BEAVERTON SCHOOL DISTRICT
COOPER MOUNTAIN ELEMENTARY SCHOOL

BEAVERTON SCHOOL DISTRICT
16550 SW MERLO ROAD
BEAVERTON, OR 97003

SEISMIC EVALUATION AND CONCEPTUAL SEISMIC STRENGTHENING SCHEME

NOVEMBER 14, 2018

KPFF PROJECT NO. 10021800754

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INTRODUCTION AND PROJECT SCOPE

Cooper Mountain Elementary School is located in Beaverton, Oregon at 7670 SW 170th Avenue. The building consists of several different building types and construction years ranging from 1954 to 1986. This report presents the findings of a seismic evaluation to assess the vulnerability of Cooper Mountain Elementary School in a seismic event. This report does not address issues related to gravity framing. The evaluation and correlating strengthening scheme was performed using the Tier 1 screening procedure of American Society of Civil Engineers 41-17 "Seismic Evaluation and Retrofit of Existing Buildings" (ASCE 41-17).

The recommended strengthening scheme presented in this report provides rehabilitation of the seismic resisting system and mitigation of nonstructural hazards to the Basic Performance Objectives for Existing Buildings associated with Risk Category IV as outlined in ASCE 41-17 Table 2-2 and amended by the Seismic Rehabilitation Grant Program (SRGP).

A summary of the different building parts can be found in Table 1 below as well as a more thorough description of the building in the following section.

Table 1: Project Summary Information

Building Part	Building Part Name	Included in Retrofit	Year Built	Building Type	Nonstructural Retrofits Included in Scope Y/N	Previous Seismic Retrofit Y/N (Year if Yes)
A1	Classrooms	Y	1967-1970	C2a	Y	2010
A2	Auditorium/Gym	Y	1967	C2a	Y	2010 (very minor)
B1	Cafeteria Building	Y	1954	W2	Y	2010
B2	Mechanical Area/Lobby	Y	1967	W2	Y	2010
C1	Classrooms	Y	1986	W2	Y	N
C2	Covered Play	Y	1986	S1a	Y	N
Total Retrofit Cost		$3,320,475				
Retrofit Square Feet		60,750 SF				
Retrofit Cost per Square Foot		$54.66/SF				Yes/No
Is the campus within a tsunami, FEMA flood zone or other high hazard area?						No

The seismic evaluation included a review of the original structural drawings and an assessment of observable structural conditions. The findings presented herein are limited to those conditions and components for which sufficient information could be found within the original structural drawings and confirmed on-site by the visual observations of KPFF personnel.

Observations, analyses, conclusions, and recommendations contained within this report reflect our engineering judgment. Concealed problems with the construction of the building may exist that cannot be revealed through drawings and photos alone. Therefore, KPFF can in no way warrant or guarantee the condition of the existing construction of the building, or the future building performance.

BUILDING DESCRIPTION

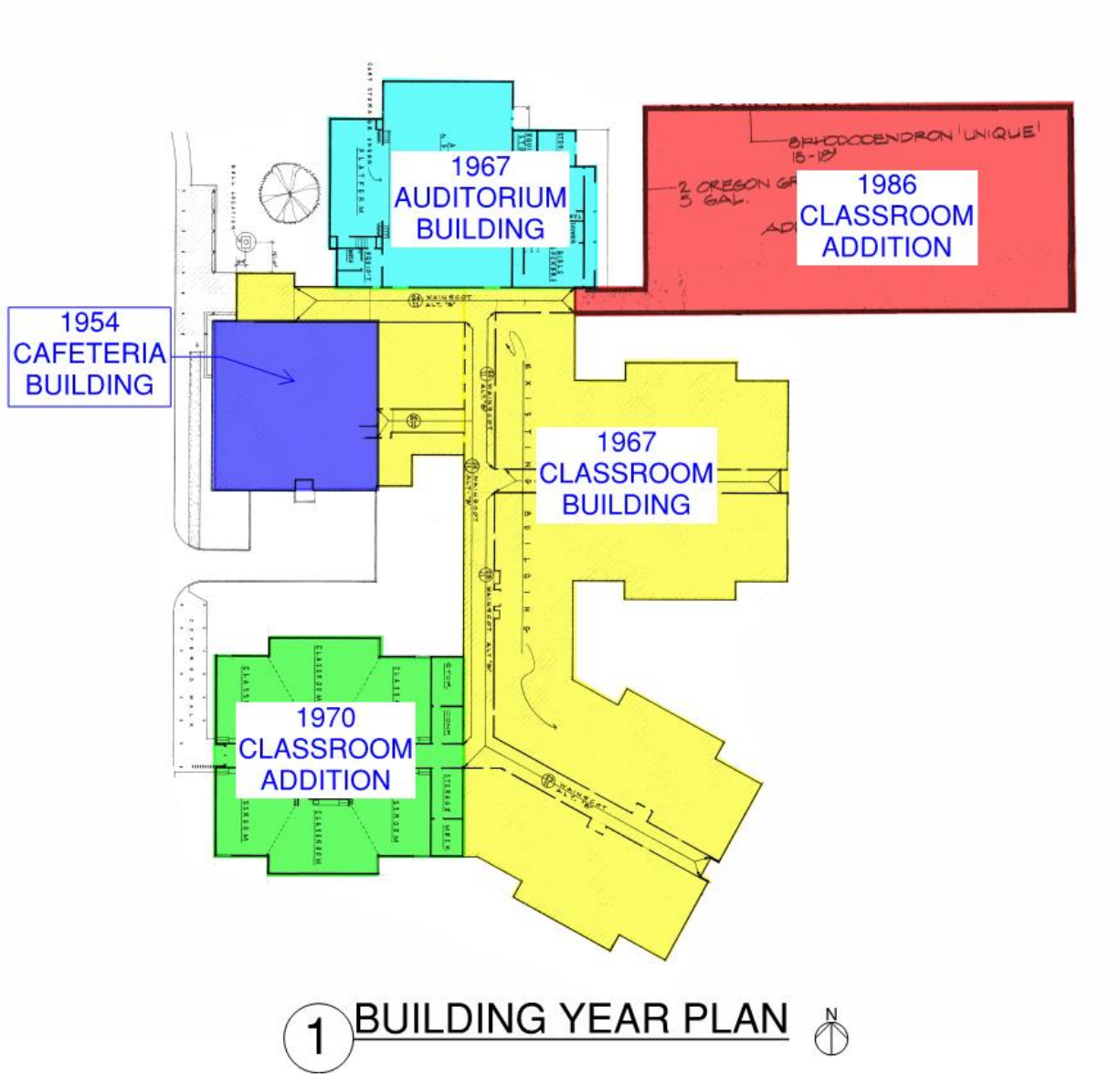

Figure 1: Building Year Plan

The oldest remaining part of Cooper Mountain Elementary School is the cafeteria that was originally designed and constructed in 1954 by Richard Marlitt Nelson Hodges Architects. Several other additions were added by Annand, Boone, Drynan, and Huffstutter Architects and Engineers in 1967 and 1970.

The 1954 cafeteria building is wood framed with a concrete slab-on-grade. All buildings associated with the construction between 1967 and 1970 are similarly constructed with a wood framed roof supported by reinforced concrete walls and a conventional shallow foundation with a concrete slab-on-grade. The exception is the 1986 addition, which is wood framed with a wood roof. The east

portion of the addition that serves as a covered play space is built with cantilevered steel columns with a wood framed roof.

Lastly, there was a voluntary partial seismic upgrade was completed in 2010. A majority of the building was re-roofed and plywood sheathing was either added or verified that it met minimum nailing requirements. No work was completed on the 1967 auditorium addition or the 1986 classroom addition.

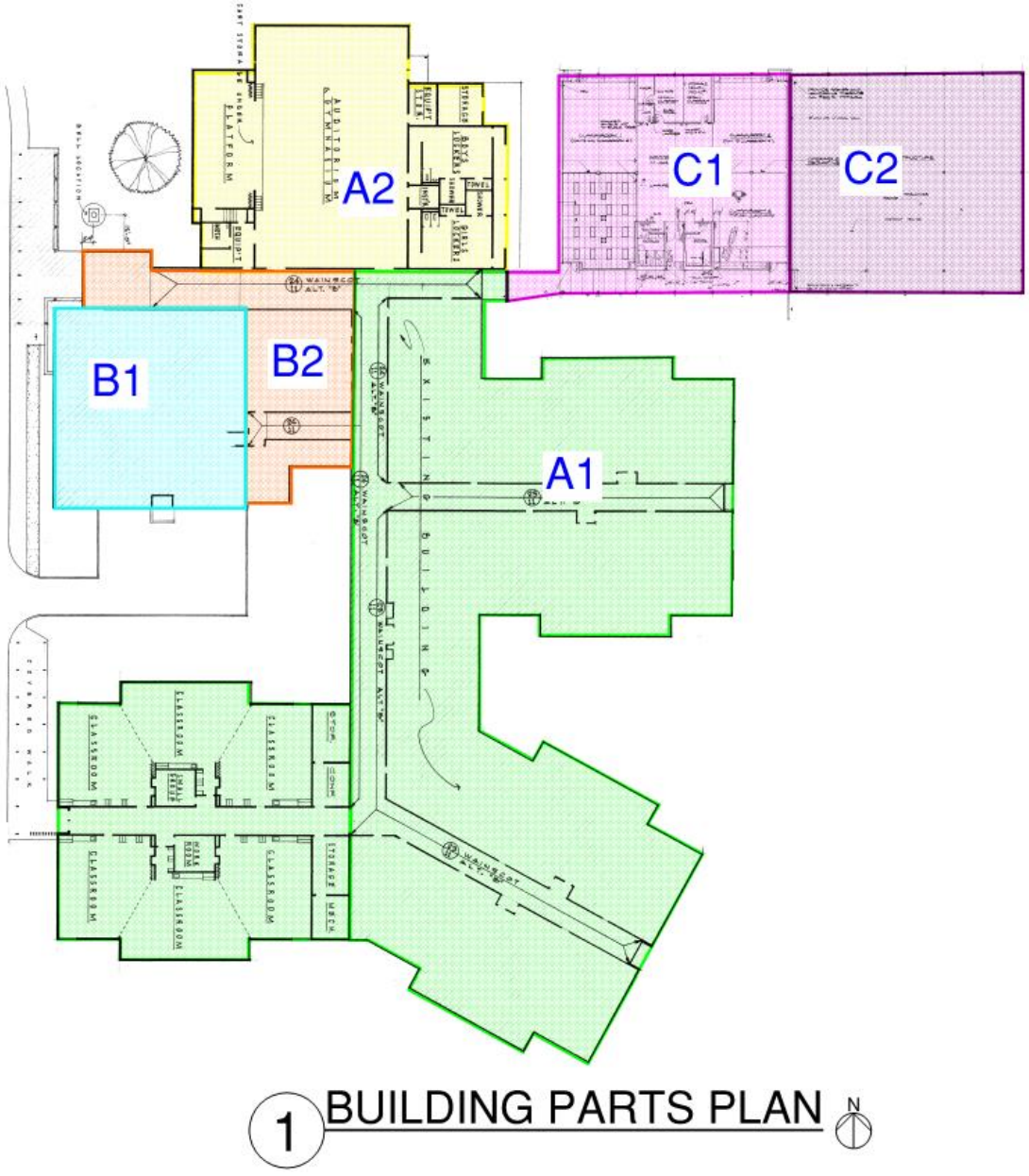

Figure 2: Building Parts Plan

Structurally, the school can be idealized into six different "building parts" (See Figure 2), since it contains multiple additions and remodels with different structural systems. The different areas were partitioned out because they were constructed at either different times, different materials, or have

a significant step at the roof diaphragms. In the evaluation, Building Parts A and B are connected and are treated as one building with no seismic joints. Building Part C can be treated as a standalone structure.

The 1967 and 1970 addition, designated as building parts A1 and A2, are single level areas that makes up most of the building. This portion of the building has a wood framed roof that consists mostly of glulam beams that support wood joists and plywood sheathing. Along the corridor to the south classroom wing the roof is framed out of gable trusses and plywood sheathing. The wood roof framing is supported by exterior reinforced concrete walls and interior pipe columns. The concrete walls and pipe columns are supported by conventional strip and spread footings, respectively, with a slab-on-grade. Out-of-plane connection strengthening was added to Building Part A1 in 2010 along with collector strapping. Out-of-plane connection strengthening was added to only one wall in Building Part A2 in 2010.

The 1954 cafeteria and surrounding buildings that were added in 1967 are grouped as Building Parts B1 and B2. These two building parts are grouped together because they are of similar construction or share common elements and roof elevations.

Building Part B1 is the oldest remaining part of the entire school. It consists of a double height multipurpose room that is used as the cafeteria. To the south there is a two-level volume that is used as a kitchen on first level and a music room on the second level. This building part is constructed mainly out of wood framing. The existing drawings are unclear as to how this area is framed, however the 1967 and 2010 remodel drawings show wood walls with a shiplap roof. Plywood sheathing was added in 2010. This area has a conventional slab-on-grade with a shallow foundation.

Building Part B2 is framed similarly to area B1 and was added in 1967. This part has wood framed walls that support wood joists and a wood framed roof.

Building Parts C1 and C2 were constructed in 1986. Drawings from this addition are in poor condition and it is difficult to decipher how this building part is framed in some areas. Part C1 has a plywood roof that is supported by wood joists and glulam beams. The beams are supported by wood posts and exterior wood bearing walls with embedded wood posts.

Building Part C2 has a wood framed roof that consists of plywood sheathing, wood joists, and glulam beams. The beams are supported by steel posts that cantilever from the ground from concrete pier foundations. There is asphalt paving under the covered play.

Reference Figures 3 through 8 for photographs of the building exterior:

Figure 3: West elevation of Building Part A1

Figure 4: East elevation of Building Part A1

Figure 5: East elevation of Building Part A1

Figure 6: South elevation of Building Part B1

Figure 7: North/West elevation of Building Part A2 (gymnasium)

Figure 8: West elevation of Building Part A2 and B2

Figure 9: North elevation of Building Parts C1 & C2

Figure 10: "Pop-up" at Building Part C1

Figure 11: Roof framing at covered play area of Building Part C2

Figure 12: CMU wall at covered play area of Building Part C2

OBSERVATIONS

Site Reconnaissance

KPFF conducted a site survey of the building on May 14, 2018, to verify the general conformance of the existing documents and general building condition. The existing drawings appear to be generally accurate based on the visual observation of construction readily accessible to view.

Document Review

The following documents were available for review:

Drawings:

- 1954 – Cafeteria building, dated 05/28/1954
- 1967 – Classroom addition, dated 08/31/1967
- 1970 – Classroom addition, dated 01/08/1970
- 1986 – Classroom addition, dated 02/12/1986
- 2010 – Reroofing voluntary upgrade, dated 09/30/2010

Reports:

- 2016 – ASCE/SEI 41-13 Seismic Evaluation for Cooper Mountain Elementary School, by JG Pierson Consulting Structural Engineers, dated September 2016

STRUCTURAL EVALUATIONS

The purpose of this report is to find deficiencies in the building structure and provide schematic upgrades to address these deficiencies. The Tier 1 screening procedure is one of three procedures outlined in ASCE 41-17 which are listed below as Tiers.

> **Tier 1—Screening:** This procedure includes completing checklists for the structure and nonstructural items (reference Appendix A). During this phase, a review is performed utilizing available construction documents. In addition to the construction plans, a site visit is made to assess the condition for the existing structure for deterioration of the structure and finishes and compare the existing structure to the information provided in available drawings.
>
> **Tier 2—Deficiency-Based Evaluation:** The Tier 2 deficiency-based evaluation is an option which includes additional analysis and evaluation of all the potential deficiencies identified with a Tier 1 Screening. A Tier 2 evaluation was beyond the scope of this project.
>
> **Tier 3—Systematic Evaluation:** The Tier 3 systematic procedure involves an analysis of the entire building and is required for building exceeding a certain height for a particular building type. A Tier 3 evaluation was not required for this building.

ASCE 41-17 defines two performance objectives for existing buildings and new buildings, BPOE and BPON respectively. The BPOE ground motions for existing buildings are lower than the BPON ground

motions as they will likely have a shorter continued life span than a new building. A Tier 1 evaluation will evaluate the existing building at the BPOE performance objective at the BSE-1E hazard level, the BSE-2E hazard level, or both, given the buildings Risk Category as defined in ASCE 41-17 Table 2-2.

The Seismic Rehabilitation Grant Program (SRGP), with consideration of ASCE 41-17, requires using the minimum of either BSE-1E or 75% of BSE-1N hazard level with an appropriate target structural performance level in Tier 1, in addition to the required minimum of BSE-2E or 75% or BSE-2N seismic hazard level.

The larger occupancy rooms, such as the Cafeteria and Gymnasium area at Cooper Mountain Elementary School, are intended to be used as emergency service buildings and emergency shelters and are categorized as Risk Category IV. These areas are integrated with the school buildings, therefore the entire school was evaluated to meet a Life Safety structural performance and Hazards Reduced nonstructural performance level for BSE-2E. Additionally, the Immediate Occupancy structural performance and Position Retention nonstructural performance level for BSE-1E was also checked. This evaluation is aligned with the requirements of ASCE 41-17, Table 2-2 for a building categorized as Risk Category IV.

The Life Safety and Immediate Occupancy performance levels assumes the following from a design earthquake event:

- Life Safety is a structural performance level in which a structure has significantly damaged components but retains a margin against the onset of partial or total collapse. It is possible that the structure will be damaged to the extent that it is not practical to repair and re-occupy the building.
- Immediate Occupancy is a structural performance level in which a structure remains safe to occupy and essentially retains its pre-earthquake strength and stiffness.

