Rating form completed by:

RICHARD NIEWIAROWSKI, S.E.
Evaluator: RWN
Date: 07/22/2019

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

DATE: 07-22-2019 (Group 1 Building Assessment was performed in December, 2018)

UCSF building seismic ratings

Hunters Point Research Facility

CAAN #3011
75 Crisp Road (830 & 831 Palou Avenue), San Francisco, CA 94124
UCSF Campus: Outlying Area-Hunters Point

Plan (831 Palou, 830 Palou, Annex)

West elevation (looking northeast)

Rating summary	Entry	Notes
UC Seismic Performance Level (rating)	IV	Based on drawings review and ASCE 41 Checklists and quick checks, the expected seismic performance is likely to be better than IV[1].
Rating basis	Tier 1	ASCE 41-17 – Completed only for main building at 830 Palou Ave.
Date of rating	Dec., 2018	
Recommended UCSF priority category for retrofit	None	Priority A=Retrofit ASAP Priority B=Retrofit at next permit application for modification
Ballpark total project cost to retrofit to IV rating	N/A	
Is 2018-2019 rating required by UCOP?	Yes	Does not have a documented previous review
Further evaluation recommended?	No	

Building information used in this evaluation

- Structural & Architectural drawings for 831 & 830 Palou Ave., prepared by J. Francis Ward, Architect, dated Nov. 1965.

Additional building information known to exist

- Drawings of various modifications and minor additions (UCSF Drawing Archives).

Scope for completing this form

Review of the original 1965 structural and architectural drawings. An ASCE 41-17 Tier 1 evaluation was performed only for the main building at 830 Palou Ave. (831 Palou Ave. and the light steel framed Annex are small, essentially unoccupied structures not requiring evaluation). A site visit, escorted by the building manager, Mr. Robert Cotter, was made 10/25/2018.

Brief description of structure

This facility located at 75 Crisp Road, consists of three separate building structures:

- 831 Palou Ave.: A 30' x 40' (1200 GSF), one story (10' high), reinforced concrete shear wall building with a light steel framed, unfilled metal deck roof diaphragm anchor bolted to the tops of the concrete shear walls. Foundations are shallow, continuous strip wall footings. There is more than 100 LF of 8" thick reinforced concrete shear walls, well distributed in each direction. The building is unoccupied and used only for storage. The adjacent dog-kennels are abandoned.
- 830 Palou Ave. (75 Crisp Road): A one story (10' tall) reinforced concrete building of about 13,800 OGSF with an 8" R/C slab roof supported on an egg-crate like array of 8" thick R/C shear walls (there is more than a total of 800 LF of well distributed shear walls in each direction). The floor is a 9" thick R/C slab over a crawl space, supported on R/C beams, pile caps, and R/C piles (piles are about 60' deep) driven to refusal and founded in hard serpentine rock.
- Annex: A one-story, light metal stud framed building of about 2500 GSF, with more than 100 LF of sheet rock or plywood sheathed shear walls in each direction. This annex building is essentially unoccupied except for the research animals (mostly mice).

Building code: The structural design drawings are dated November, 1965. The building was designed for the U.S. Navy. The governing code is presumed to be the latest pre-1965 edition of the Tri-Services Manual used by the U.S. Navy.

Building condition: Good. There is no evidence of settlement or on-going leaks. The building manager indicated that other than typical maintenance the structure is in good condition.

Building response in 1989 Loma Prieta Earthquake: Unknown. No damage was observed and no earthquake related repair work was reported.

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

The Tier 1 evaluation of 830 Palou Avenue for the BSE-2E (5%/50yrs) ground motion revealed no structural deficiencies. The concrete shear walls are 8" thick with a single curtain of reinforcing (there is so much linear feet of shear wall length that the quick check analysis shear stresses are less than one $\sqrt{f'_c}$.

The liquefaction potential at the site is very high. However, the liquefaction hazard related to the building is expected to be low given that the structure is founded on piles driven to refusal. All services connected to the building are vulnerable to the liquefaction hazard.

