

Case Studies of Successful U.S. School Seismic Screening Programs

EERI School Earthquake Safety Initiative: Safety Screening, Inventory, and Evaluation of Schools Subcommittee

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Objectives

This work is being conducted by the School Earthquake Safety Initiative (SESI) of the Earthquake Engineering Research Institute (EERI).

The objective of this document is to create a list of best practice school screening and inventory programs throughout the US. This list of programs aims to capture and describe a variety of programs that showcase diversity of scope and scale, as well as tools and resources used. The SESI Safety Screening, Inventory, and Evaluation of Schools Subcommittee will develop a companion document based on these examples to provide clear recommendations that are aimed at helping new school earthquake safety advocates make good decisions and understand the many variables in a screening program as they consider and develop appropriate methods for their unique situation.

The case studies in this document have been compiled in a “fact sheet” format to maximize readability and allow readers to compare the cases easily while also gaining a more comprehensive understanding of each program. More information and references have been provided for each case in order to direct interested professionals to more detailed information.

This document is in its developmental stages, therefore, any recommendations and suggestions from readers and reviewers is welcome.

Reviewers familiar with any particular case study who have updated information or additional resources to add should contact the SESI Committee (sesi@eeri.org), so that they can update the document accordingly. Submissions of new or missing case studies are also welcome.

Alaska – Kodiak Island

Size (number of structures; one or multiple school districts? Wholesale state effort?)	Kodiak Island Borough School District – screened 14 school facilities, and retrofitted 8 structural and non-structural sites.
Scope of effort (screening only, retrofits, policy, etc.)	Screening and retrofits
Funding Sources and Amounts	<p>Screening Funds: \$500,000 general obligation bond to fund assessment of buildings, fault mapping, and seed money for staffing and mitigation programs.</p> <p>\$55,000 FEMA Pre-Disaster Mitigation (PDM) planning grant to fund creation of a Hazard Mitigation Plan.</p> <p>Retrofitting Funds: \$2,940,156 in FEMA HMP grants and \$5,199,916 from Kodiak Island Borough budget to complete 8 separate projects within the schools.</p>
Key Players	This program started as a grassroots effort beginning with local geologists and engineers and spreading to parents, teachers, and Kodiak Island Community members.
Screening Processes	Available documents suggest a combination of RVS 154 2 nd Ed, ASCE Tier 1, and other structural, non-structural, and geological investigations
Additional Tools Used	FEMA Benefit Cost Analysis toolkit
Phases and Current Status of Project	<p>Project Status: complete</p> <p>1999-2005 New 2000 IBC, new local faults Identified</p> <p>Oct 2002 – fatal design flaw identified by Structural Engineer</p> <p>Early 2004 – initial \$500,000 bond passed to fund assessment</p> <p>June 2007 – PDM Grant Received</p> <p>2006 – State Legislature approves \$910,000</p>
Was the program replicated or built upon?	This program influenced school screening programs in other parts of Alaska. Matanuska-Susitna and Kenai Peninsula Borough School District followed.
What was the key to success? Any lessons from this process?	The key to success was a passionate community and a local government willing to partner with the grassroots effort to prioritize the retrofits. The KIB government also reached out to the state level, asking the SHMO to create two phases in the Hazard Mitigation Plan planning process which allowed the entire process to happen much more quickly. Commitment to high quality work gave money to a Probabilistic Seismic Hazard Analysis for the area brought new faults to attention and provided more accurate PGAs to consider in the screening process.

Summary

The Kodiak Island School District Pilot project began as a grassroots effort that started with geologists and engineers bringing attention to the problem and eventually growing to a push from parents, teachers, and the local Kodiak Island Community. The borough partnered with the community and sponsored a \$500,000 bond to assess school buildings and provide start up costs for staffing and mitigation programs. Through the Boroughs successful outreach efforts the bond passed in 2004. Kodiak Island Borough (KIB) did not have a Hazard Mitigation Plan at the time, making them ineligible for a FEMA grant to retrofit the schools after the screening funded by the bond. Concurrently with the bond effort, KIB applied for and received a FEMA PDM Planning grant, and initiated the creation of a Multi-Jurisdiction Hazard Mitigation Plan. However since the completion of the plan for all jurisdictions would be completed long after the initial screening for just Kodiak Island Borough schools, the Alaska SHMO allowed the planning process to be split into two phases, the first completing the HMP for just KIB, and the second phase completing the HMP for the remaining jurisdictions.