Analyses performed as part of the Tier 1 screening process are limited to Quick Checks. Quick Checks are simple analysis procedures used to calculate the stiffness and strength of certain building components. Some of the Quick Checks utilize a total seismic force, termed the *Pseudo Seismic Force,* by ASCE 41-17 for Tier 1. Calculation of the *Pseudo Seismic Force* is based on a formula that utilizes geographic seismicity, mass of the building, stiffness, and structural building type. The base shear is then distributed to each level of the structure based on a weighted proportion of each level's mass and height above the ground.

The seismic analysis considers the following spectral response accelerations with Site Class D soils:

	Basic Performance Objective	
	BSE-1E (75% of BSE-1N minimum)	BSE-2E (75% of BSE-2N minimum)
S_{x1}	0.492	0.797
S_{xs}	0.295	0.467

The site is classified as having a High Level of Seismicity per ASCE 41-17.

ASCE 41-13 Evaluation Findings

Structural Performance

The building's seismic performance was assessed in accordance with ASCE 41-13 and the direction of the Beaverton School District. A majority of the structure is considered to have concrete shear walls with a flexible diaphragm, Type C2a. The building areas associated with Building Parts B and C1 are considered to have wood framed (commercial and industrial), Type W2. The remaining Building Part C2 is considered to have steel moment frames with a flexible diaphragm, Type S1a. This last designation for Building Part C2 is not entirely accurate as it is a cantilevered column structure. However, ASCE 31 does not have a specific check for cantilever column structures and a steel moment frame is the most appropriate. The appropriate Tier 1 checklists for these building types in a high seismicity region are provided in Appendix A of this report.

Below is a summary of the items that were found to be non-conforming or unknown along with comments and/or recommendations. In accordance with an ASCE 41-13 assessment, these items require mitigation:

- Load Path – This criterion requires that the structure shall contain 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.
    - In Building Part A1, there is not a continuous load path from the roof to the foundation at the walls along the edge of the classroom wings. This non-conformance item has been addressed by item "E" in the strengthening plan.
    - The 1970 addition, in Building Part A1, does not have proper shear transfer from the roof to the existing shear walls below. This non-conformance item has been addressed by item "F" in the strengthening plan by adding plywood sheathing to the cripple wall framed between the roof and concrete wall.
    - The 1987 covered play addition, in Building Part C2, does not have a complete load path from the existing diaphragm to the cantilevered columns. This non-conformance item has been addressed by item "K" in the strengthening plan.

- Wall Anchorage At Flexible Diaphragms – This criterion requires that concrete and masonry walls that are dependent on flexible diaphragms for lateral support area anchored for out-of-plane forces.
    - The 2010 roof upgrades appeared to address most of the reinforcing required to support the concrete wall for out-of-plane forces. However, the north auditorium building, of Building Part A2, appears to still require reinforcing. This non-conformance item has been addressed by item "J" in the strengthening plan.

- Wall Anchorage – This criterion requires that 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.
    - Anchorage needs to be added to the existing CMU wall to the existing roof diaphragm at the 1987 addition. This non-conformance item has been addressed by item "C" and item "D" in the strengthening plan.

- Liquefaction – This criterion requires that liquefaction-susceptible, saturated, loose granular soils that could jeopardize the building's seismic performance shall not exist in the foundation soils at depths within 50 ft under the building.
    - There is no specific geotechnical report available for this building and the liquefaction risk is expected to be low based on information a geotechnical engineer and their experience with nearby projects. According to the Oregon Department of Geology and Mineral Industries (DOGAMI) there is no liquefaction hazard and this building is likely compliant with this requirement.

- Slope Failure – This criterion requires that the building site is sufficiently remote from potential earthquake-induced slope failures or rock falls to be unaffected by such failures or is capable of accommodating any predicted movements without failure.
    - There is no geotechnical report available for this building and the slope failure risk is unknown. However, based on a conversation with a geotechnical engineer familiar with this area, this building is likely compliant with this requirement. A full geotechnical report is recommended to confirm.

- Surface Fault Rupture – This criterion requires that surface fault rupture and surface displacement at the building site are not anticipated.
    - There is no geotechnical report available for this building, local faults have not been identified and the risk is unknown. According to the Oregon Department of Geology and Mineral Industries (DOGAMI) and a geotechnical engineer, there are no faults close to the building site. This building is likely compliant with this requirement.

- Ties Between Foundation Elements – This criterion requires 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.
    - There are individual spread footings that support floor framing located under the 1987 addition that are not tied together. The site class of the soil is unknown. The soil type on site should be verified and it is likely that the Site Class of the building is D. If so, wood diagonal bracing could be added during the retrofit to satisfy this requirement.

- Redundancy – The number of lines of shear walls in each principal direction is greater than or equal to 2.
    - From the existing drawings and site observations of Building Part B1, it appears that there is an inadequate amount of shear walls. New wood shear walls are being added

to comply with this requirement. This non-conformance item has been addressed by item “A” in the strengthening plan by retrofitting existing walls to meet the seismic demands.

- Building Part A1 does not have enough shear walls along the corridor. This non-conformance item has been addressed by item “D” in the strengthening plan by adding additional walls.

- Shear Stress Check – This criterion requires that the shear stress in the shear walls, as calculated per the procedures of ASCE 41-13, are less than the specified maximum values outlines in ASCE 41-13.
  - It appears that there is lath and plaster sheathing on the walls of the existing 1954 cafeteria and adjacent classroom building to the south in Building Part B1. Lath and plaster does not provide enough lateral strength for the loads as defined by ASCE 41-13. This non-
  - conformance item has been addressed by item “A” in the strengthening plan.

- Narrow Wood Shear Walls – Narrow wood shear walls with an aspect ratio greater than 2-to-1 are not used to resist seismic forces.
  - In Building Part B1 there is a short wall along the stairwell that is truncated by a mechanical vent reducing its length. This non-conformance item has been addressed by item “A” in the strengthening plan.

- Walls Connected Through Floors – This criterion required that shear walls have an interconnection between stories to transfer overturning and shear forces through the floor.
  - In Building Part B1 it is unclear as to how the walls are connected through the floor and at the foundation. This building part is likely non-compliant with this requirement and has been addressed by item “A” in the strengthening plan by adding new shear wall anchorage and hold downs as required.
  - In Building Part C1, the existing drawings do not specify the wall anchorage. This building part is likely non-compliant with this requirement and has been addressed by item “B” in the strengthening plan by adding new shear wall anchorage and hold downs as required.

- Hold down Anchors – This criterion requires that all shear walls have hold down anchors, constructed per acceptable construction practices, attached to the end studs.
  - According to the existing drawings the walls appear to be anchored continuously with anchor bolts along the foundation, however designated hold downs do not appear to exist. New hold down anchors would be installed where needed and has been addressed by item “A”, “E” and “F” in the strengthening plan.

- Wood Posts – This criterion requires that there is a positive connection of wood posts to the foundation.
  - It is unclear how Building Part B1, the 1954 Cafeteria building, is framed and how and what material the posts that support the roof framing are and how they are connected to the foundation. It is assumed that this building part is complaint with this requirement.

- In Building Part C1 it is unclear from the existing drawings how the wood posts in the crawlspace are attached to the footing and floor framing. Based on our site observations in the crawlspace, connections were not observed. It is likely that this connection will need to be reinforced. This building part is likely non-compliant with this requirement and has been addressed by item “H” in the strengthening plan.

- Girder Column Connection – There is a positive connection using plates, connection hardware, or straps between the girder and the column support.
  - The existing drawings are unclear as to how the existing framing is tied together or how the 1954 building is framed. The building is likely complaint with this section, however it will need to be verified.

- Wood Sills – All wood sills are bolted to the foundation.
  - The sill attachment, of Building Part C1, is unclear from the existing drawings. The wall sills are likely compliant with this requirement considering when this building was constructed.

- Girder Column Connection – There is a positive connection using plates, connection hardware, or straps between the girder and the column support.
  - The existing drawings, of Building Part C1, are unclear as to how the existing framing is tied together. The girder column connection is likely compliant with this requirement considering when this building was constructed.

- Wood Sill Bolts – Sill bolts are spaced at 6 ft or less, with proper edge and end distance provided for wood and concrete.
  - From the existing drawings, of Building Part B1, anchor bolts appear to be spaced at 8’-0” o.c. This non-conformance item has been addressed by item “A” in the strengthening plan by adding additional bolts as required.
  - The sill attachment in Building Part C1 is unclear. Considering when the building was constructed it is likely that this building part is compliant with this requirement but will need to be verified.

- Diaphragm Continuity – The diaphragms are not composed of split-level floors and do not have expansion joints.
  - In Building Part C1, there is a stepped diaphragm at the "pop-up" located at the center of the roof diaphragm. Plywood sheathing appears to be on the vertical face of the wall that separates the low and high roof; however, there doesn’t appear to be a transfer of diaphragm shear between the two diaphragms. This non-conformance item has been addressed by item “G” in the strengthening plan by adding additional strapping at the roof diaphragm.

- Diaphragm Reinforcement At Openings – There is reinforcing around all diaphragm openings larger than 50% of the building width in either major plan dimension.
  - In Building Part C1, there is a stepped diaphragm at the "pop-up" located at the center of the roof diaphragm that creates an opening of approximately 50% of the roof diaphragm and no reinforcing appears to be present. This non-conformance item has

been addressed by item “G” in the strengthening plan by adding additional strapping at the roof diaphragm.

- Diagonally Sheathed And Unblocked Diaphragms – This criterion requires that all diagonally sheathed or unblocked wood structural panel diaphragms have horizontal spans less than 30 ft and aspect ratios less than or equal to 3-to-1.
    - The roof diaphragm in Building Part B1 spans greater than 30 ft. The 2010 retrofit drawings added plywood sheathing to the existing shiplap roofing which is effectively a blocked diaphragm. With that consideration the roof diaphragm is likely capable of the potential shear demands as a blocked diaphragm even though it spans greater than 30 ft.
    - In Building Part C1 the plywood diaphragm spans approximately 72 ft and is currently unblocked. Item “M” in the strengthening plan adds strap blocking to the top of the plywood to provide blocking for the diaphragm and additional nailing to strengthen the diaphragm. In item “G” in the strengthening plan, collector straps have been added to the roof to address the roof pop-up in the middle of the diaphragm.
    - Building Part A1 contains original plywood sheathing but is currently an unblocked diaphragm. Item “N” in the strengthening scheme adds blocking for the diaphragm. In the 2009 retrofit, chord and collector strapping was added to this diaphragm.
    - The north auditorium, in Building Part A2, has a roof diaphragm that spans greater than 30 ft. This area was also excluded from the 2010 re-roofing upgrade and this was not mitigated in that effort. This non-conformance item has been addressed by item “J” in the strengthening plan by adding plywood roof sheathing and verifying that it can span and is capable of resisting its seismic demand.

- 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.
    - The 2010 roof upgrades appeared to address most of the reinforcing required to support the concrete wall for out-of-plane forces in Building Part A2. However, the north auditorium building appears to still require reinforcing. This non-conformance item has been addressed by item “J” in the strengthening plan by adding additional strapping at the roof diaphragm.

- Wall Thickness – This criterion requires that the thicknesses of bearing walls is not less than 1/25 the unsupported height or length, whichever is shorter, nor less than 4 in.
    - The thickness of the tall walls in Building Part A2, appear to be less than 1/25 the unsupported height. This non-conformance item has been addressed by item “I” in the strengthening plan by adding additional steel framing to strongback the existing concrete walls.
    - There are partial height concrete walls on the north and west walls of the cafeteria. These walls will be braced by the new plywood shear wall adjacent to these existing concrete walls (item “A” SIM in the strengthening scheme). The new shear wall will contain full height studs capable of bracing the partial height concrete wall.

- Transfer To Shear Walls – Diaphragms are connected for transfer of seismic forces to the shear walls.
    - The 2010 roof upgrades appeared to address most of the reinforcing required to support the concrete wall for in-plane seismic forces in Building Part A1. However, the north auditorium building, Building Part A2, appears to still require reinforcing to transfer in-plane shear loads. This non-conformance item has been addressed by item "J" in the strengthening plan by adding additional strapping at the roof diaphragm.

- Cross Ties – This criterion requires that there are continuous cross ties between diaphragm chords.
    - The 2010 roof upgrades appeared to add the required continuous cross ties to most of Building Part A1. However, the north auditorium building appears to still require cross ties. This non-conformance item has been addressed by item "J" in the strengthening plan by adding additional strapping at the roof diaphragm.
    - In Building Part C2, no continuous cross ties appear to be present. This non-conformance item has been addressed by item "K" in the strengthening plan by adding additional strapping and blocking at the roof diaphragm.

- Straight Sheathing – This criterion requires that all straight sheathed diaphragms have aspect ratios less than 1-to-1 in the direction being considered.
    - It is unclear what the existing sheathing type is at Building Part A2. Assuming that the sheathing is straight sheathing, the auditorium roof does not meet this requirement. This non-conformance item has been addressed by item "J" in the strengthening plan by adding plywood and additional strapping and blocking at the roof diaphragm.

- Spans – This criterion requires that all wood diaphragms with spans greater than 12 ft consist of wood structural panels or diagonal sheathing.
    - It is unclear what the existing sheathing type is at Building Part A2. Assuming that the sheathing is straight sheathing, the auditorium roof does not meet this requirement. This non-conformance item has been addressed by item "J" in the strengthening plan by adding plywood and additional strapping and blocking at the roof diaphragm.

- Transfer to Steel Frames – Diaphragms are connected for transfer of seismic forces to the steel frames.
    - In Building Part C2, there does not appear to be a connection capable of transferring seismic forces from the roof diaphragm to the cantilever columns in the north-south direction. This non-conformance item has been addressed by item "K" in the strengthening plan.

- Compact Columns – All frame elements meet section requirements set forth by AISC 341Table D1.1, for moderately ductile members.
    - Steel columns are not compact in Building Part C2. This non-conformance item has been addressed by item "I" in the strengthening plan by adding steel plates to the side of the existing columns.

Nonstructural Components

The building's nonstructural components were evaluated based on the requirements of ASCE 41-1. The appropriate Tier 1 checklists are provided in Appendix A of this report and a summary of the items that were found to be non-conforming along with comments and/or recommendations is provided below. In accordance with an ASCE 41-17 assessment, these items require mitigation:

- Fire Suppression Piping – This criterion requires that Fire suppression piping is anchored and braced in accordance with NFPA-13.
    - Most fire suppression piping was behind walls and ceilings and bracing could not be verified. It is assumed that the piping is unbraced and has been addressed in the cost estimate provided in Appendix C.

- Flexible Couplings – This criterion requires that fire suppression piping has flexible couplings.
    - Most fire suppression piping was behind walls and ceilings and flexible couplings could not be verified. It is assumed that the piping is not flexible and has been addressed in the cost estimate provided in Appendix C.

- Sprinkler Ceiling Clearance – This criterion requires that penetrations through panelized ceilings for fire suppression devices provide clearances in accordance with NFPA-13.
    - The sprinkler clearance could not be verified, however appeared to be compliant with this requirement based off of our on-site observations. An allowance has been made in the cost estimate provided in Appendix C for non-compliant fixtures.

- Hazardous Material Distribution – This criterion requires that piping or ductwork conveying hazardous materials is braced or otherwise protected from damage that would allow hazardous material release.
    - Gas piping appeared to be braced however all piping was not visible for observation. This assumed non-conformance item has been addressed in the cost estimate provided in Appendix C.

- Flexible Couplings – This criterion requires that hazardous material ductwork and piping, including natural gas piping, has flexible couplings.
    - Gas piping was observed to be non-compliant. This non-conformance item has been addressed in the cost estimate provided in Appendix C.

- Light Partitions Support by Ceilings – This criterion requires that the tops of gypsum board partitions are not laterally supported by an integrated ceiling system.
    - A few walls were observed to be unsupported. This non-conformance item has been addressed in the cost estimate provided in Appendix C.

- Suspended Lath and Plaster – This criterion requires that suspended lath and plaster ceilings have attachments that resist seismic forces for every 12 ft^2 of area.
    - This criterion could not be verified on site or in the provided drawings. This requirement applies to the 1954 Cafeteria area in Building Part B1. This building part

is most likely non-compliant with this requirement. This non-conformance item has been addressed in the cost estimate provided in Appendix C.

- Integrated Ceilings, Edge Clearance and Edge Support – This criteria requires that integrated suspended ceilings are laterally restrained, have free edges with clearances of ¾" for lateral movement and free edge support by 2" closure angles.
    - This criteria is deficient throughout the building and is addressed in the cost estimate provided in Appendix C.

- Lens Covers – This criterion requires that lens coves on light fixtures are attached with safety devices.
    - This criterion was observed to be non-compliant and is addressed in the cost estimate provided in Appendix C.

- Canopies – This criterion requires that canopies at building exits are anchored to the structure at a spacing of less than 6 ft.
    - This criterion was observed to be non-compliant at the canopy by the boiler room and is addressed in the strengthening scheme and cost estimate provided in Appendix C.

- Anchorage of URM Chimneys – This criterion requires that masonry chimneys are anchored at each floor level and at the roof.
    - This criterion was observed to be non-compliant and is addressed in the strengthening scheme and cost estimate provided in Appendix C.

- Tall Narrow Contents – The criterion requires that contents more than 6 ft high with a height-to-depth or height-to-width ratio greater than 3-to-1 are anchored to the structure or to each other.
    - Kitchen shelving appeared not to be anchored as well as other items and these are addressed in the strengthening scheme.

