The purpose of this evaluation report is to establish eligibility for Seismic Mitigation Program (SMP) funding as distributed by the State Allocation Board (SAB) and administered by the Office of Public School Construction (OPSC). It is not the intent of this evaluation to provide a complete ASCE 41 evaluation.

The evaluation is complete when eligibility has been determined.

|  |  |
| --- | --- |
| **TABLE OF CONTENTS** | **Structural Engineer Stamp** |
| 1. Eligibility Check Summary 2. Evaluation Process 3. Site and Building Description 4. Deficiency List 5. ASCE 41 Evaluation Statements  * Appendix A: Structural Calculations * Appendix B: Evaluation Statement Notes * Appendix C: Photographs and Details |  |

|  |  |
| --- | --- |
| **REPORT PREPARED BY:** | |
| Structural Engineer: | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (stamp and signature above) |
| Firm: | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| Address: | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| Phone (optional): | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| Email (optional): | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

**1. ELIGIBILITY CHECK SUMMARY**

|  |  |  |  |
| --- | --- | --- | --- |
|  | | **YES** | **NO** |
| **1.1** **Building Occupancy:** The building’s current or planned use involves regular occupancy by students and staff, as detailed in Section 3.2. | |  |  |
| **1.2** **Structural System:** The building’s seismic force-resisting system includes at least one of the building types listed in Section 3.5. | |  |  |
| **1.3** **Collapse Potential:** The building has deficiencies associated with a high potential for local or global collapse in the evaluation earthquake. See Sections 4 and 5 for a list of identified deficiencies. | |  |  |
| **1.3.1**  **Collapse Potential Due to Ground Shaking.** The following critical deficiencies have been identified: | | | |
| Load Path | Captive Columns | | |
| Weak Story | Beam Bars | | |
| Soft Story | Deflection Compatibility | | |
| Vertical Discontinuity | Flat Slabs | | |
| Mass | Redundancy | | |
| Torsion | Unreinforced Masonry Bearing Walls | | |
| Adjacent Buildings | Shear Stress Check (Shear Wall or Infill) | | |
| Mezzanines | Redundancy (Shear Wall) | | |
| Shear Stress Check (Column) | Openings at Shear Walls | | |
| Axial Stress Check | Topping Slab | | |
| Flat Slab Frames | Wall Anchorage | | |
| Other: This building is considered to have a high potential for local or global collapse in the evaluation earthquake because \_\_\_\_\_\_\_\_\_\_\_\_\_\_. Refer to Section 4 for additional information. | | | |
| **1.3.2**  **Collapse Potential Due to Geologic Hazard:**  Surface Fault Rupture  Liquefaction  Earthquake Induced Landslide | | | |

**2. EVALUATION PROCESS**

**2.1 Purpose and Scope**

As described in DSA Procedure (PR) 08-03: Seismic Mitigation Program, the primary purpose of this evaluation is to confirm the subject building’s eligibility for SMP funding as allocated by the SAB and administered by OPSC. Its intent is to identify conditions that represent “a high potential for catastrophic collapse”. The evaluation is based upon the following investigation measures:

* Document review: See Section 2.3 below for a summary of available documents.
* Site visit: See Section 2.4 below for a summary of scope of site observation.
* Completion of standardized evaluation checklists in Section 5 below based on the specific characteristics of the existing building to identify a critical deficiency.

It is not the intent of this evaluation to perform a complete life safety evaluation. Earthquake safety hazards other than those listed in this report might exist. Furthermore, it is not the intent of this evaluation to identify deficiencies with respect to post-earthquake use or recovery feasibility. Unless specifically noted, the scope of this evaluation does not include:

* Material testing or destructive investigation.
* Comprehensive condition assessment or verification of construction documents.
* Assessment of code compliance, either at present or at the time of construction.
* Assessment for load combinations not including earthquake effects.
* Consideration of hazards related to egress.
* Consideration of hazardous materials.
* Consideration of damage to nonstructural components or contents.
* Consideration of adjacent buildings or structures.

The collapse hazard potential of this building is based on the site’s geologic hazard as designated in Section 1.3.2 above. A geologic hazard report has been prepared and submitted to CGS for review and a copy is included with this evaluation report. The geologic hazard report identifies the expected displacements that will be imposed on the structure as a result of the geological hazard, and the structural analysis has been performed accordingly.

This report serves to demonstrate phase 1 eligibility as described in DSA PR 08-03. The remaining phases described in DSA PR 08-03 are outside the scope of this evaluation and report.

