

Rating form
completed by:**RUTHERFORD + CHEKENE**
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Evaluator: CLP/EFA/BL

Date: 06/28/2019

Text in *green* is to be part of UC Santa Cruz building database and may be part of UCOP database

DATE: 2019-06-28

UC Santa Cruz Building Seismic Ratings
Crown Faculty Wing

CAAN #7156

670 Crown Service Road, Santa Cruz, CA 95064

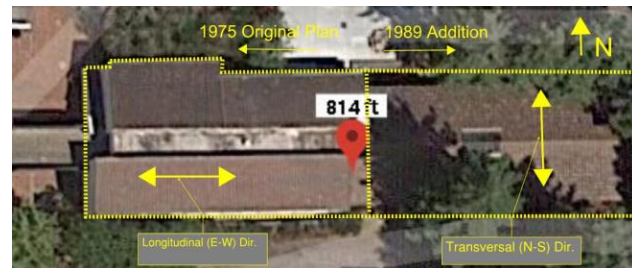
UCSC Campus: Main Campus

South Elevation (Looking Northwest)



06-28-19

Plan



Rating summary	Entry	Notes
UC Seismic Performance Level (rating)	V (Poor)	
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	High (\$200-400/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	Clearly identify walls with plywood sheathing, connections, and load path to foundation. Retrofit may include additional blocking, straps, clips, and hold downs.

¹ We translate this Tier 1 evaluation to a Seismic Performance Level rating using professional judgment. Non-compliant 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 19 May 2017 *UC Seismic Safety Policy* and Method B of Section 321 of the 2016 *California Building Code*.

² Per Section III.A.4.i of the 26 March 2019 *UC Seismic Program Guidebook, Version 1.3*, 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 drawings by Ernest J. Kump Associates, "Residential College No. 3, University of California, Santa Cruz," dated variously in 1966, Sheets A1 to A63 (73 sheets). Drawings are for Buildings J, K, L, M & N; relevant sheets are for "Faculty Study Building Unit K."
- Structural drawings by Ernest J. Kump Associates, "Residential College No. 3, University of California, Santa Cruz," dated 24 February 1966, Sheets S1 to S48 (73 sheets). Drawings are for Buildings J, K, L, M & N; relevant sheets are for "Faculty Study Building Unit K."
- Drawings by Palmer and Rahe Architects, "Crown College Faculty Office Addition, University of California, Santa Cruz," dated 28 June 1985, Sheets 1 to 10.

Additional building information known to exist

None.

Scope for completing this form

Reviewed architectural and structural drawings for the original 1967 construction and for the 1985 addition, made brief site visit on 3 June 2019, and carried out ASCE 41-17 Tier 1 evaluation.

Brief description of structure

The Crown Faculty Study Building is one of a cluster of five wood framed buildings that form the core of Crown College. These buildings were originally known as Buildings J, K, L, M and N of Residential College No. 3. The Crown Faculty Study Building was Building "K" in the drawings. The adjacent buildings include the Crown Administration Building ("N") to the northwest, the Crown Gatehouse ("M") to the north, the Crown Dining Commons ("L") to the northeast, and the Crown Classroom Building ("J") to the northwest. The Faculty Wing includes a 1985 addition that sits to the east of the original building. The Crown complex was designed in 1966 by architects Ernest J. Kump Associates. The firm logo is also on the structural drawings and a signature for Peter Kump AIA No. 651 appears on both the architectural and structural sheets, so it appears there was no independent structural design professional involved. The construction completion date is unknown, but it is assumed to be 1967. An additional Library Building by the same designer was added to the south of the Classroom Building in about 1968. The architectural firm of Palmer and Rahe designed the 1985 addition to the Faculty Wing.

The original building is a two-story wood structure of roughly 5,232 square feet. The 1985 addition is a one-story building of 2,157 square feet with a small basement mechanical room. Because the grade level slopes up to the east, the floor level of the 1985 addition aligns with the second floor of the original 1967 building. The 1967 building is basically rectangular in plan with a central corridor running the length of the building in the longitudinal direction. There are vertical discontinuities in the wall layout in both directions. There are solid transverse walls on either side of the central corridor although several second story walls do not have corresponding walls at the lower floor. Portions of the second floor are 4 feet wider in the transverse direction than the first floor, so the exterior second floor walls on the north side of the building are not aligned with the first floor walls. The longitudinal perimeter walls at both levels are penetrated with many window openings. The longitudinal corridor walls have clerestory windows above the flat roof level and door openings along their length below. There is a flat roof portion at a height of 20'-2" above the first floor at the central corridor but the corridor walls rise to heights of either 24'-2" or 27'-9" above the first floor and then slope down towards the top of the perimeter walls at 18'-8". The second floor is 10'1" above the first floor. Roof and floor joists are spaced at 16" on center; roof and floor surfaces are a mix of ½" and 5/8" blocked plywood diaphragms. An 8" concrete stem wall comes up to the underside of the second floor along the original east wall of the building where the grade was higher. The 1985 addition extended the structure to the east with cripple walls that taper to the east.

The Crown Faculty Study Building is linked by a one-story heavy timber pedestrian bridge at the second floor level to both the Classroom Building and the Library Building that was built at the same time as the Library. A gap between the walkway and the Classroom Building appears on the drawings as 4" minimum but appeared to be approximately ½" where the bridge abuts the Faculty Wing stairway.

Building Condition: The building appeared to be well maintained for a structure of this vintage. We did not observe any signs of structural deterioration that would influence the rating, but most of the structural members are covered with architectural finishes.

Identification of levels: The original building has two stories above grade (first floor and second floor); the 1985 addition has one story with a small partial basement at the west end of the addition. The floor of the 1985 addition aligns with the second floor of the original building. The original foundation stem walls at the perimeter come up to the level of the first floor framing, except the section of wall along the original east end where the stem wall comes up to the underside of the second floor where the grade level is higher. Grade around the building site gently slopes up towards the east.

Foundation system: The original perimeter walls bear on a continuous 8" thick concrete stem wall on an 18" wide footing. The stem walls typically come up to the underside of the first floor framing except the location cited above at the east end where it comes up to the underside of the second floor framing. The original interior bearing walls consist of wood cripple walls with 3/8" plywood sheathing on both sides supported on a shorter 8" stem wall on a 14" wide footing. The 1985 addition has wood framed cripple walls on concrete stem walls at the perimeter and posts on concrete piers along each corridor wall.

Structural system for vertical (gravity) load: All the vertical loads are carried by roof and floor joists that span to wood stud walls except for the roof joists above the extended portions of the second floor where the joists are supported by lintels that span to 4x4 wood posts. The building has one flat roof surface above the central corridor and four separate sloped roof surfaces. 2x6 roof joists span across the flat portion of the roof between the corridor walls with 1/2" plywood sheathing. The sloped roof surfaces are comprised of 5/8-inch plywood sheathing spanning between 2x12 wood joists. The sloping roof joists are supported at the top of the corridor walls at one end and at the top of the perimeter wall or lintel and posts at a height of 18'-8". The second floor has 5/8-inch plywood spanning between a mix of 2x12, 4x12 and 8x12 floor joists, some of which extend 4' beyond the wall below. It appears these were designed to cantilever as the soffit framing below is not detailed to resist vertical loads. The 1985 addition has a pitched roof with 2x12@24" roof joists that span between the corridor walls and the perimeter walls. The stud wall on the south side extends beyond the cripple wall below; these walls are not vertically aligned. The corridor walls are supported by two rows of wood posts supported on concrete piers.

Structural system for lateral forces: Lateral forces in the transverse (N-S) direction are transferred from the plywood roof diaphragms through blocking at the top of the transverse walls which are sheathed with double sided 3/8" plywood. Plywood roof nailing is specified in the sheet notes on S1 as 8d@6" at margins and 8d@12" intermediate. Some details show additional nailing at eaves or connections. Detail 1/S35 shows nailing and blocking from joists to shear walls; Detail 2/S35 shows the sill plate and anchor bolt conditions at the base of the walls. These typically have a 2x4 mud sill with 5/8" x 9" long anchor bolt spaced at 32" on centers. Not all second story walls have a corresponding wall below; two transverse walls are wider at the top than the bottom and do not have straps and hold downs to transfer the overturning forces. Lateral forces in the longitudinal (N-S) direction are transferred from the plywood roof diaphragm through blocking and around clerestory windows to the corridor walls at the center of the building. The drawings state that walls are to have 3/8 plywood sheathing with nailing of 8d@4" at edges and 8d@12" at intermediate boundaries. None of the walls are designated as shear walls on the plans but it appears that all walls were supposed to be sheathed. Structural details are provided for "corridor wall tiedowns" at door openings at the base of the corridor walls but no other walls appear to have these tiedown details. The first-floor connection details shown in Section 8/S35 have cross grain bending in the ledgers at the perimeter walls. Corridor walls are detailed per Details 1/S35 and 2/S35 but additionally have tiedowns per Detail 3/S35 at each side of ground floor doors. Section 8/S34 shows the corridor walls also have some Simpson A-1 clips at the first to second floor. The load path from the roof of the extended portions is unclear as there does not appear to be a mechanism to transfer loads delivered from the 4x4 posts to the walls below.