The structure is not expected to experience significant nonlinear response in a major earthquake, and damage is likely to be limited to minor concrete cracking, less than the damageability expected for rating level IV.

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	Y
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	N		

Summary of review of nonstructural life-safety concerns, including at exit routes. [1]

- All gas cylinders are anchored (chained) to wall mounted rails.
- All animal (mice) cages are on multi-tiered metal racks with wheels, free to roll in an EQ shaking.
- Roof mounted equipment was not reviewed.

UCOP non-structural checklist item	Life safety hazard?	UCOP non-structural checklist item	Life safety hazard?
Heavy ceilings, feature or ornamentation above large lecture halls, auditoriums, lobbies or other areas where large numbers of people congregate	None 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.	None observed

Basis of Seismic Performance Level rating

The 830 Palou structure is a very stiff, one-story structure only ten feet high. There are over 900 LF of 8" thick reinforced concrete shear walls in the longitudinal (east-west) direction and over 800 LF of shear walls in the transverse (north-south) direction. The walls are very well distributed throughout the building's footprint. The walls are well doweled into the 8" thick reinforced concrete roof slab and the 9" thick R/C suspended floor slab and supporting grade beams. The grade beam grid, floor slab, and all shear walls are supported by a total of 156 concrete piles.

The average wall shear stress is less than one $\sqrt{f'_c}$ (quick check D/C ≤ 0.21), and the D/C ratio for "unreduced"shear per pile is 0.60. Given that the building is well-tied together, contains a significant number of redundant shear wall lines, and does not have a soft or weak story or plan irregularities, it is not expected to experience significant nonlinear response in a major earthquake. Damage is likely to be limited to minor cracking, less than the damageability expected for a rating of IV.

[1] 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.

Recommendations for further evaluation or retrofit

No additional evaluation is required.

Peer review comments on rating

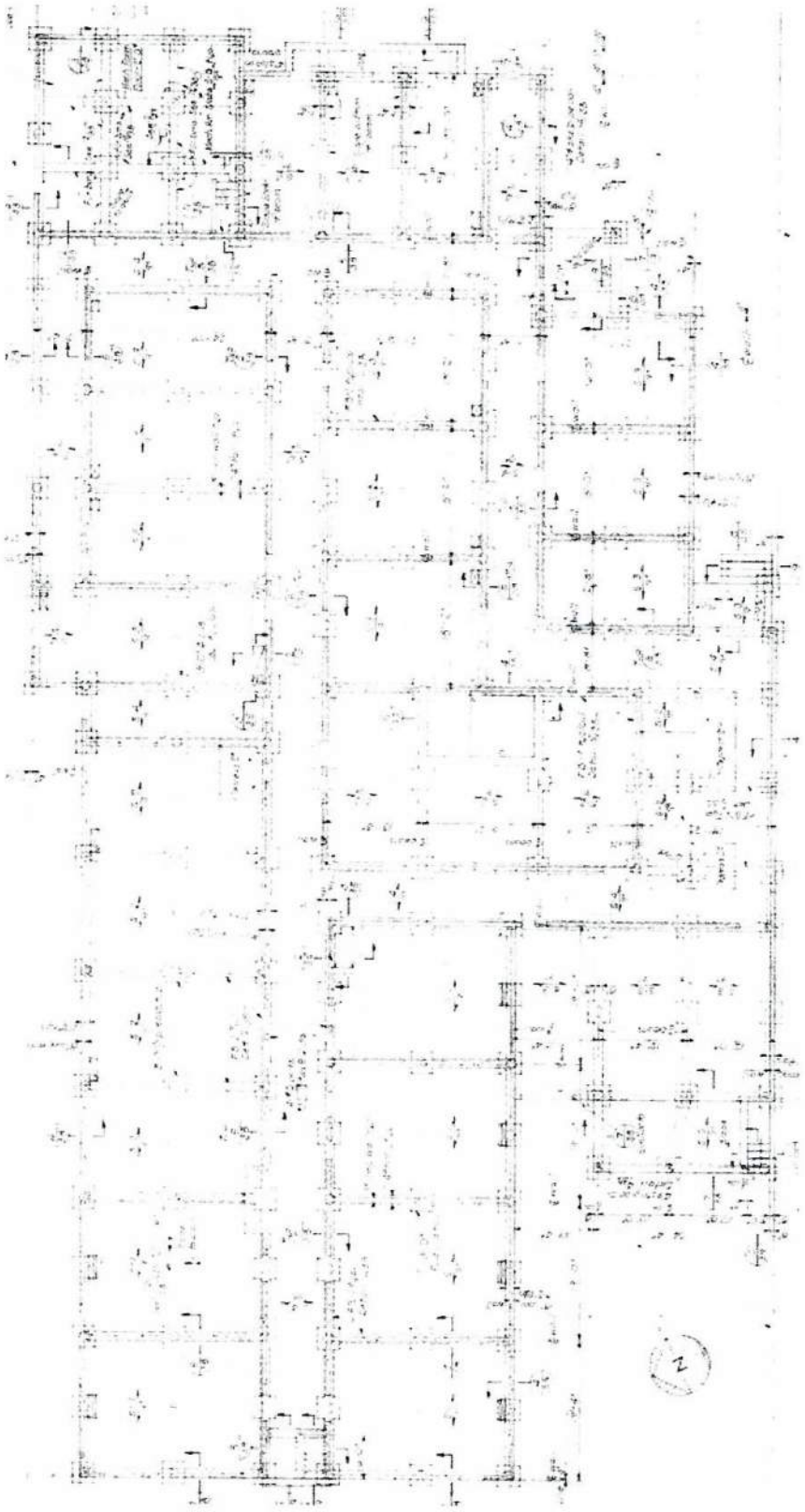
The four structural members of the UCSF Seismic Review Committee (SRC) reviewed the evaluation in December 2018 and were unanimous that the Seismic Performance Level Rating is Level IV and no further study is required.

