

Rating form completed by
Jack Wegleitner, Jay YinText in *green* is to be part of UC Santa Cruz building database and may be part of UCOP database

DATE: 2019-06-30

UC Santa Cruz building seismic ratings

LML William T. Doyle Research Building

CAAN #7438

102 McAllister Way, Santa Cruz CA 95060

UCSC Campus: Coastal Sciences Campus



6/28/19



Rating summary	Entry	Notes
UC Seismic Performance Level (rating)	IV (Fair)	
Rating basis	Tier 1	ASCE 41-17 ¹
Date of rating	2019	
Recommended UC Santa Cruz priority category for retrofit	Priority B	Priority A=Retrofit ASAP Priority B=Retrofit at next permit application
Ballpark total construction cost to retrofit to IV rating ²	Medium (~\$50/sf-\$200/sf)	See recommendations on further evaluation and retrofit.
Is 2018-2019 rating required by UCOP?	Yes	Building was not previously rated.
Further evaluation recommended?	Yes	Inspect addition roof connection to existing roof and tie to existing roof

¹ We translate this Tier 1 evaluation to a Seismic Performance Level rating using professional judgment. Noncompliant items in the Tier 1 evaluation do not automatically put a building into a particular rating category, but we evaluate such items 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. See Section III B of the UC Seismic Policy and Method B of Section 321 of the 2016 California Existing Building Code.

² Per Section 3.A.4.i of the Seismic Program Guidebook, the cost includes all construction cost necessitated by the seismic retrofit, including restoration of finishes and any triggered work on utilities or accessibility. It does not include soft costs such as design fees or campus costs. The cost is in 2019 dollars.

Building information used in this evaluation

- Architectural and Structural drawings by Esherick Homsey Dodge and Davis Architects and Planners; and Rutherford and Chekene Consulting Engineers, "Coastal Marine Laboratory, Support Building." As-built dated 19 Aug 1977, Sheets A1-A7 and S1-S3.
- Architectural and Structural drawings by Office of Campus Facilities Physical Planning and construction "Aquatic Toxicology Laboratory, Addition to Existing Support Building." As-built dated 29 October 1986, Sheets A1-A5 and S1.
- University of California building database information, "LML William T. Doyle Research building" provided by Jose Sanchez (UCSC) on 2018-11-20.

Additional building information known to exist

None

Scope for completing this form

Reviewed structural drawings and performed a site visit to confirm as-builts. Evaluated nonstructural life-safety hazards during site visit. Completed an ASCE41-17 Tier 1 evaluation

Brief description of structure

The LML William T. Doyle Research Building is on UCSC's Coastal Sciences Campus. The building was designed in 1977 by Esherick Homsey Dodge and Davis Architects and Planners; and Rutherford and Chekene Consulting Engineers. Construction was completed in 1978

The main building is two stories with a gable roof. The roof and second floor are supported by shear walls, wood posts, and wood framing throughout the building. A storage shed was built to the west of the main structure at some point after the original construction. An addition to the main structure that connects the storage shed to the main structure was designed in 1986. The addition is also wood framed but the drawings do not indicate any shear walls. The drawings are available for the addition but not for the storage shed.

The building is divided into multiple storage and lab spaces. Many of these lab spaces use redwood plywood sheets as the wall siding. These sheets of plywood are not considered shear walls.

Shear walls support the roof at the exterior of the building. Posts support the roof ridge at the interior of the building. Interior shear walls are continuous from the foundation to the roof in the longitudinal direction but not in the transverse direction. All walls and posts are supported by shallow foundations

Identification of levels: A main ground floor with offices and lab space. A second floor of storage rooms runs the length of the building under the ridge of the gable roof. (Ground Floor, 2nd floor)

Foundation system: The site is level. The structure is supported on a slab-on-grade over granular cushion. Walls and posts are supported by grade beams

Structural system for vertical (gravity) load: The gravity system consists of wood framing supported by stud bearing walls and post. The roof is also wood sheathed and framed

Structural system for lateral forces: The roof is a wood diaphragm that attaches to wood stud plywood shear walls around the perimeter of the building with additional walls on the interior. Interior shear walls are continuous through the second floor. The addition to the west of the building does not have any indicated shear walls. The roof of the addition is attached to the roof of the original structure and the storage shed. The storage shed has metal straps on some of its walls. Specifications on the metal straps are unknown. The walls are attached to sills which are anchored to the foundation.

Brief description of seismic deficiencies and expected seismic performance including mechanism of nonlinear response and structural behavior modes

The walls of the main building have enough capacity according to the quick checks. The addition and storage shed are expected to perform sufficiently because of the metal straps in the storage shed and the gypsum in the addition. The connection of the addition roof is expected to separate from the main structure and the shed. This connection should be inspected and reinforced if necessary.

Structural deficiency	Affects rating?	Structural deficiency	Affects rating?
Lateral system stress check (wall shear, column shear or flexure, or brace axial as applicable)	N	Openings at shear walls (concrete or masonry)	N
Load path	N	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.³

No falling hazards observed during the site visit.

No nonstructural life-safety concerns seen in or around the structure.

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	N	Unrestrained hazardous materials storage	N
Heavy masonry or stone veneer above exit ways and public access areas	N	Masonry chimneys	N
Unbraced masonry parapets, cornices or other ornamentation above exit ways and public access areas	N	Unrestrained natural gas-fueled equipment such as water heaters, boilers, emergency generators, etc.	N

Discussion of rating

The building meets the requirements of the Tier 1 checklist and was given a IV rating. A priority B was given so further inspect and strengthening of the addition's roof girder connection to the existing roof framing could happen at the next permit application.

Recommendations for further evaluation or retrofit

The connection between the addition roof and the original roofs should be inspected to confirm the as-builts. The connection should be strengthened to sufficiently tie the roofs together to prevent separation during an earthquake.

³ 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.

Peer review of rating

This seismic evaluation was discussed in a peer review meeting on 24 June 2019. Reviewers present were Bret Lizundia of R+C and Joe Maffei of Maffei Structural Engineers. Comments from the reviewers have been incorporated into this report. The reviewers agreed with the assigned rating.

Additional building data	Entry	Notes
Latitude	36.949	
Longitude	-122.066	
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	0	
Building occupiable area (OGSF)	6649 sq ft	
Risk Category per 2016 CBC Table 1604.5	II	
Building structural height, h_n	21 ft.	Structural height defined per ASCE 7-16 Section 11.2
Coefficient for period, C_t	.02	Estimated using ASCE 41-17 equation 4-4 and 7-18
Coefficient for period, β	.75	Estimated using ASCE 41-17 equation 4-4 and 7-18
Estimated fundamental period	0.227sec	Estimated using ASCE 41-17 equation 4-4 and 7-18
Site data		
975 yr hazard parameters S_s, S_1	1.26, 0.471	
Site class	D	
Site class basis	Geotech ⁴	See footnote below
Site parameters F_a, F_v	1.2, 1.829	
Ground motion parameters S_{cs}, S_{c1}	1.52, 0.86	
S_a at building period	1.513	
Site V_{s30}	900 ft/s	
V_{s30} basis	Estimated	Estimated based on site classification of D.
Liquefaction potential	Low	
Liquefaction assessment basis	County Map	See footnote 4
Landslide potential	Low	
Landslide assessment basis	County Map	See footnote 4

⁴ Determination of site class and assessment of geotechnical hazards are based on correspondence with Pacific Crest Geotechnical Engineers and Nolan, Zinn, and Associates Geologists. [Revised Geology and Geologic Hazards, Santa Cruz Campus, University of California, Job # 04003-SC 13 May 2005]. Site class is taken as D throughout the main campus of UC Santa Cruz. The following links provide hazard maps for liquefaction, landslide, and fault rupture:

<https://gis.santacruzcounty.us/mapgallery/Emergency%20Management/Hazard%20Mitigation/LiquifactionMap2009.pdf>

<https://gis.santacruzcounty.us/mapgallery/Emergency%20Management/Hazard%20Mitigation/LandslideMap2009.pdf>

<https://gis.santacruzcounty.us/mapgallery/Emergency%20Management/Hazard%20Mitigation/FaultZoneMap2009.pdf>

Active fault-rupture hazard identified at site?	No	
Fault rupture assessment basis	County Map	See footnote 4
Site-specific ground motion study?	No	
Applicable code		
Applicable code or approx. date of original construction	Built: 1978 Code: 1973 UBC	
Applicable code for partial retrofit	None	No partial retrofit
Applicable code for full retrofit	None	No full retrofit
Model building data		
Model building type North-South	Wood,W2 - Wood Frames, Commercial and Industrial	
Model building type East-West	Wood,W2 - Wood Frames, Commercial and Industrial	
FEMA P-154 score	No	Not included here because we performed ASCE 41 Tier 1 evaluation.
Previous ratings		
Most recent rating	Unknown	
Date of most recent rating	Unknown	
2 nd most recent rating	-	
Date of 2 nd most recent rating	-	
3 rd most recent rating	-	
Date of 3 rd most recent rating	-	
Appendices		
ASCE 41 Tier 1 checklist included here?	Yes	Refer to attached checklist file in Appendix A.



