SESI: Talking Earthquake Safety with Local Influencers and Decision-Makers

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SESI Mission, Vision & Goals

What is SESI?

SESI is a global and collaborative network of diverse, expert, and passionate professionals who are committed to creating and sharing knowledge and tools that enable progressive, informed decision making around school earthquake safety.

Our Goal:

Leverage our extensive expertise and reputation to conduct regionally appropriate actions that make a tangible and positive difference in communities around the world, by protecting the lives of all who inhabit school buildings.

Our Vision:

Serving the world as a leader in the science, public policy, and advocacy of school earthquake safety.
Why Focus on School Safety?

“Schoolchildren have a right to learn in buildings that are safe from earthquakes” (ACEHR, 2012)

Earthquakes can have both immediate and long-term impacts on school buildings, their occupants, and the surrounding community in a variety of ways.

Most devastatingly, they can cause deaths and injuries among students and staff when structures are unsafe or located in areas vulnerable to earthquakes.
Goal

• SESI is committed to creating and sharing knowledge and tools that will enable progressive, informed decision-making around school safety

• SESI’s goal is to leverage the extensive expertise of its members to conduct regionally-appropriate actions that can make a tangible and positive difference in communities around the world

• One approach is to engage school safety advocates in the challenging task of educating risk holders and appealing to whole communities to recognize and prioritize the importance of school safety before, during, and after earthquakes
Approach

• Hazardous schools exist throughout the U.S. and globally. The majority of the school districts where such hazardous schools exist are already challenged by competing economic needs and limited resources.

• To initiate action at a local grassroots level, SESI has developed a template PowerPoint that can be presented by EERI members and other school safety advocates to parent organizations, school boards, community leaders and decision-makers, and local and state agencies.

• The purpose of the PowerPoint is to describe the school safety issues of the local community.
Approach

- The PowerPoint will introduce EERI and SESI, describe (1) what the specific earthquake hazard and school vulnerability issues are in the community: (2) what can happen in an earthquake, (3) which types of buildings are most vulnerable (such as URM), (4) the impact and risk of nonstructural component failures, disruption to the community due to damaged schools, and (5) what steps can be taken to improve school safety. Resources that are available to school safety advocates will also be provided.
Three Key Points Concerning School Earthquake Safety

1. There are many schools that are vulnerable to damage or collapse in an earthquake.
2. There is limited awareness of the earthquake risk to schools so in many cases, not much is being done.
3. The importance of school earthquake safety extends beyond the classroom – it is critical to the well-being of the entire community.
Promoting Safe Buildings for Schoolchildren
“School children have a right to learn in buildings that are safe from earthquakes”

Who Are We?

- We are EERI
- We are SESI

Photo Credit: Lucy Arendt
Why Are We Talking To You?

- You have a **vested interest** in our community’s schools and children
- The more you know about earthquakes, the more you can do to **protect** yourself and the children in our community

“An ounce of **prevention** is worth a pound of **cure**”
- Benjamin Franklin, speaking in 1736 to Philadelphians about the need for fire safety
Why Are We Talking To You?

- Earthquakes can devastate schools, and the larger community, through
  - **Injuries and fatalities** of people in school buildings
  - **Damage** to — and possibly **collapse** of — school buildings
  - **Damage to building contents**
  - **Non-availability** of school buildings for community events or as shelters
3 Key Points

1. Many schools in the U.S. are **vulnerable** to damage or collapse in an earthquake.
2. Not much is being done about this, as too few people are **knowledgeable** about earthquake risk.
3. Our **community’s health and survival** depends on our schools and their safety in an earthquake.
1. Vulnerable schools

- Older school buildings may have been built to older, *inadequate* building code standards.
- School administrators may not have the *funding* to address these vulnerabilities.

*Helena, Montana earthquake of 1935*

Example of vulnerable reinforced concrete schools built prior to seismic codes or according to very old codes.

*Photo Credit: NISEE, 1935*
1. Vulnerable schools (cont.)

