | 3.3 | 0.30 | Ply 3 | 2610 | 55000 | 181500 | 0.32 | 34.8 | 10.6 | 4.0 | 4.5 | OK |
| A | | 6.4 | 0.58 | NONE | 0 | 0 | 0 | 0.00 | 0.0 | 0.0 | 0.0 | 4.5 | OK |
| | | | | | | | | | | | | | |
| B | | 7.3 | 0.66 | NONE | 0 | 0 | 0 | 0.00 | 0.0 | 0.0 | 0.0 | 4.5 | OK |
| B | | 19.3 | 1.75 | Ply 2 | 1995 | 40000 | 772000 | 1.00 | 145.2 | 7.5 | 3.8 | 4.5 | OK |
| | | | | | | | | | | | | | |
| C | | 5 | 0.45 | Ply 3 | 2610 | 55000 | 275000 | 0.29 | 56.9 | 11.4 | 4.4 | 4.5 | OK |
| C | | 5.6 | 0.51 | Ply 3 | 2610 | 55000 | 308000 | 0.33 | 63.8 | 11.4 | 4.4 | 4.5 | OK |
| C | | 5.8 | 0.53 | Ply 3 | 2610 | 55000 | 319000 | 0.34 | 66.1 | 11.4 | 4.4 | 4.5 | OK |
| C | | 5.7 | 0.52 | Ply 3 | 2610 | 55000 | 313500 | 0.33 | 64.9 | 11.4 | 4.4 | 4.5 | OK |
| | | | | | | | | | | | | | |
| D | | 10.2 | 0.93 | Ply 1 | 1400 | 22000 | 224400 | 0.50 | 48.4 | 4.7 | 3.4 | 4.5 | OK |
| D | | 10.4 | 0.95 | Ply 1 | 1400 | 22000 | 228800 | 0.50 | 49.3 | 4.7 | 3.4 | 4.5 | OK |

Degenkolb

| | | | | | |
|---|---|---|---|---|---|
| **Subject:** | Tier 2 Wall Checks at BSE-2E CP | **Job Number:** | B7901001.00 | **Date:** | 03/22/17 |
| **Job:** | UCSF Alumni House | **By:** | RMG | **Section:** | 5.1 |
| | | **Checked By:** | | **Page** | |

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**1st to 2nd - North South**

| Parallel grid | Wall Seg # | Wall length | h/b | Wall type | Capacity | G | K | %V | Vpanel | Vs | DCR | M | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | ft | | | plf | lbs/in | | | kips | kips/ft | | | |
| 1 | | 8.5 | 0.77 | Ply 3 | 2610 | 55000 | 467500 | 0.44 | 85.6 | 10.1 | 3.9 | 4.5 | OK |
| 1 | | 5.5 | 0.50 | Ply 3 | 2610 | 55000 | 302500 | 0.28 | 55.4 | 10.1 | 3.9 | 4.5 | OK |
| 1 | | 5.5 | 0.50 | Ply 3 | 2610 | 55000 | 302500 | 0.28 | 55.4 | 10.1 | 3.9 | 4.5 | OK |
| | | | | | | | | | | | | | |
| 2 | | 9.1 | 0.83 | Ply 3 | 2610 | 55000 | 500500 | 0.33 | 86.8 | 9.5 | 3.7 | 4.5 | OK |
| 2 | | 4.3 | 0.39 | Ply 3 | 2610 | 55000 | 236500 | 0.16 | 41.0 | 9.5 | 3.7 | 4.5 | OK |
| 2 | | 4.9 | 0.45 | Ply 3 | 2610 | 55000 | 269500 | 0.18 | 46.7 | 9.5 | 3.7 | 4.5 | OK |
| 2 | | 5.3 | 0.48 | Ply 3 | 2610 | 55000 | 291500 | 0.19 | 50.6 | 9.5 | 3.7 | 4.5 | OK |
| 2 | | 4.0 | 0.36 | Ply 3 | 2610 | 55000 | 220000 | 0.14 | 38.2 | 9.5 | 3.7 | 4.5 | OK |
| | | | | | | | | | | | | | |
| 3 | | 12.3 | 1.12 | Ply 3 | 2610 | 55000 | 676500 | 0.56 | 115.4 | 9.4 | 3.6 | 4.5 | OK |
| 3 | | 9.7 | 0.88 | Ply 3 | 2610 | 55000 | 533500 | 0.44 | 91.0 | 9.4 | 3.6 | 4.5 | OK |
| | | | | | | | | | | | | | |
| 4 | | 5.1 | 0.46 | Ply 3 | 2610 | 55000 | 280500 | 0.27 | 42.9 | 8.4 | 3.2 | 4.5 | OK |
| 4 | | 4.9 | 0.45 | Ply 3 | 2610 | 55000 | 269500 | 0.26 | 41.2 | 8.4 | 3.2 | 4.5 | OK |
| 4 | | 5.1 | 0.46 | Ply 3 | 2610 | 55000 | 280500 | 0.27 | 42.9 | 8.4 | 3.2 | 4.5 | OK |
| 4 | | 9 | 0.82 | Ply 3 | 2610 | 55000 | 495000 | 0.47 | 75.7 | 8.4 | 3.2 | 4.5 | OK |

**1st to 2nd - East West**

| Parallel grid | Wall Seg # | Wall length | h/b | Wall type | Capacity | G | K | %V | Vpanel | Vs | DCR | M | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | ft | | | plf | lbs/in | | | kips | kips/ft | | | |
| A | | 5.5 | 0.50 | Ply 3 | 2610 | 55000 | 302500 | 0.3 | 51.9 | 9.4 | 3.6 | 4.5 | OK |
| A | | 4.6 | 0.42 | Ply 3 | 2610 | 55000 | 253000 | 0.3 | 43.4 | 9.4 | 3.6 | 4.5 | OK |
| A | | 6.9 | 0.63 | Ply 3 | 2610 | 55000 | 379500 | 0.4 | 65.2 | 9.4 | 3.6 | 4.5 | OK |
| A | | 7.75 | 0.70 | NONE | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 4.5 | OK |
| A | | 5 | 0.45 | NONE | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 4.5 | OK |
| A | | 6.6 | 0.60 | Ply 3 | 2610 | 55000 | 363000 | 0.4 | 62.3 | 9.4 | 3.6 | 4.5 | OK |
| | | | | | | | | | | | | | |
| B | | 7.3 | 0.66 | Ply 2 | 1995 | 40000 | 292000 | 0.2 | 48.3 | 6.6 | 3.3 | 4.5 | OK |
| B | | 23.7 | 2.15 | Ply 2 | 1995 | 40000 | 948000 | 0.8 | 156.7 | 6.6 | 3.3 | 4.5 | OK |
| | | | | | | | | | | | | | |
| C | | 5.1 | 0.46 | Ply 3 | 2610 | 55000 | 280500 | 0.2 | 47.6 | 9.3 | 3.6 | 4.5 | OK |
| C | | 5.5 | 0.50 | Ply 3 | 2610 | 55000 | 302500 | 0.2 | 51.4 | 9.3 | 3.6 | 4.5 | OK |
| C | | 5.3 | 0.48 | Ply 3 | 2610 | 55000 | 291500 | 0.2 | 49.5 | 9.3 | 3.6 | 4.5 | OK |
| C | | 5.4 | 0.49 | Ply 3 | 2610 | 55000 | 297000 | 0.2 | 50.4 | 9.3 | 3.6 | 4.5 | OK |
| C | | 11.4 | 1.04 | Ply 3 | 2610 | 55000 | 627000 | 0.3 | 106.5 | 9.3 | 3.6 | 4.5 | OK |
| | | | | | | | | | | | | | |
| D | | 22 | 2.00 | Ply 3 | 2610 | 55000 | 1210000 | 1.0 | 205.0 | 9.3 | 3.6 | 4.5 | OK |

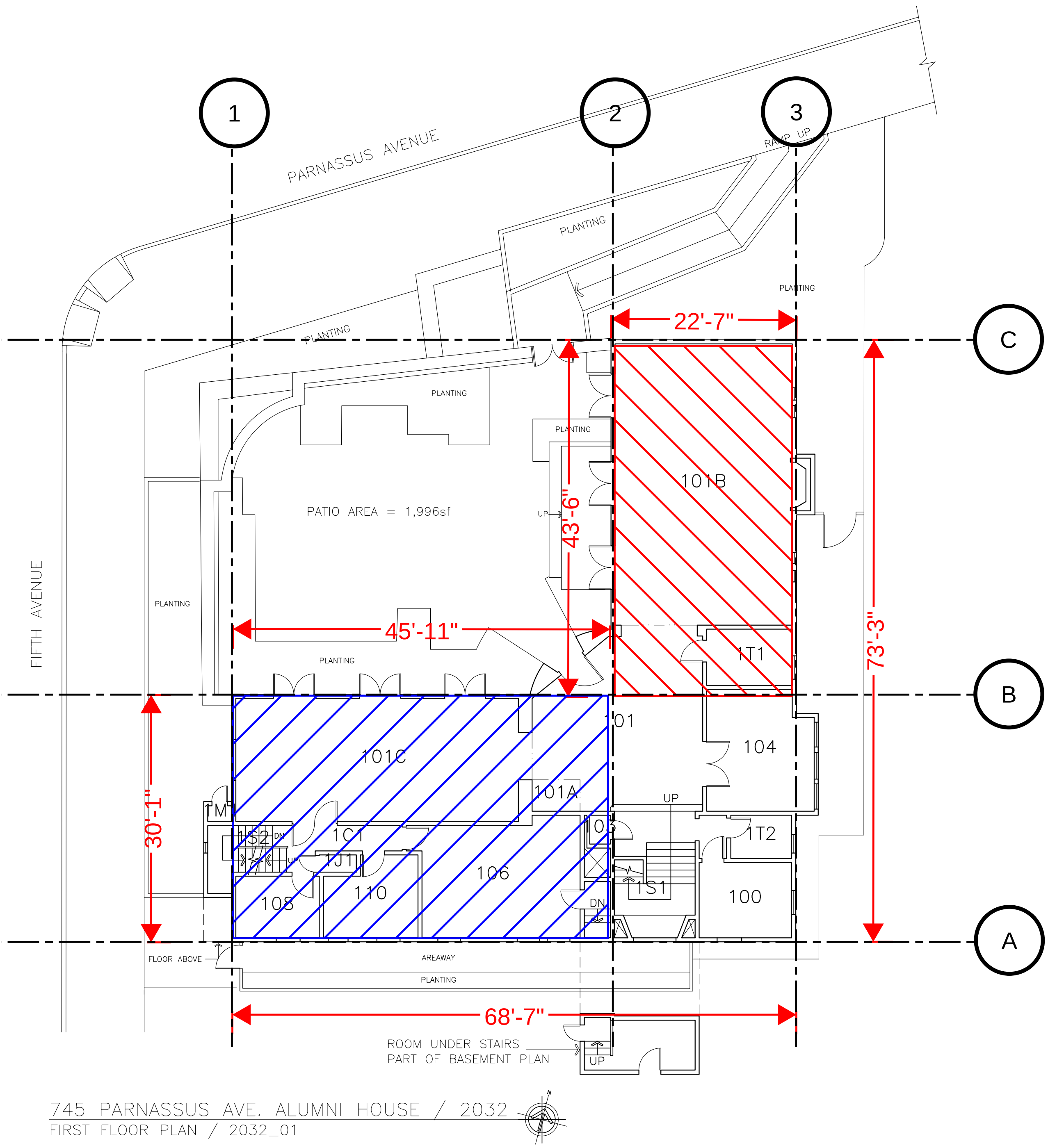
# Section 5.2
## Diaphragm Type

CRITICAL FIRST AND SECOND FLOOR DIAPHRAGM SPANS SHOWN ON PLAN BELOW.

PROPOSED LAYOUTS WERE VERIFIED FOR CAPACITY AT BOTH BSE-1N LIFE SAFETY AND BSE-2N COLLAPSE PREVENTIONS AS SHOWN IN CALCULATIONS.

SOME PRELIMINARY DIAPHRAGM LOAD PATH DETAILS HAVE BEEN DEVELOPED IN LATER SECTIONS OF CALCULATIONS PACKAGE.

DIAPRHAGM AT 1ST LEVEL IS CONSIDERED TO WORK AS A TENSION/COMPRESSION ELEMENT, TRANSFERING LOAD DIRECTLY TO BUILDING FOUNDATION AND THEREFORE IS NOT CONSIDERED IN NEED OF RETROFIT.