University of California, Santa Cruz
ASCE 41-17 Tier 1 Seismic Evaluation
7438 - LML William T. Doyle Research Building

Appendix A
ASCE 41-17 Checklists

UC Campus:	Santa Cruz			Date:	6/19/2019		
Building CAAN:	7438	Auxiliary CAAN:	-	By Firm:	Degenkolb Engineers		
Building Name:	LML William T. Doyle Research Building			Initials:	JSW	Checked:	
Building Address:	102 McAllister Way, Santa Cruz, CA 95060			Page:	1	of	3

ASCE 41-17 Collapse Prevention Basic Configuration Checklist

LOW SEISMICITY

BUILDING SYSTEMS - GENERAL

	Description
C NC N/A U <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	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) Comments:
C NC N/A U <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	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) Comments:
C NC N/A U <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>	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) Comments:

BUILDING SYSTEMS - BUILDING CONFIGURATION

	Description
C NC N/A U <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	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. A.2.2.2. Tier 2: Sec. 5.4.2.1) Comments:
C NC N/A U <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	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) Comments:
C NC N/A U <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	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) Comments:

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

UC Campus:	Santa Cruz			Date:	6/19/2019		
Building CAAN:	7438	Auxiliary CAAN:	-	By Firm:	Degenkolb Engineers		
Building Name:	LML William T. Doyle Research Building			Initials:	JSW	Checked:	
Building Address:	102 McAllister Way, Santa Cruz, CA 95060			Page:	2	of	3

ASCE 41-17 Collapse Prevention Basic Configuration Checklist

C NC N/A U <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<p>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)</p> <p>Comments:</p>
C NC N/A U <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<p>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)</p> <p>Comments:</p>
C NC N/A U <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<p>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)</p> <p>Comments: Symmetric building.</p>

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

GEOLOGIC SITE HAZARD

	Description
C NC N/A U <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<p>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)</p> <p>Comments:</p>
C NC N/A U <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<p>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)</p> <p>Comments:</p>
C NC N/A U <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<p>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)</p> <p>Comments:</p>

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

UC Campus:	Santa Cruz			Date:	6/19/2019		
Building CAAN:	7438	Auxiliary CAAN:	-	By Firm:	Degenkolb Engineers		
Building Name:	LML William T. Doyle Research Building			Initials:	JSW	Checked:	
Building Address:	102 McAllister Way, Santa Cruz, CA 95060			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 NC N/A U <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<p>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)</p> <p>Comments: $50.5/22=2.3$ $0.6*1.513=0.91$</p>
C NC N/A U <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<p>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)</p> <p>Comments: Site class D and slab on grade tie together spread footings.</p>

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

UC Campus:	Santa Cruz		Date:	6/19/2019		
Building CAAN:	7438	Auxiliary CAAN:	By Firm:	Degenkolb Engineers		
Building Name:	LML William T. Doyle Research Building		Initials:	JSW	Checked:	
Building Address:	102 McAllister Way, Santa Cruz, CA 95060		Page:	1	of	4

ASCE 41-17 Collapse Prevention Structural Checklist For Building Type W2

LOW AND MODERATE SEISMICITY														
SEISMIC-FORCE-RESISTING SYSTEM														
		Description												
C	NC	N/A	U	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)										
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Comments:										
C	NC	N/A	U	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)										
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>Structural panel sheathing</td> <td>1,000 lb/ft</td> </tr> <tr> <td>Diagonal sheathing</td> <td>700 lb/ft</td> </tr> <tr> <td>Straight sheathing</td> <td>100 lb/ft</td> </tr> <tr> <td>All other conditions</td> <td>100 lb/ft</td> </tr> </table>			Structural panel sheathing	1,000 lb/ft	Diagonal sheathing	700 lb/ft	Straight sheathing	100 lb/ft	All other conditions	100 lb/ft
Structural panel sheathing	1,000 lb/ft													
Diagonal sheathing	700 lb/ft													
Straight sheathing	100 lb/ft													
All other conditions	100 lb/ft													
				Comments:										
C	NC	N/A	U	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)										
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Comments:										
C	NC	N/A	U	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)										
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Comments:										
C	NC	N/A	U	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)										
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Comments:										
C	NC	N/A	U	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)										
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Comments:										

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

UC Campus:	Santa Cruz		Date:	6/19/2019		
Building CAAN:	7438	Auxiliary CAAN:	By Firm:	Degenkolb Engineers		
Building Name:	LML William T. Doyle Research Building		Initials:	JSW	Checked:	
Building Address:	102 McAllister Way, Santa Cruz, CA 95060		Page:	2	of	4

ASCE 41-17

Collapse Prevention Structural Checklist For Building Type W2

C	NC	N/A	U	<p>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)</p> <p>Comments:</p>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
C	NC	N/A	U	<p>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)</p> <p>Comments:</p>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
C	NC	N/A	U	<p>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)</p> <p>Comments:</p>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
CONNECTIONS				
Description				
C	NC	N/A	U	<p>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)</p> <p>Comments:</p>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
C	NC	N/A	U	<p>WOOD SILLS: All wood sills are bolted to the foundation. (Commentary: Sec. A.5.3.4. Tier 2: Sec. 5.7.3.3)</p> <p>Comments:</p>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
C	NC	N/A	U	<p>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)</p> <p>Comments:</p>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	

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

UC Campus:	Santa Cruz		Date:	6/19/2019		
Building CAAN:	7438	Auxiliary CAAN:	By Firm:	Degenkolb Engineers		
Building Name:	LML William T. Doyle Research Building		Initials:	JSW	Checked:	
Building Address:	102 McAllister Way, Santa Cruz, CA 95060		Page:	3	of	4

ASCE 41-17 Collapse Prevention Structural Checklist For Building Type W2

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

CONNECTIONS

	Description
C NC N/A U <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	WOOD SILL BOLTS: Sill bolts are spaced at 6 ft (1.8 m) or less with acceptable edge and end distance provided for wood and concrete. (Commentary: A.5.3.7. Tier 2: Sec. 5.7.3.3) Comments:

DIAPHRAGMS

	Description
C NC N/A U <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>	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) Comments:
C NC N/A U <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	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) Comments:
C NC N/A U <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>	DIAPHRAGM REINFORCEMENT AT OPENINGS: There is reinforcing around all diaphragm openings larger than 50% of the building width in either major plan dimension. (Commentary: Sec. A.4.1.8. Tier 2: Sec. 5.6.1.5) Comments:
C NC N/A U <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>	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) Comments:
C NC N/A U <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	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) Comments:

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

UC Campus:	Santa Cruz			Date:	6/19/2019		
Building CAAN:	7438	Auxiliary CAAN:		By Firm:	Degenkolb Engineers		
Building Name:	LML William T. Doyle Research Building			Initials:	JSW	Checked:	
Building Address:	102 McAllister Way, Santa Cruz, CA 95060			Page:	4	of	4

**ASCE 41-17
Collapse Prevention Structural Checklist For Building Type W2**

C NC N/A U <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<p>DIAGONALLY SHEATHED AND UNBLOCKED DIAPHRAGMS: All diagonally sheathed or unblocked wood structural panel diaphragms have horizontal spans less than 40 ft (12.2 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)</p> <p>Comments:</p>
C NC N/A U <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<p>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)</p> <p>Comments:</p>



University of California, Santa Cruz
ASCE 41-17 Tier 1 Seismic Evaluation
7438 - LML William T. Doyle Research Building

Appendix B
Quick Check Calculations



Subject: Global Data	Job Number: B9956006.00	Date: 06/28/19
Job: UCSC Tier 1 Seismic Evaluations CAAN 7438	By: JSW	Section:
	Checked By:	Page