The 1985 addition shows a 1" separation to the original construction; this does not appear adequate to avoid pounding between the two sections. The drawings explicitly indicate which walls were designated as shear walls with a shear wall schedule. Lateral loads in the longitudinal direction are transferred from the roof diaphragm to the perimeter walls; lateral loads in the transverse direction are transferred to the three transverse walls, two at the east end and one near the west end. The perimeter walls on the north side are vertically aligned with the sheathed

cripple studs below; the walls on the south side are not aligned with the shear walls below. While the diagonal soffit is sheathed, it contains a continuous vent. The drawings show A35 clips and ST12 straps from the wall to the floor diaphragm, but this does not resolve the overturning forces on the south wall.

It is important to note that this building survived the 1989 Loma Prieta Earthquake with ground motions on the order of 0.44g and 0.47g in the two horizontal directions and 0.4g vertical (UCSC Lick Observatory Station on campus). We are not aware of any significant structural damage to this building. As the exterior walls all have cement plaster finishes over the plywood, and all walls also have gypsum board fireproofing, it appears the building has more lateral capacity than indicated by this Tier 1 check, so we recommend this be reviewed as part of a Tier 2 evaluation.

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

Identified seismic deficiencies of the building include the following:

- The building has apparent vertical discontinuities in both directions and lacks a clear load path for loads in the longitudinal direction for the cantilevered areas where the second floor is wider than the first.
- Connection details from floors to walls and floors to the foundation stem wall include cross grain bending.
- The transverse walls are wider at the upper floor and lack straps and hold downs to resist overturning. While drawing notes that walls should have plywood sheathing, the original drawings do not clearly show which walls are assumed to resist lateral loads. Not all the transverse walls extend down to foundation transverse walls.
- It appears the original designer assumed the longitudinal loads could all be resisted by the central corridor walls. There is no clear load path from the outboard edges of the heavy tile roof to the 4x4 posts and down to the walls below.
- There is a potential for pounding between the bridge structure and the stairs at the west end of the building.
- A Tier 2 deficiency-based analysis of the shear walls, transfer of loads to walls, transfer between floors, and foundation connections is needed to understand the capacity and performance of this lateral force-resisting system. We recommend conducting a field survey to confirm locations of plywood sheathing and foundation transverse walls.

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	Y	Liquefaction	N
Adjacent buildings	Y	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)	Y	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 nonstructural life-safety concerns, including at exit routes.³

We observed one unanchored tall bookcase in a corridor near the east end of the building. The north entry has an area with two-story glazing above and adjacent to the door. We recommend verifying that the glazing consist of tempered glass or the like. We observed an unrestrained water heater in the basement mechanical room. This building has what appear to be unrestrained Spanish tiles, including some adjacent to stairs and over adjacent

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 nonstructural hazards may occur.

footpaths. We recommend providing positive attachment for tiles (if not currently present) adjacent to stairs and walkways to preclude a life-safety concern.

UCOP nonstructural checklist item	Life safety hazard?	UCOP nonstructural 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 observed	Unrestrained hazardous materials storage	None observed
Heavy masonry or stone veneer above exit ways and public access areas	None observed	Masonry chimneys	None observed
Unbraced masonry parapets, cornices or other ornamentation above exit ways and public access areas	None observed	Unrestrained natural gas-fueled equipment such as water heaters, boilers, emergency generators, etc.	Yes

Basis of rating

A Seismic Performance Level rating of V is assigned to the structure based on the structural deficiencies identified by the Tier 1 check, including the lack of vertical elements at portions of the perimeter of the second story, detailing that will induce cross-grain bending at wall-to-diaphragm ties, and the potential for damage from pounding of the walkway at the second story to the west exit stair.

Recommendations for further evaluation or retrofit

We recommend the performance of a Tier 2 evaluation to review the lateral force-resisting capacity of the wood shear walls, internal connections, floor-to-floor connections, and connections to the footings. Since the drawings are not clear regarding the location of plywood, we recommend that the walls be surveyed to identify plywood sheathing (single sided, double sided, or none). If the walls or connections are inadequate, connections could be strengthened, or supplemental lateral resistance could be added. Retrofits might include hold downs and straps between floors at vertical discontinuities. A clear load path should be provided for longitudinal loads at the perimeter. We assign the building to Priority Category B, as the structural retrofit of the building should be done when there are any plans for modifying or change of occupancy. If there is a possibility to prioritize a nonstructural limited retrofit, we recommend that bracing of the water heater be performed as soon as possible and separately from any other retrofit that can be planned for this building. Falling hazards reduction, such as the tile roofs adjacent to exits or footpaths, should be given the next higher priority.

Peer review of rating

The key issues and expected seismic performance of this building are similar to that for the Crown Classroom Building (CAAN #7155). The peer review of that building, carried out on 24 June 2019, can be applied to this building. Reviewers present were Joe Maffei of Maffei Structural Engineering and Jay Yin of Degenkolb Engineers.

Additional building data	Entry	Notes
Latitude	36.999831	
Longitude	-122.054441	
Are there other structures besides this one under the same CAAN#	No	Original and 1984 Addition included here
Number of stories above lowest perimeter grade	2	
Number of stories (basements) below lowest perimeter grade	0	Small partial basement at middle of bldg.
Building occupiable area (OGSF)	7,389	From UCSC facilities database.
Risk Category per 2016 CBC Table 1604.5	II	

Building structural height, h_n	22 ft	Structural height defined per ASCE 7-16 Section 11.2
Coefficient for period, C_t	0.020	Estimated using ASCE 41-17 equation 4-4 and 7-18
Coefficient for period, β	0.75	Estimated using ASCE 41-17 equation 4-4 and 7-18
Estimated fundamental period	0.14 sec	Estimated using ASCE 41-17 equation 4-4 and 7-18
Site data		
975-year hazard parameters S_s, S_1	1.289, 0.489	From OSHPD/SEAOC website
Site class	D	
Site class basis	Geotech ⁴	See footnote below
Site parameters F_a, F_v	1.0, 1.811	From OSHPD/SEAOC website
Ground motion parameters S_{cs}, S_{c1}	1.289, 0.886	From OSHPD/SEAOC website
S_a at building period	1.29	
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 below
Landslide potential	Low	
Landslide assessment basis	County map	See footnote below
Active fault rupture identified at site	No	
Fault rupture assessment basis	County map	See footnote below
Site-specific ground motion study?	No	
Applicable code		
Applicable code or approx. date of original construction	Built: 1967, 1985 Code: 1964 and 1982 UBC	Dates inferred based on design years
Applicable code for partial retrofit	None	No partial retrofit.
Applicable code for full retrofit	None	No full retrofit
FEMA P-154 data		
Model building type – north-south	W2 Wood frame	
Model building type – east-west	W2 Wood frame	

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:

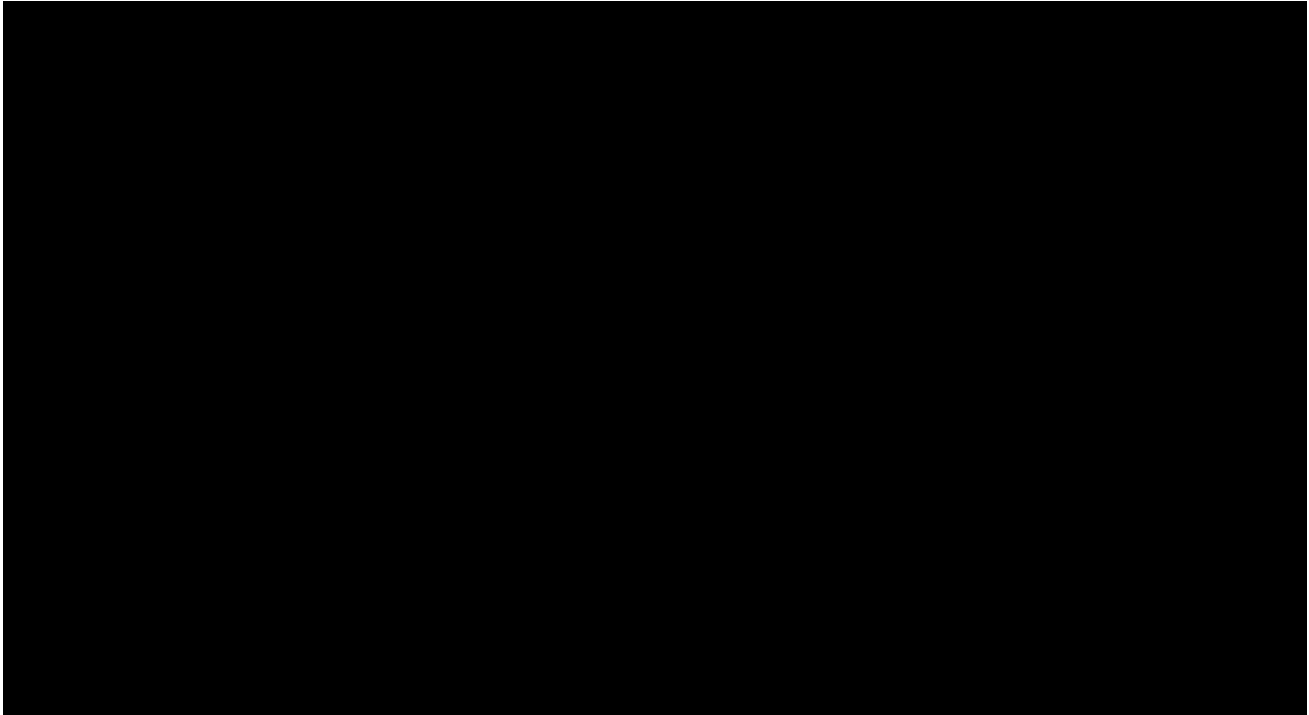
<https://gis.santacruzcounty.us/mapgallery/Emergency%20Management/Hazard%20Mitigation/LiquifactionMap2009.pdf>