Degenkolb

| | | | | | |
|---|---|---|---|---|---|
| **Subject:** | Daphragm Size - BSE-1E LS | **Job Number:** | B7901001.00 | **Date:** | 03/22/17 |
| **Job:** | UCSF Alumni House | **By:** | RMG | **Section:** | 5.2 |
| | | **Checked By:** | | **Page** | |

Diaphragm Type

| Number | Grade | Nail | Spacing, in | thk, in | Nom lbs/ft | Exp lbs/ft | Comment |
|---|---|---|---|---|---|---|---|
| 1 | Struct 1 | 8d | 6 | 15/32 | 540 | 810 | Expected Capacity = 1.5 times NDS SDPWS 2015 fully blocked with 2" nailed face width nominal capacity |
| 2 | Struct 1 | 8d | 4 | 15/32 | 720 | 1080 | |
| 3 | Struct 1 | 10d | 4 | 15/32 | 850 | 1275 | |
| 4 | Struct 1 | 10d | 2 | 15/32 | 1460 | 2190 | |

**Roof Diaphragm**

Forces N-S

| Diaphragm | Span | Span | Depth | Aspect Ratio (L/W) | Type | Capacity | Fpx | v | DCR | M | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Grids | ft | ft | | | plf | kips | plf | | | |
| East | 1-2 | 45.9 | 30.1 | 1.5 | 3 | 1275 | 115.6 | 1921.1 | 1.5 | 3 | OK |
| West | 2-3 | 24 | 73.25 | 0.3 | 3 | 1275 | 139.4 | 951.2 | 0.7 | 3 | OK |

Forces E-W

| Diaphragm | Span | Span | Depth | Aspect Ratio (L/W) | Diaph Sheathing | Capacity | Fpx | v | DCR | M | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Grids | ft | ft | | | plf | kips | plf | | | |
| North | B-C | 43.5 | 24 | 1.8 | 3 | 1275 | 82.1 | 1710.7 | 1.3 | 3 | OK |
| South | A-B | 30.1 | 68.6 | 0.4 | 3 | 1275 | 172.9 | 1260.1 | 1.0 | 3 | OK |

**2nd Floor**

Forces N-S

| Diaphragm | Span | Span | Depth | Aspect Ratio (L/W) | Diaph Sheathing | Capacity | Fpx | v | DCR | M | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Grids | ft | ft | | | plf | kips | plf | | | |
| West | 1-2 | 45.9 | 30.1 | 1.5 | 2 | 1080 | 83.9 | 1393.3 | 1.3 | 3 | OK |
| North | 2-3 | 22.6 | 73.25 | 0.3 | 2 | 1080 | 101.1 | 689.9 | 0.6 | 3 | OK |

Forces E-W

| Diaphragm | Span | Span | Depth | Aspect Ratio (L/W) | Diaph Sheathing | Capacity | Fpx | v | DCR | M | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Grids | ft | ft | | | plf | kips | plf | | | |
| North | B-C | 43.5 | 22.6 | 1.9 | 2 | 1080 | 59.6 | 1317.6 | 1.2 | 3 | OK |
| West | A-B | 30.1 | 68.6 | 0.4 | 2 | 1080 | 125.4 | 913.9 | 0.8 | 3 | OK |

**1st Floor**

Forces N-S

| Diaphragm | Span | Span | Depth | Aspect Ratio (L/W) | Diaph Sheathing | Capacity | Fpx | v | DCR | M | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Grids | ft | ft | | | plf | kips | plf | | | |
| West | 1-2 | 45.9 | 30.1 | 1.5 | 1 | 810 | 49.3 | 819.0 | 1.0 | 3 | OK |
| North | 2-3 | 22.6 | 73.25 | 0.3 | 1 | 810 | 59.4 | 405.5 | 0.5 | 3 | OK |

Forces E-W

| Diaphragm | Span | Span | Depth | Aspect Ratio (L/W) | Diaph Sheathing | Capacity | Fpx | v | DCR | M | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Grids | ft | ft | | | plf | kips | plf | | | |
| North | B-C | 43.5 | 22.6 | 1.9 | 1 | 810 | 35.0 | 774.5 | 1.0 | 3 | OK |
| West | A-B | 30.1 | 68.6 | 0.4 | 1 | 810 | 73.7 | 537.2 | 0.7 | 3 | OK |

Degenkolb

| Subject: | Daphragm Size - BSE-2E CP | Job Number: | B7901001.00 | Date: | 03/22/17 |
|---|---|---|---|---|---|
| Job: | UCSF Alumni House | By: | RMG | Section: | 5.2 |
| | | Checked By: | | Page | |

Diaphragm Type

| Number | Grade | Nail | Spacing, in | thk, in | Nom lbs/ft | Exp lbs/ft | Comment |
|---|---|---|---|---|---|---|---|
| 1 | Struct 1 | 8d | 6 | 15/32 | 540 | 810 | Expected Capacity = 1.5 times NDS SDPWS 2015 fully blocked with 2" nailed face width nominal capacity |
| 2 | Struct 1 | 8d | 4 | 15/32 | 720 | 1080 | |
| 3 | Struct 1 | 10d | 4 | 15/32 | 850 | 1275 | |
| 4 | Struct 1 | 10d | 2 | 15/32 | 1460 | 2190 | |

**Roof Diaphragm**

Forces N-S

| Diaphragm | Span | Span | Depth | Aspect Ratio (L/W) | Type | Capacity | Fpx | v | DCR | M | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Grids | ft | ft | | | plf | kips | plf | | | |
| East | 1-2 | 45.9 | 30.1 | 1.5 | 3 | 1275 | 245.5 | 4077.4 | 3.2 | 4 | OK |
| West | 2-3 | 24 | 73.25 | 0.3 | 3 | 1275 | 295.8 | 2018.9 | 1.6 | 4 | OK |

Forces E-W

| Diaphragm | Span | Span | Depth | Aspect Ratio (L/W) | aph Sheath | Capacity | Fpx | v | DCR | M | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Grids | ft | ft | | | plf | kips | plf | | | |
| North | B-C | 43.5 | 24 | 1.8 | 3 | 1275 | 174.3 | 3630.9 | 2.8 | 4 | OK |
| South | A-B | 30.1 | 68.6 | 0.4 | 3 | 1275 | 366.9 | 2674.5 | 2.1 | 4 | OK |

**2nd Floor**

Forces N-S

| Diaphragm | Span | Span | Depth | Aspect Ratio (L/W) | aph Sheath | Capacity | Fpx | v | DCR | M | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Grids | ft | ft | | | plf | kips | plf | | | |
| West | 1-2 | 45.9 | 30.1 | 1.5 | 2 | 1080 | 178.0 | 2957.2 | 2.7 | 4 | OK |
| North | 2-3 | 22.6 | 73.25 | 0.3 | 2 | 1080 | 214.5 | 1464.2 | 1.4 | 4 | OK |

Forces E-W

| Diaphragm | Span | Span | Depth | Aspect Ratio (L/W) | aph Sheath | Capacity | Fpx | v | DCR | M | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Grids | ft | ft | | | plf | kips | plf | | | |
| North | B-C | 43.5 | 22.6 | 1.9 | 2 | 1080 | 126.4 | 2796.5 | 2.6 | 4 | OK |
| West | A-B | 30.1 | 68.6 | 0.4 | 2 | 1080 | 266.1 | 1939.8 | 1.8 | 4 | OK |

**1st Floor**

Forces N-S

| Diaphragm | Span | Span | Depth | Aspect Ratio (L/W) | aph Sheath | Capacity | Fpx | v | DCR | M | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Grids | ft | ft | | | plf | kips | plf | | | |
| West | 1-2 | 45.9 | 30.1 | 1.5 | 1 | 810 | 104.6 | 1738.3 | 2.1 | 4 | OK |
| North | 2-3 | 22.6 | 73.25 | 0.3 | 1 | 810 | 126.1 | 860.7 | 1.1 | 4 | OK |

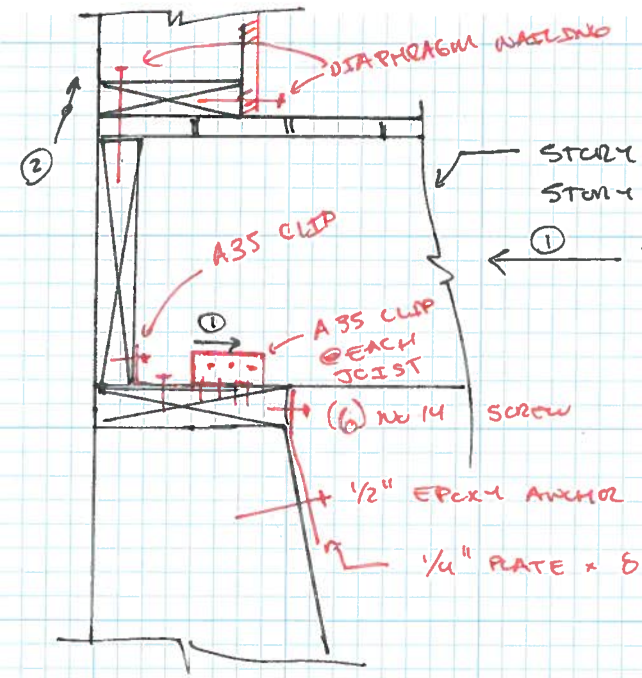
Forces E-W

| Diaphragm | Span | Span | Depth | Aspect Ratio (L/W) | aph Sheath | Capacity | Fpx | v | DCR | M | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Grids | ft | ft | | | plf | kips | plf | | | |
| North | B-C | 43.5 | 22.6 | 1.9 | 1 | 810 | 74.3 | 1643.8 | 2.0 | 4 | OK |
| West | A-B | 30.1 | 68.6 | 0.4 | 1 | 810 | 156.4 | 1140.2 | 1.4 | 4 | OK |

# Section 5.3
# Details

Degenkolb

| | | | |
|---|---|---|---|
| Subject: DETAIL A | Job Number: B7901 @1.00 | Date: 04/21/2017 | |
| Job: ALUMNI HOUSE | By: MXN | Section: | |
| | Checked By: | Page 1 | of |




STORY I JOIST @ 16" O.C.
STORY I AREA = 2,900 SF

① FORCE @ DIAPHRAGM LEVEL @ BSE 1E

$= \frac{169{,}000^{\#}}{2{,}900\ ft^2} \times \frac{16}{12} = 50^{\#}/FT$ OF JOIST

MAX LENGTH = 30' ASSUME 1/2 C, 1/2 T

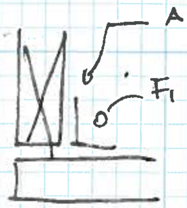
1/2 C → - - - - - - - - → 1/2 T

$C = T = 50^{\#}/ft \times 15' = 750^{\#}$ @ BSE 1E

$F$ BSE 2E $= \frac{231{,}000}{29{,}000} \times \frac{16}{12} \times 15 = 1{,}593^{\#}$ (2E)

② = MAX SHEAR WALL FORCE: 5 k/ft @ BSE 1E; 11.4 k/ft @ BSE 2E } CRITICAL

- CHECK A35 FOR SHEAR LOAD @ 16" O.C. [NOTE: T/C CAPACITY OK BY INSP.]




CAPACITY w (12) 8d @ 1 1/2 = 595# (Cd = 1.0)

EXP: = 595# × K_f = 595 × 2.88 × 1.5 = 2,570#

MAX LOAD @ 1E = 5k/ft ⇒ 6.7k @ 16" O.C.

MAX LOAD @ 2E = 11.4k/ft ⇒ 15.2k/ft @ 16" O.C.

m @ LS = 6.0    m @ CP = 8.0

$V_{2}E/m_{LS} = 1.12^k$    $V_{2}$ @ 2E $/m_{CP} = 1.9^k$

$Q_{exp} > Q_E/m$ @ 1E & 2E ✓

Degenkolb

| Subject: DETAIL A | Job Number: | Date: 04/21/2017 |
|---|---|---|
| Job: ALUMNI HOUSE | By: | Section: |
| | Checked By: | Page 2 of |

IN PLANE

- LOAD TRANSFER FROM SILL PLATE TO BENT PLATE THROUGH WOOD SCREWS. USE LS. DESIGN.

A35 CLIP FOR SHEAR EXP = $2.6^k$/CLIP @ 16" o.c.

FOR BENT PLATE @ 24" O.C. ⇒ $2.6^k \times 24/16 = 3.9^k$/BENT PLATE

- WITHDRAWAL LOAD TRANSFER TO BENT PLATE IS UNREDUCED SEISMIC

$= 1.5^k$ @ 16" o.c. @ BSE-2E ⇒ $1.5 \times 24/16 = 2.31^k$/BENT PLATE

CHECK SCREW FOR $3.9^k$ IN PLANE & $2.3^k$ WITHDRAWAL

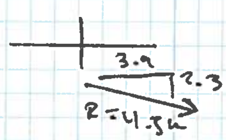
$V_u = Z \times K_f = 217^\# \times 3.32 = 720^\#$/SCREW

$W_u = 172^\#/in \times K_f \times (2/3)(4") = 1,553^\#$/SCREW

⇒ USE 6 SCREWS : $V_u = 6 \times 720^\# = 4.32^k > 3.9$ OK ✓

$W_u = 6 \times 1.5^k = 9.0^k > 2.3$ OK ✓

CHECK $Z'_\alpha$ :




$\alpha = \tan^{-1}(2.3/3.9) = 30.5°$

$p = 4 \times 2/3 = 2.67"$

$$Z'_\alpha = \frac{(W' \times p) Z'}{W' p \cos^2\alpha + Z' \sin^2\alpha} = \frac{(1.55 \times 2.67)(0.72)}{(1.55 \times 2.67)\cos^2 30.5 + 0.72 \times \sin^2 30}$$

$Z'_\alpha = 0.92^k$/SCREW $= 5.5^k$ @ 6 SCREWS $> 4.5^k$ OK ✓

Degenkolb

Subject: DETAIL A

Job Number: Date:

Job: By: Section:

Checked By: Page 3 of

EPOXY ANCHOR : $V_R = 3.9^k$ $W_R = 2.6^k$

PER PROFIS : (2) 5/8" Ø EPOXY ANCHOR IN 2,500 psi CRACKED CONCRETE

SEE PRINT

$V_u = 6980^{\#}$ $W_u = 8590^{\#}$ NOTE Ø = 1

DCR = 0.56 = 0.30

$\frac{\Sigma DCR}{1.2} = 0.72$ ok

| | | | |
|---|---|---|---|
| Company: | Degenkolb | Page: | 1 |
| Specifier: | MXN | Project: | UCSF Alumni House |
| Address: | | Sub-Project I Pos. No.: | B7901001.00 |
| Phone I Fax: | \| | Date: | 4/21/2017 |
| E-Mail: | | | |