GLOBAL DATA

ASCE 41-17 SEISMIC EVALUATION & RETROFIT OF EXISTING BUILDINGS
 CHAPTER 4 - TIER 1 EVALUATION
 LINEAR STATIC PROCEDURE
 COLLAPSE PREVENTION
 BSE-2E HAZARD LEVEL

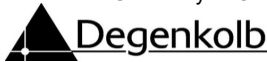
SITE DATA:

Latitude:	36.949246 °N	102 McAllister Way	USGS Seismic Design Map Application:
Longitude:	-122.066056 °W	Santa Cruz, CA 95060	http://geohazards.usgs.gov/hazardtool/application.php
Site Class:	D (default)	(Stiff Soil)	Site Class [ASCE 41-17, §2.4.1.6]
S _s	= 1.261 g	(USGS) (5% / 50 years)	USGS Mapped (T = 0.2 sec) [ASCE 41-17, §2.4.1.3]
S ₁	= 0.471 g	(USGS) (5% / 50 years)	USGS Mapped (T = 1.0 sec) [ASCE 41-17, §2.4.1.3]
F _a	= 1.200	(Site Class D)	Site Coefficient (T = 0.2 sec) [ASCE 7-16, Table 11.4-1]
F _v	= 1.829	(Site Class D)	Site Coefficient (T = 1.0 sec) [ASCE 7-16, Table 11.4-2]
S _{XS}	= 1.513 g	= F _a S _s	Site-Adjusted Design (T = 0.2 sec) [ASCE 41-17, Eq. 2-1]
S _{X1}	= 0.861 g	= F _v S ₁	Site-Adjusted Design (T = 1.0 sec) [ASCE 41-17, Eq. 2-2]

BUILDING DATA:

Building Type:	W2	(Wood Frames, Commercial and Industrial)	[ASCE 41-17, Table 3-1]
Year Built:	1976		
Number of Stories:	2 stories		
Parapet Height:	0.00 ft		
Roof Height:	25.50 ft		
Total Area:	6,745 sf		

Level	Height [ft]	Elevation [ft]	Length _{N-S} [ft]	Length _{E-W} [ft]	Area [sf]	Diaphragm Stiffness	Diaphragm Description
Roof	13.0	25.5	95	51	4,845	Rigid	Plywood Sheathing
2nd	12.5	12.5	95	21	1,948	Rigid	Plywood Sheathing
1st	0.0	0.0	95	51	4,798	-	-



Subject: Weight Take Off	Job Number: B9956006.00	Date: 06/28/19
Job: UCSC Tier 1 Seismic Evaluations CAAN 7438	By: JSW	Section:
Checked By:		Page

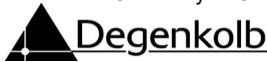
WEIGHT TAKEOFF

ASCE 41-17 SEISMIC EVALUATION & RETROFIT OF EXISTING BUILDINGS
 CHAPTER 4 - TIER 1 EVALUATION
 LINEAR STATIC PROCEDURE
 COLLAPSE PREVENTION
 BSE-2E HAZARD LEVEL

ROOF TYPE: ROOF

	Roofing / Re-roofing	@	5.0 psf	5.0 psf	y
0.5 in	Rock Ballast (Gravel)	@	8.0 psf per inch	0.0 psf	n
3 ply	Ready Roofing	@	0.3 psf per ply	0.0 psf	n
5 ply	Felt Roofing	@	0.5 psf per ply	0.0 psf	n
0.25 in	Slate	@	40.0 psf per inch	0.0 psf	n
	Shingles (Asphalt)	@	2.0 psf	0.0 psf	n
	Copper or Tin	@	1.0 psf	0.0 psf	n
	Corrugated Asbestos-Cement	@	4.0 psf	0.0 psf	n
	Waterproofing Membranes (Smooth Bituminous)	@	1.5 psf	0.0 psf	n
	Cement Tiles	@	16.0 psf	0.0 psf	n
	Clay Tiles (Spanish)	@	19.0 psf	0.0 psf	n
	Mortar Bed for Clay Tiles	@	10.0 psf	0.0 psf	n
	Roof Insulation	@	1.0 psf	1.0 psf	y
1 in	Insulation (Rigid)	@	1.5 psf per inch	0.0 psf	n
1 in	Insulation Boards (Fibrous Glass)	@	1.1 psf per inch	0.0 psf	n
3 in	Vermiculite Concrete	@	2.5 psf per inch	0.0 psf	n
0.5 in	Fire Proofing	@	2.0 psf per inch	0.0 psf	n
	Diaphragm - core planks	@	35.0 psf	0.0 psf	n
2.5 in	Concrete Slab (Normal Weight)	@	12.5 psf per inch	0.0 psf	n
4.75 in	Concrete Fill (Light Weight)	@	9.2 psf per inch	0.0 psf	n
0.5 in	Concrete Overpour (Light Weight)	@	9.2 psf per inch	0.0 psf	n
18 ga	Bare Metal Deck	@	3.0 psf	0.0 psf	n
2 in	Wood Decking	@	2.5 psf per inch	0.0 psf	n
2 in	Wood Sheathing	@	3.0 psf per inch	0.0 psf	n
0.5 in	Plywood	@	3.2 psf per inch	1.6 psf	y
	Framing	@	20.0 psf	0.0 psf	n
6 ft O.C.	Steel Beams	@	22.0 plf	0.0 psf	n
36 ft O.C.	Steel Girders	@	76.0 plf	0.0 psf	n
1.33 ft O.C.	Wood Sub-Purlins	@	1.8 plf	1.3 psf	y
14.5 ft O.C.	Wood Purlins	@	3.0 plf	0.2 psf	y
20 ft O.C.	Wood Girders	@	5.0 plf	0.2 psf	y
12.75 ft O.C.	Concrete Beams	@	800.0 plf	0.0 psf	n
20 ft O.C.	Concrete Girders	@	300.0 plf	0.0 psf	n
12.00 ft trib. ht.	Typical Columns (A _{trib} = 400 sf)	@	8.3 plf	0.2 psf	y
	Ceiling	@	5.0 psf	5.0 psf	y
0.5 in	Gypsum Board Ceiling	@	4.4 psf per inch	0.0 psf	n
	Acoustical Fiber Board	@	1.0 psf	0.0 psf	n
	Plaster Ceiling (On Tile)	@	5.0 psf	0.0 psf	n
	Suspended Metal Lath & Plaster (Gypsum Plaster)	@	10.0 psf	0.0 psf	n
	Suspended Steel Channel System	@	2.0 psf	0.0 psf	n
	Suspended Wood Furring System	@	2.5 psf	0.0 psf	n
	T-bar Ceiling System	@	3.0 psf	0.0 psf	n
100% floor area	Interior Partitions (Below)	@	5.0 psf	5.0 psf	y
	M.E.P.	@	5.0 psf	5.0 psf	y
	Miscellaneous	@	1.4 psf	1.4 psf	y
	Percast Fascia (4sqft)	@	47.1 psf	0.0 psf	n
	Other	@	1.0 psf	0.0 psf	n
	Other	@	1.0 psf	0.0 psf	n
	Other	@	1.0 psf	0.0 psf	n
	Other	@	1.0 psf	0.0 psf	n
	Other	@	1.0 psf	0.0 psf	n

ROOF WEIGHT = 26.0 psf



Subject: Weight Take Off	Job Number: B9956006.00	Date: 06/28/19
Job: UCSC Tier 1 Seismic Evaluations CAAN 7438	By: JSW	Section:
	Checked By:	Page

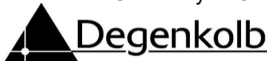
WEIGHT TAKEOFF

ASCE 41-17 SEISMIC EVALUATION & RETROFIT OF EXISTING BUILDINGS
 CHAPTER 4 - TIER 1 EVALUATION
 LINEAR STATIC PROCEDURE
 COLLAPSE PREVENTION
 BSE-2E HAZARD LEVEL