- Fall Prone Contents and Equipment – This criterion requires that equipment, stored items, or other contents weighing more than 20 lb whose center of mass is more than 4 ft above the adjacent floor level are braced or otherwise restrained.
    - Kitchen ovens were stacked on each other and did not appear to be anchored and is addressed in the strengthening scheme.

- In-line Equipment – This criterion requires that in-line equipment weighing more than 75 lbs is supported and laterally braced independent of the duct or piping system.
    - This criterion could not be verified and was assumed to be non-compliant based on the year of construction and is addressed in the strengthening scheme.

- Tall Narrow Equipment – This criterion requires that equipment more than 6 ft high with a height-to-depth or height-to-width ration greater than 3:1 is anchored to the floor slab or adjacent structural walls.
    - This criterion was found to be deficient in the boiler room and is addressed in the strengthening scheme.

- Suspended Contents and Equipment – This criterion requires that suspended contents and equipment free to swing or move with the structure are positioned such that they do not damage themselves or adjoining components.
    - It was observed that there was suspended light fixtures in the classrooms that are free to swing and could cause damage. This non-compliance item was addressed in the cost estimate provided in Appendix C.

- Conduit Couplings - This criterion requires that conduit greater than 2.5 in. that is attached to equipment with relative seismic displacement have flexible couplings or connections.
    - This criterion was found to be deficient in the boiler room and is addressed in the strengthening scheme.

- Fluid and Gas Piping – This criterion requires that fluid and gas piping is anchored and braced to the structure to limit spills or leaks.
    - It is assumed to be non-compliant throughout as there was a non-compliant pipe observed in the kitchen. This item was addressed in the cost estimate in Appendix C of this report.

- Duct Bracing – This criterion requires that ducts larger than 6 ft^2 in cross-sectional area and round ducts larger than 28 in. in diameter are braced.
    - It was observed during the site visit that ductwork above the ceiling was not braced. This non-compliant item was addressed in the cost estimate provided in Appendix C.

Photos of Deficiencies:

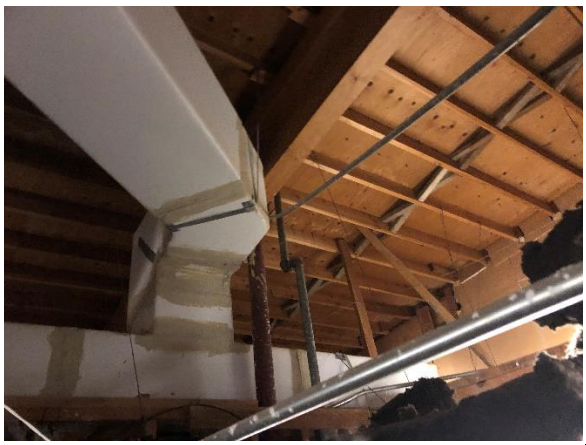

Figure 13: Unblocked plywood roof diaphragm

Figure 14: Absence of blocking for load path transfer

Figure 14: Lack of positive connection of wood posts to the foundation

Figure 16: Tall and narrow contents in the kitchen

GENERAL SUMMARY AND RECOMMENDATIONS

Based on the ASCE 41-13 Tier 1 screening, Cooper Mountain Elementary School presently has deficiencies that could result in localized hazards, or partial or total collapse of the structure in a major seismic event. Significant deficiencies include failure of the wood shear walls at the 1954 cafeteria building, failure to transfer in-plane loads with concrete shear walls along Building Part A1 corridor, and transfer of seismic forces to the columns at the covered play structure located in Building Part C2.

Refer to Appendix B for the proposed strengthening scheme targeted to achieve the Performance Levels associated with Risk Category IV per ASCE 41-17 and the SRGP. All of the seismic deficiencies are included in the retrofit scope of work and all of the retrofit's scope of work elements are included in the cost estimate.

The proposed details contained in this report represent a cost-effective solution for the Cooper Mountain Elementary School seismic upgrade.

The BCA spreadsheet fragility curves were adjusted for Building Parts A1, A2, B1 and B2 to account for the 2010 partial seismic strengthening at the roof level in these areas. The level of strengthening completed in 2010 for each section varies as noted in the building description section of the report and has been accounted for in the fragility modifications. The slight damage and moderate damage states were adjusted to reflect this strengthening. Due to the nature of the remaining deficiencies, particularly in the gymnasium and cafeteria portion of the building, the diaphragm strengthening alone does not change the extensive and complete damage states. No strengthening work was completed in Building Parts C1 and C2 so these fragility curves were not adjusted.

APPENDIX A

ASCE 41-13 CHECKLISTS

Project Name BSD Cooper Mountain SRGP

Project Number 10021800754

ASCE /SEI 41-17 Tier 1 Checklists

Firm:	KPFF Consulting Engineers
Seismicity Level:	High
Completed By:	LB/JBE
Date Completed:	11/14/2018
Reviewed By:	JBE
Review Date:	11/14/2018

Project Name BSD Cooper Mountain SRGP

Project Number 10021800754

Table 17.2. Collapse Prevention Basic Configuration Checklist

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
Low Seismicity **Building System—General**			
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.	5.4.1.1	A.2.1.1 Part A1: Not a continuous load path from the roof to the foundation at the walls along the corridor. Part A2, does not have proper shear transfer from the roof to the existing shear walls below. Part C2, does not have a complete load path from the existing diaphragm to the cantilevered columns.
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.	5.4.1.2	A.2.1.2
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.	5.4.1.3	A.2.1.3
Building System—Building Configuration			
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.	5.4.2.1	A.2.2.2
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.	5.4.2.2	A.2.2.3
C NC N/A U	VERTICAL IRREGULARITIES: All vertical elements in the seismic-force-resisting system are continuous to the foundation.	5.4.2.3	A.2.2.4
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.	5.4.2.4	A.2.2.5
C NC N/A U	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
C NC N/A U	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
Moderate Seismicity (Complete the Following Items in Addition to the Items for Low Seismicity) **Geologic Site Hazards**			
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 (15.2 m) under the building.	5.4.3.1	A.6.1.1
C NC N/A U	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
C NC N/A U	SURFACE FAULT RUPTURE: Surface fault rupture and surface displacement at the building site are not anticipated.	5.4.3.1	A.6.1.3

Table 17.2. Collapse Prevention Basic Configuration Checklist

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
High Seismicity (Complete the Following Items in Addition to the Items for Moderate Seismicity) Foundation Configuration			
[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 $0.6S_a$	5.4.3.3	A.6.2.1
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.	5.4.3.4 There are individual spread footings that support floor framing located under the 1987 addition that are not tied together. The site class of the soil is unknown.	A.6.2.2

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

Project Name BSD Cooper Mountain SRGP

Project Number 10021800754

Table 17.3. Immediate Occupancy Basic Configuration Checklist

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
Very Low Seismicity **Building System—General**			
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.	5.4.1.1	A.2.1.1 Part A1: not a continuous load path from the roof to the foundation at the walls along the corridor. Part A2, does not have proper shear transfer from the roof to the existing shear walls below. Part C2, does not have a complete load path from the existing diaphragm to the cantilevered columns.
C NC N/A U	ADJACENT BUILDINGS: The clear distance between the building being evaluated and any adjacent building is greater than 0.5% of the height of the shorter building in low seismicity, 1.0% in moderate seismicity, and 3.0% in high seismicity.	5.4.1.2	A.2.1.2
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.	5.4.1.3	A.2.1.3
Building System—Building Configuration			
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.	5.4.2.1	A.2.2.2
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.	5.4.2.2	A.2.2.3
C NC N/A U	VERTICAL IRREGULARITIES: All vertical elements in the seismic-force-resisting system are continuous to the foundation.	5.4.2.3	A.2.2.4
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.	5.4.2.4	A.2.2.5
C NC N/A U	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
C NC N/A U	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
Low Seismicity (Complete the Following Items in Addition to the Items for Very Low Seismicity) **Geologic Site Hazards**			
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 (15.2 m) under the building.	5.4.3.1	A.6.1.1
C NC N/A U	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
C NC N/A U	SURFACE FAULT RUPTURE: Surface fault rupture and surface displacement at the building site are not anticipated.	5.4.3.1	A.6.1.3
Moderate and High Seismicity (Complete the Following Items in Addition to the Items for Low Seismicity) **Foundation Configuration**			
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 $0.6S_a$.	5.4.3.3	A.6.2.1

Project Name BSD Cooper Mountain SRGP

Project Number 10021800754

Table 17.3. Immediate Occupancy Basic Configuration Checklist			
Status	**Evaluation Statement**	**Tier 2 Reference**	**Commentary Reference**
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.	5.4.3.4 There are individual spread footings that support floor framing located under the 1987 addition that are not tied together. The site class of the soil is unknown.	A.6.2.2

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

Project Name BSD Cooper Mountain SRGP

Project Number 10021800754

Table 17-6. Collapse Prevention Structural Checklist for Building Type W2

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
Low and Moderate Seismicity **Seismic-Force-Resisting System**			
C **NC** N/A U	REDUNDANCY: The number of lines of shear walls in each principal direction is greater than or equal to 2.	5.5.1.1 Compliant for 1978	A.3.2.1.1
C **NC** N/A U	SHEAR STRESS CHECK: The shear stress in the shear walls, calculated using the Quick Check procedure of Section 4.4.3.3, is less than the following values: Structural panel sheathing 1,000 lb/ft Diagonal sheathing 700 lb/ft Straight sheathing 100 lb/ft All other conditions 100 lb/ft	5.5.3.1.1 It appears that there is lath and plaster sheathing on the existing 1954 walls. The shear demand is greater than 100 lb/ft. This is compliant for the 1978 building.	A.3.2.7.1
C NC N/A U	STUCCO (EXTERIOR PLASTER) SHEAR WALLS: Multi-story buildings do not rely on exterior stucco walls as the primary seismic-force-resisting system.	5.5.3.6.1	A.3.2.7.2
C NC N/A U	GYPSUM WALLBOARD OR PLASTER SHEAR WALLS: Interior plaster or gypsum wallboard is not used for shear walls on buildings more than one story high with the exception of the uppermost level of a multi-story building.	5.5.3.6.1	A.3.2.7.3
C **NC** N/A U	NARROW WOOD SHEAR WALLS: Narrow wood shear walls with an aspect ratio greater than 2-to-1 are not used to resist seismic forces.	5.5.3.6.1 Compliant for 1978	A.3.2.7.4
C NC N/A **U**	WALLS CONNECTED THROUGH FLOORS: Shear walls have an interconnection between stories to transfer overturning and shear forces through the floor.	5.5.3.6.2 The two-story volume at the south side of the cafeteria appears to be balloon framed but would need to be confirmed. 1978 likely is not compliant as well. Addressed in scheme.	A.3.2.7.5
C NC **N/A** U	HILLSIDE SITE: For structures that are taller on at least one side by more than one-half story because of a sloping site, all shear walls on the downhill slope have an aspect ratio less than 1-to1.	5.5.3.6.3	A.3.2.7.6
C NC **N/A** U	CRIPPLE WALLS: Cripple walls below first-floor-level shear walls are braced to the foundation with wood structural panels.	5.5.3.6.4	A.3.2.7.7
C NC N/A U	OPENINGS: Walls with openings greater than 80% of the length are braced with wood structural panel shear walls with aspect ratios of not more than 1.5-to-1 or are supported by adjacent construction through positive ties capable of transferring the seismic forces.	5.5.3.6.5	A.3.2.7.8
Connections			
C **NC** N/A U	WOOD POSTS: There is a positive connection of wood posts to the foundation.	5.7.3.3 1978 crawl space not compliant	A.5.3.3
C NC N/A U	WOOD SILLS: All wood sills are bolted to the foundation.	5.7.3.3	A.5.3.4
C **NC** N/A U	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 1978 crawl space not compliant, 1954 should be verified	A.5.4.1
High Seismicity (Complete the Following Items in Addition t the Items for Low and Moderate Seismicity) **Connections**			
C **NC** N/A U	WOOD SILL BOLTS: Sill bolts are spaced at 6 ft (1.8 m) or less with acceptable edge and end distance provided for wood and concrete.	5.7.3.3 From the existing drawings anchor bolts appear to be spaced at 8'-0" o.c. This non-conformance item has been addressed by item "a" in the strengthening plan by adding additional bolts as required. 1978 to be verified.	A.5.3.7
Diaphragms			
C **NC** N/A U	DIAPHRAGM CONTINUITY: The diaphragms are not composed of split-level floors and do not have expansion joints.	5.6.1.1 1978 roof "pop-up" non- compliant	A4.1.1
C NC N/A U	ROOF CHORD CONTINUITY: All chord elements are continuous, regardless of changes in roof elevation.	5.6.1.1	A.4.1.3

Project Name BSD Cooper Mountain SRGP

Project Number 10021800754

Table 17-6. Collapse Prevention Structural Checklist for Building Type W2

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
C **NC** N/A U	DIAPHRAGM REINFORCEMENT AT OPENINGS: There is reinforcing around all diaphragm openings larger than 50% of the building width in either major plan dimension.	5.6.1.5 1978 roof "pop-up" non-compliant	A.4.1.8
C NC **N/A** U	STRAIGHT SHEATHING: All straight-sheathed diaphragms have aspect ratios less than 2-to-1 in the direction being considered.	5.6.2 It is unclear from the existing drawings what the roof sheathing originally was. However, a new 1/2" plywood sheathing roof was added in 2009.	A.4.2.1
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.	5.6.2	A.4.2.2
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 have aspect ratios less than or equal to 4-to-1.	5.6.2 Blocking NC at areas indicated in strengthening scheme.	A.4.2.3
C NC N/A U	OTHER DIAPHRAGMS: The diaphragms do not consist of a system other than wood, metal deck concrete, or horizontal bracing.	5.6.5	A.4.7.1

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

Project Name BSD Cooper Mountain SRGP

Project Number 10021800754

Table 17-7. Immediate Occupancy Checklist for Building Type W2

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
Very Low Seismicity Seismic-Force-Resisting System			
C **NC** N/A U	REDUNDANCY: The number of lines of shear walls in each principal direction is greater than or equal to 2.	5.5.1.1 Compliant for 1978	A.3.2.1.1
C **NC** N/A U	SHEAR STRESS CHECK: The shear stress in the shear walls, calculated using the Quick Check procedure of Section 4.4.3.3, is less than the following values: Structural panel sheathing 1,000 lb/ft(14.6 kN/m) Diagonal sheathing 700 lb/ft (10.2 kN/m) Straight sheathing 100 lb/ft (1.5 kN/m) All other conditions 100 lb/ft (1.5 kN/m)	5.5.3.1.1 It appears that there is lath and plaster sheathing on the existing 1954 walls. The shear demand is greater than 100 lb/ft. Compliant for 1978.	A.3.2.7.1
C NC N/A U	STUCCO (EXTERIOR PLASTER) SHEAR WALLS: Multi-story buildings do not rely on exterior stucco walls as the primary seismic-force-resisting system.	5.5.3.6.1	A.3.2.7.2
C NC N/A U	GYPSUM WALLBOARD OR PLASTER SHEAR WALLS: Interior plaster or gypsum wallboard is not used for shear walls on buildings more than one story high with the exception of the uppermost level of a multi-story building.	5.5.3.6.1	A.3.2.7.3
C **NC** N/A U	NARROW WOOD SHEAR WALLS: Narrow wood shear walls with an aspect ratio greater than 2-to-1 are not used to resist seismic forces.	5.5.3.6.1 Compliant for 1978	A.3.2.7.4
C NC N/A **U**	WALLS CONNECTED THORUGH FLOORS: Shear walls have an interconnection between stories to transfer overturning and shear forces through the floor.	5.5.3.6.2	A.3.2.7.5
C NC **N/A** U	HILLSIDE SITE: For structures that are taller on at least one side by more than one-half story because of a sloping site, all shear walls on the downhill slope have an aspect ratio less than 1-to-2.	5.5.3.6.3	A.3.2.7.6
C NC **N/A** U	CRIPPLE WALLS: Cripple walls below first-floor-level shear walls are braced to the foundation with wood structural panels.	5.5.3.6.4	A.3.2.7.7
C NC N/A U	OPENINGS: Walls with openings greater than 80% of the length are braced with wood structural panel shear walls with aspect ratios of not more than 1.5-to-1 or are supported by adjacent construction through positive ties capable of transferring the seismic forces.	5.5.3.6.5	A.3.2.7.8
C **NC** N/A U	HOLD-DOWN ANCHORS: All shear walls have hold-down anchors attached to the end studs constructed in accordance with acceptable construction practices.	5.5.3.6.6 According to the existing drawings the walls appear to be anchored continuously with anchor bolts along the foundation, however designated hold downs do not appear to exist. New hold down anchors would be installed where needed.	A3.2.7.9
Connections			
C **NC** N/A U	WOOD POSTS: There is a positive connection of wood posts to the foundation.	5.7.3.3 1978 crawl space not compliant	A.5.3.3
C NC N/A U	WOOD SILLS: All wood sills are bolted to the foundation.	5.7.3.3	A.5.3.4
C **NC** N/A U	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 1978 crawl space not compliant, 1954 should be verified	A.5.4.1
Foundation System			
C NC **N/A** U	DEEP FOUNDATIONS: Piles and piers are capable of transferring the lateral forces between the structure and the soil.		A.6.2.3
C NC **N/A** U	SLOPING SITES: The difference in foundation embedment depth from one side of the building to another does not exceed one story high.		A.6.2.4