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

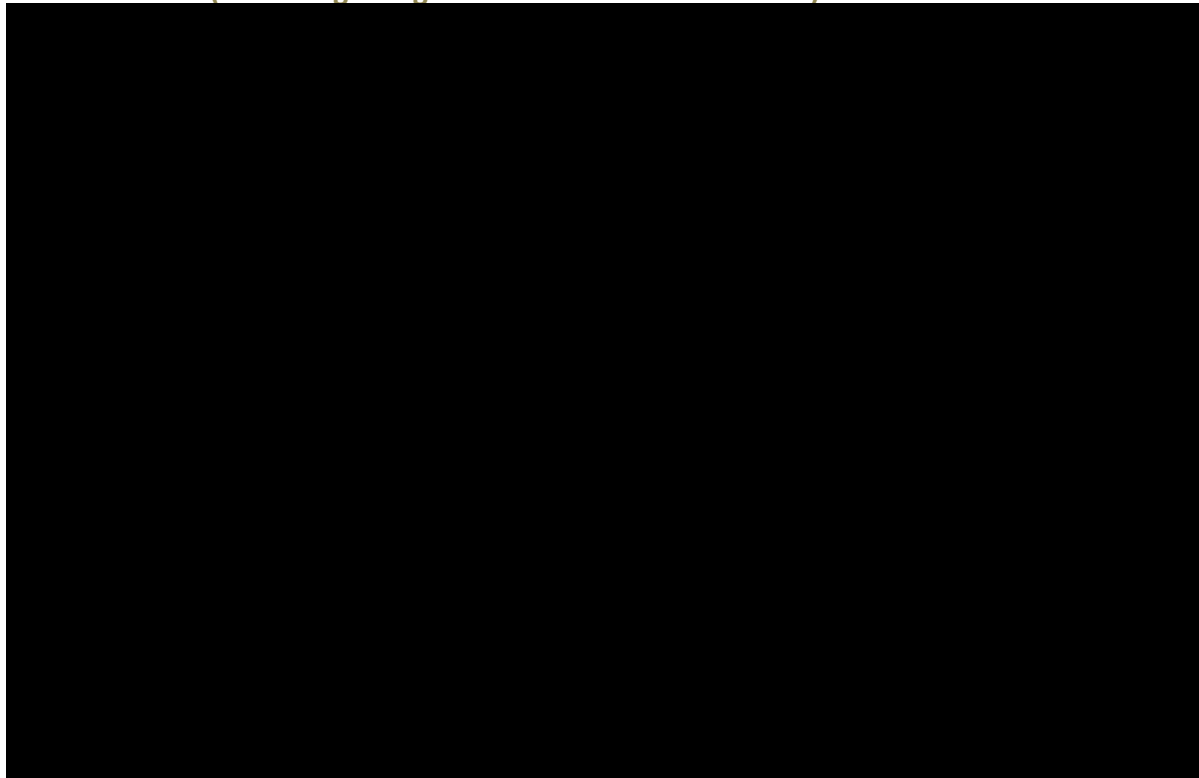
<https://gis.santacruzcounty.us/mapgallery/Emergency%20Management/Hazard%20Mitigation/FaultZoneMap2009.pdf>

FEMA P-154 score	N/A	Not included here because we performed ASCE 41 Tier 1 evaluation.
Previous ratings		
Most recent rating	-	Not evaluated before.
Date of most recent rating	-	
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.

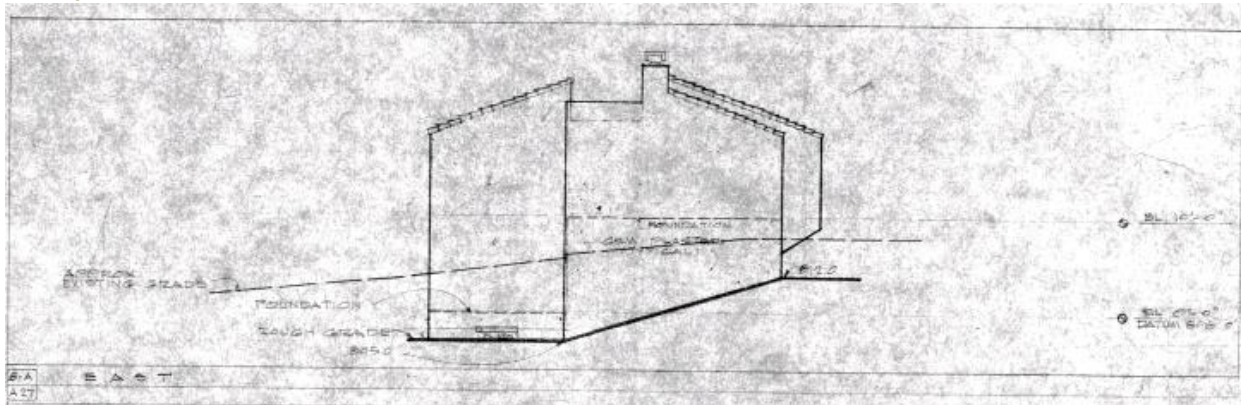
Architectural First Floor Plan A15 Marked with Assumed 3/8" Plywood Sheathed Stud Walls



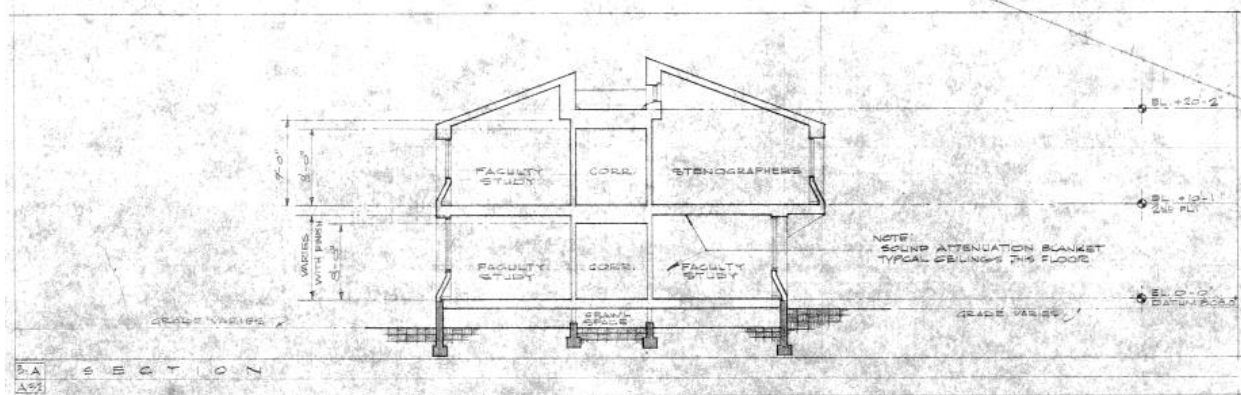
Architectural Second Floor Plan A15 Marked with Assumed 3/8" Plywood Sheathed Stud Walls Below (Overhang along West End of North Elevation)



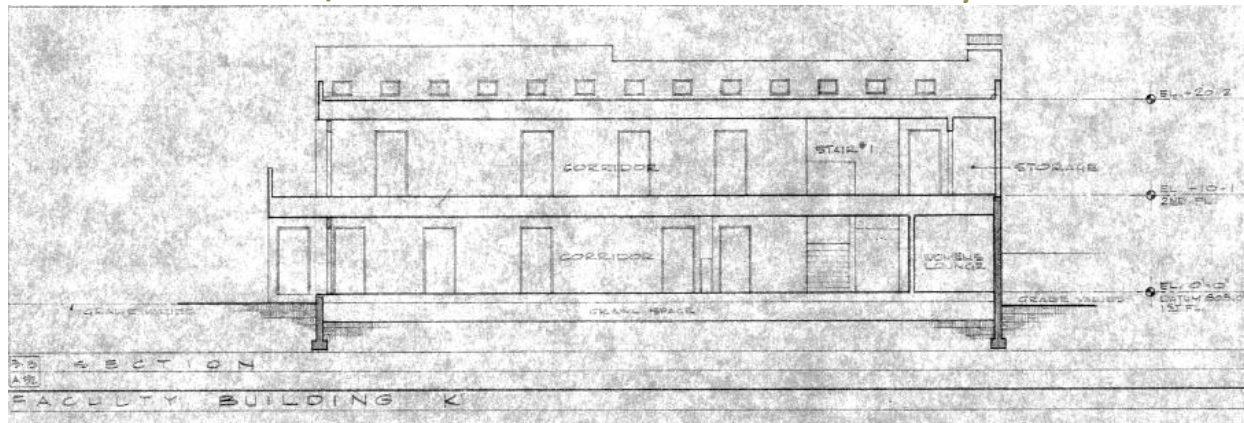
Architectural East Elevation 8A/A27 (Shows Overhang and Differing Roof Planes, Looking West)



