CALIFORNIA CASE STUDY

SCHOOL DISASTER RISK REDUCTION:
think globally, act locally

CHILDREN AT RISK

DISASTER IMPACTS

FINDING SOLUTIONS

SAFETY INITIATIVES

TAKING ACTION

Children at Risk in California

Few would disagree that our children deserve the right to a safe education…



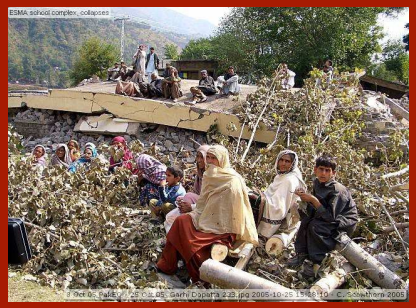

Children at Risk in California

Indeed, California has been at the forefront of improvements in earthquake safety in schools…




Children at Risk in California

… but not everyone is aware that more than 7,500 school buildings in California still pose a potential life safety threat to children



Children at Risk in California

... and many communities are not aware of what they could be doing now to prepare for an "unscheduled event" in the future.

Children at Risk in California

It would be nice to think that it "it can't happen here"....but is that true?

How many students in California will still be at risk when the next earthquake strikes?

Source: NOLA..com

What Can Happen?

Children can be injured and killed.

School buildings can be damaged or destroyed.

School supplies and equipment can be lost.

Photographer: Shinichi Kawase.
Courtesy: University of Kobe Library

Courtesy: NOLA.com

What Can Happen?

Education can be disrupted.

Lives are forever altered.

Community can be lost.

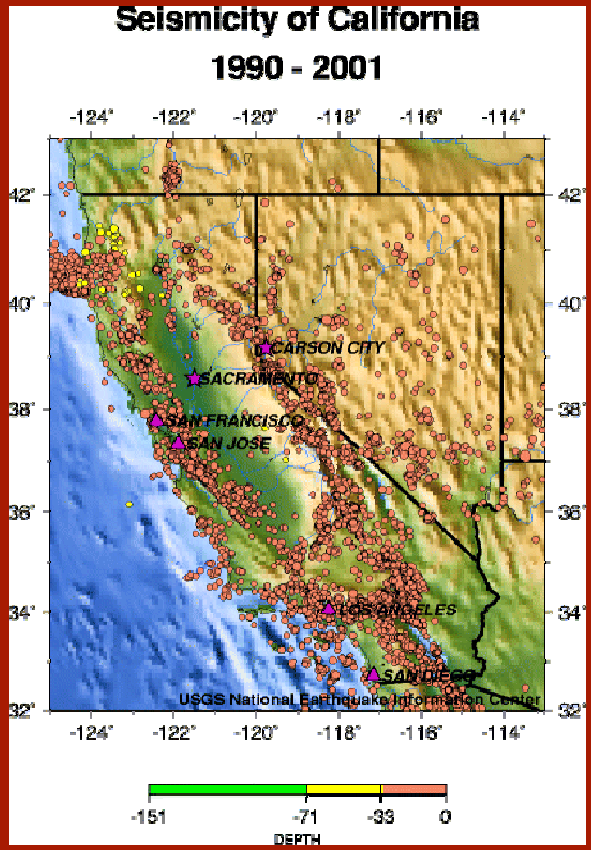
Courtesy: California, EERC, University Berkeley

Courtesy: Ministry of Education, Republic

Earthquake Hazard in California

"The probability that a major earthquake will hit in some part of California in the next 30 years is over 95 percent."