Project Name BSD Cooper Mountain SRGP

Project Number 10021800754

Table 17-7. Immediate Occupancy Checklist for Building Type W2

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
Low, Moderate, and High Seismicity (Complete the Following Items in Addition to the Items for Very Low Seismicity)			
Seismic-Force-Resisting System			
C **NC** N/A U	NARROW WOOD SHEAR WALLS: Narrow wood shear walls with an aspect ratio greater than 1.5-to-1 are not used to resist seismic forces.	5.5.3.6.1 Compliant for 1978	A.3.2.7.4
Diaphragms			
C **NC** N/A U	DIAPHRAGM CONTINUITY: The diaphragms are not composed of split-level floors and do not have expansion joints.	5.6.1.1 1978 roof "pop-up" not compliant	A4.1.1
C NC N/A U	ROOF CHORD CONTINUITY: All chord elements are continuous, regardless of changes in roof elevation.	5.6.1.1	A.4.1.3
C **NC** N/A U	DIAPHRAGM REINFORCEMENT AT OPENINGS: There is reinforcing around all diaphragm openings larger than 50% of the building width in either major plan dimension.	5.6.1.5 1978 roof "pop-up" not compliant	A.4.1.8
C NC **N/A** U	STRAIGHT SHEATHING: All straight-sheathed diaphragms have aspect ratios less than 1-to-1 in the direction being considered.	5.6.2 It is unclear from the existing drawings what the roof sheathing originally was. However, a new 1/2" plywood sheathing roof was added in 2009.	A.4.2.1
C NC N/A U	SPANS: All wood diaphragms with spans greater than 12 ft (3.6 m) consist of wood structural panels or diagonal sheathing.	5.6.2	A.4.2.2
C **NC** N/A U	DIAGONALLY SHEATHED AND UNBLOCKED DIAPHRAGMS: All diagonally sheathed or unblocked wood structural panel diaphragms have horizontal spans less than 30 ft (9.2 m) and have aspect ratios less than or equal to 3-to-1.	5.6.2 blocking NC at areas indicated in strengthening scheme	A.4.2.3
C NC N/A U	OTHER DIAPHRAGMS: The diaphragms do not consist of a system other than wood, metal deck, concrete, or horizontal bracing.	5.6.5	A.4.7.1
Connections			
C **NC** N/A U	WOOD SILL BOLTS: Sill bolts are spaced at 4 ft or less with acceptable edge and end distance provided for wood and concrete.	5.7.3.3 From the existing drawings anchor bolts appear to be spaced at 8'-0" o.c. This non-conformance item has been addressed by item "a" in the strengthening plan by adding additional bolts as required. 1978 to be verified.	A.5.3.7

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

Project Name BSD Cooper Mountain SRGP

Project Number 10021800754

Table 17-8. Collapse Prevention Structural Checklist for Building Types S1 and S1a

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
Low Seismicity **Seismic-Force-Resisting System**			
[C] NC N/A U	REDUNDANCY: The number of lines of moment frames in each principal direction is greater than or equal to 2.	5.5.1.1	A.3.1.1.1
C NC **[N/A]** U	DRIFT CHECK: The drift ratio of the steel moment frames, 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
[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 $0.30F_{y.}$	5.5.2.1.3	A.3.1.3.2
[C] NC N/A U	FLEXURAL STRESS CHECK: The average flexural stress in the moment frame columns and beams, calculated using the Quick Check procedure of Section 4.4.3.9, is less than $F_{y.}$ Columns need not be checked if the strong column-weak beam checklist item is compliant.	5.5.2.1.2	A.3.1.3.3
Connections			
C **[NC]** N/A U	TRANSFER TO STEEL FRAMES: Diaphragms are connected for transfer of seismic forces to the steel frames.	There does not appear to be a connection capable of transferring seismic forces from the roof diaphragm to the cantilever columns in the north-south direction.	
[C] NC N/A U	STEEL COLUMNS: The columns in seismic-force-resisting frames are anchored to the building foundation.	5.7.3.1	A.5.3.1
Moderate Seismicity (Complete the Following Items in Addition to the Items for Low Seismicity) **Seismic-Force-Resisting System**			
[C] NC N/A U	REDUNDANCY: the number of bays of moment frames in each line is greater than or equal to 2.	5.5.1.1	A.3.1.1.1
[C] NC N/A U	INTERFERING WALLS: All concrete and masonry infill walls placed in moment frames are isolated from structural elements.	The north-south CMU wall on the east side of the building appears to be connected to the roof diaphragm. However, the roof is flexible so it is likely OK even though it takes load. The next frame is approximately 28 feet away. This item will need to be verified if a higher analysis is completed on the building.	
C NC **[N/A]** U	MOMENT-RESISTING CONNECTIONS: All moment connections can develop the strength of the adjoining members based on the specified minimum yield stress of steel.	5.5.2.2.1 Cantilever column system	A.3.1.3.4
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	MOMENT-RESISTING CONNECTIONS: All moment connections are able to develop the strength of the adjoining members or panel zones based on 110% of the expected yield stress of the steel in accordance with AISC 341, Section A3.2	5.5.2.2.1 Cantilever column system	A.3.1.3.4
C NC **[N/A]** U	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 Cantilever column system	A.3.1.3.5
C NC **[N/A]** U	COLUMN SPLICES: All column splice details located in moment-resisting frames include connection of both flanges and the web.	5.5.2.2.3 Single story building	A.3.1.3.6
C NC **[N/A]** U	STRONG COLUMN—WEAK BEAM: The percentage of strong column-weak beam joints in each story of each line of moment frames is greater than 50%.	5.5.2.1.5 Cantilever column system	A.3.1.3.7
C **[NC]** N/A U	COMPACT MEMBERS: All frame elements meet section requirements in accordance with AISC 341, Table D1.1, for moderately ductile members.	5.5.2.2.4 Columns are not compact	A.3.1.3.8

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Table 17-8. Collapse Prevention Structural Checklist for Building Types S1 and S1a						
Status				**Evaluation Statement**	**Tier 2 Reference**	**Commentary Reference**
Diaphragms (Stiff or Flexible)						
C	**NC**	**N/A**	**U**	OPENINGS AT FRAMES: Diaphragm openings immediately adjacent to the moment frames extend less than 25% of the total frame length.	5.6.1.3	A.4.1.5
Flexible Diaphragms						
C	**NC**	**N/A**	**U**	CROSS TIES: There are continuous cross ties between diaphragm chords.	5.6.1.2	A.4.1.2
C	**NC**	**N/A**	**U**	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
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.	5.6.2	A.4.2.2
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.	5.6.2	A.4.2.3
C	**NC**	**N/A**	**U**	OTHER DIAPHRAGMS: Diaphragms do not consist of a system other than wood, metal deck, concrete, or horizontal bracing.	5.6.5	A.4.7.1

The building does not appear to have continuous cross ties.

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

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Table 17-9. Immediate Occupancy Checklist for Building Types S1 and S1a

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
Very Low Seismicity Seismic-Force-Resisting System			
C NC **N/A** U	DRIFT CHECK: The drift ratio of the steel moment frames, calculated using the Quick Check procedure of Section 4.4.3.1, is less than 0.015.	5.5.2.1.2	A.3.1.3.1
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 $0.30F_y$.	5.5.2.1.3	A.3.1.3.2
C NC N/A U	FLEXURAL STRESS CHECK: The average flexural stress in the moment-frame columns and beams, calculated using the Quick Check procedure of Section 4.4.3.9, is less than F_y. Columns need not be checked if the strong column-weak beam checklist item is compliant.	5.5.2.1.2	A.3.1.3.3
Connections			
C NC N/A U	STEEL COLUMNS: The columns in seismic-force-resisting frames are anchored to the building foundation.	5.7.3.1	A.5.3.1
Low Seismicity (Complete the Following Items in Addition to the Items for Very Low Seismicity) Seismic-Force-Resisting System			
C NC N/A U	REDUNDANCY: The number of lines of moment frames in each principal direction is greater than or equal to 2. The number of bays of moment frames in each line is greater than or equal to 3.	5.5.1.1	A.3.1.1.1
C NC N/A U	INTERFERING WALLS: All concrete and masonry infill walls placed in moment frames are isolated from structural elements.	The north-south CMU wall on the east side of the building appears to be connected to the roof diaphragm. However, the roof is flexible so it is likely OK even though it takes load. The next frame is approximately 28 feet away. This item will need to be verified if a higher analysis is completed on the building.	
Connections			
C **NC** N/A U	TRANSFER TO STEEL FRAMES: Diaphragms are connected for transfer of seismic forces to the steel frames, and the connections are able to develop the lesser of the strength of the frames or the diaphragms.	5.7.2	A.5.2.2
		There does not appear to be a connection capable of transferring seismic forces from the roof diaphragm to the cantilever columns in the north-south direction.	
C **NC** N/A U	STEEL COLUMNS: The columns in seismic-force-resisting frames are anchored to the building foundation, and the anchorage is able to develop the least of the following: the tensile capacity of the column, the tensile capacity of the lowest-level column splice (if any), or the capacity of the foundation.	5.7.3.1	A.5.3.1
		The existing concrete foundation elements are not clear form the existing drawings. They are unlikely to meet this requirement and will be addressed with the strengthening of the column.	
Moderate Seismicity (Complete the Following Items in Addition to the Items for Very Low and Low Seismicity) Seismic-Force-Resisting System			
C NC **N/A** U	MOMENT-RESISTING CONNECTIONS: All moment connections are able to develop the expected strength of the adjourning members based on the specified minimum yield stress of the steel.	5.5.2.2.1	A.3.1.3.4
		Cantilever column system	
C NC **N/A** U	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 the face of the column.	5.5.2.2.2	A.3.1.3.5
		Cantilever column system	
C NC **N/A** U	COLUMN SPLICES: All column splice details located in moment frames include connection of both flanges and the web, and the splice develops the strength of the column.	5.5.2.2.3	A.3.1.3.6
		Single story building	

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Table 17-9. Immediate Occupancy Checklist for Building Types S1 and S1a

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
C NC N/A U	STRONG COLUMN—WEAK BEAM: The percentage of strong column-weak beam joints in each story of each line of moment-resisting frames is greater than 50%.	5.5.2.1.5 Cantilever column system	A.3.1.3.7
C NC N/A U	COMPACT MEMBERS: All frame elements meet section requirements in accordance with AISC 341, Table D1.1, for highly ductile members.	5.5.2.2.4 Columns are not compact	A.3.1.3.8
C NC N/A U	BEAM PENETRATIONS: All openings in frame-beam webs are less than one-quarter of the beam depth and are located in the center half of the beams.	5.5.2.2.5 Cantilever column system	A.3.1.3.9
C NC N/A U	GIRDER FLANGE CONTINUITY PLATES: There are girder flange continuity plates at all moment-frame joints.	5.5.2.2.6 Cantilever column system	A.3.1.3.10
C NC N/A U	OUT-OF-PLANE BRACING: Beam-column joints are braced out of plane.	5.5.2.2.7 Cantilever column system	A.3.1.3.11
C NC N/A U	BOTTOM FLANGE BRACING: The bottom flanges of beams are braced out of plane.	5.5.2.2.8 Cantilever column system	A.3.1.3.12
Diaphragms (Stiff or Flexible)			
C NC N/A U	PLAN IRREGULARITIES: There is tensile capacity to develop the strength of the diaphragm at reentrant corners or other locations of plan irregularities.	5.6.1.4	A.4.1.7
C NC N/A U	DIAPHRAGM REINFORCEMENT AT OPENINGS: There is reinforcing around all diaphragm openings larger than 50% of the building width in either major plan dimension.	5.6.1.5	A.4.1.8
C NC N/A U	OPENINGS AT FRAMES: Diaphragm openings immediately adjacent to the moment frames extend less than 15% of the total frame length.	5.6.1.3	A.4.1.5
Flexible Diaphragms			
C NC N/A U	CROSS TIES: There are continuous cross ties between diaphragm chords.	5.6.1.2 The building does not appear to have continuous cross ties.	A.4.1.2
C NC N/A U	STRAIGHT SHEATHING: All straight-sheathed diaphragms have aspect ratios less than 1-to-1 in the direction being considered.	5.6.2	A.4.2.1
C NC N/A U	SPANS: All wood diaphragms with spans greater than 12 ft (3.6 m) consist of wood structural panels or diagonal sheathing.	5.6.2	A.4.2.2
C NC N/A U	DIAGONALLY SHEATHED AND UNBLOCKED DIAPHRAGMS: All diagonally sheathed or unblocked wood structural panel diaphragms have horizontal spans less than 30 ft (9.2 m) and aspect ratios less than or equal to 3-to-1.	5.6.2	A.4.2.3
C NC N/A U	NONCONCRETE FILLED DIAPHRAGMS: Untopped metal deck diaphragms or metal deck diaphragms will fill other than concrete consist of horizontal spans of less than 40 ft (12.2 m) and have aspect ratios less than 4-to1.	5.6.3	A.4.3.1
C NC N/A U	OTHER DIAPHRAGMS: Diaphragms do not consist of a system other than wood, metal deck, concrete, or horizontal bracing.	5.6.5	A.4.7.1
High Seismicity (Complete the Following Items in Addition to the Items for Very Low, Low, and Moderate Seismicity) Seismic-Force-Resisting System			
C NC N/A U	MOMENT-RESISTING CONNECTIONS: All moment connections are able to develop the strength of the adjoining members or panel zones based on 110% of the expected yield stress of the steel in accordance with AISC 341, Section A3.2.	5.5.2.2.1 Cantilever column system	A.3.1.3.4
Foundation System			
C NC N/A U	DEEP FOUNDATIONS: Piles and piers are capable of transferring the seismic forces between the structure and the soil.		A.6.2.3

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Table 17-9. Immediate Occupancy Checklist for Building Types S1 and S1a						
Status				**Evaluation Statement**	**Tier 2 Reference**	**Commentary Reference**
C	**NC**	**N/A**	**U**	SLOPING SITES: The difference in foundation embedment depth from one side of the building to another does not exceed one story.		A.6.2.4

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

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Table 17-24. Collapse Prevention Structural Checklist for Building Types C2 and C2a

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
Low and Moderate Seismicity **Seismic-Force-Resisting System**			
[C] NC N/A U	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
[C] NC N/A U	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
[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 $2\sqrt{f'_C}$.	There is a combination of wood and concrete shear walls. However, the wood walls appear to be adequate to take the seismic load distributed to them from the flexible diaphragm. The sheathing type will need to be confirmed. The existing concrete walls meet this requirement.	
[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.	5.5.3.1.3	A.3.2.2.2
Connections			
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 in the Quick Check procedure of Section 4.4.3.7.	5.7.1.1 The 2009 roof upgrades appeared to address most of the reinforcing required to support the concrete wall for out-of-plane forces. However the north auditorium building appears to still require reinforcing.	A.5.1.1
C **[NC]** N/A U	TRANSFER TO SHEAR WALLS: Diaphragms are connected for transfer of seismic forces to the shear walls.	The 2009 roof upgrades appeared to address most of the reinforcing required to support the concrete wall for in-plane seismic forces. However the north auditorium building appears to still require reinforcing to transfer in-plane shear loads.	
[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.		
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	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
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.	5.5.2.5.3	A.3.1.6.3
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.	5.5.3.2.1	A.3.2.2.3
Diaphragms (Stiff or Flexible)			
C NC **[N/A]** U	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
[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.	5.6.1.3	A.4.1.4
Flexible Diaphragms			
C **[NC]** N/A U	CROSS TIES: There are continuous cross ties between diaphragm chords.	The 2009 roof upgrades appear to have added the required continuous cross ties. However the North auditorium building appears to still require cross ties.	
C **[NC]** N/A U	STRAIGHT SHEATHING: All straight sheathing diaphragms have aspect ratios less than 2-to-1 in the direction being considered.	5.6.2	A.4.2.1
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.	Most of the roof was replaced with plywood sheathing with the exception of the auditorium roof at the north side of the building. It is unclear what the existing sheathing type is at this locations. Assuming that the sheathing is straight sheathing, the auditorium roof does not meet these requirements.	
C **[NC]** N/A U	DIAGONALLY SHEATHED AND UNBLOCKED DIAPHRAGMS: All diagonally sheathed or unblocked wood structural panel	5.6.2	A.4.2.3
		The unblocked diaphragm spans more than 40 ft.	

