Oregon Schools Seismic Feedback Form

PART 1 - GENERAL INFORMATION

1. Date of submittal	*August 28, 2013*
2. County	Lane
3. School district or special education district	Springfield Public Schools 525 Mill Street, Springfield, OR 97477
4. Name and title of person submitting report	John Saraceno Assistant Director of Facilities
5. Year for reporting - Please submit a separate form for each school report	2013

Instructions: *Fill out a separate seismic feedback form for each school in your district that has replaced or modified buildings. Submit completed forms to: seismic.feedback@dogami.state.or.us*

Click here to mail the completed form to DOGAMI

Thank you for your cooperation!

PART 2 - REPLACED STRUCTURES

6. Did the district REPLACE any school structures with new buildings during the reporting year?

Yes ( ) *If yes, be sure to complete a separate seismic feedback form for EACH structure that was replaced.*

No (•) *If no, go to page 3.*

i. Name and address of the school where structure was replaced

ii. Exact structure or structures that were replaced (for example, gymnasium, main building, etc.)

iii. Type of replacement building (for example, tilt-up, masonry, wood frame, etc.)

iv. Maximum occupancy of new structure

v. Date the new structure became occupied

PART 3 - MODIFIED STRUCTURES

7. Did the district MODIFY an existing school building in a manner that may affect the seismic risk category of a school?

Yes (●) *If yes, be sure to complete a separate seismic feedback form for EACH structure that was modified.*

No ( ) *If no, you are finished. Please go to page 1 for submittal instructions.*

i. Name and address of the school where structure was modified

Thurston High School
333 58th Street
Springfield, OR 97478

ii. Exact structure or structures that were modified (for example, gymnasium, main building, etc.)

Weight room

iii. Type of modification to the building (for example, awnings anchored, structural reinforcement, etc.)

Addition

iv. Date the structure was re-occupied after modification

Sept. 10, 2012

c. Optional: Submit a copy of the seismic rehabilitation or structural engineering report

Please attach to email when you submit this form.

d. Optional: Cost and method of seismic rehabilitation funding (grant through Seismic Rehabilitation Grant Program, local school bond, etc.)

Thank you! Please return to page 1 for instructions on submitting this form.

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Assistant Director of Facilities

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ii. Exact structure or structures that were replaced (for example, gymnasium, main building, etc.)
iii. Type of replacement building (for example, tilt-up, masonry, wood frame, etc.)
iv. Maximum occupancy of new structure
v. Date the new structure became occupied

PART 3 - MODIFIED STRUCTURES

7. Did the district MODIFY an existing school building in a manner that may affect the seismic risk category of a school?

Yes (●) *If yes, be sure to complete a separate seismic feedback form for EACH structure that was modified.*

No ( ) *If no, you are finished. Please go to page 1 for submittal instructions.*

i. Name and address of the school where structure was modified

Walterville Elementary School
40589 McKenzie Highway
Springfield, OR 97478

ii. Exact structure or structures that were modified (for example, gymnasium, main building, etc.)

Main classroom buildings

iii. Type of modification to the building (for example, awnings anchored, structural reinforcement, etc.)

Structural re-inforcement

iv. Date the structure was re-occupied after modification

9-3-2013

c. Optional: Submit a copy of the seismic rehabilitation or structural engineering report

Please attach to email when you submit this form.

d. Optional: Cost and method of seismic rehabilitation funding (grant through Seismic Rehabilitation Grant Program, local school bond, etc.)

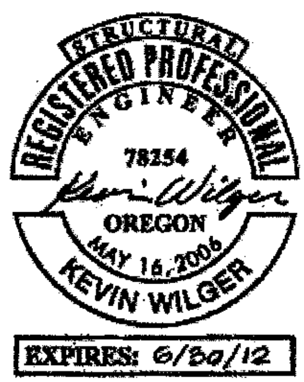
Grant through Seismic Rehabilitation Grant Program

Thank you! Please return to page 1 for instructions on submitting this form.