In total, eight structural and non-structural retrofit projects came out of the screening, partially funded by \$1,688,646 from HMGP grants and one \$1,251,510 competitive PDM grant. The flexibility of KIB allowed this project to be a success by prioritizing the retrofits over previously planned projects. Their commitment to remedy the issue drove them to seek the other qualified professionals when their in-house expertise was not sufficient.

Sources & Reference Documents

2009 WSSPC Awards in Excellence Nomination Form

[ITEM 1b – 2009 WSSPC NOMINATION FORM.pdf](#)

Letter from John Aho to WSSPC nominating this project for the 2009 Awards in Excellence

[ITEM 1a –WSSPC LETTER 10282008.pdf](#)

Final Report of Geologic and Geotechnical Seismic Vulnerability

[ITEM 2 – Supplemental KIB Mitigation Info.pdf](#)

Key Factors for Successful Implementation of Seismic Mitigation for Schools

[2007_09_18_kodiak_schools_seismic_retrofit_kelly.pdf](#)

Powerpoint slides from Gary Carver and Laura Kelly for Alaska Seismic Hazards Safety Commission School Committee, Sept 2007

The Kodiak Experience - Funding for Vulnerable School Facilities

[Bud-cassidy-schools-EERI-2014.pdf](#)

Bud Cassidy's (Kodiak Island Borough) presentation slides from the 2014 EERI Annual Meeting and 10NCEE

Kodiak Borough Invests in Earthquake Safety

[http://nhma.info/uploads/bestpractices/Kodiak%20School%20Safety%20BP_\[1\]\[1\].pdf](http://nhma.info/uploads/bestpractices/Kodiak%20School%20Safety%20BP_[1][1].pdf)

FEMA Best Practices overview the Middle School retrofit

Primary Contact

Laura W. Kelly, PE, Alaska Seismic Hazards Safety Commission, laura.w.kelly@uscg.mil

Alaska—Kenai Peninsula Borough Schools

Size (number of structures; one or multiple school districts? Wholesale state effort?)	Kenai Peninsula Borough District
Scope of effort (screening only, retrofits, policy, etc.)	Screening and recommendations
Funding Sources and Amounts	The total cost of this study was \$21,250 for the review of 47 structures (\$500-\$700 per structure). It was funded by FEMA State Support Mitigation Grant
Key Players	Kenai Peninsula Borough School District & Alaska Seismic Hazards Safety Commission
Screening Processes	The method used FEMA P-154 2 nd Edition and ROVER to evaluate a building establishes an initial score for each type of structural system (wood shear walls, steel braced frame, and so forth), with a higher score indicating greater reliability. A given building's initial score is then modified (up or down) based on other factors, including the number of stories, vertical structural irregularities, plan structural irregularities, probable soil type, whether it was designed and constructed before codes were generally enforced, and whether it was designed and constructed under substantially modern codes. The user enters the building information, and ROVER adds and subtracts from the initial score to obtain the final score. FEMA carefully selected the scores and modifications so the final score could carry some readily understandable information.
Additional Tools Used	FEMA P-154, 2 nd edition; ROVER score sheets
Phases and Current Status of Project	Project Status: complete. In this December 2015 study, BBFM Engineers completed the screening of fifteen schools, most of which have several additions. In total, they reviewed 47 structures, including original construction and additions. 19 of the 47 warrant a more detailed evaluation, while further review of the remaining 28 schools is not indicated.
Was the program replicated or built upon?	This program was influenced by the Kodiak Island, AK screening (above) and the Matanuska-Susitna School District screening efforts.
What was the key to success? Any lessons from this process?	With relatively little time or expense, this study has identified many structures that would be expected to perform acceptably during a major earthquake, largely due to modern building code requirements and construction practices. At the same time, this study also quickly and cost-effectively identified 19 structures that may perform poorly during a major earthquake.

