

Oregon Seismic Status Report - 2017



Oregon law requires school districts and education service districts to provide DOGAMI with notice of construction projects that may affect a school's seismic risk.

This report was generated by DOGAMI from submitted data.

School District/ESD: Days Creek 15

County: DOUGLAS

Contact Name: Mark Angle

Contact Email: mark.angle@dayscreek.k12.or.us

Structures Replaced? No

Name and Address:

Kind of Structure:

Type of Replacement:

Max Occupancy:

Date Occupied:

Structures Modified? No

Name and Address:

Kind of Structure:

Type of Modification:

Date Re-occupied:

Optional:

Engineering Report? Yes *If yes, attachments are appended to this report.*

Cost of Rehab:

Method of Funding:

Seismic Rehabilitation Grant Program

Notes:

Structural Seismic Evaluation Report

for the

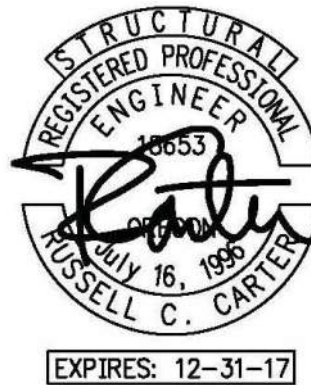
Days Creek Charter School



Prepared for:
Douglas County School District

May, 2017

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1.0 Executive Summary

1.1 Background

The Douglas County School District #15 School District (District) operating as Days Creek Charter School is located at 11381 Tiler Trail Highway in Days Creek, Oregon in Douglas County. The District operates one school campus which includes all administrative, educational and maintenance functions.

The selection of this school campus was based on a facilities tour and review of all facilities currently operated by the District. The approach to selection was multifaceted, but emphasized the most efficient use of the funds to provide the District with the most useful information moving forward. During our review of the facilities we identified buildings of particularly high risk and buildings that had potential to be funded as through future cycles of the Seismic Rehabilitation Grant Program (SRGP). This allowed us to select facilities and portions thereof that will provide the District with the most benefit from increased knowledge of the deficiencies.

To provide an all-encompassing seismic evaluation we performed visual observations and/or review of available construction documents at each of the above referenced schools. We also interviewed District staff to obtain any knowledge on known structural deficiencies. After field data was collected, each facility was evaluated in accordance with the American Society of Civil Engineers "Seismic Evaluation and Retrofit of Existing Buildings ASCE/SEI 41-13" (ASCE 41-13). The evaluation tool outlined in ASCE 41-13 allows us to determine seismic deficiencies when the aging District facilities are compared to a building designed using modern building codes.

This study provides the District with recommendations to rehabilitate the found seismic deficiencies to provide a structure that meets the expectations of "Life Safety" as outlined in ASCE 41-13. Planning level budgetary construction values for each school and support facilities have been included.

The most significant deficiencies are referenced to help the District develop repair plans as budgets allow. It is recommended that the District use this report to prioritize improvements and determine interest in seeking grant funding through the seismic rehabilitation grant programs and/or develop a comprehensive capital improvements plan and budget.

1.2 Recommended Improvements

Section 3.0 covers the specific deficiencies and subsequent recommendations for above mentioned facilities.

1.3 Conclusions

Generally speaking, the condition of the district's schools that were evaluated are good based on their respective ages. The facilities are, for the most part, well cared for buildings. The recommended improvements reflect items that do not pose a substantial immediate risk to the life safety of occupants outside of code lateral events. It should be noted that

structural deficiencies in schools of this age group are fully expected and the severity of the deficiencies noted is not uncommon.

Construction costs to retrofit each of the facilities observed will vary highly based on the degree of deficiencies being rectified. Seismic retrofit costs for each of the facilities have been developed based on historic data along with review of the deficiencies found at each location. These numbers are based on our experience retrofitting similar schools and cover both the highest priority deficiencies along with the lower priority deficiencies summarized for each building .

It is clear based on the condition of the buildings that the district is invested in maintaining the buildings to get the most use out of each structure. To ensure that the district continues to get the most out of their schools and provide a safe learning environment for the students, we would recommend generating a priority list for capital improvement projects to systematically address deficiencies as funds become available. Additionally, incremental improvements should be considered during projects that may make performing the work easier. For example, during a roof replacement project, is a good time to install connections from the roof diaphragm to the walls or a window replacement project is a good time to install shearwalls in place of windows in a wall line that does not have enough shearwall length.

Attention should be paid to the potential for upcoming seismic retrofit grant programs. Should the district be interested in pursuing grant funding for one or more schools, ZCS would be happy to provide proposals for assisting in the preparation of grant packages.

The balance of the report provides specific details regarding the construction of each school, observed deficiencies, and recommended repairs.

2.0 Project Overview

The Douglas County School District #15 School District (District), operating as Days Creek Charter School, is located in a high seismicity zone and contains one school campus with multiple structures. The main school house including the classroom wing additions, THE gymnasium and shop / vocational building are the focus of this evaluation. Please see Figure 1 – Basic Site Map, outlining the three separate building areas. The objective of this planning effort is to perform visual observations and/or review of the provided construction documents at the above mentioned facilities identifying general structural deficiencies. Once these observations have been performed, ZCS performed a seismic performance review of the structural systems in accordance with the American Society of Civil Engineers “Seismic Evaluation and Retrofit of Existing Buildings ASCE/SEI 41-13” (ASCE 41-13), in order to identify deficiencies and provide rehabilitation recommendations. Once rehabilitation recommendations were determined, planning level budgetary construction costs for each facility have been determined. It is recommended that the District use this report to prioritize improvements and determine interest in seeking grant funding through the seismic rehabilitation grant programs.

In order to accurately report the deficiencies for each school, a visit to each facility with inadequate construction documents was required. During the visit to each facility, construction type and framing methods were noted along with any observed, obvious structural deficiencies.

The age of each school and their additions are included and reflect the best information available. Each facility contained areas used for classrooms, administrative staff, assembly, etc. While each facility and sometime additions were constructed differently, access to their structural systems was limited to observation only. Observed construction type for each school and a summary of each facility’s additions and their respective construction types are located in Section 3.0.

2.1 Inspection Process and Participants

The following sections detail the inspection process and the individuals who participated in the inspections, and our methodology for review of deficiencies.

2.1.1 Inspection Process

Each school investigation was performed using a similar inspection process. The process was as follows:

- Compile all available documentation citing relevant information to be used on-site
- Review available as-constructed building information
- Inspect the exterior of the school and note obvious deficiencies
- Begin inspections at the entrance of the school and document each observable deficiency. Comment on general condition of each building.
- Photograph each deficiency
- Document structural framing methods used for each building
- Advance through each structurally independent portion of the building and make observations
- Complete interior and exterior photographic documentation
- Collate Findings and deficiencies

2.1.2 Participants

In order to identify deficiencies, improvement needs, condition, and other qualities of the existing schools, a detailed inspection effort was planned utilizing several individuals offering different perspectives and areas of expertise. Inspections were performed on xxxx

A list of those who participated in the inspection process is provided in the table below:

Name	Company
Mike Jardine	ZCS Engineering, Inc.
Alec Cheyne	ZCS Engineering, Inc.