(OES, CGS 2004 Statewide Multi-hazard Mitigation Plan)



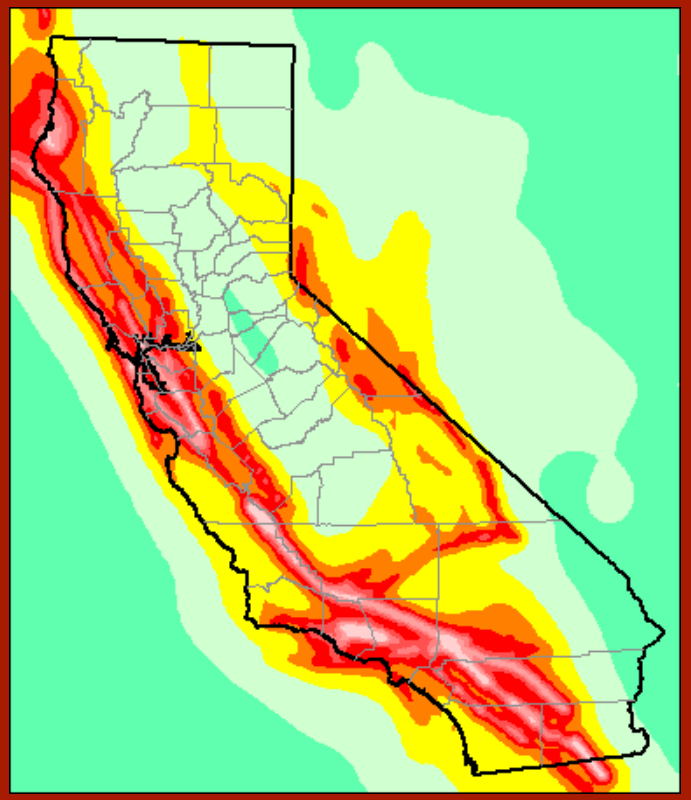
Source: USGS

The Next Major Quake: Not "If", "When..."

The 2001 FEMA working group on Catastrophic disasters identified the **three biggest U.S. urban disaster scenarios:**

- Terrorist Attack on New York City
- Hurricane in New Orleans
- **Earthquake in California**

(FEMA Working Group on Catastrophic Disasters, 2001)



Source: USGS

Students at Risk in California

- Students in California may attend a school at potential risk in a future earthquake
- **7,537** public school buildings constructed before 1978 may not be life-safe in an earthquake
- Some schools built since 1978 may also be at risk.

Courtesy: EERC, University of California, Berkeley

1933 Compton School

School Vulnerability

- Schools built prior to 1978 **may not comply with latest building codes**.
- **Older school construction designs**, though code-complaint at time of construction, do not meet current standards.
- **Aging** places older schools at additional risk.
- **Non-structural hazards** may prevent safe exit, cause injuries and deaths

Courtesy: Earthquake Engineering Research Institute

Which School Buildings Are Most Vulnerable?

- Experts believe **concrete-frame buildings** are most suspect, especially those built before the 1971 San Fernando quake prompted changes to building code requirements in 1972

Courtesy: EERC, University of California, Berkeley

Collapsed exit corridor in a Bakersfield, California school due to falling wall. 1952 Kern County earthquake.

School Disaster Impacts in California

School Disaster Impacts in California

- San Francisco, 1906
- Long Beach, 1933
- Kern County, 1952
- San Fernando, 1971
- Coalinga, 1983
- Loma Prieta, 1989
- Northridge, 1994

San Francisco, 1906

Photos Courtesy: EERC, University of California, Berkeley

Long Beach, 1933: Children Died

- **2 children killed.**
- Many more would have died if schools had been in session

Courtesy: W.L. Huber

Collapse of John Muire School on Pacific Avenue.

Long Beach, 1933: Schools Destroyed

- **70** schools destroyed.
- **120** suffered major damage.

Photo courtesy: EERC, University of California, Berkeley

Roosevelt School, Long Beach, California

Long Beach, 1933: Schools Destroyed

Engle, Harold M. Photo courtesy: EERC, University of California, Berkeley

**Compton Junior High School.
Collapsed gymnasium building: one story with brick walls and wood trussed roof.**

Long Beach, 1933: Schools Destroyed

Courtesy: W.L. Huber

Roosevelt School.