**2.2 Evaluation Criteria: Modifications to ASCE 41**

As described in DSA PR 08-03, this evaluation for collapse hazard potential is based on ASCE 41: Seismic Evaluation and Retrofit of Existing Buildings, using Tier 1 checklists as documented in Section 5 below. Where required by the checklists, Tier 1 “Quick Checks” are based on a Collapse Prevention (CP) performance objective under the BSE-2N (Basic Safety Earthquake-2 for new buildings and the Risk-Targeted Maximum Considered Earthquake) as defined in ASCE 41 Section 2.4.1.1. The ASCE 41 Tier 1 checklists are modified as follows:

* Nonstructural checklists are excluded. While some issues addressed by these checklists are relevant to nonstructural collapse potential, their completion is beyond the scope of this evaluation. Though not considered for the purpose of establishing funding eligibility, relevant deficiencies will be investigated and addressed during the mitigation phase.
* Evaluation statements required by ASCE 41 for Immediate Occupancy only are excluded.
* Evaluation statements not applicable to the subject building type are excluded.
* Certain evaluation statements related to “critical deficiencies” indicative of a high potential for structural collapse are identified.
* Evaluation statements are modified at the direction of DSA for clarity and consistency with this SMP program.

The following specific Tier 1 evaluation statements have been modified at the direction of DSA to reflect emphasis on collapse-level performance:

* Table 5B: The “OVERTURNING” evaluation statement is not included.
* Table 5C, Evaluation Statement C8: The requirement for 25 percent of the joint bars to be continuous for the length of the member is removed.
* Table 5E, Evaluation Statement E2: Statement is added because the presence of an unreinforced masonry bearing wall system is deemed a critical deficiency. ASCE 41 evaluation statements specific to the unreinforced masonry bearing wall system are omitted.
* Table 5H, Evaluation Statement JH: The 1/8-inch gap limitation relating to the stiffness of wall anchors is removed.

An ASCE 41 Tier 2 evaluation is provided for any critical item found to be noncompliant by the Tier 1 evaluation. Tier 2 evaluations are in accordance with ASCE 41 Chapter 5 based on the acceptance criteria determined as follows:

* Collapse Prevention (CP) performance objective under the BSE-2N (Basic Safety Earthquake-2 for new buildings and the Risk-Targeted Maximum Considered Earthquake) as defined in ASCE 41 Section 2.4.1.1.
* Life Safety (LS) performance objective under the BSE-1N (Basic Safety Earthquake-1 for new buildings) as defined in ASCE 41 Section 2.4.1.2.

**2.3 Document Review**

The documents listed in Table 2.3 below were available for reference in completing the evaluation, in general compliance with ASCE 41, Section 3.2. The Set ID is used to identify each document set as cited throughout this report.

| **TABLE 2.3: REVIEWED DOCUMENTS** | | |
| --- | --- | --- |
| **Set ID** | **Date** | **Description** |
|  |  |  |
|  |  |  |

**2.4 Site Visit**

In general compliance with ASCE 41, Section 4.2.1, the site was visited to verify the building configuration and condition for purpose of completing the evaluation.

|  |  |
| --- | --- |
| Visit Date: | \_\_\_\_\_\_\_\_\_\_ |
| Visiting Engineer(s) and Staff: | \_\_\_\_\_\_\_\_\_\_ |
| School District Contact Person: | \_\_\_\_\_\_\_\_\_\_ |
| School Campus Representative: | \_\_\_\_\_\_\_\_\_\_ |

The scope of the site visit was based on our judgment, accessible areas, and convenience of the school on-site liaison. The following list records the scope of the site visit:

Interview with on-site liaison.

Grounds observation to verify soil, slopes, drainage, and general condition.

Exterior observation to verify basic massing, configuration, and general condition.

Interior observation to verify use, wall line configuration, and general condition.

Rooftop observation.

Basement or crawl space observation.

Plenum space observation above the ceiling.

Observation of unfinished spaces (e.g., mechanical rooms, closets, etc.).

Observation of structure-architecture interaction details.

Observation of roof-to-wall connections.

Observation of the gravity load-resisting system framing.

Observation of the seismic force-resisting system.

Review of adjacent buildings to assess potential pounding.

Other: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

The site visit confirmed that the existing structure generally conforms to the available drawings listed in Table 2.3 above, except as recorded in Table 2.4 below.

| **TABLE 2.4: VARIANCE FROM ORIGINAL DRAWINGS** | | |
| --- | --- | --- |
| **Set ID** | **Condition Shown on Plans** | **Condition Observed at Site Visit** |
|  |  |  |
|  |  |  |
|  |  |  |

**3. SITE AND BUILDING DESCRIPTION**

**3.1 Existing Building Summary**

**3.1.1 General Information**

|  |  |
| --- | --- |
| Year of Original Construction: | \_\_\_\_\_\_\_\_\_\_ |
| DSA Application Number: | \_\_\_\_\_\_\_\_\_\_  Original Construction  Work done pursuant to the Garrison Act (Ed Code 17367) |
| Number of Stories Above Grade: | \_\_\_\_\_\_\_\_\_\_\_ |
| Number of Stories Below Grade: | \_\_\_\_\_\_\_\_\_\_\_ |
| Total Floor Area (approximate): | \_\_\_\_\_\_\_\_\_\_\_ square feet |

