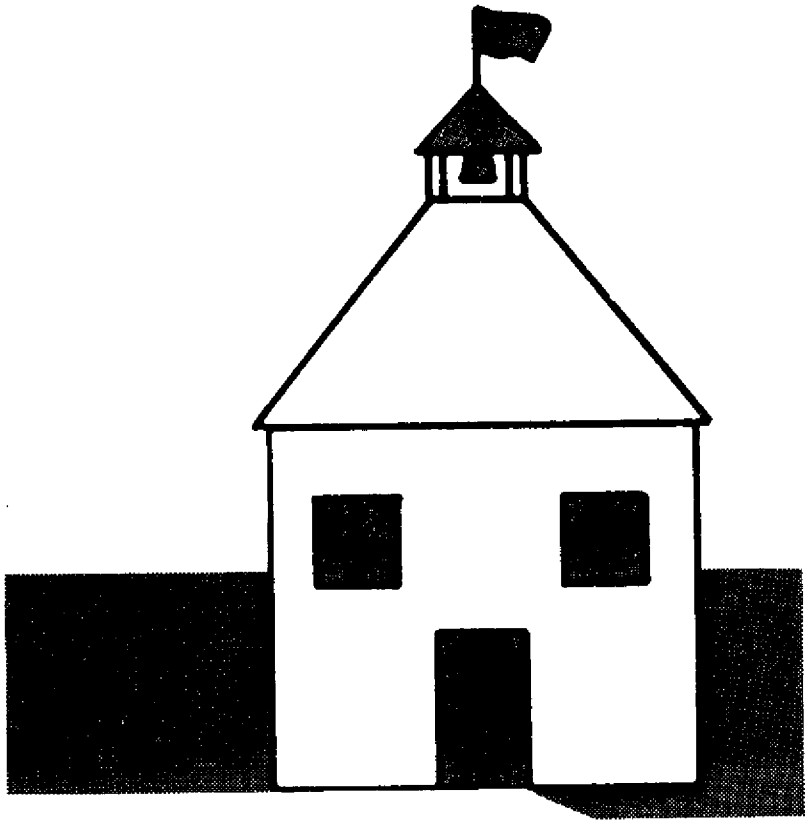
Guidebook for Developing a School Earthquake Safety Program



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ACKNOWLEDGMENTS

The **Guidebook for Developing a School Earthquake Safety Program** was prepared by Marilyn P. MacCabe, Earthquakes and Natural Hazards Programs Division, Federal Emergency Management Agency. Its design began in the summer of 1980, during a workshop on school earthquake safety and education at the U.S. Geological Survey. Since then, the guidebook has evolved to reflect the input of over 100 people who have participated in its development, review, or field test. These contributors--from the states of Arkansas, California, Illinois, Maryland, New York, South Carolina, Tennessee, Virginia, and Washington--include:

- American Red Cross representatives.
- Engineers and architects.
- Environmental education specialists.
- Federal, State, and local emergency management specialists.
- Fire safety educators.
- Geologists.
- Neighborhood earthquake safety coordinators.
- Parents and students.
- Planning specialists.
- Psychologists.
- Public works engineers.
- School district board members, superintendents, risk managers, and science coordinators.
- School principals and teachers.
- State school safety and education program specialists.
- Youth group leaders.

The Federal Emergency Management Agency extends its appreciation to these individuals, whose efforts and dedication to the earthquake safety of school children made possible the publication of this guidance and resource document.

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SECTION 1

Introduction

This guidebook is designed to assist the school community of principal, teachers, staff, parents, and students to develop and tailor an earthquake safety program for their school.

An earthquake safety program involves more than preparing a response plan. It is an ongoing activity that includes identifying the hazards in your school; conducting earthquake drills; and **involving** teachers, parents, and students in developing a plan for providing students with care and shelter until they can be reunited with their parents. An effective program also includes training and exercises, as well as classroom discussions and activities to help students understand the importance of taking quake-safe actions.