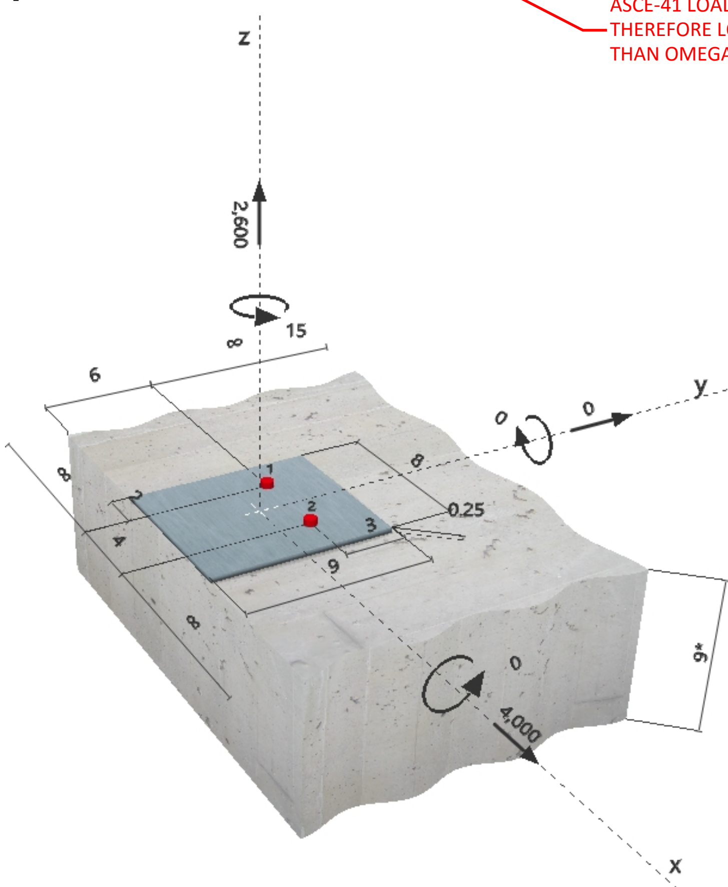
**Specifier's comments:** Preliminary Retrofit Detailing

## 1 Input data

| | |
|---|---|
| **Anchor type and diameter:** | **HIT-RE 500 V3 + HAS 5/8** |
| Effective embedment depth: | $h_{ef,act}$ = 6.000 in. ($h_{ef,limit}$ = - in.) |
| Material: | 5.8 |
| Evaluation Service Report: | ESR-3814 |
| Issued I Valid: | 1/1/2017 \| 1/1/2019 |
| Proof: | Design method ACI 318-14 / Chem |
| Stand-off installation: | $e_b$ = 0.000 in. (no stand-off); t = 0.250 in. |
| Anchor plate: | $l_x$ x $l_y$ x t = 8.000 in. x 9.000 in. x 0.250 in.; (Recommended plate thickness: not calculated |
| Profile: | no profile |
| Base material: | cracked concrete, 2500, $f_c$' = 2500 psi; h = 9.000 in., Temp. short/long: 32/32 °F |
| **Installation:** | **hammer drilled hole, Installation condition: Dry** |
| Reinforcement: | tension: condition B, shear: condition B; no supplemental splitting reinforcement present<br>edge reinforcement: none or < No. 4 bar |
| Seismic loads (cat. C, D, E, or F) | Tension load: yes (17.2.3.4.3 (d))<br>Shear load: yes (17.2.3.5.3 (c)) |

ASCE-41 LOADS ARE UNREDUCED, THEREFORE LOADS ARE GREATER THAN OMEGA NAUGHT.

**Geometry [in.] & Loading [lb, in.lb]**



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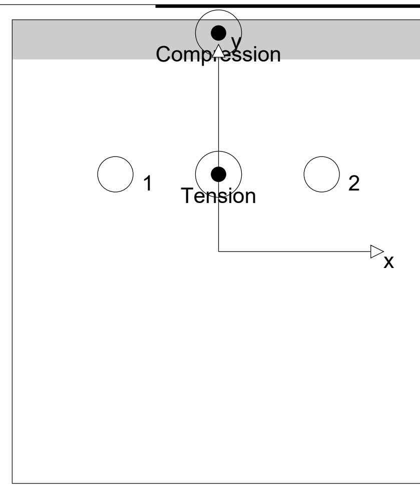
## 2 Load case/Resulting anchor forces

Load case: Design loads

**Anchor reactions [lb]**
Tension force: (+Tension, -Compression)

| Anchor | Tension force | Shear force | Shear force x | Shear force y |
|---|---|---|---|---|
| 1 | 2011 | 2502 | 2000 | -1504 |
| 2 | 2011 | 2502 | 2000 | 1504 |

max. concrete compressive strain: 0.11 [‰]
max. concrete compressive stress: 461 [psi]
resulting tension force in (x/y)=(0.000/1.500): 4022 [lb]
resulting compression force in (x/y)=(0.000/4.243): 1422 [lb]




## 3 Tension load

| | Load $N_{ua}$ [lb] | Capacity $\phi$ $N_n$ [lb] | Utilization $\beta_N = N_{ua}/\phi N_n$ | Status |
|---|---|---|---|---|
| Steel Strength* | 2011 | 10650 | 19 | OK |
| Bond Strength** | 4022 | 6406 | 63 | OK |
| Sustained Tension Load Bond Strength* | N/A | N/A | N/A | N/A |
| Concrete Breakout Strength** | 4022 | 5583 | 73 | OK |

* anchor having the highest loading **anchor group (anchors in tension)

### 3.1 Steel Strength

$N_{sa}$ = ESR value refer to ICC-ES ESR-3814
$\phi\ N_{sa} \geq N_{ua}$ ACI 318-14 Table 17.3.1.1

**Variables**

| $A_{se,N}$ [in.$^2$] | $f_{uta}$ [psi] |
|---|---|
| 0.23 | 72500 |

**Calculations**

| $N_{sa}$ [lb] |
|---|
| 16385 |

**Results**

1.0 PER ASCE 41-13

| $N_{sa}$ [lb] | $\phi_{steel}$ | $\phi_{nonductile}$ | $\phi\ N_{sa}$ [lb] | $N_{ua}$ [lb] |
|---|---|---|---|---|
| 16385 | 0.650 | 1.000 | 10650 | 2011 |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### 3.2 Bond Strength

$N_{ag} = \left(\frac{A_{Na}}{A_{Na0}}\right) \psi_{ec1,Na}\, \psi_{ec2,Na}\, \psi_{ed,Na}\, \psi_{cp,Na}\, N_{ba}$ — ACI 318-14 Eq. (17.4.5.1.b)

$\phi\ N_{ag} \geq N_{ua}$ — ACI 318-14 Table 17.3.1.1

$A_{Na}$ = see ACI 318-14, Section 17.4.5.1, Fig. R 17.4.5.1(b)

$A_{Na0} = (2\ c_{Na})^2$ — ACI 318-14 Eq. (17.4.5.1c)

$c_{Na} = 10\ d_a \sqrt{\frac{\tau_{uncr}}{1100}}$ — ACI 318-14 Eq. (17.4.5.1d)

$\psi_{ec,Na} = \left(\frac{1}{1 + \frac{e_N'}{c_{Na}}}\right) \leq 1.0$ — ACI 318-14 Eq. (17.4.5.3)

$\psi_{ed,Na} = 0.7 + 0.3 \left(\frac{c_{a,min}}{c_{Na}}\right) \leq 1.0$ — ACI 318-14 Eq. (17.4.5.4b)

$\psi_{cp,Na} = MAX\left(\frac{c_{a,min}}{c_{ac}}, \frac{c_{Na}}{c_{ac}}\right) \leq 1.0$ — ACI 318-14 Eq. (17.4.5.5b)

$N_{ba} = \lambda_a \cdot \tau_{k,c} \cdot \alpha_{N,seis} \cdot \pi \cdot d_a \cdot h_{ef}$ — ACI 318-14 Eq. (17.4.5.2)

#### Variables

| $\tau_{k,c,uncr}$ [psi] | $d_a$ [in.] | $h_{ef}$ [in.] | $c_{a,min}$ [in.] | $\tau_{k,c}$ [psi] |
|---|---|---|---|---|
| 2210 | 0.625 | 6.000 | 6.000 | 1260 |

| $e_{c1,N}$ [in.] | $e_{c2,N}$ [in.] | $c_{ac}$ [in.] | $\lambda_a$ | $\alpha_{N,seis}$ |
|---|---|---|---|---|
| 0.000 | 0.000 | 13.621 | 1.000 | 0.950 |

#### Calculations

| $c_{Na}$ [in.] | $A_{Na}$ [in.$^2$] | $A_{Na0}$ [in.$^2$] | $\psi_{ed,Na}$ |
|---|---|---|---|
| 8.819 | 320.65 | 311.09 | 0.904 |

| $\psi_{ec1,Na}$ | $\psi_{ec2,Na}$ | $\psi_{cp,Na}$ | $N_{ba}$ [lb] |
|---|---|---|---|
| 1.000 | 1.000 | 1.000 | 14102 |

#### Results

| $N_{ag}$ [lb] | $\phi_{bond}$ | $\phi_{seismic}$ | $\phi_{nonductile}$ | $\phi\ N_{ag}$ [lb] | $N_{ua}$ [lb] |
|---|---|---|---|---|---|
| 13141 | 0.650 | 0.750 | 1.000 | 6406 | 4022 |

1.0 PER ASCE 41-13

9855 LBS


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## 3.3 Concrete Breakout Strength

$N_{cbg} = \left(\frac{A_{Nc}}{A_{Nc0}}\right) \psi_{ec,N} \psi_{ed,N} \psi_{c,N} \psi_{cp,N} N_b$ — ACI 318-14 Eq. (17.4.2.1b)

$\phi\ N_{cbg} \geq N_{ua}$ — ACI 318-14 Table 17.3.1.1

$A_{Nc}$ see ACI 318-14, Section 17.4.2.1, Fig. R 17.4.2.1(b)

$A_{Nc0} = 9\ h_{ef}^2$ — ACI 318-14 Eq. (17.4.2.1c)

$\psi_{ec,N} = \left(\frac{1}{1 + \frac{2\ e_N'}{3\ h_{ef}}}\right) \leq 1.0$ — ACI 318-14 Eq. (17.4.2.4)

$\psi_{ed,N} = 0.7 + 0.3\left(\frac{c_{a,min}}{1.5h_{ef}}\right) \leq 1.0$ — ACI 318-14 Eq. (17.4.2.5b)

$\psi_{cp,N} = \text{MAX}\left(\frac{c_{a,min}}{c_{ac}}, \frac{1.5h_{ef}}{c_{ac}}\right) \leq 1.0$ — ACI 318-14 Eq. (17.4.2.7b)

$N_b = k_c\ \lambda_a \sqrt{f_c'}\ h_{ef}^{1.5}$ — ACI 318-14 Eq. (17.4.2.2a)

### Variables

| $h_{ef}$ [in.] | $e_{c1,N}$ [in.] | $e_{c2,N}$ [in.] | $c_{a,min}$ [in.] | $\psi_{c,N}$ |
|---|---|---|---|---|
| 6.000 | 0.000 | 0.000 | 6.000 | 1.000 |

| $c_{ac}$ [in.] | $k_c$ | $\lambda_a$ | $f_c'$ [psi] |
|---|---|---|---|
| 13.621 | 17 | 1.000 | 2500 |

### Calculations

| $A_{Nc}$ [in.$^2$] | $A_{Nc0}$ [in.$^2$] | $\psi_{ec1,N}$ | $\psi_{ec2,N}$ | $\psi_{ed,N}$ | $\psi_{cp,N}$ | $N_b$ [lb] |
|---|---|---|---|---|---|---|
| 330.00 | 324.00 | 1.000 | 1.000 | 0.900 | 1.000 | 12492 |

### Results

| $N_{cbg}$ [lb] | $\phi_{concrete}$ | $\phi_{seismic}$ | $\phi_{nonductile}$ | $\phi\ N_{cbg}$ [lb] | $N_{ua}$ [lb] |
|---|---|---|---|---|---|
| 11451 | 0.650 | 0.750 | 1.000 | 5583 | 4022 |

DCR = 0.47

1.0 PER ASCE 41-13

8590 LBS


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## 4 Shear load

| | Load $V_{ua}$ [lb] | Capacity $\phi V_n$ [lb] | Utilization $\beta_V = V_{ua}/\phi V_n$ | Status |
|---|---|---|---|---|
| Steel Strength* | 2502 | 5898 | 43 | OK |
| Steel failure (with lever arm)* | N/A | N/A | N/A | N/A |
| Pryout Strength (Concrete Breakout Strength controls)* | 2502 | 8016 | 32 | OK |
| Concrete edge failure in direction y-** | 4273 | 4891 | 88 | OK |

* anchor having the highest loading **anchor group (relevant anchors)

### 4.1 Steel Strength

$V_{sa,eq}$ = ESR value refer to ICC-ES ESR-3814

$\phi V_{steel} \geq V_{ua}$ ACI 318-14 Table 17.3.1.1

**Variables**

| $A_{se,V}$ [in.$^2$] | $f_{uta}$ [psi] |
|---|---|
| 0.23 | 72500 |

**Calculations**

| $V_{sa,eq}$ [lb] |
|---|
| 9830 |

**Results**

| $V_{sa,eq}$ [lb] | $\phi_{steel}$ | $\phi_{nonductile}$ | $\phi V_{sa}$ [lb] | $V_{ua}$ [lb] |
|---|---|---|---|---|
| 9830 | 0.600 | 1.000 | 5898 | 2502 |