M. R. RICHARDS ENGINEERING INC
100 WEST 13th AVENUE SUITE 210 EUGENE OR 97401
541-687-0129 WWW.MRRICHARDS.COM

STRUCTURAL EVALUATION

Walterville Elementary School



Prepared For

Springfield Public Schools

October, 2010

M. R. RICHARDS ENGINEERING INC
100 WEST 13th AVENUE SUITE 210 EUGENE OR 97401
541-687-0129 WWW.MRRICHARDS.COM

STRUCTURAL EVALUATION
Walterville Elementary School

SUMMARY

M. R. Richards Engineering has conducted a structural evaluation of the Walterville Elementary School to identify seismic deficiencies and consider the feasibility of a seismic rehabilitation project. It has been determined that a structural upgrade to the existing building, consisting of additional shear walls and seismic anchorage ties for specific brick veneer locations, will significantly decrease seismic hazards and risk. A benefit-cost analysis has been performed and it was found that this project would be cost-effective at reducing casualties and structural damage in the occurrence of a seismic event.

DESCRIPTION

The Walterville Elementary School is a sprawling single-story wood-framed building comprised of an Administration / Library component, a Gymnasium / Kitchen component, and three Classroom components all connected by a covered walkway system. Construction of the school took place in a number of phases, with the first phase beginning in 1950 and the final phase completing around 1970. Due to the numerous phases of construction, slight variations on the same framing system were used for the different components of the building.

All of the building components utilize cast-in-place concrete slabs on grade and continuous footings bearing on competent native soil. Wood-framed exterior and interior bearing walls support a variety of roof framing systems

The roof of the Administration/Library component uses glue-laminated beams at 10 feet on center supporting 2x6 purlins at 16 inches on center with plywood roof sheathing. There is a small mechanical penthouse framed on top of the roof over the Library.

The Gymnasium/Kitchen component has two basic roofing systems. The gable roof over the Gymnasium uses trusses at 21 feet on center supporting 8x14 heavy timber beams with 2x10 purlins spanning from beam to beam. The remainder of the flat roof elements surrounding the Gymnasium use 2x10 rafters supported directly by bearing walls.

The Eastern Classroom component has a gable roof that uses roof trusses at 10 feet on center supporting 2x6 purlins at 16 inches on center with plywood sheathing.

The Central Classroom component has a gable roof that uses roof trusses at 10 feet on center supporting 2x6 purlins at 16 inches on center with 1x perpendicular sheathing.

The Western Classroom component has a gable roof that uses roof trusses at 24 inches on center with 1x diagonal sheathing.

The covered walkway system is framed with 2x purlins attached to the sides of the various building components where they have adjacency, and is supported by an edge beam with steel pipe columns spaced at 10 feet on center along the open sides.

A remodel of the heating system for the entire school was carried out this last summer, with all new mechanical units being installed in the attics over the classrooms, over the library, and in the gymnasium. These units were installed with seismic anchorage per the current building code.

SCOPE OF EVALUATION

This structural evaluation included review of available documents including the original construction drawings for each of the phases of construction and the Rapid Visual Screening (RVS) data provided by the Oregon Department of Geology and Mineral Industries (DOGAMI) from a 2006 study.

Evaluation of the Walterville Elementary School was performed using American Society of Civil Engineers (ASCE) 31-03 Seismic Evaluation for Existing Buildings. The goal of ASCE 31 is to identify the weak links in a building's lateral-force-resisting system that can lead to significant failure or collapse. It also addresses life-safety issues pertaining to the seismic anchorage of non-structural elements in the building. The methodology utilizes a three-tier approach to the evaluation of any structure. Each tier provides the engineer with more detailed and concise information regarding the potential deficiencies of the structure to better develop a focused rehabilitation scheme. The level of analysis increases with each tier, and the conservatism of the evaluation decreases correspondingly.

Tier 1, the Screening Phase, uses a series of checklists that allow the engineer to identify potential structural, non-structural, and geotechnical hazardous elements of the building and site. The evaluating engineer addresses each checklist statement and determines whether it is compliant, non-compliant, or not applicable. Compliant statements identify conditions that are acceptable. Non-compliant statements identify conditions that are in need of further investigation. In some cases, the standard specifies additional calculations that may be performed to address a non-compliant statement. In other cases, a detailed analysis of the building must be performed using the procedures of Tier 2.