Additional building data	Entry	Notes
Latitude	37.7262	UCSF Group 1 Buildings Geotechnical Characteristics and Geohazards, Egan (2019)
Longitude	-122.3754	UCSF Group 1 Buildings Geotechnical Characteristics and Geohazards, Egan (2019)
Are there other structures besides this one under the same CAAN#	Yes	See Building Description discussion of the three separate structures covered under this CAAN.
Number of stories above lowest perimeter grade	1	
Number of stories (basements) below lowest perimeter grade	0	There is a crawl space below the suspended floor slab.
Building occupiable area (OGSF)	13,800	Approximate calculation
Risk Category per 2016 CBC 1604.5	II	
Building structural height, h_n	10 ft	ASCE 7-16, Section 11.2
Coefficient for period, C_t	0.02	ASCE 41-17, Section 4.4.2.4
Coefficient for period, β	0.75	ASCE 41-17, Section 4.4.2.4
Estimated fundamental period	0.11 sec	Estimated using ASCE 41-17 equation 4-4
Site data		
975-year hazard parameters S_s, S_1	1.424g, 0.554g	SEAOC/OSHPD Seismic Design Maps Tool
Site class	D	
Site class basis	Geotech Parameters	UCSF Group 1 Buildings Geotechnical Characteristics and Geohazards, Egan (2019)
Site parameters F_a, F_v	1.000, 1.746	SEAOC/OSHPD Seismic Design Maps Tool
Ground motion parameters S_{cs}, S_{c1}	1.424g, 0.967g	UCSF Group 1 Buildings Geotechnical Characteristics and Geohazards, Egan (2019) W = 3037 kips, V base = 6055 kips
S_a at building period	1.424g	
Site V_{s30}	270 m/s	
V_{s30} basis	Estimated	UCSF Group 1 Buildings Geotechnical Characteristics and Geohazards, Egan (2019)
Liquefaction potential/basis	Yes	Bldg. is supported on piles driven to refusal, so liquefaction related hazard to building is probably low. UCSF Group 1 Buildings Geotechnical Characteristics and Geohazards, Egan (2019)
Landslide potential/basis	No	UCSF Group 1 Buildings Geotechnical Characteristics and Geohazards, Egan (2019)