1.0 PER ASCE 41-13

8589 LBS

### 4.2 Pryout Strength (Concrete Breakout Strength controls)

$V_{cp} = k_{cp} \left[\left(\frac{A_{Nc}}{A_{Nc0}}\right) \psi_{ed,N}\, \psi_{c,N}\, \psi_{cp,N}\, N_b\right]$ ACI 318-14 Eq. (17.5.3.1a)

$\phi V_{cp} \geq V_{ua}$ ACI 318-14 Table 17.3.1.1

$A_{Nc}$ see ACI 318-14, Section 17.4.2.1, Fig. R 17.4.2.1(b)

$A_{Nc0} = 9\, h_{ef}^2$ ACI 318-14 Eq. (17.4.2.1c)

$\psi_{ec,N} = \left(\frac{1}{1 + \frac{2\, e_N'}{3\, h_{ef}}}\right) \leq 1.0$ ACI 318-14 Eq. (17.4.2.4)

$\psi_{ed,N} = 0.7 + 0.3 \left(\frac{c_{a,min}}{1.5 h_{ef}}\right) \leq 1.0$ ACI 318-14 Eq. (17.4.2.5b)

$\psi_{cp,N} = \text{MAX}\left(\frac{c_{a,min}}{c_{ac}}, \frac{1.5 h_{ef}}{c_{ac}}\right) \leq 1.0$ ACI 318-14 Eq. (17.4.2.7b)

$N_b = k_c\, \lambda_a \sqrt{f_c'}\, h_{ef}^{1.5}$ ACI 318-14 Eq. (17.4.2.2a)

**Variables**

| $k_{cp}$ | $h_{ef}$ [in.] | $e_{c1,N}$ [in.] | $e_{c2,N}$ [in.] | $c_{a,min}$ [in.] |
|---|---|---|---|---|
| 2 | 6.000 | 0.000 | 0.000 | 6.000 |

| $\psi_{c,N}$ | $c_{ac}$ [in.] | $k_c$ | $\lambda_a$ | $f_c'$ [psi] |
|---|---|---|---|---|
| 1.000 | 13.621 | 17 | 1.000 | 2500 |

**Calculations**

| $A_{Nc}$ [in.$^2$] | $A_{Nc0}$ [in.$^2$] | $\psi_{ec1,N}$ | $\psi_{ec2,N}$ | $\psi_{ed,N}$ | $\psi_{cp,N}$ | $N_b$ [lb] |
|---|---|---|---|---|---|---|
| 165.00 | 324.00 | 1.000 | 1.000 | 0.900 | 1.000 | 12492 |

**Results**

| $V_{cp}$ [lb] | $\phi_{concrete}$ | $\phi_{seismic}$ | $\phi_{nonductile}$ | $\phi V_{cp}$ [lb] | $V_{ua}$ [lb] |
|---|---|---|---|---|---|
| 11451 | 0.700 | 1.000 | 1.000 | 8016 | 2502 |

1.0 PER ASCE 41-13

11451 LBS

Input data and results must be checked for agreement with the existing conditions and for plausibility!
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### 4.3 Concrete edge failure in direction y-

$V_{cbg} = \left(\frac{A_{Vc}}{A_{Vc0}}\right) \psi_{ec,V}\, \psi_{ed,V}\, \psi_{c,V}\, \psi_{h,V}\, \psi_{parallel,V}\, V_b$ — ACI 318-14 Eq. (17.5.2.1b)

$\phi\ V_{cbg} \geq V_{ua}$ — ACI 318-14 Table 17.3.1.1

$A_{Vc}$ see ACI 318-14, Section 17.5.2.1, Fig. R 17.5.2.1(b)

$A_{Vc0} = 4.5\, c_{a1}^2$ — ACI 318-14 Eq. (17.5.2.1c)

$\psi_{ec,V} = \left(\frac{1}{1 + \frac{2e'_v}{3c_{a1}}}\right) \leq 1.0$ — ACI 318-14 Eq. (17.5.2.5)

$\psi_{ed,V} = 0.7 + 0.3\left(\frac{c_{a2}}{1.5c_{a1}}\right) \leq 1.0$ — ACI 318-14 Eq. (17.5.2.6b)

$\psi_{h,V} = \sqrt{\frac{1.5c_{a1}}{h_a}} \geq 1.0$ — ACI 318-14 Eq. (17.5.2.8)

$V_b = \left(7 \left(\frac{l_e}{d_a}\right)^{0.2} \sqrt{d_a}\right) \lambda_a \sqrt{f'_c}\, c_{a1}^{1.5}$ — ACI 318-14 Eq. (17.5.2.2a)

**Variables**

| $c_{a1}$ [in.] | $c_{a2}$ [in.] | $e_{cV}$ [in.] | $\psi_{c,V}$ | $h_a$ [in.] |
|---|---|---|---|---|
| 6.000 | - | 0.704 | 1.000 | 9.000 |

| $l_e$ [in.] | $\lambda_a$ | $d_a$ [in.] | $f'_c$ [psi] | $\psi_{parallel,V}$ |
|---|---|---|---|---|
| 5.000 | 1.000 | 0.625 | 2500 | 1.000 |

**Calculations**

| $A_{Vc}$ [in.$^2$] | $A_{Vc0}$ [in.$^2$] | $\psi_{ec,V}$ | $\psi_{ed,V}$ | $\psi_{h,V}$ | $V_b$ [lb] |
|---|---|---|---|---|---|
| 198.00 | 162.00 | 0.927 | 1.000 | 1.000 | 6164 |

**Results**

| $V_{cbg}$ [lb] | $\phi_{concrete}$ | $\phi_{seismic}$ | $\phi_{nonductile}$ | $\phi\ V_{cbg}$ [lb] | $V_{ua}$ [lb] |
|---|---|---|---|---|---|
| 6987 | 0.700 | 1.000 | 1.000 | 4891 | 4273 |

1.0 PER ASCE 41-13

6987 LBS

DCR = 0.61

## 5 Combined tension and shear loads

| $\beta_N$ | $\beta_V$ | $\zeta$ | Utilization $\beta_{N,V}$ [%] | Status |
|---|---|---|---|---|
| 0.720 | 0.874 | 1.000 | 133 | not recommended |

$\beta_{NV} = (\beta_N + \beta_V) / 1.2 <= 1$

0.47

0.61

90 % OK!


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## 6 Warnings

- The anchor design methods in PROFIS Anchor require rigid anchor plates per current regulations (ETAG 001/Annex C, EOTA TR029, etc.). This means load re-distribution on the anchors due to elastic deformations of the anchor plate are not considered - the anchor plate is assumed to be sufficiently stiff, in order not to be deformed when subjected to the design loading. PROFIS Anchor calculates the minimum required anchor plate thickness with FEM to limit the stress of the anchor plate based on the assumptions explained above. The proof if the rigid base plate assumption is valid is not carried out by PROFIS Anchor. Input data and results must be checked for agreement with the existing conditions and for plausibility!
- Condition A applies when supplementary reinforcement is used. The Φ factor is increased for non-steel Design Strengths except Pullout Strength and Pryout strength. Condition B applies when supplementary reinforcement is not used and for Pullout Strength and Pryout Strength. Refer to your local standard.
- Design Strengths of adhesive anchor systems are influenced by the cleaning method. Refer to the INSTRUCTIONS FOR USE given in the Evaluation Service Report for cleaning and installation instructions
- Checking the transfer of loads into the base material and the shear resistance are required in accordance with ACI 318 or the relevant standard!
- An anchor design approach for structures assigned to Seismic Design Category C, D, E or F is given in ACI 318-14, Chapter 17, Section 17.2.3.4.3 (a) that requires the governing design strength of an anchor or group of anchors be limited by ductile steel failure. If this is NOT the case, the connection design (tension) shall satisfy the provisions of Section 17.2.3.4.3 (b), Section 17.2.3.4.3 (c), or Section 17.2.3.4.3 (d). The connection design (shear) shall satisfy the provisions of Section 17.2.3.5.3 (a), Section 17.2.3.5.3 (b), or Section 17.2.3.5.3 (c).
- Section 17.2.3.4.3 (b) / Section 17.2.3.5.3 (a) require the attachment the anchors are connecting to the structure be designed to undergo ductile yielding at a load level corresponding to anchor forces no greater than the controlling design strength. Section 17.2.3.4.3 (c) / Section 17.2.3.5.3 (b) waive the ductility requirements and require the anchors to be designed for the maximum tension / shear that can be transmitted to the anchors by a non-yielding attachment. Section 17.2.3.4.3 (d) / Section 17.2.3.5.3 (c) waive the ductility requirements and require the design strength of the anchors to equal or exceed the maximum tension / shear obtained from design load combinations that include E, with E increased by $\omega_0$.
- Installation of Hilti adhesive anchor systems shall be performed by personnel trained to install Hilti adhesive anchors. Reference ACI 318-14, Section 17.8.1.

**Fastening does not meet the design criteria!**


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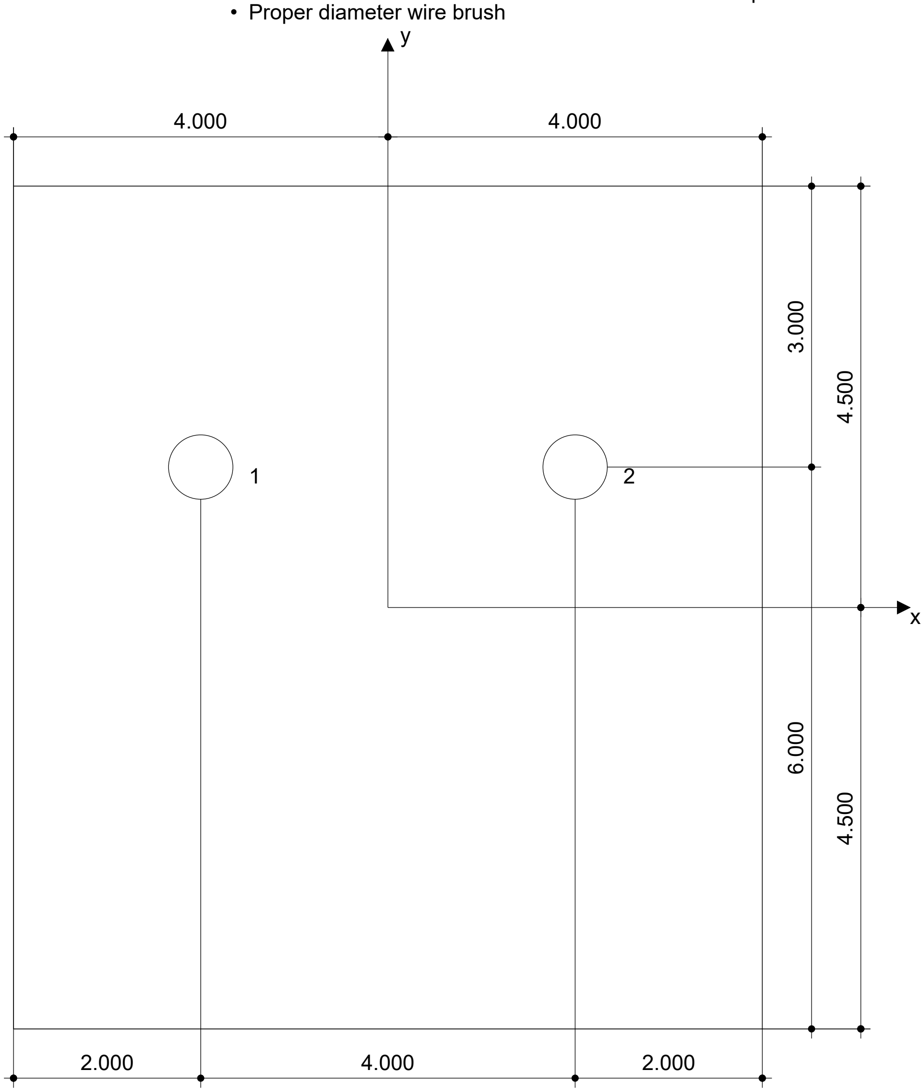
## 7 Installation data

Anchor plate, steel: -
Profile: no profile
Hole diameter in the fixture: $d_f$ = 0.688 in.
Plate thickness (input): 0.250 in.
Recommended plate thickness: not calculated
Drilling method: Hammer drilled
Cleaning: Compressed air cleaning of the drilled hole according to instructions for use is required

Anchor type and diameter: HIT-RE 500 V3 + HAS 5/8
Installation torque: 720.000 in.lb
Hole diameter in the base material: 0.750 in.
Hole depth in the base material: 6.000 in.
Minimum thickness of the base material: 7.500 in.