Tier 2, The Evaluation Phase, is a more involved evaluation focusing upon the areas identified by Tier 1 as being deficient. As in Tier 1, a Tier 2 evaluation is intended to identify structures not requiring rehabilitation. If deficiencies are identified using the procedures of Tier 2, the engineer may choose to develop rehabilitation schemes for those deficiencies based on the Tier 2 acceptance criteria or conduct a detailed seismic analysis using the procedures of Tier 3.

Tier 3 usually consists of performing a full building analysis or focus on specific elements that were found to be deficient from the Tier 2 review using the current building code. Rehabilitation schemes are developed to resolve any outstanding seismic deficiencies.

Field investigations were conducted to review the condition of the structure and verify construction details. A preliminary design for structural upgrades was developed and construction costs estimated by Construction Focus. A Benefit/Cost Analysis based on FEMA Earthquake Data Module 6.1.1 was performed for the completed project.

FINDINGS

The RVS of schools and emergency services buildings conducted in 2006 by DOGAMI assigned the Walterville Elementary School a Rapid Visual Screening (RVS) score of 0.1 for the primary structure and –0.1 for the secondary structure, indicating a very high collapse potential. This screening is in agreement with our independent review of the RVS.

Our initial evaluation of the building's lateral force resisting system was in accordance with an ASCE 31-03 analysis. ASCE 31, Seismic Evaluation of Existing Buildings, is a standardized procedure to evaluate the risks and hazards of buildings to earthquakes. The evaluation includes a determination of site seismicity and level of performance, and detailed checklists for seismic hazards based on construction materials, building systems and construction details.

The level of performance required for the Walterville Elementary School was determined to be "Life Safety". This means that building occupants should not be critically injured during an earthquake, even though the building may be damaged to the extent that continued operation is not possible.

The level of seismicity was determined to be "High". The value of S_{DS} is 0.526 and S_{D1} is 0.328 based on a site class of D for stiff soil and mapped spectral accelerations in accordance with 2003 NEHRP Seismic Design Provisions. Table 2-1 of ASCE 31 provides the level of seismicity for these values. The primary seismic hazard for western Oregon is a strong earthquake due to subduction of tectonic plates.

The Walterville Elementary School structural framing system utilizes wood stud bearing walls and a timber roof system. The checklists that were used for the ASCE 31 Tier 1 screening included: Basic Structural for building type W2 (wood frame with wood shear panels), Supplemental Structural for building type W1, Geological Site Hazards and Foundations, Basic Nonstructural components, and Intermediate Nonstructural components.

For the "life safety" level of performance, Tier 2 analysis is required for any checklist items that are non-compliant. The following is a summary of the checklist items (in italics) that are non-compliant and a response to those issues:

LOAD PATH: The structure shall contain a minimum of one complete load path for Life Safety and Immediate Occupancy for seismic force effects from any horizontal direction that serves to transfer the inertial forces from the mass to the foundation.

> The Central and Western Classroom components lack shear walls in the north/south direction. The elimination of a select number of windows and the introduction of new shear walls and load transfer hardware is recommended.

REDUNDANCY: The number of lines of shear walls in each principal direction shall be greater than or equal to 2 for Life Safety and Immediate Occupancy.

> The Central and Western Classroom components lack shear walls in the north/south direction. The elimination of a select number of windows and the introduction of new shear walls and load transfer hardware is recommended.

SHEAR STRESS CHECK: The shear stress in the shear walls, calculated using the quick check procedure of Section 3.5.3.3 shall be less than the following values for Life Safety and Immediate Occupancy.

> Numerous shear walls failed to pass the stress check throughout the building. After further evaluation using the seismic design provisions of the current building code, it is recommended that either the existing shear walls are upgraded or new shear walls are added.

OPENINGS: Walls with openings greater than 80 percent of the length shall be braced with wood structural panel shear walls with aspect ratios not more than 1.5 to 1 or shall be supported by adjacent construction through positive ties capable of transferring the lateral forces.

Both the Central and Western Classroom components have openings in excess of 80 percent on the east and west elevations with no shear walls. The elimination of a select number of windows and the introduction of new shear walls and load transfer hardware is recommended.

SPANS: All wood diaphragms with spans greater than 24 feet for Life Safety and 12 feet for Immediate Occupancy shall consist of wood structural panels or diagonal sheathing.