There Choose an item. other essentially identical buildings on this campus. \_\_\_\_\_\_\_\_\_\_\_

**3.1.2 Photographs**

|  |
| --- |
| *[INSERT PHOTO]* |
| **Photo 1: \_\_\_\_\_\_\_\_\_ (mo/da/year)** |
| *[INSERT PHOTO]* |
| **Photo 2:\_\_ \_\_\_\_\_\_\_ (mo/da/year)** |

**3.1.3 Ground Floor Plan**

*[INSERT GRAPHIC OF PLAN]*

**3.2 Building Occupancy**

The original, current, and planned future uses of the building include those indicated here:

| **Use Category** | **Original** | **Current** | **Future** |
| --- | --- | --- | --- |
| Office / Administration |  |  |  |
| Classrooms / Instruction Areas |  |  |  |
| Kitchen |  |  |  |
| Assembly: Dining |  |  |  |
| Assembly: Auditorium |  |  |  |
| Assembly: Gymnasium |  |  |  |
| Locker Rooms |  |  |  |
| Patio Cover / Bus Shelter / Walkway Cover |  |  |  |
| Bleachers / Stadium Structure |  |  |  |
| Other Occupancy: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |  |  |  |
| Mechanical / Utility Rooms or Enclosures |  |  |  |
| Bulk Storage |  |  |  |
| Vacant / Unused |  |  |  |
| Other Unoccupied |  |  |  |

**3.3 Site Seismicity**

|  |  |
| --- | --- |
| Site Location: | Latitude: \_\_\_\_\_\_\_\_\_\_ ; Longitude: \_\_\_\_\_\_\_\_\_\_ |
| Site Class: | Choose an item. (in accordance with ASCE 7, Chapter 20)  Determined by geotechnical/geohazard investigation.  Determined from Set ID \_\_\_\_\_\_\_\_, sheet \_\_\_\_\_\_\_\_ per Section 2.3 above.  Default per ASCE 7 Section 11.4.3. |
| Risk Category: | Choose an item. |
| Mapped MCE from ASCE 7: | *SS* = \_\_\_\_\_g (short period)  *S1* = \_\_\_\_\_g (1 second period) |
| Site Class Coefficients: | *Fa* = \_\_\_\_\_ (short period, ASCE 7, Table 11.4-1)  *Fv* = \_\_\_\_\_ (1 second period, ASCE 7, Table 11.4-2) |
| BSE-2N Seismicity: | *SXS* = *SS Fa* = \_\_\_\_\_g (ASCE 41, Equation 2-1)  *SX1* = *S1 Fv* = \_\_\_\_\_g (ASCE 41, Equation 2-2) |
| BSE-1N Seismicity: | *SDS* = (2/3)*SS Fa* = \_\_\_\_\_g (ASCE 41, Equation 2-4)  *SD1* = (2/3)*S1 Fv* = \_\_\_\_\_g (ASCE 41, Equation 2-5) |
| Fundamental Building Period: | *T* = \_\_\_\_\_ sec (ASCE 41, Section 4.4.2.4, Equation 4-4) |
| Tier 1 Spectral Acceleration: | *Sa* = \_\_\_\_\_g (ASCE 41, Section 4.4.2.3) |

**3.4 Gravity Load-Resisting System**

Based on its vintage, the building is assumed to have been originally designed and constructed under the \_\_\_\_\_\_\_\_\_\_.

Sheet \_\_\_\_\_ of Set ID \_\_\_\_\_\_\_\_\_\_ confirms the building was originally designed and constructed under the \_\_\_\_\_\_\_\_\_\_.

**3.4.1 Roof Framing**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**3.4.2 Floor Framing**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**3.4.3 Ground Floor Framing**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**3.4.4 Vertical Load-Bearing Elements**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**3.4.5 Foundation and Basement**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**3.5 Building Type**

The structural system of the existing building corresponds to the building type(s) designated below. Building type definitions are in accordance with ASCE 41 classifications except for C1B and S1B, which are defined in DSA PR 08-03 Appendix D. Where multiple building types are selected in the same plan direction, the building is considered a mixed system (M) per DSA PR 08-03.