Long Beach, 1933: Education Disrupted

- *School held in tents **for 2 years***

Courtesy: of California, EERC, University Berkeley

Compton Union High School, Los Angeles

Long Beach, 1933: Catalyst for Change

Courtesy: W.L. Huber

Jefferson Junior High School.

Long Beach, 1933: Action Taken

Passage of the *1933 Field Act*, California's first school safety construction legislation

Courtesy: EERC, University of California, Berkeley

Kern County, 1952: Testing the Field Act

- **20** schools damaged or destroyed
- Most damaged and destroyed schools were built **before 1933**
- **>50%** of pre-1933 schools were damaged

Courtesy: EERC, University of California, Berkeley

Collapse of Cummings Valley School

Kern County, 1952: Non-Structural Damage

Courtesy: Earthquake Engineering Research Institute

Unsecured light fixtures like these in the Dawson Elementary School library would have caused many injuries if school had been in session.

Kern County, 1952: Progress Made

Importance of Field Act highlighted

Minimal damage to post-1933 schools.

Courtesy: EERC, University of California, Berkeley

No damage to Arvin Elementary during the 1952 Kern County earthquake.

Coalinga, 1983: Non-Structural Hazards

- **Minimal structural damage** to schools
- **Significant non-structural** damage was catalyst for 1984 Katz Act

Photo Credit: NOAA

Loma Prieta, 1989: Not All Field Act Schools Are Safe

- **5 schools seriously damaged** (3 pre-Field Act, 1 Field Act, 1 damaged by collapsed freeway)
- **1 classroom collapsed** in a post-Field Act school building (the first and only to date)
- **Weakness of many reinforced-concrete structures** demonstrated

Courtesy: EERC, University of California, Berkeley

Front view of older school showing column failures. (Watsonville, California)

Northridge, 1994: Non-Structural Hazards

- **24 of 127** affected schools suffered significant structural damage.
- If the earthquake had struck during school hours, **nonstructural hazards** would have made **safe exit impossible for hundreds of children and teachers.**

Courtesy: Earthquake Engineering Research Institute

Northridge: Non-structural Damage

- **1,500 buildings** suffered damage to suspended lighting and ceiling systems
- **Falling equipment, file cabinets, other furniture** caused significant damage
- New construction requires more secure lighting (but most don't have this yet)

Policy Solutions in California

Safety Policies in California

Field Act, 1933:
Making New Schools Safer (updated in 1976, 1978)

Garrison Act, 1939:
Making Existing Schools Safer

Greene Acts, 1967 and 1968:
Enforcement of Construction Standards

Geological Hazards Act, 1967 & Alquist-Prioto Act 1972
School site hazards study and school siting restrictions

Katz Act, 1984:
Non-Structural Safety

Assembly Bill 300:
Assessing the Safety of Pre-1978 schools

Courtesy: Man and Element

1933 Field Act:
Making New Schools Safer

- **New building code** for school construction to a higher standard.
- Safety of public schools became **an important policy goal.**
- Engineers, public officials, and general public united.
- Mandated building code and regulatory procedure for **new school construction.**
- **Required review** of school buildings upon request (by school board or 10% of local parents.

Courtesy: EERC, University of California, Berkeley

No damage reported to this one-story, wood-frame Field Act school in the 1966 Parkfield, CA earthquake.

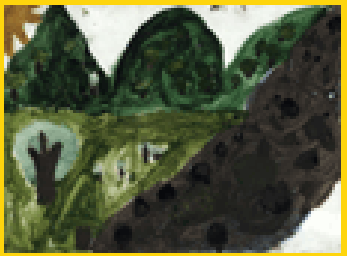
1939 Garrison Act: Making Existing Schools Safer

- Required immediate examinations of pre-Field Act schools.
- Mandated modernization of non-Field Act compliant structures.
- Key problems: Non-enforcement, no time limits or deadlines.

