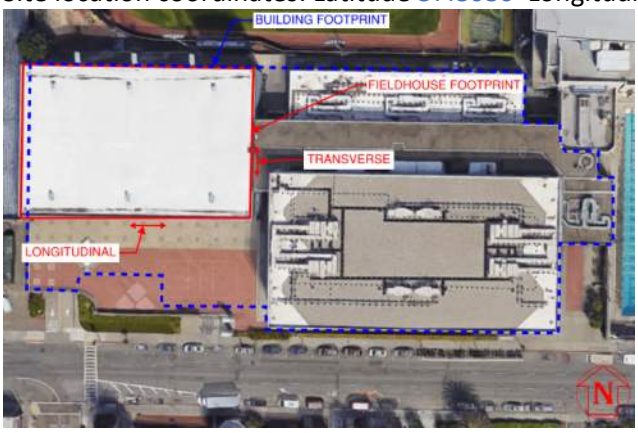
Degenkolb Berkeley UNIVERSITY OF CALIFORNIA

Evaluator: TAB
Date: 02/20/19

**ASCE 41-17 Tier 1 Seismic Evaluation**

Building Name: Recreational Sports Facility, Fieldhouse
CAAN ID: 1365
Auxiliary Building ID: 1365.3
Address: Core Campus, Berkeley, CA 94720
Site location coordinates: Latitude 37.8686 Longitudinal -122.2623




*Plan Image or Aerial Photo*

*South Elevation Photo*

**UCOP *SEISMIC PERFORMANCE LEVEL* (OR "RATING") BASED ON TIER 1 EVALUATION FINDINGS: V**

**BUILDING DATA**

ASCE 41-17 Model Building Type (Governing Building Type bolded for Seismic Risk Model when multiple types exist):

a. Longitudinal Direction: **S2A: Braced Frame w/ Flexible Diaphragm** over C2: Conc. SW
b. Transverse Direction: **S2A: Braced Frame w/ Flexible Diaphragm** over C2: Conc. SW

Square Footage: 51,233ft$^2$ (Including basement level) out of 191,703 ft$^2$ total
Building Length: 184'-3"
Building Width: 118'-6"
Building Height: 38'-8"
Story Height: 14'-0" (BSMT), 38'-8" (1st)
Number of stories *above* grade: 1
Number of basement stories *below* grade: 1

Year of Original Construction and Code Year: 1984, 1979 UBC
Year of Later Constuction and Code Year: 2007 (Wall Cladding Repair), 2001 CBC (Assumed)

**COST RANGE TO RETROFIT (if applicable): Medium: over $50 per sf and less than $200 per sf**

**BUILDING DESCRIPTION**

**General**

This building finished construction in 1984 and is situated on a level site. The structure referenced as, "Fieldhouse", is part of the RSF complex. The RSF has two buildings that are separated with an expansion joint in the parking garage level creating an East and West building. These buildings have separate superstructures separated by seismic joints above grade. The Fieldhouse Superstructure is part of the West Building at the RSF complex. The Fieldhouse Superstructure is one 39' tall story above a concrete parking podium. The building is rectangular in shape with a footprint of about 184'-3" feet in the EW direction and 118'-6" feet in the EW direction at the structure above the podium. The building area is approximately 53,800 square feet and houses hardwood courts above and parking in the podium level.

**Structural System**

The gravity structural system consists of metal deck with steel trusses spanning 118.5' in the transverse direction to steel wide flange columns. The ground level consists of precast/post-tensioned concrete tee beams that span 59'-6" in the transverse direction to concrete walls. The lateral system consists of braced frame system over a concrete shear wall system. The roof is a bare metal deck diaphragm that distributes load to perimeter braced frame lines. The braces are constructed of W14x43's and are arranged to form three X configurations between a 2 bay wide by 2 story tall steel framing in the longitudinal direction. In the transverse, the same braces are oriented to form two large X's in 3 bay wide by 3 story tall steel framing.(See appendix elevation figures for clarification) The frame lines of the braces align with the concrete shear walls below in the podium level. The ground floor diaphragm is a 4" topping slab or 6" slab that spans to the concrete shear wall system. The concrete shear walls are 12" thick and supported by a pile foundation that is tied together with a 6" slab on grade.

**Building Condition**

Good, no deteroiation observed.

**Date of Site Visit:** 02/15/2019, Ray Pugliesi & Torrey Bolden, Degenkolb Engineers
Limitations of walk-through: none

**SITE INFORMATION**

Site Class (A-F): C Basis: Geologic Hazards and Site Classification, Geomatrix Plate 2
Site Specific Ground Motion Study? Yes, 2015 Update to the Site-Specific Seismic Hazard Analyses and Development of Seismic Design Ground Motions
**BSE-1N Spectral Accelerations:** Basis: 2015 Site Specific Report Table 5 for 36-75 ft Soil
$S_{DS}$: 2.40 $S_{D1}$: 0.71
**BSE-2E Spectral Accelerations:** Basis: 2015 Site Specific Report Table 6 for 36-75 ft Soil
$S_{XS}$: 3.15 $S_{X1}$: 1.05
Level of Seismicity: High
Performance Level: Collapse Prevention Structural Performance

Geologic Hazards:
Fault Rupture No Basis: Earthquake Zones of Required Investigation- Oakland West Quadrangle https://maps.conservation.ca.gov/cgs/informationwarehouse/regulatorymaps/

Liquefaction No Basis: Earthquake Zones of Required Investigation- Oakland West Quadrangle https://maps.conservation.ca.gov/cgs/informationwarehouse/regulatorymaps/
Landslide No Basis: Earthquake Zones of Required Investigation- Oakland West Quadrangle https://maps.conservation.ca.gov/cgs/informationwarehouse/regulatorymaps/