|  |  |  |  |
| --- | --- | --- | --- |
| **ID** | **Building Type** | **Plan Direction** | |
| **North-South** | **East-West** |
| C1 | Concrete Moment Frames |  |  |
| C1B | Reinforced Concrete Cantilever Columns |  |  |
| C2a | Concrete Shear Walls, Flexible Diaphragm |  |  |
| C3a | Concrete Frame with Infill Masonry Shear Walls, Flexible Diaphragm |  |  |
| PC1 | Precast/Tilt-up Concrete Shear Walls, Flexible Diaphragm |  |  |
| PC1a | Precast/Tilt-up Concrete Shear Walls, Rigid Diaphragm |  |  |
| PC2 | Precast Concrete Frames with Shear Walls, Rigid Diaphragm |  |  |
| PC2a | Precast Concrete Frames without Shear Walls, Rigid Diaphragm |  |  |
| RM1 | Reinforced Masonry Bearing Walls, Flexible Diaphragm |  |  |
| S1B | Steel Cantilever Columns with Wood Roofs |  |  |
| S3 | Pre-engineered Rigid Frames with Metal Siding and/or Rod Bracing |  |  |
| URM | Unreinforced Masonry Bearing Walls, Flexible Diaphragm |  |  |
| URMa | Unreinforced Masonry Bearing Walls, Rigid Diaphragm |  |  |
|  | None of the above |  |  |

**3.6 Seismic Force-Resisting System**

In accordance with ASCE 41 Table 3-2, the benchmark building code (Choose an item.) year for this building type is \_\_\_\_***.***

**3.6.1 General Description, Materials, and Details**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**3.6.2 Horizontal System Elements**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**3.6.3 Vertical System Elements**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**3.6.4 Foundation System**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**3.6.5 History of Retrofit or Significant Alteration**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**4. DEFICIENCY LIST**

Tables 4.1 and 4.2 summarize the potential deficiencies identified in Section 5 below. Other deficiencies may exist. The evaluation was stopped once critical deficiencies were identified.

|  |  |  |
| --- | --- | --- |
| **TABLE 4.1: NONCOMPLIANT CONDITIONS** | | |
| **Condition** | **Discussion** | **Additional Evaluation** |
|  |  |  |
|  |  |  |
|  |  |  |

|  |  |  |
| --- | --- | --- |
| **TABLE 4.2: UNKNOWN CONDITIONS** | | |
| **Condition** | **Discussion** | **Additional Evaluation** |
|  |  |  |
|  |  |  |
|  |  |  |

**5. ASCE 41 EVALUATION STATEMENTS**

Evaluation statements provided in this section are from ASCE 41. They have been modified for this project with DSA approval as described in Section 2.2 of this report. References within the evaluation statements to other section numbers are generally to sections of ASCE 41.

C = Compliant

NC = Noncompliant

U = Unknown or not investigated

NA = Not applicable to this building

Items marked NC or U are summarized in Section 4 above.

| **TABLE 5A: GEOLOGIC SITE HAZARDS AND FOUNDATIONS | ALL BUILDINGS** | | | | |
| --- | --- | --- | --- | --- |
| **No.** | **Status** | **Evaluation Statement** | **Tier 2 Reference** | **Commentary Reference** |
| **A1** | **NC** | **CRITICAL ITEM** | 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 under the building. | 5.4.3.1 | A.6.1.1 |
| **A2** | **NC** | **CRITICAL ITEM** | 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. | 5.4.3.1 | A.6.1.2 |
| **A3** | **NC** | **CRITICAL ITEM** | SURFACE FAULT RUPTURE: Surface fault rupture and surface displacement at the building site are not anticipated. | 5.4.3.1 | A.6.1.3 |
| **A4** | **NC** | 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. | 5.4.3.4 | A.6.2.2 |

| **TABLE 5B: BUILDING CONFIGURATION | ALL BUILDINGS** | | | | |
| --- | --- | --- | --- | --- |
| **No.** | **Status** | **Evaluation Statement** | **Tier 2 Reference** | **Commentary Reference** | |
| **B1** | **NC** | **CRITICAL ITEM** | 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. | 5.4.1.1 | A.2.1.1 | |
| **B2** | **NC** | **CRITICAL ITEM** | 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. | 5.4.2.1 | A.2.2.2 | |
| **B3** | **NC** | **CRITICAL ITEM** | 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. | 5.4.2.2 | A.2.2.3 | |
| **B4** | **NC** | 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. | 5.4.2.4 | A.2.2.5 | |
| **B5** | **NC** | VERTICAL IRREGULARITIES: All vertical elements in the seismic-force-resisting system are continuous to the foundation. | 5.4.2.3 | A.2.2.4 | |
| **B6** | **NC** | 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. | 5.4.2.5 | A.2.2.6 | |
| **B7** | **NC** | 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. | 5.4.2.6 | A.2.2.7 | |
| **B8** | **NC** | ADJACENT BUILDINGS: The clear distance between the building being evaluated and any adjacent building is greater than 1.5% of the height of the shorter building. | 5.4.1.2 | A.2.1.2 | |
| **B9** | **NC** | MEZZANINES: Interior mezzanine levels are braced independently from the main structure or are anchored to the seismic-force-resisting elements of the main structure. | 5.4.1.3 | A.2.1.3 | |