- Not all school buildings are built to the same standards (e.g., public vs. private schools)
- School building configuration and function can increase vulnerability – for example, schools with large assembly rooms (e.g., gyms, auditoriums) may be at greater risk of earthquake damage

Source: Earthquake Risk and San Francisco's Private Schools Report, 2013
2. Lack of awareness

BELIEF
At least some people believe that earthquakes aren’t a real or a major threat, either because they’re rare, or because they can’t recall any big ones.

REALITY
Many parts of the U.S. are prone to earthquakes, including parts that haven’t experienced them lately or often, or that haven’t experienced large ones.

Earthquakes don’t require people to know about them – they happen regardless.
2. Lack of awareness

BELIEF
At least some people believe that school buildings “must have been” built to withstand disasters like earthquakes.

REALITY
Even though children are legally required to attend school, older schools are not built to current standards and won’t withstand earthquakes to the extent that newer school buildings will.
3. Beyond the classroom

- Damage to individual school buildings, school sites, roads, and utilities can lead to school closures that last weeks, months, or longer.

- When students can’t attend school,
  - Students’ education is interrupted
  - Family routines are disrupted
  - Community recovery is delayed
Example!

- After the Mineral, Virginia M5.7 earthquake in 2011, all Louisa County school facilities were damaged.
- About 40% of the student capacity in the county was lost.
- Thomas Jefferson Elementary School (TJES) and Louisa County High School (LCHS) were closed for the remainder of the school year.
- Both schools were demolished and replaced, TJES in August 2014 and LCHS in August 2015.

3. Beyond the classroom (cont.)

- Schools are often designated as post-disaster community shelters – assuming the buildings are considered safe – because of their prime locations and large spaces (e.g., gyms).

Photo Source: Dave Gatley, FEMA
What Can Happen to Schools in an Earthquake?

- **Building damage**
  - Older, brittle buildings can partially or completely collapse

- **Nonstructural damage**
  - Even without collapse, bookshelves can overturn, and ceilings and light fixtures can fall

- **Injuries and deaths**
### The U.S. Has Been Lucky!

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<thead>
<tr>
<th>Year</th>
<th>Event</th>
<th>Magnitude</th>
<th>Time</th>
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<tbody>
<tr>
<td>1906</td>
<td>San Francisco, CA</td>
<td>7.8</td>
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<td>1925</td>
<td>Santa Barbara, CA</td>
<td>6.8</td>
<td>6:42 am, Monday, June 29</td>
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<td>1994</td>
<td>Northridge, CA</td>
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<td>2014</td>
<td>South Napa, CA</td>
<td>6.0</td>
<td>3:40 am, Monday, August 24</td>
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Only the events in **burgundy** occurred during school hours.

Source: FEMA P-1000, Safer, Stronger, Smarter: A Guide to Improving School Natural Hazard Safety
[https://www.fema.gov/media-library/assets/documents/132592](https://www.fema.gov/media-library/assets/documents/132592) (E-3)
Are We At Risk?

- Local seismic hazards and risk
- Local historical seismicity
- Significant earthquakes
Earthquakes and Seismic Hazard in Utah

- Utah, especially the Wasatch Front adjacent to the Wasatch fault, is "earthquake country"
- Nearly 80% of Utah’s population resides within 15 mi of the Wasatch fault and 75% of the state’s economy
Which Buildings Are Vulnerable?

- Those built without modern seismic provisions in the code
  - Typically, buildings built before 1975
  - Can also include buildings built later depending on the local building codes, design configuration, and inspection integrity
  - Talk to your local building department to learn more!
Which Buildings Are Vulnerable? (cont.)

- **Building material matters!**
  - Unreinforced masonry (URM) is a high risk
  - **Older concrete** buildings can be a problem in high seismic hazard areas and in areas considered to be low in seismic hazard but where significant earthquakes have happened in the past
  - Earthquakes **will find** the weak areas in otherwise well designed and constructed buildings
Unsecured brickwork crashed to the ground over Molalla High School's exits in 1993. No one was hurt because the quake occurred about 5 a.m. during spring break.

Photo Credit: Steven Nehl/The Oregonian/1993
Which Buildings Are Vulnerable? (cont.)