Additionally, custodial and maintenance staff were interviewed when available during the inspections regarding any concerns with their respective schools and the subject school's overall performance.

2.2 Building Deficiency Review

The report provides a brief description of the deficiencies observed during our on-site investigation for each school. Each of the deficiencies identified corresponds to the items outlined in *ASCE 41-13: Seismic Evaluation and Retrofit of Existing Buildings*. As a guideline for each of the inspections and the building review, checklists known as Tier 1 were performed for the structure types within each school. A summary of each building's structural systems and observed deficiencies is provided in Section 3.0 and the respective Tier 1 evaluations are located in appendices.

It is the intent of the District, as part of this study, to determine the structural deficiencies of the building as compared to current prescribed loading and detailing requirements for lateral (wind/seismic) loading to a performance level of "Life Safety" per ASCE 41-13. The level of performance is defined per ASCE 41-13 as:

"Structural performance level, life safety, means post-earthquake damage state in which significant damage to the structure has occurred but some margin against either partial or total structural collapse remains. Some structural elements and components are severely damaged but this has not resulted in large falling debris hazards, either inside or outside the building. Injuries may occur during the earthquake; however, the overall risk of life-threatening injury as a result of structural damage is expected to be low. It should be possible to repair the structure; however, for economic reasons this may not be practical. Although the damaged structure is not an imminent collapse risk, it would be prudent to implement structural repairs or install temporary bracing prior to reoccupancy."

Per ASCE 41-13 a seismic hazard level is required. In order to obtain a performance level of "Life Safety" the seismic hazard shall be BSE-1N as defined in section 2.4.1.2 and C2.4.1.2. The BSE-1N hazard level earthquake has a probability of occurring once in every 475 years, or 10% chance in 50 years. This design level earthquake has a similar rate of occurrence and magnitude as the current state adopted building codes. A 25% reduction in

force is recommended the City of Portland City Code for the evaluation and rehabilitation of existing buildings per chapter 24.85. We feel this provides an appropriate level of performance for this facility.

3.0 Structure Summaries, Observed Deficiencies, and General Repair Recommendations

The information obtained through the on-site observations outlined in Section 2.0 is summarized below. A general summary of each structurally independent portion of the building is provided followed by a table summarizing the deficiencies observed. Lastly, a list of repair recommendations is provided along with anticipated costs to rectify the deficiencies.

3.1 Days Creek Charter School:



Days Creek Charter School -- Classroom Building Entrance

3.1.1 Structure Summary

Original Classroom Seismic Hazard Rating: Moderate

Due to a lack of original construction documents, the exact date of the building's original construction is unknown. However, based on the varying ages of the school additions and the type of construction of the original building, the school is estimated to be built in approximately the 1920's. This assumption is also based on the fact the architect, whose stamp resides on the second addition's drawings, was working for a northwest architectural firm was in the area building the City of Roseburg City Hall. This building went on to receive three classroom additions prior to 1954 when the high school addition was added on. A final major addition to the classroom building was constructed on the south end of the building in

1965; this reinforced masonry addition joined the classroom building to the freestanding gymnasium building. See Figure 2 illustrating this progression.

After review all available construction documents per ASCE 41-13 the all portions of the main school house is primarily classified as a W2 construction type:

Wood Frames, Commercial and Industrial W2 – These buildings are commercial or industrial buildings with a floor area of 5,000 ft² or more. There are few, if any, interior walls. The floor and roof framing consists of wood or steel trusses, glulam or steel beams, and wood posts or steel columns. The foundation system may consist of a variety of elements. Seismic forces are resisted by wood diaphragms and exterior stud walls sheathed with plywood, oriented strand board, stucco, plaster, or straight or diagonal wood sheathing, or they may be braced with rod bracing. Wall openings for storefronts and garages, where present, are framed by post-and-beam framing.

All portions of the classroom building were construction primarily utilizing similar techniques and construction materials. The roof consists of a straight sheathed roof diaphragms supported by 2x roof joists at 16" O.C. The roof joists then bear on interior bearing walls and exterior shear walls. The diagonally sheathed shear walls are then anchored to a continuous reinforced concrete foundation.

The evaluation of these facilities indicates that rehabilitation of existing lateral system components is necessary to meet the requirements for Life Safety as outlined in ASCE 41-13. See Appendix B for Tier 1 evaluations. The following is a list of seismic deficiencies encountered:

- The straight sheathed and diagonally sheathed roof diaphragms do not have adequate capacity to resist seismic forces.
- The roof diaphragms are not properly attached to the shear walls below. In most cases these walls do not extend above the ceiling line. Very common for this age of construction.
- The shear walls do not have adequate capacity to resist seismic forces
- The plaster covered interior walls which are assumed to be shear walls do not have adequate capacity
- The shear walls are not properly attached to the foundation elements to resist sliding forces induced by a seismic event.
- Holdowns are not present to resist overturning forces resulting from seismic forces
- Reentrant corners are susceptible to damage from seismic induced tension forces.
- Post-to-beam connections are not adequate.

- The large window walls along the east and west faces of the high school building do not provide lateral resistance required to support seismic forces.

The 1965 high school classroom addition per ASCE 41-13 is classified as a RM1 construction type:

Reinforced Masonry Bearing Walls with Flexible Diaphragms [RM1] – These buildings have bearing walls that consist of reinforced brick or concrete block masonry. The floor and roof framing consists of steel or wood beams and girders or open web joists and are supported by steel, wood, or masonry columns. Seismic forces are resisted by the reinforced brick or concrete block masonry shear walls. Diaphragms consist of straight or diagonal wood sheathing, plywood, or unstopped metal deck and are flexible relative to the walls. The foundation system may consist of a variety of elements.

The 1965 high school classroom building construction consists of a plywood roof diaphragm supported by open web wood parallel chord joists spaced at 16" O.C. The roof joists bear on interior 8" reinforced concrete masonry unit (CMU) perimeter bearing walls. Neither a new CMU wall nor a new wood framed wall was provided at the attachment to the existing building.

The evaluation of the facility indicates that rehabilitation of existing lateral system components is necessary to meet the requirements for Life Safety as outlined in ASCE 41-13. See Appendix B for Tier 1 evaluations. The following is a brief list of seismic deficiencies encountered:

- The CMU walls are not properly attached to the roof diaphragm to resist out-of-plane forces. This could result in the roof slipping off its bearings and collapsing.
- The CMU walls are not properly attached to the roof diaphragm to resist in-plane forces.
- The roof diaphragm of the 1965 addition is not properly attached to the existing high school. Given this lack of connection a shear wall along this line is not provided along this edge of the diaphragm

3.1.2 Gravity Resisting Systems and General Observations

A non-formal structural review of gravity resisting elements did not reveal any deficiencies of major concern at this time.