Active fault-rupture hazard identified at site?	No	UCSF Group 1 Buildings Geotechnical Characteristics and Geohazards, Egan (2019)
Site-specific ground motion study?	No	
Applicable code		
Applicable code or approx. date of original construction	Constructed 1966	Code unknown. Presumed to be pre-1965 Tri-Services Manual used by the U.S. Navy.
Applicable code for partial retrofit	None	No partial retrofit known
Applicable code for full retrofit	None	No full retrofit known
Model building data		
Model building type North-South	C2A. C2, CFS1	831 Palou (C2A), 830 Palou (c2), Annex (CFS1)
Model building type East-West	C2A. C2, CFS1	831 Palou (C2A), 830 Palou (c2), Annex (CFS1)
FEMA P-154 score	N/A	ASCE 41 Tier 1 evaluation was performed instead
Previous ratings		
Most recent rating	None	
Date of most recent rating	N/A	No previous ratings are available
2nd most recent rating	--	
Date of 2nd most recent rating	--	
3rd most recent rating	-	
Date of 3rd most recent rating	-	
Appendices		
ASCE 41 Tier 1 checklist included here?	Yes	For main building at 830 Palou Ave. only

Appendix A

Additional Images



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Appendix B

ASCE 41- 17 Tier 1 Checklists (Structural)

UC Campus:	UCSF Hunters Point			Date:	12/12/2018		
Building CAAN:	3011	Auxiliary CAAN:		By Firm:	Richard Niewiarowski, SE		
Building Name:	Hunters Point Research Facility			Initials:	*RWN*	Checked:	
Building Address:	830 Palou Street, San Francisco, CA			Page:	1	of	3

ASCE 41-17
Collapse Prevention Basic Configuration Checklist

LOW SEISMICITY

BUILDING SYSTEMS - *GENERAL*

	Description
C ☉ NC ☐ N/A ☐ U ☐	LOAD PATH: The structure contains a complete, well-defined load path, including structural elements and connections, that serves to transfer the inertial forces associated with the mass of all elements of the building to the foundation. (Commentary: Sec. A.2.1.1. Tier 2: Sec. 5.4.1.1) **Comments:**
C ☉ NC ☐ N/A ☐ U ☐	ADJACENT BUILDINGS: The clear distance between the building being evaluated and any adjacent building is greater than 0.25% of the height of the shorter building in low seismicity, 0.5% in moderate seismicity, and 1.5% in high seismicity. (Commentary: Sec. A.2.1.2. Tier 2: Sec. 5.4.1.2) **Comments:**
C ☐ NC ☐ N/A ☉ U ☐	MEZZANINES: Interior mezzanine levels are braced independently from the main structure or are anchored to the seismic-force-resisting elements of the main structure. (Commentary: Sec. A.2.1.3. Tier 2: Sec. 5.4.1.3) **Comments:**

BUILDING SYSTEMS - *BUILDING CONFIGURATION*

	Description
C ☉ NC ☐ N/A ☐ U ☐	WEAK STORY: The sum of the shear strengths of the seismic-force-resisting system in any story in each direction is not less than 80% of the strength in the adjacent story above. (Commentary: Sec. A2.2.2. Tier 2: Sec. 5.4.2.1) **Comments:**
C ☉ NC ☐ N/A ☐ U ☐	SOFT STORY: The stiffness of the seismic-force-resisting system in any story is not less than 70% of the seismic-force-resisting system stiffness in an adjacent story above or less than 80% of the average seismic-force-resisting system stiffness of the three stories above. (Commentary: Sec. A.2.2.3. Tier 2: Sec. 5.4.2.2) **Comments:**
C ☉ NC ☐ N/A ☐ U ☐	VERTICAL IRREGULARITIES: All vertical elements in the seismic-force-resisting system are continuous to the foundation. (Commentary: Sec. A.2.2.4. Tier 2: Sec. 5.4.2.3) **Comments:**