**PREVIOUS RATINGS SUMMARY**

1. Good – 1997 Preliminary Seismic Evaluation (SAFER), Forell Elsesser Engineers, Inc.

**DOCUMENTATION**

Architectural Drawings: "University of California, Berkley Intramural Sports Facility", ELS Design Group, 06/29/1982, A0.0-A9.7 (Sub Consultant DWG's Included)

Structural Drawings: "University of California, Berkley Intramural Sports Facility", T.Y. Lin International, 06/29/1982, S1-S25 with RS1-RS5

Seismic Evaluations: "1997 Preliminary Seismic Evaluation (SAFER)", Forell Elsesser Engineers, Inc., 08/19/1997, FEMA-178 Structural Checklist

Geotechnical Reports: "Report of Soils and Foundation Investigation", Provenzano & Assoc., 05/15/1981

Other Documents: "Recreational Sports Facility – Wall Cladding Repair, Technical Roof Services, Inc., July, 2004, Drawings

**CONSTRUCTION DATA**

| | | | |
|---|---|---|---|
| Gravity Load Structural System: | Metal deck on steel trusses spanning to steel WF columns at roof. PC/PT Concrete Tee beams with topping slab span to walls at podium level. | | |
| Exterior Transverse Walls: | Stud w/ plaster | Opening(s)? | Yes |
| Exterior Longitudinal Walls: | Stud w/ plaster | Opening(s)? | Yes |
| Roof Materials/Framing: | 1 ½" 16 ga. Metal Deck | | |
| Intermediate Floors/Framing: | N/A | | |
| Ground Floor: | PC/PT Concrete Tee beams with 4" topping slab spanning to walls. | | |
| Columns: | W14x43, 68, or 82 | Foundation: | Pile Foundation |
| General Condition of Structure: | Good | | |
| Evidence of Settling?: | No | | |
| Special Features & Comments: | The brace connections are not explicitly designed rather they were deferred to the contractor. Braces are multi-tiered to the roof. The building shares a pile foundations along GL 7. | | |

**LATERAL-FORCE-RESISTING SYSTEM**

| | Longitudinal | Transverse |
|---|---|---|
| **ASCE 41-17 Building Type:** | S2 BF over C2 Conc. SW | S2 BF over C2 Conc. SW |
| Diaphragms: | Metal Deck o/ Conc. Top. | Metal Deck o/ Conc. Top. |
| Vertical Elements: | WF Col / Conc. SW | WF Col / Conc. SW |

| | | |
|---|---|---|
| Connections: | Shear Tabs , Haunch Seats | Shear Tabs , Haunch Seats |
| Details: | RS-3 haunch, RS-5 steel | RS-3 haunch, RS-5 steel |
| Estimated Fundamental Period, T (sec): | 0.308 | 0.308 |
| BSE-2E Spectral Acceleration, $S_a$: | 3.15g | 3.15g |
| Modification Factor, C: | 1.2 (S2 – Table 4-7) | 1.2 (S2 – Table 4-7) |
| Building Weight, W (kips): | 678 (S2) , 7277 (C2) | 678 (S2) , 7277 (C2) |
| Seismic Base Shear, V (kips): | 2562 (S2) , 32093 (C2) | 2562 (S2) , 32093 (C2) |
| System Modification Factor, $M_s$: | 7.0 (BF) ,4.5 (SW) | 7.0 (BF) ,4.5 (SW) |

**Significant Structural Deficiencies, Potentially Affecting *Seismic Performance Level* Designation:**

- ☐ Lateral System Stress Check (wall shear, column shear or flexure, or brace axial as applicable)
- ☐ Load Path
- ☑ Adjacent Buildings
- ☐ Weak Story
- ☐ Soft Story
- ☑ Geometry (horizontal irregularities)
- ☐ Torsion
- ☐ Mass – Vertical Irregularity
- ☐ Cripple Walls
- ☐ Wood Sills (bolting)
- ☐ Diaphragm Continuity
- ☐ Openings at Shear Walls (concrete or masonry)
- ☐ Liquefaction
- ☐ Slope Failure
- ☐ Surface Fault Rupture
- ☐ Masonry or Concrete Wall Anchorage at Flexible Diaphragm
- ☐ URM wall height to thickness ratio
- ☐ URM Parapets or Cornices
- ☐ URM Chimney
- ☐ Heavy Partitions Braced by Ceilings
- ☐ Appendages

**OVERALL SEISMIC DEFICIENCIES & EXPECTED SEISMIC PERFORMANCE**

The below items have been identified as non-compliant:

1. *Connection Strength* – The brace connections are shown on the construction documents as a deferred items. The W14x43 braces are referenced with a 100k connection strength and the tensile capacity of the brace far exceeds this design strength. This deficiency could lead to a loss of the structural system.
2. *Adjacent Buildings* - Seismic joints between the adjacent structures are inadequate for the expected displacements. The roof levels of the adjacent Handball superstructure does align with the roof diaphragm in the Fieldhouse Superstructure. The alignment of the stories should mitigate the structural damage related to pounding.
3. *Uplift at Pile Caps* – There is no detail showing the connection of the pile cap to the piles. This may induce rocking at the foundation. It is believed that the connection detail may be on a previous sub-package that is not available at this time. This is not expected to be life safety issue.

This structure has been assigned a SPL rating of V due to the above. Assuming the brace connections meet the design criteria on the construction documents exactly, the connections are expected to be inadequate for the demands required. The loss of connections results in a potential collapse hazard. With a better understanding of the brace connections through access to the shop drawings or a field survey of the connections, and a more detailed Tier 2 or Tier 3 analysis, these deficiencies and their resulting seismic behavior can be better understood and further evaluated.

No non-structural deficiencies are identified for this building.

**Seismic Retrofit Concept Sketches/Description (only if above-listed rating is V or greater):**

The main deficiency of this structure is a result of poor brace connections. The brace connections could be strengthened or the members could be replaced, possibly with BRBs, and the appropriate connections. Column strengthening may also be required to facilitate the new bracing system.