### 7.1 Recommended accessories

| Drilling | Cleaning | Setting |
|---|---|---|
| • Suitable Rotary Hammer<br>• Properly sized drill bit | • Compressed air with required accessories to blow from the bottom of the hole<br>• Proper diameter wire brush | • Dispenser including cassette and mixer<br>• Torque wrench |




**Coordinates Anchor in.**

| Anchor | x | y | $c_{-x}$ | $c_{+x}$ | $c_{-y}$ | $c_{+y}$ |
|---|---|---|---|---|---|---|
| 1 | -2.000 | 1.500 | - | - | 6.000 | - |
| 2 | 2.000 | 1.500 | - | - | 6.000 | - |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Subject: DETAIL B | Job Number: B7901 001.00 | Date: 04/21/2017

Job: ALUMNI HOUSE | By: MXN | Section:

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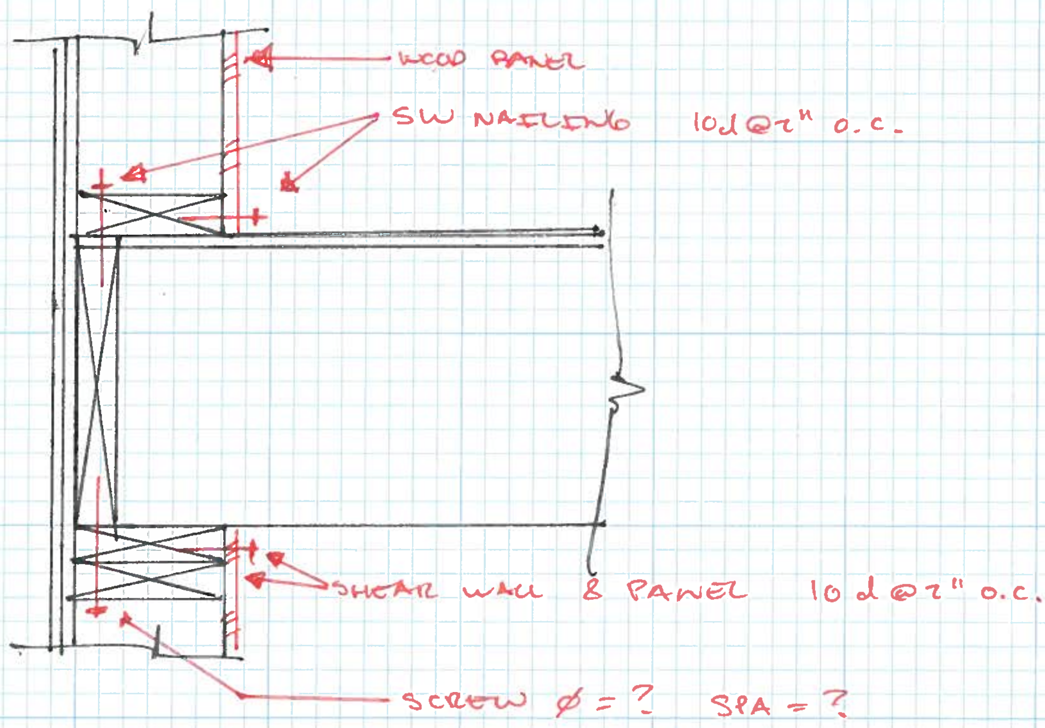
SHEAR TRANSFER FROM 2ND LEVEL TO 1ST LEVEL SHEAR WALL




PER NDS:

2 OF 10d NAIL INTO DF ~ 90#

2 OF 1/4" WOOD SCREW INTO DF ~ 160#

USE 1/4" Ø SCREW @ 4" O.C. SPA.

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**Subject:** DETAIL C | **Job Number:** B7901.001.00 | **Date:** 04/21/2017
**Job:** ALUMNI HOUSE | **By:** MXN | **Section:**
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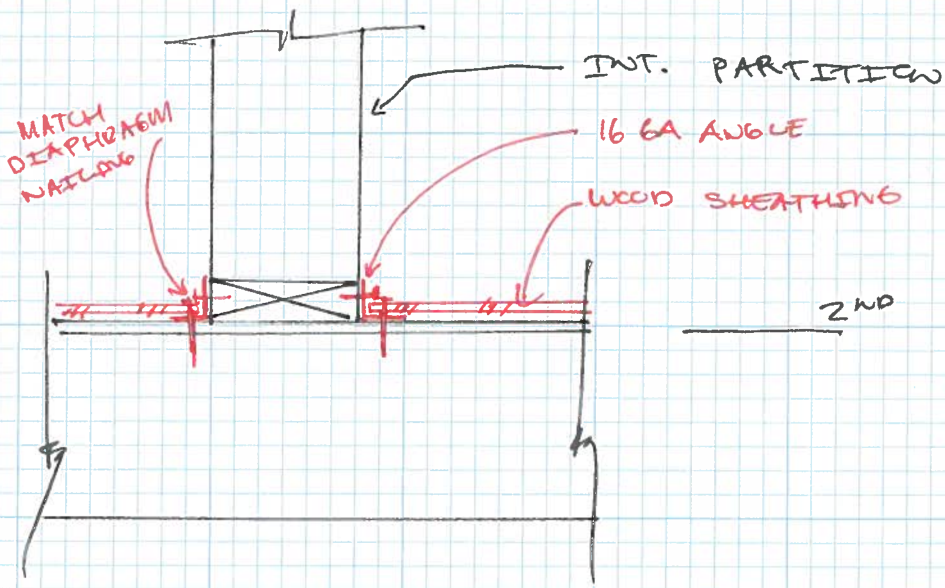
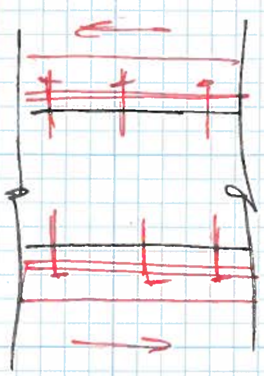
SHEAR TRANSFER OF DIAPHRAGM AROUND PARTITIONS




MAX DIAPHRAGM = 10d @ 4" O.C. NAILING w/ 1,275 #/ft EXPECTED CAPACITY

$Q_{UF}$ = 1,275 #/ft BASED OFF WALL EXPECTED CAPACITY LIMIT STATE



- PLATE SHEAR CAP

$$f_v = \frac{3V}{2bd} = \frac{3 \times 1{,}275\ \#/ft}{2 \times 5.5 \times 1.5} = 232\ \#/in^2$$

$$F_v' = F_v \times 3.84 \times 1.0 \qquad F_v = 180$$

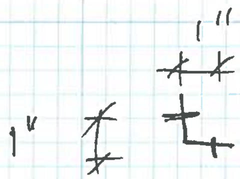
$$= 691\ \#/in^2$$

OK ✓

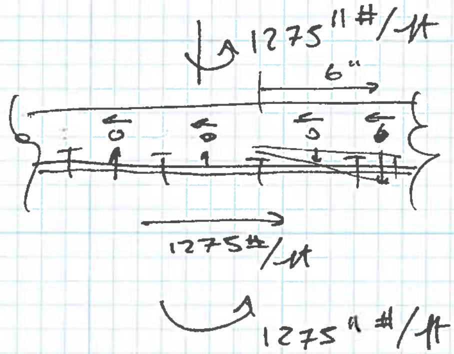
- 16 GAGE ANGLE

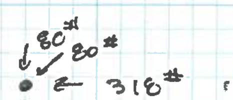
Degenkolb

| Subject: DETAIL C | Job Number: | Date: |
|---|---|---|
| Job: | By: | Section: |
| | Checked By: | Page 2 of |




1,275 #/ft

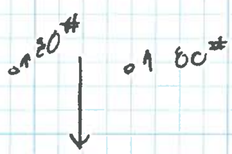



$V_{QD} = \sqrt{80^2 + 80^2 + 318^2}$

$= 340^{\#}$

• CHECK SCREWS



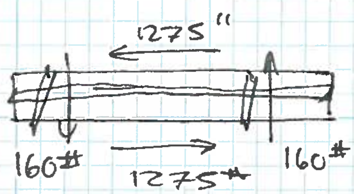

R @ 4" F/CL ∴ R = 1275/8 = 160#

Z of 10d = 115 #

Z' = 115# × 3.32 × 1 = 382# > $V_{QD}$ ✓ ok

• CHECK ANGLE 16 Ga = 0.06"

calc AT SINGLE LEG




$V_x = 0.6 \times 33 \times 12" \times 0.06" = 14^k$

$V_y = 0.6 \times 33 \times 2" \times 0.06 = 2.4$

# <u>Section 5.4</u>
# Hold Downs

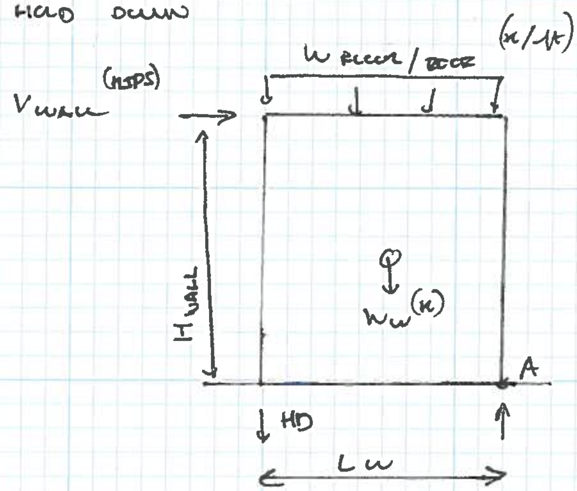
Degenkolb

**Subject:** SHEAR WALL HOLD DOWN | **Job Number:** B7901001.00 | **Date:** 4/21/17

**Job:** UCSF ALUMNI HOUSE | **By:** MXW | **Section:**

**Checked By:** | **Page** 1 **of**

- HOLD DOWN




CRITICAL @ 0.9D

$$\curvearrowright + \sum M_A = 0: \quad V_{WALL} \times H - W_W \times \frac{L_W}{2} - W_F \times \frac{L_W^2}{2} - HD \times L_W = 0$$

$$H_D L_W = V_{WALL} \times H - W_W \times \frac{L_W}{2} - W_F \times \frac{L_W^2}{2}$$

$$H_D = \frac{V_{WALL} \times H}{L_W} - \frac{W_W}{2} - \frac{W_{FLOOR/ROOF} \times L_W}{2}$$

- HOLD DOWN TO SILL:

MAX FORCE @ BSE 1N = $142^k$

@ BSE 2N = $211^k$

m - MACHINE BOLT METAL TO WOOD = 3 @ LS

= 3.5 @ CP

m - BRACE IN TENSION × 0.6 = 4 @ LS

= 5.6 @ CP

} CHECK HOLD DOWN FOR m = 3 @ LS & m = 3.5 @ CP

HOLD DOWN FORCE: @ LS = 142/3 = $47^k$

@ CP = 211/3.5 = $60^k$

Degenkolb

| | | | |
|---|---|---|---|
| Subject: HOLD DOWNS | | Job Number: B7906601.00 | Date: 4/24/17 |
| Job: UCSF ALUMNI HOUSE | | By: MXW | Section: |
| | | Checked By: | Page 2 of |

- SIMPSON HD9B INTO 4½" MIN MEMBER (i.e. (3) 2x6)

DF/SP ALL = 9,920 # @ $C_D = 1.6$

DF/SP EXP = ALL × 3.32 ÷ 1.6 × 1.5 = 30.8 k

⇒ @ 2 HOLD DOWN PER CHORD

$T_c = 2 \times 30.8 = 61.6^k > 60^k$ @ BSE-2E CP ✓

- ANCHOR IS 7/8" ⌀

DEVELOP EXPECTED ANCHOR CAPACITY

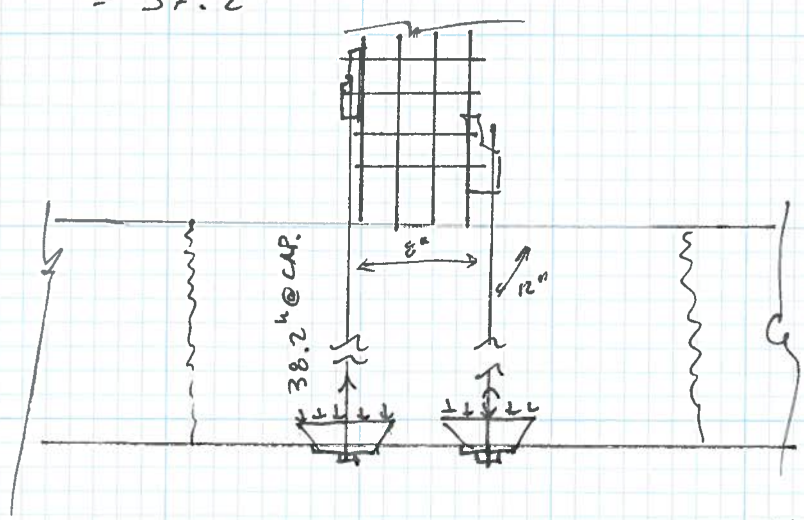
$T_{A.B.} = F_{ut} \times A_b \times 1.1$

$= 56.2^{ksi} \times (7/8)^2 \pi/4 \times 1.1$

$= 37.2^k$

ASSUME GR 55 A.B. $F_u = 75^{ksi}$

$\therefore F_{ut} = 0.75 \times 75^{ksi} = 56.2^{ksi}$




$F_{BR} = 0.85 \times f'c \times \sqrt{A_2/A_1} \times A_1$

$\sqrt{A_2/A_1} \sim \sqrt{\frac{8 \times 8}{4 \times 4}} \simeq 2.0$

$= 0.85 \times 4^{ksi} \times 2 \times 16 in^2 = 109^k$

CAN USE 3"×3" PL WASHER.