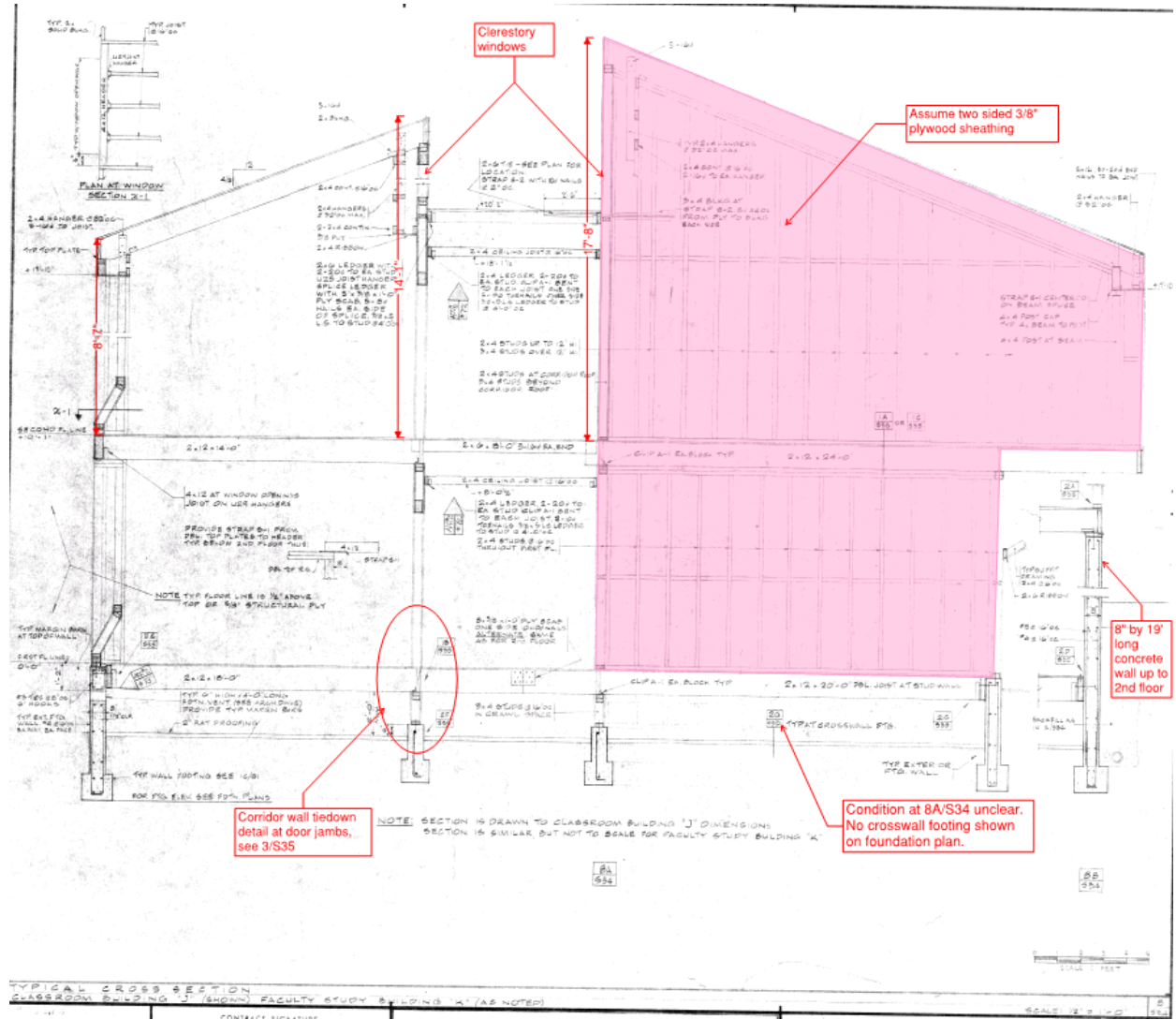
Architectural Section 3A/A32 (Shows Overhang, Looking West)



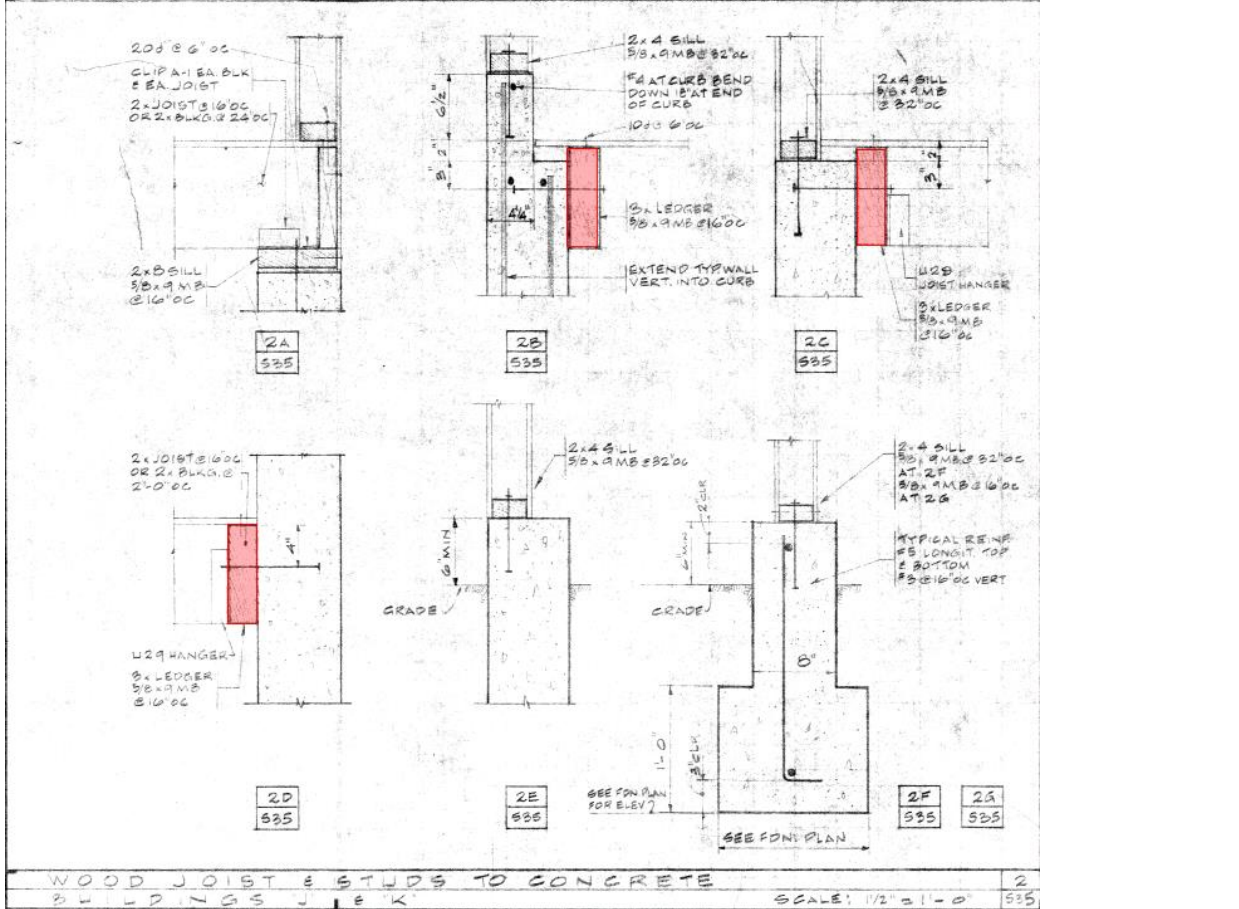
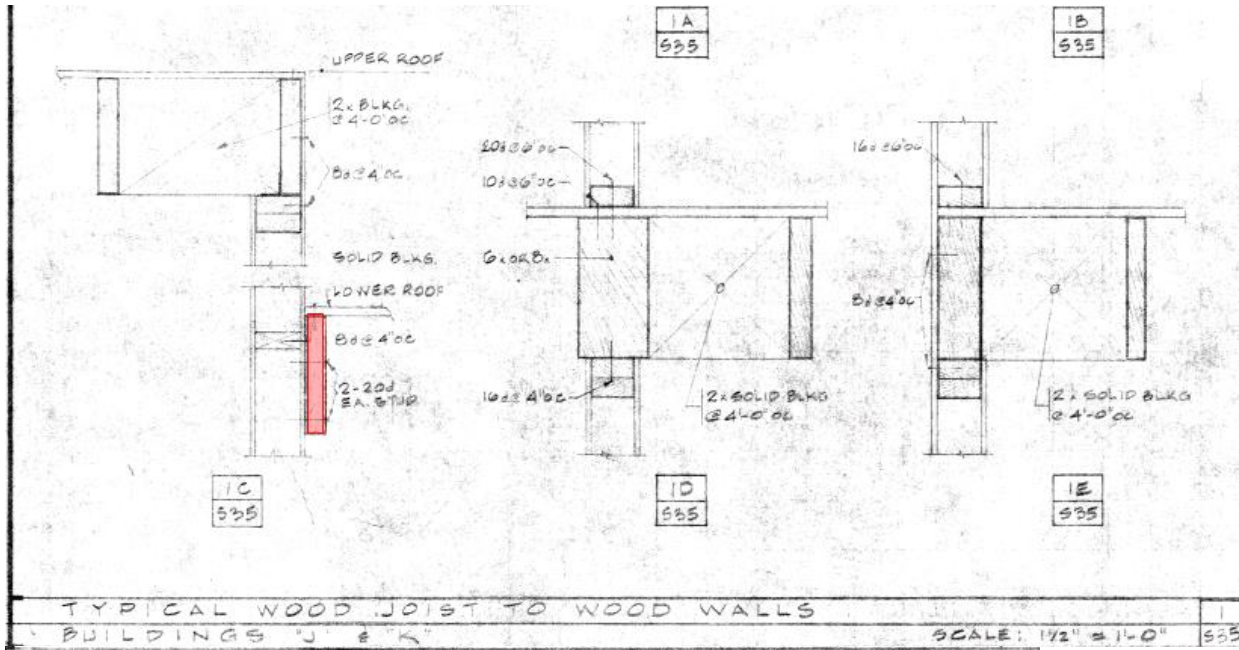
Architectural Section 3B/A32 at Corridor Walls with Doors and Clerestory Windows Above