Courtesy: Man and Element

1968 Greene Act & Geologic Hazards Legislation/

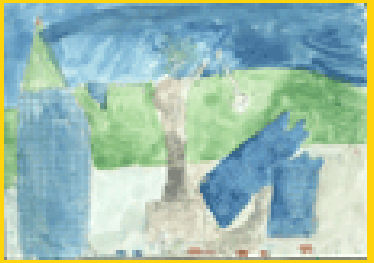
- Set deadlines for compliance with Garrison Act
- Set schedule for seismic retrofitting of pre-1933 schools – by 6/30/75
- Provided funding for school districts with insufficient funds for repair
- Mandated geological hazards studies for all new school sites
- Amended by 1972 Alquist-Prioto act



Courtesy: Man and Element

1972 Alquist-Prioto Act: Safer School Sites & UBC changes

- **1972** Alquist-Prioto Act – Safer School Sites prohibited schools sited on fault zones. (eg. Berkeley closed 2 schools as a result).
- **1976** Substantial improvements in Uniform Building Code (UBC) for seismic-resistant design.
- **1978** Improvements to UBC adopted for design and construction of school buildings.
- **Gaps:** Schools built before 1978 do not meet the most current safety standards.



Courtesy: Man and Element

1984 Katz Act: Mandating Planning and Preparedness

Schools must plan and prepare for earthquakes (public and private elementary and high schools with >50 students)

Required:

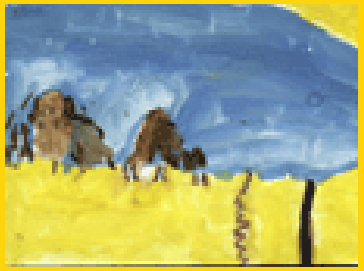
- Periodic drills
- Training for students and staff in EQ safety and response
- Non-structural hazard mitigation
- Personal liability of superintendents and board members for non-compliance

Courtesy: EERC, University of California, Berkeley

Library, Lakeside Union Elementary School. (Kern County, California)

1999 Assembly Bill 300: Seismic Safety Inventory

- **9,959 pre-1978 schools assessed** on paper for structural safety by Office of State Architects
- Over **7,500 public schools buildings at potential risk**
- Information initially available by school board request only
- In 4 years only 70 of 1,400 (3%) districts requested the information from State Architect's office.
- Information not released to public until 2005
- No follow-up mandated or funded.



Courtesy: Man and Element

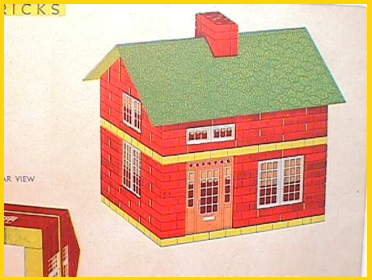
Signs of Success

- Since passage of Field Act, no school collapse or loss of life due to earthquake.
- Few Field Act schools have required demolition due to earthquake damage.
- Significant evidence shows Field Act standards are more effective than UBC standards
- Public awareness of school seismic safety issues has increased.
- New legislation is proposed (2005) to allocate $500 million for seismic upgrade to complement modernization funds (authored by State Assembly Member Loni Hancock of Berkeley).

Courtesy: Marla Petal

Remaining Risks

- Schools built before 1978 do not meet current standards and may be dangerous
- Some built since 1978 may not be safe.
- Private schools have not been covered
- Building categories that have been exempted (leased, portable classrooms)
- Non-Structural risk reduction also needed
- Public may be unaware of specific risks



Remaining Challenges

Complacency

- Fear of “Pandora’s Box”
- Battling false sense of confidence that all schools are safe
- Insufficient public pressure and demand

Need for aggressive inspection and plan review

- Opponents think it's too costly or time consuming
- Quantity of work often exceeds staff capacity