Degenkolb

Subject: HOLD DOWNS
Job: UCSF ALUM HOUSE
Job Number:
Date:
By:
Section:
Checked By:
Page 3 of

• HOLD DOWN 2ND TO 1ST

= $68^k$ @ BSE-1 $\qquad 68/m_{LS} = 22.6^k$

= $115^k$ @ BSE-2 $\qquad 115/m_{CP} = 32.9^k$

→ SIMPSON STRONG-TIE HDU 8 × SDS 2.5 INTO 3" MLAV

DF/SP ALL = $6,765^{\#}$ @ $C_D = 1.6$

DF/SP EXP = $6.76^k \times 3.32 \times 1.5 \div 1.6 = 21^k$

(2) HDU 8 × SDS 2.5 EXP CAP = $42^k > 33^k$ ✓

Degenkolb

| Subject: | Shear Wall Hold Down Load | Job Number: | B7901001.00 | Date: | 04/24/17 |
|---|---|---|---|---|---|
| Job: | UCSF Alumni House | By: | RMG | Section: | 5.4 |
| | | Checked By: | | Page | |

| | Wall Heights | | | Wall Weight | |
|---|---|---|---|---|---|
| H 2nd-Roof | 11 | ft | Ext | 18.1 | psf |
| H 1st-2nd | 10 | ft | Int | 10 | psf |

**2nd to Roof -North South**

| Parallel grid | Wall Seg # | Wall length | Trib Width | wFloor | Wall Type | Wall Above | Weight Wall | BSE-1E V Wall | BSE-1E Hold Down Wall | BSE-1E Hold Down Total | BSE-2E V Wall | BSE-2E Hold Down Wall | BSE-2E Hold Down Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | ft | ft | klf | | | kips | kips | kips | kips | kips | kips | kips |
| 1 | A | 9.5 | 0 | 0.0 | Ext | No | 1.90 | 0.0 | -1 | -1 | 0.0 | -1 | -1 |
| 1 | B | 15.9 | 0 | 0.0 | Ext | No | 3.17 | 60.6 | 40 | 40 | 128.5 | 87 | 87 |
| | | | | 0.0 | | | | | | | | | |
| 2 | A | 4 | 0 | 0.0 | Ext | No | 0.80 | 0.0 | 0 | 0 | 0.0 | 0 | 0 |
| 2 | B | 5.1 | 12 | 0.4 | Ext | No | 1.02 | 17.3 | 36 | 36 | 36.7 | 78 | 78 |
| 2 | C | 6.9 | 12 | 0.4 | Ext | No | 1.38 | 23.4 | 35 | 35 | 49.7 | 77 | 77 |
| 2 | D | 7.3 | 12 | 0.4 | Ext | No | 1.46 | 24.8 | 35 | 35 | 52.6 | 77 | 77 |
| 2 | E | 4.7 | 12 | 0.4 | Ext | No | 0.94 | 16.0 | 36 | 36 | 33.9 | 78 | 78 |
| | | | | 0.0 | | | | | | | | | |
| 3 | A | 14.7 | 1 | 0.0 | Int | No | 1.62 | 65.6 | 48 | 48 | 139.3 | 103 | 103 |
| | | | | 0.0 | | | | | | | | | |
| 4 | A | 6.25 | 12 | 0.4 | Ext | No | 1.25 | 0.0 | -2 | -2 | 0.0 | -2 | -2 |
| 4 | B | 14.1 | 12 | 0.4 | Ext | No | 2.81 | 47.4 | 33 | 33 | 100.6 | 74 | 74 |
| 4 | C | 4.66 | 12 | 0.4 | Ext | No | 0.93 | 0.0 | -1 | -1 | 0.0 | -1 | -1 |
| | | | | | | | | | Max | 48 kips | | Max | 103 kips |

**2nd to Roof - East West**

| Parallel grid | Wall Seg # | Wall length | Trib Width | wFloor | Wall Type | Wall Above | Weight Wall | BSE-1E V Wall | BSE-1E Hold Down Wall | BSE-1E Hold Down Total | BSE-2E V Wall | BSE-2E Hold Down Wall | BSE-2E Hold Down Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | ft | ft | klf | | | kips | kips | lbs | lbs | kips | lbs | lbs |
| A | 1 | 3.4 | 15 | 0.5 | Ext | No | 0.68 | 16.9 | 53 | 53 | 35.9 | 115 | 115 |
| A | 2 | 3.7 | 15 | 0.5 | Ext | No | 0.74 | 18.4 | 53 | 18 | 39.1 | 115 | 18 |
| A | 3 | 3.3 | 15 | 0.5 | Ext | No | 0.66 | 16.4 | 53 | 16 | 34.8 | 115 | 16 |
| A | 4 | 6.4 | 15 | 0.5 | Ext | No | 1.28 | 0.0 | -2 | 0 | 0.0 | -2 | 0 |
| | | | | | | | | | | | | | |
| B | 1 | 7.3 | 1 | 0.0 | Int | No | 0.80 | 0.0 | -1 | 0 | 0.0 | -1 | 0 |
| B | 2 | 19.3 | 1 | 0.0 | Int | No | 2.12 | 68.4 | 38 | 68 | 145.2 | 81 | 68 |
| | | | | | | | | | | | | | |
| C | 1 | 5 | 15 | 0.5 | Ext | No | 1.00 | 20.8 | 44 | 21 | 56.9 | 123 | 21 |
| C | 2 | 5.6 | 15 | 0.5 | Ext | No | 1.12 | 23.3 | 44 | 23 | 63.8 | 123 | 23 |
| C | 3 | 5.8 | 15 | 0.5 | Ext | No | 1.16 | 24.1 | 44 | 24 | 66.1 | 123 | 24 |
| C | 4 | 5.7 | 15 | 0.5 | Ext | No | 1.14 | 23.7 | 44 | 24 | 64.9 | 123 | 24 |
| | | | | | | | | | | | | | |
| D | 1 | 10.2 | 0 | 0.0 | Ext | No | 2.04 | 22.8 | 24 | 23 | 48.4 | 51 | 23 |
| D | 2 | 10.4 | 0 | 0.0 | Ext | No | 2.08 | 23.2 | 24 | 23 | 49.3 | 51 | 23 |
| | | | | | | | | | Max | 68 kips | | Max | 115 kips |

Degenkolb

| | | | | | |
|---|---|---|---|---|---|
| **Subject:** | Shear Wall Hold Down Load | **Job Number:** | B7901001.00 | **Date:** | 04/24/17 |
| **Job:** | UCSF Alumni House | **By:** | RMG | **Section:** | 5.4 |
| | | **Checked By:** | | **Page** | |

**1st to 2nd - North South**

| | | | | | | | | **BSE-1E** | | | **BSE-2E** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Parallel grid | Wall Seg # | Wall length | Trib Width | wFloor | Wall Type | Wall Above | Weight Wall | V Wall | Hold Down Wall | Hold Down Total | V Wall | Hold Down Wall | Hold Down Total |
| | | ft | ft | klf | | | kips | kips | lbs | lbs | kips | lbs | lbs |
| 1 | A | 8.5 | 0 | 0.0 | Ext | No | 1.54 | 40.3 | 51 | 40 | 85.6 | 110 | 40 |
| 1 | B | 5.5 | 0 | 0.0 | Ext | Yes (1-B) | 1.00 | 26.1 | 52 | 66 | 0.0 | 0 | 154 |
| 1 | C | 5.5 | 0 | 0.0 | Ext | Yes (1-B) | 1.00 | 26.1 | 52 | 66 | 52.5 | 104 | 154 |
| | | | | | | | | | | | | | |
| 2 | A | 9.1 | 0 | 0.0 | Int | No | 0.91 | 40.9 | 49 | 41 | 86.8 | 104 | 41 |
| 2 | B | 4.3 | 12 | 0.3 | Ext | Yes (2-B) | 0.78 | 19.3 | 48 | 55 | 41.0 | 104 | 133 |
| 2 | C | 4.9 | 12 | 0.3 | Ext | No | 0.89 | 22.0 | 48 | 22 | 46.7 | 104 | 22 |
| 2 | D | 5.3 | 12 | 0.3 | Ext | No | 0.96 | 23.8 | 48 | 24 | 0.0 | -1 | 24 |
| 2 | E | 4.0 | 12 | 0.3 | Ext | Yes (2-E) | 0.73 | 18.0 | 48 | 54 | 37.5 | 102 | 132 |
| | | | | | | | | | | | | | |
| 3 | A | 12.3 | 1 | 0.0 | Int | Yes (3-A) | 1.23 | 54.4 | 48 | 102 | 0.0 | -1 | 206 |
| 3 | B | 9.7 | 1 | 0.0 | Int | No | 0.97 | 42.9 | 48 | 43 | 81.6 | 92 | 43 |
| | | | | | | | | | | | | | |
| 4 | A | 5.1 | 12 | 0.3 | Ext | No | 0.93 | 15.4 | 32 | 15 | 42.9 | 91 | 15 |
| 4 | B | 4.9 | 12 | 0.3 | Ext | Yes (4-B) | 0.89 | 14.8 | 32 | 47 | 41.2 | 91 | 121 |
| 4 | C | 5.9 | 12 | 0.3 | Ext | Yes (4-B) | 1.07 | 17.8 | 32 | 50 | 0.0 | -1 | 124 |
| 4 | D | 9 | 12 | 0.3 | Ext | No | 1.63 | 27.2 | 31 | 27 | 0.0 | -2 | 27 |
| | | | | | | | | | Max | 102 kips | | Max | 206 kips |

**1st to 2nd - East West**

| | | | | | | | | **BSE-1E** | | | **BSE-2E** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Parallel grid | Wall Seg # | Wall length | Trib Width | wFloor | Wall Type | Wall Above | Weight Wall | V Wall | Hold Down Wall | Hold Down Total | V Wall | Hold Down Wall | Hold Down Total |
| | | ft | ft | klf | | | kips | kips | lbs | lbs | kips | lbs | lbs |
| A | 1 | 5.5 | 15 | 0.4 | Ext | No | 1.00 | 18.8 | 36 | 19 | 0.0 | -2 | 19 |
| A | 2 | 4.6 | 15 | 0.4 | Ext | No | 0.83 | 15.7 | 36 | 16 | 0.0 | -1 | 16 |
| A | 3 | 6.9 | 15 | 0.4 | Ext | Yes - (A-3) | 1.25 | 23.5 | 36 | 40 | 65.2 | 102 | 56 |
| A | 4 | 7.75 | 15 | 0.4 | Ext | No | 1.41 | 0.0 | -2 | 0 | 0.0 | -2 | 0 |
| A | 5 | 5 | 15 | 0.4 | Ext | No | 0.91 | 0.0 | -1 | 0 | 33.1 | 71 | 0 |
| A | 6 | 6.6 | 15 | 0.4 | Ext | No | 1.20 | 22.5 | 36 | 23 | 43.6 | 71 | 23 |
| | | | | | | | | | | | | | |
| B | 1 | 7.3 | 1 | 0.0 | Ext | No | 1.32 | 22.7 | 34 | 23 | 68.2 | 102 | 23 |
| B | 2 | 23.7 | 1 | 0.0 | Ext | Yes - (B-2) | 4.30 | 73.8 | 32 | 142 | 221.4 | 100 | 211 |
| | | | | | | | | | | | | | |
| C | 1 | 5.1 | 15 | 0.4 | Ext | Yes (C-1) | 0.93 | 22.4 | 47 | 43 | 47.6 | 101 | 64 |
| C | 2 | 5.5 | 15 | 0.4 | Ext | Yes (C-2) | 1.00 | 24.2 | 47 | 47 | 51.4 | 101 | 71 |
| C | 3 | 5.3 | 15 | 0.4 | Ext | Yes (C-3) | 0.96 | 23.3 | 47 | 47 | 0.0 | -1 | 71 |
| C | 4 | 5.4 | 15 | 0.4 | Ext | Yes (C-4) | 0.98 | 23.8 | 47 | 47 | 50.3 | 101 | 71 |
| C | 5 | 11.4 | 1 | 0.0 | Int | No | 1.14 | 50.2 | 48 | 50 | 0.0 | -1 | 50 |
| | | | | | | | | | | | | | |
| D | 1 | 22.6 | 0 | 0.0 | Ext | Yes (D-2) | 4.10 | 96.6 | 45 | 120 | 0.0 | -2 | 143 |
| | | | | | | | | | Max | 142 kips | | Max | 211 kips |

# SECTION 6.0
# PRODUCT DATA

# LTP4/LTP5/A34/A35

## Framing Angles and Plates

The larger LTP5 spans subfloor at the top of the blocking or rim board. The embossments enhance performance.

The LTP4 Lateral Tie Plate transfers shear forces for top plate-to-rim board or blocking connections. Nail holes are spaced to prevent wood splitting for single and double top plate applications. May be installed over plywood sheathing.

The A35 angle's exclusive bending slot allows instant, accurate field bends for all two- and three-way ties. Balanced, completely reversible design permits the A35 to secure a great variety of connections.

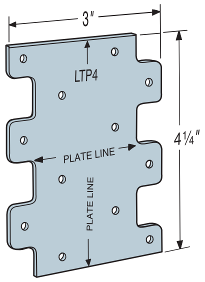
**Material:** LTP4/LTP5 — 20 gauge; all others — 18 gauge

**Finish:** Galvanized. Some products available in stainless steel or ZMAX® coating; see Corrosion Information, pp. 15–18.