FLOOR TYPE: **FLR-2**

	Flooring		@	15.0 psf	15.0 psf	y
1 in	Floor Tiles	(Terrazzo)	@	13.0 psf per inch	0.0 psf	n
0.75 in	Wood Flooring	(Hardwood)	@	4.6 psf per inch	0.0 psf	n
2 in	Wood Blocks		@	3.3 psf per inch	0.0 psf	n
2 in	Asphalt Blocks		@	12.0 psf per inch	0.0 psf	n
0.75 in	Mastic		@	12.0 psf per inch	0.0 psf	n
1 in	Cement Finish		@	12.0 psf per inch	0.0 psf	n
2 in	Mortar Bed		@	12.0 psf per inch	0.0 psf	n
2 in	Floor Fill	(Stone Concrete)	@	12.0 psf per inch	0.0 psf	n
0.75 in	Subflooring		@	4.0 psf per inch	0.0 psf	n
	Marble & Mortar, Stone Concrete		@	33.0 psf	0.0 psf	n
	Solid Flat Tile, 1-in Mortar Base		@	23.0 psf	0.0 psf	n
	Floor Insulation		@	1.0 psf	1.0 psf	y
1 in	Insulation	(Rigid)	@	1.5 psf per inch	0.0 psf	n
1 in	Insulation Boards	(Fibrous Glass)	@	1.1 psf per inch	0.0 psf	n
3 in	Vermiculite Concrete		@	2.5 psf per inch	0.0 psf	n
0.5 in	Fire Proofing		@	2 psf per inch	0.0 psf	n
	Diaphragm		@	20.0 psf	0.0 psf	n
3 in	Concrete Slab	(Normal Weight)	@	12.5 psf per inch	0.0 psf	n
4.75 in	Concrete Fill	(Light Weight)	@	9.2 psf per inch	0.0 psf	n
0.5 in	Concrete Overpour	(Light Weight)	@	9.2 psf per inch	0.0 psf	n
18 ga	Bare Metal Deck		@	3.0 psf	0.0 psf	n
2 in	Wood Decking		@	2.5 psf per inch	0.0 psf	n
1.125 in	Wood Sheathing		@	3.0 psf per inch	3.4 psf	y
0.5 in	Plywood		@	3.2 psf per inch	1.6 psf	y
	Framing		@	20.0 psf	0.0 psf	n
6 ft O.C.	Steel Beams		@	22.0 plf	0.0 psf	n
36 ft O.C.	Steel Girders		@	76.0 plf	0.0 psf	n
2 ft O.C.	Wood Sub-Purlins		@	1.8 plf	0.0 psf	n
1 ft O.C.	Wood Purlins		@	3.0 plf	3.0 psf	y
20 ft O.C.	Wood Girders		@	5.0 plf	0.0 psf	n
8 ft O.C.	Concrete Beams		@	200.0 plf	0.0 psf	n
20 ft O.C.	Concrete Girders		@	300.0 plf	0.0 psf	n
12.00 ft trib. ht.	Typical Columns	(A _{trib} = 400 sf)	@	8.3 plf	0.2 psf	y
	Ceiling		@	5.0 psf	5.0 psf	y
0.5 in	Gypsum Board Ceiling		@	4.4 psf per inch	0.0 psf	n
	Acoustical Fiber Board		@	1.0 psf	0.0 psf	n
	Plaster Ceiling	(On Tile)	@	5.0 psf	0.0 psf	n
	Suspended Metal Lath & Plaster	(Gypsum Plaster)	@	10.0 psf	0.0 psf	n
	Suspended Steel Channel System		@	2.0 psf	0.0 psf	n
	Suspended Wood Furring System		@	2.5 psf	0.0 psf	n
	T-bar Ceiling System		@	3.0 psf	0.0 psf	n
100% floor area	Interior Partitions	(Above & Below)	@	10.0 psf	10.0 psf	y
	M.E.P.		@	5.0 psf	5.0 psf	y
	Miscellaneous		@	1.8 psf	1.8 psf	y
	Other		@	1.0 psf	0.0 psf	n
	Other		@	1.0 psf	0.0 psf	n
	Other		@	1.0 psf	0.0 psf	n
	Other		@	1.0 psf	0.0 psf	n
	Other		@	1.0 psf	0.0 psf	n

FLR-2 WEIGHT = 46.0 psf



Subject: Weight Take Off	Job Number: B9956006.00	Date: 06/28/19
Job: UCSC Tier 1 Seismic Evaluations CAAN 7438	By: JSW	Section:
Checked By:		Page

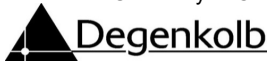
WEIGHT TAKEOFF

ASCE 41-17 SEISMIC EVALUATION & RETROFIT OF EXISTING BUILDINGS
 CHAPTER 4 - TIER 1 EVALUATION
 LINEAR STATIC PROCEDURE
 COLLAPSE PREVENTION
 BSE-2E HAZARD LEVEL

WALL TYPE: **WALL-R**

	Wall Covering	@	4.0 psf	4.0 psf	y
1 in	Exterior Stucco	@	11.4 psf per inch.	0.0 psf	n
1 in	Wood Sheathing	@	3.0 psf per inch	0.0 psf	n
0.5 in	Gypsum Sheathing	@	4.0 psf per inch	0.0 psf	n
0.5 in	Gypsum Wallboard	@	4.4 psf per inch	0.0 psf	n
	Porcelain Enamel Panels	@	5.0 psf	0.0 psf	n
	Metal Lath & Plaster (Gypsum Plaster)	@	10.0 psf	0.0 psf	n
	Wall Insulation	@	1.0 psf	1.0 psf	y
1 in	Insulation (Rigid)	@	1.5 psf per inch	0.0 psf	n
1 in	Insulation Boards (Fiber Board)	@	1.5 psf per inch	0.0 psf	n
0.5 in	Fire Proofing	@	2 psf per inch	0.0 psf	n
	Wall Framing	@	20.0 psf	0.0 psf	n
8 in	Concrete Wall (Normal Weight)	@	12.5 psf per inch	0.0 psf	n
8 in	CMU Wall w/ Full Grouting (Normal Weight)	@	83.0 psf	0.0 psf	n
8 in	Solid CMU Wall (Normal Weight)	@	87.0 psf	0.0 psf	n
4 in	HCB Wall w/ Full Grouting	@	38.0 psf	0.0 psf	n
3.5 in	Solid Clay Brick Wall	@	11.1 psf per inch	0.0 psf	n
0.5 in	Plywood	@	3.2 psf per inch	1.6 psf	y
16 in O.C.	Wood Studs (2 x 6)	@	1.8 plf	1.3 psf	y
16 in O.C.	Metal Channel Studs	@	2.0 plf	0.0 psf	n
8 ft O.C.	Steel Girts	@	6.0 plf	0.0 psf	n
	Miscellaneous	@	1.1 psf	1.1 psf	y
	Other	@	1.0 psf	0.0 psf	n
	Other	@	1.0 psf	0.0 psf	n
	Other	@	1.0 psf	0.0 psf	n
	Other	@	1.0 psf	0.0 psf	n
	Other	@	1.0 psf	0.0 psf	n

Solid Wall Weight = 9.0 psf
 Window & Door Weight = 8.0 psf
 % Solid Wall = 80%
WALL-R WEIGHT = 8.8 psf



Subject: Weight Take Off	Job Number: B9956006.00	Date: 06/28/19
Job: UCSC Tier 1 Seismic Evaluations CAAN 7438	By: JSW	Section:
	Checked By:	Page

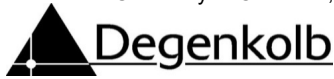
WEIGHT TAKEOFF

ASCE 41-17 SEISMIC EVALUATION & RETROFIT OF EXISTING BUILDINGS
 CHAPTER 4 - TIER 1 EVALUATION
 LINEAR STATIC PROCEDURE
 COLLAPSE PREVENTION
 BSE-2E HAZARD LEVEL

WALL TYPE: **WALL-2**

	Wall Covering	@	4.0 psf	4.0 psf	y
1 in	Exterior Stucco	@	11.4 psf per inch.	0.0 psf	n
1 in	Wood Sheathing	@	3.0 psf per inch	0.0 psf	n
0.5 in	Gypsum Sheathing	@	4.0 psf per inch	0.0 psf	n
0.5 in	Gypsum Wallboard	@	4.4 psf per inch	0.0 psf	n
	Porcelain Enamel Panels	@	5.0 psf	0.0 psf	n
	Metal Lath & Plaster (Gypsum Plaster)	@	10.0 psf	0.0 psf	n
	Wall Insulation	@	1.0 psf	1.0 psf	y
1 in	Insulation (Rigid)	@	1.5 psf per inch	0.0 psf	n
1 in	Insulation Boards (Fiber Board)	@	1.5 psf per inch	0.0 psf	n
0.5 in	Fire Proofing	@	2 psf per inch	0.0 psf	n
	Wall Framing	@	20.0 psf	0.0 psf	n
8 in	Concrete Wall (Normal Weight)	@	12.5 psf per inch	0.0 psf	n
8 in	CMU Wall w/ Full Grouting (Normal Weight)	@	83.0 psf	0.0 psf	n
8 in	Solid CMU Wall (Normal Weight)	@	87.0 psf	0.0 psf	n
4 in	HCB Wall w/ Full Grouting	@	38.0 psf	0.0 psf	n
3.5 in	Clay Brick Wall	@	11.1 psf per inch	0.0 psf	n
0.5 in	Plywood	@	3.2 psf per inch	1.6 psf	y
16 in O.C.	Wood Studs (2 x 6)	@	1.8 plf	1.3 psf	y
16 in O.C.	Metal Channel Studs	@	2.0 plf	0.0 psf	n
8 ft O.C.	Steel Girts	@	6.0 plf	0.0 psf	n
	Miscellaneous	@	1.1 psf	1.1 psf	y
	Other	@	1.0 psf	0.0 psf	n
	Other	@	1.0 psf	0.0 psf	n
	Other	@	1.0 psf	0.0 psf	n
	Other	@	1.0 psf	0.0 psf	n
	Other	@	1.0 psf	0.0 psf	n