The need for an individual school earthquake safety program and an effective earthquake response plan is based on the following assumptions:

- A major earthquake can occur without warning and could occur during school hours.
- This event would cause widespread damage resulting from gound shaking and other hazards triggered by the earthquake (e.g., fires and the release of toxic materials).
- Transportation routes, telephone communications, and other utility services would be disrupted.
- Medical, fire, and rescue personnel would be severely overtaxed and would not be able to respond to every school within the affected area for several hours.

Therefore, individual school communities should prepare to be self-sufficient—capable of relying on their own resources to protect and care for the school population until outside help is available. The guidebook provides the foundation for developing this capability. **It is intended to be used by the school principal and a committee of teachers, parents, and students** as a guide and workbook for developing action plans for their school's earthquake safety program.

Because earthquakes occur less frequently than other disasters, the extra time it takes to plan for this event is often weighed against the "odds" that it will not occur in this decade, or that it will not happen while school is in session. Although many planning issues in this guidebook apply only to earthquakes, most also apply to other hazards such as fires, floods, hurricanes, and tornadoes. Therefore, the extra time you spend on earthquake planning is also time well spent in enhancing your general emergency plans.

Steps leading to the creation of action plans are outlined in **Section 2, The Planning Process.** Each remaining section of the guidebook addresses a specific program area:

Section 3, Hazard Identification, focuses on how to estimate the potential impact of a major earthquake on your city/town, school, and classrooms, and how to identify hazards you can eliminate, reduce, or only anticipate.

Section 4, Earthquake Drills, discusses immediate dangers to expect and to avoid during an earthquake, the importance of earthquake drills, and appropriate protective measures to take.

Section 5, Immediate Response and Care Requirements, assumes that principals, teachers, and other staff members will be required to carry out first aid, search and rescue, fire control, and other first-hour priority actions without assistance from emergency response personnel.

Section 6, Communication, addresses the need to develop alternative plans for communicating when electrical power and telephone services are disrupted. The section also includes suggestions for conveying emergency information to parents.

Section 7, Post-Earthquake Shelter Planning, considers the aftermath of a major earthquake and the extraordinary responsibilities you may have to assume to care for and shelter the student population beyond the normal dismissal hour.

Appendices include optional planning forms and an example of an earthquake safety program plan developed cooperatively by members of a school earthquake safety committee. A special **Teacher's Package on Earthquake Drills** is also included to help classroom teachers prepare their students to take quake-safe actions.

Take one step at a time. As you move forward, each action you take to increase the earthquake safety of your school's population will be worthwhile. Benefits derived from your efforts will extend beyond the school setting into the home and community. The preparations learned and practiced by staff members, students, and parents will help these individuals cope more effectively—no matter when or where an unpredictable emergency occurs.

SECTION 2

The Planning Process

The planning approach described in this section is one way to work toward developing action plans for your earthquake safety program. The best way to proceed, however, is **your** way. Consider the steps in this section as suggestions to help you get started. These steps cover:

- How to generate interest and recruit support.
- How to divide your planning program into manageable components.
- How to develop a simple program framework.
- How to select issues for action.
- How to prepare action plans based on **your** view of what can be accomplished within a manageable time frame.

STEP ONE: Generate interest.

If an earthquake took place during school hours, would administrators, teachers, students, and parents know how to react appropriately? Or would there be uncertainty, confusion, and needless injuries?

The following assumptions and the problems they are likely to cause reflect the current state of preparedness at most schools in high or moderate earthquake risk areas. This account is offered to help you generate interest in the need to prepare all members of the school community to cope safely and effectively during and following an earthquake.

Emergency Planning

In many communities, emergency response plans are prepared on the assumption that the schools will look after themselves. In these same communities, school plans are generally developed on the assumption that essential services and emergency assistance will be provided by community agencies. Earthquake plans, as well as plans for other potential disasters, are often based on the assumption that water, gas, electricity, food supplies, communication systems, and transportation systems will remain available and operative.

Little effective attention has been given to the necessity for self-sufficiency and the state of isolation that could realistically confront schools in case of a major earthquake.

Teacher Training

It is generally unclear just what teachers are expected to do in an earthquake emergency, and teachers are untrained for some of the responsibilities most often expected of them. For example, it is assumed that teachers will give first aid in an emergency, but few teachers are trained in first aid and there is usually no requirement for such training. Further, teachers are not systematically briefed on the many problems that must be dealt with in case of an earthquake, nor on the special needs of children on such occasions.