| **TABLE 5C: CONCRETE MOMENT FRAMES | BUILDING TYPES C1, C1B\*, PC2a**  \*Statements denoted with an asterisk are not applicable to Building Type C1B | | | | | |
| --- | --- | --- | --- | --- | --- |
| **No.** | **Status** | **Evaluation Statement** | **Tier 2 Reference** | **Commentary Reference** |
| **C1** | **NC** | **CRITICAL ITEM** | COLUMN SHEAR STRESS CHECK: The shear stress in concrete columns, calculated using the Quick Check procedure of Section 4.4.3.2, is less than the greater of 100 lb/in.2 or 2√f'c. | 5.5.2.1.4  5.5.2.3.4 | A.3.1.4.1 |
| **C2** | **NC** | **CRITICAL ITEM** | COLUMN AXIAL STRESS CHECK: The axial stress caused by unfactored gravity loads in columns subjected to overturning forces because of seismic demands is less than 0.20f’c (0.10f’c for precast columns). 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’c. | 5.5.2.1.3 | A.3.1.4.2 |
| **C3** | **NC** | **CRITICAL ITEM** | FLAT SLAB FRAMES: The seismic force-resisting system is not a frame consisting of columns and a flat slab/plate without beams. | 5.5.2.3.1 | A.3.1.4.3 |
| **C4** | **NC** | PRESTRESSED FRAME ELEMENTS: The seismic force-resisting frames do not include any prestressed or post-tensioned elements where the average prestress exceeds the lesser of 700 lb/in.2 or f’c/6 at potential hinge locations. The average prestress is calculated in accordance with the Quick Check procedure of Section 4.4.3.8. | 5.5.2.3.2 | A.3.1.4.4 |
| **C5** | **NC** | **CRITICAL ITEM** | CAPTIVE COLUMNS: There are no columns at a level with height/depth ratio less than 50% of the nominal height/depth ratio of the typical columns at that level. | 5.5.2.3.3 | A.3.1.4.5 |
| **C6** | **NC** | NO SHEAR FAILURES: The shear capacity of frame members is able to develop the moment capacity at the ends of the members. | 5.5.2.3.4 | A.3.1.4.6 |
| **C7** | **NC** | STRONG COLUMN–WEAK BEAM\*: The sum of the moment capacity of the columns is 20% greater than that of the beams at frame joints. | 5.5.2.1.5 | A.3.1.4.7 |
| **C8** | **NC** | **CRITICAL ITEM** | BEAM BARS\*: At least two longitudinal top and two longitudinal bottom bars extend continuously throughout the length of each frame beam. | 5.5.2.3.5 | A.3.1.4.8 |
| **C9** | **NC** | COLUMN BAR SPLICES: All column bar lap splice lengths are greater than 35db and are enclosed by ties spaced at or less than 8db. Alternatively, column bars are spliced with mechanical couplers with a capacity of at least 1.25 times the nominal yield strength of the spliced bar. | 5.5.2.3.6 | A.3.1.4.9 |
| **C10** | **NC** | BEAM BAR SPLICES\*: The lap splices or mechanical couplers for longitudinal beam reinforcing are not located within lb/4 of the joints and are not located in the vicinity of potential plastic hinge locations. | 5.5.2.3.6 | A.3.1.4.10 |
| **C11** | **NC** | COLUMN TIE SPACING: Frame columns have ties spaced at or less than d/4 throughout their length and at or less than 8db at all potential plastic hinge locations. | 5.5.2.3.7 | A.3.1.4.11 |
| **C12** | **NC** | STIRRUP SPACING\*: All beams have stirrups spaced at or less than d/2 throughout their length. At potential plastic hinge locations stirrups are spaced at or less than the minimum of 8db or d/4. | 5.5.2.3.7 | A.3.1.4.12 |
| **C13** | **NC** | JOINT TRANSVERSE REINFORCING\*: Beam-column joints have ties spaced at or less than 8db. | 5.5.2.3.8 | A.3.1.4.13 |
| **C14** | **NC** | **CRITICAL ITEM** | DEFLECTION COMPATIBILITY: Secondary components have the shear capacity to develop the flexural strength of the components. | 5.5.2.5.2 | A.3.1.6.2 |
| **C15** | **NC** | **CRITICAL ITEM** | FLAT SLABS: Flat slabs or plates not part of the seismic force-resisting system have continuous bottom steel through the column joints. | 5.5.2.5.3 | A.3.1.6.3 |
| **C16** | **NC** | INTERFERING WALLS: All concrete and masonry infill walls placed in moment frames are isolated from structural elements. | 5.5.2.1.1 | A.3.1.2.1 |
| **C17** | **NC** | PRECAST CONNECTION CHECK\*: The connections at joints of precast concrete frames have the capacity to resist the shear and moment demands calculated using the Quick Check procedure of Section 4.4.3.5. | 5.5.2.4 | A.3.1.5.1 |