Solid Wall Weight = 9.0 psf
 Window & Door Weight = 8.0 psf
 % Solid Wall = 80%
WALL-2 WEIGHT = 8.8 psf



Subject: Seismic Mass	Job Number: B9956006.00	Date: 06/28/19
Job: UCSC Tier 1 Seismic Evaluations CAAN 7438	By: JSW	Section:
	Checked By:	Page

SEISMIC MASS

ASCE 41-17 SEISMIC EVALUATION & RETROFIT OF EXISTING BUILDINGS
 CHAPTER 4 - TIER 1 EVALUATION
 LINEAR STATIC PROCEDURE
 COLLAPSE PREVENTION
 BSE-2E HAZARD LEVEL

ROOF/FLOOR WEIGHT SUMMARY:

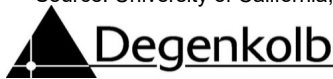
Level Type	Weight [psf]
ROOF	26
FLR-2	46

WALL WEIGHT SUMMARY:

Wall Type	Weight [psf]		
	Net	Solid	Openings
WALL-P	26.0	26	8
WALL-R	8.8	9	8
WALL-2	8.8	9	8

SEISMIC MASS SUMMARY:

Level	FLOOR			WALL ABOVE				WALL BELOW				TOTAL WEIGHT [kips]	
	Level Type	Weight [psf]	Area [sf]	Wall Type	Weight [psf]	Length [ft]	Height [ft]	Wall Type	Weight [psf]	Length [ft]	Height [ft]		
Roof	ROOF	26	4,845	WALL-P	26.0	0	0.00	WALL-R	8.8	300	6.50	143	
2nd	FLR-2	46	1,948	WALL-R	8.8	150	6.50	WALL-2	8.8	150	6.25	106	
												TOTAL	250



Subject: Seismic Forces	Job Number: B9956006.00	Date: 06/28/19
Job: UCSC Tier 1 Seismic Evaluations CAAN 7438	By: JSW	Section:
	Checked By:	Page:

SEISMIC FORCES

ASCE 41-17 SEISMIC EVALUATION & RETROFIT OF EXISTING BUILDINGS
 CHAPTER 4 - TIER 1 EVALUATION
 LINEAR STATIC PROCEDURE
 COLLAPSE PREVENTION
 BSE-2E HAZARD LEVEL

BUILDING TYPE: W2 (Wood Frames, Commercial and Industrial) [ASCE 41-17, Table 3-1]
SITE CLASS: D (default) #N/A [ASCE 41-17, §2.4.1.6]

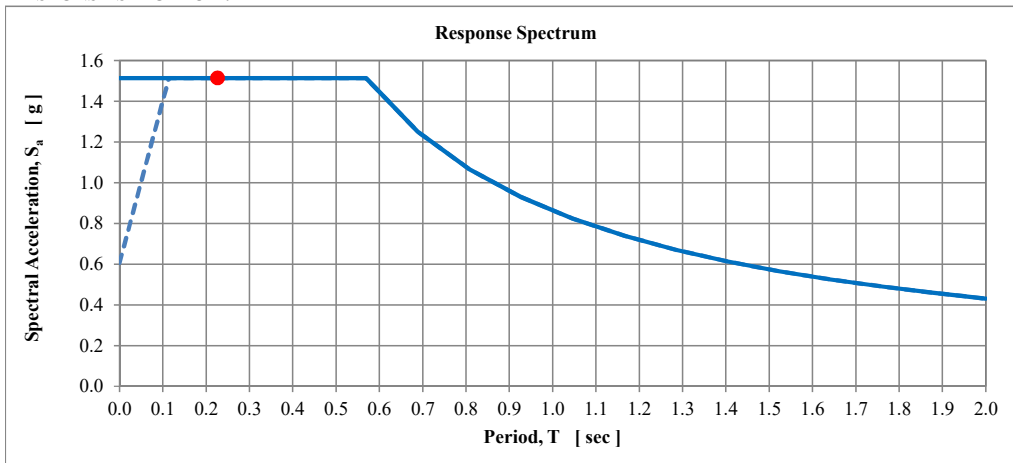
DESIGN SPECTRAL ACCELERATIONS:

S_{XS} = 1.513 g (BSE-2E) Site-Adjusted Design (T = 0.2 sec) [ASCE 41-17, Eq. 2-1]
 S_{X1} = 0.861 g (BSE-2E) Site-Adjusted Design (T = 1.0 sec) [ASCE 41-17, Eq. 2-2]

BUILDING PERIOD:

h_n = 25.5 ft (Base to Roof) Building Height [ASCE 41-17, §4.4.2.4]
 C_t = 0.020 (Building Type W2) Period Coefficient [ASCE 41-17, §4.4.2.4]
 β = 0.750 (Building Type W2) Period Exponent [ASCE 41-17, §4.4.2.4]
 T = 0.227 sec = $C_t h_n^\beta$ Fundamental Period [ASCE 41-17, Eq. 4-4]

RESPONSE SPECTRUM:



PSEUDO LATERAL FORCE:

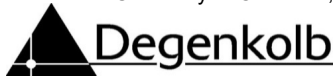
n = 2 (n = 2) Total Number of Stories
 C = 1.1 (Building Type W2) Modification Factor [ASCE 41-17, Table 4-7]
 S_a = 1.513 g = MIN { S_{X1} / T , S_{XS} } Spectral Acceleration [ASCE 41-17, Eq. 4-3]
 V = 1.665 W = $C S_a W$ Pseudo Lateral Force [ASCE 41-17, Eq. 4-1]

VERTICAL DISTRIBUTION OF SEISMIC FORCES:

k = 1.00 ($T \leq 0.5$ sec) Seismic Distribution Exponent [ASCE 41-17, §4.4.2.2]

Level	h_x [ft]	w_x [kips]	$w_x h_x^k$	C_{vx}	F_x [kips]	V_j [kips]
Roof	25.5	143	3,650	0.73	304	304
2nd	12.5	106	1,330	0.27	111	415
TOTAL	-	250	4,980	1.00	415	-

$F_x = C_{vx} V = [w_x h_x^k / \Sigma (w_x h_x^k)] V$ [ASCE 41-17, Eq. 4-2a]
 $V_j = \Sigma F_x$ [ASCE 41-17, Eq. 4-2b]



Subject: Quick Checks	Job Number: B9956006.00	Date: 06/28/19
Job: UCSC Tier 1 Seismic Evaluations CAAN 7438	By: JSW	Section:
	Checked By:	Page:

QUICK CHECKS

ASCE 41-17 SEISMIC EVALUATION & RETROFIT OF EXISTING BUILDINGS
 CHAPTER 4 - TIER 1 EVALUATION
 LINEAR STATIC PROCEDURE
 COLLAPSE PREVENTION
 BSE-2E HAZARD LEVEL

BUILDING TYPE: W2 (Wood Frames, Commercial and Industrial) [ASCE 41-17, Table 3-1]

AVERAGE SHEAR STRESS CHECK: [ASCE 41-17, §A.3.2.7.1]
 $v_n = 1,000 \text{ plf}$ (Structural Panel Sheathing) Shear Wall Capacity [ASCE 41-17, §A.3.2.7.1]
 $M_s = 4.5$ COLLAPSE PREVENTION System Modification Factor [ASCE 41-17, Table 4-8]
 $v_{j, \text{avg}} = (1 / M_s) (V_j / L_w)$ Average Shear Wall Stress [ASCE 41-17, Eq. 4-8]
 $L_w = L_{w, \text{total}} - L_{w, \text{openings}}$ Net Wall Length [ASCE 41-17, §4.4.3.3]