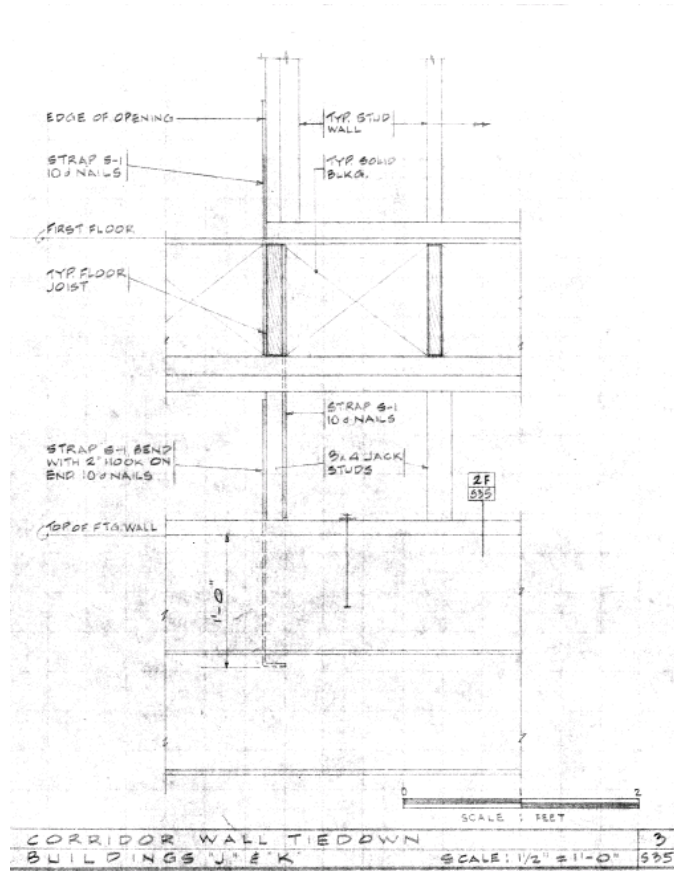
Interior Transverse Building Sections 8A & 8B/S34 (Similar) with Vertical Offset



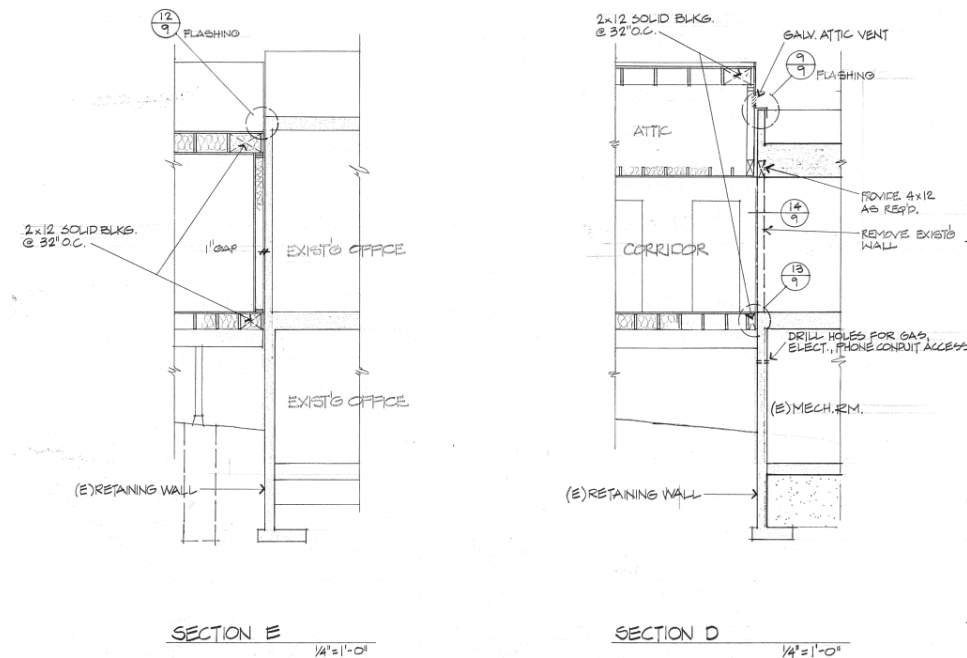
Cross-Grain Bending in Typical Details 1C, 2B, 2C, 2D/S35 at Connections from Corridor Roof to Wall and from Floor to Foundation Stem Walls



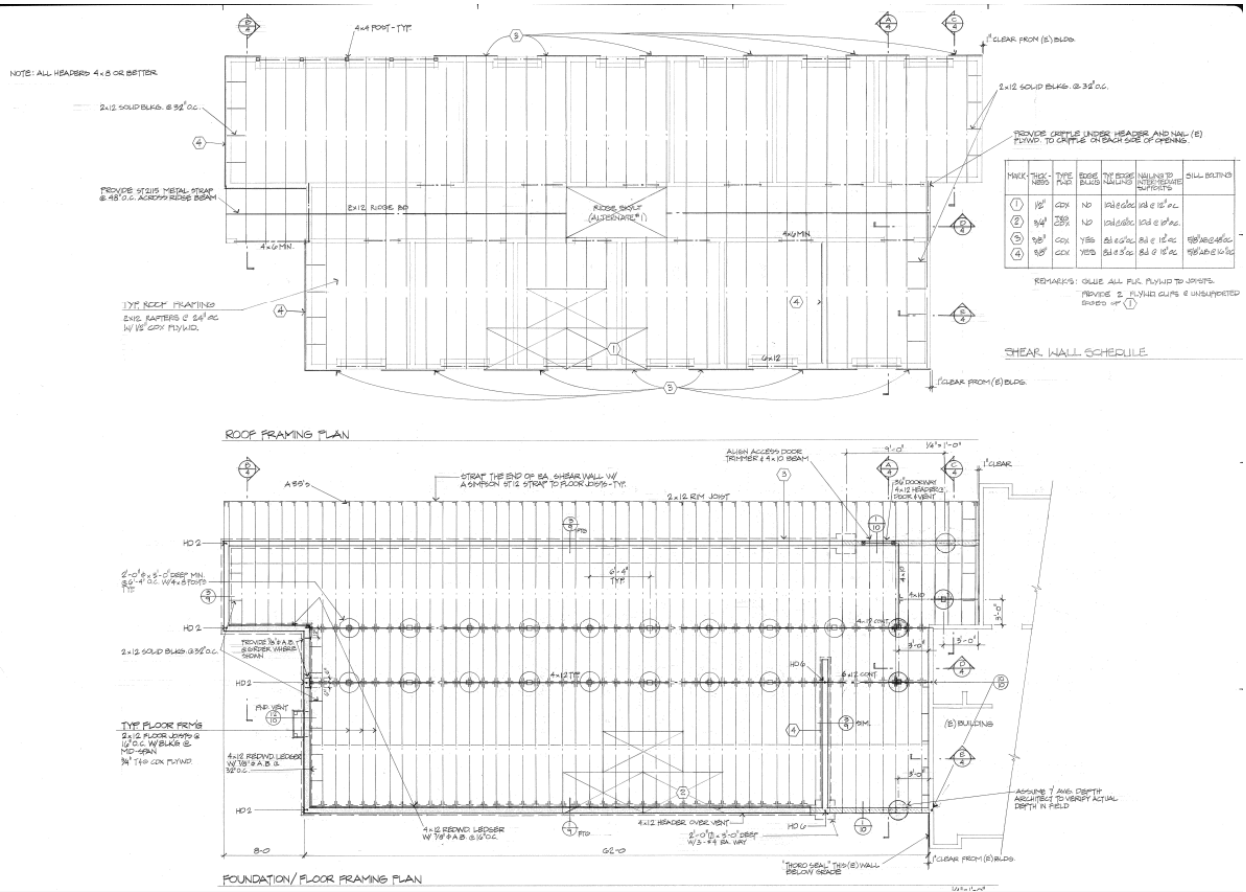
Connection Details at "Corridor Wall Tiedown" (at first floor door jambs only)