It is often assumed that teachers will stay with their students in an emergency until parents arrive. Some parents, however, may not be able to reach the school for many hours. From the first hour following an earthquake, teachers will be torn between responsibilities toward their students and concern for their own families.

Student Education

There is little evidence of programs for training children to understand and deal with the earthquake hazard at school, at home, and in the community. The defense that some children are frightened by thinking about earthquake danger could just as well be made against educating children for fire safety.

Parent Education

The respective responsibilities and authorities of school personnel and parents in the case of an emergency are rarely addressed. Too often, school emergency plans provide, and/or parents assume, that students will be dismissed.

When moderate earthquakes **have** occured during school hours, major problems were created by anxious parents telephoning schools and flooding areas in autos seeking to remove their children. In many instances, traffic jams were so bad that no emergency vehicles could reach the schools.

Fortunately, in many cases following these actual events, school administrators directed that no student be allowed to venture home alone. Throughout one school district, there were reports of home damage, leaking gas, broken water pipes, and downed power lines. To send students home would have forced some 12,000 children onto the city streets. Approximately 54 percent of these children would have been sent to homes where both parents were at work, many at a considerable distance from home. Children as young as age five would have been alone and in severe danger.

These and similar concerns reflecting your own state of earthquake preparedness, as well as your expectations of what could be accomplished, might be raised at faculty meetings, at district-level conferences with principals, safety officers, or board members, and at parent-teacher meetings at your school.

Once you've generated interest, keep it positive and active. With time and patience, interest should evolve into concern and, ultimately, into action.

STEP TWO: Recruit support.

At the initial stage of your planning effort, you might form an informal steering committee (of two or three members) to recommend the course for your program. Once you've made a start (which may simply be a short list of priority actions), form an earthquake safety committee to get the program moving.

Members of this committee might include:

- The principal;
- The assistant principal or head teacher;
- Teachers with current first aid/CPR training certificates;
- School secretary, nurse, custodian;
- Parent representatives; and
- Student representatives (from upper grades in an elementary school).

Do recruit one or two committee members to chair meetings and coordinate your planning activities.

As you go through this guidebook and begin to develop an action plan for your program, you may need to call on some experts for more information and advice. Eventually, you will have your own support network, which might include:

- Local emergency services officials (e.g., fire, police, city emergency managers);
- Community American Red Cross chapter representatives;
- Experts on geology, structural engineering, and geophysics at your local college or university, or in private practice;
- School district and/or city building inspectors;
- Members of local environmental groups, civic organizations, and retirement associations;

- Community/neighborhood representatives with special skills (e.g., ham radio operators, building engineers, doctors, nurses, and medical paraprofessionals); and

- Safety experts in business and industry.

A promising source of experts might be found in your current student body or alumni files under "parents: occupation."

> *Maintain good relations with your support group. Encourage personal thank-you notes from teachers and students. Letters of appreciation from principals and district offices, PTAs, etc., sent to the supervisors of the individuals assisting your school will foster continuation of their support.*

STEP THREE: Divide your planning activity into manageable components.

The components of your school's earthquake safety program should reflect plans and activities that will meet **your** expectations of what could be accomplished over a period of several years.

Figure 1 is a list of possible program components that you may want to consider. Several of these components can be further divided into planning units as shown under **EARTHQUAKE RESPONSE PLAN.**

STEP FOUR: Develop a simple outline for your program.

At this early stage of planning, a simple outline could include:

- A statement of purpose, and

- One long-term goal and one or two **easily attainable** short-term goals.

- **HAZARD IDENTIFICATION**
- **EARTHQUAKE DRILLS**
- **EARTHQUAKE RESPONSE PLAN**
  - A chain of command.
  - A set of procedures for:
    - Post-earthquake building evacuation;
    - Student and staff safety (search and rescue, first aid, and record keeping);
    - Building security (fire control, utilities check, damage assessment); and
    - Communication (on- and off-site).
  - Staff roles and responsibilities.
  - **Simple** lists of **specific** actions to be taken by all staff members during and immediately following an earthquake.
- **EARTHQUAKE EDUCATION**
- **TRAINING PROGRAMS**
- **HAZARD REDUCTION PROJECTS**
- **SHELTER PLANS**
- **EQUIPMENT AND SUPPLIES**

Figure 1. SUGGESTED PROGRAM COMPONENTS

STEP FIVE: Identify planning issues.