North-South Direction:

Level	V_j [kips]	$L_{w, \text{total}}$ [ft]	$L_{w, \text{openings}}$ [ft]	L_w [ft]	$v_{j, \text{avg}}$ [plf]	DCR	Quick Check
Roof	304	220	51	169	400	0.40	OK
2nd	415	220	51	169	546	0.55	OK

East-West Direction:

Level	V_j [kips]	$L_{w, \text{total}}$ [ft]	$L_{w, \text{openings}}$ [ft]	L_w [ft]	$v_{j, \text{avg}}$ [plf]	DCR	Quick Check
Roof	304	102	14	88	769	0.77	OK
2nd	415	130	14	116	796	0.80	OK



University of California, Santa Cruz
ASCE 41-17 Tier 1 Seismic Evaluation
7438 - LML William T. Doyle Research Building

Appendix C
Pictures and Details



University of California, Santa Cruz
ASCE 41-17 Tier 1 Seismic Evaluation
7438 - LML William T. Doyle Research Building



Roof diaphragm framing



Plywood shear wall behind redwood wall cover



University of California, Santa Cruz
ASCE 41-17 Tier 1 Seismic Evaluation
7438 - LML William T. Doyle Research Building



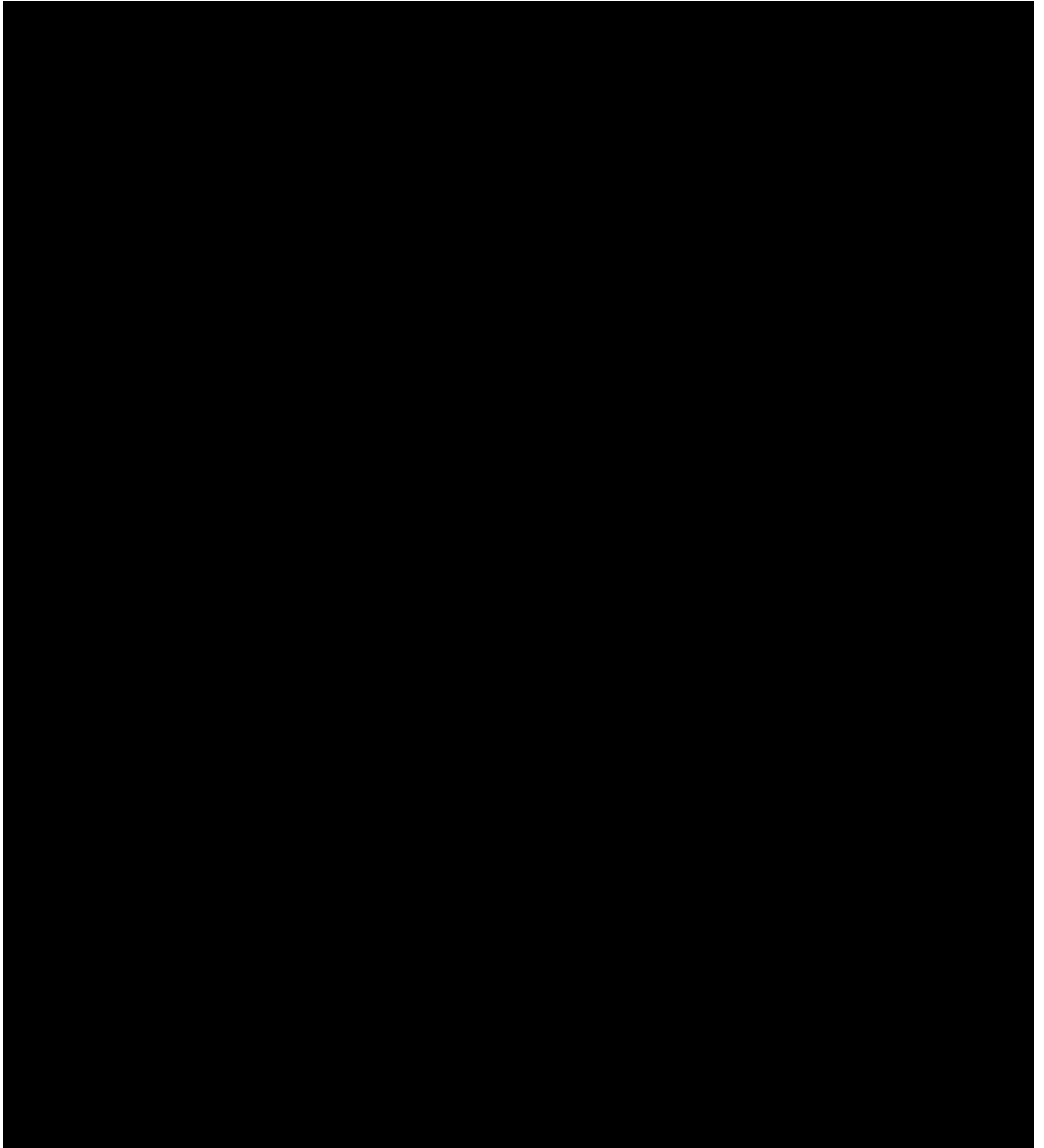
Addition roof connection to original structure



Storage shed metal straps



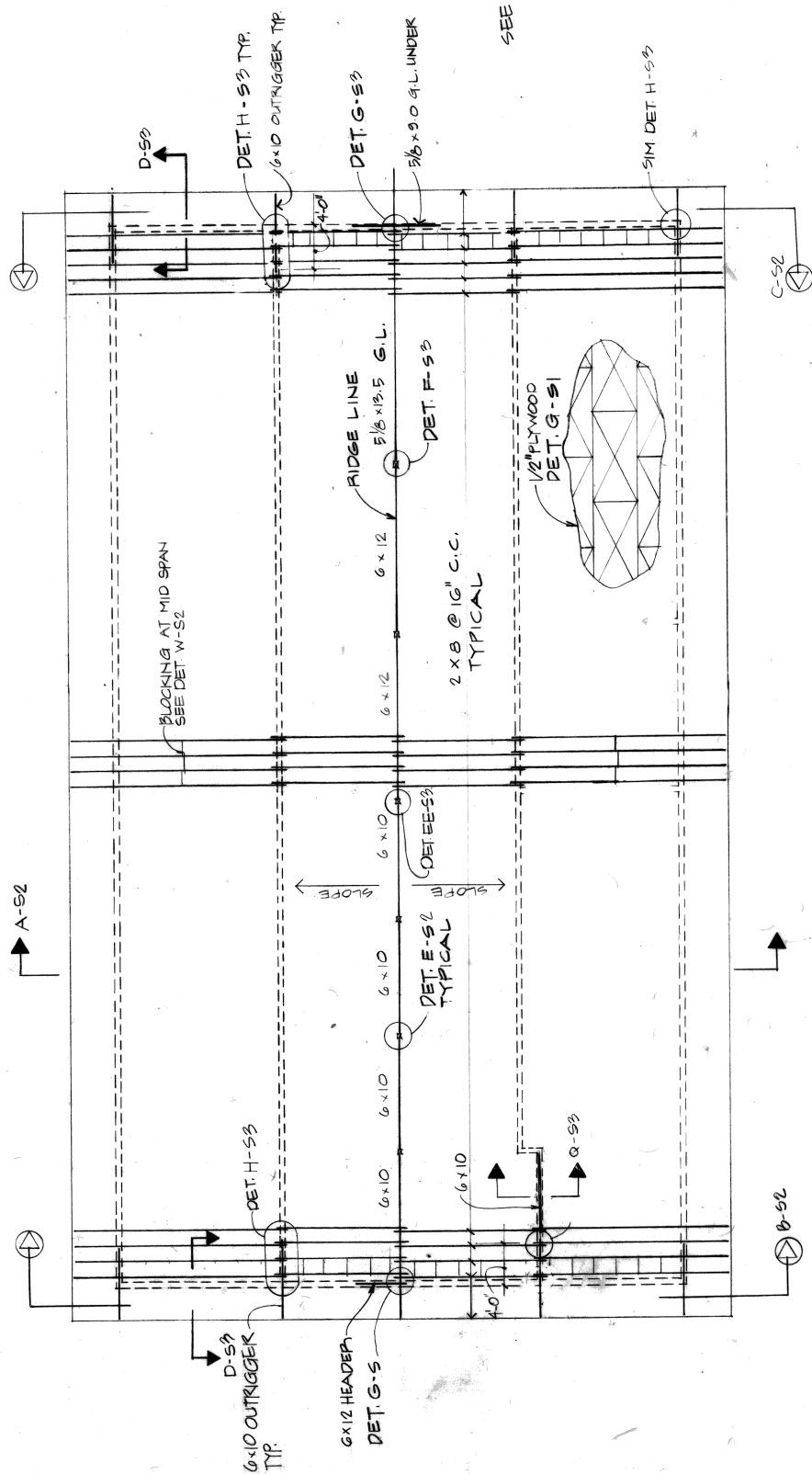
University of California, Santa Cruz
ASCE 41-17 Tier 1 Seismic Evaluation
7438 - LML William T. Doyle Research Building