**Appendices**

A. Additional Photos

B. ASCE 41-17 Tier 1 Checklists (Structural)

C. UCOP Seismic Safety Policy Falling Hazards Assessment Summary

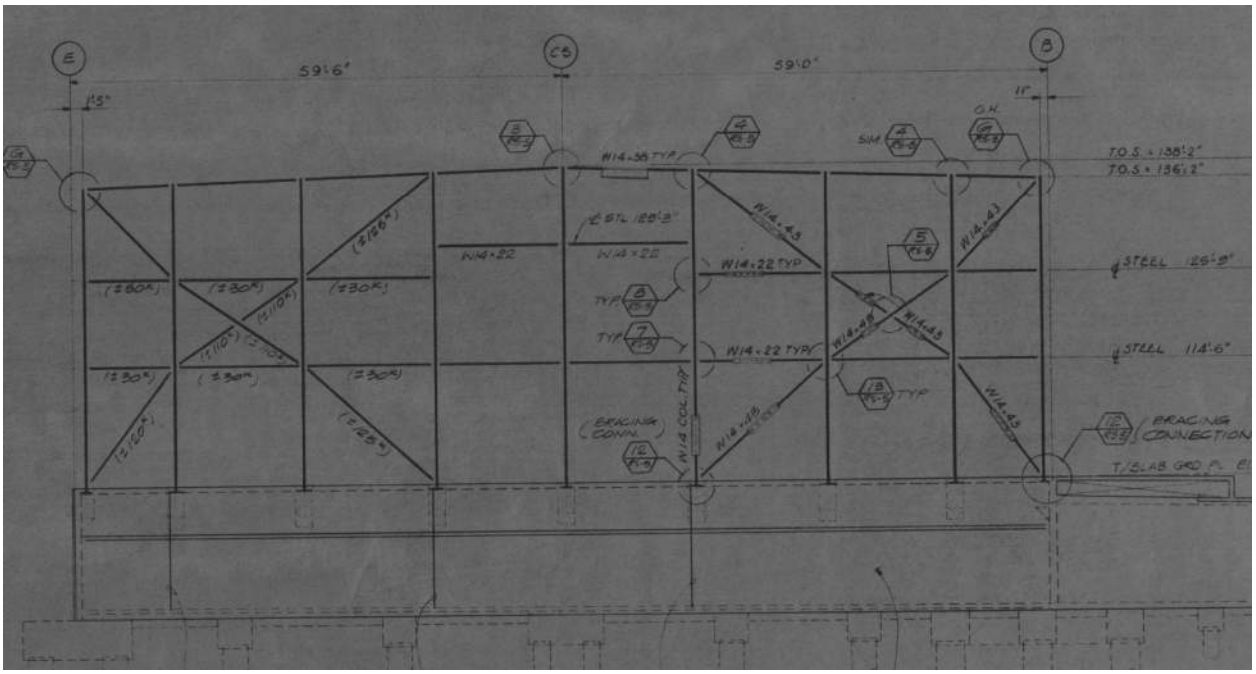
D. Quick Check Calculations

**APPENDIX A**
**Additional Photos**

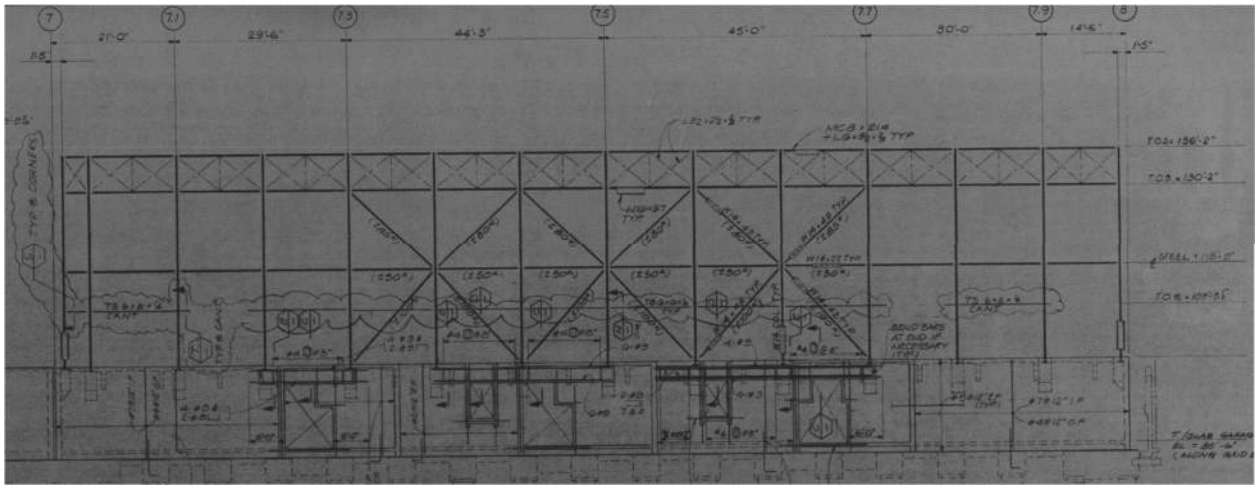
Seismic Joint Where Building Share a Pile Foundation on GL 7

Steel Trusses and Underside of Roof

Haunch Supporting Braced Frame Columns




Transverse Braced Frame Elevation




Longitudinal Braced Frame Elevation

**APPENDIX B**
**ASCE 41-17 Tier 1 Checklist (Structural)**

| UC Campus: | Berkeley | | | Date: | 2/20/2019 | | |
|---|---|---|---|---|---|---|---|
| Building CAAN: | 1365 | Auxiliary CAAN: | 1365.3 | By Firm: | Degenkolb Engineers | | |
| Building Name: | Recreational Sports Facility, Fieldhouse | | | Initials: | TAB | Checked: | |
| Building Address: | 2301 Bancroft Way, Berkeley, CA | | | Page: | 1 | of | 3 |