Table 17-24. Collapse Prevention Structural Checklist for Building Types C2 and C2a			
Status	**Evaluation Statement**	**Tier 2 Reference**	**Commentary Reference**
	diaphragms have horizontal spans less than 40 ft (12.2 m) and aspect ratios less than or equal to 4-to-1.		
C NC N/A U	OTHER DIAPHRAGMS: Diaphragms do not consist of a system other than wood, metal deck, concrete, or horizontal bracing.	5.6.5	A.4.7.1
Connections			
C NC **N/A** U	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

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

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Table 17-25. Immediate Occupancy Structural Checklist for Building Types C2 and C2a

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
Very Low Seismicity Seismic-Force-Resisting System			
C NC N/A U	COMPLETE FRAMES: Steel or concrete frames classified as secondary components from a complete vertical-load-carrying system.	5.5.2.5.1	A.3.1.6.1
C NC N/A U	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
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 $2\sqrt{f'_c}$.	5.5.3.1.1	A.3.2.2.1 There is a combination of wood and concrete shear walls. However, the wood walls appear to be adequate to take the seismic load distributed to them from the flexible diaphragm. The sheathing type will need to be confirmed. The existing concrete walls meet this requirement.
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. The spacing of reinforcing steel is equal to or less than 18 in. (457 mm).	5.5.3.1.3	A.3.2.2.2
Connections			
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.	5.7.1.1 The 2009 roof upgrades appeared to address most of the reinforcing required to support the concrete wall for out-of-plane forces. However the north auditorium building appears to still require reinforcing.	A.5.1.1
C **NC** N/A U	TRANSFER TO SHEAR WALLS: Diaphragms are connected for transfer of loads to the shear walls, and the connections are able to develop the lesser of the shear strength of the walls or diaphragms.	5.7.2 The 2009 roof upgrades appeared to address most of the reinforcing required to support the concrete wall for in-plane seismic forces. However the north auditorium building appears to still require reinforcing to transfer in-plane shear loads.	A.5.2.1
C NC N/A U	FOUNDATION DOWELS: Wall reinforcement is doweled into the foundation, and the dowels are able to develop the lesser of the strength of the walls or the uplift capacity of the foundation.	5.7.3.4	A.5.3.5
Foundation System			
C NC **N/A** U	DEEP FOUNDATIONS: Piles and piers are capable of transferring the lateral forces between the structure and the soil.		A.6.2.3
C NC **N/A** U	SLOPING SITES: The difference in foundation embedment depth from one side of the building to another does not exceed one story.		A.6.2.4
Low, Moderate, and High Seismicity (Complete the Following Items in Addition to the Items for Very Low Seismicity) Seismic-Force-Resisting System			
C NC **N/A** U	DEFLECTION COMPATIBLITY: Secondary components have the shear capacity to develop the flexural strength of the components and are compliant with the following items in Table 17-23: COLUMN-BAR SPLICES, BEAM-BAR SPLICES, COLUMN-TIE SPACING, STIRRUP SPACING, and STIRRUP AND TIE HOOKS.	5.5.2.5.2	A.3.1.6.2
C NC **N/A** U	FLAT SLABS: Flat slabs or plates not part of seismic-force-resisting system have continuous bottom steel through the column joints.	5.5.2.5.3	A.3.1.6.3
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. Coupling beams have the capacity in shear to develop the uplift capacity of the adjacent wall.	5.5.3.2.1	A.3.2.2.3

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Table 17-25. Immediate Occupancy Structural Checklist for Building Types C2 and C2a

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
C NC N/A U	OVERTURNING: All shear walls have aspect ratios less than 4-to-1. Wall piers need not be considered.	5.5.3.1.4	A.3.2.2.4
C NC **N/A** U	CONFINEMENT REINFORCING: For shear walls with aspect ratios greater than 2-to-1, the boundary elements are confined with spirals or ties with spacing less than $8d_b$.	5.5.3.2.2	A.3.2.2.5
C NC N/A U	WALL REINFORCING AT OPENINGS: There is added trim reinforcement around all wall openings with a dimension greater than three times the thickness of the wall.	5.5.3.1.5	A.3.2.2.6
C **NC** N/A U	WALL THICKNESS: Thicknesses of bearing walls are not less than 1/25 the unsupported height or length, whichever is shorter, nor less than 4 in. (101 mm).	5.5.3.1.2 The thickness of the tall walls in building part A2, appear to be less than 1/25 the unsupported height.	A.3.2.2.7
Diaphragms (Stiff or Flexible)			
C NC **N/A** U	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
C NC N/A U	OPENINGS AT SHEAR WALLS: Diaphragm openings immediately adjacent to the shear walls are less than 15% of the wall length.	5.6.1.3	A.4.1.4
C **NC** N/A U	PLAN IRREGULARITIES: There is tensile capacity to develop the strength of the diaphragm at reentrant corners or other locations of plan irregularities.	5.6.1.4 The 2009 roof upgrades appeared to add strapping at reentrant corners. However the North auditorium building appears to still require some additional strapping at the plan irregularities.	A.4.1.7
C NC **N/A** U	DIAPHRAGM REINFORCEMENT AT OPENINGS: There is reinforcing around all diaphragm openings larger than 50% of the building width in either major plan dimension.	5.6.1.5	A.4.1.8
Flexible Diaphragms			
C **NC** N/A U	CROSS TIES: There are continuous cross ties between diaphragm chords.	The 2009 roof upgrades appear to have added the required continuous cross ties. However the North auditorium building appears to still require cross ties.	
C **NC** N/A U	STRAIGHT SHEATHING: All straight-sheathed diaphragms have aspect ratios less than 1-to-1 in the direction being considered.	5.6.2	A.4.2.1
C **NC** N/A U	SPANS: All wood diaphragms with spans greater than 12 ft (3.6 m) consist of wood structural panels or diagonal sheathing.	Most of the roof was replaced with plywood sheathing with the exception of the auditorium roof at the north side of the building. It is unclear what the existing sheathing type is at this locations. Assuming that the sheathing is straight sheathing, the auditorium roof does not meet these requirements.	
C **NC** N/A U	DIAGONALLY SHEATHED AND UNBLOCKED DIAPHRAGMS: All diagonally sheathed or unblocked wood structural panel diaphragms have horizontal spans less than 30 ft (9.2 m) and aspect ratios less than or equal to 3-to-1.	5.6.2 The unblocked diaphragm spans more than 40 ft.	A.4.2.3
C NC **N/A** U	NONCONCRETE FILLED DIAPHRAGMS: Untopped metal deck diaphragms or metal deck diaphragms with fill other than concrete consist of horizontal spans of less than 40 ft (12.2 m) and have aspect ratios less than 4-to-1.	5.6.3	A.4.3.1
C NC N/A U	OTHER DIAPHRAGMS: Diaphragms do not consist of a system other than wood, metal deck, concrete, or horizontal bracing.	5.6.5	A.4.7.1
Connections			
C NC **N/A** U	UPLIFT AT PILE CAPS: Pile caps have top reinforcement, and piles are anchored to the pile caps; the pile cap reinforcement and pile anchorage are able to develop the tensile capacity of the piles.	5.7.3.5	A.5.3.8

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

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Table 17.38. Nonstructural Checklist

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
Life Safety Systems			
C **NC** N/A U	**HR—not required; LS—LMH; PR—LMH.** FIRE SUPPRESSION PIPING: Fire suppression piping is anchored and braced in accordance with NFPA-13.	13.7.4 Assumed to be NC and included in scheme.	A.7.13.1
C **NC** N/A U	**HR—not required; LS—LMH; PR—LMH.** FLEXIBLE COUPLINGS: Fire suppression piping has flexible couplings in accordance with NFPA-13.	13.7.4 Assumed to be NC and included in scheme.	A.7.13.2
C NC N/A U	**HR—not required; LS—LMH; PR—LMH.** EMERGENCY POWER: Equipment used to power or control Life Safety systems is anchored or braced.	137.7.7 It appeared that the emergency power was anchored sufficiently.	A.7.12.1
C NC **N/A** U	**HR—not required; LS—LMH; PR—LMH.** STAIR AND SMOKE DUCTS: Stair pressurization and smoke control ducts are braced and have flexible connection sat seismic joints.	13.7.6	A.7.14.1
C **NC** N/A U	**HR—not required; LS—MH; PR—MH.** SPRINKLER CEILING CLEARANCE: Penetrations through panelized ceilings for fire suppression devices provide clearances in accordance with NFPA-13.	13.7.4	A.7.13.3
C NC N/A U	**HR—not required; LS—not required; PR—LMH.** EMERGENCY LIGHTING: Emergency and egress lighting equipment is anchored or braced.	13.7.9	A.7.3.1
Hazardous Materials			
C **NC** N/A U	**HR—LMH; LS—LMH; PR—LMH.** HAZARDOUS MATERIAL EQUIPMENT: Equipment mounted on vibration isolators and containing hazardous material is equipped with restraints or snubbers.	13.7.1 Assumed to be NC and included in scheme.	A.7.12.2
C NC **N/A** U	**HR—LMH; LS—LMH; PR—LMH.** HAZARDOUS MATERIAL STORAGE: Breakable containers that hold hazardous material, including gas cylinders, are restrained by latched doors, shelf lips, wires, or other methods.	13.8.3	A.7.15.1
C **NC** N/A U	**HR—MH; LS—MH; PR—MH.** HAZARDOUS MATERIAL DISTRIBUTION: Piping or ductwork conveying hazardous materials is braced or otherwise protected from damage that would allow hazardous material release.	13.7.3 13.7.5 Gas piping appeared to be braced however all piping was not visible for observation.	A.7.13.4
C NC N/A U	**HR—MH; LS—MH; PR—MH.** SHUTOFF VALVES: Piping containing hazardous material, including natural gas, has shutoff valves or other devices to limit spills or leaks.	13.7.3 13.7.5	A.7.13.3
C **NC** N/A U	**HR—LMH; LS—LMH; PR—LMH.** FLEXIBLE COUPLINGS: Hazardous material ductwork and piping, including natural gas piping, have flexible couplings.	13.7.3 Gas piping was observed to be non-compliant with this requirement.	A.7.15.4
C NC **N/A** U	**HR—MH; LS—MH; PR—MH.** PIPING OR DUCTS CROSSING SEISMIC JOINTS: Piping or ductwork carrying hazardous material that either crosses seismic joints or isolation planes or is connected to independent structures has couplings or other details to accommodate the relative seismic displacements.	13.7.3 13.7.5 13.7.6	A.7.13.6
Partitions			
C NC **N/A** U	**HR—LMH; LS—LMH; PR—LMH.** UNREINFORCED MASONRY: Unreinforced masonry or hollow-clay tile partitions are braced at a spacing of at most 10 ft (3.0 m) in Low or Moderate Seismicity, or at most 6 ft (1.8 m) in High Seismicity.	13.6.2	A.7.1.1
C NC **N/A** U	**HR—LMH; LS—LMH; PR—LMH.** HEAVY PARTITIONS SUPPORTED BY CEILINGS: The tops of masonry or hollow-clay tile partitions are not laterally supported by an integrated ceiling system.	13.6.2	A.7.2.1

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Table 17.38. Nonstructural Checklist

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
C NC **N/A** U	**HR—not required; LS—MH; PR—MH.** DRIFT: Rigid cementitious partitions are detailed to accommodate the following drift ratios: in steel moment frame, concrete moment frame, and wood frame buildings, 0.02; in other buildings, 0.005.	13.6.2	A.7.1.2
C **NC** N/A U	**HR—not required; LS—not required; PR—MH.** LIGHT PARTITIONS SUPPORTED BY CEILINGS: The tops of gypsum board partitions are not laterally supported by an integrated ceiling system.	13.6.2 A few light partitions were found to not be laterally supported.	A.7.2.1
C NC **N/A** U	**HR—not required; LS—not required; PR—MH.** STRUCTURAL SEPARATIONS: Partitions that cross structural separations have seismic or control joints.	13.6.2	A.7.1.3
C NC **N/A** U	**HR—not required; LS—not required; PR—MH.** TOPS: The tops of ceiling-high framed or panelized partitions have lateral bracing to the structure at a spacing equal to or less than 6 ft (1.8 m).	13.6.2	A.7.1.4
Ceilings			
C **NC** N/A U	**HR—H; LS—MH; PR—LMH.** SUSPENDED LATH AND PLASTER: Suspended lath and plaster ceilings have attachments that resist seismic forces for every 12 ft² (1.1 m²) of area.	This criterion could not be verified on site or in the provided drawings. This requirement applies to the 1954 Cafeteria area in building part B1. This building part is most likely non-compliant with this requirement.	
C NC **N/A** U	**HR—not required; LS—MH; PR—LMH.** SUSPENDED GYPSUM BOARD: Suspended gypsum board ceilings have attachments that resist seismic forces for every 12 ft² (1.1 m²) of area.	13.6.4	A.7.2.3
C **NC** N/A U	**HR—not required; LS—not required; PR—MH.** INTEGRATED CEILINGS: Integrated suspended ceilings with continuous areas greater than 144 ft² (13.4 m²) and ceilings of smaller areas that are not surrounded by restraining partitions are laterally restrained at a spacing no greater than 12 ft (3.6 m) with members attached to the structure above. Each restraint location has a minimum of four diagonal wires and compression struts, or diagonal members capable of resisting compression.	13.6.4	A.7.2.2
C **NC** N/A U	**HR—not required; LS—not required; PR—MH.** EDGE CLEARANCE: The free edges of integrated suspended ceilings with continuous areas greater than 144 ft² (13.4 m²) have clearances from the enclosing wall or partition of at least the following: in Moderate Seismicity, ½ in. (13 mm); in High Seismicity, ¾ in. (19 mm).	13.6.4	A.7.2.4
C NC **N/A** U	**HR—not required; LS—not required; PR—MH.** CONTINUITY ACROSS STRUCTURE JOINTS: The ceiling system does not cross any seismic joint and is not attached to multiple independent structures.	13.6.4	A.7.2.5
C **NC** N/A U	**HR—not required; LS—not required; PR—H.** EDGE SUPPORT: The free edges of integrated suspended ceilings with continuous areas greater than 144 ft² (13.4 m²) are supported by closure angles or channels not less than 2 in. (51 mm) wide.	13.6.4	A.7.2.6
C NC **N/A** U	**HR—not required; LS—not required; PR—H.** SEISMIC JOINTS: Acoustical tile or lay-in panel ceilings have seismic separation joints such that each continuous portion of the ceiling is no more than 2,500 ft² (232.3 m²) and has a ratio of long-to-short dimension no more than 4-to-1.	13.6.4	A.7.2.7

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Table 17.38. Nonstructural Checklist

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
Light Fixtures			
[C] NC N/A U	**HR—not required; LS—MH; PR—MH.** INDEPENTENT SUPPPORT: Light fixtures that weigh more per square foot than the ceiling they penetrate are supported independent of the grid ceiling suspension system by a minimum of two wires at diagonally opposite corners of each fixture.	13.6.4 13.7.9	A.7.3.2
C NC **[N/A]** U	**HR—not required; LS—not required; PR—H.** PENDANT SUPPORTS: Light fixtures on pendant supports are attached at a spacing equal to or less than 6 ft. Unbraced suspended fixtures are free to allow a 360-degree range of motion at an angle not less than 45 degrees from horizontal without contacting adjacent components. Alternatively, if rigidly supported and /or braced, they are free to move with the structure to which they are attached without damaging adjoining components. Additionally, the connection to the structure is capable of accommodating the movement without failure.	13.7.9	A.7.3.3
C **[NC]** N/A U	**HR—not required; LS—not required; PR—H.** LENS COVERS: Lens covers on light fixtures are attached with safety devices.	13.7.9	A.7.3.4
Cladding & Glazing			
C NC **[N/A]** U	**HR—MH; LS—MH; PR—MH.** CLADDING ANCHORS: Cladding components weighing more than 10 lb/ft^2 (0.48 kN/m^2) are mechanically anchored to the structure at a spacing equal to or less than the following: for Life Safety in Moderate Seismicity, 6 ft (1.8 m); for Life Safety in High Seismicity and for Position Retention in any seismicity, 4 ft (1.2 m).	13.6.1	A.7.4.1
C NC **[N/A]** U	**HR—not required; LS—MH; PR—MH.** CLADDING ISOLATION: For steel or concrete moment-frame buildings, panel connections are detailed to accommodate a story drift ratio by the use of rods attached to framing with oversize holes or slotted holes of at least the following: for Life Safety in Moderate Seismicity, 0.01; for Life Safety in High Seismicity and for Position Retention in any seismicity, 0.02, and the rods have a length-to-diameter ratio of 4.0 or less.	13.6.1	A.7.4.3
C NC **[N/A]** U	**HR—MH; LS—MH; PR—MH.** MULTI-STORY PANELS: For multi-story panels attached at more than one floor level, panel connections are detailed to accommodate a story drift ratio by the use of rods attached to framing with oversize holes or slotted holes of at least the following: for Life Safety in Moderate Seismicity, 0.01; for Life Safety in High Seismicity and for Position Retention in any seismicity, 0.02, and the rods have a length-to-diameter ratio of 4.0 or less.	13.6.1	A.7.4.4
C NC **[N/A]** U	**HR—not required; LS—MH; PR—MH**THREADED RODS: Threaded rods for panel connections detailed to accommodate drift by bending of the rod have a length-to-diameter ratio greater than 0.06 times the story height in inches for Life Safety in Moderate Seismicity and 0.12 times the story height in inches for Life Safety in High Seismicity and Position Retention in any seismicity.	13.6.1	A.7.4.9
C NC **[N/A]** U	**HR—MH; LS—MH; PR—MH.** PANEL CONNECTIONS: Cladding panels are anchored out of plane with a minimum number of connections for each wall panel, as follows: for Life Safety in Moderate Seismicity, 2 connections; for Life Safety in High Seismicity and for Position Retention in any seismicity, 4 connections.	13.6.1.4	A.7.4.5