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

UC Campus:	UCSF Hunters Point			Date:	12/12/2018		
Building CAAN:	3011	Auxiliary CAAN:		By Firm:	Richard Niewiarowski, SE		
Building Name:	Hunters Point Research Facility			Initials:	*RWN*	Checked:	
Building Address:	830 Palou Street, San Francisco, CA			Page:	2	of	3

ASCE 41-17
Collapse Prevention Basic Configuration Checklist

C	NC	N/A	U	
☒	☐	☐	☐	GEOMETRY: There are no changes in the net horizontal dimension of the seismic-force-resisting system of more than 30% in a story relative to adjacent stories, excluding one-story penthouses and mezzanines. (Commentary: Sec. A.2.2.5. Tier 2: Sec. 5.4.2.4) **Comments:**
☒	☐	☐	☐	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) **Comments:**
☒	☐	☐	☐	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) **Comments:**

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

GEOLOGIC SITE HAZARD

				Description
C	NC	N/A	U	
☐	☒	☐	☐	LIQUEFACTION: Liquefaction-susceptible, saturated, loose granular soils that could jeopardize the building's seismic performance do not exist in the foundation soils at depths within 50 ft (15.2m) under the building. (Commentary: Sec. A.6.1.1. Tier 2: 5.4.3.1) **Comments: Liquefaction potential of site soils is very high. However, the structure is founded on piles driven to refusal and is probably not vulnerable. All site services to the building are vulnerable.**
☒	☐	☐	☐	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) **Comments:**
☒	☐	☐	☐	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) **Comments:**

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

UC Campus:	UCSF Hunters Point			Date:	12/12/2018		
Building CAAN:	3011	Auxiliary CAAN:		By Firm:	Richard Niewiarowski, SE		
Building Name:	Hunters Point Research Facility			Initials:	*RWN*	Checked:	
Building Address:	830 Palou Street, San Francisco, CA			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** ☐	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) **Comments:**
C ☑ **NC** ☐ **N/A** ☐ **U** ☐	TIES BETWEEN FOUNDATION ELEMENTS: The foundation has ties adequate to resist seismic forces where footings, piles, and piers are not restrained by beams, slabs, or soils classified as Site Class A, B, or C. (Commentary: Sec. A.6.2.2. Tier 2: Sec. 5.4.3.4) **Comments:**

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

UC Campus:	UCSF Hunters Point			Date:	12/21/2018		
Building CAAN:	3011	Auxiliary CAAN:		By Firm:	Richard Niewiarowski, SE		
Building Name:	Hunters Point Research Facility			Initials:	*RWN*	Checked:	
Building Address:	830 Palou Street, San Francisco, CA			Page:	1	of	3

ASCE 41-17
Collapse Prevention Structural Checklist For Building Type C2-C2A

Low And Moderate Seismicity

Seismic-Force-Resisting System

	Description
C ☐ NC ☐ N/A ☒ U ☐	COMPLETE FRAMES: Steel or concrete frames classified as secondary components form a complete vertical-load-carrying system. (Commentary: Sec. A.3.1.6.1. Tier 2: Sec. 5.5.2.5.1) **Comments:**
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) **Comments:**
C ☒ NC ☐ N/A ☐ U ☐	SHEAR STRESS CHECK: The shear stress in the concrete shear walls, calculated using the Quick Check procedure of Section 4.4.3.3, is less than the greater of 100 lb/in.^{2} (0.69 MPa) or $2\sqrt{f'_c}$. (Commentary: Sec. A.3.2.2.1. Tier 2: Sec. 5.5.3.1.1) **Comments: Vavg ≤ 20 psi.**
C ☒ NC ☐ N/A ☐ U ☐	REINFORCING STEEL: The ratio of reinforcing steel area to gross concrete area is not less than 0.0012 in the vertical direction and 0.0020 in the horizontal direction. (Commentary: Sec. A.3.2.2.2. Tier 2: Sec. 5.5.3.1.3) **Comments: ρ = 0.0025**