# ASCE 41-17
# Collapse Prevention Basic Configuration Checklist

## LOW SEISMICITY

### BUILDING SYSTEMS - *GENERAL*

| C | NC | N/A | U | Description |
|---|---|---|---|---|
| ■ | ☐ | ☐ | ☐ | LOAD PATH: The structure contains a complete, well-defined load path, including structural elements and connections, that serves to transfer the inertial forces associated with the mass of all elements of the building to the foundation. (Commentary: Sec. A.2.1.1. Tier 2: Sec. 5.4.1.1)<br><br>Comments: |
| ☐ | ■ | ☐ | ☐ | ADJACENT BUILDINGS: The clear distance between the building being evaluated and any adjacent building is greater than 0.25% of the height of the shorter building in low seismicity, 0.5% in moderate seismicity, and 1.5% in high seismicity. (Commentary: Sec. A.2.1.2. Tier 2: Sec. 5.4.1.2)<br><br>Comments:<br>Expansion joint of 1 ½" inadequate. See detail 3/A3.11. |
| ☐ | ☐ | ■ | ☐ | MEZZANINES: Interior mezzanine levels are braced independently from the main structure or are anchored to the seismic-force-resisting elements of the main structure. (Commentary: Sec. A.2.1.3. Tier 2: Sec. 5.4.1.3)<br><br>Comments: |

### BUILDING SYSTEMS - *BUILDING CONFIGURATION*

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

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

| UC Campus: | Berkeley | | | Date: | 2/20/2019 | | |
|---|---|---|---|---|---|---|---|
| Building CAAN: | 1365 | Auxiliary CAAN: | 1365.3 | By Firm: | Degenkolb Engineers | | |
| Building Name: | Recreational Sports Facility, Fieldhouse | | | Initials: | TAB | Checked: | |
| Building Address: | 2301 Bancroft Way, Berkeley, 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)<br><br>Comments:<br>The horizontal dimension changes by more than 30% in the EW direction between the superstructure and podium levels. |
| ☑ | ☐ | ☐ | ☐ | MASS: There is no change in effective mass of more than 50% from one story to the next. Light roofs, penthouses, and mezzanines need not be considered. (Commentary: Sec. A.2.2.6. Tier 2: Sec. 5.4.2.5)<br><br>Comments:<br>Light roof over concrete podium has a mass differential greater than 50%, but the roof is light. |
| ☑ | ☐ | ☐ | ☐ | TORSION: The estimated distance between the story center of mass and the story center of rigidity is less than 20% of the building width in either plan dimension. (Commentary: Sec. A.2.2.7. Tier 2: Sec. 5.4.2.6)<br><br>Comments:<br>Regular above the podium level. |

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

### GEOLOGIC SITE HAZARD

| C | NC | N/A | U | Description |
|---|---|---|---|---|
| ☑ | ☐ | ☐ | ☐ | LIQUEFACTION: Liquefaction-susceptible, saturated, loose granular soils that could jeopardize the building's seismic performance do not exist in the foundation soils at depths within 50 ft (15.2m) under the building. (Commentary: Sec. A.6.1.1. Tier 2: 5.4.3.1)<br><br>**Comments:** |
| ☑ | ☐ | ☐ | ☐ | SLOPE FAILURE: The building site is located away from potential earthquake-induced slope failures or rockfalls so that it is unaffected by such failures or is capable of accommodating any predicted movements without failure. (Commentary: Sec. A.6.1.2. Tier 2: 5.4.3.1)<br><br>**Comments:** |
| ☑ | ☐ | ☐ | ☐ | SURFACE FAULT RUPTURE: Surface fault rupture and surface displacement at the building site are not anticipated. (Commentary: Sec. A.6.1.3. Tier 2: 5.4.3.1)<br><br>**Comments:** |

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

| UC Campus: | Berkeley | | | Date: | 2/20/2019 | | |
|---|---|---|---|---|---|---|---|
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| Building Address: | 2301 Bancroft Way, Berkeley, 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)<br><br>**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)<br><br>**Comments:** |

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

| UC Campus: | Berkeley | | | Date: | 2/11/2019 | | |
|---|---|---|---|---|---|---|---|
| Building CAAN: | 1365 | Auxiliary CAAN: | 1365.3 | By Firm: | Degenkolb Engineers | | |
| Building Name: | Recreational Sports Facility, Fieldhouse | | | Initials: | TAB | Checked: | |
| Building Address: | 2301 Bancroft Way, Berkley, CA | | | Page: | 1 | of | 4 |

# ASCE 41-17
# Collapse Prevention Structural Checklist For Building Type S2-S2A

## LOW SEISMICITY

### SEISMIC-FORCE-RESISTING SYSTEM

| | Description |
|---|---|
| C ☒ NC ☐ N/A ☐ U ☐ | REDUNDANCY: The number of lines of braced frames in each principal direction is greater than or equal to 2. (Commentary: Sec. A.3.3.1.1. Tier 2: Sec. 5.5.1.1)<br>**Comments:** |
| C ☒ NC ☐ N/A ☐ U ☐ | COLUMN AXIAL STRESS CHECK: The axial stress caused by gravity loads in columns subjected to overturning forces is less than $0.10F_y$. Alternatively, the axial stress caused by overturning forces alone, calculated using the Quick Check procedure of Section 4.4.3.6, is less than $0.30F_y$. (Commentary: Sec. A.3.1.3.2. Tier 2: Sec. 5.5.2.1.3)<br>**Comments:**<br>BF Columns do not have high gravity loads |
| C ☒ NC ☐ N/A ☐ U ☐ | BRACE AXIAL STRESS CHECK: The axial stress in the diagonals, calculated using the Quick Check procedure of Section 4.4.3.4, is less than $0.50F_y$. (Commentary: Sec. A.3.3.1.2. Tier 2: Sec. 5.5.4.1)<br>**Comments:** |