Summary

FEMA developed a rapid evaluation procedure outlined in their publication P-154, "Rapid Visual Screening of Buildings for Potential Seismic Hazards: A Handbook." This contains a method for evaluating structures' seismic performance very quickly and without great expense, referring to it as a "sidewalk survey." It takes into account the age and type of structure, building height, irregularities in the structure that decrease reliability, and whether it was constructed before the enforcement of design codes and the implementation of construction inspection. FEMA developed this method to provide a tool to give building owners and managers good, actionable information with minimal up-front cost. The second edition of FEMA P-154 is also available in a program called ROVER (Rapid Observation of Vulnerability and Estimation of Risk), which runs on mobile devices and uploads data and results wirelessly to a central server. An added advantage of ROVER is that the database it establishes can be used after a major earthquake. The database can contain both building plans as well as photographs of the building in its pre-earthquake condition.

Source & Reference Documents

Vulnerability of Some Kenai Peninsula Borough Schools to Earthquake Damage Based on Rapid Visual Screening

[Rapid-Visual-Screening-of-Kenai-Borough-Schools-December-1-2015.pdf](#)

[Appendix-A-Score-Sheets.pdf](#)

Pdfs of the final report documenting the Kenai Peninsula rapid visual screening project, from BBFM Engineers.

Primary Contact

Laura W. Kelly, PE, Alaska Seismic Hazards Safety Commission, laura.w.kelly@uscg.mil

Dennis L. Berry, BBFM Engineers, dberry@bbfm.com

Alaska – Matanuska-Susitna Screening Pilot

Size (number of structures; one or multiple school districts? Wholesale state effort?)	A selection of Matanuska-Susitna Borough School District – 7 schools and 17 structures screened total
Scope of effort (screening only, retrofits, policy, etc.)	Screening only
Funding Sources and Amounts	<p>\$18,500 in FEMA grants</p> <ul style="list-style-type: none"> • \$8500 Engineer time (\$10,000 additional volunteer hours) • \$4275 setting up server and learning software • \$8145 reviewing drawings, visiting schools, entering data • \$6000 report preparation
Key Players	Alaska Seismic Hazards Safety Commission, FEMA, EERI. BBFM Engineers were contracted to screen buildings and donated some of their time to reduce costs
Screening Processes	FEMA 154 2 nd Edition (see Alaska Kenai Peninsula Borough Schools table for more information on FEMA 154 2 nd Ed)
Additional Tools Used	ROVER (The goal of this study was to show how ROVER is a quick and cost effective tool to perform initial assessments for schools)
Phases and Current Status of Project	Project Status: completed in February 2015. The pilot studied seventeen buildings spread between seven schools. The study flagged buildings with a collapse risk of over 1% for further assessment. Over half of the structures (53%) were seen to have unacceptable Seismic Risk. Screening was contracted out to BBFM Engineers who provided a total of \$18500 in labor.
Was the program replicated or built upon?	Screening programs in Kodiak Island and Matanuska-Susitna Boroughs are followed by one currently underway in Kenai, AK
What was the key to success? Any lessons from this process?	The screening method required little time and expense, which is its biggest strength. With relatively fewer resources, this study has identified that less than half of the structures that would be expected to perform well during a major earthquake. At the same time, this study also quickly and cost-effectively identified that about 53% of the structures that may perform poorly during a major earthquake.

Summary

A study managed by EERI and the Alaska Seismic Hazards Safety Commission with the goals of showing, “planners how quickly and cost effectively an initial assessment can be performed for schools using ROVER’s rapid visual assessment program, and to rate a sampling of existing schools to provide the Matanuska-Susitna School District information crucial to their planning purposes.” The pilot studied seventeen buildings spread between seven schools. The study flagged buildings with a collapse risk of over 1% for further assessment. Over half of the structures (53%) were seen to have greater than 1% (unacceptable) seismic risk. The greatest cost besides labor was to set up the ROVER server. If the Borough decided to continue screening the remaining schools it could be completed for approximately \$600-\$800 per original structure of addition if photos were transferred instead of sending an engineer to the location.