Floor plans original building



University of California, Santa Cruz
 ASCE 41-17 Tier 1 Seismic Evaluation
 7438 - LML William T. Doyle Research Building



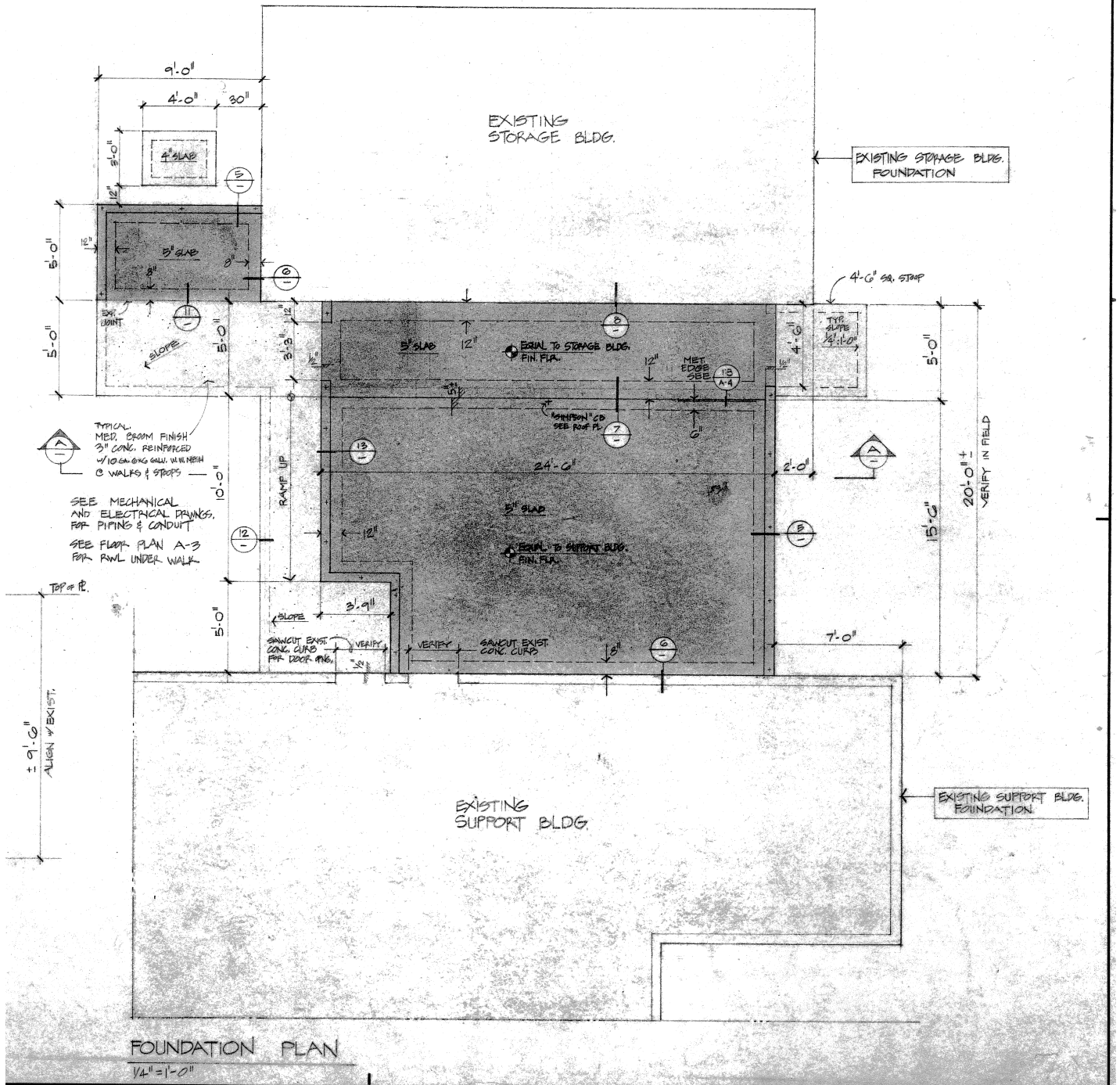
ROOF FRAMING PLAN

SCALE: 1/8" = 1'-0"

Roof plan original building



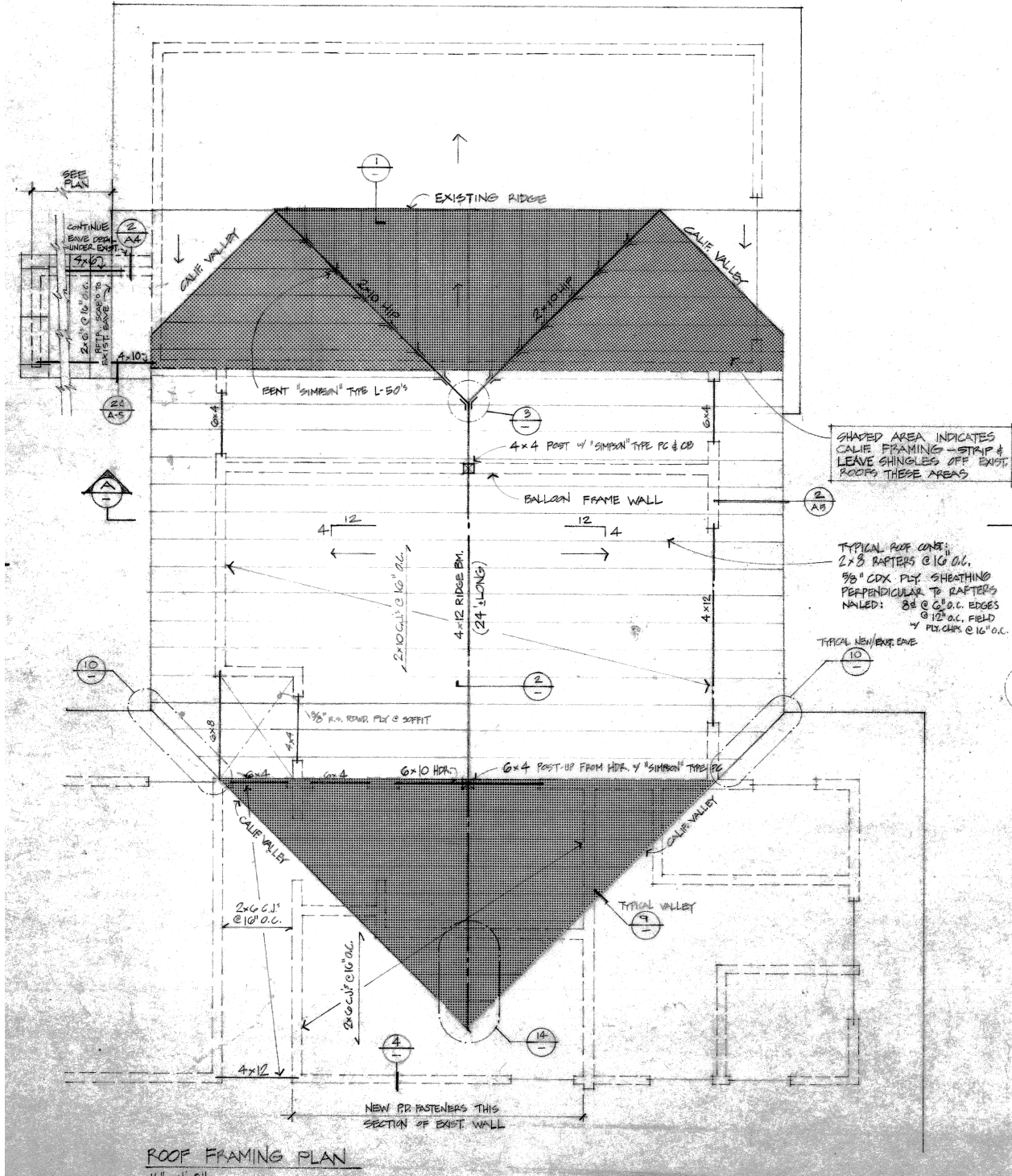
University of California, Santa Cruz
ASCE 41-17 Tier 1 Seismic Evaluation
7438 - LML William T. Doyle Research Building