The checklists and suggestions in Sections 3 to 7 will help you identify the planning issues and problems you may want to consider in developing an action plan for reaching your goals.

A form for listing planning issues and ranking their priority is provided in Appendix A.* This form, **Overview of Planning Issues,** is offered as a planning tool to help you (1) select the issues you may want to consider now, and (2) set aside issues that can wait until you've gathered the energy and "people support" to address them.

STEP SIX: Recommend strategies for resolving planning issues.

Now you've reached a point where you can be creative and imaginative. The process for generating strategies for resolving planning issues and problems can be an invigorating "brainstorming" session. If you decide to select this course, follow three rules:

- **Set a time limit** for generating recommendations for each issue (five or ten minutes, depending on the number of participants).
- **Impose no boundaries.** Encourage creativity by advising participants that all recommendations are welcome, regardless of time or cost considerations.
- **Permit no discussion at this time.** Discussions concerning the advantages and disadvantages of each recommendation would follow the brainstorming session.

The **Overview of Planning Strategies** form (in Appendix A) could be used to record recommendations, then used to estimate time and/or cost for carrying out each recommended action and fitting each action into immediate, short-term, or long-term schedules.

Once you've weighed the advantages and disadvantages of each recommendation for one or more planning issues, select those you want to work on.

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*Use of all planning forms provided in Appendix A is optional.

STEP SEVEN: Prepare committee work plans.

Work plans or action plans are a good way to chart your course and your progress. They give you an opportunity to record accomplishment of each task as an achievement, a milestone. If you choose to take this step, translate the recommendations you decided to work on into planning objectives—statements of WHAT you intend to accomplish. You may wish to use the **Committee Work Plan** form in Appendix A to add the HOW (tasks), the WHO (whoever has time), and the WHEN (deadlines for completing each task).

Another option is to use the **Earthquake Safety Action Plan** form (Appendix A) to display tasks and activities for each objective on a timeline. This form could be modified to reflect several school years.

Your action plans and their timelines should reflect your expectations of what can be accomplished within a manageable time frame. For example, consider:

- "No cost" actions that could be taken during the current school year, over a short (two- to three-year) term, and over a long (four- to six-year) term.
- Actions that could be phased into routine maintenance schedules, teacher in-service training, or PTA agendas.
- Actions that may require school district and/or school board approval.
- Actions that could be accomplished in the short term (with a little help from school fundraising activities).
- Actions that could be accomplished in the long term with school district support.

Need More Help?

As the Acknowledgments page of this guidebook indicates, many people are committed to helping school communities develop effective earthquake safety programs. Several of these individuals are currently developing additional information about program areas such as earthquake education.

If you want to be included on our mailing list for future publications, write to:

Federal Emergency Management Agency
Earthquakes and Natural Hazards
Programs Division, SL-NT
500 C Street, S.W.
Washington, D.C. 20472

SECTION 3

Hazard Identification

This section is intended to help you identify potential earthquake hazards at your school. Regardless of your current capability to reduce hazards, simply knowing what to expect is the foundation of quality plans and procedures for conducting classroom and post-earthquake building evacuation drills and for preparing response and shelter plans.

Your hazard assessment should also consider the potential impact of a major earthquake on your community and the probable hazards it could cause. This broad view will help you to anticipate extraordinary problems. For example, additional plans will be required if your school is located below a dam or near a hazardous materials site.

Checklists in this section cover:

- How to identify potential earthquake hazards in classrooms.
- How to identify prevalent hazards throughout school buildings.
- How to identify potential earthquake hazards along building evacuation routes.
- How to identify potential earthquake hazards in the neighborhood and community.