Source & Reference Documents

Identifying Potential Earthquake Dangers To Alaska's Students and Schools

[Seismic Survey of Alaskan Schools FINAL-signed-opt.pdf](#)

PDF of the pilot study final report from BBFM Engineers

Primary Contact

Laura W. Kelly, PE, Alaska Seismic Hazards Safety Commission, laura.w.kelly@uscg.mil

Dennis L. Berry, BBFM Engineers, dberry@bbfm.com

California—San Francisco Private Schools

Size (number of structures; one or multiple school districts? Wholesale state effort?)	City and County of San Francisco
Scope of effort (screening only, retrofits, policy, etc.)	Policy and ordinance
Funding Sources and Amounts	N/A
Key Players	Private Schools Earthquake Safety Working Group
Screening Processes	Available documents suggest ASCE 41-13 Tier 1, and other structural, non-structural, and geological investigations
Additional Tools Used	FEMA Benefit Cost Analysis toolkit
Phases and Current Status of Project	<p>Project Status: ordinance passed in 2014. The Private Schools Earthquake Safety Working Group explored challenging issues such as community expectation for school safety, evaluation of earthquake risk, and potential building improvement opportunities. In late 2013 the group issued its report. Following this report, the Earthquake Safety Implementation Program (ESIP) worked with the Mayor's Office to introduce legislation requiring the seismic evaluation of select buildings in all of San Francisco's private schools. This ordinance, which was developed with a consensus from a group of concerned parents, school administrators, and community members, passed 11-0 at the Board of Supervisors and was signed into law by the Mayor on October 1, 2014.</p> <p>This ordinance is now in effect but it is not a retrofit requirement. Many schools may seek to improve any shortcomings found during the evaluation process. Schools will be able to complete any work necessary on their own terms—having as long as needed to raise funds and complete that work, without the demand of a time limit.</p>
Was the program replicated or built upon?	The program built upon previous studies, ordinances and recommendations including City of Berkeley's Soft Story Program, A Community Action Plan for Seismic Safety (CAPSS) report, Earthquake Safety Implementation Program (ESIP) Workplan 2012-2042.
What was the key to success? Any lessons from this process?	<p>Stakeholders were involved early on in the process, therefore they supported the final ordinance, causing it to pass unanimously. Hence keeping all parties involved in the working group since the beginning resulted in their understanding the importance of the ordinance and ultimately voting in its favor.</p> <p>The ordinance did not set a time limit for retrofits and this made stakeholders comfortable with having enough time to save money for necessary upgrades. Having a multi-disciplinary expert group also allowed for a successful and comprehensive completion of the report.</p>

Summary

The Private Schools Earthquake Safety Working Group, comprised of volunteer parents, school representatives, other interested persons, and City staff, studied the technical and policy issues related to the earthquake risk of private school buildings in San Francisco, and has proposed ideas for how the City may best address private school safety. In late 2013 the group issued its report. Following this report, the Earthquake Safety Implementation Program (ESIP) worked with the Mayor's Office to introduce legislation requiring the seismic evaluation of select buildings in all of San Francisco's private schools. This ordinance passed 11-0 at the Board of Supervisors and was signed into law by the Mayor on October 1, 2014. This ordinance is now in effect. The focus of this ordinance is to begin a meaningful conversation about seismic safety in our City's private schools. Earthquake evaluation is the first step in this process. Only buildings primarily used for the education and care of K-12 students or school administration that meet the building code definition of Educational "E" occupancy are required to be evaluated. This ordinance is not a retrofit requirement. Many schools may seek to improve any shortcomings found during the evaluation process. Schools will be able to complete any work necessary on their own terms—having as long as needed to raise funds and complete that work, without the demand of a time limit. This ordinance requires a life-safety level of evaluation only, submitted to the Department of Building Inspection within three years of the ordinance's effective date.

Source & Reference Documents

City and County of San Francisco Private Schools Earthquake Safety Act

[SESI Webinar 4 \(at 5:20\)](#)

Presentation by Patrick Odellini as part of the SESI Best Practices Webinars

Private Schools Earthquake Safety Working Group Report

<http://sfgov.org/esip/sites/default/files/FileCenter/Documents/11392-Earthquake%20Risk%20and%20San%20Franciscos%20Private%20Schools%2012-31-13%20REPORT.pdf>

Private Schools Mandatory Evaluation Ordinance

<http://sfgov.org/esip/sites/default/files/FileCenter/Documents/12716-Ordinance%20No%20202-14%20Private%20Schools%20EQ%20Evaluation.pdf>

SF Earthquake Safety Implementation Program's Private Schools webpage

<http://sfgov.org/esip/private-schools>

Includes links to the legislation associated, quick facts, how to comply, and meeting minutes from the working group