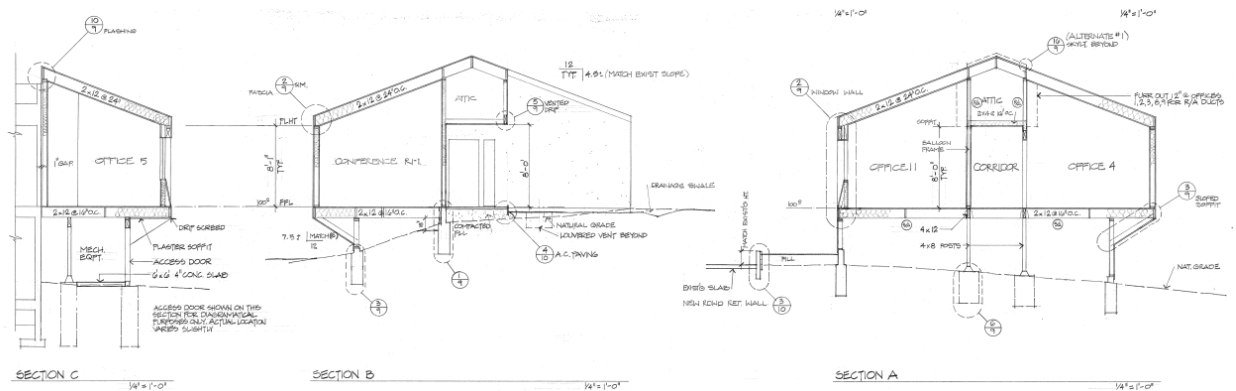
Structural Section Between 1967 and 1985 Wings with 1" Gap



Roof and Floor Framing 1985 Addition with Shear Wall Schedule (Longitudinal Walls #3 and Transverse Walls #4)



Sections at 1985 Addition with Vertical Offset on South Side



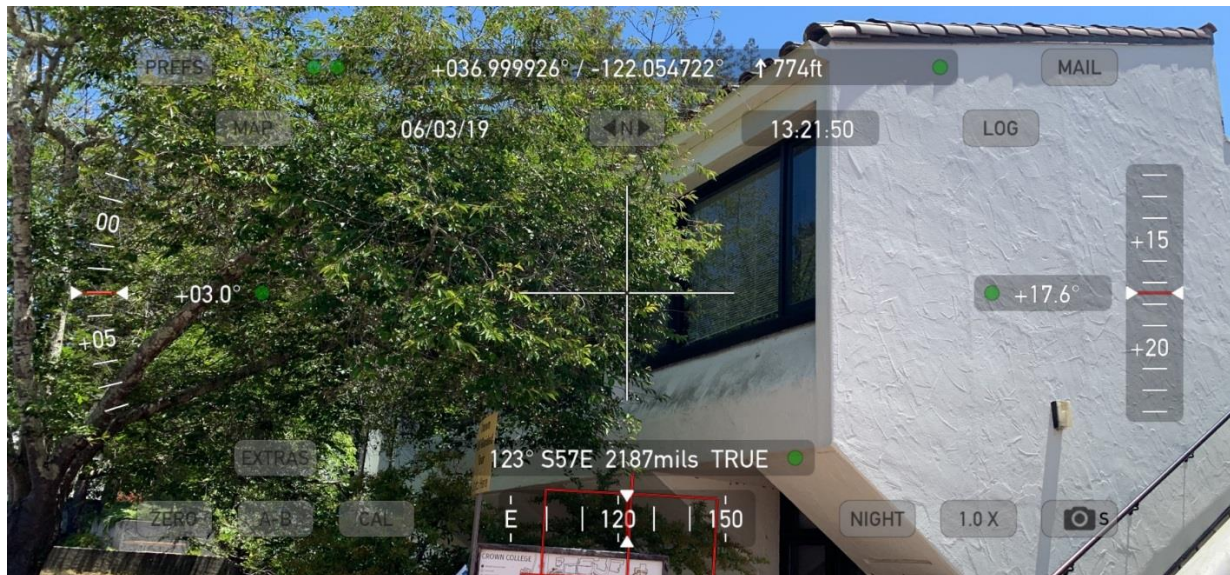


APPENDIX A

Additional Photos



West Elevation Original 1967 2-Story Faculty Wing (Looking Southeast)



Detail of Overhang at North Elevation Original 1967 2-Story Faculty Wing (Looking Southeast)



Two-Story Glazing at Entry on North Elevation



Partial North Elevation, Two-Story Portion in Foreground, One-Story Addition in Background



East Elevation 1985 One-Story Addition (Looking West)



South Elevation (Showing Interface Between 1967 and 1985 Construction)



West Elevation (Looking East from Walkway at Second Floor)



Close-up of Walkway Adjacent to West Elevation



Interior Posts Viewed from Partial Basement of 1985 Addition



Transverse Shear Wall in Partial Basement of 1985 Addition



Continuous Vent Below Overhang at South Elevation of 1985 Addition



Skylight in Corridor of 1985 Addition



Mechanical Room in Basement of 1985 Addition, Unanchored Water Heater (right), Anchored Green Tank (left)



APPENDIX B

ASCE 41-17 Tier 1 Checklists (Structural)

UC Campus:	Santa Cruz		Date:	06/28/2019		
Building CAAN:	7156	Auxiliary CAAN:	By Firm:	Rutherford + Chekene		
Building Name:	Crown Faculty Wing		Initials:	CLP, EFA	Checked:	WAL/BL
Building Address:	670 Crown Service Road, Santa Cruz, CA 95064		Page:	1	of	3

ASCE 41-17 Collapse Prevention Basic Configuration Checklist

LOW SEISMICITY

BUILDING SYSTEMS - GENERAL

	Description
C NC N/A U <input type="radio"/> <input checked="" type="radio"/> <input type="radio"/> <input type="radio"/>	<p>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)</p> <p>Comments: Transfer of heavy roof loads at projecting perimeter of original building in longitudinal direction unclear. Note this feature only occurs on north side of original building 7156. 1985 addition has overhang on south side.</p>
C NC N/A U <input type="radio"/> <input checked="" type="radio"/> <input type="radio"/> <input type="radio"/>	<p>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)</p> <p>Comments: Drawings show 1" gap between 1967 and 1985 construction. Height of addition at interface about 22 feet so gap inadequate, but floor levels align.</p>
C NC N/A U <input type="radio"/> <input type="radio"/> <input checked="" type="radio"/> <input type="radio"/>	<p>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)</p> <p>Comments: No mezzanines</p>

BUILDING SYSTEMS - BUILDING CONFIGURATION

	Description
C NC N/A U <input checked="" type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	<p>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)</p> <p>Comments: Two-story portion appears to have similar strength at both floors.</p>
C NC N/A U <input checked="" type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	<p>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)</p> <p>Comments: Two-story portion appears to have similar stiffness at both floors.</p>
C NC N/A U <input type="radio"/> <input checked="" type="radio"/> <input type="radio"/> <input type="radio"/>	<p>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)</p> <p>Comments: Exterior walls above do not align with shear walls below in longitudinal direction.</p>

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

UC Campus:	Santa Cruz		Date:	06/28/2019		
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Building Name:	Crown Faculty Wing		Initials:	CLP, EFA	Checked:	WAL/BL
Building Address:	670 Crown Service Road, Santa Cruz, CA 95064		Page:	2	of	3