### CONNECTIONS

| | Description |
|---|---|
| C ☒ NC ☐ N/A ☐ U ☐ | TRANSFER TO STEEL FRAMES: Diaphragms are connected for transfer of seismic forces to the steel frames. (Commentary: Sec. A.5.2.2. Tier 2: Sec. 5.7.2)<br>**Comments:** |
| C ☐ NC ☒ N/A ☐ U ☐ | STEEL COLUMNS: The columns in seismic-force-resisting frames are anchored to the building foundation. (Commentary: Sec. A.5.3.1. Tier 2: Sec. 5.7.3.1)<br>**Comments:**<br>Steel columns are discontinuous at concrete shear walls and land on cast-in-place haunches. Concrete column detailing in not continuous to the foundation. |

# ASCE 41-17
# Collapse Prevention Structural Checklist For Building Type S2-S2A

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

### SEISMIC-FORCE-RESISTING SYSTEM

| C | NC | N/A | U | Description |
|---|---|---|---|---|
| ☉ | ☐ | ☐ | ☐ | REDUNDANCY: The number of braced bays in each line is greater than 2. (Commentary: Sec. A.3.3.1.1. Tier 2: Sec. 5.5.1.1)<br>**Comments:** |
| ☐ | ☉ | ☐ | ☐ | CONNECTION STRENGTH: All the brace connections develop the buckling capacity of the diagonals. (Commentary: Sec. A.3.3.1.5. Tier 2: Sec. 5.5.4.4)<br>**Comments:**<br>Braces in the E-W direction are W14x43's have a buckling capacity of ~166k w/ unbraced L of 21.75'. Deferred connection design force of ±100k |
| ☉ | ☐ | ☐ | ☐ | COMPACT MEMBERS: All brace elements meet compact section requirements in accordance with AISC 360, Table B4.1. (Commentary: Sec. A.3.3.1.7. Tier 2: Sec. 5.5.4)<br>**Comments:**<br>W14x43 meets compactness requirements for ASTM A36 steel specified on drawings. |
| ☉ | ☐ | ☐ | ☐ | K-BRACING: The bracing system does not include K-braced bays. (Commentary: Sec. A.3.3.2.1. Tier 2: Sec. 5.5.4.6)<br>**Comments:** |

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

### SEISMIC-FORCE-RESISTING SYSTEM

| C | NC | N/A | U | Description |
|---|---|---|---|---|
| ☐ | ☐ | ☉ | ☐ | COLUMN SPLICES: All column splice details located in braced frames develop 50% of the tensile strength of the column. (Commentary: Sec. A.3.3.1.3. Tier 2: Sec. 5.5.4.2)<br>**Comments:**<br>No column splices |

# ASCE 41-17
# Collapse Prevention Structural Checklist For Building Type S2-S2A

| C | NC | N/A | U | |
|---|---|---|---|---|
| ☒ | ☐ | ☐ | ☐ | SLENDERNESS OF DIAGONALS: All diagonal elements required to carry compression have *Kl/r* ratios less than 200. (Commentary: Sec. A.3.3.1.4. Tier 2: Sec. 5.5.4.3)<br>**Comments:** |
| ☐ | ☒ | ☐ | ☐ | CONNECTION STRENGTH: All the brace connections develop the yield capacity of the diagonals. (Commentary: Sec. A.3.3.1.5. Tier 2: Sec. 5.5.4.4)<br>**Comments:**<br>Braces in the E-W direction are W14x43's have a buckling capacity of ~166k w/ unbraced L of 21.75'. Deferred connection design force of ±100k |
| ☒ | ☐ | ☐ | ☐ | COMPACT MEMBERS: All brace elements meet section requirements in accordance with AISC 341, Table D1.1, for moderately ductile members. (Commentary: Sec. A.3.3.1.7. Tier 2: Sec.5.5.4)<br>**Comments:**<br>W14x43 meets ductility requirements for ASTM A36 steel specified on drawings. |
| ☒ | ☐ | ☐ | ☐ | CHEVRON BRACING: Beams in chevron, or V-braced, bays are capable of resisting the vertical load resulting from the simultaneous yielding and buckling of the brace pairs. (Commentary: Sec. A.3.3.2.3. Tier 2: Sec. 5.5.4.6)<br>**Comments:** |
| ☒ | ☐ | ☐ | ☐ | CONCENTRICALLY BRACED FRAME JOINTS: All the diagonal braces frame into the beam–column joints concentrically. (Commentary: Sec. A.3.3.2.4. Tier 2: Sec. 5.5.4.8)<br>**Comments:**<br>Suggested bracing connections are concentric. |

## DIAPHRAGMS (STIFF OR FLEXIBLE)

| | | | | Description |
|---|---|---|---|---|
| C | NC | N/A | U | |
| ☒ | ☐ | ☐ | ☐ | OPENINGS AT FRAMES: Diaphragm openings immediately adjacent to the braced frames extend less than 25% of the frame length. (Commentary: Sec. A.4.1.5. Tier 2: Sec. 5.6.1.3)<br>**Comments:** |

## 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)<br>**Comments:**<br>Continuous top chord of open web joists at roof diaphragm, and cross bracing perpendicular to joists |

| UC Campus: | Berkeley | | | Date: | 2/11/2019 | | |
|---|---|---|---|---|---|---|---|
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| Building Name: | Recreational Sports Facility, Fieldhouse | | | Initials: | *TAB* | Checked: | |
| Building Address: | 2301 Bancroft Way, Berkley, CA | | | Page: | 4 | of | 4 |