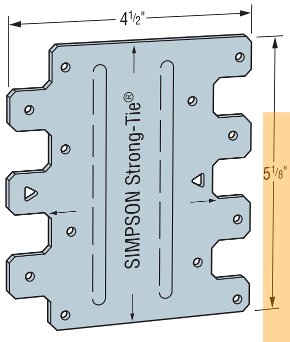
**Installation:**

- Use all specified fasteners; see General Notes
- A35 — Bend one time only

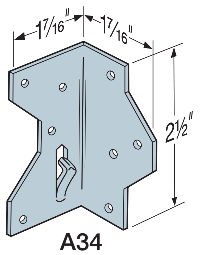
**Codes:** See p. 14 for Code Reference Key Chart



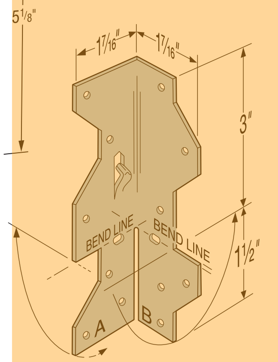

LTP4



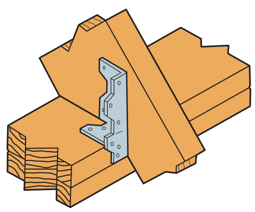

LTP5



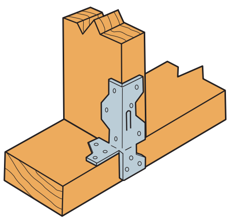

A34



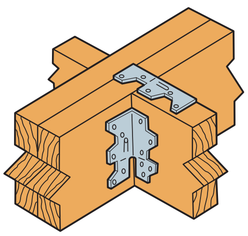

A35



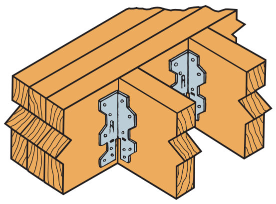
Joists to Plate with A Leg Inside



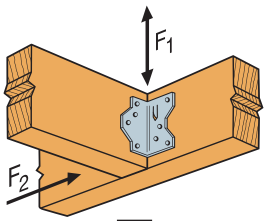
Studs to Plate with B Leg Outside



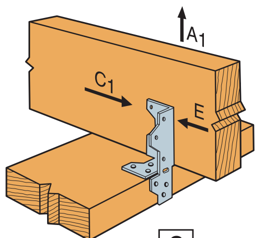
Joists to Beams



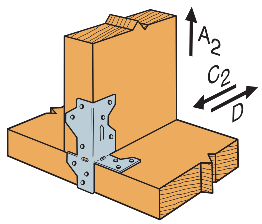
Ceiling Joists to Beam



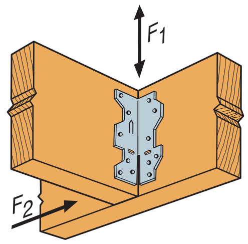

1 A34



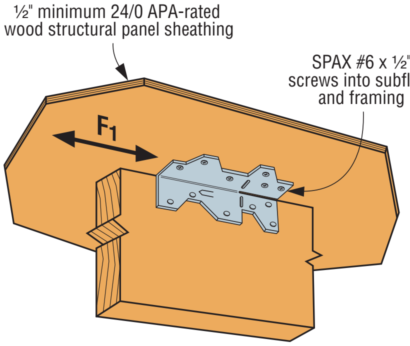

2 A35



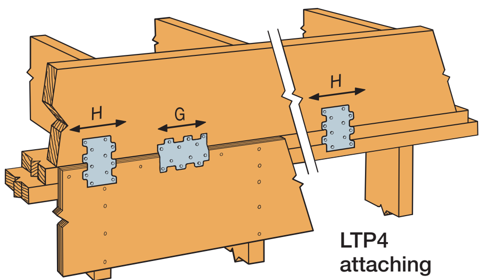

3 A35




4 A35

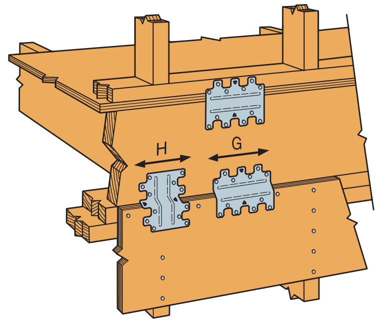



5 A35




6 LTP4 Installed over Wood Structural Panel Sheathing

LTP4 attaching Top Plates to Rim Board




7 LTP5 Installed over Wood Structural Panel Sheathing

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# LTP4/LTP5/A34/A35

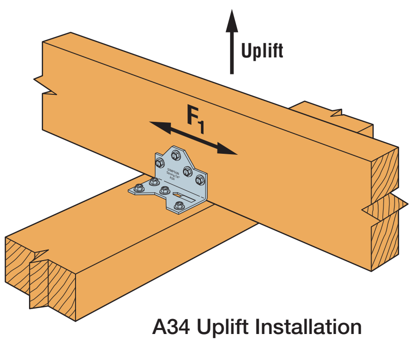
## Framing Angles and Plates (cont.)

These products are available with additional corrosion protection. For more information, see p. 18.

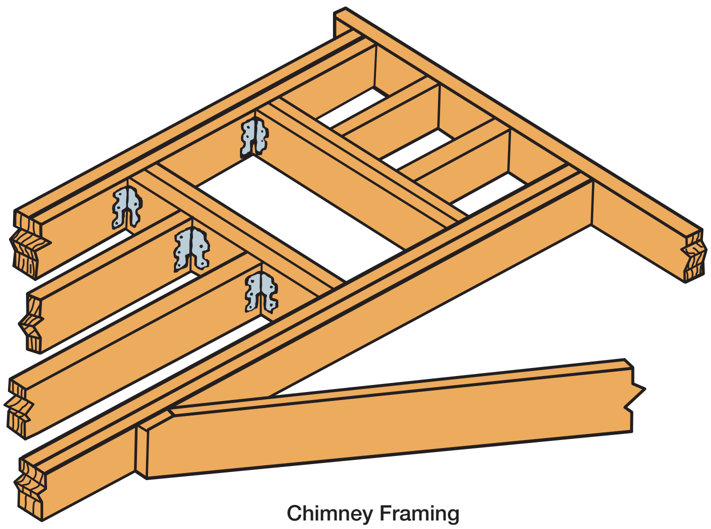
These products are approved for installation with the Strong-Drive® SD Connector screw. See pp. 39–40 for more information.

| Model No. | Type of Connection | Fasteners | Direction of Load | DF/SP Allowable Loads | | | SPF/HF Allowable Loads | | | Code Ref. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Floor (100) | Roof (125) | (160) | Floor (100) | Roof (125) | (160) | |
| A34 | 1 | (8) 8d x 1½" | $F_1$ | 395 | 485 | 515 | 340 | 415 | 445 | IP1, L5, L18, FL |
| | | | $F_2$[6] | 395 | 455 | 455 | 340 | 390 | 390 | |
| | 1 | (8) #9 x 1½" SD | $F_1$ | 395 | 485 | 515 | 340 | 415 | 445 | I27, L5, FL |
| | | | $F_2$ | 395 | 455 | 455 | 340 | 390 | 390 | |
| | | | Uplift | 240 | 240 | 240 | 170 | 170 | 170 | 170 |
| A35 | 2 | (9) 8d x 1½" | $A_1$, E | 295 | 365 | 395 | 255 | 315 | 340 | IP1, L5, L18, FL |
| | | | $C_1$ | 210 | 210 | 210 | 180 | 180 | 180 | |
| | 3 | (12) 8d x 1½" | $A_2$ | 295 | 365 | 380 | 255 | 315 | 325 | |
| | | | $C_2$ | 295 | 365 | 370 | 255 | 315 | 320 | |
| | | | D | 230 | 230 | 230 | 200 | 200 | 200 | |
| | 4 | (12) 8d x 1½" | $F_1$ | 595 | 695 | 695 | 510 | 600 | 600 | |
| | | | $F_2$[6] | 595 | 670 | 670 | 510 | 575 | 575 | |
| | 5 | (12) #6 x ½" SPAX | $F_1$ | 420 | 420 | 420 | 360 | 360 | 360 | 170 |
| LTP4 | 6 | (12) 8d x 1½" | G | 580 | 670 | 670 | 500 | 570 | 575 | IP1, L5, L18, FL |
| | | | H | 580 | 600 | 600 | 500 | 515 | 515 | |
| LTP5 | 7 | (12) 8d x 1½" | G | 580 | 620 | 620 | 500 | 535 | 535 | IP1, L18, FL |
| | | | H | 545 | 545 | 545 | 470 | 470 | 470 | |

1. Allowable loads are for one angle. When angles are installed on each side of the joist, the minimum joist thickness is 3".
2. Some illustrations show connections that could cause cross-grain tension or bending of the wood during loading if not reinforced sufficiently. In this case, mechanical reinforcement should be considered.
3. LTP4 can be installed over ⅜" wood structural panel sheathing with 8d x 1½" nails and achieve 0.72 of the listed load, or over ½" and achieve 0.64 of the listed load. 8d commons will achieve 100% load.
4. LTP4 satisfies the IRC continuously sheathed portal frame (CS-PF) framing anchor requirements when installed over raised wood floor framing per Figure R602.10.6.4.
5. The LTP5 may be installed over wood structural panel sheathing up to ½" thick using 8d x 1½" nails with no reduction in load.
6. Connectors are required on both sides to achieve $F_2$ loads in both directions.
7. **Fasteners:** 8d x 1½" = 0.131" dia. x 1½" long; SPAX #6 x ½" = 0.138" dia. x ½" long. See pp. 26–27 for other nail sizes and information.




A34 Uplift Installation



Chimney Framing

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UPDATED 04/17/17

# HDB/HD

## Holdowns

Simpson Strong-Tie offers a wide variety of bolted holdowns offering low-deflection performance for a range of load requirements.

The HD3B is a light-duty holdown designed for use in shearwalls and braced-wall panels, as well as other lateral applications.

The HD5B, HD7B and HD9B bolted holdowns incorporate the proven design of our HDQ8 SDS-style holdown and feature a unique seat design which greatly minimizes deflection under load. HDB holdowns are self-jigging, ensuring that the code-required minimum of seven bolt diameters from the end of the post is met. They can be installed directly on the sill plate or raised above it and are suitable for back-to-back applications where eccentricity is a concern. HDBs are designed to provide loads for intermediate-load-range shearwalls, braced-wall panels and lateral applications.

HD holdowns offer the highest allowable loads, providing high capacity for both vertical and horizontal applications. The HD12 and HD19 are self-jigging, ensuring that the code-required minimum of seven bolt diameters from the end of the post is met. They can be installed back-to-back when eccentricity is an issue.

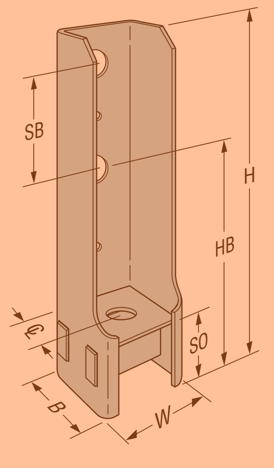
**Material:** See table

**Finish:** HD3B/HD5B/HD7B/HD9B — Galvanized; HD — Simpson Strong-Tie® gray paint; HDG available. For stainless steel options, see L-C-SSHD at **strongtie.com**.

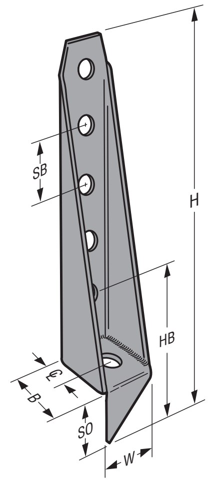
**Installation:** • See General Notes on pp. 75–76

- Bolt holes shall be a minimum of 1⁄32" to a maximum of 1⁄16" larger than the bolt diameter (per 2015 NDS, section 12.1.3.2)
- Stud bolts should be snugly tightened with standard cut washers between the wood and nut (BPs are required in the City and County of Los Angeles)
- HD and HDB holdowns are self-jigging and will ensure minimum bolt end distance when installed flush with the sill plate
- Standard cut washer is required under the anchor nut for HD12 with 1" anchor and HD19 with 1⅛" anchors

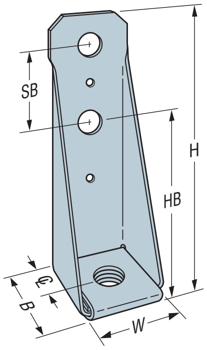
**Codes:** See p. 14 for Code Reference Key Chart



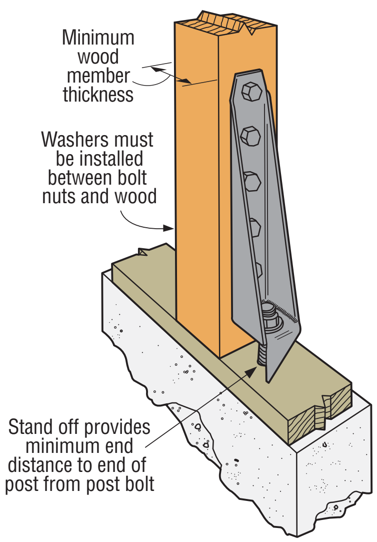

**HD5B**
*(HD7B and HD9B similar)*
U.S. Patents
6,006,487 and 6,327,831



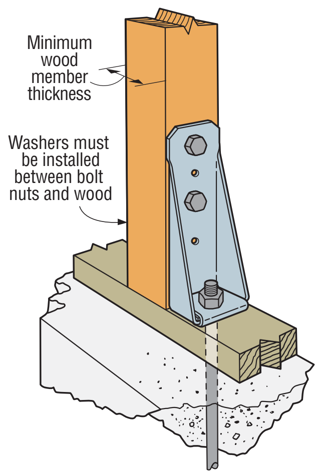

**HD19**
*(HD12 similar)*



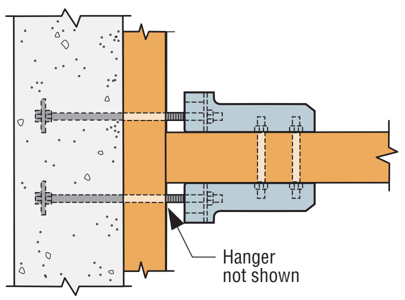

**HD3B**




**Vertical HD19 Installation**




**Vertical HD3B Installation**




**Horizontal HDB Installation**
*(Plan view)*

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# HDB/HD

## Holdowns (cont.)

These products are available with additional corrosion protection. For more information, see p. 18.