ASCE 41-17 Collapse Prevention Basic Configuration Checklist

C NC N/A U <input type="radio"/> <input type="radio"/> <input checked="" type="radio"/> <input type="radio"/>	<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: Single story</p>
C NC N/A U <input type="radio"/> <input type="radio"/> <input checked="" type="radio"/> <input type="radio"/>	<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: Single story</p>
C NC N/A U <input type="radio"/> <input type="radio"/> <input checked="" type="radio"/> <input type="radio"/>	<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: Flexible diaphragms.</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 type="radio"/> <input type="radio"/> <input type="radio"/> <input checked="" type="radio"/>	<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: There is no mapped liquefaction on https://gis.santacruzcounty.us/mapgallery/Emergency%20Management/Hazard%20Mitigation/LiquifactionMap2009.pdf.</p>
C NC N/A U <input type="radio"/> <input type="radio"/> <input type="radio"/> <input checked="" type="radio"/>	<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: There are no mapped landslides on https://gis.santacruzcounty.us/mapgallery/Emergency%20Management/Hazard%20Mitigation/LandslideMap2009.pdf.</p>
C NC N/A U <input type="radio"/> <input type="radio"/> <input type="radio"/> <input checked="" type="radio"/>	<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: There are no faults at the project site per https://gis.santacruzcounty.us/mapgallery/Emergency%20Management/Hazard%20Mitigation/FaultZoneMap2009.pdf.</p>

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UC Campus:	Santa Cruz		Date:	06/28/2019		
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Building Name:	Crown Faculty Wing		Initials:	CLP, EFA	Checked:	WAL/BL
Building Address:	670 Crown Service Road, Santa Cruz, CA 95064		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="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	<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: Shear wall width $B = 22'$, Building Height (avg) is $H = 22'$, $B/H = 1.0$ (from 1967 portion) $S_a = 1.29g$ per ATC at BSE-2E $0.6 \times S_a = 0.774$ $B/H > 0.6 S_a$</p>
C NC N/A U <input type="radio"/> <input type="radio"/> <input type="radio"/> <input checked="" type="radio"/>	<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 assumed. All foundation elements tied together with continuous strip footings. It is unclear if the slab-on-grade is positively tied to the footings.</p>

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UC Campus:	Santa Cruz		Date:	06/28/2019		
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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 <input checked="" type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	<p>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)</p> <p>Comments: There are more than two lines in each direction.</p>								
C NC N/A U <input checked="" type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	<p>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)</p> <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> <p>Comments: Maximum shear stress at first floor in transverse direction is 488plf and in the longitudinal direction is 433 plf.</p>	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								
C NC N/A U <input checked="" type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	<p>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)</p> <p>Comments: Exterior walls are stucco over 3/8 plywood; not relying on stucco.</p>								
C NC N/A U <input checked="" type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	<p>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)</p> <p>Comments: Gypboard not relied on</p>								
C NC N/A U <input checked="" type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	<p>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)</p> <p>Comments: Aspect ratios ok but walls in original building typically do not have hold downs or straps.</p>								
C NC N/A U <input type="radio"/> <input checked="" type="radio"/> <input type="radio"/> <input type="radio"/>	<p>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)</p> <p>Comments: Drawings show Simpson clips (A-1) between floors and straps at base as "corridor wall tiedowns" but no ties or straps for other walls or transverse walls where wider at upper floor. 1985 addition mostly one story.</p>								

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

C NC N/A U <input type="radio"/> <input type="radio"/> <input checked="" type="radio"/> <input type="radio"/>	<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: Sloping site but concrete stem walls come up to first floor so say N/A. 1985 addition mostly single story</p>
C NC N/A U <input checked="" type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	<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: Interior cripple walls have doubled sided 3/8" plywood. All perimeter walls of original connected to concrete stem wall. Perimeter cripple walls of addition have sheathing.</p>
C NC N/A U <input type="radio"/> <input checked="" type="radio"/> <input type="radio"/> <input type="radio"/>	<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: Second floor longitudinal walls that project beyond first floor do not have clear load path; windows at upper floor with no shear walls in same plane and no straps to other walls.</p>
CONNECTIONS	
	Description
C NC N/A U <input checked="" type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	<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: 1985 addition has two lines of wood posts with Simpson hardware.</p>
C NC N/A U <input checked="" type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	<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: 5/8" x9" MB at 16" or 32" everywhere.</p>
C NC N/A U <input checked="" type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	<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: Straps at window headers and posts supporting window headers.</p>

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Building Name:	Crown Classroom Building		Initials:	CLP, EFA	Checked:	WAL/BL
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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="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	<p>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)</p> <p>Comments: 5/8" bolts typically at 32". Addition has 7/8" AB at 16" or 32".</p>

DIAPHRAGMS

	Description
C NC N/A U <input type="radio"/> <input checked="" type="radio"/> <input type="radio"/> <input type="radio"/>	<p>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)</p> <p>Comments: Roof diaphragm split between flat portion and two sloping portions and addition has pitched roof with 1" gap to original roof.</p>
C NC N/A U <input type="radio"/> <input checked="" type="radio"/> <input type="radio"/> <input type="radio"/>	<p>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)</p> <p>Comments: Roof diaphragm split between two sloping portions</p>
C NC N/A U <input type="radio"/> <input type="radio"/> <input checked="" type="radio"/> <input type="radio"/>	<p>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)</p> <p>Comments: Roof diaphragm split between flat portion and two sloping portions</p>
C NC N/A U <input type="radio"/> <input type="radio"/> <input checked="" type="radio"/> <input type="radio"/>	<p>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)</p> <p>Comments: There are no large openings.</p>
C NC N/A U <input checked="" type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	<p>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)</p> <p>Comments: Diaphragms have plywood sheathing.</p>

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

C NC N/A U <input type="radio"/> <input type="radio"/> <input checked="" type="radio"/> <input type="radio"/>	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) Comments: Diaphragms have blocked plywood sheathing.
C NC N/A U <input type="radio"/> <input type="radio"/> <input checked="" type="radio"/> <input type="radio"/>	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) Comments: Diaphragms have plywood sheathing.



APPENDIX C

UCOP Seismic Safety Policy Falling Hazards Assessment Summary

UC Campus:	Santa Cruz		Date:	06/28/2019		
Building CAAN:	7156	Auxiliary CAAN:	By Firm:	Rutherford + Chekene		
Building Name:	Crown Faculty Wing		Initials:	CLP, EFA	Checked:	WAL/BL
Building Address:	670 Crown Service Road, Santa Cruz, CA 95064		Page:	1	of	1

UCOP SEISMIC SAFETY POLICY Falling Hazard Assessment Summary

	Description
P N/A <input type="checkbox"/> <input checked="" type="checkbox"/>	Heavy ceilings, features or ornamentation above large lecture halls, auditoriums, lobbies, or other areas where large numbers of people congregate (50 ppl or more) Comments: There are no heavy ceilings, features, or ornamentation.
P N/A <input type="checkbox"/> <input checked="" type="checkbox"/>	Heavy masonry or stone veneer above exit ways or public access areas Comments: There is no masonry or stone veneer.
P N/A <input type="checkbox"/> <input checked="" type="checkbox"/>	Unbraced masonry parapets, cornices, or other ornamentation above exit ways or public access areas Comments: There are no masonry parapets, cornices or other ornamentation.
P N/A <input type="checkbox"/> <input checked="" type="checkbox"/>	Unrestrained hazardous material storage Comments:
P N/A <input type="checkbox"/> <input checked="" type="checkbox"/>	Masonry chimneys Comments: There are no masonry chimneys.
P N/A <input checked="" type="checkbox"/> <input type="checkbox"/>	Unrestrained natural gas-fueled equipment such as water heaters, boilers, emergency generators, etc. Comments: Unanchored water heater in mechanical room below 1985 addition. Some other items anchored so mix of anchored and unanchored items. Provide bracing or anchorage for gas-fired MEP items. Recommend excess flow valves or seismic shut-off since building surrounded by trees.
P N/A <input checked="" type="checkbox"/> <input type="checkbox"/>	Other: 2-story glazing around and above entrance on North side. Skylight above corridor in 1985 addition. Do not know if tempered. Comments: Recommend replace glazing or provide protective film.
P N/A <input checked="" type="checkbox"/> <input type="checkbox"/>	Other: Spanish roof tiles with steep slope along all longitudinal walls. Comments: Do not know if tiles secured with nails or if nails still intact after many years. Check especially adjacent to stairs and entrances. (Most areas beneath eaves are landscaped so not as much of a falling hazard.)
P N/A <input checked="" type="checkbox"/> <input type="checkbox"/>	Other: Tall Bookcases or tall furniture in corridors or where they could block doors and egress. Comments: One unanchored tall bookcase observed in corridor. Corridors should be free of obstacles and falling hazards located away from doors in interior offices. Tall items should be anchored.