| **TABLE 5D: CONCRETE SHEAR WALLS | BUILDING TYPES C2a, PC1, PC1a, PC2** | | | | |
| --- | --- | --- | --- | --- |
| **No.** | **Status** | **Evaluation Statement** | **Tier 2 Reference** | **Commentary Reference** |
| **D1** | **NC** | **CRITICAL ITEM** | REDUNDANCY: The number of lines of shear walls in each principal direction is greater than or equal to 2. | 5.5.1.1 | A.3.2.1.1 |
| **D2** | **NC** | **CRITICAL ITEM** | SHEAR STRESS CHECK: The shear stress in the concrete shear walls or precast panels, calculated using the Quick Check procedure of Section 4.4.3.3, is less than the greater of 100 lb/in.2 or 2√f'c. | 5.5.3.1.1 | A.3.2.2.1  A.3.2.3.1 |
| **D3** | **NC** | 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. | 5.5.3.1.3 | A.3.2.2.2  A.3.2.3.2 |
| **D4** | **NC** | 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. | 5.5.3.2.1 | A.3.2.2.3 |
| **D5** | **NC** | WALL OPENINGS: The total width of openings along any perimeter precast wall line constitutes less than 75% of the length of any perimeter precast wall when the wall piers have aspect ratios of less than 2-to-1. | 5.5.3.3.1 | A.3.2.3.3 |
| **D6** | **NC** | CORNER OPENINGS: Walls with openings at a building corner larger than the width of a typical precast wall panel are connected to the remainder of the wall with collector reinforcing. | 5.5.3.3.2 | A.3.2.3.3 |
| **D7** | **NC** | COMPLETE FRAMES: Steel or concrete frames classified as secondary components form a complete vertical-load-carrying system. | 5.5.2.5.1 | A.3.1.6.1 |
| **D8** | **NC** | PRECAST FRAMES: For buildings with concrete shear walls, precast concrete frame elements are not necessary as primary components for resisting seismic forces. | 5.5.2.4  5.5.2.5.1  5.5.2.5.2 | A.3.1.5.2 |
| **D9** | **NC** | PRECAST CONNECTIONS: For buildings with concrete shear walls, the connection between precast frame elements, such as chords, ties, and collectors in the seismic-force-resisting system, develops the capacity of the connected members. | 5.6.1.1 | A.3.1.5.3 |

| **TABLE 5E: MASONRY SHEAR WALLS | BUILDING TYPES C3a, RM1, URM, URMa** | | | | |
| --- | --- | --- | --- | --- |
| **No.** | **Status** | **Evaluation Statement** | **Tier 2 Reference** | **Commentary Reference** |
| **E1** | **NC** | **CRITICAL ITEM** | REDUNDANCY: The number of lines of shear walls in each principal direction is greater than or equal to 2. | 5.5.1.1 | A.3.2.1.1 |
| **E2** | **NC** | **CRITICAL ITEM** | UNREINFORCED MASONRY BEARING WALLS: The seismic force-resisting system in any direction shall not rely on or consist primarily of unreinforced masonry bearing walls. | None |  |
| **E3** | **NC** | PROPORTIONS: The height-to-thickness ratio of the unreinforced infill walls at each story is less than 9. | 5.5.3.1.2 | A.3.2.6.2 |
| **E4** | **NC** | CAVITY WALLS: The infill walls are not of cavity construction. | 5.5.3.5.2 | A.3.2.6.3 |
| **E5** | **NC** | INFILL WALLS: The infill walls are continuous to the soffits of the frame beams and to the columns to either side. | 5.5.3.5.3 | A.3.2.6.4 |
| **E6** | **NC** | **CRITICAL ITEM** | SHEAR STRESS CHECK: The shear stress in the unreinforced masonry shear walls, calculated using the Quick Check procedure of Section 4.4.3.3, is less than 30 lb/in.2 for clay units and 70 lb/in.2 for concrete units. Infill wall bays with openings greater than 25% of the wall area shall not be included in Aw of Eq. (4-8). | 5.5.3.1.1 | A.3.2.5.1 |
| **E7** | **NC** | **CRITICAL ITEM** | SHEAR STRESS CHECK: The shear stress in the reinforced masonry shear walls, calculated using the Quick Check procedure of Section 4.4.3.3, is less than 70 lb/in.2. | 5.5.3.1.1 | A.3.2.4.1 |
| **E8** | **NC** | PROPORTIONS: The height-to-thickness ratio of the shear walls at each story is less than the following:  Top story of multi-story building: 9  First story of multi-story building: 15  All other conditions: 13 | 5.5.3.1.2 | A.3.2.5.2 |
| **E9** | **NC** | REINFORCING STEEL: The total vertical and horizontal reinforcing steel ratio in reinforced masonry walls is greater than 0.002 of the wall with the minimum of 0.0007 in either of the two directions; the spacing of reinforcing steel is less than 48 in., and all vertical bars extend to the top of the walls. | 5.5.3.1.3 | A.3.2.4.2 |