# ASCE 41-17
# Collapse Prevention Structural Checklist For Building Type S2-S2A

| 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)<br><br>**Comments:** |
| ☐ | ☐ | ☒ | ☐ | SPANS: All wood diaphragms with spans greater than 24 ft (7.3 m) consist of wood structural panels or diagonal sheathing. (Commentary: Sec. A.4.2.2. Tier 2: Sec. 5.6.2)<br><br>**Comments:** |
| ☐ | ☐ | ☒ | ☐ | 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)<br><br>**Comments:** |
| ☒ | ☐ | ☐ | ☐ | 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)<br><br>**Comments:** |

| UC Campus: | Berkeley | | | Date: | 2/12/19 | | |
|---|---|---|---|---|---|---|---|
| Building CAAN: | 1356 | Auxiliary CAAN: | 1365.3 | By Firm: | Degenkolb Engineers | | |
| Building Name: | Recreational Sports Facility, Fieldhouse | | | Initials: | TAB | Checked: | |
| Building Address: | 2301 Bancroft Way, Berkeley, 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)<br>**Comments:**<br>Podium level concrete walls support braced frame system above and podium slab. No continuous concrete column detailing to the foundation. |
| 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)<br>**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)<br>**Comments:** |
| 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)<br>**Comments:** |

## 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)<br>**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)<br>**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)<br><br>**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)<br><br>**Comments:**<br>No secondary columns present |
| C | NC | N/A | U | |
| ☐ | ☐ | ☑ | ☐ | 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)<br><br>**Comments:** |
| C | NC | N/A | U | |
| ☑ | ☐ | ☐ | ☐ | 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)<br><br>**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)<br><br>**Comments:** |
| C | NC | N/A | U | |
| ☑ | ☐ | ☐ | ☐ | 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)<br><br>**Comments:** |

| UC Campus: | Berkeley | | | Date: | 2/12/19 | | |
|---|---|---|---|---|---|---|---|
| Building CAAN: | 1356 | Auxiliary CAAN: | 1365.3 | By Firm: | Degenkolb Engineers | | |
| Building Name: | Recreational Sports Facility, Fieldhouse | | | Initials: | TAB | Checked: | |
| Building Address: | 2301 Bancroft Way, Berkeley, 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)<br><br>**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)<br><br>**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)<br><br>**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)<br><br>**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)<br><br>**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)<br><br>**Comments:**<br>Positive connections to existing piles not shown in drawings referenced for this evaluation. Believed to be part of previous sub-package. |

**APPENDIX C**
**UCOP Seismic Safety Policy Falling Hazards Assessment Summary**

| UC Campus: | Berkeley | | | Date: | 2/14/2019 | | |
|---|---|---|---|---|---|---|---|
| Building CAAN: | 1365 | Auxiliary CAAN: | 1365.3 | By Firm: | DEGENKOLB ENGINEERS | | |
| Building Name: | Recreational Sports Facility, Fieldhouse | | | Initials: | *TAB* | Checked: | |
| Building Address: | 2301 Bancroft Way, Berkley, 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)**<br>**Comments:** |
| P ☐ N/A ☒ | **Heavy masonry or stone veneer above exit ways or public access areas**<br>**Comments:** |
| P ☐ N/A ☒ | **Unbraced masonry parapets, cornices, or other ornamentation above exit ways or public access areas**<br>**Comments:** |
| P ☐ N/A ☒ | **Unrestrained hazardous material storage**<br>**Comments:** |
| P ☐ N/A ☒ | **Masonry chimneys**<br>**Comments:** |
| P ☐ N/A ☒ | **Unrestrained natural gas-fueled equipment such as water heaters, boilers, emergency generators, etc.**<br>**Comments:** |
| P ☐ N/A ☐ | **Other:**<br>**Comments:** |
| P ☐ N/A ☐ | **Other:**<br>**Comments:** |
| P ☐ N/A ☐ | **Other:**<br>**Comments:** |

Falling Hazard Risk: Low

Note: P= Present, N/A = Not Applicable

**APPENDIX D**
**ASCE 41-17 Quick Check Calculations**

| | | | | | |
|---|---|---|---|---|---|
| **Subject:** | Weight Take Off | **Job Number:** | B8114004.00 | **Date:** | 7/11/2019 |
| **Job:** | RSF - Fieldhouse | **By:** | TAB | **Section:** | |
| | | **Checked By:** | | **Page/of:** | |

| **Roofing** | |
|---|---|
| Material | Area Weight |
| 1.5" 16 GA Metal Deck | 4 |
| 4 ply felt and gravel | 5.5 |
| R-11 Insulation | 2.25 |
| PV Installation | 10 |
| **Σ** | **22** |

| **Exterior Partition** | |
|---|---|
| Material | Area Weight |
| 6" Struct Studs | 1.5 |
| 1" Rigid Insulation | 1.5 |
| Batt Insulation | 1 |
| 7/8" Cem Plaster | 11 |
| 1/2" Gyp | 2 |
| **Σ** | **17** |

**Tee "T1" Slab Weight** 120 **pcf**

| **Section** | **Area [ft²]** | | |
|---|---|---|---|
| Flange | 4.17 | 50 | |
| Flange Taper | 1.36 | 16 | |
| Web | 2 | 24 | |
| | Σ | 90 | psf |

| **Gym Floor** | |
|---|---|
| Material | Area Weight |
| T1 PC/PT | 90 |
| Batt Insulation | 0.5 |
| Wood Plat. | 1.5 |
| **Σ** | **93** |

**Roof**

| | | |
|---|---|---|
| L = | 184.25 | ft |
| D = | 118.5 | ft |
| Area = | 21834 | $ft^2$ |

| **Item** | **Total #** | **Area ft2** | **Length ft** | **Height ft** | **Area Weight psf** | **Weight lbf** | |
|---|---|---|---|---|---|---|---|
| Roofing | | 21834 | | | 22 | 480340 | |
| Exterior Partition Wall | | | 606 | 19.2 | 17 | 197438 | |
| | | | | | **Σ $W_{floor}$** | **678** | **kip** |