Primary Contact

Laura Samant, Chair of Private Schools Working Group, laura.samant@gmail.com

California—Piedmont School District

Size (number of structures; one or multiple school districts? Wholesale state effort?)	City-wide
Scope of effort (screening only, retrofits, policy, etc.)	Screening and retrofitting recommendations
Funding Sources and Amounts	<ul style="list-style-type: none"> • \$56m Bond (voter approved) • \$3.1m State modernization funds – require 40% local contributions (60% State) • \$12m CA state Proposition 1D Seismic Retrofit funds obtained – require 50% local contributions (50% State) • The program ended in 2012, on time and on budget
Key Players	Parents, Piedmont Administration
Screening Processes	FEMA 310 tier 1 evaluation
Additional Tools Used	
Phases and Current Status of Project	Project Status: completed in 2012. Piedmont administration gathered a small group of knowledgeable parents to perform a Voluntary FEMA 310 tier 1 evaluation to report to the superintendent. The administration established a budget to create a bond measure which passed (narrowly). A Technical Advisory Committee then provided retrofit recommendations. The program ended in 2012, on time and on budget
Was the program replicated or built upon?	The program was not built upon because it completed screening of all vulnerable schools in the city
What was the key to success? Any lessons from this process?	Strong leadership and advocacy of the program from parents was a key to its success. Piedmont also holds a reputation for having great schools and therefore, it deemed this program important in upholding that reputation and making sure that its school buildings were safe.

Summary

Spurred on by concerned parents, Piedmont administration gathered a small group of knowledgeable parents to perform a Voluntary FEMA 310 tier 1 evaluation to report to the superintendent. The administration established a budget to create a bond measure which passed (narrowly). A Technical Advisory Committee then provided retrofit recommendations.

Source & Reference Documents

Piedmont Schools Evaluation and Retrofits

[SESI Webinar 4 \(at 41:00\)](#)

Presentation by Janiele Maffei as part of the SESI Best Practices Webinars

Primary Contact

Janiele Maffei, California Earthquake Authority, maffeij@calquake.com

Oregon Seismic Rehabilitation Grant Program (SRGP)

Statewide for public K-12 schools and community colleges	78 school projects have been funded so far. Approximately 80 more school retrofit projects will be funded in May 2017
100% state funding for retrofits up to a maximum of \$1.5 million	Retrofitting to meet Oregon Revised Statute 455.400, which requires seismic life safety of public schools by 2032
Funding Sources and Amounts	Retrofit Funding: Up to \$1.5 million per project, Program funding changes based on state budget allotment for each biennium . Funding level per biennium \$15 million beginning in 2009; raised to \$175 million for the 2015-2017 biennium of \$175 million
Key Players	Oregon Emergency Management, Business Development Dept., DOGAMI
Screening Processes	ASCE 41-13 required by SRGP for grant funding. FEMA 154 2 nd Edition completed in 2007 and posted at www.oregongeology.org/sub/projects/rvs/ .
Additional Tools Used	SRGP- specific Benefit Cost Analyses (BCA) tool.
Phases and Current Status of Project	Project status: Ongoing, 41 schools awarded grants in May 2016.
Was the program replicated or built upon?	Ongoing, Grant budget approved year to year. Modest funding in the initial years. Significantly increased funding for 2015-17 biennium.
What was the key to success? Any lessons from this process?	A key factor in the program's success is the support of Senate President Peter Courtney.

Summary

This effort was initiated in 2001, with the passage of new laws that require public school buildings to have seismic life safety. The grant program was initially managed by Oregon Emergency Management, and then transferred to the Oregon Business Development Department. It has been funded by general obligation bonds. The Oregon Seismic Rehabilitation Grant Program requires that schools must be retrofitted to life safety or immediate occupancy as defined by ASCE 41-13. Projects are chosen by a selection committee with representatives from various stakeholder groups. Benefit-cost analysis is

required using an Oregon BCA Tool and the benefit-cost ratio is considered by the committee but there is not a mandate that the benefit-cost ratio exceed 1.0. The grant funds requested by applicants has exceeded the available funds each year of the program, because of the widespread need for seismic retrofits for schools in Oregon and because the grant program provides 100% funding for projects up to \$1.5 million. Retrofits with costs above the grant cap require local matching funds. The Governor's Budget for 2017-2019 includes \$200 million for the grant program, including \$160 million dedicated for schools. The key factor in its success is the leadership of Senate President Peter Courtney who advocated for this program for many years.