The Central Classroom component has diaphragm spans in excess of 40 feet with 1x straight sheathing, but the aspect ratio is 1.25 to 1 and the stresses are within the allowable range.

OVERTURNING: The ratio of the horizontal dimension of the lateral-force-resisting system at the foundation level to the building height shall be greater than 0.6Sa.

An evaluation of the shear wall overturning in each of the building components has been performed per the current building code and modifications at a number of locations are recommended.

TIES: Masonry veneer shall be connected to the back-up with corrosion resistant ties. The ties shall have a spacing equal to or less than 24 inches with a minimum of one tie for every 2-2/3 square feet.

There are a number of locations where brick veneer is adjacent to paths of emergency egress, and if they fell away would potentially block the exit or cause bodily harm. Since the existing veneer ties are not easily observed, and some of them are almost 60 years old, we are recommending the installation of new veneer seismic ties adjacent to areas of exiting.

Further analysis of the lateral force resisting system was conducted using design criteria established by the current building code. As mentioned in the items above, the primary deficiency in the seismic-load-resisting system is inadequacy of the shear walls in the north/south direction of the three classroom components. This is being resolved through the addition of new wood-framed shear walls on the east and west exterior walls of these elements.

CONCLUSION

A seismic upgrade of the Walterville Elementary School building will be relatively straightforward. The two primary items of work would be the construction of additional shear walls in the Classroom and Library components, and installation of seismic ties for the existing brick veneer in locations where the brick would potentially block the exit corridors during an earthquake if it were to fall away from the building. The biggest challenge is the existence of cabinetry and plumbing fixtures at locations where new shear walls are to be installed. These items will need to be removed to do the shear wall work and replaced after the work is completed. The attached "Statement of Probable Cost" by Construction Focus, Inc. provides construction cost and soft cost estimates for the proposed seismic rehabilitation.

It should be noted that a complete mechanical system renovation was performed on the entire Walterville Elementary School building this last summer. All of the outdated heaters were removed and replaced with new equipment that was installed with seismic anchorage per the current building code. Consequently, no seismic bracing of the mechanical system is required. A seismic renovation of the structural frame would be an appropriate next step in extending the useful life of this facility for many years to come.

SCOPE OF WORK FOR REHABILITATION PROJECT

The objective of the seismic rehabilitation project for the Walterville Elementary School is to upgrade the structure for Life-Safety performance to reduce the potential for death and injuries, prevent damage to the building, and lessen the economic impact of loss of function from a seismic event. A structural evaluation has determined that it is feasible to make structural modifications that will significantly increase the building seismic resistance.

When the project moves ahead, an architectural consultant will be brought on board to coordinate the seismic upgrade with the project program requirements. The project design will be in conformance with the current Oregon State Structural Code, which is based on the International Building Code. Seismic design loads will be determined by mapped site-specific lateral accelerations and consideration of the foundation soil properties. Review of the design and construction documents will be provided by the Lane County Building Department.

A contractor for the project will be selected through competitive bidding. The contractor will be required to be bonded and adhere to fair labor practices. Quality assurance will be part of the construction process. Independent inspectors hired by the Springfield Public Schools will perform special inspection of the seismic work, and the design engineer will make regular site visits to observe the work. Springfield Public Schools will have project management personnel to monitor the progress of the project and coordinate reimbursement for grant funding. This project will be managed in a professional manner from start to finish.

PROPOSED PROJECT SCHEDULE:

File for Rehabilitation Grant	October 2010
Selection of Design Team	January 2011 to April 2011
Design Complete	April 2011 to July 2011
Receive Building Permit	August 2011 to December 2011
Contractor Selection	January 2012 to March 2012
Begin Rehabilitation Work	May 2012 to August 2012
Substantial Completion	August 2012 to September 2012

It is planned that the construction schedule will fall within the timeline requirements for the grant program.

The Walterville Elementary School Seismic Rehabilitation has been shown to be cost effective and properly documented. The construction of the seismic upgrade will be ready to proceed shortly after the proposed time of grant award. This project meets the goals of the seismic grant program and could serve as a model project to advance awareness of seismic mitigation to other agencies and communities. It is recommended that the Walterville Elementary School be accepted as a recipient of an Oregon State Seismic Rehabilitation Grant.