Foundation plan addition



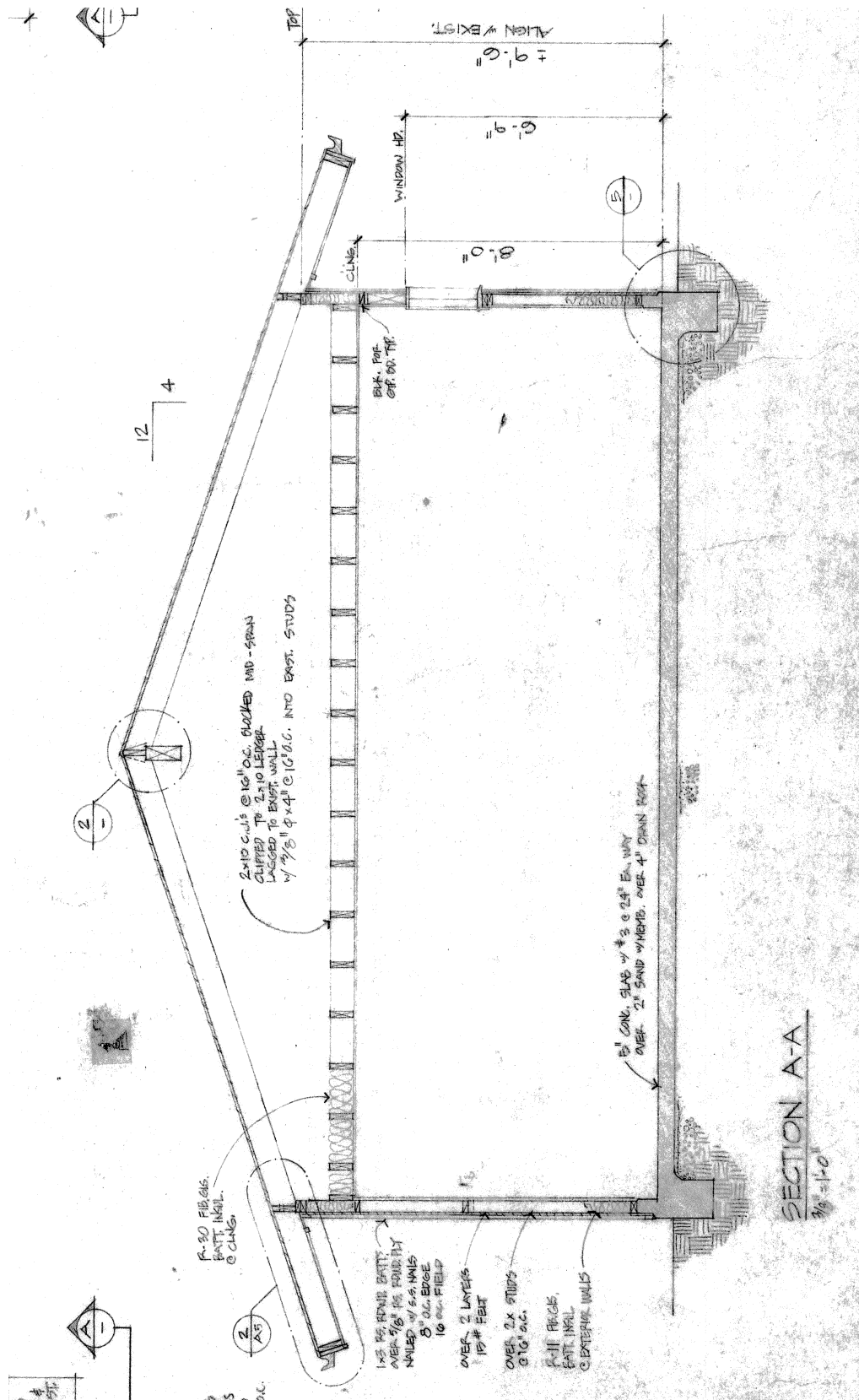
University of California, Santa Cruz
ASCE 41-17 Tier 1 Seismic Evaluation
7438 - LML William T. Doyle Research Building



Roof plan addition



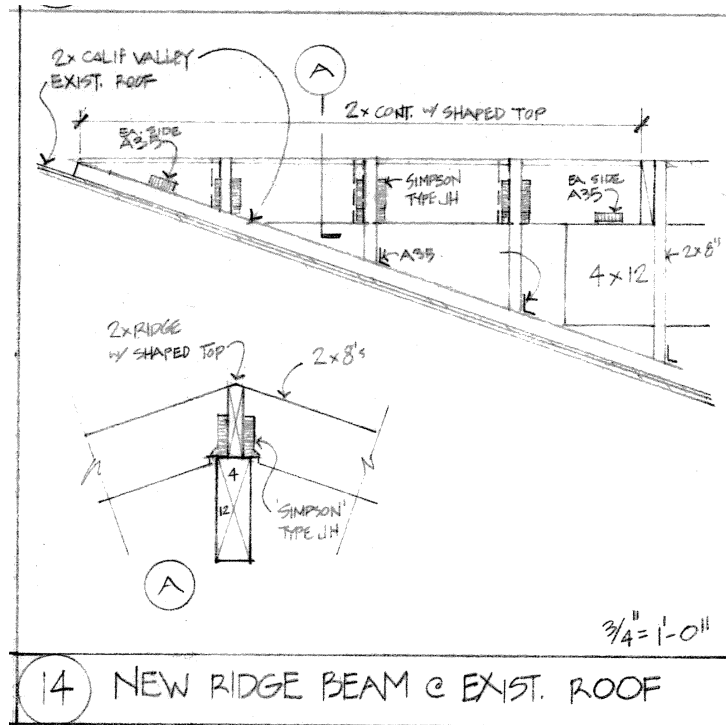
University of California, Santa Cruz
ASCE 41-17 Tier 1 Seismic Evaluation
7438 - LML William T. Doyle Research Building



Addition Elevation

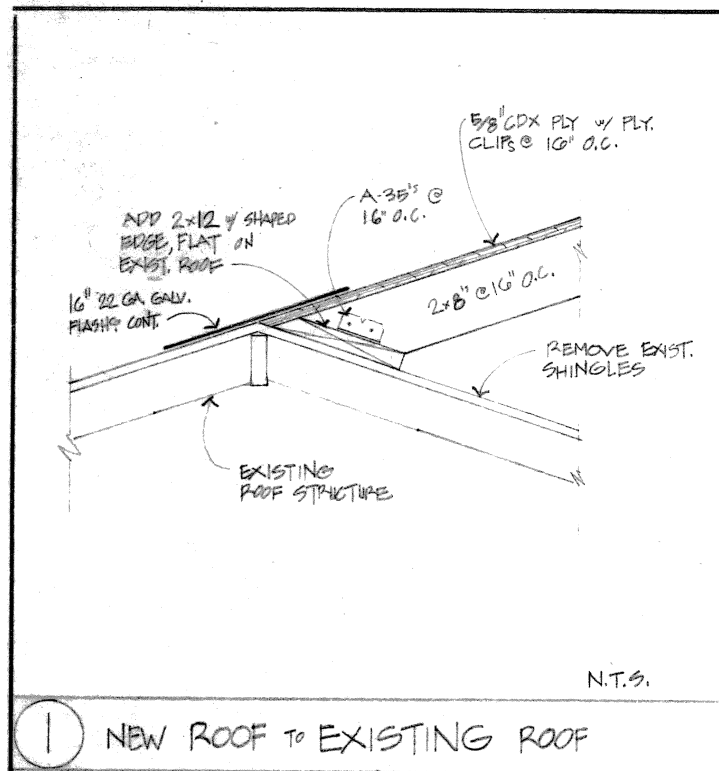


University of California, Santa Cruz
 ASCE 41-17 Tier 1 Seismic Evaluation
 7438 - LML William T. Doyle Research Building



14 NEW RIDGE BEAM @ EXIST. ROOF

Addition roof to original roof detail



1 NEW ROOF TO EXISTING ROOF

Addition roof to shed roof detail