**Ground**

| **Item** | **Total #** | **Area ft2** | **Length ft** | **Height ft** | **Area Weight psf** | **Weight lbf** | |
|---|---|---|---|---|---|---|---|
| Exterior Partition Wall | | | 606 | 19.2 | 17 | 197438 | |
| Slab Area | | 32000 | | | 93 | 2976000 | |
| 4" LWC Topping | | 32000 | | | 40 | 1280000 | |
| 12" Conc Wall | | | 1022 | 14.0 | 150 | 2146200 | |
| | | | | | **Σ $W_{floor}$** | **6600** | **kip** |
| | | | | | **Σ $W_{total}$** | **7277** | **kip** |

Degenkolb

| | | | | | |
|---|---|---|---|---|---|
| **Subject:** | Base forces | **Job Number:** | B8114004 | **Date:** | 7/11/2019 |
| **Job:** | RSF - Fieldhouse | **By:** | TAB | | |
| | | **Checked By:** | | | |

## ASCE 41-17 Linear Static Base Shear
## Tier 1

# Braced Frame Base Shear

**INPUT DATA**

| | | | | | |
|---|---|---|---|---|---|
| C: | Modification factor (Table 4-7) = | 1.2 | | 2 BF Stories | |
| $S_1$: | Spectral Response Acceleration @ 1 sec. = | 1.03 | | (from MCE maps or Site Specific) | |
| $S_s$: | Short Period Response Acceleration = | 2.47 | | (from MCE maps or Site Specific) | |
| SC: | Soil Class = | D | | (A through F), 1.6.1.4.1 | |

| Table 1-5: | $S_1$ <= 0.1 | $S_1$ = 0.2 | $S_1$ = 0.3 | $S_1$ = 0.4 | $S_1$ >= 0.5 |
|---|---|---|---|---|---|
| Soil Class D | 2.4 | 2.0 | 1.8 | 1.6 | 1.5 |
| $F_v$ | - | - | - | - | 1.50 |

| | | | | | |
|---|---|---|---|---|---|
| $F_v$: | Site Coefficient for $S_1$ = | 1.50 | | (Table 11.4-1) | |

| Table 1-4: | $S_s$ <= 0.25 | $S_s$ = 0.50 | $S_s$ = 0.75 | $S_s$ = 1.00 | $S_s$ >= 1.25 |
|---|---|---|---|---|---|
| Soil Class D | 1.6 | 1.4 | 1.2 | 1.1 | 1.0 |
| $F_a$ | - | - | - | - | 1.00 |

| | | | | |
|---|---|---|---|---|
| $F_a$: | Site Coefficient for $S_s$ = | 1.00 | | (Table 11.4-2) |
| $S_{X1}$: | Spectral Response Acceleration @ 1 sec. = | 1.05 | | Table 6, UCB Site Specific |
| $S_{xs}$: | Short Period Acceleration = $F_a$*$S_s$ = | 3.15 | | Table 6, UCB Site Specific |
| $\beta$: | Building System Exponent = | 0.75 | | (4.4.2.4) |
| $C_t$: | Building System Coefficient = | 0.02 | | (4.4.2.4) |
| W: | Total Building Weight = | 678 | kips | |
| hn: | Total Building Height = | 38.3 | feet | |
| n: | Number of Stories = | 2 | | |
| $S_{M1}$: | Spectral Response Acceleration @ 1 sec. = | 1.07 | | (2-2) |
| $S_{Ms}$: | Short Period Acceleration = $F_a$*$S_s$ = | 3.60 | | (2-1) |
| $S_{d1}$: | Design spectral acceleration, 1 s = | 0.71 | | |
| $S_{ds}$: | Design spectral acceleration, short = | 2.40 | | |

**CALCULATE BASE SHEAR FOR BSE-2 (MCE)**

| | | | | |
|---|---|---|---|---|
| T: | Fundamental Period of Vibration = $C_t$ * $h^{\beta}$ = | 0.308 | sec. | (4-4) |
| $S_a$: | Spectral Acceleration at Building Period = | 3.15 | | (4-3) |
| V: | Pseudo Seismic Force = | 2562 | kips | (4-1) |

Degenkolb

| | | | | |
|---|---|---|---|---|
| **Subject:** | Base forces | **Job Number:** | B8114004 | **Date:** 7/11/2019 |
| **Job:** | RSF - Fieldhouse | **By:** | TAB | |
| | | **Checked By:** | | |

**ASCE 41-17 Linear Static Base Shear**
**Tier 1**

## Concrete Shearwall Base Shear

**INPUT DATA**

| | | | | |
|---|---|---|---|---|
| C: | Modification factor (Table 4-7) = | 1.4 | | 1 Conc SW Stories |
| $S_1$: | Spectral Response Acceleration @ 1 sec. = | 1.03 | | (from MCE maps or Site Specific) |
| $S_s$: | Short Period Response Acceleration = | 2.47 | | (from MCE maps or Site Specific) |
| SC: | Soil Class = | D | | (A through F), 1.6.1.4.1 |

| Table 1-5: | $S_1$ <= 0.1 | $S_1$ = 0.2 | $S_1$ = 0.3 | $S_1$ = 0.4 | $S_1$ >= 0.5 |
|---|---|---|---|---|---|
| Soil Class D | 2.4 | 2.0 | 1.8 | 1.6 | 1.5 |
| $F_v$ | - | - | - | - | 1.50 |

| | | | | |
|---|---|---|---|---|
| $F_v$: | Site Coefficient for $S_1$ = | 1.50 | | (Table 11.4-1) |

| Table 1-4: | $S_s$ <= 0.25 | $S_s$ = 0.50 | $S_s$ = 0.75 | $S_s$ = 1.00 | $S_s$ >= 1.25 |
|---|---|---|---|---|---|
| Soil Class D | 1.6 | 1.4 | 1.2 | 1.1 | 1.0 |
| $F_a$ | - | - | - | - | 1.00 |