As you identify potential hazards, put into perspective those you can eliminate, reduce, or only anticipate. You'll discover that many hazards can be reduced substantially or even eliminated with little effort and no cost (e.g., removal of heavy objects from high shelves). Other hazard reduction measures might be phased into your routine maintenance schedule. Since the more costly measures are likely to compete with other budget items, you may wish to develop a plan to reduce a few hazards each year.

STEP ONE: Obtain or draw a map of school and school grounds.

This combination plot map and floor plan will serve many purposes. It will be used to note potential hazards and the location of utilities, emergency equipment, and supplies. Further, it will provide a basis for (1) establishing an evacuation route; (2) identifying a safe, open-space assembly area; and (3) developing procedures for conducting emergency response activities (e.g., search and rescue, damage assessment, etc.).

Mark clearly by name the location of classrooms, library, and other activity rooms, restrooms, heating plant, hallways, and all doors and closets. In addition, locate:

___ Main shut-off valves for water and gas

___ Electrical power master switch

___ Stoves, heating/air-conditioning equipment

___ Chemical storage and gas lines in laboratories

___ Hazardous materials stored by custodians and gardeners

___ Portable, battery-powered PA equipment/radios/lighting

___ Fire extinguishers

___ First-aid equipment

___ Outside water faucets/hoses

___ Overhead power lines

___ Sewer lines

___ Underground gas lines

> *As you work through this and subsequent steps, make a list of your information needs, such as the locations of sewer and underground gas lines. Then contact the appropriate information source(s) in your school district or community (e.g., the Fire Department or Public Works Office).*

Before you proceed with the next steps, do review the abbreviated account of school damage resulting from the Coalinga Earthquake (Appendix E). This report will help you gain a better understanding of the problem. Also note in Appendix E the illustrated suggestions for reducing potential hazards.

STEP TWO: Identify potential earthquake hazards in classrooms.

The checklist below will help you identify common classroom earthquake hazards that can be reduced or eliminated at little or no cost. You may wish to task a subcommittee to survey each classroom. Or you may decide to ask classroom teachers to conduct their own hazard assessment. The **Classroom Hazard Inventory** form (in Appendix A) can be used with either approach.

Figure 2 shows how the committee could use the information from the completed inventory forms to (1) determine the scope of potential classroom hazards throughout the school, and (2) develop plans to reduce these hazards.

___ Are free-standing cabinets, bookcases, and wall shelves secured to a structural support?

___ Are heavy objects removed from high shelves?

___ Are aquariums and other potentially hazardous displays located away from seating areas?

___ Is the TV monitor securely fastened to a securely fastened platform?

___ Is the TV monitor securely attached to a portable (rolling) cart with lockable wheels?

___ Is the classroom piano secured against rolling during an earthquake?

___ Are wall-mounted objects (clocks, maps, etc.) secured against falling?

___ Are hanging plants secured to prevent them from swinging free or breaking windows during an earthquake?

> *Encourage student participation in this hazard assessment. The **Teacher's Package on Earthquake Drills** in Appendix B contains a classroom activity designed to increase student awareness of earthquake hazards and student resourcefulness in identifying ways to reduce hazards.*

COMMITTEE WORK PLAN
CLASSROOM HAZARD ASSESSMENT

- Tally classroom hazards from **Classroom Hazard Inventory** forms.
- Recommend remedies/objectives.
- Develop and assign tasks.

Planning Problem: Classrooms contain:

___ unsecured bookcases.

___ unsecured wall shelves.

___ unsecured freestanding cabinets.

___ unsecured TV monitors.

___ rolling pianos.

___ hanging plants.

___ heavy objects on high shelves.

(Give numbers of bookcases, cabinets, etc., involved.)

Recommendation: Determine and implement best procedures for securing bookcases, cabinets, wall shelves, TVs, and rolling pianos.

Tasks:

- Meet with maintenance personnel at school or district office.
- Determine whether or not parents can be recruited to help.
- Determine cost of bolts, brackets, etc.
- Identify possible funding support.
- Establish work schedule.
- Conduct project.

Person Responsible: _____ Report Due: _____

Figure 2. COMMITTEE WORK PLAN FOR ADDRESSING CLASSROOM HAZARDS

STEP THREE: Identify common earthquake (and other) hazards throughout school buildings.