Connections

	Description
C ☐ NC ☐ N/A ☒ U ☐	WALL ANCHORAGE AT FLEXIBLE DIAPHRAGMS: Exterior concrete or masonry walls that are dependent on flexible diaphragms for lateral support are anchored for out-of-plane forces at each diaphragm level with steel anchors, reinforcing dowels, or straps that are developed into the diaphragm. Connections have strength to resist the connection force calculated in the Quick Check procedure of Section 4.4.3.7. (Commentary: Sec. A.5.1.1. Tier 2: Sec. 5.7.1.1) **Comments:**
C ☒ NC ☐ N/A ☐ U ☐	TRANSFER TO SHEAR WALLS: Diaphragms are connected for transfer of seismic forces to the shear walls. (Commentary: Sec. A.5.2.1. Tier 2: Sec. 5.7.2) **Comments:**

ASCE 41-17
Collapse Prevention Structural Checklist For Building Type C2-C2A

C	NC	N/A	U	
☉	☐	☐	☐	FOUNDATION DOWELS: Wall reinforcement is doweled into the foundation with vertical bars equal in size and spacing to the vertical wall reinforcing directly above the foundation. (Commentary: Sec. A.5.3.5. Tier 2: Sec. 5.7.3.4) **Comments:**

High Seismicity (Complete The Following Items In Addition To The Items For Low And Moderate Seismicity)

Seismic-Force-Resisting System

				Description
C	NC	N/A	U	
☉	☐	☐	☐	DEFLECTION COMPATIBILITY: Secondary components have the shear capacity to develop the flexural strength of the components. (Commentary: Sec. A.3.1.6.2. Tier 2: Sec. 5.5.2.5.2) **Comments:**
☉	☐	☐	☐	FLAT SLABS: Flat slabs or plates not part of the seismic-force-resisting system have continuous bottom steel through the column joints. (Commentary: Sec. A.3.1.6.3. Tier 2: Sec. 5.5.2.5.3) **Comments:**
☐	☐	☉	☐	COUPLING BEAMS: The ends of both walls to which the coupling beam is attached are supported at each end to resist vertical loads caused by overturning. (Commentary: Sec. A.3.2.2.3. Tier 2: Sec. 5.5.3.2.1) **Comments:**

Diaphragms (Stiff Or Flexible)

				Description
C	NC	N/A	U	
☉	☐	☐	☐	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:**
☉	☐	☐	☐	OPENINGS AT SHEAR WALLS: Diaphragm openings immediately adjacent to the shear walls are less than 25% of the wall length. (Commentary: Sec. A.4.1.4. Tier 2: Sec. 5.6.1.3) **Comments:**

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Building Address:	830 Palou Street, San Francisco, CA			Page:	3	of	3

ASCE 41-17
Collapse Prevention Structural Checklist For Building Type C2-C2A

Flexible Diaphragms

	Description
C ☐ NC ☐ N/A ☑ U ☐	CROSS TIES: There are continuous cross ties between diaphragm chords. (Commentary: Sec. A.4.1.2. Tier 2: Sec. 5.6.1.2) **Comments:**
C ☐ NC ☐ N/A ☑ U ☐	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 ☐	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:**
C ☐ NC ☐ N/A ☑ U ☐	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 aspect ratios less than or equal to 4-to-1. (Commentary: Sec. A.4.2.3. Tier 2: Sec. 5.6.2) **Comments:**
C ☐ NC ☐ N/A ☑ U ☐	OTHER DIAPHRAGMS: 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:**

Connections

	Description
C ☑ NC ☐ N/A ☐ U ☐	UPLIFT AT PILE CAPS: Pile caps have top reinforcement, and piles are anchored to the pile caps. (Commentary: Sec. A.5.3.8. Tier 2: Sec. 5.7.3.5) **Comments:**

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Appendix C

UCOP Seismic Safety policy Falling Hazards Assessment Summary

UC Campus:	UCSF Hunters Point			Date:	07/24/2019		
Building CAAN:	3011	Auxiliary CAAN:		By Firm:	Richard Niewiarowski		
Building Name:	Hunters Point Research Facility			Initials:	*RWN*	Checked:	
Building Address:	830 Palou Street, San Francisco, CA			Page:	1	of	1