3.1.3 Evaluation of Incidental Items

Incidental, non-structural items can play a major role in the overall expense of rehabilitating an existing building. These costs can be significant, and can be very difficult to estimate prior to construction.

- Proper attachment and bracing of storage racks/cabinets/books shelves over 4' tall or 3:1 (height:width) ratio
- Attachment of equipment over 20 lbs. and above 4', and all equipment over 100 lbs.
- Attachment of all emergency lighting, power equipment and associated wiring
- Bracing of overhead fluid piping and any gas piping
- Verification/installation of emergency shutoff valves for gas utilities
- HVAC units should be evaluated for stability under seismic loading.

Based upon ZCS's previous experience and discussions with site personnel the building contains some form of hazardous material. These materials will need to be dealt with on a case-by-case basis as they are encountered during the project.

3.1.4 Seismic Rehabilitation Recommendations

The following structural improvements are required to resolve the deficiencies noted in section 3.1.1. These improvements are detailed below and in the attached schematic seismic rehabilitation drawings found in Appendix C. These drawings were prepared to assist in defining the rehabilitation scope of work.

- Remove and replace the existing roof membranes to allow for the installation of a new layer of plywood over the existing sheathed diaphragms
- Provide blocking, clipping and nailing connections along top of walls to establish adequate connection between top of wall and diaphragm to ensure complete and well-defined load path for in-plane and out-of-plane loads.
- At locations where interior shear walls do not extend to the underside of the roof sheathing provide new stud wall framing as necessary to allow new plywood shear walls in the attic spaces to properly transmit seismic forces from the roof diaphragm to the shear walls below.
- Sheath existing exterior and interior walls as required to increase the seismic force resisting capacity of the building
- Install new connection hardware between the sill plates and concrete foundation elements
- Provide new holdown devices at shear wall ends to properly resist overturning forces
- Provide seismic strapping at reentrant corners to withstand seismically induced tension forces.

- Provide new connection hardware to all post and beam locations.
- Reduce the number of windows along the east and west lines of the high school addition to provide a properly design seismic force system
- Remove and replace the existing roofing membrane for the 1965 addition to allow the inspection of the nailing pattern and re-nailing as required to provide an adequate diaphragm
- Provide out-of-plane anchorage between the roof diaphragm and the CMU walls
- Provide in-plane clipping, blocking and connection to properly attach the roof diaphragm to the CMU walls
- Properly attach the lower 1965 roof diaphragm to the original high school addition wall to provide a shear line along this edge of the diaphragm. Given the increased demand on the wall this wall will require new plywood sheathing at a minimum to be installed on one side of the structural framing.
- All HVAC equipment found throughout the building shall be properly braced and attached to the structure to limit the potential damage.
- All piping found within the building that is greater than 12" from structure shall be properly attached and braced.
- All non-structural bracing deficiencies need additional bracing.
- After these are implemented the building will meet the "life safety" performance level per ASCE 41-13.

3.1.5 Preliminary Construction Cost Estimate

In order to assist the District in maintenance and improvement planning, planning level budgetary construction costs have been developed for each school as detailed in this report. These rough order of magnitude costs are an estimate of the costs associated with structural improvements based on the visual observations and assumptions included in this report and our prior experiences. These values are not to be used for specific project planning purposes, but are meant to assist the District in planning processes.

Retrofit solutions for each school have not been developed or hard quoted and as such these values are subject to change as projects are developed and further evaluation and design is performed. These costs are related to rectifying the deficiencies noted above, but do include anticipated costs for incidental work required to complete the upgrades. In addition to the hard costs noted below, an additional 15% for soft costs such as engineering and permitting and 25% for contingency should be included for each project the District pursues. If the District decides to advance specific projects, the contingency percentage may be reduced as the design is advanced

Construction costs to retrofit each of the building observed will vary highly based on the degree of deficiencies being rectified. However given the similarity of the structures found within the main school house, the seismic retrofit costs for structural improvements will likely

range from \$55 to \$60 per square foot based on buildings of similar construction. The total square footage for the main school house is approximately 24,500 square feet for an approximate overall construction cost of \$1,347,500 to \$1,4700,000. These numbers are based on our experience retrofitting similar schools and cover both the highest priority deficiencies along with the lower priority deficiencies summarized for each building.

3.2 Days Creek Charter School Gymnasium Building



Days Creek Charter School – Gymnasium Building

3.2.1 Structure Summary

Gymnasium Seismic Hazard Rating: Low

The original gymnasium structure was built in 1940 as a free standing structure that included a gym and stage area. The gymnasium building was later attached to the classroom building in 1965. After the buildings initial construction it received a minimum of three additions to the structure to achieve its current size. A major addition was done to the south of the building to enlarge the gym space. This is evident in the ceiling and flooring. The original exterior wall south wall was removed for this. This wall was also the main bearing wall for the roof structure. A new clear spanning roof beam was added with structural supporting columns and footings. Due to a lack of original construction documents the dates of these additions cannot be exactly determined. However, based on conversations with the District and based on the information provide please see figure 3 illustrating the progression of the gym as we understand it.

Per ASCE 41-13 the gymnasium building is primarily classified as a W2 construction type:

Wood Frames, Commercial and Industrial W2 – These buildings are commercial or industrial buildings with a floor area of 5,000 ft² or more. There are few, if any, interior walls. The floor and roof framing consists of wood or steel trusses, glulam or steel beams, and wood posts or steel columns. The foundation system may consist of a

variety of elements. Seismic forces are resisted by wood diaphragms and exterior stud walls sheathed with plywood, oriented strand board, stucco, plaster, or straight or diagonal wood sheathing, or they may be braced with rod bracing. Wall openings for storefronts and garages, where present, are framed by post-and-beam framing.

The gymnasium building construction primarily consists of a straight sheathed roof diaphragm supported by 2x roof purlins over timber bowstring trusses for main gymnasium area. The lower flatter roofs of the additions consist of 2x joists and rafters support a straight or diagonally sheathed diaphragm. The bowstring trusses and roof purlins then bear on exterior timber shear walls. The diagonally sheathed shear walls are then anchored to the reinforced concrete foundation. Similar wall construction is utilized for the walls for the additions.