Funding Gap:

- Regulation without resources
- Burden on school district creates competition between seismic safety and education

Dependence on local action rather than state-wide solution

- School construction funding insufficient and local tax-base dependent’’’

Courtesy: FSSS

LOCAL INITIATIVES

California Communities Mobilizing
and
Advocating for School Safety

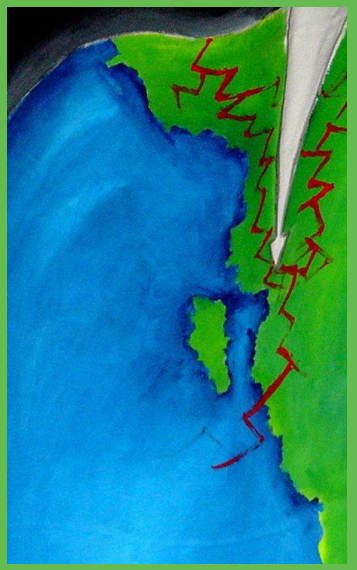
Example of Success: Piedmont

- Buildings at risk evaluated and prioritized for seismic upgrade.
- $56 million bond measure to retrofit 4 schools approved by voters in March 2006.

Courtesy: FSSS

Example of Success: Alameda

- All schools seismically upgraded to meet life safety standards.



Courtesy: FSSS

Example of Success: Berkeley

- All schools seismically upgraded, *beyond* “life safety” level.

Courtesy: FSSS

Berkeley:
Context for Success

- **Socioeconomic context**: Berkeley is a relatively affluent community.
- **Policy context:** State legislative mandates exist.
- **Resource context:** Key organizations were willing and able to become engaged.
- **"Window of opportunity":** Loma Prieta and Northridge earthquakes and Oakland and Malibu fires raised awareness before ballot initiatives.

QuickTime™ and a TIFF (Uncompressed) decompressor are needed to see this picture.

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Source
Disaster Resistant Berkeley

Berkeley:
Keys to Success

- **Community engagement**, accountability and action
- **Securing "Champions"**: Parents worked to develop alliances with other stakeholders.
- **Multidisciplinary approach** to problem-solving
- **Strategic communication** of risk and solutions
- **Seismic safety** has become a broad community value

Taking Action in California

Next Steps: Overview

- **Building level assessments** to identify which schools are at potential risk
- **Raising funds** for school seismic safety
- Policies for **retrofit decision-making** and **action-planning**
- **Incremental retrofit** (a facilities budget increase of 10% over 20 years would allow us to address the gap).
- **Linking seismic safety** and modernization decisions

Next Steps for State Legislature

- **Allocate seismic retrofit funds** in all statewide and local bond measures.
- **Fund regulatory staff** from these bond monies.
- **Ensure equal access to modernization funds.** Since modernization funds favor high growth districts, older urban districts have had less access to these funds to leverage seismic safety. Activity should be linked, but not access to funds.

Next Steps for School Districts

- **Identify** which schools are at risk
- **Share** vulnerability information openly
- **Raise local funds** to match state and federal funds.
- **Prioritize retrofit** based on occupancy levels. Support Incremental retrofit.

Next Steps for Scientists/Experts

- **Present evidence** to legislators
- **Support advocates** with evidence-based research and guidance
- **Communicate risk** effectively to non-technical audiences

Next Steps for Advocates

- Create and sustain **momentum**
- Increase **public awareness**
- **Demand assessment, action, accountability**
- **Mobilize** resources: people, organizations, knowledge
- **Support funding** measures
- Foster **safety as a community value**
- **Involved all stakeholders**: especially statewide parent, teacher, staff, student and administrator organizations.

ACKNOWLEDGEMENTS

Produced by:
Risk RED

Contributors:
Arrietta Chakos
Marla Petal
Carol Kunz
and the
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School Seismic Safety Committee

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Keith Knudsen
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