UCOP SEISMIC SAFETY POLICY
Falling Hazard Assessment Summary

	Description
P ☐ N/A ☒	**Heavy ceilings, features or ornamentation above large lecture halls, auditoriums, lobbies, or other areas where large numbers of people congregate (50 ppl or more)** **Comments:**
P ☐ N/A ☒	**Heavy masonry or stone veneer above exit ways or public access areas** **Comments:**
P ☐ N/A ☒	**Unbraced masonry parapets, cornices, or other ornamentation above exit ways or public access areas** **Comments:**
P ☐ N/A ☒	**Unrestrained hazardous material storage** **Comments:**
P ☐ N/A ☒	**Masonry chimneys** **Comments:**
P ☐ N/A ☒	**Unrestrained natural gas-fueled equipment such as water heaters, boilers, emergency generators, etc.** **Comments:**
P ☐ N/A ☒	**Other:** **Comments:**
P ☐ N/A ☒	**Other:** **Comments:**
P ☐ N/A ☒	**Other:** **Comments:**

Falling Hazards Risk: *Low*

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

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Appendix D

Quick Check Calculations

RICHARD NIEWIAROWSKI
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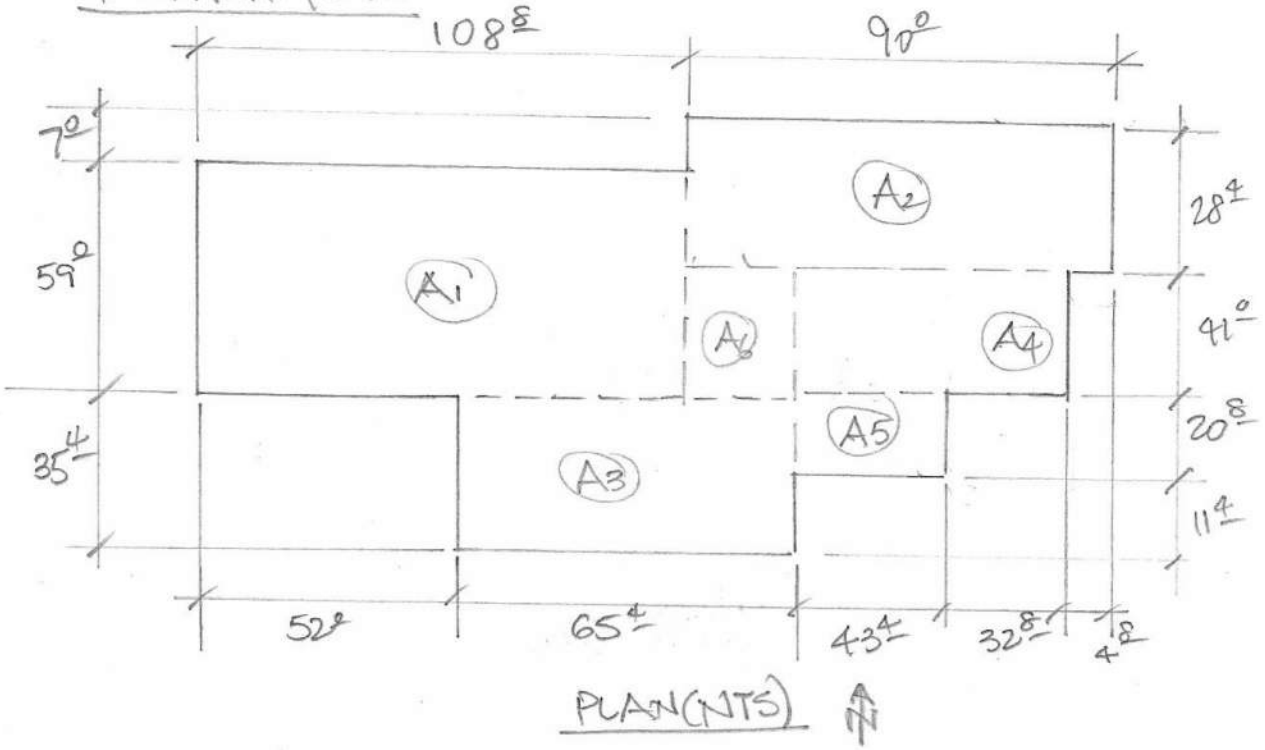
HUNTERS POINT RESEARCH FACILITY
830 PALOU ST., SF.
CAAN: 3011

BLDG AREAS & WTS.