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Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
C NC **N/A** U	**HR—MH; LS—MH; PR—MH.** BEARING CONNECTIONS: Where bearing connections are used, there is a minimum of two bearing connections for each cladding panel.	13.6.1.4	A.7.4.6
C NC **N/A** U	**HR—MH; LS—MH; PR—MH.** INSERTS: Where concrete cladding components use inserts, the inserts have positive anchorage or are anchored to reinforcing steel.	13.6.1.4	A.7.4.7
C NC **N/A** U	**HR—not required; LS—MH; PR—MH.** OVERHEAD GLAZING: Glazing panes of any size in curtain walls and individual interior or exterior panes more than 16 ft^2 (1.5 m^2) in area are laminated annealed or laminated heat-strengthened glass and are detailed to remain in the frame when cracked.	13.6.1.5	A.7.4.8
Masonry Veneer			
C NC **N/A** U	**HR—not required; LS—LMH; PR—LMH.** TIES: Masonry veneer is connected to the backup with corrosion-resistant ties. There is a minimum of one tie for every 2-2/3 ft^2 (0.25 m^2), and the ties have spacing no greater than the following: for Life Safety in Low or Moderate Seismicity, 36 in. (914 mm); for Life Safety in High Seismicity and for Position Retention in any seismicity, 24 in. (610 mm).	13.6.1.2	A.7.5.1
C NC **N/A** U	**HR—not required; LS—LMH; PR—LMH.** SHELF ANGLES: Masonry veneer is supported by shelf angles or other elements at each floor above the ground floor.	13.6.1.2	A.7.5.2
C NC **N/A** U	**HR—not required; LS—LMH; PR—LMH.** WEAKENED PLANES: Masonry veneer is anchored to the backup adjacent to weakened planes, such as at the locations of flashing.	13.6.1.2	A.7.5.3
C NC **N/A** U	**HR—LMH; LS—LMH; PR—LMH.** UNREINFORCED MASONRY BACKUP: There is no unreinforced masonry backup.	13.6.1.1 13.6.1.2	A.7.7.2
C NC **N/A** U	**HR—not required; LS—MH; PR—MH.** STUD TRACKS: For veneer with cold-formed steel stud backup, stud tracks are fastened to the structure at a spacing equal to or less than 24 in. (610 mm) on center.	13.6.1.1 13.6.1.2	A.7.6.1
C NC **N/A** U	**HR—not required; LS—MH; PR—MH.** ANCHORAGE: For veneer with concrete block or masonry backup, the backup is positively anchored to the structure at a horizontal spacing equal to or less than 4 ft along the floors and roof.	13.6.1.1 13.6.1.2	A.7.7.1
C NC **N/A** U	**HR—not required; LS—not required; PR—MH.** WEEP HOLES: In veneer anchored to stud walls, the veneer has functioning weep holes and base flashing.	13.6.1.2	A.7.5.6
C NC **N/A** U	**HR—not required; LS—not required; PR—MH.** OPENINGS: For veneer with cold-formed-steel stud backup, steel studs frame window and door openings.	13.6.1.1 13.6.1.2	A.7.6.2
Parapets, Cornices, Ornamentation, and Appendages			
C NC **N/A** U	**HR—LMH; LS—LMH; PR—LMH.** URM PARAPETS OR CORNICES: Laterally unsupported unreinforced masonry parapets or cornices have height-to-thickness ratios not greater than the following: for Life Safety in Low or Moderate Seismicity, 2.5; for Life Safety in High Seismicity and for Position Retention in any seismicity, 1.5.	13.6.5	A.7.8.1
C **NC** N/A U	**HR—not required; LS—LMH; PR—LMH.** CANOPIES: Canopies at building exits are anchored to the structure at a spacing no greater than the following: for Life Safety in Low or Moderate Seismicity, 10 ft (3.0 m); for Life Safety in High Seismicity and or Position Retention in any seismicity, 6 ft (1.8 m).	13.6.6	A.7.8.2

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Table 17.38. Nonstructural Checklist

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
C NC **N/A** U	**HR—H; LS—MH; PR—LMH.** CONCRETE PARAPETS: Concrete parapets with height-to-thickness ratios greater than 2.5 have vertical reinforcement.	13.6.5	A.7.8.3
C NC **N/A** U	**HR—MH; LS—MH; PR—LMH.** APPENDAGES: Cornices, parapets, signs, and other ornamentation or appendages that extend above the highest point of anchorage to the structure or cantilever from components are reinforced and anchored to the structural system at a spacing equal to or less than 6 ft (1.8m). The evaluation statement item does not apply to parapets or cornices covered by other evaluation statements.	13.6.6	A.7.8.4
Masonry Chimneys			
C NC N/A U	**HR—LMH; LS—LMH; PR—LMH.** URM CHIMNEYS: Unreinforced masonry chimneys extend above the roof surface no more than the following: for Life Safety in Low or Moderate Seismicity, 3 times the least dimension of the chimney; for Life Safety in High Seismicity and or Position Retention in any seismicity, 2 times the least dimension of the chimney.	13.6.7	A.7.9.1
C **NC** N/A U	**HR—LMH; LS—LMH; PR—LMH.** ANCHORAGE: Masonry chimneys are anchored at each floor level, at the topmost ceiling level, and at the roof.	13.6.7	A.7.9.2
Stairs			
C NC **N/A** U	**HR—not required; LS—LMH; PR—LMH.** STAIR ENCLOSURES: Hollow-clay tile or unreinforced masonry walls around stair enclosures are restrained out of plane and have height-to-thickness ratios not greater than the following: for Life Safety in Low or Moderate Seismicity, 15-to-1: for Life Safety in High Seismicity and for Position Retention in any seismicity, 12-to-1.	13.6.2 13.6.8	A.7.10.1
C NC **N/A** U	**HR—not required; LS—LMH; PR—LMH.** STAIR DETAILS: The connection between the stairs and the structure does not rely on post-installed anchors in concrete or masonry, and the stair details are capable of accommodating the drift calculated using the Quick Check procedure of Section 4.4.3.1 for moment-frame structures or 0.5 in. for all other structures without including any lateral stiffness contribution from the stairs.	13.6.8	A.7.10.2
Contents and Furnishings			
C NC **N/A** U	**HR—LMH; LS—MH; PR—MH.** INDUSTRIAL STORAGE RACKS: Industrial storage racks or pallet racks more than 12 ft high meet the requirements of ANSI/RMI MH 16.1 as modified by ASCE 7, Chapter 15.	13.8.1	A.7.11.1
C **NC** N/A U	**HR—not required; LS—H; PR—MH.** TALL NARRROW CONTENTS: Contents more than 6 ft (1.8 m) high with a height-to-depth or height-to-width ratio greater than 3-to-1 are anchored to the structure or to each other.	13.8.2	A.7.11.2
C **NC** N/A U	**HR—not required; LS—H; PR—H.** FALL-PRONE CONTENTS: Equipment, stored items, or other contents weighing more than 20 lb (9.1 kg) whose center of mass is more than 4 ft (1.2 m) above the adjacent floor level are braced or otherwise restrained.	13.8.2	A.7.11.3
C NC **N/A** U	**HR—not required; LS—not required; PR—MH.** ACCESS FLOORS: Access floors more than 9 in. (229 mm) high are braced.	13.6.10	A.7.11.4
C NC **N/A** U	**HR—not required; LS—not required; PR—MH.** EQUIPMENT ON ACCESS FLOORS: Equipment and other contents supported by access floor systems are anchored or braced to the structure independent of the access floor.	13.7.7 13.6.10	A.7.11.5

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Table 17.38. Nonstructural Checklist

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
C NC **N/A** U	**HR—not required; LS—not required; PR—H.** SUSPENDED CONTENTS: Items suspended without lateral bracing are free to swing from or move with the structure from which they are suspended without damaging themselves or adjoining components.	13.8.2	A.7.11.6
Mechanical and Electrical Equipment			
C **NC** N/A U	**HR—not required; LS—H; PR—H.** FALL-PRONE EQUIPMENT: Equipment weighing more than 20 lb (9.1 kg) whose center of mass is more than 4 ft (1.2 m) above the adjacent floor level, and which is not in-line equipment, is braced.	13.7.1 137.7	A.7.12.4
C **NC** N/A U	**HR—not required; LS—H; PR—H.** IN-LINE EQUIPMENT: Equipment installed in line with a duct or piping system, with an operating weight more than 75 lb (34.0 kg), is supported and laterally braced independent of the duct or piping system.	13.7.1	A.7.12.5
C **NC** N/A U	**HR—not required; LS—H; PR—MH.** TALL NARROW EQUIPMENT: Equipment more than 6 ft (1.8 m) high with a height-to -depth or height-to-width ratio greater than 3-5o-1 is anchored to the floor slab or adjacent structural walls.	13.7.1 13.7.7	A.7.12.6
C NC **N/A** U	**HR—not required; LS—not required; PR—MH.** MECHANICAL DOORS: Mechanically operated doors are detailed to operate at a story drift ratio of 0.01.	13.6.9	A.7.12.7
C **NC** N/A U	**HR—not required; LS—not required; PR—H.** SUSPENDED EQUIPMENT: Equipment suspended without lateral bracing is free to swing from or move with the structure from which it is suspended without damaging itself or adjoining components.	13.7.1 13.7.7	A.7.12.8
C NC **N/A** U	**HR—not required; LS—not required; PR—H.** VIBRATION ISOLATORS: Equipment mounted on vibration isolators is equipped with horizontal restraints or snubbers and with vertical restraints to resist overturning.	13.7.1	A.7.12.9
C NC N/A U	**HR—not required; LS—not required; PR—H.** HEAVY EQUIPMENT: Floor-supported or platform-supported equipment weighing more than 400 lb (181.4 kg) is anchored to the structure.	13.7.1 13.7.7	A.7.12.10
C NC N/A U	**HR—not required; LS—not required; PR—H.** ELECTRICAL EQUIPMENT: Electrical equipment is laterally braced to the structure.	13.7.7	A.7.12.11
C **NC** N/A U	**HR—not required; LS—not required; PR—H.** CONDUIT COUPLINGS: Conduit greater than 2.5 in. (64 mm) trade size that is attached to panels, cabinets, or other equipment and is subject to relative seismic displacement has flexible couplings or connections.	13.7.8	A.7.12.12
Piping			
C **NC** N/A U	**HR—not required; LS—not required; PR—H.** FLEXIBLE COUPLINGS: Fluid and gas piping has flexible couplings.	13.7.3 13.7.5	A.7.13.2
C **NC** N/A U	**HR—not required; LS—not required; PR—H.** FLUID AND GAS PIPING: Fluid and gas piping is anchored and braced to the structure to limit spills or leaks.	13.7.3 13.7.5	A.7.13.4
C NC **N/A** U	**HR—not required; LS—not required; PR—H.** C-CLAMPS: One-sided C-clamps that support piping larger than 2.5 in. (64 mm) in diameter are restrained.	13.7.3 13.7.5	A.7.13.5
C NC **N/A** U	**HR—not required; LS—not required; PR—H.** PIPING CROSSING SEISMIC JOINTS: Piping that crosses seismic joints or isolation planes or is connected to independent structures has couplings or other details to accommodate the relative seismic displacements.	13.7.3 13.7.5	A.7.13.6

Table 17.38. Nonstructural Checklist

Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
Ducts			
C **NC** N/A U	**HR—not required; LS—not required; PR—H.** DUCT BRACING: Rectangular ductwork larger than 6 ft² (0.56 m²) in cross-sectional area and round ducts larger than 28 in. (711 mm) in diameter are braced. The maximum spacing of transverse bracing does not exceed 30 ft (9.2 m). The maximum spacing of longitudinal bracing does not exceed 60 ft (18.3 m).	13.7.6	A.7.14.2
C NC N/A U	**HR—not required; LS—not required; PR—H.** DUCT SUPPORT: Ducts are not supported by piping or electrical conduit.	13.7.6	A.7.14.3
C NC **N/A** U	**HR—not required; LS—not required; PR—H.** DUCTS CROSSING SEISMIC JOINTS: Ducts that cross seismic joints or isolation planes or are connected to independent structures have couplings or other details to accommodate the relative seismic displacements.	13.7.6	A.7.14.4
Elevators			
C NC **N/A** U	**HR—not required; LS—H; PR—H.** RETAINER GUARDS: sheaves and drums have cable retainer guards.	13.7.11	A.7.16.1
C NC **N/A** U	**HR—not required; LS—H; PR—H.** RETAINER PLATE: A retainer plate is present at the top and bottom of both car and counterweight.	13.7.11	A.7.16.2
C NC **N/A** U	**HR—not required; LS—not required; PR—H.** ELEVATOR EQUIPMENT: Equipment, piping, and other components that are part of the elevator system are anchored.	13.7.11	A.7.16.3
C NC **N/A** U	**HR—not required; LS—not required; PR—H.** SEISMIC SWITCH: Elevators capable of operating at speeds of 150 ft/min (0.30 m/min) or faster are equipped with seismic switches that meet the requirements of ASME A17.1 or have trigger levels set to 20% of the acceleration of gravity at the base of the structure and 50% of the acceleration of gravity in other locations.	13.7.11	A.7.16.4
C NC **N/A** U	**HR—not required; LS—not required; PR—H.** SHAFT WALLS: Elevator shaft walls re anchored and reinforced to prevent toppling into the shaft during strong shaking.	13.7.11	A.7.16.5
C NC **N/A** U	**HR—not required; LS—not required; PR—H.** COUNTERWEIGHT RAILS: All counterweight rails and divider beams re sized in accordance with ASME A17.1.	13.7.11	A.7.16.6
C NC **N/A** U	**HR—not required; LS—not required; PR—H.** BRACKETS: The brackets that tie the car rails and the counterweight rail to the structure are sized in accordance with SAME A17.1.	13.7.11	A.7.16.7
C NC **N/A** U	**HR—not required; LS—not required; PR—H.** SPREADER BRACKET: Spreader brackets are not used to resist seismic forces.	13.7.11	A.7.16.8
C NC **N/A** U	**HR—not required; LS—not required; PR—H.** GO-SLOW ELEVATORS: The building has a go-slow elevator system.	13.7.11	A.7.16.9

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

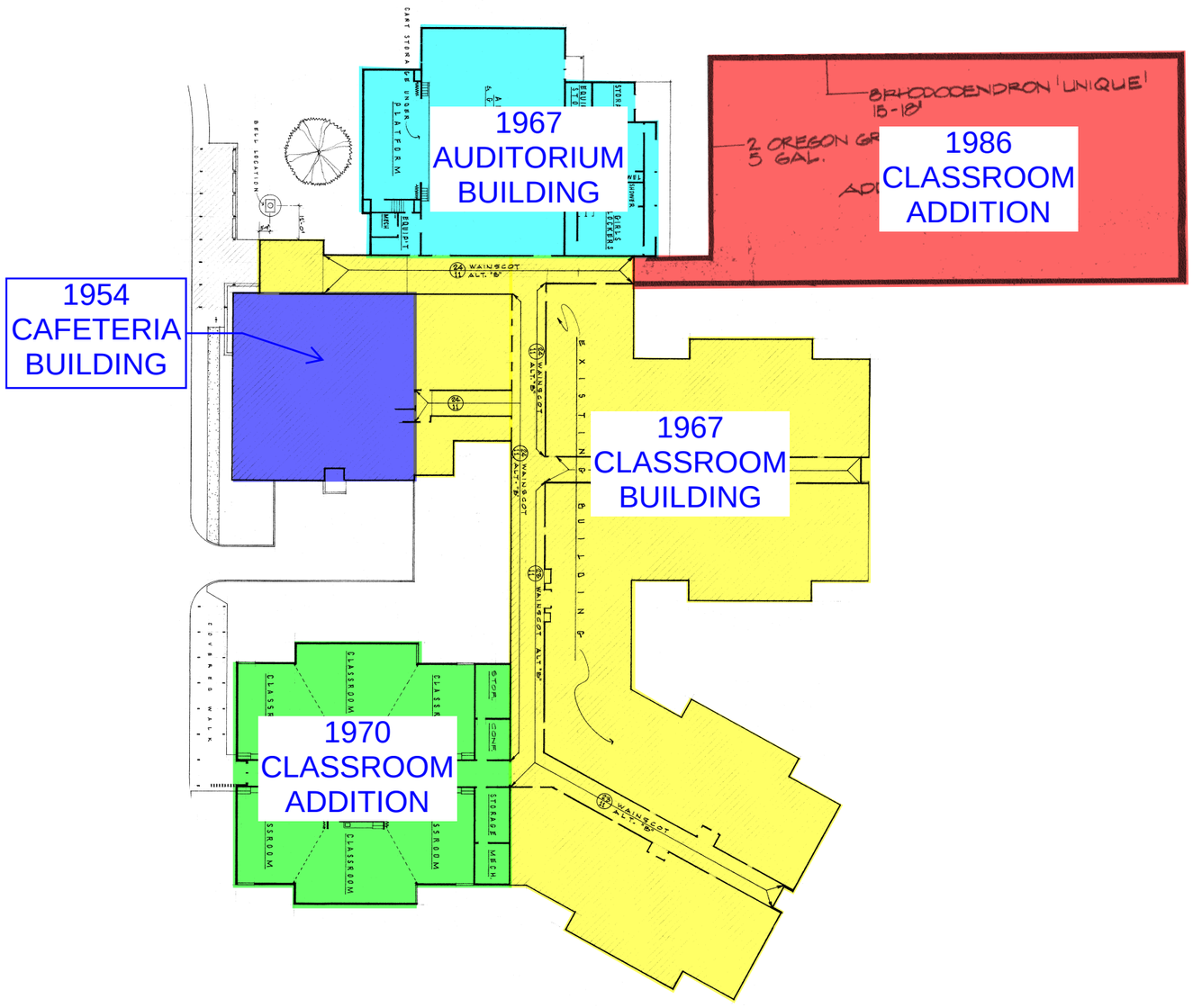
[a] *Performance Level: HR = Hazards Reduce, LS = Life Safety, and PR = Position Retention.*