| **TABLE 5F: STEEL SYSTEMS | BUILDING TYPES S1B\*, S3**  \*Statements denoted with an asterisk are not applicable to Building Type S1B. | | | | |
| --- | --- | --- | --- | --- |
| **No.** | **Status** | **Evaluation Statement** | **Tier 2 Reference** | **Commentary Reference** |
| **F1** | **NC** | **CRITICAL ITEM** | REDUNDANCY: The number of lines of resistance in each principal direction is greater than or equal to 2. | 5.5.1.1 | A.3.3.1.1 |
| **F2** | **NC** | **CRITICAL ITEM** | BRACE AXIAL STRESS CHECK\*: The axial stress in the diagonals, calculated using the Quick Check procedure of Section 4.4.3.4, shall be less than 0.50Fy. | 5.5.4.1 | A.3.3.1.2 |
| **F3** | **NC** | CONNECTION STRENGTH\*: All brace connections develop the yield capacity of the diagonals. | 5.5.4.4 | A.3.3.1.5 |
| **F4** | **NC** | K-BRACING\*: The bracing system does not include K-braced bays. | 5.5.4.6 | A.3.3.2.1 |
| **F5** | **NC** | DRIFT CHECK: The drift ratio of the steel moment frames acting alone, calculated using the Quick Check procedure of Section 4.4.3.1, is less than 0.030. | 5.5.2.1.2 | A.3.1.3.1 |
| **F6** | **NC** | MOMENT-RESISTING CONNECTIONS: All moment connections can develop the elastic moment (*FyS*) of the adjoining members. | 5.5.2.2.1 | A.3.1.3.4 |
| **F7** | **NC** | PANEL ZONES\*: All panel zones have the shear capacity to resist the shear demand required to develop 0.8 times the sum of the flexural strengths of the girders framing in at the face of the column. | 5.5.2.2.2 | A.3.1.3.5 |
| **F8** | **NC** | COMPACT MEMBERS: All frame elements meet compact section requirements in accordance with AISC 360, Table B4.1. | 5.5.2.2.4 | A.3.1.3.8 |
| **F9** | **NC** | STEEL COLUMNS: The columns in seismic-force-resisting frames are anchored to the building foundation. | 5.7.3.1 | A.5.3.1 |
| **F10** | **NC** | ROOF PANELS: Where considered as diaphragm elements for lateral resistance, metal, plastic, or cementitious roof panels are positively attached to the roof framing to resist seismic forces. | 5.7.5 | A.5.5.1 |
| **F11** | **NC** | WALL PANELS: Where considered as shear elements for lateral resistance, metal, fiberglass, or cementitious wall panels are positively attached to the framing and foundation to resist seismic forces. | 5.7.5 | A.5.5.2 |

| **TABLE 5G: DIAPHRAGMS | ALL BUILDINGS** | | | | |
| --- | --- | --- | --- | --- |
| **No.** | **Status** | **Evaluation Statement** | **Tier 2 Reference** | **Commentary Reference** |
| **G1** | **NC** | DIAPHRAGM CONTINUITY: The diaphragms are not composed of split-level floors and do not have expansion joints. | 5.6.1.1 | A.4.1.1 |
| **G2** | **NC** | CROSS TIES: There are continuous cross ties between chords of flexible diaphragms. | 5.6.1.2 | A.4.1.2 |
| **G3** | **NC** | ROOF CHORD CONTINUITY: All chord elements are continuous, regardless of changes in roof elevation. | 5.6.1.1 | A.4.1.3 |
| **G4** | **NC** | **CRITICAL ITEM** | OPENINGS AT SHEAR WALLS: Diaphragm openings immediately adjacent to the shear walls are less than 25% of the wall length. | 5.6.1.3  5.5.3.3.1 | A.4.1.4 |
| **G5** | **NC** | OPENINGS AT BRACED FRAMES: Diaphragm openings immediately adjacent to the braced frames extend less than 25% of the frame length. | 5.6.1.3 | A.4.1.5 |
| **G6** | **NC** | OTHER DIAPHRAGMS: Diaphragm do not consist of a system other than wood, metal deck, concrete or horizontal bracing. | 5.6.5 | A.4.7.1 |
| **G7** | **NC** | **CRITICAL ITEM** | TOPPING SLAB: Precast concrete diaphragm elements are interconnected by a continuous reinforced concrete topping slab with a minimum thickness of 2 in. | 5.6.4 | A.4.5.1 |
| **G8** | **NC** | STRAIGHT SHEATHING: All straight sheathed diaphragms have aspect ratios less than 2 to 1 in the direction being considered. | 5.6.2 | A.4.2.1 |
| **G9** | **NC** | SPANS: All wood diaphragms with spans greater than 24 ft consist of wood structural panels or diagonal sheathing. | 5.6.2 | A.4.2.2 |
| **G10** | **NC** | DIAGONALLY SHEATHED AND UNBLOCKED DIAPHRAGMS: All diagonally sheathed or unblocked wood structural panel diaphragms have horizontal spans less than 40 ft and aspect ratios less than or equal to 4 to 1. | 5.6.2 | A.4.2.3 |