The evaluation of the facility indicates that rehabilitation of existing lateral system components is necessary to meet the requirements for Life Safety as outlined in ASCE 41-13. See Appendix B for Tier 1 evaluations. The following is a brief list of seismic deficiencies encountered:

- The straight sheathed diaphragm exceeds code prescribed aspect ratio and capacity.
- The straight sheathed diaphragm spans are greater than 40 feet.
- The roof connection attachment where the existing south wall of the original gym was removed is unknown. It is likely this connection is not adequate to properly transmit seismic forces to the perimeter shear walls at this change in construction.
- The attachments of the lower roofs of the east and west additions are unknown and likely to not have the adequate strength to transfer seismic loads as intended.
- In-plane connections are not adequate to transfer diaphragm loads to the foundation.
- The gymnasium portion of the building is taller than lower portions of the building. This creates a geometric irregularity. This geometric irregularity could result in pounding of the adjacent roof diaphragms into the gymnasium walls. The pounding effects increase the buckling loads on the walls.
- The bowstring trusses are not properly attached to the perimeter walls for in-plane and out-of-plane forces.
- The bowstring trusses are structurally inadequate to support gravity and seismic loading. The lack of redundancy in the connections of the web, top and bottom chords can lead to catastrophic collapse of the roof.

3.2.2 Gravity Resisting Systems and General Observations

A non-formal structural review of gravity resisting elements did not reveal any deficiencies.

3.2.3 Evaluation of Incidental Items

Incidental, non-structural items can play a major role in the overall expense of rehabilitating an existing building. These costs can be significant, and can be very difficult to estimate prior to construction.

- Proper attachment and bracing of storage racks/cabinets/books shelves over 4' tall or 3:1 (height:width) ratio
- Attachment of equipment over 20 lbs. and above 4', and all equipment over 100 lbs.
- Attachment of all emergency lighting, power equipment and associated wiring
- Bracing of overhead fluid piping and any gas piping
- Verification/installation of emergency shutoff valves for gas utilities
- Suspended ceiling seismic bracing at exits
- HVAC units should be evaluated for stability under seismic loading.

Based upon ZCS's previous experience and discussions with site personnel the building contains some form of hazardous material. These materials will need to be dealt with on a case-by-case basis as they are encountered during the project.

3.2.4 Seismic Rehabilitation Recommendations

The following structural improvements are required to resolve the deficiencies noted in section 3.2.1. These improvements are detailed below and in the attached schematic seismic rehabilitation drawings found in Appendix C. These drawings were prepared to assist in defining the rehabilitation scope of work.

- Remove and replace the existing roof membranes to allow for the installation of a new layer of plywood over the existing sheathed diaphragms
- Provide blocking, clipping and nailing connections along top of walls to establish adequate connection between top of wall and diaphragm to ensure complete and well-defined load path for in-plane and out-of-plane loads. This applies to the entire building area.
- Further evaluate the connection of the two roof where the original south wall was removed. It is likely a new moment frame or trussed special moment frame will be required along this line to properly support the two separate building constructions.
- Strengthen gym wall using steel or wood strong backs as required to strengthen the taller gym walls
- Given our extensive knowledge of bowstring truss roofs and their lack of structural redundancy, it is our recommendation that the existing roof structure be strengthened or replaced. Strengthening would consist of establishing

properly detailed connections using steel side plates and additional through bolts. Reducing the forces within the bottom chords to acceptable levels through the use of post tension cables. Additional bottom chord and top chord elements maybe required.

- All HVAC equipment found throughout the building shall be properly braced and attached to the structure to limit the potential damage.
- All piping found within the building that is greater than 12" from structure shall be properly attached and braced.
- All non-structural bracing deficiencies need additional bracing.
- After these are implemented the building will meet the "life safety" performance level per ASCE 41-13.

3.2.5 Preliminary Construction Cost Estimate

Construction costs to retrofit each of the building observed will vary highly based on the degree of deficiencies being rectified. However given the similarity of the structures found within the gymnasium, the seismic retrofit costs for structural improvements will likely range from \$115 to \$130 per square foot based on buildings of similar construction. The total square footage for the gymnasium is approximately 15,600 square feet for an approximate overall construction cost of \$1,800,000 to \$2,030,000. These numbers are based on our experience retrofitting similar gymnasiums and cover both the highest priority deficiencies along with the lower priority deficiencies summarized for each building.

3.3 Days Creek Charter School:



Days Creek Charter School – Shop/Vocational Building

3.3.1 Structure Summary

Original Classroom Seismic Hazard Rating: Low

The shop/vocational building was built in 1971 as a free standing structure that included a work bay and office area. An addition was added to the structure on the west side at an unknown date.

Per ASCE 41-13 the shop/vocational building is primarily classified as a W2 construction type:

Wood Frames, Commercial and Industrial W2 – These buildings are commercial or industrial buildings with a floor area of 5,000 ft² or more. There are few, if any, interior walls. The floor and roof framing consists of wood or steel trusses, glulam or steel beams, and wood posts or steel columns. The foundation system may consist of a variety of elements. Seismic forces are resisted by wood diaphragms and exterior stud walls sheathed with plywood, oriented strand board, stucco, plaster, or straight or

diagonal wood sheathing, or they may be braced with rod bracing. Wall openings for storefronts and garages, where present, are framed by pot-and-beam framing.

The shop building construction primarily consists of a plywood roof diaphragm supported by roof truss joists at 24" O.C. The top chords of the truss joists bear on exterior shear walls. The plywood sheathed shear walls are then anchored to the reinforced concrete foundation.

The evaluation of the facility indicates that rehabilitation of existing lateral system components is necessary to meet the requirements for Life Safety as outlined in ASCE 41-13. See Appendix B for Tier 1 evaluations. The following is a brief list of seismic deficiencies encountered:

- No out-of-plane connection at the top of walls
- In-plane connections are not adequate to transfer diaphragm loads to the foundation.
- Diaphragm exceeds code prescribed aspect ratio.
- Diaphragm spans are greater than 40 feet.

3.3.2 Gravity Resisting Systems and General Observations

A non-formal structural review of gravity resisting elements did not reveal any deficiencies.

3.3.3 Evaluation of Incidental Items

Incidental, non-structural items can play a major role in the overall expense of rehabilitating an existing building. These costs can be significant, and can be very difficult to estimate prior to construction.

- Proper attachment and bracing of storage racks/cabinets/books shelves over 4' tall or 3:1 (height:width) ratio
- Attachment of equipment over 20 lbs. and above 4', and all equipment over 100 lbs.
- Attachment of all emergency lighting, power equipment and associated wiring
- Bracing of overhead fluid piping and any gas piping
- Verification/installation of emergency shutoff valves for gas utilities
- Suspended ceiling seismic bracing at exits
- HVAC units should be evaluated for stability under seismic loading.

Based upon ZCS's previous experience and discussions with site personnel the building contains some form of hazardous material. These materials will need to be dealt with on a case-by-case basis as they are encountered during the project.

3.3.4 Seismic Rehabilitation Recommendations

The following structural improvements are required to resolve the deficiencies noted.