[b] *Level of seismicity: L = Low, M = Moderate, and H = High.*

APPENDIX B

STRENGTHENING SCHEME

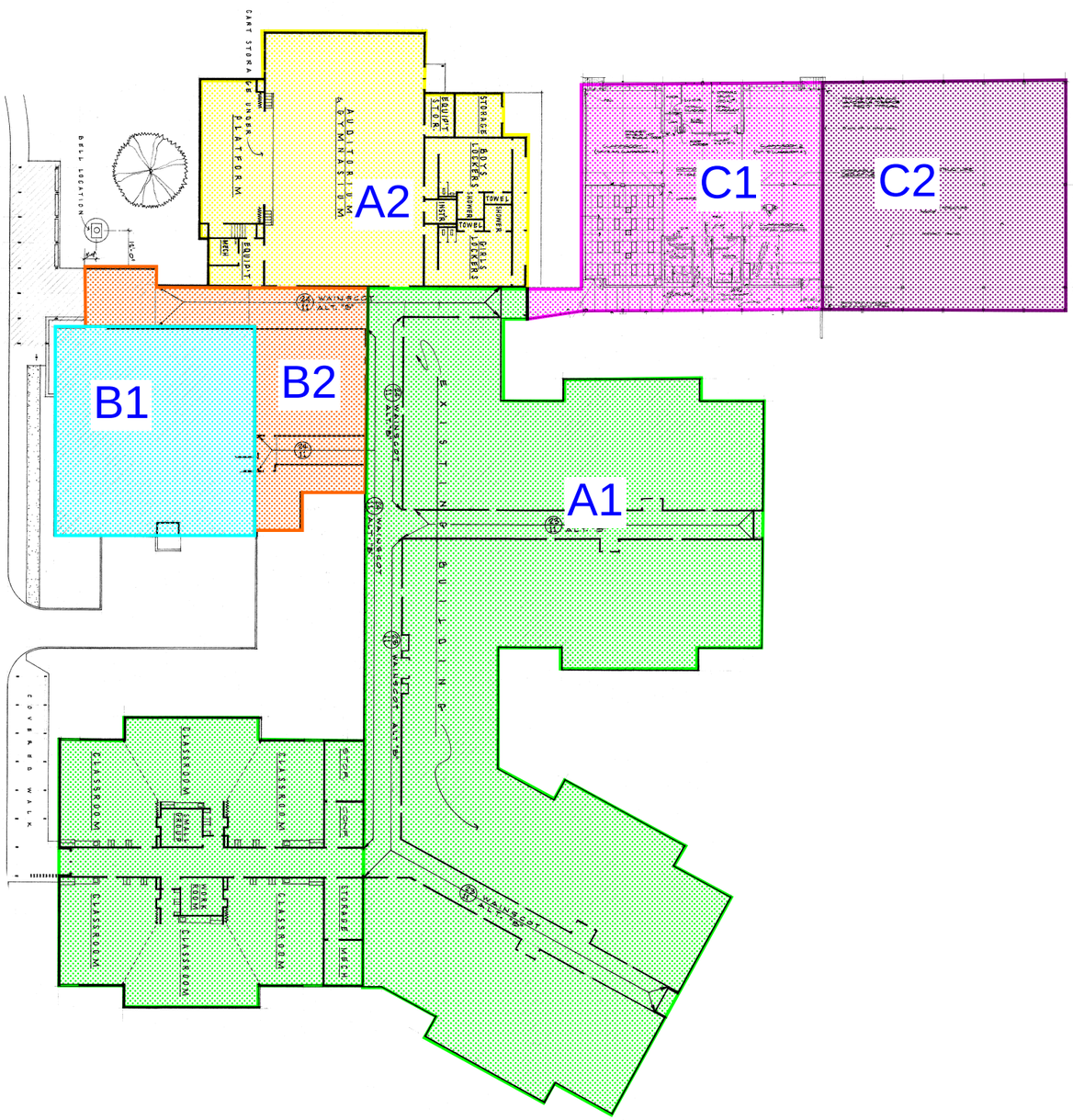
kpff Portland, Oregon	Project BSD Cooper Mountian ES	By LL/JBE	Sheet No. S-1
	Location Beaverton, Oregon	Date 10/29/18	
	Client Beaverton School District	Revised	Job No. 21800754
	Seismic Strengthening Plan	Date	



1 BUILDING YEAR PLAN

N

kpff Portland, Oregon	Project: BSD Cooper Mountian ES	By: LL/JBE	Sheet No.: S-2
	Location: Beaverton, Oregon	Date: 10/29/18	
	Client: Beaverton School District	Revised	Job No.: 21800754
	Seismic Strengthening Plan	Date	



INDICATED BUILDING PART A1 (PART A IN BCA).
TYPE C2a CONSTRUCTION (1967/1970)

INDICATED BUILDING PART A2 (PART B IN BCA).
TYPE C2a CONSTRUCTION (1967)

INDICATED BUILDING PART B1 (PART C IN BCA).
TYPE W2 CONSTRUCTION (1954/1967)

INDICATED BUILDING PART B2 (PART D IN BCA).
TYPE C2a AND W2 CONSTRUCTION (1967)

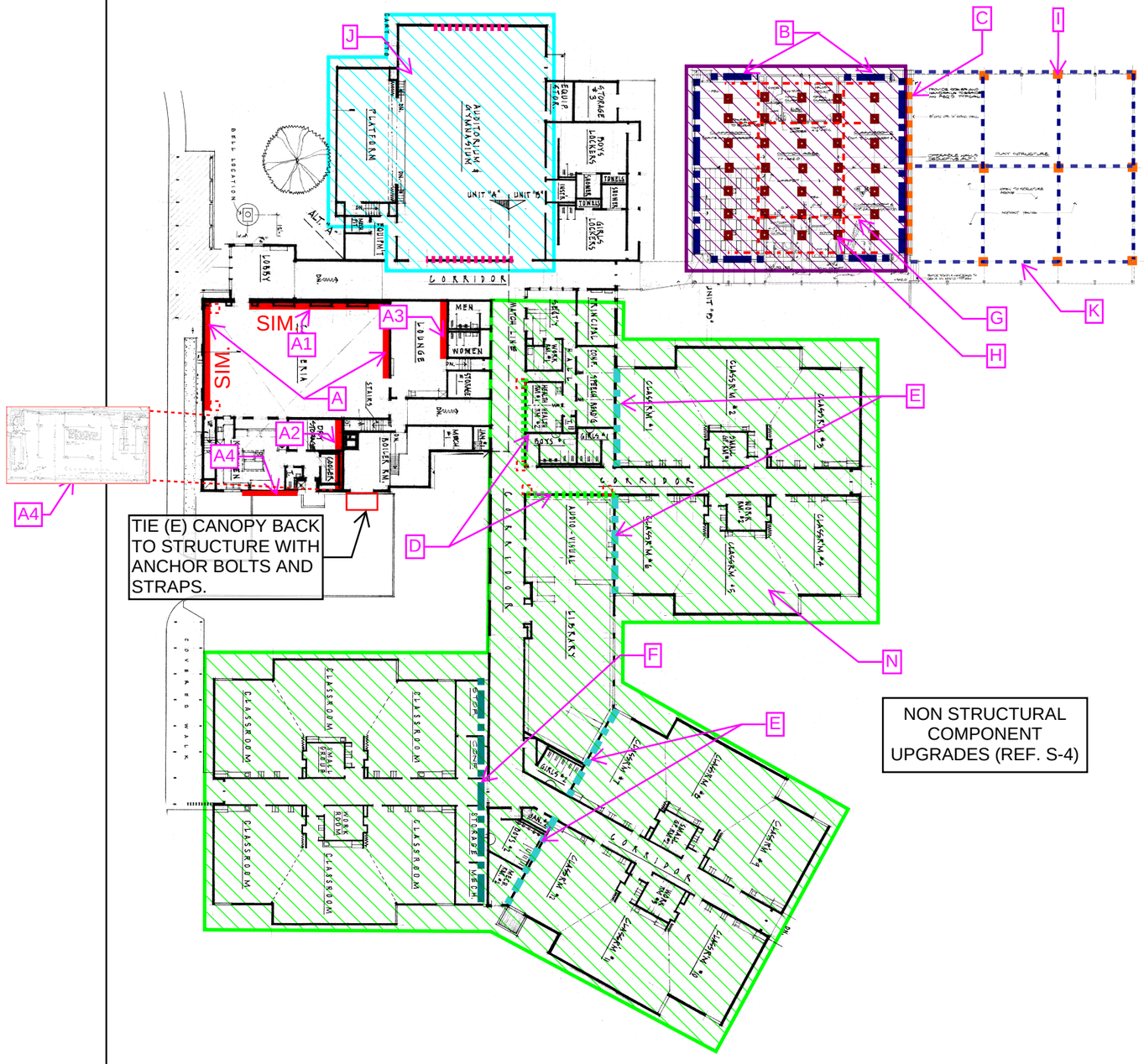
INDICATED BUILDING PART C1 (PART E IN BCA).
TYPE W2 CONSTRUCTION (1986)

INDICATED BUILDING PART C2 (PART F IN BCA).
TYPE S1A CONSTRUCTION (1986)

1 BUILDING PARTS PLAN

N

kpff Portland, Oregon	Project: BSD Cooper Mountian ES	By: LL/JBE	Sheet No.: S-3
	Location: Beaverton, Oregon	Date: 10/29/18	
	Client: Beaverton School District	Revised	Job No.: 21800754
	Seismic Strengthening Plan	Date	



a. A - A5 SIM. — REMOVE (E) WALL FINISHES AND ADD NEW 1/2" PLYWOOD SHEATHING TO 1 SIDE OF (E) WOOD WALLS. PROVIDE BLOCKING & ATTACHMENT TO ROOF SHEATHING. PROVIDE HOLDOWNS AT EACH END OF WALL AND ANCHOR BOLTS @ 4' O.C. FROM SILL TO FOUNDATION ALONG LENGTH OF WALL. AT SIM.: PROVIDE NEW FULL HEIGHT 2X6 WOOD STUDS, NEW SILL AND TOP PLATES AND FTG AS SHOWN.

b. B — REMOVE AND REPLACE EXISTING WALL SHEATHING WITH 1/2" STRUCTURAL PLYWOOD. PROVIDE POSITIVE ANCHORAGE TO FOUNDATION CAPABLE OF TRANSFERRING SHEAR AND PROVIDE ANCHOR BOLTS AT 4' O.C. FROM SILL TO FOUNDATION.

c. C — STRENGTHEN OUT OF PLANE CONNECTION FROM CMU WALL TO ROOF DIAPHRAGM

d. D — PROVIDE NEW SINGLE SIDED WOOD SHEAR WALL WITH HOLD DOWNS, FOOTINGS, AND WALL TO ROOF CONNECTION.

e. E — PROVIDE 1/2" PLYWOOD SHEATHING WITH NAILING CAPABLE OF RESISTING SHEAR DEMANDS. CONFIRM BLOCKING & ATTACHMENT TO ROOF SHEATHING. PROVIDE HOLDOWNS AT EACH END OF WALL AND ANCHOR BOLTS @ 4' O.C. FROM SILL TO FOUNDATION ALONG LENGTH OF WALL .

f. F — PROVIDE SHEATHING AT WOOD FRAMED WALL BETWEEN ROOF AND TOP OF (E) CONCRETE WALL CAPABLE OF TRANSFERRING IN-PLANE SEISMIC LOADS AS WELL AS PROVIDE OUT-OF-PLANE REINFORCING AT EXISTING CONCRETE WALL, REFERENCE SK-1 ATTACHED.

g. G — ROOF LEVEL SIMPSON COLLECTOR STRAPPING ON TOP OF EXISTING PLYWOOD ROOF SHEATHING. PROVIDE BLOCKING UNDER STRAPS.

h. H — PROVIDE POSITIVE CONNECTION FROM EXISTING FLOOR POST TO FLOOR FRAMING AND FOUNDATION. PROVIDE WOOD DIAGONAL BRACE BETWEEN TOP OF EACH FOUNDATION AND BOTTOM OF FLOOR FRAMING

i. I — STRENGTHEN STEEL COLUMNS WITH 1/4" STEEL PLATE STITCH WELDED TO EACH SIDE OF EXISTING STEEL COLUMN TO MEET SEISMIC COMPACTNESS REQUIREMENTS

j. J — REMOVE EXISTING ROOFING MATERIAL AND INSTALL NEW 1/2 " PLYWOOD DIAPHRAGM. PROVIDE OUT-OF-PLANE AND IN-PLANE ATTACHMENT TO (E) CONCRETE WALLS INCLUDING CROSS TIES AS REQUIRED.

k. K — PROVIDE BLOCKING AND/OR POSITIVE ATTACHMENT OF ROOF FRAMING TO ROOF DIAPHRAGM CAPABLE OF TRANSFERRING SHEAR. PROVIDE SIMPSON STRAPPING AND A35 CLIPS TO FRAMING AT UNDERSIDE OF ROOF TO ACT AS A CROSSTIE.

l. L — PROVIDE HSS6x4 STEEL STRONG BACKS @4'-0" O.C.

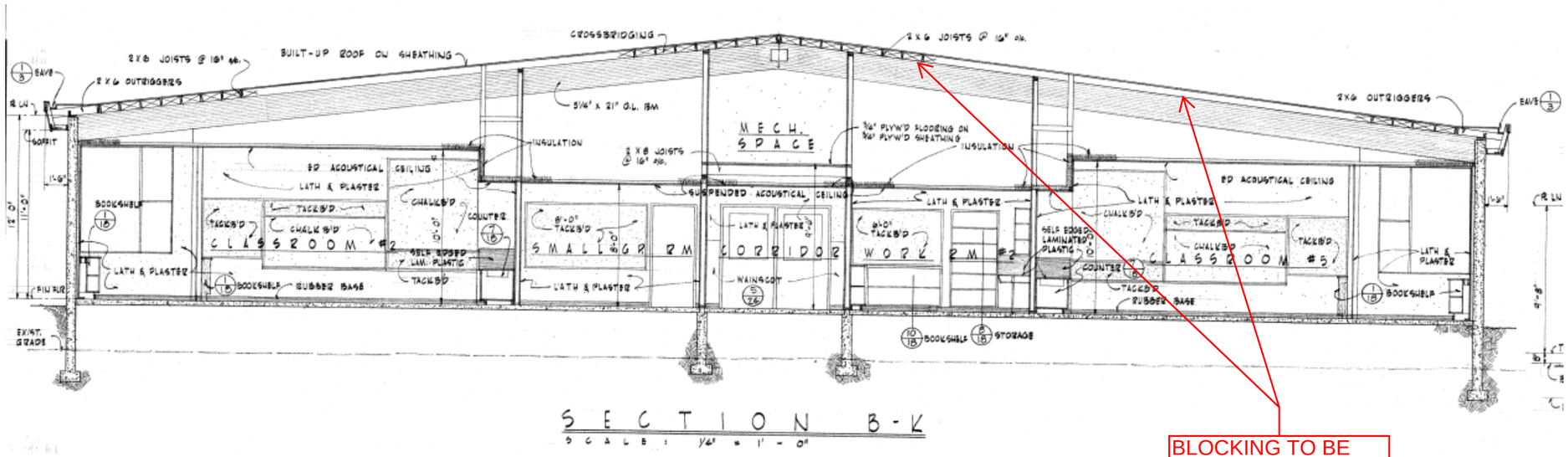
m. M — REMOVE EXISTING ROOFING MATERIAL AND INSTALL STRAP BLOCKING AT UNSUPPORTED PLYWOOD EDGES. PROVIDE ADDITIONAL NAILING AT SUPPORTED PLYWOOD EDGES.

n. N — PROVIDE BLOCKING BELOW ROOF (ABOVE CEILING) WITH 2X6 STUD BLOCKING ALONG ALL UNSUPPORTED PANEL EDGES. CONNECT THE BLOCKING WITH (4) A35 CLIPS

1 BUILDING PARTS PLAN

N

kpff Portland, Oregon	Project: BSD Cooper Mountian ES	By: LL/JBE	Sheet No.: S-4
	Location: Beaverton, Oregon	Date: 10/29/18	
	Client: Beaverton School District	Revised	Job No.: 21800754
	Seismic Strengthening Plan	Date	

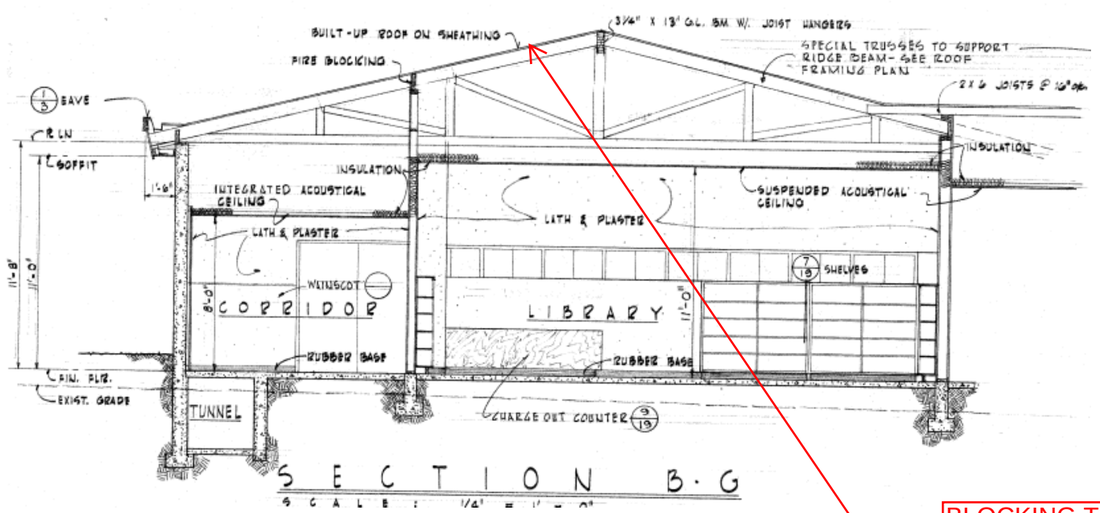


SECTION B-K

SCALE: ¼" = 1'-0"