___ Are toxic, corrosive, and flammable materials securely stored to withstand falling and breaking?

___ Are warning signs posted in areas housing hazardous materials?

___ Are appliances (e.g., water or space heaters) securely anchored?

___ Are fire extinguishers checked annually (or in accordance with fire code requirements)?

___ Are fire extinguishers secured against falling?

___ Are office file cabinets secured against falling; do file drawers have adequate latches to prevent contents from spilling?

___ Are light fixtures adequately supported?

___ Are windows near exits made of safety glass?

___ Are "portable" buildings properly tied to foundations?

___ Are automatic gas shut-off valves installed?

STEP FOUR: Identify potential hazards along building evacuation routes.

The key to developing procedures for a quick and orderly evacuation is a thorough assessment of the hazards likely to be encountered enroute from classroom and other activity rooms to safe, open-space areas. Help with this assessment and subsequent planning steps may be obtained from your local Fire Department.

___ Do hallways and/or doors contain glass panels?

___ Are these panels of safety (tempered) glass?

Check fire code requirements for safety glass along evacuation routes.

___ Do lockers, bookshelves, and other storage units line hallways?

Following an earthquake, hallways may be cluttered with debris from ceilings, fallen light fixtures, broken glass, and toppled storage units. Students should be advised to anticipate these hazards.

___ Is lighting dependent on electricity rather than sunlight?

If the lighting system fails in enclosed hallways or stairways, resulting darkness will make it difficult to navigate safely. If emergency (battery-powered) lights are available, be sure to secure them against falling.

___ Does your school building have elevators?

Elevators are extremely vulnerable to damage from earthquakes. Ground shaking may cause counterweights and other components to be torn from their connections, causing extensive damage to elevator cabs and operating mechanisms.

Post signs near elevators prohibiting their use in the event of fire AND earthquake.

___ Do building exit routes pass through arcades, canopies, or porch-like structures?

Columns supporting arcades or porches may fail and roof overhangs may sag or fall.

___ Are clay or slate tiles on roofs of school buildings?

___ Is school building faced with parapets, balconies, or cornices?

Roof tiles, parapets, balconies, cornices, and other facades and decorations may fall during an earthquake. And, because they have been weakened, these components may fall after the ground stops shaking.

The greatest danger exists directly outside building exits. Students should be cautioned to move quickly past these hazardous areas.

___ Are gas, sewer, and power lines near outdoor assembly area?

STEP FIVE: Identify potential hazards in the neighborhood surrounding your school.

Locate the following potential hazards on a street map available from your city's Planning Office, Chamber of Commerce, or an auto club:

___ Facilities containing toxic, chemically reactive, and radioactive materials (manufacturers and users; e.g., gas stations)

___ High-voltage power lines

___ Transportation routes of vehicles carrying hazardous materials (freeways, railroad tracks)

___ Major underground gas and oil pipelines

___ Underground utility vaults and above-ground transformers

___ Multi-story buildings vulnerable to damage or collapse

___ Water towers, water tanks

Many of the above potential hazards are not readily apparent. Help in identifying their location may be obtained from your Fire Department, city/county Public Works Office, and Building Inspection Department.

STEP SIX: Determine the vulnerabilty of your community to the following earthquake effects.

___ Strong to violent ground shaking

___ Flooding from collapsed dams/levees

___ Landslides

___ Tsunami (seismic sea waves)

Sources of information about the history of earthquakes in your area and maps depicting the level of ground-shaking intensity from past and projected earthquakes include your State geologist, city/county Planning Office, and geology or geophysics departments at colleges and universities. Information, publications, and maps may also be obtained from the U.S. Geological Survey, Office of Publications, 503 National Center, Reston, Virginia 22092.

Dam failure inundation maps and maps depicting potential landslide areas may be available from the State Dam Safety Office and the State Geological Survey, respectively. A city/county Planning Office or Office of Emergency Services may also have maps or information.

Contact the local or State Office of Emergency Services for information about tsunami risk areas and warning procedures for the coastal areas of Alaska, California, Hawaii, Oregon, Washington, and U.S. Territories.