Source & References Documents

Oregon Seismic Rehabilitation Grant Program (SRGP)

[SESI Webinar 3 \(at 17:00\)](#)

[Webinar Presentation Notes](#)

Presentation by Gloria Zacharias as a part of the SESI Best Practices Webinars

Statewide Seismic Needs Assessment Using Rapid Visual Screening (RVS) [Senate Bill 2 (2005)]

<http://www.oregongeology.org/sub/projects/rvs/default.htm>

Oregon Geology site for the first phase of the program where DOGAMI performed Rapid Visual Screenings of all schools and other critical facilities. This site provides an overview of the project, screening results, status reports, and press on the topic.

Oregon Business Development Department (OBDD) Infrastructure Finance Authority- Seismic Rehabilitation Grant Program

<http://www.orinfrastructure.org/Infrastructure-Programs/Seismic-Rehab/>

The application page for the program. Details on who can apply, eligibility, pamphlets, etc.

Oregon Moves Toward Girding Schools Against an Inevitable Great Quake

http://dotearth.blogs.nytimes.com/2014/12/11/oregon-moves-toward-girding-schools-against-an-inevitable-great-quake/?_r=0

Article about Oregon's \$100 million allocation toward retrofitting. Includes Yumei Wang's email to SESI about the State budget

Building Safe School Programs

[1-2012 NEC memphis asce cdrm YW ECW.pdf](#)

Yumei Wang's presentation slides. Includes a selection of safe school initiatives as well as a look at Oregon's mitigation program. Shows 5 key factors determined to show seismic vulnerability and the spread of their K12 RVS scores.

Primary Contact

Gloria Zacharias, Oregon Business Development Department (OBDD), gloria.zacharias@oregon.gov

Oregon—Portland School Building Improvement Bond

Size (number of structures; one or multiple school districts? Wholesale state effort?)	Portland Public Schools (PPS) is the largest public school district in Oregon. PPS portfolio includes almost 100 sites with 85 currently operating as schools. Roughly half of PPS schools were constructed prior to WWII, half constructed between 1945 and 1965, and only 2 new schools built in the last 40 years. Over 25 schools have or will be receiving seismic strengthening by the summer 2016.
Scope of effort (screening only, retrofits, policy, etc.)	Screening, strengthening and retrofitting (in addition to other facility improvements). Incremental seismic strengthening and full seismic retrofit as part of the historic modernization projects.
Funding Sources and Amounts	Bond program resources (June 2016): <ul style="list-style-type: none"> • Approved Bond: \$482m • State Seismic Grant Funds: \$2.8m • Additional Resources: \$3.2m • Bond Premium: \$47m • Concordia University: \$15.5m Total Resources: \$550.5m
Key Players	City of Portland, Portland Public Schools, Concordia University
Screening Processes	ASCE 41-13 for historic modernized schools Previously completed FEMA 178 and other seismic reports for incremental seismic strengthening
Additional Tools Used	Seismic Expected Performance Rating
Phases and Current Status of Project	Project Status is ongoing. Incremental seismic strengthening completed during summer breaks include structural and non-structural mitigation such as URM chimney reduction, hollow clay tile bracing, roof diaphragms, URM parapet bracing, wall to roof connections and shear walls.
Was the program replicated or built upon?	The summer seismic project scopes built on/continued the incremental seismic strengthening completed as a result of the previous 1995 school construction bond.
What was the key to success? Any lessons from this process?	Guiding documents, such as Long Range Facilities Plan and Educational Specifications, are important. Bond Accountability Committee and performance audits are critical for checks and balances.

Summary

In November of 2012, the Portland voters passed a \$482 million school capital improvement bond, with 67% of voters supporting this eight-year program that we hope will be the first step in modernizing all of the schools over the next 30 years. Work is well underway on the School Building Improvement Bond. The bond is rebuilding and modernizing three historic high schools and replacing one K-8 school. It has also replaced roofs and completed seismic safety, accessibility and science classroom improvements.