| **TABLE 5H: CONNECTIONS | ALL BUILDINGS** | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **No.** | **Status** | | **Evaluation Statement** | | **Tier 2 Reference** | | **Commentary Reference** | |
| **H1** | **NC** | **CRITICAL ITEM** | WALL ANCHORAGE: Exterior concrete or masonry walls that are dependent on the diaphragm 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. | | 5.7.1.1 | | A.5.1.1 | |
| **H2** | **NC** | WOOD LEDGERS: The connection between the wall panels and the diaphragm does not induce cross-grain bending or tension in the wood ledgers. | | 5.7.1.3 | | A.5.1.2 | |
| **H3** | **NC** | MINIMUM NUMBER OF WALL ANCHORS PER PANEL: There are at least two anchors connecting each precast wall panel to the diaphragm elements. | | 5.7.1.4 | | A.5.1.3 | |
| **H4** | **NC** | STIFFNESS OF WALL ANCHORS: Anchors of concrete or masonry walls to wood structural elements are taut and stiff enough to limit the relative movement between the wall and the diaphragm before engagement of the anchors, as needed for reliable bearing. | | 5.7.1.2 | | A.5.1.4 | |
| **H5** | **NC** | GIRDER-COLUMN CONNECTION: There is a positive connection using plates, connection hardware, or straps between the girder and the column support. | | 5.7.4.1 | | A.5.4.1 | |
| **H6** | **NC** | GIRDERS: Girders supported by walls or pilasters shall have at least two ties securing the anchor bolts unless provided with independent stiff wall anchors with strength to resist the connection force calculated in the Quick Check procedure of Section 4.4.3.7. | | 5.7.4.2 | | A.5.4.2 | |
| **H7** | **NC** | CORBEL BEARING: If the frame girders bear on column corbels, the length of bearing is greater than 3 in. | | 5.7.4.3 | | A.5.4.3 | |
| **H8** | **NC** | CORBEL CONNECTIONS: The frame girders are not connected to corbels with welded elements. | | 5.7.4.3 | | A.5.4.4 | |
| **H9** | **NC** | TRANSFER TO SHEAR WALLS: Diaphragms are connected for transfer of seismic forces to the shear walls. | | 5.7.2 | | A.5.2.1 | |
| **H10** | **NC** | TRANSFER TO STEEL FRAMES: Diaphragms are connected for transfer of seismic forces to the steel frames. | | 5.7.2 | | A.5.2.2 | |
| **H11** | **NC** | TOPPING SLAB TO WALLS OR FRAMES: Reinforced concrete topping slabs that interconnect the precast concrete diaphragm elements are doweled for transfer of forces into shear wall or frame elements, and the dowels are able to develop the least of the shear strength of the walls, frames or slabs. | | 5.7.2 | | A.5.2.3 | |
| **H12** | **NC** | CONCRETE COLUMNS: All concrete columns are doweled into the foundation with a minimum of four bars. | | 5.7.3.1 | | A.5.3.2 | |
| **H13** | **NC** | 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. | | 5.7.3.4 | | A.5.3.5 | |
| **H14** | **NC** | PRECAST WALL PANELS: Precast wall panels are connected to the foundation. | | 5.7.3.4 | | A.5.3.6 | |
| **H15** | **NC** | UPLIFT AT PILE CAPS: Pile caps have top reinforcement, and piles are anchored to the pile caps. | | 5.7.3.5 | | A.5.3.8 | |

**APPENDIX A: STRUCTURAL CALCULATIONS**

**APPENDIX B: EVALUATION STATEMENT NOTES**

**APPENDIX C: PHOTOGRAPHS AND DETAILS**