- Remove and replace the roofing membrane and re-nail the existing roof sheathing to provide an adequate roof diaphragm
- Provide blocking, clipping and nailing connections along top of walls to establish adequate connection between top of wall and diaphragm to ensure complete and well-defined load path for in-plane and out-of-plane loading.
- Provide continuous blocking between diaphragm chords.
- All HVAC equipment found throughout the building shall be properly braced and attached to the structure to limit the potential damage.
- All piping found within the building that is greater than 12" from structure shall be properly attached and braced.
- All non-structural bracing deficiencies need additional bracing.
- After these are implemented the building will meet the "life safety" performance level per ASCE 41-13.

3.3.5 Preliminary Construction Cost Estimate

Construction costs to retrofit each of the building observed will vary highly based on the degree of deficiencies being rectified. However given the similarity of the structures found within the shop structure, the seismic retrofit costs for structural improvements will likely range from \$35 to \$45 per square foot based on buildings of similar construction. The total square footage for the shop building is approximately 6,600 square feet for an approximate overall construction cost of \$250,000 to \$300,000. These numbers are based on our experience retrofitting similar buildings and cover both the highest priority deficiencies along with the lower priority deficiencies summarized for each building.

4.0 Conclusion

The findings described in this report have been limited to the seismic lateral force resisting structural systems present at each school and were the result of visual observations and review of construction documents. Generally speaking, the condition of the schools was good based on their respective ages. The schools are, for the most part, well cared for buildings. The recommended improvements listed above reflect items that do not pose a substantial immediate risk to the life safety of occupants (unless noted otherwise) outside of code lateral events. It should be noted that structural deficiencies in schools of this age group are fully expected and the severity of the deficiencies noted above common.

It is clear based on the condition of the buildings that the District has invested in maintaining the buildings to get the most possible use out of each structure. To ensure that the District continues to get the most out of their schools and provide a safe learning environment for the students, we would recommend generating a priority list for capital projects to systematically address deficiencies as funds become available. Additionally, incremental updates should be considered during projects that may make performing the work easier. For example, during a roof replacement project is a good time to install connections from the roof diaphragm to the walls and rectify deficient roof sheathing. Similarly, a window replacement project is a good time to install shearwalls in place of windows in a wall line that does not have enough shearwall length.

Attention should be paid to the potential for upcoming seismic retrofit grant programs. Each of the schools noted above are good candidates for programs that can fund some or all of the expenses related to seismic retrofit of school buildings. Should the District be interested in pursuing grant funding for one or more schools, ZCS would be happy to provide proposals for assisting in the preparation of grant packages.

Based on our visual observations, we find the school structures to be in good condition and generally safe for occupancy.

Given the current condition of the structures, the code governing existing buildings does not mandate that upgrades are required unless the building is scheduled for repairs, alterations, additions, or a change in occupancy. However, voluntary seismic upgrades are permitted and encouraged.

Please contact our office if you would like to discuss our findings.