Source & Reference Documents

School building school improvement bond, Portland Public Schools, web page.
<http://www.pps.net/Page/117>

Contact

Jen Sohm, Design Quality Manager, jsohm@pps.net

Jerry Vincent, Chief Office of School Modernization, JVincent2@pps.net

Utah Schools Legislation and Screening Program

Size (number of structures; one or multiple school districts? Wholesale state effort?)	Statewide – covering K-12 schools in Utah. 128 schools screened.
Scope of effort (screening only, retrofits, policy, etc.)	Policy and screening: One bill requiring districts seeking bond money to submit any RVS information they have to the Utah Seismic Safety Commission and one budget item that allocates money to screen schools. Both work towards creating a comprehensive Inventory of screened K-12 school buildings for Utah.
Funding Sources and Amounts	\$150,000 was provided from the Utah State general budget (one time item) in the care of Utah office of Education to hire contractors to complete RVS for all schools not yet screened.
Key Players	Utah Seismic Safety Commission, Structural Engineers Association of Utah, support of Utah Senators
Screening Processes	Schools screened by Utah Dept of Edu with state provided funds used FEMA 154, 2 nd Edition RVS methodology. The bill recommends usage of FEMA 154 RVS, but open to other more detailed studies from the separate screenings of schools.
Additional Tools Used	ROVER to collect, store, and evaluate data.
Number of Assessors	
Phases and Current Status of Project	Project Status: TBD. Legislation passed in 2013 after 4 years of multiple failed legislation attempts and one pilot study. As of September 2015, 70-80 school screenings have been completed under the original budget. By the end of 2015 it is expected that the remaining funding will cover all schools that have no screening data. The remaining schools have already completed RVS on their own and submitted data to Utah’s ROVER database.
Was the program replicated or built upon?	It is expected that current budget amount will cover the majority of necessary screenings. There is currently no program or legislation for retrofits.
Any lessons from this process? What was the key to success?	After multiple attempts to pass legislation, performing a preliminary study is a great next step to prove motivation for wider action such as funding and implementing retrofits.

Summary

After a 3 year struggle to get funding, in 2011 FEMA created a pilot study to show legislature that funding is needed for further study. This RVS pilot study used ROVER and showed as many as 60% of the schools screened may be vulnerable. With more bill attempts prompted by the results of this pilot study, in 2013 a Schools Seismic Safety Screening Bill and Program were approved by the state legislature and Governor’s Office. The program was a onetime budget item of \$150,000 for the

screening of all Utah schools, and the Bill required districts to submit RVS reports on pre-1975 buildings when they were looking to have a bond funding program. The project was contracted out to an engineering firm to organize and conduct screening efforts from budget funding. Districts that conducted separate screenings paid their own contractors, whereas Weber County accomplished screening entirely through volunteer effort.

Many of the schools with more resources have already completed seismic evaluations and have submitted information from these evaluations to the state's ROVER database. Seismic evaluations for the remaining schools will be completed by the end of 2015 using funds authorized from the Utah State general budget.

Sources & Reference Documents:

Utah Schools RVS Legislation

[SESI Webinar 2 \(at 26:00\)](#)

Presentation by Barry Welliver as a part of SESI Best Practices Webinar. Includes legislative story and an in depth overview of the initial FEMA Study

Utah Schools Seismic Safety Screening Bill and Program Approved by the State Legislature and the Governor's Office - April 2013

[Utah Schools Seismic Safety Screening Update Final4-013.pdf](#)

Document with written description of legislative story

Utah Students At Risk--The Earthquake Hazards of School Buildings

[Utah_Students_At_Risk.pdf](#)

Final report from FEMA RVS study

Primary Contact

Barry Welliver, BHW Engineers, bhwelliver@me.com

Utah Schools Pilot Study

Size (number of structures; one or multiple school districts? Wholesale state effort?)	128 public and charter school buildings of the 1,000 in Utah, emphasized diversity in schools selected
Scope of effort (screening only, retrofits, policy, etc.)	Screening Only
Funding Sources and Amounts	\$69,000 in grants from FEMA
Key Players	Utah Seismic Safety Commission, Structural Engineers Association of Utah. 17 engineers from the Structural Engineers Association of Utah assessed the buildings.
Screening Processes	FEMA 154 2 nd Edition RVS and ATC-67 ROVER for FEMA to collect, store, and evaluate data
Additional Tools Used	
Phases and Current Status of Project	Project Status: complete See Utah Students at Risk report for findings.
Was the program replicated or built upon?	This screening effort influenced legislation in Utah as documented below.