A BUILDING SECTION

BLOCKING TO BE ADDED TO UNDERSIDE OF DECKING PER PLAN



SECTION B-G

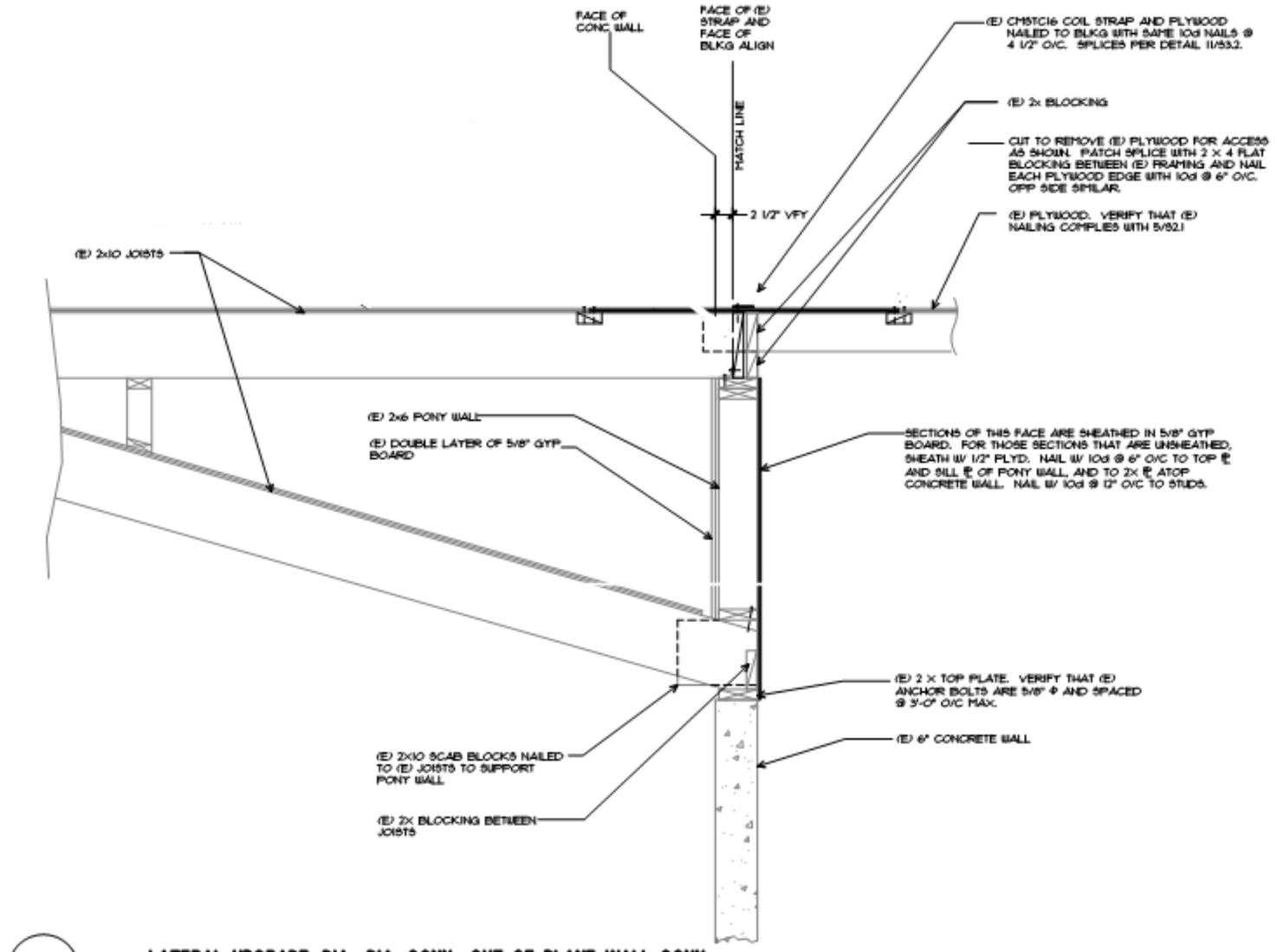
SCALE: ¼" = 1'-0"

B BUILDING SECTION

BLOCKING TO BE ADDED TO UNDERSIDE OF DECKING PER PLAN

Non Structural Component Upgrades as Required:
- Provide attachments at suspended ceilings that resist seismic forces for every 12 square feet where none are provided.
- Provide adequate ceiling sprinkler bracing and ceiling clearance
- Brace/anchor free standing items and mechanical equipment
- Brace/anchor/provide flexible couplings where required for all piping and ducts.
- Brace/anchor for all electrical equipment and lighting.
- Provide 2in wide angle support for suspended ceilings along the perimeter of the ceiling.
- Provide lens cover safety devices on all light fixtures.
- Provide anchorage and bracings of existing masonry chimney in the boiler room to the underside of the roof diaphragm and to the concrete pedestal.
- Provide bracing for all in line mechanical equipment.
- Brace/anchor/provide conduit couplings where required for all piping.
- Brace/anchor ductwork where required for all piping and ducts.

kpff Portland, Oregon	Project BSD Cooper Mountian ES	By LL/JBE	Sheet No. S-5
	Location Beaverton, Oregon	Date 10/29/18	
	Client Beaverton School District	Revised	Job No. 21800754
	Seismic Strengthening Plan	Date	



SK1 **LATERAL UPGRADE: DIA., DIA. CONN., OUT OF PLANE WALL CONN.**

1" = 1'-0"

Architectural Scope Notes by OHPD
10/29/2018

General Note
-Provide allowance for hazardous materials abatement.
-New scope added in dark purple font.

A

Cafeteria - East and West Walls
-Demolish (62) wall mounted tectum acoustic panels (2.5x4).
-Disconnect, remove, and reinstall surface mounted electrical conduit and devices.
-Disconnect, remove, salvage, and reinstall (2) network hubs, (8) speakers, (1) clock, and (3) wall mounted lights.
-Demolish 4'-0" of 5/8" gypsum board soffit per structural note.
-Demolish 5/8" gypsum board and veneer plaster on walls.
-Demolish (8) 2x2 recessed light fixtures at dropped soffit.
-Where new footing is noted on structural plan, demolish existing concrete floor slab and flooring for installation of new concrete footing, approximately 2' x 2'.
- Remove and salvage for reinstallation MEP vent grilles and duct work to provide access for new sheathing.
- Reinstall/adjust MEP venting grills and ductwork and equipment to accommodate new shear wall in soffit.
-Install new 5/8” gypsum board with veneer plaster over plywood sheathing indicated in Structural note. Provide new rubber base and paint wall to match existing.
-Install (62) new wall mounted acoustic panels (2.5x4).
-Install new 4'-0" wide dropped 5/8" gypsum board soffit with (8) 2x2 recessed light fixtures.
-Provide allowance for MEP uninstall/reinstall and modification at ceiling level adjacent to shear wall.
-Where new footing is noted on structural plan, patch concrete slab after installation of footing and install VCT flooring to match existing flooring.

A1

Cafeteria - North Wall (scope is in addition to "A" above)
-Demolish built out furred wall along north wall to structural framing.

A2

Dry Storage
-Demolish 5/8" gypsum board, veneer plaster, and rubber base.
-Install new 5/8” gypsum board with veneer plaster over plywood sheathing indicated in Structural note. Provide new rubber base and paint wall to match existing.
-Remove, salvage, and reinstall (4) dry storage shelving units.
-Remove, salvage, and reinstall (3) tall cabinets.
-Demolish gypsum board ceiling 2’ along entire length of wall.
-Install 5/8” gypsum board with veneer plaster at ceiling; paint ceiling to match existing.

`

A3

Lounge @ Upper Level
-Demolish 5/8" gypsum board, plaster, and rubber base.
-Install new 5/8” gypsum board with veneer plaster over plywood sheathing indicated in Structural note. Provide new rubber base and paint wall to match existing.
-Remove, salvage, and reinstall (1) bulletin board (4x4).
-Provide allowance for MEP uninstall/reinstall and modification at ceiling level adjacent to shear wall.
-Remove, salvage, modify and reinstall 2'x4' ceiling panels along wall.
-Disconnect, remove, and reinstall surface mounted electrical conduit and devices.

A4

Kitchen and Music Room at the Exterior
-Demolish exterior cement plaster siding.
-Demolish plywood sheathing.
-Demolish existing window
-Remove metal flashing.
-Remove, salvage, and reinstall downspout.
-Infill window with wood framing and 5/8" gypsum board with veneer plaster on interior. Provide R-21 batt insulation in framing cavity.
-Provide new 1/2" plywood sheathing as indicated in structural note.
-Provide self adhered water barrier, provide new exterior cement plaster siding; paint exterior wall to match existing.

A5

Music Room Located above the Dry Storage & Kitchen
-Demolish (1) upper built-in shelving units, (3) upper cabinets, (4) lower cabinets, and (1) lower built-in open shelving units.
-Demolish countertop, back splash, and rubber base along wall.
-Demolish (1) sink.
-Remove, salvage, and reinstall (1) soap dispenser and (1) paper towel dispenser.
-Install new sink.
-Install (3)upper and (4) lower casework, countertop, back splash, and rubber base to match existing.
-Remove, salvage, modify existing 2'x4' ceiling panels along wall. Remove ceiling suspension grid along wall and install modified grid.
-Provide allowance for MEP uninstall/reinstall and modification at ceiling level adjacent to shear wall.
-Disconnect, remove, and reinstall surface mounted electrical conduit and devices.
-Demolish gypsum board and veneer plaster.
-Install new 5/8” gypsum board with veneer plaster over plywood sheathing indicated in Structural note. Paint wall to match existing.
-Demolish 1 foot sub-flooring the length of the shear wall to expose framing to provide access for shear wall installation
- Install new subfloor and patch existing exposed flooring where access for shear wall installation was required.

B

1986 Classroom Addition

-Demolish (6) upper cabinets and (2) 4' wide lower coat rack, and (3) base cabinets.
-Demolish 3'-0" high plastic laminate wainscot and rubber base.
-Demolish gypsum board and veneer plaster.
-Demolish strip of carpet, sub flooring, and floor sheathing to provide access to foundation wall.
-Provide new 1/2" plywood sheathing per structural note.
-Provide new 5/8" gypsum board with veneer plaster over plywood sheathing indicated in Structural note. Provide new rubber base and paint wall to match existing.
-Provide new 2'-6" high plastic laminate wainscot and rubber base to match existing.
-Remove, salvage, and reinstall (1) magnetic marker board (6'x6'), (2) tack boards (4'x6'), (2) marker boards (4'x8'), (3) 1x tack boards, (1) projection screen, and (2) book shelves.
-Remove, salvage, modify existing 2'x4' ceiling panels along wall. Remove ceiling suspension grid along wall and install modified grid.
-Install (6) new upper cabinets and (2) 4' wide lower coat rack, and (3) base cabinets.
-Disconnect, remove, and reinstall surface mounted electrical conduit and devices.
-Provide allowance for MEP uninstall/reinstall and modification at ceiling level adjacent to shear wall.
-Replace subfloor sheathing and carpeting where removed for access to shear wall.

C

Play shed Connection to Classroom Addition

-Paint exposed structural connections to match existing.

D

Corridor

-Demolish 4’-6" high tackable wall surface and rubber base for entire length of shear wall.
-Demolish gypsum board and veneer plaster behind the tackable surface.
-Demolish 3’-0" of VCT flooring and slab along length of shear wall. Excavate for new footings indicated in Structural note.
-Disconnect, remove, salvage, and reinstall (1) fire strobe.
-Provide allowance for MEP uninstall/reinstall and modification at ceiling level adjacent to shear wall.
-Remove, salvage, modify existing 2'x4' ceiling panels along wall. Remove ceiling suspension grid along wall and install modified grid.
-Install new 4’-6” high tackable wall surface and rubber base along wall. Color to match existing.
-Install 3’-0" of new concrete floor slab and VCT flooring along wall. VCT color to match existing.

E

Classroom

-Demolish 5/8" gypsum board, veneer plaster, and rubber base up to the casework.
-Provide new 1/2" plywood sheathing.
-Provide new 5/8” gypsum board with veneer plaster over new plywood sheathing indicated in Structural note. Provide new rubber base and paint wall to match existing.
-Remove, salvage, and reinstall (1) magnetic marker board (6'x6'), (2) tack boards (4'x6'), (2) marker boards (4'x8'), (3) 1x tack boards, (1) projection screen, and (2) book shelves.
-Remove, salvage, modify existing 2'x4' ceiling panels along wall. Remove ceiling suspension grid along wall and install modified grid.
-Disconnect, remove, and reinstall surface mounted electrical conduit and devices.
-Provide allowance for MEP uninstall/reinstall and modification at ceiling level adjacent to shear wall.

F

Sheathing Below Roof @ Corridor Side

-Remove, salvage, modify existing 2'x4' ceiling panels along wall. Remove ceiling suspension grid along wall and install modified grid.
-Provide 350SF of 1/2" plywood sheathing at areas of wall between top of concrete wall and roof that are unsheathed per Structural note.

G

1986 Classroom Addition Roof Connection

-Demolish built-up roofing with ballast over entire roof.
-Install new SBS roofing, R-20 Rigid insulation, cover board, and flashings over entire roof after completion of structural work.
-Remove and replace gutters and downspouts
-Provide allowance for uninstall/reinstall of MEP equipment, devices, and conduit on roof.
-Remove and salvage 2x4 ceiling tiles as needed for access to underside of roof deck to install blocking indicated in structural note.
-Reinstall salvaged 2x4 ceiling tiles at conclusion of structural work.

H

1986 Classroom Addition Crawl Space

Work performed below in crawl space.
No finish work required.

I

Play Shed Columns

-Paint existing columns and new steel plates to match color of existing structure.

J

Roof

-Demolish metal roofing and rigid insulation.
-Remove (2) mechanical roof fans.
-Demolish 200 lf of gutter.
-Demolish (6) downspouts.
-Install (2) new mechanical roof fans.
-Install new wood sleepers, rigid insulation, cover board, and metal roofing over plywood diaphragm indicated in Structural note.
-Install 200 lf of gutter.
-Install (6) new downspouts.

K

Play Shed

-Paint new components indicated in Structural note; color to match existing. Use high-performance coating.

L

Gym Strong Backs.

-Remove, salvage, and reinstall wall mounted equipment: (2) basketball hoops, hooks for (2) mats, (1) climbing wall system, (1) overhead bar on brackets (approximately 12 feet long).
-Remove, salvage, and reinistall 2x4 ceiling tiles at column locations. Modify grid at columns and reinstall tiles.
-Demolish (E) VCT flooring for new columns
-Patch and repair flooring
-Paint steel columns indicated in structural note. Use high-performance coating.

M

Strap Blocking

-Roof removal and replacement scope coincides with Note G.

N

Blocking Below Roof

-Remove and salvage 2x4 ceiling tiles as needed for access to underside of roof deck.
-Reinstall salved ceiling tiles at conclusion of structural work.

APPENDIX D

STAMPED/SIGNED FEMA FLOOD LETTER

111 SW Fifth Avenue, Suite 2500 Portland, OR 97204 503.542.3860 **kpff.com**

November 13, 2018

RE: Cooper Mountain Elementary School
7670 SW 170th Avenue
Beaverton, OR 97007

To Whom It May Concern:

This letter certifies that the subject school buildings are located outside of designated flood hazard areas, floodways or other flood areas, as shown on the Federal Emergency Management Agency (FEMA) National Flood Hazard Layer FIRMette designated "41067C0528E, 11/4/2016, Not Printed" (attached).

Based on the attached FEMA FIRMette, the school appears to be located within Zone X designating the property as within an "Area of Minimal Flood Hazard". Based on available topographic information (attached), the school's floor is approximately located at an elevation of 340 feet which is a high point on the map and approximately 600 feet from the nearest stream showing an elevation of approximately 300 feet.

Because the subject school is located within Zone X, located at a high point and 600 feet distance from the nearest stream, it is our opinion that no further information is necessary to determine that the school is located outside of the 100-year flood zone.

Curt Vanderzanden, PE
Principal | KPFF Consulting Engineers

Attachments: FEMA FIRMette
USGS Topo Map

10021800754-JS

National Flood Hazard Layer FIRMette

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Area of 1% annual chance flood with average depth less than one foot or with drainag areas of less than one square mile *Zone*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN — Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 — Cross Sections with 1% Annual Chance / Water Surface Elevation
- Coastal Transect
- 513 — Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represe an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 11/9/2018 at 5:35:22 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

The National Map US Topo

BEAVERTON QUADRANGLE
OREGON-WASHINGTON CO.
7.5-MINUTE SERIES

COOPER MOUNTAIN ELEMENTARY SCHOOL MAIN BUILDINGS USGS ELEV. 340'+

APPROX. JOHNSTON CREEK USGS STREAM ELEV. = 300'+

Approx. Dist. to nearest stream = 600'+

Produced by the United States Geological Survey
North American Datum of 1983 (NAD83)
World Geodetic System of 1984 (WGS84). Projection and 1 000-meter grid: Universal Transverse Mercator, Zone 10T
10 000-foot ticks: Oregon Coordinate System of 1983 (north zone)

This map is not a legal document. Boundaries may be generalized for this map scale. Private lands within government reservations may not be shown. Obtain permission before entering private lands.

Imagery.....NAIP, October 2014
Roads.....U.S. Census Bureau, 2015 - 2016
Names.....GNIS, 2016
Hydrography.....National Hydrography Dataset, 2014
Contours.....National Elevation Dataset, 2009
Boundaries.....Multiple sources; see metadata file 1972 - 2016
Public Land Survey System.....BLM, 2016
Wetlands.....FWS National Wetlands Inventory 1977 - 2014

SCALE 1:24 000

CONTOUR INTERVAL 10 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

This map was produced to conform with the National Geospatial Program US Topo Product Standard, 2011. A metadata file associated with this product is draft version 0.6.19

ROAD CLASSIFICATION
Expressway, Secondary Hwy, Ramp, Local Connector, Local Road, 4WD, Interstate Route, US Route, State Route

1 Hillsboro
2 Linnton
3 Portland
4 Scholls
5 Lake Oswego
6 Newberg
7 Sherwood
8 Canby
ADJOINING QUADRANGLES

BEAVERTON, OR
2017