Appendix A: Figures



Figure 1 – Basic Site Map

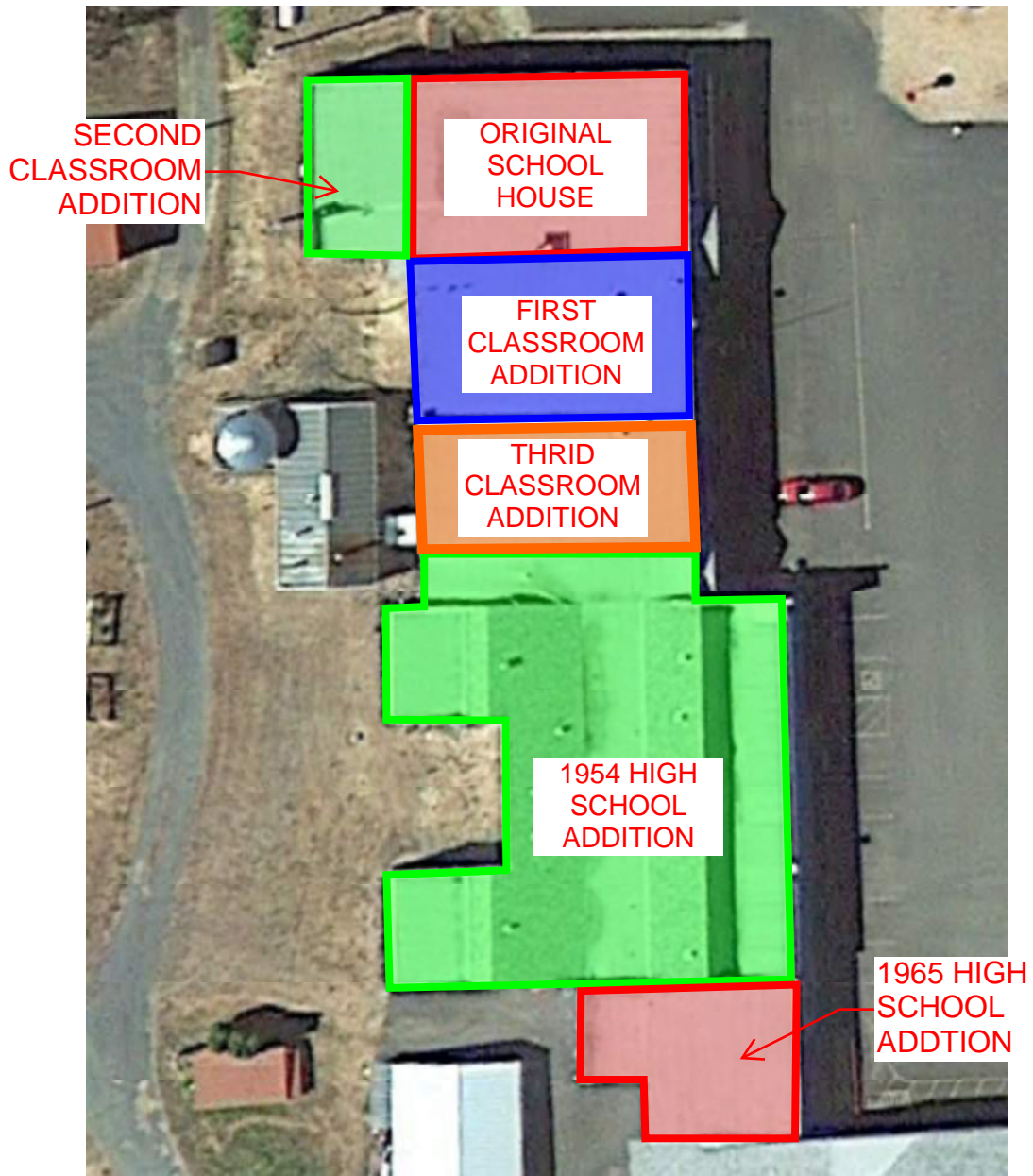


Figure 2 – Main School House Building Additions Map

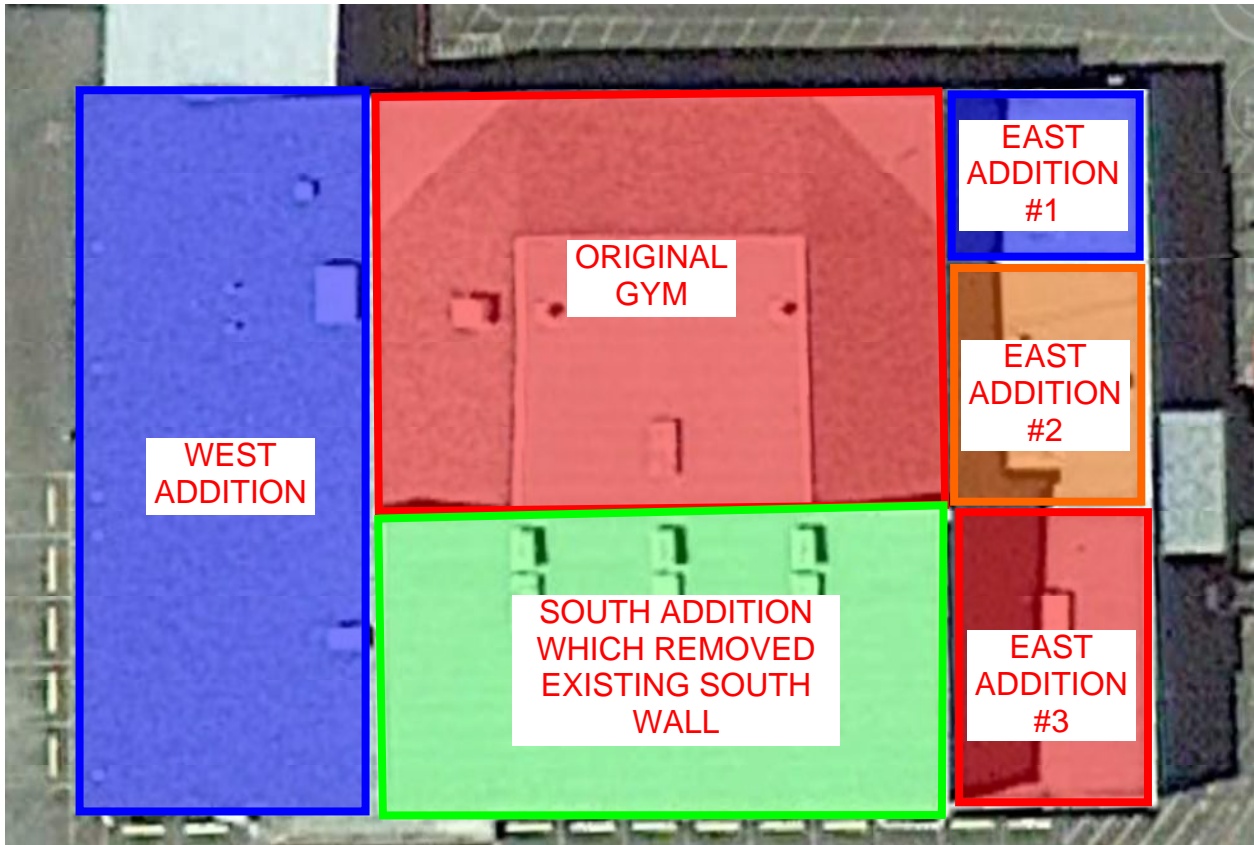


Figure 3 – Gymnasium Additions Map

Appendix B: Structural Tier 1 Check Sheets

Project: Days Creek

Location: _____

Completed by: _____

Date: _____

16.1.2LS LIFE SAFETY BASIC CONFIGURATION CHECKLIST

Low Seismicity

Building System

General

- C NC N/A U LOAD PATH: 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. (Commentary: Sec. A.2.1.1. Tier 2: Sec. 5.4.1.1)
- C NC N/A U ADJACENT BUILDINGS: The clear distance between the building being evaluated and any adjacent building is greater than 4% of the height of the shorter building. This statement shall not apply for the following building types: W1, W1a, and W2. (Commentary: Sec. A.2.1.2. Tier 2: Sec. 5.4.1.2)
- 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. (Commentary: Sec. A.2.1.3. Tier 2: Sec. 5.4.1.3)

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. (Commentary: Sec. A.2.2.2. Tier 2: Sec. 5.4.2.1)
- C NC N/A U SOFT STORY: The stiffness of the seismic-force-resisting system in any story is not less than 70% of the seismic-force-resisting system stiffness in an adjacent story above or less than 80% of the average seismic-force-resisting system stiffness of the three stories above. (Commentary: Sec. A.2.2.3. Tier 2: Sec. 5.4.2.2)
- C NC N/A U VERTICAL IRREGULARITIES: All vertical elements in the seismic-force-resisting system are continuous to the foundation. (Commentary: Sec. A.2.2.4. Tier 2: Sec. 5.4.2.3)
- C NC N/A U GEOMETRY: There are no changes in the net horizontal dimension of the seismic-force-resisting system of more than 30% in a story relative to adjacent stories, excluding one-story penthouses and mezzanines. (Commentary: Sec. A.2.2.5. Tier 2: Sec. 5.4.2.4)
- C NC N/A U MASS: There is no change in effective mass more than 50% from one story to the next. Light roofs, penthouses, and mezzanines need not be considered. (Commentary: Sec. A.2.2.6. Tier 2: Sec. 5.4.2.5)
- 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. (Commentary: Sec. A.2.2.7. Tier 2: Sec. 5.4.2.6)

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 shall not exist in the foundation soils at depths within 50 ft under the building. (Commentary: Sec. A.6.1.1. Tier 2: 5.4.3.1)
- C NC N/A U SLOPE FAILURE: The building site is sufficiently remote from potential earthquake-induced slope failures or rockfalls to be unaffected by such failures or is capable of accommodating any predicted movements without failure. (Commentary: Sec. A.6.1.2. Tier 2: 5.4.3.1)
- C NC N/A U SURFACE FAULT RUPTURE: Surface fault rupture and surface displacement at the building site are not anticipated. (Commentary: Sec. A.6.1.3. Tier 2: 5.4.3.1)

High Seismicity: Complete the Following Items in Addition to the Items for Low and 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_w. (Commentary: Sec. A.6.2.1. Tier 2: Sec. 5.4.3.3)
- C NC N/A U TIES BETWEEN FOUNDATION ELEMENTS: The foundation has ties adequate to resist seismic forces where footings, piles, and piers are not restrained by beams, slabs, or soils classified as Site Class A, B, or C. (Commentary: Sec. A.6.2.2. Tier 2: Sec. 5.4.3.4)