| Model No. | Material | | Dimensions (in.) | | | | | | | Fasteners | | Minimum Wood Member Thickness (in.) | Allowable Tension Loads (160) | | Deflection at Highest Allowable Load | Code Ref. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Base (in.) | Body (ga.) | HB | SB | W | H | B | ℄ | SO | Anchor Dia. | Stud Bolts | | DF/SP | SPF/HF | | |
| HD3B | — | 12 | 4¾ | 2½ | 2½ | 8⅝ | 2¼ | 1⁵⁄₁₆ | ⅜ | ⅝ | (2) ⅝ | 1½ | 1,895 | 1,610 | 0.156 | IP3, FL, L21 |
| | | | | | | | | | | | | 2½ | 2,525 | 2,145 | 0.169 | |
| | | | | | | | | | | | | 3 | 3,130 | 3,050 | 0.120 | |
| | | | | | | | | | | | | 3½ | 3,130 | 3,050 | 0.120 | |
| HD5B | ³⁄₁₆ | 10 | 5¼ | 3 | 2½ | 9⅜ | 2½ | 1¼ | 2 | ⅝ | (2) ¾ | 1½ | 2,405 | 2,070 | 0.153 | |
| | | | | | | | | | | | | 2½ | 3,750 | 3,190 | 0.129 | |
| | | | | | | | | | | | | 3 | 4,505 | 3,785 | 0.156 | |
| | | | | | | | | | | | | 3½ | 4,935 | 4,195 | 0.150 | |
| HD7B | ³⁄₁₆ | 10 | 5¼ | 3 | 2½ | 12⅜ | 2½ | 1¼ | 2 | ⅞ | (3) ¾ | 3 | 6,645 | 5,650 | 0.142 | |
| | | | | | | | | | | | | 3½ | 7,310 | 6,215 | 0.154 | |
| | | | | | | | | | | | | 4½ | 7,345 | 6,245 | 0.155 | |
| HD9B | ⅜ | 7 | 6⅛ | 3½ | 2⅞ | 14 | 2½ | 1¼ | 2⅜ | ⅞ | (3) ⅞ | 3½ | 7,740 | 6,580 | 0.159 | |
| | | | | | | | | | | | | 4½ | 9,920 | 8,435 | 0.178 | |
| | | | | | | | | | | | | 5½ | 9,920 | 8,430 | 0.178 | |
| | | | | | | | | | | | | 7¼ | 10,035 | 8,530 | 0.179 | |
| HD12 | ⅜ | 3 | 7 | 4 | 3½ | 20⁵⁄₁₆ | 4¼ | 2⅛ | 3⅝ | 1 | (4) 1 | 3½ | 11,350 | 9,215 | 0.171 | |
| | | | | | | | | | | | | 4½ | 12,665 | 10,765 | 0.171 | |
| | | | | | | | | | | | | 5½ x 5½ | 14,220 | 12,085 | 0.162 | |
| | | | | | | | | | | 1⅛ | (4) 1 | 3½ | 11,775 | 9,215 | 0.171 | |
| | | | | | | | | | | | | 4½ | 13,335 | 11,055 | 0.177 | |
| | | | | | | | | | | | | 7¼ | 15,435 | 13,120 | 0.194 | |
| | | | | | | | | | | | | 5½ x 5½ | 15,510 | 12,690 | 0.162 | |
| HD19 | ⅜ | 3 | 7 | 4 | 3½ | 24½ | 4¼ | 2⅛ | 3⅝ | 1⅛ | (5) 1 | 7¼ | 16,735 | 14,225 | 0.191 | |
| | | | | | | | | | | | | 5½ x 5½ | 16,775 | 12,690 | 0.200 | |
| | | | | | | | | | | 1¼ | (5) 1 | 7¼ | 19,360 | 15,270 | 0.180 | |
| | | | | | | | | | | | | 5½ x 5½ | 19,070 | 16,210 | 0.137 | |

1. To achieve published loads, machine bolts shall be installed with the nut on the opposite side of the holdown. If reversed, the Designer shall reduce the allowable loads shown per NDS requirements when bolt threads are in the shear plane.
2. Lag screws will not develop the listed loads.
3. HD19 with 1¼" anchor rod requires No. 1 or better post to achieve published loads.

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# HDU/DTT



## Holdowns

***This product is preferable to similar connectors because of a) easier installation, b) higher loads, c) lower installed cost, or a combination of these features.***

HDU holdowns are pre-deflected during the manufacturing process, virtually eliminating deflection under load due to material stretch. They use Simpson Strong-Tie® Strong-Drive® SDS Heavy-Duty Connector screws which install easily, reduce fastener slip and provide a greater net section when compared to bolts.

The DTT tension ties are designed for lighter-duty holdown applications on single 2x posts. The DTT1Z is installed with nails or Simpson Strong-Tie Strong-Drive SD Connector screws and the DTT2Z installs easily with the Strong-Drive SDS Heavy-Duty Connector screws (included). The DTT1Z holdowns have been tested for use in designed shearwalls and prescriptive braced wall panels as well as prescriptive wood-deck applications (see p. 337 for deck applications).

For more information on holdown options, contact Simpson Strong-Tie.

**HDU Special Features:**

- Holdown designs virtually eliminate deflection due to material stretch
- Uses Strong-Drive SDS Heavy-Duty Connector screws which install easily, reduce fastener slip, and provide a greater net section area of the post compared to bolts
- Strong-Drive SDS Heavy-Duty Connector screws are supplied with the holdowns to ensure proper fasteners are used
- No stud bolts to countersink at openings

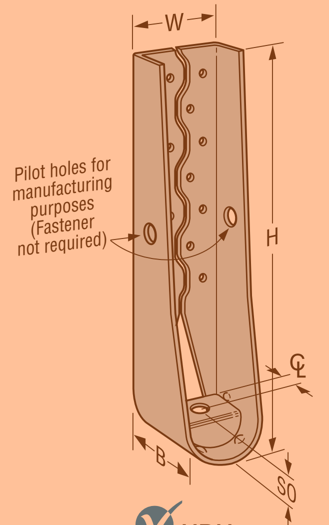
**Material:** See table

**Finish:** HDU — Galvanized; DTT1Z and DTT2Z — ZMAX® coating; DTT2SS — stainless steel

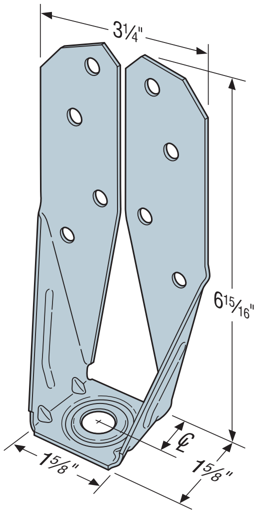
**Installation:**

- See General Notes on pp. 75–76
- The HDU requires no additional washer, the DTT requires a standard-cut washer (included with DTT2Z) be installed between the nut and the seat
- Strong-Drive SDS Heavy-Duty Connector screws install best with a low-speed high-torque drill with a ⅜" hex-head driver

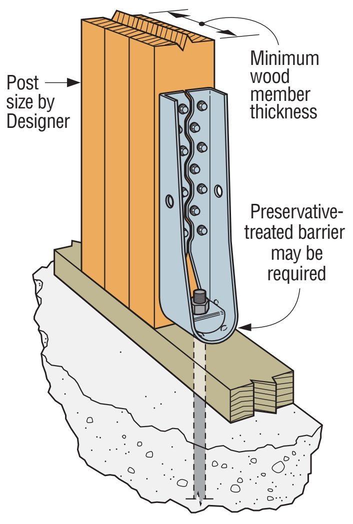
**Codes:** See p. 14 for Code Reference Key Chart



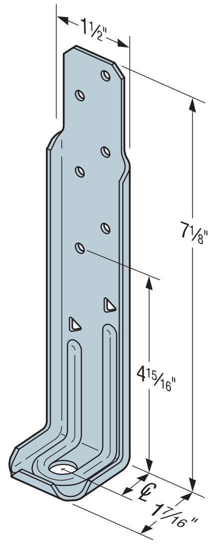

HDU
U.S. Patents 5,979,130



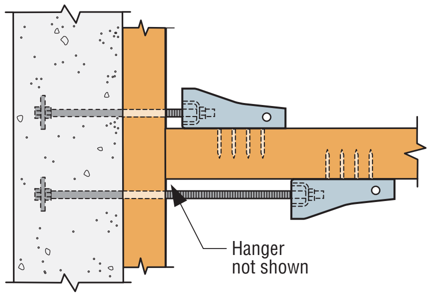

DTT2Z
U.S. Patent 8,555,580




Vertical HDU Installation




DTT1Z
U.S. Patent Pending




**Horizontal HDU Offset Installation**
*(Plan view)*

See Holdown and Tension Tie General Notes on p. 76.

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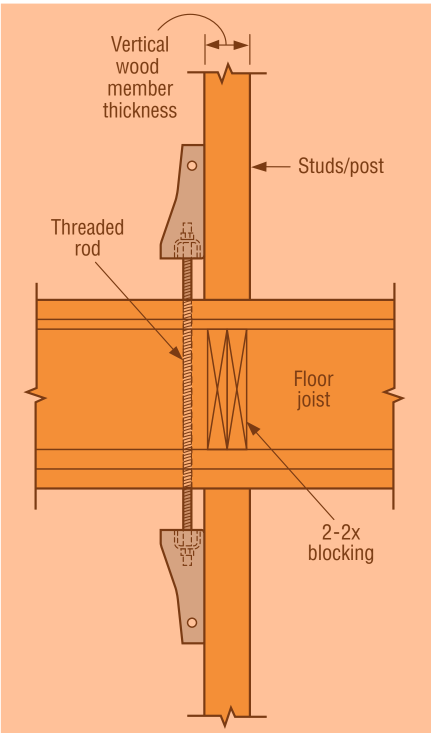
# HDU/DTT

## Holdowns (cont.)

These products are available with additional corrosion protection. For more information, see p. 18.

| | Model No. | Ga. | Dimensions (in.) W | H | B | ℄ | SO | Fasteners: Anchor Bolt Dia. (in.) | Post Fasteners | Minimum Wood Member Thickness (in.) | Allowable Tension Loads (160)[1] DF/SP | SPF/HF | Deflection at Allowable Load (in.) | Code Ref. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | DTT1Z | 14 | 1½ | 7⅛ | 1 7/16 | ¾ | 3/16 | ⅜ | (6) SD #9 x 1½" | 1½ | 840 | 840 | 0.170 | IP2, L19, FL |
| | | | | | | | | | (6) 10d x 1½" | | 910 | 640 | 0.167 | |
| | | | | | | | | | (8) 10d x 1½" | | 910 | 850 | 0.167 | |
| SS | DTT2Z | 14 | 3¼ | 6 15/16 | 1⅝ | 13/16 | 3/16 | ½ | (8) ¼" x 1½" SDS | 1½ | 1,825 | 1,800 | 0.105 | I6, L8, FL |
| | | | | | | | | | (8) ¼" x 1½" SDS | 3 | 2,145 | 1,835 | 0.128 | |
| SS | DTT2Z-SDS2.5 | | | | | | | | (8) ¼" x 2½" SDS | 3 | 2,145 | 2,105 | 0.128 | |
| | HDU2-SDS2.5 | 14 | 3 | 8 11/16 | 3¼ | 1 5/16 | 1⅜ | ⅝ | (6) ¼" x 2½" SDS | 3 | 3,075 | 2,215 | 0.088 | |
| | HDU4-SDS2.5 | 14 | 3 | 10 15/16 | 3¼ | 1 5/16 | 1⅜ | ⅝ | (10) ¼" x 2½" SDS | 3 | 4,565 | 3,285 | 0.114 | |
| | HDU5-SDS2.5 | 14 | 3 | 13 3/16 | 3¼ | 1 5/16 | 1⅜ | ⅝ | (14) ¼" x 2½" SDS | 3 | 5,645 | 4,065 | 0.115 | |
| | HDU8-SDS2.5 | 10 | 3 | 16⅝ | 3½ | 1⅜ | 1½ | ⅞ | (20) ¼" x 2½" SDS | 3 | 6,765 | 4,870 | 0.110 | |
| | | | | | | | | | | 3½ | 6,970 | 5,020 | 0.116 | |
| | | | | | | | | | | 4½ | 7,870 | 5,665 | 0.113 | |
| | HDU11-SDS2.5 | 10 | 3 | 22¼ | 3½ | 1⅜ | 1½ | 1 | (30) ¼" x 2½" SDS | 5½ | 9,335 | 6,865 | 0.137 | |
| | | | | | | | | | | 7¼ | 11,175 | 8,045 | 0.137 | |
| | HDU14-SDS2.5 | 7 | 3 | 25 11/16 | 3½ | 1 9/16 | 1 9/16 | 1 | (36) ¼" x 2½" SDS | 4x6[3,4] | 10,770 | 7,755 | 0.122 | 170 |
| | | | | | | | | | | 7¼[3] | 14,390 | 10,435 | 0.177 | I6, L8, FL |
| | | | | | | | | | | 5½[2,3] | 14,445 | 10,350 | 0.172 | |

1. See pp. 75–76 for Holdown and Tension Tie General Notes.
2. Noted HDU14 allowable loads are based on a 5½" wide post (6x6 min.).
3. HDU14 requires heavy-hex anchor nut to achieve tabulated loads (supplied with holdown).
4. Loads are applicable to installation on either narrow or wide face of post.




Typical HDU Tie Between Floors

Holdowns and Tension Ties

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