Falling Hazards Risk: **Low**



APPENDIX D

Quick Check Calculations



Unit Weights:

Building 7156 Crown Faculty Wing 1967 portion

	Seismic Weight	Dead Load	
Main BLDG Flat Roof	psf		Remarks
flat roofing	5.5	5.5	3-ply with gravel
1/2" plywood for flat roof	1.5	1.5	
Rafter and ceiling joists	2.8	2.8	2x6@16" plus 2x4@16"
ceiling	2.0	2.0	typ. gypboard ceiling panels
MEP+misc+lighting	3.0	3.0	flat area
Total psf	14.8	14.8	
flat area	560.0		ft^2
Sloping Tile roofs			
Spanish clay tile	19.0	19.0	
5/8" plywood	1.8	1.8	at 36 pcf
membrane	1.0	1.0	
rafters	3.0	3.0	2x10 @ 16" o.c.
MEP+misc+lighting	2.0	2.0	sprinklers, lighting, projectors etc.
ceiling	2.0	2.0	typ. gypboard ceiling panels
subtotal on slope	28.8	28.8	scale this by 1.07 to account for slope
partition including shear walls	16.5	0.0	see below
Total weight per unit area	45.3	28.8	psf
Projected area under sloping roof	2080.0		ft^2
Total Seismic weight at roof	106724.2		lbs
	40.43		equivalent psf



	Seismic Weight	Dead Load	
2nd floor	psf		Remarks
5/8" plywood	1.8	1.8	at 36 pcf
joists incl cantilevers	3.9	3.9	2x12 @ 16" o.c. (increase by 10% to account for extra 4x12s and 8x12s)
ceiling	2.0	2.0	typ. gypboard ceiling panels
MEP+misc+lighting	3.0	3.0	sprinklers, lighting, radiators, projectors etc.
partition including shear walls	22.9	28.0	see below
Total weight per unit area	33.6	38.6	
Floor area	2640.0		ft ²
Total Seismic weight at 2nd	88619.0		lbs

estimate partition/wall weights	ft		Remarks
lineal feet exterior stucco walls	221.0	8.0	height avg trib to roof
weight ext walls		20.5	2x4 @ 16 plus two layers 3/8 plywood plus exterior cement plaster plus insulation +misc+ 2 layers 5/8 gyp
		8.0	glazing plus sash etc longitudinal walls only about 25% glazing
		18.0	use intermediate value
lineal feet interior wall at 2nd floor	140.0	8.0	height avg trib to roof
		10.5	2x4 @ 16 plus two layers 3/8 plywood plus insulation +misc+ 2 layers 5/8 gyp
Area at 2nd		2640.0	ft ²
total ext plus int at 2nd floor	361.0		
Weight, roof		43584.0	lbs
Weight per unit area at roof		16.5	psf actual trib to roof
Weight, 2nd		60503.0	lbs
Weight per unit area at 2nd floor		22.9	psf trib to 2nd for 10.083'



Story Weights (1967 portion)

Level	Area (ft ²)	Unit Weight (psf)	Seismic Weight (kips)
Typ. Roof	2640	40	107
2nd floor	2640	34	89
1st floor (neglect)	2520	0	0
	5160		195

Note:

1- Roof area is projected on horizontal plane; not surface area of roof.

Period

1967 portion		1967 highest roof		1967 flat roof		1985 avg roof	
C _t =	0.02	C _t =	0.02	C _t =	0.02	C _t =	0.02
h _n (ft)=	22 avg	h _n (ft)=	27.75	h _n (ft)=	20.083	h _n (ft)=	16
B=	0.75	B=	0.75	B=	0.75	B=	0.75
T=	0.20 sec	T=	0.24 sec	T=	0.19 sec	T=	0.16 sec

BSE-2E Response Spectrum

ATC Hazards by Location

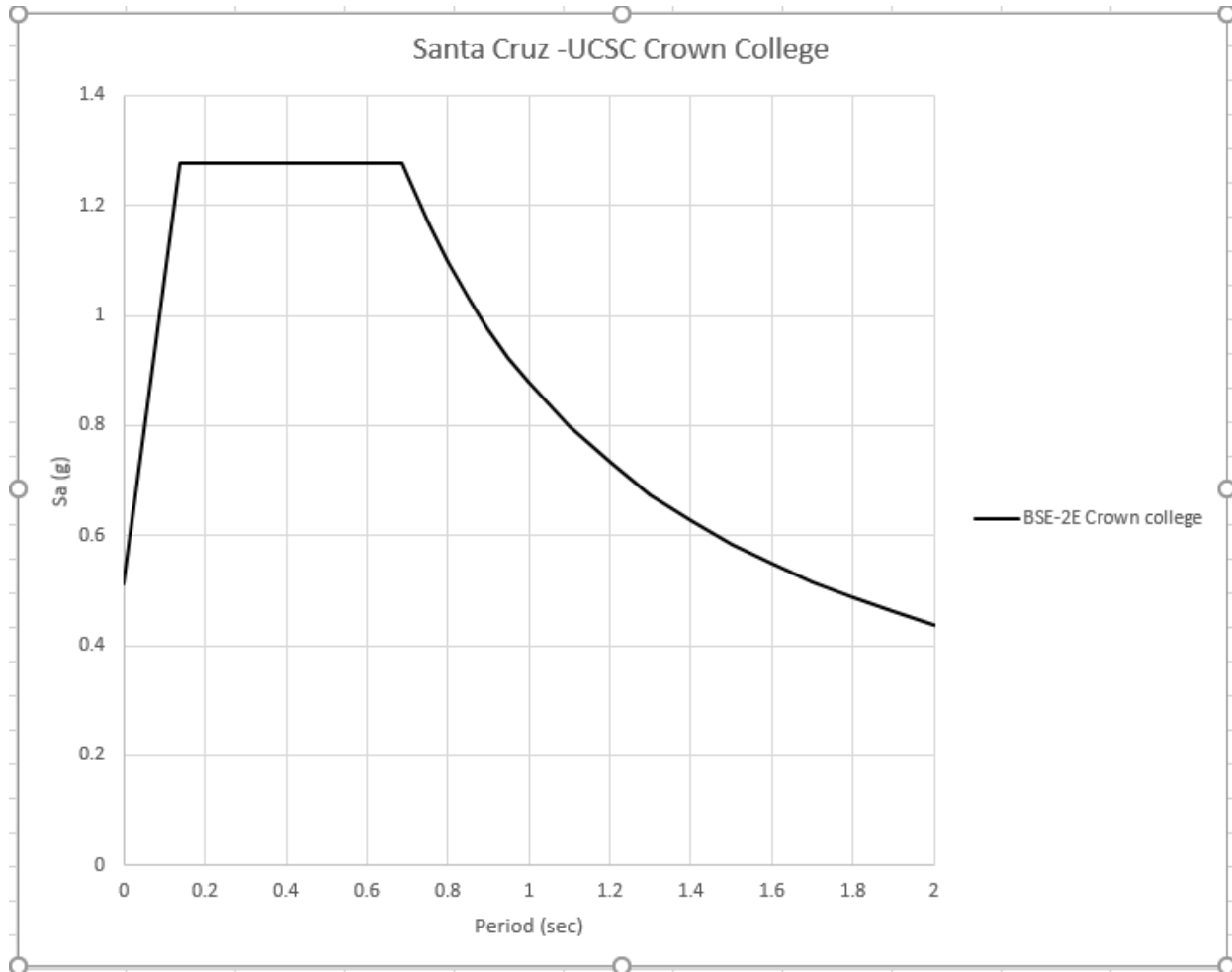
Search by Address: 36.999831 Search by Coordinate: -122.054441 Search

Wind Snow Tornado **Seismic**

Hazard Level BSE-2E

Name	Value	Description
S _s	1.289	MCE _R ground motion (period=0.2s)
F _a	1	Site amplification factor at 0.2s
S _{XS}	1.289	Site modified spectral response (0.2s)
S ₁	0.489	MCE _R ground motion (period=1.0s)
F _v	1.811	Site amplification factor at 1.0s
S _{X1}	0.886	Site modified spectral response (1.0s)

Map showing the location of the hazard level BSE-2E at 811 ft above sea level near San Francisco, California. The map includes labels for Santa Rosa, San Francisco, Stanislaus National Forest, Yosemite National Park, Salinas, Monterey, Fresno, and CALIFORNIA.





Story Shears (1967 portion)

Sa=	1.29	
W=	195	kips
C=	1.1	Per ASCE 41-17 Table 4-7

Sx1 T Sxs
0.886 0.20 1.289

V=	277	kips
----	-----	------

k= 1.00

Per ASCE 41-17 Section 4.4.2.2, K = 1.0 for periods less than 0.5 sec and K = 2.0 for T >2.5 sec. It varies linearly in between 0.5 sec and 2.5 sec period.

Floor Levels	Story Height (ft)	Total Height, H (ft)	Weight, W (kips)	W x H ^k	coeff	Fx (kips)	Story Shear, V (kips)
Roof	12.00	22.08	106.72	2,357	0.73	201	201
2nd Floor	10.08	10.08	88.62	894	0.27	76	277
1st Floor			195.34				
				3,250	1	277	

Notes:

- 1- The base of building is assumed to be at the 1st floor. 1985 Addition is 1-story plus small basement. This calc for original 2-story wing that has fewer walls.
- 2- Use an average for roof height of 22 feet.
- 3- Modification Factor, C, per ASCE 41-17, Table 4-7.



Average Stress (1967 portion):

Ms=	4.5	CP of wood shear wall from Table 4-8
-----	-----	--------------------------------------

N-S direction (Transverse)			
Level	Force (kips)	length of wall (ft)	average shear stress (plf)
2nd Flr Level	201	134	333
1st flr Level	277	126	488

E-W direction (Longitudinal)			
Level	Force (kips)	length of wall (ft)	average shear stress (plf)
2nd Flr Level	201	142	314
1st flr Level	277	142	433