Project: Shop

Location: _____

Completed by: _____

Date: _____

16.3LS LIFE SAFETY STRUCTURAL CHECKLIST FOR BUILDING TYPE W2: WOOD FRAMES, COMMERCIAL AND INDUSTRIAL

Low and Moderate Seismicity

Lateral Seismic-Force-Resisting System

- NC N/A U REDUNDANCY: The number of lines of shear walls in each principal direction is greater than or equal to 2. (Commentary: Sec. A.3.2.1.1. Tier 2: Sec. 5.5.1.1)
- NC N/A U SHEAR STRESS CHECK: The shear stress in the shear walls, calculated using the Quick Check procedure of Section 4.5.3.3, is less than the following values (Commentary: Sec. A.3.2.7.1. Tier 2: Sec. 5.5.3.1.1):
 - Structural panel sheathing 1,000 lb/ft
 - Diagonal sheathing 700 lb/ft
 - Straight sheathing 100 lb/ft
 - All other conditions 100 lb/ft
- 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. (Commentary: Sec. A.3.2.7.2. Tier 2: Sec. 5.5.3.6.1)
- NC N/A U GYPSUM WALLBOARD OR PLASTER SHEAR WALLS: Interior plaster or gypsum wallboard is not used as shear walls on buildings more than one story high with the exception of the uppermost level of a multi-story building. (Commentary: Sec. A.3.2.7.3. Tier 2: Sec. 5.5.3.6.1)
- 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. (Commentary: Sec. A.3.2.7.4. Tier 2: Sec. 5.5.3.6.1)
- NC N/A U WALLS CONNECTED THROUGH FLOORS: Shear walls have an interconnection between stories to transfer overturning and shear forces through the floor. (Commentary: Sec. A.3.2.7.5. Tier 2: Sec. 5.5.3.6.2)
- 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-1. (Commentary: Sec. A.3.2.7.6. Tier 2: Sec. 5.5.3.6.3)
- NC N/A U CRIPPLE WALLS: Cripple walls below first-floor-level shear walls are braced to the foundation with wood structural panels. (Commentary: Sec. A.3.2.7.7. Tier 2: Sec. 5.5.3.6.4)
- 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. (Commentary: Sec. A.3.2.7.8. Tier 2: Sec. 5.5.3.6.5)

Connections

- NC N/A U WOOD POSTS: There is a positive connection of wood posts to the foundation. (Commentary: Sec. A.5.3.3. Tier 2: Sec. 5.7.3.3)
- NC N/A U WOOD SILLS: All wood sills are bolted to the foundation. (Commentary: Sec. A.5.3.4. Tier 2: Sec. 5.7.3.3)
- 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. (Commentary: Sec. A.5.4.1. Tier 2: Sec. 5.7.4.1)

High Seismicity: Complete the Following Items in Addition to the Items for Low and Moderate Seismicity.

Diaphragms

- NC N/A U DIAPHRAGM CONTINUITY: The diaphragms are not composed of split-level floors and do not have expansion joints. (Commentary: Sec. A.4.1.1. Tier 2: Sec. 5.6.1.1)
- NC N/A U ROOF CHORD CONTINUITY: All chord elements are continuous, regardless of changes in roof elevation. (Commentary: Sec. A.4.1.3. Tier 2: Sec. 5.6.1.1)
- 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. (Commentary: Sec. A.4.1.8. Tier 2: Sec. 5.6.1.5)
- NC N/A U STRAIGHT SHEATHING: All straight sheathed diaphragms have aspect ratios less than 2-to-1 in the direction being considered. (Commentary: Sec. A.4.2.1. Tier 2: Sec. 5.6.2)
- NC N/A U SPANS: All wood diaphragms with spans greater than 24 ft consist of wood structural panels or diagonal sheathing. Wood commercial and industrial buildings may have rod-braced systems. (Commentary: Sec. A.4.2.2. Tier 2: Sec. 5.6.2)
- 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 and aspect ratios less than or equal to 4-to-1. (Commentary: Sec. A.4.2.3. Tier 2: Sec. 5.6.2)
- NC N/A U OTHER DIAPHRAGMS: The diaphragm does not consist of a system other than wood, metal deck, concrete, or horizontal bracing. (Commentary: Sec. A.4.7.1. Tier 2: Sec. 5.6.5)

Connections

- NC N/A U WOOD SILL BOLTS: Sill bolts are spaced at 6 ft or less, with proper edge and end distance provided for wood and concrete. (Commentary: A.5.3.7. Tier 2: Sec. 5.7.3.3)

Project: School building

Location: _____

Completed by: _____

Date: _____

16.3LS LIFE SAFETY STRUCTURAL CHECKLIST FOR BUILDING TYPE W2: WOOD FRAMES, COMMERCIAL AND INDUSTRIAL

Low and Moderate Seismicity

Lateral Seismic-Force-Resisting System

- NC N/A U REDUNDANCY: The number of lines of shear walls in each principal direction is greater than or equal to 2. (Commentary: Sec. A.3.2.1.1. Tier 2: Sec. 5.5.1.1)
- NC N/A U SHEAR STRESS CHECK: The shear stress in the shear walls, calculated using the Quick Check procedure of Section 4.5.3.3, is less than the following values (Commentary: Sec. A.3.2.7.1. Tier 2: Sec. 5.5.3.1.1):

Structural panel sheathing	1,000 lb/ft
Diagonal sheathing	700 lb/ft
Straight sheathing	100 lb/ft
All other conditions	100 lb/ft
- C NC N/A U STUCCO (EXTERIOR PLASTER) SHEAR WALLS: Multi-story buildings do not rely on exterior stucco walls as the primary seismic-force-resisting system. (Commentary: Sec. A.3.2.7.2. Tier 2: Sec. 5.5.3.6.1)
- C NC N/A U GYPSUM WALLBOARD OR PLASTER SHEAR WALLS: Interior plaster or gypsum wallboard is not used as shear walls on buildings more than one story high with the exception of the uppermost level of a multi-story building. (Commentary: Sec. A.3.2.7.3. Tier 2: Sec. 5.5.3.6.1)
- 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. (Commentary: Sec. A.3.2.7.4. Tier 2: Sec. 5.5.3.6.1)
- 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. (Commentary: Sec. A.3.2.7.5. Tier 2: Sec. 5.5.3.6.2)
- 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-1. (Commentary: Sec. A.3.2.7.6. Tier 2: Sec. 5.5.3.6.3)
- C NC N/A U CRIPPLE WALLS: Cripple walls below first-floor-level shear walls are braced to the foundation with wood structural panels. (Commentary: Sec. A.3.2.7.7. Tier 2: Sec. 5.5.3.6.4)
- 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. (Commentary: Sec. A.3.2.7.8. Tier 2: Sec. 5.5.3.6.5)

Connections

- C NC N/A U WOOD POSTS: There is a positive connection of wood posts to the foundation. (Commentary: Sec. A.5.3.3. Tier 2: Sec. 5.7.3.3)
- NC N/A U WOOD SILLS: All wood sills are bolted to the foundation. (Commentary: Sec. A.5.3.4. Tier 2: Sec. 5.7.3.3)
- 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. (Commentary: Sec. A.5.4.1. Tier 2: Sec. 5.7.4.1)

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High Seismicity: Complete the Following Items in Addition to the Items for Low and Moderate Seismicity.