- Buildings with particular structural features, identified by engineering evaluation
  - Buildings of unusual shape
  - Buildings poorly tied together (e.g., walls to floors)
Nonstructural Damage

- Even with moderate shaking, you’ll see **falling** ...
  - Bookcases and cabinets
  - Light fixtures and portions of ceilings
  - Heavy pieces of external walls or decorations
- This damage can cause **serious** injury!
What Can You Do?

- Regularly practice earthquake **drills** and evacuation procedures
- Create and update **emergency plans** and supplies; educate staff, students, and families so everyone knows what to expect and what to do
- Schedule a meeting with your **local building department** to better understand your school building’s risk

Photo Credit: media.morristechnology.com
What Can You Do? (cont.)

◦ Ask engineering professionals to help you (your school, the school district):
  ▫ Identify hazards that are likely to impact the site and buildings, and use ASCE/SEI 41-13 or equivalent standards to assess buildings in earthquake-prone areas
  ▫ Prioritize vulnerabilities that impact life safety and develop a mitigation plan based on benefit/cost analysis of the options; consider all potential uses of the building
What Can You Do? (cont.)

- If you’re a member of the legislature, school district, or school board,
- And you’re in a region with high or moderate earthquake hazard ...

Consider taking the following FOUR steps to promoting safer schools...
Four Steps to Promoting Safer Schools

1. Establish programs to **identify** URM or older concrete school buildings – then, use screening or risk assessment methodologies to identify vulnerabilities, identify repair or replacement costs, and prioritize buildings for retrofit or replacement.
Four Steps to Promoting Safer Schools (cont.)

2. Establish **funding** mechanisms, financial assistance, and incentives to finance the retrofit or replacement of URM or older concrete school buildings.
Four Steps to Promoting Safer Schools (cont.)

3. Establish fully-funded programs at the state, regional, or school district levels to set criteria and standards, allocate funding for retrofit and replacement projects, and ensure quality compliance of all retrofit or replacement projects for schools.
Four Steps to Promoting Safer Schools (cont.)

4. Require structural upgrades or replacement of all URM schools and consider restrictions on older concrete school buildings in regions with moderate or high seismic hazard by 2033, the 100-year anniversary of the Long Beach earthquake in California.
Damage to John Muir School, Pacific Avenue, Long Beach (1933)
Photo Credit: W. L. Huber, USGS - Public Domain,
FIVE Major Takeaways

1. Earthquake risk is **real**, and should not be ignored, even when major earthquakes are rare.
2. Earthquakes can **damage schools**, sometimes to the point of collapse.
3. Schools not built well or in line with the most current seismic codes are at **great risk** of damage or collapse in an earthquake.
FI VE Major Takeaways (cont.)

4. Damage or collapse can lead to injuries or fatalities
5. Steps can be taken to reduce the risk of earthquakes and protect our children

We can – and must! – act today for the security and future of our kids!
Questions?

Elementary school students in a California classroom  
Photo Credit: Monkey Business Images
Resources

- EERI School Resources
  - [https://www.eeri.org/projects/schools/resources/](https://www.eeri.org/projects/schools/resources/)
- Rapid Visual Screening (RVS) and Assessment:
  - FEMA P-154, Rapid Visual Screening of Buildings for Potential Seismic Hazards
  - ASCE 41-13, Seismic Evaluation and Retrofit of Existing Buildings
  - Best Practices for RVS: [placeholder, will be coming?]
  - Case Studies of RVS of schools: [https://www.eeri.org/projects/schools/subcommittees/#eval](https://www.eeri.org/projects/schools/subcommittees/#eval)
- FEMA 395, Incremental Seismic Rehabilitation of School Buildings (K-12)
- 4th grade earthquake engineering curriculum [https://www.eeri.org/projects/schools/subcommittees/#education](https://www.eeri.org/projects/schools/subcommittees/#education)
Summary

• It is our hope that EERI members and school safety advocates who are aware of school safety issues in their local community will use this PowerPoint to initiate meaningful communication with the appropriate decision-makers.

• Once that communication link has been established, a core group of advocates can assist in moving the process forward with assistance from SESI.