| | | | | |
|---|---|---|---|---|
| $F_a$: | Site Coefficient for $S_s$ = | 1.00 | | (Table 11.4-2) |
| $S_{X1}$: | Spectral Response Acceleration @ 1 sec. = | 1.05 | | Table 6, UCB Site Specific |
| $S_{xs}$: | Short Period Acceleration = $F_a$*$S_s$ = | 3.15 | | Table 6, UCB Site Specific |
| $\beta$: | Building System Exponent = | 0.75 | | (4.4.2.4) |
| $C_t$: | Building System Coefficient = | 0.02 | | (4.4.2.4) |
| W: | Total Building Weight = | 7277 | kips | |
| hn: | Total Building Height = | 14.0 | feet | |
| n: | Number of Stories = | 1 | | |
| $S_{M1}$: | Spectral Response Acceleration @ 1 sec. = | 1.07 | | (2-2) |
| $S_{Ms}$: | Short Period Acceleration = $F_a$*$S_s$ = | 3.60 | | (2-1) |
| $S_{d1}$: | Design spectral acceleration, 1 s = | 0.71 | | |
| $S_{ds}$: | Design spectral acceleration, short = | 2.40 | | |

**CALCULATE BASE SHEAR FOR BSE-2 (MCE)**

| | | | | |
|---|---|---|---|---|
| T: | Fundamental Period of Vibration = $C_t$ * $h^{\beta}$ = | 0.145 | sec. | (4-4) |
| $S_a$: | Spectral Acceleration at Building Period = | 3.15 | | (4-3) |
| V: | Pseudo Seismic Force = | 32093 | kips | (4-1) |

Degenkolb

| | | | | | |
|---|---|---|---|---|---|
| **Subject:** | Shear Stress Check *4.4.3.3* | **Job Number:** | B8114004 | **Date:** | 7/11/2019 |
| **Job:** | RSF - Fieldhouse | **By:** | TAB | | |
| | | **Checked By:** | | | |

Considering All Possible Wall

**North-South Loading**

| | | |
|---|---|---|
| Lwall = | 497.5 | ft |
| twall = | 12 | in |
| Ms = | 4.5 | for Conc SW, Limited Safety |
| Aw = | 71640 | $in^2$ |
| $V_{base}$= | 32093 | kip |
| vj-avg = | 100 | psi |

**East-West Loading**

| | | |
|---|---|---|
| Lwall = | 498.5 | ft |
| twall = | 12 | in |
| Ms = | 4.5 | for Conc SW, Limited Safety |
| Aw = | 71784 | |
| $V_{base}$= | 32093 | kip |
| vj-avg = | 99 | psi |

| | | | | | |
|---|---|---|---|---|---|
| **Subject:** | Wall Steel Reinforcement Ratio | **Job Number:** | B8114004 | **Date:** | 7/11/2019 |
| **Job:** | RSF - Fieldhouse | **By:** | TAB | | |
| | | **Checked By:** | | | |

## Concrete Walls

### Typical 12" Wall

Vertical: #4 at 12" o.c., each way, both faces

| | | | |
|---|---|---|---|
| twall = | 12 | in | |
| Abar = | 0.2 | in2 | |
| spacing = | 12 | in | |
| rho = | 0.0028 | OK | > 0.0012 vertical minimum ratio |

Vertical: #4 at 12" o.c., each way, both faces

| | | | |
|---|---|---|---|
| twall = | 12 | in | |
| Abar = | 0.2 | in2 | |
| spacing = | 12 | in | |
| rho = | 0.0028 | OK | > 0.002 horizontal minimum ratio |

| | | | | | |
|---|---|---|---|---|---|
| **Subject:** | Column Axial Check *4.4.3.6* | **Job Number:** | B8114004 | **Date:** | 7/11/2019 |
| **Job:** | RSF - Fieldhouse | **By:** | TAB | | |
| | | **Checked By:** | | | |

Material Properties

| | | |
|---|---|---|
| $f_y$ = | 36 | ksi |
| $f_{ye}$ = | - | ksi |

Tributary Area

| Roof Framing | | |
|---|---|---|
| $w_{joist}$ = | 7.5 | ft |
| $l_{joist}$ = | 118.5 | ft |
| Roof DL = | 22 | psf |
| Roof LL = | 20 | psf |
| $W_{DL}$ = | 19.6 | kip |
| $W_{LL}$ = | 4.4 | kip |
| $W_{grav}$ = | 31.8 | kip |

| Wall Trib | | |
|---|---|---|
| w = | 7.5 | ft |
| h = | 38.66 | ft |
| Wall DL = | 17 | psf |
| W = | 4.9 | kip |

Column Axial Stress Due to Gravity

**East West**

| Property | W14x43 |
|---|---|
| Ag $in^2$ | 12.6 |
| Fy x Ag | 453.6 |
| Pg / Py | **0.07** |

**< 0.1** Gravity Req

| | | | | | |
|---|---|---|---|---|---|
| **Subject:** | Diagonal Brace Check *4.4.3.4* | **Job Number:** | B8114004 | **Date:** | 7/11/2019 |
| **Job:** | RSF - Fieldhouse | **By:** | TAB | | |
| | | **Checked By:** | | | |

Material Properties

| | | |
|---|---|---|
| $f_y$ = | 36 | ksi |
| $f_{ye}$ = | - | ksi |

Diagonal Brace Check

**North South**

| | | |
|---|---|---|
| V = | 2562 | kip |
| s = | 13.2 | ft |
| $M_s$ = | 7.00 | *TBL 4-9* , Limited Safety |
| $L_{br}$ = | 19.9 | ft |
| $N_{br}$ = | 8 | |
| Ag = | 12.6 | W14x43 |
| $fj^{avg}$ = | 5.5 | kip |

**$f_j/f_y$ = 0.152**