Diaphragms

- C (NC) N/A U DIAPHRAGM CONTINUITY: The diaphragms are not composed of split-level floors and do not have expansion joints. (Commentary: Sec. A.4.1.1. Tier 2: Sec. 5.6.1.1)
- C (NC) N/A U ROOF CHORD CONTINUITY: All chord elements are continuous, regardless of changes in roof elevation. (Commentary: Sec. A.4.1.3. Tier 2: Sec. 5.6.1.1)
- 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. (Commentary: Sec. A.4.1.8. Tier 2: Sec. 5.6.1.5)
- C NC (N/A) U STRAIGHT SHEATHING: All straight sheathed diaphragms have aspect ratios less than 2-to-1 in the direction being considered. (Commentary: Sec. A.4.2.1. Tier 2: Sec. 5.6.2)
- (C) NC N/A U SPANS: All wood diaphragms with spans greater than 24 ft consist of wood structural panels or diagonal sheathing. Wood commercial and industrial buildings may have rod-braced systems. (Commentary: Sec. A.4.2.2. Tier 2: Sec. 5.6.2)
- 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 and aspect ratios less than or equal to 4-to-1. (Commentary: Sec. A.4.2.3. Tier 2: Sec. 5.6.2)
- (C) NC N/A U OTHER DIAPHRAGMS: The diaphragm does not consist of a system other than wood, metal deck, concrete, or horizontal bracing. (Commentary: Sec. A.4.7.1. Tier 2: Sec. 5.6.5)

Connections

- C NC N/A (U) WOOD SILL BOLTS: Sill bolts are spaced at 6 ft or less, with proper edge and end distance provided for wood and concrete. (Commentary: A.5.3.7. Tier 2: Sec. 5.7.3.3)

Project: Gym

Location: _____

Completed by: _____

Date: _____

16.3LS LIFE SAFETY STRUCTURAL CHECKLIST FOR BUILDING TYPE W2: WOOD FRAMES, COMMERCIAL AND INDUSTRIAL

Low and Moderate Seismicity

Lateral Seismic-Force-Resisting System

- © NC N/A U REDUNDANCY: The number of lines of shear walls in each principal direction is greater than or equal to 2. (Commentary: Sec. A.3.2.1.1. Tier 2: Sec. 5.5.1.1)
- © NC N/A U SHEAR STRESS CHECK: The shear stress in the shear walls, calculated using the Quick Check procedure of Section 4.5.3.3, is less than the following values (Commentary: Sec. A.3.2.7.1. Tier 2: Sec. 5.5.3.1.1):
- | | | |
|----------------------------|-------------|--------|
| Structural panel sheathing | 1,000 lb/ft | |
| Diagonal sheathing | 700 lb/ft | 250 Pf |
| Straight sheathing | 100 lb/ft | |
| All other conditions | 100 lb/ft | |
- 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. (Commentary: Sec. A.3.2.7.2. Tier 2: Sec. 5.5.3.6.1)
- C NC (N/A) U GYPSUM WALLBOARD OR PLASTER SHEAR WALLS: Interior plaster or gypsum wallboard is not used as shear walls on buildings more than one story high with the exception of the uppermost level of a multi-story building. (Commentary: Sec. A.3.2.7.3. Tier 2: Sec. 5.5.3.6.1)
- © 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. (Commentary: Sec. A.3.2.7.4. Tier 2: Sec. 5.5.3.6.1)
- 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. (Commentary: Sec. A.3.2.7.5. Tier 2: Sec. 5.5.3.6.2)
- 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-1. (Commentary: Sec. A.3.2.7.6. Tier 2: Sec. 5.5.3.6.3)
- C NC (N/A) U CRIPPLE WALLS: Cripple walls below first-floor-level shear walls are braced to the foundation with wood structural panels. (Commentary: Sec. A.3.2.7.7. Tier 2: Sec. 5.5.3.6.4)
- 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. (Commentary: Sec. A.3.2.7.8. Tier 2: Sec. 5.5.3.6.5)

Connections

- © NC N/A U WOOD POSTS: There is a positive connection of wood posts to the foundation. (Commentary: Sec. A.5.3.3. Tier 2: Sec. 5.7.3.3)
- © NC N/A U WOOD SILLS: All wood sills are bolted to the foundation. (Commentary: Sec. A.5.3.4. Tier 2: Sec. 5.7.3.3)
- 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. (Commentary: Sec. A.5.4.1. Tier 2: Sec. 5.7.4.1)

High Seismicity: Complete the Following Items in Addition to the Items for Low and Moderate Seismicity.

Diaphragms

- C (NC) N/A U DIAPHRAGM CONTINUITY: The diaphragms are not composed of split-level floors and do not have expansion joints. (Commentary: Sec. A.4.1.1. Tier 2: Sec. 5.6.1.1)
- C (NC) N/A U ROOF CHORD CONTINUITY: All chord elements are continuous, regardless of changes in roof elevation. (Commentary: Sec. A.4.1.3. Tier 2: Sec. 5.6.1.1)
- 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. (Commentary: Sec. A.4.1.8. Tier 2: Sec. 5.6.1.5)
- C NC (N/A) U STRAIGHT SHEATHING: All straight sheathed diaphragms have aspect ratios less than 2-to-1 in the direction being considered. (Commentary: Sec. A.4.2.1. Tier 2: Sec. 5.6.2)
- (C) NC N/A U SPANS: All wood diaphragms with spans greater than 24 ft consist of wood structural panels or diagonal sheathing. Wood commercial and industrial buildings may have rod-braced systems. (Commentary: Sec. A.4.2.2. Tier 2: Sec. 5.6.2)
- 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 and aspect ratios less than or equal to 4-to-1. (Commentary: Sec. A.4.2.3. Tier 2: Sec. 5.6.2)
- (C) NC N/A U OTHER DIAPHRAGMS: The diaphragm does not consist of a system other than wood, metal deck, concrete, or horizontal bracing. (Commentary: Sec. A.4.7.1. Tier 2: Sec. 5.6.5)

Connections

- C NC N/A (U) WOOD SILL BOLTS: Sill bolts are spaced at 6 ft or less, with proper edge and end distance provided for wood and concrete. (Commentary: A.5.3.7. Tier 2: Sec. 5.7.3.3)

Google Maps Days Creek Charter School



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