For a summary and resources see above entry.

Washington School Seismic Safety Pilot (Aberdeen and Walla Walla)

Size (number of structures; one or multiple school districts? Wholesale state effort?)	Two school districts, comparably sized (9-10 schools each), one from each side of Washington State. The pilot study screened a total of 35 buildings.
Scope of effort (screening only, retrofits, policy, etc.)	Screening only
Funding Sources and Amounts	\$750,000 from FEMA National Earthquake Hazard Reduction Program
Key Players	Washington State Seismic Safety Committee, WSSPC, Structural Engineers Association of Washington, Washington Association of Building Officials, Office of Superintendent of Public Instruction (OSPI)
Screening Processes	ASCE 31-03 Tier 1 (Seismic Evaluation of Existing Buildings), Life Safety Performance Objective. A team of 15 volunteer engineers inspected buildings. Additionally, two local geologists completed site class characterizations for the project.
Additional Tools Used	FEMA Hazus-MH – Input ASCE 31-03 screening data into HAZUS to estimate potential damage in two different levels of shaking – ground shaking specified in building code and a likely scenario earthquake deemed appropriate for the site.
Phases and Current Status of Project	Project Status: completed in 2010. Process and results documented in a Final Report
Was the program replicated or built upon?	The hope was that it would lead to funding of a statewide program. The results were used to compile a budget request to the Washington State Legislature for action during the legislative session. However, no subsequent action was taken. This may have been due, in part, to the fiscal climate within the state and across the country at the time the report was completed. It has spurred another effort that is now occurring in Thurston County, Washington and supported by EERI and FEMA. The process that was identified and utilized is helping with current and future efforts.
Dates and Timeline:	This was a two phased project <ul style="list-style-type: none"> • Phase 1: Compile and scan existing building drawings, conduct and ASCE 41-Tier 1 assessment along with site-specific shear wave measurements and model potential losses in HAZUS • Phase 2: Complete ASCE 41-Tier 2 assessment for two buildings chosen by the district. Cost estimates were also completed to allow school districts to apply for grants.
What was the key to success? Any lessons from this process?	While the project did not lead to widespread implementation, it was ultimately successful because it gave local school districts and the local counties information that could be used to support applications for the nationally competitive FEMA Pre-Disaster Mitigation (PDM)

	<p>Grant Program, locally competitive FEMA Hazard Mitigation Grant Program (HMGP), or local bond initiatives. It has also spurred on an additional pilot project currently underway in Thurston County, Washington.</p> <p>There were several key lessons learned from this project:</p> <ol style="list-style-type: none"> 1. Participating school districts wanted a rank-ordered list of buildings to determine where to best focus their efforts, such as considering the cost-benefit of retrofitting more vulnerable structures as opposed focusing in on less vulnerable structures where they could extend the life of the building. They could consider removing/replacing the more vulnerable structures as part of their overall mitigation strategy. 2. Ensuring engineers had drawings to review in advance of site visits helped expedite the screening process 3. Leveraging relationships with key school personnel to support the effort at both the state and local levels cannot be underestimated.
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Summary

This project was 3 year multi-hazard screening of schools state wide (with a \$750,000 budget). To ensure that this is a meaningful screening for as many as 295 districts, it was decided to automate as much of the evaluation as possible by utilizing available GIS data with limited data inputs from the districts. The process also included an innovative step-wise screening method to prioritize evaluations and retrofits. 28 districts are also planning partners (pilots) and are performing more detailed assessments with a fill in the blank “Toolkit,” local HMPs and support for development of mitigation projects. The process included auto generated reports with prioritized recommendations for next steps for accessibility to the districts.

In connection to this effort is a 2011 pilot study of Walla Walla and Aberdeen school districts and a study in Thurston County completed in 2015.

Source & Reference Documents

Washington State School Seismic Safety Pilot Project — Providing Safe Schools for Our Students
http://file.dnr.wa.gov/publications/ger_ofr2011-7_school_pilot_project.pdf
 Final Report from Aberdeen and Walla Walla, WA pilot screening project.

Washington School Seismic Safety Assessment Pilot Project
[3-Schelling-School-Seismic-Safety-Assessment-Pilot-Project.pdf](#)
 John Schelling’s PowerPoint slides on the topic from the 2013 EERI meeting

Primary Contact

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