PLAN (NTS)

A_1: 59 × 108.67 = 6412
A_2: 28.33 × 90 = 2550
A_3: 35.33 × 65.33 = 2308
A_4: 41 × 76 = 3116
A_5: 20.67 × 43.33 = 896
A_6: 37.67 × 9.33 = 352

15,634 #

ROOF WTS

ROOF WTS:

SLAB: $\frac{8}{12}(0.150)(15,634) = 1563^K$

EQUIP: $(15,634)\left(\frac{25^\#}{1000}\right) = 391^K$

$W_{R_1} = 1,954^K$

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HUNTERS PT.
CAAN: 3011

WALLS:

	EW	NS
Ext. Walls: $198.67 \times 2 + 101.33 \times 2 = 606^{LF}$;	397'	203'

Int. Walls:

EW: $164 \times 2 + 25 + 44 + 56 + 36 + 28 + 3 \times 21 =$ ——— 580'

NS: $9 \times 26 + 4 \times 26 + 70 + 2 \times 43 + 3 \times 23 + 3 \times 21 =$ ——— 626'

Total length Interior walls = 1206^{LF}

$L_{EW} = 977^{LF}$ $L_{NS} = 829^{LF}$

$\Sigma = 1,806^{LF}$

Openings: Discount Wall length by 20%

Effective lengths ⇒ $L_{EW} \approx 780^{LF}$; $L_{NS} \approx 660^{LF}$; TOTAL $L_W \approx 1440^{LF}$

WT walls: $\left(\frac{8}{12}\right)(0.150)\left[600 \times 8' + 1206 \times 5'\right] = 1,083^{k}$

TOTAL SEISMIC WT: $1954 + 1083 = 3,037^{k}$

Performance Objective (BPOE/Table 2.1) ⇒ use CP for BSE-C

BASE SHEAR: $V = CS_a W$ (Eq. 4-1 / ASCE (4-17))

$C = 1.4$ (1-story C2 Bldg) (Table 4-7)

$T = C_t h_n^{\beta} = (0.02)(10)^{0.75} = 0.11$ sec (Eq. 4-4)

$S_{CS} = 1.424g$; $S_1 = 0.967g$ (BSE-C — Egan 2019)

$S_a = S_{D1}/T \leq S_{CS}$ (Eq. 4-3)

$S_a = 0.967/0.11 = 8.8 >> 1.424 \Rightarrow S_a = 1.424$

$\therefore V = (1.4)(1.424)(3037^{k}) = 6,055^{k}$

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Avg Wall shear Stress:

$v_{avg} = V / A_w \cdot M_s$ ($M_s = 4.5$ — for CP)

EW Direction: $A_{w_{EW}} = 780^{LF}(8 \times 12) = 74{,}880\ in^2$

$V_{avg} = (6055 / (4.5)(74{,}880) \approx 18\ psi << 100\ (D/C = 0.18)$ ✓

NS Direction: $A_{w_{NS}} = 660^{LF}(8 \times 12) = 63{,}360\ in^2$

$V_{avg} = (6055 / (4.5)(63360) \approx 21\ psi << 100\ (D/C = 0.21)$ ✓

Shear Transfer @ Piles

Total No. piles = 156 $\Rightarrow V_p = 6055 / 156 = 38.8^k$

Dowels: 4-#7 (w/ 18" embedment); $A_s = 4 \times 0.60 = 2.40\ in^2$

$V_{capacity} = (0.7)(2.4)(40^{ksi}) = 67^k > 38.8^k$ ✓
(A_s) (f_y)

($D/C \approx 0.60$) ✓
[for unreduced shear demand]